CHAPTER 3: PRAGMATISM, INTERACTION DESIGN AND A THEORETICAL FRAMEWORK

This chapter discusses the theoretical foundation for a pragmatic theory of interaction design. The philosophical starting point is with Dewey's pragmatism and the pragmatic understandings of experience, judgment and interpretation. These concepts form the building blocks for the theory. I will also discuss the pragmatic threads in design theories like the influences of Ehn's participatory design and Schön's reflective practice. The chapter concludes with a framework for a new theory of interaction design.

3.1 Dewey, pragmatism and design

In this section, I will provide a brief background of Dewey and pragmatism. The particular concepts of experimentalism, judgment and interpretation will be discussed in greater detail in subsequent sections. I will also aim to answer the question of what motivates the connection between pragmatism and interaction design, and discuss the parallels between pragmatic experience and descriptions of design.

3.1.1 Background to pragmatism

John Dewey (1859-1952) along with Charles Sanders Peirce and William James were the founders of philosophical pragmatism. The contributions of Dewey's pragmatism extend beyond the borders of philosophy. They influenced the social, political and

educational developments of his time through to today. His philosophical views anticipated aspects of Wittgenstein and re-emerged in later thinkers like Richard Rorty and Hans Joas.

In the early twentieth century, pragmatism re-examined foundational questions about how we know and the representations we make of the world through science and knowledge. In the questioning of existing metaphysical truths, pragmatists sought not to simply replace old philosophical truths with new philosophical truths. The aim of pragmatism was to look to science and philosophy for the opportunities they afforded individuals to find meaning in their lives. Pragmatism's disavowal of metaphysics leaves no room for absolutes and certainties. Dewey committed to the non-metaphysical notion that human knowledge is provisional, incomplete, and probabilistic. Dewey saw such a commitment as neither a reason for despair nor false comfort but as a practical matter of philosophically engaging with human experience as fully as possible without recourse to underlying absolutes or transcendental truths. In many respects, Dewey's concerns were with the actions of knowing as opposed to the objects of knowing. This orientation to process combined with the social and ethical views of the world and knowledge that pragmatism presents is what makes it relevant today. The emphatic lack of a foundational approach to thought and reason was made explicit decades before postmodernism. Dewey asserted the need to abandon the dualisms of truth and falsehood, subject and object, and mind and body that dominated prior metaphysical philosophies.

Metaphysics aside, Dewey's greatest charge against certain philosophies centred around the denigrations of the everyday practicality of inquiry and experience: "the most serious indictment to be brought against non-empirical philosophies is that that they have cast a cloud over the things of ordinary experience. They have not been content to rectify them. They have discredited them at large" (Dewey, 1929a, p.40). Pragmatists saw a gap

between sciences, philosophical knowledge and the everyday experiences of living and acting in the world. Dewey's own philosophical starting point was with the here and now of lived experience. Dewey observed that we often experience life as routine coping with familiar situations, however some situations are problematic. His notion of inquiry flowed from the idea of the problematic everyday experience in which a situation is confusing, unresolved, disturbing and lacking in clear possibilities of action. He states, "we must begin with things in their complex entanglements rather than with simplifications made for the purpose of effective judgment and action" (Dewey, 1958, p.387). Truly valuable judgments and actions arise from complexities, not simplifications. Boisvert, a Dewey biographer, describes Dewey's challenge that "the philosopher must become once again an ordinary human being who lives, enjoys, undergoes, suffers, imagines, hopes, struggles, loves, and plans for the future" (Boisvert, 1998, p.16).

Experience is the starting point for philosophic thought in pragmatism. Dewey speaks of experience in its most radical and genuine form describing it as having an "inclusive integrity" (Dewey, 1985). As Boisvert describes it, "on this level, 'experience' weaves together the environment, memory, reactions to physical conditions, interests, limitations, and projects envisioned" (Boisvert, 1998, pp.16-17). Dewey describes experience as interactional. It is the result of interaction between a person and aspects of the world she lives in – or in pragmatist terms entities-in-interaction. Experience resides in neither the person nor the situation but in the interaction between them. In this sense experience is not of the mind or a product of subjective perceptions. Metaphysical dualisms have little place here.

Pragmatic inquiry is the response to the complexities or problematic everyday experiences we encounter. For Dewey, inquiry is a practical tool that transforms

experiences into comprehensible situations, in which possible successful actions are made clear. Pragmatism as such is a generative philosophy; it both uncovers the multiple possibilities through knowledge of an experience and simultaneously offers the more fulfilling and ethical pathways through the possibilities. Yet pragmatism is not a system of thought without people. It is people who are the pragmatists who animate the philosophy, and who do so at different levels of expertise as they develop. Dewey's pragmatism speaks more to how one knows than what one knows. Knowledge is developed through a growing awareness and sensitivity that comes with time or in the prosaic sense, experience. Knowledge may reveal possibilities, but it is evolving judgment and interpretation that determine the value of the possibilities.

3.1.2 Why pragmatism and interaction design?

Pragmatism, in particular Dewey's pragmatism, has the potential to elucidate the intellectual coherency of interaction design that is born out of practice, experience, and human interaction. Equally it provides methods for revealing how the field contributes to knowing in the world. The main pragmatist concepts of experience, judgment and interpretation will serve as the building blocks for the foundation of the theory proposed in this thesis.

Many past theories support a pragmatist view of design. McCarthy and Wright see in pragmatism a revisionary approach to HCI in arguing for the need to understand technology through experience (McCarthy and Wright, 2004). Richard Coyne saw pragmatism as having a supporting role in adopting postmodern theories in information technology design (Coyne, 1995). In addition, the design theorist Richard Buchanan has discussed Dewey as a touchstone in his view of design as a liberal art (Buchanan, 1995). Henrik Gedenryd relied on pragmatism in design as a basis for an interactive cognition

view of design thinking (Gedenryd, 1998). In this chapter I will discuss how Ehn's participatory design via Heidegger and Wittgenstein held a pragmatist position and how Schön's reflective practice is deeply indebted to pragmatism. Perhaps with the exception of Schön, who acknowledged Dewey's influence, no design theories have incorporated pragmatism as a foundation, and especially not with respect to interaction design.

The threads of pragmatism in design thinking are important in showing a natural relationship between the philosophy and design. Yet, it is the very way in which Dewey's pragmatism formulates inquiry that is of utmost relevancy and need in interaction design. Pragmatism's commitments to inquiry through the lived world of experience and the role of the inquirer are critical to design. This is because of design's own commitment to the lived world of practice, and also because design is a human act driven by human actors, namely designers. Additionally, pragmatist notions of experience encapsulate the holistic dynamics of design. Dewey's emphasis on everyday life strikes a chord within design given its often mundane and ubiquitous role in our lives. As discussed above, experience is interactional where "interconnection and interdependency are the rule" (Boisvert, 1998, p.24), and as such, temporality and change are continuous and cannot be abstracted away. This is an apt framing for design experience and accounts for the underlying reasons for design theory's past resistance to abstraction. Dewey accounts for the lack of representation in experience yet argues for its substantiation through inquiry; a tack that design theory can productively follow.

3.1.3 Design and experience

The dynamics of design are the very problematic experiences from which Dewey's inquiries begin. This is echoed in Schön's own well-known characterization of designers engaging situations of uncertainty, instability, uniqueness and value conflict (Schön, 1983).

Traditionally, design theorists have described the vagaries of design in similar fashion. For example, Herbert Simon (Simon, 1973) characterized a class of problems as ill-structured, meaning that in contrast to structured problems, ill-structured problems were undetermined, crossed several domains of knowledge, lacked clear goals, and came with incomplete information. Equally there is the notion of design as “wicked problems” by the design theorist and planner Horst Rittel and Melvin Weber (Rittel and Webber, 1973). Rittel saw in design planning ill-defined problems that could be characterized as “wicked”: such problems are messy, circular, incomplete, contradictory, often changing and rife with complex interdependencies. Rittel enumerated ten properties of “wicked problems” (Rittel and Webber, 1973):

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

Among these ten properties we find many parallels to pragmatism’s understanding of experience. For example, there is concreteness to these problems such that “every

wicked problem is essentially unique" and that every attempted solution "counts significantly." Wicked problems consist of dynamic interrelationships or, in pragmatist terms, entities-in-interaction such that the "problem can be considered to be a symptom of another problem" and there is no definitive endpoint or "stopping rule." Multiplicity can be assumed such that wicked problems "do not have an enumerable (or an exhaustively describable) set of potential solutions" and "are not true-or-false, but better or worse." Lastly, the planner or designer is present within a wicked problem such that it is the designer's "choice of explanation" that "determines the nature of the problem's resolution" and that a designer is responsible and is liable with respect to the problem, "the planner has no right to be wrong."

I previously cited Schön's characterization of the situation designers encounter as engaging uncertainty, instability, uniqueness and value conflict (Schön, 1983). Schön's theories echoed Dewey by addressing the gap between the abstract knowing of philosophers and scientists that he referred to as "technical rationality" and the practice-based knowing of professionals that he called reflective practice (Schön, 1983). Designers are embodied within the theory as reflective practitioners who generate knowing by doing. Schön generally referred to design experience as "design situations." Like Rittel's "wicked problems," reflective practice accounts for the dynamic, contingent, and unfolding nature of design. Yet Schön was also careful to detail and elucidate the actions and reflections of the designer embodied within design situations. The designer functions by going back and forth between construction and reflection of the situation as a means to understand the situation the designer is creating.

Interaction design can be understood as a prospective action animated by a proactive and embodied inquirer who experiments within a present moment in order to

consider future actions and contingencies. For example, Schön views design as a conversation (Schön, 1983). Rittel understands design as argumentation (Rittel and Webber, 1973). In either case, each analogy explicitly describes an activity in which the actions of speaking/listening, and the nature of what is being said/understood are intertwined and dynamically inform each other for further prospective actions. We can view design in pragmatist terms as the interactions between an inquirer or designer, subject-matters or possibilities within the lived world, and actions.

3.1.4 Key aspects of pragmatism and design

So far in this chapter, I've introduced pragmatism as a philosophical starting point for a theory in interaction design. Key philosophical principles set pragmatism apart from other philosophies and hold affinities with interaction design practice, namely pragmatism disavows absolutes, seeing knowledge as provisional, incomplete, and probabilistic. Furthermore pragmatism holds a generative view that looks prospectively toward actions that create value and knowledge. Lastly, I also discussed how pragmatism has a natural relationship to design and how a pragmatist lens fits with past descriptions of the design experience, namely "wicked problems" and "design situations".

3.2 Interaction design as experience

In this section of the chapter, I will show how a pragmatist formulation of experience and inquiry directly informs an understanding of interaction design by emphasizing how the interactional nature of inquiry and experience makes clear the role of a designer as an embodied inquirer, and that the experience of designing can be articulated by the dimensions of experience that include concreteness, multiplicity, and entities-in-interaction. Lastly, I will discuss how past design thinkers offer clear starting points for

such a theory in line with pragmatism, including reflective practice, ethnography and participatory design.

3.2.1 Concreteness

A pragmatist begins thinking and knowing with experience, and assumes that it is only through experience that we interact with the world. In deceptively simple terms, Dewey states that the meaning of experience is experience itself. In *Experience and Nature* (Dewey, 1958), Dewey describes a surprising and fearful sound heard in a darkened house during a storm. The sound turned out to be the knocking of a window shade against glass. Dewey explains that the experience of the sound was unexpected and haunting. Learning the source of the sound does not alter the experience and to hear the sound again would make for a new and different experience altogether. A pragmatist grounded in ordinary experience simultaneously accepts its concreteness and the existential integrity of contingency, responsibility and the possibility of not knowing or failing. These are the conditions of experience and any inquiry of the experience.

As I've discussed, experience is interactional between entities that include the inquirer:

> The outline of the common pattern is set by the fact that every experience is the result of interaction between a live creature and some aspect of the world in which he lives. A man does something; he lifts, let us say a stone. In consequence he undergoes, suffers, something: the weight, strain, texture of the surface of the thing lifted. The properties thus undergone determine further doing. The stone is too heavy or too angular, not solid enough; or else the properties undergone show it is fit for the use for which it is intended. The process continues until a mutual adaptation of the self and the object emerges and that particular experience comes to a close (Dewey, 1934, p.45).

This example by Dewey from *Art as Experience* (Dewey, 1934) prefigures Schön's description of a design situation (Schön, 1983), and moreover describes again the

concreteness of the experience, i.e. it is as it can be described and is without some other purpose or meaning. Further dimensions detailed in this example include the interactional nature between "a live creature and some aspect of the world," and the multiplicity of experience as an indefinite set of unknowns, possibilities and adaptations. Additionally, Dewey's passage makes clear the embodied presence of the inquirer. The "man" is not an observing spectator; rather he is an experimenter trying out different actions in a continuum between knowing and doing.

I'd like now to turn to a personal account of a visit to a natural history museum that was part of a research project that I later use as a case study in this thesis. The example is of a museum for which our team was researching and developing an adaptive museum guide. A visit to a museum reveals an everyday yet dynamic interaction situation. The factors within museum experiences are social, cultural, historical and psychological. The influences on the experience vary from the actions and previous knowledge of the visitor, the visitor's learning style, and the dynamics of friends, family and strangers around them. Naturally, the experience is affected by the presence of the artifacts and the relationships within collections as an outcome of institutional history, curatorship, exhibition design, and architecture. The time of day, duration of visit, room temperature and so on, all have an impact. In museum studies literature, the experience has been characterized as "multivariate", that is, it cannot be assessed by a single factor such as exhibit design, signage, or time spent in front of an artifact (Lehn et al., 2001a). Instead, the museum experience is subject to multiple influences and results in multiple outcomes (Leinhardt and Crowley, 1998).

From the perspective of an interaction designer, grappling with understanding a museum visit, the experience can be both elusive and at times self-evident. It was elusive

given the multiplicity of qualities. It was self-evident at times given my own history of having worked in museums as a preparator, having visited innumerable natural history and science museums, and having experience and knowledge of designing with interactive technology in museums and similar contexts. After my first visit to the museum we were working with I left with a number of reflections. The exhibit displays were like a series of small theatrettes set along a slightly curving path, the exhibit design was repetitive but playful. I found that the playful quality was accentuated by a large mastodon display that punctuated the centre of the curving path. Each display, like a tiny theatre for one, enveloped you as you moved in closer to view the artifacts. Like a theatre set, the oversized structures were made of inexpensive materials, brightly painted wood, large signage, and Plexiglas. The overall quality of the exhibit displays was of temporary structures that had been in use too long, and as a result there was some wear and tear. As it was, the museum was about to be closed for major renovations and the exhibits completely redone. Nevertheless, I found that the wear and other aspects of the building, such as worn carpeting and cool interior temperatures (I kept a sweater on) undercut the light heartedness of the look and feel of the exhibit. On the other hand, the acoustics were not very good since the ceilings were high, however I liked how they added a raucous and joyful aspect, especially when children visited. The trailing and echoing sounds created an acoustic shape accentuating the curvy pathway. A simple wooden puzzle game created a noisy racket of wooden puzzle pieces falling into a wooden chute. This noise drew people into the space since it was often accompanied by surprise and laughter. And so the space felt contradictory in that it was both upbeat and downbeat at the same time. Adding to this was the fact that the natural history artifacts were themselves interesting, however each display was so crammed full of objects that the net result was fatigue and frustration, which ultimately led me to boredom when trying to figure out the significance of each artifact. To

make matters worse, the previous day I visited the museum's research facilities and collections storage. In a word the visit was exciting. The facilities literally housed the equivalent of two to three football fields of artifacts and data. Seeing the artifacts in the context of active research and having researchers on hand to contextualize the data and bring to the discussion personal anecdotes of the experience of collecting them or working with them brought the collection alive in a way the museum exhibit did not.

These impressions of my first visit to the exhibit show the concreteness of the experience that I felt. There is no single priority in representing a museum visit as an experience, and the voice or presence of the inquirer of that experience is evident. With respect to interaction design we can say that the experience does not readily give over to a single problem to solve nor can it be viewed as a whole easily reducible to salient factors. In design, first-person accounts are critical, yet a view that incorporates the multiplicity of perspectives and possibilities may make the most of the concreteness of experience. The emerging practice of design ethnography suits this need well. Ethnographic methods provide an integrated and contextually descriptive approach, better suited to engaging experience in everyday contexts. Ethnography involves both a set of methods for doing fieldwork and an analytic approach for making sense of the data collected during the fieldwork (Button, 2000). Ethnographic studies conducted throughout the design work provide crucial details about the specific situation and practices, yielding both designed artifacts and systems that are a better fit and more sustainable within their context (Randall et al., 2007), and create new knowledge about interaction design (Wakkary et al., 2007). In fact, field studies in design have a long history that is parallel to ethnography and can distinctly be considered as design ethnography (Randall et al., 2007).

3.2.2 Designer as inquirer

Throughout and subsequent to Dewey's time, the inclusion of memory, affect, somatics and actions of the inquirer in the formulation of experience led to criticisms of subjectivity. Dewey's critique of objectivity, namely reductionism and rational abstraction, is misconstrued as a call for subjectivity:

> Whether a certain term, say "experience," has subjectivistic or objectivistic implications, we might have to consider whether, taken without specific qualifications, it was not rather a neutral term, a term to be used "without prejudice."… In contrast with this conceivable meaning of the term neutral, which might be called the logical, stands another term which might be called the metaphysical or ontological, namely there is a certain sort of stuff which is, intrinsically, neutral (Dewey, 1980, pp.49-50)

Dewey's rebuttal is to challenge the dualism of objectivity and subjectivity and the underlying metaphysical claims such as the idea of intrinsic neutrality in inquiry. Dewey's experience was not fashioned in metaphysical terms. He later lamented the inability for philosophy to understand experience as anything other than an individual perspective.

> The appeal to "experience" was a thoroughly wholesome appeal to liberate philosophy from desiccated abstractions. But I failed to appreciate the fact that … philosophy had corrupted and destroyed the wholesomeness of the appeal – that "experience" had become effectively identified with experiencing in the sense of the psychological, and the psychological had become established as that which is intrinsically psychical, mental, private (Dewey, 1929a, p.362).

Dewey's claim is that experience is things as they are, i.e. experience is its concreteness. He argued that inquirers always begin and constantly return to the concreteness of the experience and the embodied inquirer. The non-linearity of the experience, for example the shift from emotion to bodily state or the simultaneous multiple and heterogeneous possibilities are part of the "inclusive integrity" of experience. Inter-subjectivity, or the sharing of subjective states by others, is part of that inclusiveness. In my own example of the museum visit, the subject-matters of the inquiry included my own

perceptions as a visitor and design researcher together with inquiries of other states like other members of the team, the other museum visitors, the curator, the natural history researchers, and the museum administration. Dewey argued for the fullness (including the somatic and embodied) of the participation of inquirers in order to understand experience.

3.2.3 Multiplicity

Descriptions of experience fold and unfold, often in different and even contradictory trajectories, despite being of the same experience. It would be incorrect to consider these as attempts at exhaustive accounts. Pragmatic experiences are inexhaustible. Dewey referred to this as the "infinitely other and more" in human experience, yet at the same time there is completeness or an "inclusive integrity" rendered by the inquirer. The "infinitely other" is expressed as a multiplicity, "sense data" that is saturated with memory, affect, somatic awareness, and history. In my example of the museum, boredom, playfulness, the need to wear a sweater, and memories of visits to the storage facilities mixed and intermingled. The multiplicity or multivariate (Lehn et al., 2001b) challenge a single meaning or purpose to the experience.

Multiplicity at its most evident is expressed in social and cooperative endeavours. Interaction design is collaborative and interdisciplinary within the design team and participatory with respect to the stakeholders and end users. It is a highly social and cooperative discipline. Boisvert (Boisvert, 1998) makes this point with an example of a community wanting to know if a particular water source provides potable water. Some may want to identify the chemical makeup of the water, others may wish to examine the history of water use by communities, and others may be interested in the religious symbolism or irrigation potential for crops. The point Boisvert makes is that both the context and the material of the inquiry, in this case water, and what Dewey refers to as subject-matters, is

not one-dimensional to be viewed in one correct way. Boisvert explains that subject-matters are "repositories of multiple possibilities, many of which remain latent until the activities of inquirers help bring them out" (Boisvert, 1998, p.37). This further elaborates on the pragmatic formulation of the interaction between an inquirer, subject-matters, and actions. Returning to the example of the museum visit, the multiplicity of possibilities within the inquiry from a design researcher perspective included the questions of the design of play in interaction and content, the role of tangibility in an interface supportive of play and learning, the role of user model and adaptive reasoning in supporting a tangible interface, and the potential of acoustic ecologies and displays. Each is a possible research question that is simultaneously embodied in the situation.

3.2.4 Entities-in-interaction

As one might expect it is a challenging and questionable task to isolate and explain dimensions of pragmatic experience. The qualities of experience are intertwined and thus I've already discussed the dynamic interrelationships or entities-in-interaction in explaining multiplicity and concreteness. This is unavoidable. However there is a primacy given to entities-in-interaction in Dewey's formulation that must be clearly stated. Experience is constituted by the dynamic interaction between entities in the lived world. It neither resides in the person nor in the world but in the interaction between them. Yet the comprehensibility of experience depends on the fully present and interacting inquirer.

Schön's articulation of reflective practice goes a long way toward manifesting the idea of entities-in-interaction in design and professional practice. Schön sought to dispel the idea that design is an inexplicable black box. Hence, he focused considerable energy on carefully formalizing the actions of doing in design by naming different design actions such as design moves, reframing, backtalk, etc (Schön, 1983). A central concept is that designers

are in constant conversation with materials, and the design artifact's emergent forms. This dialogic model for design exemplifies the notion of entities-in-interaction.

The technique of design games in participatory design (Ehn, 1989) is another example of entities-in-interaction in the formalized practice of design. Theoretically based on Wittgenstein's' idea of language games and Heidegger's idea of embodiment, design games are a manifestation of the comprehensibility of design through interaction. Design games incorporate an inter-subjective approach between designers and end-users in which the aim is mutual learning between designers and end-users. As an example, Ehn cites the making of cardboard props of computer and networking equipment and a design game aimed at experimenting with possible configurations of workspace and a new system (Ehn and Kyng, 1991a). Design games adhere to the principle of "design by doing" by allowing users to enact their practical skills while participating in the design process. It is important to point out that the design games target the phenomenological aspects of designing and the embodiment of skills through role-playing and physical re-enactments.

3.2.5 Key aspects of interaction design as experience

Dewey's pragmatism has taken our formulation of interaction design some distance from the traditional empirical approach that is at the heart of an HCI view of interaction design. The traditional approach would call for a reduction of the design phenomenon into hierarchical elements that could be isolated and compared as variables. Additionally, traditional empiricism calls for an "objective" inquirer who minimizes his or her presence within the inquiry. HCI in its various flavours tempers this strict notion of empirical studies yet adheres to the central tenets of an objective viewer and a distant phenomenon. In HCI, understandings of interaction design are further eclipsed by the view that the user is the phenomenon of study; the focus being on the interactions of a user. This leaves a gap in the

understanding of what design of interactive technologies is and how it is performed. Current interaction design theory makes little attempt to explain the field at the epistemological level, avoiding "what is interaction design" questions or simply adopting HCI concepts in place of asking the questions. Where current interaction design theory does weigh in, the theory focuses on how interaction design is performed. Methodological discussions are less clear on their scientific and research value (in the context of HCI) and hence the position of the researcher is ambiguous. However, interaction design methods tend to hold onto the notion of the user as a distant phenomenon and the object of study. As a consequence, whereas HCI focuses on the interaction *of* a user, interaction design methods tend to focus on interactions *with* a user, i.e. how to incorporate the idea of the user into the design process. In contrast, our discussions have led us to an understanding of interaction design in which the experience of design is the phenomenon of study, in which the designer is directly involved in shaping the phenomenon and rendering it meaningful.

What I have been discussing in this chapter is a vastly different formulation for thought and knowing in interaction design. Pragmatism does not separate the phenomenon from the experience but argues that the phenomenon emerges in the form of experience through interaction with an inquirer. As Schön makes clear, the designer shapes the design situation, and Dewey's pragmatist interacts and resolves experiences through an embodied inquiry. The epistemological assumption underlying this pragmatist view is that experience is concrete and indivisible except as a simultaneous multiplicity of possibilities that can only be known through the interactions and actions of a present inquirer.

From our discussion so far on inquiry and experience in interaction design, I draw the following:

- Pragmatism's formulation of experience (concreteness, multiplicity, and entities-in-interaction) directly informs and illuminates interaction design;
- An interaction designer is an inquirer of the design experience, acting as an active agent in the knowing and comprehensibility of interaction design through an embodied and proactive presence in the inquiry;
- Several departure points in past design thinking exist for a mobilization of pragmatism in interaction design including ethnography, participatory design, and reflective practice.

3.3 Interaction design as inquiry

If we consider interaction design as experience, then instances of interaction design in both practice and research can be seen as inquiries. In a pragmatist view, the differences in actions of interaction design between research and practice are less of a concern since the two approaches are subsumed under the idea of an inquiry. I will focus on three aspects that describe the nature of inquiry in interaction design and the idea that a designer is an inquirer: experimentalism, judgment, and interpretation.

3.3.1 Experimentalism

Dewey advocated for inquiry as a hands-on interaction with the world in which an inquirer shapes, tests, and explores an experience while simultaneously constructing the experience. In design and in most other human experiences, clear separations or borders between thinking and doing are non-existent. The embodied inquirer simultaneously acts and reflects with the situation as a way of knowing. While Dewey was critical of philosophy aping science in a reductionism of things known, he lauded the acts of knowing in science, namely experimentation. Dewey directly contrasted "experimentalism" with "empiricism," seeing the latter as outdated and insufficient. Earlier in the discussion on concreteness (see 3.2.1 Concreteness), I cited a passage by Dewey from *Art as Experience*

(Dewey, 1934) to explain the interaction between an inquirer and entities. In the passage, a man lifts a stone and through a series of interactions he explores the properties until a "mutual adaptation" emerges between him and the object thus resolving the experience. At the heart is an experimentalism that rests on embodiment, imagination, and future possibilities.

Dewey's experimentalism is premised on the embodiment and presence of the experimenter. He argued against the distant observer and the precepts of the disembodied mind or objectivity. Dewey commented on how traditional philosophy was akin to "a spectator viewing a finished painting rather than after that of the artist producing a painting" (Boisvert, 1998, p.37). An inquirer is one who manipulates the subject-matter and introduces changes for intended and unintended effect thus directly participating in the act of knowing. Earlier (see section 3.2.4 Entities-in-interaction), I discussed how Schön's reflective practice rests on a dialogic relationship between designers and design processes and materials reliant on action and reflection. Reflection-in-action captures the qualities of Dewey's embodied inquirer exceptionally well:

> When someone reflects-in-action, he becomes a researcher in the practice context. He is not dependent on the categories of established theory and technique, but constructs a new theory of the unique case. His inquiry is not limited to a deliberation about means, which depends on a prior agreement about ends. He does not keep means and ends separate, but defines them interactively as he frames a problematic situation. He does not separate thinking from doing, ratiocinating his way to a decision, which he must later convert to action. Because his experimenting is a kind of action, implementation is built into his inquiry (Schön, 1983, p.69).

Evidently influenced by Dewey's inquirer, Schön's reflective practitioner "does not separate thinking from doing." The practitioner experiments in ways that simultaneously integrate reflection, action, and implementation. Further, experimentation is not "limited to a deliberation of means" and so is more independent of predetermined goals; in fact the

experimentation shapes both the process and the goals together into descriptions of the problem from which may emerge a more productive possibility. This strongly echoes Dewey's entities-in-interaction and the premise that the experience is shaped by the inquirer's interaction with the aim of creating possibilities for future good.

> In more detail, shaping the problem is what Schön refers to as a frame experiment: When the phenomenon at hand eludes the ordinary categories of knowledge-in-practice, presenting itself as unique or unstable, the practitioner may surface and criticize his initial understanding of the new phenomenon, construct the new description by an on-the-spot experiment… he may construct a new way of setting the problem—a new frame which, in what I shall call a 'frame experiment', he tries to impose on the situation" (Schön, 1983, p.63).

Schön has mobilized Dewey's inquirer into modes of practice like design. As the inquirer engages problematic experiences, the practitioner invokes an inquiring experimentalism with new phenomena or problems in practice. The frame experiment is explicitly the type of shaping of subject-matters expressed by Dewey. Further, the frame experiments are possible descriptions of the problem and outcomes. An inquirer explores and creates multiple and even contradictory experiments as part of the overall inquiry. In this mode of pragmatic inclusivity and multiplicity, such descriptions are simultaneous representations of the situation at hand and elicitations of possible future outcomes. It is imagination that motivates experiments and descriptions of the present problem and future possibilities. Dewey argues that past traditions of philosophy drove a sharp wedge between artists and scientists (Boisvert, 1998). The imaginative constructions of the artists were minimized as fanciful flights of subjectivity. The identity of the scientist as objective stripped him or her of any imaginative capacity. Dewey of course argued that both scientists and artists fuelled their experimental inquires with imagination. Schön captured this shared approach between practitioners of art and science in his characterization of "virtual worlds" or experimental spaces for creativity:

> The therapist's use of the transference and the architect's sketchpad are examples of the variety of virtual worlds on which all the professions are dependent. A sculptor learns to infer from the feel of a maquette in his hand the qualities of a monumental figure will be built from it. Engineers become adept at the uses of scale models, wind tunnels, and computer simulations. In an orchestra rehearsal, conductors experiment with tempo, phrasing, and instrumental balance…Virtual worlds are contexts for experiment within which practitioners can suspend or control some of the everyday impediments to rigorous reflection-in-action. They are representative worlds of practice in the double sense of "practice". And practice in construction, maintenance, and use of virtual worlds develops the capacity for reflection-in-action which we call artistry" (Schön, 1983, p.162).

The virtual world is an experimental space that is to be understood in its many forms of imaginary constructs including the ephemeral (therapist's transference), provisional (architect's sketchpad), and concrete (sculptor's maquette, engineer's scale model or a musical rehearsal). These experimental "spaces" allow for imaginary representations of what is and what could be. Schön's allusion to the double meaning of practice grounds imagination and experimentation in two different ways. Firstly, the more imaginative descriptions are concrete or make the present or future situation experiential, i.e. the experience can be brought into practice more readily. Secondly, imagination is itself a skill that is practiced and increases in ability and quality to the level of "artistry".

Our discussion so far has focused on the material and procedural nature of design, yet the subject-matters of inquiry include the social. For example, Schön expands on the idea of experimental space in a discussion of role-playing and the exploration of interpersonal situations:

> A role-play is an improvised game in which the participants learn to discover properties of an interpersonal situation and to reflect-in-action on their intuitive responses to it. In improvisation, musical or dramatic, participants can conduct on-the-spot experiments in which, as improvisation tends towards performance, the boundaries between virtual and real worlds may become blurred (Schön, 1983, p.162).

The formulation of social embodiment, improvisation, and experimentalism took on its clearest form in Ehn's description of design games in participatory design (Ehn, 1989). As discussed previously (see 3.2.4 Entities-in-interaction), in design games, imagination underpins the social and embodied inquiry. Imagination drives the inquiry and the need for the social knowledge exchange and collaboration. Imagination answers the exploration of future possibilities as in the design games exploring possible design outcomes. Ehn articulates an embodied participation through social interaction in design that is theoretically based in Wittgenstein's language games. Ehn saw design and other skills as essentially languages. Both design and skills could be bridged in a generative and participatory fashion through the structure of games based on improvisation and role-playing. Ehn extended the idea of language games to include embodied interactions in order to highlight and make explicit the tacit and practice-based knowledge of design and other forms of knowledge embodied in skills and practices. Interaction in the sense of participatory design is mutual learning that is firstly descriptive and ultimately generative. Design games allowed designers and users to enact together activities that imaginatively explored and played with future possibilities. The collaborative and social exchange was cemented by the shared embodiment of the design exploration. This social embodiment allowed users to enact their longstanding practical skills and share these with designers, meanwhile participating in a creative design process. Participatory designers structured design games as an embodied exchange of knowledge, collaborative knowledge creation, and shared experimentation.

A designer as a pragmatic inquirer is at the heart of experimentalism. First and foremost this establishes the active and participatory presence of the designer within the creation of design and knowledge. The disavowal of the observant spectator for the

proactive and hands-on inquirer puts a particular emphasis on the first-hand accounts of experience. In addition, pragmatic experimentalism is not the result of planned experimental design but rather is a consequence of emergent interaction. This type of experimentalism can best be accounted for in ethnographic and auto-ethnographic terms. Ehn provides first-hand descriptions of actions of the systems he helped shape as a designer (Ehn, 1989), and Schön relied heavily on ethnographic vignettes or case stories as a tool to advance his theories (Schön, 1983). Earlier, in section 3.2.1 Concreteness, I discussed ethnography in design and its role in respect to the concreteness of experience. We can know from this that the notion of the designer as an inquirer is well served by ethnographic commitments on the part of the designer, including participant observation, views of the participants, analysis, and reciprocity. Ethnography serves as a tool of inquiry, for example in the realm of social embodiment in participatory design, as well as the critical need to provide transferable accounts of the design experience itself. In many respects, Schön's idea of reflecting back on practice requires the material and the descriptions of design to facilitate the reflections within interaction design, and also requires the communication to fields outside of interaction design.

In summary, experimentalism in interaction design incorporates the following principles:

- Design inquiry requires embodied participation of the designer with matters that are social, material, and procedural;
- Design inquiry involves multiple constructions and representations of present and future possibilities motivated by imagination and experimentation;
- Design inquiry is a first-hand experience that for inquiry and valid accounting requires ethnographic commitments to adequately relate the concreteness and multiplicity of the design experience.

3.3.2 Experimental actions of the inquirer

In our discussions so far I have shown that an inquiring interaction designer simultaneously reflects, acts and implements through experimentation. The experimentation is not a hands-off affair; rather the designer directly shapes the design experience in order to create productive possibilities. I discussed how pragmatism describes embodiment, imagination, and multiple possibilities as intertwined within experimentation and as such form the basis for inquiry in interaction design. The designer has an embodied presence in the inquiry and the design experience is constituted through his or her interactions. The experimentation shapes present and future possibilities emergent in the experience. And lastly, as part of the inquiry, a clear account of the design experience and the role of the designer are given. These accounts of the design experience provide the designer and others with the opportunity to understand and interpret the judgments exercised as part of the inquiry. Central to experimentalism is the back and forth between judgment and interpretation.

The simultaneity of thinking and action in interaction design requires the integration of judgment into the process of inquiry. Judgment in design is integral to the on-the-spot experimentation of inquiry. It is often formative, in the moment of design as well as summative, an evaluation of an outcome. This is not an arbitrary matter but rather ongoing decision-making is one of the mechanisms of inquiry that keeps it progressing and enables it. In returning to Dewey's example of the man and the stone, judgment fuels the experimentation and prods the imagination to attempt one framing and reframing after another.

The actions of the designer in the face of indeterminate situations are to move and shape the situation into a greater and greater determinacy. As Schön states it,

"experimentation is a kind of action, implementation is built into the inquiry" (Schön, 1983, p.69). The connection of means to ends in the immediacy of both comprehension of the situation and action within the situation is an act of judgment and interpretation that is served by what Dewey refers to as "somatic intelligence" (Dewey, 1929b). Somatic intelligence can be understood as *thoughtful manipulation* (Boisvert, 1998). Judgment together with interpretation makes certain that experimentation is not unconsidered or haphazard. The reflective shaping of the interaction designer toward particular outcomes is what moves the situation from multiple possibilities toward a set of actual possibilities.

Löwgren and Stolterman in *Thoughtful Interaction Design* (Löwgren and Stolterman, 2004) emphasize that design is an ethical activity. They argue that interaction designers need to reconcile as best they can their own ideals and values with the design outcomes they produce. It is a designer who motivates knowing in the experience of interaction design and a designer who is responsible for the actions resulting from that knowledge. The experience of interaction design, its concreteness and entities-in-interaction, makes it difficult to avoid the responsibility. Designer inquirers are embodied in the design situation and cannot retreat from the ordinary experience of their design actions. Design is not solely an "intellectual" exercise; it is an embodied and felt experience that does not elude the designer. Participation in the experience through somatic intelligence acknowledges the responsibility and supports the exercising of judgment and interpretation to shape the conditions that bring along with them good and bad consequences. And so careful reflective action is needed to determine which ends should be achieved and which should be discouraged. To paraphrase Boisvert, progress in interaction design "is neither inevitable as the optimist would hold, nor hopeless as would hold the pessimist. A world where possibilities are ever-present is a world in which intelligent

participants have to gauge carefully the consequences of their actions" (Boisvert, 1998, p.25).

Judgments are actions in interaction design; in other words they are design decisions that create representations of possible outcomes, design activities that help reflectively progress the inquiry, provisional and final design outcomes, and evaluations of those outcomes and other judgments. The designer inquirer's judgment is a response to the pluralism of the situation and is motivated by responsibility and supported by somatic intelligence. However judgments alone cannot address the multiplicity; rather the actions of inquiry are characterized as a back and forth between judgment and interpretation. Multiplicity of the design situation must be negotiated and is therefore critically dependant on interpretation.

In the sciences, formative knowledge is seen as speculative or conjectural at best. Dewey's pragmatism however makes no such commitment to absolute knowing, and rests on the understandings that we act without certitude and that knowing wrestles with the fullness of the lived world that is temporal and changing. Critical understanding of experience is an ongoing opening of that fullness. This does not mean that claims of knowing go untested, rather pragmatic inquiries are subject to the test of the concrete experience from which they are derived and are also subject to the remit that the claims hold value or afford possibilities over time. In experimentation, interpretations carry out this evaluation and shaping of the claims, especially in understanding the development and existence of interactive artifacts and systems.

In design, this call for constant reflection and analysis of conditions on the part of the designer has multiple dimensions. These include the different perspectives of the designer inquirer, design team members, and views of stakeholders in the design situation.

Additionally there is a temporal dimension that interprets results summatively as findings and seeks ongoing interpretations over time through criticism

3.4 Theoretical framework

In Chapter 1 (see 1.2 Role of theory in interaction design), I discussed the role of theory in interaction design. I concluded that theory that served interaction design would ideally describe critical concepts, principles and definitions, and provide an explanation of the relationships, actions, actors and processes within interaction design. The theory would facilitate new forms of practice, creativity, and discoveries with a prospective orientation grounded in the practice of making that leads to an understanding of future possibilities. And the theory would guide interaction designers in determining the value of each possibility. The novelty of this type of theory is in the acknowledgment of the practice of design and the role of the designer. I have to this point discussed at length the philosophical framework of pragmatism for interaction design. The further uniqueness of the theory is in its details. This section is devoted to articulation of a pragmatist view of interaction design in a mobilized form that supports the putting into action the views discussed. And by doing so, articulating and uncovering the details that make the theory unique to interaction design.

The vehicle for this is a theoretical framework that shapes the discussions above into a more explicit form. The framework is comprised of three layers: 1) experience layer; 2) inquiry layer; 3) actions layer. The experience layer is the setting out of core concepts and definitions. The inquiry layer addresses the design experience or a given design situation. The actions layer expresses the design activity throughout the full lifecycle of the interaction design artifact(s) or system.

3.4.1 Experience layer

The experience layer describes epistemological assumptions and the basic thinking underlying interaction design. The aim of this layer is to define concepts that are core to interaction design. The experience layer is a high level understanding of the field that frames reflection on disciplinary concepts and definitions and generates meta-level or epistemological accounts of experiences of interaction design, i.e. what lies within and without our understanding of the field. In many respects this is the philosophical view of the field, in and of itself it is not very helpful for inquiring about particular design situations or design practice, but without it we would lack the theoretical foundation and tools to best understand interaction design and have principles by which we validate and interpret the newness of knowledge created and the success of our activities.

In this layer we find two overarching concepts. The first is that interaction design is understood as experience. In this chapter, I have discussed the match between interaction design and the pragmatist formulation of experience. The experience of interaction design can be articulated by the dimensions of concreteness, multiplicity, and entities-in-interaction:

- *Concreteness*: experience is as it can be described, without some other purpose or meaning. There is no single priority within an experience and as such it does not readily give over to a single problem to be solved nor is it easily viewed as a whole reducible to salient factors. Concreteness describes experience as contradictory, irrefutably present and accessible, yet contingent and open to not knowing.
- *Multiplicity*: experience is inexhaustible, being saturated with intellect, memory, affect, somatic awareness, and history, yet there is an "inclusive integrity" to an experience that can be rendered explicit by inquiry. Experience as such is a repository of multiple possibilities to be drawn out by an inquirer.

- *Entities-in-interaction*: experience is constituted by the dynamic interaction between entities in the lived world. It neither resides in the person nor in the world but in the interaction between them. The comprehensibility of experience is reliant on inquiry.

The second concept is that an interaction designer is an inquirer of that experience. These two concepts, interaction design as experience, and an interaction designer as inquirer, are interdependent. The attributes of experience rely on an inquirer for comprehensibility and imagination to uncover its possibilities. This is explicit in the idea of entities-in-interaction. In a sense, an interaction designer as inquirer constructs the experience of design and therefore cannot be separated from the experience. Key attributes to an interaction design inquirer are embodiment and proactiveness:

- *Embodiment*: design experience is both constituted by the interactions of the designer and the world, and is simultaneously rendered comprehensible by the inquiring interactions of a designer. Experience and inquiry is felt, somatic, and interactive. Given this, a designer is not a distant observer in design experience but rather is an embodied presence in both the experience and the inquiry.
- *Proactiveness*: an interaction designer actively shapes the experience to imaginatively render the multiple possibilities latent in the experience.

In Figure 4, the experience layer is illustrated with key concepts and attributes. At each layer there are a set of outcomes, some of which are theoretical and others practical yet all satisfy a theoretical need. The experience layer is in essence epistemological, and so outcomes are theoretically reflexive on the core thinking underlying the theory and field (see Figure 4). The outcomes are theoretical reflections on the experience of interaction design, including critical inquiry of design experience, the nature of design inquiry, and methodological discussion of design actions. Additionally, at this level the outcomes include descriptive accounts of what constitutes interaction design as a measure of the borderlines of the field. This layer outlines a level of the theory for researchers and

practitioners to address and discuss aspects of what constitutes the field of interaction design.

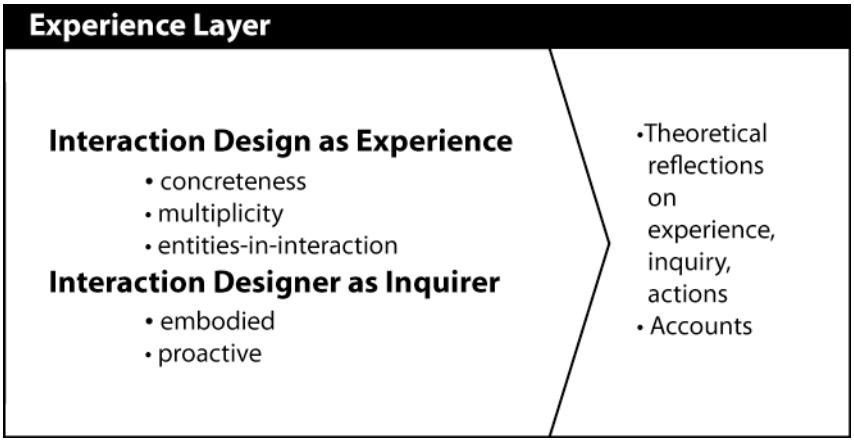

Figure 4 Experience layer of the framework

3.4.2 Inquiry layer

The next layer of the framework is the inquiry layer. This layer addresses design inquiries of a given design experience. For example, individual design projects can be considered inquiries. This layer allows us to better understand the research and knowledge contributions of individual projects and is one part of the framework that articulates how interaction design is conducted at the project level.

At the centre of interaction design as inquiry is the idea of experimentalism. As discussed earlier in this chapter (see 3.3.1 Experimentalism), the practitioner invokes an inquiring experimentalism with new phenomena in practice. Design inquiry is a hands-on interaction with the world in which the designer shapes, tests, and explores an experience. Simultaneously, the designer constructs the experience as a result of the experimentation and as such, the designer simultaneously acts and reflects with the situation as a way of knowing. Earlier in the discussion on concreteness (see 3.2.1 Concreteness), I referred to design inquiry as a "mutual adaptation" between the designer and entities in the world as a

means to resolving the experience. In Figure 5, experimentalism occupies the centre of the illustration, representing how this principle animates design inquiry.

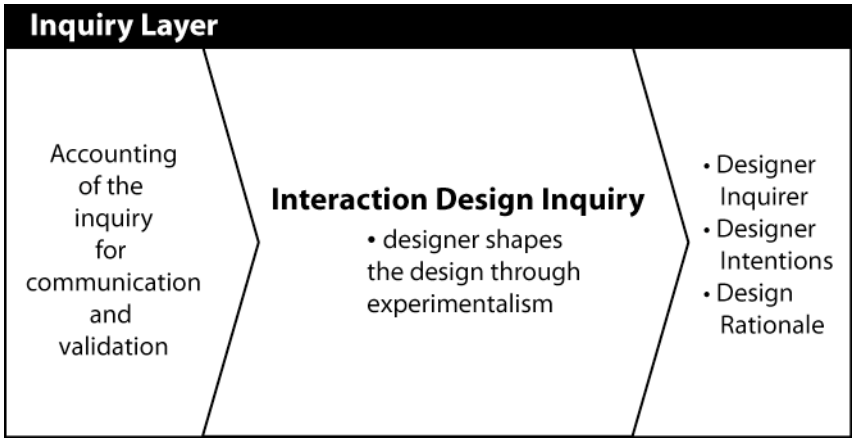

Figure 5 Inquiry layer of the framework

Experimentalism in interaction design requires embodiment, imagination, and future possibilities. These are manifest in what I call the outcomes or products of inquiry. The embodiment of the inquirer, i.e. who is the inquirer, shapes the inquiry. The designer inquirer's imagination and prospective thinking brings intention, motivation, and ultimately a rationale for the unfolding of the inquiry. In Figure 5, these products of the inquiry are illustrated to the right of the model. They include:

- *Designer inquirer*: who is (are) the inquirer(s)? What past experience is relevant to the particular inquiry?
- *Designer intentions*: explicit statement of the intent or intents of the inquirer with respect to the design inquiry. How will the shaping of the experience be guided and what are imagined outcomes?
- *Design rationale*: explicit reflection on the whys and hows of the inquiry. Rationales support the designers' intentions.

At the conclusion of the section in this chapter discussing experimentation (see 3.3.1 Experimentalism) I discussed how the experimentalism, which is first-hand, can be accounted for through ethnographic and self-reflective approaches. In Figure 5, to the left

of the illustration, actions of accounting for the design inquiry run parallel to the inquiry itself. Explicit accounts of what transpires over the course of the inquiry provided valuable communication of design knowledge through action and open the process to critique and validation.

3.4.3 Actions layer

The actions layer describes the acts and outcomes of interaction design. In a sense this layer describes the practice level of design, the detailed acts and actual outcomes, yet it should be viewed in light of the overall framework. The results of decision-making and the actualities of design become visible in this layer. The layer is defined by the key concepts of judgment and interpretation, and the recurring need for accounting of the process and outcomes.

Two concepts determine the interaction design actions, judgment and interpretation. As discussed earlier in the chapter (see 3.3.2), judgment in interaction design is integral with the on-the-spot experimentation of inquiry. Judgment comes in two forms, formative in the moment of design actions as well as summative in the evaluation of outcomes. This ongoing decision-making and constant judgment is the mechanism that keeps the inquiry progressing, enabling it. The second concept is interpretation. The multiplicity of the inquiry is irreducible. This requires that the pluralism of the situation be negotiated and interpreted. In design, this calls for the constant reflection and analysis of conditions on the part of the designers and critics. In Figure 6, these concepts form the core of the actions layer.

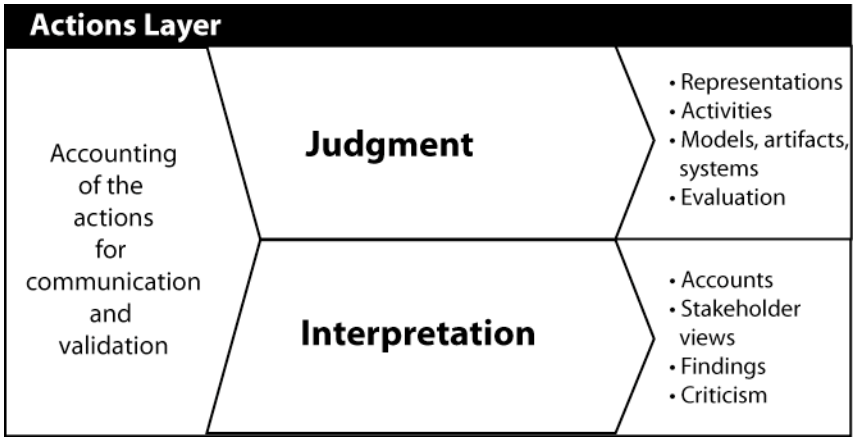

Figure 6 Actions layer of the framework

The actions and outcomes of this layer are bound within each of the two concepts. In the case of judgment, the products of judgment range from representation of design decisions to results. They include:

- *Representations*: externalizations of design decisions and imagined possibilities such as sketches, storyboards, scenarios, models, and prototypes;
- *Activities*: externalizations of processes to aid or model design judgment like workshops, role-playing, and design games;
- *Models, artifacts, and systems*: results of judgment and design actions that are final products;
- *Evaluations*: range of formative and summative evaluations from expert reviews, informal evaluations to formalized user testing.

In the case of interpretation, this concept is manifest in engagement with end-users and stakeholders, findings, and criticisms:

- *Stakeholder views*: formative engagement in design through co-designing or assessment in for example, participatory design workshops or user-centered focus groups;
- *Findings*: formative and summative conclusions based on interpretations of actions and results of evaluations;

- *Criticism*: formative and ongoing critique of design decisions and outcomes during the design process in the form of critiques to ongoing formal criticism from external critics.

In Figure 6, these products and outcomes of the inquiry are illustrated to the right of the model.

Similar to the ethnographic and other accounts of process, in the inquiry layer, the action layer requires a similar descriptive documentation of the process. In Figure 6, to the left of the illustration, actions of accounting for the design inquiry run parallel to the inquiry itself. Explicit accounts of what transpires over the course of the inquiry provided valuable communication of design knowledge through action and open the process to critique and validation.

3.4.3 Framework and summary

Figure 7 assembles all the layers into a representation of the entire framework. The layers are hierarchical. The actions layer nests in the inquiry layer. The inquiry layer is within the experience layer. The inquiry layer and actions layer represent a particular inquiry or interaction design project.

This chapter is pivotal in the dissertation and covered extensive ground, so it merits a brief summary. The chapter introduced Dewey's pragmatism. I showed that there are pragmatist threads in previous design theories, which led to discussing how pragmatism is relevant to interaction design. I explained how pragmatism's notion of experience relates to existing descriptions of design like "wicked problems" and "design situations". This demonstrated the productive potential of viewing interaction design as a pragmatist experience. The chapter followed with a detailed description of important pragmatist terms and how they could relate to interaction design. These include concreteness, designer as

inquirer, multiplicity, and entities-in-interaction. The pragmatist approach to knowing is through an inquiry of experience. This frames the practice of interaction design to be an inquiry. An inquiry in design is constituted by experimentalism and interaction designer actions of judgment and interpretation. In concluding the chapter, I propose a theoretical framework to mobilize the theory discussed in the chapter. The framework includes a hierarchy of layers named experience, inquiry and actions. This chapter introduced the philosophical basis for the theory, analysed its applicability to interaction design, and concluded with a theoretical framework intended to mobilize the theoretical conclusions.

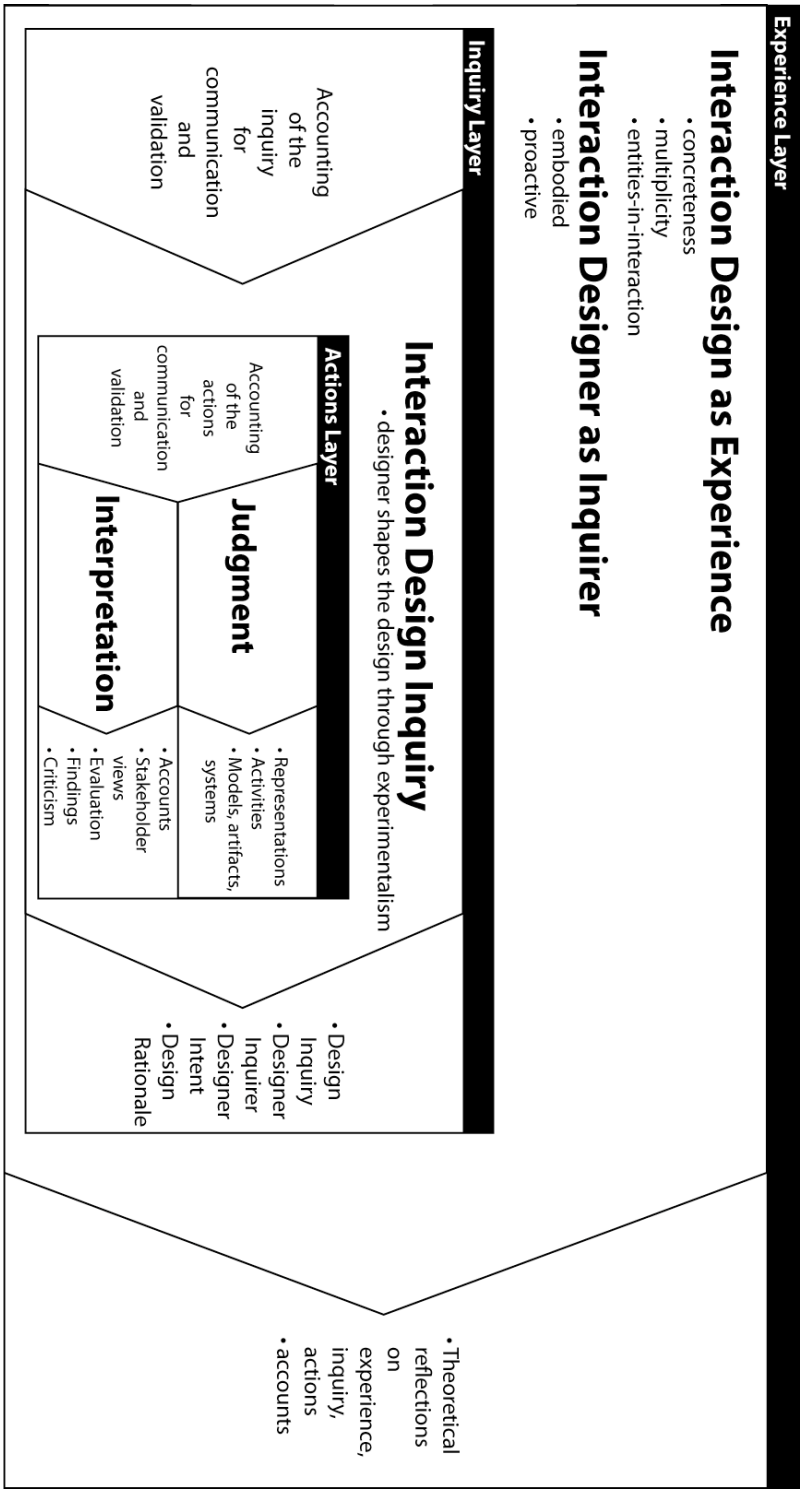

Figure 7 The complete framework