

THESIS

TEAM CREATIVE PERFORMANCE:
EXPLORING THE RELATIONSHIP BETWEEN TEAM DIVERSITY AND CONFLICT
AFFECTING THE CREATIVE PRODUCTIVITY OF INTERIOR DESIGN STUDENT
TEAMS

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ABSTRACT

TEAM CREATIVE PERFORMANCE: EXPLORING THE RELATIONSHIP BETWEEN TEAM DIVERSITY AND CONFLICT AFFECTING THE CREATIVE PRODUCTIVITY OF INTERIOR DESIGN STUDENT TEAMS

This exploratory case study used mixed methods to examine five main variables and their possible effects on team creative productivity: team learning style diversity, student self-awareness, task conflict, process conflict, and relationship conflict. The case study incorporates 40 interior design students in teams of four, developing a design for a community service learning project. This study is primarily interested in understanding team creative performance through the process and work of interior design students. High levels of deep level diversity are believed to have positive influence on team creative process, promoting a wide variety of ideas from diverse perspectives. For this study team deep-level diversity was measured by Kolb's Learning Style Inventory (3.1). Prior researchers have found high levels of team learning style diversity can improve team productivity, however this study found no significant relationship between Kolb learning style diversity (KLSD) and team productivity or creativity. These results may be due to lack of KLSD among student participants and/or the high number of students with bi-modal learning styles (i.e., exhibiting equal preferences for two learning styles). However, it was found that gender diversity did have a positive relationship to team creativity. No relationship was found between learning style diversity and task, process or relationship conflict. Task conflict was found to have a positive relationship to creative outcomes and low or moderate

levels of process conflict were found to have a positive relationship to team productivity. Self-awareness was found to mediate conflict in sometimes unexpected ways. For example, task conflict was positive for team creativity when teams trusted each other enough to debate ideas. Students who expressed high levels of self-awareness often tended to be highly agreeable, and by seeking common ground experienced little to no task conflict. This finding suggests students may need more practice and better tools for engaging in productive task conflict leading to more creative outcomes. Process conflict at low to moderate levels was found to be positive for team productivity, however at high levels it caused relationship conflict negatively affecting team productivity. Although findings did not support a significant relationship between learning style diversity and team creative productivity, this study suggests further research is needed to understand the influence of bi-modal learners on team deep-level diversity and the effects they may have on team processes and creative productivity.

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TERMS AND DEFINITIONS

creativity: the production of new and original ideas considered useful (Amabile, 1996);

creative process: the sequence of thoughts and actions leading to a novel, adaptive production (Lubart, 2001); creative insights and illuminations considered over a series of stages or sub-processes, such as preparation, incubation, intimation, insight/illuminations, and verification (Wallas, 1926, p. 25);

creative productivity: teams or individual producing work or product efficiently where the end goal also requires a novel or new solution;

design process: a design process generates a conceptual solution for a problem stated in the form of requirements (Retrieved from [http://www.definitions.net/definition/design process](http://www.definitions.net/definition/design%20process));

faultlines: the concept of group faultlines is dependent on the compositional dynamics of multiple demographic ...[variables] potentially subdividing a group. Faultlines divide a group's members on the basis of one or more...[variables] (Lau & Murningham, 1998);

high performance team: A group of people with specific roles and complementary talents and skills, aligned with and committed to a common purpose, who consistently show high levels of collaboration and innovation, that produce superior results (Bard, 2015)

innovation: successful implementation of creative ideas within an organization producing an outcome (Amabile, 1996);

Kolb learning style diversity (KLSD): learning styles within a team representing one of the four categories within the KLSI.

Kolb learning style inventory (KLSI): an instrument designed to measure the degree to which individuals display different learning styles, derived from Kolb's experiential learning theory (Kolb & Kolb, 2005, p.10);

learning style: an individual's mode of gaining knowledge, especially a preferred or best method (Retrieved from <http://dictionary.reference.com/browse/learning-style>);

process conflict: conflict occurring when team members disagree about how the work or task is to be accomplished (e.g., disagreements about roles and responsibilities, assignment of duties, or the allocation of resources; Jules, 2007, p. 3);

relationship conflict: disagreements based on personal and social issues not related to work (often times rooted in anger, personal friction, personality clashes, ego, and tension; Thompson, 2008);

task conflict: differences in viewpoints, ideas and opinions (Isaksen & Ekvall, 2010);

team creativity: a collective phenomenon where members behaviorally, cognitively, and emotionally attempt new things, take novel approaches to their work, or generate products, processes or procedures that are both novel and useful (Gilson & Shalley, 2004);

team productivity: The degree to which the team produces work of quality and quantity in meeting the task objective.

team diversity: The differences (small or large) between team members as measured by one or multiple individual attributes(see Surface-Level diversity, Mid-level diversity, deep-level diversity for list of attributes referenced in this research)

surface-level diversity (SLD): differences in age, race, and gender; as attributes are highly visible, as physical characteristics of a person often ascertained within the first few minutes of meeting;

mid-level diversity (MLD): differences of knowledge, skills and abilities, attributes are not readily visible, however are often found in a resume or are known by ones reputation; often as attributes people are most willing to share and proud to disclose; and

deep-level diversity (DLD): attributes not visible to others; they take time to be discovered. (i.e., one's personality, attitudes, values and beliefs).

CHAPTER I

INTRODUCTION

Increasing competitiveness in a globalized economy identifies *creative collaboration* as critical to organizational performance. Organizations value creative collaboration as a means to spark innovation avoiding organizational stagnation and decline, ultimately resulting in the growth of revenues and capacities (“Trust is,” 2012). Collaboration, in the form of work teams, in this new world economy demonstrates potential to foster and execute innovative solutions beyond the contribution of single individuals as problems, challenges, and ideas become highly complex. Further, innovation has been credited as an essential component for business survival and success in the global marketplace (“Amplify Your,” 2013, p. 28”). As technology advances and competition increases organizations have turned to innovation and collaboration not as a choice, but a means to survive.

“Collaboration...is a primary work style for many organizations” (Ludwig & Smith, 2012, p. 97). With organizations looking to creative collaborations to move from survival strategies to supercharged growth, emphasis and reliability on the creative outcomes of teamwork has invited research efforts across diverse industries. These efforts have been directed toward understanding why some teams work and other teams flounder (West, 2012).

The best companies take a holistic approach to collaboration, understanding there are many factors that influence collaboration, including technology, human resources policies, corporate culture, and the facility itself and how it’s furnished, all of which also have an impact on employee productivity and satisfaction (“What It”, 2012, p. 2)

Collaboration is regarded as a critical component of successful teamwork, or coined as team collaboration, this capacity is perceived a positive resource with team dynamics challenged by obstacles impacting quality of innovation and overall productivity; dynamics for example

including diversity, conflict, and both individual and team awareness. “Team collaboration has never been more important in the workplace, but getting it right isn’t easy. When an organization lacks collaboration and teamwork skills, it often ends up functioning as a collection of silos” (Hermann International, n.d.).

While teamwork is important in diverse organizations, within the professional domains encompassing creation of the built environment (e.g., architecture, interior design, and landscape architecture) teamwork is a necessary strategy to execute larger scale, complex projects. Commercial interior design practice is an inherently creative industry (Dohr & Portillo, 2011) dependent upon internal and external teams comprised of design and client professionals. High-performing *design* teams are highly focused on their goals of achieving superior business results using the design process; they contribute unique expertise, knowledge, skills, and abilities (KSA’s), to generate unique and powerful group perspective. Creating teams with an ideal combination of attributes is thought to increase overall business productivity and creativity, which has become increasingly important to successful design firms. However, other factors of team diversity and team conflict may also affect the ability of teams to perform with their highest potential. This research study examines team *diversity* and *conflict* to help understand their relationships to team performance and overall team creativity of interior design teams.

Team Diversity

Team diversity and its relationship to creativity has been empirically examined and tested across diverse industries (Bell, 2007; Bell, Villado, Lukasik, Belau, & Briggs, 2011; Chowdhury, 2005; Harvey, 2013; Shin, Kim, Lee & Bian, 2012). Researchers have identified many types of diversity including demographic (Chowdhury, 2005; Lau & Murnighan 1998; Williams & O’Reilly 1998), knowledge and skills (Bantel & Jackson, 1989; Frey, Lüthje & Haag, 2011), and

values (Klein, Knight, Ziegert, Lim, Saltz, 2011) impacting team function. Researchers have found diversity of knowledge, skills, and abilities (KSA's) to be advantageous to both innovation and performance in teams (Jackson, 1995; Jehn, Northcraft, & Neale 1999; Van Knippenberg, De Dreu & Homan, 2004). Other researchers have found teams divided in their values, beliefs, and personality to be highly unpredictable, subjected to increased amounts of negative conflict, and ultimately experience a decrease in team effectiveness and overall creative productivity (Bell 2007; Harvey, 2012; Klein et al., 2011). Diversity and conflict impact creative processes influencing whether high-performance design teams succeed or fail in constructing and achieving innovative levels of problem solving.

Impact of Team Diversity on Design Education

In design education, the challenge of promoting greater innovation and creativity in team work is influenced by team diversity. Empirical evidence focusing on ways in which educators can best prepare and enhance individual learning within the context of team diversity, and conflict, may lead to tools for successful ideation inviting increased innovation. Interior design educators, in striving to provide students with the technical skills and knowledge to meet accreditation requirements, are shaping entry-level interior designers (CIDA, 2014), preparing these students for successful transition to practice demanding highly creative problem identification skills and resolution of conflict within teams.

Herman Miller's research program, under the auspices of the Learning Spaces Research Project, revealed 70% of college student time is spent engaged in team activity. Data collected from interior design majors at Colorado State University, however, indicated only 50% of time was spent in team problem solving (Dr. Katharine Leigh, personal communication, December 10, 2014), thus it may be assumed team work occurs at least half of the time during one's

professional education. Implement learning through hands-on experience (e.g., experiential learning) will help students understand and master interpersonal skills when engaged in team projects (Williams, 1990), helping them experience the dynamics, challenges, and rewards of working with others to achieve greater creative outcomes. Educators could target strategies for promoting team diversity and conflict, currently seen as challenges to collaborative creativity, to enhance team project success and rewarding for students; this knowledge may help educators instill mindfulness by encompassing self-awareness, creative thinking, and innovative educational strategies.

Types of Team Diversity

Two primary types of diversity are documented in the empirical literature, *surface-level* and *deep-level* (Chowdhury, 2005; Lau & Murnighan, 1998; Williams & O'Reilly 1998; Klein et al., 2011). Surface-level diversity is exemplified in the way in which one person might categorize another within the first moments of their meeting based on perceived age, gender, and ethnicity (Chowdhury, 2005; Lau & Murnighan 1998; Williams & O'Reilly 1998; Pelled, 1996). Deep-level diversity encompasses characteristics of a person that take time to discover, for example, their values, beliefs, and personality trait information typically not shared in the work place. This research delineates a third type of diversity, *mid-level*. Mid-level diversity is defined for the purpose of this research as a person's knowledge, skills and abilities (KSA's). Research by Bantel and Jackson (1989) and Frey, Lüthje, and Haag (2011) examines the benefits of KSA's but, and classifies or groups KSA's with either surface-level diversity or deep-level diversity. Researchers have yet to determine a clear classification for KSA's for mid-level diversity; this interstitial-level of diversity is singled out to increase clarity for this exploratory case study.

Individual Learning Styles

Over 70 different learning style models can be located in the research literature; given the research project focus on application to the interior design profession, Kolb's model of experiential learning is deemed appropriate to examine the impacts, if any, of team learning style diversity on task, process, and relationship conflict. According to Kolb and Kolb (2005), learners take control of their learning process by choosing a learning approach engaging their strengths through a deepened awareness of their preferred learning style in response to situational demands (for example, in team problem solving). Kolb identifies four predominant learning styles as *divergent*, *assimilating*, *convergent*, and *accommodating* (2005). The ideal learning process, according to Kolb, would use all four learning styles in a learning cycle with a tendency to be drawn to a preferred learning style. Creative productivity in the interior design profession may benefit from thinkers and learners drawing from each quadrant of Kolb's defined learning styles, with each style of learning valued for its affinity to different tasks required through the design process. Although Kolb's model is generally highly accepted with empirical support, it is not without its critics (Manolis, Burns, Assudani, & Chinta, 2013). For the purpose of this investigation, the Kolb typologies are used to differentiate participants within teams to identify composites of learning style because researchers have found positive relationships between team learning style diversity and team productivity.

Jules (2007) and Kyprianidou, Demetriadis, Tsiatsos, and Pombortsis (2011) examine the influence of diversity in team learning styles on team performance; their findings reported higher levels of team learning style diversity correlated with positive influence on team effectiveness and overall productivity, however, neither study included measures for creativity. In contrast, De Dreu (2006) found positive outcomes for team creativity inversely impacting team productivity,

whereas moderate levels of task conflict correlated with team creativity. Further, because team diversity has been linked to *task*, *process*, and *relationship conflict*, as a mediator of team effectiveness (De Dreu & Weingart, 2003; De Wit, Greer, & Jehn, 2012), measures for these three conflict typologies are examined in this study.

Statement of the Problem

Researchers have suggested there is little evidence explaining how measures of deep-level diversity in teams impact their creative outcomes. Deep-level diversity remains one of the most unknown and unpredictable constructs describing team characteristics influencing overall team behavior and outcomes. The need for further understanding of factors describing and linking deep-level diversity to team creative outcomes is still needed.

According to Kolb and Kolb (2005), students are drawn to areas of study based on their innate learning style, with greater probability of identifying homogeneous yet distinct learning styles within specific fields of study. However, according to Thompson (2008), interior design students are often found to be quite diverse regarding learning style, representing each learning style category. The interior design program at Colorado State University, used as the source for data collection in this study, is notably creative as cited in accreditation reports (CSU CIDA Team Report, 2009, 2015), yet students represent a highly homogeneous group when defined by their surface-level diversity. It is possible that the student body is more diverse when defined by measures of deep-level diversity, such as learning style. Design processes undertaken by interior design teams in problem seeking and problem solving may be impacted by team learning style diversity and its impacts on task, process, and relationship conflict — three areas challenging the design creativity and innovation of teams.

Purpose of the Study

The purpose of the study is to examine the relationship of team learning style diversity to conflict (i.e., relationship, task, and process conflict) to reveal factors influencing team creative productivity. In this investigation team learning style diversity is measured by Kolb's Learning Style Inventory (LSI 3.1) to understand student approaches in team problem seeking and solving to achieve creativity and productivity in outcomes. The study also seeks to understand conflict that may occur throughout the team design process. As organizations strategically construct teams to solve increasingly complex problems, understanding the relationships among these factors is critical to achieve global competitiveness. "Creative thought [and outcomes] offers individuals, teams, organizations, and the broader society the ability to see things in new ways" (Nemiro, 2004, p. 283).

Research Questions

RQ1: How does team learning style diversity relate to team conflict (task, process, and/or relationship)?

RQ2: How does task conflict relate to team creativity or team productivity?

RQ3: How does team process conflict relate to team creativity or team productivity?

RQ4: How does team learning style diversity influence team creative productivity?

RQ5: How does individual self-awareness influence team conflict (task, process, and/or relationship)?

RQ6: How does individual self-awareness influence team creative productivity?

Study Delimitations

Teams were formed by the instructor for the course prior to the research study commencement and not purposely constructed to maximize or enhance the KLSD in each team. The team composition was, however, based on mid-level diversity (KSA's) according to self-identified leadership skills, graphic abilities, organization, and team support skills — traits found by numerous researchers to be advantageous for creativity. Forming the teams in this manner reflected professional practice processes where managers create teams based on the contributions of designer KSA's as matched to project type and requirements.

The KLSI was selected as a measuring tool based upon the theoretical proposition people learn best through experience or hands-on learning as suggested by the research of Dewey (1938), Piaget (1952), Freire (1985), Montessori (1965), and Gardner (2006). Interior design is a hands-on discipline utilizing visually communicated projects, as opposed to test-centric measurements, thus the use of KLSI instrument is appropriate for this study where students are participating in experiential learning through teamwork.

The decision to collect data from student experiences versus professional practice was based upon accessibility to a cohort examining the same design problem — in this case, the Innovation Center for the city of Fort Collins. By controlling the project focus and scope, comparisons across teams could be drawn, potentially providing insights for educators and practitioners working with teams.

Researcher Perspective

Reflecting on my life, wondering why or how I became the person I am today, I realize the many parts of my life experiences that shape my interest in teamwork and creativity. I grew up in a family that encouraged individual thought and expression. As a child, I was heavily

involved in the arts, attending many film and theater productions, musical performances and art gallery exhibitions. Inspired by a family of artists, musicians, theater performers, I too am a dancer, musician, and artist. If not for these experiences, I do not believe I would be the creative thinker I am today.

As a young adult, my undergraduate experience at Colorado State University (CSU) further shaped my interest in creativity and teamwork. First, my experience as part of the Deans Leadership Council for Applied Human Sciences introducing me to the Myers Briggs Type Indicator. I became fascinated with examining human behavior and interactions, which eventually led to my discovery of Kolb's learning style inventory. The leadership council was comprised of an amazing group of students and one of my favorite groups of people with whom I have ever worked. My second experience involved working on group projects with other students in the interior design program. Through these experiences, I formed good friendships, one of which was not foreseeable given how much we disliked each other during the first two years of the program! We were forced to work together on a design project and had to learn to collaborate. This friendship made me a believer in the power of being open to experience and respecting others for their strengths, as it was what ultimately made us an unstoppable team.

Graduating in May 2003 with a BS in Interior Design, I pursued a career designing hotels and restaurants with HVScompass, a hospitality design firm. I often worked on three or more hotel projects at the same time, with each project comprising a different team of people, internal and external to the firm. Throughout my professional career I found myself part of many functional and dysfunctional teams, furthering my interest in the composition of teams working in highly creative fields. Through team conflicts, personality clashes, and developing friendships, it took a while to understand my own strengths as a designer and creative professional. Often my

employers would tell me how creative I was, but I did not really understand what they meant when they said this while also pointing out my weaknesses. I now realize that it was not my creative performance they were referring to, but rather my abstract way of seeing the world, the way I visually process information, and my ability to be flexible in the way I think. Creativity has always been a significant part of my life, and now with my thesis research I am able to put the pieces of my own experiences in a perspective I can share with others

CHAPTER II

LITERATURE REVIEW

The literature review discusses team creativity, team productivity and team performance: as necessary areas of discussion for position of this research inquiry, as a frame for team creative productivity, and to develop a study model to guide the research inquiry. Team activities provide a lens through which researchers can examine creative productivity. However, as the following literature review suggests, this relationship invites greater clarity and focus.

Teams engage a collection of individuals with different needs, backgrounds, and expertise, transforming their actions into an integrated, effective working unit (Thamhain & Wilemon, 1987). However, an *effective* team requires people with technical skills necessary to perform the work at hand with interpersonal, decision-making, and problem-solving skills (Thompson, 2008). Research surrounding team performance suggests teams have increased opportunities for success when compared to individual performance using a multiplicity of external contacts, varied experiences, and diverse perspectives increasing team access to broader resources. For design process and decision-making, the depth of resources and diversity embodied in team member expertise and skills can reinforce team abilities to reach creative solutions (Perry-Smith, 2006) and effective team productivity.

Team Creativity

Research on creativity began in the 1950s (Guilford) with his address to the American Psychological Association emphasizing the need for empirical work in this area; team creativity, however, is a relatively new area of development. From the 1970s to 1990s, creativity researchers referred to creativity as an outcome product or service (Amabile, 1996); this perspective has transitioned to creativity as a process by which innovative outcomes can be

achieved. Despite progress made to identify creativity's role in the team literature, empirical investigations remains in infancy regarding how teams can maximize their creative potential. This research project conceptualizes creativity as a process the team works through on the journey to producing creative outcomes.

Team Creative Process

Education, business, and organizations globally value creativity (Partnership for 21st Century Skills, n.d; The Colorado Talent Pipeline Report, n.d.), and creativity and outcomes surrounding measures of effectiveness have been recognized as the direct result of team creative processes (Gilson, Litchfield, & Gilson, 2015). The creative process was first defined as a sequence of four steps, including thoughts and actions, leading to a novel idea and identified as (a) preparation, (b) incubation, (c) illumination, and (d) verification (Wallas, 2014). Researchers have expanded and explored variations to this creative process model and questioned whether these models are also representative of the team creative-process. Zhang and Bartol (2010) and Gilson (n.d.) develop the team creative process as it relates to team productivity and innovation as an end goal in their research investigations. Two contrasting conceptualizations of team creative processes are illustrated by Zhang and Bartol's (2010) "(1) problem identification, (2) information searching and encoding, and (3) idea and alternative generation" (p.108) and Gilson's (n.d.) (1) idea generation (2) problem solving: gather, share and evaluate information (3) idea evaluation. In the former, process ideation occurs as a latter step differs from Gilson's analysis in which idea evaluation is revealed as the last step. According to Gilson and Shalley (2004), team creative processes bring together ideas from a wide range of sources in developing new and useful outcomes. Zhang and Bartol (2010) and Gilson and Shalley (2004) posit the key to successful team creative process lies in the individual's level of engagement and involvement.

Although researchers agree individual engagement is an important factor to the success of a team's creative process, there is no clear consensus on the actions or steps needed in order to achieve a creative outcome. Guilford (1950), found Wallas's four phase model to be inadequate positing, "it tells us almost nothing about the mental operations that actually occur" (p. 451). Both practitioners and researchers alike continue to develop their own versions of the creative process because creative outcomes have become increasingly valued for their benefit to enhancing business success.

Team Productivity and Team Performance

Team productivity is one measure for determining what constitutes a *high performance team*. Team productivity, unlike team performance, is often a measure of pieces of work accomplished, whereas team performance is specifically looking at the success of outcomes achieved. Team structure studies often use team performance outcomes as a final measure determining the importance of each team. However in many team studies, criterion used to distinguish high-performing teams from other types of teams are unclear. Additionally, high-performance teams often are expected to produce innovative solutions, yet researchers fail to designate whether task requirements necessitate creative thinking or innovative outcomes. Researchers seldom explore creativity in relation to team productivity, despite research findings with contradictory relationships between the two factors. De Dreu (2006) found creative processes slow team productivity while Richard, Barnett, Dwyer, and Chadwick (2004) found team productivity and innovation to be positively correlated.

Performance Typologies

Research on team performance carried out by Larson and LaFasto (as cited in Thompson, 2008, p. 61) characterized three types of teams based on the type of task performed: *tactical*, *problem solving*, and *creative*.

- a) *Tactical teams* demonstrate well-defined goals and are extremely organized, with pre-determined outcomes. Teams considered to be tactical include sports teams, medical teams, or manufacturing production teams. Tactical teams are recognized for allocating specific roles, performing brief tasks, and tasks that are often repeated.

Cannon-Bowers and Salas (1998) and Fletcher (1999) further define types of decision making and problem solving skills of tactical teams suggesting good problem solving and decision making skills are components of effective tactical teams.

- b) *Problem solving teams* resolve challenges with high complexity, such as might be found in academic, organizational, or R&D research teams, for example, a team working on a cure for cancer (Thompson, 2008).
- c) *Creative teams* construct solutions by thinking out of the box when defining a problem, and exploring alternative ideas and ways of thinking (Thompson, 2008).

This study seeks information about creative teams with an understanding that this differentiates them from tactical and problem solving teams. However, these typologies ignore the expanding complexities of team work required of organizations to be competitive in the global marketplace with their attention on a single function.

Jehn also identifies two types of teams based on type of task: *routine-* and *non-routine-based* teams. She defines routine-based teams as those with low levels of task variability and tasks generally familiar and done the same way each time (as cited in Hall, 1972, pp. 259-260). In contrast, non-routine-based teams tackle complex problems requiring team decision making to address the complexity of the problem (De Dreu & Weingart, 2003). Non-routine tasks require

problem solving, have few set procedures, and a high degree of uncertainty (Van de Ven, Delbecq, & Koenig, as cited in Jehn, 1995, p. 260). Jehn focuses on measuring team performance and efficiency outcomes without specifically referencing creativity, yet her research in the area of task conflict is helpful in developing an understanding of the relationship of creativity and task conflict which will be discussed in a later section. Researchers following Jehn's work also note the connection between creativity and non-routine-based teams.

Model for Team Effectiveness

Extensive research has been conducted on variables influencing team effectiveness resulting in the creation of various models intended to better understand team functions. These research models are commonly grounded in the input-process-output model (IPO). "The IPO model has historically been the dominant approach to understanding and explaining team performance" (Mohammed & Hamilton, 2007, p. 353). Inputs are existing factors reflecting the resources available to the team before work begins such as: motivation, personality, abilities, experiences and demographic attributes. Processes are considered interactions between team members as well as mediating factors between team inputs and outputs. Historically team processes included "coordination, communication, conflict management, and motivation" (p. 353), whereas recent models now also include creativity and problem solving. Outputs are the results of group activity valued by teams and organizations. Figure 1 illustrates an adapted perspective of the IPO model specific to team performance, to include creativity as a process mediating team performance outcomes, and adding a focus on team emergent states.

IPEO MODEL

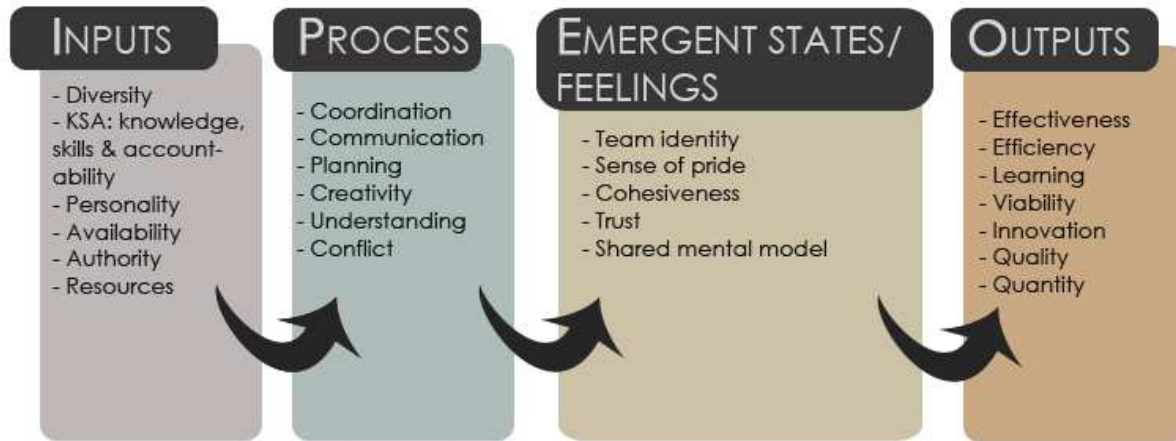


Figure 1: IPO model attributes in business (adapted from a course lecture by T. Maynard, Leading High Performance Teams, (October 2013) in which IPEO was introduced.

The IPO model is used as a tool to understand team performance serving as the foundation for Steiner's formula to assess Actual Team Productivity. Teams face many obstacles as they progress through the team process (see Figure 1); the P in the IPEO process. Steiner developed an approach (Figure 2) in an effort to explain how teams who begin with great potential end up failing. Team's often do not perform to their highest abilities due to process loss, referring to losses during this process phase due to team conflict, coordination difficulty, and communication breakdowns (Mohammed & Hamilton, 2007, p. 354).

Steiner's Formula for Actual Team Productivity



Figure 2: Steiner's formula for team productivity (Steiner, 1972)

In recent years creativity researchers Nijstad and Paulus (2003) adapted Steiner's formula to illustrate Actual Group Creativity as:

$$\textit{Actual Group Creativity} = \textit{Potential Group Creativity} - \textit{Process Loss}$$

Creativity has been increasingly recognized as a crucial part of team processes, however many teams also fail to meet their creative potential due to process losses. Research continues to expand around factors affecting process losses in team creativity. These variables are similar to team productivity losses and include team conflict, communication, and diversity (Nijstad, & Paulus, 2003). Interest in specific factors influencing creativity in the organizational environment continues to draw the focus of researchers (Perry-Smith & Shalley, 2014; Harvey, 2012; Gilson (n.d.); Hirst et al., 2009) and they continue to build research agendas to understand factors affecting team process losses and how to improve Actual Group Creativity.

Creativity and the Design Process

Diverse professions use a design process, including engineers, business developers, product development, artists; and, although similar, each discipline reflects its own step-by-step design process. The creative process, integrated as a part of the interior design process, is unique from the creative and design processes found in non-design disciplines. The design professions (i.e., industrial design, graphics, architecture, landscape architecture, and interior design) seek to first identify and then solve a challenge, whereas non-design professions more often begin with a given problem. The design process has become valuable in the realm of business “when organizations...embed design into their culture... they use design as output but also as a mean of making better business decisions” (Lockwood, 2010, p. 83).

Aspelund (2010) identifies a seven step design process (e. g., inspiration, identification, conceptualization, exploration/refinement, definition/modeling, communication, and production)

but fails to connect the process as a cyclic activity with feedback looping to frame outcomes to inform the next design project. Edwards (as cited in Sully, 2015, p. 123) identifies an eight step process encompassing the following activities:

1. Formulation: inception and feasibility of the problem;
2. Programming: research and scoping of user needs;
3. Outline proposals: schematic design, detail, and preliminary product information;
4. Representation: design development;
5. Presentation: client review and sign off ;
6. Movement and implementation: construction documents, bid or design build;
7. Project supervision: construction administration; and
8. Evaluation – reflection, feedback, POE (post-occupancy evaluation).

This model approaches greater specificity but yet excludes the ideation phase associated with creativity. In Sully's (2015) *The Design Process*, three types of interior design process models were characterized:

- *instinctive* - motivation, inspiration, idea, action and resolution;
- *methodological* – research, analysis, synthesis, evaluation, and solution; and
- *professional* – briefing, programming, research, market comparisons, prototype, technological feedback, presentation of optional solutions, revisions of designs, acceptance of final solution, making/site supervision, and product completion.

The phases in the above models also correspond to the contractual design process or project management process for design contracts used by the American Institute of Architects (AIA).

Figure 3 visualizes common phases of the interior design process in practice.

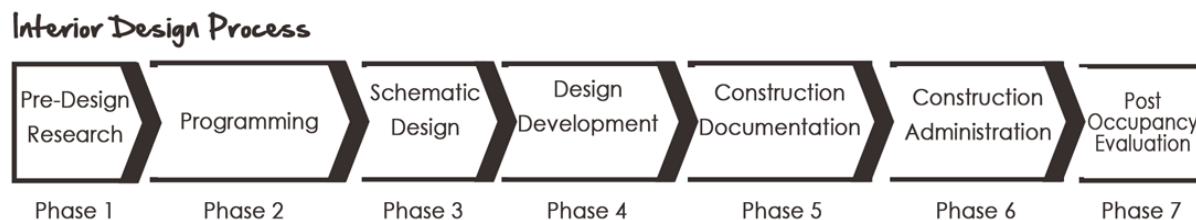


Figure 3: Sequential phases of the interior design process model.

The design process begins and ends with the collection of information and research, *programming*, requires the synthesis of research as related to the client's needs. The first and

second phases, *pre-design* and *programming*, although heavy in research require creative thinking and problem finding skills important to the creative process. The third phase of design, *schematic design*, requires the application of problem solving and formulating solutions in a tangible form expressed through sketches and drawings of the interior space and requires designers to think critically, be flexible, and consider many alternate solutions. The fourth phase, *design development*, develops the design and relevant character of the space, encompassing the selection of color, lighting, furniture, accessories, and art. The fifth phase, *construction documentation*, details and documents the design intent of the project to communicate clearly for the purposes of construction, engineers all parts of the building team. This phase requires the design to be extremely detail-oriented and combined with exceptional time management skills. The sixth phase, *construction administration* (CA) takes place during the building and construction of the space. The designer is involved throughout this phase: monitoring the development of the space, supporting the contractor in implementing their designs, and helping to resolve potential problems that arise during the construction process. This process also involves quick problem-solving and decision-making skills. The seventh and final phase of design is called is referred to as *post-occupancy evaluation* or (POE), a service offered to clients once the building is occupied. POE gathers information or feedback from users of space to examine what works and what might be improved. The POE helps guide future projects toward better and hopefully more innovative and functional spaces.

Each phases requires the integration of diverse modes of learning and knowledge acquisition from research and analysis of interior space requirements and client needs to hands-on technological representations of design solutions. The process model summarizes activities resulting in a completed design project achieving the outcomes desired by an owner or client but

does not illustrate the elusive cognitive processes required by individuals in a team. To meet the demands or needs of the client involves more than following the steps of the interior design process; it requires the idea generation, problem solving (gathering, sharing and evaluating information), idea evaluation, processes outlined by Gilson (n.d.) comprising the team creative process. The interior design process is a team process requiring people with various expertise through each step of the process.

Kolb Learning Styles

According to Kolb and Kolb (2005), each person in this world is born with innate strengths and preferences for learning. These strengths dictate how we learn and approach the world, work, life, and decisions we make. These unique experiences become both strengths and weakness and often are perceived as the differences setting people apart. Despite differences of race, gender, education, or personality, Kolb believes each person is drawn to their field because of their strengths. Watson and Thompson (2001) find interior design programs attract students of all learning styles, addressing the wide variety of skills required by the interior design process and making interior design a highly diverse profession. Kolb's model illustrates a basic breakdown of four learning styles and indicates the attributes making each style unique in its approach to learning.

Kolb's Experiential Learning Theory (ELT) builds on the seminal work of Dewey (1938) and emphasizes learning through experience (Kolb & Kolb, 2005). ELT developed to understand each person's preference for approaching learning; it acknowledges and helps build a foundation to understand different learning style brought into a classroom.

In Kolb's Learning Style Inventory, four modes of learning are identified:

- a) *Divergent Learners*: This learning style excels in thinking that requires the gathering of information and generation of ideas. Divergent learners are

interested in different cultures and ways of thinking; they are imaginative, and emotional. Divergents' are people-oriented and thrive in team environments.

- b) *Assimilating Learners*: These learners take their time and think ideas through. Less concerned with people, assimilators enjoy the exploration of ideas and concepts. People with this learning style prefer research, lectures.
- c) *Convergent Learners*: These learners find practical uses for ideas and theories. They prefer to experiment with new ideas, simulations, and practical applications.
- d) *Accommodating Learners*: These learners are hands-on and often jump right into action. They typically prefer to work with others and enjoy involving themselves in new and challenging experiences. Accommodators prefer to think on their feet, learn from their peers and from their experiences rather than research. More reliant on their people skills than their technical skills and abilities.

Life experiences, family influence, and hereditary make-up are factors influencing one's preferred learning mode (Kolb, 2003) and these four learning modalities are mapped along an X-Y axis.

Just as one's learning preference is formed by unique background and experiences of the individual so are values and beliefs. According to Leigh (211) "values, are enduring beliefs shared by members of a culture, about what is good or desirable and what is not; in the workplace, [values] exert major influences on the behavior and perceptions...affecting their choice of where to work and under what conditions" (p. 18). According to Kolb the same holds true for one's learning values, leading students to choose the educational path best suited to their learning style. Figure 4 illustrates the innate strengths and experiences mediating one's values and beliefs, ultimately affecting one's preferred learning style. Kolb's research predicts that each field of study will attract students from similar learning style preferences. However, this may not hold true for interior design programs based on the research by Watson and Thompson (2001) finding all learning styles represented and revealing the possibility for an increased amount of

deep level diversity among students (and discussed further in the next section). Furthermore, this type of diversity may potentially have a positive impact on student team creative product outcomes.

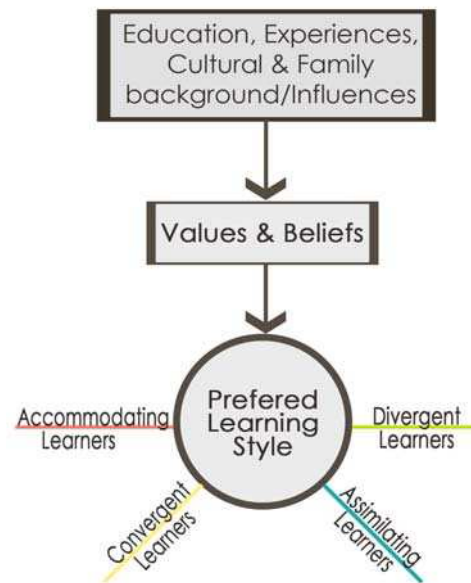


Figure 4: Relationship of individual values and beliefs shaping preferred learning styles demonstrated through Kolb's learning style typologies.

Team Diversity

“Diversity is typically conceptualized as ...differences between individuals on any attribute ...lead[ing] to the perception that another person is different from self” (Van Knippenberg & Schippers, 2007, pg. 517). These differences researchers find to be both the key to team creativity and effectiveness, and yet the downfall as well. Diversity is one of the many contributing factors affecting team innovation. Diversity of people, ideas, and perspectives can be a primary source of creativity (Watson et al., 1993; Wiersema & Bantel, 1992) Yet it can also a cause of conflict negatively impacting productivity (citations)

Researchers define two primary types of diversity: Surface-Level Diversity (SLD) and Deep-Level Diversity (DLD). For the purposes of this research a third category of diversity is conceptualized as Mid-Level Diversity (MLD).

Surface-Level Diversity (SLD).

SLD can be defined as differences in age, race, and gender and are highly visible, or physical characteristics of a person often ascertained within the first few minutes of interaction; opinions are typically formed prior to verbal conversation. SLD may be a catalyst for the development of assumptions about one's similarity or dissimilarity to values and behaviors they expect to find. Since the 1980s, researchers have been interested in developing methods to construct effective, innovative teams, using SLD, to transform business performance. Bantel and Jackson (1989), in an early empirical study examining variables of diversity affecting innovation, found no relationship between innovation and team composition. They did find top management teams with younger members increased a teams' overall innovation, yet high heterogeneity of age and tenure diversity increased turnover, with turnover attributed to higher levels of conflict causing stress.

Richard, Barnett, Dwyer and Chadwick (2004) found racial diversity to be positively correlated for innovative team project outcomes. Richard et al. (2004) found most innovative teams become more productive as racial diversity increases. Chowdhury (2005) believes demographically homogeneous teams to be just as creative as heterogeneous teams. Over time, however, the positive impacts of SLD appear to diminish (Harrison, Price, & Bell, 1998).

Although creating teams with demographic diversity has been found positive for creativity, a pitfall is the potential of developing faultlines or "divisions and how to respond in time when team fractures do arise... Project teams can fly or founder on the demographic

attributes of team members and the fractures they can create” (Gratton, Voight, & Erickson, 2007). Argumentative tendencies may develop between subgroups who feel superior to each other causing emotional conflict to arise leaving teams non-cooperative and ineffective (Eisenhardt, Kahwajy, & Bourgeois III, 1997). Since faultlines are usually formed around demographic difference (e.g., team SLD) realized at the onset of team creation, teams could experience an immediate negative impact during team-forming stages (Lau & Murningham, 1998). This situation could immediately lead to high levels of team emotional conflict and, according to Amabile (1996, it is almost impossible for teams to recover from this type of conflict. Although demographic diversity has the potential for elevated levels of team creativity, the risk of creating group faultlines and the rise of subgroup formation may materialize as negative effects on internal communications and general group functioning.

The impacts of SLD on team creativity may be positive, but can become negative when factors of team conflict and faultlines undermine teams’ abilities to be creative. In general, researchers agree diversity of team knowledge, skills and ability are found to positively influence team innovation. Thus, a team’s breadth of knowledge resources is found to improve the originality of ideas created by the group (Muir & Hida, 2004; Rietzschel et al., 2007).

Mid-Level Diversity (MLD)

MLD is conceptualized as team inputs linked to knowledge, skills, and abilities. These attributes are not as immediately visible as SLD and include information typically found in a resume or known by one’s reputation and experience, often the attributes people are most willing to share and proud to disclose. MLD is not a formally recognized term used in literature, but is defined here for its positive effect on team performance.

Empirical studies find variables of MLD beneficial to team performance (Frey, Lüthje, & Haag, 2011; West, 2002; Jackson et al., 1991; Jehn, Northcraft, & Neale, 1999). Early research by Shaw (1971) and Wanous and Youtz (1986) found team performance more effective when composed of members of diverse skills, knowledge, abilities, and perspectives. In addition, researchers have also extended the benefits of MLD to include increased team creativity and innovation (Bantel & Jackson, 1989; Van Kippenberg & Schippers, 2007). Heterogeneity of education and functional background (e.g., experience and knowledge) of top management teams in banking, increased overall team innovation (Bantel & Jackson, 1989). Shin et al. (2013) expands the research of MLD with findings demonstrating MLD enhances the individual's creativity within the team. MLD's positive influence on team performance and innovation is thought to occur when the base of knowledge has greater diversity and the team's resources grow and increase their ability to integrate diverse information and reconcile diverse perspectives, thus stimulating creative thinking and preventing groups from moving to premature consensus (Van Kippenberg & Schippers, 2007).

Team MLD has become an important consideration in team formation both for increased team performance and innovation, however, forming teams with high MLD can be challenging when team members are selected from within a singular field of study. Teams of people with the same education and background may introduce less MLD to a team, thus decreasing the potential for creative outcomes. Forming teams based on MLD in educational environments can present challenges for creative performance, and similarly pose issues within professional practice. Team MLD might not always be achievable; however, forming teams of highly skilled people is challenging no matter what factors are considered. Other factors of diversity can lead to team

process losses or gains, including individual factors such as values, beliefs, and personality described here as deep-level diversity, and affect team performance and innovation.

Deep-Level Diversity (DLD)

DLD attributes are intangible and invisible; these are attributes that take time to reveal themselves and are often defined as the individual's "personality, attitudes, values, and beliefs" (Harrison, Price, & Bell, 1998; Jackson et al., 1995). These deep-level attributes are typically personal and not shared in formal settings such as the workplace, although as team members build trust these deep-level attributes are slowly discovered through exchanges of personal information through verbal and non-verbal cues. Thus, deeper level knowledge of one's team members takes time to develop.

Once knowledge of DLD becomes more apparent, the previous effects of SLD become less salient (Stangor, Lynch, Duan & Glass, 1992). These findings are based on Byrne's (1971) similarity attraction theory, which found people prefer to associate with similar others. Team member knowledge of attitudinal, belief, and value similarity between team members forms the basis for sustained attraction and association (Byrne, 1971). When attitudes and beliefs are in opposition, higher levels of tension may lead to team relationship conflict resulting in high team turnover rates and negative performance ratings. O'Reilly, Chatman, and Caldwell's (1991) findings reveal employee teams with high levels of DLD to be less committed to their work, unhappy, and more likely to quit.

Klein et al. (2011) found "teams high in values diversity ... [and] teammates' open expression of their differing values may foster unproductive and damaging conflict within the team" (p. 34). "Yet little consensus [is evident]... about how to conceptualize and measure values and ... how to do so in a manner ... conceptually meaningful across levels of analysis,

from the individual at the micro level to societal and cultural institutions at the macro level” (Rokeach, 1973, p. 775). Jehn and Mannix (2001) measure work values, innovativeness, carefulness, autonomy, adaptability, and informality based on the research findings by O'Reilly, Ghatman, & Galdwell (1991). Klein et al. (2011) conceptualized two values differently in terms of work ethic and traditionalism; “traditionalism is a value conveying commitment and acceptance of the customs and ideas of traditional cultures...” (Bardi, Calogero, & Mullen, as cited in Klein et al., 2011, p. 27). “Traditionalism is tightly linked to behavior, such as ... displaying modesty with regard to personal achievements and talents, and accepting positive and negative events without complaining or bragging” (Bardi & Schwartz, as cited in Klein et al., 2011, p. 27). Values are conceptualized in diverse studies in a variety of manners.

The effects of DLD values on team level processes and performance continues to reveal a shallow pool of research studies. This may be due to inconsistent ways DLD is conceptualized and measured. One constant among research findings is the relationship between DLD and conflict. (Jehn & Mannix, 2001; Klein et al., 2011; O'Reilly et al., 1991). The KLSI has also been used in measuring values. Although the KLSI has not been conceptualized as a tool to measure value diversity, there appears to be a connection with DLD when other researchers have used the KLSI to measure DLD. For example, Jules (2007) found diversity of KLSI beneficial to team overall performance, except when high levels of process conflict were correlated with high levels of value diversity causing relationship conflict.

Three primary types of conflict are found to moderate team diversity inputs and team performance outputs: task, process and relationship conflict. Depending on team function, conflict is found to have positive and negative impacts on team innovation and performance (Jehn & Bendersky, 2003).

Conflict in Teams

A global survey found that 85 per cent of employees experience some level of conflict across all organizational positions (CPP, 2008). In addition, 2.8 hours a week on average is spent dealing with conflict by each employee, costing companies an estimated \$359 billion in paid hours (CPP, 2008). An internet search for team conflict in the workplace yields approximately 60,500,000 million results. Numerous studies have investigated understanding, managing, and resolving conflict. Isaksen and Ekvall's research encompassing conflict (2010), proposed workplace conflict to be organized into three different types - *relationship*, *task*, and *process conflict*. In a meta-analysis of studies conducted by De Dreu and Weingart (2003) all three types of conflict negatively correlated with team performance. Other research findings, however, have revealed not all conflict is bad and some types of conflict positively impact team innovation. DeWit et al. (2012) conducted a meta-analysis of 80 different studies between 2003 and 2012. "Task conflict and group performance were more positively related among studies where the association between task and relationship conflict was relatively weak, in studies conducted among top management teams" (p. 360). Furthermore, Jehn and Bendersky (2003) believe the impact of conflict on team performance is dependent on the type of conflict.

Relationship Conflict

Relationship conflict is characterized by anger, aggression, frustration, or hostility among or between individuals on a personal level. This type of conflict is often rooted in differences in personality and opinions, such as politics and religion, and is usually non-task related (Jehn & Bendersky, 2003). Relationship conflict is consistently found to negatively impact team performance. Amabile (1996) found negative implications of relationship conflict so difficult that once teams experienced relationship conflict it is almost impossible for them to recover.

Gersick (1988) found groups with early indications of relationship conflict had more difficulties in general and increased amounts of relationship conflict as deadlines approached. Jehn (1997) began to see situations in her research where task conflict escalated into relationship conflict beginning with task based disagreements; this finding was later supported by numerous studies (Friedman et al., 2000; Pelled et al., 1999; Wang, Jing, & Klosek, 2007).

Task Conflict

Task conflict invites an awareness of differences in viewpoints and opinions pertaining to a group task requiring an ability to question and discuss opposing ideas and opinions (Amason & Sapienza, 1997). Task conflict in teams includes discussions centered on identifying the task, analyzing the task, and resolving the issues presented. This is not to be confused with process conflict which focuses on team discussion of how to accomplish the task, what methods to use, when and where the team will meet, and setting deadlines. In a meta-analysis of 30 studies, De Dreu and Weingart (2003) focused on team conflict as a mediator of team performance and satisfaction finding both task and relationship conflict negatively related to team performance. Subsequently, De Dreu (2006) found, despite negative correlation of conflict on team performance, task conflict at moderate levels was positively correlated to team creativity. De Dreu (2006) and Chen (2006) also found moderation to be important; too much task conflict was found to lead to relationship conflict, bad for both team productivity and innovation. Researchers theorize engaging in creative behaviors may increase group tension, resulting in team unproductiveness and is detrimental to innovativeness and performance (Janssen, Van de Vliet, & West, 2004).

Task conflict increases team members' tendencies to scrutinize task issues (i.e., finding and identifying the problem at hand) and consider the problem more deeply, fostering learning

and the development of new and creative insights, which is thought to lead teams to become more creative (De Dreu & Weingart, 2003). Chen (2006) found an increase in task conflict when teams included people with various backgrounds and expertise, specifically when project outcomes required high levels of problem solving and critical thinking. Teams with access to expanded information, such as found with MLD, delve deeper into the discussion of ideas and solutions leading to more innovative solutions (Chen, 2006). The research surrounding the creativity literature continues to look at this phenomenon prompting further investigation into how much and when task conflict is positive for creativity. Jehn and Mannix, (2001) found higher performing teams experienced higher levels of task conflict during the middle stages of the project process versus low performing teams who encountered highest levels of task conflict at the end of a project. A study by Shah and Jehn (1993) found teams composed primarily of friends experienced higher levels of task conflict than teams of people not familiar with one another. They found teams of friends to be more cohesive, exhibit higher levels of trust, and accepted each other's strengths and weaknesses, and were more aware of their feelings and concerned with maintaining friendships. In contrast, Katz (1982) found R&D teams working comfortably and successfully together over time suffer less process losses - great for team effectiveness; however, because their roles become routinized minimizing conversations of task conflict, productivity is increased and innovation is minimized.

Process Conflict

The third type of conflict, process conflict, refers to disagreements over the approach to the task (Isaksen & Ekvall, 2010). Process conflicts are disagreements about how to accomplish the task including the strategies of how it will be done, such as delegation (who does what) and responsibility (Jehn & Bendersky, 2003; it involves disagreement of allocation of resources and

roles within the team (Jehn, 1997). Originally considered a part of task conflict, process conflict is now a separate category and more closely linked to relationship conflict due to its increased potential to negatively impact team productivity (Behfar et al., 2010). Currently there are no studies linking process conflict to creativity, with the majority of the research regarding process conflict focusing on team viability and performance. Process conflict is a necessary part of the conversation for any team to function and perform (Behfar, Mannix, Peterson, & Trochim, 2010). There are many positive and essential facets of process conflict, including clarification of roles and use of resources, scheduling timelines, and planning deadlines (Jehn & Mannix, 2001) — all factors necessary for successful team management and effective allocation of work.

Process conflict may not be specifically related to innovative outcomes however; if not properly managed, process conflict can be detrimental to team efficiency. When teams fail to develop consensus on how work should be allocated or how time should be used, relationship conflict may develop, diminishing team performance and willingness to work together (Behfar et al., 2010). Jules (2007) examined learning style diversity in relation to process conflict affecting team productivity and found process conflict had an increasingly negative impact on team performance when experienced in greater magnitudes. Teams who sort out process conflict early have a greater chance of success. According to Janicik and Bartel (2003), teams who consider all planning options, set time expectations, and discuss foreseeable problems prior to commencing work are more productive. Although no research findings directly link process conflict to team creative processes, healthy process conflict is important for team performance.

Creative Productivity

Looking at the constructs of creativity and productivity suggests the potential to examine both in a holistic way in order to understand how teams can simultaneously produce creative work or outputs in a productive or efficient manner. The review of literature reveals studies have either focused on one or the other construct but failed to consider their integration or relationship.

Conceptual Model

The conceptual model breaks down the components of the IPEO team effectiveness model to investigate specific attributes. The model seeks to understand the moderating influences of team conflict and self-awareness on creative productivity (Figure 5).

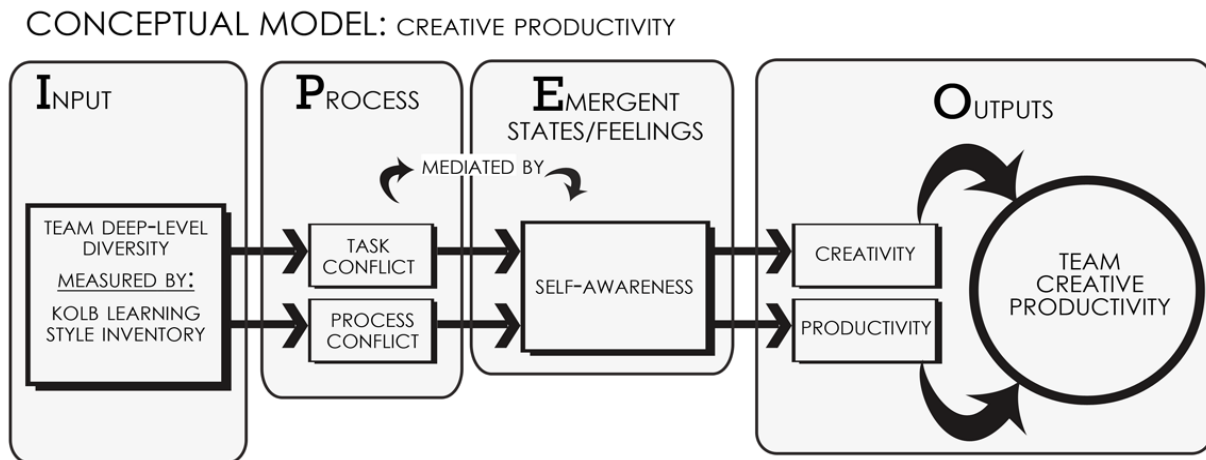


Figure 5: Conceptual Model of Creative Productivity

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

This research project seeks to understand how team composition and perception of conflict within the team environment may relate to creative productivity. The research design is a qualitative exploratory case study examining the creative processes and outcomes in ten teams of interior design students undertaking a design challenge. Case study design was chosen to explore the relationship between team learning style diversity and team creative outcomes to test assumptions made by the researchers within the context of a single group project conducted in a creative discipline. The study design has the potential to bring greater understanding of what influences team creative performance, reinforcing or contradicting prior findings. Yin (2003) suggests “exploratory case method as the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context” (p.1).

Case Selection

From an organizational perspective, the interior design program at CSU can be considered a competitive program with nationally recognized accreditation from the Council for Interior Design Accreditation (CIDA) since 1991. Collaboration and team learning is a requirement for accreditation as identified in Section II of the CIDA 2014 Professional Standards (CIDA, 2014). Interior design students in the interior design program each participate in team learning projects throughout their education with an expectation of highly creative outcomes. In these team learning experiences, diverse types of conflict are observed (Katharine Leigh, personal communication, October 5, 2014).

The senior level interior design capstone studio class was selected by the researcher to examine team behavior over the course of a six-week project developed by the instructor. This cohort of students were chosen based on their broad exposure to team learning experiences in their three years of study to date and their approaching entry within one additional semester into professional practice. The student population and the design objectives of the assignment represent similarity in approaches to team learning across CIDA accredited programs. Participants were selected using the class roster, with all forty students electing to be study participants.

The design project used for the study was a service-learning project requiring students to work in teams. A service-learning project is required in the course each year, providing service to the community, broadening the student's experiences by working with real clients, and emulating the design process of the larger capstone project. The assignment for this community design project includes concept development, space planning, and detailing resulting in an interior design renovation for the city's Innovation Center serving city employees and the community. Teams were formed by the instructor to maximize MLD. Kyprianidou et al. (2012) and Jules (2007) suggest forming teams with high levels of learning style diversity will improve team productivity; in this study, student learning style preference was not used to determine team composition.

As a time-bound case study, events were presented in chronological order. The study builds an explanation of events through the early, middle, and late stages of the design process as experienced by teams working on a project with a fixed deadline. The research approach builds on existing themes developed by empirical research seeking to understand diversity in teams and its impact on creative productivity.

Team Formation Criteria

The instructor divided students during the second week of the semester into 10 teams of four individuals based on self-perceived knowledge, skills, and abilities (KSA's) deemed important to optimize team creativity and innovation. These were: 1) leadership, 2) technology and graphics, 3) communication and organization capabilities, and 4) being a good team member. Students self-assessed their strengths and evenly distributed themselves into 10 teams of four individuals. This method of team formation previously promoted a balance of skills, knowledge, and experience in past service-learning projects undertaken by the instructor. This also reduced the possibility of students forming groups based on friendships and cliques. As suggested by Shah and Jehn (1993), groups of workers who are friendly and know the most about each other are more likely to share information without inhibition.

Project Process

Prior to project commencement, the researcher sent out an electronic survey assessing the students' perception of self-awareness, prior peer relationships, and affinity toward team work. According to Jordan and Troth (2009) "the ability to deal with one's own emotions, might be more inclined to listen to alternative viewpoints and seek superior solutions without feeling threatened by the possibility of being wrong" (p. 211).

Upon arrival to the class meeting (Week 1), the instructor presented the assignment verbally and distributed the project sheet with written explanation of the requirements and objectives of the project, including the scope of the project and expectations of deliverables. The researcher then presented a discussion of the Kolb Learning Style Inventory. The lecture was designed to build on student self-awareness regarding their personal learning styles. This educational lecture occurred during the first two hours of a four-hour studio class and prior to the

site visit planned for the second class in Week 1 as a team service-learning project. Also, the learning module was aimed at creating a conscientiousness of self to equip students with knowledge of how their behaviors affect the team and individual members, and subsequently how they might use this knowledge in working with teammates who differed in their learning style.

The Kolb Learning Style Inventory (LSI 3.1) was administered using a paper and pencil test to identify students' preferred learning styles. The students calculated the results of their own testing and shared results with their team members. The students, having completed the inventory, were then asked to locate their individual learning styles on an x-y grid using a whiteboard to share the results. According to Kolb (1981), learning style inventory tools can be useful in helping students develop self-awareness as well as awareness of others' uniqueness and differences in learning approach. If so, it is possible heightened awareness and understanding of differences could aid in higher levels of psychological safety, trust, and openness within a team.

For the second class meeting of week 1, a visit to the project site took place. The visit provided students with opportunities to ask questions of the client, clarify intended functions, make observations, and begin the first phase of conceptual and design problem identification with their team members. The next checkpoint, the following week (Week 2) encompassed review of the challenges each team identified with the instructor. Week 3 was spent in the development of responses to the challenge. With week 4 a university break, students were encouraged to keep prepping and planning their time accordingly to finish on time. Returning from break, students continued working in their teams and the final class session in week 6 was dedicated to presenting each team's final design solution to client representatives. The student teams were allocated class meetings to make progress on their project during seven of the nine

studio sessions over a period of six weeks and held team work sessions in class and outside of formal class meeting times.

Participant Consent

The consent letter (Appendix A) was distributed during the first class meeting for the project (Week 1) and collected ($N = 40$). Their consent provided the researcher with access to five sources of data: a) student records for information regarding age, race, and gender, b) self-awareness assessment, c) learning style preference determined by the Kolb Learning Style Inventory (KLSI), d) self-reflection survey responses to weekly prompts, and e) design project artifacts. The protocol for this study was reviewed by the Research Integrity and Compliance Review Office's Institutional Review Board (IRB) at Colorado State University and determined to be in compliance with NIH CFR 46 and the federal regulations governing review of research involving human subjects (Appendix H).

Instrumentation

Five sources of data were collected: Kolb Learning Style Inventory, student reflective prompts, and external evaluations of creativity and productivity.

Demographic Data

Demographic data were collected from student records (i.e., age, race, and gender). Chowdhury (2005) found, in study of entrepreneurial teams, demographic heterogeneity variables did not demonstrate a significant influence on team effectiveness. Richard et al. (2004) found teams with either homogeneous racial diversity or highly heterogeneous racial diversity supportive of creativity; however, moderate levels of racial diversity decreased innovation. Furthermore, Chowdhury (2005) states "a team can achieve diversity without having different demographic characteristics among its members" (p. 730). Pelled (1996) examined the

relationship between demographic diversity and conflict, finding high levels of age, sex, and race diversity increased the amount of relationship conflict, labeled in the study as affective conflict, experienced by the team and considered negative in team performance.

Kolb's Learning Style Inventory 3.1

Kolb's Learning Style Inventory 3.1 (KLSI)¹ was used to capture student learning style values. The KLSI aims to capture the preferred manner individuals' process information (Kolb, 2005). The KLSI can build a foundation for understanding the students' deep-level values as learners. The test encompasses twelve questions and each question has four answers where participants are to order their responses.

Example Question

4 = Most like you to 1 = least like you.

Question: When I Learn

_____ *I like to see results from my work*

_____ *I like ideas and theories*

_____ *I take my time before acting*

_____ *I feel personally involved in things*

The Kolb LSI serves as a model for students to understand how members of their team value learning in different ways and helps build awareness of the diversity existing among team members.

Student Reflection Prompts

¹Kolb's Learning Style Inventory (LSI) is a reliable instrument ($\alpha = .70$) and frequently used to determine learning style preference (Kayes, 2005). Instrument reliability was confirmed across seven randomly selected studies of approximately 7,000 student participants in liberal arts colleges (Kolb, 2005).

One objective of this research was to capture each student's perceptions and experiences as they work through the team design process, thus the data were collected through the use of self-report reflection prompts. A total of five survey prompts were sent spread out over the six week period of time. Individually, participating students were asked to submit responses to the self-reflection survey prompt provided electronically through the use of Qualtrics, an online survey instrument. The self-reflection prompts included both Likert-scale and open-ended responses. The survey prompts collected data using *a-priori* themes derived from the literature review. These themes were developed to inform the research questions as well as account for other possible variables that could affect the outcome of the data including: learning style preferences, task conflict, process conflict, relationship conflict, and the team creative processes. These self-reflection responses presented an opportunity to examine interpretive insights about what feelings, emotions, and thoughts were experienced by students throughout the group interior design process.

Examples:

1. What work/task did your team accomplish this week?
 - a. Of that work/task, which were you responsible for
 - b. Who, if any, did you work with this week on this task?
2. My team is able to discuss oppositional and diverse ideas openly and productively answer with: Strongly agree to strongly disagree

These electronic prompts were sent through the class management system directly to class e-mail addresses. The student responses were kept securely within the Qualtrics account that only the researcher could access and identities were coded to protect student privacy, maintaining anonymity. This arrangement reassured students their responses would not influence their project grade (Appendix B).

External Evaluations of Team Creativity and Productivity

Project artifacts developed by each team were collected for external evaluations of creativity and productivity. Use of external evaluation is common in professional design programs and in the CSU academic culture. Four external evaluators, interior design professionals, were given specific guidelines (Appendix D) for evaluating the creativity of the drawing artifacts. One productivity juror was given a Likert-scale evaluation sheet for evaluating productivity as measured by the student's quality and quantity of work produced (Appendix F). The external productivity juror was a non-design professional educator chosen to provide an unbiased review of the final products.

Each external reviewer received electronic transmittal pdf's of each team's final projects, which included three design process boards and a bound booklet describing the project solution (Appendix I). Evaluators were given two weeks to complete their assessment. External evaluations had no bearing on the student's final grade, nor were the assessments and comments shared with the students. Reviewers were provided with an evaluation rubric based on Guilford's (1967) alternative use task. The factors included "fluency (the number of ideas), originality (the number of unusual or unique ideas), and flexibility (the number of different categories implied by the ideas)." (Runco, 2007, p. 7).

Creativity assessment. The measures of creativity identified by Guilford are: fluency, flexibility, originality, and elaboration of ideas presented. Definitions for each of the measures of creativity were included with the evaluation sheet in order to build a cohesive understanding of meanings for all jurors to follow.

Examples:

Rating on a scale of 1 to 5, 1 equals failing and five equals excellent:

1. Please rate the originality* of the design concept?
2. How much Flexibility* in design?
3. Please rate the fluency* of ideas?
4. Project development, in terms of the design? How well did they elaborate*?

- * Originality: Freshness or uniqueness, of the idea, method, or performance.
- * Elaboration: Expanding and embellishing of design ideas & details supporting the overall concept.
- * Fluency: Quantity of design ideas
- * Flexibility: Trying new ideas, taking risks with the design

Qualitative short answer questions collecting additional feedback for each project:

1. What is the strength of this project? Please explain:
2. What is the weakness of this project?
3. Please provide additional comments or observations about this design project:

Team Productivity Assessment. Team productivity assessment was conducted by the external non-design juror. Like the creativity jurors, this juror had no ties to the class of students in order to eliminate biased feedback regarding the student project outcomes. The external productivity juror was asked to provide feedback specifically related to team productivity according to two categories: quality of project elements and quantity of work produced.

Examples:

Project quality measures include:

1. Clear and readable digital images, graphics,
2. Logical and easy to understand Organization
3. Spelling, Grammar and overall quality of writing

Examples of project quantity measures include:

1. Clearly identifies the challenge, and why.
2. Quantity of information appropriate for design communication
3. Identifies the types of activities the spaces will accommodate based on user needs, as well as the tools required.
4. Three illustrated boards
5. Elaboration of information in project solution booklet

The project book and posters addressed the following information:

6. Location
7. User profile of space
8. Plumbing & electricity & overall budget

Each response used a Likert-scale measure, 1-3 (1= Unsatisfactory or Failing, 2 = Acceptable, 3 = Excellent). The total number of points were added together to form the final team score for productivity.

Approach to Data Analysis

First team profiles were constructed for each team, indicating each team's anticipated attributes based on the researchers conceptual diagram indicating a profile based on team learning style diversity as they were located on Kolb's Cycle of Learning graph (Figure 6). The individual students in the team were identified as numbers 1, 2, 3 and 4 (e.g., team member one on the Red Team is R1 and team member two on the Yellow Team is Y2).

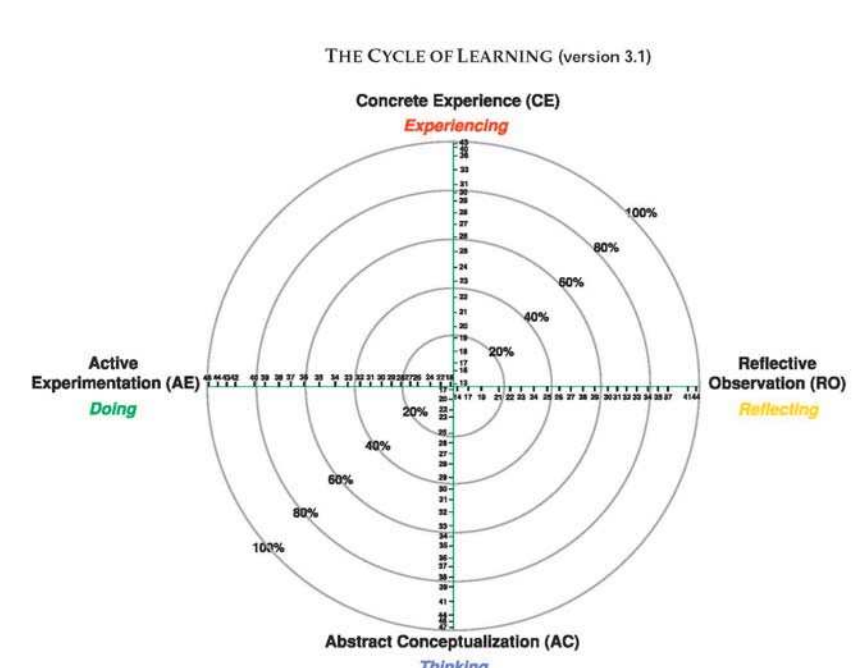


Figure 6: Kolb The Cycle of Learning Students would locate their learning style along this x-y graph.

Once student identities were coded, the qualitative data analysis of the data set began. It was comprised of survey responses ranging from one word to 2-3 sentences. Each team's survey prompt answers were compiled in one file per team; student responses were aggregated for each survey prompt. I used margin notes to identify and note themes and patterns within the data; at the same time, I familiarized myself with each team's overall experience using a thick read of all responses. I found this to be an important step in the data analysis process and used research memos to capture the big picture of the students' experiences before shifting focus to more specific themes.

Next, combined responses of all questions for each team were organized into one file, while also identifying where each of the *a-priori* themes appeared. This was helpful, leading to the development of a *block matrix* organizing important themes and keeping the objectives of the data analysis focused. The block matrix became wieldy and a more refined approach using a micro view examining specific attributes and themes to organize and understand the data. This process helped in the examination of specific relationships between separate themes and interactions of themes as experienced by the team over the duration of the project, week by week. By starting with the creation of a block matrix for each team highlighting themes, this aided in the effort to identify attributes directly related to each theme and summarize findings by theme and across themes.

Next, each theme was independently examined, doing a comparison of all teams, beginning with task conflict. The importance of taking a specific theme and comparing all teams was to analyze and establish a ranking system of teams who exhibited low, medium, and high levels of task conflict. This process of analysis was then completed for process and relationship conflict. All three types of team conflict were analyzed and ranked low to high to compare and

synthesize relationships with the primarily quantitative data variables, team diversity, creativity, and productivity outcomes.

Qualitative Value

To examine the reliability and validity of the study, qualitative measures of credibility, transferability, dependability, and conformability were addressed.

Credibility

The study utilizes persistent observation on a weekly basis, prolonged engagement over a six-week duration, multiple data sources using student demographics, reflections, and project outcomes, and member checking using advisors during data analysis and in the synthesis of outcomes to create and validate interpretations.

Transferability

Further CIDA accreditation assures a similar outcome (i.e., the entry level interior designer) in student knowledge, skills, and abilities. The study research design may have applicability in other contexts by providing thick description in the analysis to enable others to reach similar conclusions.

Dependability

The use of external evaluators in assessing design product outcomes will reinforce reliability. Additionally, tools and procedures were reviewed by experienced researchers.

Confirmability

Biases, motivations, interests, or perspectives I may have had as the researcher were addressed by process notes, instrument review, and review of data synthesis by expert researchers. In addition, my working hypothesis allows me to confirm and interpret appropriate characteristics of the data.

Visualization of Qualitative Relationships

To examine relationships among factors and the themes under investigation in this study, the analysis method enables a visual understanding of the complexities of, for example, creativity examined in relationship to productivity. The method of analysis involved defining factor levels (e.g., low, medium, high) followed by the creation of matrices for each of the relationships examined.

CHAPTER IV

RESEARCH FINDINGS

The study focuses on examining team creativity and productivity to improve an understanding of their relationship to each other and to the construct of creative productivity. Data analysis comprises three sub-sets of data: team learning style diversity, student reflections, and external juror ratings of team outcomes for creativity and productivity.

Team Learning Style Diversity

The learning style diversity in this study is reflected by surface, mid, and deep levels of learning style diversity. Each team member, after completing the KLSD instrument, located and shared their specific learning style. This information was then compiled for each of the ten teams, constructing the method by which team diversity could be described relative to the composite profile of team learning style.

Surface level diversity is measured by using student data from academic records to identify age, race, and gender. Mid-level diversity attributes were used to form the ten teams based on students' self and peer perceived strengths and skills. Profiles of deep-level learning style diversity among team members were constructed using the student data resulting from the Kolb Learning Style Inventory 3.1 (Figure 7).

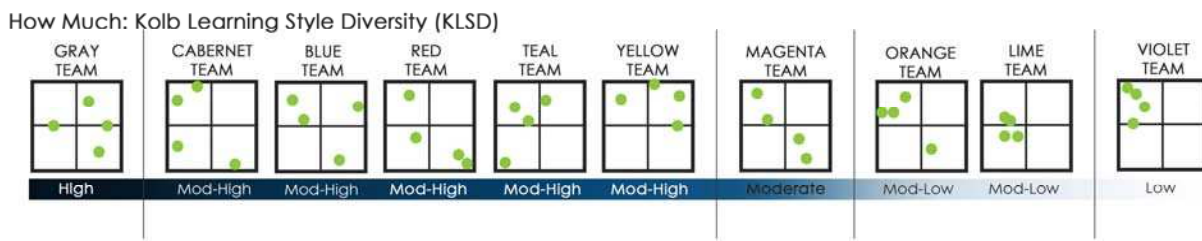


Figure 7: Learning style diversity captured by the Kolb Learning Style Inventory 3.1 (KLSD) across the ten project teams.

Each dot represents one student participant with the box representing the entirety of the team. The quadrants are representative of the four different learning style preferences. Across the 10 teams, five different typologies to describe the extent of diversity surfaced. Content analysis of each team learning style preference to contextualize iconic interpretation of placements along x-y axes resulted in the visual representation shown in Figure 8.

1. *High*: Each of 4 learning style preferences were evident;
2. *Moderate-High*: Three of 4 learning style preferences were evident;
3. *Moderate*: Bi-lateral symmetry with two different learning style preferences were evident;
4. *Moderate-Low*: One primary learning preference and one opposite; and
5. *Low*: One primary learning preference.

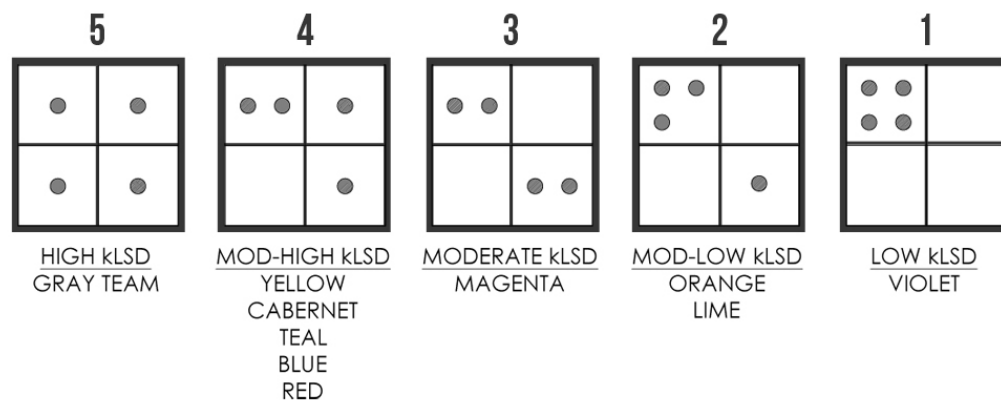


Figure 8: KLSD by team member reflecting five typologies used to describe degree of team learning preference diversity.

Team Faultlines

Faultlines may be identified in teams where members perceive strong similarities among members of the team, creating subgroups and, in turn, emphasizing perceived differences between subgroups. Faultlines can occur at all levels of diversity, with subgroups formed around age, gender, education, or even deep-level variables such as religion. In this study, seeking to

examine team conflict as a contributor to outcomes, faultlines can be a source of conflict when subgroups are more likely to team up against one another. One might anticipate at the learning style point of analysis, that the Magenta team might exhibit a faultline because two teammates are accommodators and two assimilators. However, no evidence of faultline occurrences was evident. The Magenta team members appeared congenial in their approach to decisions.

M4: Everyone got along great and we equally divided up the work.

To see the effects of faultlines and the creation of subgroups it is necessary for the team members to perceive a strong difference in learning style affecting the team in order for the subgroups to emerge.

Student Reflections

Responses to prompts emailed to all students produced reflective narrative enlightening the project processes each teams' experienced, for example, how the Magenta team described their working style:

M2: We started the book, poster, floor plan, and picking of furniture and finishes. I did the floor plan on Revit and helped pick the finishes. We all worked together.

Although students were educated on learning style preferences, many of the student teams, as a whole, perceived knowing their learning style preference had little bearing on their team experience with the exception of the Violet team, who based their project concept and solution on the fact that their team demonstrated low learning style diversity.

KLSD and Similarity Attraction Theory

The Violet team's composition, unique in reflecting the greatest homogeneity with each team member identifying with a similar learning preference, appeared to find inspiration in the

fact they were all identified as the same learning style to the extent they purposely incorporated this knowledge into their final solution (Image 1)

V2: We based our entire project off of our learning style, in this way it was incredibly helpful

V3: Our entire concept was based on the learning style so doing the quiz helped inspire our entire project

The perceptions of working together captured in comments by the Violet team confirm ideas surrounding the theory of similarity attraction - people prefer to work with others they perceive to be more like themselves, anticipating their own values, attitudes, and beliefs will be upheld (Barside et al., 2000). Acknowledging the similarity of their individual learning styles drove their excitement for the project, thus became the basis for their design concept, and increased their bond as a team.

V2: They [team mates] are amazing people and we all were incredibly collaborative in comparison to other groups we observed.

Example: Incorporation of learning style:

Learning Styles

Kolb designed a learning theory in 1974 which organizes people into four different categories of learning styles. These sections are designated based on a person's personal preference of various interactions in social environments, educational experiences, and basic cognitive development. This learning style preference is the product of interactions within the four sections, or how the individual works with other individuals in their opposite learning style. The sections are broken up into accommodating, diverging, converging, and assimilating.

Accommodating learning style is also known as doing and feeling. People with this learning style require hands-on application and rely on intuition rather than logic. They are attracted to new challenges and experiences and are efficient in carrying out plans. They however tend to rely on other learning style for analysis break down and logical information because they typically rely on gut instinct.

Diverging learning style is known as feeling and watching. These people look at things from different perspectives. They are sensitive and prefer to rather watch than do. They tend to observe and gather information and use their imagination to solve problems. Diverging people are typically good at brain storming ideas and using their creativity. They tend to work with an open mind and enjoy working in groups to work towards a solution.

Converging is also known as the doing and thinking group. They use their previous learning to solve problems and find solutions for practical issues. They prefer technical tasks and are less concerned with interpersonal interactions. Converging people are more attached to technical tasks and problems. They tend to experiment a lot and find practical applications in their learning.

Assimilating people are known to be watching and thinking. They prefer a concise, local approach to learning. They require a good clear explanation rather than practical opportunity. They are less focused on people and more focused on ideas and abstract concepts. They also enjoy logically sound theories and excel in formal learning environments with structure. Lectures, readings, exploring, analyzing, and thinking things through are the preferred methods of assimilating learners.



Only one team member from the Magenta team reflected learning style had an impact on the team's overall performance, pointing out team members' skills were found to be more valuable:

M4: It [knowledge of KLSD] helped a little bit. There weren't any issues between group members and everyone had different skills that were applied to different parts of the project.

Team Task Conflict

The analysis of task conflict examined student reflections to highlight statements indicative of struggles surrounding tasks during the process as well as lack of team opposition on task. It is challenging to differentiate between task and process conflict. In this study how to do something was identified as process (e.g., programs or tools used, when members will meet) whereas reflections centering on ideas and the way in which the team or an individual would solve a problem were considered task conflict.

Task Conflict Characterization

In order to differentiate among the degree of task conflict, an *a priori* theme, it was characterized as low, moderate low, and moderate high referencing the literature where low and high task conflict are examined. Two researchers re-read narratives attributed to positive and negative references to task conflict. After each researcher's thick read, discussion of the categorization into low, medium, and high task conflict refined understanding of characteristics defining each level.

- *Low task conflict*: similar ideas, no one opposes, and little idea exploration; team members reporting instructor significantly influencing concept and solution;
- *Moderately low task conflict*: open to ideas, everyone contributed, exploration of ideas with instructor reinforcing the shaping of their concept; and
- *Moderately high task conflict*: positive level of conflict, increased debate and critique, fully prepared concept development, formulated concrete idea to share with instructor.

None of the teams appeared to have experienced high levels of task conflict at risk of developing relationship conflict.

In some cases, team members actively avoided task conflict —possibly due to lack of skills and experience with debate and critique, discussed later, or concern over inciting relationship conflict. Some teams exhibited low task conflict due to worry about time constraints (Orange Team) while others were highly agreeable (Gray and Violet Teams). Teams with moderately high levels of task conflict (Yellow, Lime, Teal, Cabernet) exhibited greater debate and critique.

Low Task Conflict

The Red, Violet and Blue teams ranked lowest for levels of task conflict. The Violet and Blue team exhibited openness and agreeableness, while the Red team struggled with negative

attitudes and lack of team participation. All three teams had difficulty with idea generation limiting opportunities for subsequent idea synthesis.

Minimal Ideation

Three teams (Red, Violet, and Blue) struggled to develop more than one concept idea before their scheduled meeting with the professor. When asked how many ideas were explored Red team member (R2) replied, “We explored one.” The Blue team intended to employ independent ideation and mentioned creating a Pinterest board for this purpose; however, it seems they never had the time to share ideas as a team before meeting with the professor.

B3: We all were supposed to find some concept photos to drive our concept. I created a shared Pinterest board for this to happen.

B3: We also met with [the professor] this week to further develop our idea.

B2: We decided to move forward with our final concept because it highlighted a different area of the space and it was [the professor’s] favorite.

B3: ...we haven't really explored any other ideas besides our original. We thought it was very strong and [the professor] helped us develop it.

B3: After our concept meeting with [the professor], we all agreed that it would be best to start working on this project again after break where we could all focus on the project.

The phrase *supposed to* describes actions the team intended to take in developing their ideas and inspiration using a Pinterest account; however, before they could meet to go over ideas the team met with the professor and the final design concept was produced. The team decided no further concept development was necessary.

The Violet team also experienced very little ideation, yet as one of the most agreeable teams they struggled to generate ideas.

V2: ...with similar mindsets, it's hard for our group to step outside of the box.

The Violet and Red teams did not describe any individual ideation strategies, relying on team brainstorming processes primarily during scheduled class work sessions. The lack of individual ideation strategies appears to have led the team to fixate on a single design concept as a means of addressing the project criteria.

Design Synthesis

Two of three teams credited the course professor with helping them identify a design concept, whereas no mention of meeting with the professor was shared by the Red team. The development of the Red team's concept was also generated with only three of the four team member's in attendance. The final driving concept was this team's one and only idea developed; the whole team loved the solution and felt no need to pursue other ideas. Team member R4 who was not present, later confirms being confident about this concept but expresses that the team is agreeing for the sake of completing the project on time:

R4: I don't feel entirely comfortable contributing ideas because of feeling like they will agree just for the sake of finishing the project and not giving real feedback.

In addition, team member R4 confirms a low quantity of ideas presented and extremely low presence of task conflict:

R4: We haven't really discussed diverse ideas, mostly just follow along with what the other people say.

The Blue team relied on the professor to synthesize their concept ideas and the Violet team adopted a concept derived from the discussion with the professor; both teams engaged in little task conflict prior to this meeting. The Blue team brought several ideas to their meeting with the professor, indicating the final idea came through synthesis of these ideas with guidance from the professor:

B2: ...we were able to all merge our ideas and thoughts into one solid concept. This happened mostly through our meeting with the professor.

The Blue team's decision seemed to be heavily influenced by the professor's feedback:

B2: We decided to move forward with our final concept because it highlighted a different area of the space and it was [her] favorite and...

B3: we haven't really explored any other ideas besides our original. We thought it was very strong and the professor helped us develop it.

The Violet team blamed their learning style homogeneity for the trouble they are having engaging in task conflict:

V2: We are all the same learning style, and thus it's hard to develop roles as my team is fairly similar. This feeds into our indecisive and agreeing nature.

None of the team members seemed very enthusiastic about their original concept; however, all were excited about the new idea to emerge from their meeting with the professor:

V3: We explored one concept, but then the professor directed us towards another so now that is our main focus.

Little idea exploration happened after their meeting with professor despite comments from two team members who felt it important to explore ideas further:

V3: We still need to further explore our ideas.

However, due to time crunch and lack of time, the Violet team experienced a hard time making this project a priority:

V3: ...it has been hard to work around everyone's schedule to find a time to actually get together and meet.

V2: We have little time to dedicate to this project, which is a bit stressful!

The combination of little idea generation and exploration, overall team agreeableness, and lack of time resulted in minimal indications of task conflict. The literature would suggest this situation would result in low creativity (as was found to be the case with the Red and Blue teams).

Moderately Low Task Conflict

The orange team was one of three teams with low team learning style diversity; classified as such, one might have anticipated they would have greater alignment of thought and decision-making. We might have expected them to get along well with one another indicating satisfaction with the process. Discussed later, however, findings indicate evidence of process conflict leading to relationship conflict. The orange team reflected positive signs of task conflict in combination with some negative. It seems the team was open to hearing each other's ideas, however some student felt ideas were held back or dismissed for the sake of time. Toward the end of the project the orange team seemed rushed and the signs of task conflict seemed to drop out of conversation.

O1: I think it is known that all ideas are totally encouraged to be discussed because in prior discussions we are pretty consistent in reacting on each other's ideas and making sure that everyone is heard. However I think that sometimes the ideas may still be held back.

O2: Everyone is very optimistic and wants to make sure they see everything from every angle before making a concrete decision. At the same time, they want to get this project done in a timely manner so lesser ideas are politely dismissed.

Moderately High Task Conflict

Common themes among these four teams (Yellow, Teal, Cabernet, & Lime) include: participation by all members through the ideation processes, quantity of ideas contributed, openness to ideas, and high level of comfort in sharing ideas coupled with higher levels of group debate and critique.

The Yellow team exhibits more signs of task conflict than any other team in this study. They appear comfortable sharing ideas knowing their team will give constructive feedback, and are comfortable if members disagree over ideas.

Y4: "My team is very good at collaboration and open to new ideas so I feel very comfortable contributing ideas even if my team ultimately doesn't agree with

them” (Y4) and “I feel very comfortable contributing ideas to my team because they are open to new ideas and give constructive feedback on whether they feel the idea is a good one or one that won't work very well”

The Yellow team described how they struggled while framing the design problem:

Y1: “Yes, we had some complications between choosing from the makers’ space and the ideation space. The most conflict came from which one would best suit our group”.

This was an ongoing discussion that was not resolved quickly. The Yellow team also noted that their members take feedback with grace:

Y3: “I feel comfortable contributing ideas to this team because they're able to handle conflicting opinions or ideas with maturity”

This high level of maturity may be why the Yellow team exhibited more task conflict, because not only did team members share ideas, but they felt comfortable critiquing ideas, giving feedback to others without worry of invoking hurt feelings or spurring relationship conflict.

Although there is no clear relationship between KLSD and task conflict as illustrated by a visual correlational table (figure 9), there is a relationship found between team task conflict and creativity (to be discussed later).

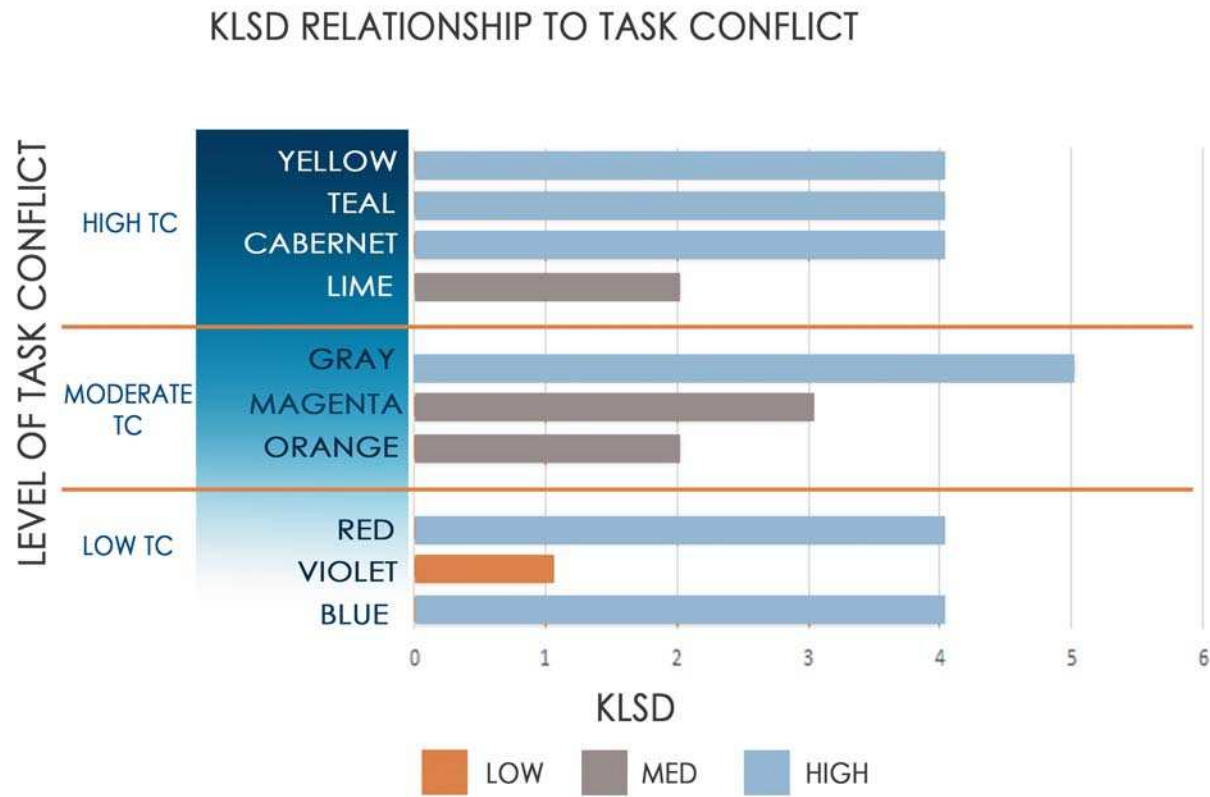


Figure 9: *Team learning style diversity relationship to level of team task conflict*

Assessment of Team Creativity

Four interior design professionals agreed to serve as external jurors. Each attended a CIDA accredited institution for an undergraduate first professional degree in interior design; one juror earned a Master's degree in interior design. Jurors differed on the types and extent of work experience after receiving their academic degrees, ranging from 2-10 years of experience in large commercial interior design and sales.

Each juror received a description of the project assignment requirements, access to PDF's of the presentation boards describing teams' challenges, their solutions, specific detail information, and project books (e.g., programmatic information on client requirements and documentation of the spaces), via Dropbox with instructions regarding how to rank product (project) creativity.

The juror form (Appendix D) allocated 1-5 points for each of seven questions for a maximum of 35 points. Three short answer questions followed:

1. What is the strength of this project? Please explain:
2. What is the weakness of this project?
3. Please provide additional comments or observations about this design project:

The juror responses to the open-ended questions helped to frame and justify their ratings.

Jurors commented on both team creativity and productivity suggesting they found it difficult to separate the two constructs in their assessment, possibly due to weak communication by the team to accurately convey the design concept, making it difficult to rate the originality of the design solutions.

Juror 4: They [Lime Team] did not give much description of why they offered up their solution. Having not seen their formal verbal presentation it was hard for me to find their concept

Juror 3's comments illustrate a lack of communication by the team impeded their ability to judge the Lime team's project for design originality when the ideas were not clearly described.

[Lime team] Did a good job describing the issue but didn't follow through on explaining design solution. While the renderings are great I don't understand what they did to solve the issue why did they choose the furniture layouts that they show? They explained that connecting spaces was key but why? What happens when they get to those spaces?

A comment by Juror 1 referring to the Violet team and their rationale for assigning the team to one of the lowest rankings for creativity focused more on design communication than creativity of ideas presented.

It would be nice for them to challenge themselves in developing alternative ways to communicate information on the poster in lieu of the longer narratives

These statements by the jurors may explain the inconsistent creativity ratings for the Lime and Violet teams suggesting jurors may have benefited from specific training concerning how to separate the creativity and productivity measures.

Juror scores were compiled with individual scores for each question on the Juror Evaluation form and provided an aggregated rating (Figure 10). Scoring among jurors varied and reflect a continuum from low to high. Average of scores among jurors (Figure 11) reflect a continuum from low to high with the Red, Gray, and Blue team product outcomes evaluated as least creative and the Teal and Cabernet team products as most creative. Ratings for the Lime and Magenta teams at the mid-point appear mixed. Jurors also reflect consistently lower scores (Juror 3) vs. higher scores (Juror 1).

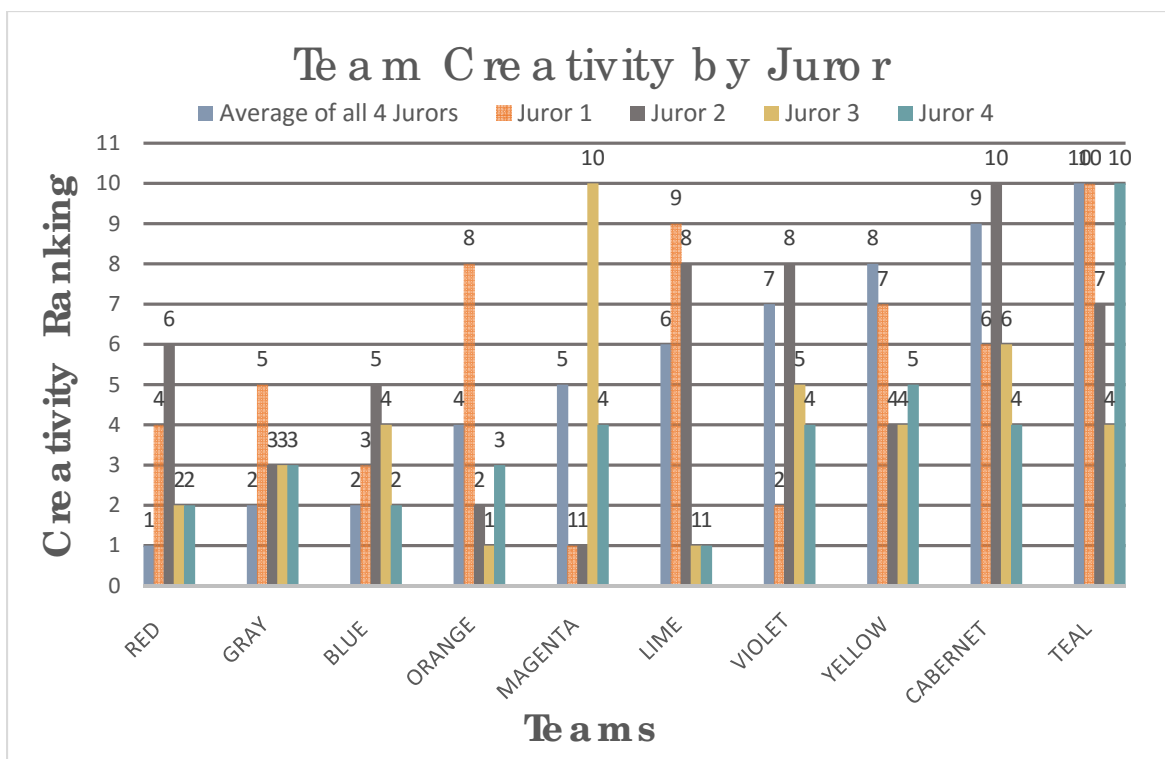


Figure 10: Team creativity ranked by aggregated ratings and by individual jurors.

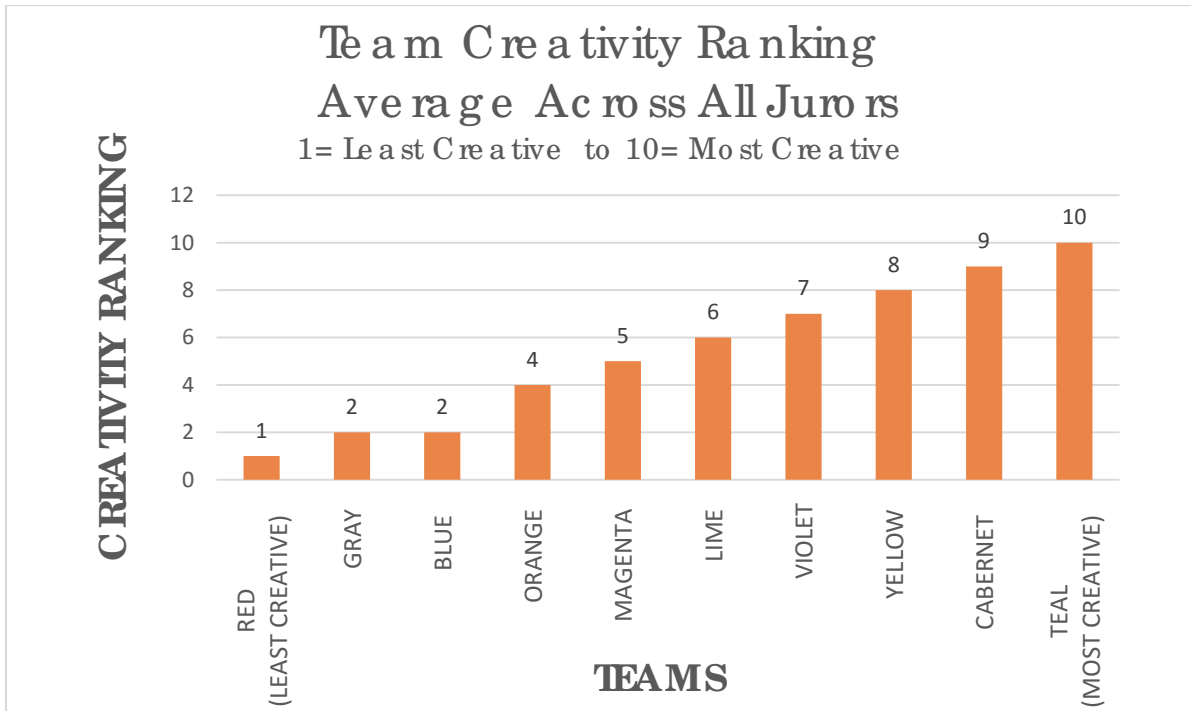


Figure 11: Aggregated ranking of team creativity by jurors. Task Conflict and Creativity

Analysis of the reflection responses suggests a relationship between task conflict and creativity as anticipated in the conceptual model. Teams with higher levels of task conflict were ranked higher for creativity than teams with lower levels of task conflict. The top three teams with highest level of creativity (Lime, Teal, and Yellow) were also the three teams that exhibited the highest levels of task conflict, with no signs of relationship conflict.



Figure 12: Task conflict in relationship to team creativity ranking 1 = least creative and 10 = most creative

The Red team ranked lowest for creativity, and signaled possible relationship conflicts due to high levels of process conflict. The Blue team ranked among the bottom three for creativity but the Violet team ranked among the top four making them the only team with low task conflict to rank in the top four for creativity. This could be due to the Violet team's homogeneity of learning style discussed earlier.

Gender Diversity

Gender diversity, a variable of surface level diversity, seems to have a positive correlation with team creativity. This class of seniors comprised primarily of females, six teams were all female and four contained one male member (Violet, Yellow, Teal, and Cabernet). The researcher noticed the top four teams for creativity each contained the one of the four males in the class. Placing the four males in different groups was not part of the study design. The ratio of males to females is very typical to see within this program. It is hard to know if these results

would be true for future studies. However in this study gender diversity and team creativity appear to have a highly positive correlation (Figure 11), whereas no clear correlation was found between deep level diversity (KLSD) and team creativity (Figure 15).

Assessment of Team Productivity

The measures for team productivity were defined using clear parameters and a non-design professional served as the evaluator. Inclusion of a non-design juror was considered after creativity jurors were challenged in separating creativity and productivity. The juror was from a discipline outside the interior design field and asked to assess accuracy and quantity of work produced by teams.

The juror was given the set of productivity criteria (Appendix F) addressing accuracy (e.g., spelling, grammar, and image quality) and quantity of work (e.g., organization, elaboration of information, and meeting the general requirements of the assignment). Each measure had a maximum of three points. The points awarded to each team were aggregated to give each team a final score (Figure 13). The lowest productivity scores were for the Orange, Gray, Red and Cabernet teams (22 - 24.5/33 points). Teams assessed as moderate for the productivity measures included the Blue, Violet, Yellow, and Magenta teams scoring between 25 and 27.5 out of 33 possible points. Since all teams except for one (Red Team) omitted assignment information regarding budget parameters, it was deemed unlikely any other teams could receive the full 33 points. Although budget and other building requirements were requested in the assignment, it also appears teams ignored this part of the assignment, therefore all teams were treated equally on this measure receiving 0 points. One quantity measure was eliminated (overall budget) because only one team addressed this requirement.

The Magenta and Lime teams ranked highest on the productivity measures (28 and 30.5/33 points, respectively), primarily due to clear organization of their design solution and adequate elaboration of their design solution. Comments by the productivity juror indicated acknowledgement of their simple yet clear response to the design problem.

Description of present building is great. Excellent use of circles to show problems and existing spaces. Vertical integration – good graphics. Showed problem and design answer.

The Magenta team was acknowledged for their clear organization of the information presented.

The quantity of information presented was also characterized as precise and understandable.

The problem graphic was excellent and showed the areas for a solution. They did not overthink the presentation of the poster. It was succinct and to the point. I didn't have to read a bunch of verbiage to get to the design. They were commissioned to state the problem and solve it. They did that.

The Orange team ranked lower primarily due to quality issues in written communication, scoring 1.5 out of 3 points; elaboration of design theory was distracting to the design solution to the juror in addition to the choice of graphics illustration using triangles.

Too much theory. Too much diamond design, takes space and has no function. I don't get the concept of the triangle. Lots of wasted space with designs and for what purpose?

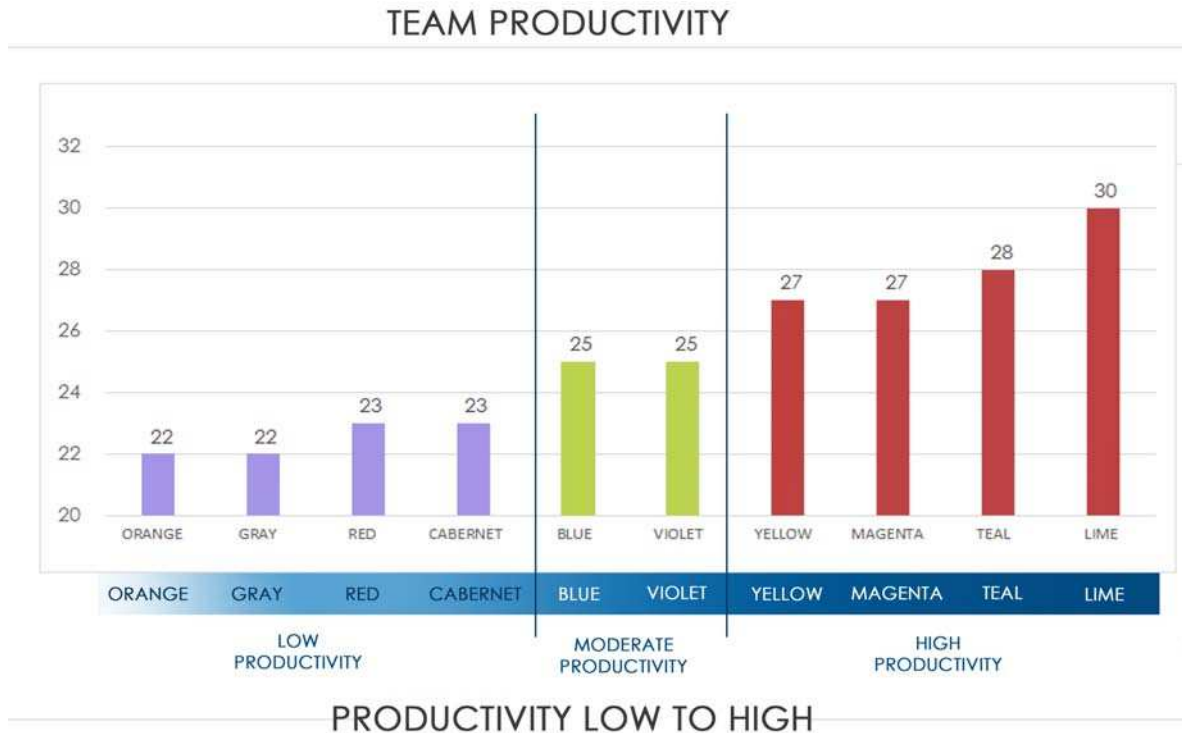


Figure 13: Team productivity ranking by the external juror

The Violet team's homogeneity appeared to have a positive effect on team productivity, ranking higher than anticipated given their low diversity.

Surface Level Diversity Related to Creativity and Productivity

In this study, teams with gender diversity (Violet, Yellow, Teal, and Cabernet) were rated higher for creativity than teams demonstrating gender homogeneity. During the team formation process, based on students' knowledge, skills and abilities, each male student ended up on a separate team and the four teams who ranked the highest in creativity each had one male on their team. Previous researchers have found higher levels of gender diversity to have a positive influence on creativity (Hoffman & Maier, 1961); the study findings support Hoffman and Maier's findings.

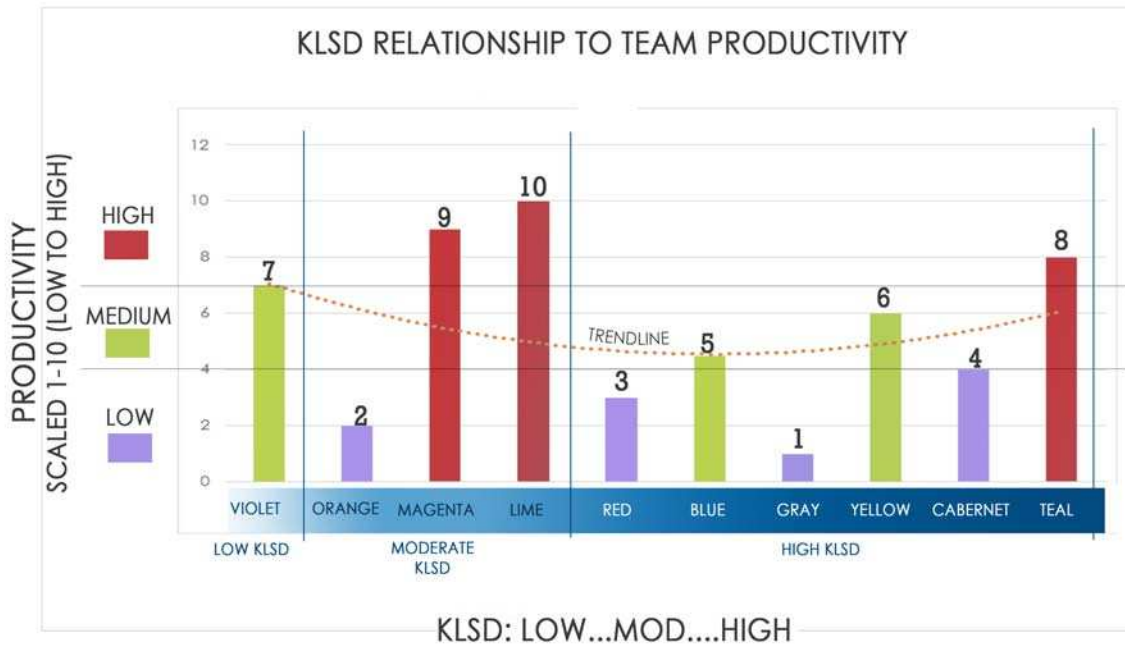


Figure 14: Team learning style diversity related to team productivity outcomes.

Deep-Level Diversity's Relationship to Creativity and Productivity

Deep-level diversity factors influencing team performance can be difficult to identify and measure. Research findings often point to a need to find new methods for measuring and testing variables of deep-level diversity to accurately explain their impact on team performance. I anticipated high levels of learning style diversity would increase team performance for both productivity and creativity. However, analysis of the data reveals no clear relationship between learning style diversity and teams' overall creative performance. The most diverse teams ranked both in the top three for creativity and bottom three for creativity. Of the six teams with high levels of learning style diversity, only two of these teams were rated with high levels of productivity (see Figure 15).

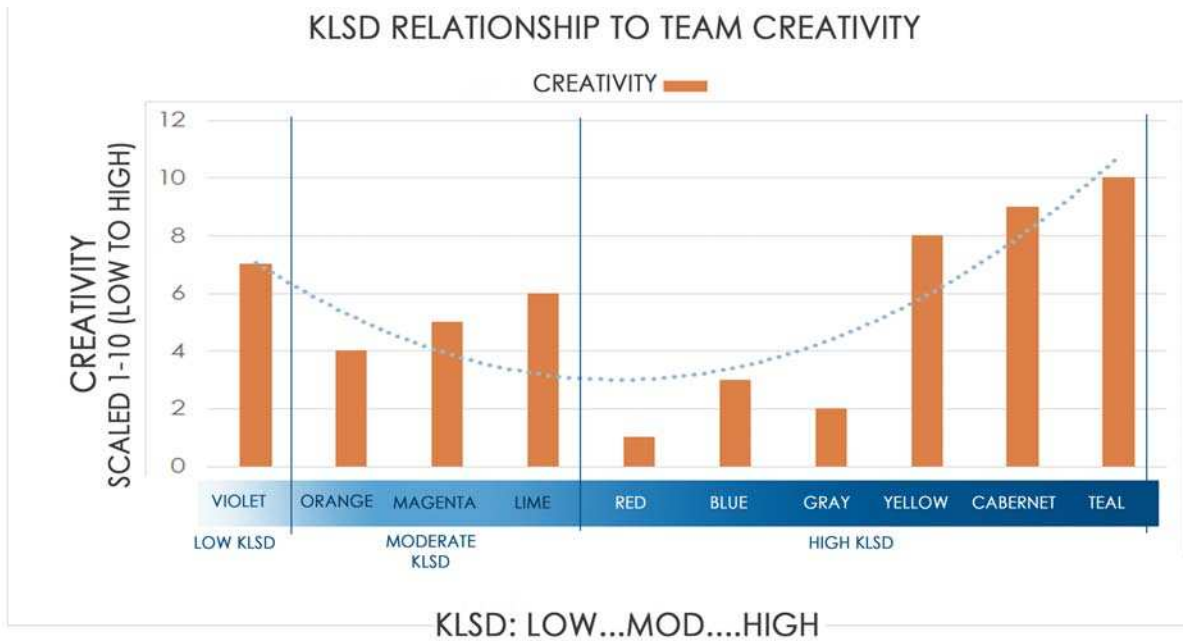


Figure 15: Team learning style diversity relationship to team creativity outcomes.

Relationship of Team Creativity to Productivity

Findings from previous studies suggest teams with higher creativity will demonstrate less productivity (De Dreu, 2006). However, results from this study did not support an inverse relationship; except for the Violet team, those teams reflecting greater creativity (Teal, Yellow, Violet, Lime) are also the more productive teams. Teams who rated higher for productivity were seemingly better at visually and verbally communicating their design solution through the use of clear graphics related to succinct verbal explanation. However, not all of the most creative teams were the most productive (e.g., Cabernet team) with the relationship between creativity and productivity weakly linked.

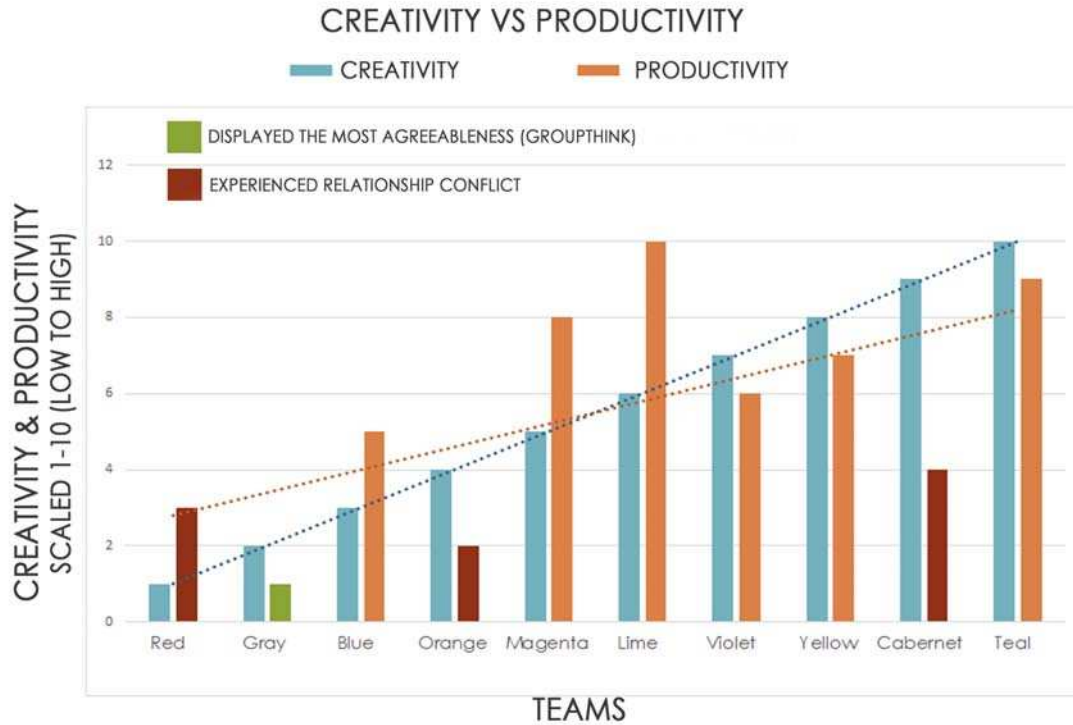


Figure 16: Team creativity relationship to team productivity.

Findings from the creativity analysis illustrate a division between high and low creativity in teams with an inconsistent creativity rating found for teams placed in the middle of the continuum. Discrepancies between juror's ratings, most notable for the Lime and Magenta teams, raise questions regarding juror inter-reliability, the process used for measuring creativity, and the student's skills for communicating their design solution effectively. Juror three, who ranked Magenta as the most creative team, also made comments referencing measures of productivity which could have affected creativity scores. This would not be surprising since the Magenta team was ranked third for team productivity and serves as an example of how it can be difficult to separate the two measures. Despite this variance, the averages across jurors were not greatly affected where the top and bottom ranked teams were clearly identified.

Creativity and Task Conflict

In general, teams that engaged in individual ideation strategies and spent more time in the ideation phase had higher levels of task conflict and ranked higher for creativity. The four teams ranked with the moderately-high levels of task conflict (Lime, Cabernet, Teal, Yellow) were open to hearing ideas, comfortable sharing, generated ideas independently and with their team, experienced longer periods of idea exploration, exhibited the highest levels of idea feedback and critique and ranked high for creativity. Teams with moderately-low task conflict (Orange, Magenta, and Gray) were also open to hearing others ideas, but experienced less debate and critique of ideas due to positivity and anxiety over time constraints, ranking these teams among the lower half for creativity. The three teams who experienced low task conflict (Blue, Violet, Red) all exhibited very little idea exploration and little team feedback or critique with Red and Blue rated the lowest in creativity, whereas the Violet team ranked in the top four. Student comments among the moderately-low and low task conflict teams suggest they feel overly supportive of their teammates and possibly may lack the skills or experience needed to engage in productive task conflict. Variation in the creative outcomes for the Gray team (who ranked lower than the other moderately-low task conflict teams) and Violet team (who ranked higher than the other low task conflict teams) may be due to other factors such as differences in skills and abilities and/or instructor assistance.

Self-Awareness and Task Conflict

The first week of student survey prompts included questions regarding students' individual self-awareness (Table 1). The results were interesting, finding that students believe themselves very aware of their own actions and how they affect others.

Table 1. Individual and Team Self-Awareness

| QUESTIONS Rank on a scale of 1-6 | | Average of all students |
|-------------------------------------|---|----------------------------|
| 1 | I am aware of how my words affect people around me | 5.25/6 |
| 2 | I listen to my classmates ideas and opinions without jumping to conclusions | 4.75/6 |
| 3 | I can receive constructive feedback without becoming defensive | 5.0/6 |
| 4 | I am aware of my tone of voice and body language when collaborating with other people. | 5.0/6 |
| 5 | I am aware when I am having negative emotions, and I don't let the negativity affect the people around me | 4.5/6 |
| 6 | I am very open to hearing and incorporating others ideas and opinions | 5.0/6 |
| 7 | I will keep my ideas & opinions to myself if I know my team will disagree | 3.4/6 |
| 8 | I am aware people will have different ways of approaching learning than I do | 5.25/6 |
| 9 | I believe I can learn new things from my classmates when working together | 5.25/6 |
| 10 | I am respectful of others point of view even when I disagree | 5.0/6 |
| 11 | I am honest about my feelings and thoughts and communicate them to my team openly | 4.5/6 |
| 12 | I actively listen to people when they are talking | 5/6 |
| 13 | I am open to hearing criticism of my ideas/opinions | 5/6 |

Most interesting, however, is the contrast between question 7 and Questions 2,6,10 and 13.

Q7: I will keep my ideas & opinions to myself if I know my team will disagree

▪ ***Average response 3.4/6 somewhat disagree***

Eighteen students answered with disagree while the other 22 answered with agree. More than half the class is more likely to keep their opinions to themselves if they know their team will disagree. However, this is interesting because almost all the students in the class are willing to hear criticism. Questions 2, 6, 10, and 13 demonstrate this contrast in thought.

Q2: I listen to my classmate's ideas and opinions without jumping to conclusions
▪ ***Average response 4.75/6 somewhat agree to agree***

Q6: I am very open to hearing and incorporating others ideas and opinions
▪ ***Average student response 5/6 Agree***

Q10: I am respectful of others point of view even when I disagree
▪ ***Average student response 5/6 Agree***

Q13: I am open to hearing criticism of my ideas/opinions
▪ ***Average student response 5/6 Agree***

Not a single student answered any of the above four questions with a response of less than “somewhat agree”. Although most of the students are unlikely to speak up when they know their team will disagree (according to responses collected for question 7), in contrast they are more likely to be open and respectful of others ideas when they disagree and open to discussion and criticism of their own ideas as opposed to others. The conclusion may be that the students seem to prefer the criticism of their own ideas, but they do not seem apt to deliver constructive criticism to others ideas.

Process Conflict and Team Productivity

As anticipated in the conceptual model, findings suggest a relationship between process conflict and overall team productivity. Teams were organized according to process conflict categories of low, moderate, and high.

- *Low process conflict:* Teams describing little time spent planning and organizing assignment tasks and workloads;
- *Moderate process conflict:* Teams who mentioned the assigning of task, but with little debate or discussion; and
- *High process conflict:* Teams who described discussing different ways to achieve the final outcome, or took issue with how others were approaching the design process.

The three teams with the highest levels of process conflict (Red, Orange and Cabernet) demonstrated the lowest measures for productivity. Teams with low and moderate levels of process conflict (Red, Yellow, Lime, Blue, Magenta, Violet, and Teal) experienced higher levels

of overall team productivity with the exception of the Gray team, which experienced levels of productivity in line with the high process conflict teams.

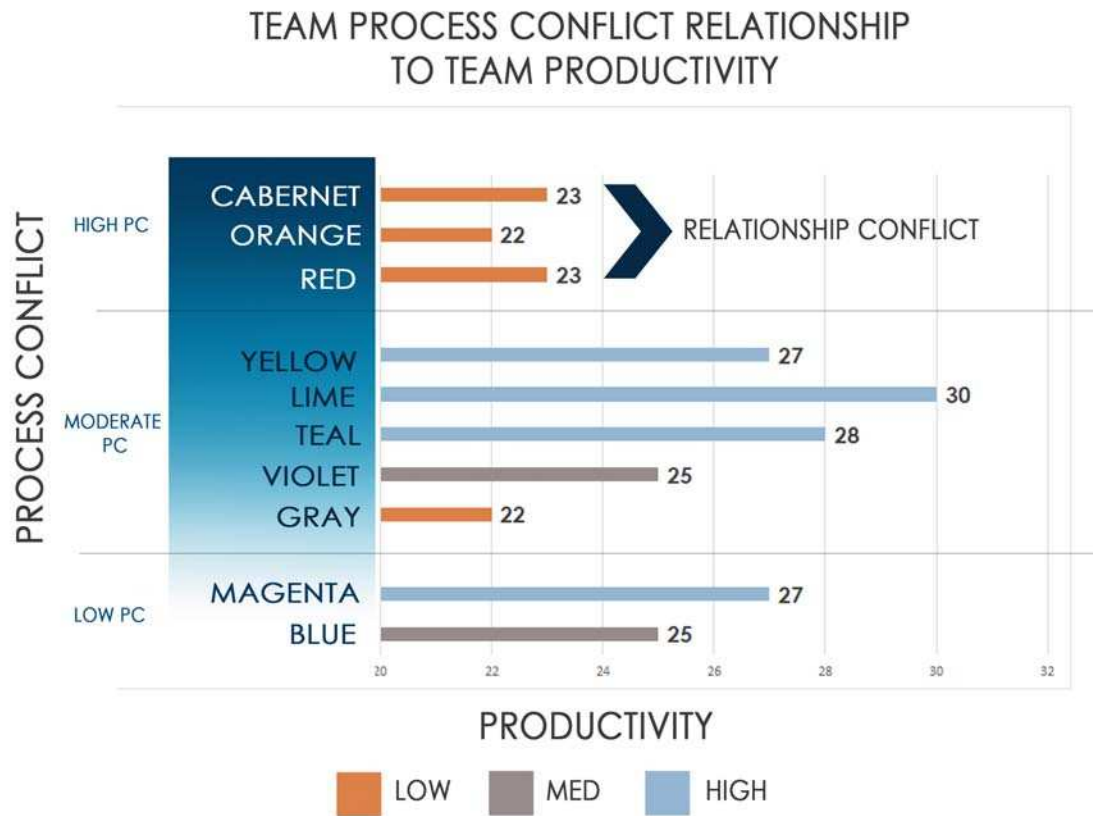


Figure 17: *Process conflict and its relationship to team productivity*

Teams with high process conflict showed signs of relationship conflict, which negatively impacted overall team productivity. Relationship conflict questions were included in the last four surveys prompting students to share any disagreements or frustrations as they experienced them through the project.

Example: Relationship conflict question

Have you been part of any disagreement(s) of heightened emotions either project related or NOT project related? What were the argument(s) about? Is the context(s) of the argument ongoing? What team members have been involved?

In most instances students answered “No” to this question or responded with a positive comment. It seems none of the students had outright arguments with their teams, however there were comments suggesting unresolved issues and growing frustration through the project timeline, sometimes culminating in a comment such as the one below:

O2: While I appreciate the A that our group received on this project, I believe it was completely undeserved. The model was terrible and the posters were haphazardly cut as a result of my group ditching me to have the books bound. While I do appreciate the grade, I believe this major needs to be more realistic to students throughout their years at CSU. No matter how much talent or charisma you possess (sic), if the work is not done in a professional and timely manner by all people claiming the work to be their own then you won't have much success in this or any field. The fact that we're still having these problems now tells me that this was never communicated to these students earlier in their college careers.

Comments by O2 are directed toward members of the team, however they were never shared with the team. Relationship conflict described by the Red, Orange and Cabernet teams appeared to stem directly from process conflict issues and negatively impacted both quality and quantity of work.

The Red team's struggle came from communication issues with regard to delegating work and resulted in duplication of work. Lack of communication led to high levels of frustration among the Red team members.

R3: Another team member never came to work on any of the project with us, so that was also a bit frustrating because she did a part of the project without telling any of us, so we unknowingly redid it.

The Orange and Cabernet team also struggled with unresolved issues stemming from process conflict driven by concern for quality of work and craftsmanship issues. In both teams, the concerned team members failed to speak up. In the case of the Orange team, avoiding speaking up only made matters worse. O2 and O3 were very concerned with the level of quality craftsmanship team member O4 was putting into the making of the physical model.

O2: My concern is that the model will not be done because of the individual responsible for that portion of the project. Despite having started the model for her, I am afraid she will put off her responsibilities til the last minute resulting in a poor product.

O2 thought instead of confronting O4 she would just do part of her work for her, and then was even more frustrated with the final product. O2 was unaware that her work was incorrect, leaving more work to be done by O4 with even less time left.

O4: My challenge came from another team member starting the model, and it not being to scale and figuring out how to adjust to the work already done.

In the end the Orange team ran short on time working to finish both the posters and project book up until the very last minute.

O2: The biggest challenge was the last push. Even though I had asked my group members if they needed any help throughout the end of the project, no one said they needed help until the hour before it was due. Within that hour I had to print off our posters, buy foam core for the posters, mount and trim our boards, pay for our books to be bound, and burn all of our information onto cd's. I was also chastised for not helping finish the model even though our model maker didn't start until midnight the night before the project was due and I had already made the exterior walls for her. In the end, I would say people taking responsibility for their actions and completing tasks on time was the hardest part for this group.

The Cabernet team found themselves working up to the last minute putting pieces of their project together due to their poor time management and allocation of responsibilities. The Cabernet team almost missed the deadline arriving late to the final presentations when C2 noticed multiple errors on both the presentation posters and program book and immediately fixed these before officially submitting the project for a grade. C2 was upset and embarrassed by these errors, and when one teammate laughed at the mistakes, this enraged C2 further.

C2: All would have been ok if the proofreading was done (it has since been corrected by me and rebound) but the posters not being complete on time really REALLY ticks me off. If we had actually presented to the city (as planned), I would have been mortified to have my team show up late. On top of which, we were posterless so what if she started with our team?!?!?! Honestly, I'm still furious about this, especially when the person that procrastinated just laughed it off. This is why I showed up 4 hours early to help, and finish my part of the

model. However, nothing was said about the posters not being done. Of course people SHOULD pull their own weight, but ultimately, I want an A so I'll pick up the pieces to ensure that happens--same with all the other group projects. I'm really getting tired of having to do that. Thank God we have no more group projects!!!! At this point, I really hate them.

All three of the teams Red, Orange, and Cabernet who experienced high process conflict appeared to have also suffered from relationship conflict, which negatively impacted team productivity.

The seven other teams who were ranked with low to moderate levels of process conflict (Gray, Red, Yellow, Lime, Blue, Magenta, Violet, Teal), were found to have moderate to high levels of productivity, with the exception of the Gray team. As anticipated, moderate to low levels of process conflict were more beneficial to team productivity than were high levels of process conflict. An example of moderately high process conflict included teams who identified issues with how work was being done but were resolved quickly by addressing the topic.

L4: there were some issues with perspectives in the renderings that another teammate and I thought needed to be altered so we said that we could help fix it, but another group member was worried that would hurt the student's feelings that did the work in the first place and said we shouldn't alter the original work without telling them. So we said we wanted to fix some things and that was resolved.

Moderate process conflict was identified primarily by the number of times team members addressed the topic of distributing the work and conversations of when and how work would be accomplished.

V4: When we have meetings in class we discuss what we should work on, where we should be and plan when we can meet.

M4: We divided up each section to work on. We communicate and ask each other for their opinion/approval on our section if need be.

The Gray team had low levels of process conflict and low overall team productivity; they did not appear to have experienced relationship conflict. Other factors may account for this

team's lower rates of productivity, such as avoiding conflict and team members being too "nice," unwillingness to speak up. In survey five, the teams were asked how satisfied they were with the final outcome and team member G2 replied "Very Dissatisfied." However, G2 did not show any signs of being displeased with the team and at the end stated

R2: everyone is creative and friendly" (R2) and "no [challenges]. we went very smoothly

Overall, the findings in this study for process conflict aligned with expected outcomes for team productivity. The teams in this study with the highest levels of process conflict all measured with lower levels of team productivity and experienced relationship conflict induced by process conflict. These teams contained members who were more concerned with the quality of work done by their teammates, and in other instances had poor planning which lead to running out of time. Teams in this study who measured with medium to low levels of process conflict generally ranked higher in team productivity. Process conflict is a variable of team functioning; it is necessary to experience some process conflict in order to achieve high levels of project quality as well as timely outputs. Process conflict (low to moderate levels) aided the majority of the teams in achieving a higher quality of work and quantity of work produced.

CHAPTER V

DISCUSSION AND FUTURE RESEARCH

This research project explores how student style learning style preference relates to team conflict and seeks to understand how this relationship influences the team's ability to be both creative and produce quality products. Data collected during the study were analyzed using a visual approach to content analysis characterizing the preferred learning style, design process narratives, and subsequently comparing these findings with the ratings of creativity developed by the external jurors. Quantitative values were assigned to enable correlational comparisons.

Examination of Research Questions

The study findings examine the components and relationships identified in the conceptual model (Figure 6). Six research questions guided the investigation with findings as follows:

RQ1: How does team learning style diversity relate to team conflict (task, process, and/or relationship)?

- Learning style diversity was not found to have a relationship to task conflict.
- Learning style diversity was not found to have a relationship to process conflict.

RQ2: How does task conflict relate to team creativity or team productivity?

- Task conflict was found to have a positive relationship to team creativity.
- Team task conflict was not found to have a direct relationship to team productivity.

Task conflict did have a positive relationship to team creative outcomes.

Figure 18 illustrates the findings for this study as they relate to team task conflict and overall creativity. Teams with higher levels of task conflict generally ranked higher for creativity than teams with low task conflict. Even though the level of task conflict the students experienced

never escalated to relationship conflict, due to overall lower levels of task conflict, Figure 18 includes the line of relationship conflict based on findings from previous studies.

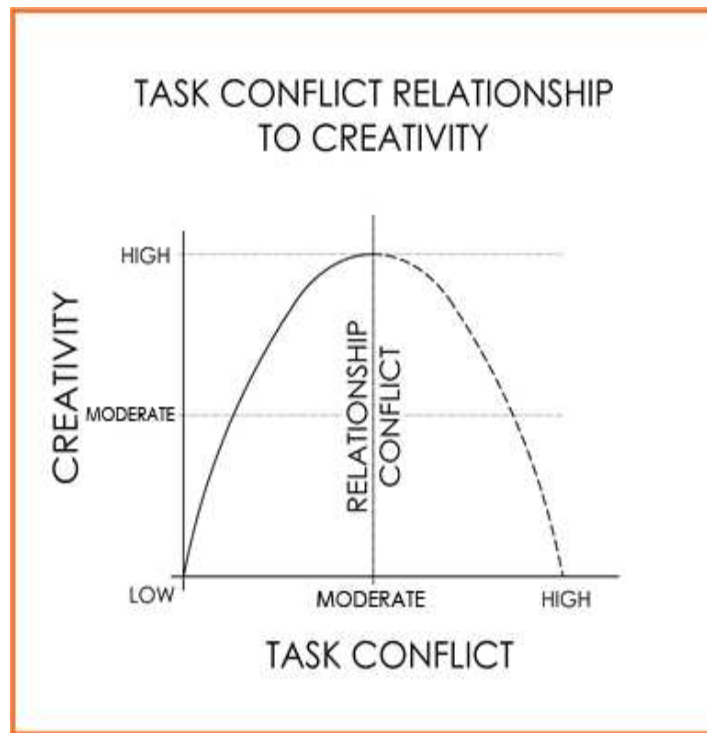


Figure 18: Findings for team task conflict relationship to team creativity indicate an inverse relationship

RQ3: How does team process conflict relate to team creativity or team productivity?

- No relationship was identified among team process conflict and team creativity.
- Process conflict was found to have a positive relationship to team productivity when found in teams with low to moderate levels of process conflict. Whereas process conflict found at high levels resulted in relationship conflict, which negatively impacted team productivity.

Teams with high levels of learning style diversity demonstrated little relationship to process conflict; however, (Figure 16) a positive relationship between team process conflict and team productivity was found. Process conflict was found to have stronger correlation with team productivity than team creativity. Teams with moderate to low process conflict had higher levels

of team productivity, whereas teams with high process conflict generally had lower productivity and experienced issues of relationship conflict. Generally the teams with low productivity experienced relationship conflict due to high process conflict. The presence of high process conflict leading to relationship conflict is thought to be a result of the homogeneity of mid-level diversity, due to participants following the same program of study, thus bringing similar levels of KSA in the area of interior design.

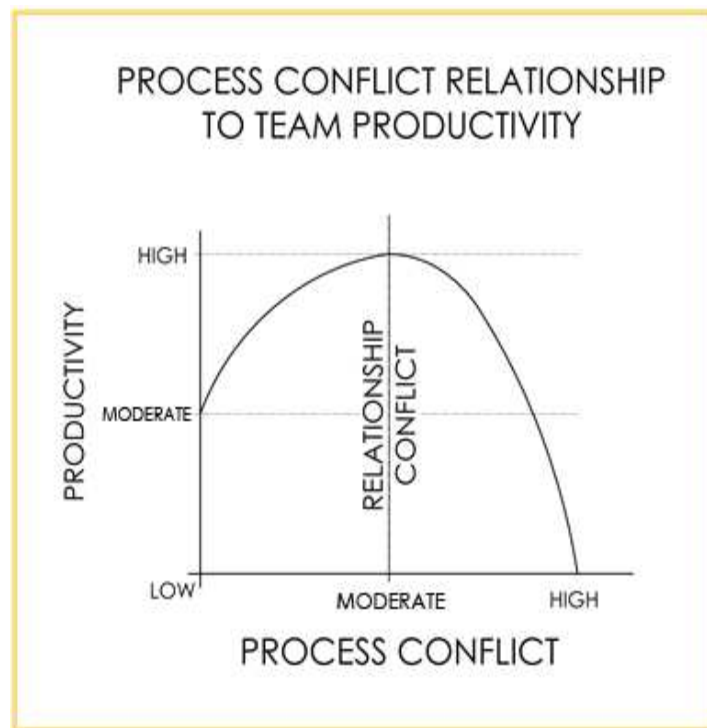


Figure 19: Team process conflict's inverse relationship to team productivity.

RQ4: How does team learning style diversity influence team creative productivity?

Findings as they relate to RQ4 are not supported, as Figure 20 illustrates the findings for KLSD do not show any significant relationship to team creative productivity. However, in general, as team creativity rises so does team productivity.

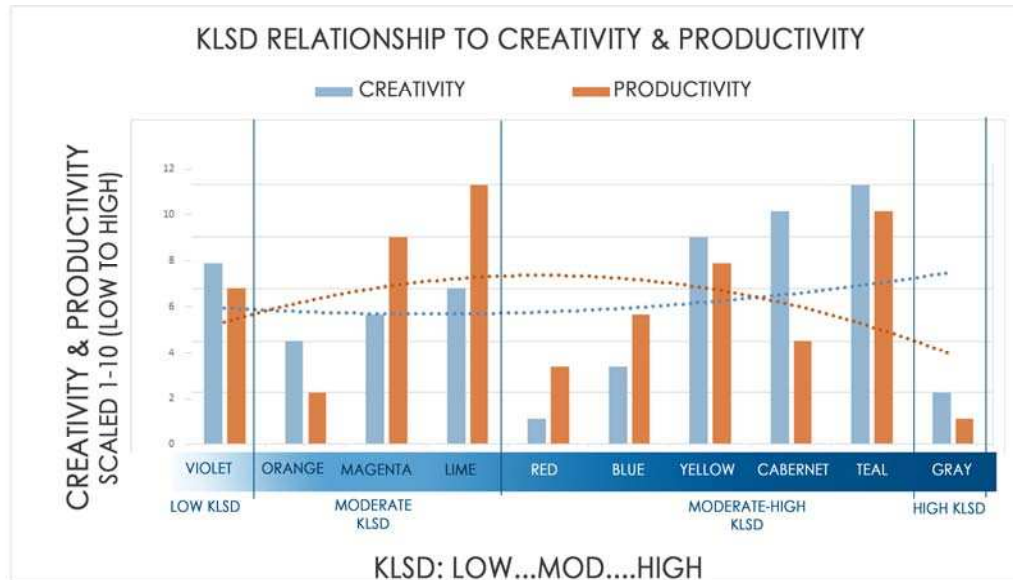


Figure 20: Findings KLSD relationship to team creative productivity

RQ 5: How does individual self-awareness influence team conflict (task, process, and/or relationship)?

Partially supported: many students who were highly aware of their actions or contributions affecting others were found less likely to participate in debate and critique. In many cases this lack of speaking up was due to a fear of inserting a contrasting thought or idea that may not be considered positive or helpful or be considered a good idea. This is not to say, however, that students who were unaware were also found more likely to participate in debate and critique.

Figure 21 illustrates the relationship of student self-awareness as it relates to creative outcomes, reflecting findings that partially support RQ5. The most significant relationship between task conflict and student self-awareness were with teams who exhibited higher levels of task conflict, leading to a higher ranking for creativity. Thus, students who were more comfortable with debate and critique were able to produce higher levels of creative insight. However, the teams who were highly self-aware were often afraid to participate in healthy

debate and critique, thus leaving a negative impact on the team's overall creativity. Although there was not a significant relationship found between task conflict and team productivity, it was found that generally team productivity increased with team creativity, provided relationship conflict was avoided. This suggests that by providing students with methods and tools for positive debate and critique, we may be able to increase the level of creative productivity a team is able to achieve.

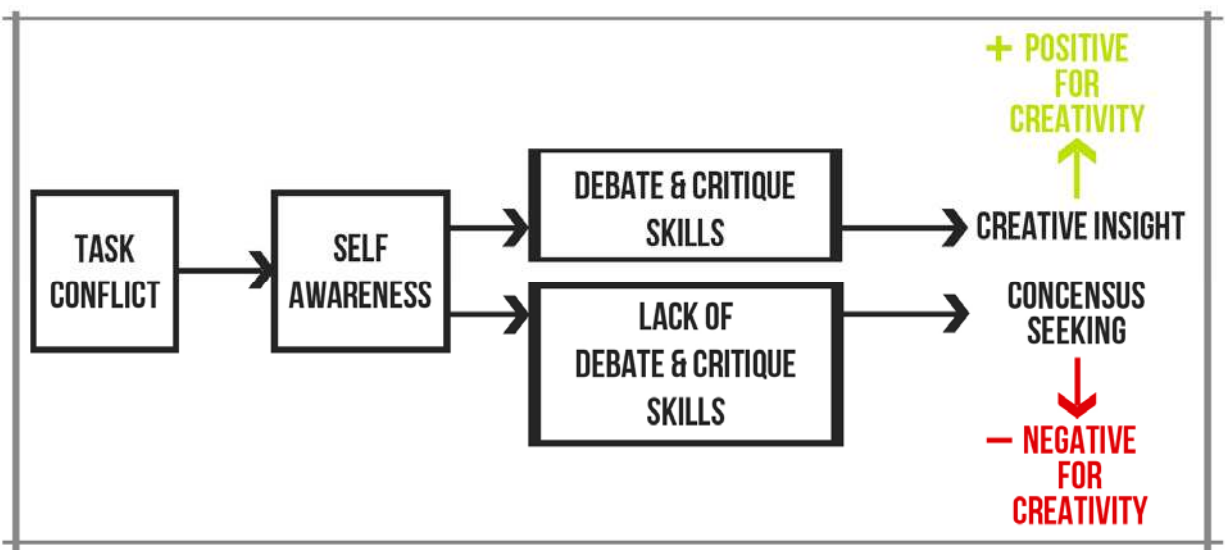


Figure 21: Findings of task conflict moderated by self-awareness lead to creative outputs.

RQ6: How does individual self-awareness influence team creative productivity?

The measures developed to examine this research questions were inconclusive.

Study Limitations

The context within which this study takes place manifests limitations imbedded in the use of a convenience sample, and other unique characteristics of the sample and team compositions.

Student Familiarity

These students are shaped as a cohort once accepted into the program at the end of their first year of foundational design studies; the majority of fourth year students have spent all four

years in the same classes for the major, learning together. This program structure is similar to other CIDA accredited programs with a sequential pattern of knowledge acquisition. Students participate in team learning 50% of the time throughout the program of study². Students expressed strong familiarity with classmates' abilities, strengths, and weaknesses. The extent to which this knowledge might influence their team experience remains unknown. This strong familiarity may benefit team processes, shortening the time it takes most teams to get to know each other before higher levels of performance are achieved. This familiarity may also have limited the teams' performance based on preconceived notions of what team members think of teammates' capabilities causing social loafing or lower standards of performance. And finally, it is possible there is unknown baggage from previous team experiences unknowingly impacting study findings.

Baseline Creativity Test

Although the field of interior design promotes creative problem solving and processes, not all students demonstrate the same level of critical thinking. Measuring the creative product of the team was one of the primary outcomes examined as part of this study, however, the extent to which individual creativity might affect group creativity is unknown. It is possible teams whose products were rated higher in creativity may have had individual team members with higher baseline creativity. In the future, administering a baseline creativity test to establish individual creativity levels can examine correlations among teams with high creativity ratings and the participation of creative thinkers on the team.

² According to data collected from two [d] lab post-occupancy surveys submitted for the Environmental Design Research Association (EDRA) Certificate of Research Excellence (CORE).

Juror Inter-Reliability

Jurors were selected based on their educational background and interior design practice experience. However, significant discrepancies among jurors' perceptions were identified through review of their evaluation comments. In addition Jurors during project evaluations may have allowed questions surrounding quality of work (productivity) to influence their perception and assessment of creativity, leaving the researcher unsure of jurors' ability to separate measures of creativity from productivity. In retrospect, selection criteria for jurors might have considered different criterion for juror selections. Perhaps knowledge of teaching and learning or an understanding of theories surrounding creativity might have solidified the constructs of creativity and productivity when applied to project outcomes. Providing specific juror training and education about differences for creativity and productivity measures may have produced different outcomes. Greater consistency between jurors might also aid in higher inter-juror reliability thus increasing the reliability of the overall creativity ratings used in this study.

Discussion

Four collateral issues surfaced as plausible areas in which future research may add to the body of knowledge surrounding team performance: the impact of bimodal learners, time pressure impact on creative performance, the role of debate and critique in creative outcomes, and the impact of groupthink.

Bimodal Learning Style Preference

A large number of students demonstrated bimodal learning styles. The Kolb Learning Style Inventory (LSI 3.1) represents learning styles using four quadrants along an x-y continuum; when a score falls on the axis line between two quadrants, this occurrence is referred to as a bimodal learning preference; two learning styles may be equally evident in the individual. A

bimodal learning preference was assigned to students scoring on the axis line or within one point of the line. Bimodal learning style preferences comprised 27.5% of the participants defined as a student's measures located on the line separating two learning styles or within one point of the x-y axis line. The high percentage of bimodal learning preferences was unanticipated.

Table 2. Kolb Learning Style Preference of Interior Design Students (N = 40)

| KO LB' S FO UR MAJO R LEARNING STYLE PREFERENC ES | | | |
|---|---------------------------------|----------------------------------|---------------|
| DIVERG ENT | ASSIMILATO R | C ONVERG ENT | ACCOMMODATING |
| 3 | 8 | 4 | 14 |
| 7.50% | 20% | 10% | 35% |
| BIMODAL LEARNING STYLES | | | |
| ACCOMMODATING & C ONVERG ENT | DIVERG ENT & ASSIMILATING | DIVERG ENT & ACCOMMODATING | |
| 7 | 2 | 2 | |
| 27.50% | | | |

For many teams, the level of team diversity was recorded higher due to the presence of bimodal learning preferences. In the Gray team, two of four members reflected a bimodal learning preference with one team member connected to two of four learning preferences and the three other team members connecting to the remaining two learning styles. The Gray team is the only team to represent the highest level of Kolb's characterization of learning style diversity. The presence of this bimodal effect might be specifically evident in applied professions, in this study, interior design. Occurrences of bimodal learning styles have not been a focus in prior studies (Jules, 2007; Kyprianidou et al., 2012), thus implications about this occurrence deserve future

empirical attention. Although a different learning style inventory was referenced, in the study by Watson and Thompson (2001) encompassing 147 undergraduate interior design students from an accredited interior design program (i.e., CIDA) in southwest United States (including Colorado), 49% of students evidenced a bimodal learning style.

Time Pressure and Creative Performance

Did time pressures experienced during the project assignment impact the level of creativity or productivity in the project outcomes? The Inverted U model (Yerkes & Dodson, 1908) identified a relationship between pressure and performance with peak performance achieved when individuals experience moderate levels of pressure. A majority of teams identified concern about the time frame of the project. With too much or too little pressure, observed as teams delayed starting the project, peak effectiveness was not evidenced until near the project deadline; demands of other courses and external work commitments created complex time demands for team members, constructing barriers to team meetings and creating a perception among teams that the allotted time frame challenged their performance. As fourth year students preparing to graduate the following spring, the researcher, and instructor, assumed teams and individuals understood the production of quality in their outcomes requires planning and time management. Teams appeared to procrastinate until an interim deadline loomed close; at the midpoint of the project, few teams had produced evidence of work outcomes progressing toward the team goal.

Time Spent In Ideation and Creative Outcomes

Teams dedicating more than 50% of the overall project time to ideation and participating in individual ideation as well as group ideation received higher rankings for creativity of their outcome products.

Teams dedicating ideation tasks outside of the class-held team meetings utilized a larger percentage of the overall project time to ideate overall. These teams narrowed down their ideas, were opposed to immediately settling on one idea without other explorations. These teams relied less on the instructor in the development of their teams' concept (the "answer") and were generally more creative overall, possibly due to their expanded investigations and thinking. Teams allocating less than a third of the overall project time to ideation were observed to primarily participate in group ideation, relying more heavily on the instructor to stimulate development of their team concept and generally received ratings of the bottom five projects related to team creativity. These team members were also observed to take time away from the project between weeks three and four during a university break in the semester; once feeling their concept had been approved by the instructor no further ideation was pursued leading to the commencement of design development after this break.

Critical Thinking and Creativity

Debate and critique skills allow students to participate in critical thinking and evaluation; the study anticipated student team members would critically evaluate alternatives, agreed-upon solutions, or approaches to the presentation of their work. However, debate and critique activities were minimally evidenced in student reflections potentially suggesting a lack of experience or awareness of these skills. The literature and study outcomes support the idea that teams evidencing higher levels of task conflict positively correlate with creative outcomes. Although the study revealed teams engaging in conflict of opinion, team reflections indicated the importance of agreeing with other teammates' ideas similar to their own. "Children are taught to never disagree with their parents, police officers and other figures of authority, and in many schools, students are taught not to never disagree with their teachers" (Johnson, 2015, p. 22).

Johnson's theory of Constructive Controversy proposes cooperation and conflict are necessary to enhance creativity and high-quality decision-making. His teaching methods emphasize the importance of intellectual conflict to achieve highly innovative outcomes, emphasizing the importance of presenting students with conflicts, encouraging students to form their own opinions, teaching them how to see the point of view of others, and encouraging them to discuss varying perspectives. Skills, tools, and methods for engaging in debate and critique leading to creative problem solving may be an area for faculty to consider for maximizing creative potential.

Groupthink

Janis and Mann (as cited in Leana, 1985) define groupthink as decision-making in groups exhibiting high concurrence-seeking tendencies "inhibiting the realistic systematic appraisal of all relevant aspects of the decision" (p. 5). The student teams appeared to exhibit groupthink, counterproductive to team productivity. Symptoms of groupthink (Janis, 1982) referred to as defective decision-making processes were clearly evident. The first, reflecting the incomplete exploration of alternatives, is evidenced in several teams processes. For example, the Red team examined one idea and no other, deciding as a group this was adequate to meet project requirements. These teams spent little time in surveying alternative ideas. Groupthink also surfaced when leaving the meeting with the instructor to review their concept; groups decided there was no need to further investigate ideas to move forward.

Poor information searches illustrated a second symptom of groupthink. Although research is a large component of this project, much of the required information requested by the instructor and project needs based on the final design could be described as underdeveloped, due

to a lack of information or depth of information gathered by the team. Solutions might have considered information yet to be uncovered with potential to alter the final solution.

Additional symptoms evidenced include: incomplete identification of objectives, failure to examine risks of the selected choice, selective bias in processing the information available, failure to re-evaluate alternatives, and failure to consider contingency plans. It is hard to say how many of these characteristics apply to each student team, since groupthink was not measured in this study. Groupthink, however, may explain why the study found different levels of task conflict within teams, with overall the levels of task conflict low, and missing levels of deep discussion on ideas presented.

Potentially, high levels of concurrence-seeking or groupthink may also have been influenced by high levels of self-awareness by students. Students seem to be highly aware of their actions affecting others; instead of promoting healthy task conflict, this situation appears to have further promoted groupthink. To avoid or minimize groupthink from occurring, informing students of the skills required for positive decision-making as a team, and alternately, the perils of groupthink would reiterate the opportunities and tools to productively analyze ideas while inviting the individual expression of ideas within teams.

Self-Awareness

Although a component of the study, further consideration might have implemented this trait differently. Students' ratings for the self-awareness questions were high, with averages ranging from agree to strongly agree. As self-reported responses, one does not know whether these students portray these behaviors while working with their team. The average shown for each question is across all students in the class, however, there were some outliers. On Question 11 (are you honest about your feelings?), several teams (Blue, Cabernet, Red, and Teal) had at

least one student who responded with a: disagree or strongly disagree. Two of these teams (Cabernet, Teal) were ranked in the top for ratings of creativity and two were in the bottom (Red, Blue). The Red and Cabernet team experienced relationship conflict, due to frustrations with their team possibly due to their lack of communication and honesty of their feelings.

Implications for Education

Task conflict occurring in the process of idea synthesis and discussion, as an exchange of oppositional opinions, is part of the critical thinking and problem solving process. Interior design students are asked to find solutions to problems with every project assignment. In this research study, levels of task conflict and level of engagement in task conflict are lower than expected, inviting the development of classroom tools and methods to enhance productive task conflict to ensure creative outcomes.

Interior design programs emphasize the importance of creative thinking as products of productive task conflict. Students might be provided with additional experiences and tools to enhance these skills. Students benefit from constructive conflict (Johnson, 2015); a tool used by educators to improve the innovation and problem solving capabilities of individuals and groups. Educating students in how to engage in a discussion presenting opposing ideas, and demonstrating ways to encourage intellectual conflict with peers could encourage healthy task conflict.

The study also found student teams engaging in individual and group ideation reflected greater creative outcomes; these teams utilized individual ideation maximizing time in team ideation and demonstrated greater team creativity. Individuals able to utilize time outside of group meetings and class time for individual ideation were able to utilize their team project work time better by bringing more developed ideas to the table.

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APPENDICES

APPENDIX A: Student Letter of Consent

APPENDIX B: Student Prompts

APPENDIX C: Invitation to Evaluators

APPENDIX D: External Juror Project Creativity Evaluation Form

APPENDIX E: Juror Creativity Ratings

APPENDIX F: Team Productivity Evaluation Sheet

APPENDIX G: Team Productivity Ratings

APPENDIX H: IRB Letter of Approval

APPENDIX I: Student Work

APPENDIX A: Student Letter of Consent



Letter of Consent

Department of Design and Merchandising
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<http://www.drm.cahs.colostate.edu/>

Date _____

Dear seniors;

My name is Hillary Smith and I am a researcher and graduate student in the department of Design and Merchandising at Colorado State University. We are conducting a case study research project aimed at explaining team dynamics and how they affect team creative productivity. The Principal Investigators (PI) are Drs. Katharine Leigh and Laura Malinin, faculty of design in the department of Design and Merchandising; I am serving as the Co-Principal Investigator.

During the course of the INTD 400 service learning project we would like you to answer several questions in response to question prompts that will be posted on Qualtrics. There will be five prompts, one for each week during the project. The nature of these questions will only gauge your progress and thought processes while working on the project and will not be probing into any personal or private matters. Each prompt will take you about 20 minutes during the class presentation on teaming. You will be asked to take the Kolb Learning Style Inventory (KLSI) which will take roughly 10 minutes to complete;

The results of your KLSI will be shared with you and your teammates. In addition to the questions we would like you to share your final team projects with an external panel of interior design professionals and two graduate students for anonymous evaluation. Your total time commitment for this research activity is no more than 3 hours total which includes your responses to weekly prompts.

Your participation in this project is voluntary; should you decide to not participate in the study, you may withdraw your consent and stop participation at any time without penalty; although you may not withdraw from your team assignment, you may stop responding to the prompts. Your grade will in no way be impacted by your decision to participate or not participation in the study. Responses are collected outside class time. Demographic data will be aggregated to describe the participants in the study (i.e., year in school, GPA, age, nationality, and gender). However, your name and identification will remain private with all data will be maintained within a locked cabinet by the PI's; you may be assured confidentiality.

There may be no direct benefit to you associated with your participation in this research, but by participating in this research project we hope to gain a better understanding of the design process to inform future teaching assignments and improve student's design outcomes. Finally, while it is not possible to fully identify all potential risk involved in these research procedures, the researcher(s) have taken reasonable safeguards to minimize any known and potential unknown risk to the participants.

By signing on the line below, you give your consent to participate; we will provide you with a copy of the consent for your records. We greatly appreciate your participation. If you have any questions or concerns regarding the research either at this point or at any time during the future, please feel free to contact me at 303-886-1239; Hillary.Smith@colostate.edu. I would be happy to respond to your questions or concerns.

If you have any questions about your rights as a volunteer in this research, contact Evelyn Swiss at 491-1381 evelyn.swiss@colostate.edu.

Thank you in advance, for your valuable support of my research project.

Sincerely,

Hillary Smith, Graduate Student and Co-PI

Katharine Leigh, Ph.D., Professor and PI

Laura Malinin, Ph.D., Assistant Professor and Co-PI

Student Printed Name _____ Student Signature _____

APPENDIX B: Student Prompts



Department of Design and Merchandising

ATTITUDES (INITIAL SURVEY)

Please answer the following questions as open and honestly as possible. Your answers are only being used for the purpose of this study. Your identity will be kept confidential.

| | Strongly Disagree | Disagree | Somewhat Disagree | Somewhat Agree | Agree | Strongly Agree |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I am aware of how my words affect people around me | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I listen to my classmates ideas and opinions without jumping to conclusions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I can receive constructive feedback without becoming defensive | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am aware of my tone of voice and body language when collaborating with other people. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am aware when I am having negative emotions, and I don't let the negativity affect the people around me. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am very open to hearing and incorporating others ideas and opinions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I will keep my ideas & opinions to myself if I know my team will disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am aware people will have different ways of approaching learning than I do | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I believe I can learn new things from my classmates when working together | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am respectful of others point of view even when I disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

I am honest about my feelings and thoughts and communicate them to my team openly

I actively listen to people when they are talking

I am open to hearing criticism of my ideas/opinions

| | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

How do you feel about team projects?

Dislike Extremely

Dislike Very Much

Dislike Slightly

Like Slightly

Like Very Much

Like Extremely

| | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|

How satisfied are you to be working with this team of students?

☐ Very Dissatisfied

☐ Dissatisfied

☐ Somewhat Dissatisfied

☐ Somewhat Satisfied

☐ Satisfied

☐ Very Satisfied

How effective do you think team projects are in creating innovative project outcomes?

Have you worked with any of these team members before? Tell me how you felt about this experience?

Using the slider bars below indicate the level of confidence you have for yourself and each of your team members in regards to their knowledge, skills, and abilities they bring to this team project.

Please follow this list for coding your team members

Team1: (A)Andrea (B)Kim (C)Sam (D)Sherilyn
 Team2: (A)Brianna (B)Brienne (C)Brodie (D)Kristy
 Team3: (A)Allyson (B)Amea (C)Haley (D) Taylor
 Team4: (A)Ajay (B)Candice (C)Leah (D)Susan
 Team5: (A)Erika (B)Holly (C)Julia (D)McKenna
 Team6: (A)Ellyn (B)Hannah (C)Melissa (D)Stephanie
 Team7: (A)Alexa (B)Courtney (C)Emily (D)Spencer
 Team8: (A)Kaitlyn (B)Kelsie (C)Jazzy (D)Mary
 Team9: (A)Briar (B)Michelle (C)Michael (D)Sydney
 Team10: (A)Jenna (B)Kami (C)Kelcey (D)Tyler

| | Not Confident | | | Somewhat Confident | | | | Very Confident | | | |
|---------------|---------------|---|---|--------------------|---|---|---|----------------|---|---|----|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Team Member A | | | | | | | | | | | |
| Team Member B | | | | | | | | | | | |
| Team Member C | | | | | | | | | | | |
| Team Member D | | | | | | | | | | | |

How important is the following?

| | Not at all Important | Very Unimportant | Neither Important nor Unimportant | Very Important | Extremely Important |
|---|-----------------------|-----------------------|-----------------------------------|-----------------------|-----------------------|
| For you to receive an "A" | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How important is giving back to the community to you? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

List each of your team members including yourself and, identify one unique strength that person brings to the team.

How would you rate your relationship with each of your team members?

Please follow this list for coding your team members

Leave your member spot blank

Team1: (A)Andrea (B)Kim (C)Sam (D)Sherilyn
 Team2: (A)Brianna (B)Brienne (C)Brodie (D)Kristy
 Team3: (A)Allyson (B)Amea (C)Haley (D) Taylor
 Team4: (A)Ajay (B)Candice (C)Leah (D)Susan
 Team5: (A)Erika (B)Holly (C)Julia (D)McKenna
 Team6: (A)Ellyn (B)Hannah (C)Melissa (D)Stephanie
 Team7: (A)Alexa (B)Courtney (C)Emily (D)Spencer
 Team8: (A)Kaitlyn (B)Kelsie (C)Jazzy (D)Mary
 Team9: (A)Briar (B)Michelle (C)Michael (D)Sydney
 Team10: (A)Jenna (B)Kami (C)Kelcey (D)Tyler

| | We are not friends and avoid talking | We only talk in class about project related topics | We like working together and consider ourselves friends but we don't always sit with the same group of friends in class | Good friends and work closely together in class. Occasionally spend time together outside of class. | One of my best friends in the class. Spend lots of time together in and out of class. |
|---------------|--------------------------------------|--|---|---|---|
| Team Member A | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Team Member B | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Team Member C | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Team Member D | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

What do you think will be the biggest challenge for you working with this team?

Student Survey 3 (Week 1 Prompts)

What work/task did your team accomplish this week?

- a. Of that work/task, which were you responsible for
b. Who, if any, did you work with this week on this task?

Of the time spent working on your project this week what percentage of your time was spent working individually vs. working with 1 or more team members?

Total must equal 100%

Working Individually Working with 1 or more team members

Answer the following in respect to this last week only

| | Strongly Disagree | Disagree | Somewhat Disagree | Somewhat Agree | Agree | Strongly Agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I am comfortable contributing ideas to the team | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| My team is able to discuss oppositional and diverse ideas openly and productively | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Explain why or why not you feel comfortable contributing ideas to the team.

Explain how your team is able or is not able to discuss diverse ideas openly and productively

Answer the following in respect to occurrences during this last week only

| | Never | Occasionally | Often | Constantly |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| How often do members of your team discuss who should do what this week? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How frequently do members of your team disagree about the way to complete a team task? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Do you recall one or more disagreements about how work should be done or who should do it? Describe

How much time do you perceive your team spends doing the following?

Must equal 100%

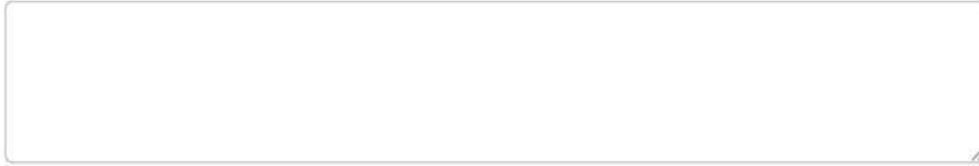
| | |
|---------------------------------------|--------------------------------|
| Generating ideas | <input type="text" value="0"/> |
| Analyzing & evaluating ideas | <input type="text" value="0"/> |
| Finding solutions for problems | <input type="text" value="0"/> |
| Implementing ideas to a final product | <input type="text" value="0"/> |
| Total | <input type="text" value="0"/> |

Have you witnessed or been part of any disagreement(s) of heightened emotions either project related or NOT project related?

What are the argument(s) about?

Is the argument(s) ongoing?

Who is involved



Student Survey 3 (Week 3 Prompts)

What work/task did your team accomplish this week?

- a. Of that work/task, which were you responsible for
- b. Who, if any, did you work with this week on this task?

part 1. How many ideas or concept solutions did your team explore?

Part 2. List each (even if you didn't explore the idea in depth)

and include the **pro's and con's** discussed for each idea

Part 3. Please describe how and why you decided to move forward with your final concept.

Please take the time to develop this answer to the best of your ability.

Ways to elaborate

- What were key issues you or your team wished to address in developing the design
- Did your team identify any key challenges of the space.
- Have you developed a common goal or vision with your team to help guide you through the design process?
- Are you considering the end user in developing your concept or are there other factors more important to you driving your design decisions?

Originality of your design options was important to you

☐ Strongly Disagree

☐ Disagree

☐

- ☐ Neither Agree nor Disagree
- ☐ Agree
- ☐ Strongly Agree

Of the time spent working on your project this week what percentage of your time was spent working individually vs. working with 1 or more team members?
Total must equal 100%

Working Individually Working with 1 or more team members

Answer the following in respect to this last week only

| | Strongly Disagree | Disagree | Somewhat Disagree | Somewhat Agree | Agree | Strongly Agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I am comfortable contributing ideas to the team | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| My team is able to discuss oppositional and diverse ideas openly and productively | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Did you contribute your ideas to the design solutions presented? Of the ideas presented by you, do you think their were ideas the team should have explored further?

Answer the following in respect to occurrences during this last week only

| | Never | Occasionally | Often | Constantly |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| How often do members of your team discuss who should do what this week? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How frequently do members of your team disagree about the way to complete a team task? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Do you recall one or more disagreements about how work should be done or who should do it? Describe

How much time do you perceive your team spends doing the following?

Must equal 100%

Generating ideas

0

Analyzing & evaluating ideas

0

Finding solutions for problems

0

Implementing ideas to a final product

0

Total

0

Have you been part of any disagreement(s) of heightened emotions either project related or NOT project related?

What were the argument(s) about?

Is the context(s) of the argument ongoing?

What team members have been involved?

What are your primary concerns regarding this project as you return to classes from break?

Student Survey 4 (Week 4 Prompts)

What work/task did your team accomplish this week?

- a. Of that work/task, which were you responsible for
- b. Who, if any, did you work with this week on this task?

Of the time spent working on your project this week what percentage of your time was spent working individually vs. working with 1 or more team members?

Total must equal 100%

Working Individually Working with 1 or more team members

Answer the following in respect to this last week only

| | Strongly Disagree | Disagree | Somewhat Disagree | Somewhat Agree | Agree | Strongly Agree |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I am comfortable contributing ideas to the team | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

My team is able to discuss
oppositional and diverse ideas
openly and productively



Explain why or why not you feel comfortable contributing ideas to the team.

Explain how your team is able or not able to discuss diverse ideas openly and productively

Answer the following in respect to occurrences during this last week only

| | Never | Occasionally | Often | Constantly |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| How often do members of your team discuss who should do what this week? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How frequently do members of your team disagree about the way to complete a team task? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Do you recall one or more discussions about how work should be done or who should do it? Describe

What if any concerns do you have at this time in the completion of this project, over and beyond finishing the project on time. What issues have you experienced? What have been the major obstacles or challenges in the process slowing your progress?

In your opinion, how satisfied are you with your teams ability to manage time?

- ☐ Very Dissatisfied
- ☐ Dissatisfied
- ☐ Somewhat Dissatisfied
- ☐ Somewhat Satisfied
- ☐ Satisfied
- ☐ Very Satisfied

In your opinion, how satisfied are you with your teams design concept?

- ☐ Very Dissatisfied
- ☐ Dissatisfied
- ☐ Somewhat Dissatisfied
- ☐ Somewhat Satisfied
- ☐ Satisfied
- ☐ Very Satisfied

In your opinion, do you think your team has the motivation and desire to do what it takes to get this project done on time and at the quality you think it should be at? Do you?

Have there been any decisions made that you did not agree with but went along with anyway?

Yes or No

What was the decision?

Do you have any personal frustrations or concerns with this project, the process or decisions made by your team members that you may not have shared with your team, but wouldn't mind sharing with me?
 You may also have thoughts or questions, or concerns, outside of the people in your team, regarding the project it's self that you or your team may be struggling with. Please share your thoughts and feedback, both positive or negative

How much time do you perceive your team spends doing the following?


Must equal 100%

| | |
|---------------------------------------|--------------------------------|
| Generating ideas | <input type="text" value="0"/> |
| Analyzing & evaluating ideas | <input type="text" value="0"/> |
| Finding solutions for problems | <input type="text" value="0"/> |
| Implementing ideas to a final product | <input type="text" value="0"/> |
| <hr/> | |
| Total | <input type="text" value="0"/> |

Have you witnessed or been part of any discussions(s) of heightened emotions either project related or NOT project related?

What are the discussions(s) about?

Who is involved?



How satisfied are you with the progress your team has made on this project THIS WEEK?

- ☐ Very Dissatisfied
- ☐ Dissatisfied
- ☐ Somewhat Dissatisfied
- ☐ Somewhat Satisfied
- ☐ Satisfied
- ☐ Very Satisfied

Final Survey

Of the time spent working on your project **this week**, What percentage of your time was spent working individually vs. working with 1 or more team members?

Total must equal 100%

Working Individually Working with 1 or more team members

Answer the following in respect to occurrences during this last week only

How often do members of your team discuss who should do what this week?

How frequently do members of your team disagree about the way to complete a team task?

How likely were you to speak up to your team when you disagree with a decision made?

- ☐ Very Unlikely
- ☐ Unlikely
- ☐ Somewhat Unlikely
- ☐ Somewhat Likely
- ☐ Likely
- ☐ Very Likely

How much time do you perceive your team spends doing the following?
Must equal 100%

| | |
|---------------------------------------|--------------------------------|
| Generating ideas | <input type="text" value="0"/> |
| Analyzing & evaluating ideas | <input type="text" value="0"/> |
| Finding solutions for problems | <input type="text" value="0"/> |
| Implementing ideas to a final product | <input type="text" value="0"/> |
| <hr/> | |
| Total | <input type="text" value="0"/> |

How satisfied are you with the final outcome of your team project?

- ☐ Very Dissatisfied
- ☐ Dissatisfied
- ☐ Somewhat Dissatisfied
- ☐ Somewhat Satisfied
- ☐ Satisfied
- ☐ Very Satisfied

What was the biggest challenge for you working with this team?

What was the best part about working with this team?

How original do you think the final outcome of your project is?

- ☐ Not at all original
- ☐ Very Unoriginal
- ☐ Neither Original or Unoriginal
- ☐ Very Original
- ☐ Extremely Original

How practical do you think your final design solution is

- ☐ Not at all practical
- ☐ Very impractical
- ☐ Neither
- ☐ Very Practical
- ☐ Extremely Practical

How was this team project different from other team projects in the past?

Do you think learning about your Kolb learning style preference prior to starting this project helped, hindered, or impacted your team experience in any way?

Any additional comments you want to share about this team project?

APPENDIX C: Invitation to Evaluators

Dear (Name of Potential Juror);

Hello, my name is Hillary Smith and I am a graduate student in Interior Design at Colorado State University working on my Master's thesis project. The primary focus of my study examines the impact of conflict on creativity in teams comprised of interior design seniors. The capstone class will be working, in teams of four, on a team service learning project. I am asking for help in providing your professional evaluation of selected final projects using criteria provided to assess originality, quality of design solution, and overall creativity. The project outcomes encompass three boards showing challenge selected by the team, their solution in response to that challenge, and project details, with a scale model of the spatial solution. All 10 team projects will be sent to for you to examine and evaluate. PDFs of project components will be available on Thursday, December 11th with your evaluations returned by Friday, December 19th. I greatly appreciate your participation in this research. Please confirm your interest by November 15th.

For questions and more information about my research, please feel free to contact me at hillaryannesmith@gmail.com; Cell at 303.886.1239

Sincerely,

Hillary Smith, Graduate Student

APPENDIX D: External Juror Evaluation Form

JUROR EVALUATIONS

JUROR NAME _____

Team # _____

PROJECT CONTEXT

Please, using the definitions and questions below rate each projects to the best of your ability.
Please make sure you label each evaluation sheet with the team number.

Reference definitions:

- * Originality: Freshness or uniqueness, of the idea, method, or performance.
- * Elaboration: The expanding and embellishing of design ideas & details supporting the overall concept.
- * Fluency: The quantity of design ideas
- * Flexibility: Try new ideas, take risks with the design

Please use the rating scale below to asses each factor of the project:

5 = excellent 4 = above average 3 = satisfactory 2 = unsatisfactory 1 = failing

Your rating will not influence or be used in any way regarding project grading.

1. Please rate the originality* of the design concept?
2. How much Flexibility* in design?
3. Please rate the fluency* of ideas?
4. Project development, in terms of the design? How well did they elaborate*?
5. How well do the solution(s) meet the challenges of the space? Is the solution practical?
6. Are the elements of the design congruent and supportive of the overall concept?
7. Rate the project justification?

The following short answer questions invite your feedback:

1. What is the strength of this project? Please explain:
2. What is the weakness of this project?
3. Please provide additional comments or observations about this design project:

APPENDIX E: Juror Creativity Ratings

| TEAM | Creativity Q's | GRAY | RED | ORANGE | YELLOW | LIME | BLUE | VIOLET | MAGENTA | TEAL | CABERNET |
|---|---|------|-----|--------|--------|------|------|--------|---------|------|----------|
| JUROR 1 | Please rate the originality* of the design concept? | 3 | 2 | 3.5 | 1 | 3 | 3 | 3 | 1 | 4 | 2 |
| JUROR 2 | | 3 | 4 | 4 | 3 | 5 | 4 | 5 | 3 | 4 | 5 |
| JUROR 3 | | 3 | 3 | 4 | 3 | 4 | 4 | 5 | 5 | 5 | 5 |
| JUROR 4 | | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 5 | 4 |
| JUROR 1 | How much Flexibility* in design? | 2 | 2 | 3 | 3.5 | 3 | 2 | 1 | 2 | 4.5 | 3 |
| JUROR 2 | | 3 | 4 | 3 | 4 | 5 | 4 | 5 | 3 | 5 | 5 |
| JUROR 3 | | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 5 | 4 | 5 |
| JUROR 4 | | 3 | 3 | 3 | 5 | 3 | 3 | 4 | 4 | 5 | 4 |
| JUROR 1 | Please rate the fluency* of ideas? | 2 | 2 | 2 | 3.5 | 4 | 1 | 1 | 1 | 2 | 1 |
| JUROR 2 | | 3 | 4 | 3 | 4 | 5 | 4 | 4 | 3 | 5 | 5 |
| JUROR 3 | | 4 | 3 | 1 | 4 | 3 | 4 | 4 | 5 | 3 | 5 |
| JUROR 4 | | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 5 | 4 |
| JUROR 1 | Project development, in terms of The design? How well did they elaborate? | 2 | 2 | 4 | 3.5 | 3.5 | 2 | 1 | 1 | 3 | 2 |
| JUROR 2 | | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 3 | 4 | 4 |
| JUROR 3 | | 3 | 3 | 3 | 4 | 2 | 3 | 5 | 5 | 3 | 5 |
| JUROR 4 | | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 4 |
| JUROR 1 | Are the elements of the design congruent and supportive of the overall concept? | 2 | 2 | 4 | 3 | 4 | 1 | 2.5 | 2 | 4 | 3.5 |
| JUROR 2 | | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 4 |
| JUROR 3 | | 3 | 3 | 2 | 4 | 2 | 3 | 3 | 5 | 3 | 3 |
| JUROR 4 | | 3 | 3 | 4 | 5 | 3 | 3 | 4 | 4 | 5 | 4 |
| Average | | 62 | 61 | 64.5 | 72.5 | 68.5 | 62 | 71.5 | 67 | 80.5 | 77.5 |
| Overall Rating | | 8 | 9 | 7 | 3 | 5 | 8 | 4 | 6 | 1 | 2 |
| 5 = excellent 4 = above average 3 = satisfactory 2 = unsatisfactory 1 = failing | | | | | | | | | | | |
| 1st place 2nd place 3rd place | | | | | | | | | | | |

APPENDIX F: Team Productivity Evaluation Sheet

TEAM_____

Rate on a Scale of 1-3

1= unsatisfactory or Failing

2= acceptable

3=excellent

1. Quality of work: _____

- Clear & readable digital images, graphics..... _____
- Logical and easy to understand Organization..... _____
- Spelling, Grammar and overall quality of writing..... _____

• **addresses the following information:**

- Location, _____
- User profile of space, _____
- plumbing & electricity..... _____
- overall budget _____

2. Quantity of work: _____

- Clearly identifies the challenge, any why. _____
- Quantity of information appropriate for design communication..... _____
- Identifies the types of activities the spaces will accommodate
based on user needs, as well as the tools required _____
- 3 Posters minimum..... _____
- Elaboration of information in Program..... _____

COMMENTS:

APPENDIX G: Team Productivity Ratings

| | Gray | Red | Orange | Yellow | Lime | Blue | Violet | Magenta | Teal | Cabernet |
|--------------------|-------|------|--------|--------|---------|------|--------|---------|-------|----------|
| Quality of Project | 5.25 | 5.5 | 6.5 | 8 | 8.5 | 6 | 6 | 7.25 | 7.75 | 5 |
| Quantity of Work | 16.75 | 17.5 | 15.5 | 19 | 22 | 19 | 19 | 19.75 | 20 | 18 |
| TOTAL | 22 | 23 | 22 | 27 | 30.5 | 25 | 25 | 27 | 27.75 | 23 |
| RANKING | LOW | LOW | LOW | HIGH | HIGHEST | MOD | MOD | HIGH | HIGH | LOW |

APPENDIX H: IRB Letter of Approval

From: Evelyn.Swiss@ColoState.EDU
Sent Date: Monday, January 26, 2015 15:55:56 PM
To: Hillary.Smith@colostate.edu, Katharine.Leigh@ColoState.EDU, Laura.Malinin@colostate.edu
Cc:
Bcc:
Subject: The following Protocol has been Approved: 14-5373H
Message:

The IRB has approved your protocol referenced below:

Protocol ID: 14-5373H
Principal Investigator: Malinin, Laura

Protocol Title: Creativity in Teams
Review Type: EXPEDITED
Approval Date: January 21, 2015

This is not an official letter of approval. Your approval letter is available to you in the "Event History" section of your approved protocol in eProtocol.

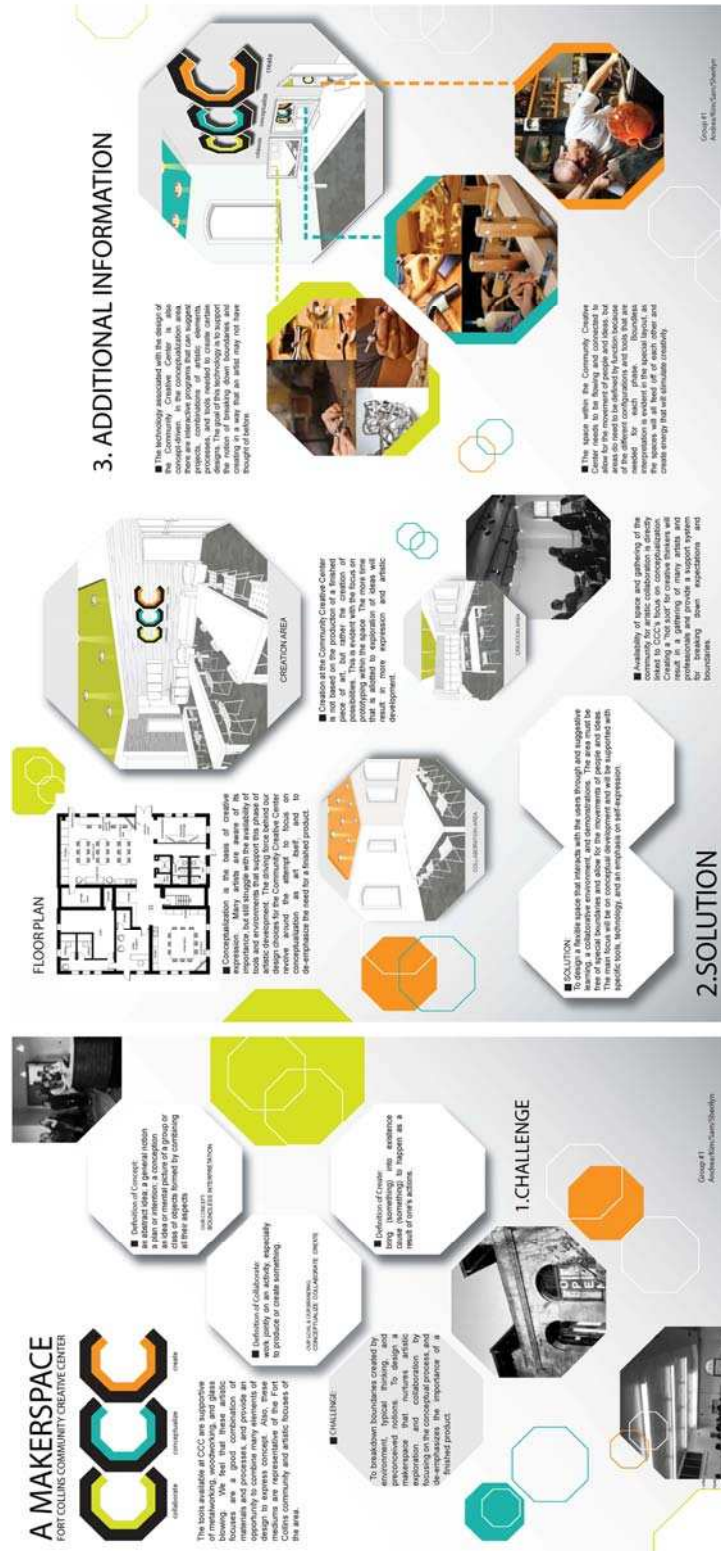
If you have any questions regarding this approval, please contact:

CSU IRB: RICRO_IRB@mail.colostate.edu; 970-491-1553
Evelyn Swiss: Evelyn.Swiss@Colostate.edu ; 491-1381

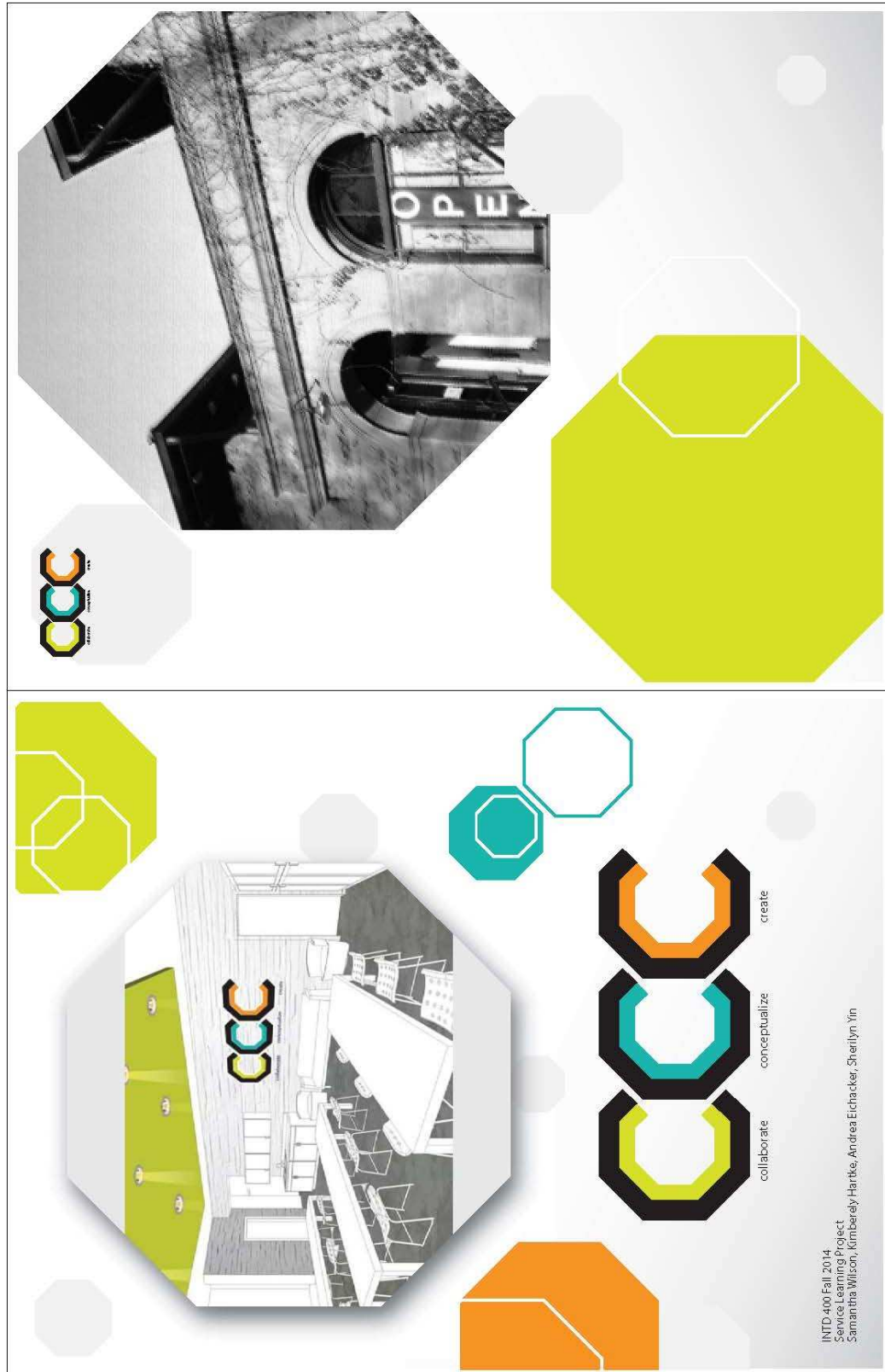
TO ACCESS THIS PROTOCOL, LINK TO:
<https://csu.keyusa.net/>

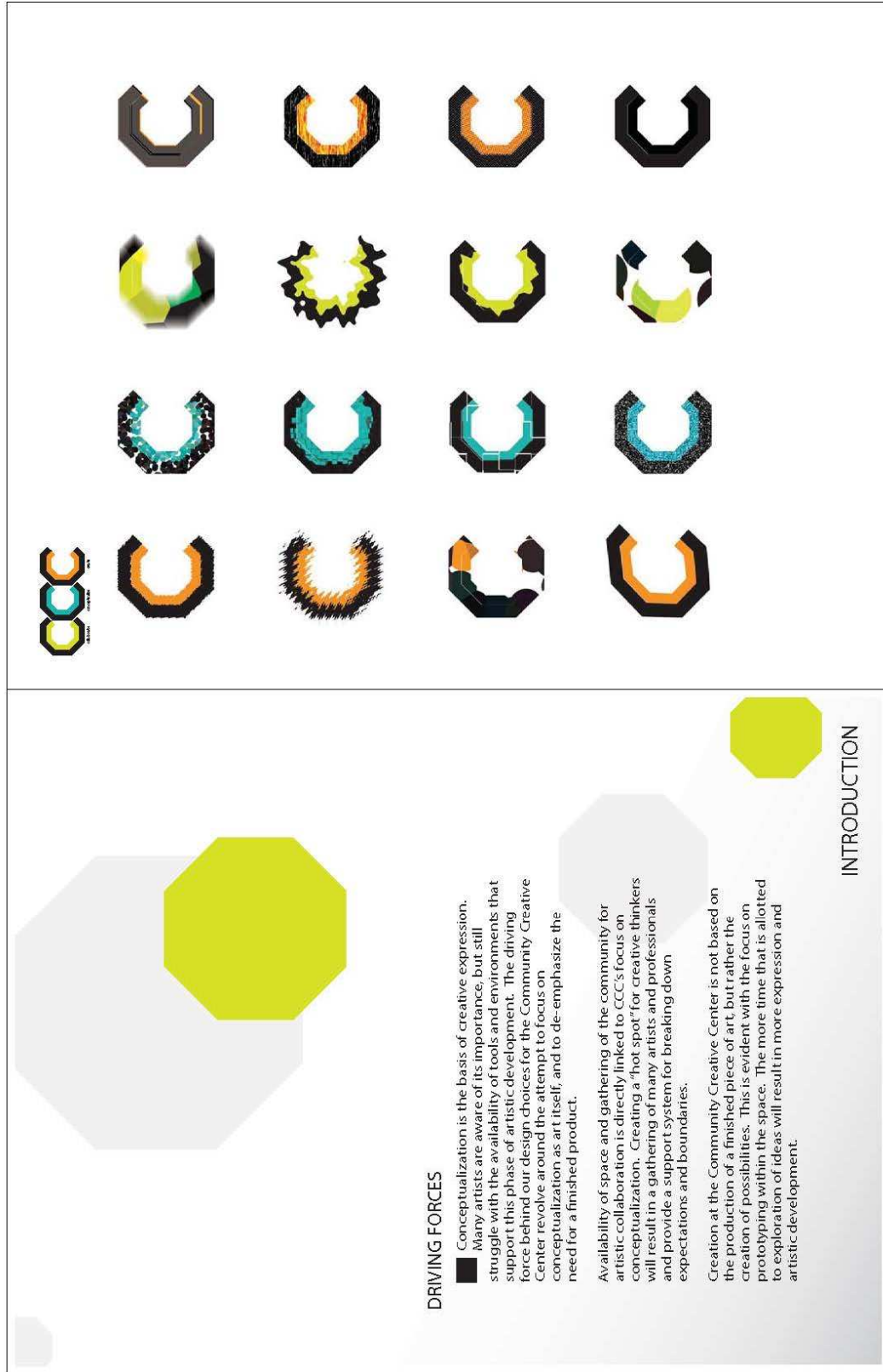
APPENDIX I: Student Work

Gray Team Posters



Gray Team Program Book





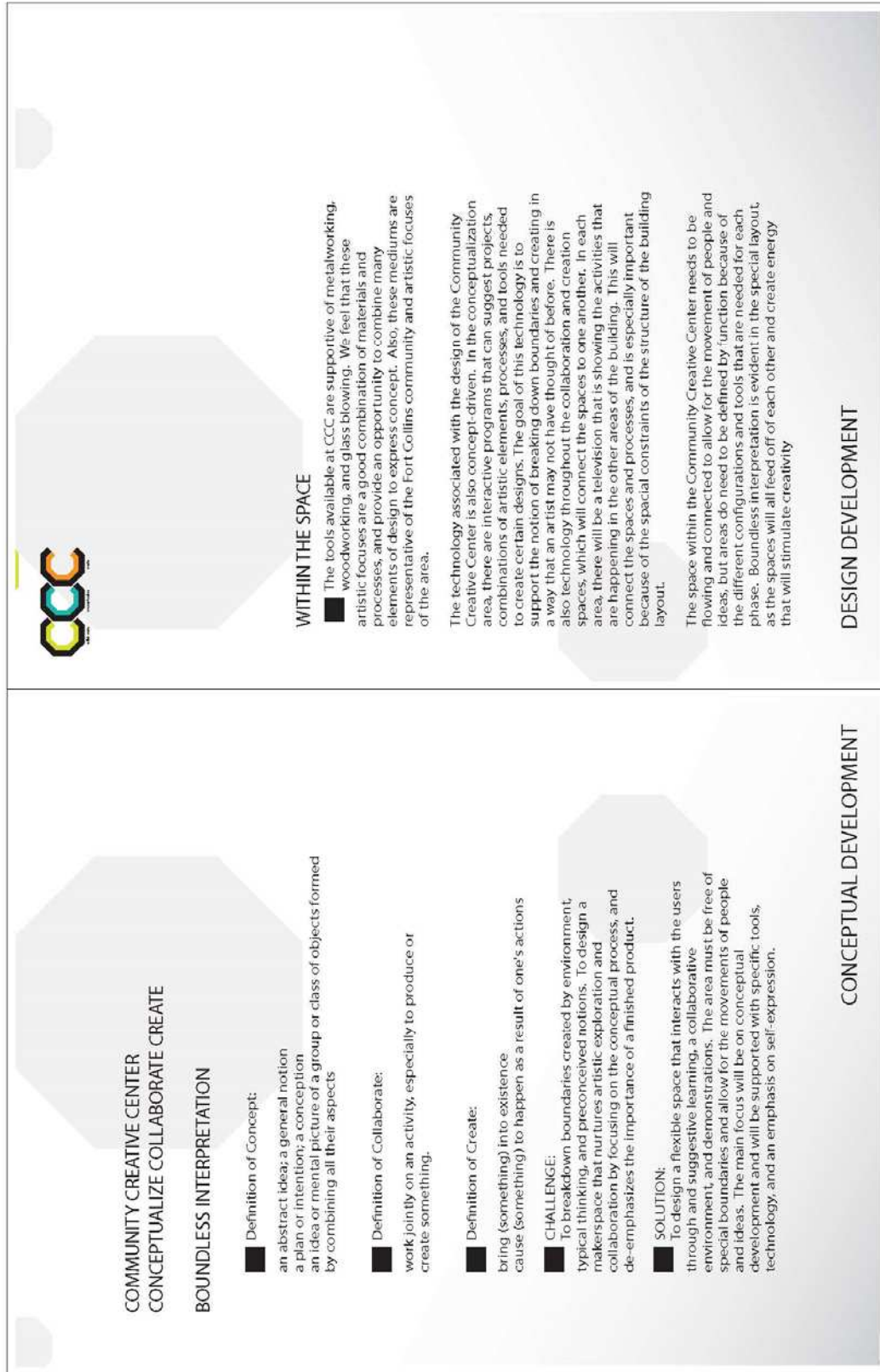
DRIVING FORCES

Conceptualization is the basis of creative expression. Many artists are aware of its importance, but still struggle with the availability of tools and environments that support this phase of artistic development. The driving force behind our design choices for the Community Creative Center revolve around the attempt to focus on conceptualization as art itself, and to de-emphasize the need for a finished product.

Availability of space and gathering of the community for artistic collaboration is directly linked to CCC's focus on conceptualization. Creating a "hot spot" for creative thinkers will result in a gathering of many artists and professionals and provide a support system for breaking down expectations and boundaries.

Creation at the Community Creative Center is not based on the production of a finished piece of art, but rather the creation of possibilities. This is evident with the focus on prototyping within the space. The more time that is allotted to exploration of ideas will result in more expression and artistic development.

INTRODUCTION





AESTHETICS

Boundless interpretation is the design concept, and needs to be depicted within the aesthetics of the space. To best accomplish this, a palate must be created and distractions and "idea leading" interior design should be avoided. The walls and structure should be neutral and serve as a tool to conceptualize with the application of write-on wall paint. All furniture will be simple in nature and flexible where needed. The materials used for the furniture will be industrial and functional, and relate to the metal, wood, and glass that is the basis for artistic expression in the Community Creative Center. The incorporation of futuristic elements such as technology and pops of vibrant color (separate from the direct workspaces) will add interest. There will be a gallery associated with the conceptualization space to showcase results of the makerspace. Also, the "blank canvas" that is created with the minimalist approach to the walls will allow a community created processes and visuals to be displayed. There is no rule to clean up your thought process reminisces when you leave, maybe it can inspire the next users of the space!

INTRODUCTION



FOCUS ON COMMUNITY

It is clear that one of the main focuses of the Community Creative Center is to create interaction within the artistic community in Fort Collins. It is also important to allow learning activities to take place in the space, which will generate another level of involvement and outreach. Both the collaboration and creation spaces can house demonstrations, classes, and group activities. The furniture is flexible and technology is present in each space to support this initiative.

DESIGN DEVELOPMENT

■ The technology associated with the design of the Community Creative Center is also concept driven. In the conceptualized area, there are interactive programs that can suggest projects, combinations of artistic elements, processes, and tools needed to create certain designs. The goal of this technology is to support the notion of breaking down boundaries and creating in a way that an artist may not have thought of before.

CONCEPTUALIZATION

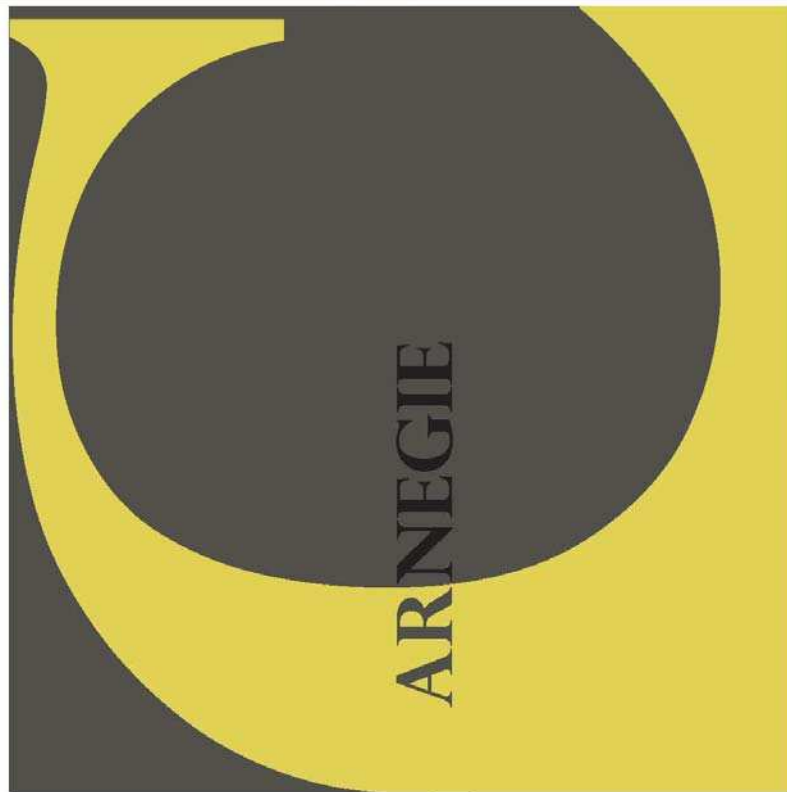


COLLABORATIVE METHODS

■ Collaborative methods are being more widely used because it emphasizes process over object production and technical proficiency. Identifying the recent growth of collaborative projects as a "global phenomenon," these practices have been defined as existing on a continuum that encompasses mainstream work in biennials and work that overlaps with the fields of development, urban planning and environmental activism. The increase in collaborative practices shows evidence of a paradigm shift within the field of art. This is broken down into two parts; one, the move towards collective production and the organization of process-based art projects allow for viewer participation. Collective projects encourage viewers to have a degree of self-reflection and to experience the art in different ways. The mode of perception is not instrumental, but rather, anticipatory and open. Evaluation through collaborative art reveals a more complex model of social change and identity because each piece of art is challenged and complicated.

THEORY RESEARCH





CONTENTS

1. User Profile
2. Site Analysis
3. Challenge
4. Concept
5. Research
7. Solution
9. FF&E & Costs

User Profile

The Carnegie Innovation Center is redesigning its space to cater to the creative needs of various professionals and students over eighteen years of age. There will be a staff member who checks the visitors in for their appointment as well as an IT worker to assist with any questions about the technology being used.

The space will be available to use during the regular opening and closing hours of the Community Creative Center. In the morning the goal is to schedule students to use the space and then in the evening the professionals can schedule to use the space after they get off work. However appointments will determine who is in the space and anyone can make an appointment for anytime convenient for them. Appointments are only allowed to last for a maximum of 2 hours.

The idea is to design the space to house separate sections. Each section will cater to different points in the creation process. The first will be brainstorming, followed by development and then finalization. Each activity will be located in a different area of the entire room and will need separation by partitions that do not completely close off each area.

The new ideation center will be built using the expertise of a construction team. The addition of a separate or new structure is not necessary. Volunteer work is an option for the non-structural portions of the construction process.

Site Analysis

The Historic Carnegie Building was originally a library that opened its doors in 1903. In 1973, the library was converted into the Fort Collins Museum, but is now occupied by the Community Creative Center. Centrally located in Fort Collins Library Park, the Carnegie building draws in visitors off the street, particularly those interested in art, culture, and history.

The first floor is a public gallery space available for rent and exhibition and the basement is occupied by a recording studio, a classroom, and some smaller offices. The mezzanine level is not currently being utilized to its full potential, and is available for creative reinvention.



“1903”

| | |
|---|--|
| <div data-bbox="475 1350 974 1440" data-label="Section-Header"> <h2>Challenge</h2> </div> <div data-bbox="777 1047 812 1339" data-label="Text"> <p>Creating a space that will facilitate the evolution of ideation.</p> </div> <div data-bbox="833 1047 974 1339" data-label="Text"> <p>By locating the ideation space in the existing mezzanine the maker's space can be located downstairs. This allows the ease of moving equipment on the ground level instead of upstairs. This also creates a sound barrier so that visitors utilizing the ideation space will not find distractions from the noises downstairs.</p> </div> | <div data-bbox="712 485 974 552" data-label="Section-Header"> <h2>Concept</h2> </div> <div data-bbox="761 562 974 928" data-label="Text"> <p>Our goal for this space is geared towards creating a design that focuses primarily on the function. An ideation space is used for aiding in the generation of ideas and solutions to problems. The final product will effectively aid users and enhance the creativity of the final outcomes of their sessions. Since this ideation space is going to be used by people of different professions with various problems, the design has to incorporate different features that are necessary by a variety of people. By asking, "Does it work" we are constantly reminding ourselves to check if the design accommodates everyone.</p> </div> <div data-bbox="1021 562 1050 928" data-label="Text"> <p>“DOES IT WORK?”</p> </div> |
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BROOKLYN FASHION AND DESIGN ACCELERATOR AT PRATT INSTITUTE

The Accelerator was founded by Debora Johnson, executive director of the Center for Sustainable Design Strategies, who also founded the Pratt Design Incubator for Sustainable Innovation in 2002.

The Accelerator encompasses a production lab, sustainable strategies lab, technology lab, classrooms, and spaces for discussions. These spaces provide designers and entrepreneurs the resources needed to go from generating ideas to physical production and beyond.

The Accelerator, a multi-disciplinary working environment, is committed to producing designs with minimal environmental impacts. It integrates local sourcing, zero-waste production, and material upcycling into the student's practices. Supporting local companies is another primary concern of the Accelerator; contributing to the development of the school's growing creative community. It also includes a showroom where students can showcase their work and inspire others.

Research

CO-CREATION INSTITUTE AT HONG KONG POLYTECHNIC UNIVERSITY SCHOOL OF DESIGN

Co-creation is an approach to innovation where new ideas emerge from highly present collective engagement. This consists of the social, reciprocal dimension and the act of coming into being, creating something more complex and abstract than production.

"At its root, co-creation is a social, collaborative and creative process to generate innovation through the dialogue and participation of all actors to construct new win-win opportunities and experiences" - Lego Views.

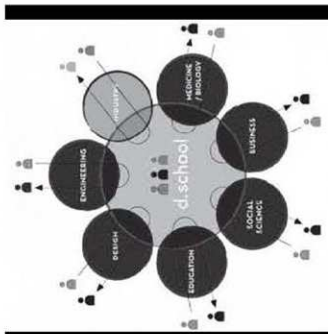
Every innovative organization allows for open free-form conversations. Learning has transpired from a primarily individual activity to one that is now team-based. Particularly in the business division, educational systems continue to evolve from lecture intensive knowledge transmission to active learning approaches.



STANFORD UNIVERSITY D.SCHOOL

The d.school is Stanford's center for innovative students and faculty to collaborate on ideas. Technology, business, and human values are the three factors that make up the concept of design innovation. Through design thinking and transformative learning, the d.school helps prepare students to face the challenges of their generation.

Creative and analytical approaches combined with personalization and real-world application drive student's problem solving processes. The d.school places strong emphasis on collaboration for discovering new ways of looking at old problems. Design thinking is thought to be the force behind the team-work approach as students are encouraged to combine their ideas and work together on projects.



Our solution for this ideation space was to create four separate areas that will promote various stages of ideation. The first area is located closer to the door and it is for socializing. People can use this area when they haven't gotten into the flow of the ideation process. This way they can get out any conversations and distractions before heading to the transforming room. In the transforming area people can work alone or in groups to come up with their next innovative creation. In this room there are group tables and white boards. This will allow multiple groups to work at once and with various people of various backgrounds overhearing one another, this could lead to comingling and the refinement of better ideas.

Then after they have an idea they think is sufficient, the group or individual can move to the next section which is for refining their ideas a little more. They may find themselves spending most of their time in the room. Should they find that their idea is not as amazing as expected, they can then move back into the brainstorming area.

Finally, if the group has an idea they are in love with and it is working out they can move into the last area which is the finalization room. In this room there is a projection screens and computers to allow the team to work on finishing up their idea and making it complete for presentation.

There is also a computer lab as well as bathroom and a kitchenette for the visitors to utilize while they are working in this space. This way other teams can work on their projects individually should the finalization room be full.

By using floor to ceiling windows to separate the ideation spaces there is an open feeling however with the sense of privacy. This will also allow the natural light to filter into the rest of the space since the ideation rooms were built on the wall housing the majority of the windows. By combining the history and character from some of the historical elements of the building with the popular contemporary and technological style the space becomes aesthetically pleasing and user friendly.

Solution

LOW CONFERENCE TABLE

MEDIASCAPE

CONFERENCE CHAIR

CAMPFIRE SEATING

MOVE

GROUP WORK TABLE

FF&E & Costs

*All products can be found through Steeplecase Furniture company.



FURNITURE - \$66,833

- Conference Chair - \$1,600 x 16
- Low Conference Table - \$3,000 x 4
- Group Work Tables - \$600 x 9
- Mediascape Tables - \$6,000 x 4
- Move Chairs - \$200 x 18
- Paper Table - \$80 x 6
- Ottoman - \$300 x 21
- Campfire Lamp - \$800 x 2
- Sofa - \$1,300 x 3
- Love Seat - \$800 x 2
- Wedge - \$520 x 2
- Screen - \$550 x 2
- Cubbies - \$200 x 2
- Shelves - \$50 x 12
- Lighting Fixtures - \$500 x 15

TECHNOLOGY - \$95,000

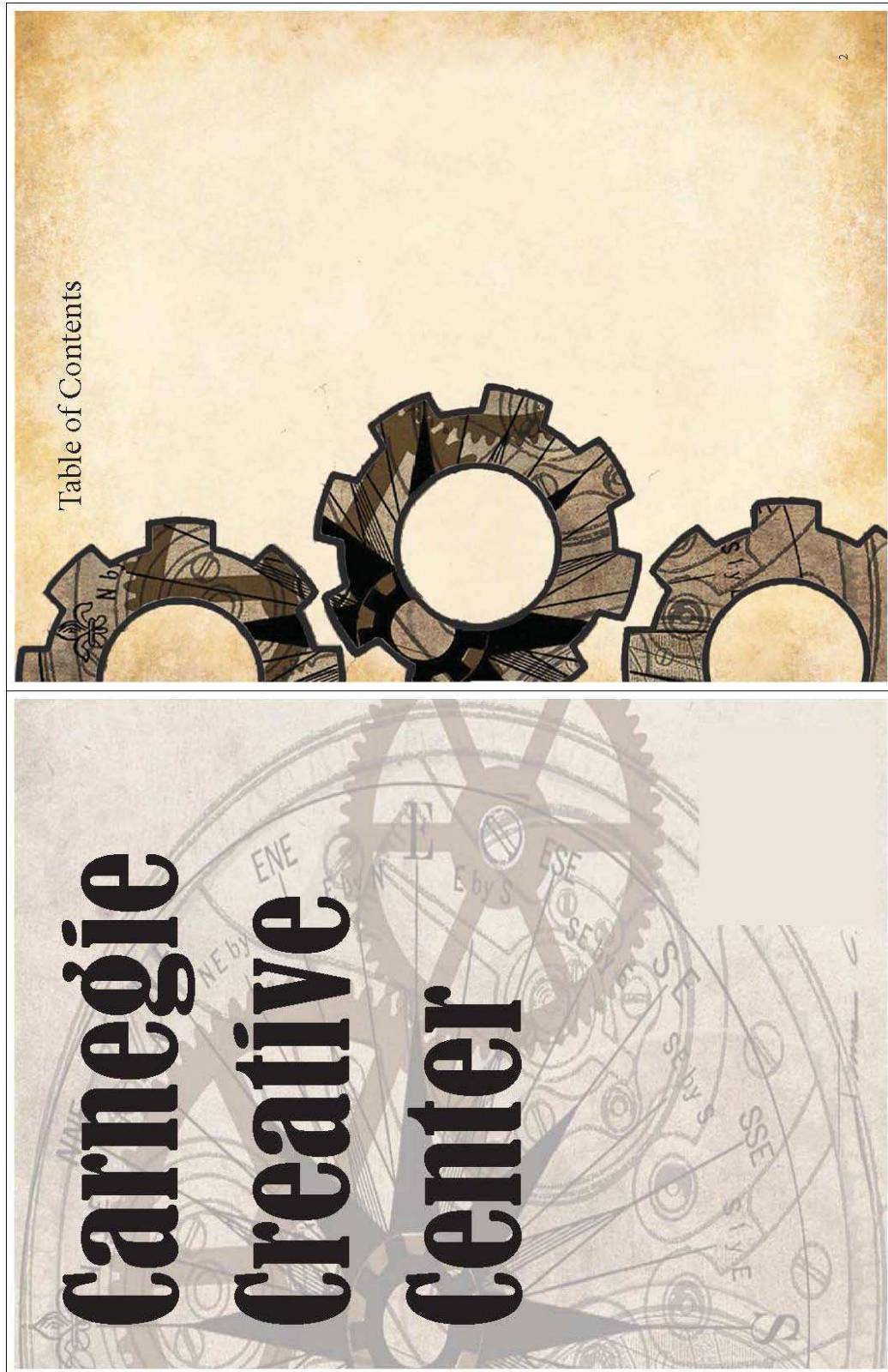
- Computers - \$500 x 18
- 3D Printer - \$ 43,000 x2

CONSTRUCTION - \$30,500

- Walls - \$20,000
- Paint - \$500
- Electrical - \$5,000
- Plumbing - \$5,000

TOTAL - \$192,333

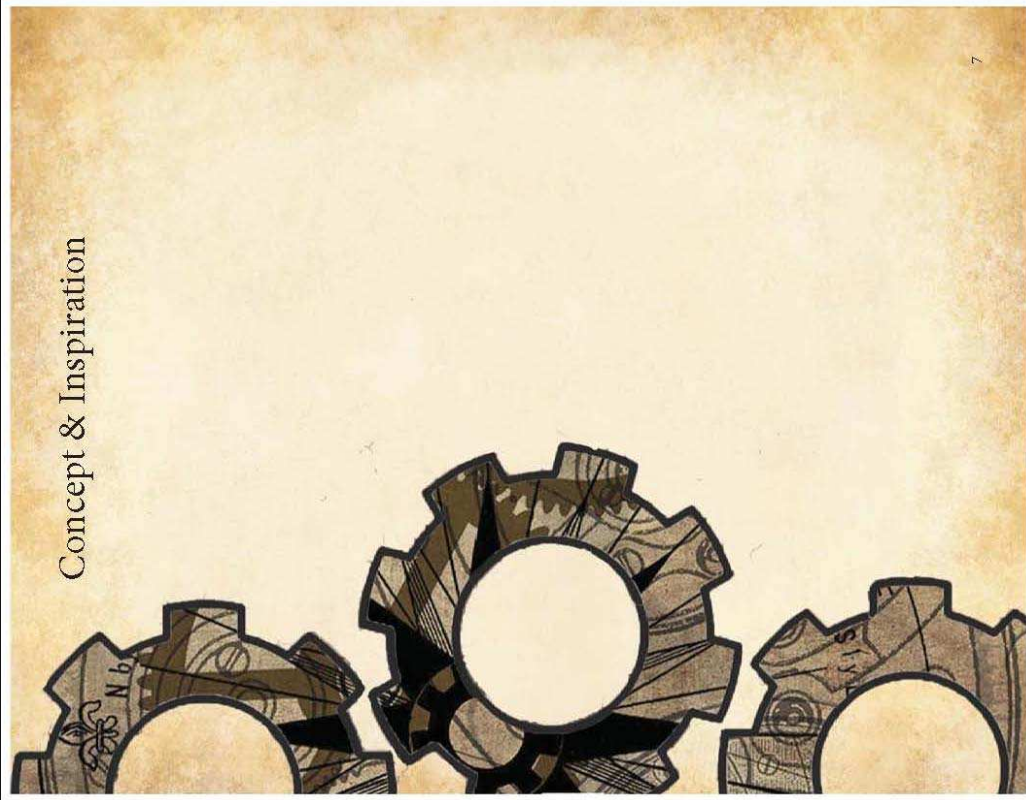




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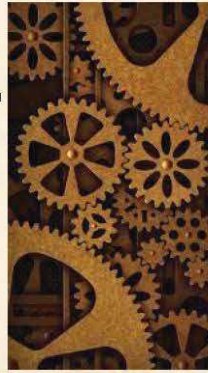
Before/ Existing



7



Linking the future
to the past



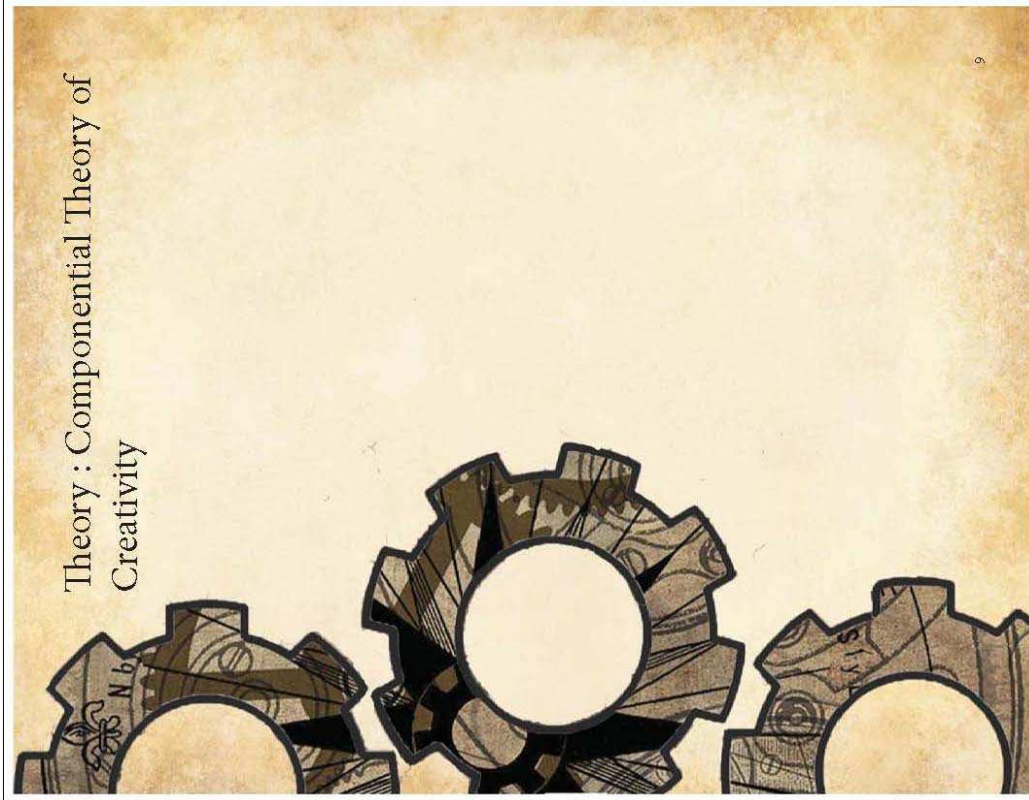
Collaborative
Rejuvenation



Innovative Integrity



8

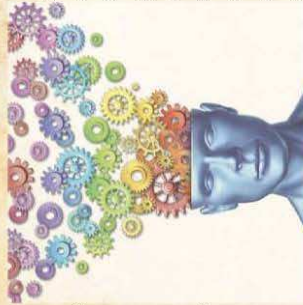


Theory : Componential Theory of Creativity

9

A

theory can be based off of a set of principles or can be an idea that accounts for a situation, a



course of action, or the occurrence of an event. Theories are used to describe or give a personal explanation to ideas, actions, motives, principles, etc. Theories help kick start the communication, collaboration, and ideation to develop a stronger theory and reasoning behind an action.

Theories are very applicable in the design world. Regarding an office space, the Componential Theory of Creativity is a great theory to narrow in on. "The componential theory of creativity is a comprehensive model of the social and psychological components necessary for an individual to produce creative work" (Amabile, 2012). The theory is grounded in a definition of creativity as the production of ideas or outcomes that relate to some goal.

In this theory, there are four components needed for any creative response. The first three components are within the individual which are (1) domain relevant skills, (2) creativity-relevant processes, and (3) intrinsic task motivation. The last component is outside the individual which is the social environment in which the individual is working. The current version of the theory includes organizational creativity and innovation, carrying implications for the work environments created by managers.

Going deeper, domain-relevant skills include knowledge, expertise, technical skills, intelligence, and talent

particular domain where the problem-solver is working – such as product design or electrical engineering.

The second component is the creativity-relevant process. It includes a cognitive style and personality characteristics that are conducive to independence, risk-taking, and taking new perspectives on problems, as well as a disciplined

work style and skills in generating ideas. The personality processes include self-discipline and a tolerance for ambiguity



10



Intrinsic task motivation is passion which is the motivation to undertake a task or solve a problem because it is interesting, involving, personally challenging, or satisfying. People aren't as creative when they take on a task out of the extrinsic motivation arising from contracted-for rewards, surveillance, competition, evaluation, or requirements to do something in a certain way (Amabile, 2012). People are most creative when they feel motivated primarily by the interest, enjoyment, satisfaction, and challenge of the work itself – and not by extrinsic motivators. "Because, as research has shown, salient extrinsic motivators can undermine intrinsic motivation, their presence or absence in the social environment is critically important. So, too, is the presence or absence of forces that can support intrinsic motivation" (Amabile, 2012)

The last component is the work environment or, more commonly known as, the social environment. This includes all of the extrinsic motivators that have been shown to undermine intrinsic motivation, as well as a number of other factors in the environment that can serve as obstacles or as stimulants to intrinsic motivation and creativity. "Research in organizational settings

has revealed a number of work environment factors that can block creativity, such as norms of harshly criticizing new ideas; political problems within the organization; an emphasis on the status quo; a conservative, low-risk attitude among top management; and excessive time pressure" (Amabile, 2012). Other factors can stimulate creativity, such as a sense of positive challenge in the work; work teams that are collaborative, diversely skilled, and idea-focused; freedom in carrying out the work; supervisors who encourage the development of new ideas; top management that supports innovation through a clearly articulated creativity-encouraging vision and through appropriate recognition for creative work; mechanisms for developing new ideas; and norms of actively sharing ideas across the organization (Amabile, 2012).

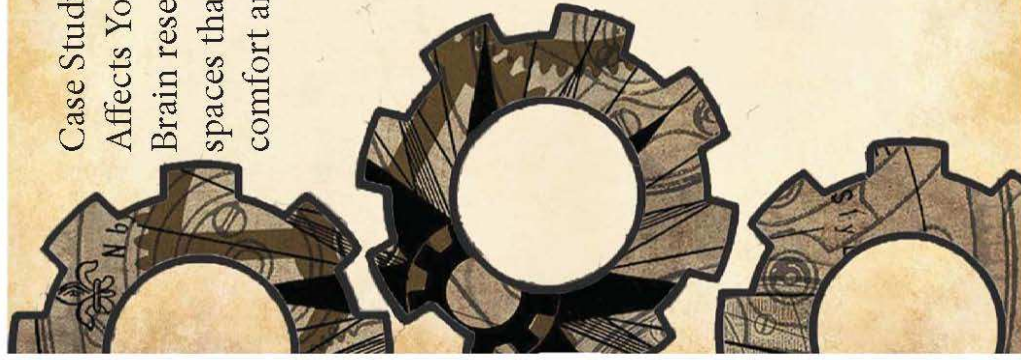
These four components work together to form positive environment conducive to learning and creative thinking. Applying these aspects to the Cambridge House Project will transform the dull and nonfunctional upstairs office space into an inspiring

room that one can keep their mind open and flowing with ideas.

Amabile, T. M. (2012, April 26). Componential Theory of Creativity Retrieved from <http://www.hs-niederrhein.de/faculty/publication/w30/Paper12-096.pdf>

11

Case Study 1: How Room Design Affects Your Work and Mood; Brain research helps us craft spaces that relax, inspire, awaken, comfort and heal



12

This article written by Emily anthes describes how Dr.



Jonas Salk who invented the polio vaccine made the discovery in a monastery in Italy after leaving the dark basement laboratory he had been working in. "He came to believe so strongly in architecture's ability to influence the mind that he teamed up with renowned architect Louis Kahn to build the Salk Institute in La Jolla, Calif., as a scientific facility that would stimulate breakthroughs and encourage creativity." (Anthes pg 6) In the 60's and 70's environmental psychology examined the effect architectural design had on human behavior and the research has influenced design. Some architecture schools are even offering classes in introductory neuroscience to educate students as to how environments influence the mind.

In 2007 Joan Meyers-Levy reported that the height of a room can influence creativity in the thought process. The study showed that individuals in a room with taller ceiling height came up with more abstract ideas while those in a lower ceiling height condition came up with more concrete groupings. "Ceiling height affects the way you process information. You're focusing on the specific details in the lower-ceiling condition" (Meyers-Levy). The study indicated that

elevated ceilings make people feel physically less constrained, so they also mentally feel less constrained and think more freely. This could be a contributing factor as to why Dr. Jonas Salk was able to think more abstractly in the 13th century monastery in Italy versus the basement laboratory in Pittsburgh.

As well as ceiling height affecting the thought process, a study published in 2000 by Nancy Wells of Cornell University suggests that views to the outside influence intellect by improving concentration and focus. Views of nature are specifically helpful. "Such findings may be the result of a restorative effect on the mind of gazing on natural scenes, according to an idea developed by psychologists Stephen Kaplan and Rachel Kaplan, both at the University of Michigan at Ann Arbor. By this theory, the tasks of the modern world can engender mental fatigue, whereas looking out at a natural setting is relatively effortless and can give the mind a much needed rest." (Anthes pg 8) The views of courtyards in the monastery and the Italian country side could have restored Dr. Salks attention and helped him focus in a way that he never could have in the basement laboratory. As well as Natural views, daylight is important for humans by improving our circadian rhythms. Having access to daylight improves alertness and allows us to sleep better at night.



13



Furniture choices can also influence human interaction. Some of the earliest environmental psychology research focused on seating plans in residential health care facilities; scientists discovered that the common practice of placing chairs along the walls of resident day rooms or lounges actually prevented socializing. A better plan to encourage interaction, researchers found, is organizing furniture in small groupings throughout the room. Semi circular configurations have been shown to increase participation and collaboration whereas rows or straight configurations encourages independent work.

Things to consider for the ideation space include ceiling height, views and furniture arrangements to boost collaboration and innovation of the users. The ceiling height of the space is 11' which gives us plenty of space to play with, instead of using walls or dividers spaces could be segregated

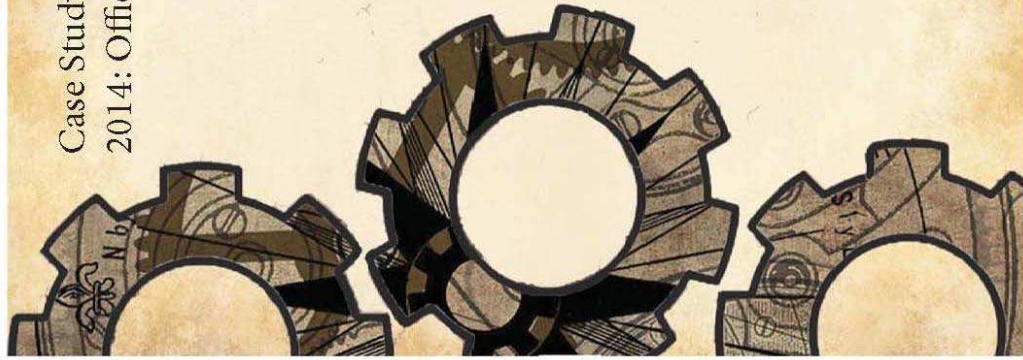
by creating different ceiling heights for different uses, keeping the ceilings full height in the main collaboration area and dropping them lower in areas for relaxation which will make the full height ceilings contrast more. To influence focus, windows that are currently covered can be opened and the space outside could be transformed into a courtyard to create more restorative views to inform boost focus in the space. Furniture arrangements will be placed in the middle of the space versus against walls and could be shaped in curved or semi circular patterns to encourage collaboration and participation amongst the users. These considerations from several environmental psychology studies will influence our design and be kept in mind as we move forward.

http://www.aberrantdata.co.uk/resources/Room_Design.pdf



14

Case Study 2: Interiors Awards 2014: Office: Small



15

** Clever details make this project stand out. It has a sophisticated palette that is a departure from the typical startup aesthetic, with textures that are both raw and refined. The furnishings and bold lighting choices reinforce the individuality of the design." -Jury*



An interior with its roots in the industrial

past has been reimagined as a space-age version of the Eames workshop by Studio O+A for San Francisco tech-startup Giant Pixel. Concrete walls and heavy wood joists were left exposed in this former printing press built more than a century ago. A few new design elements—including a suspended fireplace, orb-shaped speakers, and plenty of chrome furnishings—reference the groovy 1960s. Still, other new elements bridge the eras, such as a cantilevered white concrete desk and a water-jet-cut room divider made of cold-rolled steel.

"The clients gave us a lot of leeway, and they had the same interest in getting a good product," says Neil Bartley, senior project manager at San Francisco-based Studio O+A, led by Contract 2011 Designers of the Year Verda Alexander and Primo Orpilla. The successful tech entrepreneurs who founded Giant

Pixel—a company that programs gaming applications—are similarly passionate about design. "I've always wanted to work in an awesome office," says co-founder Alan Braverman. "And I wanted to build a space that our friends and people from neighboring startups would want to visit, to help us recruit engineers and designers."

The star of the reception area is the show-stopping concrete desk, a custom piece by Oakland-based Concreteworks. Its hollow concrete shell is supported by an internal steel structure that is bolted to the frame of the building. At the entrance, a divider of cold-rolled steel has been water-jet cut with a pattern of binary code that spells out the text of the opening crawl of Star Wars. The team's intense dedication to detail can be found in subtler touches elsewhere. For instance, conference room tables often have solid bases to conceal wiring, but the tables in Giant Pixel have been custom-designed by Los Angeles-based MASHstudios with cutout bases to create a sense of transparency.



16



detail in commercial interiors."

Since taking occupancy about a year ago, the Giant Pixel team has grown into its new office space. The bar has become an incredibly popular spot—what was originally intended to be a monthly happy hour has become a weekly event—and, therefore, its white floor has already required refinishing. Braverman's only complaint is that the Friday happy hour occasionally interrupts him in the throes of programming. "Our company is working on three projects at a time," he says. "It's a very productive space."

The two-story office is outfitted with open Knoll Antenna Workspaces as well as standing desks to accommodate different modes of working, while whiteboards of glossy back-painted glass promote brainstorming. The office has three private meeting rooms, as well as a living room area defined by a midcentury inspired Fireorb fireplace suspended from the ceiling, curved plywood Jels-Laub Slurp chairs, and soft Arper poufs.

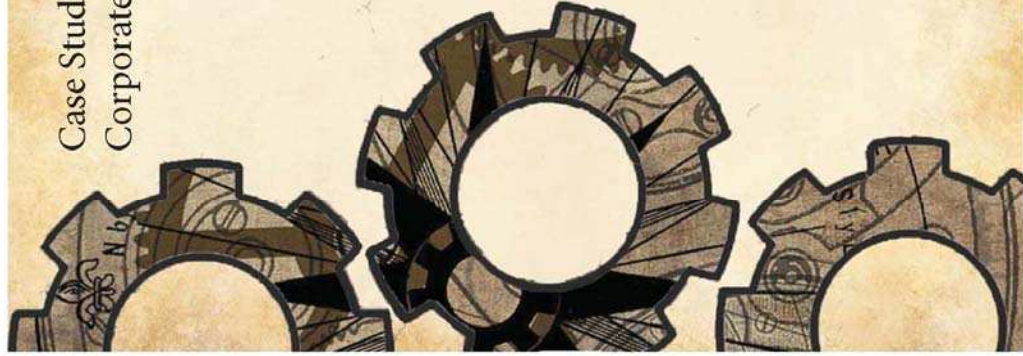
Work also occurs in the basement, where staff gather in the company's lounge and program next to each other on banquettes upholstered in caramel calfskin. The polished underground space, which Bartley describes as "the speakeasy of the future," has a long bar with custom millwork and stainless-steel fittings. Several vintage arcade games are handy for blowing off steam. The lounge-appropriate mood lighting includes Sonneman Orb chandeliers and a strip of illuminated concrete along the edge of the ceiling. "It's one of those little moves that are fun for a designer," Bartley says. "It's rare to get to that level of



<http://www.contraanddesign.com/contract/design/features/interiors>
Awards-2013/01/14.html

17

Case Study 3: Design - Features - Corporate Design



18

After a recent merger, Olson, a Minneapolis-based marketing agency that has created everything from social media campaigns for Oscar Meyer to rewards programs for L'Oréal, found itself bursting at the seams. Its 375 employees were scattered over two locations, and teams—organized by disciplines such as public relations and database analytics—were often separated. “We were feeling increasingly fragmented,” says Sue Williams, Olson’s director of operations. “We just had to come together.”

They came together in a new office designed by Gensler within a building that is intricately linked to the robust manufacturing heritage of the Midwest. Built in 1912 as a vertical assembly plant and showroom for Ford Motor Company, The Ford Center

is listed on the National Register of Historic Places as part of the Minneapolis Warehouse Historic District, and it boasts high ceilings and large windows—assets that helped its renovation and adaptive reuse by developer Union Properties earn LEED Gold status. Starting from scratch in this building, which is in a vibrant area adjacent to downtown and the Minnesota Twins’ Target Field, sent a powerful signal. As one of the top 10 independent, full-service agencies in North America, Olson had moved to the “national stage,” observes Bill Lyons, principal and managing director of Gensler’s Minneapolis office. “This building was charged with serving as a symbol of that growth.”



Connecting to history

For the most part, the historicity of the property was a plus. “It’s such a unique building with huge floorplates,” Lyons says. “It was perfect for a creative tenant like Olson.” Because the interior was an



empty shell, the Gensler team could define everything from bottom to top, beginning with the installation of reclaimed oak flooring—milled from logs found at the bottom of Lake Superior—and continuing with the Corten steel dividers that weave their way through the space to separate function areas.

“We tried to root all of the materials in the industrial qualities that are so important to the building’s history,” Lyons says.

Gensler developed a visual metaphor to make the firm whole and elevate the company’s stature. “The driver was that Olson makes connections. So what better

connector is there than a staircase?” Lyons says. This key insertion—linking the 125,000 total square feet from the seventh floor through the tenth floor, plus a small portion of the sixth floor—allows employees to easily get to other floors as well as giving them new ways of seeing each other at work. Hundreds of variously sized, wall-mounted mirrors adorn the walls surrounding the suspended staircase, creating a shimmering fun-house effect. Offering partial glimpses and off-kilter experiences, the mirrors “represent the as-yet-unimagined connections that emerge from collaborative work,” says Betsy Vohls, senior associate at Gensler. The landings each “act as a nexus,” she continues. “We planted different amenities on different floors to pull people throughout the entire agency.”



Color-coded floors and gathering spaces

Each floor has its own lounge area and espresso bar; two floors also feature wine bars, while another accommodates the company's lunchroom. Each floor is differentiated by individual color palettes, including hues of orange, red, blue, and gray. These colors turn up everywhere, from the string art installations that serve as floor number markers to the patterns of the custom sofas, to the Gensler-created graphics in the small project rooms.

The number of informal gathering spaces and the variety of conference rooms—from brand rooms that seat six to eight people to the large pitch room that can seat up to 40—is a key component of the design. "We wanted as many opportunities as possible for the exchange of ideas," Williams says. "When we were spread out and tight for space, everything had to be planned in advance. Now we have a lot more chances to spontaneously meet, and to see work in progress." In the brand rooms, for instance, work is often pinned up or outlined on whiteboards so that

meetings can start, stop, and then continue easily. Most employees work in the open at Steelcase benches, desks, while the 50 or so executive offices are entirely demountable. The connections to local history, though, are evident with interior elements that include everything from original art to found lamps to small vintage machine pieces set on reclaimed wood blocks. The idea of craft—of making things—is a strand that runs from the building's heritage to the modern workmanship of Olson.

Key Design Highlights

A new staircase connects all floors of the office and creates opportunities for spontaneous interactions between staff.

Vintage furnishings mix with modern furniture systems for an effect that befits a creative company. From bars to branding rooms, staff can meet in a variety of informal spaces.

Graphics painted on the ceilings of the elevator lobbies, when viewed together from outside, form a clever branding device.



Olson

Architect: Gensler

Client: Olson

Where: Minneapolis

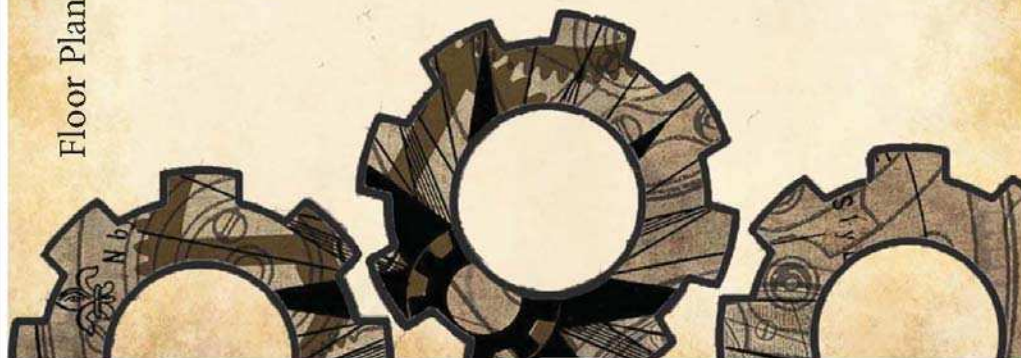
What: 125,000 total square feet on five floors

Cost: \$47.5M, withhold at client's request

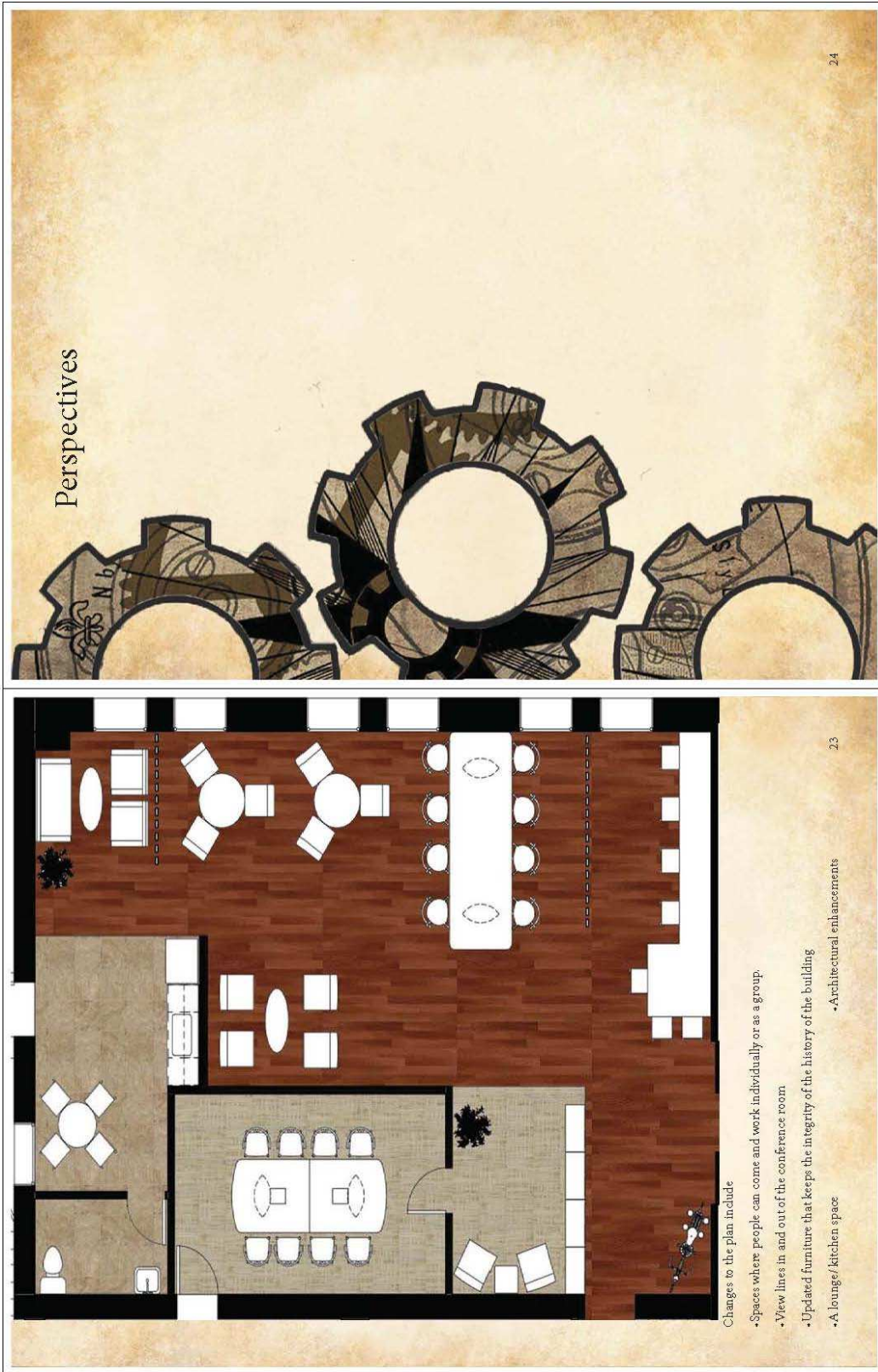
<http://www.gensler.com/projects/olson/>
Feature/Olson: 11/09, Rural

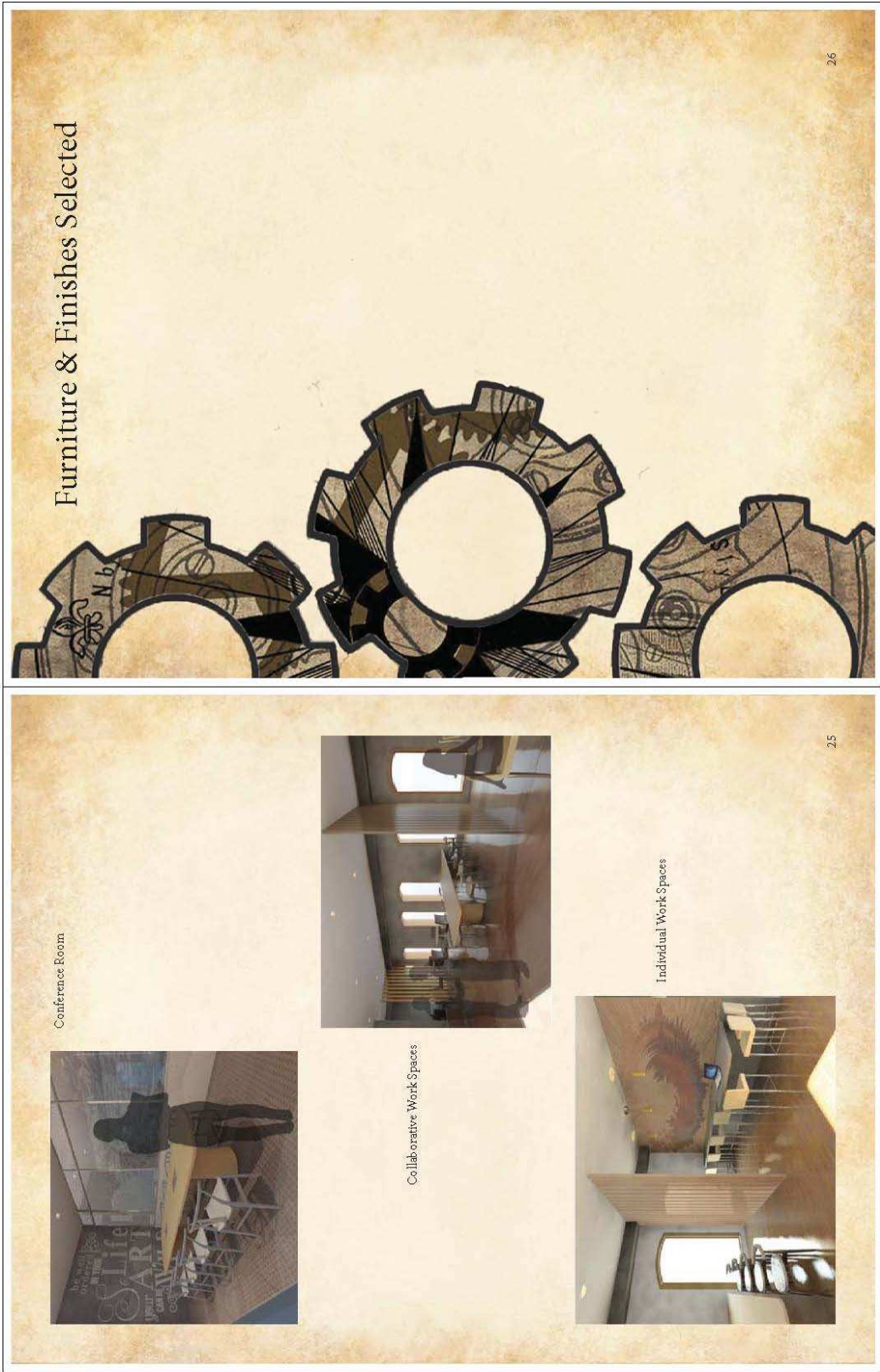
21

Floor Plan



22









challenge

The Carnegie building in Old Town Fort Collins represents a culture of rich diversity and community. Currently, the building is being used as an art gallery where local artists can set up exhibitions of their work and display them for a limited amount of time. The administration of the building wishes to create an artists' community where residents of Fort Collins can come to learn, create, and share while celebrating the vibrant artistic culture of Fort Collins, CO.

The Carnegie building was originally a library, opened to the public in 1903 by Andrew Carnegie; it became the new residence of the Fort Collins Museum in 1976.

Now the building, 109 years after it was opened, is changing again. What once was a knowledge center, then an arts & culture center, is now given the opportunity to be all three, thanks to Arts Incubator of the Rockies (AIR), Beet Street, working with the City of Fort Collins, will be rejuvenating and retrofitting the building to be the new AIR Headquarters. There will be plenty of space for the initiative and everything it plans to offer to the public. There will still be gallery spaces to showcase the work of creatives, spaces for workshops and events, and administrative offices for AIR and Beet Street. There will also be distance learning classes, a café with wi-fi access, and a black box theatre for a simple, intimate performance experiences.



user profile

We are specifically designing the Ideation Space of the building. The user of the space is artists across Fort Collins, as well as the surrounding community. The target audience is local to Fort Collins. These age demographics range from children, to teenagers to adults. The user includes families, couples, and other groups. These people could be professionals or students.

Art can be expressed in a multitude of formats that require a multitude of resources. The media that art is produced through can be so varied that the artist is forced to relocate in order to use different services. It is vital then, to create a space that contains as many resources as possible. This space in particular can be used for presentation and gallery exhibition of art, and the maker space below can be the source for producing the art.

The main focus is to create a universal design. Since this building is acting as an art gallery and community center, the design must be aesthetically pleasing, comfortable and welcoming to all groups of people.



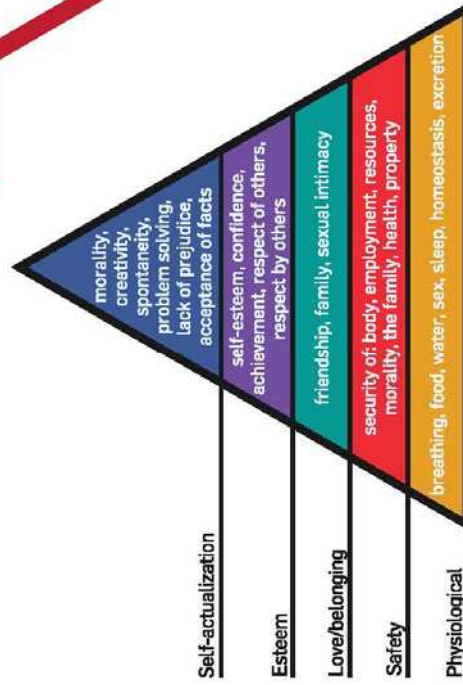
theory

Frederick Winslow Taylor believed that workers are motivated primarily by pay. He believed that workers do not enjoy work, and therefore require supervision and control, and should perform small tasks instead of large ones with the appropriate training and tools. He thought workers should be paid on a time-pleasure system, and this system results in harder workers who will maximize productivity.

Elton Mayo held the theory that workers are not only concerned with money, but could be more motivated if their social needs were met while at work. He established the Human Relations School of thought, which encourages managers to take more of an interest in workers, recognizing their opinions and acknowledging that they enjoy working together. From experiments in changes in lighting and working conditions, he concluded that workers were best motivated by better communication, greater manager involvement, and working in groups or teams.

Abraham Maslow, with the help of Frederick Herzberg, established the Neo-Human Relations School in the 1950s. This school of thought focused largely on the psychological needs of employees. He introduced the Hierarchy of Needs, which is composed of five levels of human needs that should be fulfilled. The first and bottom level is Physiological Needs, which include hunger and thirst. The next level is Safety Needs, which includes security and protection. The third level is Social Needs, which include a sense of belonging and love. The fourth level is Esteem Needs, which include self-esteem, recognition and status. And the top and final level is Self-Actualization. The next level could only be opened after the lower level had been fully met.

Frederick Herzberg believed in a theory of motivation that had two to three motivators and hygiene factors. The motivators would directly motivate workers to work harder, and are more concerned with the actual job. Hygiene factors acted as de-motivators if not present, and are factors that surround the job. Methods that can be applied to achieve improvement in the nature and content of the job include job enlargement, job enrichment, and empowerment. Job enlargement provides workers with a greater variety of tasks and assignments, whereas job enrichment gives more power to the employees to make decisions as they apply to working life.

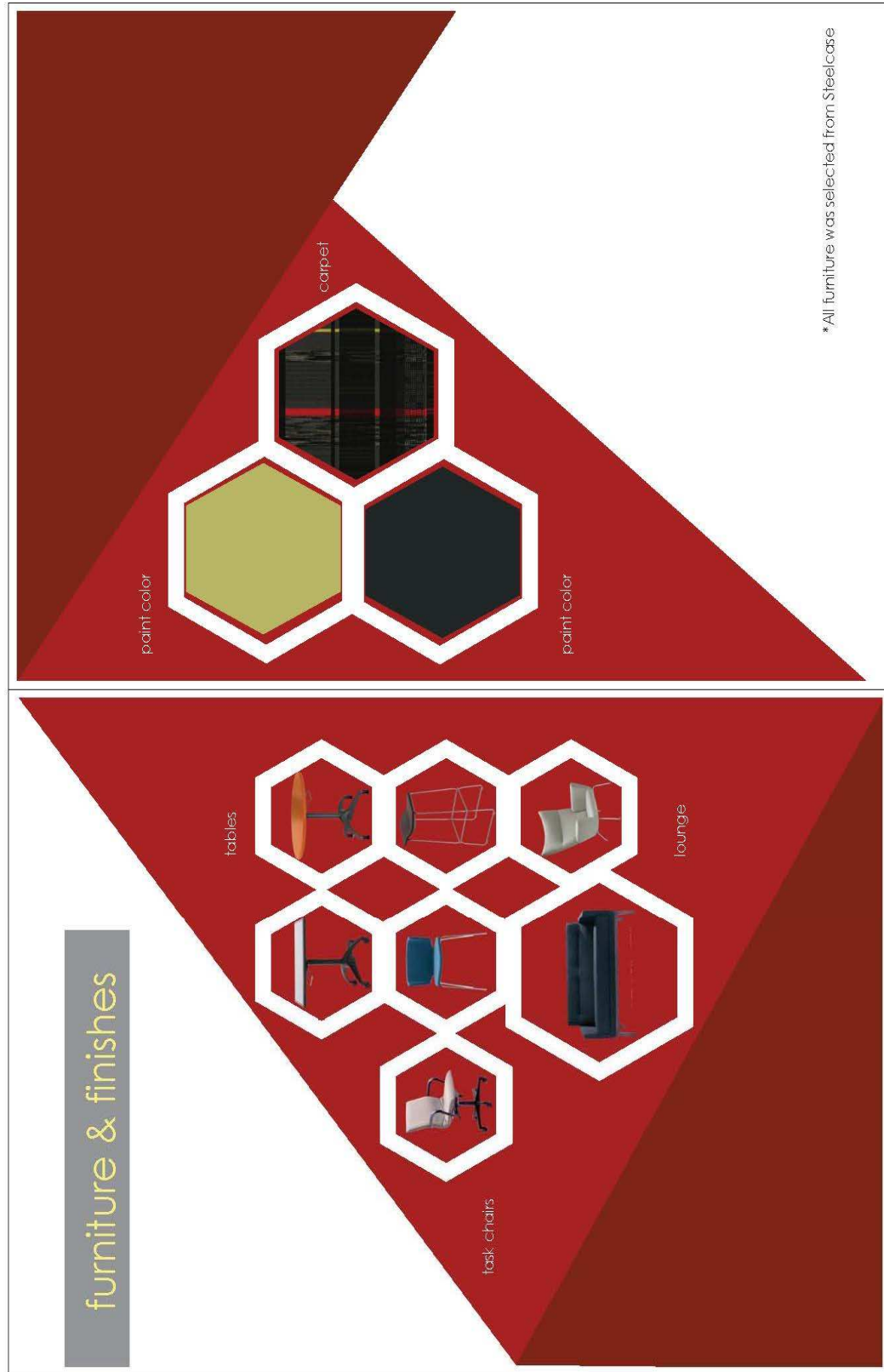


Maslow's Hierarchy of Needs

solution

The solution to our challenge of creating a space that can be used for artists across Fort Collins and the surrounding community is to design a space that combines traditional artisan craftsmanship with modern technologies. Our focus is the Ideation Space of the building. In this ideation space, we have established a flexible and interchangeable concept that would cater to the user's needs and desires. The space will be used in a variety of ways. Students can study in a quiet environment, and tutors can be available to assist with schoolwork. Professionals can conduct meetings by creating a conference room with flexible partitions. It can also act as a quiet place to read and relax, with lounge furniture throughout. The space can also transform into a gallery room, complete with tables and tack boards to showcase works of art. A presentation space is another option, equipped with smart boards and a presentation platform. The space is flexible and provides various opportunities for utilization.










Teal Team Posters





CLIENT PROFILE

The Carnegie library is a cultural center for visitors and artists who come from all over to experience art and to create art. The main floor is used to display art and sculptures. While the other two floors will be used to imagine and create for local artists.

Our space will be a ideation space where artists of all ages can come to imagine, brainstorm, collaborate and ultimately create their vision using technology. Artists will be able to share their ideas with others while in a laying down positions. After brainstorming and working through ideas with others, the space will shift to become a work area to continue to develop the idea until it is ready for creation.



CARNEGIE CREATIVE CENTER

IDEATION SPACE



HISTORY

Andrew Carnegie was born in 1835 in Dunfermline, Scotland. His family immigrated to Pittsburgh, Pennsylvania in 1848 when Andrew was 13 years old. Throughout his youth Andrew has many jobs including a messenger boy, a personal telegrapher at the Pennsylvania Railroad. When Andrew was 21 he invested in sleeping cars and began receiving a return of \$5,000 dollars annually. Andrew made many other investments using his money including oil and other companies. Andrew's biggest stepping stone to success was his first steel plant. He then developed the steel industry using new technological innovations. Using his wealth Andrew began to found libraries and schools across the U.S. starting in 1888.

In 1904 Andrew Carnegie donated \$12,000 to fund the building of the Carnegie Building in Fort Collins, Colorado. It housed over 3,900 books and used native red sandstone from Horsetooth Reservoir on the building's facade. In the late 1930s the east side of the building was expanded, but the library soon outgrew the building. The Fort Collins Museum was established in the building in 1977 and has been displaying art since.



VERSATILE CLASSROOMS

"Design Thinking" is a model of learning that combines hands on learning with independent problem solving. This model can be achieved through the classroom environment, furniture and ability of different learning styles to interact in the classroom. Some ways to create "design thinking spaces" are to:

- Provide movable furniture
- Provide breakout spaces for small groups of students
- Create collaborative spaces that can be transformed
- Create shared space for student use

We will create a "design-thinking" space in the Carnegie Library using all of these practices. Our space will be for small group settings for artists to collaborate and brainstorm with other artists. This will be a shared space for artists which can be transformed for different functions including visual brainstorming and process work as artists think about their design.

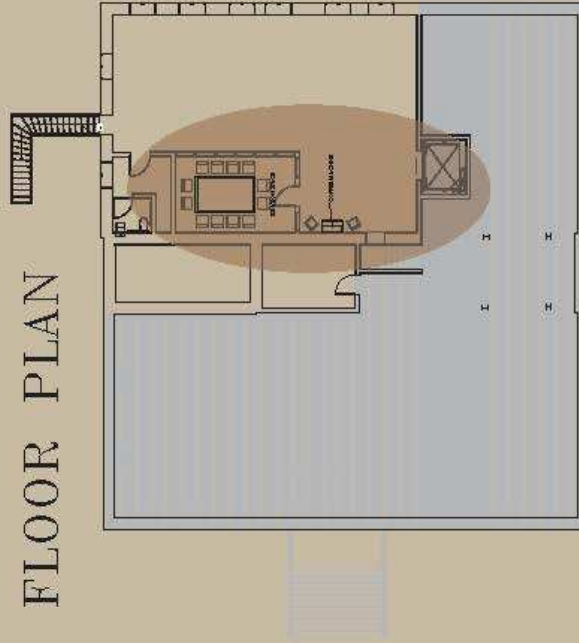


WATER COOLER EFFECT

The water cooler effect occurs when two or more members of a work environment meet in one communal space and converse to enhance collaboration. This can be beneficial as those who wouldn't normally interact meet and share ideas in order to create new ideas. Meeting in these informal spaces can create informal conversations and allows workers to explore the knowledge they have and share knowledge.

This is relevant in our space as the in-between space as you first enter the floor can become a "water cooler" space where artists can interact and share ideas with others. This will be our informal space where artists can relax and share a cup of coffee with others. Before they enter a more formal space where they brainstorm they have the potential to obtain ideas from others.

FLOOR PLAN





IDEATION

We find that often times the best ideas come to us when we are laying down and a thought pops into your head. This is the whole concept of this ideation space. We plan to easily transition from ideation when laying down looking up and the projector, to creation when the table comes down and the chairs come up and its time to work. Our table is on an automatic pulley system that goes up and down. On the ceiling we have placed a projector which can show up on the double paned glass table with projector paper in between them. This steers learning in a different kind of creative fashion. There are ipads that are stored on the side of every chair to jot down notes or upload slides on to the projector. The ergonomics of the chairs will set your neck at ease while looking up and the projections. This is an All In One space for the creative users.

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