

A Frame-Based Theory of Information Behavior: A Grounded Theory Study

Charles M. Naumer

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Reading Committee:

Karen Fisher, Chair
Michael Crandall
David Hendry
Hans J. Scholl

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University of Washington

Abstract

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Charles M. Naumer

Chair of the Supervisory Committee:
Karen E. Fisher, Professor
Information School

Information needs is a difficult phenomenon to understand as well as to define (Case, 2012). Understanding the way people identify their information needs is considered very difficult to assess given that they exist in someone's head (Belkin & Vickery, 1985). Indeed, Wilson (1981) suggests "it may be advisable to remove the term 'information needs' from our professional vocabulary and to speak instead of information seeking towards the satisfaction of needs" (p. 9). Leading in this direction, Taylor's (1968) foundational theory of information need has been criticized for its receipt of little empirical validation (Nicolaisen, 2009). Therefore, the question is how does one study information need and where does it fit within the field's theoretical understanding of information behavior.

This question leads to a primary research objective directed at exploring the relationship between the way people frame a problem and the way they define their information needs. The concept of framing - used in many cognate fields - has not been widely applied in information science. The use of framing as a knowledge representation construct is explored in terms of how it might relate to information needs and inherent concepts of information seeking and use.

A multi-dimensional, in-depth, long-term case study methodology was employed to collect data. The complex problem environment chosen was parents' sensemaking behavior when choosing a school for their child. As part of this methodology, software was developed to capture or surface participants' mental activity associated with framing the problem and defining their information needs. Participants used the software for a seven to ten week period as they attempted to make sense of the issue of school choice. Participants also kept journals documenting their thought processes and were interviewed every other week throughout the study. As a result, data supporting the study consisted of software usage logs, journal entries, user generated knowledge maps, and extensive interview data.

A constructivist grounded theory approach was used to guide data collection and analysis, and theory development. Using this approach the frame-based theory of information behavior emerged. This theory explains information behavior in terms of four key concepts: frames, information needs, information and context. These four concepts are described as continually evolving through processes of development and reflection.

The proposed frame-based theory identifies frames as knowledge representation constructs that offer a way of understanding information needs in the context of making sense of complex problems. Key implications of this research include: 1) frames as a key concept for understanding information behavior, 2) the definition of information needs as a filter between a person's framing of an issue and the information environment, 3) integration of the concept of context into our understanding of information behavior, 4) development and reflection loops as a means of describing the interaction between the

four key elements of the model, 5) a way of connecting and extending information science to other disciplines through the construct of a frame, and 6) an approach to informing the development of systems and resources that support sensemaking.

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Although, I never had the pleasure of meeting Dr. Robert Taylor, I felt an instant kinship to him as his work reflected a commitment to identify ways in which information scientists could “add value”. His writings reflect an earnest desire to help people and understand ways in which information scientists can better help people. His work on question-negotiation shows a commitment to those ideals. His work on value added approaches situates the work we do as information scientists as in service to mankind.

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Chapter 1: Introduction to the Study

The following study is submitted to satisfy the requirements of the dissertation degree at the University of Washington's Information School. This study will identify the research objectives pursued, the significance of these research objectives, the research supporting the exploration of these objectives and the methodology by which these problems will be explored.

Research Motivation and Assumptions

As is the case with other studies regarding policy and decision making processes, the personal motivation for this dissertation research is derived from the hope that mankind might better use information to make sense out of complex issues and in doing so make better decisions regarding important problems facing mankind (Schön & Rein, 1994). The Internet has enabled the creation and availability of vast amounts of information. The availability of information has the potential to improve people's lives by improving decision making and understanding of complex issues. However, it also has the potential to mislead, confuse and obstruct people from understanding these same issues.

The collective decision making of individuals has a profound impact on the well-being of mankind. Personal choices regarding health, education, careers, parenting, energy use and finance greatly affect the well-being of a civilization. Also of great importance are the voting decisions that shape public policy in a democracy. As the

world becomes more connected, the importance of individuals' collective decision making and sensemaking is more important than ever.

In the past decade, the focus of Internet based systems has been on information access rather than information understanding. In order to realize the potential of these new technologies to improve the capabilities of mankind, methods and practices need to be developed to support people's efforts to understand complex issues and engage in good decision making processes. One of the primary challenges facing information scientists must be to create better systems to support sensemaking. It is my hope that this research may play a role in improving the way we understand information behavior and that this new understanding leads to the development of more effective research practices and the development of systems to support peoples understanding of complex issues and decision making.

This study is informed by findings from a pilot study conducted in 2005 (Naumer, 2005). The 2005 study identified the framing behavior of parents attempting to choose a school for their child. The parents interviewed and observed demonstrated active patterns of framing the issue and creating structure around the issue as a form of sensemaking. Based on their framing of an issue, they identified their information needs which supported their decision making process. This study was instrumental in identifying the research objectives described in the following section.

Research Objectives

The following research objectives serve as the starting point for this study: To better understand the relationship between the development of a person's framing of a

complex problem and his or her identification of the information needed to understand the problem and make a decision?

This objective is made more specific by considering the following questions:

1. What factors and processes contribute to a person's information need development?
2. What factors and processes contribute to a person's framing of a problem?
3. What are the specific linkages between a person's framing of a problem and their identification of information needs?

Figure 1 visually describes the research area of inquiry as initially defined. The overarching context for the study is the sensemaking process individuals might engage in while attempting to understand and make a decision regarding a complex problem. Of particular relevance to this study are the following: 1) the development of an individual's information needs associated with the problem as described by Taylor's information needs model, the 2) framing of the problem within the context of the participant's experience using a conceptual mapping approach, and finally 3) the relationship between information needs development and framing processes.

Complex Problem Sensemaking (School Choice)

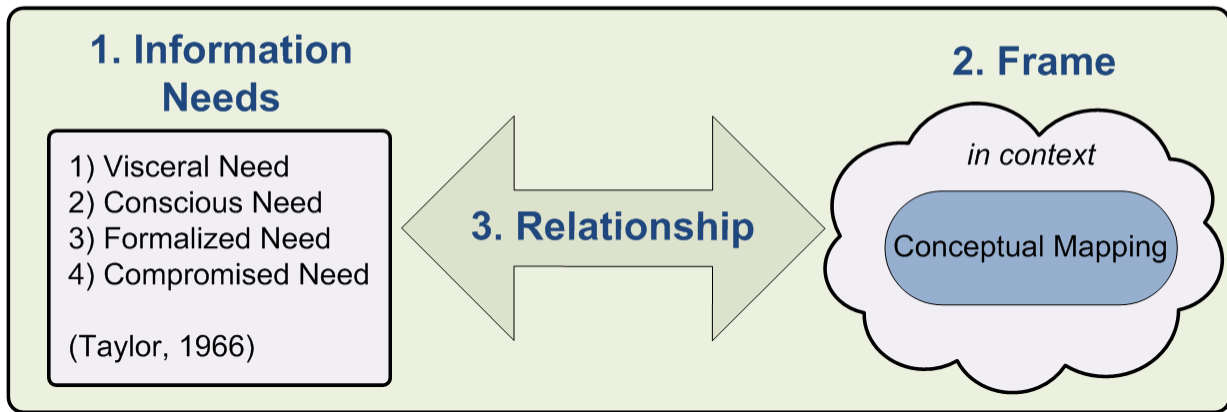


Figure 1: Research Objective Diagram

Research Justification

Researchers in the fields of information science, decision sciences, public policy, education and communication have worked hard to better understand and improve decision making processes. The objective of this research study is to expand on the existing knowledge base in the following ways.

Information Needs Research

An exploration of information science literature reveals a dearth of information needs research related to 1) motivations for identifying information needs, 2) human processes related to the development of information needs in a problem Based and “real world” work context, and 3) social approaches to developing conceptual definitions of information need (Hjørland, 1997a; MacMullin & Taylor, 1984; T. Wilson, 2006). In general, there has been relatively little research conducted regarding information needs compared to other aspects of human information behavior.

In the 1960's the topic of information needs and the recognition of information needs as something that is constructed was first described by Robert Taylor (R. Taylor, 1968; R. S. Taylor, 1962). Additionally, information needs played a role in the information behavior models developed by Belkin, Chatman, Dervin, Ellis, Fisher, Kuhlthau, Savolainen, and Wilson among others (Bates, 1989; Belkin, 1980a; Chatman, 1992; Dervin, 1983, 1986; Ellis, 1989; Fisher, 2004; Carol Collier Kuhlthau, 2004; Savolainen, 1995; T. D. Wilson, 1999a). Despite information needs being an important part of all of these models, the lack of empirical research on information needs has continued to be a topic of discussion within the information science literature (Hjørland, 1997b; Markey, 1981; Nicolaisen, 2009).

Perhaps the best known research around the topic of information needs was conducted by Robert Taylor. Taylor's information needs model has been widely cited for the past several decades. Much of the information behavior research in the 1960's and 1970's focused on a highly individualized view of human behavior. In recent years, research has recognized the importance of social processes and context as part of human information behavior. In light of this research, the work of pioneers such as Taylor need to be examined to consider the role social processes and technological evolutions in the context of people's development of information needs.

Problem Framing Research

In other fields such as communication studies and public policy, the concept of framing has been used to describe the way that problems are described and conceptualized. The concept of framing has received little attention within the field of

information science. Preliminary research indicated that this concept might be an important way to understand information need development (Naumer, 2005).

This study approaches the issue of framing based on a social constructionist view of information (Tuominen & Savolainen, 1997). The constructivist perspective contends that people create mental representations of situations or problems and that these mental representations drive their behavior. Social constructionists understand the construction of these mental models as occurring through social discourse. Knowledge about reality is a social product created through conversation and interaction between people. Dervin argues that “knowing is made and remade, reified and maintained, challenged and destroyed in communication: in dialogue, contest and negotiation” (Dervin, 1994). It is from this perspective that the concept of framing will be defined.

Information Framing and Information Needs Development Research

Several important information science researchers have used the paradigm of a gap to explain the motivations for information seeking behavior (Belkin 1980; Dervin 1986; Kuhlthau 1991). However, little attention has been paid to how these gaps develop. Traditionally, information science literature has been concerned with how to bridge the gap through the use or application of information rather than how the gaps themselves develop. The objective of fields such as information retrieval and information science has been to meet users’ information needs which are often characterized by a so called gap in knowledge.

Of particular relevance to my interest in the framing of information is the initial stages of needs development. Specifically the ways in which people first build their understanding and conceptualization of their information needs. The work of Taylor

and his four phases of information needs development, as well as Belkin's ASK theory and Dervin's sensemaking approach will be examined in the context of framing formation (Taylor 1968, Belkin 1980, Dervin 2003).

As argued by Wilson, for several decades there has been very little research done on the motivations of people in seeking and using information (T. Wilson, 2006). There is a gap in the research regarding the conditions and processes that motivate information seeking and influence a person's definition of their information needs. The development of theories and models to explain the way the framing of an issue impacts a person's motivation to seek information and their understanding of their information needs may address a gap in the information behavior research.

Public Policy Research

From a policy perspective, there has been strong interest in developing frameworks to be used for the purposes of improving policy making processes and resolving conflicts. Schön's work on frame reflection and Checkland's soft systems methodology are two examples. Most of this research has been focused on exploring people's values, expectations and perceptions as opposed to understanding how information influences people's conception of policy problems (Solesbury, 2005).

The exploration of the definition of people's information needs in a policy context will begin to address the way people think about policy issues from an information perspective. This research examines information behavior in the context of a public policy issue, specifically school choice. The use of this context may help define the way information needs are developed and associated with a person's understanding of complex problems associated with many public policy issues.

Research Purpose

The primary purpose of this study is to explore the concepts of information, information needs and framing and the relationship between these entities. Based on this research, theory was explored that may be used to explain this phenomena. The development of this theory includes examining whether a person's framing of a problem domain affects their understanding of their information needs, whether a person's understanding of their information needs affects their framing of a problem, and how much of a person's defined information needs stem from their explicit framing of a problem. Additionally, this study explores how the social exchange of information affects participant's framing of a problem and information need development.

In order to explore the existence of these relationships it was important to develop a preliminary model identifying the different aspects of information needs and information framing. By clearly identifying different attributes and aspects of information needs, the impact of information framing was ascertained and vice versa. Therefore, a model describing information needs was developed. This model identifies attributes that we might assign to an information need such as how concrete the need is, how well developed it is, how difficult it might be to attain information to address the need, and whether information supporting it is likely to be objective or subjective. The model also identified aspects such as motivations for information needs, how social exchanges of information trigger information needs and how context relates to an information need.

Similarly, a model identifying attributes and aspects of information frames was also developed as a means of informing theory development and the initial stages of data

analysis. Factors such as how frames can be explicated, the degree to which frames are dynamic, triggers that change frames, and how context impacts the framing process were considered. The development of a preliminary model allowed information frames to be explained and explored throughout the course of this study.

Lastly, software played an important role in the study. Online software was used to support the collection of data regarding the way people define their information needs and frame problems. This software undoubtedly influenced people's process of understanding their information needs and the way they frame a problem. In order to account for the influence of the software, the interaction of the software was studied. As a result, this study yielded important information about ways in which tools might support people's development of information needs and information framing.

Definition of key terms and concepts

In the context of this research study, the concepts of “complex problems”, “framing”, and “sensemaking” require preliminary definition.

Complex Problems

The classification of types of problems has had important implications to disciplines that study problem solving. Some of the different types of classifications refer to how well a problem is defined and whether the problem is static or dynamic. Complex problems have characteristics described by Rittel and Webber's definition of “wicked problems” (Rittel, 1973). As will be discussed further, “wicked problems” are ill-defined problems that are circular and dynamic. There are many solutions to this type of

problem and it is very difficult to determine the “best” solution given the dynamic nature of the problem.

Framing

The concept of framing has been used in many different contexts across academic disciplines. In the context of these research objectives, framing is defined as situating the problem within the context of a person’s experiences and knowledge. Framing occurs when a person identifies key conceptual aspects of a problem that they can make sense of in terms of their experience and knowledge.

Sensemaking

The concept of sensemaking has been defined in multiple ways. In the context of the stated research objectives, sensemaking refers to the interactive process of exchanging information toward achieving the goal of better understanding a problem. This definition reflects aspects of communication underlying the sensemaking process and its continuous dynamic nature.

The statement of these research objectives makes the assumption that framing plays a role in the way people engage in sensemaking. It also assumes that the framing of issues impacts the development of a person’s information needs, and conversely, that information need development impacts a person’s framing of an issue. Further clarification of the terms used as part of the description of the research objectives and the underlying assumptions implicit in the approach to studying the research objectives will be addressed in subsequent chapters.

The term sensemaking has been spelled different ways by various researchers. For the purpose of this research study the generic reference to the term will be spelled as “sensemaking”. When referring to Dervin’s approach the term will be spelled as “Sense-Making” which is the spelling Dervin has designated to her representation of the concept.

Scope of Study

As will be described, the study follows a grounded theory approach guided by the research objectives identified. The primary objective of the study is to investigate the phenomena of framing and information need development. Based on this investigation, the development of theory allowing us to better understand the phenomena is explored.

The methods for data collection and breadth of human experience described as part of this study created many topics for exploration. For example, the use of a software system to collect information raises many interesting questions related to the human computer interaction dynamics observed. Similarly, the context of school choice and the data collected regarding parent’s decision making processes regarding this choice provide opportunities for a qualitative exploration of parent’s information and decision making behavior. These areas of inquiry were explored to a limited extent in relation to their impact on the quality of this study and as a means of building the basis for the development of theory. Therefore, this study is bounded by the exploration and analysis of the data within the defined scope of building theory as practiced through a grounded theory approach.

Chapter 2: Literature Review and Research Grounding

Introduction

This chapter examines the literature related to problem framing and information needs development. The result of this examination will be to situate the research objectives within these domains, to show this research's relevance to these fields and the how the research addresses gaps in the literature.

Important to the examination of the stated research objectives is the definition of terms used to describe the problem. As stated, the definition of terms such as sensemaking, information needs and wicked problems have important implications toward clearly identifying the phenomenon studied as well as the research approach adopted. This chapter will further define these terms and clarify the theoretical foundation supporting the approach to understanding the research objectives.

The research objectives are firmly situated within the discipline of information science building upon the work of information scientists such as Robert Taylor, Brenda Dervin, Tom Wilson and others. The objective of this study is to build new knowledge within the information science literature around processes of framing and information need development in the context of complex problem solving. The relationship between problem framing and information need development is explored.

The study pays particular attention to “conceptual” information”. Information that serves the primary purpose of describing the ways people might conceptualize a topic or issue. This type of information is different than “factual information” directed at establishing a truth claim to be supported or refuted.

Much of the work considered in information science is related to satisfying an information need. This approach assumes that a person has conceptualized the issue and is able to express their information need in concrete terms. Examples of these types of needs are locating a web page, requesting a book, accessing a document or obtaining a statistic. Relatively little work has been focused on the use of information to conceptualize an issue in the context of need development.

Although the research question is situated within the discipline of information science, the design of the study draws heavily on work in other disciplines. Multiple disciplines have developed research regarding the central concepts of sensemaking, problem solving, and framing. These concepts do not belong only to one discipline. Complex social problems have multiple facets that may be informed by work in many academic disciplines. Methodological challenges to addressing this problem may also be informed by methods in other disciplines.

Information Need

Information need is one of the most central concepts within information science (IS). Libraries and other information systems exist because people seek information. An in-depth understanding of “information needs” is critical to answering some of the larger questions facing IS from an individual, organizational, and societal perspective. These questions include: (1) how are information needs created? (2) what motivates people to seek information? (3) how do people express their information needs? (4) how does relevance affect information need development? (5) how do people organize and plan for the expression of information need? (6) how might systems be developed to

improve information need development? and (7) how do people define their information needs when seeking information to solve a problem?

The Definition of "Need" in Cognate Fields

The concept of "need" is unsurprisingly central to many different disciplines. Perhaps the best known is psychology and Maslow's hierarchy of needs (Maslow, 1943). Maslow's theory of human motivation contends that human needs can be organized into a hierarchy or a pyramid of five types of needs. At the bottom of the pyramid are **basic or physiological needs** such as breathing, food, water, sex and sleep. The next level relates to **safety** including physical security, employment, property and resources. Above this level is a sense of **love and belonging** associated with friendship, family, and intimacy. At the next level is **esteem** which is reflected in self-esteem, confidence, and respect by others. Lastly, Maslow described the highest level of need being that of **self-actualization**, which is characterized as involving personal development associated with morality, creativity, spontaneity, and problem solving. Maslow's hierarchy is often used as the basis for understanding human motivation. Another, simpler, categorization of human need by psychologists is that of: (1) physiological need, (2) affective need, and (3) cognitive need (T. D. Wilson, 1981).

Human needs also factor centrally in the field of economics as a component of an understanding of the demand for goods and services. Human needs theory has played a prominent role in political economy research as a means of supporting economic development theory. For example, the political economist and Nobel prize winning scholar, Amartya Sen, based his arguments on the moral grounds for public spending on the basis of a definition of human needs (Sen, 1970). Political scientists use theories of

human needs as a way to better understand conditions for peace, conflict resolution, and negotiation (Burton, 1990).

Perhaps most closely related to many of the inquiries on information need in IS is the definition of “educational need”. The concept of need in the field of education has been used both to assess and express individual needs as well as to measure aggregate needs at the local, state or federal level (Dearden, 1966; White, 1974; Woodhead, 1987). Other disciplines, such as health sciences, have conducted their own studies on information needs in the context of their fields (Timmins, 2006).

Information Needs and IS

Despite its centrality to information seeking, use and sharing the concept of information need remains ambiguous in the literature. This difficulty may stem from the fact that it is challenging to create a boundary around the concept of information needs. Wilson (1981) was one of the first to note that one of the difficulties faced in defining information needs is separating the concept from “wants”, “expressed demand”, “satisfied demand” and so on. He partially attributed this to the “failure to identify the context within which information needs investigations are carried out” (T. D. Wilson, 1981, p. 8). Hjørland (1997) later argued that “it is essential not to confuse the concept of need with the concept of demand.” To illustrate the difference, Hjørland presented a situation in which the demand for information from a library was low due to factors such as accessibility; yet, the information needs of the people in the community were high (Hjørland, 1997a, p.159). In this situation, need and demand were clearly not equal.

Green also considered the differences between “wants,” “demands,” and “needs” (Green, 1990). He identified four aspects as most central to an understanding of the concept of information need: (1) need is necessarily instrumental, (2) needs are usually contestable, (3) need has a strong relationship with necessity, and (4) there is no necessary psychological element in a need. Green also stressed that need does not necessarily mean that information is lacking—a person may need information that they already have.

Wilson later suggested that an information need is secondary to a primary need such as food, shelter, and clothing (T. D. Wilson, 1999). In order to understand an information need, it is necessary to understand the context of human needs that created a need for information. This approach to understanding information need requires a broad understanding of people’s personal situations.

An explicit information need is often the motivating force behind a user's action to seek information. Recognizing the motivational factors involved in human information behavior is critical to understanding other parts of the information seeking and use process and has raised several important questions. For example, motivation is central to research regarding passive and active approaches to information seeking as well as blunting and avoidance behaviors. Information needs have also been associated with human needs research in general. As will be discussed human needs research have been important in a number of fields.

The difficulty of ascertaining a person's information need partly explains the lack of a more thorough consideration of the concept. In the early 1980s, Belkin and Vickery (1985) argued that since information needs exist in someone's head they are very

difficult to assess (Belkin & Vickery, 1985). Harter (1992) later suggested that information needs are akin to a person's mental state, arguing that they are in a constant state of flux as a person continually acquires new information (Harter, 1992). Given these considerations and the close relationship between information need and other sub-disciplines consideration of need, it has been suggested that "needs" research may fall outside the scope of IS and be better suited to other disciplines. Wilson, (1981) suggests "it may be advisable to remove the term "information needs" from our professional vocabulary and to speak instead of "information seeking towards the satisfaction of needs" (T. D. Wilson, 1981, p. 9) .

Historical Evolution of Information Need Research within IS

In a historical context, studies concerning information need have evolved greatly. In the famous monograph "The Library's Public," Berelson (1949) synthesized the results of library studies from 1930 to 1949, and reported that libraries were used primarily for accessing books and were patronized by the younger, better-schooled, culturally-alert members of the community (Berelson, 1947). Despite collecting demographic data, little attention was paid to the types of uses that people made of libraries, especially in connection to particular needs. Most of the studies summarized by Berelson were concerned with "demands" rather than "needs," and were aimed at informing collection development and circulation practices.

The 1940's and mid 1950's were marked by the vast increase in the amount of scientific literature generated and released in the post-war era. Responding to Vannevar Bush's call to "make more accessible a bewildering store of knowledge," researchers began studying how information is used in relation to work focusing particular attention

on science and technology (Bush, 1945). This type of research was primarily focused on determining how information sources could be made more useful to scientists, and in this context the information needs of scientists were studied.

The 1960's and 1970's ushered in an era in which IS research focused on social and community issues. Several major, large-scale studies were conducted, including the study of the information needs of urban residents of Baltimore and the "The Humphry Report" of Maine (Humphry, 1979; Warner, 1973). These public library-oriented studies sought to identify the information needs of large populations. The federal government through the U.S. Department of Education also demonstrated an interest in identifying the information needs of citizens and voiced "a desire to develop strategies for providing equitable and needed information services to all citizens" (Chen & Herson, 1982). As part of this effort, the US Department of Education funded Ching-Chih Chen and Peter Herson to study the information seeking patterns of the general public, as well as a study by Brenda Dervin examining the information needs of urban residents of Seattle (Dervin and al 1976; Chen and Herson 1982).

A similar large publicly funded study was conducted in Britain during this period. The INISS Project directed by Tom Wilson and David Streatfield studied the communication and information flows in local authority social services departments (T. D. Wilson, 1981). The project was particularly innovative for its use of action research to foster change in the organizations and employment of qualitative methods such as structured observation. Wilson credited this five-year project as being a major influence of the ideas expressed in his seminal 1981 paper on user studies and information needs.

During the 60's and 70's a new conceptualization of information need also began to emerge. In 1962 Robert Taylor published an article examining the process of information need development by asking questions at the reference desk of a library (Taylor, 1962). He followed up this article four years later in 1968 with his seminal article "Question-Negotiation and Information Seeking in Libraries" (Taylor, 1968). Bruce (2005) describes Taylor's work as having "laid the foundation for deeper conceptual understanding of the motivations or triggers for information seeking. It was the basis for subsequent insights by researchers such as Belkin, Saracevic, Ingwersen, Dervin and Kuhlthau" (Bruce, 2005).

During this period other researchers, including Brenda Dervin, began to focus their attention on understanding the process by which information needs are determined and expressed which introduced a new way of viewing information users and information needs (Dervin, 1976). In their landmark 1977 work "Public Library Use, Users, Uses" Zweizig and Dervin challenged researchers with identifying the uses (and *possible* uses) that people make of public libraries by focusing on situational needs (Zweizig, 1977). They observed that the time for studying "how much use is made of libraries and by whom" was outdated. They helped redirect the focus of research from "the user in the life of the library" to "the library in the life of the user."

In their seminal 1986 ARIST chapter, Dervin and Nilan expounded on the paradigm shift occurring within IS describing the movement from a system-oriented paradigm of past decades to a new user-centered or alternative approach that emphasized constructive, active users, subjective information, situationality, holistic views of experience, internal cognition, and systematic individuality (Dervin & Nilan, 1986). At

the heart of this paradigm shift was its view of users and their inherent information needs which were no longer seen as “empty buckets” that could be filled with “bricks of information” (to use Dervin’s terminology). Dervin and Nilan gave three examples of such user-centered scholarship: Taylor’s user-values or value-added approach, Dervin’s Sense-Making approach, and Belkin and colleagues’ anomalous-states-of-knowledge approach (Dervin & Nilan, 1986). Notable definitions of information need cited by Dervin and Nilan include: “a conceptual incongruity in which the person’s cognitive structure is not adequate to a task” (Ford, 1980); “when a person recognizes something wrong in his or her state of knowledge & wishes to resolve the anomaly” (Belkin 1978); “when the current state of possessed knowledge is less than needed” (Krikelas 1983), and “when internal sense runs out” (Dervin, 1980). During this period Dervin and Dewdney proposed neutral questioning based on Dervin’s Sense-Making approach as a technique for understanding users’ information needs at the reference desk (Dervin & Dewdney, 1986).

Case (2012) views Dervin’s work and specifically the Sense-Making approach to be “the most ambitious attempt to explain the origins of information needs” (Case, 2012, p. 84). Dervin’s Sense-Making approach considers information need as being derived from a person’s desire to make sense out of a situation (Dervin 1992). The Sense-Making approach describes a person reaching a point where help is needed to bridge a gap in understanding. According to the Sense-Making approach, the “gap” represents a crucial point at which a person develops a need for information to allow them to move forward. The “gap” is the point when a person recognizes and articulates his or her information needs. An important aspect of sensemaking as it relates to information need is the

recognition that information needs are not isolated but are connected to a larger context. When an information need is considered in a larger context, it will be linked to numerous information needs. As one information need is addressed, other needs will likely develop.

The user centered work of Dervin, Wilson, Kuhlthau, Belkin and others in the 1970's and 1980's introduced holistic approaches to understanding information behavior and laid the foundation for an exploration of the role of "context" in understanding human information behavior. Since the 1990's, "context" became more deeply considered in all aspects of information behavior. In 1996 information seeking in context became its own subspecialty within the field of IS. As research interest coalesced around this topic, a conference was organized in Tampere, Finland and aptly named the Information Seeking in Context (ISIC) conference. According to Pettigrew, Fidel and Bruce (2001), "another quantum leap had occurred within information behavior... emphasize[ing] the contextual interplay of cognitive, social, cultural, organizational, affective, and linguistic factors" (Pettigrew & McKechnie, 2001, p. 67). Kuhlthau described information seeking in context as "focus[ing] on a holistic view of information needs in the course of people's lives" (Kuhlthau & Vakkari, 1999, p. 723).

Social context has been a particularly important aspect of studies of information seeking in context. Chatman's work exemplifies studies that carefully consider the influences of social contexts on all aspects of information behavior. For example, Chatman's study of the information behavior of women prisoners suggests that "life in the round will, for everyday purposes, have a negative effect on information seeking" and that "people will not search for information if there is no need to do so. If members

of a social world choose to ignore information, it is because their world is working without it” (Chatman, 1999, p. 214). In this study Chatman demonstrated a strong connection between information need and the social context or social world of the participants.

Lastly, research on everyday life information seeking (ELIS) has also evolved during this time period (Dervin and al 1976; Durrance 1984; Chatman 1991; Harris and Dewdney 1994; Savolainen 1995; Savolainen 1997). This research focused on information seeking behavior as part of people’s everyday life experience as compared to job related information behavior studies.

Information Paradigms and Models

The concept of information need can be understood in greater depth according to three theoretical perspectives. As argued by Tuominen, Talja, and Savolainen, information science has evolved in three stages where each stage was dominated by a particular theoretical perspective (Tuominen, 2002a). These three perspectives were labeled the "information transfer" model, the "constructivist" model and the "constructionist" model. These three perspectives might also be termed the physical view, cognitive view, and social view.

The transfer model, or physical view of information need, is based on the concept of demand for physical objects. This perspective considers an information system as a process for transmitting “information objects” such as books and documents. Based on this conceptualization, information need might be represented as a request for a physical document. The system might then be measured according to its capacity to deliver the physical objects meeting the information need. This view is tied to the

conceptualization of information as a “thing.” This perspective has been influential in the development of methods to evaluate libraries and other information systems according to their ability to deliver books and documents on demand.

Under the Constructivist, or Cognitive View, information needs are seen in terms of the knowledge structures of people. This view seeks to understand information needs based on the mental models, processes and relationships. Therefore, people’s information needs are based on knowledge or lack of knowledge about a topic, their level of proficiency regarding a process, and the cognitive processes they engage in to make sense of information.

Taylor’s work exemplifies this constructionist or cognitive view. Considered a pioneer in IS, before becoming Dean of the School of Information Studies at Syracuse University, Taylor worked as a reference librarian and developed a model of the information seeking process which articulated information need development through question formulation. This concept was described in two articles published in 1962 and 1968, the latter of which is most often cited (Taylor, 1968; Taylor, 1962).

Taylor’s conception of information need advances the idea that people progress through four levels of question formulation:

- Q1 – the actual, but unexpressed need for information (the visceral need);
- Q2 – the conscious, within-brain description of the need (the conscious need);
- Q3 – the formal statement of the need (the formalized need);
- Q4 – the question as presented to the information system (the compromised need).

Taylor’s model is especially important as the first time the suggestion was made that a person may experience a sense of need for information before being conscious of it or

able to articulate it. The very notion of such a concept creates an awareness of why professionals should support a user in articulating his or her information need and necessitates shifting the focus from information to that of understanding the user.

Taylor's model recognizes that the information need presented to a system or person is a compromised need and that a negotiation occurs between the stages of recognizing a need and presenting it to an information system. Therefore, the information need expressed to a system in the form of a query, for example, is only a representation of the information need and is constrained

In this sense Taylor's work preceded the user-centered shift in information science by nearly two decades. Taylor's levels of information need development continues to be often cited and an important underlying work for much research including the development of subsequent information models such as Belkin's ASK model, Kuhlthau's ISP model, and Dervin's Sense-Making approach.

Informed by Taylor's conception of information need, several theories of information-seeking arose that defined information need as being motivated by a sense of uncertainty. Theories falling under this category could be considered Belkin's Anomalous State of Knowledge, Kuhlthau's ISP, and Dervin's Sense-Making methodology (Belkin, 1980b; Dervin, 1992a; Dervin & Nilan, 1986; C. C Kuhlthau, 1993). These theories explain the motivation for searching for information as being derived from a gap in knowledge which manifests itself as a sense of uncertainty. In comparison to Wilson's model, they do not explicitly represent an external need that preempts an information need; they recognize information need as a part of a larger situation. Dervin is especially clear in this regard, conceptualizing a user as someone

situated in context and in the process of defining his or her situation. Dervin's approach to situating a user in context has strong implications toward understanding the social view of information behavior although Sense-Making is most often considered as part of the cognitive view (Dervin, Foreman-Wernet, & Lauterbach, 2003).

Social Constructionist or Social View

Those espousing a social constructionist perspective (the third theoretical framework according to Tuominen, Talja and Savolainen, 2002), criticize the cognitive perspective for failing to recognize the impact of the social realm on information behavior. Hjørland claims that Taylor's information need model is individualistic and argues that "behind the concrete information seeking-process lies an information need that is an integration of the individual and the collective information need" (Hjørland 1997, p. 168). This perspective and other holistic perspectives recognize that information need is not something static located in the user's head but as something dynamic that changes as the user interacts with information and society as a whole (Hjørland, 1997). This conception of information need recognizes need development as being socially situated and realizes the needs of a group may be different than the needs of an individual implying that the needs of a group should be considered in addition to or instead of the needs of an individual.

Although Wilson's models are most often associated with the cognitive perspective, his concept of holistic information need might also be classified in the social realm. In his second model of 1981, Wilson made two propositions regarding information need. The first proposition argues that information need is a secondary need emerging from a

primary need. A primary need encompasses basic needs such as food, shelter, companionship and employment. Primary needs can be classified as the following:

Physiological needs – need for food, water, shelter, etc.

Affective needs – need for attainment, domination, etc.

Cognitive needs – need to plan, learn, etc.

The second proposition suggests that in the course of seeking information to satisfy needs, individuals will likely run into barriers of different kinds (T. D. Wilson, 1981).

Wilson also proposed the idea of information behavior in context. The concept of information in context and the development of information needs in context was a precursor to the rise of interest in information seeking in context.

In his 1996 report Wilson commented on the lack of progress in assessing information need as follows.

“At the root of the problem of information-seeking behavior is the concept of *information need*, which has proved intractable for the reason advanced by Wilson in 1981; that is, *need* is a subjective experience which occurs only in the mind of the person in need and, consequently, is not directly accessible to an observer. The experience of need can only be discovered by deduction from behaviour or through the reports of the person in need” (T. D. Wilson & Walsh, 1996, p. 6).

Wilson’s models of information behavior have evolved throughout the past several decades (T.D. Wilson 1981; T.D. Wilson and Walsh 1996; T.D. Wilson 1999). The significance of his treatment of information need in relation to information seeking behavior is the holistic or ecological nature of his model. This situates information behavior in a person’s contextual setting. In his models of 1996 and 1999, Wilson

separated information need from motivation—recognizing that information needs are not always acted upon.

There is a growing body of research that addresses information behavior in a social context and within this, research on information need is addressed. Notable research studies include those by Fisher and colleagues regarding information grounds, Harris & Dewdney on battered women, and Chatman's stream on marginalized populations (Harris and Dewdney 1994; Chatman 1999; Fisher, Naumer et al. 2005; Fisher, Landry et al. 2006). As a motivating research question, Chatman discovered that the expression and development of information needs were largely influenced by social factors. In environments such as a prison, she found evidence that information needs were socially constructed (Chatman 1999)—findings that were confirmed by Fisher et al., in their studies of information flow in informal, social settings or information grounds (Fisher 2005). Savolainen's (1995) model of information seeking in the context of way of life (ELIS) also addresses information behavior in a social context. As described by Savolainen (2005), the ELIS model "was developed to elaborate the role of social and cultural factors that affect people's way of preferring and using information sources in everyday settings (Savolainen 2005)."

Information need is a central concept to virtually all information models. It represents the starting point and motivation that brings a user to engage in the process of information seeking. The definition of information need is allusive and may best be defined according to the meta-theoretical framework used to guide this research.

New Inquiries

Research on information needs has taken new, exciting directions since the mid-1990s for three primary reasons: (1) important foundational work on “needs” has been carried out, thus enabling exploration into new forays, (2) researchers have become even more interdisciplinary than in the past, applying rich ideas from other fields to their work, and (3) the advent of the Internet and the World Wide Web along with other new information and communication technologies facilitated more and new information behaviors that are more easily studied than in the past.

Promising recent research directions include research conducted on community information needs (Pettigrew, Durrance et al. 2002; Fisher, Naumer et al. 2005; Durrance, Souden et al. 2006). This includes research on non-purposive information seeking as expressed as serendipity and information encountering (Foster and Ford 2003; Erdelez 2004). Recognizing the role of lay mediaries in the information seeking process in terms of not only searching for information but also helping others realize their information needs through such phenomena as imposed queries and gate-keeping (Abrahamson and Fisher 2007). Research on the process of knowledge structure transformation on information need development shows promising signs of furthering our understanding of information needs from multiple perspectives (Cole, 2011; Cole, Leide, Large, Beheshti, & Brooks, 2005) .

A working definition of “information needs”

Based on the described work to define “information needs” the following assumptions were made in order to guide the research. This working definition includes the following:

- 1) As argued by Green, information need does not necessarily mean that information is lacking—a person may need information that they already have (Green 1990).
- 2) Information needs are akin to a person's mental state, arguing that they are in a constant state of flux as a person continually acquires new information (Harter 1992).
- 3) Information need evolves from a state of being subconscious to being articulated (Taylor 1968).

In the context of this research study and in accordance with the assumptions described, information need was understood as information that may be helpful toward supporting a problem solvers sensemaking behavior. Moving beyond the established definitions of information need, a framework of characteristics defining a problem solver's perception of their information need and their integration of their understanding of that need into their sensemaking behavior was developed as a result of the pilot study and review of the literature. This emerging framework of characteristics is necessary as an analytic tool to be used to examine the relationships described as part of the research questions stated.

The following characteristics define the identification of information need by the problem solver and the problem solvers understanding of those information needs within the context of conceptualizing a problem domain.

Recognition: Unrealized ← Realized → Articulated

The overriding operational definition of information need is influenced by Taylor's pioneering work of understanding information need as something that is constructed by

problem solvers. Taylor's research showed that people move from a state of having subconscious needs for information to a state whereby they recognize their need and can formalize a request for information from a person or system. The first attribute of information need is how well it is the identification of the how well "realized" the information need is on this spectrum.

Nexus of generation: Internal ← Internal/External → External

This information need attribute is based on where the definition of the information need occurred. The information need definition may be internally generated by the problem solver or generated externally to the problem solver. This attribute is constructed on a scale whereby the information need could be considered to be almost wholly derived by the problem solver, defined collaboratively with others, or completely defined by others external to the problem solver. The development of this characteristic recognizes both the cognitive and social nature of information need definition.

Satisficing: Satisfied ← → Unsatisfied

The degree to which an information need has been fulfilled is also subject to the perceptions of the problem solver. The concept of satisficing may be used to describe the degree of fulfillment. If a problem solver considers the information need to be fulfilled, then the user will be satisfied that they have enough information to address the perceived information need. If the problem solver does not perceive having enough information to fulfill the information need, the need will be considered unsatisfied. A problem solver's perspective of fulfilling the information need may fall anywhere along this perspective.

Satisficing cost structure: Expensive $\leftarrow \rightarrow$ Inexpensive

The difficulty of attaining information to address an information need is another important attribute defining the relationship between a problem solver and the definition of information need. There may be some information needs that are virtually impossible to address. These information needs may include projecting future events. Or, obtaining the information to address the need may be cost prohibitive in terms of time and money. On the other end of the spectrum, acquiring information to address the need may be easily achieved.

Relevance: Low \leftrightarrow High

This characteristic describes the degree by which an identified information need is perceived to be relevant by the problem solver. This is particularly important to externally generated information needs.

Influence: Low $\leftarrow \rightarrow$ Heavy

This characteristic describes the influence of the information need on the task of conceptualizing the problem domain. The identification of an information need may have no influence or a great influence on a problem solvers process of conceptualizing a problem domain. As described, there is a need to further define and develop models explaining information needs and information need development within the context of a social constructionist orientation.

Sensemaking

Sensemaking is a topic that has been considered by many researchers from the perspectives of different disciplines. These perspectives share an interest in how people

make sense of their world and incorporate context as part of the factors contributing to sensemaking. In this way, sensemaking perspectives are highly relevant to this study.

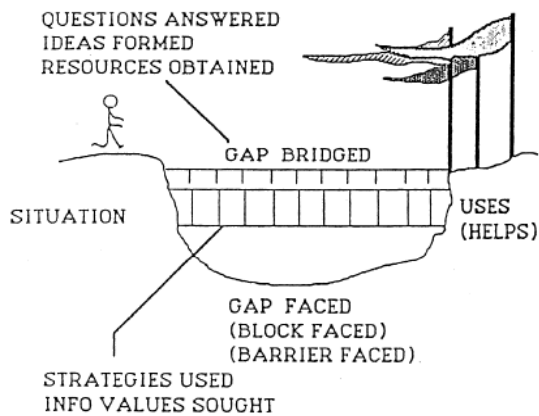
Information Science and Communications: Dervin

Dervin differentiates her conception of sensemaking from others by spelling it as Sense-Making. She credits the development of Sense-Making to the early everyday citizen information need studies of Warner (1973) and Chen and Herson (1980). In these studies information needs were situated in terms of the sources used by the citizens and the primary needs identified such as housing, family, employment, and welfare (Chen & Herson, 1982; Dervin & Nilan, 1986; Warner, 1973). The importance of these studies is that instead of identifying documents requested, they identified the contextual factors driving the need for information.

Dervin's Sense-Making approach continues to play a significant role in the work of IS researchers and has significantly influenced the research direction adopted as a part of this study. The Sense-Making approach is defined by Dervin as having "come to be used to refer to a theoretic net, a set of assumptions and propositions, and a set of methods which have been developed to study the making of sense that people do in their everyday experiences. Some people call Sense-Making a theory, others a set of methods, others a methodology, others a body of findings. In the most general sense, it is all of these." (Dervin 1992, p. 61)

Dervin's Sense-Making methodology is based on the metaphor that people find themselves in a situation facing a gap. In order to bridge that gap, they need help. The components of this metaphor are the *situation*, the gap and the uses. The situation refers to the time-space context in which a person is situated. The *gap* includes the stops

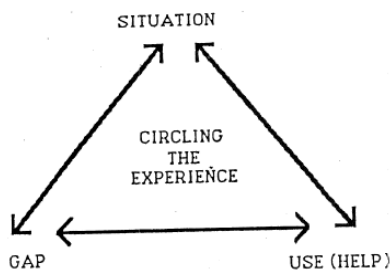
or barriers that prevent moving across the time-space continuum. The *uses/helps* signify the way a person might overcome these barriers and move forward.



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Figure 2: The Sense-Making metaphor.

Based on this metaphor the sensemaking triangle of situation-gap-help/use is derived to explain how an individual moves through an experience where each moment is potentially a Sense-Making moment (Dervin, 1992a; Dervin & Naumer, 2009).



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Figure 3: The Sense-Making triangle.

The concept of Sense-Making, how people make sense out of their world, and the constructivist perspective to which this approach is most closely associated is central to the research objectives directed at understanding how framing affects people's understanding of the world. In addition to the premise of Sense-Making, there are

many facets or assumptions of the approach that have contributed to thinking regarding framing and information behavior in general.

The ontological-epistemological divide: the in-between

Dervin describes Sense-Making “as methodology between the cracks, as addressing the in-between... between chaos and order, structure and person, facts and illusions, external worlds and inner, universals and particulars” (Dervin 1999, p. 730). This approach circumvents some of the difficulties of committing to one epistemological position at the expense of another and focuses attention on the “in-between”. Dervin suggests that Sense-Making approach should be directed at the gap between agency and structure seeking to make sense out of the relationship between person and structure. Similarly, Dervin argues Sense-Making does not privilege either realism or interpretive-based methodologies but concentrates on how the in-between is negotiated. The “in-between” as described by Dervin is especially important in regard to the way that framing is a negotiation between agency and structure.

“Verbing” as a primary ontological category

The Sense-Making approach draws attention to “verbs” and away from “nouns”, this reflects a commitment to understanding process. “Sense-Making refocuses attention from the transcendent individual or collective human unit to the verbing... refocuses our attention away from nouns and substances to verbs and processes” (Dervin 1999, p. 731-732). It concentrates on the “hows” of information behavior from the perspective of the individual and the collective. Dervin’s call for a focus on process, reflected

throughout the tools and methods associated with Sense-Making, is central to a research approach well suited to studying framing.

Individuals as Theorists

Another important aspect of Sense-Making is the central assumption that ordinary human beings are theorists. This assumption recognizes the agency of individuals to develop world views consistent with their experiences and apply their world view to making sense of the world (Naumer, Fisher, & Dervin, 2008). Additionally, Dervin recognizes that humans have the capacity to translate their knowledge from the unarticulated realms of their beings to the articulated. This commitment is integral to the assumption that humans have the capacity to explain through dialogue their Sense-Making behavior. It's a key assumption underlying this research study which depends on participants explaining their sensemaking behavior as represented by their framing of problems and articulation of information needs.

Discontinuity and Continuity

Central to the Sense-Making approach is the concept of discontinuity as developed by Richard F. Carter. The essence of this assumption is “that there are persistent gap conditions in all existence – between entities (living and otherwise), between times, and between spaces. Accompanying this assumption is the idea that communicating is best isolated, studied, and generalized by focusing on these gap conditions” (Dervin 2003, p.63-64). Dervin argues that if communication is bridging behaviors that are constructed to deal with gaps, then the gap concept is a powerful means of focusing on the communication phenomenon.

The concept of discontinuity is the basis for information “gaps” that define a person’s motivation for information seeking. As pointed out by Yoon and Nilan (1999), most research on the cognitive aspects of information seeking focuses on the uncertainty aspect of user cognition motivating information behavior (Yoon 1999). They suggest that “certainty and uncertainty represent a gestalt of the user’s perception of an information need” (Yoon 1999, p. 791). This perspective recognizes that in order to recognize a “gap,” a person must have knowledge to form the gap. Savolainen (1993) also asks “whether the concept of ‘continuity’ is more fundamental because the concept of discontinuity seems to be derived as its negation” (Savolainen 1995, p. 16).

The notion of certainty, as well as uncertainty, could also be informed by Checkland and Vickers’ work on appreciative systems which emphasize the existing structures rather than missing gaps. Referring to a personal communication from 1974, Checkland reflects on Vickers thoughts on sensemaking ideas and his experience (Checkland 2005). According to Checkland,

“Vickers rejected the goal-seeking model of human activity, regarding it as too poverty-stricken to encompass the richness of being human. His theory is that life does not consist of seeking an endless succession of goals; instead it consists of experiencing relationships, trying to maintain satisfactory ones and elude unsatisfactory ones. This concept, as well as immediately reflecting the experience of all of us in the human tribe, also has the virtue that it does not throw away the concept of goal-seeking; rather it subsumes goal-seeking as an occasional special case” (Checkland 2005, p. 286).

Related to Vickers’ writings is the appreciative inquiry approach used in organizations to focus on what is working and build upon the positives of an

organization rather than focusing on defining problems and fixing what is broken. A similar movement exists in the field of psychology described as positive psychology, defined as the scientific study of optimal human functioning. The positive psychology movement is a shift from focusing on repairing mental illness using a disease model of human functioning toward focusing attention on the sources of psychological health (Seligman 2005).

This critique of the gap and bridge metaphor does not suggest that this is not a valuable approach in studying communication behavior but does indicate that there may be a complimentary aspect that is not as often studied as proposed by Yoon and Nilan (1999). In the case of this research, the complimentary aspect is the structure described by the framing of a problem which is understood as the structure around gaps.

Linear vs. non-linear representations

As Dervin acknowledged in her presentation at ASIST 2005, Sense-Making is often criticized for being linear. Dervin remarked that the triangle representing the Sense-Making process is meant to be repeated. However, the way that the metaphor has been applied in practice and research does not truly reflect a non-linear approach and that research from the field of system dynamics and systems thinking might inform an expansion of the metaphor to reflect non-linearity and feedback loops. After reviewing systems dynamics and systems thinking research, Amanda Spink (1997) reviews the concept of feedback within information science research and calls for the need to enlarge this concept within information seeking and retrieving research (Spink 1997). Framing, as represented in the system dynamics and systems thinking research, may be one technique for understanding feedback loops and expanding non-linear approaches.

Singular vs. multiple (complexity)

Stemming from the criticism of non-linearity is the concept of complexity and the notion that a person may be engaged in multiple Sense-Making activities at once. Dervin's metaphor might be interpreted to infer a singular linear process when in fact, there may be multiple Sense-Making processes occurring at the same time interacting with each other. Once again, system dynamics and systems thinking may be able to shed light on new ways of understanding the phenomenon in terms of system approaches. The use of frames to understand how context is associated with a person's behavior may also be a way to understand a person's engagement in multiple Sense-Making activities.

Purposive and Individual

Most Sense-Making studies focus primarily on purposive information seeking behavior centered on the motivations of an individual, although Dervin is careful to say that Sense-Making concept may be applied to the micro-level and macro-level (Savolainen 1995; Dervin 2003). Dervin's writings also reflect more on individual Sense-Making than on the construction of sense through social negotiation processes (Savolainen 1995; Olsson 2005). From a framing perspective, the defining of a problem may happen before purposive information seeking occurs, setting the stage for the development of an information need at a latter point in time. The definition of the problem may occur by someone else and be imposed on a person. The definition of information need, in terms of a framing exercise, may also occur in a social setting with the motivation for inquiry originating collectively.

HCI Perspective: Russell, Steffik, Card, Pirolli

While working at PARC in 1993, Dan Russell, Mark Steffik, Peter Pirolli and Stuart Card co-authored a paper titled the *Cost Structure of Sensemaking*. This paper considered sensemaking from the perspective of the discipline of human computer interaction (HCI). Their definition of sensemaking is “the process of searching for a representation and encoding data in that representation to answer task-specific questions” (Russell, Steffik et al. 1993). They discuss sensemaking in the context of performing information retrieval tasks and the cost structures of performing sensemaking tasks. The stated objective of this work was to understand the cost structure of sensemaking and the role of sensemaking in various information processing tasks.

These four authors continue to pursue research interests regarding the development of information systems and sensemaking. They have actively promoted the understanding of sensemaking within the HCI community by organizing several workshops at the CHI conference. Peter Pirolli has explored sensemaking in relation to his theory of information foraging, while Stuart Card has examined sensemaking through the concepts of information visualization (Card, Moran et al. 1983; Card, Pirolli et al. 1994; Pirolli and Card 1995). Other researchers from the HCI community such as George Furnas and Yan Qu of the University of Michigan have also conducted research in the area of sensemaking (Qu and Furnas 2005).

The use of the term sensemaking, by researchers focused primarily on topics related to human computer interaction, tends to examine the cognitive tasks associated with sensemaking. This approach has been most commonly used as a means of attempting to

explain and predict user behavior to inform technology design choices. It focuses on understanding the cognitive tasks and structures of sensemaking in the form of representations and tends to reduce the process of sensemaking to discrete cognitive steps. This approach toward understanding sensemaking may be useful to better understand software design but is not as applicable to the study of information behavior as part of this study.

Cognitive Problem Solving Perspective: Klein et al.

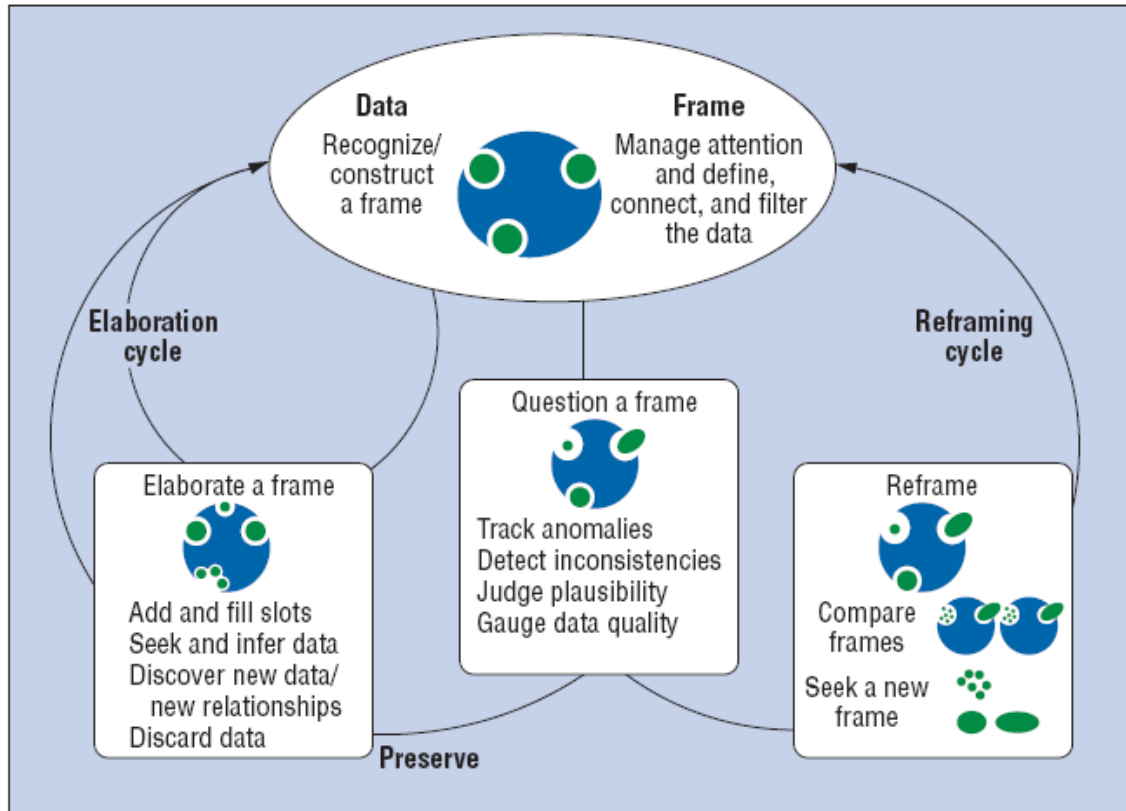
Klein and colleagues' approach to understanding sensemaking shares the interest expressed in the HCI community of building systems to aid sensemaking. Klein describes sensemaking as having “become an umbrella term for efforts at building intelligent systems” (Klein, Moon et al. 2006). Some of this work has fallen under the rubric of human-centered computing.

Klein's approach is rooted in his background as a psychologist, studying naturalistic decision making and improving decision making in individuals and teams. Klein, et al., are careful to explain that a broad definition of sensemaking as “how people make sense out of their experience in the world” could easily encompass or be confused with concepts often studied in psychology such as creativity, curiosity, comprehension, mental modeling and situation awareness. He clarifies his understanding as “sensemaking is a motivated, continuous effort to understand connections (which can be among people, places, and events) in order to anticipate their trajectories and act effectively” (Klein, Moon et al. 2006).

Klein, et al. argue that the naturalistic decision making perspective offers a unique perspective in approaching the problem of building intelligent sensemaking systems and

offers empirical evidence that refutes several conceptions regarding sensemaking. Using cognitive task analysis a large corpus of studies exists on how domain practitioners make complex decisions in dynamic environments. According to Klein, et al., evidence from these studies refute the following conceptions: 1) that data fusion and automated hypothesis generation aid sensemaking, 2) sensemaking is simply connecting the dots, 3) more information leads to better sensemaking, 4) it's important to keep an open mind, 5) biases are inescapable and prevent reliable sensemaking, and 6) sensemaking follows the waterfall model of how data leads to understanding.

Klein studies sensemaking at a macrocognitive level as opposed to a microcognitive level. The macrocognitive scope views people's problem solving behavior in terms of their view of complex sociotechnical systems rather than the microcognitive level which seeks to understand sequences of mental events (Klein, Ross et al. 2003). The Data-Frame Theory of Sensemaking as depicted in figure 4, posits a close-loop transition sequence between mental model formation and mental stimulation (Klein, Moon et al. 2006). In this model, sensemaking occurs by adding details to the frame and by questioning or doubting the hypothesis regarding the connections among data. In this way the aspects of elaborating the frame and preserving the frame are a part of the process defined as sensemaking.



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Figure 4: The Data-Frame Theory of Sensemaking

The Data-Frame Theory of Sensemaking consists of nine assertions (Klein, Phillips et al. 2007).

1. Sensemaking is the process of fitting data into a frame and fitting a frame around the data.
2. Therefore, the “data” are inferred, using the frame, rather than being perceptual primitives.
3. The frame is inferred from a few key anchors.
4. The inferences used in sensemaking rely on inductive reasoning as well as logical deduction.
5. Sensemaking usually ceases when the data and frame are brought into congruence.
6. Experts reason the same way as novices, but have a richer repertoire of frames.

7. Sensemaking is used to achieve a functional understanding – what to do in a situation – as well as an abstract understanding.
8. People primarily rely on just-in-time mental models.
9. Sensemaking takes different forms, each with its own dynamics.

Klein et al.'s Data-Frame theory is primarily focused on the task of sensemaking within the context of decision making. As such, sensemaking is defined as the deliberate effort to understand events. This problem directed approach narrows in on individuals' behavior related to a defined problem or decision context. The Data-Frame theory also tends to focus on an individual's cognitive processes rather than social processes. It concentrates on available data and the interaction between data and frame rather than the construction of information needs definitions.

Organizational Studies: Weick and Snowden

In the area of organizational studies both Karl Weick and David Snowden among others have done significant work to understand the way sensemaking occurs in organizations. Their work has been largely devoted to organizational decision making, strategy development and dealing with complexity. There are many similarities between Weick and Snowden's treatment of complexity and the value of narrative as a response to it (Browning and Boudes 2005).

Karl Weick's conception of sensemaking

By examining Weick's use of the sensemaking concept, an understanding of its application is enlarged beyond the fields of IS and communication to the study of organizations and organizational systems. Of particular interest is the relationship

Weick draws to system sciences and cybernetics. Weick attributes the development of the concept to many milestones dating back to the early 1900's. Key milestones include George Herbert Mead's exploration of the intertwined relationship between the self and society in his book *Mind, Self, and Society* published in 1934. Another key milestone noted by Weick is Berger and Luckmann's (1966) publication *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Weick also recognizes contributions to thought in this field by several scholars studying cybernetics, including Boulding's work on organizations as systems and Steinbruner's exploration of the satisficing sensemaker engaged in cybernetic decision processes.

Weick describes the concept of sensemaking as "literally meaning the making of sense" (Weick 1995, p. 4) and "to engage in sensemaking is to construct, filter, frame, create facticity, and render the subjective into something more tangible". It is "less about discovery than it is about invention" (Weick 1995, p. 14). Weick contends that "sensemaking is to be understood literally, not metaphorically". He describes sensemaking as being "about such things as placement of items into frameworks, comprehending, redressing surprise, constructing meaning, interacting in pursuit of mutual understanding, and patterning" (Weick 1995, p. 14). He goes on to say further that sensemaking should not be used as a synonym for interpretation, arguing that the use of the interpretation reflects a focus on a one-way relationship between the interpreter and some kind of text. Sensemaking is not only about interpreting but it is also about authoring. Weick describes the central questions of sensemaking researchers as how individuals construct what they construct, why, and with what effects (Weick 1995).

Weick lists seven distinguishing characteristics of sensemaking aimed at setting it apart from other explanatory processes. These characteristics are 1) grounded in identity construction, 2) retrospective, 3) enactive of sensible environments, 4) social, 5) ongoing, 6) focused on and by extracted cues, and 7) driven by plausibility rather than accuracy (Weick 1995, p. 17). These seven identifying characteristics and descriptions of the sensemaking concept distinguish it from Dervin's sensemaking approach as defined by the gap metaphor.

Another important contribution Weick makes in defining sensemaking is to differentiate it from the term interpretation. Weick argues that the term sensemaking is often used as a synonym for interpretation. The same holds true in IS for the use of the term sensemaking as conceived by Dervin. Weick describes interpretation as a form of explanation or the process of interpreting meaning, whereas sensemaking addresses processes of creating representations as well as interpreting them.

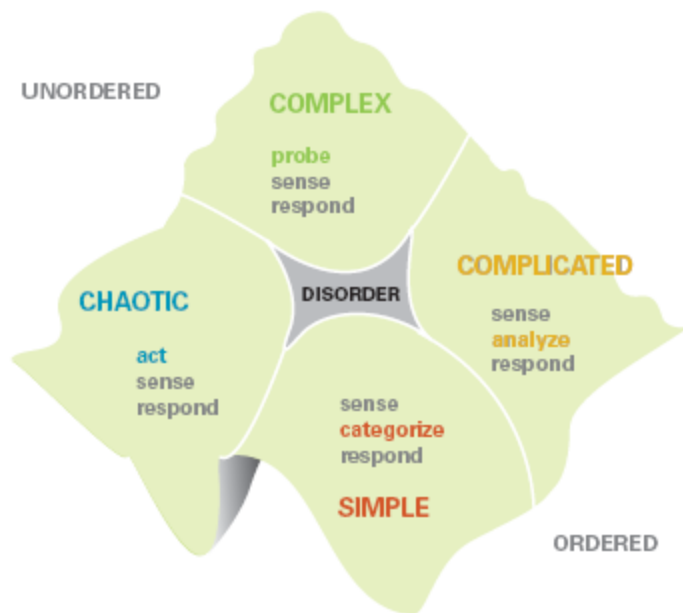
Weick recognizes that investigators may define sensemaking very differently. Many sensemaking investigators imply that sensemaking involves placing stimuli into some kind of framework or frame of reference (Starbuck & Milliken, 1988 as cited in Weick 1995). They contend that the process of situating stimuli into frameworks enables them to "comprehend, understand, explain, attribute, extrapolate, and predict" (Starbuck & Milliken, 1988, p.51 as cited in Weick 1995). Other investigators emphasize the interpretive process beyond the placement of information in frameworks. These investigators often have a very broad perspective, taking into account information seeking, meaning ascription, and action as part of the sensemaking process. There are also differences in the way context has been explored. Sensemaking has been

considered in an organizational context as well as an individual process whereby “individuals develop cognitive maps of their environment” (Ring & Rands, 1989 as cited by Weick).

Weick’s conception of sensemaking is informative by broadening and challenging the use of the term in information science. The use of Weick’s sensemaking in organizational contexts may prove important toward advancing the concept of the use of “frames”.

Snowden, Kurtz

Kurtz and Snowden describe the Cynefin framework as a sensemaking framework which was developed as a means of helping people deal with complex situations. One of the primary assumptions implicit in this framework is that the ability to respond to complexity is dependent on a sense of place. This enables people of diverse views to engage in sensemaking, through narrative, regarding what happened, what could have happened and how they might act differently in the future (Browning and Boudes 2005). They base this framework on research in complexity science and several years of action research using narrative and complexity theory in organizational knowledge exchange, decision-making, strategy, and policy making (Kurtz and Snowden 2003; Snowden 2006; Snowden and Boone 2007). The Cynefin framework, as depicted in figure 5, has five domains: Complex, Chaos, Knowable and Known. The fifth domain is described as a central area encompassing disorder.



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Figure 5: Cynefin Framework

The framework has been used with groups of practitioners as a way to explore the context of a situation and reflect on how the five domains relate to their situation. For example, the framework might be used to gain new insights on a contentious issue, plan interventions to move a situation from one domain to another, consider how different communities of practitioners should be managed, or develop strategies for knowledge retention. In-conjunction with the use of the framework action research methods, contextualization, narrative database, convergence and alternative history are used to explore the framework in relation to the practitioner’s situation or problem area. The Cynefin framework is one of the few approaches that recognizes the unknown and take steps to identify the unknown. This recognition has similarities to the process of identifying unknown information – or information needs.

Summary of Sensemaking models

The cognitive problem solving camp approaches sensemaking from the perspective of a problem. The emphasis is on making sense of the problem rather than making sense of information. It is bound by describing sensemaking in the scope of problem solving. “Cognitivists and others who conceive of thinking as logical information-processing and analytical problem-solving concern themselves mainly with the kind of thinking processes which take place at the “competent performer” stage. Herbert Simon is a leading exponent of this view. In his attempt to understand how people select plans, goals, and strategies, Simon and his colleagues have convincingly illustrated how people confronted with unknown tasks in unfamiliar situations act as analytical problem-solvers. The cognitivists, however, tend to generalize these results as being valid for all intelligent behavior. People are generally seen as problem-solving beings who follow a sequential model of reasoning consisting of “elements–rules–goals–plans–decisions.” It is this model which the cognitivists have attempted to simulate in computers and in problem-solving models, in “expert systems” and in artificial intelligence. Their extrapolation yields good results when the models are applied to well-defined tasks with well-defined solutions.

The cognitivists have had much less success, however, when the tasks and solutions are less well-defined. According to Dreyfus and Dreyfus (1986), the poor results reflect the lack of evidence for the cognitivists’ assertion that humans can act intelligently only by acting as analytical problem-solvers. There are other kinds of intelligent behavior, assert Dreyfus and Dreyfus, which appear especially among those individuals who are either very proficient or experts in their fields (Dreyfus and Dreyfus 1986). This critique

of the cognitivists' approach is an underlying assumption guiding the development of the research and orienting it toward Dervin and Weick's approach to sensemaking.

Information in Context

The importance of the concept of context has emerged as a central concern in the social sciences. In his book *Making Social Science Matter*, Flyvbjerg (2001) dedicates an entire chapter to context and makes the claim that “context is central to understanding what social science is and can be” (Flyvbjerg 2001, p. 9). Within the field of information science, the study of information behavior in a social context has increased in popularity within the past decade. The study of context as a means of understanding information behavior breaks from the cognitivists' tradition as described in the previous section. The recognition of the importance of context reflects a broader, more holistic, and complex understanding of the forces that influence human behavior. The development of a sub-speciality field within information science called information seeking in context and the work of Elfreda Chatman will be discussed as it relates to this research study.

Context: Information Seeking in Context

In the field of IS, the concept of context can be closely linked to the shift to the user-centered paradigm and was discussed as far back as the 1970's and 1980's. In 1996, information seeking in context began developing its own subspecialty within the field of IS. As research interest coalesced around this topic, a conference was organized in Tampere, Finland and aptly named the Information Seeking in Context (ISIC)

conference. This conference has been held once every other year in different locations throughout the world.

Information seeking in context has been discussed in detail in at least two ARIST review articles, the first by Pettigrew, Fidel, and Bruce in 2001, and the second by Solomon in 2002. (Pettigrew and McKechnie 2001; Solomon 2002). A special edition of *Information Processing and Management* (1999), edited by Kuhlthau was dedicated to the topic of information seeking in context. According to Pettigrew, et al. (2001), “another quantum leap has occurred within information behavior... emphasiz[ing] the contextual interplay of cognitive, social, cultural, organizational, affective, and linguistic factors” (Pettigrew and McKechnie 2001, p. 67).

The concept of ‘context’ in information science can have such broad implications to become nearly useless (Dervin 1997). It can include almost all factors that might affect a user in his or her information seeking process. As Pettigrew (1999) claims, “the notion of context may prove as indefinable or perhaps uncontainable as ‘information’ or even ‘information need’ (Pettigrew 1999). Kuhlthau describes information seeking in context as “focus[ing] on a holistic view of information needs in the course of people’s lives” (Kuhlthau and Vakkari 1999, 723).

Information studies in a Social Context: Chatman

Of particular interest is Elfreda Chatman’s ethnographic research of the 1980’s and 1990’s, motivated by the insufficiency of theory to address “the information needs of people who had yet to find a voice in the literature” (Chatman 1999, p. 207). Through Chatman’s research she developed several theories including “A Theory of Information Poverty”, “A Theory of Life in the Round”, and “A Theory of Normative Behaviour”.

Integral to all of these theories is Chatman's concept of the *small world*. Chatman uses this term "to describe a world in which everyday happenings occur with some degree of predictability" (Chatman 2000 p. 3). A critical aspect of this concept is that it recognizes that "people share physical and/or conceptual space within a common landscape of cultural meaning" (Chatman, 2000, p. 3).

In Chatman's 1999 paper titled "A Theory of Life in the Round" she describes a life in the round as:

"A life in the round is a public form of life. It is a lifestyle with an enormous degree of imprecision. Yet, it is this inexactitude that provides an acceptable level of certainty. This way of life sets standards by which one constructs everyday meaning from reality. It is a "taken-for-granted," "business-as-usual" style of being."
(Chatman 1999, p. 207)

This research study was conducted using ethnographic research and interviews with 80 women in prison. Central to Chatman's theory are the concepts of small world, social norms, social types, and worldview. Through an exploration of these central concepts, she developed the following six propositional statements that make up her theory of life in the round:

Proposition 1: A small world conceptualization is essential to life in the round because it establishes legitimized others (primarily "insiders") within the world who set boundaries on behavior.

Proposition 2: Social norms force private behavior to undergo public scrutiny. It is this public arena that deems behavior – including information-seeking behavior – appropriate or not.

Proposition 3: The result of establishing appropriate behavior is the creation of worldview. This worldview includes language, values, meaning, symbols, and a context that holds the worldview within temporal boundaries.

Proposition 4: For most of us, a worldview is played out as life in the round. Fundamentally, this is a life taken for granted. It works most of the time with enough predictability that, unless a critical problem arises, there is no point in seeking information.

Proposition 5: Members who live in the round will not cross the boundaries of their world to seek information.

Proposition 6: Individuals will cross information boundaries only to the extent that the following conditions are met: (1) the information is perceived as critical, (2) there is a collective expectation that the information is relevant, and (3) a perception exists that the life lived in the round is no longer functioning (Chatman, 1999, p. 214).

Chatman's research is highly relevant to the concepts of framing and context as explored in this study. Her research raises many questions regarding processes of framing and information need development. As stated by McCool (1995), "good theory acts as a catalyst to induce and guide further research" (McCool 1995, p. 15). Chatman's research supports this sentiment.

Information need development and Taylor's stages

Chatman suggests that the development of information needs is influenced by the social environment. If this is the case, it would be constructive to better understand the development or breakdown of need development according to Taylor's four stages in a social context. In other words, how might a social environment affect this progression

of need development? If Chatman's proposition that information seeking is negatively impacted is accepted, could Taylor's information need development stages inform our understanding where breakdown occurs?

If general patterns of behavior in the need development process were discovered, it would be worth considering the factors that influence this process by either improving it or hampering it. It would also be interesting to consider whether this process was impacted by the types of needs. For example, are some needs better moved through the stages of the development process than others? These questions have helped shaped the research and will be considered during the analysis stage of this study.

Insiders and framing

The concept of insiders and outsiders was introduced in Chatman's 1996 study *The impoverished life-world outsiders*. Chatman discusses the role of insiders in defining the social world of prisons (Chatman, 1996). The "insider-outsider" dichotomy identifies many interesting characteristics of social worlds. It also raises many questions regarding the way that information and problems are framed as part of different social worlds.

Adoption and Resistance

In Chatman's study she explores an interview with an inmate regarding legal services. The inmate presents a view for why legal material was removed from the library. When Chatman presents an alternative view for why the material was removed from the library, her explanation was met with great resistance. This demonstrates the

resistance a member of a particular social world is to a “reframing” of a situation in a way incompatible with that of their social world.

Chatman also describes an interview with an inmate who resisted integration into the prison world. The inmate clung to her behavior, attitudes, and perspective that she brought with her from the street. Her transition from an outsider to an insider was long and painful. Another inmate discussed her transition from using drugs to “going clean” and the painful experience with a loan shark that caused her to change her ways.

These examples highlight the process by which inmates change perspectives or resisted changing perspectives. This research brings to light the risk-reward equation at the root of these descriptions. In all three cases it could be surmised that incentives either to change perspectives or resist the change had a significant impact on whether a new perspective was adopted. The risk-reward equation is another important dynamic that will be observed in this research study.

Conclusions

Information science research focusing on social context marks an important new direction for information behavior research. The identification and development of information seeking in context as a sub-specialty, along with ground breaking research by scholars such as Elfreda Chatman have created a rich environment for future research efforts. Information behavior in a social context is central to the consideration of framing.

Problems and Problem Solving

In Dervin and Nilan's (1986) seminal Annual Review of Information Science and Technology article *Information Needs and Uses*, the authors identify MacMullin and Taylor's (1984) article *Problem Dimensions and Information Traits*, along with Belkin's ASK theory, and Dervin's Sense-Making methodology as three significant bodies of research signaling the move toward a user-center conceptualization of information environments. MacMullin and Taylor's article builds upon Taylor's work identifying stages of information need development. It makes the case for improved information system design through an improved understanding of a person's situation as defined by his or her problem dimensions and information traits. They argue that current information models are inadequate "due in part to a failure to understand the contexts from which the need for information arises" (MacMullin and Taylor 1984, p. 93).

Many of the ideas introduced in MacMullin and Taylor's (1984) paper are relevant to the concept of framing. For example, the authors state "Within each situation, problems are generated and sometimes defined in order to structure ideas or to trigger action" (MacMullin and Taylor 1984, p. 93). They go on to state that "by focusing on problems, we are moving on a continuum which proceeds from questions to problems to sensemaking" (MacMullin and Taylor 1984, p. 95). They define a problem as having three components: 1) the initial state, 2) the goal state; and the 3) processes required to move from initial state to goal state.

General problem types

As suggested by MacMullin and Taylor (1984), understanding the dimensions of a problem is central to understanding users' information needs. In order to build a conceptual definition of the concept of framing, it is important to understand the characteristics of problem types and especially ill-defined problems such as “wicked problems”. Also important, is the decision making processes often associated with these types of problems.

Different types of problems may be differentiated along the dimensions of the definition of their given state and their goal state. According to these two dimensions there are four possible combinations of problems.

Table 1: Problem states

1) Well-defined given state and well-defined goal state.	2) Well-defined given state and poorly-defined goal state.
3) Poorly-defined given state and well-defined goal state.	4) Poorly-defined given state and poorly-defined goal state.

(Mayer 1992)

Simon defines an ill-structured problem as a problem whose structure lacks definition in some respect (Simon 1986). The problem has unknowns associated with the ends (set of project goals) and means (set of process actions and decision rules) of the solution at the outset of the problem solving process. Problem definition and redefinition activity are considerable.

"Wicked" Problems

Rittel and Webber (1973) were one of the first to define the idea of a wicked problem.

A "wicked" problem as defined by Rittel and Webber in 1973 has several characteristics.

As described by Rittel (1973) specific aspects of problem wickedness include:

- 1. You don't understand the problem until you have developed a solution.* Indeed, there is no definitive statement of "The Problem." The problem is ill-structured with an evolving set of interlocking issues and constraints.
- 2. Wicked problems have no stopping rule.* Since there is no definitive "The Problem", there is also no definitive "The Solution." The problem solving process ends when one runs out of resources.
- 3. Solutions to wicked problems are not right or wrong.* They are simply "better," "worse," "good enough," or "not good enough."
- 4. Every wicked problem is essentially unique and novel.* There are so many factors and conditions, all embedded in a dynamic social context, that no two wicked problems are alike, and the solutions to them will always be custom designed and fitted.
- 5. Every solution to a wicked problem is a "one-shot operation."* Every attempt has consequences. As Rittel says, "One cannot build a freeway to see how it works." This is the "Catch 22" about wicked problems: one can't learn about the problem without trying solutions, but every solution tried is expensive and has lasting unintended consequences which are likely to spawn new wicked problems.
- 6. Wicked problems have no given alternative solutions.* There may be no solutions, or there may be a host of potential solutions that are devised, and another host that are never even thought of. (Rittel 1973)

The idea of a wicked problem was developed in the context of social planning and lends itself particularly well to social problems. Rittel's "wicked problems" as "problems of governmental planning, and especially those of social and policy planning. Such problems are ill-defined and rely on political judgment for resolution (Rittel 1973)." Every attempt to create a solution changes the understanding of the problem and does not lend itself to being solved in a linear fashion; the problem definition is continually

evolving as new solutions are considered. It almost always occurs in a social context reflected by the diversity among stakeholders.

The characteristics of wicked problems are important since it introduces the idea of a problem as something dynamic and continually changing. According to Rittel's definition of a problem, the characteristics of a problem closely resemble that of a system. The context of the problem will be important to understanding users' framing and information needs development processes.

Problem Solving

In order to understand information behavior as applied to ill-defined and wicked problems and to support a conceptual definition of framing in this context, it is helpful to understand philosophies regarding problem solving. In particular, the associationist philosophy and the Gestalt philosophy have played a significant part in the way we think about problem solving.

Associationist Philosophy

The field of problem solving finds its roots in the associationist philosophy first introduced by Aristotle. In Aristotle's view, thinking can be described as the trial and error application of the preexisting response tendencies we call "habits". He considers problem solving to have three elements 1) the stimulus (a particular problem-solving situation), 2) the responses (particular problem-solving behaviors), and 3) associations between a particular stimulus and a particular response. As described by Mayer (1992) this philosophy can be defined as using three laws:

Law 1: Doctrine of association by contiguity – events or objects that occur in the same time or space are associated in memory so that thinking of one will cause thinking of the other.

Law 2: Doctrine of association by similarity – events or objects that are similar tend to be associated in memory.

Law 3: Doctrine of association by contrast – Events or objects that are opposites tend to be associated in memory.

Gestalt Philosophy

A different view of problem solving is advanced by Gestalt psychologists in the 1930's. According to Gestalt psychologists, the process of problem solving is a search to relate one aspect of a problem situation to another, and it results in a structural understanding – the ability to comprehend how all the parts of the problem fit together to satisfy the requirement of the goal. This involves reorganizing the elements of the problem situation in a new way to solve the problem.

This method of problem solving corresponds with how a problem is perceived or how it appears. It evaluates the motivational tension to solve the problem and looks to define the complete set of information that is needed to solve the problem. It also looks at whether information is displayed prominently in the foreground or less prominently in the background. Gestalt psychologists call this the figure ground relationship which plays a part in the conceptualization of the problem space.

A basic concept in the Gestalt approach is that there are two kinds of thinking. One is based on creating a new solution to a problem, called productive thinking, whereby a new organization of knowledge is produced. The other, reproductive thinking, indicates old habits or behaviors are simply reproduced (Mayer 1992, p. 39-42). The conceptual definition of framing presented most closely follows productive thinking.

Problem Solving and Bounded Rationality

Also, highly relevant to the way we understand a problem environment and the concept of framing is through the work of scholars studying problem solving. These scholars include Herbert Simon, Alan Newell, Daniel Kahneman, and Amos Tversky (Kahneman 1984; Simon 1986; Newell 1990). They challenged the notions that human beings make rational choices and have called into question the bedrock of classic economics that man makes rational decisions.

Classical economics has sought to explain an individual's behavior as the result of rational behavior. The concept of rational behavior attributes individual choices as a result of an effort to maximize the return on the effort. This explanation of human behavior is rooted in the theory of subjective expected utility (SEU). The SEU theory makes the assumption that choices are made among a given, fixed set of alternatives and that each of these alternatives has a (subjectively) known probability distribution of outcomes. Based on the probability distribution of expected outcomes, a choice is made that maximizes the expected value of a given utility function (Savage 1954).

Simon called this model into question in the 1950's when he developed a behavioral theory based on the idea of "bounded rationality". His research showed that decisions are not made on the basis of "maximization" but by "satisficing" (Simon 1950). Satisficing occurs when humans set an aspiration level, which if achieved, they will be satisfied. If they don't achieve their level of aspiration, they will either change aspiration levels or change their conceptualization of the decision (Simon 1986).

The bounded rationality theory takes into account cognitive limitations individuals might face in pursuing the maximization of their objectives. These cognitive limitations

could be related to cognitive capacity or information accessibility. As a result, the behavioral approach that emerges explains a relationship between decision-making processes and decision-making. The concept of satisficing and bounded rationality is critical to the idea of framing in that it suggests that humans' decision making behavior may rely on heuristic constructs which in turn may be impacted by framing approaches.

Framing Review

The historical roots of western thought regarding framing stem back to writings on rhetoric by the philosophers of ancient Greece who used oratory to debate issues of public and political importance. Interest in rhetoric was passed from the Greeks to the Romans and explored in great depth by Aristotle in his book *The Art of Rhetoric* written in 350 BC (Aristotle 1991). Aristotle sought to understand the art of persuasion by systematically exploring the effects of the speaker, speech, and audience. Aristotle begins *The Art of Rhetoric* by saying that “rhetoric is the counterpart of dialectic.” Dialectical methods are necessary to find truth, whereas rhetorical methods are required to communicate it.

Multi-Disciplinary Perspectives of Framing

In recent years, a large body of literature focused on framing has developed in fields such as sociology, economics, psychology, cognitive linguistics, communication, political science and media studies (Borah, 2011). A recent study identified two broad foundations for framing research – sociological and psychological. This study contends that the framing research that evolved from sociological foundations refers to the frames in communication. These types of frames tend to focus on words, images, phrases, and

presentation styles that are used to shape communication (Borah, 2011, p. 275).

Whereas, framing research that finds its roots in psychology focuses on the individual and ways in which individuals organize, prioritize, and focus their thinking. The result is a duality within framing research where frames are considered as part of a person's external information environments, such as the news media, and internally as part of an individual's mind.

The terms "frames" and framing have been defined in a myriad of ways as part of the literatures of several disciplines. These terms often reflect the research objectives and foundational theories prevalent in that discipline. The diversity of approaches to the use and conceptualizations of the terms has caused framing research to be used uniquely as part of distinctly different research approaches (Borah, 2011). A few of these definitions will be explored before describing a conceptual framework that might be used to employ the terms within the discipline of information science as applied to information behavior.

In addition to the myriad of ways the term frame is defined across disciplines, there are also closely related terms such as mental models and schema that are often used synonymously. These terms will also be explored as a way of positioning the concept of a frame within a multi-disciplinary literature as well as within the context of this study.

Artificial Intelligence / Cognitive (Objectivist)

The concept of a "frame" was introduced by Minsky (1974) as a response to his belief that most theories in Artificial Intelligence and in Psychology were not able to account for, practically or phenomenologically, common-sense thought. As a result, he attempted to develop a unified, coherent theory to shed light on common-sense thought.

The essence of this theory is “when one encounters a new situation (or makes a substantial change in one’s view of the present problem), one selects from memory a structure called a *Frame*. This is a remembered framework to be adapted to fit reality by changing details as necessary” (Minsky 1974, p. 1).

Minsky developed a model to describe a frame as a data-structure used to organize knowledge. According to this model, a frame has slots which hold information regarding the characteristics and attributes of the frame subject. A frame can be altered through the process of assigning new values to the slots in order to “frame” a new situation. Minsky’s conception of frames was used in artificial intelligence for knowledge representation and psychology for understanding cognitive activity.

“A *frame* is a data-structure for representing a stereotyped situation, like being in a certain kind of living room or going to a child’s birthday party. Attached to each frame are several kinds of information. Some of this information is about how to use the frame. Some is about what one can expect to happen next. Some is about what to do if these expectations are not confirmed.” (Minsky 1974, p. 1)

Minsky describes emerging theories of intelligence “moving away from traditional attempts both by behavioristic psychologists and by logic-oriented students of Artificial Intelligence in trying to represent knowledge as collections of separate, simple fragments” (Minsky 1974, p. 3). The perspective advance by Minsky (1974) is based on an objectivist conception of reality. This idea of framing may have a physical structure in terms of the way that bits are organized on a computer chip or the way they are organized in a type of physical structure cognitively. In artificial intelligence, the

technical definition of frame has “evolved to mean something like a fixed set of named slots whose values vary across applications”(Barsalou, 1992, p. 28).

Cognitive Psychology (Constructivist)

The use of the term frame in cognitive psychology has often been confused with schema. Barsalou (1992) points out that the same structural properties proposed for frames have been used to articulate the structure of schemata. The term “schema” was first introduced by Sir Frederic Bartlett, one of the early pioneers of modern cognitive psychology, in his well-known book, *Remembering* (1932). He described the principle behind the concept of schema as “the past operates as an organized mass rather than as a group of elements each of which retains its specific character”(Bartlett, 1932, p. 197). Tannen (1993), points out that an important aspect of Bartlett’s definition, and hers, is the notion that they are actively being developed and are not static. She notes that the dynamic nature of schema (or frames) was lost as the idea was incorporated into studies of artificial intelligence by Minsky, Charniak and others (Tannen, 1993, p. 16).

Barsalou (1992) claims that “schema” is often criticized for being vague and unspecified in the field of cognitive psychology and proposes a definition of frames consisting of attribute-value sets, structural invariants, and constraints. He describes frames as having a recursive nature and being “dynamic relational structures whose form is flexible and context dependent”(Barsalou, 1992, p. 2). He contends that “frames provide the fundamental representation of knowledge in human cognition”(Barsalou, 1992, p. 2).

Cognitive/Linguistics (Constructivist)

In the field of cognitive linguistics, emphasis is placed on the role language plays in developing associations between concepts. The cognitive linguistic perspective is most often associated with George Lakoff. In his book, *Women, Fire, and Dangerous Things* (1987) he makes the case for the importance of categorization claiming that “whenever we reason about kinds of things – chairs, nations, illnesses, emotions, any kind of thing at all – we are employing categories” (Lakoff 1987, p. 5). This book was significant in refuting the current objectivist view underlying cognitive science.

Lakoff expanded the concept of cognitive categorization by introducing research on the role metaphors play in shaping world views (Lakoff and Johnson 2003). He later applied the role of metaphors to politics in his book, *Moral Politics: How Liberals and Conservatives Think* (Lakoff 2002). This book introduced the concept of framing from a cognitive linguistic perspective as applied to politics. Lakoff makes the case that framing is primarily about moral values and systems of ideas, and secondarily about the language that is used to express them.

Lakoff illustrates a political frame for the use of the term “tax relief”. He claims that these two words create a metaphor of a rescue scenario where there is a hero (the reliever-of-pain), a victim (the afflicted), a crime (the affliction), a villain (the cause-of-affliction), and a rescue (the pain relief) (Lakoff 2004, p. 4). His contention is that these evoked metaphors play a significant role in the way we make sense of the world.

Sociology, Communications and Political Science (Constructionist)

Sociologists, political and communication scientists have also studied framing. These disciplines have predominantly studied framing in social constructionist terms as

first introduced by Goffman (1974) in his book *Frame analysis: an essay on the organization of experience*. Goffman described frames in terms of social constructs which are “schemata of interpretation” enabling individuals “to locate, perceive, identify, and label” (Goffman 1974, p. 21). Since Goffman’s identification of frames, there has been considerable research in these fields regarding framing, although no clear definition of the term has been established.

Current efforts are underway to establish a consistent conceptualization of framing theory within the field of communication (Entman 1993). Entman advanced the following definition of framing toward the objective of gaining consensus around the concept of framing. He proposed that framing be described as a way to “select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretations, moral evaluation, and/or treatment recommendations” for the issue being described (Entman 1993). Within the fields of political science, the concept of framing has been further narrowed to identify different types of framing such as goal framing, risk framing, institution framing, and valence framing (Nelson 2004).

Related concepts

Mental models

Mental models have been particularly influential within the disciplines of systems thinking, systems science and human computer interaction (HCI). Within the disciplines of systems thinking and systems science mental models have been considered differently. Richardson, et al. (1994) describes mental models in a dynamic, planned action setting as needing to be “composed of (at least) these four elements:

intentions, perceptions, system structures, and plans” (Richardson, Andersen, Maxwell, & Stewart, 1994, p. 3). This definition defines a mental model as describing a process systematically in terms of not only of intentions and perceptions but also of structures and plans. Whereas, Senge (1994) claims mental models “can be simple generalizations such as “people are untrustworthy,” or they can be complex theories, such as my assumptions about why members of my family interact as they do. But what is most import to grasp is that mental models are active – they shape how we act” (Senge, 1994, p. 175).

Within the HCI literature user’s mental models of how something works has been described as being “one of the most tantalizing ideas in the psychology of human-computer interaction (HCI)” and as “one of the most widely discussed theoretical constructs: It was in the vanguard of early attempts to derive theoretical approaches to HCI that progressed cognitive science at the same time as having a genuine practical impact” (Payne, 2003, p. 136). Of particular importance to this study is Payne’s (2003) observation that “Considerably less attention, in cognitive psychology, has been given to the contents of the mind: what do people believe about an aspect of the world, what is the relation between these beliefs and reality, and how do the beliefs affect their behavior?” (p.139). In the general sense as described by Senge a frame could be form of a mental model. Or as Payne (2003) describes, frames may be representative of a mental model that Payne considers as describing contents of the mind.

Concept maps

Another form of knowledge representation is the concept map. Trochim (1989), describes a concept map in a group context as “a pictorial representation of the group's thinking which displays all of the ideas of the group relative to the topic at hand, shows how these ideas are related to each other and, optionally, shows which ideas are more relevant, important, or appropriate” (Trochim, 1989, p. 2). Concept maps are often used as tools to promote dialogue and share understanding among a group. Techniques for analyzing the maps have also been developed as a way to bring greater analytic rigor to the use of concept maps. Concept maps have many similarities with the frame construct as discussed but have traditionally not been used to link to contextual factors in the same way as the framing construct.

Framing Summary

As demonstrated, framing and related terms are widely used in a number of tangential disciplines to information science. The definition of the terms are divergent within disciplines and across disciplines with little consensus despite wide recognition of the need for consensus. Despite, the lack of an agreed definition there are commonalities among the definitions that prove valuable to understanding frames, and knowledge representations in general.

Several attributes have emerged as being particularly important in the context of this study:

- 1) The purpose of representing knowledge as both an internal cognitive structure and external form of knowledge expression.

- 2) The means for incorporating context into knowledge representations that describe a person's understanding of an area of inquiry.
- 3) A structural way to understand the linkages between concepts, attributes, and values as an independent entity with its own unique characteristics.
- 4) The idea that this structure is dynamic constantly shifting and adapting to both external and internal processes.

At its core, a frame is a type of knowledge representation. As described, knowledge representation constructs such as frames, schema, mental models, and concept maps all share the purpose of modeling the way people understand a phenomenon. After much consideration, the concept of a frame was chosen as the best construct to use given the context of this study. Frames have been described as social constructs and have been tied to contextual factors such as a person's experiences in the world.

Framing constructs represent a way of understanding the perspective of an individual by placing an issue or problem in the context of person's life experience. It creates a structure in accordance with a Gestalt model of problem solving. The structure emphasizes features of the situation and moves others to the background as described in Gestalt psychology as figure and ground. A frame selects the aspects of an issue to be considered and defines a person's scope of inquiry.

Framing Approaches

Framing has also been tied to processes such as analytics and reflection which provide important new ways for understanding information behavior.

Frame Analytics

The frame analytic approach focuses research effort on understanding the effect of framing on individual behavior as described by the cognitive and constructionist approaches. This approach is closely linked to the work of Daniel Kahneman, recipient of the 2002 Nobel Prize in economics for his work with the late Amos Tversky studying the conditions under which individuals made decisions according perceived risk. Their findings indicated that the way a problem was “framed” impacted perceived risk and the choices made by the individual (Kahneman 1984). The prospect of a loss has a greater impact on decision-making than does the prospect of an equivalent gain. A decision maker will select the option with the highest subjective utility, regardless of whether or not that provides the highest objective gain. Their findings provide further evidence that real-world decision-makers do not make decisions according to the theory of expected-utility maximization (Kahneman 1979).

Frame Reflection

Donald Schön and Martin Rein (1994) introduced the concept of “frame reflection” in their book *Frame reflection: toward the resolution of intractable policy controversies* (Schön and Rein 1994). Schön and Rein (1994) “see policy positions as resting on underlying structures of belief, perception, and appreciation, which [they] call ‘frames’” (Schön and Rein 1994, p. 23). The objective of this research is to understand and improve the process rather than to study the phenomenon. They argue that so-called “frame conflicts” are at the root of many policy controversies.

Schön and Rein (1994) reason that “human beings can reflect on and learn about the game of policy making even as they play it, and, more specifically, that they are capable

of reflecting *in action* on the frame conflicts that underlie controversies and account for their intractability” (Schön and Rein 1994, p. 37). This belief is at the heart of their proposal for ‘frame-reflective discourse’ as a way to resolve policy controversies.

Frame Analysis and Reflection: Descriptive and Normative Approaches

Research regarding framing includes both descriptive and normative approaches.

The following table provides an overview of how this research is situated across this spectrum of activity.

	Frame Analysis	Frame Reflection
Researchers (partial list)	(Goffman 1974; Entman 1993; Benford 2000; Lakoff 2002; Nelson 2004)	(Checkland 1990; Schön and Rein 1994; Senge 1994)
Definition	The analysis of the effects of framing on individuals and groups behavior.	The process of reflecting on the framing activity toward improving processes.
Descriptive	Approaches used are quasi-experimental studies, surveys, voting patterns and other quantitative methods in addition to naturalistic methods.	The case study method has been used to evaluate and describe framing activities as associated with frame reflection, soft system methodology and systems thinking.
Normative	“Strategic framing” is applied to issue framing as part of political processes in an effort to influence voting and issue representation.	Checkland, Schön, Rein and Senge all have contributed toward developing methodologies directed at improving practice by improving the process of frame reflection.

A conceptual definition of framing

As argued, the shift toward considering certainty and continuity, along with uncertainty and discontinuity, could have important implications for the way

information behavior is understood. Instead of focusing exclusively on “gaps”, the focus shifts toward understanding the process of building or extending existing knowledge. This view is fundamental to the concept of framing which may not have as much to do with bridging gaps as with building on existing understandings. As argued by others, the majority of information behavior may be directed at building on existing knowledge (Savolainen 1993; Yoon 1999; Olsson 2005).

Using a metaphor based on an architectural model, framing means to raise the beams and support structure on which the rest of the building hangs. Applying this conception of the term to an information problem, we can envision the framing of the problem as the structure on which a conceptual understanding of a problem rests. This view is compatible with the conceptual definition of framing advanced by the social constructionist perspective. If we identify certain aspects of a problem that are more important than others, we start to build a structure on which we can hang additional information and build the structure of the problem.

The assumption guiding this research study is that the information structure is a dynamic system that is continually changing to reflect the context of the individual. This view better represents information behavior in a more holistic, organic and dynamic light, allowing for the inclusion of the concept of feedback loops and non-linear processes. This conceptualization might also better support the idea that it is much easier and more common to reinforce or strengthen an existing world view rather than tear apart and rebuild a new world view.

An approach based on discontinuity (sensemaking) would mandate questions regarding the “hows” or the “verbs” of information behavior (Dervin 1992). For

example, how did a person define his or her situation? How did the individual develop a sense for what type of information was needed? How was a person stopped from progressing?

An approach based on continuity might ask questions devised to understand principles of certainty and continuity regarding the “whats” and “whys” of the situation. For example, “what” and “why” were certain aspects identified as major issues? What are some of the past experiences used in the identification of these questions? What and why were certain aspects identified as more important than others?

The “whats” and “whys” address issues of ontology; the how’s address questions of epistemology. The main point of contention is regarding the focus of research interest, arguing that the “whats” deserve more research attention. This view does not deny that the current approaches based on uncertainty regard questions of “nouns” or “whats” as having no importance at all, but it suggests more attention should focus on them as central to a person or group’s context. Therefore, the current paradigm seems to focus the majority of attention on the epistemological elements and neglects the ontological elements of information behavior that is important to incorporating context into our understanding of information behavior.

The following definitions are used as part of this research.

Definition of a Frame (Noun)

A frame is a dynamic representation of a situation (issue, problem or solution) where certain aspects of a situation are made more salient than others, and relationships are suggested that link these aspects to ideas, concepts, values, and metaphors. The

objective of a frame is to affect the way individuals and groups make sense out of a situation and as a means of building knowledge.

Definition of Framing (Verb)

Framing entails representing a situation (issue, problem of solution) in a way where certain aspects of a situation are made more salient than others and to infer relationships between the salient aspects to ideas, concepts, values and metaphors. The objective of framing is to affect the way individuals and groups make sense out of situations.

Chapter 3: Philosophical Grounding

In addition to the specific research discussed, of primary importance to any social science research study is the question of what constitutes “good” science and the “truth”. The following describes the philosophical grounding of the study. The debate regarding “good” science has been fiercely debated between natural scientists and social scientists for decades. The so-called “Science Wars” emerged between the natural sciences and social sciences relative to the nature of science and social science in particular. This debate has hinged largely on whether the findings of science are social constructs or truths about an external reality. On one end of the spectrum are those such as Rorty, Gadamer, and Habermas who contend that “truth is made rather than found” (Rorty, 1989, p. 3). On the other end of the spectrum is Wilson (1989) who argues for a “consilience” or uniting of the sciences under a grand theory following the rationalist positivist approach to science (E. O. Wilson, 1998). Wilson (1989) argues for a reductionist approach to social science inquiry in which human behavior can be explained by understanding the neurological processes that control human behavior. This debate has important implications for the conceptual and methodological approach adopted as part of this study. The following will discuss the work of Kuhn, Burrell and Morgan, and others as a way of situating the research within the philosophy of science debates.

Thomas Kuhn: Paradigms

Thomas Kuhn’s concept of “paradigms” has been central to many of the discussions that have taken place as part of the “Science Wars”. In Thomas Kuhn’s seminal book

The Structure of Scientific Revolutions, originally published in 1962, he injected a degree of relativism into an understanding of sciences by describing the concept of a paradigm. Kuhn defines a paradigm in the following two different manners:

1) “On the one hand, it stands for the entire constellation of beliefs, values, and techniques, and so on shared by the members of a given community.”

2) “On the other, it denotes one sort of element in that constellation, the concrete puzzle-solutions which, employed as models or examples, can replace explicit rules as a basis for the solution of the remaining puzzles of normal science” (Kuhn, 1996, p. 200).

According to Kuhn, scientists operating within the boundaries of this paradigm are doing “normal science”. Kuhn describes the acts in accordance of “normal science” as “puzzle-solving”. “Bringing a normal research objectives to a conclusion is achieving the anticipated in a new way, and it requires the solution of all sorts of complex instrumental, conceptual and mathematical puzzles.” (Kuhn 1996, p. 36) “Puzzle-solving” entails adhering to the accepted beliefs, values, and techniques of the community by building upon the models and examples of the established scientific tradition. The evolution of “normal science” is highly cumulative, steadily extending the scope and precision of scientific knowledge.

Working within the boundaries of “normal science” influences the questions that are posed and the problems that are confronted. The problems that are chosen are problems that fall within the boundaries of the scientific tradition of the field. They are problems that extend or add clarity to existing knowledge. Kuhn argues that pressing societal problems such as lasting peace or a cure for cancer are not puzzles at all since they may not have a solution (Kuhn, 1996, p. 37).

One of Kuhn's central theses is that science does not always follow the established trajectory of extending and refining scientific knowledge. He argues that there are periods of time when "scientific revolution" occurs. These "revolutions" are marked by a paradigm shift. During a paradigm shift, "extraordinary science" occurs which alters the landscape from which a new "normal science" emerges.

Paradigm shifts occur as a result of anomalies within the existing paradigm that cannot be explained by "normal science". Kuhn describes these anomalies as commencing with the "recognition that nature has somehow violated the paradigm-induced expectations that govern normal science" (Kuhn 1996, p. 52-53). Anomalies within "normal science" lead to a period of crisis where a sense grows that something is fundamentally wrong. During these periods of time, "normal science" may be challenged and new paradigms proposed.

Kuhn's work is significant in that it casts doubt over the "traditional" or "accepted" practices of science by injecting a degree of relativism into the natural sciences. Oreskes et. al.'s (1994) challenge the use of models surfaces similar concerns which question the limits of established scientific process to derive models that reflect an objective reality. By suggesting that all models are inaccurate, they introduce an element of interpretivism into scientific practice. This argument could be extended beyond "models" to consider all aspects of a methodology and to question it on the basis of its validity and as being subjective to those that have created it.

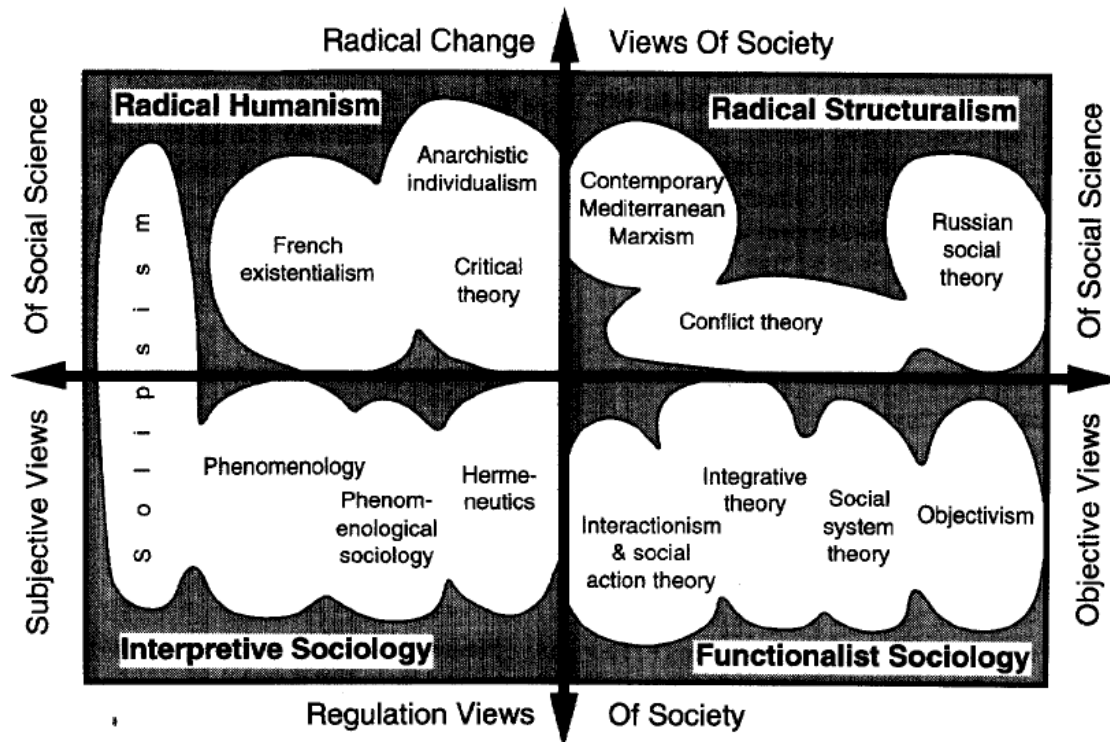
Burrell and Morgan: Framework for understanding Social Action

In an attempt to clarify some of the major sources of confusion regarding the social sciences and to address important differences reflected in the philosophy of science

debates, Burrell and Morgan (1979) present four “paradigms” for understanding social action in their book *Sociological Paradigms and Organizational Analysis*. The objective of this book is to “clarify and help overcome what seems to be some of the major sources of confusion within the social sciences at the present time”(Burrell, 1979, p. x). They contend that social theory can be divided into four mutually exclusive views of the social world. These four views are fundamental to the practice of social science research and the way that the researchers see the world they are analyzing.

Burrell and Morgan (1979) refer to these views as “paradigms” but are careful to differentiate the way they use the word “paradigm” from the way it is used by Thomas Kuhn. Their use of the word “paradigm” refers to the meta-theoretical assumptions that underlie a world view regarding the nature of science and society. This conception of paradigm is more concerned with understanding different perspectives within social theory and as a tool to examine the philosophical underpinnings of scientific work.

As depicted in Figure 6, Burrell and Morgan’s (1979) framework includes four paradigms: radical humanism, radical structuralism, interpretive sociology, and functionalist sociology. Burrell and Morgan explain the differences between these four paradigms as straddling four dimensions: nominalism vs. realism, anti-positivism vs. positivism, voluntarism vs. determinism, and ideographic theory vs. nomothetic theory. These positions are consolidated around the issues of radical change views of society vs. regulative (stability) views of society and subjective views of social science vs. objective views of social science which make up either end of an axis in the two by two matrix represented in Figure 6.



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Figure 6 Burrell and Morgan's framework framework of four paradigms as redrawn by Lane (1999)

Of particular interest is Burrell and Morgan's differentiation between interpretive sociology and functionalist sociology. This difference contributes to much of the philosophical debate in systems sciences. An interpretive perspective views the role of a model as a tool to inform, or as Oreskes (1994) states "a heuristic device", whereas in the functionalist view a model represents an objective view.

A relationship between Kuhn's (1996) concept of a scientific revolution directed primarily at the physical and natural sciences, and Burrell and Morgan's (1979) description of a radical change view of society as opposed to a regulative change view of society may be bridged by understanding the impact of people's perception on model behavior. If we accept Kuhn's (1996) notion that scientific revolutions involve radical

changes of perspective, or a so called “paradigm shift”, a radical change view of society as described by Burrell and Morgan (1979) might follow. Oreskes (1994) points out that a model may successfully explain past events and present events but that is no guarantee that the model will predict future events. A shift in a model’s exogenous variables may cause the model not to predict the future accurately. If we assume a model’s exogenous variables are affected by human’s perceptions, a paradigm shift, could ultimately be the cause of a model’s inaccuracy. Alternatively, the probability of a model to represent “reality” could decrease. A gradual decrease might be explained by incremental changes in people’s perceptions. This view would be more in accordance with Burrell and Morgan’s (1979) regulative view of society.

Flyvberg: A Solution to the Science Wars

Another approach to addressing the issues surfaced in philosophy of science debates, is presented by Bent Flyvberg in his book *Making Social Science Matter*. Flyvberg presents a way out of the Science Wars by “developing a conception of social science based on a contemporary interpretation of the Aristotelian concept of phronesis, variously translated as prudence or practical wisdom.” This approach advocates for going beyond analytical, scientific knowledge (episteme) and technical knowledge or know-how (techne) to questions regarding judgment and decision making.

Flyvberg argues that the social sciences are weakest where the natural sciences are strongest and vice versa. The social sciences have not been able to develop explanatory and predictive theory to the extent of the natural sciences. Conversely, the natural sciences have not contributed much in terms of reflexive analysis and discussion of

values and interests which are the essence of enlightened political, economic, and cultural development (Flyvbjerg 2001).

Flyvberg contends that “context is central to understanding what social science is and can be”. He describes typical questions regarding the philosophy of science and epistemology as “What is knowledge?”; “What can we know?”; “Under what conditions can we know that we know?” The question most apt at addressing an understanding of context is “How do people acquire knowledge and skills?” Flyvberg’s conception of context shifts the focus toward understanding how people think. This approach reflects the purpose and direction of this research study to understand how people engage in sensemaking when they frame an issue and develop an understanding of their information needs. Flyvberg’s proposed shift in approach may also provide an important bridge toward defining ways in which this research might fulfill the objectives identified in the introduction of this study to inform work in other disciplines.

Discussion of Philosophical Grounding

The philosophical assumptions underlying this research study reflect the assumption that “truth” is largely a construct of human behavior. This does not necessarily mean that there aren’t “truths” or facts that are independent of human behavior, rather the “truth” that matters is the one that people believe. This research is about understanding how people come to know this “truth”. It reflects an assumption that changes in a person’s understanding most often happens in small steps over time rather than all at once. Therefore, the quadrant of Burrell and Morgan’s framework most representative of this research is the interpretive sociology perspective.

The next section will focus on work in the field of information science that is congruent with the philosophical assumptions described.

Information Science MetaTheory

Within the field of information science, many scholars have explored the theory underlying key concepts used as part of information science studies. Metatheory as described by Bates (2005), “can be seen as the philosophy behind the theory, the fundamental set of ideas about how phenomena of interest in a particular field should be thought about and researched”(Bates, 2005, p. 2). The concept of metatheory is similar to the concept of paradigm as described by Thomas Kuhn in 1962 (Kuhn, 1996). Kuhn (1996) describes a paradigm in terms of scientific practice as including “law, theory, application, and instrumentation together to provide models from which spring particular coherent traditions of scientific research”(Kuhn, 1996, p. 10). These paradigms serve to “define the legitimate problems and methods of a research field” (Kuhn, 1996, p. 10). The importance of metatheory is to build a foundation that defines the ontological and epistemological commitments guiding research.

Although there is some consensus regarding the concept of a metatheory, what actually constitutes a metatheory in the field of information science is less clear. Bates (2005) identifies thirteen metatheories divided into three categories based on whether the categories use a nomethetic, mixed, or ideographic approach to understanding a phenomenon. A nomethetic approach is concerned with discovering general laws of the “real world” and is committed ontologically to the belief that there are universal patterns and processes as part of the larger world. The nomethetic approach is often associated with the natural and physical sciences as part of the positivist tradition. An ideographic

approach, on the other hand, is concerned with discovering the particulars of a relatively narrower area of study. The ideographic method of inquiry seeks understanding through the study of the anomalies that define a much narrower element of inquiry. This approach seeks to uncover the themes and patterns that are representative of that specific area of inquiry. This approach builds knowledge by focusing on the particulars and is most closely associated with the humanities.

Others have described the metatheories guiding research in IS as divided between the physical paradigm and cognitive paradigm or as empiricism, rationalism and historicism (Ellis, 1992; Hjørland, 1997a). Tuominen, Talja, and Savolainen (2002) argue that the following three metatheories have shaped the field: information transfer model, constructivism, and constructionism (Tuominen, 2002b). They argue that these three metatheories may be used to categorize much of the information science theory and research. For the purpose of this study, Tuominen's conceptualization of the predominant metatheories guiding information science will be used as guiding framework.

The information transfer model is based on the mathematical information theory model advanced by Shannon and Weaver (1948) in their seminal work *A Mathematical Theory of Communication*. This theory conceives of information, or message, as an object emanating from a source, transmitted into a signal, and received by a receiver which converts it back to a message which is then finally delivered to a destination (Shannon, 1948). The communication process is examined in terms of the impact on the object described as bandwidth, noise, and redundancy. Associated with this model are measures of frequency, noise, distortion, and entropy which were used to examine

the communication process. This approach has also been referred to as the “physical paradigm” (Ellis, 1992).

As the predominant paradigm in the 1950’s, 1960’s and 1970’s, the majority of information seeking studies focused on channels of information and the systems used to transmit this information. These studies primarily treated the person as the user of information objects and focused on the types of information needs from the system, how much they used the system, and what information resources users requested. Although information science, for the most part, has moved beyond these types of studies, Shannon and Weaver’s (1948) model is still used to show the flow of information and is also credited with the concept of reducing uncertainty which has been incorporated into subsequent information models (M. J. Bates, 1999; Case, 2002; C Cole, 1999).

The second metatheory described by Tuominen, et al. (2002) is constructivism. Constructivism emphasizes a user’s role in constructing meaning from information. This view portrays the user as an active constructor of meaning derived from the information received and not simply a passive receiver of information. This perspective places the individual as the creator of knowledge and meaning. In this sense, context is studied as it relates to the process of deriving meaning from information. This view is central to the movement in the field of IS from a system centered to a user centered focus. The user centered focus is closely linked to the cognitive view of information behavior. Dervin and Nilan’s 1986 landmark article published in the *Annual Review of Information Science and Technology* marks the emergence of the constructivist paradigm within information behavior research (Dervin & Nilan, 1986). Studies incorporating this approach began slowly emerging in the late 1960’s, 1970’s and 1980’s,

becoming the prevailing paradigm since the late 1980's. Studies of this nature examine how people make sense of information, shifting the focus from the information itself and the systems that manage it to the way people construct meaning from the information.

Social Constructionism

The third metatheory presented by Tuominen is constructionism. This view “stresses the dialogic and contextual nature of knowledge production and the dialogic and contextual nature of users, information needs and relevance criteria” (Tuominen, 2002b, p. 277). According to this perspective, “reality” is socially constructed occurring through acts of discourse. Therefore, knowledge about reality is based in language and the social process of communicating. This approach rejects the notion that reality is constructed in people’s minds and finds its roots in the highly acclaimed book titled The Social Construction of Reality published in 1966 by the sociologists Berger and Luckmann (Berger & Luckmann, 1966).

As applied to information science studies, the concept of “information practice” is preferred over “information behavior” (Tuominen, 2005). The shift reflects a commitment to the construction of meaning emerging from groups rather than the construction of meaning by an individual. Studies adopting the social constructionist perspective have begun emerging within the past decade. These studies have a strong focus on the social context in which meaning occurs and have been advanced by researchers such as Tuominen, Savolainen, Talja, Chatman, and Fisher. (Chatman, 1999, 2000; K. Fisher, 2005; K. E. Fisher, 2004; K. Fisher, Naumer, Durrance,

Stromski, & Christiansen, 2005; Savolainen, 1997; Talja, 1999, 2005; Talja & Maula, 2003; Tuominen, Talja, & Savolainen, 2003).

The social constructionism view best describes the philosophical assumptions guiding this research study. The research methods and design pay particular attention to gaining insight into the social forces that influence the development of a person's conceptual understanding of an issue and the identification of his or her information needs.

Chapter 4: Research methodology, design and limitations

This chapter describes the adopted research methodology, research design, data collection process and data analysis approach. It also identifies potential limitations of these approaches as they relate to the study. All of these topics of discussion are grounded in the research objectives and philosophical assumptions previously discussed. The theoretical underpinnings of the research methodology and design also serve to explain the researcher's perspective and provide the reader with greater clarity regarding the research study.

Research Methods

This research study adopts qualitative research methods and a grounded theory approach toward developing theory as a way of addressing the research objective. A series of case studies were used as a means of generating data to support investigation of the research objectives and subsequent theory building using grounded theory methodologies.

According to Bates (2005), underneath the broad umbrella of a metatheory lie individual theories used to explain some phenomena. Fisher writing as Pettigrew (2001) shows that there are also discrepancies in the way theory is defined among researchers in different subfields of IS (Pettigrew & McKechnie, 2001). Theories could be described as an orientation strategy to the world; as described by Tuominen (2002) "They bring into researchers' view a specific research object, and a specific way of conceptualizing, thinking about, and studying this object" (Tuominen 1997, p. 272). Theory building may be clarified or built through the process of constructing models

that represent the phenomena being studied and the ways of understanding that phenomena. In a 2001 study Pettigrew and McKechnie reported that out of 1,160 articles published in six information science journals, 34.1% of the articles discussed theory (Pettigrew and McKechnie 2001).

Qualitative research has been described as the best method for exploring human behavior and especially effective for investigating complex phenomena (Fidel 1993, p. 222). Qualitative research consists of interpretive practices that make the phenomena being explored visible through field notes, interviews, conversations, photographs, recordings, documents and memos to the self (Denzin and Lincoln 2005, p. 3). This data is then analyzed and classified as a means of making sense of complex human phenomena. In the past 20 years qualitative research methods have become increasingly popular in the field of IS as a way of understanding human information behavior (Fidel 1993, p. 219).

Multi-dimensional In-depth Long-term Case study (MILC) Method

The study uses the emerging research method called Multi-dimensional In-depth Long-term Case study (MILC) methodology. This method was pioneered by Ben Shneiderman and Catherine Plaisant at the Human-Computer Interaction Laboratory at the University of Maryland (Schneiderman 2006). This methodology emphasizes situated strategies that are ethnographically-oriented and employ longitudinal participant observation. This methodology stems from emerging research methods in the field of human computer interaction and specifically the evaluation of the impact of information visualization tools on users' understanding of complex issues. It has also

been embraced by a growing community of researchers who are studying creativity support tools.

As described by Shneiderman and Plaisant 2006, the aspects of “Multi-dimensional In-depth Long-term Case studies” are as follows:

“The multi-dimensional aspect refers to using observations, interviews, surveys, as well as automated logging to assess user performance and interface efficacy and utility. The in-depth aspect is the intense engagement of the researchers with the expert users to the point of becoming a partner or assistant. Long-term refers to longitudinal studies that begin with training in use of a specific tool through proficient usage that leads to strategy changes for the expert users. Case studies refer to the detailed reporting about a small number of individuals working on their own problems, in their normal environment.” (Shneiderman and Plaisant 2006)

The MILC methodology has been primarily used as a means of studying human behavior in relation to software systems and specifically sensemaking activities of people using information visualization tools (Perer and Shneiderman 2008). The processes and practices defined by this approach are well suited to the research study which seeks to engage participants in the use of a software tool as a means of sensemaking.

Grounded Theory

This research study is designed as an inductive exercise to yield information to support the development of theory. Inductive analysis involves the discovery and analysis of patterns, themes, and categories in one’s data (Patton, 2002). The grounded theory methodology was developed in the 1960’s by Glaser and Strauss informed by the

work of American pragmatists such as John Dewey, George H. Mead and Charles Peirce with their emphases on the necessity of conceiving a method in the context of problem solving as well as the tradition of Chicago Sociology at the University of Chicago which utilized field observations and intensive interviews as data-collecting techniques (Strauss 1987, p. 6). Grounded theory is also informed by the theoretical foundation of Symbolic Interactionism (Corbin & Strauss, 1990). Pragmatism and Symbolic Interactionism share the view that phenomena are not static but continually change in response to changing conditions. These two philosophies also share the rejection of strict determinism and non-determinism, viewing actors as having the ability to control their destinies although often recognizing that actors don't always utilize the means of controlling their destinies. Grounded theory seeks both to reveal relevant conditions and understand how actors respond to their changing conditions and the consequences of their actions (Corbin & Strauss, 1990, p. 3). Based on these premises the grounded theory methodology supports systematic development of theory from data.

Strauss and Corbin (1997) describe the status of grounded theory methodology and methods within qualitative research as being "... now among the most influential and widely used modes of carrying out qualitative research when generating theory is the researcher's principal aim" (Anselm L. Strauss & Corbin, 1997, p. vii). It has been employed in many qualitative research studies in multiple social science disciplines. Mansourian (2006) examines the adoption of grounded theory in LIS research and traces its use back to Ellis's (1987) dissertation study titled "The derivation of behavioral model for information retrieval system design". She identifies at least 20 LIS research studies, including 10 dissertations that have employed grounded theory methods

(Mansourian, 2006). Powell (1999) also identifies the adoption of grounded theory methods within the LIS research and claims “the fields of library and information science have no shortage of research questions and phenomena needing thorough exploration and continue to need more well founded theories, so there is certainly a need for more grounded theory research” (Powell, 1999, p. 103).

Grounded theory approaches are described by Strauss (1987) as a style of doing qualitative analysis that includes “features such as theoretical sampling, and certain methodological guidelines, such as the making of constant comparisons and the use of a coding paradigm, to ensure conceptual development and density” (Anselm L. Strauss, 1987, p. 5). Grounded theory approaches are concerned primarily with specific analytic strategies, not data collection methods (Charmaz 2003, p. 257). The intent of grounded theory is to move beyond description and to generate or discover a theory (Creswell 2007). Grounded theory approaches adopt a systematic inductive, comparative and interactive approach to inquiry offering several open-ended strategies for conducting inquiry (Charmaz 2003). Grounded theory has become a popular choice of methodology in multiple social science disciplines (Star 1998).

Since its development by Glaser and Strauss (1967), diverging approaches have evolved which have caused a great deal of discussion among researchers (Bryant, 2003; Barney G. Glaser, 2002; Heath & Cowley, 2004). The split between the methods began after the publication of *Qualitative Analysis for Social Scientists* by Strauss (1987) and *Basics of Qualitative Research: Grounded Theory Procedures and Techniques* by Corbin and Strauss (1990). The dispute between the approaches became particularly contentious when Glaser (1992) published a highly critical account of why Corbin and

Strauss's approach should not be considered "grounded theory" but a form of qualitative data analysis. Despite Glaser's contention, both approaches have been widely adopted, and the debate has continued as to which form of grounded theory is best.

Three approaches to grounded theory studies have emerged and been the focus of vigorous discussion. The approaches are the original methods described by Glaser and Strauss in their ground breaking book *The Discovery of grounded theory: Strategies for qualitative research* published in 1967 (Glaserian), a modified version developed by Strauss and Corbin (1990) (Straussian), and finally constructivist grounded theory (CGT) proposed by Kathy Charmaz (2000).

In recent years the original method of grounded theory developed by Glaser and Strauss has been criticized for the positivistic premises assumed and embedded within the logic of the method itself. Critics argue that Glaser and Strauss's approach assumes an objective reality to be discovered (Bryant 2003; Charmaz 2003; Heath and Cowley 2004; Denzin and Lincoln 2005; Charmaz 2006; Mills, Bonner et al. 2006; Mills, Bonner et al. 2008; Charmaz 2008). The Glaserian orientation, which assumes an objective reality, runs counter to the ontological and epistemological premises that comprise the philosophical assumptions guiding the design of this research study.

In their 1990 book, *Basics of qualitative research: Grounded theory procedures and techniques*, Strauss and Corbin set out to specify and develop more advanced, rigorous analytic techniques to be used as part of grounded theory analysis. As cited by Mills (2006), the authors moved away from a strict objectivist position and recognized "the interplay between researcher and the actors studied – if the research is intensive – is likely to result in some degree of reciprocal shaping". However, the authors continue to

pose concerns about valid and reliable data and interpretations and researcher bias consistent with “normal science” throughout their writings and description of grounded theory methods (Charmaz, 2003, p. 254). Critics claim that Strauss and Corbin never directly address the paradigm of thought that underpins their method (Mills, Bonner et al. 2006).

In response to the criticism of both the Glaserian grounded theory approach described by Glaser and Strauss (1967) and the Straussian approach developed by Strauss and Corbin (1990), constructivist grounded theory was proposed by Kathy Charmaz (2000). Charmaz adopts an ontologically relativist and epistemologically subjectivist position that redefines the interaction between researcher and participants in the research process (Mills, Bonner et al. 2006). Charmaz states that “constructivist grounded theory recognizes that the viewer creates the data and ensuing analysis through interaction with the viewed. Data does not provide a window on reality. Rather “discovered” reality arises from the interactive process and its temporal, cultural, and structural contexts. Researcher and subjects frame that interaction and confer meaning up on it” (Charmaz 2003, p. 273).

The recognition of the role of the researcher in co-creating the data and “reality” is important to this study. The study requires participants to use software to guide them through the process of identifying their framing of a problem and their associated information needs. The injection of the researcher and a process into the study setting raises significant issues for methodological approaches that attempt to identify and minimize observer bias in an effort to recognize an external, generalizable reality. A constructivist grounded theory approach accepts the role of the researcher. This

approach seeks to define conditional statements that interpret how subjects construct their realities and does not attempt to constitute a set of hypothesis and level of generalizable truth (Charmaz 2003, p.273). Instead, a constructivist grounded theory approach attempts to constitute a set of hypotheses and concepts that offer both explanation and understanding fulfilling a pragmatist criterion for usefulness (Charmaz 2003, p.273). Therefore, for the purpose of this study, the constructivist grounded theory approach is most aligned with the ontological and epistemological assumptions described in the previous section as well as the research design approach that introduces software and a process into the participants' activities. The constructivist grounded theory guides the study although both Glaserian and Straussian techniques have informed the study to a large degree as the foundation of grounded theory studies. The influence of these methods was carefully considered in relation to the constructivist approach proposed by Charmaz and philosophical foundation for this study.

Summary of Method Selection

The research study is primarily directed at developing theory to explain the relationship between issue framing and information need development. It is outside the scope of this research study to empirically test the theory developed. Therefore, as described, the MILC case study methodology and constructivist grounded theory methodology are best aligned with the scope of the research study, philosophical assumptions, nature of the research problem and the application of software as part of the process of studying user's behavior.

Research Study Design

Problem Selection and Context

In order to study the phenomena of information needs development and information framing using naturalistic approaches, a complex, real life problem solving context was explored. The ideal context required the problem facing potential participants to be a complex problem characterized by many of the criteria used to describe ill-defined and/or wicked problems. Ideally the complex nature of the problem lends itself to many types of interpretation and perspectives. It requires the gathering of information from multiple sources to support decision making behavior and lends itself to being framed from different viewpoints. In addition to the selected context having the problem characteristics described, potential study participants need to be highly motivated and engaged.

Several different groups of people and problem contexts were studied such as anti-gang task forces, political activists, urban planners and retirement planners. Ultimately, the problem context selected was school choice. The context of school choice meets the criteria as being ill-defined, allowing for multiple potential “right” answers, dynamic, and messy as described in the previous sections. Additionally, school choice provides a potential pool of highly motivated information seekers.

The initial pilot study of parents’ information seeking behavior identified the framing of the issue as being a critical part of parents’ sensemaking behavior (Naumer 2005). As part of this study parents were observed in focus groups and interviewed to ascertain how they made sense of complex issues such as school choice. The pilot study

confirmed the nature of the problem context and that parents were considerably motivated and engaged in the study.

Purposeful Sampling Strategy

A purposeful strategy was used as a means of identifying participants for the study. Purposeful sampling strategies are often used in qualitative research studies as a way to purposefully inform an understanding of the research problem and central phenomenon in the study (Creswell 2007). Creswell (2007), defines purposeful sampling strategies as a process where “inquirer selects individuals and sites for study because they can purposefully inform an understanding of the research problem and central phenomenon in the study”. Through the recruitment process participants were sought who shared the objective of choosing a school for their child and who could potentially provide diverse perspectives and problem framing strategies that might inform the research objectives of the study.

The participants in this study were all experiencing the phenomenon being studied, the process of making sense of a complex issue and determining their information needs. They demonstrated motivation for understanding the problem by self-selecting themselves into the study. Selection choices were based on participants potential contribution to providing information that contributes to developing theory. All participants are parents or guardians who were considering the decision of where to enroll their child in school. The assumption underlying this decision is that parents of young children are more likely to have less formed opinions of what factors to consider when choosing a school and less developed information needs. By having less

developed information needs at the onset of the study they would be more likely to develop their information needs in an observable way during the study.

Potential participants were recruited using classified ad sites such as Craigslist and through early childhood provider networks. Participants were incentivized to participate in the study with a \$50.00 gift certificate. Additionally, many parents cited the desire to learn more about schools and the process of choosing a school for their child by participating in the study. In order to achieve diversity applicants for the study were asked to fill-out an online application. This application asked questions ascertaining information about the ages of their children, where they are in the process of thinking about schools for their children, how many schools they were considering, their current beliefs about schools, and their level of engagement in the process.

Sample Size: Theoretical Saturation

The objective of grounded theory research is to reach “theoretical saturation”. Theoretical saturation occurs when “no additional data are being found whereby the sociologist can develop properties of the category. As he sees similar instances over and over again the researcher becomes empirically confident that a category is saturated. He goes out of his way to look for groups that stretch diversity of data as far as possible, just to make certain that saturation is based on the widest possible range of data on the category(Glaser & Strauss, 1967, p. 61).” Glaser and Strauss (1967) go on to say that a researcher using grounded theory methodologies cannot state at the outset of the research study how many groups will be sampled since it is unknown how many samples will be necessary to achieve theoretical saturation (Glaser & Strauss, 1967).


Grounded theory research is often iterative where participants are continually added as theory develops through the research process. Interview protocols and other methods of data collection evolve as the theory develops allowing the researcher to focus on the development of theory through progressively more focused data collection methods. A staggered iterative research approach was used that is in keeping with grounded theory methods.






The initial cohort consisted of 2 participants. Subsequent cohorts consisted of four participants. Each cohort was studied over a 7-10 week period. After each iteration, data was analyzed and used to inform subsequent iterations. Cohorts were added to the process and the duration of the data collection process was extended until theory saturation occurred.

Mapping Software

Software was developed to capture the participants' process of identifying the way they are conceptualizing an issue, defining their information needs, and collecting information to satisfy their needs. The application also incorporates a journal function and information visualizing mapping function.


The following figure is a screen capture of the interface, allowing the participants to identify the major concepts they have identified as the focus of their inquiry. The first step entails adding a concept and ranking the concepts importance.




 1. CONCEPT
 2. NEED
 3. INFO
|
 JOURNAL
 MAP

Concepts



Please identify the main concepts or areas of interest you have regarding your choice of schools.

 1. Add a new concept. (Please enter it below.)

Concept	Importance	Action
<input style="width: 95%; height: 100%;" type="text"/>	1 - Very High ▼	<input type="button" value="Add"/>

 2. Edit your list of concepts. (Click edit or delete)

Concept	Importance	Action
Academic performance	1 - Very High	Edit Delete
School climate	1 - Very High	Edit Delete
Program offerings	1 - Very High	Edit Delete
My Child	1 - Very High	Edit Delete

 [Add Journal entry](#)
 [Logout](#)

[e-mail for help](#)

Figure 7 Software screenshot of concept identification interface

Figure 8 is a screen capture of the interface, allowing the participant to identify information needs associated with the concepts they identified in step 1. They are also able to rank the importance of each one of these needs.

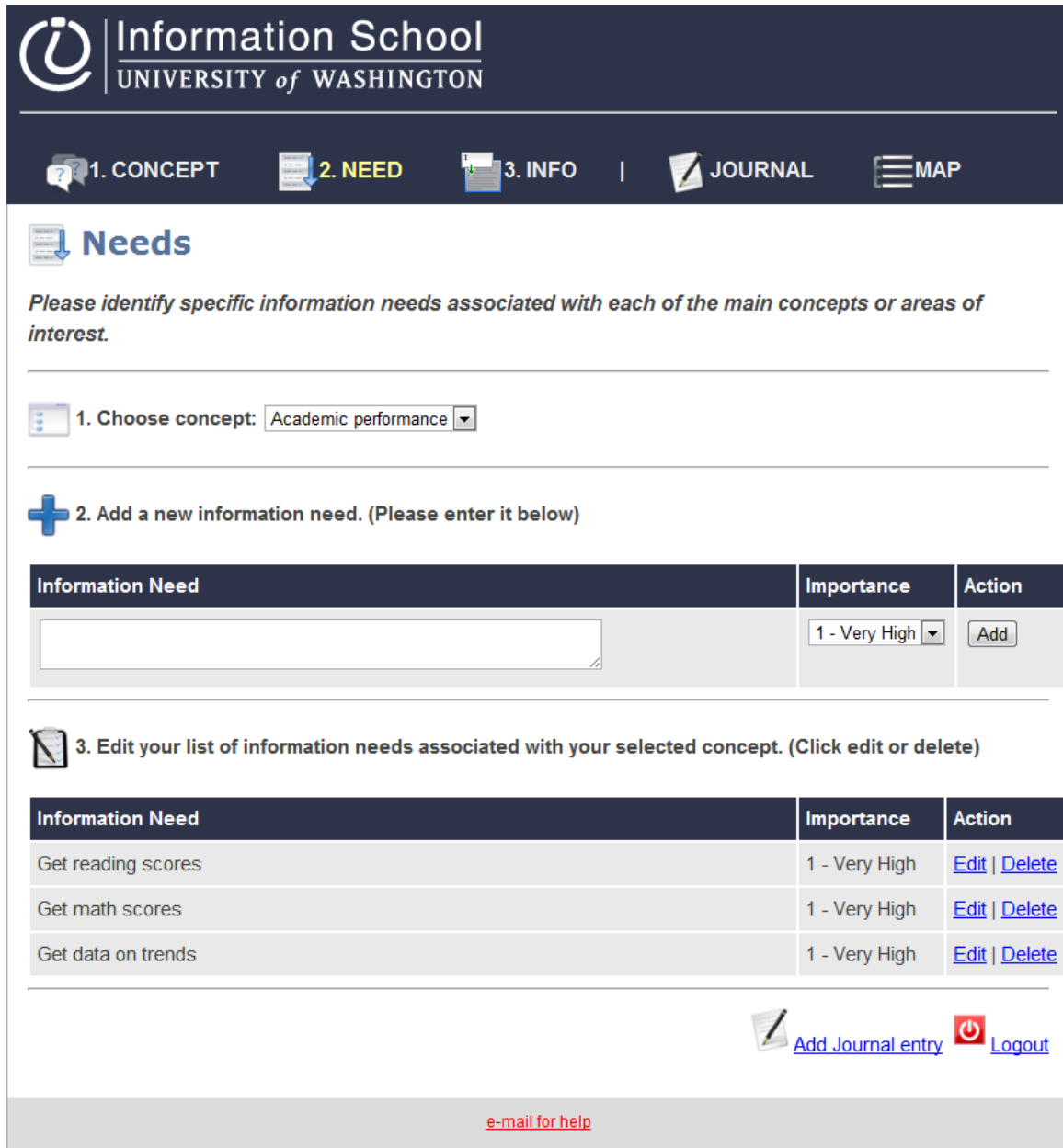


Figure 8 Software screenshot of need identification interface

Figure 9 is a screen capture of the interface, allowing participants to identify information collected in response to their identified information needs. Participants are

able to rank the importance of each one of these information items in terms of their usefulness in supporting decision making.

The screenshot shows the 'Information' section of the Information School University of Washington website. The header includes the university logo and navigation tabs for '1. CONCEPT', '2. NEED', '3. INFO', 'JOURNAL', and 'MAP'. The main content area is titled 'Information' and contains instructions: 'Please identify specific information gathered to fulfill the information needs you have identified.' Below this, there is a dropdown menu for '1) Choose need:' with 'Program offerings: Program offerings' selected. A plus sign icon is followed by the instruction '2) To add a new collected information note. (Please enter it below)'. This leads to a table for adding new information:

Collected information	Importance	Action
<input type="text"/>	1 - Very High	<input type="button" value="Add"/>

Below this is a section for existing information, starting with a notepad icon and the instruction '3) The following is information collected associated with your selected need. (Click edit or delete)'. This is followed by a table of collected information:

Collected Information	Importance	Action
Schools provide good information on program offerings.	2 - High	Edit Delete
Talked to parents about the school's program offerings.	2 - High	Edit Delete

At the bottom right of the interface, there are links for 'Add Journal entry' and 'Logout'. A footer link 'e-mail for help' is located at the very bottom.

Figure 9 Software screenshot of information identification interface

Figure 10 is a screen capture of the interface, enabling the participants to journal their experiences and thought processes influencing their decision making processes. Participants are able to rank the importance of the each one of these journal entries.

Information School
UNIVERSITY of WASHINGTON

1. CONCEPT | 2. NEED | 3. INFO | **JOURNAL** | MAP

Journal

Please note the experiences you had that influenced the way you are thinking about your choice of schools. These experiences could be related to your thought processes, interactions with others, or any other experience that has shaped your thinking about your choice.

+ 1. To add a new journal entry. (Please enter it below)

Journal Entry	Importance	Action
<input type="text"/>	1 - Very High	Add

📄 2. The following are your list of journal entries. (Click edit or delete)

Journal Entry	Importance	Action
Today I spoke with an ex-principal who gave me some good insight on what to look for in a school. As a result I added a new issue to consider.	1 - Very High	Edit Delete

[Logout](#)

[e-mail for help](#)

Figure 10 Software screenshot of journal interface

Figure 11 is a screen capture of the information map generated as a result of the participant's identification of concepts, needs and information. These maps show the relationship between these areas hierarchically and allow participants to construct their maps by adding and editing items interactively.



Information Map

The following map provides an overview of the concepts, needs and information you have selected. You may add or edit information on this map by clicking the corresponding links.

Concept: Academic performance [edit](#)

- **Need: Get data on trends** [edit](#)
 - Collected: Some of the school handouts show performance trends of school. [edit](#)
 - Collected: State website reports performance data for past 5 years. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: Get math scores** [edit](#)
 - Collected: State website shows scores. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: Get reading scores** [edit](#)
 - Collected: Statewide website shows scores. [edit](#)
 - [Add New Collected Information Note](#)
- [Add New Information Need](#)

Concept: My Child [edit](#)

- **Need: What is my my child's learning style?** [edit](#)
 - Collected: Have been talking to friends to better understand how they think about their kids learning styles. [edit](#)
 - Collected: Have been watching my son to better understand how he learns. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: What type of environment will be best for him?** [edit](#)
 - Collected: Have observed how the teacher's interact during the open houses. [edit](#)
 - Collected: Have talked to other parents about the school. [edit](#)
 - Collected: School open houses have talked a lot about the environment. [edit](#)
 - [Add New Collected Information Note](#)
- [Add New Information Need](#)

Concept: Program offerings [edit](#)

- **Need: Is Spanish offered?** [edit](#)
 - Collected: Asked each school if offered. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: Parent's opinions on program offerings** [edit](#)
 - Collected: Talked to Anderson's about their experience. Mostly good. [edit](#)
 - Collected: Talked to Jones about their experience. Very positive. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: Program offerings** [edit](#)
 - Collected: Schools provide good information on program offerings. [edit](#)
 - Collected: Talked to parents about the school's program offerings. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: What after school programs are available?** [edit](#)
 - Collected: Got list of after school programs. [edit](#)
 - [Add New Collected Information Note](#)
- [Add New Information Need](#)

Concept: School climate [edit](#)

- **Need: How do other children feel?** [edit](#)
 - Collected: Asked Jake M. how he felt at school. [edit](#)
 - Collected: Talked to Emily J. about how she felt at school. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: How does the school feel?** [edit](#)
 - Collected: Toured Burbank. Was alright. [edit](#)
 - Collected: Toured Crestwell and felt very good. [edit](#)
 - [Add New Collected Information Note](#)
- **Need: How safe is the school?** [edit](#)
 - [Add New Collected Information Note](#)
- **Need: What are other parent's opinions?** [edit](#)
 - Collected: Talked to Andersons about Crestwell. Positive reviews. [edit](#)
 - Collected: Talked to Jones' about Burbank. Mediocre reviews. [edit](#)
 - [Add New Collected Information Note](#)
- [Add New Information Need](#)



[Add Journal entry](#)



[Logout](#)

[e-mail for help](#)

Figure 11 Software screenshot of information maps interface

Figure 12 is a screen capture of the interface, providing participants the ability to view other people's maps.

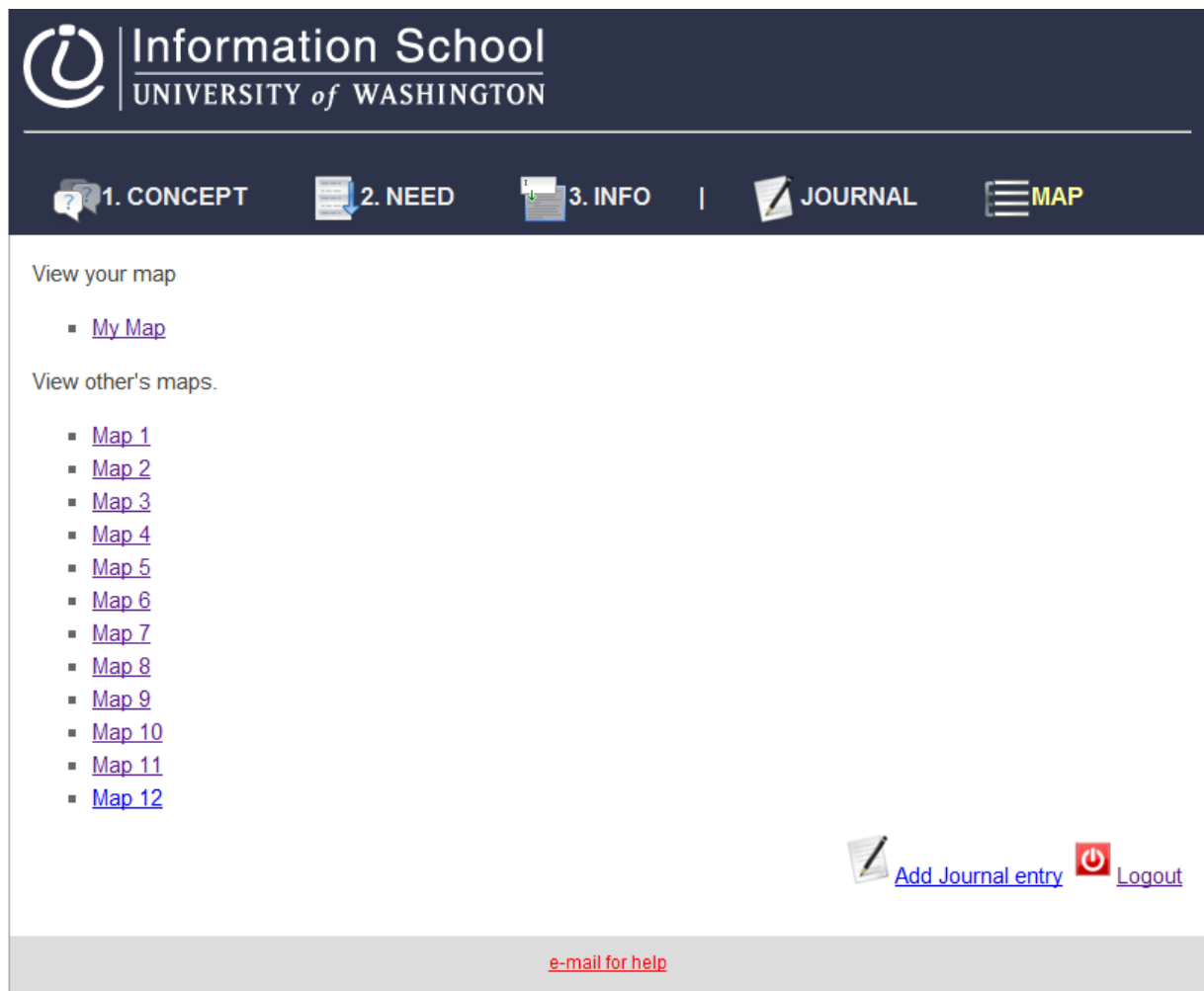


Figure 12 Software screenshot of map selection interface

Data Collection

The study used four different types of data. Data was collected using interviews, journal entries, concept mapping and software usage logs. The aggregation of these four types of information constituted the data analyzed and informed theory development.

A seven week time frame was selected to follow the participants through the school choice decision making process. This time frame was selected based on a typical two month information awareness cycle that many school districts follow. The pilot study results indicated a seven week period of time was enough to observe the evolution of a participant's thinking. Lastly the time period was a reasonable time commitment to request from participants. Due to challenges and timing regarding holidays and interview schedules, a few of the participants were involved in the study for up to 10 weeks.

Table 2 depicts an overview of the seven week data collection process including the types of data collected at each phase.

Table 2 Overview of Weekly Participant and Data Collection Schedule

Week	Participant's Activity	Data Collected
1	Initial baseline interview conducted (appendix tbd) Training on the use of software when a computer was accessible Received software training material (appendix tbd)	Interviews were recorded and transcribed
2	Used software to begin building their information maps Used online journal to record their thoughts and experiences that impacted their decision	Information maps Journal entries Software usage logs

3	<p>Check-in interview (approx. 15 minutes) Used software to begin building their information maps Used online journal to record their thoughts and experiences that impacted their decision</p>	<p>Interview data Information maps Journal entries Software usage logs</p>
4	<p>Used software to begin building their information maps Used online journal to record their thoughts and experiences that impacted their decision</p>	<p>Information maps Journal entries Software usage logs</p>
5	<p>Check-in interview (approx. 15 minutes) Used software to begin building their information maps Used online journal to record their thoughts and experiences that impacted their decision</p>	<p>Interview data Information maps Journal entries Software usage logs</p>
6	<p>Used software to begin building their information maps Used online journal to record their thoughts and experiences that impacted their decision</p>	<p>Interview data Information maps Journal entries Software usage logs</p>
7	<p>Final interview (approx. 1 hour) (appendix tbd) Used software to begin building their information maps Used online journal to record their thoughts and experiences that impacted their decision</p>	<p>Interview data Information maps Journal entries Software usage logs</p>

Data Timeline

Seven week timeline

During **week 1** the participant was interviewed to establish a baseline understanding of the participant’s framing of the issue and how the information needs were identified.

The interview was also used to gain an understanding of the participant's context for understanding the problem, his/her previous engagement with the issue, barriers to understanding the issue and the participant's overall motivation.

During **weeks 2, 4, and 6**, the participant's journals and usage of the concept mapping tool were reviewed. If no activity had been recorded, the participants were reminded to make a journal entry and interact with the concept mapping tool if the thinking had evolved during the week.

During **weeks 3 and 5**, journal entries, concept maps and software usage were reviewed. The participants were also interviewed for 15-20 minutes in order to ask clarifying questions and gain a better understanding of how their thinking had evolved over a two-week time period.. The focus of this brief interview was to understand how the participants' framing of the problem changed. Inquiries were made into causes for the changes and the impacts it had on how participants understand their information needs.

During **week 7** the final interview was conducted and recorded. This interview entailed the researcher reviewing the participant's journal, concept mapping, software log files, and previous interviews with the participant. As these different artifacts were examined, the researcher focused on asking questions to surface data that supported a better understanding of the thought processes and influences that may have changed the participants' framing of the issue of school choice and their identification of information needs.

Interviews

Interviews were a very important and fruitful source of data. The interviews allowed me, as a researcher, to drill-down into the specifics of the decision making process. The interviews were also dynamic in the sense that as the study evolved and my theory development evolved, I focused on the most relevant aspects of the participants' descriptions of their decision making process.

Journal entries

During the course of the study, participants kept a online journal describing information or encounters they had that influenced their thinking about where to send their child to school. The journal exercise was designed to capture everyday incidents that influence parents' decision making processes.

Conceptual Maps

Participants used online software to map their framing of the school choice decision and associated information needs. This tool was used primarily to extract information about the school choice decision and required participants to think about the decision. The use of the tool and diagramming of the decision and associated information needs was tracked over time.

The software enabled participants to conceptually map the framing of their school choice decision and associate their information needs to their framing of the problem. Detailed maps are displayed as part of the case study profiles in Chapter 5.

Software usage logs

In addition to analyzing the development of problem frame and information need maps, software usage logs were analyzed. Usage data was gathered to determine how often the participants used the software, how often they changed their maps, and in what other ways they used the software. As will be described, this data was useful in gaining insight into the role and impact of the software on participant behavior.

Data analysis software and management

Atlas.ti (version 6.2) was chosen as the analytical tool to support the management and analysis of data. The use of Atlas.ti facilitated the implementation of the data analysis techniques described. The software supported comprehensive analysis of data through the building of multifaceted coding structures that could be used and applied. Using the software, codes were grouped into families and classified per code type i.e. open, selective, focused, or theoretical. Additionally, the software's allowed for the development of detailed networks of relationships which were visually displayed. This technique was exceptionally helpful in developing an understanding of relationships between codes and applying them to the data. Finally, the development and classification of memos allowed for fluid note taking within the documents being analyzed.

In addition to using Atlas.ti, proper management of collected data was important for security and confidentiality of the data, as well as safeguarding in the event of a catastrophic event such as fire or computer hardware failure. The audio recording and text based digital files were stored on a password protected hard drive and were encrypted to maintain security and confidentiality. Additionally, these data files were

backed up daily to a remote location. The backed up data files were encrypted before being transferred to the remote facility. Decryption of the backed up files was only possible by the primary researcher and was not possible by the third-party backup facility.

Participant Recruitment

Ten parents participated in this study. The parents were recruited through the posting of advertisements via online services such as Craigslist, parent discussion forums and through the distribution via social network tools such as Twitter. Responses were received from a wide geographic area. Participants from urban areas were chosen as they were better qualified to participate in the study given their ability to choose from multiple options. Participants in rural or less densely populated settings often had only one school choice.

Recruitment of participants followed these steps:

Step 1 - Recruitment: Ads were placed via Craigslist and parent forums, such as GreatSchools.net, targeted to the following metropolitan areas: Atlanta, Baltimore, Boston, Chicago, Detroit, Kansas City, New York City, Phoenix, Pittsburgh, and St. Louis. The top 30 metropolitan areas were identified, and ads were rotated throughout these regions in order to obtain geographic diversity among participants.

Step 2 – Screening Survey: Parents were asked to complete an online screening survey (appendix 2). 154 parents filled out this survey and 109 parents were determined to be eligible for the study based on the age of their children and indication of their desire to explore multiple schools.

Step 3 – Consent form: The 109 parents deemed eligible were sent consent forms and asked to return the consent form via e-mail, fax or mail. 27 consent forms were returned.

Step 4 – Sign-up: All 27 parents were asked to indicate their availability to participate in the study. Of these 27 parents 19 indicated a desire to begin the study.

Step 5 – Study commencement: Of the 19 parents who scheduled themselves for the initial, interview 13 were available to begin the study and carried through the initial interview.

Step 6 – Study follow through: Of the 13 parents who began the study, ten completed all seven weeks. Two of the three who did not complete the seven week study and indicated that they could not continue due to personal time constraints. One did not respond to phone calls or e-mails.

Data Analysis

Analytic Strategy: Grounded Theory

As previously discussed, the grounded theory approach finds its roots in the foundational grounded theory work of Glasser and Strauss (1967) and has branched into at least three variations. These different approaches have created vigorous debate in the field regarding the merits of each variation. This debate has been particularly contentious regarding the differences between the original formulation of grounded theory as described by Glasser and Strauss, referred to as “Glasserian” and an evolved method proposed by Strauss and Corbin, referred to as “Straussian”(Annells, 1997a, 1997b; Bryant, 2003; Charmaz, 2003, 2006; Corbin & Strauss, 1990; Barney G Glaser, 2002; Barney G. Glaser & Strauss, 1967, 1967; Heath & Cowley, 2004; Mills, Bonner, &

Francis, 2006; Anselm L. Strauss, 1987; Anselm L. Strauss & Corbin, 1997; Urquhart, Lehmann, & Myers, 2010). Of particular importance to this study, was the divergence between “Glaserian”, “Straussian” and “constructivist grounded theory” concerning the prescription of coding methods and research techniques.

Kelle (2005) identifies the tension between the concepts of “emergence” and “theoretical sensitivity” as underlying much of the methodological struggle between the Glaserian and Straussian approaches. The term “theoretical sensitivity” was introduced by Glaser and Strauss (1967) and used to describe the researcher’s ability to “see relevant data” and understand it in relation to the development of theory. The concept of “emergence” is central to Glaser and Strauss’s purpose for grounded theory of offering an alternative to the hypothetico-deductive approach widely applied social research. The tension between these two concepts can be described by asking the question of how a researcher can be “theoretically sensitive” if they have nothing to base their approach on. Strauss has attempted to resolve this tension by developing more rigid coding guidelines, specifically “axial” coding, which prescribe a structure for the development of codes around an “axis”. This type of coding is designed to identify areas for theory development and guide researchers toward identifying theoretical constructs. Glaser rejects this approach as undermining the core concept of emergence by “forcing” researchers into a preconceived structure that stifles discovery and the development of emergent theories (Barney G. Glaser, 1992). Constructivist ground theory methodologists tend to suggest that readers use grounded theory strategies in ways that best address their research objectives (Charmaz, 2006). For the purpose of this study, I

found the coding methodologies suggested as part of Charmaz's constructivist grounded theory approach, which include axial coding, to be most appropriate.

Coding Strategies

Charmaz (2006) identifies at least two main phases of coding that every grounded theory study should follow. The first phase 1) is the initial coding involving naming words, lines or segments of data, followed by 2) a more selective coding approach that organizes the most significant or frequent initial codes to sort, synthesize, integrate, and organize large amounts of data. She speculates that most grounded theories will evolve from the initial plan and recommends learning from your data to make sense of the data to shape your analysis (Charmaz, 2006, p. 46). She identifies four types of coding strategies derived from the work of both Glaser and Strauss as follows.

Open coding

Open coding is the initial stage of coding and entails identifying, labeling, and categorizing phenomena. As prescribed by Charmaz (2006), it is at this stage I asked "what does this data suggest" and "from whose point of view" (Charmaz, 2006, p. 48). Initially, coding was performed at a granular word-by-word, line-by-line level. This coding approach allowed for broad discovery and exploration of theoretical possibilities. The initial coding exercise was not constrained by any set categories or concepts, the codes were "provisional, comparative, and grounded in the data" as advised by Charmaz (2006). The focus of this exercise was to describe and label what was found in the data. Constant comparison occurred as I would code items in the data and return to previous coded data comparing my latest set of codes.

Following the development of a set of general codes based on the line-by-line, word-by-word coding, I shifted toward coding and comparing incidents. As Charmaz (2006) points out, whether you conduct line-by-line coding or incident-to-incident depends on the data you have collected, the stage of the research process, and the purpose for collecting these data. The incident-to-incident fit my data and research process better in most cases. These incidents were primarily focused on how users made their decisions and thought about information. It was at this point I thought more about the process and how the pieces fit together. However, as prescribed by Charmaz, during the initial coding process, my codes were “provisional, comparative, and grounded in the data” (Charmaz, 2006, p. 48).

The initial coding stage also can identify areas where data is lacking. During the initial coding process, I was able to identify areas in which I needed to collect more data. As Charmaz (2006) claims, this is inevitable when adopting an emergent method of conducting research. One of the advantages of grounded theory strategies, and the process of simultaneous data collection and analysis practices, is the early discovery of areas where more data collection is needed and the ability to make adjustments allowing for the collection of that data.

Focused coding

Focused coding is the second phase of coding and entails a more directed, selective and conceptual approach. Focused coding occurs after identifying an analytic direction to explore. The process of moving from the initial coding to the focused stage may not always be linear, as research may move back and forth between the coding types as needed. During the stage of focused coding, the process of consolidating similar terms

occurred. As I added open codes, I iteratively revisited my categories and incorporated these new codes. Through the process of focused coding I began to identify key categories.

Axial coding

Strauss bases his concept of axial coding on a general theory of action. A general theory of action guides the researcher toward using a defined coding paradigm comprised of “causal conditions”, “context”, “action strategies” and “consequences”(Corbin & Strauss, 1990). Using these constructs, axial coding entails identifying the main categories of analysis and beginning to “build up a dense texture of relationships around the “axis” of the category being focused upon”(Anselm L. Strauss, 1987, p. 64). The task associated with axial coding is to sort, synthesize, and organize data collected during the open coding and focused coding stages. The researcher assembles data in new ways identifying a central phenomenon, explores causal conditions, specifies strategies, identifies the context and intervening conditions and delineates the consequences (Creswell, Hanson, Clark Plano, & Morales, 2007, p. 67)

Strauss (1987) identifies the steps of axial coding as follows:

- 1) Laying out properties of the category, by explicitly or implicitly dimensionalizing it.
- 2) Hypothesizing about the phenomena. Specifying varieties of conditions and consequences, interactions, strategies, and consequences associated with the appearance of the phenomenon referenced by the category

3) The identification of relationships between the category and other categories.

These relationships are established through the process of monitoring being a condition, strategy, interaction, and consequence.

According to Strauss and Corbin, axial coding should answer questions such as “when, where, why, who, how, and with what consequences” (A.L. Strauss, 1998, p. 125). A diagram is often developed to support the understanding and process of documenting these relationships. This type of diagramming was supported by Atlas.ti. Iterative model building and diagramming was also a key part of this step for me.

Theoretical coding

Theoretical codes help move analysis to a more substantive level of understanding. Glaser (1978, p. 72) introduced theoretical codes as conceptualizing “how the substantive codes may relate to each other as hypotheses to be integrated into a theory”. On the basis that theoretical codes identify relationships between categories, Glaser argued that axial coding was not necessary and furthermore “forced” the user into artificial constructs that undermined the purpose of grounded theory as previously discussed (Barney G Glaser, 1992). Glaser (1978) identifies 18 coding families that may be used to help bring theoretical clarity to the emerging theory. As Kelle (2005, p.20) describes, “the controversy between Glaser and Strauss boils down to the question whether the researcher uses a well-defined “coding paradigm” and always looks systematically for “causal conditions”, “phenomena”, “context”, “intervening conditions”, “action strategies” and “consequences” in the data, or whether he or she should employ theoretical codes ad hoc, thereby drawing on a huge fund of “coding families”.

Techniques of a Grounded Theory study

In addition to the coding practices identified, there are several important techniques for grounded theory studies that should be considered.

Fundamental Techniques

Anells (1997a) identifies fundamental essentials from Glaser and Strauss (1967) that she suggests should be incorporated as a part of grounded theory studies regardless of which version is adopted. A discussion of each of these techniques follows:

Theoretical sampling and saturation

Theoretical sampling and saturation is relevant to the quality and quantity of data collected. As could be expected, these two aspects of grounded theory are related to each other. The higher the quality of data collected, the fewer participants needed to reach theoretical saturation. Additionally, studies collect different amounts of data per participant. As discussed, as part of this study, each participant completed four interviews, used the software and journaled regularly. Therefore, quality and aggregated quantity are both factors that need to be considered when determining sample and saturation.

Theoretical sampling is concerned with collecting data that will inform the study. Grounded theory studies should carefully select participants who will be able to yield information that will inform the development of theory. Participants should be knowledgeable about the area being considered. As previously discussed, participants were carefully selected and screened based on the common experience of school choice. The candidates were engaged in the study over the course of a seven week period. With

very few exceptions, all of the participants provided valuable information throughout the study to support theory generation.

Grounded theory methods call for the data to dictate the sample size, recognizing that researchers cannot predetermine the sample size needed until they have begun the research. The point of saturation is when “no additional data are being found whereby the sociologist can develop properties of the category” (Glaser & Strauss, 1967, p. 61). Strauss and Corbin (1998) suggest that saturation is always a “matter of degree” which highlights the subjective nature of determining saturation.

The adequacy of a theoretical sample “is judged on the basis of how widely and diversely the analyst chose his groups for saturating categories according to the type of theory he wished to develop” (Glaser & Strauss, 1967, p. 63). Although the type of participants were narrowly focused on those sharing a similar experience, the participants’ context for making their decision varied widely. Differences included geography, income, educational background, occupation, and the circumstances of their child.

A recent review of Ph.D. studies tabulated the sample sizes. The measure of analysis was interviews rather than participants to control for studies that gathered multiple data points per participant. Five hundred and sixty studies were identified that fit the inclusion criteria. Of these, 174 employed the use of grounded theory methods. The statistics describing the number of interviews included in the selected grounded theory studies are as follows: low of 4, high of 87, mode of 24, mean of 32 and median of 30 (Mason, 2010). As previously discussed, the aggregated data collected is comprised of over 40 interviews, software usage logs, information maps developed using the software

and journal entries. It was determined that theoretical saturation was achieved after the third cohort of participants.

Constant comparative data analysis

Glaser and Strauss (1967) identify comparative analysis as a strategic method for generating theory. Comparative analysis is considered an essential and key element of all variations of grounded theory. Constant comparative analysis entails going back and forth between the data collected and the analysis. As the analysis evolves, it informs the data collection process in terms of data needs, and conversely the data collected continues to inform the development of the analytic framework. As the theoretical framework develops, existing data is reviewed while new data is still being collected. In terms of this study, there was a great deal of evolution between the first cohort and second cohort, as I constantly evolved the coding schemes to reflect new data patterns that emerged.

Theoretical sensitivity

As discussed, the concept of theoretical sensitivity is a key concept of grounded theory approach and one that has been the focus of contentious debate. Both Glaser and Strauss have attempted to introduce methods that might improve a researcher's ability to theorize through the process of data analysis. Efforts, such as Strauss's (1987, 1990), to improve theoretical sensitivity by prescribing techniques and codes for surfacing theory have been criticized by Glaser (1992) as potentially having a deleterious effect on the researcher's ability to discover emergent theory.

A tension also lies around the issue of literature reviews and preconceived ideas regarding the topic to be explored. Glaser and Strauss recommend researchers “literally ignore the literature of theory and fact on the area under study, in order to assure that the emergence of categories will not be contaminated by concepts more suited to different areas” (Bulmer, 1984, p. 256). This recommendation is based on their effort to avoid researchers becoming biased toward preconceived ideas. The objective theory is to discover new emergent theory, and in order to do this, Glaser and Strauss suggest that researchers try and limit their preconceived notions approaching the topic with an open-mind. Others have contested this idea, questioning the ability for researchers to “forget” or “clear” their mind of preconceived ideas.

In terms of this study, I found the use of Strauss’s axial coding strategies to be informative and helpful in developing my theory. Although, I should note, it is impossible to know what might have emerged if I hadn’t applied these methods and adopted approaches advocated by Glaser. As a researcher, I did not feel constrained by axial coding methods and feel as if my theory benefitted from this approach.

The idea of forgoing a literature review and approaching the research objectives with a “clear” mind was particularly difficult for this study since the research objectives, and “gaps” in current knowledge, were identified by examining current information needs research. That being said, the literature review was broad covering several areas relevant to the study. As the theory emerged, the literature review was renewed and narrowed to identify specific research relevant to the theory developed.

Memo Writing

Memos are short notes that the researcher writes throughout the process. As Charmaz (2006) describes memos as artifacts that “pierce our understandings and puncture our preconceptions”(Charmaz, 2006, p. 149). They are not only valuable in the process of writing the results of the research but also during the research process. Memos prompt the researcher to “stop and analyze your ideas about the codes in any – and every – way that occurs to you during the moment” (Charmaz, 2006, p. 70).

Three types of memos -field notes, code notes, and theoretical notes- were used as part of this study. These memos were a critical piece of the research incorporated throughout the study. They were captured in a field journal as well as throughout the analysis.

The field note described situations associated with conducting the research. These notes often had to do with the items related to the research. Code notes were primarily related to describing the codes and coding decisions. These notes were instrumental in developing the code book. The use of these notes allowed me to systematically code the data, accurately code the data, refine my codes, and identify areas of further inquiry.

Lastly, the theoretical notes helped to surface theory. These notes were essential toward developing a theoretical story. The keeping of these notes provided a theoretical discipline to theory development and allowed for theory development to evolve from analytic session to analytic session. It should be noted that theoretical notes were not relegated to processes of analysis, they also emerged during periods of data collection and reflection.

Identification of a core category

The identification of a core category is disputed by the constructivist grounded theorists as being a positivist notion. For example, Charmaz (2006, p.130) claims “a constructivist approach does not adhere to positivist notions of variable analysis or of finding a single basic process or core category in the studied phenomenon”. She goes on further to say “those who take a constructivist approach aim to show the complexities of particular worlds, views, and actions”. It was not clear to me that a core category emerged. As will be described, four major categories emerged. Each of these categories was examined in terms of three components. It was difficult identifying an overarching category that would define this unless it was something broad such as “information behavior”. Based on readings of other grounded theory studies, the concept of a core category may fit studies in which a specific phenomenon is researched, such as a health condition or type of action.

Additional Techniques

Diagramming and Modeling

Diagramming and modeling is often discussed in relation to axial coding (Corbin & Strauss, 1990). Charmaz (2006) claims that an increasing number of grounded theorists are using diagramming as a way to integrate their ideas and to establish the logic of their ordering. Both diagramming and modeling were essential techniques used throughout the study. I switched from a typed form of note taking to a handwritten form in order to support diagramming during both the data collection and data analysis phases of the study. I also established a model and continually developed iterations to

create a visual representation of the emerging theory. These visual techniques were essential to my process.

Thesis Diary

The thesis diary was an important strategy for the collection and analysis of the data. The thesis diary documents all aspects of the study including correspondence with participants, observations during the research process, and other relevant data to the research process. The collected notes regarding the research process were an important source of data used to support the analysis of the data, create transparency of the research process and improve the trustworthiness of the research.

Entries into the thesis diary were coded as method notes, theory notes, and field notes. Entry notes consisted primarily of documenting an action such as scheduling a phone call. Method notes related to all aspects of the methodology such as gaining access to participants, the implementation of data collection instruments and other processes or actions related to the study's method. Theory notes were especially important to the grounded theory approach in this study. Theory notes were focused on insights to theory development as described by grounded theory approach. Lastly, field notes refer to incidents or observations that occurred while in the field. Field notes were important for documenting and understanding the context of the study.

In addition to documenting the research process, the diary served as an important initial step to the analytic process. While documenting the research process through the thesis diary, the researcher engaged in reflective analysis of the process as a whole and began to build themes to support theory development. The researcher also reflected on

the implementation of the research methods, identifying aspects of the study that should be considered while analyzing the data.

Scenario Development

During the process of theory development, techniques of developing a coding scheme, models and descriptions were all important. However, another very useful analytic and discovery technique emerged that is not described in the grounded theory literature. This technique is called scenario development and is often used as part of design or development processes. This technique has been used personally as part of software development efforts and studied in a number of different applications, including public policy development. Scenario development involves creating rich fictitious scenarios directed at describing expected user interaction with software. This technique can be very helpful in identifying and uncovering important aspects and requirements for software. It is also very helpful in testing pre-conceived notions of the software being developed. In this way, that scenario development became an important analytic tool.

Research Quality and Trustworthiness

Evaluation considerations

Lincoln and Guba suggest the basic question with regard to the trustworthiness and quality of research is “how can an inquirer persuade his or her audiences that the research findings of an inquiry are worth paying attention to? (Lincoln and Guba 1985, p 300).” Some qualitative researchers recommend that qualitative research be evaluated in terms of validity and reliability (Golafshani 2003; Case 2012). The concept

of validity is concerned with the ability of the research methods to accurately represent the concepts being studied. The concept of reliability reflects the ability of the research results to replicate given similar conditions. Researchers who have made postmodern assumptions believe that these conventional constructs are not appropriate for evaluating the rigor of research and have suggested other methods of evaluating research.

Research methods based evaluation of quality

These authors have focused their attention on the method and practice of the data collection and analysis as a way of establishing research quality and trustworthiness. For example, Corbin and Strauss (1990) address grounded theory specifically and identify seven criteria to evaluate a research study. These seven criteria are listed in the following table with an assessment of how this study compares. Although comparing the results of this study is informative towards judging the quality of the study, it should be noted that Charmaz and other constructivist grounded theory methodologists would most certainly take issue with some of these criterion as being oriented toward a positivist view. Criterion 7, in particular, may not be an appropriate criterion to apply to this study given the ontological and epistemological stance adopted as part of this study.

Table 3: Research quality and trustworthiness criteria assessment

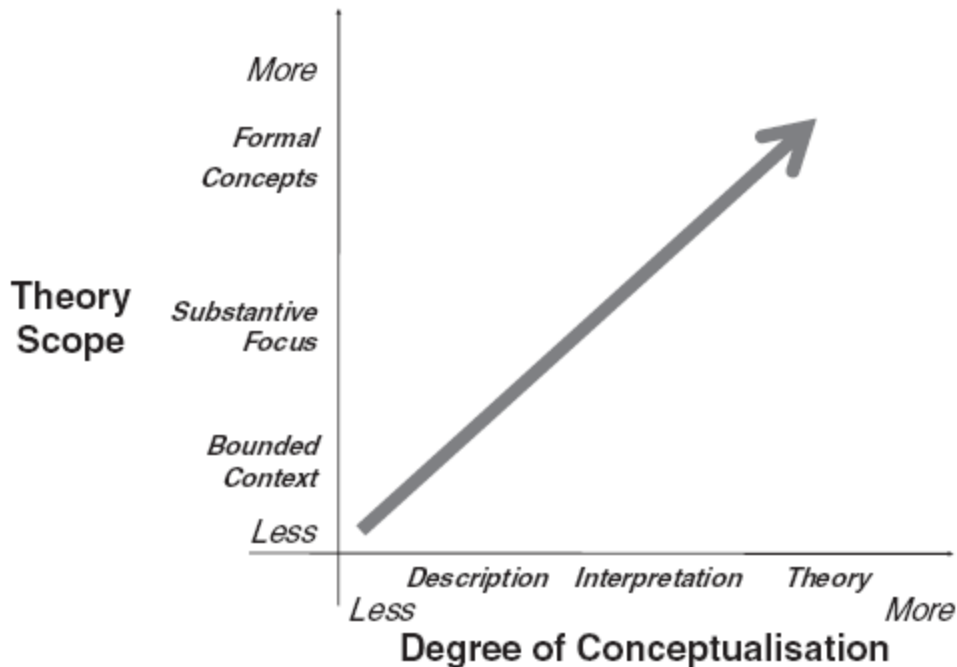
	Description	Assessment
Criterion 1: Sample Selection	How was the original sample selected? On what grounds (selective sampling)	The original sample was purposefully selected as described. Participants were selected based on their potential contributions.

Criterion 2: Categories	What major categories emerged?	The major categories that emerged were related to facets of the model and corresponding theory. The seven categories are identified in the model.
Criterion 3: Events, incidents, actions	What were some of the events, incidents, actions, and so on that indicated some of these major categories?	These categories emerged as the participants described their process of decision making and information interaction. These specific events, actions and incidents are represented in the findings section.
Criterion 4: Theoretical formulation guidance	On the basis of what categories did theoretical sampling proceed? That is, how did theoretical formulations guide some of the data collection? After the theoretical sample was carried out, how representative did these categories prove to be?	The process of constant comparisons were carried out throughout the study. As the theory emerged my interviews began to focus on the important elements of the behavior I needed to collect in order to understand the phenomena.
Criterion 5:	What were some of the hypotheses pertaining to relations among categories? On what grounds were they formulated and tested?	These hypothesis are described in the findings section. Specifically, their were hypothesis about what constituted the development of a need and the levels of need development. There were also some hypothesis regarding the feedback loop aspect of the model.
Criterion 6: Hypotheses	Were there instances when hypotheses did not hold up against what was actually seen? How were the discrepancies accounted for? How did they	One of the most prescient examples is the hypothesis regarding level 1 visceral information needs. I did not find evidence supporting this

	affect the hypotheses?	hypothesis.
Criterion 7: Core Category	How and why was the core category selected? Was the selection sudden or gradual, difficult or easy? On what grounds were the final analytic decisions made? How did extensive “explanatory power” in relation to the phenomena under study and “relevance” figure into the decisions?	As discussed, a core category did not emerge. However, 7 primary categories did exist. These categories evolved as the data was analyzed, sorted and classified. The final analytic decisions were made on the basis that they held up to constant comparative scrutiny. “Explanatory power” did not factor in relation to the phenomena under study.

Theory based model of evaluation

Urquhart, et al. 2009, focused their attention on evaluating grounded theory studies based on the objective to build good theory. They argue that many grounded theory studies use grounded theory only as a coding method and that grounded theory should not be just used as a coding technique but as a method of theory generation as its name implies. Aligned with this perspective, they developed a framework for analyzing grounded theory studies that focuses on the theory itself. They propose that a grounded theory study be evaluated along two axis: 1) Theory Scope and 2) Degree of Conceptualization.



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Figure 13 Framework for analyzing grounded theory studies. Urquhart, et al. 2009

The horizontal axis of this framework describes the degree of conceptualization. The authors argue that a key objective for grounded theory research is for greater depth of analysis. The first stage of conceptualization is **description** which describes the stage where analysis has not progressed beyond identifying concepts at the level of categories. The second stage is the **interpretation** of categories and properties. It is at this stage when selective coding occurs. The final stage is **theory** where theory is formulated.

Urquhart, et al. 2009, developed guidelines for grounded theory studies in information systems (Urquhart et al., 2010). Their guidelines are listed in table 4 along with an assessment of how this study compares.

Table 4 Assessment of quality according to Urquhart, et. al. five guidelines

	Description	Assessment
Constant comparison	<p>Constant comparison is the process of constantly comparing instances of data labeled as a particular category with other instances of data in the same category.</p> <p>Constant comparison contributes to the development of theory by exposing the analytic properties of the codes and categories to rigorous scrutiny. This guideline for data analysis encourages researchers to be both rigorous and theoretical (Charmaz, 2006).</p>	<p>Following the initial coding of the data, key incidents that identified participant's decision making processes were identified and compared. Constant comparisons resulted in more detailed development of the emerging theory.</p>
Iterative conceptualization	<p>This guideline suggests that researchers should increase the level of abstraction and relate categories to each other through a process of iterative conceptualization. In grounded theory, this is done using theoretical coding. The relationships between categories can be of many different types, not just causal. Theoretical coding contributes to an understanding of relationships between the concepts or factors of a theory. Theoretical memos are also very important to the development of theoretical coding and the whole process of iterative conceptualization.</p>	<p>A model was used to identify relationships between the main categories identified. This model developed in an iterative process along with the development of the code book. The result of the iterative development of both the model and the codebook resulted in identification and development of the key theoretical constructs which emerged over the course of the study. Additionally, theoretical memos were kept throughout the study that were used to inform the development of theory.</p>
Theoretical sampling	<p>This guideline stresses the importance of deciding on analytic grounds where to</p>	<p>Once the critical aspects of the data were identified the emergent theory was tested</p>

	<p>sample from next in the study. Theoretical sampling helps to ensure the comprehensive nature of the theory, and ensures that the developing theory is truly grounded in the data.</p>	<p>against the data to ensure the theory was comprehensive enough. (comparison to models helped as well)</p>
<p>Scaling up</p>	<p>This guideline suggests how a researcher might counter what is said to be a common problem in grounded theory viz. the production of a low level theory, which is then hard to relate to the broader literature. Scaling up is the process of grouping higher-level categories into broader themes. Scaling up contributes to the generalizability of the theory.</p>	<p>The initial focus of the study was on the relationship between information needs and framing. The focus expanded substantially as the theory developed into a more holistic view of information behavior including the concept of information.</p>
<p>Theoretical integration</p>	<p>This guideline helps the researcher deal with what we think is an obligation of the grounded theorist – theoretical integration. Theoretical integration means relating the theory to other theories in the same or similar field. It is the process of comparing the substantive theory generated with other, previously developed, theories. This principle contributes to theoretical integration in the discipline and could help in the generation of formal theories.</p>	<p>Theoretical integration was a critical piece to the development of the theory. As discussed previously, existing theory played an important role in the development of the emerging theory. Examining the emergent theory against existing theory challenged me to go back to my data and verify both convergent and divergent elements of my theory.</p>

Other considerations

Researcher's Biases

The constructivist approach to this study recognizes the role that the researcher plays in co-constructing meaning. Therefore, to some degree, researcher bias is incorporated into the methodological approach of this study. It should also be noted that contrary to the prescribed approach of Glaser and Strauss (1967), I approached this study with preconceived notions of existing theory. One of the primary research objectives of this study was to evaluate Taylor's information needs theory.

The mental model uncertainty principle

Related to the above consideration of researcher's bias is the difficulty of uncovering knowledge representations of all types given the fact that they reside in a person's head and need to be described by a person in some way in order to be revealed. Richardson, et al. (1994) describe the mental model uncertainty principle as "subjects' mental models – the cues they are using and their interpretations of them, their cognitive models of system function, their strategies and tactics, and their goals – cannot be directly elicited without distortion. Any process of direct, guided elicitation tells subjects something about what the researchers are looking for and subjects respond accordingly" (Richardson, Andersen, Maxwell, & Stewart, 1994, p. 13).

The mental model uncertainty principle as described by Richardson, et al. (1994) applies to this study and is relevant to the discussion of how frames are considered as part of this study. In keeping with a social constructionist approach, frames are considered as an imperfect model of a person's thinking. The frames as described as part of this study are recognized as being constructed socially and as a result of

participants' interaction with the researcher. Their utility, as part of this study, is not as a way of describing "reality" but as a way of better understanding information behavior. As described in Chapter 3, the grounding of the study is rooted in an interpretive sociological perspective and as such models are described as "heuristic devices" rather than objective models of reality.

Other Potential Bias

Other sources of bias included the use of the software, which guided the user into a particular type of decision making. Users of the study were asked to identify concepts, needs, and information in that order. By requiring them to use this approach, they may have become biased describing their decision making process. In order to assess this bias, participants were repeatedly asked to reflect on the experience of using the software as opposed to the way they might normally make decisions. Beyond the use of the software as a data collection tool, the software was valuable in terms of helping to define the conversation. The use of the software gave the participants firsthand experience identifying concepts and information needs. As a result, we were able to converse about these constructs, and they were able to describe their processes using accurate understanding of these constructs.

As discussed previously, the purposive sampling approach entailed finding parents who were motivated to explore educational choices for their children. All parents exemplified a high degree of motivation and engagement in the process. They appeared to be motivated by intrinsic desires to make the best choice for their children rather than the \$50 gift certificate offered as a reward for participating in the study. It is likely

that they exemplify a higher degree of engagement and motivation than a general population sampling.

The primary way that this form of potential bias was addressed was to confront it directly in my interviews. From the initial stages of the study's design, the potential for bias was recognized; however, there were few if any ways identified that could serve the purpose of collecting data about the phenomena identified and creating a shared language that didn't involve potentially biasing the participant. Therefore, it was determined the best way to proceed was to recognize the bias and ask participants directly how their form of decision making might have differed if they were not a part of the study..

Another form of potential bias was the seeding of the frames. The initial cohort of two participants would have only had one other frame to compare to their own. Therefore, additional frames were created in order to provide some diversity of thought and to be able to collect data from the participants on their experience viewing other frames. These frames were created to purposefully demonstrate other perspectives. Although, by seeding the frames, "artificial" data was injected into the system; these seeded frames only served to improve the data back from participants and did not violate the purpose and methodological approach. If the study were solely focused on the social exchange of data in a networked environment, then the seeding approach might have introduced significantly more bias.

The seeds were informed by previous work in understanding parents' decision making, including previous research and systems design around school choice.

Literature regarding school choice was also used to identify potential areas of inquiry as reflected in the seeded information maps.

The following four information maps were used to seed the study as discussed.

Seed 1

Seed 1 was developed to reflect general inquiries around academic performance with the inclusion of a child Based concept. This child Based concept was introduced as a way to prompt thinking away from schools to the interaction between schools and the child, taking into consideration characteristics of a child.

Information Map

Concept: Academic performance

- **Need: Get data on trends**
 - Collected: Some of the school handouts show performance trends of school.
 - Collected: State website reports performance data for past 5 years.
- **Need: Get math scores**
 - Collected: State website shows scores.
- **Need: Get reading scores**
 - Collected: Statewide website shows scores.

Concept: My Child

- **Need: What is my my child's learning style?**
 - Collected: Have been talking to friends to better understand how they think about their kids learning styles.
 - Collected: Have been watching my son to better understand how he learns.
- **Need: What type of environment will be best for him?**
 - Collected: Have observed how the teacher's interact during the open houses.
 - Collected: Have talked to other parents about the school.
 - Collected: School open houses have talked a lot about the environment.

Concept: Program offerings

- **Need: Is Spanish offered?**
 - Collected: Asked each school if offered.
- **Need: Parent's opinions on program offerings**
 - Collected: Talked to Anderson's about their experience. Mostly good.
 - Collected: Talked to Jones about their experience. Very positive.
- **Need: Program offerings**
 - Collected: Schools provide good information on program offerings.
 - Collected: Talked to parents about the school's program offerings.
- **Need: What after school programs are available?**
 - Collected: Got list of after school programs.

Concept: School climate

- **Need: How do other children feel?**
 - Collected: Asked Jake M. how he felt at school.
 - Collected: Talked to Emily J. about how she felt at school.
 - **Need: How does the school feel?**
 - Collected: Toured Burbank. Was alright.
 - Collected: Toured Crestwell and felt very good.
 - **Need: How safe is the school?**
 - **Need: What are other parent's opinions?**
 - Collected: Talked to Andersons about Crestwell. Positive reviews.
 - Collected: Talked to Jones' about Burbank. Mediocre reviews.
-

Figure 14: Seeded Information Map 1

Seed 2

Seed 2 introduced the concepts of parent involvement and quality of teachers as impacting or reflecting the quality of the school. Also included were reputation or online ratings and test scores as external measures of the quality of the school. Lastly, the philosophy of the school was listed as a way of better understanding the way the school works or if there was a philosophy guiding the school.

Information Map

Concept: Parent involvement

- **Need: How active is the PTA?**
 - Collected: Found PTA minutes online for a few of the schools.
 - Collected: Talked to friend about PTA.
- **Need: How many parents volunteer at the school?**
 - Collected: Observed parent volunteer sign-up sheets.
 - Collected: Talked to friend about number of parents volunteering in her son's class.

Concept: Reputation

- **Need: Is there an online rating system?**
 - Collected: Found an online rating system - but a little suspicious of the criteria used.
 - Collected: Read online parent comments on a website.
- **Need: What are other parents opinion on schools?**
 - Collected: Talked to parents.
- **Need: What do kids say about the schools?**

Concept: School philosophy

- **Need: How are the schools philosophy's different than other schools?**
 - Collected: Asked principals how their school is different.
- **Need: How would my son cope with the philosophy of the school?**
- **Need: What is the school's philosophy?**
 - Collected: Asked other parents what they think about the philosophy.
 - Collected: Read website descriptions.
 - Collected: Talked to principals.

Concept: Teachers

- **Need: Are the teachers touchy feely or more disciplined?**
 - Collected: Listened to their presentations at back to school nights.
 - Collected: Observed the teachers interact with kids.
- **Need: How engaged are the teachers?**
 - Collected: Asked other parents how engaged they feel the parents are.
 - Collected: Talked to some of the teachers.
- **Need: Why are they teaching?**
 - Collected: Listened to presentations.
 - Collected: Talked to a few teachers who told me their motivation.
 - Collected: Tried to get a feel for what was motivating them to teach.

Concept: Test Scores

- **Need: What are the test scores?**
 - Collected: Found a website that talked about test scores.
-

Figure 15: Seeded Information Map 2

Seed 3

Seed 3 reflects the thinking of a parent who is concerned with the rigor and experience their child might have in the school. Included are how customized the school might be to a child and the type of rigor and discipline instituted by the school.

Information Map

Concept: Class size or ratio

- **Need: What are average class sizes?**
 - Collected: Reviewed online website that lists class student/teacher ratios.

Concept: Customization

- **Need: Do they allow kids to progress at their own rate?**
 - Collected: Looked at curriculum.
- **Need: Do they group kids by abilities?**
 - Collected: Most schools seem to be based on my discussions with parents and teachers.
- **Need: How much do they customize the curriculum?**
 - Collected: Talked to teachers and principals.
- **Need: How much individual attention do kids get?**
 - Collected: Talked to parents whose children attended schools.
 - Collected: Talked to teachers and principals.
- **Need: What do they do with kids that get "bored"?**

Concept: Discipline

- **Need: How much control over the classroom do most teachers have?**
 - Collected: Got parent opinions.
 - Collected: Observed - but it is hard to tell exactly.
- **Need: Is the school relatively strict?**
- **Need: What kind of discipline policies do they have?**
 - Collected: Asked principals during open house. A couple of the schools discipline seemed to be a big deal.
- **Need: What systems are in place to reinforce good behavior?**
 - Collected: Asked a few teachers. This seems to be unique to each teacher.

Concept: Rigor

- **Need: How difficult are the assignments?**
 - Collected: Jefferson and Spruce passed out sample assignments.
 - Collected: Jefferson customizes homework assignments to students. More difficult for some kids.
 - Collected: Talked to parents - got differing opinions.
 - **Need: How hard do they push kids?**
 - Collected: Asked teachers this question during open houses.
 - **Need: How much homework is assigned?**
 - Collected: Talked to other parents.
-

Figure 16: Seeded Information Map Seed 3

Seed 4

Seed 4 reflects a community and social focus, as well as a consideration for the logistics between choosing a private or a public school. This information map identifies possibilities beyond private school choice and spurred thinking about what differentiates the two.

Information Map

Concept: Community

- **Need: Are parents involved?**
 - Collected: Tried to get a sense from other parents.
- **Need: How does the school feel?**
 - Collected: Just paid attention to how I felt in the school
 - Collected: Looked at how each school was decorated.
 - Collected: Tried to get a feel of how the teachers interacted with children.
 - Collected: Visited the restrooms to see how clean they were and to check for graffiti.
- **Need: What is the school community like?**
 - Collected: Tried to get a sense from other parents.

Concept: Cost

- **Need: What are the costs of each school?**
 - Collected: Got price information from private schools.

Concept: Peer group

- **Need: What are the characteristics of the children attending the school?**
 - Collected: Looked at statistics.
- **Need: What might my daughter's peer group look like?**
 - Collected: Talked to friends about types of children that attend school.
- **Need: Which one of my daughters friends will be attending the school?**
 - Collected: Talked to friends.

Concept: Private vs. Public

- **Need: What is the difference between schools especially the public / private ones?**
 - Collected: Listened to private school pitches that describe the advantages.

Concept: Proximity

- **Need: How close are the schools to our house?**
 - Collected: Looked online to get an idea of how long the commutes would be to the school.
-

Figure 17: Seeded Information Map Seed 4

Thick Rich Descriptions

Qualitative research studies often entail providing the reader with thick rich descriptions of the settings, conditions, and situations making up the context of the study. These descriptions not only serve the purpose of providing the reader with a greater depth of understanding of the data but also serve to validate the researcher's claims by grounding them in the data. Descriptions of the participant's unique circumstances are included as part of the case study vignettes described in Chapter 5. Most importantly, the words of the participants were used throughout this study to accomplish these purposes.

Triangulation

As discussed the multi-dimensional in-depth long-term case study approach resulted in multiple types of data collected. Using the constant comparison technique, a fundamental practice guiding grounded theory studies, emerging theory was tested for consistency and discrepancies across interview data, information maps, and software usage logs. Additionally, data was collected as part of three cohorts over a six month period; the time span between interviews and cohorts allowed data to be analyzed prior to subsequent interviews. As a result of this analysis, theory began to emerge which guided subsequent interviews. This allowed for areas of inquiry to be explored at a deeper level in order to confirm or refute the conceptual underpinnings of the emerging theory.

Ethical considerations

The research study was submitted to the internal review board of the University of Washington for approval according to their requirements. Informed consent was obtained for all participants. Prior to each interview, participants were asked if I had their permission to record the interview and were informed that they could choose not to answer any question and could end the interview at any time. Participants were asked to refrain from using people's real names during interviews and surveys. If an actual name was used, it was removed from the interview transcripts. Pseudonyms were used throughout the thesis when describing a participant. All personal identifiers were removed from data collection instruments and files.

Chapter 5: Case Study Vignettes

The following case study vignettes serve to provide an overview of each of the participant's unique circumstances. These vignettes, also serve to explain the basis for participant's perspectives in their own words.

Case Studies Overview

The following table identifies the ten case studies by age of the parent participating, the age of their children, the number of schools they were considering during the initial stages of the study and the city they live in.

Table 5: Summary of Participants Demographics

	1	2	3	4	5	6	7	8	9	10
Age	31	38	39	37	22	32	34	42	55	32
Gender	Female	Female	Female	Male	Female	Female	Female	Female	Female	Male
Race	Black	White	White	White	Black	White	Other	White	Black	White
Children's Ages	10,2	8,6,8 months	4	4,8 months	3	3	4,11 months	5	4	5,3,6 months
Schools	5	Not sure	Not sure	2	3	3	3	2	3	3
City	Seattle WA	Chicago IL	Detroit MI	Boston MA	Baltimore MD	Chicago IL	Phoenix AZ	Phoenix AZ	Kansas City KS	Detroit MI

The following provides additional information on each of the ten case studies that served as the primary data source for this study.

Case Study 1: Amy

Amy lives in the state of Washington and is beginning to consider schools for her two year old daughter. She has been actively engaged in making choices regarding her daughter's day care. She has recent experience with a 10 year old step-daughter. Her experience with her 10 year old step-daughter has informed her decision in many ways. She hopes for a better educational experience with her two year old than she believes her ten year old step-daughter has had. Amy has values that she feels strongly about and guides her decision making.

She describes being actively involved with her two year old daughter's learning and holds high expectations for her daughter. She describes her two year-old as beginning to read and feels it is very important that the school she chooses for her child is able to challenge her child and teach her valuable skills both academically and socially.

I was looking definitely at what kind of resources the school has. You know, like, individual attention types, resources also the level of attention that she'll be able to receive also education wise because she's a bit advanced for her age. So I need to be able to put her into program where I know she's going to be around children that are around the same education level or maybe even around the same age group so that she might be on the same education level.

She is actively involved in framing the issue of school choice and shows willingness to rethink her existing understanding. She has strong opinions driven by her own occupation and a strong sense of values regarding education. Amy seeks other people's

opinions but is very careful to consider the source of the information, placing higher value on opinions expressed by others with similar values to her own.

Yes, similar parenting skills as well as just, actually knowing the parents themselves rather than going online. So it was more about, it was easier just to find parents that, you know would have written reviews about their, you know their children's experience at, you know such and such XYZ School versus knowing someone personally and that their children attended the school. Then that way I can also know who the actual parent is. So in that respect, that group of parents were very difficult for me to find, I only, had like about 3 or 4 friends that I knew how important, you know education was in how involved they were with their children versus being able to go online and saying Ok! You know these many parents, I don't know what their educational system value, or values are.

She believes that her map does represent the way that she is thinking about the issue but did not include a concept describing diversity that evolved over the course of the study. This area of importance emerged as a result of her experiencing schools that mentioned this as a part of the curriculum. She identifies herself as black and her husband as white which she describes as making her particularly aware of this issue. She struggles to define or “frame” the concept of diversity and expresses her belief that it is more than just race based. She is looking for cultural diversity as well and is drawn to schools that incorporate the concept of diversity into their programs.

When I had my own, I wanted to make sure, you know, I instilled a lot of the same educational values. So essentially kind of like the way that I grew up, I was brought up.

The effect of diversity because I'm black, my husband is white, the region that we live in has a high population of native Americans, not very many minorities and so I needed to, I wanted her to be in an area where she does get exposed to different races and various type of culture.

Selected Question and Responses from Entrance and Exit Surveys

Table 6: Case Study 1 Profile

Question	Response
What is your age?	31
What is your gender?	Female
What is your race?	Black or African American
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Master's degree
What is your current employment status?	Employed for wages
Describe your current occupation.	Research Health Science Specialist
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No
Has anyone in your immediate family been a K-12 educator within the last 10 years?	Yes
What is your total household income?	\$90,000 to \$99,999
What zip code do you live in?	98002 (Auburn, WA)
How long have you lived in your current zipcode?	2 to 5 years
How long have you lived in your current residence?	2 to 5 years
What are the ages of your children?	10, 2

How certain are you of where your child will attend school?	I am fairly certain but considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have you used?	Friends, neighbors and acquaintances, School staff, Printed brochures, Internet websites, Other: Parents and other teachers
What do you think are the most important factors to consider when choosing a school?	Educational ranking, ability to mold to the child's learning, classroom/teacher ratio, availability of items to students, diversity, price, location
How many schools are you considering?	5

Information Map

Concept: Academic performance

- **Need: Gather information about where the school stands in regards to performance against other schools in the district**
 - Collected: Finding out where the school ranks among private and public institutions in the area.

Concept: Learning curriculum

- **Need: Tailored development**
- **Need: What type of curriculum do they have?**
 - Collected: I want to know what kind of curriculum do they serve? Is it mostly arts and crafts, mathematics, overall academic, or mostly life skills?

Concept: Parent involvement

- **Need:**

Concept: Reputation

- **Need: What do other parents and children have to say about the school?**

Concept: Responsiveness of School

Concept: School Safety

- **Need: Is the school lated in a safe area?**

Concept: School hours

- **Need: Do the hours meet my hours for work (drop off and pick up) -- how much extra would it be for her to be late?**
 - **Need: If i'm a little bit late is this going to be a problem to pick her up? -- will they remove her after a certain amount?**
-

Figure 18: Information Map Case Study 1

Case Study 2: Christina

Christina is very engaged in thinking about the choice of schools for her oldest boy. She is concerned with her choice and distressed about some of the information she has come into contact with regarding schools in her district. She actively develops scenarios as a way of surfacing her anxieties about the schools. These scenarios allow her to frame the issue and identify information needs. She worried about whether her son would be challenged enough and developed scenarios to describe what might happen if he weren't stimulated.

What worries me most actually is how well they are actually going to, I mean right now my problem is finding that my child kind of excelling beyond the other kids. and so I guess what really worries me the most is how are they going to work with kids that are excelling beyond others or lagging beyond others because I know in the future I could potentially have someone lagging behind and what concerns me for a child is excelling. He's going to get bored, create problems and kids get stuck in trouble, you know, because they are basically bored in class and then for a child lagging behind that worries me because you know they're going to fall behind and they're going to just start losing interest because they don't even know where to catch up and it just kind of I guess spirals out of control from there.

Throughout the study she had a few key concerns that were not resolved and were difficult to attain information that might alleviate some of her concern. The first concern was regarding the fact that many of the teachers spoke Polish as their first language. She worried whether or not her son would be able to understand them. She used scenario development to identify potential consequences of this situation.

that is actually a concern of mine. I don't necessarily have a problem with them being in classes of Polish kids; I just don't want it to be something like hinder my son's ability to learn.

By the end of the seven week study, Christina felt as if she were making progress with her decision but not completely satisfied yet.

Well I mean, I guess as the progress is going on, I feel like I'm getting a better idea of what I'm looking for. There's no, I guess, specific time where I can recall where I felt like it was like a breakthrough but I do, there was a time I guess at some point I just felt like I was on the right track for what I was looking for and I was getting more, narrowing it down to the kind of information that I really wanted.

Selected Question and Responses from Entrance and Exit Surveys

Table 7: Case Study 2 Profile

Question	Response
What is your age?	38
What is your gender?	Female
What is your race?	White
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Bachelor's degree
What is your current employment status?	Stay at home parent
Describe your current occupation.	Currently I stay home with kids
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	(no response)
Has anyone in your immediate family been a K-12 educator within the last 10 years?	No
What is your total household income?	\$100,000 to \$149,999

What zip code do you live in?	60634 (Chicago, IL)
How long have you lived in your current zipcode?	5 to 10 years
How long have you lived in your current residence?	5 to 10 years
What are the ages of your children?	6, 3, 8 months
How certain are you of where your child will attend school?	I am not sure and considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have you used?	Friends, neighbors and acquaintances, Internet websites
What do you think are the most important factors to consider when choosing a school?	Academic standards, experience of staff, teachers enthusiasm with children, ability to recognize children and allow gifted children to grow and aid others that need additional assistance
How many schools are you considering?	Still reviewing

Information Map

Concept: Ability to work with and recognize gifted children/children that need additional help

Concept: Cost

- **Need: Annual tuition for private schools.**
 - Collected: Obtained by calling, visiting, and received info from the schools.

Concept: Curriculum

- **Need: Received minimal info from schools as some is based on state standards and teachers.**

Concept: Location

- **Need: Proximity to the home.**
 - Collected: Did my own research by using google maps to determine how each school is from the home and reviewed any obstacles that may delay picking up/dropping off (rail road tracks, traffic).
 - Collected: Mapped out the location from the home.

Concept: Parent access to student grades online

- **Need: All schools are providing for children in first grade or older.**

Concept: School hours

- **Need: School day start and end.**
 - Collected: Found on websites.

Concept: Teacher's expertise/experience

- **Need: Bio on teachers experience.**
 - Collected: Found on school website.
 - Collected: Spoke to other parents about their opinions on expertise.

Concept: Teacher/Student ratio in classroom

- **Need: Average classroom size**
 - Collected: Some schools have provided over the phone and a some online.

Concept: Test Scores

- **Need: Reviewed state websites for a comparison of school scores.**
-

Figure 19: Information Map Case Study 2

Case Study 3: Melissa

Melissa has a 4 ½ year old boy. She began looking into schools at the same time she started the study. The initial factors she identified in the initial interview were curriculum, teachers and cost.

I would like him to go to a quality school that will not just focus on academics but lets him explore other things as well. So I know that cost is going to be a factor because some private schools. There are several around us and I'm thinking of a couple that I would like to look into for him. So cost would be a factor.

Melissa also considered transportation, distance and the potential impact of sending her son to a school outside of their community.

And then looking at the distance, if he goes to the public schools then his elementary school is pretty much literally in my backyard. He can walk out of the back yard into the yard of the school. It's separated by a fence. So I'm looking at, you know, the ease of can watch him walk out the backyard and go to school. Is it something that I would have to drive him to and pick him up from and distance then plays a factor. And of course looking at, do you want to take him out of the community that he's in, because the two of the private schools, one would be approximately 12 miles away and I think the other one is right about the same mileage wise but it's in the opposite direction. So if he has school activities, you know, is it going to be worthwhile to make that drive and of course that adds into the cost because, it's money as well.

Melissa is a former teacher which has a powerful influence on the way she has framed the issue. She has strong opinions and tends to have in-depth views of schools considering a number of different factors. Melissa is also very detailed in her examination of the issue considering cost and transportation issues in detail.

I mean I think I'm probably a bit more biased and an average person having taught in the schools and knowing a little bit more about what goes on with, in the school system. You know I'm apt to look more heavily at just what are the teachers doing with the kids day to day. And what the activities and the projects are going to be. I know that a lot of teachers are, you know very worksheet happy and I'm not, I'm more of a hands on person. And I also know of course the different learning styles and the differences between how boys and girls learn and process

information. So you know, I'm going to be looking a little bit more deeply into those things. And then cost becomes, you know, a little bit, it is very important because what can you afford as far as your budget goes, but it becomes secondary to what the school is about.

By end of the study, Melissa was comfortable with her decision. She felt that the process of evaluating schools was very helpful in giving her comfort in the choice she made to send her son to their neighborhood school.

I think looking through the entire process and going through, looking at the different districts including the private schools, I think it's made me even more comfortable. I do like this decision that I'm making and I feel better about it rather than just going at it by default, this is where you're supposed to go. Taking the time to actually look at different districts and having that realization that the neighborhood school was a good choice.

Selected Question and Responses from Entrance and Exit Surveys

Table 8: Case Study 3 Profile

Question	Response
What is your age?	39
What is your gender?	Female
What is your race?	White
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Bachelor's degree
What is your current employment status?	Stay at home parent
Describe your current occupation.	Stay at home mom
Have you been a pre-Kindergarten to 12th grade educator within the last 10	Yes

years?	
Has anyone in your immediate family been a K-12 educator within the last 10 years?	Yes
What is your total household income?	\$80,000 to \$89,999
What zip code do you live in?	48307 (Rochester, MI)
How long have you lived in your current zipcode?	10 years or more
How long have you lived in your current residence?	10 years or more
What are the ages of your children?	4
How certain are you of where your child will attend school?	I am fairly certain but considering options
Have you sought information regarding potential schools for your child?	No, but I intend to seek information
If you have sought information regarding schools what sources have you used?	Other: I haven't looked into anything yet
What do you think are the most important factors to consider when choosing a school?	teachers, curriculum and other learning opportunities (i.e. Extra-curricular activities), distance from home and possible cost
How many schools are you considering?	Not sure yet

Concepts, Needs, Information Map

Information Map

Concept: Cost

- **Need: Are scholarships available?**
 - Collected: Lots of paperwork and time involved in financial aid process.
 - Collected: Scholarship amounts awarded do not typically cover half of tuition.
 - Collected: Yes. Some are need-based, some merit-based.
- **Need: How much will school cost (if private)?**
 - Collected: A lot! Tuition will cover fees and books, but not the "extras" such as picture day, field trips, school clothes (possible uniform), etc.
 - Collected: Travel time and cost of gas also need to be considered.
- **Need: How much will school cost (if public)?**
 - Collected: No tuition, of course, but the "extras" should always be considered into the cost: picture day, school clothes or uniform (some public schools now adhere to a school uniform policy), field trips, lunch, etc.
 - Collected: Travel time and cost of gas need to be considered (if choosing public school B).

Concept: Curriculum/Extra Curricular Activities

- **Need: How is the school meeting the state standards?**
 - Collected: Curriculum in the public schools follows state standards. Extra activities available as well.
 - Collected: Spoke with teachers at both private schools: curriculum follows (and exceeds) state standards
- **Need: What are the extra curricular activities offered?**
 - Collected: Activities vary widely from school to school, grade level to grade level (true for both private and public)

Concept: Distance/Community

- **Need: How far away is the school?**
 - Collected: Private school A is 12 miles away.
 - Collected: Private school B is 20 miles away.
 - Collected: Public school A is less than a block away (through our back yard).
 - Collected: Public school B is about 15 miles away.
- **Need: How will being in a different school community affect child?**
 - Collected: Friends child makes would be a greater distance from home.
 - Collected: Not living in the community means extra time and travel for school functions.
- **Need: How will travel time and cost of gas factor in?**
 - Collected: Gas is between \$3 and \$4 a gallon right now. A 40 mile round trip would be approximately a gallon of gas.
 - Collected: Private schools A and B offer busing at an extra cost. Public school A has busing. Public school B has no busing.
 - Collected: Someone will need to take child to school (car pool availability? bus availability? extra cost involved for busing?).

Concept: Teachers

- **Need: Are teachers highly qualified?**
 - Collected: By law all teachers need to be highly qualified, certified to teach in their specialty.
 - **Need: Who are the teachers/length of tenure/etc?**
 - Collected: Spoke with teachers at the private schools: all friendly, knowledgeable, highly qualified
 - Collected: The same goes for the teachers in the public schools. All seem interested with children, very involved in school life.
-

Figure 20: Information Map Case Study 3

Case Study 4: Ryan

Ryan has two daughters: 4 year old and 8 month old. He and his wife are actively evaluating school choices for his 4 year old daughter. His initial criteria was primarily academic but has shifted toward being more concerned with the social environment. Ryan and his wife are very engaged in making the best choice for their daughter. He has indicated that perhaps his daughter has some special needs, and as a result their criteria for selecting a school will be different than for his younger daughter.

Ryan describes himself as being drawn to quantitative data but realizes that with regard to his older daughter, his priorities need to be on the social environment she is in and the need for “socialization”. He describes this type of qualitative data as being much harder to obtain. He also struggles to develop a definition of his needs with regard to socialization

“I would be more confident if I, if I could tell you what it was we’re trying to measure. I’d be more confident if there were, if there were known metrics and data on those metrics that we could use to compare.”

Ryan has very strong metacognitive skills and reflects deeply on how he is thinking about the issue, his information needs, and potential biases. He recognizes that unique characteristics of the context surrounding his decision including his own biases.

I think even through this conversation, I understand more that there are other pieces that were not capturing but, I think that I’m aware of them. My own upbringing, my own history, my own background, my culture, my race, my, where I live in the country, my demographics.

Ryan is also able to try and see the situation through someone’s perspective. He describes thinking about his daughter and wondering what she would want. He describes this process of having an impact on the way he frames issues.

So when I have aha moments, it's when I change my perspective, when I see things from someone else's view point. Just to use the case of school decision, I think if there were any "aha's", when I think of my daughter's perspective, I keep thinking what's best for her world, what is, from her perspective, what's best for her, I mean she's only a 4 year old, obviously we're going to ultimately make decisions but, what would she want, and if she were us, what would she want for us, so I guess, changing perspective, sometimes is a key driver of the "aha".

By the end of the seven week period, Ryan had not made his decision but felt strongly about one particular direction.

I am still thinking about it. My data strongly suggest to me that we're going to move in one direction.

Selected Question and Responses from Entrance and Exit Surveys

Table 9: Case Study 4 Profile

Question	Response
What is your age?	37
What is your gender?	Male
What is your race?	White
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Master's degree
What is your current employment status?	Employed for wages
Describe your current occupation.	Project Manager for Healthcare Company
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No

Has anyone in your immediate family been a K-12 educator within the last 10 years?	Yes
What is your total household income?	\$100,000 to \$149,999
What zip code do you live in?	02054 (Millis, MA) MSA - Boston
How long have you lived in your current zipcode?	5 to 10 years
How long have you lived in your current residence?	5 to 10 years
What are the ages of your children?	4, 8 months
How certain are you of where your child will attend school?	I am fairly certain but considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have you used?	Friends, neighbors and acquaintances, School staff, Printed brochures, Internet websites
What do you think are the most important factors to consider when choosing a school?	curriculum. cost. diversity. tailoring program to needs of specific student.
How many schools are you considering?	2

Concepts, Needs, Information Map

Information Map

Concept: Cost

- **Need: Annual cost**
 - Collected: Millis Public School/clyde brown - 'free' (from taxation)
 - Collected: Montessori - \$10,223. (MUCH higher than I would have expected). Also leads to another need - duration of school day.
- **Need: Tax implication**
 - Collected: Can (and have been) getting some tax relief on extended day from public school as nonprofit
 - Collected: Montessori is a nonprofit; can take tax deduction on a limited amount of the expense

Concept: Diversity

- **Need: Need demographic breakdown by economic status**
 - Collected: Town median resident age - 37.1 (>mass average); avg. household earnings \$79,081 (>mass average);
- **Need: Need demographic breakdown by race**
 - Collected: MILLIS - 96.2% white; 1.1% asian; 0.7% black; 0.9% hispanic. (VERY homogenous)
 - Collected: Need data on Montessori school demographics - listed as 'N/A' on the private school register

Concept: Duration of School Day

- **Need: Accessibility of pre/post school child care options**
 - Collected: Montessori - would need to involve outside child care/pickup/transportation
- **Need: Hours of Operation**
 - Collected: Clyde Brown - 8 AM - 3:30 PM
 - Collected: Montessori - 9AM - 3PM

Concept: Location

- **Need: Physical space/geography of the school itself (ie. space to play)**
- **Need: Proximity to other child care (babysitter and in-laws)**
- **Need: Proximity to our home**
 - Collected: Millis Public School (C. Brown) - 0.9 miles
 - Collected: Montessori School - 2.1 miles

Concept: Socialization

- **Need: This is the hard one to quantify...**
 - Collected: Interesting; the # of students in each grade DECLINES in Montessori: Pre-K - 63 students Kind - 22 students Grade 1 - 10 students Grade 2 - 10 students Grade 3 - 10 students Grade 4 - 5 students Grade 5 - 6 students Grade 6 - 6 students Grade 7 - 4 students Grade 8 - 4 students

Concept: Standardized Test Scores

- **Need: Need MCAS scores for each grade**

Concept: Student to Teacher ratio

- **Need: Need student to teacher ratio for each grade**
 - Collected: Clyde Brown -
 - Collected: Woodside Montessori - 10:1 average
-

Figure 21: Information Map Case Study 4

Case Study 5: Angela

Angela is a young mother and she describes her recent experiences in school as having a big influence on the way she views her choices.

Well! Seeming that I'm young, so these schools are pretty much already fresh in my brain from the things that I had to go through. So I kind of don't want my son to have to face the kind of stuff that I did going to school.

She is very concerned with the amount of time and attention her son will get. She is actively engaged in thinking about whether she is considering all aspects of the decision. Her recent experience has been with a Montessori school, and this experience has caused her to actively engage in framing and challenge established frames introduced by the schools she is considering.

Angela also actively involves multiple people when considering an issue, looking at it from different angles and perspectives. She evaluates how a decision might affect herself and others.

Ok! Well first I like to look at the issue from different angles like how it affects me. How it would affect someone else around me and then once I figure that out, I usually just try to figure out a way to solve the problem. And of course, come up with different ways and then the fairest way works best. And if I need to help, ask someone else for help or their opinion.

Angela also had a particularly positive experience using the online tool. She described it as helping her think through the problem although she describes it as being a different exercise than she would normally follow.

Well! I know the map actually helped a lot because I was able to sit down and really kind of see it all down on paper instead of all jumbled up in my head.

Angela also seems to be in tune with her child. She considers his personal style and needs carefully when thinking about schools.

Yes! Like when it comes to my son and where I was looking like, I think he would kind of be better suited with schools that have one-on-one programs because I realized that he likes to play with other kids but sometimes he really likes to be by himself. And that's , when he doesn't think I'm watching, that's when I really see him thinking, and I think the school with one-on-one programs will be really beneficial for him.

At the end of the study, Angela had still not made her decision but said, “I feel pretty good” about my decision and felt comfortable with the prospect of making the decision.

Selected Question and Responses from Entrance and Exit Surveys

Table 10: Case Study 5 Profile

Question	Response
What is your age?	22
What is your gender?	Female
What is your race?	Black or African American
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Never married
What is the highest degree or level of school you have completed?	High school graduate – high school diploma or the equivalent (for example: GED)
What is your current employment status?	Self-employed
Describe your current occupation.	Baker
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No
Has anyone in your immediate family been a K-12 educator within the last 10 years?	No

What is your total household income?	\$40,000 to \$49,999
What zip code do you live in?	21229 (Baltimore, MD)
How long have you lived in your current zipcode?	5 to 10 years
How long have you lived in your current residence?	5 to 10 years
What are the ages of your children?	3
How certain are you of where your child will attend school?	I am not sure and considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have you used?	Friends, neighbors and acquaintances, School staff, Printed brochures, Internet websites
What do you think are the most important factors to consider when choosing a school?	location, teachers and the schools overall performance
How many schools are you considering?	3

Concepts, Needs, Information Map

Information Map

Concept: Curriculum

- **Need: How are they teaching the students**
 - Collected: Looked at the schools website.
- **Need: How long do they stay on a particular topic.**

Concept: Location

- **Need: How far is the school from our home.**
- **Need: How long will it take to pick him up from school**
 - Collected: Drove to the schools and gauged the time it would take to pick him up and bring him home.

Concept: My Child

- **Need: How does my child learn?**
 - Collected: monitored my child's performance in head start.
- **Need: What is the best way to teach him?**

Concept: Private vs. Public

- **Need: How much does it cost?**
 - Collected: Handouts and Website.

Concept: Program offerings

- **Need: Before/after school care**
- **Need: Languages**
 - Collected: Looked at the schools website.
- **Need: Sports**
 - Collected: Looked at the schools website.

Concept: Size of classroom

- **Need: How large are the classes**
- **Need: what is the student to teacher ratio**

Concept: teachers expericence

- **Need: How long has the teacher been teaching**
 - **Need: How much experience does the teacher have**
 - Collected: Talked to the individual teachers
 - **Need: Where did the teacher go to school**
-

Figure 22: Information Map Case Study 5

Case Study 6: Crystal

Crystal is just beginning the process of evaluating schools for her son. She and her husband are anticipating moving about the same time their son starts school. She describes schools as being a big influence on where they move.

“My husband didn’t get the best education. I got a good education and it’s very important to both of us that he goes to a good school system. So that’s probably one of the top three factors in determining where we’re going to be living.”

She is very engaged in thinking about the issues and open to changing her views. She describes the evolution of her thinking and is active in terms of both framing the problem and identifying needs. Crystal recognizes that she doesn’t know as much about choosing a school as she would like. She is in the initial stages of understanding and considers herself needing more information and work on understanding framing. She describes her situation as

“a little bit overwhelming as I am constantly gaining information and it’s kind of a situation where I could spend a lot of time researching”

and

“it’s kind of like a rabbit hole, I mean once you get one useful bit of information, that leads you to something else that you hadn’t considered”

Crystal describes prioritizing her information needs and defining their scope so that she does not feel overwhelmed and can process them one step at a time.

She also describes her husband and her as being strongly impacted by their feelings. These feelings impact almost all facets of her information gathering and decision making.

“So my husband and I, are both really “feeling based” people and so that’s kind of big for us too. When we walk into a place, how are we feeling, are we feeling welcomed, are we feeling not so welcomed, you know that kind of thing.”

By the end of the study Crystal had not made a decision but felt as if she had made good progress and was well on the way to making a decision.

“I feel really good about it. Both my husband and I, we’re very, like I said we started off with no information, really no inclination either way and now I think we kind of narrowed it down to two schools and now we’re really excited about one of them.”

Selected Question and Responses from Entrance and Exit Surveys

Table 11: Case Study 6 Profile

Question	Response
What is your age?	32
What is your gender?	Female
What is your race?	White
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Bachelor’s degree
What is your current employment status?	Stay at home parent
Describe your current occupation.	stay at home mom
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No
Has anyone in your immediate family been a K-12 educator within the last 10 years?	No
What is your total household income?	\$60,000 to \$69,999

What zip code do you live in?	60169 (Chicago, IL)
How long have you lived in your current zipcode?	2 to 5 years
How long have you lived in your current residence?	2 to 5 years
What are the ages of your children?	3
How certain are you of where your child will attend school?	I am not sure and considering options
Have you sought information regarding potential schools for your child?	No, but I intend to seek information
If you have sought information regarding schools what sources have you used?	Other: have not sought info yet
What do you think are the most important factors to consider when choosing a school?	Class size, test scores, diversity of student body
How many schools are you considering?	3

Information Map

Concept: Academics

- **Need: Info on what is offered in terms of academics - foreign language, maths, English programs, arts, etc.**
 - Collected: Emphasis on arts - this is very important to me and I was happy to see this information for our local public school.
 - Collected: Excellent offerings and high standards at local public school and within the district.

Concept: Atmosphere of school

- **Need: Find out what the atmosphere of school is - by visits, talking to parents, etc.**
 - Collected: Visited two local elementary schools and noted "vibe" - teachers, administrative staff, children, etc.

Concept: Diversity

- **Need: Percentages of ethnicities represented in school population**
 - Collected: Strong diversity considering district and neighborhoods. Obtained info on state report card for the district and school.

Concept: High percentage of grads to 4 year school

- **Need: (For high school as opposed to elementary school) - data on percentage of grads going on to college or university**
 - Collected: Didn't look into this - I decided it wasn't relevant just yet!
-

Figure 23: Information Map Case Study 6

Case Study 7: Kelly

Kelly has a 4 year old and 1 ½ year old. She started out evaluating four schools. Kelly has a Master's degree in elementary education. She describes her own educational experience as strongly influencing the way she is approaching the choice. Her son is currently in Montessori preschool. Her experience with Montessori schools has also influenced her thinking about school.

Kelly lives in Phoenix, Arizona and describes the school district that she lives in as having a lot of charter schools and choices. She tried to enroll him in a Montessori school but her son was not chosen. The lottery deadline is approaching and she feels pressure to make the right decision. She describes her initial focus as reading and math.

...now that he has a good foundation and practical life skills, my husband and I are more focused on the core education like, reading and math, and those are the two things that we really want him to master.

Kelly worries that her son is already lagging behind as a result of conversations and interactions with friends and family.

I don't want to, but, I think we're comparing. We have friends and family who have kids with similar ages and they're starting to read and they're a little bit older so of course they could be a little bit more advanced, but I think it's just we're struggling to catch up. We don't want to catch up, we want to have him fully immersed in academics.

She feels pressure to act quickly regarding school choices and worries about possibly not being able to get him in to the school of her choice if she waits too long.

it would be nice for him to be in the Montessori school for another year, but just in terms of later on, he's not going be able to get into these schools 'cause the classes will be full and we can't get in and so we'll have lost our opportunity.

During the seven week study, Kelly broadened her criteria significantly, ultimately, identifying nine categories of interest. She was actively engaged in reflecting on all

aspects of her information gathering and decision making process. By the end of the seven week process, she narrowed in on one choice and expressed a high level of confidence and satisfaction with her direction.

We're pretty confident we're going to go with the school that provides the arts with the regular academic curriculum.

Selected Question and Responses from Entrance and Exit Surveys

Table 12: Case Study 7 Profile

Question	Response
What is your age?	34
What is your gender?	Female
What is your race?	Other
What is your ethnicity?	Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Master's degree
What is your current employment status?	Employed for wages
Describe your current occupation.	Administrator
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No
Has anyone in your immediate family been a K-12 educator within the last 10 years?	No
What is your total household income?	\$80,000 to \$89,999

What zip code do you live in?	85041 (Phoenix, AZ)
How long have you lived in your current zipcode?	5 to 10 years
How long have you lived in your current residence?	Less than 1 year
What are the ages of your children?	4, 11 months
How certain are you of where your child will attend school?	I am fairly certain but considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have you used?	Friends, neighbors and acquaintances, Internet websites
What do you think are the most important factors to consider when choosing a school?	Student teacher ratio, School performance, diversity, opportunities for extra-curricular activities, arts education
How many schools are you considering?	3

Concepts, Needs, Information Map

Information Map

Concept: Accessibility

- **Need: Lottery or open enrollment**
 - Collected: Lottery for most schools - demand is high
 - Collected: Lottery if not enough spaces available
- **Need: Need to apply each year?**
 - Collected: Kindergarten best option for openings
 - Collected: Prep academy - need to apply again but preference given to students who have been at the school.

Concept: Before and After school programs

- **Need: Cost**
 - Collected: ASU - need more info
 - Collected: Charter schools are free
 - Collected: Eagle Harmony - \$10 registration and \$260/month
 - Collected: Eagle Prep - \$10 registration and \$300/month
 - Collected: Required number of volunteer hours
 - Collected: Tempe - \$50 registration and \$223 a month + \$88 for before school depending if enough interest.
- **Need: Extra curricular activities offered such as sports, music, art**
 - Collected: Days offered
 - Collected: Number of students that participate
- **Need: Safety of the students**
 - Collected: Feedback from parents
 - Collected: Management of children to and from program - students taken from classroom to onsite program
 - Collected: Sign in and out system
- **Need: Start/End times**
 - Collected: ASU - Drop off at 7:30am
 - Collected: Eagle - 7am to 6pm
 - Collected: Tempe - Drop off at 6:30 am Pick-up available until 6pm

Concept: Cost

- **Need: Cost for extra curricular activities**
- **Need: Fundraising**
- **Need: List of supplies**
- **Need: Tuition rates**

Concept: Curriculum

- **Need: PE and Arts available**
 - Collected: Arts part of the curriculum
 - Collected: Music offered at afterschool programs
 - Collected: PE and Music classes every other week
- **Need: Recess**
 - Collected: During summer and bad weather students can go to the gym
 - Collected: Recess is flexible
- **Need: Teaching methods**
 - Collected: Centers in reading, math etc created for students
 - Collected: Individual learning plan for each student
 - Collected: Loving atmosphere - no yelling at students however discipline is present
- **Need: Technology available**
 - Collected: Computer lab available once a week
 - Collected: Smart boards in classroom

Concept: Location

- **Need: Distance from daycare and school**
 - Collected: ASU - Downtown - will be the same as now
 - Collected: Eagle Prep - a few blocks
 - Collected: Eagle harmony - 24th & Southern - 52 mi. or about 1.5 hr driving time
 - Collected: Tempe - few blocks from work
- **Need: Distance from home**
- **Need: Distance from work**
 - Collected: 10 minutes to Broadmor - door to door 30 minutes to Prep with light traffic
 - Collected: Harmony - on the way to work off of highway

Concept: Mission of the school/teachers

- **Need: Eagle Harmony - Teacher's have 5+ year experience and music teacher has a masters in music technology, thesis was on music technology for use in music therapy. ALL GOOD!**
- **Need: Goal of the school**
 - Collected: Instill the idea of graduating from college at early age
 - Collected: Reading and writing by end of kindergarten
- **Need: Teacher's goal for the class**
 - Collected: Ability to work with all students
 - Collected: social skills
- **Need: Teacher's goal for the student**
 - Collected: Eagerness to learn
 - Collected: Leadership
 - Collected: reading and writing by the end of kinder
 - Collected: social skills

Concept: My Child's learning style

- **Need: Needs more one on one attention**
- **Need: Smaller class size for fewer distractions**
 - Collected: ASU up to 25 students in a class - they have student interns, student teachers and volunteers in class as well.
 - Collected: Eagle schools fewer students in classroom
 - Collected: Tempe - need more info

Concept: School rating - AZ Dept of Education

- **Need: Any changes at the school, i.e. change in teachers, administrators**
- **Need: Criteria of ratings**
- **Need: Past scores**
- **Need: Range of ratings**

Concept: Student Teacher ratio

- **Need: Instructional Aides available**
 - **Need: Number of students per class for all grades**
 - **Collected: No more than 25**
 - **Need: Parent volunteers available**
 - **Need: Student Teachers/Interns available**
 - **Collected: Collaboration with local community college**
 - **Collected: Collaboration with local university**
-

Figure 24: Information Map Case Study 7

Case Study 8: Heather

Heather is in the process of considering options for her five year old son. She began her research by examining the different types of programs the schools offer after hearing that many of the schools were eliminating programs like phonics.

Seeing my nieces and nephews and how they, like my one niece, they didn't teach her phonics. They taught her like a memory thing and she doesn't, she has problems like summing up words and so that also made me decide that I wanted to lean more towards the phonics.

Heather recently moved into the area and is interested in, not only the school, but also the neighborhood it is in.

So that's why I wanted a tour of the school because I wanted to see not only how the school looks but I wanted to be able to see the neighborhood because one school, I don't know the neighborhood too well because we just moved to the area and the other one, I mean it looks like a nice neighborhood but I'd like to just go and look around a little bit more.

She is very interested in identifying information like teacher student ratio but also wants to see the school and understand it better.

Well, I want to find out more. I want to find out what their teacher student ratio is and I'm hoping to get that. I want to see how the classrooms are set up. I want to see how the people are, just in general, how they are.

Heather works in the criminal justice field which she describes as having an influence on her decision making.

Okay, well, I work in the criminal justice field. Okay?

Let's just say I encounter lots of people from certain tutoring schools here in Arizona and I know I would never send my child to one specific one because of my encounter with them.

She describes her background as informing many of her information needs and speculates that she probably has different information needs than other parents.

It intersects a lot because of my basic concerns. He's got to go to the bathroom. Where is the bathroom? Is it in the classroom? Is it down the hall? Does he go by himself? A lot of things probably other parents may not even think about. I will because of where I'm coming from.

Heather also acknowledges that her own experience in school has impacted the way she thinks about the decision for her son.

Well, I went to catholic school and then I was put into public school and actually I learned better, I learned more in public school than I did in catholic school. But their curriculum is different so that's what made me look at each school's curriculum, just seeing what they offer.

Ultimately, Heather felt as if questions regarding security and student/teacher ratio could be answered, and she felt comfortable with them, she could then focus on the type of school curriculum. By the end of the seven week period, she felt comfortable with her choice and indicated that visiting the schools was the most important activity she engaged in.

because no matter what the website said or even you know, the information that I requested from the schools... you get more of, it has more of an impact when you see the school, when you see the classroom, when you meet the teachers and the principal

Selected Question and Responses from Entrance and Exit Surveys

Table 13: Case Study 8 Profile

Question	Response
What is your age?	42
What is your gender?	Female

What is your race?	White
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Master's degree
What is your current employment status?	Stay at home parent
Describe your current occupation.	Homemaker
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No
Has anyone in your immediate family been a K-12 educator within the last 10 years?	No
What is your total household income?	\$10,000 to \$19,999
What zip code do you live in?	85281 (Tempe, AZ) Phoenix-MSA
How long have you lived in your current zipcode?	1 to 2 years
How long have you lived in your current residence?	1 to 2 years
What are the ages of your children?	5
How certain are you of where your child will attend school?	I am fairly certain but considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have	Friends, neighbors and acquaintances, Internet websites

you used?	
What do you think are the most important factors to consider when choosing a school?	Learning style and plan
How many schools are you considering?	2

Concepts, Needs, Information Map

 **Information Map**

Concept: Course curriculum

- **Need: School Course Curriculum**
 - Collected: DVD from the school district on there course curriculum

Concept: Student/teacher ratio

- **Need: Class size**
- **Need: student teacher ratio**

Concept: security

- **Need: Tour the school**
 - Collected: Open house scheduled for the 16th
-

Figure 25: Information Map Case Study 8

Case Study 9: Alexis

Alexis is the caregiver for a 6, 8, and 15 year old. She is actively engaged in making a decision regarding the schools for all three children. She learned that their school district was losing its accreditation. The issue of school district accreditation introduced a new set of questions into her information gathering and decision making process. She worked diligently to understand the implications of accreditation and what it might mean for her children.

Well, the two younger ones, I would like for them to go to the same school. I actually have considered them all going to the same school. There's a school here ACE African Centered Education which has actually three campuses. They have a lower campus for kindergarten to 6th grade. The middle campus has 7th grade to ninth grade and then the upper campus is high school which is where my 15 year old goes now.

So, I was actually considering putting the younger ones in there, too, but I'm not sure. You know it, or not right now, but Canon City school district is having a crisis. They have been deemed non-accredited, How do you want to accredit a whole school district? But, yeah, that's been on the news the last couple of days - how the whole Canon City school district lost their accreditation.

Alexis describes her process of information gathering as taking into account the logistics of sending her children to that school and the exploring other aspects.

First of all I have to consider location, proximity to the house, whether they have bus service or not. Okay? That's a big concern. Then I look at their academics, well, like some of them even at the kindergarten to the 5th grade teach specialty math, computer skills, things like that which I think, oh that's wonderful. They didn't have all that when I went to school. So, I look especially at them, some of them are deemed for at risk youth, you know, minorities, and I'm not too happy with that. Then there are a whole set of charter schools - probably four that are actually run by University of Missouri. So, I'm kind of looking at them. I'm in a big dilemma right now, especially like I said with the news coming down that the schools have lost their accreditation.

During the seven week period, Alexis discovered that she was eligible to send her children to a different school district that wasn't in jeopardy of losing their accreditation. This was a major turning point for her and made her decision much easier.

Well, the most influential factor is the accreditation factor. Then, we're looking at transportation; we're looking at cost; We're looking at proximity to home; we're looking at things like, after school care. We're looking at morning care and getting them there. And like I said, here at Ray Town School District, their commutes are good, 45 minutes later in the morning rather than getting them ready to catch a bus very early. In the end knowing that even most of the Charter schools do have free transportation, okay well, for where we live out here, they probably would be one of the first children picked up and they're going to have to wake up early, they're going to be riding in the bus maybe for an hour. Just, I'm really not happy with that either.

At the end of the seven week period, Alexis indicated she felt as if she “covered the bases she needed to” in terms of her research and felt as if she was making a good decision.

Selected Question and Responses from Entrance and Exit Surveys

Table 14: Case Study 9 Profile

Question	
What is your age?	55
What is your gender?	Female
What is your race?	Black or African American
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Divorced
What is the highest degree or level of school you have completed?	Associate degree

What is your current employment status?	Employed for wages
Describe your current occupation.	Tenant Research Analyst
Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No
Has anyone in your immediate family been a K-12 educator within the last 10 years?	No
What is your total household income?	\$30,000 to \$39,999
What zip code do you live in?	64138 (Kansas City, MO)
How long have you lived in your current zipcode?	2 to 5 years
How long have you lived in your current residence?	2 to 5 years
What are the ages of your children?	6, 8, and 15
How certain are you of where your child will attend school?	I am not sure and considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have you used?	Friends, neighbors and acquaintances, Printed brochures
What do you think are the most important factors to consider when choosing a school?	School accreditation and reputation, class size, teaching style
How many schools are you considering?	3

Information Map

Concept: Need and want to have children in an accredited school system

- **Need:** I am really having a hard time with the accreditation issue here in Kansas City. Have found out that I am also within the Raytown district. Raytown is accredited, has very good school

Concept: What is better for my Daughter Raytown School Dist, or ACE Academy

Concept: accreditation

- **Need:** still waiting to hear what is going on with school district

Concept: cost

- **Need: If all children are to go to ACE, is there a multi child discount, are there breakfast, lunch provisions**
 - **Collected:** Sending children to nRaytown school district, there will be no cost (public school system),
 - **Collected:** There are discounted breakfast and lunch programs in place as well as before and after school care for young ones.
 - **Collected:** multi child discount, would have to seek other child care options
- **Need: What is KC school dist doing or what will be the outcome of present accreditation issue**

Concept: location

- **Need: I would like for kids to all go to one school if possible or a affiliated schools**
 - **Need: need to know about transportation whether the school would offer bus transportation service, or assess what it would do to my schedule if i had to drop off and pickup. Also if all children are to go to ACE how would bus ride affect children, and teen that would have to watch them, also what would happen in even of one or more had afterschool activities**
 - **Collected:** We overlap with Raytown school district so i am just going to send kids there for now. Good Schools, good district, bussing, close to home afterschool care.(didnt know we overlapped, but now that I do it seems like that is going to be the ticket.
-

Figure 26: Information Map Case Study 9

Case Study 10: Jason

Jason is highly engaged in thinking about the choice of schools for his children. His family is currently home-schooling his children. He's fairly happy with the results but is actively evaluating whether this is the best choice for his family. His experience with home-schooling has informed his current thinking. He also thinks very carefully about which path might be best for his children based on their own particular characteristics.

The process really begins at birth. In each one, birth of the child, taking into the consideration each child, as an individual, and their needs may differ from one to the other, so we look at their personality and we look at their learning ability and their learning desire. Those two things are really key in determining what path is best for them. So, our oldest child is introverted, very intelligent and very driven to learn, and we think that if we put him into a situation of a noisy surrounding with lots of other children at his same growth or same age but of different maybe physical abilities and mental learning abilities, that he may be more introverted than he already is and that might impair his ability to learn and be successful in a classroom setting of a public school. So, these types of things lead us down the path as to what is best for them. So, if my middle aged daughter is very social and outgoing and has more leadership skills, she may strive for being in a larger group setting and that's not something we could offer with a home school. So, I guess what I draw from this is that his personality, is probably the biggest factor in determining which way we will go between our two choices at the moment, public school or home school.

Jason's family has moved several times in the last few years which has impacted their decision and ways of evaluating their choices. Jason describes his thinking about schools and choices for his children as changing over the course of the last several years, largely as a result of his experience with home-schooling.

Yes, they have changed. I'm more firmly rooted in the home-schooling side of it because we now have a half year of experience and so far we see the benefits of it on a day to day basis. So, that's kind of reinforced that aspect of it. Home-schooling still is not widely accepted or known and a lot of people would question that reasoning so it's a bit off the norm and yeah, over time, I have grown more towards home-schooling as a better option at least for my oldest child.

He is very aware of his framing of the issue and actively examines his thinking, showing a willingness to change his views. Jason is also very analytical and shows a preference to what he describes as “hard” data to support his decision making.

Certainly, personally I try to look for information that is concrete, can be referenced that can be tracked and measured and that’s everything from class size, resources, budgets of a public school to a lesser extent, the test scores. There are a lot of questions regarding the validity and usefulness of standardized testing and that was a great insight, but I do prefer to look at things that are concrete and can be measured, more so than opinion which can be very wild.

Jason decided to continue home-schooling his children although indicated that he would continue to evaluate the decision. At this point he was “satisfied” with his decision.

Selected Question and Responses from Entrance and Exit Surveys

Table 15: Case Study 10 Profile

Question	
What is your age?	32
What is your gender?	Male
What is your race?	White
What is your ethnicity?	Not Hispanic or Latino
What is your marital status?	Married
What is the highest degree or level of school you have completed?	Bachelor’s degree
What is your current employment status?	Employed for wages
Describe your current occupation.	Engineer

Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?	No
Has anyone in your immediate family been a K-12 educator within the last 10 years?	No
What is your total household income?	\$90,000 to \$99,999
What zip code do you live in?	48309 (Rochester Hills, MI) MSA - Detroit
How long have you lived in your current zipcode?	Less than 1 year
How long have you lived in your current residence?	Less than 1 year
What are the ages of your children?	6 months, 3 years, 5 years
How certain are you of where your child will attend school?	I am fairly certain but considering options
Have you sought information regarding potential schools for your child?	Yes, but I intend to seek additional information
If you have sought information regarding schools what sources have you used?	Friends, neighbors and acquaintances, School staff, Internet websites
What do you think are the most important factors to consider when choosing a school?	The most important factors to consider when choosing a school have to do with how well a particular child will thrive at the school. This takes into account their intellect, personality and drive as well as location to home and cost of attendance.
How many schools are you considering?	Approx. 3

Information Map

Concept: The ability to accelerate the curriculum or focus on areas of interest.

- **Need: Are there programs that allow an accelerated coursework or specialized focus?**
 - Collected: School by school evaluation of the coursework they offer.

Concept: The opportunity for academic excellence for my child.

- **Need: School district information related to success rate of students.**
 - Collected: Historical data on the grade point average of students.
 - Collected: Historical data on the graduation rate of students.
- **Need: School district reputation. Do they hire the best teachers, are they well known for academics?**
 - Collected: State level school district rankings.
 - Collected: Word of mouth feedback.
 - Collected: Word of mouth feedback.
- **Need: Standardized test scores of a school district.**
 - Collected: Historical data.

Concept: The social, behavioral & environmental impact on my child.

- **Need: The general make-up of the schoolroom classes age range.**
 - Collected: School by school information.
 - **Need: The general make-up of the schoolroom classes ethnic diversity.**
 - Collected: Demographic data.
-

Figure 27: Information Map Case Study 10

Chapter 6: Data Analysis

Participants were asked to use an online tool to identify the conceptual areas of exploration, their information needs associated with each of these areas, and the information collected in support of their information needs. They were also asked to journal regarding their day to day process of conceptualizing the issue, identifying needs and collecting information. In addition to using the online tool, participants were interviewed throughout the process.

As a result the following types of information were collected:

- 1) **Interview data** – Participants were interviewed throughout the seven week study. Interview data was extensive, accounting for the greatest depth of insight. The interviews built upon the use of the software and journal entries allowing for greater exploration of participants thought processes, behaviors, and context. The coding scheme and subsequent model are primarily based upon interview data.
- 2) **Journal data** – Participants were asked to use the online journal to describe their thinking and experiences that influenced the development of their conceptual understanding of the issue and their decision. Data collected as part of the journals was useful in guiding check-in interviews and allowing opportunities for further exploration. Journal entries were coded along with interviews during the data analysis phase of the study.
- 3) **Information maps** – Participants' development of information maps varied. The number of conceptual issues identified varied from three to nine. In general, participants indicated that their final maps represented their understanding of

the issue. The maps were most useful in creating a means of identifying and talking about participants' understanding of the issues in the interviews. They were also very important in surfacing concerns or thoughts.

- 4) **Software usage data** – Software usage logs were studied to determine the degree of development of the maps. Usage logs indicate that participants actively constructed their maps.

Interview and Journal data

The collective data was analyzed through a series of iterative coding exercises. As described in Chapter 4, the analysis of the data followed a series of steps according to grounded theory methodology. This process resulted in the development of a core set of codes that guided my final selective coding exercise.

Coding Scheme Overview

The following diagram represents the analytic framework developed to guide the process of data analysis. My final set of codes were organized into four distinct categories 1) Frames, 2) Information Needs, 3) Information and 4) Context. Each of these four categories were further developed according to the emergent characteristics discovered throughout the data analysis process. The processes of development and reflection were examined in terms of each of these four categories. Therefore, there were three areas of inquiry explored for each category 1) properties, 2) development, and 3) reflection.

Properties represent the characteristics of the category that could be fixed at a point of time. These properties represent qualities of the category. The subcategories of

development and reflection represent processes. The coding schemes developed for each of these processes represent characteristics describing the process.

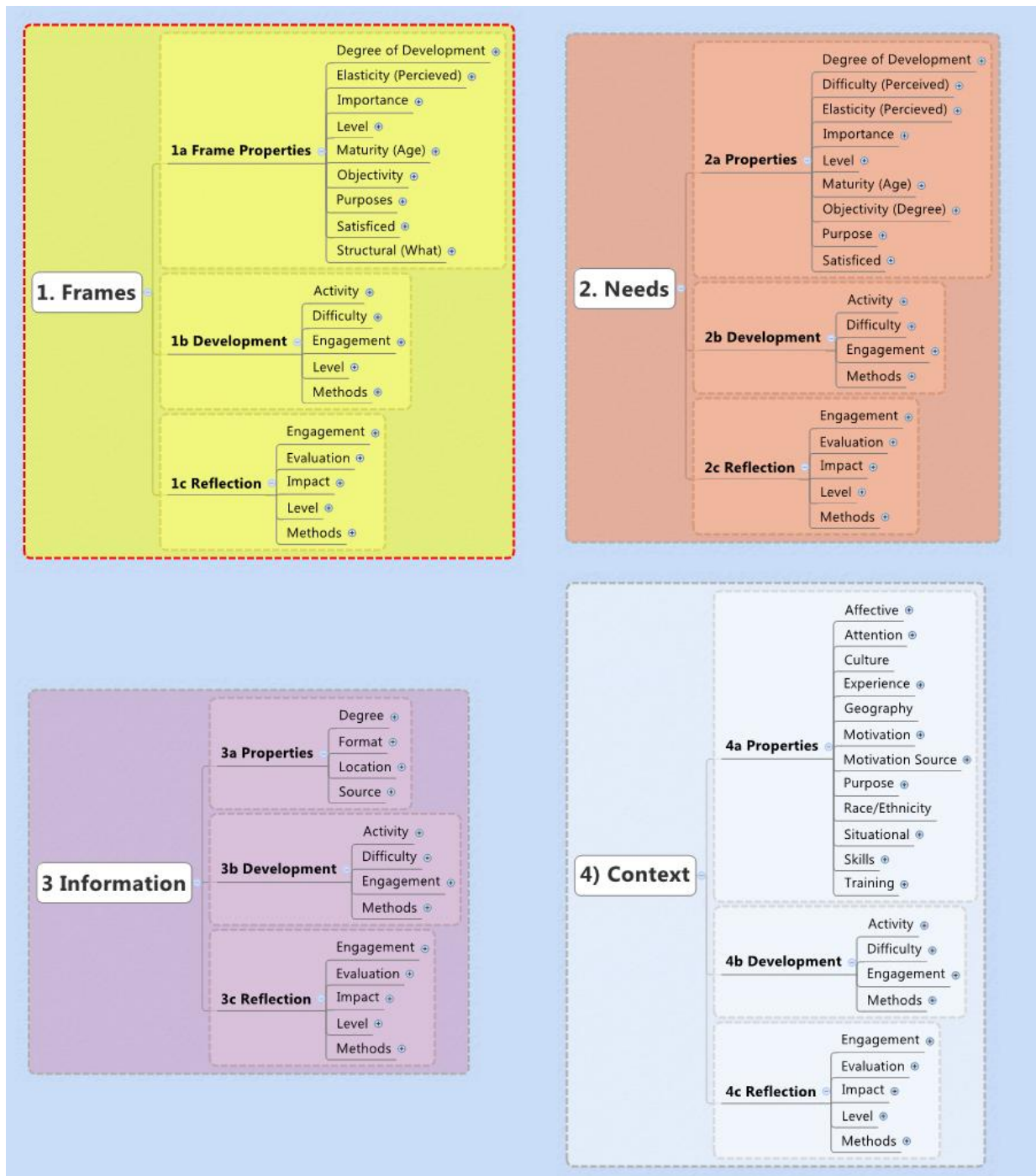


Figure 28: Coding overview

Detailed descriptions of codes and code categories may be found in Appendix 9.

Category 1 – Frames

Frames have been identified as a core process for understanding information behavior. A frame is a dynamic representation of a situation (issue, problem or solution) where certain aspects of a situation are made more salient than others, and relationships are suggested that link these aspects to ideas, concepts, values, and metaphors. The frame as a whole or individual elements may be linked to factors influencing the way a person understands an issue including informational and contextual factors.

For this study frames explain the way people conceptualize and understand their choices and the decision process regarding where to send their child to school. People identified conceptual elements of their frames, the information needs associated with these concepts and information gathered in support of their needs using the software tool provided.

1a Frame Properties

Frame properties, as represented in Figure 29, describe a frame at a point of time according to characteristics such as the perceived elasticity, importance, level of development, maturity, objectivity, purpose, level of satisficing, and final structure. These characteristics may be used to describe a frame at one point in time.

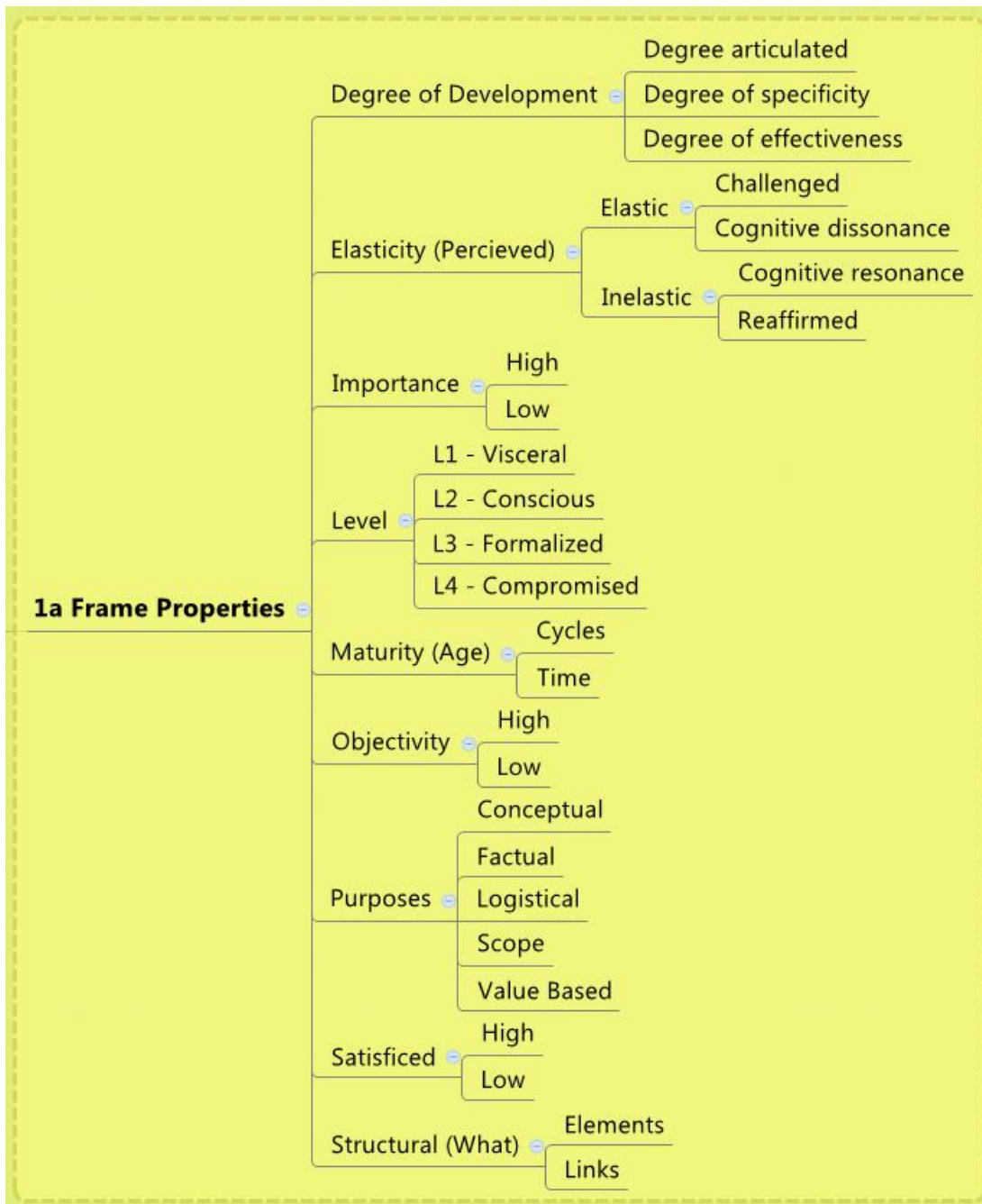


Figure 29: 1a Frame Properties

Grounding: Frame Properties

The following quotation is an example of how a person describes her process of framing. It contains several of the coding elements identified as part of frame

properties. This example shows that she is open to considering different options and considers her frame to be elastic. She has not satisfied her need to develop a frame. Her search for understanding is largely conceptual and she is highly engaged in the process of frame development.

“Ok! Thinking about it, it’s definitely been an iterative process. I would say, with the birth of my daughter over four years ago now, we started thinking about it. We were doing some longer term planning and starting to set up college and things and all that, so that precipitated conversation about what we wanted to do for her education in the shorter term. I think when, probably the biggest step forward that we took is when we enrolled my daughter in early intervention based on some, trying to get the right way to say it, she was missing some major milestones. So we got her involved in an early intervention program and with that we realized that we’re going have to make some decisions about what we want to do for pre-school, for kindergarten and ultimately for every elementary school. We’re going to have to make some decisions, and we want to be in the driver’s seat. We don’t want to do that passively.”

The following quotation is an example of how one of the participant’s frame has become reinforced and less elastic as a result of his experience.

“Yes, they have changed. I’m more firmly rooted in the home schooling side of it because we have now half year of experience and so far we see the benefits of it on a day to day basis. So, that’s kind of reinforced that aspect of it; whereas when we began, home schooling still is not widely accepted or known and a lot of people would question that reasoning so, it’s a bit off the norm and yeah, over time I have grown more towards home schooling as a better option at least for my oldest child.”

This quotation identifies one of the participant’s willingness to add elements to her frame and expand upon it. It also shows her level of satisfaction with her current frame is low and that she expects it to evolve.

“It’s kind of changed from focusing on the public schools right, to what other things can we do to enhance his education and give him the best opportunity possible with our regards to limitations such as public schools. May be it could be the public school or private school or home school, I think we are far more open minded now to say that there are more opportunities and more things within our

means that we can do to get him the best chance as success and a higher education.”

This quotation identified the initial stages of framing and the type of uncertainty or visceral feelings that manifest themselves and lead to frame development.

“I think for me a lot of it is feeling based because something is kind of nagging at me or something isn’t sitting right, a lot of times my worries or thoughts become or kind of manifest themselves physically so I’ll know, so if I’m feeling a little stressed, if I start crunching my teeth or you know kind of tighten my muscles up and am not relaxing, then I kind of know that, hey, there’s something going on that’s not sitting right with me and I need to figure out what it is and figure out how to remedy it. So for me lot of times it’s more of a physical process in the beginning and then that’s when I start the process of thinking about it, writing it down, kind of getting it out.”

This quotation identifies a person’s process of surfacing the elements of a frame and exploring the frame socially.

“I think what has been most revealing over the past couple months is that there were so many factors that my wife and I considered but we, how conscious they were or how much we talked about them, I think the past two weeks, we started putting pen and paper to this process, I don’t think either of us appreciated, how many factors we were both considering.”

1b Frame Development

Frame development characteristics, as represented in Figure 30, these codes identify aspects associated with the development of a frame. These characteristics include participants’ activity toward developing a frame, the perceived difficulty of developing the frame, their engagement in the process and their methods of informing development.

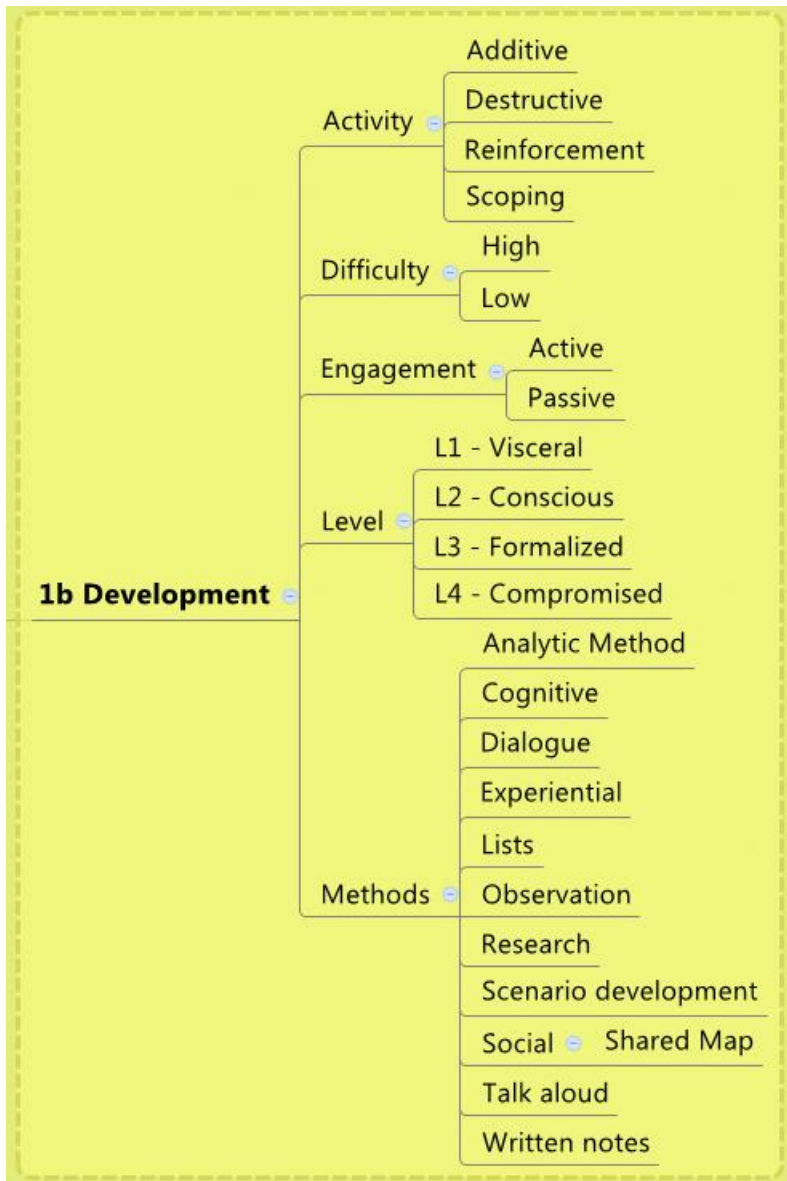


Figure 30: Frames 1b Development

Grounding: Frame Development

These quotations identify participants' active engagement in framing and adding to their original conception of the frame. It shows their methods for developing and reflecting on their frame. It also identifies their reflection of the frame and as a result the additive activity described.

“I think, I think I’ve maybe broadened my perspective a little bit in that, my, my original assumption was always, I’m going to move to a town that has a good educational system and I will put my child in public school because what I did growing up, that I think had been a huge evolution, but I think we’re opening our eyes a little bit more and saying ok! There are, there are other options and we need to consider them.”

The following is an example of a participant’s explanation of her realization that her information map was missing a concept. She describes how she considers adding it.

“Well! I mean, it seems that what we’ve been thinking about really is the community, and I haven’t had a chance to put that in yet. I’m kind of looking at how the community plays a role within the school and how the school plays a role within the community, how we guess, how well they work together, so I haven’t put that in yet. So it’s not, on my information map although, you know I am thinking about it as a kind of area that we’ve, my husband and I, have kind of been talking about, what I said telling him about, you know this study and we started talking about things that we’re looking for, that’s one thing we kind of determined that will be a pretty important task and we, we like to be active in our community. Let’s say our community is looking out for kids and we think that’s really important.”

The following journal entry describes active development and reflection of frames based on a conversation with a family member.

Journal Entry: “I had an interesting conversation with my sister-in-law. We are going through a very similar decision-making process; I was surprised to find, however, that I was mentally disagreeing with her decision, primarily because I believe that she is overlooking a critical concept. (This means that I have been, too, as it isn’t on my list). Based on the conversation, she appears to be seeking to minimize her child’s exposure to diversity. (I’m oversimplifying). My wife and I are seeking just the opposite; we want to ensure that our daughter is exposed to economic, social, and racial diversity, as much as is possible. This is a factor.”

The following demonstrates a participant’s attempt to use a frame to define a scope of inquiry recognizing her limitations at the time.

“I think that different things are important to different people and maybe some of this is even better on other people’s maps. Maybe it will become important to me as I go along? What I feel like right now, the main things that I have on there is pretty much all I can handle”

Another example shows how a person broadens her scope as she became more comfortable with the topic.

Ok! So the way that you work or think then is to say ok, I'm going to start with academics and diversity, that's going to be my starting point and I'm going to get more comfortable with that and then as I feel more comfortable I may start broadening the way I think about it and add climate and then add my child's learning style.

The following quotation demonstrates the use of a future scenario exercise as a way of making sense out of the current situation and framing the decision.

Yes, it did. It became my, I mean because I, just like I said, I still had a lot to understand how the school does their accreditation and what that means. The teachers aren't teaching up to their part, they're not bringing the kids to the level that they need to and that maybe speaks to the fact that you can't get your kids graduating from high school, they can't get a job, and they have no motivation. They don't have the skills they need.

1c Frame Reflection

Frame reflection characteristics, as represented in Figure 31, identifies aspects associated with the reflection of a frame. These characteristics include a person's level of engagement, the processes of evaluating a frame, the impact of the evaluation on the frame itself, the level of development, and the methods applied toward reflecting on the frame itself.

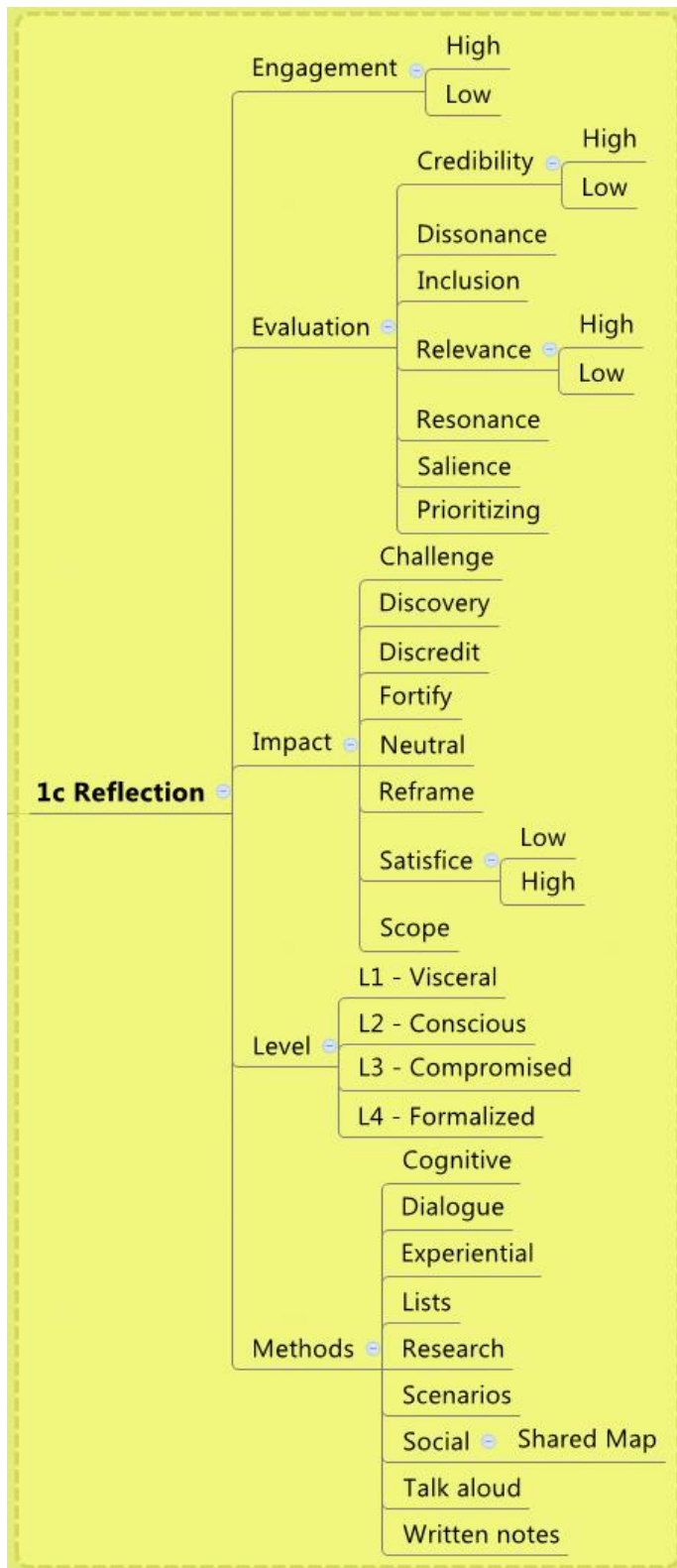


Figure 31: Frames 1c Reflection

Grounding: Frame Reflection

Frame development and reflection processes are almost always intertwined.

Embedded in the the previous examples of frame development processes are examples of frame reflection processes.

The following is an example of how one of the participant's thinking evolved as she reflected on how she reflected on the way she was framing an issue. As a result of her reflection, she added concepts to her frame and then moved to the next step of identifying her information needs associated with her framing of the issue.

"It's not like a light bulb, just goes off and on all of a sudden, it's there, I guess it is more of an, almost like an awakening, like a process where I become more aware of another concept. I guess coming to an awareness of my own thinking is what happens. I'm having a hard time putting it into words. I think it's like those pieces are under the surface, there's something going on in the background, there's my awareness I guess and I either become aware of the fact that, hey there's something that I'm missing or hey, there's something else that I've already been including as a factor here and I need to gather some information on it."

The following describes a technique one of the participants used to reflect on the way he was framing an issue.

"My wife is a, she's a social worker. She graduated from social school, a social work school, 8 years ago now and one of the exercises that she would always, frequently, have me do when we were, when she was working on case studies is she would want me to put myself in issues of the individual, of the subject whom we are studying. So when I have aha moments, it's when I change my perspective, when I see things from someone else's view point. Just to use the case of school decision, I think if there were any aha's, when I think of my daughter's perspective, I keep thinking what's best for her world, what is, from her perspective, what's best for her, I mean she's only a 4 year old, obviously we're going to ultimately make decisions but, what would she want, and if she were us, what would she want for us, so I guess, changing perspective, sometimes is a key driver of the aha."

The quotation describes the process of listing or visually organizing thoughts as a way of developing a frame and reflecting on it.

“Yeah! Well! I mean first of all the first step is identifying the issue and then personally I usually take some time to mull it over in my head and if it’s something that I may really have a hard time making the decision and or figuring out a solution to, I mentioned to you before that I’m a list maker and so I’ll do pros and cons list or just make a list of things that are troubling me, I find it helpful to just write things down, see it on paper and sometimes when I see it on paper it becomes more clear to me. I think it’s because I’m more of a visual learner so that’s probably why but for me a lot of list making pros and cons and then after I make it, narrow it down and I will discuss it with my husband or my mom, it depends on the issue and just think about what’s best for myself or the family or whatever one has to do.”

The elasticity of frames may be considered not only in terms of adding elements but also ranking their importance. One participant described the importance, or salience, of an element of her frame as being most likely to change.

I think it’s important to rank them. I don’t think for some people it’s going to be a conscious decision. And conversely for other people it’s going to be more conscious than others. The most important actually did change for me, looking at the cost of private school, the down side of living in this county is that the cost is horrendous. So that became a greater factor than say who his teacher’s going to be.

Category 2 – Information Needs

Information needs have been identified as another core category for understanding information behavior. Information needs are examined in terms of the characteristics of a need at a point in time, as well as the processes of development and reflection. These characteristics mirror those of frames in many ways.

2a Information Needs Properties

Information needs characteristics, as represented in figure 32, reflect the current state of the need at a point in time. These characteristics reflect qualities associated with identified need and perceptions of the need. The data also indicated that people

have different purposes for their needs. Some of the information needs identified were for the purpose of better understanding an issue and others were related to addressing a specific need identified by the framing of an issue.

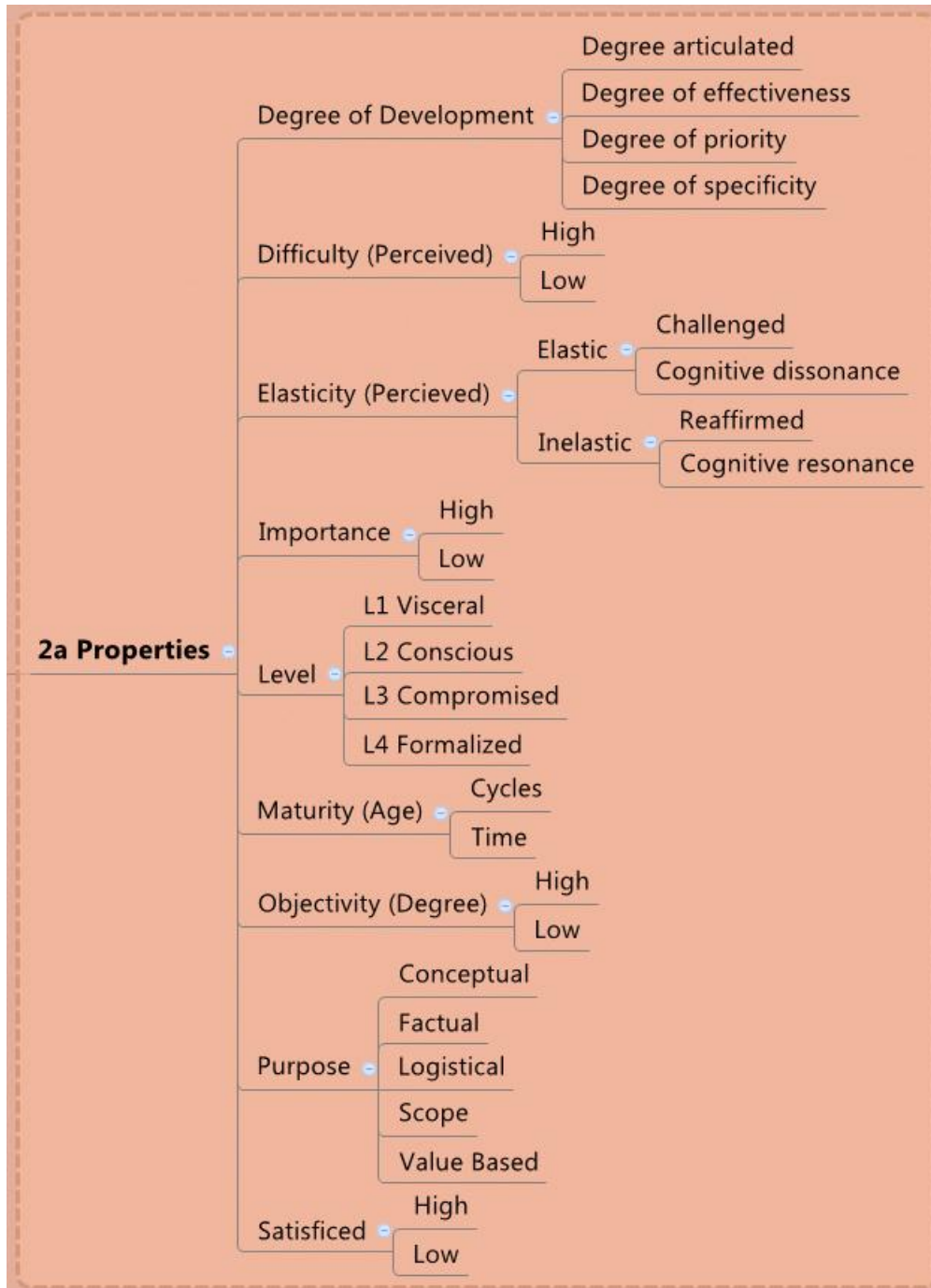


Figure 32: Information Needs 2a Properties

Grounding: Needs properties

The following quotation demonstrates a participant's general understanding of the type of information she needs but she is struggling to define and put into practice. The participant views her information need as one that should be more fully developed and articulated in terms of what she is attempting to measure. The participant perceives the information need will evolve and she applies high importance to the need. She is conscious of the need and is struggling to articulate it and create specificity around the need.

What we need is, we need to figure out the right way to compare, compare the behavioral aspect of, of this private school with the behavioral aspects that kids are getting in a public school. And I, I think, I, you know we both have ideas of how to get to it in terms of interviewing different parents and in terms of you know spending time at those schools, through observation, you observe what it is that you are actually measuring. So, to answer your question directly, I think it's going to be pretty hard. I think we need to define concretely what it is we're trying to measure, otherwise we're going to be spending a lot of time and not get a whole lot of value from it.

This same participant describes his attempts to understand how to ask the right types of questions.

Accreditation with home schooling programs is still kind of a question mark out there. So reading about what accreditation is required for different states and different programs and staying accredited with the home schooling program, that drove the need to find more information what's required for our state, our city, our county and then more information on what program supports this type of accreditation.

2b Needs Development

Needs development characteristics, as represented in Figure 33, identify aspects associated with the development of information needs. These characteristics include a

person’s activity toward developing a need, the perceived difficulty of developing the need, the engagement in the process and the methods of informing development.

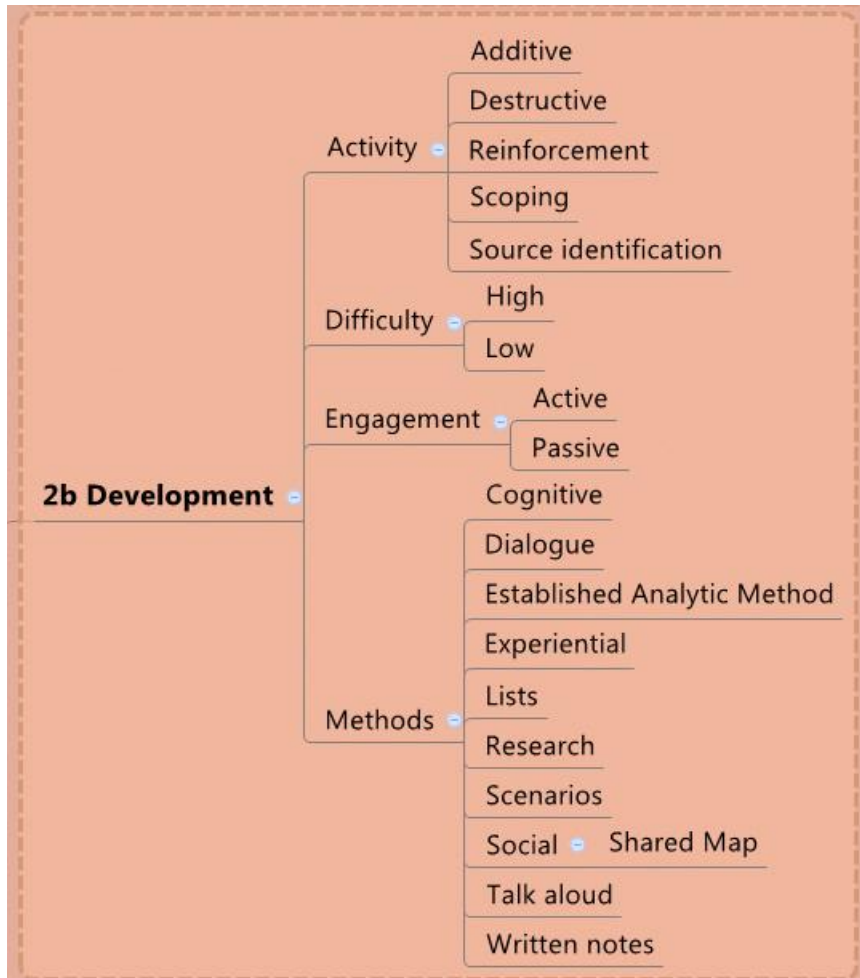


Figure 33: Information Needs 2b Development

One of the participants reflects on the development of his needs and suggests that this is the area where the most development occurs.

I think the needs, what’s the right way to say it? There’s always an opportunity to get more information. So I think we’ve identified the the static needs, the needs as of right now. But they are subjected to growth and change. Out of everything the needs are probably the ones that grow. They probably don’t shrink. You probably need,

socialization, my key concept is a good example. As other ways of assessing, socialization become available, you can add more and more information needs.

The following example identifies a participant relying on his partner to help define needs and the expertise of his partner facilitating the framing of their needs.

I was fortunate enough that my wife being an educator and having classroom experience....knows what needs to be done. She knows the end result of what a first grader should know. She knows where to go to find out what the matrix is and knowing where a first grader should be at the end of the year helps determine what information they need to learn throughout the year which in turn leads to okay, what is the curriculum needed to support them. So, I think in this case, I was fortunate enough to know that my wife already knew the questions to ask. So we had to just dig a little deeper into whether or not school programs meet those needs.

One of the participants describes the process she engages in when identifying her information needs as a step by step process.

I'll try to break things down into smaller segments, into smaller pieces that put together to the whole complicated issue that gives the way to, I guess, drill down to actually collection of data. So if it's a complicated issue and there are many areas that we need information or inputs from, breaking these down and separating them into different pieces or chunks helps it become easier to gather the information that we really want to get and it also helps to find what's also really important to the issue. So as I break apart the issue maybe, find some things that we didn't think of, I didn't know were important or things I didn't know should be considered as part of the overall issue. So, overall I really try to break it down to get to the details and to get something that I can rely on, that's quantitative.

The following quotation describes how a participant moves from a more general definition of information needs to the more specific.

Well yes, in the beginning I was just, you know, looking for general information on the school, size of class and stuff like that and then after that I was looking for specific curriculum development stuff like that, then I had to look at transportation, things like that, what other services they provide.

2c Information Needs Reflection

Information needs reflection characteristics, as represented in Figure 34, identify aspects associated with the reflection of information needs. These characteristics include the person's level of engagement, the processes of evaluating a frame, the impact of the evaluation on the frame itself, the level of development, and the methods applied toward reflecting on the frame itself.

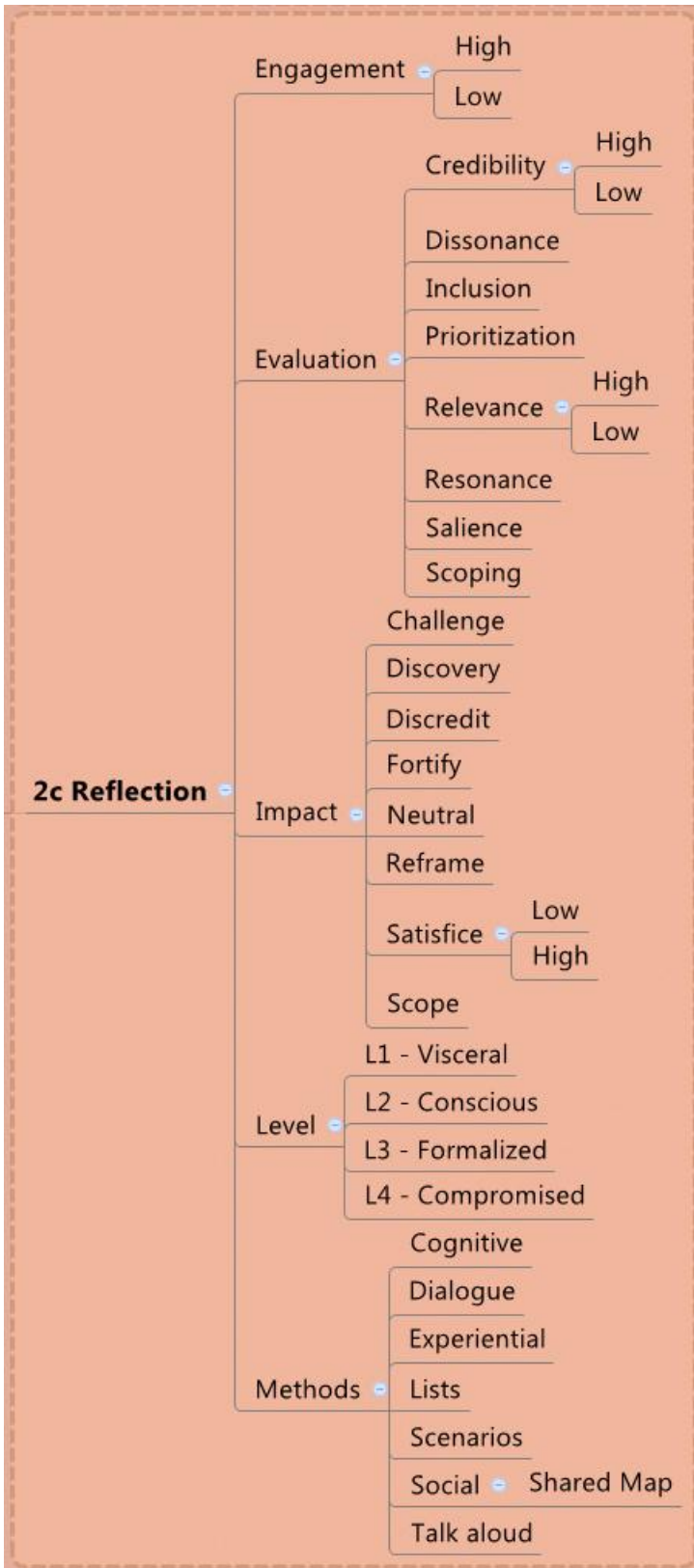


Figure 34: Information Needs 2c Reflection

The following example demonstrates a participant's reflection on her needs and attempts to understand what she is trying to achieve in order to specify her needs.

I'm looking for, I guess, characteristics, like I haven't had that answered, because I don't think I formed this part well enough. I don't have the right measure. You know and, you could look at negative consequences, you could look at like statistics on dropout rates and maybe statistics such as suspensions and, and that kind of negative consequence or behaviors, that's not what we want to get at. We want to get at, is the program fostering an environment where kids can make in improvements where they can make friends or they can apply themselves because they're comfortable, socially? So I don't know what the right measures are, that's the hard part.

One of the participant's describes a situation where she encountered some information that caused her to question her frame and identify an area where she might need more information. In this example, she does not have a clear sense of where this information is or what type of information she is likely to acquire.

Some of that also came from just talking to people. Chicago Public Schools made an announcement that they knew they were behind and they needed to do something, Chicago Public Schools were talking about extending the days because they are behind. So it's, it's part of that discussion, that kind of influenced me and is part of what influenced me. It's actually impacted me knowing that my son is one of the top kids in his class. I don't necessarily want him switching to private school and have him become, you know one that, just an average student or something but I, I don't want him to be missing out on something because Chicago Public Schools are not teaching it yet. And you know other schools are. So that's also part of what's making me more curious to, to look into more information to see if there's something more I should be doing for him.

Category 3 – Information

Information is another core category for understanding information behavior. The category information was coded in terms of characteristics associated with it as it is identified by participants. Based on a social constructionist view of information, many of the characteristics associated with information are incorporated as part of the

information needs category. This reflects the belief that the participant constructs meaning of the information.

3a Information Properties

Information needs characteristics, are represented in Figure 35. These characteristics reflect the source of information, locus of information and the format of the information.

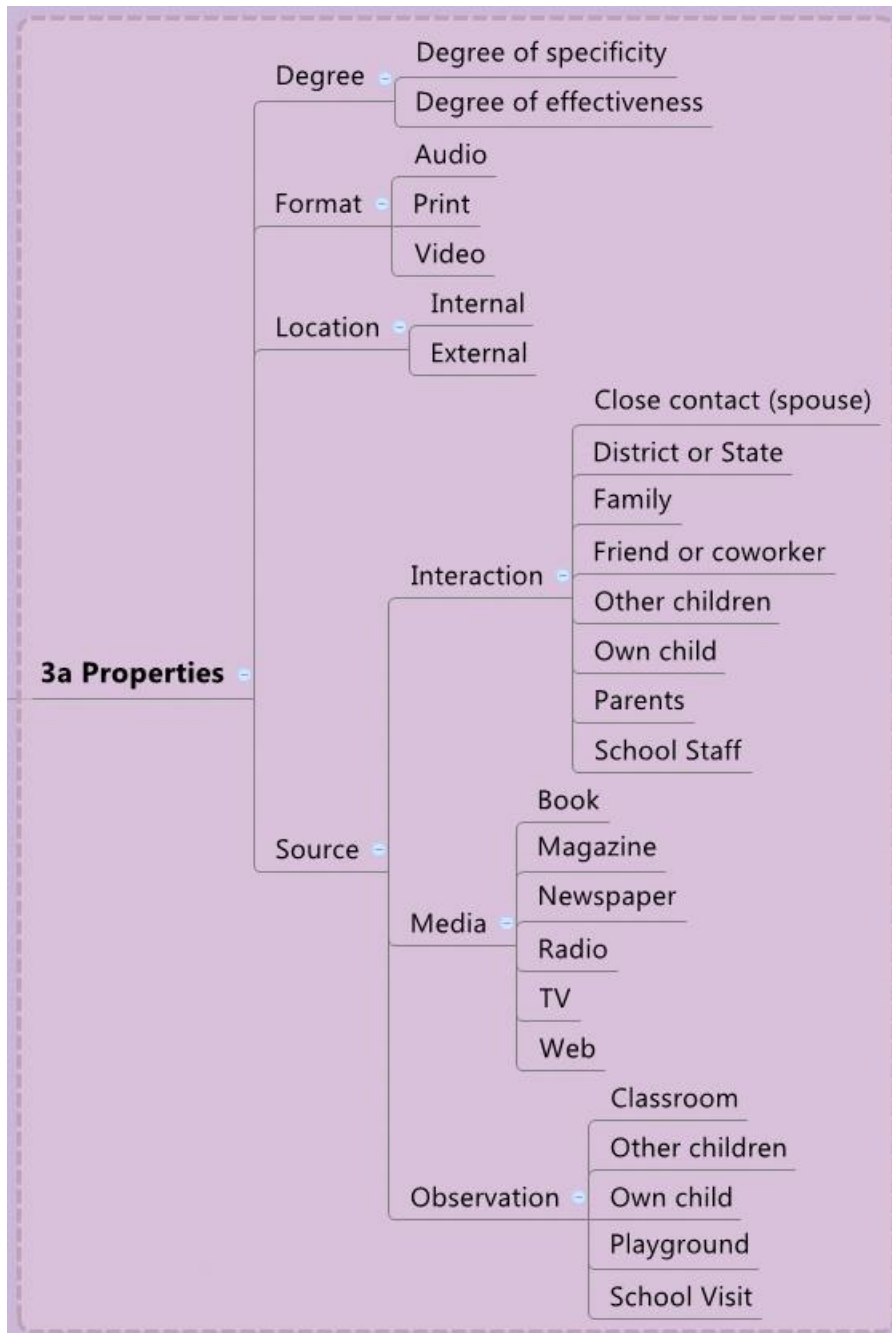


Figure 35: Information 3a Properties

The following example describes a parent acquiring information socially through interaction with parents, children and observation.

And then talking with, I have friends who are parents who have gone to, sent their kids to a couple of different schools and talking with them and see what their impressions are and then there are kids in his pre-school that have older brothers

and sisters that are going to the public school. And then talking to them and see how, what their impressions are of the school district and ask if they, you know just did they consider a private school or did they just send them to the local public school and how is that for them

The following example demonstrates a preference for information attained socially from close contacts and the participant's identification with the person sharing the information.

I think the most significant external factors have been discussions with family members who are going through similar processes. Obviously we're not the first people who'll have to make this decision. So I discount a lot of what the outside world thinks. I take to heart, I care a lot about what people who have very similar value systems they can feel. So the feedback that I get from my family from older siblings, my wife's older siblings mostly, they have a much greater influence than a co-worker would than usually they would. I'd much rather hear it from another family member who's gone through this already.

The following quotation describes the process of gathering and storing information over a period of time. It also shows the participant's active engagement in identifying information to support her understanding

The process really begins at birth. In each one, birth of the child, taking in to the consideration each child as an individual and their needs may differ from one to the other so, we look at their personality and we look at their learning ability and their learning desire. Those two things are really key in determining what path is best for them. So, our oldest child is introverted, very intelligent and very driven to learn and we think that if we put him into a situation of a noisy surrounding with lots of other children of his growth of same age but a different may be, physical abilities and mental learning abilities that he may be more introverted than he already is and impair his ability to learn and be successful in a classroom setting of a public school. So, these types of things lead us down the path as to what is best for them. So, if my middle aged daughter is very social and outgoing and has more leadership skills, she may strive for being in a larger group setting and that's not something we could offer with a home school. So, guess what I gained from this is that his personality, is probably the biggest factor in determining which way we will go between our two choices at the moment, public school or home school.

The following example describes one of the participant's perceptions that she is collecting too much information.

I do too much reading. I read too many magazines, too many parenting magazines, too many books about parenting and blogs and you know you get a lot of ideas from other people. Some are good, some are not so good. But sometimes, discussions with other parents as well has led me to think about things I may be wouldn't have thought of before, like immersion schools, we didn't have that when I was growing up or if we did, not my community. So talking with other parents as well, you know that had children of same age or little bit older that's not official. And just kind of seeing what's going on in society and what are communities are kind of doing, kind taking cues from there as well.

The following quotation identifies one of the participant's collecting factual, statistical information on schools and her satisfaction with the amount of information she received.

Although our magnet schools are liberal arts schools but it's not like, they consider the magnet schools to be the better schools. But liberal arts aren't really something that I'm concerned about at your age. So I did look into the scores for, for her education as far as how well pupils are doing like, reading and math and science, for my school compared to the other two public schools in my area and also looked into private schools around here as well, actually had private schools, the private schools send me information telling what they offered and give me more details on the experience of the teachers. So let me think well, what I was doing. That's enough in my mind at the moment.

The following example identifies a participant searching for information at her local library.

Probably our local library, there are these kind of really great resource for me on, you know lot of different areas. We found a lot of time there, but they have a kind of all sorts of information on, on all sort of things because a lot of it is toward senior education obviously so I, I probably will be seeking more information from that area as well, definitely a public library. I think it will really be beneficial. Other than that again off the top of my head I can't think as to look outside where we're going to look for information. I'm sure something else will pop up. But who knows what that will be.

This example demonstrates that the participant associated higher value to information coming from someone she knew as opposed to a stranger.

“Similar parenting skills as well as just, just having that, that actually knowing the parents themselves rather than going online. So it was more about, it was easier just to find parents that, you know would have written reviews about their, you know their children’s experience at, you know such and such XYZ School versus knowing someone personally that their children attended the school and then that way I can also know who the actual parent is.”

3b Information Development

Information development characteristics, as represented in Figure 36, identify aspects associated with the development of information. These characteristics include a person’s activity toward developing information, the perceived difficulty of developing information, the engagement in the process and the methods of informing development.

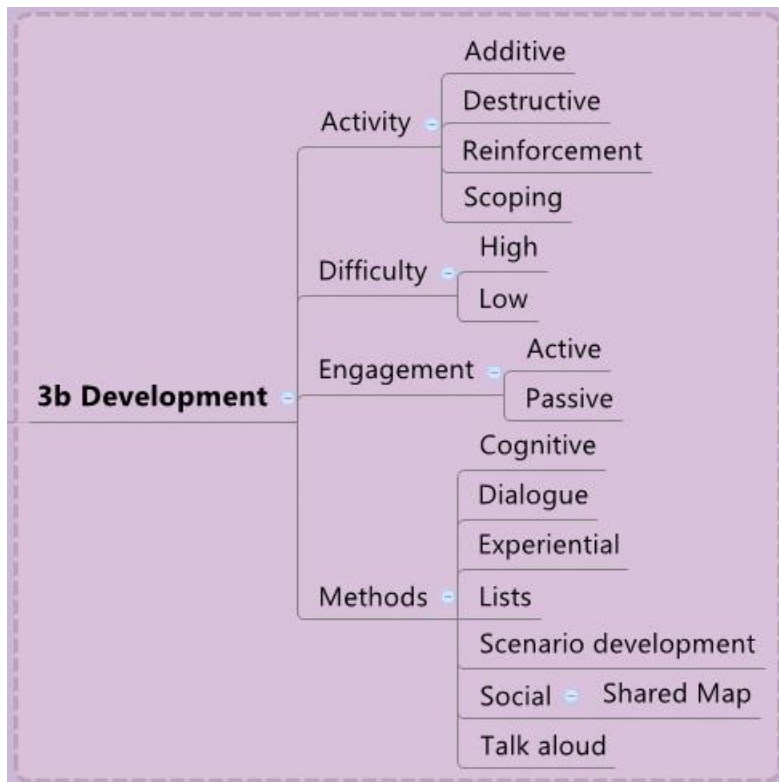


Figure 36: Information 3b information development

The following example demonstrates one of the participant's attempts to create a situation where he gathers information.

I'm still trying to ascertain ways to measure socialization. This weekend, we watched my daughter playing with other kids, a lot. This process is already impacting how I react with her - I am 'testing' her, socially, all the time. (We made her wait her turn, for a long time, for a go-kart ride. I was essentially observing how she interacted and reacted, during the wait period, with her cousins).

The following quotation describes one of the participant's active creation of information that she is able to use to inform her process.

No! I think it will be something that we're writing down. I write things down anyway. I have books full of all sorts of garbage. I think it's something that's, it's something important to me that I don't want to mess up on it. I don't want to miss things so it's important as to where I would continue to keep a list and that will still evolve and I think things will be crossed out and things will be checked off, but it is something that we'll keep, we'll keep a track of because it's so important now.

The following is an example of a participant's description of how she is developing her frame and statement of information need in terms of a problem statement.

So we're trying to come to agreement on what the scope of the issue is and define a very clear problem statement

3c Information Reflection

Information reflection characteristics, as represented in Figure 37, identify aspects associated with the reflection of information. These characteristics include a person's level of engagement, the processes of evaluating information, the impact of the evaluation on the interpretation of the information itself, the level of engagement, and the methods applied toward reflecting on the information.

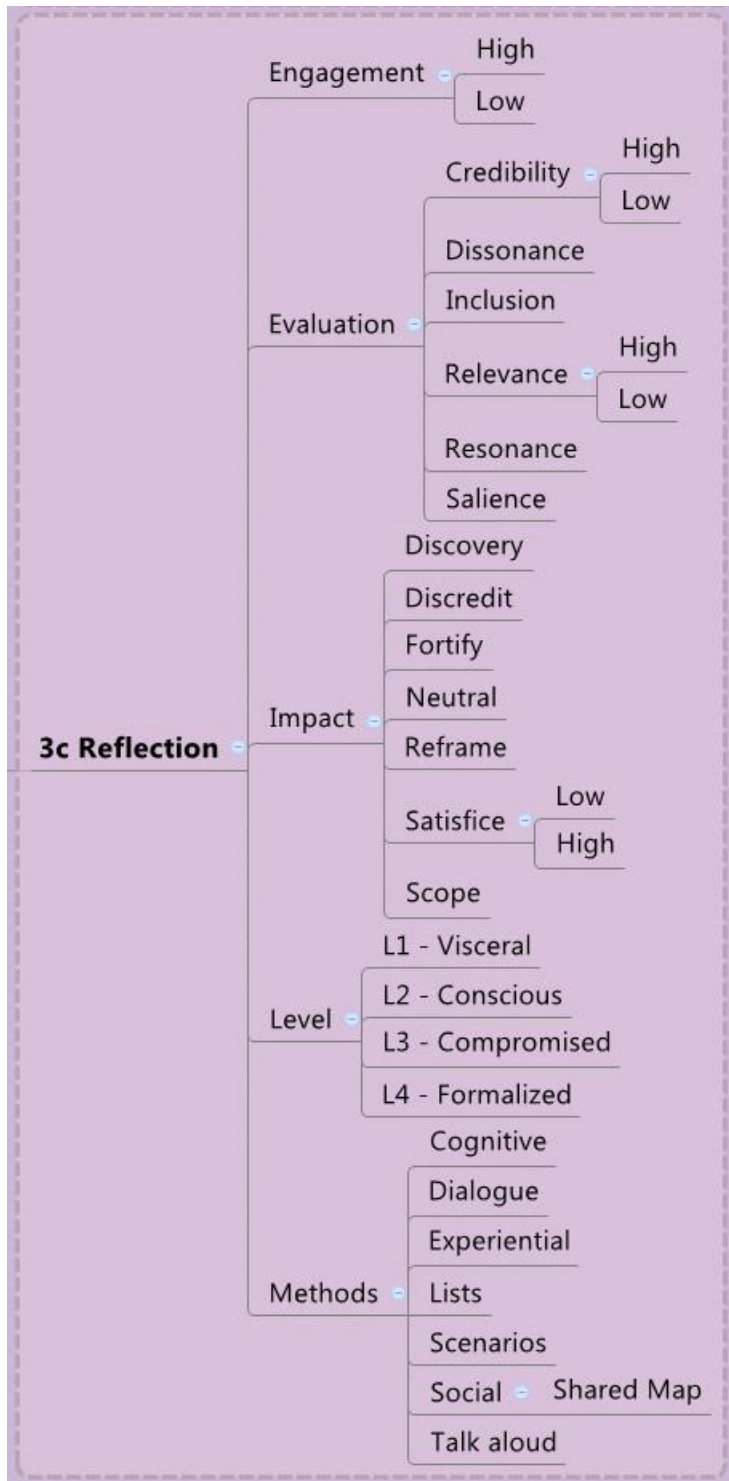


Figure 37: Information 3c Reflection

The following example depicts one of the participant's attempts to gather information from multiple places and reflecting on that information. This participant actively evaluates information in terms of its quality or potential bias.

I used to or I've gone to the website greatschools.com and then it shows the, provides the names, test scores and then also AIMS is the standardized tests in Arizona and then it also provides feedback from students, teachers, parents and that I know some of them may be like, biased and may be from teachers, not teachers like, principals themselves saying oh, this is a great school but, I read that, take that into consideration and so that and then advertisements that I see in local like, children's events magazines, that's here that and then the, another local ad that I saw, I just went over to another school that's fairly close in part of another school that I had been looking into and then also from colleagues, when I was in the education program, I knew a lot of that like, just knowing because at that time when I was in school, my son was about 2 years old and so I knew which districts to stay away from because I was in the classroom with those teachers and they were saying how that the principles were and like all of that, I know which school to stay away from and then with my student teaching, I learnt a lot from those teachers as well and seeing where they were sending their kids to school so, that was a lot of information I have. And then so, yeah, that's how I learned that, the district that I live in was in a very good district and then the colleague that I was in class with, she told me of this school that just happens to be at the school that they really are interested in, is just around the corner.

The following quotation demonstrates a participant's active search for information coming from a specific source.

I, you know it was on two respects, it was a little bit more difficult to find parents than it was to be able to just go online. You know you can go online, you can find reviews and things like that but to actually find parents that had children that attended school that was similar to this age too. The ones that I wanted to send her to was a lot harder to find.

Category 4 – Context

Context is the final core category identified. Context represents all of the outside factors that might influence all three of the other categories, particularly framing and information needs development and reflection. Context also plays an important role in how information is interpreted or situated within a participant's overall information

behavior and has strong linkages to all of the identified characteristics in the other categories.

4a Context Properties

Contextual characteristics as identified are related to participants' unique perspectives as influenced by factors such as emotions, attention, experience, motivation, personal background, and purpose.

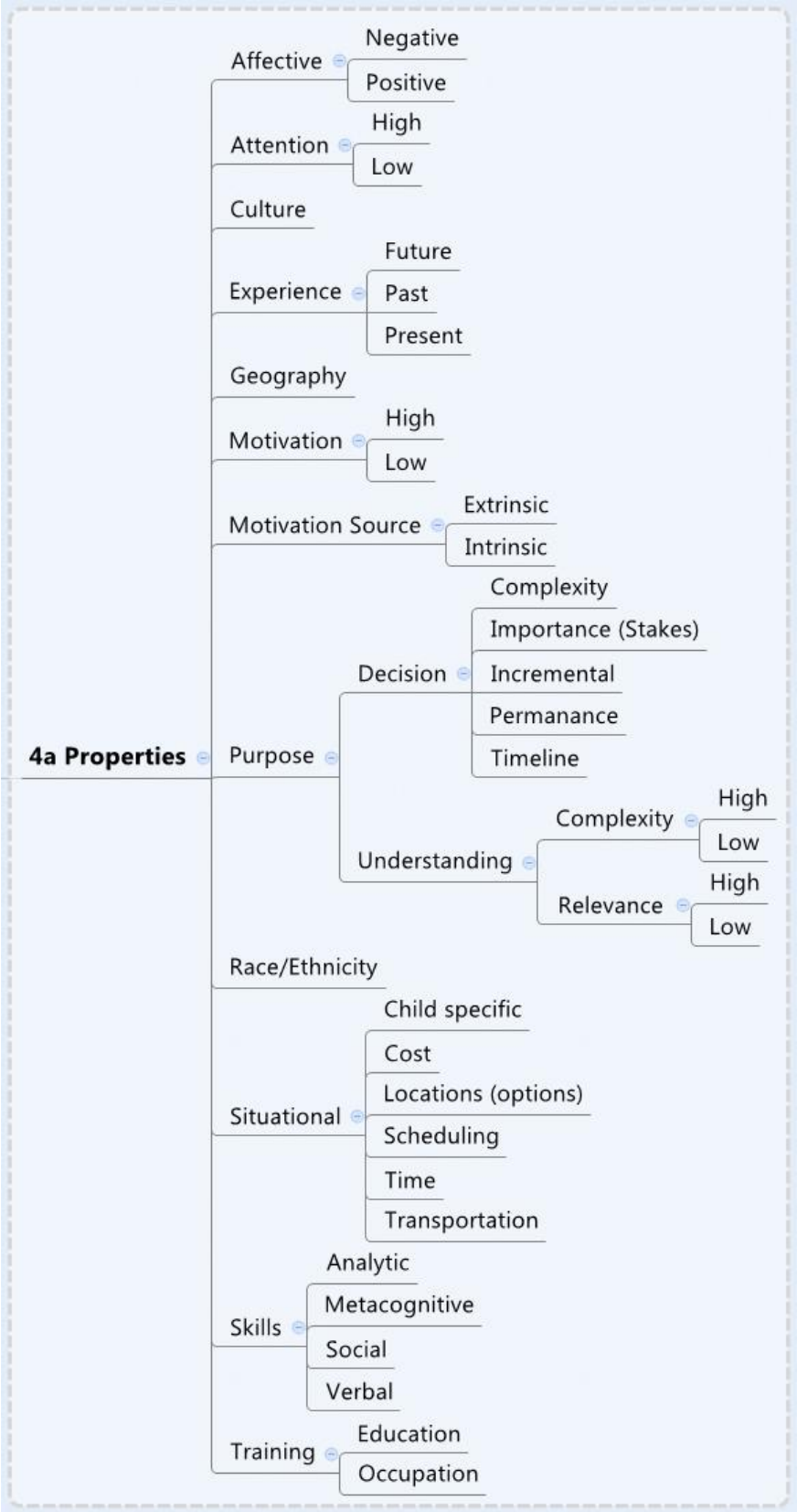


Figure 38: Context 4a Properties

The following quotation identifies the role feelings play in understanding and framing problem.

I think a lot of what we feel remains under the surface. It definitely drives the weight of some of the concepts, but I don't think that my wife or I do a good job of being explicit about how much our feelings matter.

In the following example the participant identifies her experience as a contextual factor influencing their views of the problem.

Based on experiences... Well looking at it from a teacher view point, I know that test results can be skewed. So I'm not going to look at, this particular school puts out 98 % of marks, that's good but I also know that those results could be skewed. And I would look more at, what is the curriculum being covered versus the output. So from personal experience I would look based on my own school experience as a child and then as a teacher as well.

The following example reflects a situation in the larger community that defines the context of the decision and results in the identification of another frame element.

You know, lately the issue of safety and security in public school setting comes to mind. Initially, that wasn't so much of a concern, even though we're, after the tragedy in Columbine and there was a level of awareness. So security and safety issues in the schools and our proximity to the Detroit public school systems has given us throughout the last number of years you know, metal detectors have come in place and, it hasn't really, it's always been there in our consideration but it just seems to be occurring a lot more often than it used to be and in places that no one expects, there's always a place where nobody really expects anything bad to happen. And, now we are thinking it may even be a safer place to be in an inner-city school where they do have metal detectors and everyone comes in through those metal detectors every day. That's another thing that we have for last two and a half years we have discussed more and more and thought about more.

This example identifies occupation and past experience as an important contextual factor driving the participant's understanding of the issue.

I, myself, went through the teaching certification so I have a masters in Elementary Education and so just in my background and what I've learned. I just want to better monitor my student because just personal background my personal experience with, when I was in school. The thing is that parents weren't as involved and so I would like to be more involved with my kids and children's education and just I know that the test scores, the standardized test don't really touch on most of the aspects of other intelligences that the students have so, but just, it's a good basis to stand on to see what the background of the student, just to know the overall environment of the school, especially reading and math are tougher, that environment, and so basically, that's just the personal experience with my education and my background.

4b Context Development

Context development refers to the process of creating experiences that define the context of a situation or reshaping existing contextual elements. The category of context development was added as a result of evaluating corresponding activities in the other major categories and evaluating their applicability to context. It was also added after identifying participants' active involvement in creating their own context. For example, many of the participants sought information by visiting schools. As a result of visiting a school, they may have experienced something that not only provided them the information they sought, but also created something more than information. For example, if a parent visits a school and has a very positive experience resulting from positive interactions with the staff, observations of the children, and a positive reaction to other less definable elements of the school that experience could be considered context. The parent could refer to the experience at the school as a part of the context for making a decision. Another example might be a parent's involvement in changing a situation. Parents might decide that they should move to a different neighborhood. In this situation, they will have created a new context in which the decision is embedded.

Context development characteristics, as represented in Figure 39, identify aspects associated with the development of context. These characteristics include a person's

activity toward contextual experiences, the perceived difficulty of developing context, the engagement in the process and the methods of informing development.

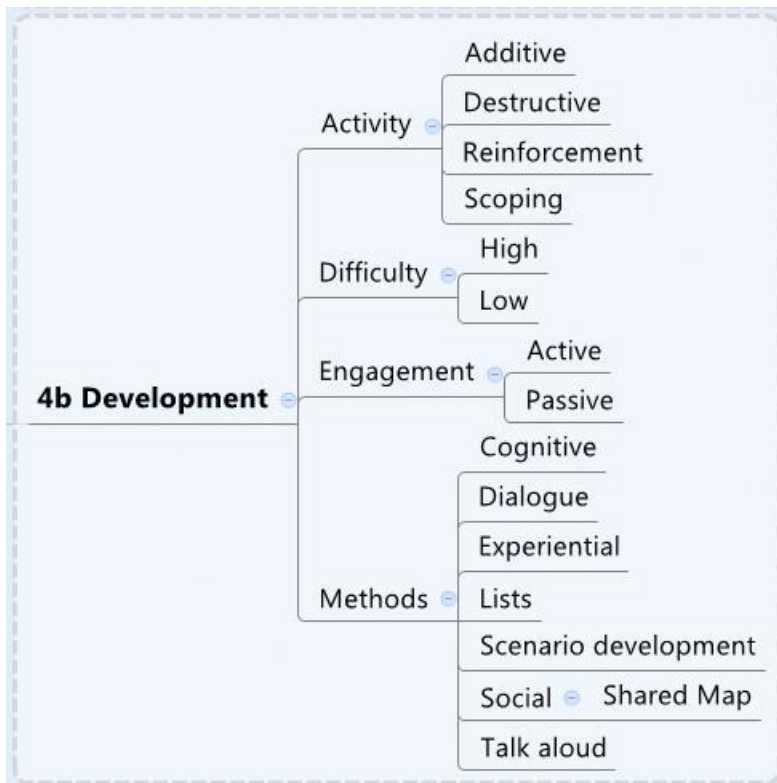


Figure 39: Context 4b Development

The following example identifies ways in which participants described their efforts to gain experiences. It also reflects their attempts to put those experiences into the context of their own lives.

“I think so! Consciously I probably was already internalizing what we felt when looking at these schools. To the schools that we walked out of, we were very positive, very happy about one more than the other and they were both good experiences but when we walked out, we were really excited and chattering about it and we were really happy about what we felt, what we saw and we didn’t have a whole lot of conversations with a lot of people in the school but it was more of overall feeling. So I think I was already, on some level, conscious of it but it wasn’t, I didn’t talk about it”

This example identifies a family's experience that became part of the context in which they understand the issue.

“The benefits that we initially thought there would be with home schooling such as additional family time, more flexibility in both scheduling and curriculum ideas, we’ve really seen a great benefit and we can do a lot of different things, a lot of interesting things that you wouldn’t be able to get in a typical classroom setting. And, the advancements that my son has made in curriculum level from grade one to advancing towards the grade two, in half year time period shows that, that doesn’t have to be a hindrance when you’re in a home schooling setting so, you can speed up the curriculum to the student’s ability. Those are some of the things that have reinforced this as a particularly good option.”

Lastly, context can also be complicated involving multiple conditions that affect each other.

I’ve been thinking about going back to school and some of that, well it’s been put off mainly because of the job loss situation but it’s still in thought process so perhaps when Gabriel goes to school full-time then maybe I can look more into that but I’m thinking of the school, we live in Oakland County in Michigan and I think it’s like the 5th or 6th richest county in the nation, and on one hand it’s really good because we have a lot of choices and on the other hand it’s kind of bad because things tend to be more pricy but on the good side we’ve got tons of schools to choose from and I literally live two miles, within two miles of two decent universities. But the one I was thinking about going to is the far is farther away in the Detroit area. So that whole thinking process, should I go to the school closer simply because it is closer and it would be a little more convenient that way or should I go and travel and that’s kind of changed the thought process of both have, I don’t know if they have equally good programs cause I was just getting to that step of actually going to visit and checking out the programs. So that has changed my thinking a little bit about, is the distance going to be a huge factor or should I overlook it and go anyway because it’s a better program.

4c Context Reflection

Context reflection characteristics, as represented in Figure 40, identify aspects associated with the reflection of their context. These characteristics include a person's level of engagement, the processes of evaluating context, the impact of the evaluation on the interpretation of the context itself, the level of engagement, and the methods applied

toward reflecting on context. Many of the participants in the study actively reflected on the contextual factors that were influencing the way they viewed their problem. For example, they would identify aspects of their past experience in school and reflect on whether it was fairly or unfairly biasing their view of schools.

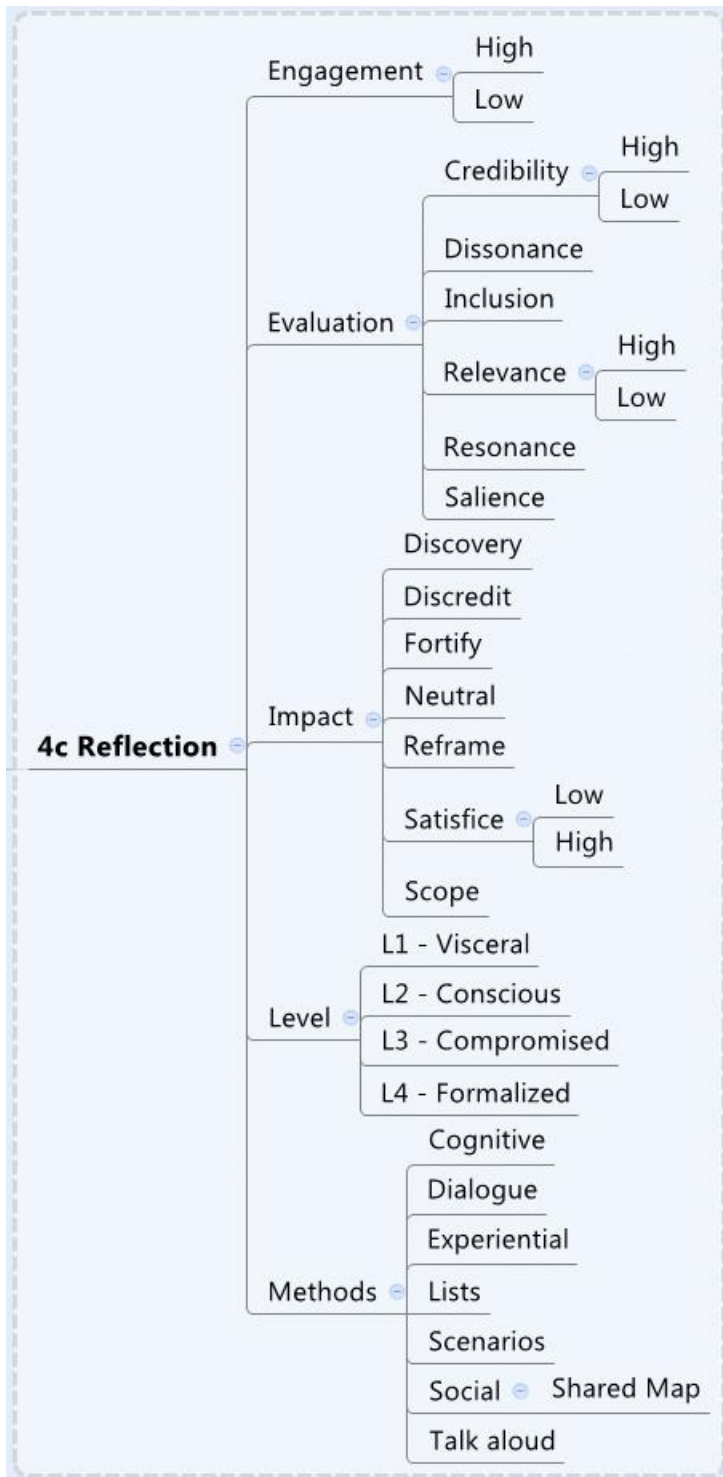


Figure 40: Information 4c Reflection

This example demonstrates awareness of many contextual factors influencing the way the participant is considering the situation and her reflection on the role of context.

I think even through this conversation, I understand more that there are other pieces that we're not capturing but, I think that I'm aware of them. (Interviewer: Ok and what are those other pieces?) My own upbringing, my own history, my own background, my culture, my race, my, where I live in the country, my demographic profile.

The following examples demonstrate a participant's willingness to reflect upon contextual factors that are influencing her approach to understanding the problem.

Mostly we have the, our personal experience. We have been evaluating schools in our local area. The third point would be that talking to people that have done home schooling which is less traditional because in the process of investigating or evaluating the schools, we talked to people who've gone through that particular system. We also talked to people who have gone through the other side and then we have our own experience, mine was a public school experience. It's very positive. I had a great education growing up so, talking to other people who've done home schooling and my own experiences played a part into the decision.

Interactions

In addition to analyzing the properties identified, interactions between the four levels were also examined. For example, context was shown to have a strong influence on the other three categories.



Figure 41: Interactions

The following example demonstrates a person's active development and reflection of her frames based on active information gathering and processing. The participant listens to her family and friends and identifies why information might be important to their framing of the issue. As a result she actively develops and reflects on their framing of the issue.

One other big piece was just conversation through this process; we've been talking with family, talking with friends, talking with other people who're going through the same process. Because this is forcing us to think, it's causing us to ask a lot of questions of others. I guess it's another way of information gathering process, through these conversations we learned more about the kind of information that other people are gathering and what drives their decisions. And I think the process of talking through

with other people who have to go through the same kind of decisions, has helped to structure our process.

The following quotation identifies a person's uncertainty around the issue and her attempt to create structure and identify a need. She describes her struggle to put her need in a question format and her perception of it being easier to talk to someone that may help them understand the issue better.

Yeah, sometimes there is a feeling that something is unknown or there is a big question mark around it. You think about it more and more. You start to think about where am I going to get this information? Where am I going to find out more? And then that starts the process of what questions do you ask. If you can find the right person to talk to it's just, that's a little bit easier and okay thinking about this, where do we go from here? That's a lot easier to do than to type into a group of search.

The following is an example of how a participant's situation changed. This change of context resulted in her reframing the issue or at least considering different aspects of the frame as being more salient.

And then cost has become more of a factor this year because my husband's been, lost his job. And so he is currently looking for something else so cost may be a bit more of a factor because he will start school next year in kindergarten. And so based on that knowledge, I will need to look into, are there other ways to help pay? Do schools offer scholarship or is it simply just you pay out of pocket? And then weighing the curriculum of the different schools and what types of those activities will be offered other than the academics. You know are there other sports programs that he will be able to participate in if he's interested, what are the music programs, after school clubs and activities?

The following example represents one of the participant's reframing her conception of the problem; as a result she redefines her information needs.

You know one other thing that I never thought about was how much structure actually meant to me and that was something that after going through the decision making process I realized Well! Structure does actually mean a lot to me and, and so you know the whole idea about looking at things in the learning curricula and the academics vigor and things like that made me realize I really needed something with

structure. So then again it made me start look at questions that were built around structure.

The following quotation describes the circular nature of information, information needs and framing.

I think it probably does go back and forth because I think what happens is like, I'll identify something that I'm interested in or I need more information on and so in the process of collecting some of that information or getting the answers to some of my questions, I might find some extra information because you know you'll be looking for many answers, you don't always try just for one answer. So there're other bits of information that you're coming across and so it starts, it leads you to start thinking about other things. So I think it's a back and forth process because you're reading through something, getting the information, the answers and then you read something else that works another, kind of another interest you thought and you had until and you do a little bit more research on that and that might lead to something else. I think it's kind of the back and forth thing.

This quotation also demonstrates the circular nature of the development of information, information needs and frames.

Yeah! I think they have changed over time, just because it's kind of like a rabbit hole. I mean once you get one useful bit of information and that leads you on to something else that you hadn't considered and then that leads you, you know onto something else and so I feel like I'm constantly picking up new information that I never thought about before because this is our first kid and it's kind of, you know a crap shoot just don't really know what we're doing. So I feel like I'm learning and learning and it's a little bit overwhelming because I'm constantly gaining information and so it's kind of a situation where you could spend a lot of time so that you can do all the research, so that has helped me from the time being I felt before I was just kind of like discovering where to go.

The following is an example of a participant defining her information needs as better understanding her son. She then uses this information to frame the properties of a school she is looking for and redefines her needs based on reframing of the issue.

Yes! Like when it comes to my son and where I was looking like, I think he would kind of be better suited with schools that have one-on-one programs because I realized that he likes to play with other kids but sometimes he really likes to be by himself. And

that's what I, when he doesn't think I'm watching, that's when I really see him thinking and I think the school with one-on-one programs will be really beneficial for him.

The following demonstrates the relationship between acquired information, the expectation for the information and the framing of a problem. The quotation describes the interaction between information, information need and framing that causes a reframing of the problem.

I think if I hit a brick wall or if I get new information that, that was almost unexpected, it makes me think about things little bit differently.

(INTERVIEWER: So hitting a brick wall, meaning you reach a point where you just don't feel like you're making progress?)

P1: Exactly! It's like you hit a saturation point. That's it.

(INTERVIEWER: Ok! And so you, you hit a point where you've collected certain information but you're still not feeling good about your decision? Is that, is that right?)

Yes

This example shows how a participant encountered some information that was processed as being highly relevant to her framing of the issue. As a result of encountering this information, the participant identified a new way to describe an information need that was even more specific and effective in address her framing of the issue.

Yes. And then one school in particular actually had the whole year curriculum written out for you to look at to see you know what they were going to do each week. I went to other schools, I asked if they had that, so that I could compare them and some of the schools didn't have it, they didn't have it written out for you, so...,

(Interviewer: So you're almost looking at that as a way of comparing the schools. So it was a new kind of information. It was really detailed information about what the school day looks like right?)

Yes.

(Interviewer: Ok. And so, in terms of the way that you are thinking about your choice, how did that fit in? How did that information fit in?)

Oh it greatly fit in because that became criteria, I was certain that answered my question and I wanted to make sure that they had what I wanted.

(Interviewer: Ok, so that, so having that detailed information about what the school day looks like, that directly into your criteria, had become much as the curriculum right?)

Yes.

(Interviewer: And then as a result, you began asking for that information, right?)

Yes I did.

(Interviewer: Specifically)

Uh huh.

(Interviewer: So when, in that specific example, you said ok, so when one school said here's what the school day looks like, you felt like wow, this is a great, this is a great way to really understand the curriculum and what the day looks like and so you said here's a potential way of getting that information to help me really fully understand the curriculum.)

Right. Yeah, I thought it was like the greatest thing and I was like Oh really, and then to see that other schools didn't have that, was a little disappointing.

This example shows how a participant experienced a change in her external context which resulted in the reflection of the adequacy of her current frame and the addition of another frame element regarding safety. This external event could lead to a reframing of the issue toward home school which would require a complete overhaul of the current frame and identification of new information needs and acquisition of new information to support this frame

"I have been questioning the whole school system and have been thinking about home schooling my child because of all the news reports lately about elementary school children having been sexually abused by a teacher and I think the other one was by a custodian. This is very important issue to me because I don't want anything to happen to my child, but on the other hand I know that school would be good for him to grow socially. I know I might seem a bit overprotective but he is my one and only child. I also I know that at this stage a good foundation will set the stage for his future academic progress."

The following example shows the perception of a person's context in relation to her framing of the problem and identification of information needs. This quotation

describes her acceptance of certain contextual factors which may have diminished her efforts to seek information.

“My son's school has a Polish principal and she herself has a thick accent. So I, I just don't see this as something that I think is really going to make a difference because it's just the neighborhood.”

Other: Frames within Frames

The coding scheme was limited to a central frame but the data suggests that frames might be layered or nested. For example, a single element of a frame could be another frame as suggested by the following quotation.

“No, I think I look at the general spectrum of it because then it gives me an open, an open idea about how many, how many things to look into, because I, I don't, I guess for me the idea, I guess when I think about the diversity I didn't have just one idea about diversity, I had several definitions of it and so the fact that, it was the fact that I, you know I didn't want to narrow myself down with a big factor and all that. So I, I literally just kind of thought of different types of diversity rather than just limiting myself to just one.”

The following describes a person linking frames together to describe a causal relationship.

“Part personal experience, part desire for my own child's well-being. I think academic excellence is hand in hand with life opportunity and if somebody has enough life opportunities then it gives them the best chance as finding happiness in their life.”

Another example of linking frames and describing a perceived causal relationship is seen here.

Again part personal experience, part media and news driven, part data driven from demographics. So, in line with the previous item of the higher level view of what we want for our kids, I think it's been proven that a more all rounded person comes from a diverse upbringing and I think it's important to me that really having the exposure to a wide range of people from all different all demographics.

Other: Information Needs, Information and Context as Frames

Additionally, the construct of a frame may be applicable to the areas of information needs, information and context. The framing construct could explain how a person understands any of these.

“Just I guess, also just watching my step daughter and what she went through and kind of the developmental process that she had and, and then thinking about my developmental process as I was, as I grew up. So just that kind of school ideology is looking into, you know I’ve done child psychology so and then the child development. So that was kind of also treated as a big role as well.”

Other: Use of tool

Another area of coding was regarding the use of the tool and the impacts of the web based tool. Questions were asked to help identify the impact of the tool on the participant’s processes of framing and information need development in particular. The impact of the sharing of maps was also explored.

One participant described the benefits of using the tool as follows:

Well! It actually kind of makes me think more, like more deeply about what I should be doing for him.

Another participant described it as being helpful in the following way.

It’s been really helpful. Because it kind of puts everything in and helps me so that I can take the time and look down and see what extra I need to be doing.

One person intentionally resisted being influenced by other maps.

One of the maps in particular had actually multiple maps, like concepts I hadn’t thought of that were of some importance to me. I didn’t take any of the concepts as my own. What I tried to be is objective about it and say look! These were important to other people. If they were important enough to me then I would have added them already. I tried not to let some of the other concepts influence my decision making.

Information Maps

On average, participants included 5.8 concepts, 10.4 needs, and 12.1 information items on their maps. Curriculum was identified as a factor by six of the ten participants; cost and location were factors that were identified by half of the participants. It was unclear whether “academics” and “test scores” were meant to identify the same concept. These two concepts were not grouped together for purposes of the following analysis.

Table 16: Information map concept frequencies

Concept	Frequency
Curriculum	6
Cost	5
Location	5
Student/Teacher Ratio	4
Teacher Quality	3
Academics	2
Child	2
Diversity	2
Hours	2
Safety	2
Tests	2

Software Usage Logs

All ten participants actively used the software to develop concept maps. The maps were used to guide interview questions throughout the seven week study. There

were 1,733 interactions with the online system. An interaction entailed some type of activity. Log usage indicated that all ten participants engaged in the process of examining other maps. This type of activity accounted for 165 of the total interactions. Data also indicated that participants actively viewed their own maps, accounting for 117 of the total interactions.

Participants added, updated and deleted entries according to the following table. An update could include changing the description of an item or assigning a different priority. 27 of the 34 information updates were generated by two users. Data indicates these users used the map to arrange and prioritize the information items collected.

Table 17: Web application interactions

	Adds	Updates	Deletes
Concept	60	9	2
Needs	104	7	0
Information	123	34	2

Data Analysis Summary

The coding scheme used to analyze the interview data and journal data was developed through many iterations. Using the constant comparison methods as prescribed by grounded theory practice, the codes were repeatedly compared to other data and to the code book itself. There are many parallels between the major categories as defined. For example, frame development and reflection mirror information need development and reflection. The mirroring of these two areas is intentional. As codes were added to each category, their applicability was evaluated to corresponding areas.

Throughout the data there were areas where it was very difficult to differentiate between frame development or framing and need development or framing. All four of these areas are often intertwined. In most of these cases, it is possible to identify characteristics associated with each one of these areas. Participants did not differentiate between these four areas, and it is expected that the circular processes of frame development and reflection, as well as need development and reflection are so ingrained that people are not aware of them.

The differentiation of these four areas is more important from a theoretical perspective than a practical perspective. By attempting to identify the behavior in terms of these four areas, we may be able gain better clarity into information behavior for purposes of sensemaking. By examining behavior in terms of the characteristics identified, we are able to understand not only the individual elements making up the whole, but the whole itself which may have its own unique characteristics.

Analysis of the information maps and software usage logs supported the findings discovered during the process of analyzing interview and journal data. Both information maps and software usage patterns supported the iterative processes of developing frames and information needs.

Chapter 7: Grounded Theory: A Frame-Based Model of Information Behavior

“A background factor far more difficult to characterize is one’s direct experience in relation to the domain of interest. The concept of experience brings us into the issues of knowledge representation and memory that are too complex to consider here; suffice it to say that typically one starts out knowing something – perhaps little or a great deal – about the phenomenon of interest, as well as about the ways in which one can find out information about it” (Case, 2012, p. 152).

Case’s statement clearly identifies the area of inquiry the emergent theory seeks to explain. The theory provides a means of addressing issues related to context (experience) and memory through a conceptual understanding of the role of frames as central part of information behavior. Frames reflect a way of understanding a person’s relationship to their understanding of an issue, problem or situation in terms of their defined information needs, information use and context. Based on the use of frames as the critical factor at the center of information behavior the theory has been coined a **“Frame-Based Theory of Information Behavior”**.

This theory is based on the analytic framework that emerged during the data analysis process and is grounded in the data as described in Chapter 6. In this chapter, a theoretic model designed for visual support of the theory is described first. Next the theory is explained using a series of theoretic or propositional statements. Then an illustrative scenario, a composite of the ten case studies described in Chapter 5, is used to contextualize the theory within human experience. Following this illustration the theory is situated in the literature by comparisons of four of the most relevant theories to frame-Based theory. Lastly, key implications of the theory to current research are identified in the field of information science.

Frame-Based Theory of Information Behavior

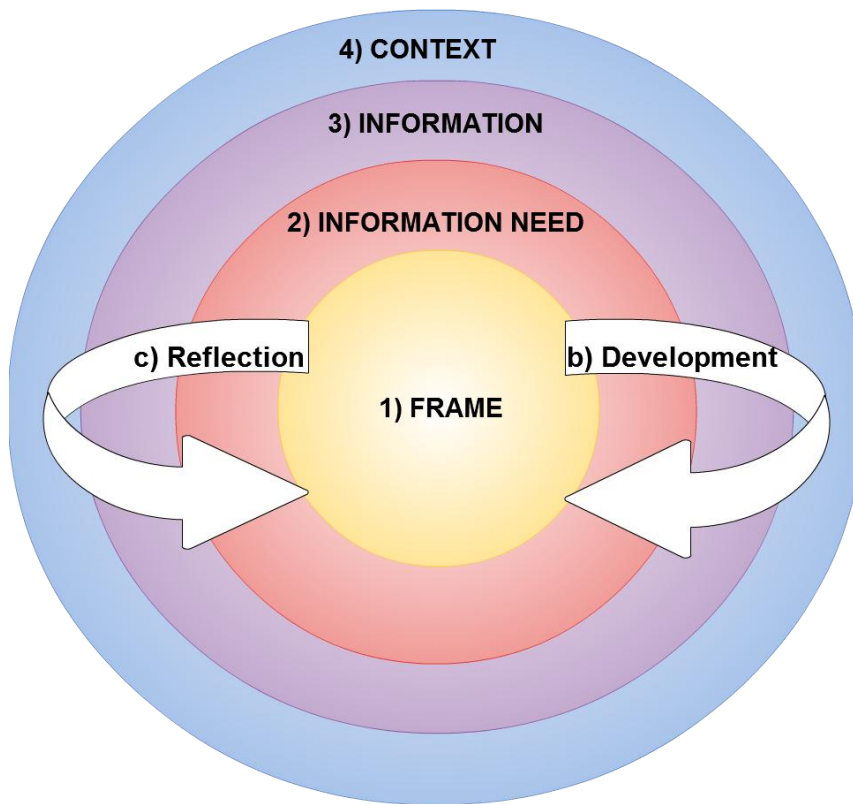


Figure 42 – Frame-Based Model

1. Frame – Is the central factor guiding a person’s understanding of an issue.

2. Information Need – Information needs act as a filter between the frame and the information world.

3. Information – Information is broadly described to include external information as well as internal information.

4. Context – Defines an individual’s unique view and circumstances.

a. Attributes – (not shown) Define the properties of each of the four layers.

b. Development – Reflects the process of developing each aspect of the model.

c. Reflection – Describes the process of evaluating each aspect of the model.

Theoretic Model

The model depicted in Figure 42 describes the following four core categories: 1) Frames, 2) Information Need, 3) Information, and 4) Context. Each of these four layers may be described in terms of a) a set of attributes, b) a process of development, and c) a process of reflection. As represented by the analytic framework described in Chapter 6,

a total of twelve high level coding areas can be used to describe information behavior by examining each layer according to their properties, processes of development and reflection. Additionally, the relationships between these layers are also explored.

Frame

In the model depicted in figure 42, a frame is the central aspect describing a person's effort to make sense of a complex issue. As described in Chapter 2, a frame is a type of mental construct or knowledge representation. From a sensemaking perspective, a frame represents structure from which gaps emerge. The construct of a frame was chosen because of its orientation to contextual factors and social influences. Frames are more aligned to a social constructionist approach to understanding the construction of knowledge as being strongly influenced by social factors whereas the use of schema may better describe a cognitive orientation. Frames were chosen instead of mental models on the basis that mental models are often used as a construct for describing how people understand how something works rather than the conceptual aspects of an issue. Mental models are important in systems science and in terms of interface design but may not be as applicable to the decision making and sensemaking context described in this study as the construct of a frame.

The frame represents the way a person conceptualizes and understands an issue. A frame is likely to have multiple facets representing different aspects of the issue. Each of these facets relates to other facets in the frame and may be associated with numerous feelings, biases and interpretations. These frames develop over a lifetime and continually evolve. In this model a frame is a way of understanding the way a person is processing and making sense of an issue.

The construct of a frame, as opposed to a mental model or conceptual model, recognizes a variety of important factors governing decision making and understanding. The term frame has been used across disciplines to describe the way people think about an issue. From the disciplines of linguistics and communications, frames incorporate a variety of contextual or situational factors that shape the way people think of an issue and ultimately make decisions. This model recognizes the linkages between concepts or frame elements and contextual factors and also specifically identifies information related areas to support the information model presented. The construct of frames reflects the socio-cognitive perspective underlying this study and provides a rich way to understand complex thought and emotions associated with sensemaking and information behavior.

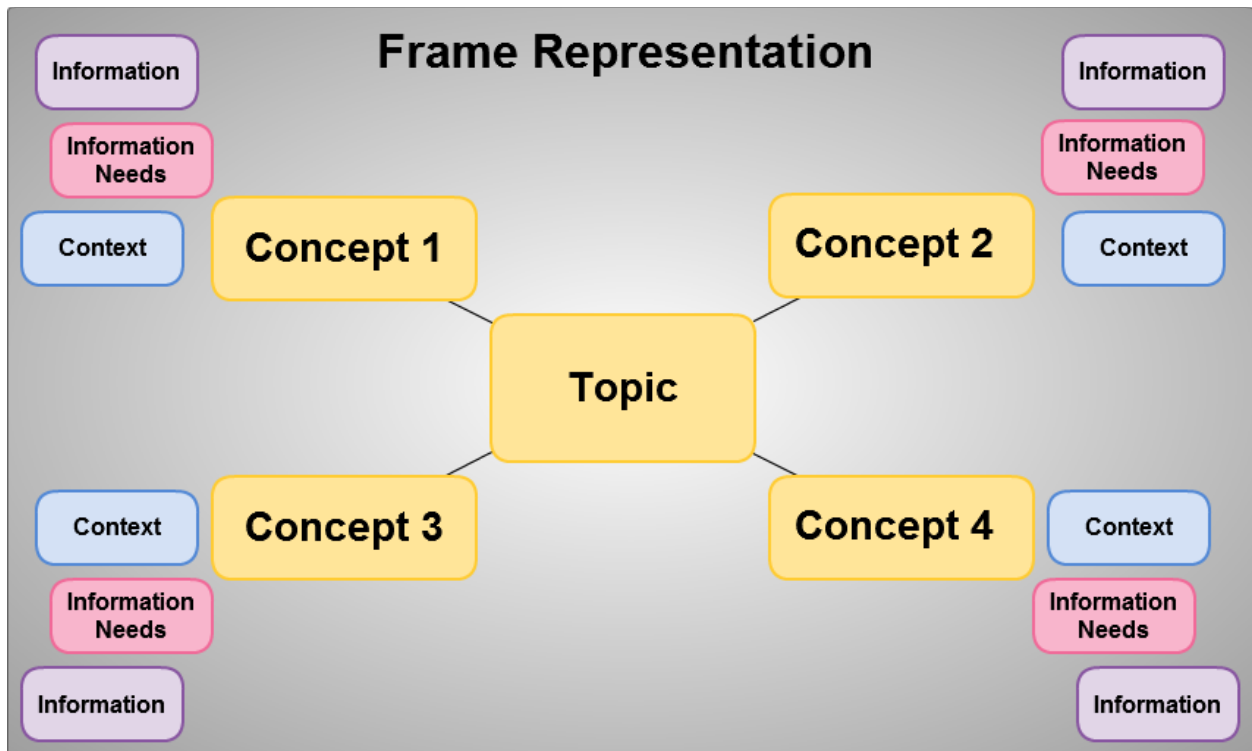


Figure 43: Frame

In the context of the model, a frame represents a group of concepts linked to a main topic. Each one of these concepts may be linked to a variety of contextual and information factors that influence the way a person feels about the concept, specifically, and the frame as a whole. For example, if a person identified a school's test scores for evaluating school choice, that concept could be associated with a wide array of factors impacting a person's perception of that specific area of consideration. A person might have strong feelings about standardized tests based on personal experiences with standardized tests as a student. If a person did not perform well on standardized tests, he or she might feel as if tests aren't an accurate measure of a student's aptitude. As a result, the individual might disregard the concept or consider it as less important relative to other concepts. Information needs specific to the concept might be identified such as the types of test scores used and how important a school considers test scores. As information related to test scores is acquired, a person is likely to interpret it according to their understanding of their information needs associated with this concept and relative to the contextual factors influencing their opinions of test scores.

The use of the construct of a frame primarily refers to an internal frame as opposed to an external frame. In this model, external frames would be considered as part of the information and context surrounding a frame. For example, political parties often attempt to influence voters by presenting a frame for understanding an issue. The presentation of these frames is intended as a way of influencing a person's internal frame of an issue. In this situation, the externally presented frame would be considered as information that is processed according to a person's understanding of needs and the contextual factors influencing the interpretation of information.

Information Needs

As shown in figure 42, information needs represent the area between the frame and information. This position represents information needs as the mechanism by which meaning making takes place between the framing layer and information layer. In this way information needs may be seen as the mechanism for operationalizing a frame. A frame is not useful unless it can be used to process information and support understanding. Therefore, as a person develops frames to understand topics, he or she is able to interpret information according to this frame and assimilate it into the development of the frame.

Typically, in the information science literature, information needs have been understood as driving information seeking behavior. As Taylor's research describes, an information need is developed to the level where a request for information can be made to a system. The proposed model understands information need as not only a means of directing information seeking behavior but also as a way of understanding information acquired. As part of this model, information need is understood to incorporate the related concepts of information relevance and salience. In addition to understanding information need as the basis for a person's understanding of "what information is needed," it also informs the question "is this information needed". Therefore, the concept of information need not only informs the outbound search for information but also the inbound evaluation of information in terms of its relevance or salience to a person's frame or frames.

Using the previous test score example, a person identifies test scores as a topic to consider and explores this concept by identifying information needed to support

understanding of this concept and seeks information according to their identified information needs. In accordance with this understanding, he/she may visit websites in an attempt to attain school test score results. That same person may watch the news and hear a report on schools' test scores. This information will be evaluated according to the understanding of information needs and interpreted according to the framing of the issue. In this way information needs act as a buffer between a person's framing of an issue and the outside information world.

Need development represents the way a person identifies and expresses information needs. The need development process entails identifying an area of the frame requiring more information to confirm and then the action of requesting information to support it. For example, using school choice as the problem context, a person might identify academic quality as a conceptual area of interest, using test scores as an indicator of academic quality. Then a conscious need for information would help gauge school quality that is consistent with the framing of the issue. They would then articulate this into a need for testing information.

The model also recognizes that information passes back through the information needs filter and may or may not be incorporated into the framing of a problem. The need feedback loop recognizes that a user evaluates information that becomes available to them and makes the following determination: 1) whether it is irrelevant or relevant to their frame, 2) how it impacts the framing of the issue (challenging the frame, neutral to the frame, or supportive of the frame), and 3) the resulting action on the framing of the issue (re-conceptualizing, invalidating, reinforcing, or additive).

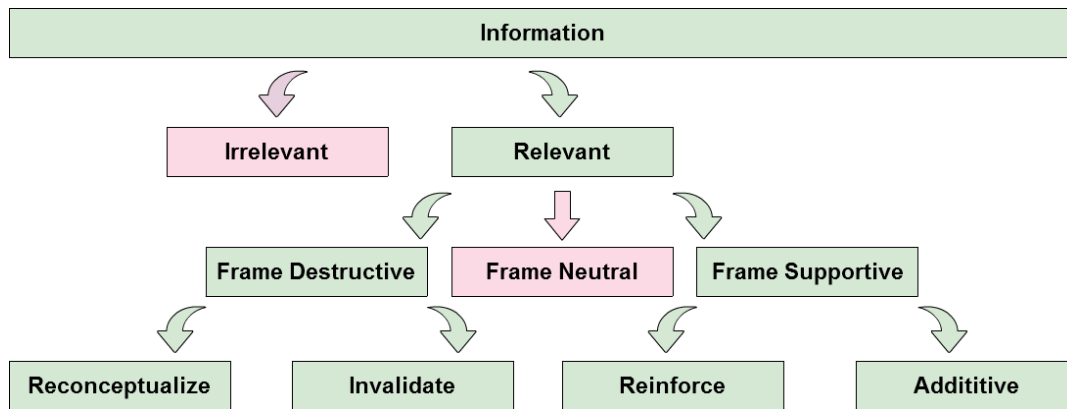


Figure 44 - Need Feedback Loop

The diagram in Figure 44 describes the possible actions that follow the steps of evaluating information that is either discovered or is attained through the process of requesting information from a system.

Lastly, information needs were examined in terms of Taylor’s information needs theory. Evidence suggests that the visceral level Taylor described may not be applicable to information needs and may be better suited to frames. A person might feel an uncertainty regarding their frame; this in turn leads to the development of an information need. Therefore, information behavior may start out with a visceral feeling of uncertainty regarding a frame which may then be put into practice as an information need. Hjørland describes this as “a confusion of two different things: the development of the knowledge of the primary problem and the change in the information need as a consequence of this primary development” (Hjørland, 1997, p. 165).

Taylor describes his four levels of information need development in the context of reference interviews. However, evidence from this study suggests that a better way to describe information needs might be according to degrees. These degrees include how the information need is articulated or specified. A person might be able to describe the

area of a frame needing further development but may not be able to articulate it in terms of a clearly stated question. Instead, the person may simply enter a term into a web based search engine as a method of retrieving information. For example, “tests” might be entered first and then in subsequent searches “school test scores” and later “Jackson elementary school reading scores” to add specificity. In Taylor’s terms he might define the use of “tests” or “schools” as L2 –a barely conscious level of development. However, in today’s world, this is a frequently used strategy for developing frames, information needs, and information to create context. In the age of the Internet, L2 information needs can also be L4 compromised needs. If this is the case, a better way of identifying need development might be according to degrees of specificity, degrees of effectiveness in yielding useful information, or degrees of usefulness in addressing the gaps in a frame.

Information

The model shows the next layer as information. For the purposes of this model, information is understood as incorporating both external information and internal information stored in memory. The meaning of information is understood as being dynamic and created by the user. It is a part of the social world. Information is not only acquired but it is also created.

For example, many of the case study participants created lists as a way of better understanding the issues. These lists allowed them to focus on their priorities and also to keep track of information collected. These lists may represent a type of information created by the user. In addition to this external representation of information, people

also described doing similar exercises in their heads. Therefore, if a person created a list that they committed to memory this would also represent a type of information.

People also reflected on information not only in terms of their needs but also specific aspects of information. For example, they described evaluating the quality and credibility of information acquired. This type of reflection was often tied closely to their understanding of information needs as well as contextual factors.

Context

Lastly, context represents the outer layer of the model. Context is a term with a broad definition encompassing such things as a person's emotion, attention, experiences, health, social capital, values, attitudes, psychological orientation, motivation, purpose, situation, skills, age, gender, ethnicity, socioeconomic status (or resources) and training. A person's situation could include time, place, constraints and controlling factors. A person might include specific personal experiences including education and occupation. There may be other factors dictating context such as race, culture, and geography. All of these factors are represented by context influencing the other facets of the model. The consideration of context in this manner provides a way of understanding context in relation to information behavior and its influence on different facets of information behavior.

The model identifies context as something that is actively evolving and developing as a person engages in information behavior. Context may be actively developed as people acquire new experiences or their situation changes. This process of evolution is identified as development and mirrors the development process in the other layers identified in the model.

Development

Development describes the process of changing the attributes associated with a layer of the model. Using the test score example, at some point in time a person might consider test scores to be very important. As a result of acquiring new information, the way test scores are understood or incorporated into their frame may change; as a result, less importance is attached to test scores. The development process could be illustrated by the person actively engaging in social dialogue, reshaping the frame and in turn changing attribute values attached to the perceived information need associated with test score information. This process could have a destructive force on changing the importance of the need from high to low.

The types of characteristics identified as part of the development process include activity, difficulty, engagement and methods. The characteristics are used to understand different aspects of the development processes. These development processes can be applied to changing attributes in all four levels of the model.

Reflection

The reflection process describes the process of reflecting on the attributes used to describe a layer of the model. Using the text score example again, a person might obtain information and reflect on it in terms of its perceived quality. This person may also reflect on the information in terms of the context for which they understand the information. Should the person deem the information of high quality, he or she might evaluate it in terms of whether it is needed or relevant to the frame. After establishing its significance, the person may reflect on the frame relevant to the new information and as a result change (or develop) the frame. This change may cause a reflection of the

information needs in relation to the modification made. As a result a change may occur in the original definition of information needs.

Theoretic Statements

“A grounded theory is reproducible in the limited sense that it is verifiable. One can take the propositions that are made explicit or left implicit, whatever the case may be, and test them” (Corbin & Strauss, 1990, p. 15).

The following theoretic statements are intended for further definition of the Frame-Based Theory of Information Behavior. These statements are also intended as a way of describing a theory that may be supported or refuted through further empirical research.

Statement 1: Frames as the central mechanism driving information behavior

A frame is the central mechanism governing information behavior. A frame represents the structural way a person ties relevant aspects of an issue together. Frames are central constructs that link important aspects of information behavior such as information needs, information and context.

Statement 2: Praxis

The term praxis has been used to describe the process of transforming theory into practice by Frieier, as the integration of action and reflection by Sartre, and as the unity of theory and practice by Lukács (Frieir, 1970, Lukács, 1972, Sartre 2006). For the purpose of the proposed model it is used to describe the process of putting each layer of the model into practice.

Therefore, praxis represents the continual circular process of putting into practice the concepts of frames, information needs, information and context throughout a person's life experience. Frames can be put into practice by defining information needed to develop and reflect upon the frame. As information is sought or evaluated in terms of the identified information needs, information needs are put into practice. Through the context of the situation and the user's experience, information is put into practice. Context is put into practice through its incorporation into a person's framing of the issue and contextualization of information.

Statement 3: Development and feedback loops

The operationalization of these concepts occurs through development and reflection processes also described as development and feedback loops. The process of operationalization occurs through processes of development as a result of reflection. These two processes are closely related and synergistic.

Illustrative Scenario

The following illustrative example is a composite of data collected as part of the ten case studies. This example has been constructed as a way of demonstrating all 12 areas of the model in the context of a person's life experience.

From an early age, Krystal thinks about what it would be like to have a child. As she gets older she begins developing "frames," helping her make sense out of what this means to her. Although the idea of having a child and raising a child is not always at the forefront of her mind, the "frame" evolves as she is exposed to different situations and reflects on questions regarding child rearing. She watches friends and family through

their child raising experience, and she reflects on her own childhood. She listens to others describe what is important to them and their philosophies regarding child rearing. She interacts with children in her neighborhood and thinks about what it would be like to be a child in this day in age. These experiences continue to shape the way she thinks about raising a child.

Krystal becomes involved in a relationship with Alex. She and Alex discuss the prospect of raising a child. Issues regarding raising a child become forefront in her mind as they think about building a family, and her “frame” becomes actively developed and customized to her current situation. Soon a child named Jason is born. Krystal’s framing takes a new turn as she faces the real challenges of raising Jason and also experiences an array of emotions, creating a new layer to the initial frame of how to raise a child. She actively reflects on her parenting, how her parenting impacts others, the day to day logistical and financial challenges and other broad areas impacting her parenting. Her frame has become multi-dimensional based on a rich variety of contextual factors.

Krystal and Alex begin discussing the type of school they envision Jason attending. They discuss their own upbringing, their opinions toward schools and education as a whole. They both agree they want “the best” for their son but aren’t able to clearly describe what “the best” means. Krystal and Alex feel that education is very important and a means toward achieving happiness in life. They continue to reflect on what “the best” means, actively paying attention to articles on child raising, talking to friends and family, and passively processing different experiences they have in light of their interest in determining what is best for their son. Krystal has regrets that she didn’t attend

college and believes that a poor K-12 experience was largely to blame for her not attending college. She wants better for her son and believes in a rigorous academic environment that can be measured by test scores and other factors including the average number of years a teacher has been teaching. She anticipates being actively involved in her son's education and is already concerned that a school will be able to challenge Jason. Additionally, she and Alex recognize the logistical challenges of getting their son to and from school due to their work schedules.

While Jason is still an infant, Krystal and Alex begin gathering information about their neighborhood school. They find out that the school's test scores are not very high. The school serves a large number of neighborhood children and has programs for children with special needs. It has a relatively inexperienced group of teachers. Krystal focuses on test scores and teacher inexperience. Krystal begins to think that they may need to look for schools outside of their neighborhood.

As a result of talking with their pediatrician and reading a variety of child-raising articles, they become familiar with the concept of milestones. They focus on these milestones and understand that they represent a way of tracking their son's progress. They are reassured that their son seems to be developing along a typical trajectory and continue to think about the educational choices they will need to make in order to support their child's growth.

When Jason is two years old and not using any words to communicate, they become concerned. They schedule a visit with their pediatrician who, much to their dismay, shares their concern. The pediatrician schedules their son for further exams with a child specialist. The results of the exam confirm that Jason is experiencing developmental

delays with regard to language, and it is determined he may have an auditory processing disorder which describes a problem with decoding speech sounds. Krystal and Alex become immersed in the world of children with auditory processing disorders. They talk to other parents who have children with this disorder; they work with specialists to provide him with therapy, and they learn techniques to adapt their home environment to support his development.

By the age of four, Jason's speech development has improved dramatically as a result of the efforts that Alex and Krystal have coordinated in support of their son. He begins to communicate verbally in short sentences and comprehend language. Although his speech processing skills are still far below those of a typical five year old, Alex and Krystal are thrilled by his progress and are determined to continue seeking support for their son.

As Jason approaches kindergarten, Krystal and Alex renew their efforts to think about schools. Krystal reflects back on the way she thought about schools before discovering that Jason had an auditory processing disorder and marvels at how differently she thinks about schools now. Krystal's number one priority is that Jason will get the support he needs to continue to make progress. She also recognizes that Jason needs to be in a socially supportive environment given his condition. Krystal wonders what else she should be concerned with and actively engages other parents of children with similar conditions to help her think about the type of school that would be best for Jason. One of the parents she talks with advises her to look for a school with a philosophy of "mainstreaming" children with disabilities. Another parent advises her to look for schools that have pull-out programs for children with special needs. This advice

seems to be conflicting, and she visits the bookstore to research other opinions about these two approaches.

Krystal and Alex struggle to understand what type of school would best serve Jason. They struggle to frame their choice, to know what questions to ask, and where to look for information. They are presented with a vast amount of information about schools, approaches to schools for children of special needs and the day-to-day challenges associated with providing care for Jason. They are very unsure of their decision and grapple with many questions.

Eventually they decide that it's important for Jason to attend a school in his neighborhood. By attending a neighborhood school, parents and children in his community may be accustomed to his unique condition which will allow him to develop stronger relationships. They also discover that a specialist will be able to work with him at the school and that the school has experience working with children of special needs. Although the neighborhood school's test results are below average, test scores are no longer a big concern of Krystal's and she is very comfortable that their choice is the right one for their son.

1a) Frame Attributes

Krystal's initial frame for choosing a school for their son is focused on the concept of "what is best" for her son. She identifies the ability of a school to challenge Jason, the quality of teachers, test scores, a rigorous academic environment and location as all being important. She actively develops her frame and views it as elastic or subject to change. It has evolved from being subconscious to being articulated and put into practice by identifying a set of information needs. Information satisficing these

information needs may support or refute the frame. Her frame serves the purposes of helping her conceptualize the issue, identify facts to support her choice, identify logistical elements such as location and being value based. Krystal begins to feel as if her frame is becoming more stable and less likely to change as she acquires more information.

This feeling of “certainty” gives way dramatically after her son is diagnosed with a medical condition. Her perception of the framing of the issue becomes highly elastic as her initial framing is reconstituted in a way that is responsive to the new contextual factors defining her situation. This dramatic change redefines her information needs and reconstitutes the type of information environment she seeks.

1b) Frame Development Attributes

Krystal is engaged in developing her framing of the issue. She actively defines the concepts that she is concerned with and bounds her inquiry by these concepts. Initially, she feels a high degree of uncertainty and struggles to identify her feelings and organize her thoughts. At this stage new concepts emerge, some of them remain important and others are disregarded. Krystal uses methods for developing her frame such as dialogue with her partner, writing lists, talking aloud to herself, and constructing future scenarios that she can use to test her frames. Krystal moves from a state of passive frame development to a state of active frame development following Jason’s diagnosis.

1c) Frame Reflection Attributes

During the process of frame development, Krystal actively reflects on her frame. She is constantly testing her framing as she acquires new information. She evaluates her frame in terms of what is most relevant, salient and aspects that resonate with her. As

she reflects on her frame, she discovers new areas of interests, discredits elements, and reframes the way she sees the issue. As Krystal encounters information in her everyday life, she processes this information according to whether she feels as if she needs it or it is applicable to her framing of the problem. After Jason's diagnosis Krystal almost entirely abandons her original frame and works to develop a new frame. This process entails reflecting on a new frame according to an entirely new set of needs.

2a) Information Need Attributes

As Krystal develops her frame of the issue, she is able to identify areas of interest where she needs more information. Her information needs at the initial stages constantly change. The purpose of her information needs is to understand the issue better (conceptually) and identify factual and logical information. The evolution of information needs moves from the more general to the more specific. As she gains greater comfort with the subject matter and information environment, she is able to seek information in a more precise and applicable manner. After Jason's diagnosis, she identifies a completely new set of needs and concerns that requires her to become comfortable with a new set of information.

2b) Information Need Development Attributes

Krystal's information needs evolve. She actively thinks about the best sources and means for attaining information to support or challenge her framing of the issue. She engages in dialogue with Alex about where and how to find more information, she writes down lists of her information needs and she thinks about possible scenarios for acquiring information. Following Jason's diagnosis, Krystal's information needs

dramatically change. She struggles to identify the “right” questions to answer and become familiar with the information environment.

2c) Information Need Reflection Attributes

As she develops her information needs, she also reflects on her needs by asking “am I asking the right questions” or “how could I ask a better question?” As she acquires new information she evaluates her definition of information needs to determine whether they are adequately addressing her frame. Her frame changes, the definition of her needs evolve.

Incoming information is evaluated in terms of her understanding of her needs. The determination of whether information is relevant and salient to her framing of the issue is filtered through the lens of information needs.

3a) Information Attributes

Krystal comes into contact with a variety of different types of information. This information is in audio, print, and video format. Some of this information she creates herself as she seeks to understand the issue, and some of it comes from external sources. Her external sources primarily come from interactions with Jason, other parents and school staff as well as observations of the playground and the classroom. Media channels such as magazines, books, TV and the web are other external sources.

2b) Information Development

Krystal actively seeks to develop a rich information environment for herself. She actively seeks out experiences that will allow her to build her knowledge base. As she engages in these different types of experiences and spends time organizing her thoughts, she generates knowledge and reconstructs existing knowledge. Through these processes

she is able to generate information that she is able to access and process through the information needs layer to the frame layer.

4c) Information Reflection

Closely associated with the reflection of information in terms of how it applies to the framing of the issue is the process of reflecting on information. The information reflection process focuses more on qualities of the information itself rather than its applicability to the frame, although it can never be completely separated from this process. The reflection process evaluates the information environment and whether the information is credible and worth the effort undertaken to acquire it.

4a) Context Attributes

Context is broadly defined as incorporating a wide range of possible factors. Krystal considers her family's financial situation, transportation logistics, her past experience in school, her motivation for choosing a school for Jason, and her abilities to make the right choice. All of these factors describe the contextual attributes of her situation. After discovering Jason's medical condition, these contextual factors completely change as their situation is redefined. The change of context has a dramatic ripple effect on all other areas of information behavior.

4b) Context Development

Similar to the notion that information is not only acquired is the recognition that individuals can create their own contexts. In Krystal's case the context of her decision was dramatically changed as a result of the medical diagnosis. Krystal and Jason have some control of situational factors such as finances, location, schedules and little control over others such as their son's medical condition. They also have some control over

factors such how they perceive their situation and their emotional reaction to events in their lives. In this way, context is recognized as something that is constructed.

After Jason's diagnosis Krystal reframed the way she considered her choice and what was best for Jason. She actively worked to redefine the context for her decision by changing her emotional disposition, gaining new experiences, and gaining training and education regarding Jason's condition.

4c) Context Reflection

Context development occurs in-conjunction with context reflection. Krystal reflects on the contextual factors influencing her view of the situation. She re-evaluates some of the reasons she feels certain ways. For example, her motivation was partially based on her belief that the quality of her K-12 education contributed to her not going to college. After further reflection on this belief, she became less convinced that this was the reason and recognized other factors that may have contributed to her not attending college. She also reflects on deeper questions regarding what is best for her son and the way her past experiences have shaped her views on what might best for her child. This example of context reflection resulted in context development (or modification).

Theory in relation to other work

As stated previously, "good theory acts as a catalyst to induce and guide further research" (McCool, 1995). Theory not only guides the development of the premises underlying this research but also provides an important way to test the foundations for this theory. Existing theory supports my propositions in many ways yet also differs. These similarities and differences allow for a more thorough examination of this theory

within the context of research in the fields of information science, communications and decision making.

The following section will take an in-depth view of the theory in relation to other relevant and important theories explaining information needs and sensemaking.

Taylor: 1968 Question-Negotiation and Information Seeking

Similarities and Differences

Taylor's 1968 theory of information needs continues to be important more than 40 years after first being published. Taylor's theory was developed in the context of the work of reference librarians helping patrons locate information. It has been widely applied outside of this context, perhaps in ways that were never intended by the author. Regardless, of the original intent by the author it has become a foundational theory within the field of information science.

As discussed, Taylor's 1968 theory regarding information needs has had a significant impact on shaping this study. The Frame-Based theory as described differs from Taylor primarily by identifying the process of conceptual framing as being separate to the information needs theory described by Taylor. The identification of conceptual framing as a distinct process from information needs development adds an important level of clarity to the needs development process.

Taylor contends that "an inquiry is merely a micro-event in a shifting non-linear adaptive mechanism"(Taylor, 1968a, p. 179).

The following table examines Taylor's four levels and identifies key differentiating factors in the Frame-Based theory proposed.

Table 18: Comparison between Taylor's Four Levels and Frame-based model

	Taylor	Naumer
Q1 – Visceral Need	The actual, but unexpressed need for information.	Q1 level is wholly related to conceptual framing. The visceral sense identifies a feeling of uncertainty. In the Frame-Based model visceral would not apply to information needs.
Q2 – Conscious Need	The conscious, within-brain description of the need.	Q2 level a person would recognize a “gap” or “anomaly” in their conceptual framing. This could be within-brain or described. At this point a person may consciously recognize the need for information to help resolve the uncertainty.
Q3 – Formalized Need	The formal statement of the need.	Q3 level a person would connect the need for information with their conceptual framing needs. The individual begins to identify strategies for resolving the conceptual framing need. Strategy could involve information either internal or external.
Q4 – Compromised Need	The question as presented to an information system. Taylor described the development of a compromised need as the point of negotiation between a person and an intermediary toward satisfying a need. He defines the result as being a “directed and structured” process.	Q4 level a person may use a variety of strategies to either frame an issue or satisfy the information needs generated from their frame. This process may not be “directed and structured” but may be less focused with the objective of acquiring information that can be processed through their information needs filter.

Additionally, the Frame-Based model proposes a more detailed feedback loop. Taylor also recognizes the importance of a feedback loop and specifically discusses the importance of evaluating the quality of information (Taylor, 1968b, p. 188). The proposed Frame-Based model goes farther, recognizing information needs as the governing factor dictating whether information is relevant and applicable to the conceptual framing model for understanding.

Cole: 2011 Theory of Information Need for Information Retrieval

Cole's 2011 theory of information need is based on similar premises as the Frame-Based model proposed as part of this study. Cole's theory is positioned in what he terms "the human condition", He defines the human condition as being informed by sense-making and evolutionary adaptation/foraging theory. Cole assumes Dervin's sense-making perspective that the world has persistent gaps, presenting a condition of discontinuity which accounts for humans continuing human dilemma (Cole, 2011, p. 1226). Most importantly Cole describes the central assumption of the theory as "while computer science sees IR as an information - or answer-finding system, focused on the user finding an answer, an information science or user-oriented theory of information need envisages a knowledge formulation/acquisition system" (Cole, 2011, p. 1216). Furthermore, Cole identifies the knowledge representation construct of a frame, as defined by Minsky, to describe information needs. In these ways, Cole's 2011 theory shares many of the same premises as the Frame-Based theory proposed.

Despite the theories being based on similar premises, they differ fundamentally in a few important ways.

- 1) Central to Cole's (2011) theory of information need is the concept of need. Cole identifies need as the central frame for his model. The Frame-Based model, identifies a frame as the central aspect of information behavior and the frame as the construct from which need is derived.
- 2) Cole's (2011) theory is largely based on Taylor's model of information need. Cole's (2011) first proposition is that "users are motivated to seek and search for information by an information need which is comprised of Taylor's four levels" (p. 1219). Despite criticism that Taylor's information needs theory has never been adequately tested, as well as recent research that calls its validity into question (Hjørland, 1997; Markey, 1981; Nicolaisen, 2009). This dissertation also calls into question the validity of Taylor's levels, suggesting that instead of levels we may consider degrees of development. Furthermore, the visceral level may better describe a level of frame development rather than need development.
- 3) Cole's (2011) second proposition, "user's information need does not evolve; only aspects of the topic the user selects to investigate evolve or shift over the course of an information search" (p. 1221). The proposed Frame-Based theory contradicts this proposition, describing the identification and expression of need as changing in response to the framing of an issue.
- 4) Lastly, Cole's (2011) theory is not grounded in empirical work. It is based on comparing and aligning information science models including Dervin (1993), Taylor (1968), Belkin (1980), Kuhlthau (1993) and Wilson (1993) around a central concept of information need in the context of knowledge representation.

Klein: 2006 Data/Frame Theory of sensemaking

Perhaps the theory that best supports the proposition of a frame as the central element of the Frame-Based information behavior model is Klein, Moon, and Hoffman's Data/Frame Theory of sensemaking (Klein, Moon, & Hoffman, 2006). As further described in Chapter 2, Klein, et. al. (2006) describe frames as taking form "when people try to make sense of events, they begin with some perspective, viewpoint, or framework – however minimal. For now, let's use a metaphor and call this a frame. We can express frames in various meaningful forms, including stories, maps, organizational diagrams, or scripts and can use them in subsequent and parallel processes".

They describe the basics of a sensemaking act as "data-frame symbiosis" that entails elaborating a frame, questioning a frame and doubting the explanations it provides. As shown in figure 45, the cycle of sensemaking includes the following two types of cycles: 1) elaborating and preserving a frame and 2) reframing a frame. They also differentiate between the acts of looking backward to refine the frame and looking forward to simulate the development of the frame. Klein, et al.'s concept of these two types of cycles is aligned with the development and reflective processes described as part of the Frame-Based theory. Their identification of backward looking and forward looking processes are reflected as part of participants' strategies for frame development.

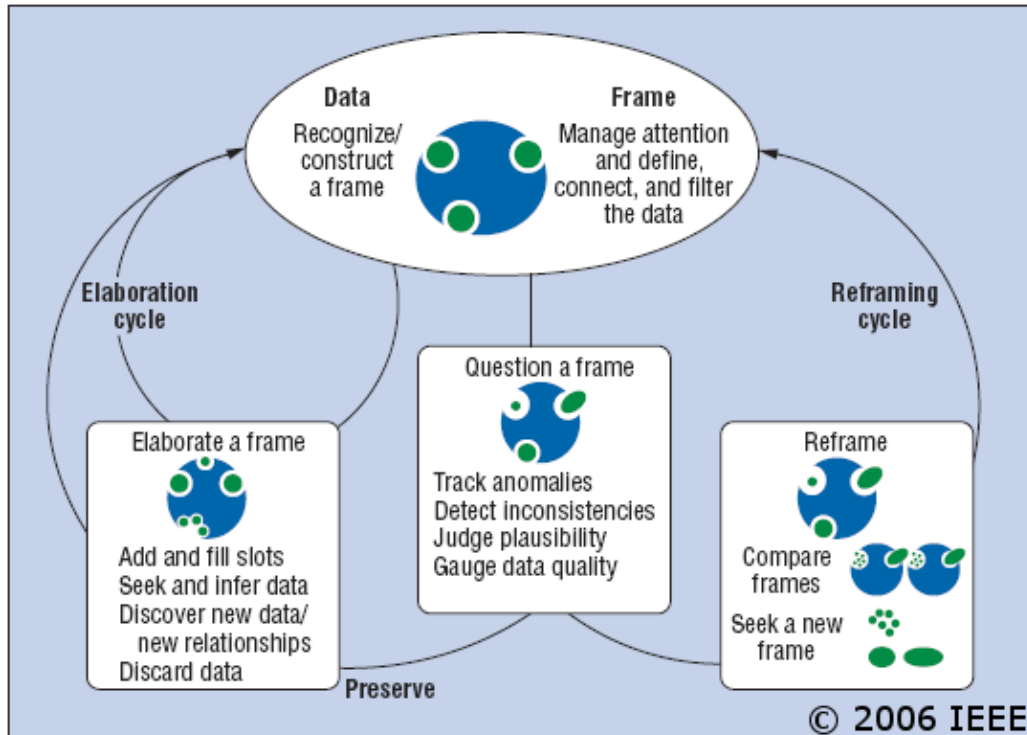


Figure 45: The Data/Frame Theory of sensemaking

The proposed Frame-Based theory shares many ideas with Klein, et al.'s (2006) data/frame theory of sensemaking regarding the importance of frames for sensemaking. It differs in terms of understanding framing within the context of information behavior as a whole and the key concepts of information needs, information and context. The Frame-Based theory includes a much broader conception of context adopting Vicker's contention that "the goal-seeking model of human activity" is "too poverty-stricken to encompass the richness of being human" (Checkland, 2005, p. 286). It also expands on the definition of frames, creating a way to identify important attributes regarding the characteristics of a frame and posits the relationship between frames and other key concepts of information behavior.

The following table identifies key similarities and differences between these two theories.

Table 19: Key similarities and differences between Klein and Naumer

	Klein, et al. (2006)	Naumer
Frames	“When people try to make sense of events, they begin with some perspective, viewpoint, or framework – however minimal. For now, let’s use a metaphor and call this a frame” p. 88	The Frame-based model also proposes frames as integral to understanding. The Frame-based model proposes a more detailed description of what constitutes a frame and identifies attributes of a frame.
Frame Development	<p>“frames change as we acquire data. In other words, this is a two-way street: Frames shape and define the relevant data, and data mandate that frames change in nontrivial ways.” p. 88</p> <p>Proposes that framing dynamics may include elaborating, questioning, comparing alternative frames, reframing a situation, and seeking anchors.</p>	<p>The Frame-based model also makes the proposition that frames change. The Frame-based model describes the relationship between frames and each element of the model.</p> <p>The Frame-based model also proposes a number of methods influencing the dynamics of frame development such as challenging a frame, expanding a frame, or reinforcing a frame</p>
Frame Influence	“Manage attention, and define, connect, and filter the data” p. 89	Similarly, the Frame-based model describes engagement, saliency, relevance and prioritization as influencing understanding of the problem.
Data / Information	Proposes the key relationship between frames and data.	Proposes a series of relationships between information needs, information and context. The inclusion of information needs recognizes the importance of frames leading to the identification of needs. The model also recognizes the importance of context as impacting the development and reflection of each layer.

In summary, the Data/Frame theory and Frame-based theory share the conception of frames and the development of frames as central to the sensemaking process. The Data/Frame theory is presented in the context of sensemaking directed toward the purpose of decision making. The Frame-based approach is situated within the context of an information behavior model underlying sensemaking activities. The Frame-based approach is empirically grounded and develops the concept of frames and frame development within a broader context of information behavior identifying key attributes which define this process from a holistic perspective.

Dervin: 1983 Sensemaking

As described in Chapter 2, Dervin's work has influenced both the premise for this research study and also the development of theory. Dervin's seminal work that contributed to the shift to a user-centered view of information behavior, conception of a sensemaking behavior as being rooted in a person's state of uncertainty, and calls to focus on "verbs" rather than "nouns" and a focus on "the hows of human individual and collective Sense-Making and sense-unmaking, on the varieties of internal and external cognizings, emotings, feelings, and communicatings that make, reinforce, challenge, resist, alter, and reinvent human worlds" (Dervin, 1999, p. 731).

It is not clear whether sense-making should be considered a theory or methodology. "Sense-Making has attempted to be a methodology that operates simultaneously in the four planes of meta-theory, substantive theory, methodology and method; the methodology-method connection is reflected by and reflects the connection between meta-theory and substantive theory" (Naumer, Fisher, & Dervin, 2008, p. 2).

Regardless of whether sense-making is considered theory or methodology, the premises

of sense-making are aligned with those of the proposed Frame-Based model. As Case (2012) describes, “Sense-making has incorporated Dewey, Kelly, and Bruner’s notions of life as an encounter with problems and discontinuities in knowledge, and also the view that information is something we create through our interactions with the obstacles in our progress through life. It is an active, process-oriented view of learning and being. The end-product of the process – sense – is equated with knowledge, but also with opinions, intuitions, evaluations, and (effective) responses” (p.189).

Key differences between the sense-making and the Frame-Based approach include the focus on structure. Sense-making focuses on the “gaps” and ways a person might “bridge” these gaps, whereas the Frame-Based approach focuses on the structures that create these gaps. The emphasis is on the mental constructs people develop and how they develop them.

Implications

The following implications for existing theory have emerged as a result of the development of the Frame-Based theory. The first three implications are related to developing and operationalizing definitions for the important concepts of information needs, information and context. As identified by Case (2012), information needs, information and context are all fundamental aspects of understanding information behavior and often ill-defined. Fisher, writing as Pettigrew, claims “the notion of context may prove as indefinable or perhaps uncontainable as ‘information’ or even ‘information need’. Simply put, ‘context’ can be defined along multiple lines and like any sociological phenomena, appears at its richest when studied or considered in multiple ways” (Pettigrew, 1999, p. 802).

Implication 1: Re-conceptualizing the definition of Information Needs

Information needs are re-conceptualized as not only driving information seeking activities, but also a means of evaluating information attained in terms of relevance and salience. Information needs are understood as occupying the position between a frame and information. This re-conceptualization of information needs as a buffer or filter between information and frames is a significant departure from current definitions and understanding of information needs.

Implication 2: Re-conceptualizing the definition of Information

Based on the writings of Popper (1972), Dervin (1976, 1977) describes three types of information: 1) objective, external information that attempts to describe reality, 2) subjective, internal information that represents our internal understanding of reality, and 3) sensemaking information that allows us to navigate between “internal” and “external” information (Case, 2012, p. 49). The definition used as part of this model is in keeping with Dervin and Popper’s definition of information and also aligned with Dervin’s contention that information is “created at a specific moment in time-space by one or more humans. Information is not seen as something that exists apart from human behavioral activity. Because there is no direct observation of reality” (Dervin, 1992b, p. 63).

As part of the described model and theory, in addition to the definition espoused by Dervin, information is further defined as something that is continually developed and reflected upon. Attributes, development and reflection processes are all understood in relation to the concept of information.

Implication 3: Re-conceptualizing the definition of Context

Context is very broadly defined and impacts all levels of the model. Context is understood as a motivating factor for information behavior but is not considered the starting point since all frames dictate how context is understood and put into practice. Frame development occurs within a context which represents both current and past effects on the person. Context could also be considered as both biological and environmental.

Implication 4: Sensemaking entails not only gaps but also structure

Sensemaking has often focused on principles of uncertainty and “gaps” that act as the impetus for some type of information behavior. In addition to areas of uncertainty, the proposed theory contends that there is an important role for structure in understanding sensemaking. The theory recognizes that these structures may be reinforced and constructed or challenged and destroyed. Frames can be internal to a person and also external, socially constructed representations that become an important force in determining sensemaking.

Implication 5: Feedback loops as a way to incorporate passive information behavior

The identification of feedback loops allows us to incorporate and understand passive information behavior. The identification of feedback loops (described as reflection processes) provides a way for understanding how people appear to be passive receivers of information yet may be actively processing (or evaluating) this information and applying it to the development of the different layers of the model.

Implication 6: Taylor's Information Needs Development

The general application of Taylor's information need levels are challenged. Instead of describing needs as residing in one of four different levels, a better way to identify information needs is along a number of continuums that describe characteristics such as degree of articulation, specificity, applicability, and effectiveness. Furthermore, it is suggested that "visceral" or unconscious level of need better describes a level of framing rather than information need.

Implication 7: Analytic approaches

The development of the Frame-Based model creates opportunities for the development of a number of analytic approaches to examining information behavior. A few of the scales introduced include:

Development – In general, the degree of development of frames and needs might be considered.

The degree of development may be further explained use the following analytic approaches:

Articulation – The degree a frame or information need is articulated. As either of these constructs become developed they become better articulated.

Specificity – The degree of specificity of a frame or information need. For example, the definition of an information need may move from the general to the more specific.

Applicability – The degree a frame is applicable to a person's problem. Or, the degree an information need is applicable to a frame.

Effectiveness – Closely related to the concept of applicability is how effective a frame is in addressing a problem or how effective a need is in identifying information identified by a frame.

Additionally, the environment a person experiences may also be useful to consider in relation to the described theory. For example:

Information and Context Environments – It may also be useful to evaluate information and context environments in terms of their richness. The data indicates that participant's experience differing degrees of richness to their information environments and context.

These analytic approaches may allow for the comparison of information and decision making behavior according to the interaction of these factors. For example, the following figure identifies three dimensions of comparison 1) The degree of frame development, 2) The degree of information need development, and 3) the richness of the information environment. The implied optimal position to support decision making could be represented as being located at the spot where Frame and Need development are high and the information environment is rich.

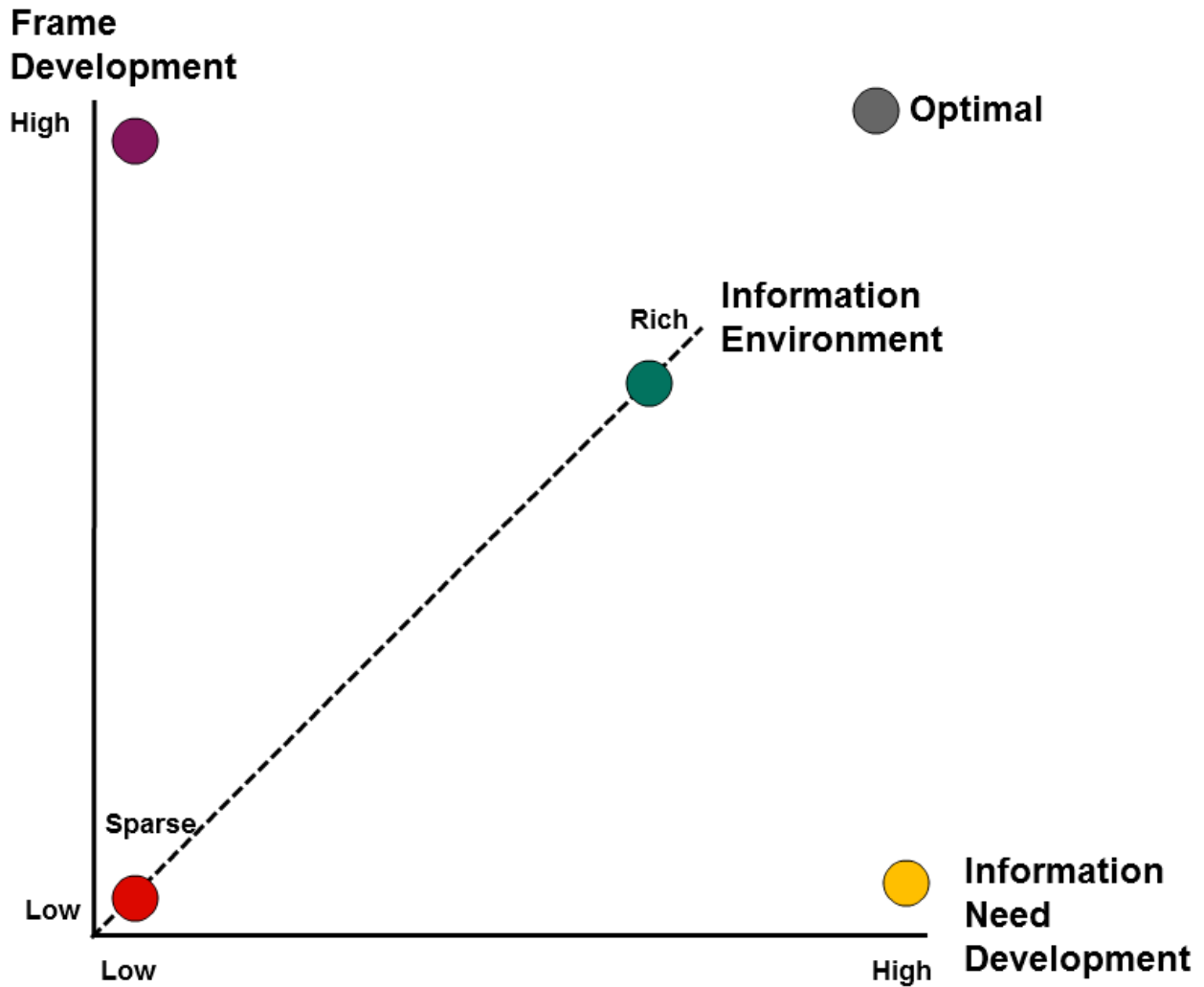


Figure 46: 3 Dimensional Analytic Analysis of Frames, Needs and Information Environment

A similar type of analysis of a person's information and decision making progress might be developed by comparing the degrees of development of articulation, specificity, applicability and effectiveness.

Chapter 8: Discussion and Future Research

The following chapter discusses the important findings associated with this study. These include the implications of the findings to multiple disciplines, potential uses of the current research and future research directions.

Importance of Findings

The motivation for this study was to create insight into the ways that mankind might better use information to make decisions regarding important problems. The results of the study identify a new way we may understand the nexus of information behavior. It suggests that by studying the structures or frames that form the “gaps” and create the conditions of “uncertainty” we may be able to create value as information scientists through better research and information systems.

In addition to introducing the concept of a central frame as the nexus of information behavior, the model also provides a new way of understanding three central concepts in the information science literature: information needs, information and context. The model proposes a way of identifying attributes of these concepts at any point in time as well as characteristics that describe their development. Situated within these definitions is an understanding of constructs such as information relevance, salience, active information seeking, passive information seeking and information use.

The frame-Based model provides a way of understanding the relationship between the three central concepts in the information science literature: information needs, information and context. The introduction of the concept of a “frame” allows us to tie these four concepts together and describe their relationships to each other. The

relationships between these concepts are described in terms of how they put each other into practice. For example, a frame is put into practice through the process of information needs identification. Without the layer of information needs connecting a frame to information, the frame is static and meaningless and the information is valueless.

Finally, one of the central motivations of this study was to better understand information needs. In the tradition of Taylor's value-added perspective and his work around question-negotiation, this approach recognizes the role of information scientists in helping people improve the definition of their information needs. As information science professionals, we shouldn't be content to say that information needs are unknowable or that they should be considered outside our domain of concern. We should adopt a holistic view of the process and recognize information needs as one of the most important facets of people's information behavior. The results of this study support the contention that we can better understand people's need development process and build better systems to support need development as a part of the overall information seeking, sharing, and use process.

Multi-Disciplinary implications

Frames may also provide an important way to integrate information science research with other disciplines such as education, communications, cognitive science, public policy and psychology. At a macro-level, frames are socially created and distributed via media. These macro-frames are created and used to describe a wide variety of issues concerning mankind. Motivations for employing these types of frames range from advancing political agendas to increasing understanding of an issue. At a micro-level

they are created by individuals motivated by factors such as a quest to understand, become better educated, help others, or fulfill emotional desires.

Social Science

In Flyvebjerg's book "Making Social Science Matter," he reasons that the "purpose of social science is "to contribute to society's practical rationality in elucidating where we are, where we want to go, and what is desirable according to diverse sets of values and interests" and to contribute "to society's capacity for value-rational deliberation and action" (p.167). Similarly, Schön and Rein state that "The search for policy rationality is a quest for hope. The hope is that human reason may have a modest place in the reality of policy practice" (p.37). The research presented as part of this study offers a way that information science can be applied toward these goals.

The concept of a frame has been widely employed by a variety of social science disciplines. The proposed model allows information science to be linked to these disciplines on the basis of the concept of a frame and to be aligned with the purposes of these disciplines. The use of frames has been employed in the field of education to explain how people learn and scaffold knowledge. In communications and political science, frames are used to convey messages. How frames impact decision making and rational behavior are seen in economics. This study provides a potentially powerful new way to integrate and expand research in these fields with research from information science.

Cognitive and Neuroscience

In addition to the linkage to the social sciences, there may also be opportunities to link work from information science to the natural sciences by better understanding how the brain works. Current work in the fields of cognitive and neuroscience describe the way information is stored and retrieved in terms of schema or frames. As research progresses in these fields, and we achieve a greater understanding of the natural processes involved in storing and retrieving information, we may gain greater insight into the role that the physical architecture of the brain plays in defining the cognitive and social frames described as part of this study.

Further development and application of current research

This research study has yielded a number of opportunities for further elicitation of ideas that emerged as part of the adopted grounded theory approach. These potential directions include the following:

Possible Publications

- 1) Publication of the theory and model as presented in this study.
- 2) Exploration and publication of the findings that redefine current definitions of information need. The explication of these ideas would include exploration of the concepts of development and reflection processes, as well as the understanding of information needs by incorporating salience and relevance.
- 3) One of the concepts to emerge from this study is the identification of information used to conceptualize a problem. This is similar to sensemaking information as

defined by Dervin. The data provides a number of promising possibilities to expand on the conception of this type of information.

- 4) The use of the software as a means of eliciting information from participants provided interesting insight on the role of this type of information system. Concepts related to the reported value of this information system in helping participants “surface” and further their development of a conceptual understanding of the issue warrants further exploration.
- 5) School choice, as a public policy issue, has been widely debated. Central to this debate is parent’s information and decision making abilities. This study has collected important data that may provide important insights into these processes.
- 6) Scenarios were used as part of the grounded theory development process. This analytic technique was used to describe and test the emerging theory and created a method of triangulating the findings. Further exploration of this technique as part of a grounded theory approach may offer researchers a new method or technique for theory development.

System Development

In addition to the proposed publications identified, there may also be opportunities to develop systems that support researchers and decision makers.

- 1) The proposed model may be useful in terms of creating a way for people to better understand an issue in terms of its information properties. The codes developed as part of this exercise may be different for different types of problem or issue spaces. A web based tool may be developed that would provide researchers and

practitioners a way to develop a schema of anticipated attributes. The frame-Based model would be used to structure the schema. The resulting schema could inform the development of systems that support the objectives of creating understanding or supporting decision making.

- 2) This research study identified the potential of a system that allows people to exchange conceptual or sensemaking information. This system is being further developed to be applied in a generic context to provide groups the ability to exchange conceptual information.
- 3) It also identified the value of systems that “surface” or make a person’s thought more transparent as a way of supporting the development of their understanding of an issue. This type of system may have less of a social function than the previous system described.

Future research directions

General applicability

Analysis and comparison to existing theory, as well as examination of its application in the context studied, strongly suggest that it may be generally applicable. However, its more general applicability has not been studied. Glaser (1967) recommends researchers move from substantive theory to formal theory through further research and empirical grounding (p.93).

The current study is grounded in the personal context of a complex problem of choosing the right school for a child. One of the limitations of this study is knowledge regarding a more general application of the model. The coding structure, as described in Chapter 5, describes specific attributes associated with school choice decisions. The

further down the coding tree, the more specific the coding structure is to the context of school choice. The application of the theory and model to different types of complex problem contexts could further support or refute the findings of this study.

In addition to specific contexts such as school choice, the application of the theory to other problem contexts may also be explored. The problem context chosen was dynamic, complex and multi-faceted. The applicability of the theory to different types of problems is another area for future exploration.

Framing constructs

Multiple disciplines have struggled to define the construct of framing. This study has taken a step forward in defining this construct, but continued development of this construct as a way of informing information behavior may be valuable. The lines of ontological and epistemological comparisons as well as interpretive versus normative distinctions may be further developed.

Sensemaking and Conceptual Information

An important part of this study has not only been about understanding how people understand issues but also how they exchange information about their understanding. Case (2012) posits that Dervin, reflecting on Popper's (1972) writings, was one of the first to identify a type of information focused on understanding "sense-making information reflects the procedures and behaviors that allow us to "move" between external and internal information to understand the world, and usually to act on that understanding as well" (p. 49). The frame-Based model described as part of this study and the software used to capture people's thinking about issues provides a new way to

think about sensemaking information and how that information might be conveyed rather through visual representations, information maps or textual descriptions.

Social networks and conceptual information

Online social networks have created a new infrastructure for exchanging information. These types of networks did not exist in the 1960's and 1970's when many of the existing theories discussed were developed. There is potential to study these networks and the exchange for information that communicates conceptual information.

Systems thinking

Concepts related to feedback loops and holistic thinking has influenced the development of the proposed theory and model. The beginning of a bridge between information science research and systems thinking research has been developed as part of this study, but further analytic and theoretic work remains to tie these two disciplines together. Preliminary research suggests that the existing model could be expanded to better incorporate systems thinking research.

Cognitive science

Additionally, the use of frames as a central concept may provide a means of creating a stronger tie to natural science literature that explains the way the brain works in storing, retrieving and using information. The constructs of frames and schemas are used within the fields of cognitive and neuroscience and may naturally map to the constructs as described as part of this study. Further research investigating the application of current cognitive and neuroscience research to information behavior may provide valuable insights to information and decision making behaviors.

Information Systems Development

The use of frames and the frame-Based model of information behavior may have useful applications for systems development. The frame-Based approach could entail developing systems that begin exploring a person's framing of an issue and the use that frame to define information needs that can be expressed to a system. This type of system would focus on frame development rather than information retrieval. The application of this type of system could be applied in a number of different contexts.

Methodological implications

The application for the frame-Based model and theory to research may also warrant further research work. Preliminary research indicates that by identifying the relationships between the four main concepts of the model and understanding them in terms of how they are put into practice, there are opportunities to test aspects of information behavior using the model.

For example, the effectiveness of an information intervention could be evaluated based on the twelve categories of the model in terms of their static properties as well as development and reflection characteristics. By deploying this methodology, the overall health of a system could be determined by the degree of development taking place.

Impact of Media frames

This study has explored the impact of others framing behavior but not the specific media messages that people are exposed to in their day to day lives. There are a number of communications studies that have been designed to ascertain the impact of these types of frames but not as applied to the frame-Based model. Examining behavior of

people by exposing them to external framing information and using a similar tool to identify how much impact the external frames have on their internal framing of the issue could also be informative regarding the impact of messages communicated by the media.

Conclusion

In closing, this grounded theory study identifies potentially new ways of understanding information behavior in the context of complex problems. It has identified a way of understanding key concepts within the information science literature and the way they relate to each other. The promise of this research rests on the potential application of the frame-Based theory of information behavior to multi-disciplinary research and systems development.

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Appendices

Appendix 1: Parent Recruitment flyer

Choosing a school for your child?

Parents or guardians of children ages 3-4 considering where to send their child to school are needed to participate in a research study.

What is the purpose of this research study?

The purpose of this study is to better understand the way people think about issues or problems and how they determine their information needs related to the issue or problem. This research study is part of a doctoral dissertation.

Where will the research study take place?

The research study will take place over a 7 week period. Participants may be asked to choose a location for a face-to-face interview at the beginning of the study and at the end of the study. During weeks 2 through 6 participants will use their computer at home to participate. **[Click here for further details]**

What will be required of me should I participate?

Participants will be required to spend approximately an hour being interviewed during the first and seventh weeks of participation. During weeks 2, 3, 4, 5 and 6 participants will be asked to use online software and a journal to describe their activities related to their school choice process. It is estimated this process will take approximately 30 minutes per week. During weeks 3 and 5 participants will be asked to participate in a telephone interview lasting 15-20 minutes. **[Click here for further details]**

Will participants be compensated for their time?

Yes, participants will receive an Amazon.com gift card valued at \$50.00.

How to apply?

To apply for this study please **[click here]** and fill out the short application.

Dissertation Title: Understanding the relationship between problem framing and information needs development

Researcher: Charles Naumer, Ph.D. Candidate – University of Washington's Information School

Contact information: Naumer@uw.edu

Appendix 2: Parent Recruitment Survey

Question 1.

Are you a parent or guardian of a child or children?

Required.

- Yes
- No

Question 2.

What is your age?

Required.

Question 3.

What are the ages of your children?

Required.

Question 4.

Will you be one of the primary decision makers in choosing your child's school?

Required.

- Yes
- No

Question 5.

How certain are you of where your child will attend school?
(Please choose the answer that describes your level of certainty)

Required.

- I am certain where my child will start school
- I am fairly certain but considering options
- I am not sure and considering options
- I do not know and have not considered any options

Question 6.

Have you sought information regarding potential schools for your child?
(Please choose the answer that best describes your information gathering)

Required.

- Yes, and I have finished seeking information
- Yes, but I intend to seek additional information
- No, but I intend to seek information
- No, and I don't intend to seek information

Question 7.

If you have sought information regarding schools what sources have you used?
(Please choose the sources of information you have used)

Required.

- Friends, neighbors and acquaintances
- School staff
- Printed brochures
- Books
- Internet websites
- Other:

Question 8.

What do you think are the most important factors to consider when choosing a school?

Required.

Question 9.

How many schools are you considering?

Required.

Question 10.

Do you have access to a computer connected to the Internet in your home?

Required.

- Yes
- No

Question 11.

Would you be able to spend 30-60 minutes a week for 7 weeks as a participant in a school choice study?

Required.

- Yes
- No

Question 12.

What zip code do you live in?

Required.

Question 13.

What is your e-mail address?

Required.

Appendix 3: Parent Exit Survey

Question 1.

What is your gender?

- Male
- Female

Question 2.

What is your e-mail address?

Required.

Question 3.

What is your zipcode?

Required.

Question 4.

What is your race?

- White
- Black or African American
- American Indian or Alaska Native
- Native Hawaiian or Pacific Islander
- Asian
- Other:

Question 5.

What is your ethnicity?

- Hispanic or Latino
- Not Hispanic or Latino

Question 6.

What is your marital status?

- Married
- Divorced
- Separated
- Widowed
- Never married
- Living with someone

Question 7.

What is the highest degree or level of school you have completed?

- No schooling completed
- Nursery school to 8th grade
- 9th, 10th or 11th grade
- 12th grade, no diploma
- High school graduate - high school diploma or the equivalent (for example: GED)
- Some college credit, but less than 1 year
- 1 or more years of college, no degree
- Associate degree (for example: AA, AS)
- Bachelor's degree (for example: BA, AB, BS)
- Master's degree (for example: MA, MS, MEng, MEd, MSW, MBA)
- Professional degree (for example: MD, MBA, DDS, DVM, LLB, JD)
- Doctorate degree (for example: PhD, EdD)

Question 8.

What is your current employment status?

- Employed for wages
- Self-employed
- Out of work and looking for work
- Out of work but not currently looking for work
- Stay at home parent
- A student
- Retired
- Other:

Question 9.

Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?

- Yes
- No

Question 10.

What is your total household income?

- Less than \$10,000
- \$10,000 to \$19,999
- \$20,000 to \$29,999
- \$30,000 to \$39,999
- \$40,000 to \$49,999
- \$50,000 to \$59,999
- \$60,000 to \$69,999
- \$70,000 to \$79,999
- \$80,000 to \$89,999
- \$90,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 or more

Question 11.

How long have you lived in your current zipcode?

- Less than 1 year
- 1 to 2 years
- 2 to 5 years
- 5 to 10 years
- 10 years or more

Question 12.

How long have you lived in your current residence?

- Less than 1 year
- 1 to 2 years
- 2 to 5 years
- 5 to 10 years
- 10 years or more

Question 13.

Please describe your current occupation.

Question 14.

Has anyone in your immediate family been a K-12 educator within the last 10 years?

- Yes
- No

Appendix 4: Survey instrument for exit survey

Final Survey

PURPOSE OF THE STUDY

This research as part of study to fulfill an academic requirement for a Ph.D. degree in Information Science. The purpose of this study is to better understand how people think about difficult problems and how they use information to help them make decisions. Specifically, I will am studying how parents understand the issue of school choice and how they identify information needed to make decisions regarding their child's education.

STUDY PROCEDURES

In addition to the information you have already provided, as part of the 7 week research study, I would like to collect additional data to support my research. In order to collect this information, I am asking for your participation in filling out the following 14 question survey. If you agree to provide this additional information, I will send you a \$5.00 amazon gift certificate.

Participation is voluntary, and refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled.

For questions about this survey please contact the investigator:

Charles Naumer, Ph.D. Candidate,
The Information School, University of Washington
Mobile: 303-949-4700
Email: Naumer@u.washington.edu

If you have questions about your rights as a research subject, you can call the Human Subjects Division at (206) 543-0098.

By answering the survey questions and clicking the submit button you, you are consenting to participation in this part of the study.

Question 1.
What is your gender?

- Male
- Female

Question 2.
What is your e-mail address?

Required.

Question 3.
What is your zipcode?

Required.

Question 4.
What is your race?

- White
- Black or African American
- American Indian or Alaska Native
- Native Hawaiian or Pacific Islander
- Asian
- Other:

Question 5.
What is your ethnicity?

- Hispanic or Latino
- Not Hispanic or Latino

Question 6.

What is your marital status?

- Married
- Divorced
- Separated
- Widowed
- Never married
- Living with someone

Question 7.

What is the highest degree or level of school you have completed?

- No schooling completed
- Nursery school to 8th grade
- 9th, 10th or 11th grade
- 12th grade, no diploma
- High school graduate - high school diploma or the equivalent (for example: GED)
- Some college credit, but less than 1 year
- 1 or more years of college, no degree
- Associate degree (for example: AA, AS)
- Bachelor's degree (for example: BA, AB, BS)
- Master's degree (for example: MA, MS, MEng, MEd, MSW, MBA)
- Professional degree (for example: MD, MBA, DDS, DVM, LLB, JD)
- Doctorate degree (for example: PhD, EdD)

Question 8.

What is your current employment status?

- Employed for wages
- Self-employed
- Out of work and looking for work
- Out of work but not currently looking for work
- Stay at home parent
- A student
- Retired
- Other:

Question 9.

Have you been a pre-Kindergarten to 12th grade educator within the last 10 years?

- Yes
- No

Question 10.

What is your total household income?

- Less than \$10,000
- \$10,000 to \$19,999
- \$20,000 to \$29,999
- \$30,000 to \$39,999
- \$40,000 to \$49,999

- \$50,000 to \$59,999
- \$60,000 to \$69,999
- \$70,000 to \$79,999
- \$80,000 to \$89,999
- \$90,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 or more

Question 11.

How long have you lived in your current zipcode?

- Less than 1 year
- 1 to 2 years
- 2 to 5 years
- 5 to 10 years
- 10 years or more

Question 12.

How long have you lived in your current residence?

- Less than 1 year
- 1 to 2 years
- 2 to 5 years
- 5 to 10 years

- 10 years or more

Question 13.

Please describe your current occupation.

Question 14.

Has anyone in your immediate family been a K-12 educator within the last 10 years?

- Yes
- No

Appendix 5: Entrance interview protocol

Introductory script:

Thank you for agreeing to participate in this research study. This research study is part of my dissertation which seeks to better understand how people conceptualize problems and identify their information needs associated with these problems.

As a parent or guardian, you need to make many parenting decisions. These decisions are often complex involving many different factors to consider and sources of information. These are the types of problem solving and information seeking challenges that this research study seeks to learn more about. Your participation in this research study can help increase current understandings of the way people identify aspects of a problem and define their information needs.

The goal of this initial interview is to better understand your current thinking about the decision of where to enroll your child. This initial interview will help me to better understand how you have come to understand the issue, what your thought processes have been, and what types of information you are seeking to help you make your decision.

Your participation in this research is voluntary, anonymous and confidential. Your name will not be recorded for data analysis nor reported.

This interview should last approximately 30 to 60 minutes. You may discontinue participation at any time.

May I have your permission to record this call?

May I verbally confirm whether you agree to participate in this interview or not? (Let participant answer.)

Thank you.

Questions:

1. What are the ages of your children?
2. When evaluating school choices what are the factors that are most important to you? In other words, how are you evaluating options for your child?
3. Can you tell me about the process that led you to consider the evaluation criteria you identified? Have your views of school changed over time? Were your initial thoughts about what might be the best school for your child different than they are today?
4. What experiences and/or information have led you to consider schools in the way you described? Can you identify any specific experiences or types of information that have changed your views on the best way to evaluate a school?
5. How would you describe the information you need to help you make decisions regarding your child's education? Have your information needs changed over time?
6. How hard do you expect it will be to get the information you need? Where do you plan on looking for this type of information?
7. How confident are you that you will be able to make the right decision for your child? What worries you the most about this decision?
8. Do you have any questions about participating in this study that I can answer at this time?

Thank you for your participation!

Appendix 6: Checkin 1 script

Introductory script:

Thank you for agreeing to participate in this research study. As previously stated, this research study is part of my dissertation which seeks to better understand how people conceptualize problems and identify their information needs associated with these problems.

The goal of this check-in interview is to better understand your decision making process and how you are currently considering the decision about where to enroll your child in school. This interview will help me to better understand how you are using the online concept and information needs mapping tool.

Your participation in this research is voluntary, anonymous and confidential. Your name will not be recorded for data analysis nor reported.

This interview should last approximately 10 to 20 minutes. You may discontinue participation at any time.

May I verbally confirm whether you agree to participate in this interview or not? (Let participant answer.)

May I verbally confirm whether you agree to allow

Thank you.

Questions:

1. Has the online application been working for you? Do you have any questions about how to use the application? Do you have any questions about the use of the online tool or about what you should be recording as part of your journal exercise?
2. How accurate do you feel the application is in depicting the way you are thinking about an issue? Does the information map capture your current thinking and information needs?
3. Any thoughts on using tool. Is it capturing your experience? If not, how could it be adapted?
4. Does the process mimic the way you would normally make an important decision like this? Would you be likely to break it down into these kind of categories – needs – info.
5. After reading your journal entries and reviewing the way you used the concept and information needs mapping software I have the following questions? (Questions to be determined based on analysis of the use of the software and journal entries).
6. The schedule is as follows. Next week we will allow visualization of other's maps? Is this ok?
7. Do you have any questions about participating in this study that I can answer at this time?

Thank you for your participation!

Appendix 7: Checkin 2 script

Introductory script:

Thank you for agreeing to participate in this research study. As previously stated, this research study is part of my dissertation which seeks to better understand how people conceptualize problems and identify their information needs associated with these problems.

The goal of this check-in interview is to better understand your decision making process and how you are currently considering the decision about where to enroll your child in school. This interview will help me to better understand how you are using the online concept and information needs mapping tool.

Your participation in this research is voluntary, anonymous and confidential. Your name will not be recorded for data analysis nor reported.

This interview should last approximately 10 to 20 minutes. You may discontinue participation at any time.

May I verbally confirm whether you agree to participate in this interview or not? (Let participant answer.)

May I verbally confirm whether you agree have this conversation recorded? (Let participant answer.)

Thank you.

Questions:

1. Has the online application been working for you? Do you have any questions about how to use the application?
2. Have you used the others maps? What has that experience been like?
3. How did it make you feel about your own map?
4. How accurate do you feel the application is in depicting the way you are thinking about an issue?
5. Any thoughts on using tool. Is it capturing your experience? If not, how could it be adapted?
6. Does the information map capture your current thinking and information needs?
7. After reading your journal entries and reviewing the way you used the concept and information needs mapping software I have the following questions? (Questions to be determined based on analysis of the use of the software and journal entries).
8. Do you have any questions about the use of the online tool or about what you should be recording as part of your journal exercise?
9. Do you have any questions about participating in this study that I can answer at this time?

Thank you for your participation!

Appendix 8: Exit interview protocol

Introductory script:

Thank you for agreeing to participate in this research study. As previously stated, this research study is part of my dissertation which seeks to better understand how people conceptualize problems and identify their information needs associated with these problems.

The goal of this exit interview is to better understand your decision making process and how you are currently considering the decision about where to enroll your child in school. This interview will help me to better understand how you are using the online concept and information needs mapping tool.

Your participation in this research is voluntary, anonymous and confidential. Your full name will not be recorded for data analysis nor reported.

This interview should last approximately an hour. You may discontinue participation at any time.

May I verbally confirm whether you agree to participate in this interview or not? (Let participant answer.)

May I verbally confirm whether you agree to have this call recorded? (Let participant answer.)

Thank you.

As discussed previously, I am very interested in understanding more about how people interact with information in order to support decision making. Specifically, I am interested in how people conceptualize an issue and define their information needs.

Initial

1. In general, can you please describe your process for understanding and making decisions about complicated issues you face in daily life?
2. Can you tell me about when you started thinking about the issue of school choice?
3. What motivated you to start thinking about your choice?

Issues:

1. When you first started thinking about the issue of school choice what were your primary concerns?
2. When you first started considering the issue do you think you could have articulated the way you thought about the issue right away – or was the process you went through to clarify the way you conceptualized the issue?
3. Have your views changed over time in terms of how you think about the issue? If so, what has caused you to change your views?
 - a. Did you read anything that shaped your views or reinforced?
 - b. Did conversations with other people shape your views?
 - c. Did you have any experiences that shaped your views?
 - d. What else contributed to your views?
4. Are there any concepts that you are thinking about that haven't been included on your map?

5. Ask questions about specific issues/concepts?
6. In general, regarding different types of decisions you make, what causes you to change the way you conceptualize an issue? Do you anticipate it will change / evolve?
7. In general, regarding different types of decisions you make, do you have a “feeling” that you are missing something?

Needs:

1. Thinking back to when you first started thinking about the issue. What information did you think you needed at the time?
2. What caused you to think about your information needs at that time?
3. When you first started considering the issue do you think you could have articulated the way you thought about your needs – or was the process you went through to clarify the way you conceptualized your needs?
4. Have you changed your expectations for the type of information you need? If so, how?
 - a. Did you read anything that shaped your information needs?
 - b. Did conversations with other people shape your information needs?
 - c. Did you have any experiences that shaped your information needs?
 - d. What else contributed to your information needs?
5. Ask questions about specific information needs.
6. In general, regarding different types of decisions you make, what causes you to change the way you conceptualize your needs?
7. In general, regarding different types of decisions you make, do you have a “feeling” that you are missing something?

Relationship:

1. Were there times when you thought about an information need and it led you to change or add another concept?
2. Were there times when you thought about an information concept and it led you to change or add an information need?
3. As you thought through your conceptualization of the problem – did you think about your information needs at the same time? Did your conceptualization guide your identification of information needs – or did you understand your information needs guide your conceptualization.

Barriers/Bridges:

1. Were there any moments that you felt you made a breakthrough in your understanding?
2. Were there any times when you felt that you reached a barrier to your understanding?
3. Are there any information needs that you feel cannot be addressed or satisfied?

Map:

1. Looking at your map can you please describe your thought processes behind each area?
2. Looking at your map.
 - a. How would you rank the importance of each concept you identified?
 - b. How would you rank the importance of each information need?
3. What are the factors that have been most influential to you in defining the way you think about the issue?

4. What are the factors that have been most influential to you in defining the way you define your information needs?

Affective:

1. How do feelings play into your decision making process?
 - a. Do they affect the way you conceptualize the issue?
 - b. Do they affect the way you define your needs?
2. How do you feel about your decision at this point?

Final:

1. Do you feel as if your map describes the way you are thinking about your choice?
2. Have you made your choice?
3. If you were going to give another parent advice – how would you advise them?
4. Do you have any thoughts on using the web application? Is this the way you would normally make a decision?

Appendix 9: Code Book

All current codes

HU: Dissertation 4
File: [D:\Analysis\Dissertation 4.hpr6]
Edited by: Super

Context

Context: Development

Context: Development: Activity
The type of activity on the development of context.

Context: Development: Activity: Additive

Context: Development: Activity: Destructive

Context: Development: Activity: Reinforcement

Context: Development: Activity: Scoping

Context: Development: Difficulty
The degree of difficulty in developing context.

Context: Development: Difficulty: High

Context: Development: Difficulty: Low

Context: Development: Engagement
The degree of engagement in the context development process.

Context: Development: Engagement: Active

Context: Development: Engagement: Passive

Context: Development: Methods
The methods employed for context development.

Context: Development: Methods: Cognitive

Context: Development: Methods: Dialogue

Context: Development: Methods: Experiential

Context: Development: Methods: Lists

Context: Development: Methods: Scenario Development

Context: Development: Methods: Social

Context: Development: Methods: Social: Shared Map

Context: Development: Methods: Talk aloud

Context: Properties

Context: Properties: Affective

Pertains to affective types of information. How something make a person feel.

Context: Properties: Affective: Negative

Context: Properties: Affective: Positive

Context: Properties: Attention

The attention or weight associated with a contextual element.

Context: Properties: Attention: High

Context: Properties: Attention: Low

Context: Properties: Culture

Aspects of a person's cultural background which define context.

Context: Properties: Experience

Pertains to information that is experiential.

Context: Properties: Experience: Future

Pertains to information regarding expected experiences or event in the future.

Context: Properties: Experience: Past

Pertains to information derived from past experiences.

Context: Properties: Experience: Present

Present experiences as the context for information needs development.

Context: Properties: Geography

Aspects of a person's current and past geographical location.

Context: Properties: Motivation

Pertains to the motivational factors propelling frame development.

Context: Properties: Motivation Source

Pertains to the source of motivational factors propelling frame development.

Context: Properties: Motivation Source: Extrinsic

Identifies external factors motivating frame development.

Context: Properties: Motivation Source: Intrinsic

Identifies internal factors motivating frame development.

Context: Properties: Motivation: High

Context: Properties: Motivation: Low

Context: Properties: Purpose

Pertains to the purpose for which the context is being applied

Context: Properties: Purpose: Decision

Pertains to a situation where the purpose for context application is a decision.

Context: Properties: Purpose: Decision: Complexity

Pertains to a situation where the purpose for context application is a complex decision.

Context: Properties: Purpose: Decision: Importance (Stakes)

Pertains to the perceived importance of the decision. Whether the decision is deemed high stakes.

Context: Properties: Purpose: Decision: Incremental

Pertains to whether the participant perceives having the ability to make incremental changes to the course of action decided - i.e. changing teachers or programs.

Context: Properties: Purpose: Decision: Permanence

Pertains to how permanent the participant feels the decision is. Is it easy to change.

Context: Properties: Purpose: Decision: Timeline
Pertains to the timeline of a decision.

Context: Properties: Purpose: Understanding
Pertains to a situation where the purpose for context application is understanding.

Context: Properties: Purpose: Understanding: Complexity
Pertains to a situation where the purpose for context application is understanding a complex issue.

Context: Properties: Purpose: Understanding: Complexity: High

Context: Properties: Purpose: Understanding: Complexity: Low

Context: Properties: Purpose: Understanding: Relevance
Pertains to the perceived relevance to the understanding of the issue.

Context: Properties: Purpose: Understanding: Relevance: High

Context: Properties: Purpose: Understanding: Relevance: Low

Context: Properties: Race/Ethnicity

Context: Properties: Situational
A situation as the context for information needs development.

Context: Properties: Situational: Child specific

Context: Properties: Situational: Cost

Context: Properties: Situational: Location (options)

Context: Properties: Situational: Scheduling

Context: Properties: Situational: Time

Context: Properties: Situational: Transportation

Context: Properties: Skills
Pertains to the type of a relevant set of skills as they relate to the issue.

Context: Properties: Skills: Analytic

Context: Properties: Skills: Metacognitive

Context: Properties: Skills: Social

Context: Properties: Skills: Verbal

Context: Properties: Training

Pertains to training and skills development as they relate to the issue.

Context: Properties: Training: Education

Pertains to context derived from education.

Context: Properties: Training: Occupation

Pertains to context derived from occupational training or experiences.

Context: Reflection

The process of reflecting on context.

Context: Reflection: Engagement

The level of engagement in reflecting on frames.

Context: Reflection: Engagement: High

Context: Reflection: Engagement: Low

Context: Reflection: Evaluation

The type of evaluation in reflecting on context.

Context: Reflection: Evaluation: Credibility

Context: Reflection: Evaluation: Credibility: High

Context: Reflection: Evaluation: Credibility: Low

Context: Reflection: Evaluation: Dissonance

Context: Reflection: Evaluation: Inclusion

Context: Reflection: Evaluation: Relevance: High

Context: Reflection: Evaluation: Relevance: Low

Context: Reflection: Evaluation: Resonance

Context: Reflection: Evaluation: Saliency

Context: Reflection: Impact

The types of impact as a result of reflecting on frames.

Context: Reflection: Impact: Discovery

Context: Reflection: Impact: Discredit

Context: Reflection: Impact: Fortify

Context: Reflection: Impact: Neutral

Context: Reflection: Impact: Reframe

Context: Reflection: Impact: Satisfice: High

Context: Reflection: Impact: Satisfice: Low

Context: Reflection: Impact: Scope

Context: Reflection: Level

The type of reflection based on Taylor's levels of information need development.

Context: Reflection: Level: L1- Visceral

Context: Reflection: Level: L2 - Conscious

Context: Reflection: Level: L3 - Compromised

Context: Reflection: Level: L4 - Formalized

Context: Reflection: Methods

Context: Reflection: Methods: Cognitive

Context: Reflection: Methods: Dialogue

Context: Reflection: Methods: Experiential

Context: Reflection: Methods: Lists

Context: Reflection: Methods: Scenarios

Context: Reflection: Methods: Social

Context: Reflection: Methods: Social: Shared Map

Context: Reflection: Methods: Talk aloud

Frames 1

Frames: Development 1b

Frames development 1b. This category refers to the process of frame development as a whole.

Frames: Development: Activity

The type of activity associated with the development of a frame

Frames: Development: Activity: Additive

Frames: Development: Activity: Destructive

Frames: Development: Activity: Reinforcement

Frames: Development: Activity: Scoping

Frames: Development: Difficulty

The degree of difficulty in developing a frame.

Frames: Development: Difficulty: High

Frames: Development: Difficulty: Low

Frames: Development: Engagement

The degree of engagement in the context development process.

Frames: Development: Engagement: Active

Frames: Development: Engagement: Passive

Frames: Development: Level

The application of Taylor's four levels of development to frame development.

Frames: Development: Level: L1 - Visceral

Frames: Development: Level: L2 - Conscious

Frames: Development: Level: L3 - Compromised

Frames: Development: Level: L4 - Formalized

Frames: Development: Methods

The methods employed for frame development.

Frames: Development: Methods: Analytic Method

Frames: Development: Methods: Cognitive

Identifies primarily cognitive processes shaping frame development.

Frames: Development: Methods: Dialogue

Identifies dialogue as shaping frame development.

Frames: Development: Methods: Experiential

Identifies experience as shaping frame development.

Frames: Development: Methods: Lists

Frames: Development: Methods: Observation

Frames: Development: Methods: Research

Frames: Development: Methods: Scenario Development

Frames: Development: Methods: Social

Identifies social interaction as shaping frame development. (closely related to social processes but meant more as one on one effort to engage in dialogue)

Frames: Development: Methods: Social: Shared Map

Frames: Development: Methods: Talk aloud

Identifies talk aloud methods for shaping frame development.

Frames: Development: Methods: Written notes
Identifies list taking processes as shaping frame development.

Frames: Development: Prioritizing
The process of prioritizing frame elements.

Frames: Development: Scoping
The process of developing frames to scope the boundaries of an issue.

Frames: Elements: Cost to Satisfice
Pertains to the perceived cost of satisficing information needs pertinent to this element.

Frames: Elements: Degree of Frame Element Objectivity
Pertains to whether an element of a frame is subject to objective information. i.e. test scores.
Pertains to whether an element of a frame is subject to objective information. i.e. affective elements of school.

Frames: Elements: Elasticity: Elastic

Frames: Elements: Elasticity: Elastic: Challenged

Frames: Elements: Elasticity: Elastic: Cognitive dissonance

Frames: Elements: Elasticity: Inelastic

Frames: Elements: Elasticity: Inelastic: Cognitive resonance

Frames: Elements: Elasticity: Inelastic: Reaffirmed

Frames: Elements: Influence
Pertains to the influence of an element of the frame in relation to other elements.

Frames: Elements: Influence: High

Frames: Elements: Influence: Low

Frames: Elements: Level

Frames: Elements: Level: L1 - Visceral

Frames: Elements: Level: L2 - Conscious

Frames: Elements: Level: L3 - Formalized

Frames: Elements: Level: L4 - Compromised

Frames: Elements: Maturity

Frames: Elements: Maturity: Cycles

Frames: Elements: Maturity: Time

Frames: Elements: Purpose
Pertains to the purpose of the frame attribute.

Frames: Elements: Purpose: Conceptual
Having the purpose of conceptualizing the issue.

Frames: Elements: Purpose: Factual
Having the purpose of identifying facts to support or challenge

Frames: Elements: Purpose: Logistical
Having the purpose of

Frames: Elements: Purpose: Value
Frame attribute specifically addresses a value based need.

Frames: Elements: Satisfice
The degree which a frame is satisfied.

Frames: Elements: Satisfice: High

Frames: Elements: Satisfice: Low

Frames: Properties
Frames attributes 1a. Represents attributes of a frame.

Frames: Properties: Degree of Development: Degree of articulation
The degree a frame can be articulated.

Frames: Properties: Degree of Development: Degree of effectiveness
The degree of effectiveness of the frame to address an issue.

Frames: Properties: Degree of Development: Degree of specificity
The degree of specificity by which a frame identifies elements of the issue.

Frames: Properties: Elasticity
The degree the frame is perceived as elastic.

Frames: Properties: Elasticity: Elastic

Frames: Properties: Elasticity: Elastic: Challenged

Frames: Properties: Elasticity: Elastic: Cognitive dissonance

Frames: Properties: Elasticity: Inelastic
Pertains to how concrete the frame is perceived by the researcher.
Pertains to evidence of perceived inelasticity of the frame.

Frames: Properties: Elasticity: Inelastic: Cognitive resonance

Frames: Properties: Elasticity: Inelastic: Reaffirmed

Frames: Properties: Elements

Frames: Properties: Elements: Elasticity: Elastic
Pertains to the perceived elasticity of the frame.

Frames: Properties: Elements: Elasticity: Elastic: Challenged

Frames: Properties: Elements: Elasticity: Elastic: Cognitive Dissonance

Frames: Properties: Elements: Elasticity: Inelastic

Frames: Properties: Elements: Elasticity: Inelastic: Cognitive resonance

Frames: Properties: Elements: Elasticity: Inelastic: Reaffirmed

Frames: Properties: Elements: Influence

Frames: Properties: Elements: Influence: High

Frames: Properties: Elements: Influence: Low

Frames: Properties: Elements: Level

Frames: Properties: Elements: Level: L1 - Visceral

Frames: Properties: Elements: Level: L2 - Conscioius

Frames: Properties: Elements: Level: L3 - Formalized

Frames: Properties: Elements: Level: L4 - Compromised

Frames: Properties: Elements: Maturity

Frames: Properties: Elements: Maturity: Cycles

Frames: Properties: Elements: Maturity: Time

Frames: Properties: Elements: Objectivity

Frames: Properties: Elements: Objectivity: High

Frames: Properties: Elements: Objectivity: Low

Frames: Properties: Elements: Priority

Frames: Properties: Elements: Purpose

Frames: Properties: Elements: Purpose: Conceptual

Frames: Properties: Elements: Purpose: Factual

Frames: Properties: Elements: Purpose: Logistical

Frames: Properties: Elements: Purpose: Value Based

Frames: Properties: Elements: Satisficed

Frames: Properties: Elements: Satisficed: High

Frames: Properties: Elements: Satisficed: Low

Frames: Properties: Importance

The perceived importance of the frame.

Frames: Properties: Importance: High

Frames: Properties: Importance: Low

Frames: Properties: Level

Pertains to the degree of frame development occurring.

Frames: Properties: Level: L1 - Visceral

Frames: Properties: Level: L2 - Conscious

Frames: Properties: Level: L3 - Compromised

Frames: Properties: Level: L4 - Formalized

Frames: Properties: Maturity

The maturity of a frame.

Frames: Properties: Maturity: Cycles

The number or degree of frame development.

Frames: Properties: Maturity: Time

The amount of time the frame has been developed.

Frames: Properties: Objectivity

The degree of objectivity of the frame.

Frames: Properties: Objectivity: High

Frames: Properties: Objectivity: Low

Frames: Properties: Purposes

The purposes of the frame.

Frames: Properties: Purposes: Conceptual

Frames: Properties: Purposes: Factual

Frames: Properties: Purposes: Logistical

Frames: Properties: Purposes: Scope

Frames: Properties: Purposes: Value Based

Frames: Properties: Satisficed

The degree the frame is satisficed.

Frames: Properties: Satisficed: High

Frames: Properties: Satisficed: Low

Frames: Properties: Structural

Frames: Properties: Structural: Elements

Frames: Properties: Structural: Links

Frames: Reflection

The process of reflecting on a frame.

Frames: Reflection 1c

Pertains to the process of reflecting on existing frames.

Frames: Reflection: Engagement

Pertains generally to the level of engagement.

Frames: Reflection: Engagement: High

Identifies an active engagement in the process of frame development.

Frames: Reflection: Engagement: Low

Identifies passive engagement in the process of frame development.

Frames: Reflection: Evaluation

The type of evaluation in reflecting on frames.

Frames: Reflection: Evaluation: Credibility

Frames: Reflection: Evaluation: Credibility: High

Indicates conversation with close relations are helpful. Credibility and maybe relevance are assumed.

Frames: Reflection: Evaluation: Credibility: Low

Frames: Reflection: Evaluation: Dissonance

Frames: Reflection: Evaluation: Inclusion

Frames: Reflection: Evaluation: Prioritizing

Frames: Reflection: Evaluation: Relevance

Frames: Reflection: Evaluation: Relevance: High

Frames: Reflection: Evaluation: Relevance: Low

Frames: Reflection: Evaluation: Resonance

Frames: Reflection: Evaluation: Salience

Frames: Reflection: Impact
Pertains to the result of the process of reflection.

Frames: Reflection: Impact: Challenge

Frames: Reflection: Impact: Discovery

Frames: Reflection: Impact: Discredit

Frames: Reflection: Impact: Fortify
Pertains to the result of reflecting on the frame.

Frames: Reflection: Impact: Neutral

Frames: Reflection: Impact: Reframe

Frames: Reflection: Impact: Satisfice
Satisficing or reducing uncertainty

Frames: Reflection: Impact: Satisfice: High

Frames: Reflection: Impact: Satisfice: Low

Frames: Reflection: Impact: Scope
Pertains to defining boundaries or limits around the decision or choices. Is it in scope.

Frames: Reflection: Level

Pertains to the frame development activity as described by four levels of activity.

Frames: Reflection: Level: L1 Visceral

During this state you may have a visceral sense of uncertainty around an issue but not be able to identify or name it.

Frames: Reflection: Level: L2 Conscious

Frames: Reflection: Level: L3 Compromised

Frames: Reflection: Level: L4 Formalized

Frames: Reflection: Methods

The methods used as part of the frame reflection process.

Frames: Reflection: Methods: Cognitive

Frames: Reflection: Methods: Dialogue

Frames: Reflection: Methods: Experiential

Frames: Reflection: Methods: Research

Frames: Reflection: Methods: Scenarios

Frames: Reflection: Methods: Social

Frames: Reflection: Methods: Social: Shared Map

Frames: Reflection: Methods: Talk aloud

Frames: Reflection: Methods: Written notes

Information 3

Core concept - Information.

Information: Development

The process of developing information.

Information: Development: Activity

The type of activity resulting from information development.

Information: Development: Activity: Additive

Information: Development: Activity: Destructive

Information: Development: Activity: Reinforcement

Information: Development: Difficulty
The degree of difficulty developing information.

Information: Development: Difficulty: High

Information: Development: Difficulty: Low

Information: Development: Engagement
The degree of engagement in the information development process.

Information: Development: Engagement: Active

Information: Development: Engagement: Passive

Information: Development: Methods
The methods employed in the information development process.

Information: Development: Methods: Cognitive

Information: Development: Methods: Dialogue

Information: Development: Methods: Experiential

Information: Development: Methods: Lists

Information: Development: Methods: Scenarios

Information: Development: Methods: Social

Information: Development: Methods: Social: Shared Map

Information: Development: Methods: Talk aloud

Information: Properties 3a
Frames attributes 3a. Represents attributes of information.

Information: Properties: Degree

Information: Properties: Degree: Degree of effectiveness
The degree the information effectively addresses the need and frame.

Information: Properties: Degree: Degree of specificity
The degree of specificity by which the information is expressed.

Information: Properties: Format
The format or type of information.

Information: Properties: Format: Audio

Information: Properties: Format: Print

Information: Properties: Format: Video

Information: Properties: Location
The nexus of the information.

Information: Properties: Location: External

Information: Properties: Location: Internal

Information: Properties: Source
The source of the information.

Information: Properties: Source: Interaction
Pertains to information derived from social interaction.

Information: Properties: Source: Interaction: Close contact (spouse)

Information: Properties: Source: Interaction: District or State

Information: Properties: Source: Interaction: Family

Information: Properties: Source: Interaction: Friend or coworker

Information: Properties: Source: Interaction: Other Children

Information: Properties: Source: Interaction: Own child

Information: Properties: Source: Interaction: Parents

Information: Properties: Source: Interaction: School Staff

Information: Properties: Source: Media
The type of media as the source of information.

Information: Properties: Source: Media: Book

Information: Properties: Source: Media: Magazine

Information: Properties: Source: Media: Newspaper

Information: Properties: Source: Media: Radio

Information: Properties: Source: Media: TV

Information: Properties: Source: Media: Web

Information: Properties: Source: Observation
Pertains to information derived from observations.

Information: Properties: Source: Observation: Classroom

Information: Properties: Source: Observation: Other Children

Information: Properties: Source: Observation: Own child

Information: Properties: Source: Observation: Playground

Information: Properties: Source: Observation: School Visit

Information: Properties: Type
The type of information.

Information: Properties: Type: Affective

Information: Properties: Type: Qualitative

Information: Properties: Type: Quantitative

Information: Reflection

The process of reflecting or evaluating information.

Information: Reflection: Engagement

The degree of engagement in the reflection process.

Information: Reflection: Engagement: High

Information: Reflection: Engagement: Low

Information: Reflection: Evaluation

The type of evaluation of information.

Information: Reflection: Evaluation: Credibility

Information: Reflection: Evaluation: Credibility: High

Information: Reflection: Evaluation: Credibility: Low

Information: Reflection: Evaluation: Dissonance

Information: Reflection: Evaluation: Inclusion

Information: Reflection: Evaluation: Relevance: High

Information: Reflection: Evaluation: Relevance: Low

Information: Reflection: Evaluation: Resonance

Information: Reflection: Evaluation: Salience

Information: Reflection: Impact

The impact of the information reflection process.

Information: Reflection: Impact: Discovery

Information: Reflection: Impact: Discredit

Information: Reflection: Impact: Fortify

Information: Reflection: Impact: Neutral

Information: Reflection: Impact: Reframe

Information: Reflection: Impact: Satisfice

Information: Reflection: Impact: Satisfice: High

Information: Reflection: Impact: Satisfice: Low

Information: Reflection: Impact: Scope

Information: Reflection: Level

Taylor's levels of development applied to the reflection process.

Information: Reflection: Level: L1- Visceral

Information: Reflection: Level: L2 - Conscious

Information: Reflection: Level: L3 - Compromised

Information: Reflection: Level: L4 - Formalized

Information: Reflection: Methods

The methods employed for frame reflection.

Information: Reflection: Methods: Cognitive

Information: Reflection: Methods: Dialogue

Information: Reflection: Methods: Experiential

Information: Reflection: Methods: Lists

Information: Reflection: Methods: Scenarios

Information: Reflection: Methods: Social

Information: Reflection: Methods: Social: Shared Map

Information: Reflection: Methods: Talk aloud

Needs 2

Core concept - Needs.

Needs: Development 2b

Needs development 2b. This category refers to the process of needs development as a whole. These are identifiable characteristics associated with the process of need development.

Needs: Development: Activity

The type of activity resulting from needs development.

Needs: Development: Activity: Additive

Needs: Development: Activity: Destructive

Needs: Development: Activity: Reinforcement

Needs: Development: Activity: Scoping

Needs: Development: Activity: Source Identification

Needs: Development: Difficulty

The perceived difficulty of needs development.

Needs: Development: Difficulty: High

Needs: Development: Difficulty: Low

Needs: Development: Engagement

The level of engagement by the participant in their information needs development.

Needs: Development: Engagement: Active

The identification of an active level of engagement by the participant in their information needs development.

Needs: Development: Engagement: Passive

The identification of a passive level of engagement by the participant in their information needs development.

Needs: Development: Methods

The methods employed for needs development.

Needs: Development: Methods: Cognitive

Cognitive processes as the primary methods used to develop information needs.

Needs: Development: Methods: Dialogue
Pertains to dialogue as a strategy for developing information needs.

Needs: Development: Methods: Established Analytic Method

Needs: Development: Methods: Experiential

Needs: Development: Methods: Lists

Needs: Development: Methods: Research

Needs: Development: Methods: Scenarios

Needs: Development: Methods: Social
Pertains to social interactions as a strategy for developing information needs.

Needs: Development: Methods: Social: Shared Map
Social maps as the context for information needs development.

Needs: Development: Methods: Talk aloud

Needs: Development: Methods: Written notes
Pertains to developing lists as a strategy for developing information needs.

Needs: Properties 2a
Needs attributes 2a. Represents attributes of needs. The identifiable attributes of needs at a point in time.

Needs: Properties: Degrees

Needs: Properties: Degrees: Articulated
The degree by which a need is articulated.

Needs: Properties: Degrees: Effectiveness
The effectiveness of a need to address the frame condition.

Needs: Properties: Degrees: Priority
The perceived priority of a need.

Needs: Properties: Degrees: Specificity
The degree of specificity reflected by a need description.

Needs: Properties: Difficulty

The perceived difficulty of satisfying the information need.

Needs: Properties: Difficulty: High

Needs: Properties: Difficulty: Low

Needs: Properties: Elasticity

Needs: Properties: Elasticity: Elastic

The perception of whether the need is subject to change (elasticity).

Needs: Properties: Elasticity: Elastic: Challenged

Needs: Properties: Elasticity: Elastic: Cognitive dissonance

Needs: Properties: Elasticity: Inelastic

The perceived concreteness of the information need.

Needs: Properties: Elasticity: Inelastic: Cognitive resonance

Pertains to cognitive concordance as the cause of information need development elasticity.

Needs: Properties: Elasticity: Inelastic: Reaffirmed

Pertains to reaffirmed needs as the cause of information need development inelasticity.

Needs: Properties: Importance

The perceived importance of the information need.

Needs: Properties: Importance: High

Needs: Properties: Importance: Low

Needs: Properties: Level

Needs: Properties: Level: L1 Visceral

Identification of a visceral information need.

Needs: Properties: Level: L2 Conscious

Identification of a conscious recognition of an information need.

Needs: Properties: Level: L3 Formalized

Identification of a formalized expression of an information need.

Needs: Properties: Level: L4 Compromised
An information need presented to a system.

Needs: Properties: Maturity
The age or maturity of a need.

Needs: Properties: Maturity: Cycles
The number of cycles an information need has changed.

Needs: Properties: Maturity: Time
The length of time an information need has matured.

Needs: Properties: Objectivity
The perceived degree of subjectivity of the information needed.

Needs: Properties: Objectivity: High

Needs: Properties: Objectivity: Low

Needs: Properties: Purpose
The purpose of the information needed.

Needs: Properties: Purpose: Conceptual
The purpose of the information needed is to support conceptualization of issue.

Needs: Properties: Purpose: Factual
The purpose of the information needed is to support the gathering of facts.

Needs: Properties: Purpose: Logistical
The purpose of the information needed is to address logistical issues.

Needs: Properties: Purpose: Scope
The purpose of defining a scope.

Needs: Properties: Purpose: Value Based
The purpose of being value based.

Needs: Properties: Satisfied
The state of satisfaction of the information need.

Needs: Properties: Satisfied: High

Needs: Properties: Satisfied: Low

Needs: Reflection 2c

Needs development 2b. This category refers to the process of needs development as a whole. These are identifiable characteristics associated with the process of need development.

Needs: Reflection: Engagement

The degree of engagement in reflecting on the information need.

Needs: Reflection: Engagement: High

Needs: Reflection: Engagement: Low

Needs: Reflection: Evaluation

The type of evaluation of the information need.

Needs: Reflection: Evaluation: Credibility

Needs: Reflection: Evaluation: Credibility: High

Needs: Reflection: Evaluation: Credibility: Low

Needs: Reflection: Evaluation: Dissonance

Needs: Reflection: Evaluation: Inclusion

Needs: Reflection: Evaluation: Prioritizing

Needs: Reflection: Evaluation: Relevance

The perceived information need as it relates to the relevance of the attribute to the decision.

Needs: Reflection: Evaluation: Relevance: High

Needs: Reflection: Evaluation: Relevance: Low

Needs: Reflection: Evaluation: Resonance

Needs: Reflection: Evaluation: Saliency

Needs: Reflection: Evaluation: Scoping

Needs: Reflection: Impact

The result of the process of reflecting on the information need.

Needs: Reflection: Impact: Challenge

Needs: Reflection: Impact: Discovery

The pertains to instances when information is discovered that creates new or enhanced frames.

Needs: Reflection: Impact: Discredit

Needs: Reflection: Impact: Fortify

Pertains to instances when information reaffirms existing frames.

Needs: Reflection: Impact: Neutral

Needs: Reflection: Impact: Reframe

Needs: Reflection: Impact: Satisfice

Pertains to the point where people reach a point where the development of information needs is satisfied.

Needs: Reflection: Impact: Satisfice: High

Needs: Reflection: Impact: Satisfice: Low

Needs: Reflection: Impact: Scope

Needs: Reflection: Level

Needs: Reflection: Level: L1 - Visceral

Needs: Reflection: Level: L2 - Conscious

Needs: Reflection: Level: L3 - Formalized

Needs: Reflection: Level: L4 - Compromised

Needs: Reflection: Methods

They type of methods employed in reflecting on the information needs.

Needs: Reflection: Methods: Dialogue

Needs: Reflection: Methods: Experiential

Needs: Reflection: Methods: Lists

Needs: Reflection: Methods: Scenarios

Needs: Reflection: Methods: Social

Needs: Reflection: Methods: Social: Shared Maps

Needs: Reflection: Methods: Talk aloud

Relationship

Category identifying relationships between concepts.

Relationship: Development

Pertains to the development of aspects of the relationship.

Relationship: Development: Common Context Influence

Relationship: Development: Context to Framing

Relationship: Development: Context to Information

Relationship: Development: Context to Needs

Relationship: Development: Framing to Context

Relationship: Development: Framing to Information

Relationship: Development: Framing to Needs

Identifies situations where framing influences needs.

Relationship: Development: Information to Context

Relationship: Development: Information to Framing

Identifies situations where information influences framing.

Relationship: Development: Information to Needs

Identifies situations where information influences needs development.

Relationship: Development: Needs to Context

Relationship: Development: Needs to Framing
Identifies situations where information needs influences framing.

Relationship: Development: Needs to Information

Relationship: Properties
Pertains the attributes of relational aspects

Tool

Tool: Bias

Tool: Impact: Helping

Tool: Interaction

Tool: Keeping conscious - reminding - keeping track of

Tool: Reflection

Tool: Surfacing

Tool: Transparency
