The Telling Line: The Relationship between Cognitive Style and Fashion Design Sketching

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The Telling Line: The Relationship between Cognitive Style and Fashion Design Sketching

An Abstract of a Thesis in Creative Studies

by

Mary Kay Culpepper

Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science

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State University of New York College at Buffalo Department of Creative Studies
ABSTRACT OF THESIS

The Telling Line: The Relationship between Cognitive Style and Fashion Design Sketching

This mixed-methods exploratory study addresses a gap in the literature by testing for links between cognitive style and the gestalt of sketches produced by college-level fashion design students. Students’ cognitive styles were appraised with the FourSight assessment, a measure of problem-solving preference gaining use in design schools. Then participants sketched fashion designs to complete a design brief. Panels of raters trained in FourSight reviewed the sketches to assess the cognitive styles of the sketchers. Quantitative analysis revealed a significant degree of interrater reliability, while qualitative analysis indicated emergent themes of selection, attitude, and innovation that aligned with FourSight types. The raters’ evaluations showed relationships between the sketches produced by fashion design students and the students’ cognitive style preferences, potentially affording designers additional insights in the problem-solving process. These findings support and extend FourSight theory and provide insights into the relationships between how people think and how they express their creativity through the concepts they produce.

Keywords: Cognitive styles, creativity, FourSight measure, fashion design sketching, problem solving

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CHAPTER 1: STATEMENT OF THE PROBLEM

Introduction

The dark-suited young man in the photograph bends over his office desk, pencil in hand. In contrast to his adult attire, he boyishly purses his thin lips in concentration, peering through the horn-rimmed glasses that dominate his pale, narrow face. With two drawings cast to his side, he unselfconsciously sketches a third.

That image by photojournalist Inge Morath (Figure 1) captures the French couturier Yves Saint Laurent at age 21, the day before he unveiled his first collection for the house of Dior—that is, the day before he became the most famous fashion designer in the world (Thurman, 2002).
Figure 1. Fashion designer Yves Saint Laurent sketches dresses in January, 1958. Photograph by Inge Morath, © The Inge Morath Foundation / Magnum Photos.
As he volunteered in the documentary film *Yves Saint Laurent: His Life and Times*, Saint Laurent began every collection of his illustrious career with a sketch, and the process invariably left him with a sense of wonder:

> When I pick up a pencil, I don’t know what I’ll draw. Nothing is planned. It’s the miracle of the moment . . . I start with a woman’s face, and suddenly the dress follows, or the garment takes shape. It’s a very pure form of creation, without any preparation, without any vision. And it is what impresses me most, this surge of thought, this capacity for creating clothes . . . (Baute & Teboul, 2003)

As Saint Laurent describes his process, it is impossible not to think of those thousands of sketches he created. They are as tangible artifacts of his creativity as his safari jacket, Mondrian dress, or garçonne suit (O’Neil, 1982). As such these lively representations of some of 20th century fashion’s most iconic creations are now prized by libraries, museums, and fashion collectors (Figure 2).
Figure 2. Women’s suit sketch by Yves Saint Laurent, circa 1982. Used with permission from Fashion Institute of Technology|SUNY, FIT Library Dept. of Special Collections and FIT Archives.
What, however, does such a sketch tell us about Saint Laurent himself? At first glance, it appears he had a way with gesture that indicated the luxury of ease in fabric and cut. On closer examination, the sketch in Figure 2—with its broad white collar and cuffs set against the quickly shaded jacket, the skirt explained in a minimum of dashed-off lines, and the model’s amusingly rouged cheeks—might also indicate that he was a witty man to whom ideas came easily, and for whom those spontaneous-seeming lines were a sort of shorthand for the precision that would emerge as the fashions were produced. After all, sketches offered a means of problem solving that held sway in Saint Laurent’s atelier (Saint Laurent, 1983). He used them not only to kick-start his thinking, but also to communicate with the hundreds of people who worked with him, from assistants to seamstresses to saleswomen to customers (O’Neil, 1983).

So it still is with fashion designers now. Molly Grad, a veteran of Saint Laurent’s studio who is creative director for the Israeli swimwear company Gottex, considers her fashion sketches to be “the starting position where all ideas come from . . .” (Borelli, 2008, p. 128).

The ideational sketch—and what it reveals about its creator—is of primary interest for this investigation. This chapter briefly highlights previous studies regarding fashion design sketching and the construct of cognitive style and examines its merits and deficiencies. The chapter proceeds with the purpose of this study, as well as its rationale, goals, and objectives. The chapter concludes with a summary of the problem and the purpose and research directions of the study.

The Need for Study

Because a sketch can play multiple roles—and because fashion design is an inherently creative profession—drawing and sketching should be tailor-made topics for creativity research.
While attention has been paid to the process fashion designers use to make clothes (for example, Eckert & Stacey, 2001; Rissanen, 2007; Sinha, 2000), significantly less quantifiable knowledge exists regarding the individual characteristics designers call on when they work. In the literature search for this investigation, queries on databases as diverse as PsychINFO, JSTOR, and Google Scholar using terms such as “fashion designers, sketching, and personality” and “fashion designers, sketching, and individual characteristics” yielded no relevant results.

Enter the construct of cognitive style, which can be considered to be the way people generally prefer to process information, solve problems, and relate to others (Witkin, Moore, Goodenough, & Cox, 1977). Because cognitive styles can be empirically studied, and because they provide a matrix for understanding the concepts of personality and cognition, they are often used by psychologists and academics to understand variations in performance (Sternberg & Grigorenko, 1997).

How might that tie into fashion design sketching? Early research in cognitive styles holds clues. Waehner (1946) analyzed and rated the task-fulfilling drawings of college students, using psychologists and the students’ teachers as expert scorers. The study was empirically unsound in part because teachers could reasonably be expected to recognize their students’ work. However, the research illustrated the long-held desire to discover elements of cognition and personality in sketches.

Another intriguing aspect emerged in the work of Witkin (1964), an early proponent of cognitive style studies. In a series of studies (including Witkin, Dyk, Faterson, Goodenough, & Karp, 1962; Witkin et al., 1977), Witkin claimed to find a link between the cognitive styles of children and their drawings. His proprietary model, which purports to measure subjects’ field-
dependence/independence—that is, their tendencies to perceive ideas in either a concrete or an analytical manner—was criticized as being arbitrary, as was Witkin’s closely-held statistical analysis (Harris, 1963).

The relationship apparently has not been explicitly explored again since then, and certainly not with fashion designers and their problem-solving sketches. Therefore, the natural follow-up question arises: Is there a relationship between the cognitive style of fashion designers and their sketches? Or, stated another way, is the cognitive style of a fashion designer evident in her or his sketches?

The answers are important for both theoretical and practical reasons. From a theoretical standpoint, any exploration of potential links between cognitive style and problem solving casts light upon the still-mysterious process of cognition. The answers have practical significance because apparel represents a significant sector of the manufacturing economy worldwide. The global apparel and textiles industry is estimated to grow by 4% annually and by 2017 reach a value of $1,369 billion (Bodimeade, 2012). Because fashion sketches are commonly the first step in garment manufacturing (Rissanen, 2007), the cost implications alone of understanding how to better use them for ideation and communication are obvious. Indeed, the efficiencies might not only save money, but produce more robust teams of designers and manufacturers—which could well result in the next big thing in fashion, and influence on par with that of Saint Laurent. Accordingly, this study examines whether a relationship exists between the cognitive profiles of fashion designers and the sketches they create in the service of solving a design problem.
Relevant Research

Articles about sketching reinforce the varied roles these drawings play in the general design process. They function as mirrors of cognition (Scrivener, Ball, & Tseng, 2000), generators of creativity and creative outcomes (Eckert, Blackwell, Stacey, & Earl, 2004), dialog-starters (Goldschmidt, 2003), idea archives (Cham & Yang, 2005), and prompts for novelty (Goldschmidt & Smolkov, 2004). Looking more specifically at where sketching falls in the fashion design continuum, Rissanen (2007) claimed sketches function as tools for making sure the entire design team literally stays on the same page, while Eckert and Stacey (2001) asserted they serve as translations to the admittedly constrained vocabulary of fashion.

Cognitive styles research, which focuses on an individual’s favored way of using one’s abilities (Sternberg & Grigorenko, 1997), has woven in and out of favor in psychological research since the 1950s. Many psychologists claim that the construct of cognitive styles measures abilities or personality (Sternberg & Zhang, 2001; von Wittich & Antonakis, 2011), and are more inclined to use assessments that measure those constructs instead. In an extensive literature review of cognitive styles research, Kozhevnikov (2007) maintained that the most robust and applicable research concentrates on decision-making styles in applied fields.

Accordingly, a handful of cognitive style measures are commonly used in research on problem solving. These include the Cognitive Styles Analysis (CSA) (Riding, 1991) and FourSight (Puccio, 2002, 2009). Each has been recently used in research with design students and professionals; the CSA has been used in design education for more than 20 years (Roberts, 2006). FourSight has been administered to design students at the Danish School of Media and Journalism, and the Illinois Institute of Technology’s Institute of Design features FourSight in its
student orientation (S. Thurber, personal communication, April 9, 2012). Regardless, neither measure has been used to investigate the decision-making tendencies of fashion designers or design students.

Two papers focusing on a possible cognitive style connection to drafting—an arguably related discipline—shed some light on the topic. Guster (1986) analyzed secondary-school students’ cognitive styles with a battery of assessments, including the Group Embedded Figures Tests (Witkin, Oltman, Raskin, & Karp, 1971), which emerged from Witkin’s (1964) research on field dependence/independence. Guster then gauged the students’ scores on drafting assignments to determine which style profile performed best. Pektas (2010) used the CSA (Riding, 1991) to assess drafting students’ cognitive styles, then had students complete a three-week, multi-part brief using design software; a panel of experts rated the students’ work for creativity. Coming at the problem from different ways, both Guster and Pektas were looking for modes of instruction that would leverage various cognitive styles.

While fashion design sketching and collage construction are quite different pursuits, a pair of studies using FourSight do indicate some relationship between problem-solving style and image-making. McLean (2004) had independent judges rate the creativity of student-made collages; the creativity scores correlated at varying levels of significance to each of the FourSight styles. Uribe Larach (2009) tracked the effect of emotionally laden narratives on the student creation of collages to similar effect. His research indicated that individuals who had certain FourSight profiles responded to the narratives by devising collages raters found to be more creative.
**Deficiencies in the Studies**

While none of these studies quite gets at the heart of the relationship between fashion designers’ cognitive styles and the sketching designers do in the course of their work, they do point to the feasibility of examining the matter. Given the promising links between FourSight and the collage-making research, as well as the intriguing results of the drafting studies, there is a place in the literature for an investigation of the relationship between fashion design sketches and FourSight preferences.

Much of the reason has to do with the scant research on the creative process of fashion design, a markedly different profession than that of architecture, engineering, and drafting. Yet those professionals, and not fashion designers, are participants in the majority of studies on cognitive styles and designers. This shortage is exacerbated by the fact that creativity is a study undertaken by disciplines as different as economics and physics. This fragmentation leads to dozens of study silos, some of which recognize the others’ accomplishments, and some of which do not. Because the triple-topic of fashion design/sketching/cognitive style has yet to be extensively published in that form, the aspiring researcher must read broadly, and try to reconcile philosophies, theories, and methodologies from those subjects, as well as the more general areas of psychology, design thinking, and sociology. Whether problem-solving design sketches reflect their creators’ cognitive styles is still an open question, and these insufficiencies indicate there is much to explore.

**Statement of Intent**

In order to investigate any potential ties between fashion design sketches and the cognitive styles of the people who make them, a study was proposed. Its purpose was to test for
possible relationships between cognitive style and fashion design sketching by working with
participants who are college fashion design students. Specifically, this study examined the
relationship between individuals’ cognitive style preferences, as assessed through the FourSight
self-report measure, and research participants’ concrete expression of creativity as represented by
their sketched solutions to a fashion design problem. In effect, the creative outcome was the
gestalt, or overall look of the sketch itself and the feeling it conveyed relative to individual
creative-thinking preferences, as seen through the eyes of a panel of experts with training in
FourSight.

Creative products do not occur in a vacuum, and creators are connected to the ideas they
produce, just as observers bear witness to those ideas. This study, therefore, was designed to
examine the gestalt of the sketches as well as the interaction between the creator and the
proposed design problem. As noted by Murdock and Puccio (1993), few studies have
undertaken such an interactionist approach and, as such, this exploration fills an important niche
in the field of creativity studies.

**Rationale, Goals, and Objectives**

The direction of this research provided a novel contribution because of the
aforementioned lack of study involving sketching, cognitive styles, and fashion designers, as
well as the need for studies that better reflect the true nature of creativity. While this
examination was informed by research (Witkin et al., 1962; Witkin, 1964) matching children’s
drawings to their cognitive styles, as defined by the field-dependence/independence construct,
the current study focused on fashion design students and the FourSight (Puccio, 2002, 2009)
assessment, which is beginning to attract attention at design schools. This study also employed
statistical analyses designed to make explicit any relationship between creative-thinking preferences and creative products.

The study began with fashion design students (many of whom were about the same age as Saint Laurent in Morath’s photograph) taking the FourSight (Puccio, 2002, 2009) assessment. Participants used pencil and paper to solve a timed design brief. A panel of five judges, all of whom are design professionals trained in the assessment, analyzed the sketches, individually noting which (if any) cognitive profile each sketch reflects. The judges’ results were quantitatively analyzed to see whether any link exists between the sketches and the cognitive styles of the creators. The ensuing qualitative analyses examined the ratings of subsequent panels and considered the drawings themselves.

Potential Benefits

From this study, it was anticipated that a quartet of contributions to the field might emerge:

1. The first-ever examination of fashion designers’ cognitive-style profiles.

2. The amplification of early theoretical work, such as that by Waehner (1946) and Witkin et al. (1962), indicating relationships between drawings and cognitive style through the use of mixed-methods design and up-to-date statistical analysis.

3. The extension of existing FourSight theory by examining creative-thinking preferences within a design setting.

4. The opportunity to demonstrate that fashion design sketching is a form of problem-solving, a cognitive process made visible with paper and pencil.
Summary

As the examples of Saint Laurent and Grad indicate, fashion designers sketch to solve problems, develop ideas, and communicate with colleagues. These examples suggest that the sketches fashion designers create could speak to their preferred ways of taking in and expressing information—that is, their cognitive styles. This would seem to make fashion design sketches a ready-made laboratory for researchers interested in cognitive styles. However, there is a paucity of work in this specific area, despite the large body of work on creativity and cognition, design as a means of problem solving, and cognitive styles, spread across several disciplines.

This exploratory study addressed a gap in the literature by testing for links between cognitive style and the gestalt of sketches produced by fashion design students. The sketches were reviewed by panels comprised of people knowledgeable in the FourSight cognitive style assessment. Quantitative and qualitative analyses determined whether there was a significant link between participants’ cognitive styles and their sketches. It was expected that this research could make theoretical contributions to the study of creativity and cognition as well as offering potential practical benefits to the fashion industry. Naturally, this subject depends upon a synthesis of the knowledge found in studies from diverse fields. Therefore a comprehensive literature review follows in Chapter Two.
CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

What happens when a fashion designer begins to sketch a new idea? How does that sketch develop to become an artifact of creative process? How effectively might it communicate a new and useful thought to others? Could understanding something about the way the designer perceives the world permit the garment in the sketch to be the next fashion breakthrough? This review endeavors to answer those questions by surveying the pertinent literature surrounding the relationship between fashion sketching and cognitive style in both professional designers and design students.

Historical Contexts, Modern Counterpoints

This section puts forth a brief discussion of the history of fashion design sketching, and contrasts it with the development of cognitive style theories. The modern context of creativity and fashion design can arguably be traced to Charles Frederick Worth, a 19th-century Englishman working in France who today is widely acknowledged to be the inventor of haute couture. An innovative designer and marketer, Worth devised the first standardized dress patterns, organized the first fashion shows with live models, and was the first designer to put a label in a garment he made (Krick, 2004). It is not clear if Worth sketched, but his aesthetic progeny in America—among them, iconic 20th century designers such as Elizabeth Hawes (see Figure 3), Charles James (see Figure 4), Norman Norell (see Figure 5), and Bill Blass (see Figure 6)—certainly did. Their archives in this country’s museums are troves of fashion sketches, often dashed on scraps of paper, and indelibly linked to the garments made from them. They offer lasting, tangible proof of the creative and ideational power of the fashion design sketch.
Figure 3. Elizabeth Hawes negligee sketch, 1931. Fabric, graphite, and colored pencil on paper. Collection of the Brooklyn Museum Fashion and Costume Sketch Collection. Copyright by the Estate of Elizabeth Hawes.
In this century, sketching, either on paper or in digital form, is still viewed as a vital step in fashion design (Rissanen, 2007), one used by students and professionals alike. The sketch itself is a vestige of creative cognition (Finke, Ward, & Smith, 1992), a complex set of thought processes that yields a result that is both novel and useful. While a sketch may be considered a product, for the purposes of this review it is construed to be a part of the process an individual designer undertakes in designing.

The individual—and his or her personality—are at the center of the construct of cognitive styles, the general way that people prefer to process information (Sternberg & Grigorenko, 1997). Developments during the 20th century in psychological thinking about cognitive styles occurred simultaneously, albeit coincidentally, as the careers of the designers discussed earlier in this introduction. For instance, about the time Hawes opened her first design house (Hawes, 1938), Jung (1923) first devised a theory of psychological types. During the late 1950s and early 1960s, as James and Norell scaled their creative heights (Golbin, 2001; Martin, 2006), psychologists such as Harvey, Hunt, and Schroder (1961) and Witkin (1964) were attempting to find connections between personality and cognition. In 1976, as Blass was becoming a household name (Blass, 2003), Kirton (1976, 1999) created his eponymous Adaptor-Innovator Inventory (KAI), a cognitive style measure discussed further in this review.

While a definitive understanding of the role cognitive style in design and the sketching process has heretofore been ignored, studying the construct in this context is nonetheless worthwhile. Sternberg and Grigorenko (1997) made an argument for broadening cognitive style research. Cognitive styles, they argue, provide an interface between the concepts of personality and cognition, can be empirically studied, might help psychologists understand variations in performance in school and in the workplace, and might illuminate the effect of climate on
accomplishment. More plainly stated, for fashion designers, a better understanding of their own cognitive styles might make it easier to sketch in ways that can be better understood by themselves and others—whether those others are teachers in school, patternmakers in a workshop, or customers in a store.

With that prologue, the following review critically appraises contemporary literature regarding creativity and cognition, cognitive style, design, and sketching. While many professions rely on the generation of creative ideas expressed through sketching (Eckert et al., 2004), few studies solely examine fashion design through that lens. In an effort to create a complete picture, this review also examines relevant work in architecture, engineering, and drafting. Architects in particular have long been studied by psychologists interested in creativity (e.g., Barron, 1963; Craik, 1973; Hall & MacKinnon, 1969; Helson, 1966). Not only do the fields of architecture, engineering, and drafting share many of the same concerns and constraints as fashion design—e.g., analyzing problems, solving sub-problems, and incorporating those into an overall solution—they have also been studied in cross-domain research linking them to creativity and fashion design (Eckert & Stacey, 2010; Stacey, Eckert, Earl, Bucciarelli, & Clarkson, 2002).

The following sections of this literature review examine relevant research on creativity and cognition, on design as a means of problem solving, and on cognitive styles. The focus then narrows to sketching—its modes, phases, value, and ability to reconcile ideas with images. The review considers sketching and cognitive style and finishes with a summary.
Creativity and Cognition

This section investigates theories that relate to creativity and cognition. Broadly speaking, cognitive theories of creativity hold that specific thought processes inform both creative people and the products they create. The theories are therefore concerned with the initial two elements of the enduring person-process-product-press construct articulated by Rhodes (1962). Cognitive theories highlighting process attempt to fathom creative thought by examining cognitive structures, while those highlighting the creative person examine the effect of individual differences on those structures.

Moreover, cognitive theories of creativity can be construed as being relevant to degrees of significance (Kozbelt, Beghetto, & Runco, 2010). That is, some theories apply to eminent, i.e., Big C creativity (Csikszentmihalyi, 1996), others to everyday, i.e., Little C creativity (Richards, 2007), and others still to both and/or to points in between. Indeed, one of those intermediate points is Pro-C creativity (Kaufman & Beghetto, 2009), a designation that encompasses professional-level creativity that stops shy of eminence. For purposes of this literature review, Pro-C creativity is a chief interest, and the models discussed below pertain to the construct.

Cognitive Models Describing the Creative Process

The creative process undertaken by a creative person has long been a matter of theoretical interest in the field. As the present study is concerned with how the process indicates an individual’s cognitive style, the theories that are most germane to that topic are discussed below.

The Four-Stage Model. In one of the first cognitive constructs of the creative process, Wallas (1926) advanced a four-stage model that moves from preparation to incubation,
illumination, and at the end, verification. Wallas asserted that these steps can be simultaneously used on varied problems, sometimes in rapid-fire order, sometimes slowly and deliberately. Wallas was prescient about the cognitive bedrock of creativity when he noted that preparation and verification are both conscious processes, while incubation, intimation, and illumination tread between the conscious and subconscious.

**Subsequent 20th-Century Models.** Following Wallas’ multi-stage model, a number of theoretical models describing the cognitive creative process were developed in the 20th century. In his bisociation of ideas theory, Koestler (1964) elaborated on the concept that creativity requires the combining of ideas. DeBono (1970) advanced lateral thinking, a non-linear, intensively idea-generative method that features varied strategies for arriving at novel solutions. Von Oech (1983) developed a two-stage model that featured the development of an idea and its implementation. Perkins (1998) described a framework of purposeful idea generation, selection, and preservation. Basadur’s (1992) Simplex model featured the steps of problem finding, problem solving, and solution implementation.

**Creative Problem Solving.** One 20th-century model is of particular interest. According to Puccio (2002), FourSight is based on Creative Problem Solving (CPS; Firestien, 1996; Isaksen, Dorval, & Treffinger, 2000; Osborn, 1953; Parnes, 1981). Since its development in the 1950s, the CPS model has undergone a variety of permutations, moving from five to six to the current three stages of the Thinking Skills Model (Puccio, Mance, & Murdock, 2011).

Tracking the creative process, the three Thinking Skills Model stages are Clarification, Transformation, and Implementation. Each stage is distinguished by separate divergent and convergent process steps. In Clarification, the steps are Exploring the Vision and Formulating
Challenges; in Transformation, Exploring Ideas and Formulating Solutions; and in Implementation, Exploring Acceptance and Formulating a Plan. Indeed, Puccio, Mance, & Murdock (2011) contend that the equilibrium between convergent and divergent thinking are essential to the success CPS as a problem-solving construct.

An executive step, Assessing the Situation, directs the user to gather data and determine at any point of the process which step to pursue next. The model is circular, with the executive step in the center. As such, it reflects the cognitive flexibility necessary to move from one stage of the problem-solving process to the next.

Its long use in the field has resulted in abundant research confirming the effectiveness of CPS (Puccio, Firestien, Coyle, & Masucci, 2006). The connection between FourSight and CPS was detailed by Puccio, Wheeler, and Cassandro (2004), which indicated that individuals are drawn to the phases of CPS that reflect their problem-solving preferences.

Models Describing the Creative Person

As noted earlier, the creative process is sparked by the creative person. Accordingly, the four models described below theorize about the properties that enable an individual to create.

Remote Associates Model. Mednick (1962, 1968) maintained that ideas are attracted, like magnets, with varying strengths, and that someone who employs remote associates—that is, fitting together ideas without strong overt bonds—is likely more creative than someone who resorts to stereotypical associations. Mednick’s own insight came from experiences as a professor being correctly contradicted by a freshman student about the theretofore accepted interpretation of a psychology experiment. Mednick reasoned that the student was less familiar
with psychological theory, and therefore more able to approach it with an open—i.e., creative—mind.

Mednick’s theory of creative persons is embodied by his Remote Associates Test (RAT; 1962), an instrument that presents lists of three seemingly unrelated words; the test-taker adds a fourth to complete each series, and the assessment is scored for creativity by an independent rater. An example would be the words “moon,” “cheese,” and “bell”; the fourth word that connects them is “blue.” Although RAT arguably concerns itself with convergent thinking rather than fluency, flexibility, and novelty (Mendelsohn, 1976), and is obviously weighted in favor of people with strong verbal abilities, it is still in wide use. In introducing the instrument, Mednick described its potential to decipher not just one form of creative thought, but the entire field. Later studies (e.g., Andrews, 1975, Mendelsohn, 1976) reported that the assessment failed to show a pervasive relationship between RAT scores and creativity. However, both RAT and Mednick’s theory are valuable because their development highlights the cognitive processes inherent in associative thinking.

**Structure of Intellect Model.** Another way of looking at the creative person was offered by Guilford (1967), who conceived of creativity as a form of problem solving, and stated that problem solving requires four distinct qualities: fluency, flexibility, originality, and elaboration. Guilford’s Structure of Intellect (SOI) model also examined the ideas of a creative person, but in the context of both convergent and divergent thinking. Moreover, this model is complex. Guilford asserted that intellect manifests itself in three dimensions—content, products, and operations—and illustrated those dimensions with a cube. In the cube were five operations: cognition, memory, divergent production, convergent production, and evaluation. The cube also housed six types of product—units, classes, relations, systems, transformations, and
implications—and four varieties of content: figural, symbolic, semantic, and behavioral. The cube was initially comprised of 120 blocks of subcategories; a later version (1988) suggested 180 blocks.

While analyses of some of the SOI dimensions appear sound, overall statistical support for the model has proved somewhat untenable (Sternberg & Grigorenko, 2001). Later research (e.g., Amabile, 1996; Csikszentmihalyi, 1996; Kaufman & Baer, 2002) accentuated the importance to creativity of affect, motivation, and domain specificity in addition to intellect. Guilford’s model nonetheless remains notable because of its influence in research about divergent and convergent thinking.

**Creative Cognition Model.** The notion that creative thought draws on characteristic cognitive processes is the basis for creative cognition theory (Finke, et al., 1992). This approach appropriates concepts from cognitive psychology—notably conceptual combination and expansion, creative imagery, analogy, and metaphor—to explain how people develop and rationalize ideas. Rooted in research that explored how subjects discovered emergent patterns in images, creative cognition theory is derived from experiments in which subjects were asked to mentally combine three visual forms, such as a cone, cube, and parallelogram, into vestigial structures that were then given object categories that sparked possible, and creative, uses for them (Finke, 1996). The resulting model is called *geneplore*, as it describes generative and exploratory processes (Finke et al., 1992). Generative processes form the spark of ideas, and can involve a range of cognitive actions—including memory retrieval, idea synthesis, and categorical recombination—sometimes all at once. Exploratory processes take those sparks and with processes such as evaluation weigh the likelihood that they might result in a creative fire or a failure to ignite.
Reliable instruments assessing creative cognition have yet to be developed. Because many of these processes occur just below the conscious level, newer studies of creative cognition (e.g., Abraham & Windmann, 2007; Scott, Lonergan, & Mumford, 2005) are informed by cognitive neuroscience as they employ case-based research to analyze the still-unfolding mental activities people use to creatively solve varied problems.

**Metacognitive Model.** In contrast to creative cognition, metacognition—literally thinking about one’s thinking—is a conscious process, and accounts for an adjacent theoretical direction. Stemming from mid- to late-20th century examinations of children and learning, metacognition is also linked in various branches of psychology to self-regulation and executive function (Livingston, 1997), and is considered a component of intelligence (Sternberg, Kaufman, & Grigorenko, 2008).

According to Flavell (1979), the difference between cognition and metacognition depends on how information is deployed. While cognitive strategies enable a designer to achieve a goal (e.g., devise a new line for the next season), metacognitive strategies will help him or her assess how effectively the goal has been reached (e.g., questioning whether the line meets cost directives and appeals to consumers). The link to creativity is implicit: Metacognitive experiences may come before or after cognitive ones—often when cognitions fail—as a way to salvage a perceived shortcoming. Given the role of reflection, metacognition incorporates the cognitive skills of memory processing and knowledge of problem-solving techniques, a topic that will be covered in the next section of this review.

In a comprehensive analysis of the research on metacognition, Georghiades (2004) described its origins, ontology, important studies, and potential. The author also confessed that
the field is fragmented and lacks an overarching nomenclature, much like the fields of creativity and design. Despite these apparent shortcomings, research continues, particularly in the fields of education and science, as evidenced by the appearance of the journal *Metacognition and Learning*, which was founded in 2007, and edited volumes such as *Metacognition and Science Research* (Zohar & Dori, 2012). These works have yet to reveal a psychometric assessment of metacognition.

**Conclusions**

The evolving, and sometimes contradictory, nature of theories of creativity and cognition therefore calls for a certain amount of perspective. Accordingly, Mumford and Antes (2007) discouraged relying on a single cognitive model to analyze creative achievement. In commentary, the authors argued that if the focus shifts to identifying a combination of strategies for problem-solving—especially those involving analogical and case-based reasoning—creative solutions might emerge. Those ideas will be discussed in the next section of this review, which considers design as a problem-solving proposition.

**Design as a Problem-Solving Construct**

**Overview**

Cognition and metacognition are considered key processes in the act of design (Rusbult, 2011). Insofar as design offers a way to ease difficulties and build on innovation, it is widely considered to be a means of solving problems (Casakin, Davidovitch & Milgram, 2010; Eastman, 1969; Goldschmidt & Smolkov, 2004). Therefore, this section provides an overview of design as a problem-solving construct.
Relevant Theories

Design is considered to predate language in human development; arguably, it began when human ancestors first developed tools almost two million years ago (MacGregor, 2010). Dong, Collier-Baker, and Suddendorf (2010) proposed that humans inherited blended qualities of metarepresentation and curiosity from our prehistoric forebears; these qualities allowed them (and, indeed, allow us still) the ability to not only break with existing models, but to consider how and why we might attempt new ones. Thus, the twin pillars of the 21st century discipline of design thinking—problem-framing and creating situations—are buttressed by the timeless constructs of metarepresentation and curiosity (Dong et al., 2010).

Symbolic Information Processing. One of the first and most influential theories in design research is symbolic information processing (SIP), advanced by Simon (1973, 1979). Simon noted the differences inherent in well-structured versus ill-structured problems, contending that cognitive thought imposes structure in the latter. To solve ill-defined problems, the designer works with information in an objective reality, using a symbolic structure formed by occurrences connected and stored in his or her memory. This model follows the optimization model favored in the natural sciences: The problem is ill-defined, the process rational and iterative (analyze the problem/design/evaluate/restate/solve the problem), and the knowledge the designer employs incorporates specific procedures and scientific laws (see Figure 7). In short, for Simon, design equaled problem solving.
**Ill-Defined Problem**

- Analyze
- Evaluate
- Restate
- Solve

**Symbolic Memory of Objective Reality**

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*Figure 7.* Symbolic Information Processing (SIP) model. The problem-solving process takes place within the designer’s own apprehension of objective reality. Adapted from “Information Processing Models of Cognition,” by H. A. Simon, 1979, *Annual Review of Psychology, 30*, pp. 363-396.
According to Visser (2010b), the SIP model—which was instrumental in the formation of the field of artificial intelligence—met with immediate favor from design researchers. Among them was Eastman (1969) who devised a protocol study Visser (2010b) called “a reference in the domains of empirical studies of design, on the one hand, and of ill-defined problems, on the other” (p. 13).

Eastman (1969) proffered two hypotheses. First, the difference between ill- and well-defined problems is the availability of a process for defining the problem and the goals for solving it. Second, the search used to find answers to both kinds of problems is the same. To test these hypotheses, Eastman assigned design tasks to a participant and recorded him as he worked. The sole subject in his study was a graduate student in industrial design with two years’ professional experience. This student’s task was to redesign a bath to make it “more luxurious” and “spacious” within a set cost. While working, the student talked about design goals, using his own experience to frame solutions. The student sketched throughout the 48-minute process, drawing plans and a section, and came up with five bath redesigns. Two of these redesigns were fully developed. In redacting the conversation with the subject, Eastman proposed that the designer followed the SIP steps, moving from analysis to design, evaluation, restatement, and solution. Eastman’s case study might be faulted for the simplicity of its design problem and the size of its sample, but its effects are far-reaching in that the protocol Eastman devised still launches many of the subsequent design research projects highlighted in this review.

**Situativity Theory.** A later, countervailing influence is situativity theory (SIT) (Greeno, 1998; Greeno & Moore, 1993; Schön, 1983, 1992), which combines both situated cognition and action. Reflection and knowing—and to some degree, intuition and art—are components of this way of considering the participants, which emphasizes the individual designer’s role in the
problem-setting. The design knowledge required might well demonstrate artistry and a sense of appropriateness, a model familiar in the arts and sciences. In this constructivist model of environmental context, each designer reflects on reality as he or she actively grapples with an essentially unique problem, and follows a process of reflective conversation (see Figure 8).
Figure 8. Environmental Context model. Working within the context of the larger society, a designer continually sets the problem; a solution emerges from the interplay of the designer’s processes, practices, and the people (including the designer) involved in the project. Adapted from “Designing As Reflective Conversation with the Materials of a Design Situation” by D. A. Schön, 1992, Knowledge-Based Systems, 5, pp. 3-14.
In an essay on Schön’s research in design, Visser (2010a) asserted that designers not only engage in reflective practice; they also possess knowledge beyond their ken, developing tacit reserves of perception that come into play when they work. Schön’s own insights were borne of his research on the SIT model with architects. In one of his most notable papers, Schön (1992) considered three variations of design case studies conducted at Massachusetts Institute of Technology. In the first, the exchange between a professor and student was deconstructed as the student talked through her design. As Schön analyzed this case, the step-by-step nature of the student’s seeing-moving-seeing mode of working allowed her to confront the intricacies of the problem and engage the human capacity to “recognize more in the consequences of their moves than they have expected or described ahead of time” (p. 7). In the second study, three practicing architects were assigned the redesign of a library. The architect who most successfully mitigated the task was recorded by Schön as moving her pencil through the building’s drawn footprint, an essential action for an architect because it simulates being in the space. Schön postulated that the act—which demonstrates both the understanding of the elements of a problem and the imposition of order (i.e., giving names, contexts, and relationships to discrete parts)—constituted a construction of reality parallel to the construction architects envision on site. In Schön’s third case study, four students were observed playing design games and building prototypes with Modula, Tinkertoys, and LEGO®. From these sessions, Schön observed that the problem space considered a part of the design task is rarely completely stated; it is incumbent upon the designer to construct the world in which he or she sets the problem space and creates the strategies to find solutions. As related to prototypes, Schön determined that they are heir to these individual constructions of reality, the boundaries of which are vague. Schön asserted their ultimate value lies in the designer’s reflection on the process.
While Schön (1992) undertook research on SIT because he, like Simon (1973, 1979), was interested in furthering artificial intelligence, Schön’s findings are nevertheless significant for those studying the human design process. Because Schön, like Eastman (1969), relied on qualitative methods, Schön’s conclusions might be undervalued by quantitative researchers exploring similar questions of design. However, Visser (2010a) identified SIT as an important theory in design research, albeit a theory still being clarified. For example, Ralph (2010) further refined SIT into sense-making, implementation, and co-evolution—that is, polishing the idea of the design in relation to its context.

A Middle Path for Practice

Carlisle and Dean (1999) advocated both SIP and SIT approaches. In an essay comparing and contrasting the theories, the authors asserted that designers balance both in solving problems, as one addresses technical problems, the other, more ideological ones. In their view, problem solving in design becomes a matter of successfully integrating knowledge from multiple sources.

Dorst and Cross (2001) maintained a similar position, holding that every successful design project offers some proof of creativity insofar as it is a solution. In an empirical study of nine practicing designers, they provided their subjects a brief to design a litter disposal system on a train, and instructions to articulate their thinking as they were videotaped in process. The resulting designs were independently judged by design faculty—also practicing designers—for creativity, aesthetics, technical aspects, ergonomics, and business aspects; overall scores were awarded based on total scores. Each rating category was equally weighted; ergonomics correlated most closely with the mean scores, while creativity correlated least. However,
creativity scores were highly ranked for the most successful designs, leading the authors to conclude that it is only one element in a well-integrated design. Based on videotapes of the designers, Dorst and Cross proposed a model in which the “problem space” and the “solution space” (p. 435) evolved simultaneously with the identification of a key concept (see Figure 7).
Problem-Space
Dimension

Solution-Space
Dimension

\[ P(t) \] initial problem space
\[ P(t+1) \] partial structuring of problem space
\[ S(t) \] initial solution space
\[ S(t+1) \] partial structuring of solution space
\[ S(t+2) \] developed structuring of solution space
\[ P(t+2) \] developed structuring of problem space

*Figure 9.* Co-evolution of problem-solution as observed in a design study. The goal for the designer is to create a matching problem-solution pair. Adapted from “Creativity in the Design Process: Co-evolution of the Problem-Solution” by K. Dorst and N. Cross, 2001, *Design Studies*, 22, p. 435.
Problems and Meaning

Visser (2006) advocated for similar multi-part studies because design problems are complex and ambiguous, and cannot be solved by conventional means. Visser contended that design training, which teaches design thinking, is essential. Further, Visser maintained that while design incorporates problem solving, it is something more: An aggregation of the ways in which an individual designer constructs representations of both the problem and the solution.

Visser’s contention is echoed in recent work by Casakin et al. (2010) and Casakin and Kreitler (2011). In studies detailed further in this section, these authors elaborate on theories of meaning (S. Kreitler & K. Kreitler, 1990), which involve dimensions of both verbal and nonverbal components. Indeed, Casakin and Kreitler (2011) indicated that the cognitive components of the creative process—recognizing dynamic features of objects and ways they develop over time; understanding structure, state, location, and sensory qualities; and relating unrelated contents—work within both words and images to distinguish highly creative architects. Design interpretations are therefore as likely to be visual as verbal, subject to the designer’s reading of not just the problem/solution continuum, but the very world around him or her.

The Architect’s Point of View

Devising design interpretations for particular spaces is the stock in trade of architects. Their working processes are a frequent topic of study for creativity researchers, who, among other topics, examine their sketching proclivities, (Bilda, Gero, & Purcell, 2006), their use of visual stimuli (Goldschmidt & Smolkov, 2004), and their cognitive styles (Roberts, 2006).

More recently, a study by Casakin et al. (2010) examined domain specificity and creative thinking among architecture students. The researchers tested 111 students (median age, 25.97)
on general creative thinking ability with four verbal and figurative items chosen from the Tel Aviv Creativity Test (R. Milgram & N. Milgram, 1976). Students also completed a five-item version of a specialized assessment for architects, the Real-Life Problem Solving: Architecture instrument (Casakin, Davidovitch & Milgram, 2007), which measured domain-specific creative thinking. Scores between the two measures were highly correlated, which lead the authors to contend that a relationship existed between general and domain-specific creative aptitudes in architectural design. Based on this finding, the authors recommended that architecture schools and studios teach creative thinking.

Digging deeper, the authors also observed that their subjects, who were more fluent on the verbal items in the general measure, were also more likely to generate more ideas on the architecture-specific one. Since the criterion measure was exclusively verbal, Casakin et al. (2010) conceded that a visually driven measure may have produced different results. Because architects must use both verbal and visual skills to solve problems, a study that could accurately measure both would be of interest, according to the authors.

Casakin and Kreitler (2011) examined cognition in design creativity. In an experiment, 52 architecture students with a mean age of 22.85 years responded to a brief to design a building for a museum. Students completed a test of meanings devised by S. Kreitler and K. Kreitler (1990) intended to measure a variety of cognitive processes. The 23 meaning variables included sensory qualities, feelings and emotions, cognitive qualities, and graphic/visual qualities. The designs created by the students were rated for creativity by three professional architects, and results were contrasted with the students’ results on the assessment. Based on the raters’ understanding of a creative mean, half the group was rated with high design creativity; the other half, low design creativity. The authors observed that the highly creative students could easily
shift inputs and develop new associations to deepen their abstractions regarding the design brief. Casakin and Kreitler asserted that these cognitive processes, dependent on the students’ frames of reference, mirror those found in other creative domains, and are only somewhat domain-specific. Moreover, cognitive processes mirror problem-solving constructs as well.

**The Fashion Designer’s Point of View**

As noted earlier in this section, far more design literature pertains to architects than to fashion designers. Among the most prolific researchers actively pursuing matters of creativity and problem solving in fashion design are Eckert and Stacey (2001, 2010). The two papers discussed here are noteworthy because they address the problem-solving aspect of fashion design within the context of designers’ cultural and cognitive frameworks.

In a 2001 address to the Design Thinking Research Symposium, Eckert and Stacey described fashion as an emergent sociocultural phenomenon paradoxically fueled by clothes designed by individuals. Working designers see scores of garments and recall myriad details, which become a cognitive repository of visual and spatial forms and contexts. Furthermore, Eckert and Stacey contended, designers spot trends and abstract them into those repositories, in effect constantly creating new associations and juxtapositions. Designers then filter these items into appropriate designs—calling to mind the reflexive model of Schön (1992).

As a result of their ethnographic studies of knitwear designers (beginning with Stacey, Eckert, & Wiley, 2002), Eckert and Stacey (2010) reported that fashion designers routinely refer to ongoing sources of inspiration in the design process—everything from photos taken during market trips to pages torn from magazines—while keeping abreast of technological developments they can leverage in production. Designers use the sources to help formulate
designs, then synthesize the images—and the designs themselves—continuously to keep up with the demands of their jobs. Indeed, the researchers maintained:

[the] skill of expert designers is in the complexity and subtlety of their perceptual evaluation of designs as much in their ability to generate design ideas, and that a large part of their creative thinking is in their perceptual filtering of the designs they imagine (p. 126).

Eckert and Stacey (2010) reiterated their contentions in an article comparing design constraints across a number of domains, including fashion. Over the course of six years, Eckert and Stacey interviewed 80 knitwear designers to formulate the basis of an artistic process of design (as contrasted by the more technical processes of engineering, software, and web design).

For fashion designers, the authors noted, a conflict exists between finding constraints (such as technical, anatomical, and taste-level) and determining the strategies for developing designs that meet specific needs. The strength of the conflict depends on various kinds of problems and various kinds of thinking. For Eckert and Stacey (2010), problem-setting is the key issue in design. From the authors’ perspective, fashion designers must frame problems in a solvable form, and then construe the specifications and the constraints in a way that successfully jogs memory and synthesis.

Conclusions

Perhaps because design research incorporates theory from psychology, aesthetics, education, engineering, and sociology, its theories regarding problem solving are kaleidoscopic, shifting through time and discipline. Concepts and terminology that pertain to one branch may bear little relation to another.
In that way, design research is like the study of creativity, and the pursuit of creativity is one of its chief concerns. Problem solving is central to the theories of both, and some theories recall aspects of others (e.g., creative cognition and situativity). Moreover, both appear to make the case for some degree of domain specificity.

However, Eckert and Stacey (2010) contended the field would benefit if there were more general knowledge about how all designers solve problems. While the solutions might not apply across the board, the authors argued that exposure to a broad range of problem-solving strategies would contribute to more creative outcomes. How those strategies might be typified in cognitive styles is the subject of the next section.

**Cognitive Styles: Characteristic Actions**

**Overview**

Whether from the perspective of problem solving or problem setting, an individual designer has a default way of thinking about a particular design problem. Called cognitive style, this default is one’s preferred way of using one’s abilities (Sternberg & Grigorenko, 1997). This section summarizes relevant literature surrounding cognitive style, relates it to creativity, and considers research undertaken on it in the arena of design.

**Background**

As mentioned earlier in this section, Jung (1923) described a network of archetypes which can be considered a system of cognitive styles. His system formed the basis of the Myers-Briggs Type Indicator (MBTI) (I. Myers & P. Myers, 1980). A psychological test frequently
used in business to identify communication styles, the MBTI is taken by an estimated 1.5 and 2 million people annually (Zemke, 1995).

The construct of cognitive styles has historically functioned as a means to connect cognition with personality, abilities, intelligence, and creativity (Chávez-Eakle, Eakle, & Cruz-Fuentes, 2012). Indeed, mid-20th century research on cognitive styles (Barron & Welsh, 1952; Gough, 1961; Hall & MacKinnon, 1969; Witkin, 1964) drew from existing psychological research on personality.

There are multiple ways of examining research on cognitive styles, and Kozhevnikov (2007) provided a robust discussion of them in a comprehensive literature review. In recapping the field’s most prominent theories and milestones, Kozhevnikov detailed early research that reached its zenith in the 1970s, virtually stopped for three decades, and recommenced in the early 2000s with examinations of metacognitive models, unifying and splintering models, and models that bind cognitive styles to various psychological constructs.

From the 1950s through the 1970s, Kozhevnikov (2007) argued, research on styles for the most part examined individual differences in information processing. According to Kozhevnikov, a trio of reasons explains why styles fell from research favor. First, many of the constructs were polar—as is Witkin’s (1964) field dependence/independence model—and insufficiently flexible to account for an individual’s situational strategic choices. Second, that same polarity was often analyzed haphazardly; few studies employed normative populations, and many employed a statistical tool called the median split criterion to dichotomize continuous variables. The practice, routinely used in the social sciences at the time, is now recognized as leading to incorrectly interpreted results (Wuensch, 2006). Third, early studies on cognitive
styles were merely descriptive and lacked a theoretical basis. Additionally, these early styles had a variety of terms and bodies of literature, much like the fields of creativity and design research addressed earlier in this review. These shortcomings still make it difficult at best to determine what they mean, and how effective they can be. While these studies did indicate that cognitive styles track individual differences in problem solving approach, the methodological and measurement miasma stalled investigation in most areas of cognitive styles, except one: decision-making styles in applied fields.

Styles at Work and Design School

If a cognitive style model is regarded through the lens of individual choice and decision making, then it might be construed as a heuristic to enable individuals to make decisions and choose one strategy over another. That, Sternberg and Zhang (2001) maintained, is what separates cognitive and thinking styles from a standard measure of abilities, a matter of validity that critics of styles still contend is a concerning issue.

A number of models measure decision-making—that is, problem-solving—proclivities. Among these are the Kirton Adaptor-Innovator Inventory (KAI) (Kirton, 1976, 1999), the Hermann Brain-Dominance Instrument (HBDI) (Hermann, 1989), the Cognitive Styles Analysis (CSA) (Riding, 1991), and FourSight (Puccio, 2002, 2009). While not tested yet in the field of fashion design, each has been recently used in research on design students and professionals.

**KAI.** In this model, the problem-solving style ranges on a continuum from utmost Adaptor to utmost Innovator. Broadly stated, Adaptors have the tendency to work within existing structures and improve existing solutions, while Innovators tend to investigate new solutions and render new ideas that might not be immediately practical. Most individuals who
take the inventory are scored on a point that falls somewhere between these two extremes. This point indicates an individual’s preferred approach to problem solving (Kirton, 1999).

Despite its corporate popularity, the KAI has limitations; von Wittich and Antonakis (2011) administered the KAI along with the NEO Personality Inventory (Costa & McCrae, 1992) to 213 Swiss economics and management students. The authors claimed that KAI scores could be predicted by personality and gender. They further suggested that researchers using KAI and other cognitive style measures must scrupulously control for personality and correct for methodological errors.

Yet the construct endures, perhaps due to its strength as an analogical device. In an exploratory paper describing the relationship between cognitive style and the selection of design methods, López-Mesa and Thompson (2006) reviewed the KAI scores of 20 designers in various divisions of an automobile manufacturer, all of whom work with engineers from the company’s chassis department. According to Kirton (1999), the mean score for engineers is 95-96; the mean score of the sample in this study was 108, which places the designers on a point toward the Innovator scale, a result the authors maintained is likely for a design group. López-Mesa and Thompson attested that design methods can also be viewed within the same context, and emphasize the importance of pairing solution tendencies with required outcomes. In addition, the authors described a benefit of design practitioners understanding the limitations and strengths of their own styles, “…designers must flex from their preferred style to use methods that are suited to solution requirements and not their own personal style preferences” (p. 385).

Ultimately, López-Mesa and Thompson supported companies integrating workflows that rely on adaptive methods for routine design work to produce reliable products as well as innovative methods to produce novel solutions that confer a competitive advantage.
**HBDI.** The HBDI is a self-report measure that uses the brain as a metaphor for the problem-solving process. The model uses quadrants to represent cerebral left (analytical), limbic left (sequential), limbic right (interpersonal), and cerebral right (imaginative) dimensions (Hermann, 1989). Optimally, individuals—despite their preferences—shift their thinking through all quadrants in problem solving.

Criticisms about the HBDI stem from its design as a self-report instrument, and from its reliance on the left- and right-brain metaphor, a concept that has since been disproven in neuroscience. Hines (1991) indicated that all spheres of the brain are involved in problem solving. A separate criticism was voiced by Meneely and Portillo (2005), who similarly indicated that right-brain dominance does not correlate with creativity, although flexibility among all four quadrants does.

A second empirical study by Meneely (2010) investigated the range of thinking preferences of 81 undergraduate interior design students who took the HBDI. Students gravitated toward the limbic and cerebral right dimensions, preferring conceptual, integrative, and expressive ways of thinking; students avoided the limbic and cerebral left dimensions, shunning analytical, critical, and logical modes. To remedy the disjuncture, Meneely suggested teaching metacognitive tools to help students understand their own thinking preferences and appreciate those of others.

**CSA.** This two-scale measure (Riding, 1991) records how people organize and structure information (Wholist-Analytic; W-A) and how they depict a memory during thinking (Verbal-Imagery; V-I). The four modes are scored through three sub-tests on the timed, computer-administered assessment.
While not a self-report measure, the CSA does score respondents for answering quickly, and has been charged by Kirton (2003) to measure a blend of style and ability. Moreover, Rezaei and Katz (2004) reported the reliability of the CSA to be low, and alleged the instrument is limited by its graphic design and cross-cultural relevance.

Nonetheless, the CSA has been used in international research and in design research in particular. Roberts (2006) studied the bearing of cognitive styles of Welsh architecture students as they pursue their degrees. In a three-year tracking of 190 students in two cohorts, Roberts noted that students who scored high on the W dimension initially underperformed those who scored higher on the A dimension, but they improved with time. Roberts surmised that a student’s cognitive style is simply a baseline, and as a range of problem-solving strategies develops in the course of his or her education, the student can overcome deficiencies.

FourSight. Initially called the Buffalo Creative Process Inventory, FourSight (Puccio, 2002, 2009) is the most recently constructed assessment in this review. As noted earlier, it is based on the CPS model. The 37-item self-report measure is available online and in a pencil-and-paper version.

Its quadratic model follows the steps of the problem-solving process—clarification, ideation, development, and implementation—and its assessment accordingly reveals profiles of Clarifier, Ideator, Developer, and Implementer. As with the HBDI, individuals can have more than one preference, or a combination of all of them. The profile of someone whose scores are even across the measure is referred to as an Integrator.

Initial analysis confirmed its internal consistency; concurrent validity has been established with correlations using KAI, MBTI, and two other problem-solving measures
(Puccio, 2002). That said, the cautions that apply to KAI and HBDI—namely, that as a self-report measure it is prone to a halo effect, and that it may actually measure aspects of personality—might apply to FourSight as well.

The latter concern was addressed by Puccio and Grivas (2009) in a study of 137 participants in a corporate training workshop who were given FourSight and the DiSC Personal Profile System, a personality inventory (Inscape, 1996). The authors reported correlations between DiSC and the FourSight Clarifier and Ideator preferences, as theoretically expected. They interpreted the findings as highlighting the affective traits necessary for creative problem solving, and echoed Meneely’s (2010) contention that understanding more about one’s own problem-solving preferences will make the creative process more robust. Puccio and Grivas also called for further study that might indicate how personality traits fold into the creative process.

The relatively recent development of FourSight accounts for the fact that no published studies in the design field have used it. However, that is subject to change. FourSight has been administered to design students at the Danish School of Media and Journalism, and the Illinois Institute of Technology’s Institute of Design in Chicago incorporated it into its student orientation in fall, 2012 (S. Thurber, personal communication, April 9, 2012).

Conclusions

The checkered history and contentious present of cognitive styles research does not override its utility in applied settings. As means of relaying the principles of metacognition to students and professionals—and of providing metaphors to heighten understanding of the creative process itself—the measures discussed here have a value that transcends their apparently tangled relationship with aspects of personality. Suggesting that individuals learn about
cognitive styles to better assimilate the phases of design, as recommended by López-Mesa and Thompson (2006), is a constructive direction, one that could heighten competitiveness and streamline innovation. Indeed, one of the initial steps in design, sketching, is the subject of the next section of this review.

**Sketching: Ideas into Images**

**Overview**

If cognitive styles indicate how individual designers engage in the creative process, sketches offer tangible evidence of that process in action. This section details literature addressing the roles of sketches in the design process, various modes of design sketching, and ways that fashion designers facilitate ideas with images.

**A Basic Tool**

This review focuses, as do Eckert et al. (2004), on sketches as hand-made marks on paper, which fashion designers variously call *sketches*, *drawings*, or, when garments are sketched on a figure, *croquis*. While digital tools, such as tablets and computer aided design (CAD) software play an increasing role in design practice and education (Meneely & Danko, 2007; Verstijnen, Hennessey, van Leeuwen, Hamel, & Goldschmidt, 1998), a substantial body of research links hand-made sketches to creative cognitive thinking (Arnheim, 1993; Fish & Scrivener, 1990; Goldschmidt, 1991, 2003; Huang, 2008; Schütze, Sachse, & Römer, 2003). Eckert et al. (2004) quoted designers who work in computer-essential domains (e.g., architecture, automotive design, software design) as nonetheless relying on hand-made sketches in the initial phases of their work.
Scrivener et al. (2000) hypothesized that drawings mirror cognitive processes, which calls to mind the creative cognition model by Finke, et al. (1992) in that a designer’s mental images synergize with the act of drawing, an exchange representing multiple mental shifts. Sketching serves as a problem-solving tool, and assists in the process of thinking and giving shape to nascent ideas (Goldschmidt, 1991). According to Gao (2003), a sketch is variously a means of communication with self and others, a method of preserving transient ideas, a thinking tool, and a way of refining reasoning. Alternatively, van der Lugt (2005) suggested that sketches assist in various functions in the design process; they can exemplify the functions of thinking, prescribing, talking, and storage. Similarly, Cham and Yang (2005) described sketching as an agent for the design thought process and noted that some designers say they are unable to fully comprehend an idea until it is sketched.

The conversational gambit apparently is a two-way street. Recalling the metacognitive model of problem solving, Goldschmidt (2003) maintained that sketches answer back to their creators, striking up a dialog of sorts between the designer and the external manifestation the sketch represents. In that way, sketches not only represent ideas, but can germinate new ones. Moreover, because of their physical existence, sketches act as instant archives—that is, visual stimuli for designs either not yet thought of or needed—which in effect provides a way of preserving design freedom (Cham & Yang, 2005).

Like a visual version of RAT (Mednick, 1962), a backlog of sketches can lead a designer to make new associations from his or her own remote associates. Because of the ambiguity inherent in sketches, reinterpreting existing ones can lead to altogether new creative insights (Eckert et al., 2004). In this way, designers sometimes view their sketches as both creativity generators and creative outcomes.
Might a sketch, then, actually foster creativity? Goldschmidt and Smolkov (2004) determined that sketching might do so in a study of 36 graduate and undergraduate architecture students who sketched the solutions for two design tasks with and without various types of visual stimuli in the form of mood boards. Using Finke’s (1990) initial creative cognition research as a springboard, the authors were primarily interested in whether the stimuli produced more creative results. In addition to finding evidence to support the hypothesis, the authors also found that sketching factored into the solutions that were independently rated as being creative, and put forth the idea that conceptual breakthroughs might be facilitated with sketching. Goldschmidt and Smolkov further surmised that sketching is a good idea when novelty is required, at least in cases where the design imagery is more, rather than less, complex.

The Necessity of Sketching

Whether sketching is actually required in the design process depends on who the designer is and how he or she is most accustomed to working. Bilda, Gero, and Purcell (2006), asked three highly-regarded professional architects in Australia to design houses for two different families. This research procedure seems to highlight the incubation/intimation/illumination sequence of Wallas’ (1926) creative process model. In the first task, the architects designed blindfolded, and externalized their ideas with sketches at the end of the session. In the second, they sketched throughout the process. The results, which were rated by three other practicing and teaching architects for design outcome, cognitive activity (perceptual, function, conceptual, evaluative, and recall), and links between the ideas, indicated that sketching made no difference. The authors’ conclusion—that expert architects do not necessarily need to sketch in the early phases of project conception—was first voiced by Verstijnen et al. (1998), who maintained that
eminent creators might be able to devise analogies with verbal imagery alone, but “others, in more mundane cases, require a sketch” (p. 546).

This point of view was challenged in an empirical study with a slightly larger sample involving 45 mechanical engineering students in Germany who were asked to design a portable garden grill (Schütze et al., 2003). Working alone, the students were randomly divided into three groups. The students were asked to realize their designs to the conceptual stage, and were timed in their efforts. In the first group, students could sketch continuously. In the second, the sketches were removed after a certain point in the process. In the third, students were not allowed to sketch at all. The second and third groups verbalized their final solutions, and only then were asked to sketch their design. After reviewing the recorded experiment, two designers and a psychologist evaluated the designs for technical quality, time spent, experienced difficulty, and certainty about the solution. The authors claimed a relationship between thinking and sketching; the quality of the grills sketched throughout the design process was higher than the others. Whether the result has more to do with the complexities of architecture versus those of engineering, or the expertise of professionals versus students, designers of every stripe still need some way of registering vague and evanescent thoughts in the process of creating, with the design thinking goal of reflecting and knowing an appropriate solution when it materializes (Schön, 1992).

Likewise, van der Lugt (2005) suggested sketching has a positive effect on design reinterpretation, which in turn creates new knowledge. As this process proceeds cyclically, new knowledge begets further reinterpretations. The author noted that sketching benefits design in two ways. The first is iterative sketching, in which each new version offers fresh insights in the form of additional analogies and metaphors. The second is that sketches indicate the potential
consequences of the designer’s thoughts. Based on the summaries of these studies, it would seem that analogies and experience are closely related to a designer’s performance.

**Fashioning Abstractions**

To be sure, not all fashion designers sketch. Rissanen (2007) cited the prominent example of Rei Kawakubo, founder of the Japan-based clothing line Comme des Garçons, who gives verbal or visual instructions to her design team for their interpretation. Although the English designer Zandra Rhodes has been known to sketch her ideas (see Figure 10), Rissanen reports she often pins paper printed with a textile’s design to her body and creates shapes that become garments.
That said, fashion illustration is taught in most academic fashion design programs in Europe and the U.S., and working designers across market levels sketch as a matter of course (Sinha, 2000). Rissanen (2007) described fashion design practice in a way that makes clear the role of sketching. The designer’s sketch sparks a collaborative process with a patternmaker that proceeds to making a flat pattern or draping a form with fabric. From either process, a garment pattern emerges, and from that a concept prototype called a muslin or toile, which prompts design and pattern alterations, and, after a few or many iterations, a production sample. The patternmaker and designer work together in three ways that involve sketches: (a) The patternmaker works from the designer’s detailed sketches and notes; (b) the patternmaker uses the designer’s sketches as a guide for the draping process; or (c) the designer deconstructs, then sketches changes for an existing garment (see Figure 11).
A) Sketch ——> Pattern ——> Toile ——> Alteration ——> Sample
B) Sketch ——> Draping ——> Pattern ——> Toile ——> Alteration ——> Sample
C) Garment ——> Sketch ——> Pattern ——> Toile ——> Alteration ——> Sample

*Figure 11.* Three fashion design workflows incorporating sketching. Adapted from T. Rissanen, *Types of Fashion Design and Patternmaking Practice*, 2007, pp. 2-4, doctoral dissertation.

These workflows evoke the interplay of situativity theory and SIP (Carlisle & Dean, 1999; Dorst & Cross, 2001), and echo Visser’s (2006) contention that a designer constructs multiple reconstructions of the problem and the solution. For a fashion designer, a sketch is an exercise in moving modalities: A two-dimensional depiction of a three-dimensional garment from which a two-dimensional pattern is ultimately produced (Rissanen, 2007).

Sketches are important in fashion because the domain does not have a precise language for design elements; a v-neck, for instance, could be wide or shallow, short or long, bound or faced, in the front or back of a garment, and all those descriptions could mean different things to different people in the course of production. Moreover, new fashion details evolve constantly without a consistent vocabulary. Reference to visual examples like sketches is often more precise than words in fashion (Eckert & Stacey, 2001).

That precision is important, because for working designers, the sketch is eventually interpreted—either by the designers themselves or by their sample-making team—into a garment. In a case study of five design firms in the United Kingdom, all of the designers interviewed conceded that their samples were more important than the designs on paper (Sinha, 2000). Whatever a sketch might tell us about the person who creates it, in the marketplace the garment—that is, the constructed embodiment of the drawn idea—matters more.

As Schön (1987) noted, “. . . the virtual world of the drawing can function reliably as a context for experiment only insofar as the results of the experiment can be transferred to the built world” (p. 159). Yet, the author asserted, sketching’s virtual state exposes characteristics and connections the built world cannot yet fathom. In short, it is where innovation is born.
Conclusions

When people think of fashion designers at work, they inevitably picture those designers sketching. Indeed, drawing ideas is a critical part of the design process, whether at the beginning or toward the end. As a means of making ideas tangible, sketching serves several purposes: An aid to cognition, a help in communication, and an inspiration bank for future designs.

As in other areas of design thinking and problem solving, far more literature exists for other fields of the domain than for fashion design. Yet papers investigating sketching in interior design, architecture and engineering are instructive for fashion design research because they illuminate sketching’s links to creativity, cognition, and design theory. Those links are strengthened by the few studies that examine the role of sketching in fashion design.

Because of its inherent flexibility, a design sketch is a potent tool in both the problem-solving and problem-setting modes that design theorists maintain are endemic to the domain. Beyond that, however, a sketch is evidence of the route an idea takes from the mind to an eventual reality. Indeed, if sketches serve the purpose of bringing to paper a designer’s ideas, they also permit the creativity researcher a window into creation (Arnheim, 1993).

In its idiosyncratic nature, a sketch might be taken as an analogy (Verstijnen et al., 1998), and as such, has an affinity to the analogical construct of cognitive styles. How the window Arnheim (1993) mentioned might open to admit a relationship between sketching and cognitive style is the subject of the next section.
Sketching and Cognitive Style

Overview

Ordinarily, this section would review literature about fashion design sketching and cognitive style. But, as has been the case with many of the categories covered in this review, such specific literature does not exist. However, a trail traced through psychology, art, and engineering over the last 65 years tracks some relevant themes. This section examines early research tying sketching to personality and cognition—both aspects of creativity and style—as well as newer studies that consider the effect of cognitive style on design performance.

Rating Drawings

Many of the initial studies regarding sketching, cognition, and personality are found in the art therapy literature, and occurred about the same time as the first wave of research in cognitive styles. The two studies discussed here are helpful in that they illustrate the drive to link personality—which, as discussed earlier, is intricately related to cognitive style—to drawing and sketching.

Waehner (1946) studied 422 spontaneous and task-fulfilling drawings of 55 college students. Students’ sketches were analyzed and scored for content as well as particular modes of expression, including shading, form, and line quality. Each student’s personality was then outlined and independently rated by a psychologist, a Rorschach expert, and the students’ teachers. The teachers were able to match drawings from 75% of their students, while the inkblot expert matched 87% of students with their drawings. The analysis in this study appears empirically unsound; obviously, the teachers could be expected to recognize their students’ work, and inkblot tests have been generally recognized as unverifiable. Despite its lack of
generalizability, the study indicates that a desire to tie sketching to personality has been a matter of long standing.

Similarly, in a study connecting drawing to personality and cognition, Stewart (1955) reviewed self-portraits of adolescents, rating them with a scale of 31 elements, including rhythm, realism, symmetry, and strength of line. This study shares many of the same concerns as the previous paper. Writing later about the study, Harris (1963) reflected on the feasibility of examining adult drawings for similar elements, primarily cognitive, perceptual, and personality factors. Yet and still, Stewart’s work illustrates the urge to know more about the relationship between sketching and cognitive styles.

**Drawing on Fields**

One of the mid-20th century’s chief proponents of cognitive styles research was the first to specifically tie styles to drawings. Witkin, using his model of field-dependence/independence (1964), investigated the development of cognitive styles with material he had been collecting for eight years (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). Witkin defined field independence as overcoming the embedded context, a concept related to Guilford’s (1967) adaptive/flexibility dimension; in his view, field dependence is the opposite state. Investigating the effect of body concepts on cognitive style, Witkin and colleagues asked children and adults to draw figures, and interpreted them for field-dependence/independence using a proprietary scale (Witkin et al., 1954). The researchers hypothesized that the more field-independent subjects would draw more completely articulated figures.

In one example, eight 10-year-old boys were asked to draw pairs of male and female figures. The drawings were rated by independent psychiatrists for role and gender
differentiation, as well as amount of detail. The subjects were given a battery of other psychometric assessments, including an IQ test. Witkin noted that the four field-independent subjects drew the figures in proportion, with clear gender differentiation, and with reference to role representation. By contrast, the four subjects rated field-dependent lacked significant detail to render proportion, gender, or role. Witkin (1964) was not surprised: “As expected, children with a more articulated way of experiencing the field in our perceptual tests produce figure drawings suggestive of a more articulated body concept” (p. 190).

Witkin (1964) dismissed the possibility that the results might be due to differences in intelligence, though the author admitted that the field-independent subjects had higher total IQ scores. One wonders if there was any accounting for drawing skill, a point Harris (1963) noted in critiquing Witkin’s research. Harris suggested exploring whether training can bring children past mere categorizing to more fully cognitively seeing. As observed previously, the model is flawed in its polarity, and his lack of transparent statistical analysis casts aspersions on his report. Harris, a contemporary, acknowledged as much. Nonetheless, the illustrations Witkin shared are now 50 years old, and still bear the recognizable stamp of cognition in action.

**Cognitive Style and Drafting**

Guster (1986) continued the work of using the field dependent/independent construct to review cognitive styles. Specifically, Guster was interested in the secondary-school drafting students’ attitudes toward drafting, drafting achievement, and scholastic grades in the subject. Using two instructors and three sets of students in the first week of class, students were pretested for attitude. Then their achievement scores were measured, and two days later, students were tested for cognitive style. Post-tests in attitude and achievement were measured during the last
week of school. However, because Guster considered the cognitive style measures to be stable over time, they were not measured again.

To layer Riding’s (1991) phraseology with Witkin’s (1964), Guster reported that the Analytic students (field-independent) learners outperformed their Wholist (field-dependent) classmates in mechanical drafting tasks. Guster suggested that students be paired with the manner of instruction that leveraged their cognitive styles, going so far as to suggest that field-dependent students could work on group projects, while their field-independent counterparts could work individually.

**Styles and Digital Drafting**

The most recent study in this group focuses on design students’ cognitive styles and their performance in digital media. Pektas (2010) measured the cognitive styles of 46 sophomore university drafting students in Turkey using the CSA (Riding, 1991); the participants were debriefed on their styles at the end of the study. In the experiment, students worked individually on a class assignment to design a campus guard house. In one three-hour class, they were asked to design using two-dimensional CAD software, and turned in their files at the end of class. The following week, students worked further on their designs, discussed them with the instructor, and turned in any revisions. In the third and final week, the students finished their designs, and handed in their work for evaluation by three expert judges from the design faculty. The experts each subjectively rated the students’ work on creativity, using Amabile’s (1996) Consensual Assessment Technique, and on technical quality. Drafting performance was rated by an exam, given as part of coursework, which used digital drafting software.

The CSA revealed that the sample group was composed of 30 Analytics, 10 Wholists, and six Intermediates. Pektas (2010) maintained Turkey’s multiple-choice college admissions
exam favors Analytics, and hypothesized there may be more in the overall student body. On the other CSA dimension, the group comprised 19 Verbalizers, 14 Bimodals, and 13 Imagers.

The raters found the Imagers’ designs more creative, and the group also rated higher than the others in drafting scores. While Pektas (2010) suggested this finding links visual thinking to design problem-solving, the author admitted that the data indicates some relationship exists between creativity and the Imagers’ CAD skills. In fact, when the drafting performance scores were controlled, the correlation between creativity and V-I raw scores was not significant. Pektas recommended a further study comparing expert and novice drafters to verify that experience has a moderating effect.

Pektas (2010) also found no statistically significant difference between the Wholist-Analyzer groups and design and drafting performance. Regardless, Pektas—like Guster (1986)—advanced the point of view that tracking design students’ cognitive styles could have positive implications for teaching strategies and course designs.

Conclusions

The studies reviewed in this section only tangentially relate to the most pertinent question asked at the beginning of this review: Could the way a designer perceives the world be reflected in their sketches? It is difficult to venture a guess based on these studies. They frame particular cognitive styles within the context of creativity and ask if one style is more creative than another.

This review is ultimately more concerned with knowing how a designer’s cognitive style is expressed in a fashion sketch, an altogether different question. The answer still seems far afield.

If it is considered that fashion sketches are two-dimensional representations of designs, they might bear some affinity to the two-dimensional computer-aided designs in research by
Pektas (2010) and Guster (1986). But much fashion design has a different process than engineering, and the results might not be congruent. In addition, unanswered questions remain about the role of skill in making these images.

Concerns linger, too, about the specific measure chosen to assess cognitive style. As mentioned earlier, studies using field dependence/independence are suspect. Riding’s (1991) CSA has its criticisms but remains in wide use. It might be instructive to see what results might be obtained with HBDI (Hermann, 1989) and KAI (Kirton, 1999), which have been used extensively in design contexts, and with FourSight (Puccio, 2002, 2009), which is just now being introduced in the domain. Those possibilities, as well as the others, are considered in the summary of this review.

Summary

A fashion design sketch has multiple functions: It is an *aide-memoire*, a note to a design team, a way of thinking on paper. It might also be thought of a way of seeing how an individual designer looks at the world. That potential role is at the heart of this chapter, and this section summarizes the most pertinent points made in this literature review.

The initial section of this review touched on creativity and cognition research. The review considered design as a means of problem solving, and then moved to an examination of cognitive styles. Sketching and its role in fashion design were discussed, followed by a survey of the spare body of literature on sketching and cognitive styles.

Creativity is truly a translational skill, spanning domains in the service of problem solving. This review, accordingly, incorporated literature from fashion, design research, psychology, aesthetics, interior design, education, engineering, and architecture. Like many
creative professions, fashion design incorporates elements of them all, and such breadth demands multiple models of creativity. Identifying a collection of strategies that employ both analogical and case-based logic would serve a fashion designer well.

The ability to approach problems with flexibility and fluency is essential to the creative process. The manner of approach is the crux of the cognitive style construct. Cognitive style is a valuable means to communicate both the concept of metacognition and a set of analogies to bridge understanding of the creative process itself. Heightened innovation is a likely outcome.

Innovative ideas are vital to the design process, and sketching can fuel those ideas. The ambiguity inherent in a fashion sketch serves both the problem-solving and problem-setting approaches referenced by design theorists. Yet, a sketch also affirms the path a set of ideas takes on its way to reality. A sketch may be considered a visual analogy, in the same way cognitive styles are often construed as metacognitive analogies.

Clearly understanding that relationship, however, requires focused research. Although two studies in this review examined cognitive styles and their relationships to drafting, no studies were found that directly related fashion sketching to cognitive style. Knowing more about how fashion designers order their views of the world could make their sketches tools for clearer communication, both for themselves and the people with whom they work.

The stakes for such understanding are high. In 2011, the U.S. apparel market accounted for $199 billion in sales (NPD Group, 2012). If fashion sketches—commonly the first step in garment manufacturing—are better understood, the cost ramifications in an industry this large could be significant.
Beyond that, though, it could also produce innovations yet to be dreamed of: The psychologist Bliss (1916) acceded to garments the important function of granting a fresh frame of mind, an octave for fashion that still resonates. As she stated, “Our oft-derided fashion makers may be more closely in touch with the spirit of the age than we dream . . . registering in their creations the profound movements of the human soul” (p. 226).
CHAPTER 3: METHODS AND PROCEDURES

Introduction

As suggested in the previous chapter, answering the central matter of this thesis—whether fashion sketches reveal the way a designer perceives the world in terms of cognitive style—requires drawing from disparate elements, including cognitive psychology, design research, sociology, education, and fashion. This exploratory study gathers these varied threads by searching for links between cognitive style and sketches produced by fashion design students. Accordingly, this section examines the research methodology used in this study. Beginning with a description of the research design, the chapter examines the characteristics of the sample, the cognitive style assessment, the design brief issued to the subjects, and the interviews conducted afterward. The chapter offers a description of the quantitative and qualitative methodologies used in the data collection process, and concludes with a summary.

Sequential Explanatory Research Design

Because of the exploratory nature of the hypothesis, this research was conducted using both quantitative and qualitative data in a mixed methods sequential explanatory design strategy. Creswell (2003) maintained this process starts with quantitative data collection and analysis, then proceeds to the qualitative data collection and analysis. Subsequently, the whole analysis is interpreted (see Figure 12).
Steps in Sequential Explanatory Research Design

Quantitative Data Collection
· Secure FourSight data
· Gather completed design briefs

Quantitative Data Analysis
· Order panel ratings
· Compute chi-squares, correlations, PRLs

Qualitative Data Collection
· Query raters
· Construct descriptive framework

Qualitative Data Analysis
· Code rater keywords
· Perform graphic analyses

Interpretation of Entire Analysis
· Summarize findings
· State meanings that emerge from findings

**Researcher Position**

Such mixed methods research customarily dictates the identification of the researcher’s values and biases at the beginning of a study. The researcher and author of this thesis spent several years in the 1980s and 1990s as a nationally recognized design journalist, exclusively covering American women’s fashion for about four years. In the process, the researcher became familiar with the business of fashion as well as with the production of ready-to-wear clothing. Moreover, the researcher’s current contacts include a number of women’s wear designers, fashion journalists, and retailers. That said, the researcher’s relationship with those contacts is solely personal. In addition, an interest in cognitive style emerged during the researcher’s graduate class work, and the researcher obtained certification in the FourSight assessment in 2011.

All researchers bring certain biases to their work. Although the researcher has made every effort to remain objective, some biases may nonetheless color the interpretation of qualitative data in particular. In disclosure, the researcher believes fashion designers filter a number of personal, cultural, and societal influences to produce their work, and that no fashion designer works in a vacuum removed from these contexts. The researcher also suggests that cognitive style assessments such as FourSight render not sharp-edged portraits of individuals, but rather mosaics that describe something of the way they see the world and act in it.

**Quantitative Method**

**Sample and Participant Selection**

In the interest of securing a population that would address the research question and efficiently meet the requirements of the institutional review board, a convenience sample was
sought. The sample consisted of 34 undergraduate students enrolled in fashion design classes at SUNY Buffalo State College and Villa Maria College in November, 2012. The demographics of this sample are reported in Table 1.

Table 1

Sample Demographics

<table>
<thead>
<tr>
<th>Students</th>
<th>n = 34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3 (9%)</td>
</tr>
<tr>
<td>Female</td>
<td>31 (91%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
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<tr>
<td>M</td>
<td>19.9</td>
</tr>
<tr>
<td>Range</td>
<td>18 – 24</td>
</tr>
<tr>
<td>School</td>
<td></td>
</tr>
<tr>
<td>SUNY Buffalo State</td>
<td>14 (41%)</td>
</tr>
<tr>
<td>Villa Maria</td>
<td>20 (59%)</td>
</tr>
</tbody>
</table>

Students from both institutions were recruited for the study by their instructors. At SUNY Buffalo State, participants were enrolled in FTT 303 Fashion Illustration/Drawing; at Villa Maria, students were taking either FDM 340 Fashion Illustration, or FDM 101 Introduction to Fashion Design. These classes were targeted because they contained a majority of fashion design majors who were at ease with drawing their ideas, and because students had not previously taken cognitive style assessments in the commission of the classes.

Study Procedure

The researcher proposed the study to The Research Foundation of The State University of New York-Buffalo State College (see Appendix A for proposal). Upon acceptance of the proposal, the researcher followed the protocol for research involving human participants outlined by the foundation (see Appendix B for research protocol).
Ten weeks prior to the beginning of the study, the researcher obtained written permission from the professors at both schools for the project. Professors agreed to allow the researcher to conduct the study during their classes.

On the selected days, professors introduced the researcher to their classes in the schools’ illustration classrooms; the researcher then asked for and received verbal consent from the students before describing the purpose of the research study and distributing informed consent forms. To reiterate the information on the forms, students were informed that the study was strictly voluntary and the results were confidential, and they were not required to participate. Furthermore, participants were advised that there were no known risks in participating in the study beyond those encountered in everyday life. Students were notified that the possible benefit associated with the study was receiving the results of a problem-solving assessment, which has a value of approximately $100. The researcher explained that confidentiality would be ensured by using randomly selected identity codes to identify the data, and that the codebook linking names to data would be kept separate from the data. In addition, any electronic data emanating from the study would be safeguarded by being stored on a password-protected, encrypted laptop computer. All of the participants then signed and returned informed consent forms (see Appendix C for informed consent form).

Participants were given paper copies of the FourSight assessment to complete; all of the participants in both groups finished the assessment in less than 25 minutes, and returned the assessments to the researcher for confidential scoring. The researcher then gave the participants packets containing a design brief (discussed in greater detail below) and three 8 ½” x 11” sheets of sketch paper so that students would have ample space for drawing. Upon opening the packets, students were notified that they would have 30 minutes to complete their sketches for the brief.
The researcher verbally requested that students draw in ink because it is a standard medium for professional designers, given its facility in rendering various line weights (Kiper, 2011), and because the completed sketches could be more faithfully reproduced for analysis. Pens and extra paper were made available for students’ use.

All students completed the brief in the allotted time, and returned the drawings in the packets to the researcher. Acting on professor permission, most students left the classroom after they finished the assignment. Those students remaining in the classroom at the end of each session were asked to stay, and were interviewed as a group about the design process in general and the brief in particular. The components of this portion of the study are outlined below.

The FourSight measure. The FourSight assessment is a paper-and-pencil questionnaire that measures an individual’s problem-solving preference (Puccio, 2009). It was chosen for this study because of its strength of measurement. Further, it is beginning to be used in design schools in the United States and Europe (S. Thurber, personal communication, April 9, 2012). However, formal design studies employing the measure have yet to be published, so the present study broke new ground. This 37-question survey is printed on a carbonless form, which requests a respondent’s name, age, gender and occupation. The directions, also on the form, request that the respondent read each statement, and mark an “X” on a Likert-type scale for responses that range from “Not like me at all” to “Like me” to “Very much like me” (see Appendix D for FourSight assessment).

After all of the participants completed FourSight, the researcher computed the scores, which revealed Clarifier, Ideator, Developer, and Implementer preferences, either singly or in combination (Puccio, 2009). Scores were then individually reported to the participants via email.
**The design brief.** As reported in the literature, designers generate their ideas in context (Eckert & Stacey, 2001); therefore, a design brief was created by the researcher so the participants would have the same problem to solve. Dorst and Cross (2001) recommended crafting a task simultaneously challenging, realistic, appropriate for the amount of time available, and keyed to the experience of the participants. Accordingly, this brief challenged students to create fashion designs for female flight attendants working for a hypothetical all-first-class domestic airline. Arroyo (2011) further suggested that a fashion design brief contain specific information about the product to be designed, its market, the target consumer, and the goal of the design, as well as the basic information regarding who, what, when, where, and how.

To that end, this brief answered those questions in a narrative format. Entitled “Fashion Sketch Design Brief,” the document described the parameters of the assignment. The brief contended that price would not be a factor in a successful design, and that the uniforms would be worn in flight as well as to and from work to denote the stylishness of the brand. The assignment listed the average age of the attendants as 28, ranging in height from 5’4” to 5’10”, with weight in proportion to their height. Furthermore, the brief instructed that the designs should cover the attendants’ tops and bottoms, and that the uniforms could contain multiple pieces. Participants were also directed to write in information that could explain their sketches, if they wished (see Appendix F for design brief).

**The post-brief interview.** Gaining further information about the participants’ reactions to the brief as well as their thoughts about the design process served to further illuminate the study’s aim to uncover links between fashion design sketching and cognitive style. Consequently, the researcher followed qualitative data collection guidelines set forth by Creswell (2003) to draft a six-question interview protocol. Interviews were conducted with
opportunistically selected students after the design briefs had been turned in (See Appendix F for interview protocol).

These small, informal focus groups (SUNY Buffalo State, n=3; Villa Maria, n=8) allowed participants to address the open-ended questions when questioned directly. While this type of interview has a number of drawbacks—respondents might be inhibited in answering in groups of peers, for example, and even when they do talk, the questioner might bias response (Creswell, 2003)—the method nonetheless permitted the researcher to direct the line of questioning, and was useful in eliciting comments about process. The questions, which were asked in the same order at both sessions, ranged from what the participants thought about while they completed the design brief to whether and why they preferred sketching by hand or computer, and if they focused on details or generalities while they sketched, and why.

The researcher verbally sought and obtained permission from the participants to audio record the interviews. Each session lasted about 25 minutes. The interviews thus captured and transcribed were not evaluated for this project because the quantitative analysis revealed unexpected results that could be better explored with a different direction in qualitative study. The interviews are, however, available for future content analysis.

**Quantitative Analysis**

For the first phase of analysis, participants’ numerical FourSight scores were examined, and notations were made of their primary types. Information was recorded for 17 variables, as detailed in Table 2.
### Table 2

*Variables Coded in Statistical Analysis*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coded As</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>SUNY Buffalo State</td>
</tr>
<tr>
<td></td>
<td>Villa Maria</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>Occupation</td>
<td>Student</td>
</tr>
<tr>
<td></td>
<td>Sales</td>
</tr>
<tr>
<td>Primary Type</td>
<td>Highest FourSight numerical score</td>
</tr>
<tr>
<td>Secondary Type</td>
<td>Second-highest FourSight numerical score</td>
</tr>
<tr>
<td>Tertiary Type</td>
<td>Third-highest FourSight numerical score</td>
</tr>
<tr>
<td>Pure Type (is student a single FourSight type)</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Clarifier</td>
<td>Predominant type is Clarifier</td>
</tr>
<tr>
<td>Ideator</td>
<td>Predominant type is Ideator</td>
</tr>
<tr>
<td>Developer</td>
<td>Predominant type is Developer</td>
</tr>
<tr>
<td>Implementer</td>
<td>Predominant type is Implementer</td>
</tr>
<tr>
<td>Medium</td>
<td>Pen, pencil, or both used in sketch</td>
</tr>
<tr>
<td>Draw Page</td>
<td>Number of pages sketched</td>
</tr>
<tr>
<td>Design Number</td>
<td>Number of designs sketched</td>
</tr>
<tr>
<td>Write On (did student write on sketch)</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Instruction (did student write on instructions)</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>
To consider the evaluation of the sketches, two important aesthetics studies were referenced. In the first, Arnheim (1974) contended that the interrelationship of parts devise the whole of an artwork, and that those interrelationships, visually experienced, bestow meaning. In the second, Arnheim (1993) further maintained that a sketch not only catalogs the cognitive methods of its designer, but also “permits the observer or theorist to catch a few stop-motion glimpses of the flow of creation” (p. 19). Therefore, in gestalt-like fashion, the sketches themselves were sufficient to see the thinking process central to the creation and the creator as well. Bearing that in mind, the researcher wanted to determine whether external raters could assess FourSight profiles from the participants’ problem-solving sketches—and thus update Witkin’s (1964) evaluations regarding children’s drawings and their cognitive styles.

Five design experts who were certified or trained in the FourSight measure were thereby recruited. Two college design professors, two fashion designers, and a design journalist agreed to independently rate the drawings. Three panelists live in the United States. While one of the professors is based in Denmark, and one of the fashion designers (who is also a professor) lives and works in England, both have experience teaching in the United States, and they were included on the panel.

Following widely used conventions for presenting creative material to raters (Amabile, 1982; S. B. Kaufman, Christopher, & J. C. Kaufman, 2008), the researcher digitally reproduced the participants’ sketches, masking only identifying marks such as email addresses or names. If participants had written on the design brief, that was also copied and attached to the sketch.
Shuffling the images in random order, the researcher then attached a rating sheet to each sketch before sending the entire set via FedEx to members of the rating panel. The rating sheet featured a Likert-type scale divided into five possible answers: Clarifier, Ideator, Developer, Implementer, and Unclear. Below that, the sheet included a comment section (see Appendix G for rating sheet).

Raters were instructed to mark the peak FourSight profile indicated in each sketch, and make any comments they felt necessary. Panelists were given two weeks to analyze the sketches. When they were finished, panelists returned the rated sketches to the researcher in a prepaid shipping envelope.

The researcher recorded the raters’ decisions and consensus for each case. Interrater reliability was calculated with the proportional reduction in loss (PRL) measure (Rust & Cooil, 1994), an algorithm designed to measure reliability in the case of multiple raters coding multiple items. Having been successfully used in creativity research (Cabra & Joniak, 2008; West, Kover, & Karuna, 2008), PRL offers a more rigorous method for determining the reliability of qualitative judgments than simple percentage of agreement.

The researcher also noted whether the panelists’ individual and aggregate decisions agreed with the results of each student’s FourSight assessment. To examine this relationship, a chi-square test was performed to predict the expected frequencies and compare them to the observed frequencies. Correlations between the raters’ decisions and various variables were also determined. Quantitative analysis was conducted with SPSS version 21 software.
Qualitative Method

Applied to sketches, Arnheim’s contention (Grundman, 2001) of the gestalt of sketching was complemented by a visual graphic analysis method, photo-elicitation, described by Rose (2012). Frequently used in the social sciences, photo-elicitation requires participants to create a photograph (or, in this case, a sketch) which is discussed in a later interview. Quite often, participants are themselves the discussants. However, because the researcher was interested in exploring the characteristics of the sketches that received high PRL agreements from the first panel of raters, two new panels of certified FourSight practitioners were recruited as raters for this qualitative segment. Indeed, as Arnheim (1993) maintained that the gestalt of sketches is sufficient to allow a viewer to see the thought process of the creation as well as the creator, FourSight-trained raters seemed the logical choice for further examining the relationship between the sketches and the sketchers’ cognitive styles.

This post-hoc segment was conducted in February, 2013. The researcher selected two drawings from each FourSight type that received PRL-derived interrater agreements of greater than .60 or .60 if there was another sketch with a PRL of greater than .60. Since there was only one Developer consensus sketch, and its PRL was .60, it was not selected. Moreover, because the quantitative study did not take into account Integraters, those drawings were likewise not selected. Extrapolating Arnheim’s (1993) contention that a sketch represents a global image of the designer’s thinking, and given that FourSight represents a scale whose lowest value is never zero (Puccio, 2009), the researcher wanted to more closely examine specific characteristics of the drawings that yielded high consensus.
The researcher digitally scanned and emailed the six sketches to the first post-hoc panel, composed of three American creativity practitioners certified in FourSight. This new panel was informed which styles were reached by the consensus of the first panel of raters. The panelists were asked to verbalize how the sketches supported the consensus.

These raters were given seven days to reply by email. Once responses were returned, the researcher analyzed the material following methodology for a priori coding of qualitative data (Taylor & Gibbs, 2010), focusing on keywords.

A second phase of inquiry was conducted with the intent of reaching a saturation point in this phase of the study. The researcher repeated the process, sending the six digitally scanned sketches to another panel of three FourSight-certified creativity practitioners—two Canadian, one American—and asked them to detail how the drawings supported the ratings from the five-person panel. Once again, raters were given seven days to respond by email.

**Qualitative Analysis**

In critical visual analysis methodology, images are understood to have dual layers of meaning (Rose, 2012; Sturken & Cartwright, 2003). Barthes (1977) characterized these as connotative and denotative; that is, images have both culturally filtered meanings, and literal, census-taking meanings.

For the purposes of this study, the connotative meanings of the six sketches were given context by the two panels of post-hoc raters as they described what they saw that confirmed the first panel’s consensus. The researcher coded the groups’ keywords separately before analyzing keywords from both groups.
To define the literal messages in the sketches, the researcher documented descriptive elements in a coding system that itemized media, number of sketches, and discrete design details. Variables from the system are excerpted in Table 3.

Table 3

*Selected Variables Coded in Denotative System*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coded As</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Contrasting fabric</td>
</tr>
<tr>
<td></td>
<td>Topstitching</td>
</tr>
<tr>
<td></td>
<td>Neckline</td>
</tr>
<tr>
<td></td>
<td>Silhouette mentioned</td>
</tr>
<tr>
<td></td>
<td>Jacket</td>
</tr>
<tr>
<td></td>
<td>Zipper</td>
</tr>
<tr>
<td></td>
<td>Bodice detail</td>
</tr>
<tr>
<td></td>
<td>Trousers</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Logo</td>
</tr>
<tr>
<td></td>
<td>Hemline</td>
</tr>
<tr>
<td></td>
<td>Defined waist</td>
</tr>
<tr>
<td></td>
<td>Pattern</td>
</tr>
<tr>
<td></td>
<td>Fabric</td>
</tr>
<tr>
<td></td>
<td>Separates</td>
</tr>
<tr>
<td></td>
<td>Season</td>
</tr>
<tr>
<td></td>
<td>Sleeves</td>
</tr>
<tr>
<td></td>
<td>Coat</td>
</tr>
<tr>
<td></td>
<td>Dress</td>
</tr>
<tr>
<td></td>
<td>Collar</td>
</tr>
<tr>
<td></td>
<td>Buttons</td>
</tr>
<tr>
<td></td>
<td>Lapels</td>
</tr>
<tr>
<td>Accessories</td>
<td>Belt</td>
</tr>
<tr>
<td></td>
<td>Tie</td>
</tr>
<tr>
<td>Variable</td>
<td>Coded As</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Earrings</td>
<td></td>
</tr>
<tr>
<td>Hat</td>
<td></td>
</tr>
<tr>
<td>Legwear</td>
<td></td>
</tr>
<tr>
<td>Footwear</td>
<td></td>
</tr>
<tr>
<td>Croquis</td>
<td>No figure</td>
</tr>
<tr>
<td></td>
<td>Single figure</td>
</tr>
<tr>
<td></td>
<td>Multiple figures</td>
</tr>
<tr>
<td></td>
<td>Partial figure</td>
</tr>
<tr>
<td></td>
<td>Full figure</td>
</tr>
<tr>
<td></td>
<td>Featureless</td>
</tr>
<tr>
<td></td>
<td>Facial features</td>
</tr>
<tr>
<td></td>
<td>Multiple designs</td>
</tr>
<tr>
<td></td>
<td>Hair</td>
</tr>
<tr>
<td></td>
<td>Erasures</td>
</tr>
<tr>
<td></td>
<td>Drawing medium</td>
</tr>
</tbody>
</table>
Coding and qualitative analyses were performed using MAXQDA 10.0 software, which manages multimedia data and provides tools for annotating images. Validity in keyword and denotative coding was established by member-checking with selected participants in the post-hoc panels, a practice recommended by Creswell (2003). Given the qualitative phase of the study, and the multiple steps of the post-hoc, qualitative phase, a triangulation was effected between the participants’ FourSight scores, the raters’ interpretations of students’ profiles based on the sketches that resulted from the design brief, and the characteristics that emerged from the researcher’s multiple reviews of the sketches themselves.

Summary

Investigating whether a relationship exists between the cognitive style of a fashion designer and his or her sketches requires a strategic combination of methodologies, and reflects the broad influences that color the study of creativity itself. This chapter examined the processes involved in collecting data for this study. Specifically, it described the sample, outlined the procedures followed in collecting data, the quantitative and qualitative components of the study, and the strategy for analyzing the resulting data. The next chapter reports the results in detail.
CHAPTER 4: PRESENTATION AND ANALYSIS OF DATA

Introduction

The previous chapter examined the tactics and processes used to collect and analyze data in this mixed-methods research study. As outlined in Creswell’s (2003) description of the sequential explanatory strategy, this chapter considers the analysis in detail, beginning with the quantitative findings and moving on to the qualitative findings.

Quantitative Results

As a first step, numbers were assigned to the cases involved in the study. The researcher gave each participant an even number, identifying them as case 10, case 20, and so on. The case number was used for tracking purposes on sketches as well; sketches from participants at SUNY Buffalo State were noted with an additional letter “B.”

Determining the distribution of participants’ \( n = 34 \) FourSight scores was the next concern. (See Appendix H for a chart reporting complete participant numbers and FourSight scores). Table 4 shows the participants’ range of scores was within the FourSight parameters of a minimum of 9 and a maximum of 45 (Puccio, 2009).
Table 4

*Descriptive Statistics for Participants’ FourSight Scores*

<table>
<thead>
<tr>
<th>Type</th>
<th>µ</th>
<th>Mdn</th>
<th>Mode</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarifier</td>
<td>33.00</td>
<td>33.00</td>
<td>33</td>
<td>5.65</td>
<td>18-43</td>
</tr>
<tr>
<td>Ideator</td>
<td>32.97</td>
<td>33.50</td>
<td>35</td>
<td>5.64</td>
<td>17-41</td>
</tr>
<tr>
<td>Developer</td>
<td>33.12</td>
<td>34.00</td>
<td>29</td>
<td>7.01</td>
<td>18-45</td>
</tr>
<tr>
<td>Implementer</td>
<td>32.12</td>
<td>32.00</td>
<td>27</td>
<td>4.82</td>
<td>19-41</td>
</tr>
</tbody>
</table>

A majority of the participants sampled (56%) had scores that indicated a single FourSight profile. The predominant type, defined as a participant’s highest score, included 5 Clarifiers (15%), 7 Ideators (21%), 7 Developers (21%), 3 Implementers (9%), and 12 Integrators (35%).

FourSight literature estimates between 10 and 20% of the general population can be categorized an Integrator, someone who has nearly equal scores in all four preferences (Puccio, 2009). In the absence of additional data on other students, it is impossible to determine if this proportion of Integrators is an anomaly for this sample or if fashion design might attract and/or retain people with this FourSight profile. FourSight does not have a separate scoring category for Integrators, so they are not tabulated in Table 4.

The demographic statistics stated in Chapter 3 were followed by a preliminary analysis of the sketches themselves. For example, 23 (68%) participants sketched on one page, while 8 (23%) used two pages, and 3 (9%) used four. Ten participants (29%) sketched in ink; 15 (44%) sketched in pencil, and 9 (27%) in both.

Table 5 examines the number of designs the participants created. Of the 16 (47%) sketches that had writing on them, 2 were made by Clarifiers, 4 by Ideators, 2 by Developers, 2
by Implementers, and 6 by Integrators. Five participants marked on the design brief—1 Developer, 1 Implementer, and 3 Integrators.

Table 5

Number of Designs Made

<table>
<thead>
<tr>
<th>Sketches</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>35.3</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>35.3</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>14.7</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>5.9</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Rating Panel Results

As discussed in Chapter 3, the five-person panel of raters that reviewed all of the sketches for cognitive style were given a five-part Likert-type scale that featured options for scoring the sketch as belonging to a Clarifier, Ideator, Developer, and Implementer, as well as an option for Unknown Style. As previously mentioned, there was no separate scoring category for Integrators; therefore, that option was not included on the rating form.

Four raters each correctly identified the primary type for five of the participants (15% of the sample); one of them correctly identified the primary type for six participants (18% of the sample). Percentages rose when the sample was altered and the Integrators were removed—to 23% and 27%, respectively. Altering the sample another way and allowing the judges a correct identification for each Integrator—since any answer other than “Unknown” could arguably be
considered correct—shifted the total of positively identified cases to 50% for four of the raters, and 53% for the fifth.

**Statistical Analysis of Rater Decisions**

Chi-square analysis examining the number of correct rater decisions versus incorrect decisions revealed the relationship was not statistically significant for the unaltered sample ($\chi^2 = .18$, $df = 4$). The relationship was also not statistically significant for either the sample without Integrators ($\chi^2 = .20$, $df = 4$), or the sample that allowed raters to score a correct identification for each Integrator ($\chi^2 = .09$, $df = 4$).

Further, as reported in Table 6, no relationships were uncovered in analyzing the unaltered and altered samples for one-tailed bivariate correlations between raters who correctly identified cognitive style and variables that might influence a correct score.

Table 6

*Bivariate Correlations between Correct Identifications and Potentially Influential Variables*

<table>
<thead>
<tr>
<th>Sample</th>
<th>Number of designs</th>
<th>Sketches with writing</th>
<th>Marked on instructions</th>
<th>Number of pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaltered ($n = 34$)</td>
<td>$r = .062$</td>
<td>$r = .311$</td>
<td>$r = .087$</td>
<td>$r = -.068$</td>
</tr>
<tr>
<td></td>
<td>$p = .395$</td>
<td>$p = .085$</td>
<td>$p = .353$</td>
<td>$p = .385$</td>
</tr>
<tr>
<td>Integrators removed ($n = 22$)</td>
<td>$r = .140$</td>
<td>$r = .257$</td>
<td>$r = .070$</td>
<td>$r = -.080$</td>
</tr>
<tr>
<td></td>
<td>$p = .215$</td>
<td>$p = .072$</td>
<td>$p = .346$</td>
<td>$p = .327$</td>
</tr>
<tr>
<td>Integrators scored as correct ($n = 34$)</td>
<td>$r = -.122$</td>
<td>$r = -.005$</td>
<td>$r = .194$</td>
<td>$r = .035$</td>
</tr>
<tr>
<td></td>
<td>$p = .247$</td>
<td>$p = .488$</td>
<td>$p = .136$</td>
<td>$p = .422$</td>
</tr>
</tbody>
</table>
Interrater Reliability

Examining the interrater decisions for stability and quality fell to the PRL reliability measure (Rust & Cooil, 1993). As discussed in Chapter 3, the PRL measure adjusts for loss in confidence due to poor rater decisions. Moreover, it is comparable to a Cronbach’s alpha score, giving the PRL congruent confidence levels. Because raters’ decisions are ostensibly subjective, Rust and Cooil (1993) suggested that reporting confidence levels equivalent to Cronbach’s alpha lends credibility to the group’s conclusions.

The first step in calculating PRL is counting the number of pairwise rater agreements for each case. To that end, the researcher determined whether raters 1 and 2, 1 and 3, 1 and 4, and 1 and 5 agreed on case 100, then whether raters 2 and 3, 2 and 4, and 2 and 5 agreed on the same case, and so on. There were nine possible agreements for each case. The next step in calculating PRL establishes the proportion of interrater agreement per case, which ranged from 0 to 7. In this sample, there was no complete agreement on any of the cases. The proportions of interrater agreements ranged from .30 to .77. The final step in calculating PRL is consulting a table published with the measure that reports reliability for various numbers of categories and judges. The resulting PRL levels ranged from .60 to .95, and the corresponding values are reported in Table 7, along with raters’ consensus of FourSight type and the scored predominant type.
Social science disciplines often stress considering Cronbach’s alpha of .70 and above as useful for research (Field, 2009). However, research conventions are just that—useful rules of thumb. For example, considering some items with levels of significance as low as .10 can be constructive, particularly in exploratory work on a little-known topic (Ritchey, 2008). Therefore, the researcher admitted items with a PRL of .60 or greater in order to get the fullest picture of the consensus cases.

### Table 7

*Interrater Agreements, PRL Values ≥ .60, Rater Consensus, and FourSight Results*

<table>
<thead>
<tr>
<th>Case</th>
<th>Interrater agreement</th>
<th>PRL</th>
<th>Consensus FourSight type</th>
<th>Scored predominant FourSight type</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>.40</td>
<td>.79</td>
<td>Ideator</td>
<td>Implementer</td>
</tr>
<tr>
<td>50</td>
<td>.30</td>
<td>.60</td>
<td>Clarifier</td>
<td>Integrator</td>
</tr>
<tr>
<td>60</td>
<td>.60</td>
<td>.95</td>
<td>Implementer</td>
<td>Developer</td>
</tr>
<tr>
<td>70</td>
<td>.40</td>
<td>.79</td>
<td>Ideator</td>
<td>Integrator</td>
</tr>
<tr>
<td>100</td>
<td>.30</td>
<td>.60</td>
<td>Ideator</td>
<td>Implementer</td>
</tr>
<tr>
<td>110</td>
<td>.40</td>
<td>.79</td>
<td>Clarifier</td>
<td>Developer</td>
</tr>
<tr>
<td>140</td>
<td>.60</td>
<td>.95</td>
<td>Implementer</td>
<td>Clarifier</td>
</tr>
<tr>
<td>170</td>
<td>.60</td>
<td>.95</td>
<td>Ideator</td>
<td>Developer</td>
</tr>
<tr>
<td>200</td>
<td>.30</td>
<td>.60</td>
<td>Clarifier</td>
<td>Clarifier</td>
</tr>
<tr>
<td>210</td>
<td>.30</td>
<td>.60</td>
<td>Clarifier</td>
<td>Clarifier</td>
</tr>
<tr>
<td>220</td>
<td>.30</td>
<td>.60</td>
<td>Implementer</td>
<td>Integrator</td>
</tr>
<tr>
<td>240</td>
<td>.60</td>
<td>.95</td>
<td>Ideator</td>
<td>Clarifier-Developer</td>
</tr>
<tr>
<td>250</td>
<td>.30</td>
<td>.60</td>
<td>Developer</td>
<td>Integrator</td>
</tr>
<tr>
<td>260</td>
<td>.30</td>
<td>.60</td>
<td>Implementer</td>
<td>Ideator</td>
</tr>
<tr>
<td>270</td>
<td>.30</td>
<td>.60</td>
<td>Implementer</td>
<td>Ideator</td>
</tr>
<tr>
<td>280</td>
<td>.40</td>
<td>.79</td>
<td>Implementer</td>
<td>Ideator</td>
</tr>
<tr>
<td>290</td>
<td>.30</td>
<td>.60</td>
<td>Implementer</td>
<td>Integrator</td>
</tr>
<tr>
<td>300</td>
<td>.30</td>
<td>.60</td>
<td>Clarifier</td>
<td>Ideator</td>
</tr>
<tr>
<td>310</td>
<td>.60</td>
<td>.95</td>
<td>Ideator</td>
<td>Integrator</td>
</tr>
<tr>
<td>340</td>
<td>.30</td>
<td>.60</td>
<td>Implementer</td>
<td>Integrator</td>
</tr>
</tbody>
</table>
Raters correctly identified 2 cases—200 and 210—as being Clarifiers. The raters also correctly identified aspects of the seven Integrators in this group. Yet, they reached consensus, sometimes quite emphatically, on 12 cases (60%) while not correctly identifying predominant FourSight types.

**Integration between Research Modes**

Reflecting on these results sparked a new line of questions: What did raters see in the sketches that caused them to agree? How did raters make the same meanings out of these images? Was what they saw related to their conceptions of FourSight styles? Conversely, did their PRL consensus hearken back to Barthes’ (1977) and Arnheim’s (Grundman, 2001) arguments that what raters saw in the sketches was there to be seen? Could rater interpretations be traced to an interaction between what the sketch contained and what they knew about cognitive styles?

As discussed in Chapter 3, a sequential explanatory strategy can be instructive when such questions arise in the analysis of a quantitative study (Morse, 1991). The researcher earlier questioned whether trained raters could look at a fashion design sketch and determine the cognitive style of the sketcher. While the quantitative review uncovered no statistically significant relationships, the PRL calculations suggested something more.

The qualitative research phase of this project sought, then, to examine what that something might be, establishing the first point of connection between quantitative and qualitative modes. To more completely understand the bridge between the two phases, a number of points from Chapter 3 bear repeating: The criteria for the selected six drawings from the sample was a PRL greater than .60, or .60 if there were another sketch with the same consensus
for the same type and a higher PRL. Accordingly, two sketches each from consensus Clarifiers (sketches 110 and 200), Ideators (170 and 310), and Implementers (60 and 280) were selected. Because only one sketch (250) was rated by the quantitative panel as having been made by a Developer, and its PRL was .60, it was not included in the qualitative part of the study. Finally, to more strongly connect the phases of the study, the researcher undertook a graphic content analysis of the selected sketches. At the same time, two additional sets of raters certified in the FourSight assessment were recruited to review these freshly selected sketches in a photo-elicitation approach (Rose, 2012), renamed “sketch-elicitation” for the purposes of this study.

Qualitative Results

Graphic analysis phase

Reviewing the selected sketches for qualitative data began as soon as the quantitative phase was over. The images sparked ongoing comparisons with relevant literature and theory discussed in Chapter 2 in an effort to elicit meanings, a qualitative reliability tactic suggested by Hsieh and Shannon (2005).

With the goal of impartially identifying the number of design elements depicted in each sketch, six randomly selected sketches without high PRL values were analyzed in terms of designs, details, and croquis. An initial 126-item coding structure, cross-checked with terms from a fashion design textbook (Ellinwood, 2011) and vetted by a fashion design professional, was used to analyze these sketches. This initial coding structure formed the basis of a second 106-item structure, cross-checked anew, that was used to evaluate the six sketches with significant PRL values. Selected items from the new structure are listed in Table 3.
Perhaps predictably, design was the largest category of coded elements (58%), and included details such as defined waistline (15 counts), hemline (12), and logo (10). High detail, which included items not a part of the fashion design per se but integral to the brief—items such as footwear (15 counts), tie (4), and belt (3)—constituted 25% of the codes. Items coded in the croquis category counted the physical components of each sketch, such as full figure (12 counts), featureless face (8), and writing on drawing (5), accounted for the remaining 17%. As shown in Figure 13, the sketches that attracted the Ideator consensus contained an average of five more elements than of sketches made by designers with the other consensus cognitive styles.
Figure 13. Graphic analysis codes counted in significant PRL-value sketches. Consensus clarifiers (CL) averaged 16.5 codes per sketch; Ideators (ID), 20.5; and Implementers (IM), 16.
Sketch-elicitation Phase

Two waves of three-person qualitative raters were emailed the sketches and asked why they thought the five-person panel arrived at the consensus they did. In each wave, panelists responded independently and emailed their replies back to the researcher. Responses in each wave were collated by sketch and coded for keywords.

The 100 keywords resulting from both waves were then sorted by the quantitative rater panel’s consensus FourSight designations for the sketches. While raters’ comments by and large supported the quantitative panel’s consensus, two raters (1, 4) mentioned that they detected but did not name other cognitive styles reflected in three sketches (60, 200, 280). Nonetheless, they supported the consensus designations, admitting the possibility that the sketches could have been made by people who had multiple FourSight types.

To abet reliability, the coding at this point was cross-checked with an independent researcher in the social sciences whose own work involves mixed-methods analysis. After multiple coding passes, in vivo keywords were hierarchically sorted into themes that included context, energy, transformation, details, completeness, and missing elements.

Further review enabled the researcher to identify three emergent themes: selection, attitude, and innovation. Selection (120 counts) included words that referred to how the elements in the sketch were chosen. Attitude (119 counts) included words that described the sketcher’s approach. Innovation (22 counts) included words that characterized the transformative aspects of the sketches. Using these three themes and the quantitative rater panel’s consensus FourSight designations, Figure 14 examines the number of combined
comments the two waves of qualitative raters made about the high PRL value sketches; a discussion of the themes follows.
Figure 14. Content counts of rater comments by sketcher’s consensus FourSight designations.

Individual keywords were counted and three emergent themes measured. Raters gave 64 selection descriptions to Clarifiers, 18 innovation descriptions to Ideators, and 46 attitude descriptions to Implementers.
Selection. Because this theme comprised details the designers included—as well as those they left out—it contained the most counts. In essence, it fundamentally focused on design.

When the designers deliberately selected details, raters were quick to notice, particularly if the sketches had writing on them. It was as if the writing highlighted the selections in each design. Said rater 6 about sketch 200: “The skirt is not just a pencil skirt, but a very structured one . . . The top has nicely tailored, pointy sleeves. Nothing is left to the choice or the imagination of the viewer . . . It is spelled out, literally, from the pillbox hat to the ankle bootie . . . This drawing shows the ‘what’ and the ‘why.’” Rater 2 agreed: “It isn’t just black and white . . . it has silvers, blacks, shades of grey, and white. A lot of clarification for the spectrum of black to white.” Sketch 200 is reproduced in Figure 15.
Figure 15. Sketch 200. Raters commented on the number of descriptive details the designer included in this drawing. From the tilt of the pillbox hat to the flare of the peplum to the comfortable ankle booties, raters agreed that the specifics in this sketch exemplified selection completeness. Although raters agreed with the consensus FourSight type of Clarifier for this participant, two noted other unspecified cognitive styles, suggesting a split type.
This sense of completeness contrasted with one of ambiguity—that is, the absence of specifics—the raters found when sketches were drawn with selections suggested, but not fully depicted. In discussing sketch 170, rater 5 noted that while the sketch showed uniforms, “. . . the details about how [they] would be worn, the shoes, etc., are left out.” Sketch 170 is reproduced in Figure 16.
Figure 16. Sketch 170. Reviewing this three-design sketch, raters commented on the sparse nature of the croquis as an indication of selection ambiguity. The sketch was also described as innovative because of the number of ideas, as well as the adaptation of functional necessities like button closures, topstitching, and belt loops into fashion features. Raters agreed with the consensus FourSight type of Ideator for this participant.
Ambiguity occasionally extended to the croquis as well. Referring to sketch 310, rater 3 said, “No detail of face or hair included—just suggested—left open for interpretation.” At times, raters cited selection in the deliberateness and specificity of details that appeared to simplify rather than complicate the designs. “Detail on detail, but not as a flood of ideas . . . these are details for clarification’s sake,” said rater 6, describing sketch 110.

As noted earlier, Clarifiers elicited the most selection comments. Rater 1 also discussed sketch 110, which was classified by the quantitative rater panel as being made by a Clarifier:

> Interesting that there is a fair amount of text used for both [designs], while [they] themselves don’t strike me as more overwhelmingly detailed than the other drawings. Perhaps just a little. Perhaps a Clarifier who is aware of any deficiencies in his or her sketch, or drawing ability, would want to make up for this by explaining things well with words.

Rater 2 agreed that sketch 110 was made by a Clarifier:

> . . . Two key indicators: While asked for a uniform, this person provided a uniform system. The smaller drawing has fewer chevrons to indicate a different status. So, not just how the uniform works, but [how it works] in context of the other uniforms. The description answers any questions we might have . . . including some we never thought to ask. We have the material, the colors, the functioning of the belt, the hemline placement, and the use of accessories.

In other words, the designer’s selection was as personal as his or her cognitive style. The details the designer chose and the way they were expressed—with line and with words—convinced the raters the design was thoroughly thought through in the style of a Clarifier. Sketch 110 is reproduced in Figure 17.
Figure 17. Sketch 110. In discussing this two-design sketch, raters contrasted the lack of detail with the deliberateness of the designer’s written comments. The conclusion one rater drew was that the designer might have been aware of imperfections in the sketch, and used words to make clear the most important features. Raters agreed with the consensus FourSight type of Clarifier for this participant.
**Attitude.** This theme included the way in which designers appeared to work, and contained the second-highest counts. In essence, it fundamentally focused on approach. In looking for clues about cognitive style, the raters seemed to seek a mood in the sketches. They appeared to search for a tone evoked by the designs.

Raters observed that some designers seemed to be in a hurry, which prompted some to speak as the designers: “You asked for a uniform, I made it happen,” said rater 2 about sketch 60. Rater 2 continued, “Even the posture gives me the sense of a no-nonsense foot-tapper ready to take action, waiting for me impatiently.” Rater 5 used much the same language about sketch 280: “Drawing has an energy to it, a sense it was done in a hurry. You need a uniform, here’s one.” Sketch 280 is reproduced in Figure 18.
Figure 18. Sketch 280. The practicality and efficiency of both the sketch and the fashion convinced raters that the predominant attitudes of this design were decisive and functional.

Although raters agreed with the consensus FourSight type of Implementer for this participant, two noted other unspecified cognitive styles in addition, suggesting a split type.
Practicality and functionality also indicated attitude. Rater 6 commented on sketch 280, “This uniform is a practical, get-to-business outfit.” Rater 2 called sketch 60 “functional and complete.” Rater 6 added a serviceable aside to the same sketch, saying, “Sleeve is pushed up to the elbow and ready to work.” Sketch 60 is reproduced in Figure 19.
Figure 19. Sketch 60. A sense of movement in this sketch, possibly intimated by the erased and redrawn shoes on the croquis, indicated a hurried attitude to the raters. Raters also commented on the design’s elbow-length sleeves as being ready for work. Although raters agreed with the consensus FourSight type of Implementer for this participant, two noted other unspecified cognitive styles in addition, suggesting a split type.
Raters also characterized attitudes such as exactitude and inclusiveness. “The word that keeps coming to me is ‘precision,’” said rater 5 about sketch 200. In discussing sketch 170, the same rater said, “When I look at these [sketches], I can’t help but thinking ‘global.’”

Sketches rated by the quantitative rater panel as being made by Implementers received persuasive comments from the qualitative raters. It was as if raters were reading the sketches for indications of the designers favored action above all else. As rater 3 said about sketch 280:

Efficiency in every line. There are no extra lines, and no incomplete lines. While the elaboration is sparse, the picture is very complete. All essential elements are noted, with the airline badge, sleeve, and waistband detail. The attitude of the figure is also very confident.

Rater 6 found a similar attitude in both sketch 280 and 60:

These two outfits mean business. The kind of no-nonsense, let’s-get-to-work look you would expect from an Implementer. And interestingly, both figures express some sense of motion and energy. I can see why a reviewer would see the hand of an Implementer in these images.

In the rush to finish the brief, these Implementer designers rendered a clear conclusion at the cost of unexplored ideas and undeveloped details, the raters suggested. The sketches seemed to convey to the raters that elaboration would only delay the completion of the project.

**Innovation.** This theme highlighted the originality noticeable in the designers’ sketches, and contained the fewest counts—a possibly unsurprising outcome for a collection of student
sketches. However, those reviewers who did comment on innovation or the lack of it were unequivocal. This theme, then, fundamentally focused on creativity.

Within this theme, raters attempted to search for fashion they had not yet encountered in a uniform design, and occasionally found it. “This person seems to be thinking ‘out of the box,’ and presenting something many of us might not have thought of on our own,” said rater 1 about sketch 310. Rater 6 had a similar reading of that sketch: “This is not your mother’s flight attendant uniform. This one has bold, new (almost avant-garde) ideas.” These are details in service of a unique stylistic vision, the raters seemed to imply. Sketch 310 is reproduced in Figure 20.
Figure 20. Sketch 310. Raters described this design as innovative because of atypical details such as fluid contours and a zippered back closure. Raters also noted the designer’s comment that this uniform would have a transcendent effect. Raters agreed with the consensus FourSight type of Ideator for this participant.
On occasion, raters were surprised by the lack of innovation. “They look like something you might [already] see on a flight attendant, so there is a low level of novelty,” rater 1 said about sketch 60. Commenting on the same sketch, rater 5 said, “I find these outfits functional but not interesting. They do the job, but it’s like there was no thought or effort put into them. The lines are straighter. They seem to be more simplistic.”

Sketch 170 (see Figure 16) struck the raters as being noticeably innovative. Featuring three uniforms incorporating a variety of design details built around a princess-seamed theme, the sketch drew several comments noting its translation of function into fashion. Rater 6 said that design necessities such as seaming, closures, and belt loops were transformed into smart design details: “These outfits are imaginative; and a tad flashy and adventurous . . . Even the mundane aspects of the uniforms are bursting with ideas that turn function into novel and decorative form.” Rater 3 observed, “[The] three designs are very different (collars, buttons), not even the same use from garment to garment.” Rater 2 concurred, saying, “You can only get that innovative if you are comfortable playing around with new ideas, and lots of them.”

The quantitative rater panel classified Sketch 170 as having been made by an Ideator. Sketches from consensus Ideators drew the highest number of innovation comments from the qualitative panels. Relating impressions of sketch 170, rater 1 explained why:

While I could certainly say that there are details included, like the buttons and belt, overall the sketches suggest basic design ideas. There are no indications of color or fabric, and none of the sketches show thought for shoes, hats, or other accessories. This fits with an Ideator’s tendency to overlook details. However, I must admit that I like the overall impact of the presentation of the figures. . . This makes me think that for this
person it was important to convey an overall image than highlight any details. This most certainly fits with the visionary aspects of an Ideator.

Rater 5 also considered sketch 170 an Ideator’s domain: “I find myself drawn into these outfits . . . they provide some element of surprise, they seem a little playful, flowing. They’re interesting.”

In other words, to these raters, the innovative power of Ideators came across as thought-provoking, intriguing, and potentially transformative.

Summary

This chapter examined the quantitative and qualitative analyses of the data gathered in this study. The quantitative section contained an analysis of participants’ FourSight scores, descriptive statistics of the sample and the first rating panel’s decisions, and a discussion of interrater reliability. An examination of the integration between the quantitative and the qualitative modes was followed by the qualitative review of the graphic analysis and sketch-elicitation phases of the project. Three emergent themes from the sketch-elicitation process were identified and explored. The following chapter will discuss these findings in more depth. Moreover, limitations of the current study, implications, and recommendations for future research will also be considered.
CHAPTER 5: SUMMARY AND IMPLICATIONS FOR FURTHER STUDY

Introduction

As envisioned in Chapter 1, this exploratory study addressed a gap in the literature of psychology, design thinking, and sociology, by testing for links between cognitive style and the gestalt of sketches produced by fashion design students. Its original contribution to the field lies at an intersection between design thinking, semiotics, and cognitive style. The raters who reviewed the sketches in this study were likely to agree on their interpretations of the FourSight cognitive styles depicted, recognizing a common gestalt even when their interpretations were at odds with the actual predominant cognitive styles of the sketchers.

This chapter, then, examines the results of this study and relates them to the goals for this research stated in Chapter 1. The main findings are reviewed, their implications discussed, and limitations of this research stated. The chapter concludes with suggestions for future studies.

Discussion of Results

Summary of Research

The purpose of this study was to test for possible relationships between cognitive style and fashion design sketching by working with students at SUNY Buffalo State College and Villa Maria College \((n = 34)\). “Cognitive style” referred to the profile identified when participants took the FourSight cognitive style assessment (Puccio, 2009). “Fashion design sketching” referred to the sketches participants produced in response to a timed design brief. In this study, expert panelists trained in FourSight examined the participants’ sketches and interpreted participants’ preferred modes of thinking within the creative process. In effect, the raters were responding to the gestalt (Arnheim, 1993) each sketch conveyed.
The study’s methodology was informed by early psychology research (Waehner, 1946; Witkin et al., 1962), which tested students for cognitive style and had them draw figures which were then interpreted by expert scorers. The present research also drew from Guster (1986) and Pektas (2010), who measured drafting students’ cognitive styles by giving students design briefs that were independently rated for creativity and technical quality.

The present study differed in that its hypothesis was that raters could review students’ hand-drawn sketches and determine the students’ cognitive styles. A sequential explanatory research design (Creswell, 2003) was chosen. Within this design—increasingly used in social science research (Ivankova, Creswell, & Stick, 2006)—quantitative data are first collected and analyzed, and then qualitative data are collected and analyzed.

In the present study, fashion design students completed the FourSight assessment (Puccio, 2009), then used pencil and paper to solve a timed design brief. Sketches were analyzed by waves of FourSight-trained raters, many of whom were design professionals as well. In the first analysis, a panel of five raters examined all of the sketches in the sample, noting which cognitive profile was reflected in each sketch. Afterward, the researcher performed a graphic analysis of six selected sketches that received consensus from the first panelists. In the final component of the study, six raters discussed why they thought the first panelists rated the six sketches the way they did.

**Summary of Results**

The sample (n = 34) included 15% Clarifiers, 21% Ideators, 21% and Developers, 9% Implementers. Additionally, there were 35% Integrators, a FourSight type that indicates roughly equal scores in all four preferences (Puccio, 2009).

Members of the first panel correctly named the sketchers’ FourSight styles at rates below chance. Chi-square tests showed no statistical significance, and bivariate correlations examining
aspects of the sketches that might have aided raters showed no relationship. However, interrater reliability performed with Rust and Cooil’s (1993) PRL statistic showed that raters agreed with alpha scores at or above .60 in 59% of the cases.

Qualitative analysis focused on six sketches with high-PRL consensus: Two each from sketches the first panel identified as being made by Clarifiers, Ideators, and Implementers. In the graphic analysis of the sketches, those ranked by the first panel to be Ideators averaged the highest counts of elements (20.5), while those from consensus Clarifiers (16.5) and Implementers (16) were nearly the same.

Two new three-person panels of FourSight-trained raters reviewed the six sketches, detailing why they thought the first panelists reached the consensuses they did. Three themes—Selection, Attitude, and Innovation—emerged from content coding analysis. In the sample, consensus Clarifiers drew the highest number of Selection comments (64); consensus Implementers, the highest number of Attitude comments (46); and consensus Ideators, the highest number of Innovation comments (18).

Fit with Goals

This study had four aims at the outset. First, it was to be an initial examination of fashion designers’ cognitive style profiles. The study sought to contribute to the work surrounding the FourSight measure, which is beginning to be used more frequently in design settings. It also aspired to build on earlier theoretical work while using contemporary analytical tools and strategies. Finally, it hoped to reiterate to scholars in the fields of creativity, design, and psychology that fashion design sketching is a form of problem-solving.

No literature has yet been uncovered that addresses fashion designers’ cognitive styles, so this appears to be a first appraisal of the topic. Because it utilized the FourSight measure to assess the designers’ cognitive styles, the study meets that goal as well.
As stated in Chapter 1, this study set out to update early cognitive style research. By employing a mixed-methods approach to analyzing the data, the study contemporized Waehner’s (1946) and Witkin’s (1964) approaches both quantitatively and qualitatively. It also avoided Waehner’s previously noted shortcoming of selecting students’ teachers to review the research, and Witkin’s lack of transparency in analysis.

As far as the trans-disciplinary goal of representing fashion design sketching as a form of problem-solving, the study builds on the work of van der Lugt (2005), which examined sketching by industrial designers during brainstorming meetings. It also looked more closely at fashion designers, a direction advocated in the cross-disciplinary research of Eckert et al. (2004).

**Implications of Findings**

Can raters look at a fashion design sketch and discern the cognitive style of the sketcher? These findings point to a nuanced picture.

The quantitative results in this research appear to indicate that the first panel of raters trained in FourSight could not do so with any relevant statistical significance. Yet the discovery that the first panel of raters agreed on the sketchers’ predominant FourSight types in 59% of the cases suggests they often saw and interpreted elements from the same drawings in the same ways. This unforeseen finding seemed to be underscored in the results from the subsequent two groups of qualitative raters as well as the graphic analysis.

**Theoretical Connections**

The sketches in the present study were the result of a problem-solving exercise. As such, it is possible they may reflect the range of cognitive styles the sketcher had to use to complete the assignment rather than a single dominant style (or, in the case of FourSight, a combination of them). That direction confirms theoretical work by Visser (2006), which holds that design can be construed as a collection of ways a designer represents both a problem and its solution.
FourSight literature reminds us that preference is not the same thing as ability, and everyone who takes the assessment scores between nine and 45 on any of the four cognitive style profiles measured (Puccio, 2009). All of the participants in the present study had individual FourSight scores, yet the students had to draw on all phases of problem solving to complete the design brief. Perhaps the resulting sketches offer insight into how all of the moving parts of problem solving work together to create solutions, a line of inquiry advanced by Goldschmidt (1991, 2003).

More than merely a window into the sketcher’s dominant style, the fashion design sketch could be a panoramic way of looking at the sketcher’s entire problem-solving process. That assertion is key in Arnheim’s (1993) contention that the gestalt of sketches allows a viewer to see a global image of its creator’s thinking, and here it brings into focus not just the creators but the viewers—in this case, the raters—as well.

Indeed, as Barthes (1977) maintained in his work on the theory of signs and symbols in images, each sketch moves through two phases after its initial idea is conceived in the mind: The first is on paper, in front of its creator; the second is before a viewer who constructs meaning for the image. In essence, the sketch is made to be analyzed—either by the sketcher or by another viewer—and, once made, is ripe for interpretation.

Given their written assignments and their training in FourSight, raters in this study could be said to have been hyper-engaged in interpreting (Sturken & Cartwright, 2003). Raters could be considered to have approached the sketches more deliberately (and possibly more self-consciously) than a casual viewer. Further, each rater brought his or her own ideas of what the sketches meant in terms of FourSight type. That they often concurred suggests the meanings they constructed were similar, regardless of the creator’s FourSight scores.
While the research initially sought to be a window into the predominant cognitive styles of the fashion design students, the raters’ robust discussions about ways in which the sketches confirm the consensus FourSight ratings pointed to an offshoot of this subject. In declaring what they held to be the pertinent ways the sketches fell in line with the consensus ratings, raters seemed to be describing to the researcher a type of focus, in addition to a cognitive style. Perhaps, then, the sketches instead offer a glimpse into the stages in the problem-solving process that dominated the students’ completion of the design brief.

Figure 21 offers an instructive example. While the participant who created this three-design sketch scored as a high Ideator on the FourSight profile, the first panel of raters reached incomplete agreement on type. Given the number of ideas in the sketch—it was one of only five in the sample that featured three designs—it might seem obvious in hindsight that it was made by an Ideator. Yet the precision of the details, such as the distinctive fabrics and footwear specified, suggest the participant spent time in both the clarification phase (perhaps asking what someone who wore a uniform daily would want in terms of care) as well as the development phase (perhaps thinking through the logistics of creating an interplay of separates). Moreover, as a solution to the design brief, this sketch was implemented in ink with considerable finesse.
Figure 21. Sketch 180. This three-design sketch illustrates the range of problem-solving phases the designer encountered in completing the design brief. Although the high number of details suggests the designer’s FourSight Ideator preference, characteristics the raters assigned to other FourSight types are in evidence. The consideration for easy-care fabrics suggests clarification; the coordinating overcoat, development; and the well-inked croquis, implementation.
Indeed, ideas appeared to have come easily to this Ideator. Yet it could well be that the designer spent a considerable amount of problem-solving attention on aspects that clarified, developed, and implemented that initial rush of ideas.

As such, this sketch—and this way of viewing it—aligns with van der Lugt’s (2005) assertion that sketching assists a designer in thinking, and with the notion that a sketch makes visible the cognitive processes involved in creativity (Finke et al., 1992). This sketch also conforms to Casakin and Kreitler’s (2011) argument that when the cognitive aspects of the design process are served with both words and images, the result can be highly creative.

**Theoretical Implications Relative to FourSight.** Considering the high-consensus sketches, the emergent themes of attitude, innovation, and selection indicate clear and theoretically consistent results that support and extend FourSight theory. As noted in Chapter 2, the assessment is predicated on CPS, as well as the notion that a self-report inventory can measure individuals’ problem-solving preferences (Puccio, 2002). That the emergent themes are congruent with FourSight preferences indicates that fashion sketches appear to hold sufficient information to enable raters to discern those preferences. As such, the sketches seem to offer a visual—as opposed to verbal—way to “read” a designer’s cognitive skill set, if not his or her outright FourSight preference.

An understanding of the global information provided in a fashion design sketch could have import for FourSight practitioners. The debriefing procedure is positioned in the measure’s presenter’s guide (Puccio, 2009) as a joint effort between the practitioner and the person who has taken the assessment. Together, they identify behavioral patterns that surface in the problem-solving process. Deployed in such a setting, the review of a sketch that illustrates how an array
of styles surface in problem solving could be a powerful graphic reminder that creative abilities are multi-faceted and can transcend type. Moreover, practitioners who teach and train FourSight could also use the results of this study to enhance their work with organizations. These results reiterate that while people have a preference in a particular setting, the demands of problem solving may require the emergence and burnishing of secondary types. The same holds true for organizations, which, like individuals, display problem-solving preferences (Puccio, 2009).

**Relevance for Other Groups.** Sketches are a means of recording idea generation and communicating those ideas (Cham & Yang, 2005), so the results of the present study could have bearing on a variety of groups. Because it provides insights into the relationships between how people think and the ways in which they express their creativity through the concepts they produce, its potential applications could apply to fields far beyond fashion design.

Schools could encourage an accommodating teaching framework that takes into account the principles of cognitive style, understanding that FourSight (Puccio, 2009) and other such assessments should be considered as integrative (as opposed to exclusionary) portraits of students’ cognitive styles.

If teaching faculties at design schools think of sketches as evidence of a range of problem-solving modes—as opposed to being simply products in themselves—students could expand their understanding of their own processes and how their work appears to others. Moreover, students beyond the study of fashion design—perhaps those in interior or landscape design, architecture, product design, filmmaking, and other disciplines which call for sketching—would benefit with a similar teaching approach.

As Eckert and Stacey (2010) noted, the profession of design would benefit if there were
greater knowledge about how all designers work. Accordingly, if professionals in the field and 
their colleagues comprehensively read design sketches for cognitive style, the production of 
those designs could have the potential for game-changing profit and innovation. Manufacturing 
could conceivably become more efficient as more people in the production chain comprehend 
and share their readings of sketches. Technological progress could be realized, too.

Limitations of this Study

All research incorporates constraints, and this exploratory study is no exception. As 
stated in Chapter 3, the study relied on a convenience sample. Generalizability would likely 
have been enhanced with a larger sample size. With that change, one wonders if raters could 
have more accurately gauged FourSight profiles.

Another set of considerations concerns the raters, who worked remotely in both the 
quantitative and qualitative phases of the study. Perhaps if the sketch-elicitations (Rose, 2012) 
had been conducted in person, rather than remotely, the resulting interviews might have yielded 
richer, more complex data. Moreover, if the raters had reached greater consensus on sketches 
they determined to have been made by Developers, the themes that emerged during the 
qualitative analysis might have been different.

Finally, this research focused on the four primary types of cognitive style the FourSight 
measure addresses. An analytical challenge arose with the high number of Integrators in the 
sample whose profiles were by definition virtually equidimensional. As addressed in Chapter 3, 
although the proportion of Integrators made no difference in this study’s results, their inclusion 
should be more explicitly planned for in subsequent studies with larger samples.
Future Directions

There is still much to explore about the relationship between a fashion design sketch and its creator’s cognitive style. Studies building on this research could take various directions. For example, research could be conducted with different cognitive style instruments, pursuant to Kozhevnikov’s (2007) contention that the construct of cognitive styles covers a complex group of measures. The present study could be repeated with a sample of professional designers. It could be conducted with a variety of cognitive style assessments. Or it could follow the course of Eckert et al. (2004) and examine sketching and cognitive styles among professional participants who work in a variety of domains.

Another direction could examine cognitive style and computer-assisted drafting, updating the work by Guster (1986) and Pektas (2010). Video-recording participants’ problem-solving activities (Dorst & Cross, 2001) might add a dimension of data that could reveal links between creative process and product.

Alternatively, participants could be actively involved with the analysis, engaging in the sketch-elicitation (Rose, 2012) themselves. Such an approach, paired with testing for cognitive style, could reveal how designers with different FourSight profiles assemble their worldviews as well as their sketches.

How a Fashion Designer Might Proceed

The prospect of near-term research on the topic piques the imagination of at least one fashion designer. In her Newport, RI, studio, women’s wear designer Katie Brierley pins her hand-drawn sketches of her current collection to a bulletin board to provide inspiration while she works on the next season’s fashions (see Figures 22 and 23).
Figure 22. The bulletin board in fashion designer Katie Brierley’s Newport, RI, studio. Brierley posts fabric samples, trims, and working drawings from the current season while she works on designs for the next. Photographed in August, 2012, by the researcher.
Figure 23. Katie Brierley’s sketch for a blouse and trousers, Isoude Spring/Summer 2013 collection. Ink and marker on paper. Appearing in the upper left of the bulletin board shown in Figure 22, this drawing features Brierley’s notes on fabric selection, stitching details, and pricing. Reproduced with permission from the designer.
Brierley’s company, Isoude, makes high-end clothes collected by fashionable women as well as by the Fashion Institute of Technology—Brierley’s alma mater (Heller, 2010) and the repository of the Saint Laurent sketch in Figure 2. Like Saint Laurent, Brierley starts all of her designs with sketches (personal communication, March 22, 2013).

The sketches on Brierley’s board are embedded with implicit and explicit considerations about cost, clientele, marketing, and the ever-evolving matter of style. They literally illustrate Rissanen’s (2007) observation that a fashion sketch has multiple purposes. Indeed, another of those purposes is to communicate with the pattern makers, seamstresses, and suppliers who read her sketches just as certainly as the raters read the sketches made by the fashion design students in this study.

The findings in the present study confirm Brierley’s intuition that designing fashion calls on a wide range of problem-solving abilities. While these study results probably will not change the way she sketches, she said they could help mitigate a challenge faced by her couture business: how to translate a ready-to-wear collection into more exclusive designs that meet the demands of premium special-order customers. “Knowing this could extend my vision . . . of the collection’s design to couture for private client orders,” she said (personal communication, March 22, 2013).

Brierley’s reaction recalls Schön’s (1992) description of situativity theory in design, with its emphasis on solving ideological problems with reflective practice, as well as Ralph’s (2010) process of sense-making, implementation, and co-evolution—a construct that particularly applies to her work with clients. It also describes the interdependent relationship between thinking, sketching, and reflecting on a design solution (Schütze et al., 2003). Certainly, if
clients and production team alike know more about Brierley’s design thinking process—and, conversely, if Brierley knows more about theirs—the agreed-upon directions could be clearer and the executions stronger, just as López-Mesa and Thompson (2006) speculated. And the designs first borne by Brierley’s sketches would come full circle.

**Summary**

The intent of the study was to examine the relationship between cognitive style and fashion design sketching as a means of problem-solving. Its findings suggest the relationship is intricate, even more complex than first imagined. Rather than providing a direct insight into the preferred cognitive style of the fashion designer, these sketches may hint, perhaps, at the stage of problem-solving that dominated the exercise of creating a flight attendant’s uniform. The study almost certainly reveals a dynamic interplay between the fashion sketches and the raters called upon to interpret them, an interplay in keeping with Barthes’ (1977) theories about decoding images. In other words, the fashion design sketches in the present study projected a cognitive style gestalt to which the raters responded.

This chapter appraised the results of this study and related them to the goals for the research stated in Chapter 1. The main findings were reviewed, their implications discussed, and limitations of this research considered. The chapter concluded with suggestions for future studies.
REFERENCES


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APPENDIX A
Institutional Review Board Proposal

A. Purpose, Research Variables, and Population

Purpose of study: This study examines whether a relationship exists between the cognitive profiles of fashion designers and the sketches they create while solving a design problem.

Background: While attention has been paid to the process fashion designers use to make clothes (for example, Sinha, 2000; Eckert & Stacey, 2001; Rissanen, 2007), not as much quantifiable knowledge exists regarding the individual characteristics designers call on when they work. For example, during the literature search for this thesis, queries on databases as diverse as PsychINFO, JSTOR, and Google Scholar using terms such as “fashion designers, sketching, and personality” and “fashion designers, sketching, and individual characteristics” yielded no relevant results.

The construct of cognitive style can be considered to be the way people generally prefer to process information, and is useful in exploring the question. Because cognitive styles can be empirically studied, and because they provide a matrix for understanding the concepts of personality and cognition, they are often used by psychologists and academics to understand variations in performance (Sternberg & Grigorenko, 1997).

How might that tie into fashion design sketching? Early research in cognitive styles holds clues. Waehner (1946) analyzed and rated the task-fulfilling drawings of college students, using psychologists and the students’ teachers as expert scorers. Witkin (1964), who was an early proponent of cognitive style studies, claimed to find a link between the cognitive styles of children and their drawings. His proprietary model, which purports to measure subjects’ field-
dependence/independence—that is, their tendencies to perceive ideas in either a concrete or an analytical manner—drew criticism as being arbitrary, as did his closely-held statistical analysis.

The relationship apparently has not explored again since then, and certainly not with fashion designers and their problem-solving sketches. Therefore, the natural follow-up question arises: Is there a relationship between the cognitive style of fashion designers and their sketches? Or, to put it another way, is the cognitive style of a fashion designer evident in her or his sketches?

**Characteristics of the Subject Population:**

a. **Age Range:** 18 years and older

b. **Sex:** Male and female

c. **Number:** The estimated number is 40-50 subjects.

d. **Inclusion Criteria:** Fashion design majors enrolled at Buffalo State College and Villa Maria College in Buffalo, NY

e. **Exclusion Criteria:** Those outside the age range and inclusion criteria.

f. **Vulnerable Subjects:** None

**B. Methods and Procedures**

**Methods of Subject Selection:** Students enrolled fashion courses at Buffalo State and Villa Maria College will be asked to take part in the study as a part of their class work.
Study Site: Classrooms at Buffalo State and Villa Maria College (permission letter attached).

Methods and Procedures Applied to Human Subjects: The proposed direction asks fashion design students enrolled in 300-level fashion illustration courses at Buffalo State College and Villa Maria College to take a pencil-and-paper version of the 37-question FourSight assessment (Puccio, 2002, 2009; see attached). The time allotted is 20 minutes. The participants will then be asked to use pencil and paper to solve a design brief (see attached) in 30 minutes or less. Between three and five randomly selected students will be interviewed after completing the brief about their process and thoughts during the assignment (see attached for questions).

Photocopied, unidentified, and randomly collated copies of the participants’ designs will be sent to a panel of five judges—a design journalist, two out-of-state college design and social science professors, and two fashion designers—all of whom are trained in debriefing FourSight results. To rate the sketches, judges will use a 5-point Likert-type scale to identify the measure’s four cognitive style profiles, as well as an option for a null result: 1 (Clarifier); 2 (Ideator); 3 (Developer); 4 (Implementer); and 5 (Unclear). The forms (see attached example) will also allow space for any written comments the judges have. On completion, the judges will return the forms to the researcher for data analysis.

C. Risks/Benefits

Potential Risks: Beyond the time spent on the procedure, the risks to subjects are minimal.

Protection against Risks: No apparent risks greater than those encountered in everyday life.
Potential Benefits: Subjects will have the opportunity to learn their own cognitive profiles, which will have the generally accepted result of being beneficial in their working and learning environments. On a greater scale, the study offers four potential benefits: 1/It will be a first attempt to measure fashion designers’ cognitive style profiles; 2/it will amplify early theoretical work, while modernizing the methodology as well as the statistics surrounding the findings; 3/it will also contribute to the work surrounding the FourSight measure, which is beginning to be used more frequently in design settings; 4/lastly, it will indicate to scholars in the fields of creativity, design, and psychology that fashion design sketching is a form of problem-solving, a cognitive process made visible with paper and pencil.

Compensation for Participation: The assessment the subjects are taking has an approximate $100 value per student. Participants who take part in the study will receive the assessment and an email debriefing at no cost.

Alternatives to Participation: Subjects may decline to participate in the study. Because they are not receiving a grade for their participation, they need no alternatives to earn equivalent academic credit; they can simply work on other assigned tasks in class as their classmates take part in the study.

Information Withheld: No information from the study will be purposely withheld from the subjects.

Debriefing: In addition to explaining the background of the assessment beforehand, the researcher will debrief participants on their FourSight profiles by email following the study.

D. Confidentiality: Subject confidentiality will be maintained by the researcher, who will assign randomly generated numbers to those who participate in the research. That number will appear
on the participant’s drawing. The list collating participants’ names with numbers will be stored on a personal computer only accessed by the researcher. Assessments and drawings will remain in the researcher’s personal files for a minimum of three years.

Attachment: Permission letter from Villa Maria College representative

Villa Maria College

Villa Maria College
240 Pine Ridge Road
Buffalo, NY 14225
September 17, 2012

State University of New York-Buffalo State College
1320 Elmwood Avenue
Buffalo, NY 14222

To the Institutional Review Board:

This letter is to confirm that Mary Kay Culpepper, a graduate student in Creativity Studies at Buffalo State, has permission to work with fashion students at Villa Maria College on research for her master’s thesis, The Yelling Line: The Relationship between Fashion Design Sketching and Cognitive Style.

I have reviewed her protocol, discussed the project with her, and believe it offers our students an educational experience while posing minimal risk of adverse events. There appear to be appropriate safeguards in place to protect student confidentiality, and the informed consent documents provide clear direction for students who have questions regarding their rights as participants in this research study. Furthermore, I believe students will benefit from taking the FourSight assessment Ms. Culpepper will administer and debrief with them.

We look forward to participating. If you have questions regarding our participation, please contact me at my email address, burdett@villa.edu.

Sincerely,

Joyce Lyn Burdett, Ph.D.
Assistant Professor, Fashion Design
Program Manager, Fashion Design and Merchandising
Villa Maria College
APPENDIX B

Institutional Review Board Approval Letter

October 10, 2012

Mary Kay Culpepper
c/o Dr. John F. Cabra
Center for Studies in Creativity
CHAS 245

Dear Ms. Culpepper:

The Institutional Review Board Administrator has determined that this protocol is exempted under one of the categories specifically waived under Section 101(b) (1-6) or 101 (i) of the Code of Federal Regulations (45 CFR 46) and has reviewed and approved your study titled, “The Telling Line: The Relationship between Fashion Design Sketching and Cognitive Styles.” Approval is granted from October 15, 2012, to October 14, 2013. The Federal Regulations require that an IRB shall conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year.

Please note that it is your responsibility to notify the Board in advance and obtain IRB approval should you make any substantive changes in the study. In addition, it is your responsibility to provide the Board with a report summarizing the results of your study within 90 days of the completion of the study.

If you have any questions, please feel free to contact Gina Game, IRB Administrator, at 878-8700 or gameg@buffalostate.edu. Thank you for submitting to the Buffalo State College’s IRB and good luck with your research!

Sincerely,

[Signature]
Jill M. Norvilitis, Ph.D.
Institutional Review Board Chair

[Signature]
JMN:gg
APPENDIX C

Informed Consent Form

INFORMED CONSENT

The telling line:

Exploring the relationship between cognitive style profiles and fashion design sketching

NAME AND TITLE OF RESEARCHER: Mary Kay Culpepper, BA, Creative Studies
graduate student
Department/Room Number: Creative Studies/Chase Hall 254 (Dr. John Cabra, advisor)
Telephone Number: 205-910-7354
Email: culpepmk01@mail.buffalostate.edu

STUDY LOCATION(S): Buffalo State College & Villa Maria College, Buffalo, NY

PURPOSE OF STUDY

The purpose of this research study is to explore whether a relationship exists between an
individual’s cognitive style preference and her/his problem solving in fashion design sketching.

SUBJECTS

Inclusion Requirements

You are eligible to participate in this study if you are at least 18 years of age and are enrolled in
a fashion design class.

PROCEDURES

The following procedures will occur: You will be given a 37-question pencil-and-paper problem-
solving assessment; it will take you about 20 minutes. Then you will be asked to follow a 30-
minute design assignment using pencil and paper. Three or four participants will be selected to
answer a few questions about the procedure after the assignment is finished.

RISKS AND DISCOMFORTS

Beyond the time you spend, there are no known risks and/or discomforts greater than those
encountered in everyday life associated with the procedures described in this study.
**BENEFITS**

The possible benefits you may experience from the procedures described in this study include receiving the results of the problem-solving assessment, an approximately $100 value.

**CONFIDENTIALITY**

*Data Storage*

Your research records will be stored in the following manner:

- All identifiable information about you will be removed, with only a code to identify you. The code that links your name to the data will be kept separate from the study data.

This information will be protected and kept confidential in the following manner:

- All data stored electronically will be stored on a secure network server, or on portable devices, such as a laptop with encryption (special software) and password protection.

**IF YOU HAVE QUESTIONS**

If you have any comments, concerns, or questions regarding the conduct of this research, please contact the researcher at the top of this form.

If you are unable to contact the researcher and have general questions, or you have concerns or complaints about the researcher, research study or questions about your rights as a human participant, please contact Gina Game, IRB Administrator, SUNY Research Foundation/Buffalo State at (716) 878-6700 or gameg@rf.buffalostate.edu.

**VOLUNTARY PARTICIPATION STATEMENT**

Participation in this study is voluntary. You may refuse to answer any question or discontinue your involvement at any time without penalty or loss of benefits to which you might otherwise be entitled. Your decision will not affect your future relationship with Buffalo State. Your signature below indicates that you have read the information in this informed consent and have had a chance to ask any questions that you have about the study.

**SIGNATURES**

___________________________________________________ _________________
Participant’s Signature                     Date

___________________________________________________ _________________
Researcher’s Signature                     Date
APPENDIX D

FourSight Assessment

Reproduced with permission from THinc Communications.
Fashion Sketch Design Brief

**Client:** New York-LA luxury airline  
**Assignment:** Flight attendant uniforms

You are to sketch your ideas for designs for uniforms for women flight attendants of a new all-first-class domestic luxury airline. The airline wants to convey that style is a key component of their brand identity, and these fashionable uniforms will symbolize the kind of service and experience passengers will enjoy on this airline.

The attendants will wear these uniforms in flight as well as to, from, and in airports as a part of their role as brand ambassadors.

Price is not a factor at this point for the designs, which will debut in January, 2014. The designs will be worn year-round. The color way(s) of these uniforms will form the basis for the palette of our airline.

Your design(s) should cover the top and bottom of the body, and may include multiple pieces. Feel free to write in any information not specifically spelled out in the design sketch.

**Additional notes:** The main role of our flight attendants is in ensuring passenger safety. Secondarily, their job involves standing for long periods of time, lifting heavy loads, serving food, and interacting with passengers. Their cross-country flights last about six hours. Attendants live in either L.A. or New York. Their uniforms should accommodate these varied roles, as well as providing a visual cue that this airline is the utmost in flying luxury.

The average age of our attendants is 28, and they range in height from 5’4” to 5’10”; their weight is in proportion to their height.
APPENDIX F

Individual Interview Questions

1. What was the main thing you thought about as you worked on the design brief?

2. Do you find it easier to solve a fashion design problem with a hand-drawn sketch or a computer drawing, and why?

3. Do you find solving fashion problems to be a matter of working within the rules, or a matter of breaking the rules, and why?

4. Do you think design is an intuitive process or a rational one, and why?

5. What was the most challenging aspect of this brief?

6. When sketching, do you focus on the details, or the overall aspects, and why?
APPENDIX G
Sketch Rating Form

Rater Form
Sketch no. ________________

Given my understanding of FourSight, I find the designer of this sketch to predominantly fit the following profile:

O Clarifier  O Ideator  O Developer  O Implementer  O Unclear

Comments:
## APPENDIX H

Table H1

*Sample FourSight Scores, Rater Consensus and PRL Calculations*

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