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## An investigation into technology and motivational influences on creativity and product output in apparel design students

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AN INVESTIGATION INTO TECHNOLOGY AND MOTIVATIONAL INFLUENCES ON  
CREATIVITY AND PRODUCT OUTPUT IN APPAREL DESIGN STUDENTS

A Dissertation

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Doctorate of Science

In

The School of Human Ecology

by  
Charles Freeman  
Louisiana State University  
August 2012

## **Dedication**

To Dr. Christine Neuenfeldt, an inspirational scholar and mentor

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## **Abstract**

The purpose of this study was to investigate the application of a social psychological theoretical framework to the study of creativity in apparel design, with a focus on technological engagement and motivational factors. A sample of 32 apparel design students from two major southeastern universities were selected to complete a self-report instruments regarding motivation and technological engagement. Students completed the Abbreviated Torrance Test for Adults (ATTA) as well as a design brief. Design illustrations were evaluated by a panel of expert judges in the field of apparel design using a consensual assessment technique (CAT). Results indicate levels of technology and internet usage and enjoyment do not relate to product output. Additionally, non-significant results indicate that previously theorized relationships between motivation and product output specific to apparel designers do not support earlier studies of literary and visual artists. Internet and technology engagement is largely based in information collection and redistribution as opposed to idea creation. This theory may explain the limited effect of internet and technology engagement on product output. While motivations across visual arts fields are key components of product output, apparel design is independent of visual arts due to its largely commercial-based enterprise. Our results support this idea and also highlight the need to create an apparel design specific theory of creativity.

## **Chapter One: Introduction**

As global competition in the apparel industry rises, competitive advantage, based in creativity, is necessary to maintain profitable business growth (Sinha, 2002). Institutions of higher education, charged with the responsibility of training and developing students, should be aware of the demand on the part of employers for highly creative individuals (von Stamm, 2008). With increased focus on critical thinking skills and problem solving, educators may foster an environment of higher learning (Ogle & Fiore, 2000).

Executive Director for the National Office for Arts Accreditation, Hope (2010) addressed the need for development of the creative person in arts education. Based on a framework for the development of creativity in education and curriculums, there is currently disconnect between recognition of creativity and the knowledge and skills required for various creative works. In addition to defining creativity policies, the aim of creativity development in education is to shift the paradigm of thought from memorization and recitation to integrating capability and possibility (Hope 2010). Hodges and Karpova (2010) report a general interest in apparel design due to creativity and creative expression; yet it is necessary to re-assess and change curricula to attract and retain students enrolled in these programs.

Few researchers have focused on examining the effects of creativity on apparel design education (Karpova, Marcketti & Barker, 2011; Kato, 1994; Kidd & Workman, 1999). Black and Cloud (2010) suggested a need to develop creative scholarship at the graduate level and advocate the use of creativity measures to assess creative work completed by students, especially those enrolled in non-thesis option programs. Other research identified base needs for educational development of content, processes and skills with a highly recommended emphasis on creativity and innovation (Cassidy, 2008).

## **Justification**

Kaufman and Sternberg (2006) in the introduction to *The International Handbook of Creativity* argued the lack of contemporary and methodologically sufficient research on creativity. This argument was based on several factors including: difficulty to study creativity, lack of encouragement to study creative thinking, ostracizing creativity studies outside traditional research areas, and acceptance of creativity studies as a fad with little to no scientific substance. Because of these concerns, careful consideration was taken prior to designing the research for this study. With a focus on educational implications of creativity research, this study intended to focus research on the creativity of the individual student engaged in the creative process. Additionally (based on the apparel design domain), this study adopted a traditional approach to the study of creativity, one which emphasized research on problem-solving and/or product creation (Glaveanu, 2010). With these considerations guiding the research, it is advisable to adopt a theory driven approach to this research, with quantifiable instrumentation and hypothesis based in theory. With a focus on the individual and the product created, a social psychological approach was best suited for this study, with the theory proposed by Amabile (1996) a standard in the field (Glaveanu, 2010; Hennessey, 2003).

Few doubt the importance of creativity in relation to apparel designers; yet research investigating creativity in apparel design is largely absent (Bye, 2010; Karpova et al., 2011; Kato, 1994; Kidd & Workman, 1999). Research in visual arts, noticeably apparel design, is lacking empirical studies that define, assess, and/or predict creative behavior in individuals at both academic and professional levels (Greenberg, 1994; Karpova et al., 2011; Kidd & Workman, 1999; Meneely & Portillo, 2005). In interior design, Meneely and Portillo (2005) report beginning designers with highly creative traits tend to design with more flexibility and

creativity than comparable beginning designers with insufficiencies in these areas. In related studies, research identifies the importance of learning styles and academic performance in architectural design studio-based settings (Demirbas & Demirkan, 2003; Kvan & Yunyan, 2005). Based on these studies in disciplines similar to apparel design, recommendations of the research include the early identification of learning styles and traits to develop design curricula most beneficial to students (Demirbas & Demirkan, 2003; Kvan & Yunyan, 2005). Initial attempts of creativity research in applied visual arts were successfully conducted, despite challenges based on methodological concerns. Although largely absent from the body of knowledge, theoretical creativity research in apparel design is in the beginning stages (see Karpova et al., 2011).

Selection of a social psychological approach to the study of creativity was based on the domain specificity of apparel design. Although recent models address some key aspects of earlier theoretical models, social psychological models presented in the 1980's capture a more comprehensive view of creativity across various domains, cultures, environments and individuals, as opposed to research focusing only a single factor or trait (Mullin, 2010). Additionally, no formal structural framework of creativity is currently available; selection of a theoretical model encompassing the various personal, procedural and environmental factors follows current trends in holistic creativity research. Research focusing on multiple factors influencing creativity contributes to the abilities of educators to enhance curriculum, better preparing students with a sustainable competitive advantage (Karpova et al., 2011). As creativity becomes a function of design success in relation to business, the value of understanding and assessment in creativity across domains will increase.

## **Problem Statement**

Through an informal analysis of apparel design graduate programs, Black and Cloud (2010) stated a lack of focus on creative scholarship as opposed to traditional research emphasis. Research extensive universities are becoming increasingly supportive of creative scholarship in relation to faculty research evaluation. Yet, there exists a disconnect across domains of the value of creative production (Weiser, 1997). One major concern for the acceptance and evaluation of creative production techniques, as compared to traditional research, is the lack of theoretical application and methodology of the creative process.

The discipline of design is based in practitioners grounded in the definition and creation of products or artifacts (Friedman 2003). With the increasing globalization and complexity involved in the creative process, defining these complexities and solutions need to be grounded in theory of application, with empirical evaluation of results (Bye, 2010). Evidenced in various fields of creativity research (Besemer, 1998; Christiaans, 2002; O'Quinn & Besemer, 1989; O'Quinn & Besemer, 2006; White & Smith, 2001), application of theoretical models of design and evaluation have met with success, yet such application of theory to practice is lacking in the domain of apparel design. Although researchers have successfully adopted a social psychological approach to the study of creativity, for the evaluation of the current generation of apparel design students, questions arise about the applicability of these theories (often 20+ years old) in the face of ever demanding technologies and communication availabilities.

## **Purpose**

The purpose of this study was to apply a social psychological theoretical framework (Amabile, 1996) for the study of creativity in apparel design students, based on creative output. A theory driven approach empirically tests hypotheses about creativity and internet usage based

on a theoretical model. The study examined the relationships between internet and technology usage habits of digital generation college students and product output evaluated by consensual assessment technique (CAT). Based on a theoretical framework, the study investigated comparisons between creativity identified through the Abbreviated Torrance Test for Adults (ATTA) and self-reported intrinsic and extrinsic motivation, identified by the Work Preference Inventory-Student Version (WPI). Additionally, this exploratory investigation examined relationships between creativity (ATTA) and product output (CAT). Current relationships and predictors outlined in the theoretical model of a social psychology of creativity (Amabile, 1996) served as a comparison against relationships investigated in this study.

### **Research Objectives**

The following specific objectives were formulated to guide this research study:

1. To investigate contemporary application of the social-psychological theory of creativity (Amabile, 1996) to assess creativity and creative output of apparel design students.
2. To investigate the effects of internet and/or technology usage on product output.
3. To investigate the relationships between self-reported intrinsic and extrinsic motivations, creativity and product output.
4. To investigate the relationships between creativity thinking abilities and product output.

### **Assumptions and Limitations**

The social psychological theory of creativity (Amabile, 1996) was selected to drive this research study based on the assumption of the product based nature of this particular creativity research. In addition there are 10 assumptions regarding creativity outlined in the original

componential framework. For the purpose and scope of this study the following selected assumptions apply:

1. It is assumed that an individual with normal cognitive ability is able to produce work that is creative on some level specific to some domain. Although the work produced could or could not be highly creative, the work will exist at some point on the continuum of everyday creative endeavors (low) to groundbreaking significant creative contributions to a field (high) (Amabile, 1996)
2. In many outstanding creative achievements, innate abilities or talents contribute to high levels of creativity, but formal education seems essential. Yet, domain relevant skills, knowledge and talent are insufficient for high creative output, by themselves (Amabile, 1996).
3. Based on the small sample size, and the independent dependent variables, ANOVA will be the best statistical measure.
4. Based on the theoretical model, task engagement and motivation are essential to high levels of creative output; personal accounts stressing intellectual freedom highlight the need to minimize external constraint (Amabile, 1983a). Often external constraints limit and/or hinder the creative process; certain individuals produce higher quantity and quality of solutions based on clear, concise parameters and limitations (Amabile, 1996).

The aim of this study is to better understand empirical relationships between factors theorized to influence creativity and creative output. Despite the research supporting the assessment and quantification of creative output, creativity remains a complex psychological phenomenon. Although it is possible to create environments conducive to creativity and attempt to measure extrinsic and intrinsic motivations, the creative processes and production are often



internalized and subject to a vast number of internal factors, some of which cannot be measured or observed. For example, studies have shown children whose parents encourage confidence and build up ego strength tend to produce works that are more creative (Runco, 2007). Although this factor could be important for the overall study of creativity, it is not a factor considered for this study. Additional examples include: sensitivity, perseverance, genetics, deviance, psychoticism and other personality and/or psychological traits.

### **Definition of Terms**

Consensual Assessment Technique – Methodology to produce clear and reliable subjective assessments of creative products or responses, specific to a domain (Amabile, 1983a).

Creative Thinking Abilities – Abilities or ways of thinking which contribute to creative output and achievement (Crammond, 2008)

Creativity (Conceptual) - “A product or response will be judged creative to the extent that (a) it is both novel and appropriate, useful, correct or valuable response to the task at hand, and (b) the task is heuristic rather than algorithmic.” (Amabile, 1996 p.35)

Creativity (Operational) - “A product or response is creative to the extent that appropriate observers independently agree it is creative. Appropriate observers are those familiar with the domain in which the product was created or the response articulated. Thus, creativity might be regarded as the quality of products or responses judged to be creative by appropriate observers, and it might also be regarded as the process by which something so judged is produced.”

(Amabile, 1996 p.33)

Creativity Index (CI) – Based on individually assessed creative thinking abilities (fluency, originality, elaboration and flexibility), composite score calculated by summing scaled scores plus creative indicators (Goff & Torrance, 2002)

Creativity Relevant Skills – Cognitive style of an individual characterized by an understanding of complexities and an ability to break set during problem solving tasks (Amabile, 1996)

Design Brief – Written description of a project requiring some form of design, with the aim to be as complete and useful as possible for problem resolution (Phillips, 2004)

Domain – area of human interest made up of its own rules, symbolic elements and system of notations; an isolated area in which one might think and act with clarity and concentration (Csíkszentmihályi, 1996)

Domain-Relevant Skills – Individual's complete knowledge or set of response possibilities, from which the new response is developed and so judged against (Amabile, 1996)

Extrinsic Motivation – Motivation derived from influences unrelated to the task itself, such as expected evaluation, reward, directives or other similar sources (Amabile, 1996)

Flexibility – Ability to process certain information, given similar stimuli, in various ways (Goff & Torrance, 2002)

Fluency – Ability to produce a quantity of ideas related to a certain task (Goff & Torrance, 2002)

Elaboration – Ability to expand and enhance ideas with details (Goff & Torrance, 2002)

Intrinsic Motivation – Motivation derived from the relationship between an individual's positive reaction and the perceived qualities or benefits of the task, such as interest, curiosity, challenge or satisfaction (Amabile, 1996)

Originality – Ability to produce ideas, which are considered uncommon or new, related to a task (Goff & Torrance, 2002)

## **Chapter Two: Literature Review**

In order to understand the relationship between creativity and the apparel design process, components of this literature review include (a) creativity definitions and major components (b) a timeline of various creativity theories; (c) social psychological theory of creativity (Amabile, 1996); (d) current applications of social psychological approaches to creativity studies; (e) design processes specific to apparel design and creativity; and (f) current research focused on learning effects of the digital generation using internet and technology.

Creativity prediction and assessment are highly discussed topics across various domains, such as psychology, business, visual arts, architecture and education (Amabile, 1983b; Eysenck, 1993; Guilford, 1950; Hope 2010; Kidd & Workman, 1999). Although there could be little agreement on specific theoretical frameworks, definitions and predictions, a consensual agreement exists on the need for creativity identification and development in the field of design education (Hope, 2010; Kato, 1994; Kidd & Workman, 1999).

Research in the field of creativity, since 1950, is immense (Mullin, 2010). Due to the multiple and diverse viewpoints of creativity, the aim of this review is to report perspectives on creativity theory and research supporting various theories, Although presenting a justification for a social psychological approach to creativity research in apparel design.

### **Defining Creativity and Major Components**

According to creativity researchers largely based in psychology and cognitive sciences, there are multiple levels of creativity definition, with a few recurring thematic concepts (Amabile, 1996; Gardner, 1993; Runco, 2007). Generally examined in the field of psychology, a person or product is considered to be creative based on novelty to the domain or field of work. In addition to novelty, the creative process and output evaluation and acceptance are commonplace

in creativity definitions (Amabile, 1983a, 1996; Gardner, 1983, 1993; Guilford, 1950; Sawyer, 2006; Torrance, 1962). Initially, much of the research focused on the person and personality, but modern theoretical models exhibited the influence of the process and product. Contemporary theoretical models support a cultural approach accounting for the various factors influencing creativity (Glaveanu, 2010). Selection or development of a theoretical model in the study and evaluation of apparel design creativity should include or account for various components.

Research into the relationship between creativity and apparel design production is complicated by the various definitions of creativity offered across domains. For example, the definitions taken from three major researchers in creativity; Guilford (1950) (psychology), Torrance (1962) (psychology and education), and Gardner (1993) (cognitive sciences) respectively, show the various components and layers of creativity definition.

A creative pattern is a manifest in creative behavior, which includes such activities as inventing, designing, contriving, composing, and planning (Guilford, 1950, p. 444).

...the process of sensing gaps or disturbing, missing elements; forming ideas or hypotheses concerning them; testing these hypotheses; and communicating the results, possibly modifying and retesting the hypotheses (Torrance, 1962, p. 16).

The creative individual is a person who regularly solves problems, fashion products, or defines new questions in a domain that is initially considered novel but that ultimately becomes accepted in a particular cultural setting (Gardner, 1993, p. 35).

As evident in these definitions, there are differences, namely in what or how creativity is produced, evaluated and documented, among researchers of related fields in defining creativity. Despite these differences, there are recurrent themes evident in defining creativity: creative person, creative process and/or creative product. Prior researchers focused on the domains independently as the following sections outline.

**Creative person.** Research in the area of creativity was not introduced in 1950, but in the presidential address to the American Psychological Association, Guilford (1950) expressed the inherent lack of the quality and quantity of psychological research in the area of creativity and creative behavior. Key to Guilford's introduction of quality creativity research was the dissection of thinking processes between convergent thinking abilities, traditionally identified through intelligence quotients (IQ) tests, and divergent thinking abilities, which were distinctive of creative individuals. Citing earlier research conducted on behalf of the United States Air Force, Guilford (1950) suggested the use of factorial research designs when investigating creative abilities in individuals. Through this process Guilford (1950) hypothesized the following nine factors would be prevalent amongst creative persons: (a) sensitivity to problems, (b) ideational fluency, (c) flexibility of set, (c) ideational novelty, (d) synthesizing ability, (e) analyzing ability, (f) reorganizing or redefining ability, (g) span of ideational structure, and (h) evaluating ability (Guilford, 1950).

Through later research, Guilford expanded on the factorial research design in creativity studies in developing a structure of the intellect theoretical model in which the differentiation between convergent and divergent thinking abilities is illustrated. With this model isolating independent factors of convergent and divergent abilities, psychometric measures of creative ability could be created and tested (Guilford, 1956). Through this model Guilford developed the Measures of Divergent Thinking test, one of the earliest divergent thinking tests (Crockerberg, 1972).

Largely based on Guilford's structure of the intellect model, Torrance developed a divergent thinking test, later to be known as the Torrance Tests of Creative Thinking (TTCT) (Kaufman & Baer, 2006; Kim, 2006). Originally, these tests were designed to better understand

how the human mind functions in an effort to design higher quality instruction based on the individual, evaluate the quality of education, and identify the creative potential in students, often disregarded based on behavior (Torrance, 1962; see also: Amabile, 1983a; Kaufman & Baer, 2006; Kim 2006). More recently the TTCT is used to identify creative potential in gifted students (Kim, 2006).

Developed in 1966, the TTCT was updated four times (1974, 1984, 1990, and 1998) and is translated into 35 languages (Millar, 2002). Internationally, the TTCT is the most widely known and used test to measure creativity (Almeida, Prieto, Ferrando, Oliveira, & Ferrándiz, 2008; Kim, 2006). Despite sufficient reported validities of both versions of the TTCT, the purpose of the tests are for research and experimentation in education, instructional planning and development, and for the identification of creative potentiality in students (Kim, 2006; Torrance, 1962).

In 1980 a shortened version was introduced by Torrance, Wu, & Ando: Demonstration Form of the Torrance Tests (D-TTCT). Highly successful in evaluating adult creative potential, the Abbreviated Torrance Test for Adults (ATTA) was developed based on the D-TTCT (Goff & Torrance, 2002). This shortened format allows for novice administration with a shortened administration time, although testing four norm-referenced abilities: fluency, originality, elaboration and flexibility. In developing the TTCT and the ATTA, the research of Torrance and the assessment instruments have been intensely scrutinized as well as lauded in creativity research (Almeida et al., 2008; Bye & Sohn, 2010; Goff & Torrance, 2002).

In furthering the search for the creative person, it is important to mention the psycho biographical approaches to identification. Research in this area focused on personality traits and personal experiences, which are indicative of creative persons. Beginning in the 1960's,

MacKinnon and Barron studied traits in creative individuals, namely architects (Barron, 1961). Sampling architects reflects an assumed duality to possess artistic ability as well as logical/scientific abilities, both key elements of creative persons (MacKinnon, 1962). Based on self reports the following personality traits emerged: strong positive self-image and self-acceptance, inventive, determined, independent, individualistic, enthusiastic, and industrious, as defined on the Myers-Briggs Type Indicator (MBTI) (MacKinnon, 1962). Additionally, these individuals were rated as being perceptive and intuitive (MacKinnon, 1961). Personal histories revealed higher parental support coupled with a lack of closeness to any single parental figure (MacKinnon, 1962). Often, these individuals were rebellious, mediocre students, and/or lacking the focus needed to successfully function in the classroom setting. Through psycho biographical inquiry and identification of the creative personality, MacKinnon (1962) urged educators to personalize instruction and attention, although allowing these individuals to use their perception and intuitive behaviors as a part of the learning process.

Following the assumption of an inherent creativity trait pioneered by Guilford and Torrance, Gardner's (1983) theory of multiple intelligences examined the evaluation of the creative person through domain specific intelligences. According to this theory, all individuals have the potential to be creative, but creative potential rests in domain specific intelligences, as compared to overall creative traits (Gardner, 1983). Unlike Torrance and Guilford, Gardner (1983) theorized individuals might be recognized as creative by excelling in any of the following eight domain intelligences: (a) musical intelligence, (b) bodily – kinesthetic intelligence, (c) logical – mathematical intelligence, (d) linguistic intelligence, (e) spatial intelligence, (f) interpersonal intelligence, (g) intrapersonal intelligence, and (h) naturalist intelligence (Gardner, 2006). For example, an individual could be highly creative in linguistics intelligence, which,

could or could not translate to apparel design creativity, where a high spatial intelligence would be more desirable.

Building on the relationship on personality and creativity, researchers indicated creativity in a domain is the by-product of personality and identity development (Albert, 1990). Through personality and identity development in individuals of average intellect, individuals selected a domain to focus based on personal decisions. With skill training and possession of certain traits, an individual showed creative behaviors that reach across domains and time; evaluated by intrapersonal assessment (Albert, 1990). A supporting study recommended creativity evaluation is limited to single-subject evaluation using psychoanalytic methods, which thereby limit overall hypothesis development and assessment (Gedo, 1990). Further personality research analyzed the influence of child development, cultural aspects and ecosystems on the evaluation of creativity. Cultural development and supportive ecosystems provided significant influence on creativity (Harrington, 1990). Personality focused creativity research acknowledged the influences of outside persons, cultural values and constraints on the development of the creative person, but limited evaluation to the singular creative person and individual personality development (Albert, 1990; Gedo, 1990; Harrington, 1990).

**Creative process.** A creativity research shift in the 1980's took place toward a focus on the creative process. Research using biographical data to link creative persons with a creative process leads to an evolving systems approach to creativity (Gruber & Wallace, 1989). Case studies linked creative breakthroughs to the process by which designers worked. Whereas many of the previous researchers suggested the use of psychometric or psycho biographical tests to identify creative potential, process research found creative potential manifests itself over time as an individual works through the creative process (Gruber & Wallace, 1989). In reference to



information gathering and processing, a task motivation component becomes the catalyst for beginning the creative process and sustaining motivation throughout until a successful resolution is achieved (Amabile, 1996). After sufficient task motivation is established, an individual's frequency and quality of response generation is determinate of the level of domain-relevant skills possessed (Amabile, 1996). Focusing theory on the process component does little to influence the education of creative persons and explain the everyday creative breakthroughs or creative leaps.

Further creative process research led to theories regarding creative leaps. A creative leap is: "a sudden perception of a completely new perspective on the situation as previously understood" (Cross, 1997 p.427). A case study of design teams involved in the design process of their choice suggested that a creative leap occurred during the evaluation of a promising concept and development of a final concept (Cross, 1997). Similar case studies supported this creative bridge or creative leap theory. Researchers found within design teams co-evolving concepts are linked by the creative bridge procedures, which culminated in achievement of a creative leap by all participating design teams (Dorst & Cross, 2001).

Classifications of the creative bridge process involved three activities (loosely based on design processes): problem reformulation, serendipitous recognition, and criteria and constraints emergence. Problem reformulation involved the designer disregarding default assumptions about the design problem and introducing new design variables based on previously assumed constants, i.e. moving a group of objects individually, despite their grouping classification. Serendipitous recognition was the development of new design solutions to pending design problems in the current environment. This also included the recognition of new functions for previously unrelated design pieces, i.e. using a book as a doorstop. Finally, the last phase

allowed for new designs to be developed based on emergent constraints or criteria established in the previous two phases, i.e. increasing the weight of a doorstep to equal that of the book. This phase allowed the designer to improve previously accepted criteria to go beyond the original design problem definition (Kolodner & Willis, 1996).

From a process approach, researchers coined the term linkography. Linkography is “a system of notation and design analysis of design processes that focuses on links among design moves (or design ideas, or decisions)” (p.594), developed by Goldschmidt (1990, 2003). Two types of designer moves are modeled: back links or previous decisions and fore links, which are affected by moves based on back links. During the analysis of designer processes, moves are classified as composite ideas and simpler ideas. Composite ideas address more than three topics concurrently, whereas simpler ideas address a singular topic. Results suggested higher levels of composite ideas, versus simpler ideas, the higher the level of creativity in the design problem solution (Goldschmidt & Tatsa, 2005). Creative process studies define creative development, but fail to discuss methods used to identify creative potential, enhance creative development or evaluate creative products.

**Creative product.** Creativity research investigating the effects of the creative person and process led to questions about tangible creativity. In the early 1980's, Amabile (1983a) theorized the only true measure of creativity is through consensual assessment of physical products.

Amabile's consensual assessment technique (CAT) (1983a, 1983b, 1996) is one of the most widely used evaluation techniques in identifying creative products. Using an expert panel of three or more judges, products are evaluated using a seven point scale with a composite score determining overall creative quality. This technique of assessment is based on the assumption of proficiency in the domain of the judges. In selecting a task for creative evaluation this technique

is based on three assumptions: (a) the task must lead to the production of a creative product or response, which might be independently evaluated by the judges, (b) the task should be heuristic in nature allowing for flexibility and multiple responses demonstrating novelty and (c) for tasks involving certain domain specific skills, individuals should represent a uniform baseline of competency in these skills (Amabile, 1996).

Research to assess creativity has produced various scales and criteria. Bilda, Gero and Purcell (2006), implemented a 10-point scale (1 – very low to 10 – very high) for the assessment of student designs by apparel industry professionals, with a limited amount of interrater agreement. In a study relating to apparel, Kidd and Workman (1999) developed a similar 10-point scale for apparel designs. The criteria for assessment were developed and listed on a ratings guide: creativity, functionality, appropriateness, originality, and aesthetic appeal. The evaluation of students' designs was a combination of educators and participants (Kidd & Workman, 1999). Results indicate no significant agreement between faculty and other students and individual students' assessment of their own work, although overall faculty rating correlated with overall students' ratings on originality. Despite availability, there is a continued need for the application of comprehensive and clearly defined evaluation methods of creativity in relation to apparel design education (Black & Cloud, 2010). With the research of quantifiable creativity evaluation lacking in the domain of apparel design, other domains and industries have adopted different version of consensual assessment with much success (Besemer, 1998; Christiaans, 2002; O'Quinn & Besemer, 1989; O'Quinn & Besemer, 2006; White & Smith, 2001). In selecting methods of assessment best suited to apparel design evaluation, the Consensual Assessment Technique (Amabile, 1983a) encompasses the need for judges familiar with the

specifics of the domain, assessment of technical execution and multiple judges' evaluations across major variables.

## Creativity Theory

Various researchers have agreed upon four main components for creativity evaluation: person, process, product or environment, despite the disparity amongst importance of individual components for creativity evaluation (Albert, 1990; Amabile, 1983a, 1996; Csikszentmihalyi, 1996; Gedo, 1990; Guilford, 1950). Additionally, Amabile (1996) and Csikszentmihalyi (1996) assert that research in the domain of creativity encompasses all major components, in order to evaluate creativity effectively. Table 1 outlines the various components of creativity theory with approaches by various researchers as well as demonstrates a timeline of creativity studies. In addition, Table 1 highlights trends in creativity research, based on citation dates, from early beginnings focusing on the person to later studies focused on the environmental factors affecting creativity.

Table 1

Components of Creativity Theories

Creativity Component	Factors	References (Chronological)
Person	Personality traits, intellect, expertise, identity development	Guilford (1950), Torrance, (1962, 1966, 1990), MacKinnon (1962), Amabile (1983a, 1996), Gardner (1983), Albert (1990), Gedo (1990), Harrington (1990)
Process	Skills, methodology, styles, strategies, breakthroughs, cognitive abilities	Amabile (1983a, 1996), Gruber & Wallace (1989), Kolodner & Willis (1996), Liu (2000), Goldschmidt & Tatsa (2006)
Product	Novelty, acceptance, resolution, functionality, aesthetic appeal,	Amabile (1983a, 1996), O'Quinn & Besemer (1989), Kidd & Workman (1999), Bilda, Gero & Purcell (2006)
Environment	Motivation, social factors, environmental conditions	Crutchfield (1962), Csíkszentmihályi (1975) , Amabile (1983a, 1996), Ryan & Deci (2000), Glaveanu (2010)

Before developing an analysis of creativity, a baseline for creativity assessment followed by a determination of which component of creativity is to be measured is established (Amabile, 1996; Kaufman & Baer, 2006). Based on the component measured, selection of an appropriate theoretical framework for research design is heavily influenced by domain-specifics, i.e. focusing on the creative products with apparel designers as this is often how they are evaluated (Kaufman & Baer, 2006). Developing an understanding of the relationship between creative ability and creative design output is essential, with careful consideration taken to theoretical research approaches (Kato, 1994; Mullin, 2010).

Much of the research on the person or process focuses on intrapersonal assessment, although focus on the product is interpersonal (Kidd & Workman, 1999). Recent initial theory development studies specific to apparel design, have yielded theoretical frameworks, neglecting the creative product (Karpova et al., 2011). In following previous recommendations for research into domain-specific creativity, Amabile's (1996) Social Psychological Theory of Creativity is suitable, comprehensive and applicable to interpersonal research investigations.

### **Social Psychological Theory**

Previous theoretical frameworks have identified individual components of creative evaluation, yet few encompass all major components: person, process, product and environment. Amabile (1996) applied social psychological methods to developing a theoretical framework for the study of creativity. Although this original framework remains largely unchanged, an updated version with additional empirical studies and support was published in 1996. In an effort to utilize current models, Amabile's (1996) revision of the theory is outlined in the current section, despite much of the framework and ideas being original to the 1983(a) publication of the framework.

Although there are wide varieties of a definition for creativity, Amabile (1996) defined creativity dichotomously. According to the developed social psychological theory of creativity, Amabile operationally defined creativity as:

A product or response is creative to the extent that appropriate observers independently agree it is creative. Appropriate observers are those familiar with the domain in which the product was created or the response articulated. Thus, creativity might be regarded as the quality of products or responses judged to be creative by appropriate observers, and it might also be regarded as the process by which something so judged is produced. (Amabile, 1996 p.33)

As for empirical research in the domain of apparel design, this operational definition is widely utilized (Kato, 1994; Kidd & Workman, 1999). For the purposes of this study, this operational definition was used in the evaluation of creative product creation and assessment. Although the operational definition allows research to quantify creativity, the theoretical framework was established on a conceptual definition of creativity:

A product or response will be judged creative to the extent that (a) it is novel and appropriate, useful, correct or valuable response to the task at hand and (b) the task is heuristic rather than algorithmic. (Amabile, 1996 p.35)

This definition covers many of the recurrent themes in creativity definition, as well as, establishes criteria for the creative process. A task is considered heuristic, if it does not follow a prescribed method for solution, although algorithmic tasks are completed utilizing an accepted method of solution. An example used by Amabile (1996) is the process of baking a cake. A heuristic approach would not follow a recipe or set ingredients, but the cook would create a recipe. Contrarily, an algorithmic approach would follow a given or learned recipe using prescribed ingredients.

**Theoretical Framework.** Creativity theoretical frameworks are often categorized as personality driven or cognitive driven (Amabile, 1996). Through social-psychological theory development, Amabile (1996) developed a componential framework for creativity research.

Recognizing the importance of the personality and cognitive functions of creativity combined with creative output, this componential conceptualization is a working theory applicable across domains of creativity (Kauffman & Baer, 2006). Amabile (1996) outlined three major influencers of creativity in the development of this framework. This framework defined creativity as creative output or performance. Firstly, domain-relevant skills are the acquired knowledge relevant to a particular domain an individual has learned. These skills include, but are not limited to: factual knowledge, trade skills, experience based knowledge, latent training, and formal education. Creativity-relevant skills represent the something extra present in creative individuals. These skills often include, but are not limited to: cognitive abilities and processes, methods for problem solving, understanding of heuristic approaches, and personality. Lastly, task motivation accounts for all variables affecting an individual's motivation to complete a certain domain specific task, including both intrinsic and extrinsic motivations. These components, individual of one another, must all be present at some level of specificity, for creativity (Amabile, 1996).

**Domain-Relevant Skills.** Although there is little research examining the relationship of domain-relevant skills and creativity, the necessity of these skills for creative output in a specific domain is an assumption of the social psychology of creativity framework (Amabile, 1996). Domain-relevant skills include different skills learned and practiced, and are seen as the possible solution paths an individual uses to produce creativity. By increasing the depth, frequency of use and number of domain-relevant skills an individual will increase the number of cognitive pathway options for solving heuristic tasks in a creative manner, thereby increasing creative output. Based on prior research showing the increase of creativity with the increase of the number of potential solutions produced, domain-relevant skills increased the potential for

creativity. Although domain-relevant skills are typically learned, often times they are mislabeled as talents, when successfully practiced and executed frequently by individuals. These talents are often domain-relevant skills for which an individual has a natural aptitude or high level of interest. Although these skills could be natural or learned, a certain level of intelligence, cognitive functions, perceptual and motor skills and education are required to develop and maintain these domain-relevant skills (Amabile, 1996).

**Creativity-Relevant Skills.** This set of skills is defined as: “...the something extra of creative performance” (Amabile, 1996, p. 87). Through analyzing creativity, the creativity-relevant skills an individual possesses determine the extent to which his/her output surpasses the creative levels of similar output, previously seen in the domain. This component is characterized by a certain cognitive style, including a capacity to develop and comprehend complexities within and involving a task or problem and the ability to suspend problem solving methodology; in order to adopt new approaches. This cognitive style is dependant on certain creative behaviors and personal history (Amabile, 1996).

In addition to the aspects of a creative cognitive style, an individual must possess the ability and knowledge of the application of a heuristic approach to problem solving. A heuristic approach to problem solving was defined as: “any principle or device that contributes to a reduction in the average search for a solution” (Newell, Shaw & Simon. 1962). Using heuristics in creative problem solving might lead to an increase in set-breaking ideas, novel outcomes, and frequency of creative output (Amabile, 1996). Additionally, a work style conducive to creative output also contributed to creativity-relevant skills. Research has suggested several features of a creative work style including: an ability to concentrate efforts for a long period of time (Campbell, 1960, Hogarth, 1980), willingness to abandon unsuccessful methods and outcomes



and allow for further incubation (Simon, 1966), continuous productive output and commitment in dealing with adversity (Walberg, 1971), and high levels of productive output and energy (Wallach & Kogan, 1965). Although some of the creativity-relevant skills are heavily influenced by personality and personal history, many of the cognitive styles and characteristics might be developed and nurtured through various creativity training exercises and programs (Amabile, 1996).

**Task Motivation.** Different theorists have addressed the issue of task motivation, with agreement on the existence of motivation on a continuum. On the motivational continuum, are several factors affecting self-determined motivation: (1) amotivation – absence of desire to involve oneself with a task, (2) intrinsic motivation – desire to involve oneself in a task solely for person gratification or pleasure, and (3) extrinsic motivation – influence of outside factors on one’s desire to involve oneself in a task (Ryan & Deci, 2000; Vallerand, Pelletier, Blais, Brière, Senécal, Vallières, 1992). Each of these differentiated stages of motivation are located on the motivation continuum ranging from amotivation to extrinsic motivation and intrinsic motivation being the highest level of self-determined motivation (Ryan & Deci, 2000).

Through various domain studies in task motivation, Amabile (1996) cites the groundbreaking work of Crutchfield (1962), in establishing the importance of task motivation in creativity. Crutchfield concluded the introduction and influence of extrinsic motivators caused subjects to become preoccupied with these extrinsic factors, allowing the initial solution to become secondary in concern. With the increase in number and influence of extrinsic factors, the intrinsic motivation of individuals decreased dramatically, along with cognitive flexibility (Crutchfield, 1962). In developing a measure for motivation, the key elements of intrinsic and extrinsic motivation must be clearly defined (Amabile, Hill, Hennessey & Tighe, 1994). Amabile

et al. (1994) outlined the major elements of both intrinsic motivations: self-determination, competence, task involvement, curiosity, enjoyment, and interest; and extrinsic motivations: concerns with competition, evaluation, recognition, money or other tangible incentives, and constraint by others. Supporting this assumption, Amabile (1996) outlined the positive influence of intrinsic motivation on creativity against the seemingly negative influence of external constraints, or guidelines and/or rules imposed by factors outside the person or problem involved in creative production. Although both of these factors are considered motivators, intrinsic factors are more difficult to control for, as they often differentiate between what a person will do versus what he/she might do, and empirical analysis of this level of motivation is often difficult to measure. Hence, Amabile (1996) suggested minimizing external constraints in order to increase intrinsic motivation and creativity. Task motivation is inherently the most important factor of the three component model because without proper motivation and freedom from constraint, individuals with high levels of both domain-relevant skills and creativity-relevant skills will be unlikely to produce creative works or processes (Amabile, 1983a).

As Amabile (1996) highlighted, task motivation and problem interest level considerations are essential in establishing tasks for designers to engage. Csíkszentmihályi (1975) defined a person's engagement with an activity as "Flow". According to "Flow" theory, designers are completely engaged with the task at hand, when intrinsic motivation is at its highest levels. Additionally, during this peak time, concentration levels and task enjoyment levels are extremely high. Csíkszentmihályi (1996) supported this theoretical approach and suggested researchers to focus on the challenge level complemented by the domain specific ability level of the design participants. Intrinsic motivation levels are increased when designers feel a sense of control over a task, with adequate time allowance for completion, clearly outlined objectives and timely,

constructive feedback and assessment (Csíkszentmihályi, 1996). In developing design tasks, educators need to be aware of these intrinsic and extrinsic motivators as they relate to the design process and domain specific ability of students and designers.

As outlined in figure 1, this model represents the process by which both low and high levels of creativity are produced and assessed. The level of creativity assessed in the output of this model is dependent upon the differing levels of the three major components. Each of these components must be available for creative output, as none of the three components is sufficient enough alone for creative output.

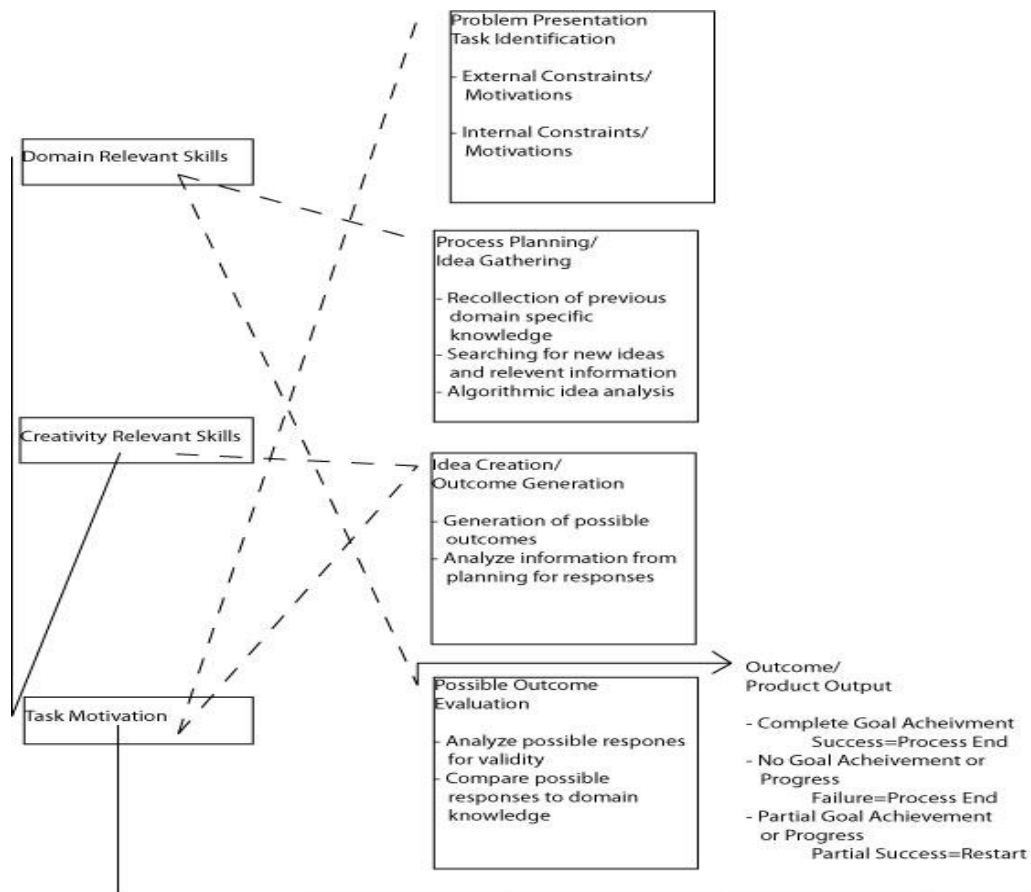


Figure 1. Social psychology of creativity theoretical framework. Adapted from Amabile (1996).

**Componential Relationships.** Based on the levels of the aforementioned components of the framework, predictive relationships might be made regarding the creative product resulting from task engagements. In addition to predictions regarding creative output specific to task engagement, the theoretical model might also predict other features such as willingness to engage in future similar tasks (Amabile, 1996).

Amabile (1996) outlined the predictive relationships of the components in six general principles. The overriding principle guiding these relationships is the multiplicative nature of each of these components. Of these components, domain-relevant skills, dictated the level of appropriateness of responses generated. Domain intelligence is the determining factor of which path to pursue during solution seeking stages of design process as well as final validation of responses generated. Creativity relevant skills determined the level of novelty of each of these responses. This higher level of creative cognition enabled one engaged in a heuristic task to fully explore and manipulate the complexities of the task assignment and/or environmental influences (Amabile, 1996).

The fourth general principle guiding theoretical predictions is the degree and type (intrinsic and/or extrinsic) motivations associated with the task engagement, which influenced the novelty of response similar to the effects of creativity-relevant skills. With task engagement, the process is structured to be cyclical, with future determinants being initial motivation and success or failure of responses generated. Lastly, the degree of intrinsic motivation affected the other components such as creativity-relevant skills and domain-relevant skills. Higher levels of intrinsic motivation led to learning in other components therefore leading to higher levels of future creative output (Amabile, 1996). These six guiding principles as well as componential predictive relationships are outlined in Table 2.

Table 2

Predictions Based on Componential Framework

Domain-Relevant Skills	Creativity-Relevant Skills	Intrinsic Task Motivation	Product/Response Generated	Future Engagement
High	High	High	“High” in creativity; a significant work	High interest and similar performance expected
High	High	Low	Moderate levels of creativity	Low interest and similar performance expected
High	Low	High	Moderate levels of creativity; predictable responses	Moderate interest and increase in creativity-relevant skills
High	Low	Low	Low levels of creativity; predictable responses	Low interest with similar performance expected
Low	High	High	Moderate levels of creativity; eccentric responses	Moderate interest and increase in domain-relevant skills
Low	High	Low	Low levels of creativity; eccentric responses	Moderate interest and increase in domain-relevant skills
Low	Low	High	Low levels of creativity; eccentric responses	Moderate interest and increase in creativity and domain-relevant skills
Low	Low	Low	low levels of creativity; eccentric responses	Low interest with similar performance expected

**Current applications of Social Psychological Theory.** Although last updated in 1996, the social psychological theory of creativity (Amabile, 1996) is a contemporary model used in various fields of research, including domain specific theoretical frameworks developed based on this social psychological theory. Current creativity research trends focus on using a social psychological approach, from ergonomics (Zeng, Proctor & Salvendy, 2010); hospitality management (Wong & Ladkin, 2008); culture and creativity (Hempel & Sue-Chan, 2010); product development (Chang, Tein & Lee, 2010); psychology (Glaveanu, 2010); and fashion design (Karpova et al., 2011). Notably these fields used the social psychology theory of creativity (Amabile, 1983a) to address the study of creativity in order to develop theoretical frameworks. In the service industry, Coehlo and Augusto (2010) referred to Amabile (1996) and the motivations focus of the social psychology theory. Based on job characteristic developments, Coehlo and Augusto (2010) developed an employee creativity framework using components of Amabile (1996) that outlined job characteristics affecting creativity. Similarly to Amabile (1996), Coehlo and Augusto (2010) highlighted the significance of intrinsic motivations and domain-relevant skills on individual job characteristics with their effects on creativity. In contrast to Amabile (1996), Coehlo and Augusto (2010) emphasized the statistical significance of autonomy of creativity. Hong and Sullivan (2009) investigated the need for instructional design frameworks, basing the concept of novel idea creation on the conceptual aspects of Amabile (1996). In theorizing a framework based on adaptive learning environments in classrooms, Hong and Sullivan (2009) emphasized the importance of idea generation in idea-centered/principle-based design, with Amabile's (1996) conceptual definition of creativity being acceptable to evaluate novel idea generation within case studies (Hong & Sullivan, 2009) As a guiding theory for knowledge reuse in business task environments, Cheung, Chau and Au (2008)

used the social psychological theory effectively in determining creativity relevant skills as well as social influences. Studying the effects of knowledge re-use in an industrial setting, Cheung et al. (2008) found individuals in a control group with higher baseline levels of creativity as measured by the ATTA generated more ideas related to task engagement than those with lower levels. Without any incentives, another driving factor for creative performance was the level of intrinsic motivation (Cheung et al., 2008). Based on these findings, Cheung et al. developed a theoretical framework for knowledge reuse in industrial settings. Although domain specific theory development does not fit the purpose of this exploratory investigation, it does illustrate the relevance of the social psychological theory (Amabile, 1996) and its current cross-disciplinary applications (see Table 3).

Much of the recent empirical studies adopting the social psychological theory (Amabile, 1996) are product based empirical studies utilizing the Consensual Assessment Technique. Kaufman, Baer and Cole (2009) examined the differences between novice and expert judges for college students' short stories. Through this comparison, research suggests certain domains could be limited in the use of novice judges, although gifted judges could be appropriate (Kaufman, Baer & Cole, 2009; Kaufman, Baer, Cole & Sexton, 2008). Further recent studies by Baer and McKool (2009) support the use of the Consensual Assessment Technique in higher education, despite some limitations and drawbacks. Consensual assessment is prevalent in research on team based creativity as well. Mullin (2010) used a consensual assessment technique to evaluate student projects in introductory engineering course. Gino, Argote, Spektor and Todorova (2010) examine transactive memory systems in team creativity product development exercises. Each of the products created were analyzed using independent judges and the Consensual Assessment technique. For the limited scope of this exploratory investigation Amabile's (1996) updated

social psychological theoretical framework is adequate based on the product focused nature of this research design while providing an opportunity to investigate major influencers and components of creativity.

Table 3

Current Applications of Social Psychological Theory across Domains

Domain	Theoretical Component	Reference
Business management	definition, domain relevant skills, motivations & assessment	Cheung et al, 2008; Coehlo & Augusto , 2010; Hempel & Sue-Chan, 2010; Wong & Ladkin, 2008
Product (idea) development and/or design	conceptual definition, domain relevant skills, motivations & assessment	Chang et al., 2010; Hong & Sullivan, 2009; Karpova et al., 2011
Engineering	assessment	Mullin, 2010
Literature	assessment	Baer et al., 2004; Kaufman et al., 2007; Kaufman et al., 2008; Kaufman et al., 2009
Music	assessment	Hickey, 2001

### **Apparel Design and Design Processes**

Watkins (1995) has shown there are many different definitions to design ranging from innate talents to acquired scientific knowledge. Most definitions of design include three main points: reference of design as a process; goal achievement oriented; and the process must solve a problem, enhance a current situation, develop novel concepts or products, achieve a level of creativity, or meet needs (Freidman, 2003).

Koberg and Bagnall (1991) developed a soft systems guide to the design process as an alternative to engineering design processes. The design process, as outlined by Koberg and



Bagnall (1991), has three main steps: analysis, concept, and synthesis. Within these three steps are seven stages (which are derived in part from the engineering design process): acceptance, analysis, definition, ideation, idea-selection, implementation, and evaluation.

The design process proposed by DeJonge (1984), is based on the major stages of the Koberg & Bagnall (1991) model, but is refined for apparel design. Although easily manipulated to creative design, DeJonge's (1984) process focuses on the functional needs assessment of apparel. Lamb and Kallal (1992) applied DeJonge's (1984) model to develop the FEA (functional, expressive, aesthetic) Consumer Needs model. This circular model functions as a soft-systems model allowing the designer to maneuver within the model in no specific order. The FEA model places at the center, the target consumer for the product being developed, with culture surrounding the target consumer. Culture was used to act as an intermediary, or filter, between consumer wants and requirements and designer wants and requirements. The functional issues addressed in the model focus on the utility of apparel and functional requirements. Expressive issues focus on the communicative, symbolic aspects of clothing, as well as social-psychological implications. The last area addresses the basic human want for beauty, or the need for aesthetics. These three areas are interrelated with one another, with no hierarchical structure (Lamb & Kallal, 1992). The studies resulting from the use of this model with apparel design students suggests the effectiveness of using this model with functional apparel, and adds that the model might be applied to non-functional aesthetic apparel design, i.e. wearable art (Lamb & Kallal, 1992).

Using the design processes of Koberg and Bagnall (1991), Lamb and Kallal (1992), and DeJonge (1984), LaBat and Sokolowski (1999) developed a three-step design process applied to textile design across fields including apparel and non-apparel textile use. Their research suggests

a common theme among previous design processes: three stages of the design process- problem definition and research, creative exploration, and implementation (LaBat & Sokolowski, 1999).

### **Internet and Technology**

Since the mainstream acceptance of the internet in the early 2000's, research has largely been influenced by the demands, expectations and capabilities of an identified digital generation, those born after 1990 (Seely-Brown, 2008). From "digital native" to a "net generation" labels regarding the generation born following 1990 have become influential in shaping common and academic perceptions of learning capabilities and habits (Selwyn, 2009). Individuals born since 1980 have come under various monikers including "digital native" based on the ease and comfortability in which technologies are adopted and embraced (Prensky, 2001). Many of these younger generations are often described as living a connected and digital adolescence, with learning behavior changes centered on technology and media (Selwyn, 2009). Much of the literature focusing on a digital generation adopts a generational schism, due largely in part to technology adoption comparisons between "youth" and a pre-digital generation (Selwyn, 2009). Much of the current literature identifies a digital generation with certain characteristics, namely an intrinsic desire to explore and adopt the latest technologies and technological trends (Fisher & Baird, 2009; Selwyn, 2009). Because of these trends, there is a current need to better understand the technology habits and learning styles of a contemporary generation through empirical research (Selwyn, 2009).

Notwithstanding assumptions about a digital generation, some benefits might be inferred from everyday digital technology use. A benefit is the duality of consequence from digital technology use: constant connectivity through technology and internet with disconnect from others and surrounding environments. This benefit is supported by research noting a shift from

interpersonal collectivism to individualism with disassociated relationships (Millan & Reynolds, 2011). Through this internet sites and technology providers provide a capacity for the personalization of services and products, of which could lead to further isolation, i.e. individualized playlists on separate MP3 players being listened to by a couple at lunch. Despite this duality of consequence, other trends in research have led to identifying this generation as a collaboration generation, a direct effect if the digital age. Characteristics of this generation include: a willingness to rely and trust the power of the masses, work together toward common goals and interests, be involved in similar activities as friends and colleagues, openly share content and information, and stress the importance of communal creativity via technology (Tapscott & Williams, 2008). From this collaboration of creativity and ideas, this generation demands a level of convenience, personalization, customization and choice regarding goods and services, including direct control over design and production (Tapscott & Williams, 2008).

In addition, technology use has also been identified to alter the capacity of young people to process information as compared to previous generations. Recent neurological studies have supported this notion by suggesting the use of the internet increases younger individuals memory capacity and increases awareness to perceptual learning (Small & Vorgon, 2008). Often times these cognitive advances are reflected by the ease at which the digital generation makes connections, processes visual dynamics and information and learns through digitally based platforms. In addition to the cognitive benefits, the digital generation is predicted to maintain a digital information network and supporting technology, which could one day supersede the human brain in connectivity (Prensky, 2008).

Although the benefits of a digital generation have been noted by researchers, disadvantages are often linked to the autonomy of the digital generation. Many of these

disadvantages stem from the capacity of a new generation to learn being linked to an inability to gather and process information in a critical manner. Additional concerns have been raised by educators and academics over the demise of academic systems largely due to the digital generations mixed relationships between information and knowledge (Selwyn, 2009). This concern has also resonated in university settings as a “Google” generation of scholars relies on information, without independent critical thought to discern knowledge from information (Fearn, 2008). This approach to scholarship has led to a decrease in traditional learning skills and lower competencies in hands-on learning, once hallmarks of a formal education (Keen, 2007).

Bigum and Rowan (2008) state the incompatibility between formal institutions and digital technology because of the formers mandate of regulation and control to dictate learning processes. Yet, if this mandate were broken then a discourse between structured learning institutions and learning tendencies of a digital generation could be established. Although future generations will experience greater access to technology and digital communications, there still exists the need for support of the creation and communication of information and/or content. As Selwyn (2009) argues, (if an institution is to adapt to a newer generation) there is a current need for educators and information agents to theoretically develop and empirically study the digital habits of a younger generation in relation to educational systems. Currently, there exists disagreement between researchers as to whether this generation differs from previous generations on the benefits and consequences of widespread technological adoption (Selwyn, 2009). This disparity further supports Selwyn’s (2009) call to better understand if a digital age has altered the cognitive habits and behaviors of the current generation of college students as opposed to previous generations. In the case of apparel design research and education, this includes comparing the digital generation to previous studies of creativity and assessment.

The use of internet and technology remains heavily linked to socio-economic status and social class and therefore has not permeated all groups of society to have a significant influence on creative thinking and output (Golding, 2000). Predominate adolescent's internet usage is largely based in gaming, text, or information gathering as opposed to idea creation (Selwyn, 2009), which would not differentiate cognition affecting creativity and idea creation from earlier generations. As Selwyn (2009) concluded the relatively minimal arguments for the total disconnect of a digital generation from pre-digital generation do not warrant an assumption of a radical overthrow of culture and knowledge consumption.

### **Summary**

Conducting empirical research in creativity includes any one of the four major components of creative definition: creative person, creative process, creative product or environment. Although each one supports research independently, the interactions, between components, are a constant in apparel design. Therefore, theoretical applications and methodologies, which synthesize all three components for overall creativity assessment, are best suited for apparel design research. This becomes increasingly important when factoring in the technology habits of a digital generation, due to the environmental influences of technology and the internet.

In 2010, research questions regarding the quality of apparel design as scholarship were raised at the International Textiles and Apparel Association's annual conference. In an effort to establish apparel designs as quality research by-products, advancing the field of knowledge, researchers are charged with the task of providing a framework for theory based application for their work. Creativity is a vital skill for apparel designers, and could often be at its peak although external constraints are minimized, such as when designers are students.

Thus, the aim of apparel design curriculum is to provide a level of competence in domain-relevant skills for apparel design students, coupled with creativity relevant skills and task motivation baselines the potential of personal success achievable in the domain. Inadequacy of product-focused, theoretical-based research in the domain of apparel design in relation to creativity is evident in the lack of literature, despite the need and benefits of this research being long overdue.

### **Hypotheses**

Selwyn (2009) suggested future research should shift the responsibility to academia to empirically study the effects of internet and technology on widely accepted education systems. In better understanding the effects of internet and technology on creativity output, a generally accepted theoretical framework for the study of creativity is adopted. In directions for future research Amabile (1996) suggests examining current application of the different theoretical factors, (a) task motivation, (b) domain-relevant skills and (c) creativity-relevant skills, utilizing empirical methods. Although the relationships outlined in the theoretical model have become generally accepted, these relationships could be dated due to the change in learning styles of a digital generation. Changes in these effects could be attributed to growing up in a technology age with constant supply of information and digital communications largely based in technology.

Based upon previous literature reviewed, the following hypotheses were proposed.

H1. There will not be a significant relationship between internet and technology usage and product output.

Rationale: Based on the literature review, the Internet use is limited in availability to some socio-economic and social classes, and is therefore not representative of the population, In addition, skill-level of Internet and technology users are limited to information collection and re-

distribution, therefore the levels of creative product output of the general population should not be affected by Internet and technology usage, engagement and enjoyment.

H2a. There will be a significant difference between creativity groups and intrinsic motivation.

H2b. There will not be a significant difference between creativity groups and extrinsic motivation.

Rationale: Despite changes in information seeking abilities of the current generation of students as well as exposure to technology and technology, motivation intentions will continue to evaluate the types and levels of creativity thinking abilities a person exhibits. Levels of intrinsic motivation are higher in creative individuals, whereas extrinsic motivation levels of creative individuals are inconclusive.

H3a. There will be a significant relationship between intrinsic motivation and product output.

H3b. There will be a significant relationship between extrinsic motivation and product output.

Rationale: When the product is created with an aim of originality and/or novelty, levels of intrinsic motivation and extrinsic motivation will significantly influence the various stages of the design process, resulting in differences in product output.

H4. There will not be a significant difference between creativity groups and product output.

Rationale: In the original work, Torrance (1962) urged against the use of a sole measure of creativity for prediction or potentiality. Cited by thousands of researchers, high levels of creative thinking abilities could not directly result in the creation of a tangible product evaluated to be creative.

## Chapter Three: Methods

This section contains the theory and methods guiding this exploratory investigation and outlines the following: (a) theoretical framework, (b) research design, (c) population and sample, (d) instrumentation, (e) data collection, (f) variable operationalization, (g) statistical analysis and (h) data interpretation.

### Theoretical Framework

This study is an exploratory investigation into student creativity, domain specific to apparel design. Hypotheses developed for testing are based on the theoretical framework proposed by Amabile (1996). Hypothesized relationships between (a) internet/technology, (b) intrinsic and extrinsic motivations, (c) creativity and (d) product output are statistically evaluated using the empirical instruments outlined in Figure 2.

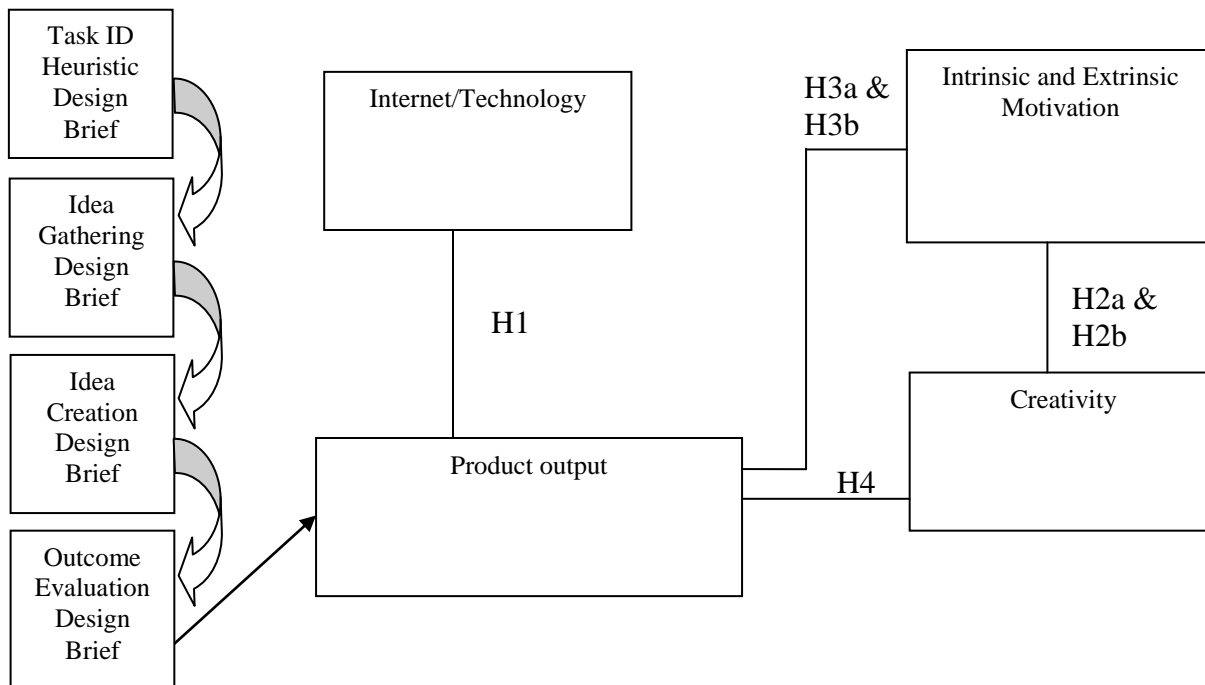


Figure 2. Empirical framework



## **Research Design**

To further the theoretical applications of creativity identification and assessment, empirical research using multiple instruments comparing two or more variables investigates relationships of creativity across domains and individuals. Plucker and Runco (1998) stated the over-exaggeration of the uselessness of single creativity measures, and agreed with Hennessey and Amabile (1988) of using multiple indicators of creative behavior as an overall assessment.

Correlational research design guided this exploratory investigation; as is suitable in the social sciences when a treatment/control group experiment does not apply to a theoretical model. Correlational research allows for a researcher to answer questions regarding multiple variables or in situations of alternative variable explanations, namely when two or more variables are examined with empirical instruments. Beginning with a theoretical application or framework, researchers use empirical measurement tools and scales to conduct data analysis on applied research questions. Adopting a survey research design for the purpose of this exploratory investigation will provide an empirical analysis of internet and technology in relation to the overall assessment of creativity in apparel design students. In addition, relationships and differences of creativity, motivation, and product output were investigated based on variable indicators inferred from survey instrument results.

## **Sample**

The sample used for this study was a convenience sample of apparel design students enrolled at two southern United States universities. A total of 32 junior level students, as based on the department classification were selected based on enrollment in a pattern development course, or its equivalent. The majority of the sample is female largely due to a limited number of

males enrolling in fashion design programs, at each respective institution. Participant sample is regionalized, therefore any generalizations are limited.

In studies on creativity results regarding gender and creativity, output are inconclusive and often biased (Runco, 2007). Research on age and creativity suggests a slump in creative performance around 9 to 10 years of age, often attributed to neuroanatomical development (Runco, 2007). Although this slump usually occurs around the fourth grade, Runco (2007) noted some maturational effects could be present in individuals based on experiences, knowledge, genetics, and other factors. Despite maturational effects often attributed to academic systems, a common perspective is participants must maintain a minimal level of intelligence to be considered to have creative potential. Those below this threshold typically cannot accomplish routine functions and therefore could be unable to produce creative works, especially when domain-specific knowledge is required (Runco, 2007). Sample selection for this exploratory investigation focused on students enrolled in a particular level of class, assuming the same time or experience in each respective program, limiting maturation and/or experience effects.

Sample size selection, based on number of students enrolled in selected design programs, represented approximately 20% of all apparel design majors at these institutions. Studies focusing on creativity in design students have typically selected sample sizes from 15 – 40 participants for quantitative survey research when a task is completed as part of theoretical research (see Bye & Sohn, 2010; Kidd & Workman, 1999; Meneely & Portillo, 2005). Volunteer student participants were taken from the respective classes and students met for a period of two hours. Institutional Review Board approval was obtained from both participating universities (Appendices A and C). Consent forms were signed and are maintained under secure conditions (Appendices B and D).

## Data Collection

During the first 25 minutes, the researcher administered informed consent (Appendix B and C) as well as the Internet/WWW Survey (Appendix E), followed by the Work Preference Inventory – College Student version (Appendix F). These instruments were administered prior to completing the Abbreviated Torrance Test for Adults (Appendix G) or the design brief (Appendix H) in an effort to minimize testing effects on internet usage and motivation variables. Since these surveys are self-reports, based on perceived actions, which could seem independent of creativity, prompt survey administration without influence from a creativity exercise was essential. In an effort to maximize creative thinking during the design brief, participants were administered the ATTA, with an administration time of fifteen minutes. By placing the ATTA between the WPI and the design brief, participants had the opportunity to transition mentally to more creative thinking. In previous research, participants' warm-up with small creativity exercises aids in creative output (Amabile, 1996). Following a brief five-minute break, participants were given a design brief and allowed forty-five minutes to complete. Although working, participants were free to break as needed, an effort to maintain the heuristic and open nature of the design brief. If a participant had further questions, the researcher was available for the final 10 minutes of the two-hour time commitment. This timeline is outlined in Table 4.

Table 4

Timeline of Data Collection

Activity	Time Frame
Introduction Informed Consent	5 minutes
Adaptation of Internet/WWW Survey	10 minutes
Work Preference Inventory – College Student Version	10 minutes

Table 4 continued

Abbreviated Torrance Test for Adults	15 minutes
Break	5 minutes
Design Brief	45 minutes

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Each of the design briefs were evaluated using the consensual assessment technique (CAT). A panel of three expert judges was selected based on proficiency in the domain of apparel design. Previous studies have used as many as 40 and as little as 2, but general agreement might be obtained using a group of judges, with a higher number of judges increasing opportunity for inter-rater reliabilities (Baer & McKool, 2009). Design briefs were confidentially and independently evaluated to ensure a double-blind review. Judges were provided instructions for evaluation and asked to, first, examine all the design briefs as a whole and then complete individual evaluations, based on the CAT. Each of the products evaluated were judged in relation to the other products in the group, as to maintain situational creativity assessment. Judges were provided with criteria and definitions, but instructed to use their professional judgment in assessing the creativity of the products (Appendix I).

### **Instrumentation**

Descriptions for the following instruments are given below: (a) Internet/WWW Survey, (b) Work Preference Inventory – College Student Version, (c) Abbreviated Torrance Test for Adults, (d) Design Brief and (e) Consensual Assessment Technique.

**Internet/ WWW Survey.** Adapted from pervious validated studies, Cheung and Huang (2005) created the Internet/WWW Survey to better understand students' attitudes and perceptions of internet usage. A 5-point Likert scale questionnaire is structured on a research

framework, identifying four constructs affecting internet usage and attitudes: (a) organizational factors; (b) perceptions and attitudes; (c) internet usage; (d) internet impacts. Scales items were developed for variables contributing to these four constructs, which are theorized to influence one another. Organizational and individual factors including: (a) support; (b) skill levels; (c) perceived complexity; determine the directional influence of the remaining three constructs. Perceptions and attitudes (perceived usefulness, enjoyment & social pressure) are positive correlated to internet usage (frequency, tendency, using various tools, & use for various tasks), which correlates to internet impact (learning & career) (Cheung & Huang, 2005). A modified version of this scale was developed because students' perceptions about the impact of the internet were not included in research objectives.

Variables selected, which represent three of the four constructs, measured in the original full scale, excluding internet impacts. Under organizational factors, scale items measuring internet skills and perceived complexity were selected to establish skill levels of participants and perceived ease of use, obtained by reverse coding complexity. Exploratory factor analysis on these items, by the originators of the instrument, explains 74% of variance in measuring organizational factors (Cheung & Huang, 2005). All three variables measuring perceptions and attitudes were selected based on research design to understand attitudes toward technology, which may be influencers of creativity. Perceived usefulness directly measures the use of the internet and technologies within a university setting and is appropriate for researching students' attitudes and perceptions. Enjoyment and social pressures measure the levels of intrinsic and extrinsic motivating factors possibly affecting attitudes toward technologies and internet usage. Exploratory factor analysis for these items represent 54% of variance explained for perceived usefulness and 80% of variance explained for enjoyment. The final construct measured was

internet usage, measuring frequency and intensity of internet usage, a measure of behavior based on attitudes and perceptions. Exploratory factor analysis yielded a single factor explaining 66% of variance (Cheung & Huang, 2005). Initial reliability results for a majority of variables reported Cronbach's alphas larger than 0.70. Results reported are based on 328 questionnaires returned by college students conducted by the originators of the instrument. For variables included in this study reliability results are: internet skills ( $\alpha = 0.752$ ); perceived complexity ( $\alpha = 0.828$ ); perceived usefulness ( $\alpha = 0.774$ ); enjoyment ( $\alpha = 0.878$ ) and internet usage ( $\alpha = 0.821$ ) (Cheung & Huang, 2005). Cronbach's alpha results over 0.70 are indicators of acceptable construct reliability.

Nineteen scale items were grouped based on: internet skills (2 items), perceived enjoyment (3 items), social pressure (1 item), internet usage (4 items), perceived complexity (3 items) and perceived usefulness (6 items). Items for perceived complexity were reverse coded, so that a higher score denotes lower levels of perceived complexity. Respondents were asked to complete a 5-point Likert scale survey assessing their attitudes regarding particular areas of internet usage from 1 – strongly disagree to 5 – strongly agree, with a response of 3 being neutral.

**Work Preference Inventory – College Student Version (WPI).** Developed by Amabile et al. (1994) the Work Preference Inventory (WPI) was designed as an explicit assessment of adult perceptions of intrinsic and extrinsic motivations, regarding what they do. Independently scored scales were developed, based on the coexistence of intrinsic and extrinsic motivations, to directly assess not only self-perceptions of competence and self-determination, but the range of cognitions and emotions related to both intrinsic and extrinsic motivations. The scales are written as to capture the major elements of both intrinsic and extrinsic motivations. Intrinsic

motivational elements include: (a) self-determination (preference for choice and autonomy), (b) competence (mastery orientation and preference for challenge), (c) task involvement (task absorption and flow), (d) curiosity (preference for complexity) and (e) interest (enjoyment and fun). Extrinsic motivational elements include: (a) evaluation concerns, (b) recognition concerns, (c) competition concerns, (d) focus on money or other tangible incentives and (e) focus on the dictates of others (Amabile et al., 1994).

Written in the first person, each of the scales asks respondents to score based on the extent to which the statement describes them. Ranges from never or almost never true of me to always or almost always true of me are written to capture general motivational orientations and focus solely on the individuals work. In an effort to reduce response sets, the approximately equal number of scale items for intrinsic and extrinsic motivations contain statements which both endorse and reject motivational orientations (Amabile et al., 1994). Currently in its 7<sup>th</sup> version, the WPI is written for adults in the workplace, with a college student version adapted for use. The thirty items compose two scales and four subscales: intrinsic motivation (subscales: enjoyment and challenge) and extrinsic motivation (subscales: outward and compensation) (Amabile, Conti, Coon, Lazenby & Herron 1996).

In assessing the reliability of the WPI, Amabile et al. (1994) report corrected item-total correlations and Cronbach's alpha for the student version of the primary scales to be satisfactory. The two primary scales intrinsic and extrinsic motivational measures reported a reliability statistics of .79 (intrinsic) and .78 (extrinsic). Reliabilities for the four subscales of motivation also produced satisfactory results. Challenge and enjoyment (intrinsic measures) reported Cronbach's alphas of .74 and .71, respectively. Outward and compensation (extrinsic measures) reported Cronbach's alphas of .71 and .78, respectively (Amabile et al., 1994). A separate

analysis including 500 Mensa adult members revealed similar reliability statistics (.82 for intrinsic and .76 for extrinsic) (Amabile et al., 1994). Although satisfactory reliability results for the student version of the WPI are reported, reliability results for the adult version are marginal to satisfactory (.75 for intrinsic and .70 for extrinsic) (Amabile et al., 1996).

Amabile, Conti, Coon, Lazenby and Herron (1996) support construct validity of the WPI based on concurrent and discriminant correlations related to questionnaires and behavioral analysis. In professional artists, extrinsic motivation positively correlated with time perceptions related to the future, although perceptions related to the past correlated negatively. Concerns over recognition and compensation tend to drive future thinking, and conversely lead to less focus on past results.

Of the subscales measured, only two (an art interest measure and one writing interest measure) negatively correlated with the Outward (Extrinsic Motivation EM) subscale. Although interest scales reported significant positive correlations with Intrinsic motivation subscales (Challenge and Enjoyment), the lack of correlations regarding Extrinsic motivation do not suggest a lack of interest or motivation, but a different type of motivation independent of interest in a subject area (Amabile et al., 1996).

In examining behavioral predictors of motivation, the primary scales and subscales of the WPI support construct validity based on tests of predictive validity. Both of the intrinsic subscales (Challenge and Enjoyment) significantly correlated with a participants' involvement in art, writing and/or problem solving. Challenge subscale suggests higher correlations to problem solving activities, as opposed to Enjoyment subscale suggesting higher correlations to art and writing activities. With involvement to certain activities, extrinsic motivation scale was significantly negatively correlated to writing and art, but positively correlated to problem



solving. Amabile et al. (1996) report similar results measuring involvement and Extrinsic motivation subscales (Outward and Compensation), with the most significant and positive correlation between Compensation and problem solving.

Of the 30 items, 15 represent intrinsic motivation questions and 15 represent extrinsic motivations. Participants were asked to complete a four point Likert scale survey on “...how true each statement is to you”. Choice options ranged from never or almost never true of you to always or almost always true of you. A neutral/middle score or option was not available to respondents to encourage committal in one direction or another.

**Abbreviated Torrance Test for Adults (ATTA).** Unlike the longer TTCT, the ATTA measures four subscales of creativity: (a) fluency, (b) originality, (c) elaboration, and (d) flexibility; with fifteen creative strengths: (i) richness and colorfulness of imagery, (ii) emotions/feelings, (iii) future orientation, (iv) humor: conceptual incongruity, (v) provocative questions, (vi) openness: resistance to premature closure, (vii) unusual visualization/different perspective, (viii) movement and/or sound, (ix) richness and/or colorfulness of imagery, (x) abstractness of titles, (xi) context: environment for object/articulateness in telling story, (xii) combination/synthesis of two or more figures, (xiii) internal visual perspective, (xiv) expressions of feelings and emotions, and (xv) fantasy (Goff & Torrance, 2002). With an administration time of 15 minutes, the authors report an ease of administration effort and scoring as benefits to this alternative of the TTCT. Since scoring and analysis is consistent with the original form of the TTCT, abbreviated verbal and figural activities are used to evaluate creativity abilities (Goff & Torrance, 2002, p.1). Including in the Abbreviated Torrance Test for Adults Manual are administration and scoring instructions.

Using the Kuder-Richardson Formula 21, K-R 21 and standard error of measurement (SEM), Goff & Torrance (2002) report reliability coefficients of .84 for total abilities and .90 for total abilities plus indicators. A major assumption of the K-R 21 is each of the items tested are not independent of other items and any statistical inference made is based on randomized item selection from subject to subject. For composite raw scores, Goff & Torrance (2002, p.34) report total abilities (K-R 21: .84, SEM=4.63) and total abilities plus indicators (K-R 21: .90, SEM=4.76). For each of the four abilities reliability statistics are: (1) fluency (K-R 21: .45, SEM=1.48), (2) originality (K-R 21: .38, SEM=1.69), (3) elaboration (K-R 21: .84, SEM=.78) and (4) flexibility (K-R 21: .38, SEM=1.47) (Goff & Torrance, 2002, p. 35). Test developers report interrater reliabilities ranging from .95 to .99, as ongoing research (Goff & Torrance, 2000). In addition, recent research in bilingual studies suggests construct validity of the ATTA in relation to creative function (Kharkhurin, 2009). Other measures of validity have been widely disputed across domains (Almeida, Prieto, Ferrando, Oliveira, & Ferrándiz, 2008).

Activity #1 includes fluency and originality, activity #2 includes fluency, originality and elaboration and activity #3 includes all four of the norm-referenced measures. Raw scores are calculated by assigning points to appropriate and related responses, specifically defined in scoring guidelines. For example, scores for fluency in activity #1 are calculated based on the number of responses given, with each response given one point. Points for the four measures are totaled for all three activities and raw scores were converted to a scaled score based on a worksheet provided. For the fifteen criterion measures, definition and examples of indicators were detailed with examples in the scoring guidelines. Frequency of occurrence determines level scores for separate indicators. For example, in scoring the emotions/feelings indicator on activity #1, responses to flying or walking on air may lead to emotional responses such as: “would feel

lazy”, “would be afraid” or “would be jealous” (Goff & Torrance, 2002). Occurrence of a single phrase expressing emotion or feeling would be scored with a + (1 point) and multiple occurrences would be scored with ++ (2 points). These point totals are added to scaled scores generated on the four norm-referenced criteria to total a creativity index. Creativity index scores range from 0 to 85+ (higher than 85). Based on creativity index score, participants are assigned a creativity group (1 – minimal to 7 – substantial).

**Design Brief.** Amabile’s theory outlines how the aforementioned components interact with one another in the creative process. The basis of this theory is how an individual assembles and processes information to arrive at creative output. Individual criteria and assessment of creative responses are based on domain-relevant skills and prior domain specific responses generated. As an overseer, creativity-relevant skill manages the response generation processes, which an individual selects and adapts throughout the creativity process.

These assumptions are the basis in creating a design brief for the purpose of this study. The participants were given a design scenario, which included a landscape photograph, taken by the author. This design brief did not include any technical or consumer constraints. Instructions stated to: “Design a three ensemble collection inspired from the image presented.” This design brief satisfied Amabile’s (1996) recommendations of task presentation that is heuristic and reflects low levels of external constraint.

**Consensual Assessment Technique.** In an effort to minimize complications from self-assessment and/or single rater bias, the consensual assessment technique (CAT) utilizes a panel of experts in the domain to subjectively evaluate creative products based on defined criteria. In the CAT, participants are asked to create a product for evaluation by a panel of expert judges. These independent judges evaluate the creativity characteristics of the product, based on

individual perceptions of the criteria outlined, on a five-point Likert-scale. Although the CAT has been widely used in evaluating collages, poems and stories based on images (Amabile, 1996, Hennessy & Amabile, 1999), potentiality for use across creative domain is wide ranging (Hickey, 2001). In using the CAT, measures of direct creativity assessment are utilized as opposed to skill measurements, which are difficult to directly associate to theoretical understandings of creativity (Kaufman et al., 2007).

In studies of adult art and creativity, Amabile (1996) defined 16 characteristics or criteria for creative output evaluation: (a) creativity; (b) novel use of materials; (c) novel idea; (d) technical goodness; (e) organization; (f) neatness; (g) effort evident; (h) planning evident; (i) balance; (j) variation in shapes; (k) representationalism; (l) symmetry; (m) expression; (n) silliness; (o) detail; (p) complexity. For the purpose of this exploratory investigation, the criteria silliness is removed. This was a key component for the design brief presented by Amabile (1979) in the original study and has no direct relation to the design brief presented here]. As previously mentioned, there are certain criteria for creativity measurement in social-psychological theory application and assessment procedure. Judges are evaluated to be experts in the domain if they exhibit a level of familiarity to have developed implicit criterion on levels of creativity, technical goodness, evidence of skill, etc. (Amabile, 1996; Baer, Kaufman & Gentile, 2004; Kaufman, Gentile & Baer, 2005; Kaufman, Lee, Baer & Lee, 2007).

In addition to the requirements for task development and sample selection, there are five requirements for the assessment procedure. First, and a major assumption of this technique, the judges should possess experience and proficiency in the domain. The experience level might vary, but some implicit criteria of creativity, technical goodness, domain skill, etc. should be evident. The question of the level of creative works produced by the judges is often raised as a

criterion for selection. Relying on the original assumption of judges familiar with the domain sharing common criteria of creativity, judges should not be preselected on any criteria aside from proficiency in the domain. Although self-evaluation of creative products might be useful, the discrepancy between judges' evaluations and self-evaluation might vary widely (Jaarsveld & Leeuwen, 2005). Therefore, the use of self-evaluations is discouraged (Amabile, 1996).

Second, to maintain the integrity and reliability of the assessment technique, the judges must evaluate the products or responses independently. In order to accept the judges evaluation of a product as creative or not, the consensus should be reached free from influence or training (Amabile, 1983a). Third, the evaluation should include items regarding the technical goodness or aesthetic appeal. In keeping with this assumption, judges evaluate on various aspects of the product, not only its creativity, to control for social factors, which could influence the relationship between creativity and technical execution (Amabile, 1996). Fourth, the judges should be asked to rate the products against one another, and not against an ideal. Maintaining the baseline of domain-relevant skill sets of the participants, evaluations comparing similar types of products, made by previous creators of varying or increased skill sets, to the current products are unreliable (Amabile, 1996). Lastly to control for method artifacts and skewed levels of interrater reliabilities, the products or responses should be viewed in different random orders by the separate judges.

Despite some benefits of the CAT, limitations exist. Assembling a panel of experts and/or judges might be difficult and expensive. Although research has suggested the use of gifted novice judges, with highly correlated ratings when compared to experts (Kaufman et al., 2005), the more significant reliability statistics are performed with a panel of expert judges. In early studies using the CAT to assess creativity levels in collages and drawings of children and adults,

Amabile (1983a & 1996) reported inter-rater reliabilities from .70-.90. In subsequent studies focusing on image and story creation in children, similar inter-rater reliabilities are reported (Hennessey & Amabile, 1999; Runco, 1999). In subsequent studies, Kaufman, Gentile and Baer (2005), found gifted novices provided reliable ratings, which were highly correlated with those of expert judges. Additionally, Kaufman, et al. (2007) report both high levels of inter-rater reliabilities and reliabilities based on generalizability theory using gifted novice judges to evaluate captions created for pictures by university students. Through this study, they suggest high levels of reliability (.80 or greater) are attainable using a moderate number of raters (5) and captions to evaluate (15) (Kaufman et al., 2007). In repeated studies, using both experts and novices; children and adults; verbal and visual products the CAT provides satisfactorily interrater reliabilities, which usually exceed .70, with some reported as high as the mid .90's. In a majority of these studies, interrater reliabilities typically range in the .80's (Amabile, 1983a, 1983b, 1996; Baer, 1997, 1998; Baer et al., 2004; Kaufman et al., 2005; Kaufman et al., 2007; Kaufman, Baer, Cole & Sexton, 2008; Runco, 1999).

A key question in assessing creativity is the validity of the instrument or theory, which is the major strength of the CAT. Since its inception, the CAT has existed unrelated to any particular theory of creativity, therefore content validity does not change based on research updates and/or paradigm shifts (Baer & McKool, 2009). As an assessment tool, the CAT asks expert raters to evaluate their perceptions of creativity of a particular object based on comparison with similar objects. Measurement of overall creativity and/or creative potential is greatly exaggerated, as the CAT is designed to capture one opinion of a selected rater of a single product in comparison to other products under evaluation (Kaufman et al., 2007). Focused on raters independent evaluations of creative products produced based on a stimulus, generalizations

relating to a single instance of creative performance are valid based on the outcome of the stimulus. Creative thinking skills or other attributes hypothesized to contribute to creative output are not evaluated using the CAT (Amabile, 1983a, 1996; Kaufman et al., 2007).

Although the opinions and standards of raters and domain experts could change over time, there is a no more objective measure of creative performance than a collective evaluation of domain-focused experts at a given moment in time (Kaufman et al., 2007). In assessing overall validity of the CAT, an acceptable measure of face validity is the opinion of an expert rater. Although it is expected raters not always completely agree, early studies conducted by Amabile (1983a, 1983b, 1996) found the raters tended to agree in their judgments of creativity, although agreements and correlations regarding technical qualities showed little to no significance. These studies suggest the creativity ratings obtained using the CAT are judgments of creativity and not other aspects related to artifacts, which supports analysis of discriminant validity in a follow-up study (Baer & McKool, 2009).

For this exploratory investigation three judges exhibiting proficiency in the domain were selected. Two of the judges were graduate students, one completing a M.S. in apparel design and the other a doctorate in apparel design. The third judge was a professor in apparel design and former custom couture designer. Judges were provided with assessment score sheets and a set of instructions for evaluation. Item scores are based on a 7-point Likert scale with 1 representing very low to 7 representing very high. Item orders on score sheets were randomized for each judge and each judge was required to evaluate the illustrations independently without discussion or input from outside sources. Additional instructions included:

1. Randomly spread out all 32 illustrations examining the group as a whole, taking time to view each illustration within its context.

2. Select illustrations to evaluate using provided score sheets, following the items in order on the score sheets.
3. Evaluate the illustrations in relation to the entire group as opposed to an ideal or industry standard.
4. Use subjective definitions for each of the scale items.
5. Place all evaluations in a sealed envelope to be given to the researcher.

Scale items included dimensions relating to creativity as well as those relating to technical quality. Amabile (1996) suggests including items of technical goodness with items of creativity for achieving discriminant validity. Of the 15 scale items, seven represent evaluations of creativity: (a) creativity; (b) novel use of materials; (c) novel idea; (d) effort evident; (e) variation in shape; (f) detail; and (g) complexity.

### **Variable Operationalization**

The variables examined in this study were internet/technology usage, intrinsic motivation, extrinsic motivation, creativity and product output. Table 5 illustrates how each of the variables will be operationalized using the aforementioned instruments. Each of the variables is determined by an indicator calculated based on instrumentations.

Table 5

#### Variable Operationalization

Variable	Operationalization	Number of Scale Items	Level of Measurement
Internet/Technology Usage	Adaptation of Internet/WWW Survey	19 Likert scale items	Interval/Single Composite Measure
Motivation (Intrinsic)	Work-Preference Inventory – College Student Version	15 Likert scale items	Interval/Single Composite Measure



Table 5 continued

Motivation (Extrinsic)	Work-Preference Inventory – College Student Version	15 Likert scale items	Interval/Single Composite Measure
Creativity	Creativity group based on creativity index scores attained from Abbreviated Torrance Test for Adults	3 activities evaluated for a composite index score	Ordinal/ Single Composite Measure
Product Output	Consensual Assessment Technique	7 Likert scale items	Interval/Single Composite Measure

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### Hypotheses Testing

Composite score measures were calculated for indicators as an empirical measurement to conduct hypothesis testing. In calculating composite scores for all responses, means of internet usage responses was generated, with a higher score indicating higher levels of internet usage, perceived usefulness, enjoyment, and social interactions. For both intrinsic and extrinsic motivation composite scores, an individual mean was calculated based on responses to the 15 items for each type of motivation, with higher scores for respective motivations indicating higher levels of a particular motivation. Points were assigned for responses to three activities completed during data collection and recorded on ATTA Scoring/Interpretation Worksheet. The four norm-referenced measures (fluency, originality, elaboration and flexibility) were assessed, followed by the 15 criterion related measures. ATTA results included creativity index and levels for 32 participants. Participants were assigned a creativity group based on individual creativity index scores. Overall, creativity product assessment scores were generated based on aggregate scores of the three judges' evaluations using consensual assessment technique.

Statistical package Statistics for the Social Sciences (SPSS) was used to conduct empirical analysis. Based on the data collected, frequency analysis was conducted to check normal distribution of variables and additional statistical assumptions. For hypotheses testing, correlations and one-way analysis of variance (ANOVA) were used. Pearson correlations of indicators were used to analyze interval variable relationships. Based on a literature search, relationships between internet/technology and product output are limited, therefore a two tailed tests was conducted for these variables. For relationships involving creativity (categorical), one-way ANOVA were used to isolate extrinsic motivation from intrinsic motivation. Because intrinsic and extrinsic motivations are considered directional influencers on creativity, both a one-tailed test for correlation and a one-way ANOVA was used to determine significant results. In cases of a significant correlation or a significant omnibus F, further means analysis and appropriate regressions and post hoc tests (Tukey's HSD) were conducted. For this exploratory investigation, intrinsic and extrinsic motivations are isolated to determine differences in each variable by creativity group. Since intrinsic and extrinsic motivation violates the normally independent distributed variable assumption, conducting a multiple analysis of variance (MANOVA) would not provide clarification on individual factor differences. For creativity and product output, the literature review indicated no significant differences between creativity and creative production, therefore a one-way ANOVA was conducted for these variables as well. Additionally, Spearman rank correlations were conducted to further explain the relationships between ranked categorical variables and interval indicators. Variable relationships were analyzed based on the hypotheses. Reliability statistics, namely Cronbach's alpha were calculated to measure the consistency of the instrumentation used.

Table 6

## Statistical Analysis of Variables

Variable (correlational) / Factor (ANOVA)	Variable	Statistical Analysis
Internet/Technology Usage	Product Output	Conduct Pearson correlation for variables – conduct bivariate regression for significant correlations
Creativity Index Groups	Intrinsic Motivation	One-way ANOVA – conduct a post-hoc analysis for significant omnibus F & Spearman rank correlations
Creativity Index Groups	Extrinsic Motivation	One-way ANOVA – conduct a post-hoc analysis for significant omnibus F & Spearman rank correlations
Intrinsic Motivation	Product output	Conduct Pearson correlation for the variables– conduct bivariate regression for significant correlations
Extrinsic Motivation	Product output	Conduct Pearson correlation for the variables– conduct bivariate regression for significant correlations
Creativity Index Groups	Product output	One-way ANOVA – conduct a post-hoc analysis for significant omnibus F & Spearman rank correlations

**Data Interpretation**

Data analyzed was interpreted based on the social psychological theory of creativity framework (Amabile, 1996). The significance and extent of the relationships were examined and compared against similar relationships theorized to exist between these variables. This information was compared and reported against prior studies conducted using a similar framework, within and outside of the apparel design domain.

## **Chapter Four: Results and Discussion**

The purpose of this study was to apply a social psychological framework to empirically study motivation and creative output of apparel design students, while investigating the role internet and technology usage in relation to product output. In this chapter the results of the empirical analysis are presented and discussed in satisfaction of the original objectives.

Exploratory data analyses of the: Internet/WWW Survey, Work-Preference Inventory – College Student Version (WPI), Abbreviated Torrance Test for Adults (ATTA) and judges' evaluations using the Consensual Assessment Technique (CAT) were conducted. Distributions and descriptive statistics are provided for the sample based on the various instrumentation used. Histograms are presented to support normal distribution of variables for hypotheses testing. Results of hypothesis testing are presented and discussed in relation to theorized relationships outlined in the social psychological theoretical framework (Amabile, 1996). Reliability results and analysis of CAT are included.

### **Description of Sample**

A convenience sample of 32 undergraduate students completed all four instruments for this exploratory investigation. This sample represents two separate universities located in the southeastern United States ( $n = 18$ ;  $n = 14$ ). Students were selected based on enrollment in a patternmaking course, which requires a junior level standing within each respective program. Of those sampled, an overwhelming majority were female ( $n = 30$ ), with a male being represented from each university. All 32 participants were pursuing a bachelor's degree in human ecology (human sciences) concentrating on apparel design and/or merchandising.

## Descriptive Statistics

**Internet/WWW Survey.** Results indicate a slightly skewed right distribution, indicative of a mean of  $\bar{x} = 4.31$  (Figure 3). These results indicate higher than average participant engagement, usage, and enjoyment in terms of internet and technology. A minority of participants ( $n = 7$ ) indicated internet and technology attitudes and behaviors of neutral to agree. Standard deviation of  $s = .40$ , with a higher than average mean, indicates overall positive agreement on internet and technology engagement, usage and enjoyment of all participants. Despite a right tendency, skewness statistics fall within an acceptable range ( $-1$  to  $1$ ). Results are atypical of anticipated responses by university-enrolled participants (Chuang and Huang, 2005). Complete descriptive statistics for each scale item as well as total instrument are provided in Table 7.

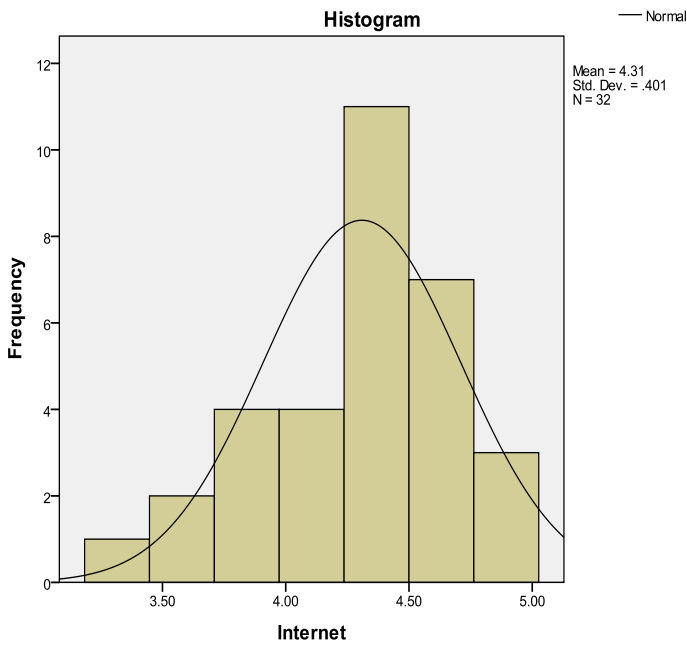


Figure 3. Distribution of composite scores for Internet/WWW Survey.

Table 7

## Descriptive Statistics for Scale Items of Internet/WWW Survey

Scale Item	Mean	Std. Deviation	Min	Max
I have used the Internet/WEB for a long time	4.91	.30	4.00	5.00
Overall I would rate my Internet/WEB skills high	4.59	.67	2.00	5.00
Internet/WEB make learning more interesting	4.41	.71	3.00	5.00
Working/Studying with the Internet/WEB is fun	4.16	.95	2.00	5.00
In general, browsing the Internet/WEB is interesting	4.72	.52	3.00	5.00
Most of my close friends/classmates think that I should be using the Internet/WEB regularly in my studies	3.81	1.00	2.00	5.00
I use the Internet/WEB very intensively (more than 2 hours per day)	4.22	.98	2.00	5.00
I use the Internet/WEB very frequently (a few times per day)	4.44	.92	1.00	5.00
I use the Internet/WEB for a variety of tasks (reports, team projects, individual homework/assignment, study collaboration, communication, research, etc.)	4.87	.34	4.00	5.00
I use a diversity of tools on the Internet/WEB for my studies (e-mail, Facebook®, Twitter®, messenger services, YouTube®, etc.)	4.69	.59	3.00	5.00
Working with the Internet/WEB is complicated, it is difficult to understand what is going on	4.44	.84	2.00	5.00
It takes too long to learn how to use the Internet/WEB to make it worth the effort	4.66	.75	2.00	5.00
In general, the Internet/WEB is very complex to use	4.37	1.10	1.00	5.00
Use of the Internet/WEB will have no impact on the performance of my study	3.81	1.12	1.00	5.00
Use of the Internet/WEB can decrease the time needed for my school work	3.94	.91	2.00	5.00
Use of the Internet/WEB can significantly increase the quality of output of my school work	4.06	.88	2.00	5.00

Table 7 Continued

Use of the Internet/WEB can increase the effectiveness of my school performance	4.09	.89	2.00	5.00
The Internet/WEB can increase the quantity of output for same amount of effort	3.59	1.01	1.00	5.00
Considering all tasks, the use of Internet/WEB helps improve my learning/study	4.09	.93	2.00	5.00
Total	4.31	.40	1.00	5.00

Cronbach's alpha was the primary measure of internal consistency to analyze scale items. Reliability analysis of scale items indicates acceptable levels of internal consistency ( $\alpha = .81$ ) (Cronbach, 1951). Alpha levels above .70 indicate the 19 scale items measure a similar variable, theorized to be internet and technology engagement, usage, enjoyment. Results of this exploratory investigation are similar to previously reported reliability analyses of the instrument's authors. For individual scale item groupings Cheung and Huang (2005) report reliability of the instrument from ( $\alpha = .75$  up to  $\alpha = .88$ ). Based on comparison between reliability of instrument usage for this exploratory investigation and previously reported investigations, results indicate the instrument is acceptable for use in inferential statistics and hypothesis testing.

**Work Preference Inventory – College Student Version.** Survey results from the Work Preference Inventory – College Student Version were entered into SPSS, reverse coding five scale items. Items specific to intrinsic or extrinsic motivations are combined in and shuffled for the survey; responses for the 15 items are isolated and analyzed separately.

Results indicate similar and normal distributions for both intrinsic (Figure 4) and extrinsic motivation (Figure 5) composite scores. While a majority of participants report means

on motivation between 2.50 and 3.50 for both intrinsic and extrinsic, intrinsic motivation means ( $\bar{x} = 3.27$ ) indicate a tendency toward intrinsic motivators, as driving work habits in participants. In comparison, extrinsic motivators in participants were lower ( $\bar{x} = 2.81$ ). These results indicate participants involved in a traditionally creative major (apparel design) self report intrinsic factors as motivating work habits in relation to their college studies. This would support earlier findings of the positive effects of intrinsic motivation on creativity (Amabile et al., 1996), assuming participants pursued a major in apparel design to express creativity as indicated in earlier research (Hodges & Karpova, 2010). Just under half of the participants reported more neutral attitudes toward extrinsic motivation ( $n = 14$ ) as compared to intrinsic motivation ( $n = 1$ ), which would indicate the polarizing perceptions of intrinsic motivation.

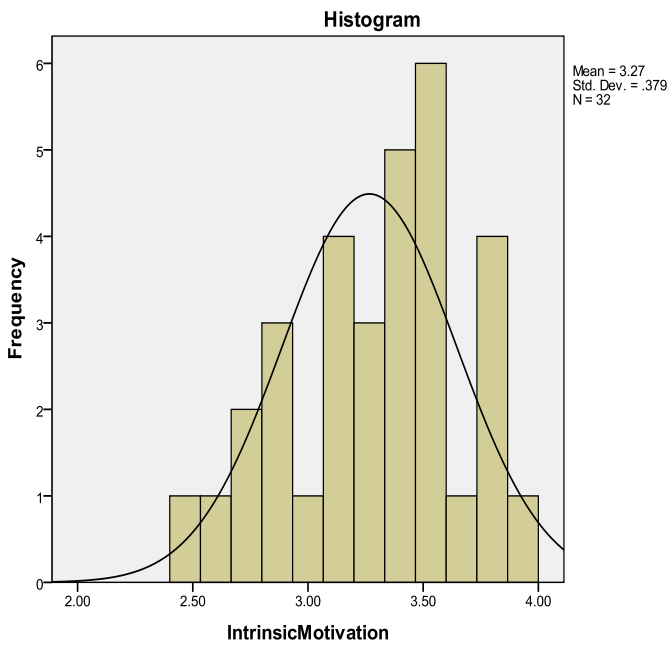


Figure 4. Distribution of composite scores measuring intrinsic motivation on Work Preference Inventory – College Student Version.



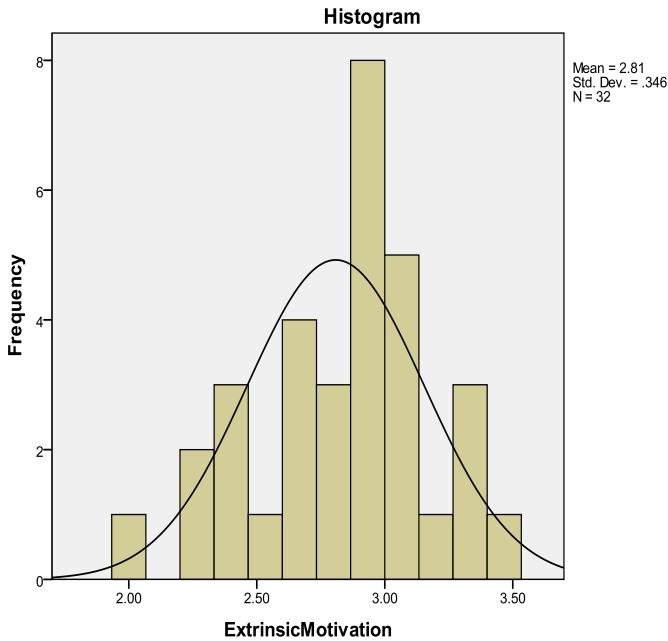


Figure 5. Distribution of composite scores measuring extrinsic motivation on Work Preference Inventory – College Student Version.

Standard deviation for both intrinsic ( $s = .38$ ) and extrinsic motivation ( $s = .35$ ) indicate little variability among participants scores and reported mean. Limited variability indicates participant self reports for both intrinsic and extrinsic motivation vary by less than .50 from the overall sample mean. Therefore, participants more favorably reported intrinsic motivational factors as opposed to extrinsic motivational factors with slight variability among individual participants. Skewness statistics for both intrinsic and extrinsic motivation support normal distributions and are acceptable for the purpose of this exploratory investigation. Standard deviations for sample are similar to results reported among creative writers and journalists (Kaufman, 2002) Descriptive statistics are provided in Table 8.

Table 8

## Descriptive Statistics for Scale Items Measuring Intrinsic and Extrinsic Motivation on Work

## Preference Inventory – College Student Version

Scale Item	Mean	Std. Deviation	Min	Max
The more difficult the problem, the more I enjoy trying to solve it	2.63	.79	1.00	4.00
I want my work to provide me with opportunities for increasing my knowledge and skills	3.81	.40	3.00	4.00
I prefer to figure things out for myself	2.84	.72	1.00	4.00
No matter what the outcome of a project, I am satisfied if I feel I gained a new experience	3.19	.97	1.00	4.00
I enjoy relatively simple, straightforward tasks (R)	2.47	.88	1.00	4.00
Curiosity is the driving force behind much of what I do	3.06	.80	2.00	4.00
I enjoy tackling problems that are completely new to me	3.16	.72	2.00	4.00
I prefer work I know I can do well over work that stretches my abilities (R)	2.97	.86	1.00	4.00
I'm more comfortable when I can set my own goals	3.09	.78	1.00	4.00
It is important for me to be able to do what I most enjoy	3.91	.30	3.00	4.00
I enjoy doing work that is so absorbing that I forget about everything else	3.56	.72	2.00	4.00
I enjoy trying to solve complex problems	2.81	1.06	1.00	4.00
It is important for me to have an outlet for self-expression	3.78	.55	2.00	4.00
I want to find out how good I really can be at my work	3.72	.46	3.00	4.00
What matters most to me is enjoying what I do	4.00	-	4.00	4.00
Intrinsic Motivation Total	3.27	.38	1.00	4.00
I am not that concerned about what other people think of my work (R)	2.56	.81	1.00	4.00
I prefer having someone set clear goals for me in my work	3.16	.81	2.00	4.00

Table 8 Continued

I am keenly aware of the goals I have for getting good grades	3.56	.67	2.00	4.00
To me, success means doing better than other people	2.47	1.02	1.00	4.00
I am keenly aware of the GPA (grade point average) goals I have for myself	3.28	.89	1.00	4.00
I'm less concerned with what work I do than what I get for it	1.91	.86	1.00	4.00
I'm concerned about how other people are going to react to my ideas	2.63	.91	1.00	4.00
I seldom think about grades and awards (R)	3.25	.88	1.00	4.00
I believe that there is no point in doing a good job if nobody else knows about it	1.50	.72	1.00	3.00
I am strongly motivated by the grades I earn	3.19	.93	1.00	4.00
I prefer working on projects with clearly specified procedures	3.03	.74	2.00	4.00
As long as I can do what I enjoy, I'm not that concerned about exactly what grades or awards I earn (R)	2.41	.95	1.00	4.00
I am strongly motivated by the recognition I can earn from other people	2.97	.93	1.00	4.00
I have to feel that I'm earning something for what I do	2.38	.94	1.00	4.00
I want other people to find out how good I really can be at my work	3.41	.84	2.00	4.00
Extrinsic Motivation Total	2.80	.35	1.00	4.00

Reliability analyses for motivation scale items indicates a sufficient alpha for intrinsic motivation ( $\alpha = .81$ ), but results for items measuring extrinsic motivation were questionable ( $\alpha = .63$ ). While reliability analysis of extrinsic motivation does not have a high level of statistical support, alpha levels greater than .60 are acceptable for the purposes of this exploratory investigation, considering the lower reported mean for extrinsic motivation. From these results, individual scale items are measuring a similar variable, theorized to be intrinsic and

extrinsic motivation, respectively. Based on the scale items and reliability analysis, a level of confidence is acceptable for the use of results from this instrument. In previous studies (Amabile et al., 1994), acceptable alpha levels ranged from .70 to .80.

**Abbreviated Torrance Test for Adults.** Participants' booklets were collected and scored according to guidelines in the Abbreviated Torrance tests for Adults Manual (Goff & Torrance, 2002), which in comparison to the normalized distributions (Goff & Torrance, 2002) follow a similar distribution in adult creativity (Table 9 & Figure 6). The mean creativity level for the sample was  $\bar{x} = 4.03$ , which is classified as average according to creativity labels based on index scores. Just over half of participants are classified from below average to above average. Close to 10% of the participant sample were classified at the highest and lowest ends of the creativity level spectrum. Sample distributions, which are similar to previously reported studies and general adult populations (Goff & Torrance, 2002; Mullin, 2010) support this instrument as an indicator of creativity-relevant skills tested in the model. Standard deviation of  $s = 1.805$  indicate increased levels of variability, which is ideal for this exploratory investigation to provide a sample rich in various levels of creative thinking abilities. Creativity levels ranged from 1 minimal ( $n = 3$ ) to 7 substantial ( $n = 3$ ).

Table 9

Range and Frequency of Student Creativity Levels

Creativity	1	2	3	4	5	6	7
Label	Minimal	Low	Below Average	Average	Above Average	High	Substantial
Participant Sample	9.4%	12.5%	18.8%	18.8%	15.6%	15.6%	9.4%
Participant Sample n=	3	4	6	6	5	5	3

Adapted from ATTA manual (Goff & Torrance, 2002, p. 33)

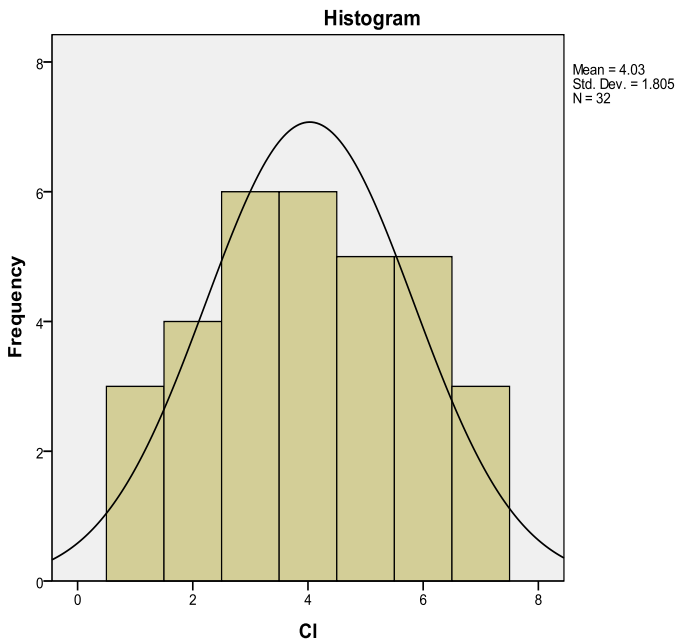


Figure 6. Distribution of creativity levels for Abbreviated Torrance Test for Adults.

**Consensual Assessment Technique.** Three independent judges assessed the 32 illustrations using the Consensual Assessment Technique, developed by Amabile (1996). Only items measuring creativity were included, as items measuring technical attributes were used to establish discriminant validity and are discussed in subsequent sections.

Judges evaluated items on a Likert scale ranging from 1 low to 7 high. Judges' means by individual creativity scale items indicate higher than average ( $\bar{x} = 3$ ) ratings ( $\bar{x} = 4.00 - 5.59$ ). Despite a higher than average mean, individual judges' ratings ranged from 10 (average item rating of 1.42) to 49 (average item rating of 7). This indicates judges effectively measured the illustrations against one another establishing low and high baselines for creativity evaluation, per instructions contributing to the reliability of judging procedures. Means across judges on items measuring creativity are similar to previous research reporting mean ratings ranging from 1.25 to 6.88 (Kaufman et al., 2008). Means for creativity scale items are provided by judge in Table 10.

Table 10

Means by Judge for Individual Scale Items for Consensual Assessment Creativity Ratings

	Creativity	Novel Materials	Novel Idea	Effort Evident	Varied Shapes	Detail	Complexity
Judge 1	5.59	5.44	5.03	5.00	5.03	4.88	4.97
Judge 2	4.84	4.00	4.00	4.34	4.50	4.50	4.50
Judge 3	5.09	4.84	4.81	5.59	5.03	5.03	4.84

Overall creativity product assessment scores were generated based on aggregate scores of the three judges' evaluations using CAT. Lowest and highest potential aggregate scores (21 to 147) were not present but aggregate scores did range from lows (40) to highs (126). Results indicate higher than average ratings on creativity with aggregate score means of  $\bar{x} = 101.88$  and a standard deviation of  $s = 20.06$  (Table 11). Higher variability among participant scores indicates establishing a baseline for low and high levels of creative evaluation by judges. As with creativity relevant skills, a wide distribution of judges' ratings supports sampling for varied levels of creative output. When combining all three judges' evaluations, reported means are similar to those in other studies using student projects evaluated by independent judges (Amabile, 1996; Kaufman et al., 2008). Distribution of aggregate scores appear normal with a slight right skew, based on the higher than average mean for judges' ratings (Figure 7). Despite slight right skew, skewness results fall within an acceptable range. Measures of technical attributes were not included in aggregate scores, in order to obtain an evaluation of creativity and product output as opposed to technical merits.

Table 11

Descriptive Statistics for Aggregate Scores of Judges' Ratings Using CAT

Statistic	
Mean	101.88
Std. Deviation	20.06
Skewness	-1.38
Minimum	40.00
Maximum	126.00

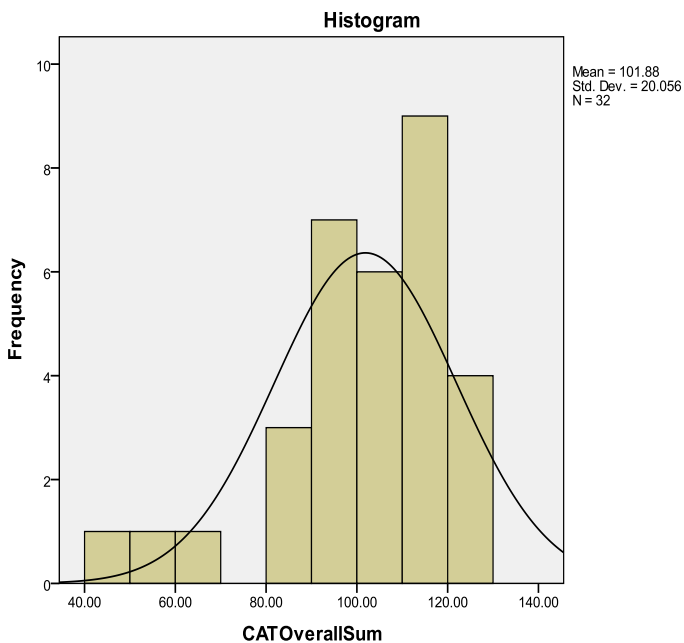


Figure 7. Distribution of aggregate scores of judges' rating using CAT.

Measures of internal consistency for judges' ratings using CAT in previous creativity research utilize Cronbach's alphas for both within and between judges' ratings (Kaufman et al., 2007). Item scales measuring creativity are analyzed separate from items measuring technical attributes. When individual judges' ratings are analyzed for internal consistency on measures of

creativity, results indicate high levels of consistency for each individual judge ( $\alpha > .90$ ). Judges consistently rated items relating to creativity similar for each individual participant. In addition to descriptive statistics supporting procedural reliability, alphas reported support scale items measuring a similar variable, theorized to be creativity. Conversely, when scale items measuring technical attributes are analyzed, judges' ratings reliability statistics become more varied, with Judges 1 and 3 reporting similar internal consistency between creativity and technical attributes. Judge 2 reported widely varying scale item measures for technical goodness.

When comparing between judges' ratings, Cronbach's alphas are calculated using the individual judge as a scale item. Results between judges indicate acceptable levels of consistency ( $\alpha = .78$ ). In comparing judges' ratings on measures of technical attributes, consistency drops below acceptable levels ( $\alpha = .58$ ). These results indicate, with a single judge exception (Judge 2), judges are highly consistent in measuring items of creativity and technical attributes individually. When individual ratings are compared against similar judges' ratings, general agreement on measures of creativity is indicated by these results, yet consistency on measures of technical goodness are questionable. These results are similar to previous studies (Amabile, 1996; Kaufman et al., 2007; Kaufman et al., 2008; Mullin, 2010). Additionally, these results support assumptions about varying degrees of technical knowledge of the individual judges. While all three satisfy requirements for proficiency in the domain, the level of proficiency is different and evident by ratings on measures of technical attributes. Therefore, results from scale items focusing on creativity are acceptable for use in this exploratory investigation, while judges found more difficulty in consistently evaluating quality levels of technical attributes. Reliability analyses and comparisons between creativity and technical attributes are provided in Table 12.



Table 12

Cronbach's Alpha by and between Judges for Individual Items Measuring Creativity and Technical Attributes

	Judge 1	Judge 2	Judge 3	Total Between Judges
Creativity	.97	.93	.93	.78
Technical Attributes	.97	.42	.94	.58

### Hypothesis Testing

One-way analysis of variance (ANOVA) and Pearson correlations were calculated using Statistical Program for Social Sciences (SPSS) and interpreted to investigate hypothesized relationships between variables. The survey research design was composed of an independent variable with three levels, a dependent variable measured multiple times and three dependent variables measured only once.

**Internet/technology and product output.** Hypothesis 1 was investigated using Pearson correlations to examine relationships between internet/technology usage and consensual assessment of creativity of illustrations. Internet/WWW survey was used to collect data regarding participant attitudes and usage habits of the internet and technology. Creative product evaluation was generated based on the Consensual Assessment Technique ratings collected by independent ratings of three judges. The following hypothesis was tested:

H1: There will not be a significant relationship between internet and technology usage and product output.

Non significant findings are hypothesized for the variables, yet directional relationships have not been pre-determined, therefore a two-tailed test for significance was conducted. Descriptive analysis for both variables indicated normal distribution and acceptable skewness, with no markedly violated assumptions. Examining the scatterplot (Figure 8) reveals a negligible positive linear relationship ( $r = .15$ ). Therefore a two-tailed correlational analysis supported visual analysis of the scatterplot. Based on previous studies, acceptable cutoff levels of significance are  $p \leq .05$ . Pearson correlations indicate no statistical significance between internet usage and product output;  $r(30) = .15, p = .42$ .

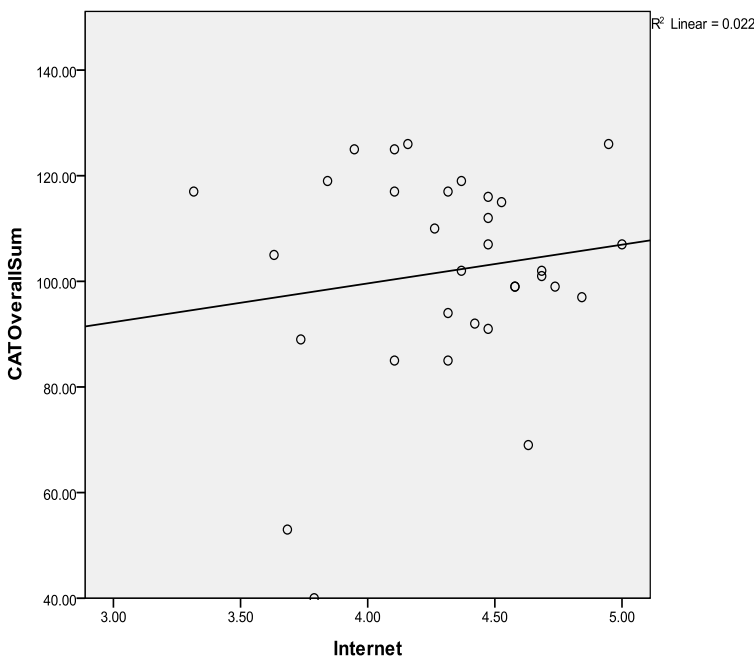


Figure 8. Graph of scores for Internet/WWW Survey and scores of judges' rating using CAT.

Based on these results, failure to reject the null hypothesis is acceptable indicating a statistically significant relationship between internet usage and product output does not exist. Based on correlations and visual scatterplot analysis, results support previously cited research indicating many digital generation youths use the Internet and technologies for gaming, text and/or information gathering. From the scatterplot, a positive trend is visible, but without

statistical support, inferences are limited. Current technologies available, outside of graphic design software, do not promote cognitive exercises in idea creation, rather information discovery and transmission. Supported by these findings, higher levels of Internet and technology engagement do not translate into increased levels of product output (Selwyn, 2009). While the Internet and technologies have influenced a digital generation over the past 15 years, the relationship between usage and idea creation needs further investigation. Survey instrumentation primarily focused on Internet usage, which may not account for all varieties of technology being used by a digital generation. Due to general nature of the internet/technology survey instrument, inferences from these results are participants' high engagement with a positive attitude toward Internet and technology does not significantly relate to actual product output. Additionally, results indicated Internet and technology usage, engagement, and enjoyment do not transfer to positive creative production using non-digital idea creation and production. Further generalizations from these results are limited.

**Creativity and motivation.** Hypothesis 2 was structured in two parts: creativity and intrinsic motivation and creativity and extrinsic motivation. Participants were assigned to creativity groups (Minimal to Substantial), as determined by creativity index scores on the Abbreviated Torrance Test for Adults. Motivations were determined based on responses to the Work Preference Inventory – College Student Version. Creativity groups are compared against scores on intrinsic and extrinsic motivation to determine if a significant difference between groups exists. A one-way analysis of variance (ANOVA) was conducted with Tukey's HSD for homogenous subsets post-hoc analysis for significant omnibus F.

H2a. There will be a significant difference between creativity groups and intrinsic motivation.

Results indicate no significant difference among creativity index groups and intrinsic motivation [ $F(6,25) = 1.24, p = .32$ ]. These results support a failure to reject the null hypothesis. Non-significant Spearman rank correlations further support the statistically inconclusive nature of these results with a negative correlation;  $r(30) = -.25, p = .09$ . Table 13 lists intrinsic motivation means by creativity groups, with standard deviations. In comparison to overall scores on intrinsic motivation, group level scores do not vary widely from the total mean. No individual group reports means above 4.0 or below 3.0, which indicates levels of intrinsic motivation by creativity groups are not significant indicators of creativity relevant skills, analyzed by the ATTA. While there is a difference between Minimal and Substantial intrinsic motivation means, the difference is not strong enough to reach similar conclusions previously reported (Amabile, 1996; Amabile et al., 1994). Means for Above average and High groups were the lowest ( $\bar{x} = 3.07$  and  $\bar{x} = 3.00$ , respectively). Intrinsic motivation means were the highest among those participants in the Substantial group ( $\bar{x} = 3.51$ ). ANOVA results with degrees of freedom and levels of significance are presented in Table 14.

Table 13

Means and Standard Deviations of Intrinsic Motivation by Creativity Groups

	Mean	Std. Deviation
Minimal	3.24	.68
Low	3.32	.25
Below average	3.48	.44
Average	3.30	.29
Above average	3.07	.36
High	3.00	.25
Substantial	3.51	.27
Total	3.27	.38

Table 14

## Analysis of Variance of Intrinsic Motivation by Creativity Groups

		Sum of Squares	df	Mean Square	F	Sig.
Intrinsic Motivation	Between Groups	1.02	6	.17	1.24	.32
	Within Groups	3.43	25	.14		
	Total	4.45	31			

H2b. There will not be a significant difference between creativity index groups and extrinsic motivation.

A statistically significant difference was found between creativity index groups and extrinsic motivation [ $F(6,25) = 4.29, p < .01$ ]. These results support rejecting the null hypothesis. Non significant Spearman rank correlations do not support the statistical significance of these results with a negligible correlation;  $r(30) = -.11, p = .28$ . Extrinsic motivation means by groups indicate the highest means are reported by Minimal ( $\bar{x} = 3.11$ ) and High ( $\bar{x} = 3.11$ ) creativity index groups, with Substantial group participants reporting lowest levels of extrinsic motivation ( $\bar{x} = 2.46$ ). Initial analysis of mean differences between these groups is partially supported by previous research (Amabile, 1994; Amabile, 1996). Differences between extrinsic motivational factors between high and low levels of creativity relevant skills are theorized, due to the negative effects of extrinsic motivation on creativity. While part of these results support the theorized relationships and previous research, a significant difference between High and Substantial groups have not been previously reported. Post hoc Tukey HSD Tests analysis indicates significant group differences between participants in the Minimal and Substantial groups and the High and Substantial groups.

Table 15

Means and Standard Deviations of Extrinsic Motivation by Creativity Groups

	Mean	Std. Deviation
Minimal	3.11	.20
Low	2.53	.31
Below average	2.77	.30
Average	3.00	.21
Above average	2.57	.22
High	3.11	.25
Substantial	2.47	.41
Total	2.81	.35

Table 16

Analysis of Variance of Extrinsic Motivation by Creativity Groups

		Sum of Squares	df	Mean Square	F	Sig.
Extrinsic Motivation	Between Groups	1.88	6	.31	4.29	.004
	Within Groups	1.83	25	.07		
	Total	3.70	31			

Table 17

Post Hoc Analysis (Tukey HSD) of Extrinsic Motivation by Creativity Groups

Creativity Group	Subset for alpha = 0.05	
	1	2
Substantial	2.47	-
Low	2.53	2.53
Above average	2.57	2.57
Below average	2.77	2.77
Average	3.00	3.00
High	-	3.11
Minimal	-	3.11
Sig.	.099	.060

Intrinsic and extrinsic motivations varied against hypothesized relationships among creativity index groups. Previous studies indicated the significant role intrinsic motivation played in relation to creativity relevant skills, yet these results do not support earlier findings. Intrinsic motivation is theorized to be a major factor in determining creativity and potential creative output in visual arts. From these findings, a statistically significant difference in intrinsic motivation among levels of creativity of participants does not exist. With apparel design education (particularly in the programs participating in this sample) emphasis is placed on business education as well as the development of apparel for general public acceptance. Creativity might be focused to fit into either business models or design tasks with high levels of constraint, i.e. designing for a particular target market. As opposed to the creative visual arts, apparel design serves a primarily functional need, with aesthetics secondary, neglecting the need for high levels of intrinsic motivation.

Based on this information, extrinsic motivation may be considered to be a stronger factor in determining creative potential as opposed to intrinsic motivations, limited to apparel design students in similar programs. As evidenced from these findings, significant differences of extrinsic motivation among creativity levels exist between Minimal and Substantial groups. The differences among High and Substantial groups are similar to results among Minimal and Substantial groups. These findings indicate participants in the Minimal and High groups report similar levels of extrinsic motivation, which may be evidenced by program curriculum and the emphasis on profitability and/or public acceptance of apparel designs. Yet those individuals identified as substantially creative still report the lowest levels of extrinsic motivation. Students involved in programs based in art departments or primarily art institutions may follow similar patterns, as those reported by substantially creative participants.

**Motivation and product output.** Hypothesis 3 was broken out into 2 separate parts: intrinsic motivation and creative product out and extrinsic motivation and product output. Motivations were determined based on responses to the Work Preference Inventory – College Student Version and creative product out was determined by results from consensual assessment of participant illustrations. Hypothesized relationships were analyzed using Pearson correlations. H3a. There will be a significant relationship between intrinsic motivation and product output.

Based on the hypothesized positive relationship between intrinsic motivation and product output, a one-tail Pearson correlation analysis was conducted. Descriptive analysis of each variable indicated normal distribution, and acceptable levels of skewness, with no markedly violated assumptions. A scatterplot (Figure 9) analysis indicates a very slight positive relationship between intrinsic motivation and product output ( $r = .18$ ). Pearson correlations indicate no significant relationship between intrinsic motivation and product output;  $r(30) = .18$ ,  $p = .16$ . Acceptable significance cutoff levels were established at  $p \leq .05$ . These results would indicate a failure to reject the null hypothesis. Unlike previous research, intrinsic motivation did not have a significant relationship with product output. Based on means and standard deviations from reported intrinsic motivation and the varied range of judges' ratings using CAT, a statistically non significant relationship is a result of a limited range of reported intrinsic motivations. These results are indicative of limited and higher than average ranges of intrinsic motivations, which may be related to students involved in creative majors. Further statistical analysis would be supported through additional sampling to provide a broader range of intrinsic motivation scores.



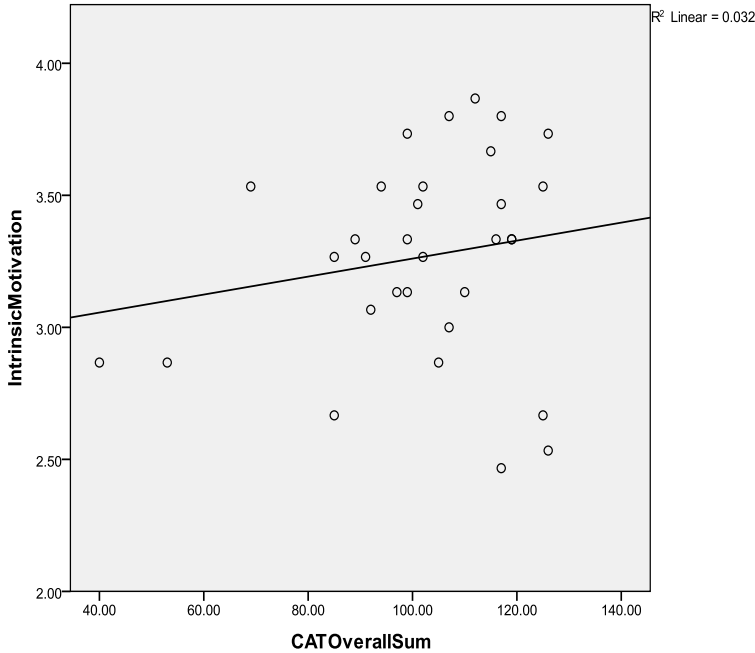


Figure 9. Graph of scores for intrinsic motivation and scores of judges' ratings using CAT.

H3b. There will be a significant relationship between extrinsic motivation and product output.

Conversely to intrinsic motivation, extrinsic motivation is theorized to be detrimental to product output. The relationship between extrinsic motivation and product output was investigated using a one-tail Pearson correlation. Based on descriptive analysis, the variables appear to be normally distributed, with no markedly violated assumptions. Scatterplot between the two variables indicate a weak negative relationship (Figure 10). Pearson correlations support this analysis, with a statistically non-significant relationship;  $r(30) = -.16$ ,  $p = .20$ . Acceptable significance levels were established at  $p \leq .05$ . These results would indicate a failure to reject the null hypothesis. Similar to intrinsic motivation, standard deviations for extrinsic motivation means limit the range of responses, which affect correlation analysis based on the wide range of judges' ratings on product output.

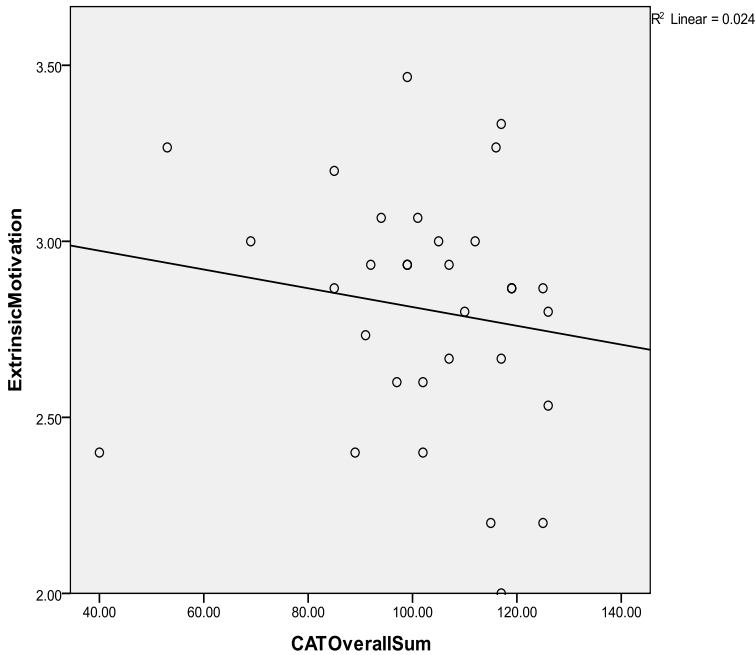


Figure 10. Graph of scores for intrinsic motivation and scores of judges’ ratings using CAT.

Based on scatterplot analysis, intrinsic and extrinsic motivations trend toward hypothesized relationships but these trends are not strong enough for statistical significance. Positive and negative correlation trends with intrinsic and extrinsic motivation and product output may be strengthened by increasing the number of participants in the sample. Yet this would neglect possible information provided by weak correlation statistics with a minimally sufficient sample. Each type of motivation and relationships with product output are discussed separately.

Intrinsic motivation has been previously linked to higher levels of product output (Amabile, 1996), yet our statistical analysis does not wholly support previous findings. Correlation trends between intrinsic motivation and creative product are positive, indicating intrinsic motivation is a factor to consider when examining product output of apparel design students, yet may not be the single most influential factor. Creating apparel designs uses many components of cognition; including spatial realization (working from 2 – D illustrations to 3 – D

garments mentally), financial analysis of production and possible profit acceptance, sub-conscious links between inspiration and design, functional analysis of garment fit, etc. Based on the aforementioned mixed cognitive requirements for apparel design (as opposed to strictly visual arts), additional factors to consider would include visual spatialization aptitude, logic and reasoning analytical skills, and social-environmental factors of apparel design education and curriculums. Intrinsic motivation influences product output in a positive manner, but for the participants of this exploratory investigation intrinsic motivation was not significantly linked to personal product output.

Extrinsic motivation, similarly, followed previous research trends of negative association with product output, albeit with no statistical significance. While extrinsic motivation negatively correlates with product output in apparel design participants, the weak nature of this relationship may indicate extrinsic motivation is not as detrimental to product output as previously theorized. Apparel designers are consistently evaluated against extrinsic motivational factors, such as profit, garment sell-thru, editorial reviews, fashion show productions, etc. Based on these expectations, apparel designers may maintain high levels of creative production due to the extrinsic demands of an ever-changing industry. For participants able to produce highly creative designs, moderate to high levels of extrinsic motivation may positively influence creativity. Combined with the negative effects of extrinsic motivation on moderate to low product output, high extrinsic motivational factors synonymous with apparel design may be a cause for the weak correlational relationships reported.

**Creativity and product output.** Hypothesis 4 examined the difference between creativity groups and consensual assessment scores of creative products. As determined by creativity index scores for participants on the Abbreviated Torrance Test for Adults, a level of

creativity (minimal to substantial) was assigned. Creative product evaluation was generated based on the Consensual Assessment Technique ratings collected by independent ratings of three judges. Creativity groups are compared against scores on consensual assessment of creative products to determine if a significant difference between groups exists. A one-way analysis of variance (ANOVA) was conducted with Tukey's HSD for homogenous subsets post-hoc analysis for significant omnibus F.

H4. There will not be a significant difference among creativity index groups and product output.

No statistically significant difference between creativity groups and ratings on product output was indicated [ $F(6,25) = .38, p = .89$ ]. Results support failure to reject the null hypothesis. Non significant Spearman rank correlations further support the statistically inconclusive nature of these results with a negative correlation;  $r(30) = .03, p = .43$ . Similar to previous research (Almeida et al., 2008), creativity relevant skills and thinking abilities are associated with creative potential not always creative production. Initial analysis of judges' ratings means by creativity group indicate little variance between groups despite a wide range of judges' ratings. Means for Average and Above average groups were the lowest ( $\bar{x} = 4.71$  and  $\bar{x} = 4.34$ , respectively). Judges' ratings means were the highest among those participants in the High group ( $\bar{x} = 5.26$ ). Participants in both extreme groups of Minimal and Substantial were not among the lowest nor highest means, which contributed to non significant findings in group comparisons. ANOVA results are presented in Table 19 for judges' ratings using CAT by creativity groups.

Table 18

Means and Standard Deviations Judges' Ratings using CAT by Creativity Groups

	Mean	Std. Deviation
Minimal	4.92	.58
Low	4.95	.69
Below average	4.90	.99
Average	4.71	1.27
Above average	4.34	1.51
High	5.26	.49
Substantial	5.00	.62
Total	4.85	.96

Table 19

Analysis of Variance for Judges' Rating using CAT by Creativity Group

		Sum of Squares	df	Mean Square	F	Sig.
Judges' ratings using CAT	Between Groups	2.37	6	.40	.38	.89
	Within Groups	25.95	25	1.04		
	Total	28.32	31			

Results indicate creativity index and groupings based on divergent thinking tests, such as ATTA, do not differ statistically when compared against independent judges' ratings of creative products. Where tests of intelligence do not always translate into highly intellectual production, creativity tests for apparel design students may be suspect to similar assumptions, based on our sample. Divergent thinking tests indicate creative potential, but should be used with caution in analyzing apparel design creativity production potential. Participants in the highest and lowest two groups reported the highest means suggesting the level of creative potential should not be

used as a gauge to predict current or future production potential. Participants in the high and substantial groups averaged the highest judges' ratings on creative products. Therefore the ATTA may not be a significant predictor of creative production, but those in higher creativity index groups may be more likely to produce highly creative work.

In an effort to support earlier research recommendations, use of the ATTA in apparel design programs should be limited as a singular tool to assist in identifying those illustrating high creative potential. In categorizing those scoring above average and lower, closer attention should be paid to individual creativity indicators as a guidepost for creative production potential. Our results support earlier research in the visual arts that potential does not predict production, rather indicates potential for quality production.

### **Summary**

Overall descriptive statistics analysis indicates a sample with varied creativity thinking abilities and wide ranging creative product assessments by independent judges. Despite internet/technology and motivation variables being slightly skewed, results are similar to previously cited studies involving undergraduate participants. Reliability analysis of individual instruments support previous research and indicate acceptable usage of the instruments for empirical analysis. From this, the sample is an acceptable representation of the population and the variable operationalization satisfies statistical requirements for analysis. Based on this non significant findings of hypothesized relationships are further supported, despite the lack of research with similar findings.

Hypothesis testing failed to support hypothesized relationships and the theoretical framework. These findings are not indicative of previous findings using creative undergraduate majors. Results indicate an inconclusive relationship between internet and technology

engagement, usage, and enjoyment and product output. Further, motivation, neither intrinsic nor extrinsic, significantly affected either creativity or product output. This component of the theoretical framework is largely supported by research in various fields from poetry to collage making, yet apparel design participants did not support earlier findings. As theorized, creativity, namely creative potential identified through the ATTA, did not differ in ratings on creative products by independent judges. As intended by Torrance (1962), divergent thinking tests, such as the ATTA, are guideposts for identifying the differing ways of thinking process between students. Our results support these intentions, as well as previous findings (Almeida, et al., 2008).

## **Chapter Five: Summary, Conclusions, Implications, and Recommendations**

Creativity is a complex social and mental phenomenon which, when studied across domains, continues to present difficulties in moving toward a unified theory. This exploratory investigation applied various instruments to empirically test theorized relationships among factors of the social psychological theoretical framework (Amabile, 1996), in which little research had been conducted specific to apparel design. Additionally, relationships among groups of participants based on creative potential and internet/technology usage, engagement, and enjoyment were examined. Results were presented in the previous chapter and are discussed in the current chapter. A summary of the results is followed by conclusions about the exploratory investigation, the implications of the findings of the current investigation, and recommendations for future research.

### **Summary**

Creativity research is often difficult to undertake (Bye, 2010), although the need for empirically supported theory and research models is evident. Specific to apparel design, current research focusing on creativity is limited (e.g. Karpova et al., 2011), more so in examining effects of internet and technology on creativity learning styles. Until recently, college students do not know a society without computers and internet technologies. Therefore, overall effects research of internet and technologies on creative thinking and learning styles may be early, but should be an influencing factor in the upcoming decade.

In investigating the current generation of apparel design students, the social psychology of creativity framework guided the empirical analysis. In addition to technology and internet usage, three variables thought to be associated with creativity were studied as well as the nature of empirical relationships. Survey instruments, divergent thinking tests and independent



consensual assessment tools were used measure the variables influencing overall creativity. Relationships between variables reported were based on predicted relationship outcomes of the guiding theoretical framework, despite limited statistical significance among variables investigated.

Internet usage and technology was not found to significantly relate to creative production of apparel design students. Long-term purposes and effects of internet and technology usage have not been examined, although results indicate participants primarily utilize these advancements for information collection and redistribution, not for idea creation. While results indicated no clear relationship between internet and technology with creative output, domain relevant skills (critical for creative production) might be attributed to readily accessible information via internet and technologies.

Motivation, considered being the single most influential factor of creativity potential and production (Amabile, 1996), did not significantly differing among creativity groups or significantly associating with creative production. Relationships of motivation both intrinsic (positive) and extrinsic (negative) with creativity have been established in visual arts, yet in applied arts, such as apparel design; these relationships have been neither supported nor definitively rejected, in the present sample. Although, many apparel designers are reliant on artistic skill and traditional visual arts training for creative designs, success and general acceptance is often dictated by extrinsic motivational factors. This dichotomous relationship is often unbalanced, unpredictable and unstable for empirical research, as indicated by the results in this study. Isolation of further factors may identify sub-traits of motivation influencing apparel design creative potential and production.

Finally, a strong indicator of predicting creative production was not divergent thinking tests, such as the Abbreviated Torrance Test for Adults. Creativity indexes, while useful in identifying those with highly creative potential, might not be an adequate tool in predicting creative production among apparel designers. Although results were mixed, the lack of statistical significance among factors determined to be influencers of creativity alerts caution to the applicability of the social psychological theory (Amabile, 1996) across domains. Apparel design is an applied visual art, whose primary function serves a basic human need – clothing. Considerations of aesthetics are secondary to functional concerns and various extrinsic motivating factors determine general domain acceptance and success (CITE). In light of these findings, alternate approaches to the scientific study of creativity for apparel design should be explored.

The purpose of this study was to apply a social psychological theoretical framework (Amabile, 1996) for the study of creativity in apparel design students, based on creative output. A theory driven approach empirically tests hypotheses about creativity and internet usage based on a theoretical model. The study examined the relationships between internet and technology usage habits of digital generation college students and product output evaluated by consensual assessment technique (CAT). Based on a theoretical framework, the study investigated comparisons between creativity identified through the Abbreviated Torrance Test for Adults (ATTA) and self-reported intrinsic and extrinsic motivation, identified by the Work Preference Inventory-Student Version (WPI). Additionally, this exploratory investigation examined relationships between creativity (ATTA) and product output (CAT). Current relationships and predictors outlined in the theoretical model of a social psychology of creativity (Amabile, 1996) served as a comparison against relationships investigated in this study.

Thirty-two apparel design students volunteered to participate in completing various surveys and self-report measures related to the variables as well as a divergent thinking test. Immediately following, participants engaged in a 45 minute creativity exercise, in which they were instructed to design a three piece ensemble inspired by a photograph. Participants received supplies and were encouraged to work freely and be creative. Based on the illustrations completed, a panel of three judges independently evaluated the works on measures of creativity and technical goodness.

The social psychological theory of creativity (Amabile, 1996) is widely used in studies of creativity focusing on either visual arts or non-arts related fields, such as business. In a field such as apparel design, skills, motivations, and garment construction capabilities range from conceptual visual arts to practical financial matters. Results from this exploratory investigation indicate, while applicable to empirically study creativity, significant relationships outlined by the social psychological theory of creativity (Amabile, 1996) framework might not transfer to apparel design creativity research.

In the current study, factors such as motivation indicated a slight influence on creativity and creative output, but without statistical significance. Continued use of the theoretical framework (Amabile, 1996), in its entirety, for domain specific creativity research was not supported. Reliability of individual instruments was within acceptable limits and supports future use in research. Non significant relationships were found among variables predicted to significantly affect one another in the overall assessment of creativity, despite adequate and often high levels of reliability of instrumentation.

A majority of the participants actively engaged in using internet and technologies for educational activities. Levels of internet and technology involvement were not statistically

related to actual product output. With the study of effects of internet and technology on creativity and learning styles still relatively premature, results of this study support earlier research of the limited use of the internet and technology as a catalyst for idea creation (Selwyn, 2009). Currently vast amounts of information and data are readily available and many users are limited to internet use for data/information collection and redistribution. Despite increased levels of internet engagement of the participants, levels of frequency, engagement and enjoyment was not found to relate to a non-digital 2-dimensional illustration creation. Internet and technology effects potentially influence levels of domain-relevant skills, through an increase in the availability of data collection during stage one of the design process.

Motivation was theorized to be the major influencing factor of creative output, according to the framework guiding this study (Amabile, 1996). Despite adequate levels of instrument reliability for both intrinsic and extrinsic motivation, once again the relationships between intrinsic and extrinsic motivation and creativity and creative output were not significant in this study. Apparel design is a profit driven industry, advanced by creativity and innovation, both reliant upon critical review and acceptance. Extrinsic factors heavily influence everyday designers and are often attributed to innovation and creativity, whereas in many visual arts fields, such as painting, these influences are not prevalent (Bye & Sohn, 2010). Due to the nature of extrinsic motivation and the apparel industry, previous conceptions of the positive effects of intrinsic motivation paired with the negative effects of extrinsic motivation on product output may not transfer to product output in apparel design. This might be particularly true for the study of creativity in apparel design curriculums with a retail/merchandising focus in addition to that of design.

As previously discussed, divergent thinking tests indicated creative potential and were frequently used with gifted children (Torrance, 1962). As their popularity rose, these tests developed in a benchmark for creative skills (Kim, 2006). Longitudinal studies confirmed results on these tests predicated creative production and output later in life. Despite this, Torrance (1962) advocated against the use of divergent thinking tests as a determinant of creativity skill level. The results of this study support earlier efforts to limit the inferences made based on divergent thinking test scores (Kim, 2006). Significant relationships were not found between creativity index scores and product output. Creativity index scores may indicate the potential for creative production; results do not predict immediate creative production.

## **Conclusions**

The findings of this study do not lend support to the social psychological theory of creativity (Amabile, 1996). Further, the theory might need further expansion to encapture all factors, which could influence creative output in apparel design. Components of the framework, such as the use of the consensual assessment technique, are valuable tools for educators to independently assess creativity production. Relationships, specific to apparel design, do not follow similar patterns of previous studies of visual arts but, are not conversely related either. Therefore, the totality of the theoretical framework guiding this study might apply to apparel design students with further investigation of influencing factors. Based on this exploratory investigation, evaluation of product output might be beneficial to future studies in creativity, especially consensual assessment of apparel designs. Further, the dynamics of apparel design and its continuum from conceptual visual arts to intense analytical skills might be completely explained through a social-psychological approach with an expanded focus.

In studying internet and technological advances and effects of creative thinking, results support the primary use of the internet and technology for information collection and redistribution. Idea creation, despite specific graphic design programs, using technology and software over the internet is limited in current use. Still in its infancy, widespread technological use and enjoyment has not impacted thought processes, namely creative production.

### **Implications**

This exploratory investigation is relevant because there are so few studies focusing on creativity in apparel design. Creativity is crucial to apparel design and if researchers are to conduct methodological research on the scholarship of design, then the difficult area of creativity must be investigated further. Simply because of the product based nature of the social psychological approach to studying creativity, many studies in apparel design readily accept this framework to guide creativity research. Yet, results from this exploratory investigation indicate this general approach may not be effective for quality in-depth research. Results did not support predicted relationships, but individual instruments were reliable and useful to future studies. Therefore, while the overall framework was not supported by empirical analysis, the instrumentation and operationalization of the variables are supported for use in future areas of creativity research.

### **Recommendations for Further Research**

Investigations into creativity often face methodological challenges and despite rigorous research design and this exploratory investigation is no exception. Future research into creativity, primarily those using similar theoretical frameworks, should increase the scope and size of this sample in an effort to highlight potential relationships reported in this exploratory investigation.

Should an increase in sample size report significant results, further analysis could determine previously unknown variables or statistical effects.

Additional future studies, in analyzing relationships of internet and technology on product output, should include product output comparisons. Using archival portfolios or garments from similar institutions, a comparison of product outputs between separate generations may yield results providing support for internet and technology impacts on product output. Generational comparisons should also include longitudinal and panel studies over the course of a four-year education and in the first few years of career development. The internet and technology instrument used in this current study relied on self-reports. Development of non self-report measures, such as observational techniques, might provide more in-depth information regarding internet and technology behaviors.

Based on the lack of significant findings in the current exploratory investigation, development of a comprehensive theoretical specific to apparel design is advisable. This study brings to light how uniquely motivation, domain relevant skills and creativity skills interact with product output, specific to apparel design, as compared to previously predicted relationships. Qualitative studies to determine underlying factors influencing different stages of the design process would provide a foundation for future theoretical development. A theoretical framework specific to apparel design should be empirically testing using developed instrumentation with control groups. While this exploratory investigation focused on illustrations as product output, future studies should encompass the entire apparel production process from illustration to final garment construction. Creativity at each stage of the apparel production process should be assessed to identify motivations and unknown variables influencing product output. Future investigations into the continuum of motivations (intrinsic to extrinsic) and product output

should focus on the relationships between intrinsic and extrinsic motivations during different stages of the apparel design process. During this process, qualitative approaches may be better suited to investigate potential variables related to motivations and creativity and product output.

Use of the consensual assessment technique was reliable and useful for future studies, but recommendations for assessment improvement are warranted. This exploratory investigation utilized three judges proficient in the domain of apparel design, but recommendations would include increasing the size and scope of the judges as well. In addition to more judges, the experience levels of judges should also be investigated to determine if the use of novice judges affects consensual assessment reliability as opposed to experts. Increasing the scope of judges' experience should also be considered, for example the use of digital artists, textile designers, photographers, etc. would provide further investigations to support or reject the widespread use of the consensual assessment technique. This exploratory investigation supported the use of consensual assessment technique to independently judge creativity. Future research could investigate the effectiveness of novice or self judging in using similar ratings sheets. While measures of technical goodness rarely provide reliable assessment, investigations into consensual assessment of technical measures may provide further insight into variables affecting product output and assessment.

Clearly, creativity is complex construct and further studies are needed to better understand its role and relationships specific to apparel design. Creative scholarship and research specific to apparel design processes and creative products is a key component to advance the understanding of design and designers, which might be applicable across other applied arts domains. While difficult to study, creativity research is benefited from investigations into identification, enhancement and theory development.



## References

- Albert, R. (1990). Identity, experiences and career choice among the exceptionally gifted and eminent. In M.A. Runco & R.S. Albert (Eds.). *Theories of creativity* (143-169). Newberry Park, CA: Sage
- Almeida, L., Prieto, L., Ferrando, M., Oliveira, E., & Ferrándiz, C. (2008). Torrance Test of Creative Thinking: The question of its construct validity. *Thinking Skills and Creativity*, 3, 53-58.
- Amabile, T. (1983a). *The social psychology of creativity*. New York: Springer-Verlag.
- Amabile, T. (1983b). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, 45, 357-376.
- Amabile, T. (1996). *Creativity in context*. Boulder, CO: Westview Press.
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, 39, 1154-1184.
- Amabile, T. Hill, K. Hennessey, B. Tighe, E. (1994). The Work Preference Inventory: Assessing intrinsic and extrinsic motivational orientations. *Journal of Personality and Social Psychology*, 66, 950-967.
- Baer, J. (1997). Gender differences in the effects of anticipated evaluation on creativity. *Creativity Research Journal*, 10, 25-31.
- Baer, J. (1998). The case for domain specificity of creativity. *Creativity Research Journal*, 11, 173-177.
- Baer, J., Kaufman, J. C., & Gentile, C. A. (2004). Extension of the consensual assessment technique to nonparallel creative products. *Creativity Research Journal*, 16, 113-117.
- Baer, J. & McKool, S. (2009). Assessing creativity using Consensual Assessment Technique. In Christopher Schreiner (ed), *Handbook of research on assessment technologies, methods, and applications in higher education* (pp. 65-77). doi:10.4018/978-1-60566-667-9
- Barron, F. (1961). Creative vision and expression in writing and painting. In D. W. MacKinnon (Ed.), *The creative person* (pp. 237-251). Berkeley: University of California, Institute of Personality Assessment Research.
- Besemer, S. (1998). Creative Product Analysis Matrix: Testing the model structure and a comparison among products – Three novel chairs. *Creativity Research Journal*, 11, 333-346.
- Bigum, C. & Rowan, L. (2008). Landscaping on shifting ground. *Asia-Pacific Journal of teacher Education*, 36, 245-255.

- Bilda, Z., Gero, J.S., & Purcell, T. (2006). To sketch or not to sketch? That is the question. *Design Studies*, 27, 587-613.
- Black, C. & Cloud, R. (2010). Development of an apparel design graduate programme emphasizing creative scholarship. *International Journal of Fashion Design, Technology and Education*, 2, 113-118.
- Bye, E. (2010). A direction for clothing and textile design research. *Clothing and Textiles Research Journal*, 28, 205-217.
- Bye, E. & Sohn, M. (2010). Technology, tradition and creativity in apparel designers: A study of designers in three U.S. companies. *Fashion Practice*, 2, 199-222.
- Campbell, D.P. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review*, 67, 380-400.
- Cassidy, T.D. (2008). Mood boards: Current practice in learning and teaching strategies and students' understanding of the process. *International Journal of Fashion Design, Technology and Education*, 1, 43-54.
- Chang, S., Tein, S. & Lee, H. (2010). Social capital, creativity and new product advantage: An empirical study. *International Journal of Electronic Business Management*, 8, 43-55.
- Cheung, P., Chau, P. Y. K., & Au, A. K. K. (2008). Does knowledge reuse make a creative person more creative? *Decision Support Systems*, 45, 219-227.
- Christiaans, H. (2002). Creativity as a design criterion. *Creativity Research Journal*, 14, 41-54.
- Coelho, F., & Augusto, M. (2010). Job characteristics and the creativity of frontline service employees. *Journal of Service Research*, 13, 426-438.
- Cramond, B. L. (2008). Future problem solving in gifted education. In L. V. Shavinina (Ed.), *The international handbook on giftedness*. Dordrecht, the Netherlands: Springer Science & Business Media.
- Crockenberg, S. (1972). Creativity tests: A boon or boondoggle for education? *Review of Educational Research*, 42, 27-45. doi: 10.3102/00346543042001027.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297-334.
- Cross, N. (1997). Descriptive models of creative design: Application to an example. *Design Studies*, 18, 427-455.

- Crutchfield, R. (1962). Conformity and creative thinking. In H. Gruber, G. Terrell, & M. Wertheimer (Eds.), *Contemporary approaches to creative thinking*. New York: Atherton Press.
- Csikszentmihályi, M. (1975). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass.
- Csikszentmihályi, Mihaly (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: Harper Perennial.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268.
- DeJonge, J.O. (1984). Forward: The design process. In S.M. Watkins (Ed.), *Clothing: The portable environment*. (pp.vii-xiii) Ames, IA : Iowa State University Press.
- Demirbaş, O. O., & Demirkan, H. (2003). Focus on architectural design process through learning styles. *Design Studies*, 24, 437-456.
- Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem-solution. *Design Studies*, 22, 425-437.
- Drew, C. (1980). *Introduction to designing and conducting research*. (2<sup>nd</sup> ed.) St.Louis, MO: C.V. Mosby Company.
- Eysenck, H. J. (1993). Creativity and Personality: Suggestions for a Theory. *Psychological Inquiry: An International Journal for the Advancement of Psychological Theory*, 4, 147-178. doi:10.1207/s15327965pli0403\_1
- Fisher, M. and Baird, D. (2009). Pedagogical mashup: Gen Y, technology, and digital learning styles. In Hin, L. and Subramaniam, R. (Eds), *Handbook of research on new media literacy at the K-12 level*. Hershey, PA: IGI Global.
- Friedman, K. (2003). Theory construction in design research: Criteria: approaches, and methods. *Design Studies*, 24, 507-522.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences* (10th Anniv. Ed.), New York, NY: Basic Books.
- Gardner, H. (1993). *Creating minds: An anatomy of creativity seen through the lives of Freud, Einstein, Picasso, Stravinsky, Eliot, and Gandhi*. New York: Basic Books.
- Gardner, H. (2006). *Multiple intelligences: New horizons*. New York: Basic Books.
- Gedo, J. (1990). More on creativity and its vicissitudes. In M.A. Runco & R.S. Albert (Eds.). *Theories of creativity* (13-34). Newberry Park, CA: Sage

- Gino, F., Argote, L., Miron-Spektor, E., & Todorova, G. (2010). First, get your feet wet: The effects of learning from direct and indirect experience on team creativity. *Organizational Behavior and Human Decision Processes*, *111*, 102-115.
- Glăveanu, V. (2010). Principles for a cultural psychology of creativity. *Culture and Psychology*, *16*, 147-163. Retrieved from [www.scopus.com](http://www.scopus.com)
- Goff, K. & Torrance, E.P. (2000). *Brief demonstrator form of the Torrance Tests of Creative Thinking: training/teaching manual for adults with technical data*. Bensenville, IL: Scholastic Testing Service, Inc.
- Goff, K. & Torrance, E.P. (2002). *Abbreviated Torrance Test for Adults manual*. Bensenville, IL: Scholastic Testing Service, Inc.
- Golding, P. (2000). Forthcoming features: information and communications technologies and the sociology of the future. *Sociology*, *34*, 165-184.
- Goldschmidt, G. (1990). Linkography: assessing design productivity. In: R. Trappl, Editor, *Cybernetics and systems '90, Proceedings of the Tenth European Meeting on Cybernetics and Systems Research*, World Scientific, Singapore, pp. 291–298.
- Goldschmidt, G. (2003). Cognitive economy in design reasoning. In: U. Lindemann, Editor, *Human behaviour in design*, Springer Verlag, Berlin pp. 53–62.
- Goldschmidt, G., & Tatsa, D. (2005). How good are good ideas? Correlates of design creativity. *Design Studies*, *26*, 593-611.
- Greenberg, E. (1994), The importance of autonomy in encouraging creativity: Managerial implications from a study in fashion design. *Creativity and Innovation Management*, *3*, 167–176.
- Gruber, H. E. & Wallace, D. B. (1989). *Creative people at work: Twelve cognitive case studies*. New York, NY: Oxford University Press.
- Guilford, J.P. (1950). Creativity. *American Psychologist*, *5*, 444-454.
- Guilford, J.P. (1956). The structure of intellect. *Psychological Bulletin*, *53*, 267-293.
- Harrington, D. (1990). The ecology of human creativity: A psychological perspective. In M.A. Runco & R.S. Albert (Eds.). *Theories of creativity* (143-169). Newberry Park, CA: Sage
- Hempel, P. S. & Sue-Chan, C. (2010). Culture and the assessment of creativity. *Management and Organization Review*, *6*, 415-435.
- Hennessey, B. A. (2003). The social psychology of creativity. *Scandinavian Journal of*

- Educational Research*, 47, 253-271. Retrieved from [www.scopus.com](http://www.scopus.com)
- Hennessey, B. A., & Amabile, T. M. (1988). Storytelling: A method for assessing children's creativity. *Journal of Creative Behavior*, 22, 235-246.
- Hennessey, B. A., & Amabile, T. M. (1999). Consensual assessment. In M. A. Runco & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (pp. 347-359). San Diego, CA: Academic Press.
- Hickey, M. (2001). An application of Amabile's Consensual Assessment Technique for rating the creativity of children's musical compositions. *Journal of Research in Music Education*, 49, 234-244.
- Hogarth, R. (1980). *Judgment and choice*. Chichester, NY: Wiley.
- Hodges, N., & Karpova, E. (2010). Majoring in fashion: A theoretical framework for understanding the decision-making process. *International Journal of Fashion Design, Technology and Education*, 3, 67-76.
- Hong, H. & Sullivan, F. R. (2009). Towards an idea-centered, principle-based design approach to support learning as knowledge creation. *Educational Technology Research and Development*, 57, 613-627.
- Hope, S. (2010). Creativity, Content, and Policy. *Arts Education Policy Review*, 111, 39-47. doi:10.1080/10632910903455736
- Jaarsveld, S., & van Leeuwen, C. (2005). Sketches from a design process: Creative cognition inferred from intermediate products. *Cognitive Science*, 29, 79-101
- Karpova, E., Marcketti, S., & Barker, J. (2011). Putting the puzzle together: Apparel professionals' perspectives on creativity. *International Journal of Fashion Design, Technology and Education*, 4, 103-113.
- Kato, S.L. (1994). An investigation of the creative process and application to apparel design models. In M.R. DeLong & A.M. Fiore (Eds.). *Aesthetics of textiles and clothing: Advancing multi-disciplinary perspectives*, No. 7, (pp.48-57). Monument CO: International Textile and Apparel Association.
- Kaufman, J. C. & Baer, J. (2006). Intelligent Testing With Torrance. *Creativity Research Journal*, 18, 99-102. doi:10.1207/s15326934crj1801\_11
- Kaufman, J. C., Baer, J., & Cole, J. C. (2009). Expertise, domains, and the consensual assessment technique. *Journal of Creative Behavior*, 43, 223-233.
- Kaufman, J. C., Baer, J., Cole, J. C., & Sexton, J. D. (2008). A comparison of expert and

- nonexpert raters using the consensual assessment technique. *Creativity Research Journal*, 20, 171-178.
- Kaufman, J. C., Gentile, C. A., & Baer, J. (2005). Do gifted student writers and creative writing experts rate creativity the same way? *Gifted Child Quarterly*, 49, 260-265.
- Kaufman, J. C., Lee, J., Baer, J., & Lee, S. (2007). Captions, consistency, creativity, and the consensual assessment technique: New evidence of reliability. *Thinking Skills and Creativity*, 2, 96-106.
- Kaufman, J.C., & Sternberg, R.J. (Eds.) (2006). *The international handbook of creativity*. New York: Cambridge University Press.
- Keen, A. (2007). *The cult of the amateur*. London: Nicholas Brealey.
- Kharkhurin, A. V. (2009). The role of bilingualism in creative performance on divergent thinking and invented filean creatures tests. *Journal of Creative Behavior*, 43, 59-71.
- Kidd, L., & Workman, J. (1999). Assessment of creativity in apparel design. *Clothing and Textiles Research Journal*, 17, 58-64.
- Kim, K.H. (2006). Might we trust creativity tests? A review of the Torrance Test of Creative Thinking (TTCT). *Creativity Research Journal*, 18, 3-14.
- Koberg, D., & Bagnall, J. (1991). *The universal traveler: A soft-systems guide to creativity, problem-solving & process of reaching goals (New Horizons ed)*. Menlo Park, CA: Crisp Publications.
- Kolodner, J.L., & Willis, L.M. (1996). Powers of observation in creative design. *Design Studies*, 17, 385-416.
- Kvan, T., & Yunyan, J. (2005). Students' learning styles and their correlation with performance in architectural design studio. *Design Studies*, 26, 19-34.
- LaBat, K.L., & Sokolowski, S.L. (1999). A three-stage design process applied to an industry-university textile product design project. *Clothing and Textiles Research Journal*, 17, 11-20.
- Lamb, J.M., & Kallal, M.J. (1992). A conceptual framework for apparel design. *Clothing and Textiles Research Journal*, 10, 42-47.
- Liu, Y.T. (2000). Creativity or novelty? *Design Studies*, 21, 261-276.
- Lyerly, S. (1958). The Kuder- Richardson formula (21) as a split-half coefficient, and some remarks on its basic assumption. *Psychometrika*, 3, 267-270, doi: 10.1007/bf02289239.

- MacKinnon, D. W. (1961). Creativity in architects. In D. W. MacKinnon (Ed.), *The creative person* (p. 237-251). Berkely, CA: University of California, Institute of Personality Assessment Research.
- MacKinnon, D. W. (1962). The nature and nurture of creative talent. *American Psychologist*, 17, 484-495.
- Meneely, J., & Portillo, M. (2005). The adaptable mind in design: Relating personality, cognitive style, and creative performance. *Creativity Research Journal*, 17, 155-166.
- Millan, E. & Reynolds, J. (2011). Independent and interdependent self-views and their influence on clothing consumption. *International Journal of Retail and Distribution Management*, 39, 162-182. doi: 10.1108/09590551111115015.
- Millar, G. W. (2002). *The Torrance kids at mid-life*. Westport, CT: Ablex.
- Mullin, J. (2010). *Investigations of student and team creativity on an introductory engineering design project*. Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA. Retrieved on August 5, 2010 from ERIC database.
- Newell, A., Shaw, J. & Simon, H. (1962). The process of creative thinking. In H. Gruber, G. Terrell, & M. Wertheimer (Eds.), *Contemporary approaches to creative thinking*. New York: Atherton Press.
- O'Quinn, K., & Besemer, S. (1989). The development, reliability, and validity of the revised Creative Product Semantic Scale. *Creativity Research Journal*, 2, 267-278.
- O'Quinn, K., & Besemer, S. (2006). Using the Creative Product Semantic Scale as a metric for results-oriented business. *Creativity & Innovation Management*, 15, 34-44.
- Ogle, J. P., & Fiore, A. M. (2000). Facilitating students' integration of textiles and clothing subject matter. Part two: Substantiating the applicability of proposed structures. *Clothing and Textiles Research Journal*, 18, 73-89.
- Phillips, P. L. (2004) *Creating the perfect design brief*. New York: Allworth Press.
- Plucker, J. & Runco, M. (1998). The death of creativity measurement has been greatly exaggerated: Current issues, recent advances, and future directions in creativity assessment. *Roeper Review*, 21, 36-39.
- Preksy, M. (2001). Digital natives, digital immigrants. *On the Horizon*, 9, 1-6.
- Preksy, M. (2008). Young minds, fast times. *Edutopia*, June. Available at: [www.edutopia.org/ikid-digital-learner-technology-2008](http://www.edutopia.org/ikid-digital-learner-technology-2008) (accessed January 15, 2012).

- Runco, M. A. (1999). A longitudinal study of exceptional giftedness and creativity. *Creativity Research Journal*, 12, 161-164.
- Runco, M.A. (2007). *Creativity theories and themes: Research, development and practice*. Burlington, MA: Elsevier Academic Press.
- Ryan, R. & Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68-78.
- Sawyer, R.K. (2006). *Explaining creativity: The science of human innovation*. New York: Oxford University Press.
- Seely-Brown, J. (2008). Foreword in Iiyoshi, T. and Kumar, M. (Eds), *Opening up education*, MIT Press, Cambridge, MA.
- Selwyn, N. (2009). The digital native – myth and reality. *Aslib Proceedings*, 61, 364-379. doi 10.1108/00012530910973776.
- Simon, H. (1966). Scientific discovery and the psychology of problem solving. In *Mind and cosmos: Essays in contemporary science and philosophy*. Pittsburg: University of Pittsburg Press.
- Sinha, P. (2002). Creativity in fashion. *Journal of Textile and Apparel, Technology and Management*, 2, 1-16.
- Small, G. & Vorgan, G. (2008). *iBrain: Surviving the technological alteration of the modern mind*. London: Collins.
- Tapscott, D. & Williams, A. (2008). *Wikinomics: How mass collaboration changes everything*. New York: Atlantic.
- Torrance, E.P. (1962). *Guiding creative talent*. Englewood Cliffs, NJ: Prentice-Hall.
- Torrance, E. P. (1966). *The Torrance Tests of Creative Thinking-Norms-technical manual research edition-Verbal Tests, forms A and B-Figural Tests, forms A and B*. Princeton, NJ: Personnel Press.
- Torrance, E. P. (1990). *The Torrance tests of creative thinking norms—technical manual figural (streamlined) forms A & B*. Bensenville, IL: Scholastic Testing Service, Inc.
- Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senécal, C., & Vallières, E. F. (1992). The academic motivation scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement*, 52, 1003–1017.
- von Stamm, B., 2008. *Managing innovation, design and creativity*. 2nd ed. Hoboken, New Jersey: John Wiley & Sons, Inc.



- Walberg, H.J. (1971). Varieties of adolescent creativity and the high school environment. *Exceptional Children*, 38, 111-116.
- Wallach, M. & Kogan, N. (1965). *Modes of thinking in young children*. New York: Holt, Rinehart, & Winston.
- Watkins, S.M. (1995). *Clothing: The portable environment*. Ames, IA: Iowa State University Press.
- Weiser, C. J. (1997). Faculty scholarship and productivity expectations - an administrator's perspective. *HortScience*, 32, 37-39.
- White, A., & Smith, B. (2001). Assessing advertising creativity using the Creative Product Semantic Scale. *Journal of Advertising Design*, 41, 27-34.
- Wong, S. C. & Ladkin, A. (2008). Exploring the relationship between employee creativity and job-related motivators in the Hong Kong hotel industry. *International Journal of Hospitality Management*, 27, 426-437.
- Zeng, L., Proctor, R. W., & Salvendy, G. (2010). Creativity in ergonomic design: A supplemental value-adding source for product and service development. *Human Factors*, 52, 503-525.

# Appendix A: IRB Approval Louisiana State University

## Application for Exemption from Institutional Oversight

Unless qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/ projects using living humans as subjects, or samples, or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This Form helps the PI determine if a project may be exempted, and is used to request an exemption.



**Institutional Review Board**  
**Dr. Robert Mathews, Chair**  
 131 David Boyd Hall  
 Baton Rouge, LA 70803  
 P: 225.578.8692  
 F: 225.578.6792  
 irb@lsu.edu  
 lsu.edu/irb

-- Applicant, Please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the IRB. Once the application is completed, please submit two copies of the completed application to the IRB Office or to a member of the Human Subjects Screening Committee. Members of this committee can be found at <http://www.lsu.edu/screeningmembers.shtml>

-- A Complete Application Includes All of the Following:

- (A) Two copies of this completed form and two copies of part B thru E.
- (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
- (C) Copies of all instruments to be used.  
 \*If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
- (D) The consent form that you will use in the study (see part 3 for more information.)
- (E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (<http://phrp.nihtraining.com/users/login.php>.)
- (F) IRB Security of Data Agreement: (<http://www.lsu.edu/irb/IRB%20Security%20of%20Data.pdf>)

1) Principal Investigator:  Rank:   
 Dept:  Ph:  E-mail:

2) Co Investigator(s): please include department, rank, phone and e-mail for each

Charles Freeman  
 Graduate Student  
 904-254-5906  
 cfree18@tigers.lsu.edu

IRB# <u>E5858</u>	LSU Proposal #
<input type="radio"/>	Complete Application
<input checked="" type="radio"/>	Human Subjects Training

3) Project Title:

Study Exempted By:  
 Dr. Robert C. Mathews, Chairman  
 Institutional Review Board  
 Louisiana State University  
 203 B-1 David Boyd Hall  
 225-578-8692 | [www.lsu.edu/irb](http://www.lsu.edu/irb)  
 Exemption Expires: 2/12/2015

4) Proposal? (yes or no)  If Yes, LSU Proposal Number

Also, if YES, either  
 This application **completely** matches the scope of work in the grant  
 OR  
 More IRB Applications will be filed later

5) Subject pool (e.g. Psychology students)

\*Circle any "vulnerable populations" to be used: (children <18; the mentally impaired, pregnant women, the aged, other). Projects with incarcerated persons cannot be exempted.

6) PI Signature:  Date  (no per signatures)

\*\* I certify my responses are accurate and complete. If the project scope or design is later changes, I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for three years after completion of the study. If I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Screening Committee Action: Exempted <input checked="" type="checkbox"/> Not Exempted <input type="checkbox"/>	Category/Paragraph <u>2</u>
Reviewer <u>Mathews</u>	Signature <u>[Signature]</u> Date <u>2/13/12</u>

## Appendix B: Consent Letter for IRB Approval Louisiana State University

### Appendix F Consent Form for a Non-Clinical Study

1. An investigation into the theoretical application of a Social-Psychological Framework (Amabile, 1983a) to assess creativity in apparel design students
2. Performance Site: Louisiana State University and Agricultural and Mechanical College
3. Investigators: The following investigators are available for questions about this study, Dr. Lisa McRoberts 225-578-3957; T and W: 10:30-11:30am
4. Purpose of the Study: The purpose of this study is to apply a social psychological theoretical framework (Amabile, 1983a) for the assessment of creativity in apparel design students.
5. Subject Inclusion: Individuals currently enrolled in fashion illustration course or its equivalent
6. Number of subjects: 30
7. Study Procedures: Participants will be asked to complete an internet usage survey as well as the Work Preference Inventory-College Student version. The researcher will administer the Abbreviated Torrance Test for Adults (ATTA). Following a brief ten-minute break, participants will be given a design brief and allowed forty-five minutes to complete. While working, participants will be free to break as needed. The completed illustrations will be turned into the researcher with no identifying information, e.g. signature, name, LSUID, etc.
8. Benefits: None.
9. Risks: The investigators perceive no imminent risk associated with the completion of this study.
10. Right to Refuse: Subjects may choose not to participate or to withdraw from the study at any time without penalty or loss of any benefit to which they might otherwise be entitled.
11. Privacy: Results of the study may be published, but no names or identifying information will be included in the publication. Subject identity will remain confidential unless disclosure is required by law.
12. Signatures:

The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Robert C. Mathews, Institutional Review Board, (225) 578-8692, irb@lsu.edu, www.lsu.edu/irb. I agree to participate in the study described above and acknowledge the investigator's obligation to provide me with a signed copy of this consent form.

Subject Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Institutional Review Board  
Dr. Robert Mathews, Chair  
203 B-1 David Boyd Hall  
Baton Rouge, LA 70803  
P: 225.578.8692  
F: 225.578.6792  
irb@lsu.edu | lsu.edu/irb

Study Exempted By:  
Dr. Robert C. Mathews, Chairman  
Institutional Review Board  
Louisiana State University  
203 B-1 David Boyd Hall  
225-578-8692 | www.lsu.edu/irb  
Exemption Expires: 2/12/2015

**Appendix C:  
IRB Approval Mississippi State University**

Charles,  
As mentioned in your approval letter, please find your stamped consent form attached.  
Thank you and best of luck with your research!

*Nicole Morse*

Assistant Compliance Administrator  
Office of Regulatory Compliance & Safety  
P.O. Box 6223  
Mississippi State, MS 39762  
Mailstop 9563  
Phone: 662-325-3994  
Fax: 662-325-8776  
[nmorse@research.msstate.edu](mailto:nmorse@research.msstate.edu)

We are now back on campus!  
53 Morgan Ave.

>>> On 2/29/2012 at 3:45 PM, in message <45A550DA570D4FC7A4AC76D427B340AC@IRB01>,  
<nmorse@research.msstate.edu> wrote:

February 29, 2012

Charles Freeman  
Mailstop 9745

RE: IRB Study #12-052: An Investigation into the Theoretical Application of a Social-Psychological Framework (Amabile, 1983a) to Assess Creativity in Apparel Design Students

Dear Mr. Freeman:

This email serves as official documentation that the above referenced project was reviewed and approved via administrative review on 2/29/2012 in accordance with 45 CFR 46.101(b)(2). Continuing review is not necessary for this project. However, any modification to the project must be reviewed and approved by the IRB prior to implementation. Any failure to adhere to the approved protocol could result in suspension or termination of your project. The IRB reserves the right, at anytime during the project period, to observe you and the additional researchers on this project.

**Please note that the MSU IRB is in the process of seeking accreditation for our human subjects protection program.! As a result of these efforts, you will likely notice many changes in the IRB's policies and procedures in the coming months. These changes will be posted online at <http://www.orc.msstate.edu/human/aahrpp.php>. The first of these changes is the implementation of an approval stamp for consent forms. The approval stamp will assist in ensuring the IRB approved version of the consent form is used in the actual conduct of research. Your stamped consent form will be attached in a separate email. You must use copies of the stamped consent form for obtaining consent from participants.**

Please refer to your IRB number (#12-052) when contacting our office regarding this application.

Thank you for your cooperation and good luck to you in conducting this research project. If you have questions or concerns, please contact me at nmorse@research.msstate.edu or call 662-325-3994. In addition, we would greatly appreciate your feedback on the IRB approval process. Please take a few minutes to complete our survey at <http://www.surveymonkey.com/s/YZC7QQD>.

Sincerely,

Nicole Morse  
Assistant Compliance Administrator

**Appendix D:  
Consent Letter for IRB Approval Mississippi State University**

Appendix F

**Mississippi State University  
Informed Consent Form for Participation in Research**

---

**Title of Research Study:** An investigation into the theoretical application of a Social-Psychological Framework (Amabile, 1983a) to assess creativity in apparel design students.

**Study Site:** Louisiana State University and Mississippi State University

**Researchers:** Charles Freeman, Mississippi State University

**Purpose**

The purpose of this research is to apply a social psychological theoretical framework for the assessment of creativity factors in apparel design students. As well as, investigate the relationships between creative thinking and self-reported intrinsic and extrinsic motivations.

**Procedures**

The researcher will administer the Abbreviated Torrance Test for Adults (ATTA)(Appendix A). Following a brief ten-minute break, participants will be given a design brief (Appendix B) and allowed forty-five minutes to complete. While working, participants will be free to break as needed. Immediately after the completion of the design brief, participants will be asked to complete the Work Preference Inventory (Appendix C). Once complete the participants will be free to leave. If a participant has further questions, the researcher will be available for the final ten minutes of the two-hour time commitment.

**Risks or Discomforts**

There are no perceived risks or discomfort associated with this project.

**Benefits**

In-class participation will be given to those students present whether participating or not.

**Incentive to participate**

No additional incentives will be provided for participation

**Confidentiality**

No identifying marks (i.e. name, MSU ID, net ID, social security number, etc.) will be made on the completed surveys. The complete Abbreviated Torrance Test for Adults will be scored by Scholastic testing Services and returned to the researcher. Only names will be identified on these results. The researcher will administer the surveys/test and retain them under lock and key in Rm. 265 of Lloyd-Ricks-Watson Hall.

MSU IRB  
Approved: 2/29/12  
Expires: -/-/-

Page 1 of 2  
Version: 11/13/2011

Please note that these records will be held by a state entity and therefore are subject to disclosure if required by law. Research information may be shared with the MSU Institutional Review Board (IRB) and the Office for Human Research Protections (OHRP).

**Questions**

If you have any questions about this research project, please feel free to contact Charles Freeman at 662-325-1293.

For questions regarding your rights as a research participant, or to express concerns or complaints, please feel free to contact the MSU Regulatory Compliance Office by phone at 662-325-3994, by e-mail at [irb@research.msstate.edu](mailto:irb@research.msstate.edu), or on the web at <http://orc.msstate.edu/participant/>.

**Voluntary Participation**

Please understand that your **participation is voluntary**. Your **refusal to participate will involve no penalty or loss** of benefits to which you are otherwise entitled. You **may discontinue your participation** at any time without penalty or loss of benefits.

**Options for Participation**

Please initial your choice for the options below:

The researchers may contact me again to participate in future research activities.

The researchers may NOT contact me again regarding future research.

**Please take all the time you need to read through this document and decide whether you would like to participate in this research study.**

If you agree to participate in this research study, please sign below. You will be given a copy of this form for your records.

\_\_\_\_\_  
Participant Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Investigator Signature

\_\_\_\_\_  
Date

**Appendix E:  
Internet/WWW Survey**

Thank you for your time. Please circle your responses using the following scale.

**1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree or Disagree; 4 = Agree; 5 = Strongly Agree**

<u>Internet skills:</u>	Strongly Disagree				Strongly Agree
1. I have used the Internet/WEB for a long time	1	2	3	4	5
2. Overall I would rate my Internet/WEB skills high	1	2	3	4	5
<u>Perceived enjoyment/fun:</u>	Strongly Disagree				Strongly Agree
1. Internet/WEB make learning more interesting	1	2	3	4	5
2. Working/Studying with the Internet/WEB is fun	1	2	3	4	5
3. In general, browsing the Internet/WEB is interesting	1	2	3	4	5
<u>Social pressure:</u>	Strongly Disagree				Strongly Agree
1. Most of my close friends/classmates think that I should be using the Internet/WEB	1	2	3	4	5
<u>Internet usage:</u>	Strongly Disagree				Strongly Agree
1. I use the Internet/WEB very intensively (more than 2 hours per day)	1	2	3	4	5
2. I use the Internet/WEB very frequently (a few times per day)	1	2	3	4	5



3. I use the Internet/WEB for a variety of tasks (reports, team projects, individual homework/assignment, study collaboration, communication, research, etc.) 1 2 3 4 5

4. I use a diversity of tools on the Internet/WEB for my studies (e-mail, Facebook®, Twitter®, messenger services, YouTube®, etc.) 1 2 3 4 5

Perceived complexity of using the Internet: Strongly Disagree Strongly Agree

1. Working with the Internet/WEB is complicated, it is difficult to understand what is 1 2 3 4 5

2. It takes too long to learn how to use the Internet/WEB to make it worth the effort 1 2 3 4 5

3. In general, the Internet/WEB is very complex to use 1 2 3 4 5

Perceived Usefulness: Strongly Disagree Strongly Agree

1. Use of the Internet/WEB will have no impact on the performance of my study 1 2 3 4 5

2. Use of the Internet/WEB can decrease the time needed for my school work 1 2 3 4 5

3. Use of the Internet/WEB can significantly increase the quality of output of my school work 1 2 3 4 5

4. Use of the Internet/WEB can increase the effectiveness of my school performance 1 2 3 4 5

5. The Internet/WEB can increase the quantity of output for same amount of effort 1 2 3 4 5

6. Considering all tasks, the use of Internet/WEB helps improve my learning/study 1 2 3 4 5

Adapted from: Cheung, W. and Huang, W. (2005), Proposing a framework to assess Internet usage in university education: an empirical investigation from a student's perspective. *British Journal of Educational Technology*, 36: 237–253. doi: 10.1111/j.1467-8535.2005.00455.x

**Appendix F:**  
**Work Preference Inventory – College Student Version**

Please rate each item in terms of how true it is to you. Please circle one and only one letter for each question according to the following scale.

**N = Never or almost never true of you**

**S = Sometimes true of you**

**O = Often true of you**

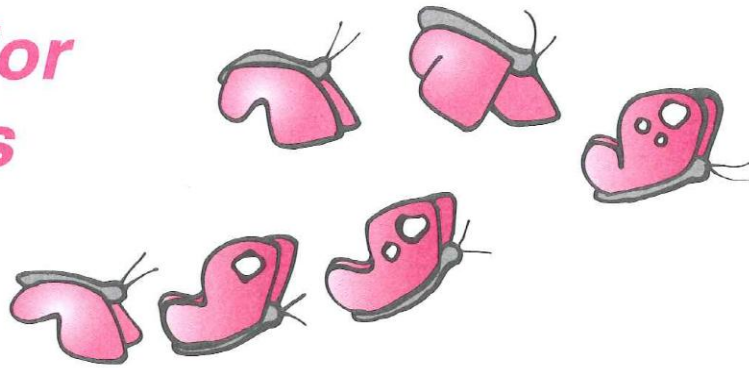
**A = Always true of you**

- |   |   |   |   |                                                                                                           |
|---|---|---|---|-----------------------------------------------------------------------------------------------------------|
| N | S | O | A | 1. I am not that concerned about what other people think of my work.                                      |
| N | S | O | A | 2. I prefer having someone set clear goals for me in my work.                                             |
| N | S | O | A | 3. The more difficult the problem, the more I enjoy trying to solve it.                                   |
| N | S | O | A | 4. I am keenly aware of the goals I have for getting good grades.                                         |
| N | S | O | A | 5. I want my work to provide me with opportunities for increasing my knowledge and skills                 |
| N | S | O | A | 6. To me, success means doing better than other people.                                                   |
| N | S | O | A | 7. I prefer to figure things out for myself.                                                              |
| N | S | O | A | 8. No matter what the outcome of a project, I am satisfied if I feel I gained a new experience.           |
| N | S | O | A | 9. I enjoy relatively simple, straightforward tasks.                                                      |
| N | S | O | A | 10. I am keenly aware of the GPA (grade point average) goals I have for myself.                           |
| N | S | O | A | 11. Curiosity is the driving force behind much of what I do.                                              |
| N | S | O | A | 12. I'm less concerned with what work I do than what I get for it.                                        |
| N | S | O | A | 13. I enjoy tackling problems that are completely new to me.                                              |
| N | S | O | A | 14. I prefer work I know I might do well over work that stretches my abilities.                           |
| N | S | O | A | 15. I'm concerned about how other people are going to react to my ideas.                                  |
| N | S | O | A | 16. I seldom think about grades and awards.                                                               |
| N | S | O | A | 17. I'm more comfortable when I might set my own goals.                                                   |
| N | S | O | A | 18. I believe that there is no point in doing a good job if nobody else knows about it.                   |
| N | S | O | A | 19. I am strongly motivated by the grades I earn.                                                         |
| N | S | O | A | 20. It is important for me to be able to do what I most enjoy.                                            |
| N | S | O | A | 21. I prefer working on projects with clearly specified procedures.                                       |
| N | S | O | A | 22. As long as I might do what I enjoy, I'm not that concerned about exactly what grades or awards I earn |
| N | S | O | A | 23. I enjoy doing work that is so absorbing that I forget about everything else.                          |
| N | S | O | A | 24. I am strongly motivated by the recognition I might earn from other people.                            |
| N | S | O | A | 25. I have to feel that I'm earning something for what I do.                                              |
| N | S | O | A | 26. I enjoy trying to solve complex problems.                                                             |
| N | S | O | A | 27. It is important for me to have an outlet for self-expression.                                         |
| N | S | O | A | 28. I want to find out how good I really might be at my work.                                             |
| N | S | O | A | 29. I want other people to find out how good I really might be at my work.                                |
| N | S | O | A | 30. What matters most to me is enjoying what I do.                                                        |

Adapted from Amabile, Hill, Hennessey & Tighe (1994). Used with Permission.

**Appendix G:  
Abbreviated Torrance Test for Adults**

**Abbreviated  
Torrance  
Test for  
Adults**



**by  
Kathy Goff, Ed.D. and E. Paul Torrance, Ph.D.**

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Sex:** \_\_\_\_\_ **Year of Birth:** \_\_\_\_\_ **Group:** \_\_\_\_\_



**SCHOLASTIC TESTING SERVICE, INC.  
BENSENVILLE, ILLINOIS 60106-1617**

**Activity 1**



JUST SUPPOSE you could walk on air or fly without being in an airplane or similar vehicle. What problems might this create? List as many as you can.

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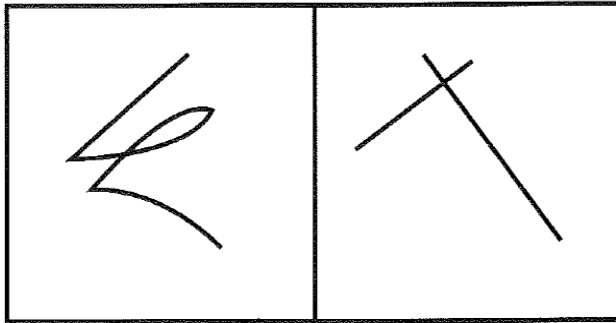
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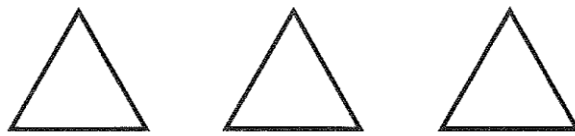
## Activity 2

Use the incomplete figures below to make some pictures. Try to make your pictures unusual. Your pictures should communicate as interesting and as complete a story as possible. Be sure to give each picture a title.



### Activity 3

See how many objects or pictures you can make from the triangles below, just as you did with the incomplete figures. Remember to create titles for your pictures.



**Abbreviated Torrance Test for Adults (ATTA)  
Scoring/Interpretation Worksheet**

Name \_\_\_\_\_ Age (yrs.) \_\_\_\_\_ Group \_\_\_\_\_ Date \_\_\_\_\_

**Norm-Referenced Measures**

Creative Ability	Raw Scores				Scaled Scores										Scaled Scores
	Activity			Total Score	11	12	13	14	15	16	17	18	19		
	1	2	3		Corresponding Raw Scores										
Fluency					1-6	7	8-9	10	11-12	13-14	15-16	17	18+		
Originality					1	2	3	4	5	6	7-8	9-10	11+		
Elaboration	X	X			1-3	4-5	6-8	9-11	12-14	15-18	19-23	24-27	28+		
Flexibility	X	X	X		-	1	-	2	3	-	4	5	6+		
Creative Roles:					Collaborator			Contributor			Accelerator				
Total Scaled Score													<input style="width: 50px; height: 20px;" type="text"/>		

**Criterion-Referenced Creativity Indicators**

**Verbal Responses (Activity #1)**

Tally	Rating	Raw Score	
___	___	___	1. Richness and Colorfulness of Imagery
___	___	___	2. Emotions/Feelings
___	___	___	3. Future Orientation
___	___	___	4. Humor: Conceptual Incongruity
___	___	___	5. Provocative Questions
<b>Total</b>		___	

**Figural Responses (Activities #2 and #3)**

Tally	Rating	Raw Score	
___	___	___	6. Openness: Resistance to Premature Closure
___	___	___	7. Unusual Visualization, Different Perspective
___	___	___	8. Movement and/or Sound
___	___	___	9. Richness and/or Colorfulness of Imagery
___	___	___	10. Abstractness of Titles
___	___	___	11. Articulateness in Telling Story
___	___	___	12. Combination/Synthesis of Two or More Figures
___	___	___	13. Internal Visual Perspective
___	___	___	14. Expressions of Feelings and Emotions
___	___	___	15. Fantasy
<b>Total</b>		___	

**Composite Measures**

\_\_\_ Total Scaled Score  
 + \_\_\_ Total Indicator Score (Count 1-point for each "+" and 2 for each "+")  
 = \_\_\_ CREATIVITY INDEX (CI)

Creativity Index*	1-50	51-59	60-67	68-73	74-77	78-84	85+
Creativity Level	1	2	3	4	5	6	7
Verbal Assessment	Minimal	Low	Below Average	Average	Above Average	High	Substantial
% of Adults in Level	4%	12%	20%	26%	20%	12%	4%

\*Interpretive Aid—Find Creativity Index in top row score range. Use information in that column to help understand the CI.

## Appendix H: Design Brief

Design Brief

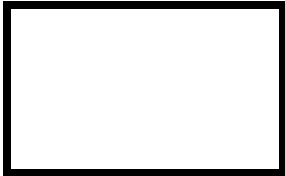
Design a three piece ensemble based on the image presented below.



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**Appendix I:  
Consensual Assessment Technique**



Consensual Assessment Technique

Design #

Detail: The amount of detail in the work.

Low						Medium			High
1	2	3	4	5	6	7			

Complexity: The level of complexity of the design.

Low						Medium			High
1	2	3	4	5	6	7			

Novel Idea: The degree to which the design itself shows technical goodness.

Low						Medium			High
1	2	3	4	5	6	7			

Technical Goodness: The degree to which the work is good technically.

Low						Medium			High
1	2	3	4	5	6	7			

Organization: The degree to which the design shows good organization.

Low						Medium			High
1	2	3	4	5	6	7			

Neatness: The amount of neatness shown in the work.

Low						Medium			High
1	2	3	4	5	6	7			

Effort Evident: The amount of effort that is evident in the product.

Low						Medium			High
1	2	3	4	5	6	7			

Planning Evident: The amount of planning that is evident in the product.

Low				Medium				High
1	2	3	4	5	6	7		

Balance: The degree to which the design shows good balance.

Low				Medium				High
1	2	3	4	5	6	7		

Variation in Shapes: The degree to which the design shows good variation of shapes.

Low				Medium				High
1	2	3	4	5	6	7		

Creativity: Using your own subjective definition of creativity, the degree to which the design is creative.

Low				Medium				High
1	2	3	4	5	6	7		

Novel Use of Materials: The degree to which the work shows novel use of materials.

Low				Medium				High
1	2	3	4	5	6	7		

Representationalism: The degree to which the design shows an effort to present recognizable real-world objects.

Low				Medium				High
1	2	3	4	5	6	7		

Symmetry: The degree to which the overall pattern is symmetrical.

Low				Medium				High
1	2	3	4	5	6	7		

Expression: The degree to which the design conveys a literal, symbolic, or emotional meaning to you.

Low				Medium				High
1	2	3	4	5	6	7		

### Consensual Assessment Techniques Directions for Scoring:

Dear Judge:

Thank you for taking the time to evaluate these fashion illustrations and for being a part of this dissertation study. The following illustrations were completed in a 45 minute time frame. Students were provided with the attached design brief and asked to illustrate one 3-piece ensemble. They were encouraged to be creative with free choice of medium. Illustrations were NOT required to be on a croquis and the focus of this evaluation is only the GARMENT designed and illustrated, not any other outside factors such as faces, hands, backgrounds, etc. You may or may not use any writing on the illustrations to make your evaluations of the garments illustrated. For any technical category, the focus should only be on qualities of garment illustration.

#### Steps for Consensual Assessment Evaluation:

1. Please complete the evaluation of all illustrations in a single time block with limited distractions. You should complete the evaluation independently (with NO other persons or outside influences). Please do not discuss your evaluations with any other judges or outside persons.
2. In a random order, place all the illustrations out on a flat surface so you can see all of them at one time. Please take a few moments to review all the illustrations within the context of the group. After reviewing the illustrations as a group, please select illustrations at random for evaluation.
3. When conducting the evaluation please write the illustration number (number written in black marker on the upper right hand corner of each illustration) on the evaluation form in the box indicated. Evaluate each illustration individually on all the characteristics. Please use your subjective opinion of each of the characteristics. The definitions offered are only a suggestion to guide your evaluation. Please evaluate each of the characteristics in the order they are listed for each individual illustration.
4. When evaluating the illustrations, rate your evaluations based on the characteristics in relation to the other illustrations. Do NOT compare each illustration to an ideal or professional standard, but instead how does the illustration rank as compared to the other illustrations of the group as a whole.
5. Once complete please place all of your completed evaluations in the envelope and seal with tape placing your signature over the seal to limit tampering.

Again thank you for your participation and should you have any questions please do not hesitate to contact me.

Kindest Regards,

Charles Freeman  
(662) 325-1293  
cfreeman@humansci.msstate.edu

## Vita

Charles Freeman received his Bachelors of Science in apparel design from Florida State University in 2005. While an undergraduate he received multiple honors including Kappa Omicron Nu honor society induction and a Claude Pepper Design Award. Following his undergraduate in 2006, he completed a Masters of Science in apparel design with a focus on creative design techniques. His collection “A Call to Arms” was well received. During his graduate degree, he worked as a graduate assistant and was nominated for an outstanding teaching award.

In 2010, he returned to school to complete his doctorate at Louisiana State University. Studying under Dr. Lisa McRoberts, he studied factors influencing creativity of apparel design students. While at Louisiana State University, he worked as a graduate assistant for the Cotton Inc. grant and the Louisiana Alligator Council grant. He presented social psychological research on diffusion of fashion at the 2011 Pop Culture/American Culture Association’s international conference in San Antonio. For this presentation, he received the Harvey Lewis Travel Award and a travel Award from the Graduate School of Louisiana State University. Research conducted with Dr. McRoberts, led to an oral presentation at the 2011 International Textiles and Apparel Association’s annual conference. In 2012, he received the Michael Schoenecke Travel Grant for Graduate Students to present his research at the Pop Culture/American Culture Association’s annual meeting in Boston.

Currently, he is an instructor at Mississippi State University in the School of Human Sciences. He teaches in the apparel, textiles and merchandising department, with courses ranging from introductory courses in clothing construction to advanced product development.