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THE MEDIATING EFFECT OF CONTEXTUAL CHARACTERISTICS ON COLLECTIVIST DYNAMICS AND ENTITY BASED CREATIVITY AMONG FACULTY IN HIGHER EDUCATION

Anthony Olalere
Clemson University, aolaler@clemson.edu

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THE MEDIATING EFFECT OF CONTEXTUAL CHARACTERISTICS ON
COLLECTIVIST DYNAMICS AND ENTITY BASED CREATIVITY AMONG
FACULTY IN HIGHER EDUCATION

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Anthony Abidemi Olalere
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Accepted by:
Dr. Russ Marion, Committee Chair
Dr. Leslie Gonzales, Co-Chair
Dr. James Satterfield
Dr. William Hanson
Dr. Jon Christensen

ABSTRACT

This study examines the mediating effect of the entity based creativity on the interaction between complexity theory and creativity among faculty members in higher education organizations. The purpose of study was to investigate how mechanisms for intellectual productivity and creativity foster intellectual and disciplinary interactions among faculty members in higher education. The theoretical framework of complexity theory and KEYS model constructs were employed in order to examine how complexity dynamics, motivation, stimulants and inhibitors foster faculty creativity in higher education.

The Partial Least Square of Structural Equation Model (PLS-SEM) was used to analyze data using the PLS algorithm, bootstrapping and predictive relevance (Q^2) to assess the predictive accuracy on creativity among 73 tenure and tenure-track faculty members in south east research-based university in the United States. The result showed that stimulant resource, inhibitors and stimulant new-thinking was identified as constructs with the strongest effect on creativity. The findings also reveal that indicator-types like organizational impediments, psychological safety, organizational encouragement, freedom, organizational pressure, fun and novelty/ originality had the greatest impact on faculty creativity in higher education. Finding in this study is consistent with complexity theorists arguments that appropriate amounts of pressure encourages workers to seek creative solutions to challenges in an effort to control that pressure and the issues of trust, confidence and organizational encouragement are important in fostering creativity.

DEDICATION

This dissertation work is dedicated to my wife and four children for their patience endurance during my doctorate program. I also give honor and praise to the Almighty God for keeping and sustaining me throughout the process of this program, for it is in Him I live, move and have my being.

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CHAPTER ONE

INTRODUCTION

Creativity in organizations is the outcome of interactions between individuals and groups that is fostered by enabling contextual conditions. Creativity emerges from an interaction of creative minds, and the experiences these creative minds have within their environment can ultimately affect the generation and development of novel ideas. It is the outcome of the entity or individual based and collectivist dynamics or group interaction based on the influence of prevailing context (Amabile, 1988; George, 2007). In the entity based perspective of creativity, it is argued that creativity lies in the heads of individuals (Mckinnon, 1965). Many of the scholarships in the last 50 years of creativity have focused on personal qualities or entity based creativity (Woodman, Sawyer, & Griffin, 1993). These researchers have focused on traits, rewards, motivations, personality, and individual qualities that enhance creativity. According to Shalley, Zhou, and Oldham (2004), "research has tended to focus on individual creativity, with little empirical research focused on creativity at the group or team level" (p. 462).

In the 1980s and 90s, researchers began to examine the group and team approach to creativity (George, 2007). In these group or collectivist approaches to creativity, it is argued that creativity outcomes are not fostered from an individual mind, but rather are a result of team and group interactions within the organizational environment. According to Hargadon and Bechky (2006), a collectivist approach to creativity is the "moment when the creative insight emerges not within a single individual, but rather across the interactions of multiple participants in the process" within an environment (p. 484).

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Additionally, recent literatures have been writing on the environmental or contextual characteristics and conditions that foster creativity (George, 1996). Early research has focussed on industry (eg sciences and business) while not much have been written about contextual conditions that foster creativity among faculty members in higher education (Fuerst &Zubek, 1968).

Extant literature on contextual conditions of faculty in post secondary organizations have focused on faculty assessment of skills and faculty perceptions of how the environment responds to their behavior rather than on contextual characteristics of faculty creativity, especially from a collectivist perspective (Blackburn, Bierber, Lawrence, & Trautvetter, 2010).

What has been examined in the literature on a collectivist or group approach are grouped and team compositions, their categorization and the conditions of interaction. Less emphasis has been placed on empirical research regarding the complexities in higher education and contextual characteristics that foster this interaction to enable creativity. In this study, the contextual characteristics that nurture creativity among faculty in higher education from the entity and collectivist perspective are examined. This research considers the entity and the collectivist interaction among faculty creativity in a workplace environment like post-secondary organizations from the lens of complexity theory.

As faculty members interact in their workplace environment, there are varying departmental standards, meanings, and definitions ascribed to creativity and productivity. Thistlethwaite (1959a, 1959b), examined what productivity means for schools in natural

sciences, humanities, and social sciences. The definition of productivity in some fields is the difference between a college's rate of producing PhD's and the rate of undergraduates who advance to earn their doctorates (Amabile, 1996). In other colleges, productivity is determined based on contributions to research, teaching, service, and how much funding faculty members can acquire. There is a lack of a common definition of creativity; moreover, a dearth of evidence exists regarding the effect of environmental conditions on workplace creativity in higher education.

The content analysis of an empirical study on creativity and innovation involving 125 Research and Development scientists showed two important findings. In the first, high creativity was examined, and in the second, low creativity was investigated. The two outcomes revealed the impact of environment on workplace as more important than the influence of personal characteristics. Based on interviews with the research and development (R&D) scientists, these researchers identified environmental factors fostering creativity, which they called "environmental stimulants." The scientists found more qualities hindering creativity, which they called "environmental obstacles" (Amabile, 1988a). It is from this study that the KEYS model (formerly known as the Work Environment Inventory, WEI) was developed to assess the work climate for creativity (Amabile, 1996)..

The KEYS Model by Amabile and colleagues, used for this study have proven to have high validity in the business workplace environment in earlier studies (Amabile, Conti, Coon, Lazenby, & Herron, 1996). The rationale for the use of this model constructs is due to the "limited type of predictor variables," with weak and often

contradictory results of previous literature in examining faculty creativity in higher education (Blackburn, Bieber, Lawrence, & Trautvetter, 2010).

Also the complexity theory constructs were used for this study. The rationale for deploying the complexity theory is that, it describes interactive systems or networks of patterned human behavior to understand how interactions emerge and how they generate creativity. Uhl-Bien, Marion, & McKelvey (2007) summed this concept up by suggesting that the outcome of complexity is creativity, adaptability and learning. The predictors of complexity theory are interaction, interdependency, pressure, and heterogeneity and psychological safety.

The KEYS construct was used to examine the entity based interactions while the complexity theory was adopted to investigate the collectivist dynamics. In this research, it is argued that creativity is an outcome of interactions between individuals and groups in a complex system like higher education and it is hypothesized that entity based creativity mediates the interaction between complexity theory and creativity among faculty in higher education.

Purpose of the Study

The purpose of this study was to examine the mediating effect of contextual characteristics of entity based perspective on the interaction between collectivist contexts and creativity among faculty members in higher education. Contextual characteristics of individual and collectivist dynamics in a complex system were investigated to understand how mechanisms for intellectual productivity and creativity foster intellectual and disciplinary interactions among faculty members in higher education. To assess the

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mechanisms that foster intellectual exchanges, complexity leadership theory constructs were used to explain how collectivist dynamics like interaction, interdependency, process conflict, and heterogeneity enhance faculty creativity.

Also considered was the KEYS model constructs of organizational encouragement, supervisor's encouragement, work group support, freedom, resources, and challenging work as stimulants of contextual characteristics while organizational impediments and work load pressure functioned as obstacles of contextual characteristic. The mediating impact of stimulants and inhibitors on the interaction between collectivist dynamic and creativity was examined. To achieve this purpose, the research was situated within the quantitative methods paradigm using the Structural Equation Model Partial Least Square software, known as SmartPLS to analyze the data.

The goal of this research was to investigate the characteristics of relationships and patterns of interactions of the entity based creativity on the interaction between collectivist dynamics and creativity in a complex environment such as higher education.

Research Questions

The overarching research question for this study is: How do organizational stimulants (supervisor's encouragement, work group support, freedom, resources, and challenging work) and organizational obstacles (work load pressure, resources, task complexity, culture, work setting, and relationships) mediate the effect of complexity contexts on faculty members' creativity in higher education? From this question, four sub-questions are presented:

1. How do collectivist dynamics influence faculty creativity?

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2. How do creativity stimulants mediate the effects of collectivist dynamics on creativity?

3. How do creativity inhibitors mediate the effects of collectivist dynamics on creativity?

4. How do stimulants and inhibitors together mediate the effects of collectivist dynamics on creativity?

Theoretical Framework

It is suggested in this study that creativity is a function of the workplace environment and the interaction among agents in the organization. This interaction takes place between individuals and groups to combine with enabling contextual conditions within the organization to enhance creativity (George, 2007). The KEYS model by Amabile, Conti, Coon, Lazenby, and Herman (1996) describes the perception workers have of their workplace and the meanings and perceptions they hold about the environment enhances creative outcome. The KEYS model focuses on the relationship between the workers' perceptions of their environment and the outcomes of the programs. In this study, the interaction among workers is investigated as well how stimulants and inhibitors of creativity in a complex system foster creativity in the workplace.

Amabile et al (1995) identified certain categories of variables that enhance creativity, which are: "autonomy, work group support resources, challenging work, workload pressures, and organizational impediments" (p.1158). The survey that Amabile

et al. (1996) created from these categories is a standardized quantitative tool divided into "stimulant scales" and "obstacle scales" (p.1158). The stimulant scale includes:

Organizational encouragement: institutional and departmental culture can encourage creativity, new-thinking, promote and develop structures that will foster the generation of new ideas. An example of a statement in this category is: "Employees are encouraged to be problem solvers and solve problems in a creative way" (Amabile et al., 1996, p. 1158).

Supervisory encouragement: Supervisory encouragement examines the extent to which head of departments and senior scholars serve as role models, set goals, support work groups, and express confidence to employees and junior colleagues. This can be explained as: "My supervisor serves as a good work model" (Amabile et al., 1996, p. 1160).

Work group support: The focus is on a diverse workplace that encourages work group support, in which there is a free flow of ideas, access to information, openness to constructive criticism, team support and challenges. An example of this is: "There is free and open communication among the work force" (Amabile et al., 1996, p. 1160).

Freedom: The word freedom also stands for autonomy. Freedom to decide what program to engage in or not to do. It represents a sense of ownership of projects. An example of this is "I have a choice to decide what to do or not to do" (Amabile et al., 1996, p. 1161).

Resources: This kind examines the extent of access to relevant resources including funds, materials, facilities and information. A sample statement is "I can get all the resources I need for my work" (Amabile et al., 1996, p.1161).

Challenging work: The features of a challenging workplace include task related challenges. The statement provided is: "I feel challenged by my current work" (Amabile et al., 1996, p. 1158).

The obstacles scale includes:

Organizational impediments: This considers the constraints to creativity like; political strife, antagonism to new ideas, unhealthy internal competition, resistance to new-thinking and maintenance of the status quo. An example of this: "There are too many political challenges in this work environment" (Amabile et al., p. 1162).

Workload pressure: Workload pressure describes excessive time constraints, unrealistic expectations, and work related distractions. A sample statement for this is "I have too much work with little time to do the work" (Amabile et al., 1996, p. 1162).

The two scales for measuring work outcomes describe creativity and productivity include:

Creativity: In a workplace that esteems creativity, there is a high expectation of creative outcomes and creative ideas are valued. Under this category is: "My work environment helps me to enhance creativity and is innovative" (Amabile et al., 1996, p. 1162).

Productivity: Consideration is given to how efficient and effective the employee work is produced. The statement offered is: "My area of work in my organization is innovative" (Amabile et al., 1996, p. 1162).

Complexity Theory

According to Marion (2012), "a complex system is an environment in which ideas interact and evolve and new ideas emerge" (p. 12). This definition views the environment and the interaction that takes place from collectivist lens. It is process oriented and it is noted that ideas and creativity reside not in the mind of an individual but through interaction and interdependency among creative individuals. In the view of Godwin (1997), complexity is the incubator for creative expression through creative play and interactions. Complexity is the examines organic dynamic interaction by identifying patterns of behavior called complexity mechanism (Uhl-Bien et al., 2007).

A complexity mechanism explains how social outcomes are processed and developed. In complexity, this process of interaction, the conditions fostering these outcomes, and the effects on the mechanism are examined. And that is why complexity is relevant to this study, because it does not only study the conditions that foster creativity, but also its process, outcome, and effects.

Complex systems are composed of agents and ideas and how their interaction produces creativity. Creativity does not solely reside within collectivist interaction even though it is the "dynamic processing of ideas and how humans interact with that dynamic" (Marion, 2012, p.18). Rather, creativity is also developed in the mind of individuals who are actors in interactions within their informal environment (Stacey,

2001). Several things occur in the process of producing these outcomes as agents become interdependent and produces what is called Complex Adaptive Systems (CAS). The process sometimes results in tensions that produce new ideas or generate better ways of doing things. The outcome of this process is a nonlinear system, change, or creativity. Many of these changes may be unexpected, but they certainly lead to the emergence of creativity and change (Marion, 2012).

Fonseca (2002) noted that creativity is the creation of meaning through the interaction of people but processed in the individual mind. Uhl-Bien et al (2007) summed up this idea by asserting that the outcome of complexity is creativity, adaptability, and learning. The predictors of these are interaction, interdependency, pressure, heterogeneity, and psychological safety.

Interaction: Interaction is a very important feature of complexity, and it encourages open, formal, and informal dialogue from the bottom up. It is usually organic in nature and will require structural and physical layout to make things happen, which is important for agent connectedness and systems capability to innovate. This type of interaction should not just be among individuals but across groups by building bridges of communication, accessibility of information and of ideas across silos (Marion, 2012).

Interdependency: Interdependency is a work related interrelationship that helps to generate creativity. Complexity theory examines the strengths of such dependency and connectedness in tasks. According to Kauffman (1995), the strength of interdependency results in tension and couplings. The result of these tensions to which agents relate and subsequently depend on one another is systemic change. Systems should thus be

structured as networks of relationships that are interdependent on one another to foster complexity and creativity (Uhl-Bien et al, 2007). The outcome of this pressure and process task conflict is constructive for creativity. However, Kauffman (1995) noted excessive interdependency may freeze the system.

Pressure: Pressure relates to task related conflicts in which agents differ in the way tasks are conducted. Task related conflicts are best for organizations, and they emerge when agents are interdependent and work in teams. The pressure that results from this type of conflict can create trilemma solutions, problem-solving and generation of creativity. Organizations should encourage task related conflicts because they are not personal conflicts but differences in how tasks can be performed; such conflicts are constructive for creativity (Jehn, 1997; Marion, 2012). Pressure can also result from lack of time to perform a task or to meet a deadline. Research on conflict and time has pointed both to lack of time as a motivation to get work done and as a stressor (Bellas & Toutkoushian, 1999).

Heterogeneity: George (2007) opined that diverse groups are more creative than homogenous ones. Many researchers have examined the importance of diversity for creativity and how a more diverse group can foster organizational creativity. This occurs when there is an infusion of diverse information through knowledge diversity, that will result in diversity of ideas (Uhl-Bien et al., 2007). Basadur (2004) noted that "teams with a more heterogeneous preference for various phases or stages of the creative process were more innovative than teams whose members were more homogeneous for various stages of the creative process" (p. 106).

Psychological Safety: Psychological safety describes the kind of support and structural assurance that individuals receive from organizations, both in times of job security, embracing new-thinking, trust, and employee supervisor encouragement (Danneels & Seth, 2003). Psychological safety comes from management when it is related to embracing new-thinking, freedom from threats, and departmental politics, which are important in fostering creativity. Those in an environment in which new-thinking is encouraged are more likely to experience more creativity than one in which new-thinking is stifled. An effective leader-member exchange is more likely to enable creativity than a poor leader-member exchange (Graen & Uhl-Bien, 1995). An environment in which free information flow, trust and confidence are promoted and where creative ideas are rewarded is more likely to engender creativity than the one without.

Adaptive Rules: Adaptive laws and rules govern the system in creating desired objectives. They should not limit but foster creative outcomes. These organizational rules should be seen to enhance interaction, interdependency, task relating pressure, accessibility to information, and collaboration in building a culture of creativity (Uhl-Bien et al., 2010).

Resources: Provision of adequate resources is necessary for creativity to take place. This is usually a combination of factors like knowledge, qualified personnel, infrastructures, and finances. It is not enough to have these resources but having access to them at the right time is equally important.

Definition of Terms

Creativity: Woodman et al. (1993) defined creativity as the "creation of valuable, useful new products, service, idea, procedure, or process by individuals working together in a complex social system" (p. 293). Shalley and Zhou (2008), distinguished between creativity and innovation. Creativity is the ideation part of innovation. Creativity always precedes innovation. Innovation is the implementation of ideas. An operational definition of creativity for this study is the "aspect of faculty members' work outcomes that are novel, add to knowledge, and are considered by peers and colleagues as creative" (Amabile, 1996, p.33).

Productivity: Productivity is the measurement of output and efficiency of a person, system, publication, grants, service, and teaching. In this study, productivity is looked at as an outcome in higher education. According to Runco (2004), creativity will result in productivity, but productivity does not always result in creativity: This research examined both creativity and productivity as an outcome variable and faculty creativity outputs in terms of publications, grants, service, presentations, inventions, and teaching.

Contextual Characteristics: Contextual characteristics refer to the "dimensions of the work environment that potentially influence an employee's creativity" (Shalley, Zhou, & Oldham, 2004, p. 935). These are factors that address environmental and social factors that influence creativity.

Stimulants of Creativity: These stimulants were identified by Amabile et al. (1996) KEYS model as a set of factors that fosters and promotes an environment of

creativity. These factors include autonomy, work group support resources, challenging work, organizational encouragement, and employee support.

Inhibitors of Creativity: Amabile et al. (1996) identified certain factors as obstacles to creativity in a workplace environment. They are what constitute hindrances to creativity in an institution. The inhibitors identified are organizational impediments and workload pressure.

Collectivist Creativity: Hargodon and Bechky (2006) defined collectivist creativity as "shifting the emphasis in research and management of creativity from identifying and managing individuals to understanding the social context and developing interactive approaches to creativity" (p. 484). It is an approach that looks at creativity from the group and the team perspective rather than from the individual or person-centered lenses.

Entity Based Creativity: Also known as individual or person-centered creativity, the approach of the entity based creativity is based on the premise that creativity is generated from the human mind. Early studies on creativity were based on characteristics that fosters individual creativity such as personality traits, cognitive factors, and motivation.

Motivation: This study focused on intrinsic motivation to understand the faculty rationale for participating and engaging in creative task (Dev, 1997). Intrinsic task motivation determines to what extent individuals will channel their ability towards creative performance and their desire to contribute to a body of knowledge. The intrinsic

motivation variables for this study are goals, need for achievement, intellectual challenge, broad interests, collaboration, exchange of ideas and fun.

SEMPLS: SmartPLS is specialized software applied to path models. Path models are "diagrams used to visually display the hypotheses and variable relationships that are examined when the structural equation model is applied" (Hair, Hult, Ringle, & Sarstedt, 2014, p. 27). SEMPLES is operated from the Java Eclipse program.

Significance of the Study

This study is significant because the KEYS model constructs which is an entity or individual based leadership, have been adopted for research in the business field, yet very little is known about its applicability to higher education. Moreover, because faculty members are comparable to employees in the workplace, the KEYS model lends itself to such study and provides a unique approach when investigating work place perceptions in higher education organizations.

The KEYS model identified constructs that examine employee perceptions applicable to a wide range of workplace environments. So far, very little is known about the contextual characteristics that foster creativity among faculty members in higher education and how faculty members interact within their workplace. Additionally, very little empirical research has been done on the patterns of interaction and interdependency that foster creativity among faculty. Therefore, this study provides a collectivist and an entity approach for identifying the variables and analyzing the patterns of interactions. The findings from these interactions enabled a theory testing of the KEYS Model through

complexity lenses in higher education as well as theory building based on findings (Eisenhardt, 1991).

This study is important because higher education is at a critical phase of development in the United States, a nation just coming out of an economic downturn. Institutions of higher education are undergoing unprecedented restructuring with the tensions that accompany changes that impose requirements for creativity and productivity on faculty and higher education in general (Schuster & Finkelstein, 2006). In this study, the nature of creative behavior in higher education among faculty and common adaptive contextual factors that can foster faculty creativity in higher education are examined.

This research explores the need to understand what keeps faculty members continually motivated in a dynamic complex environment like higher education but also because of the potential this topic has for understanding conditions that foster contextual characteristics and creativity among faculty in higher education. Insights into the mediation between contextual characteristics and faculty creativity can potentially contribute to knowledge of faculty creativity in higher education.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this literature review is to examine the empirical and theoretical studies of other authors and their contributions to the discussion on creativity in higher education, and then to use these discussions to create a model and hypotheses for this current study. In this review, creativity among faculty members is assessed from a collectivist perspective. In collectivist approach, it is assumed that organizational outcomes are the product of interactions among ideas more than that of individuals acting out of their individual capacities. At the same time, an entity based perspective suggests that creativity is the minds of individuals based on certain qualities like personality traits, intrinsic motivation, and cognitive factors. In this study, creativity is viewed from both the collectivist or group perspective and entity or individual based perspective. However, It is also assumed that individuals are members of a social group that influences their creative ideas.

Various definitions from different authors were examined, and they affirmed that creativity is both a process and an outcome. Because creativity is a process, it is claimed in this review that leadership of creativity can be taught. Finally, this review concludes that a context, such as the level of interaction or pressure in a system, is important for creativity. We find that there are certain stimulating and inhibiting factors that promote or hinder the relationship between context and creativity.

The goal of this study then was to investigate the mediating effects of these stimulants and inhibitors on the relationship between contextual characteristics and

faculty creativity in higher education. Because context is identified as important for creativity, this research then examined the contextual characteristics that enable creativity. The goal was to investigate the mediating role of these contextual characteristics on faculty creativity in higher education.

Next, this research examined some models and interdisciplinary collaborations and how these dynamics influence creativity in higher education. The models and the interdisciplinary collaboration helped to understand interaction among faculty members. This interaction sometimes creates tension, which results in complexity. The tension and complexity become a catalyst for creativity among faculty members. In addition, faculty creativity was examined to understand what creativity is to the faculty member and identify the issues that support or hinder the creative process in academia. Finally, higher education is presented as a dynamic network of interaction among disciplines that creates complexities that may foster creativity.

The literature review for this study involved an extensive search of databases of peer reviewed journals, books, and dissertations. The databases used for the search include EBSCO Electronic Journal Service, ERIC, ProQuest General Research, Emerald Full Text, Dissertation and Theses, the College of Charleston Library, and OneSearch Services in South Carolina. The search criteria include words like *creativity, innovation, faculty, productivity, leadership, KEYS model, dynamic complexity theory, contextual characteristics of creativity, models of creativity, interdisciplinary collaboration* and *collectivist creativity*. Other specific topics were also searched to enhance this research including higher education, work pressure, stimulants, inhibitors, and work environments.

References from top tier journal articles were used as additional sources of literature that would benefit this study. In carrying out the search for this literature review, priority was given to peer-reviewed empirical articles in top tier journals. The rationale for this emphasis is that peer reviewed journals are critiqued and reviewed by experts in the field before they are published.

Creativity

Scholars in the last fifty years have made suggestions on how to improve organizational knowledge, productivity, and creativity (Amabile, 1995; George, 2007; Popper, 1961; Woodman et al., 1993). Some of these contributions studies have concluded that creativity emanates from the minds of individuals (Perry Smith, 2006; Shalley & Gibson, 2004); others opined that creativity occurs in groups (George, 2007; Woodman et al., 1993). More recent studies of creativity have focused on the context of creativity (Amabile, 1996; George, 2007). In this study, individually and collectivists literatures are examined, as well as other contributions that addresses the context of creativity.

The definitions of creativity are diverse and discipline-specific just as is the literature on the topic; most researchers proposed descriptions that allow for its' applicability across disciplines (Sill, 1984; Simonton, 1993). Getzels (1995), in contrast, proposed that there is no universal definition of creativity that cuts across disciplines; rather, definitions of creativity are relative to different disciplines. Woodman et al. (1993) defined creativity as the "creation of valuable, useful new products, service, idea, procedure, or process by individuals working together in a complex social system" (p.

293). Shalley and Zhou (2008) suggested a differentiation between creativity and innovation. Creativity is the idea generation part of innovation. They opined that creativity is the implementation of ideas and that creativity always precedes innovation.

According to Runco (2004), it is important for creativity to be original, even though originality alone may not be enough. Creativity must also incorporate the element of flexibility so that it can enhance opportunities, advancement, and changes that promote improvements. Creativity is defined as the development of novel ideas that are useful, meaningful, and influential (Paulus & Nijstad, 2003). The argument about creativity and originality is that original behavior conflicts with acceptable norms and sometimes viewed as aberrant. This perspective is corroborated by Runco (2004), who stated that creativity is constrained by fixedness. The result of fixedness is usually lack of flexibility, red tape, and resistance to deviance.

The definition of Mackinnon (1962) highlighted creativity as an outcome or performance: It involves a response or an idea that is novel or at the very least statistically uncommon. Novelty and originality of thought or action, while a necessary aspect of creativity, are not alone sufficient; creativity must also be adaptive to reality. It must serve to solve a problem, fit a situation, accomplish some recognizable goal, or create a new meaning (Fonseca, 2002). Also, "true creativeness involves sustaining of the original insight, an evaluation and elaboration of it, a developing of it to the full. Creativity, from this point of view, is a process extended in time and characterized by originality, adaptiveness, and realization" (Mackinnon, 1962, p. 4). In order to introduce a definition that is applicable to all fields, Amabile (1996) suggested an operational

definition of creativity that would be relevant to the diverse discipline and yet grounded in the creative product rather than the process:

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

The definition below can be considered non-objective based on the following considerations:

- Creativity criteria are socially, culturally, historically and contextual assessment of what is creative must reflect these contexts.

- Creative outcomes should be judged as creative by those involved.

- The range of a products creativity is considered as "either more creative or less creative depending on stakeholder considerations" (Amabile, 1996, p. 2 as cited in Flynt, 1997).

Recent literature has considered creativity either from a process or an outcome perspective. The outcome, which is mostly the result, outcome or product, identifies the products, program, presentation and performance. What is judged as the outcome of creativity by different stakeholders may vary in higher education (between faculty, legislature, faculty, and between different discipline), it is necessary that the final product be considered by stakeholders as creative.

Rhodes (1961) argued in their concept of "four Ps," that creativity can be categorized under person, process, product, and press. In their analysis, Woodman et al. (1993) categorized creativity as a creative process, creative product, creative person, and the interaction of these components with other factors. The concept of "press," first mentioned by Hurry Murry in 1983, explains the pressures on the individual to be creative. George (2007) described pressure as necessary for creativity and called press "creativity prompts." Runco (2004), reviewing the *Creative Work Environment Inventory* research of Amabile (2003) and Witt and Beorkrem (1989) stated that press describes the relationship among individuals, their environment, and the social dynamics that take place between them. Some conditions that stimulate creativity were included freedom, autonomy, role models, resources, time, failure, and lack of criticism. Creativity is accomplished by the "ability to break free of the rules themselves…It's found in the human ability to move beyond existing patterns to restructure the patterns themselves, and as a result to make a more sophisticated game" (Sill, 2001, p. 296).

Most literature on creativity has focused on the stimulants or facilitators of creativity in comparison to the inhibitors of creativity. And even when these reviewers mention the inhibitors, they vary in some of their perspectives (Choi, Anderson, & Veillette, 2009). This literature identifies evaluation, time pressure, and fixedness as inhibitors of creativity (Amabile, 1996; Shalley et al., 2004). Choi et al. (2009) argued that employee creativity is restrained by task characterization (routinization and standardization) and organizational context (unsupported climate) that displays

dysfunctional social context (averse leadership, close monitoring and untrustworthy and incompetent co-workers) (p. 331).

Baumeiter, Bratslavsky, Finkenauer, and Vohs (2001) suggested that it is important to study inhibitors because, "negative conflicting behaviors in one's social network have stronger effects than positive supportive behavior" (p. 355) and negative effects have a greater impact on outcomes than do positive effects. Choi et al. (2009) asserted that literature claims that bad has a greater preponderant effect than good. They argue that the absence of a positive predictor does not mean the presence of a negative predictor. Quiet often, opposite elements like collaboration and competition could both stir up creativity, hence the need to study both stimulants and inhibitors separately.

Runco (2004), on the other hand, listed the hindrances to creativity as lack of resources, lack of respect, competition, time constraints, unrealistic expectations, negative feedback, and inappropriate standards of innovation. Without doubt, lack of freedom is an inhibitor to creativity, but freedom alone does not ensure creativity (Sill, 2001) Freedom must be supported by other enabling factors like resources, positive feedback, role models, etc. According to Amabile, Gryskiewicz, Burnside, and Koester (1990), an important characteristic of creativity of highly creative organization is a balance between freedom and constraint, which is attained by a goal-setting that is tied towards organizational mission and outcome while allowing loose procedure towards other goals. Such organization's goal is aimed at encouraging collaboration and participation.

An important resource that enables creativity is time. The significance of time was reiterated by some researchers, who stated that it takes time to be creative and to generate ideas (Frost & Jean, 2003; Runco, 2004). This argument held by researchers in higher education assert that more time is necessary for creative ideas, research, and creative outcomes (George, 2007). Apart from time spent at work, employees need time away from tasks to help them become creative. De Bono (1992) advanced the need for *creative pause,* which he referred to as planned and intentional time set aside for thinking, encouraging, and boosting creativity. De Bono (1992) suggested that sometime be set apart in the classroom to encourage students to think creatively. This time set aside should be regarded as important as any other activity in the classroom.

Many studies on creativity have concentrated on the outcomes of creativity and results of the creative process (Rhodes & Brown, 1961). In the work of Taylor (1975) as well as Feldhusen and Eng Goh (1995), theoretical models of assessment of creativity were suggested that concentrated on product generation. The model involved a product inventory based on seven criteria for product evaluation:

Generation, the power of a product to stimulate further creation of ideas;

The reformation, the extent to which it produces changes; originality, the rarity

Or the uncommonness of the product; relevancy, the extent to which it solves

A problem or fulfills a need; hedonics, its popularity or impact; complexity,

the intricacy of information involved; and condensation, the degree to which

it simplifies or integrate ideas. Reality of assessment with the inventory was

high when trained observers were used (Feldhusen and Eng Goh,1995, p. 236).

The outcomes of the creative process include publications, designs, presentations, patent inventions, increased performance, and manufactured products. This approach may sound contradictory, for it focuses on outcomes and productivity without paying attention to creativity. It is important to understand that what is productive may not necessarily be considered creative. According to Runco (2004), creativity will result in productivity, but productivity does not always result in creativity: "Productivity and creativity are correlated but not synonymous" (p. 663). Creativity helps to solve problems but not all problem solving is creative, and creativity does not always solve problems.

Simonton (1990) added one more P called *persuasion*. Persuasion denotes the ability to influence others to accept one's work. Researchers have referred to this as the need to have champions of creativity that will help creative works gain acceptance and receive buy-in from management. This stage of creativity is also very important if creative ideas are to pass on to implementation stage.

While the champions of creativity are important, so are sustainability and the future of creativity. The future of America is faced by the "graying of America" (Bruner, 1962). The importance of creativity in technological advancement, business, the society, and the lives of the individual cannot be overemphasized (Runco, 2004). The new generation of students will need to be encouraged to think creatively. Students should be taught to incorporate "mundane problem-solving" (Runco, 2004, p. 678) and everyday creativity into their routine. De Bono's (1992) lateral thinking advanced three steps to breaking away from the routine: Challenge, alternatives, and provocation. Students will need to be taught new ideas that are new to their teachers too. Teachers need to keep

studying and try to understand the next generation by keeping abreast with modern techniques, technologies and innovations.

Teaching of Creativity

There is enough evidence to support the argument that creativity can be taught (Amabile, 1987; Feldhusen & Eng Goh, 1995; Lin, 2011; Runco, 2004). Several studies support the point of view that creativity can be learned and taught. We would need to train people to be able to access creative skills. Teaching of creativity helps develop problem solving and creative skills among students. Davis and Rimm (1985) suggested 19 skills sets that can be valuable in accessing creativity: flexibility, fluency, originality, elaboration, sensitivity to problem, visualization, problem finding, ability to regress, metaphorical thinking, logical thinking, evaluation, analysis, synthesis, transformation, extension of boundaries, intuition, predicting outcomes, concentration, and resistance to closure. Even though these skills were intended for the behavioral sciences they are applicable to the field of education.

Feldhusen (1993) also introduced some creativity building skills and strategies: sensing that a problem exists, asking questions that can explain the problem, deciding on the causes of the problem and explaining. Others are the intended solutions, ascertaining the real problem, formulating new ideas for a known factor, forecasting consequences of implementing ideas, choosing the appropriate answers, and examining likely implications of this choice. Runco (1995) identified the following ideation skills: internal locus of control, non-conformance, independence, playfulness, and cognitive tempo. Feldhusen and Eng Goh (1995), in reviewing Dacey's (1989) work, suggested certain personality

skills needed to access creativity: tolerance, ambiguity, stimulus freedom, functional freedom, flexibility, risk taking, preference for complexity and disorder, good attitude toward work, androgyny, and accepting differences. These skills are behavioral factors but Woodman and Schoenfeldt (1989) introduced some structural factors like cognitive complexity, perpetual openness, field independence, locus of control, dogmatism, autonomy, self-esteem, and intuition.

Feldhusen and Eng Goh (1995) examined the techniques and methods that promote teaching creativity by exploring Davis and Rimm's (1995) work on awareness, understanding, techniques, and actualization (AUTA). Awareness reveals how to help people maximize their potential. Understanding describes how to work through the creative processes. Techniques refer to some skills that can be taught. Actualization connotes the personal factors that can promote creative thinking and creative self – fulfillment. Among factors that can promote creativity in teaching are when collaboration and interactions are present around instructional matters, which could be through conversations, joint teaching, or interaction around instructional issues. These factors encourage interdisciplinary variation among faculty and students (Etzkowitz, Kemelgor, & Uzzi, 2000).

Creativity in Individuals

Most of the earlier research carried out on creativity was about what makes the creative individual. It was entity based and person-centered. It advanced the argument that creativity emanated from the minds of individuals, the implication of which is that it offers uniqueness and lack of conformity that may sometimes foster creativity (Goncalo

& Shaw, 2005). Research revealed characteristics that promote creativity in individuals like personality traits, intrinsic motivation, and cognitive factors that foster creativity in the workplace (Woodman et al., 1993).

Woodman et al. (1993) recognized the key role knowledge contributes to creativity. The contribution of knowledge depends on the amount of domain-specific knowledge and creativity relevant skills necessary (Amabile, 1988; Feldhusen & Eng Goh, 1995). Rarely can any creativity take place without the addition of certain knowledge. Therefore, creative behavior cannot be described as knowledge free because inventions are not intended to be devoid of the requirement of knowledge. Amabile (1988) distinguished between domain-specific knowledge and creativity-relevant knowledge describing domain specific knowledge as including knowledge, technical skills, and talent necessary for creativity and creative-relevant skills as cognitive factors and personality traits.

According to Feldhusen and Eng Goh (1995), creativity is viewed as a "parallel construct to intelligence" (p. 2310) but differs from intelligence in the sense that it is upheld by cognitive or intellectual capacities. Creativity requires a combination of environmental solutions as well as personality and motivational factors. In describing the importance of cognitive abilities to create, Guilford (1984) identified fluency, originality, and elaboration as important criteria for divergent thinking. Rhodes and Brown's (1961) work relied more on individual behavior and its influences on creativity by enhancing divergent thinking and problem solving.

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There is a general consensus that a definition of creativity should include critical thinking, problem solving, problem finding, decision making, and metacognition (Feldhusen & Eng Goh, 1995; Runco, 2004; Sill, 1996). The research conducted by Getzels and Czikszentmihalyi (1975) led them to discover that problem finding is an equally creative process that is even more creative than problem solving. Mackwoth (1965) examined problem finding behavior and stated that it requires a higher level of cognitive activity than problem solving. Runco's (1994) work on problem finding differentiated between problem identification, which means the ability to recognize a problem, and problem definition, which means the ability to operationalize a problem so that it can be used.

Even though research on creativity before now has concentrated on individual perspective of creativity but extant literature from Amabile (1995), Hennessey (2003), Montuori and Purser (1997), and Perry-Smith and Shalley (2003) have all described creativity as a social phenomenon that emanates from family backgrounds, educational experiences, organizational cultures, and national values. Guilford (1984) noted the importance of individual trait involved in creativity. Feldhusen and Eng Goh (1995) theorized that within the individual, there is a complex system that includes the cognitive skills, styles, strategies, metacognitive skills, and personality factors that combine to produce an adaptive personality or behavior. Individuals respond to creativity differently, but responses should include abilities to think critically, problems finding and problem solving that would result in creative solutions, products, or performances. Feldhusen and Eng Goh suggested that the process of creativity should involve problem finding. This

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process is often reactionary and requires the ability to be evaluated for creativity it to be considered effective. It is, however, also proactive. The outcome of every creative activity determines the success or otherwise of the creative effort.

Intrinsic Motivation

At the core of personality research on creativity by both Rhodes and Brown (1961) and Woodman et al. (1993) are intrinsic motivations that make up the qualities of a creative person. Reviewing Barron and Harrington's (1981) work, Woodman et al. (1993) developed a personality trait inventory of a creative person which includes; "high valuation of esthetic qualities in experience, broad interests, attraction to complexity, high energy, dependence of judgment, autonomy, intuition, self-confidence, ability to resolve the antinomies or to accommodate apparently opposite or conflicting traits in one's self-concept, and a firm sense of self as creative" (p. 298).

Research has revealed that intrinsic motivation fosters creativity: Intrinsic motivation like love of this game, passion for work, intense excitement, and challenge of the work depends on the personality (Amabile, 1997). It has also been discovered that social environment has a significant influence on a person's level of intrinsic motivation, consequently affecting the level of personal creativity. Creating an environment that would make people love work, get excited, and have fun would make them want to return the next day with their creativity influenced. Most organizations expect their staff to be intrinsically motivated, yet creating an environment that can enhance their intrinsic motivation is worthwhile. Extrinsic motivation like rewards, salaries, meeting a deadline,

and competition may not result in motivation rather, the workers' perception can be an intrinsic motivation towards productivity.

Intrinsic motivation is entity based, individual or person centered approach to creativity. The defect of this psychological perspective is that this offers little or no insight into the role of social environment and the influence of contextual conditions on creativity. Three major parts of individual creativity suggested include expertise, creative-thinking skills, and intrinsic task motivation (Amabile, 1997).

Expertise is the beginning of all creative exercises. It is the foundation that allows for problem solving. Technical or domain knowledge of the work or a field gives the ability to understand the problem and answer complex problems. Creative thinking skills are personal characteristics like risk-taking, discipline, and perseverance to take on new challenges and overcome them (Amabile, 1997). Experts may not be able to produce creative work without creative thinking skills. Intrinsic task motivation is an element that determines the individual's capacity. Intrinsic task motivation determines to what extent individuals will engage their ability towards creative performance. The most likely direct influence of the environment is about motivation.

Creativity in Groups

Research on creativity before the early 2000s focused on an individual perspective of creativity, but recent literature (Amabile, 1995; Hennessey, 2003; Montuori & Purser, 1997; Perry-Smith & Shelley, 2003) has described creativity as a social phenomenon that derives from family backgrounds, educational experiences, organizational cultures, and national values. Sociologists have argued that even though

individuals initiate creative ideas, they belong to informal groups which in turn belong to the complex social system that influences individual behavior.

A group is the platform that initiates the problem solving process through exchanges of knowledge that result in creativity. This group based perspective of looking at creativity refers to the *collectivist approach* to creativity (George, 2007), or the team-based approach (Kurtzberg & Amabile, 2001), which occurs "when the creative insight emerges not within a single individual, but from the interaction of multiple participants in the process" (Hargadon & Becky, 2006, p. 484). Marion (2012) noted that "collectivism is a production of outcomes through the action of inter-influence, that is, inter-synchrony dynamics among adaptive agents" (p. 185). George (2007) argued that there is a need to begin to focus on creativity that emerges not from an individual but from the collective in which the interactions among individuals and teams produce creative dividends and insights above what can emerge from a single individual.

There are implications associated with an organization moving from an individual orientation to a collectivist based approach. It was suggested that collectivist orientation can improve group feelings of social harmony, cooperation and spark of creativity (Goncalo & Shaw, 2005). Entity based proponents of creativity have argued that collectivism promotes a conformity that discourages dissent views, which may be good for individual creativity.

Woodman et al. (1993), in an analysis of King and Anderson's (1990) work, described the qualities that are identifiable to groups and teams as leadership, cohesiveness, group's longevity, group composition (diversity), and group structure.

Similarly, Payne (1990) listed resource availability, leadership group size, cohesiveness, communication patterns, and group diversity as necessary for creativity from the collectivist perspective.

Groups establish social contexts that promote creative behaviors, which is produced through brainstorming among members and interactions that develop problem-solving skills and ideas. Proponents of group creativity have advocated brainstorming as a method of generating creativity. Therefore, brainstorming is the process of problem solving through generation of new ideas and the free flow of ideas in a nonjudgmental environment (Osborn, 1963). The aspect of autonomy, freedom of information, and expression is necessary for this activity to crystallize.

Proponents of the group creativity have gained currency by promoting teamwork and collaborative learning. They have elevated the importance of diversity in that it creates divergent thinking, varied expertise, and perspective. Collectivist or group creativity not only help in idea sharing but also helps to avoid mental ruts or parochialism. Paulus and Nijstad (2003) examined group creativity and identified some processes that inhibit or foster creativity. They identified cognitive, social conditions, motivation, group capacity, and normative behavior as enhancers of creativity while they identified fixedness, block memory, and conformity to group inhibitors of creativity.

In this review, this research looks at work environments that promote creativity and the patterns of interactions that facilitate creativity in higher education (Amiable et al., 1996; Runco, 2004). This study argues that ideas comes through collective and team ideas that eventuates into creativity. It will be instructive to identify the contextual

conditions that foster and enhance team and group generation of ideas in organizations. Czikszentmihalyi (1990) posited that emphasis on creativity is on the social systems and how they influence individual decisions. Amabile (1990), in support of this perspective, theorized necessary steps to initiate creativity. The first stage is the external inputs and stimulus that initiate the individual response. The second stage involves preparation in through the input of information. The third stage is the response evaluation. The fourth stage is culmination, and the fifth stage includes success, failure, or partial success (as cited in Feldhusen & Eng Goh, 1995).

Contextual Characteristics of Creativity

Contextual characteristics are generally defined as the "dimensions of the work environment that potentially influence an employee's creativity" (Shalley et al., 2010, p. 935) these are different from individual characteristics. As a result, characteristics like organizational structures, job complexity, work setting, organizational culture, and relationships with other employees and supervisors would all be considered contextual characteristics. Daly and Dee (2006) suggested five structural variables for identifying the faculty work environment in higher education as autonomy, communication openness, distributive justice, role conflict, and workload. Job satisfaction and organizational commitment were mentioned as psychological variables and kinship responsibility and available job opportunities as environmental variables. In this study, it is argued that creativity can be better understood when considering the contextual characteristics in a work environment from both entity and collectivist perspective (Shalley et al., 2010). Below is a review of some contextual characteristics of creativity:

Job complexity: Job complexity refers to the design of a task and how the level of complexity of a task enhances creativity among faculty. How complex a job is influences the level of motivation and excitement that should influence creativity (West & Farr, 1990). The studies by Hatcher, Ross and Collins (1989) revealed a correlation between employees' self-report of job complexity and the number of ideas they were able to submit for a program.

Relationship with supervisors: Research has revealed that supervisors that are supportive and non-judgmental enhance motivation and creativity (Amabile & Conti, 1999; Deci & Ryan, 1985). Supervisors who encourage and support employees stimulate creative ideas, whereas less supportive and controlling supervisors result in low employee creativity. In higher education, the level of support that faculty members receive, especially regarding new faculty members working towards tenure, influences the level of their creativity. The importance of mentoring cannot therefore be overemphasized.

Support and collaboration with other employees: Just as support from supervisors and mentors can be instrumental in enhancing creativity, support and collaboration with other employees can likewise foster creativity. Research on the supporting role of employees has, however, revealed mixed findings. Amabile et al (1996) argued that employees were more creative when members of their team played supportive roles. Van, Dyne, Jehn and Cummings (2002) revealed an insignificant correlation between creativity and work strain among employees.

Time: According to researchers, achievement and creativity require time. Amabile (1983) described time pressure on creativity as important towards an open-

ended task. Faculty time expenditures have various implications for retention, promotion, promotion, peer recognition, productivity, and productivity (Bella & Toutkoushian, 1999). There has been conflicting evidence about the importance of time on creativity. Some research has argued that when there is a time constraint, they are motivated toward high performance (DeBono, 1992) while others have asserted that shortness of time hinders improved productivity (George, 2007). A 1999 national survey reported that 86% and 80% of the faculty participants claim time pressure and lack of personal time, respectively, were considered a source of stress. The average faculty working time is 52.5 hours weekly (Magner, 1999; NCES, 1993). These findings clearly contradict recent legislature attacks on faculty use of their time and demanding accountability of faculty time.

Evaluation: A number of researchers have looked at the effects of evaluations and their impact on worker creativity (Zhou & Shalley, 2003). Some other studies focused on the role of nonjudgmental evaluation on employee creativity (Shalley, 1995). Results reveal that evaluations that are lower in judgmental evaluation are more likely to foster creativity (Amabile, Goldfarb, & Brackfield, 1990). Evaluative feedbacks and statements like, "good job," "you have done well," "you made it happen," provides higher levels of employee creativity, as research has shown (Zhou, 1998). This type of evaluation of positive reinforcement is constructive for team based creativity.

Review of Collaborative Models of Creativity

The complexity of defining creativity models is illustrated by the story of the elephant and the blind man, in which the blind man represents researchers who have

different perspectives of "elephants" based on ideas derived from their personal disciplines (Sill, 2001). Another challenge or misconception may occur because attentions focuses on one fix-all definition or model that merges information about creativity from different interdisciplinary fields, some of which may be incorrect.

In reviewing Koestler's (1964) work, Sill (2001), described creativity as a "form of synthetic thought… derived from bisociative thinking" (p.295). Through integrative thinking, this perspective examined scholarship that attempts to address an issue by studying different disciplines. This strategy is implemented by interconnecting different subject matter. Fuller (1993) described disciplines as complex structures in which "identifying disciplinary boundaries can help provide insights into the structures, functions, authority and resources available within the disciplines" (p. 126).

The act of bringing two disciplines together to better understand a concept introduces the bisociative thought into interdisciplinary studies, which requires studying and integrating cognition, thoughts, concepts, and structures into one topic. This integrative approach to creativity brings together various disciplines to achieve a common purpose. According to Storr (1998), bisociative thought is the backbone of creativity. It is the part that creates "new links between formerly disparate entities, union between opposites" (p. 199). This way of forming new links is important in creativity, in generating fresh ideas that supersede previous assumption and build new ideas or hypothesis that before never existed or were unconceivable. It is the combining of two extremes, relatively unknown ideas that is known as bisociative thinking. This approach gives insight into understanding creative and integrative thought. It is about having a

healthy disregard for the status quo through asking important questions and demanding answers to some of society's pressing issues (Storr, 1998).

The approach to creativity assessment that was used by Amabile (1990) was the consensual assessment technique arguing that a product or service is considered creativity if the designated observers adjudged it to be so. These observers must be individuals who are knowledgeable in the field, product or service.

Interdisciplinary Collaboration

The term *interdisciplinary* has often been substituted with words like "integrated," "unified," and "holistic" (Hart, 1986, p. 120). According to Newell and Green (1982), interdisciplinary studies can be defined as "inquiries which critically draw upon two or more disciplines and which leads to an integration of disciplinary insights" (p. 240). The integration of discipline here is important because it helps to initiate higher order thinking skills and to generate new ideas necessary for creativity. The acceptance of the interdisciplinary approach in some situations has not extended beyond rhetoric, while others at best have only reaffirmed the "Messianic… power of an interdisciplinary approach" (Klein, 1990, p. 30). Other scholars like rotten (2010) have argued that university support for interdisciplinary teaching and research have been quite shallow; despite "talking the talk," many universities do not "walk the walk" (p. 9).

In recent years, creativity researchers have turned their focus to interdisciplinary studies, topics, techniques, applications, and research. The goal of interdisciplinary research is to integrate knowledge; to enable freedom of inquiry, boundary crossing creativity, and synthesis; and to develop higher order thinking skills across silos (Sill,

1984). Silos by themselves are not bad when they are positive and lead to the generation of new ideas. However, interdisciplinary collaboration is expected to encourage diversity and varying perspectives good for idea generation. The application of an interdisciplinary approach fosters creativity, keeping researchers out of a "theoretical rut" disciplinary apathy and sentiments (Runco, 2004, p. 677). Boyer (1990) emphasized the need for scholarship engagement, describing interactions and collaborative research as the apogee of scholarship.

An interdisciplinary study is situated within a social context that relies on interactive dynamics involving the environment and its actors. In this study, the significance of such contextual characteristics to creativity and the importance of agents who interact with one another within their environment are identified. This social context produces a social network that is conducive to creativity and that can enhance increased productivity among faculty members.

Proponents of interdisciplinary studies have advanced two approaches. The first is a form of bridge-making that brings together different disciplines and proposes common themes like concepts, tools, and methodologies. The second is a more radical approach that calls for restructuring, which involves the integration of fields or disciplines. The process of integration or interdisciplinary problem solving requires effective communication, which should also take into account the challenges of conflicts and culture shock. Successful communication requires understanding and shared assumptions among the diverse disciplines. It demands communicative processes through interdisciplinary dialogue, problem solving, planning, and policy making (Klein, 1990).

Interdisciplinary relationships sometimes create tension and systemic changes among interacting agents, which are positive for creativity. This interaction among faculty results in dynamism and some measure of complexity. Tension in such dynamics is an outcome of complexity and tensions or creative chaos produces pressure. This pressure evolves out of the need for interdependency and reliance on each other to carry out functions. Pressure by itself is not bad if it results in action. Pressure is good if it helps to engender creativity, which emerges from conflicts and pressures. Pressure moves the agents to generate adaptive solutions or common grounds. Most pressures and conflicts that ensue from interdependency relationships of faculty and departments are constructive and can lead to adaptability, institutional learning, and problem solving (Marion, 2012). A major advantage of this interaction among interdisciplinary collaboration is that it creates an infusion of new information and perspective. The diversity of knowledge as a result of inflow of new information becomes a catalyst to improving the quality of ideas and outcomes.

The interdisciplinary problem solving process is further supported by Mason and Mitroff (1981) in their categorization of democracy, scientific method, empiricism, evolution, and holism. Democracy involves the right to participate in the process of problem solving and to utilize the results of the exercise unhindered. The scientific method demands that the most suitable approaches should be implemented in every problem solving process. Empiricism requires that generated ideas be grounded in scientific data that are connected to real life applicability. Evolution situates problem solving within a dynamic context that is continuously changing. Finally, holism

recognizes the connectedness of problems through cooperation: "Through this interplay, the problem of imposing an unrealistic schematization is avoided" (Klein, 1990, p. 37).

Faculty and Creativity

Higher education has evolved from the Industrial Revolution era when focus was on the quality of students and their academic life to the era of the professorate in which emphasis is placed on research (Boyer, 1990). Some consequences of these transformations in higher education are placing a higher reward on research than teaching, academic capitalism and the call by state legislatures demanding higher accountability and productivity of faculty (Flynt, 1997). These changes are aptly described by Boyer (1990):

> Faculty is losing out too. Research and publications have become the primary means by which most professors achieve academic status, and yet many academics are, in fact, drawn to the profession precisely because of their love for teaching or for service – even for making the world a better place….what we have, on many campuses is a climate that restricts creativity rather than sustains it. (p. xii)

The work of the faculty has like never before been under scrutiny. Questions are been asked about the quality of productivity and its products. The public is concerned about what results the taxpayers' money are producing in higher education, the lack of concern for undergraduates, and the irrelevancies of research (Johnrud, 2002). Other questions, including the priority given to teaching over research by certain institutions,

have become common especially with the rising cost of education. Attention is now paid to the cost and benefit of the investment in higher education. Therefore, the call for more scrutiny and reform has never been louder with the 2006 National Conference of State Legislatures' (NCSL) issued report on the state of higher education in the United States. The report declared that there is a crisis in higher education while demanding a higher level of accountability.

In 2007, Pat Collan during the National Center for Public Policy in Higher Education conference declared that "higher education is under-performing." Marty Finkelstein's criticism made against higher education, especially faculty, claimed that such criticism is fixated on outcomes alone without an appreciation of the historic role of faculty in research. Even though research shows that faculty members are overall satisfied with their job, claiming if they had to do it again they would choose academics (Boyer et al., 1994).

However, Bowen and Schuster, (1986) noted that faculty are identified as "dispirited, fragmented and devalued" (Johnrud & Heck, 2008, p. 540). Faculty members are not dissatisfied with their profession but with the institution. The Carnegie Foundation reported that only 39% of faculty belief that the top leadership is offering competent leadership, 58% think top administrators are autocratic, 45% think the relationship between faculty and administration is poor, and 64% of facilities surveyed agree that respect for faculty is declining (Boyer et al., 1994).

Faculty morale has been described by Kanter (1977) "as an attitudinal response to work conditions that has an impact on the behavior of individuals within the

organization" (Johnrud & Rosser, 2002). Most scholars relate high morale to high performance (Bowen & Schuster, 1986; McKeachie, 1979). In an empirical study of 10 campuses, Bowen and Schuter (1986) identified four attributes of high morale as unique organizational cultures, participatory leadership, progress in the organization, and faculty identification with the institution. Secor (1995) noted a demoralized spirit in contemporary faculty by identifying factors like politicization of departmental issues, ideological positions, disrespect between young and old regarding issues raising tension, distrust, and disillusionment.

Three areas identified as concerns for faculty include reduction of faculty quality of life, attack on professional priorities, and inability of the institution to support their professional priorities (Johnrud, 1996). Furthermore, Johnrud (2008) argued that faculty members' fall from grace can be attributed to the lack of recognition given to the faculty profession, unlike other professional fields. These challenges are similar to the KEYS model inhibitors of creativity identified by Amabile et al. (1996) and Pressure and Psychological safety identified by Uhl-Bien et al. (2007). The KEYS model inhibitors suggested are organizational impediment and workload pressure. The organizational impediments include organizational culture, management style, and organizational policies. The workload pressure could represent how faculty members spend their time and the implication of workload pressure on teaching and research productivity. The workload pressure mentioned by the KEYS model and pressure by complexity theory are somewhat similar, even though complexity extends the meaning of pressure to include task related conflicts. The question to be asked is: How does the faculty member respond

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to contextual changing conditions? Should the relevance of research be determined by how to conduct research that matters?

It is necessary at this junction to make a distinction between what literature defines as research, scholarship, and productivity in higher education. Research according to Blackburn et al. (2010) is defined as an inquiry or "activity that results in a product – an article for example" (p. 386). In contrast, scholarship is defined as "professional growth – time spent enhancing knowledge or skill in ways that may not necessarily result in a concrete product – library work, reading, exploratory inquiries, computer use" (p. 386). Productivity is referred to as the "sine qua non of faculty performance and achievement at a research institution. The outcome measure most often employed for faculty productivity is publications of various types, including books, book chapters, and journal articles" (Ryan, Healy, & Sullivan, 2011, p. 424).

Eugene Rice (1994), in the foreword to Ann Lucas's work on *Strengthening Department Leadership* asserts:

> The emphasis on the professional autonomy of faculty, misunderstood as been that of scholars who work individually on their disciplinary career independent of institutional concern and responsibilities, has been pressed to the limit. The time has come for us as faculty members to fundamentally reframe how we think about what we do and move from "my work" on to "our work" (pp. xi-xii).

The social and political context continues to demand improved performance and productivity. The social factors include public requirements for faculty to justify the use of their time, which in effect results in productivity. The issue is no longer how hard faculty work but what they should be doing with their time (Edgerton, 1993). The political context arises out of the demands by legislatures for faculty to justify the use of taxpayer money in the midst of dwindling state funding. To thrive in the midst of complex challenges, higher education will have to create new ways to "do more with less" (Massey, 1995; Seymour, 1995). Institutions that want to be the forefront in the 21st century should learn to "build bridges that connect (their students) to the future" (Farren & Kaye, 1995, p. 187). These are some of the shifts that would position higher education to face the challenges of the 21st century (Flynt, 1997).

To be able to bring about this shift in a complex system, Green (1992) suggested a need for cultural changes within institutions that can boaster creativity, which would require a diverse and global perspective. Boyer (1990) examined the importance of the quality of scholarship in fostering creativity. Brubaker (1994) considered the contribution of culture and how "the way we do things around here" (p. 82) can promote creativity. Examples of culture are the symbols, myths and values that define departments and institutions. The tenure process, how it is attained and maintained in higher education in the United States, is one that calls for attention. After undergoing this drill for six or seven years, faculty members are reluctant to change the process and often help to maintain this status.

Organizational encouragement to allow risk-taking is more likely to promote new ideas, especially if they are supported. This kind of support can come through a culture that values and encourages risk taking (Zangwill & Roberts, 1993). Unfortunately, this is not the case in most departments:

> In today's world, discovery of opportunity depends on willingness to take risks with available scarce educational resources. Yet, when higher-level administrators tighten up to reduce risk, they sap others' abilities to respond to challenge – and, it is challenge that elicits creativity. (Clark, 1983, as cited by Litterst, 1993, p. 2)

For risk-taking to be fully operational, flexibility and freedom to try new ideas are required. Complexity theory also expresses the importance of psychological safety as management support for risk-taking based on an environment that is built on trust and confidence (Uhl-Bien et al., 2007). However, for risk taking to be effective, there must be a balance between freedom and constraint, which can be supported by fair evaluation. Evaluation comes as feedback that is constructive and supportive to faculty development (Deci & Ryan, 1985). Evaluation can also be a used as intrinsic motivation to enhance faculty development (Amabile et al., 1996, p. 1160). This form of evaluation could also be viewed negatively, for faculty members could be intimidating to administrators at the university, as described by Tucker and Bryan (1991).

Most faculty members invariably believe that they know as much about running the business of the institution as those appointed to do so. Any stand by an academic

administrator, therefore, has potential for becoming controversial and subject to criticism by faculty members (Tucker & Bryan, 1991, p. 117).

What is needed is not intimidation but collaboration and participatory management that would improve the flow of ideas across the organization. According to Parnes and Noller (1972), creative ideas increase as exposure and interaction with other relevant ideas also increases. Thus, attention should be paid to increasing both information flow process and collaboration among teams within the institution (Flynt, 1997). Price (1995) claimed that attention should be given to faculty development that would contribute to satisfaction, morale, and creativity. Resources should be assigned to travel support, professional development seminars, release time from teaching workloads, sabbaticals, and collaboration to foster intellectual and collegial simulation among faculty members (Rosser, 2004)

In the study of the faculty and administrative staff work life, Johnsrud (2002) considered what part of their work life is important, the outcome of their work life, and how work life influences faculty satisfaction and productivity. Findings revealed three variables (individual characteristics of demographics, contextual variables reflecting the work environment, and organizational and career satisfaction) regarding faculty satisfaction positively associated with productivity. In their search for what motivates faculty to productivity, Blackburn and Lawrence (1995) identified self-judged competence, preferred effort given to the roles, and perceived institutional expectations of the efforts given to the institutional role as the strongest predictors of productivity.

Institutional Barriers

Institutional barriers that inhibit creativity among faculty members are often evident in conservative climates as well as bureaucratic, formal, red tapist, and politicized management styles. These barriers will not only stifle intrinsic motivation but also hinder creativity. A factor that can both be a barrier and a motivation is reward. Reward typically is viewed as positive reinforcement (Amabile et al., 1996). Research has found a high correlation between salary and the number of articles published (Tuckman & Leahey, 1975). On the other hand, faculty may feel they are not valued when there are no rewards, which can be a barrier to creativity when faculty members feel every action is tied to rewards. The best approach is to set rewards that are generous and fair but linked to creative outcomes and productivity. At the institutional level, the financial resources of colleges and universities are measured by grants, endowments, faculty remuneration, and student enrollments. This consideration may vary depending on perceptions and goals of stakeholders.

Providing adequate and equitable resources for faculty is essential, which can be in the form of support services, administrative and secretarial assistance, grant writing, availability of materials, and teaching assistants for those who focus on research. These supports, when available and equitably distributed, contribute to the level of faculty satisfaction, motivation, and creativity. It is suggested that improved work satisfaction, quality of work, and low turnover have been associated with high faculty productivity (Rosser, 2010).

Another inhibitor of faculty creativity is the use of their time. For instance, committee work of graduate students is considered as service, but this work is considered intangible, especially for junior faculty seeking tenure. The percentage of these non-research hours can not only be overwhelming but also take up valuable research and productivity time. Research is usually the first to suffer whenever advising and course workload take more of faculty time (Bolce, 2000). The objective of the junior faculty is to prioritize their time well for optimal productivity.

The goals of administrators may differ from that of the faculty, especially if connected to goals and outcomes. With this link two questions can be asked: "Has productivity really decreased in higher education"? And "are faculty members less productive now than they were in the past decade?" (Massey, 1996, p. 86). If productivity is measured by undergraduate education, then most of the top-tier universities would be considered unproductive; thus, universities seeking to become research institutions are unproductive. Also, by implication, faculty members who engage in research and teach fewer undergraduate courses are unproductive. These questions can only be answered by considering the mission of each institution. Faculty productivity can better be measured based on the desired outcome of each department and institution. As noted by Edgerton (1993) in a review of materials from 50 different campuses, 67% prefer another evaluation system besides publication to measure scholarly performance in higher education.

Higher Education as a Complex Dynamic Network

Complexity can be described as "non-linear, emergent change; interaction and interdependency; unpredictability; autolytic behavior; and dynamic movement" (Marion, 2008, p. 8). According to Schuster and Finkelstein (2006), the domain of higher education is a "grounded portrait of a complex enterprise" (p. 323). Higher education operates in academic systems organized along departmental, college, or faculty lines. The typical college or university administration is formalized. The challenge for most complicated organizations is how to manage innovation in a complicated environment (Snowden & Boone, 2007). Every discipline and department has its separate values and sub-culture, even though it is interdependent and has a common institutional culture. However, it is the interaction of these interdependencies, disciplinary cultures, standards and changing dynamics that results in a change that makes higher education chaotic and complex (Marion, 2008). With operations regulated, the expectation is that it should be efficient, effective, and creative. The bureaucratic machinery of higher education is a complicated system because of the various elements that make it up.

Complexity is a theory that describes interactive systems or networks of patterned human behavior. According to Marion (2012), complexity is about patterns of behavior that emerge from interactive dynamics among groups. The parts of a complex system are constantly changing as they interact with one another. In complicated systems, by contrast, the parts are unchanged by their interactions; a jet, for example, is complicated and not complex (Cilliers, 1998). Higher education is complicated because it is comprised of formalized, unchanging, and typically bureaucratic-structure. The system is,

however, also complex because of the interaction of academic parts and their capacity to learn and produce new ideas. The question then is how are complexity and creative activities enabled in an organization like higher education? How can people be creative either as collectives or individuals in their workplace environments? How can an environment be fostered within higher education that improves and fosters creativity? How can faculty be reoriented to lead from a complexity perspective?

In complexity leadership, therefore, attempts are made to understand how interactions emerge and how they generate creativity. The traditional approach to leadership is that a leader is a central figure who organizes controls and initiate change. This is a top-down approach to leadership. Theories like leader-member exchange (LMX), servant leadership and transformational leadership describe a leader centric interaction in some form. The traditional approach that views leader as the central actor suggests a cause and effect, linear and top bottom approach to leadership (Christensen, 2011). However, organization in higher education is too complex, not static, and certainly not linear. Higher education is comprised of interactive agents who are interdependent and dynamic (Uhl-Bien, Marion, & McKelvey, 2007). The structures that emerge from these processes of interaction and interdependency are called mechanisms and their outcomes manifest in the generation of new ideas, creativity and innovations (Marion, 2008).

Complexity from a problem solving perspective is viewed as "catastrophic interruption" (Hoffman, Cropley, Cropley, Nguyen, & Swantman, 2005, p 165). This process can be explained through three types of evolutions of complexity theory. First,

essential complexity is an intrinsic understanding gained from the task or activities carried out. This knowledge is learned over time and considered commonly understood views of the world by those in the field. As time goes on, new knowledge is explored, added, invented, and implemented.

The second is the incidental complexity that exposes differences between the structure and its expectations. Expectations grow because of new ideas and inventions. Incidental complexity is an offshoot of new ideas creating more requirements resulting in new understanding and knowledge. The most significant part of this process is that it results in the transformation of the system to meet standards and requirements. The third type of complexity is the accidental complexity that represents a major change in the way things are seen and done in the system. It produces a new understanding of the structure, exposes hidden knowledge, and produces a restructuring or re-conceptualizing of systems and structures (Hoffman, Cropley, Cropley, Nguyen, & Swantman, 2005). An ideal situation is after the accidental complexity takes place. The system should continue in a cycle with essential complexity, incidental complexity, and again accidental complexity so that the growth and development of the organization can continue.

One characteristic of dynamic complex higher education systems is the amount of information that is generated. Universities are known as the marketplace of ideas with much information processed on a daily basis. Complex organizations like higher education have at their disposal the ability to efficiently process large amounts of information that constantly are undergoing change. Each discipline and field in higher education constantly generates, gathers, and processes changing knowledge. Knowledge

and information are disseminated through teaching, presentations, and publications. Such constantly changes information and knowledge are transformed into ideas, products, presentations, and publications by interactive agents in the system.

Higher education systems are complex because they employ interactive interdependent agents that cut across disciplines for problem solving. They are interdisciplinary, multi-disciplinary and trans-disciplinary in problem solving. The benefit is that problems are approached from multiple perspectives and in a decentralized manner to achieve faster and more effective outcomes. Dynamic complex systems of higher education are adaptive to change. They have multiple stakeholders and varying influences from the environment; they are equally susceptive to the changes because they are change agents that respond quickly to influences from the environment.

The work of Uhl-Bien, Marion & McKelvey, 2007 on complexity leadership theory identifies three types of leadership roles: administrative leadership, adaptive leadership, and enabling leadership. Administrative leadership is leadership that is based on formalized, standardized bureaucratic rules. Adaptive leadership is the relationship of actors to change or the need for it. Adaptive leadership denotes a functional responsibility to react to the need for change. The leader in this context is the role played by individuals to initiate or motivate creativity and change. Enabling leadership is a catalyst that motivates change, which is the third leadership role. This type of leadership fosters conditions that motivate change. Such leaders provide enabling of contextual conditions, structures, and mechanisms under which both administrative and adaptive leaders can work (Uhl-Bien, Marion and McKelvey, 2007). Figure 1 shows the mediating effect of

collectivist dynamics (complex interactions, complexity pressure), and entity based creativity (stimulants resources and stimulants new thinking, creativity, inhibitors and motivation) on faculty creativity in higher education.

Summary

In summary, it is suggested in this review that creativity is an outcome of collectivist and individual interactions within the context of the environment. The outcome of creativity is birthed in the interaction of positive contextual characteristics that can foster creativity between the two paradigms of collectivist and the entity based creativity. Groups and individual interactions, therefore, are the context for creative behavior. Faculty member interactions play a major role in the outcome of creativity in the complex system of higher education.

Regarding the increased scrutiny of higher education and the calls for greater productivity and outcomes to justify taxpayer investments, there are conflicting research findings on how faculty justify their time. As identified by Johnrud (1996), concerns for faculty include reduction of faculty quality of life, attack on professional priorities, and inability of the institution to support their professional priorities. How do the contextual characteristics of stimulants and inhibitors of higher education help to achieve the outcome of creativity and productivity in a complex environment like higher education? How do faculty members respond to contextual changing conditions?
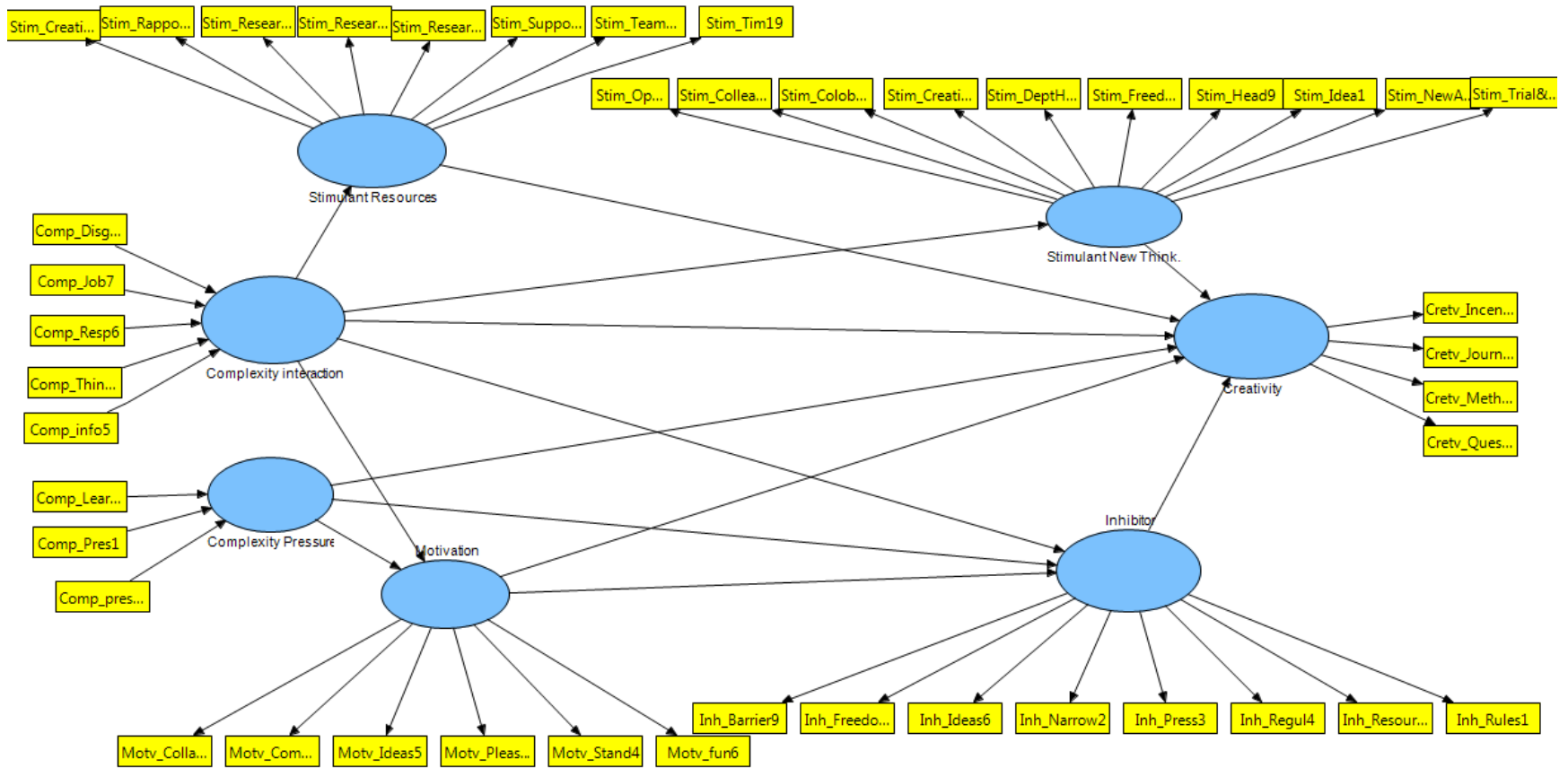
Figure 1: The mediating effect of contextual characteristics of collectivist and the entity based creativity on faculty creativity in higher education model.

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Hypotheses: Based on the review of literature, this study hypothesize that the entity variables (stimulant-resources, stimulant-new thinking, inhibitor and motivator) mediate the interaction between complexity interaction and creativity.

CHAPTER THREE

RESEARCH DESIGN

The goal of research design is to help ensure that the evidence obtained enables researchers to answer the initial question as clearly and correctly as possible (Brends, 2006; de Vaus, 2005). Research designs should begin before work plans are made that should involve questionnaires, observations, or methods. They indeed should answer the question, "What evidence do I need to collect" to answer the research question convincingly (de Vaus, 2005 , p. 5). This research sought to understand the mediating effect of contextual stimulants and obstacles on collectivist and entity dynamics among faculty members in higher education. The goal was to understand how institutional structures foster interactions among faculty creativity in higher education organizations. In this chapter, the research questions outlined in chapter one that describes the methodology used for this research are operationalized. In this study, a non-experimental design was adopted which is a study "in which the researcher collects data without introducing any new treatment or data" (McMillan & Schumacher, 2001; Polit & Hungler, 1983, p. 618).

This research is based on the post-positivist philosophy that suggests "examining the relationship between and among variables is central to answering questions and hypotheses through surveys and experiments" (Creswell, 2009, p. 145). The post-positivist assumption is a deterministic philosophy in which cases have a propensity of affecting outcomes. The rationale for the use of the post-positivist philosophy is because it allows for identifying the causes and their influences so that the outcomes can

be better understood, which will take the form of advancing relationships among variables and presenting them in the form of research questions or hypotheses (Fraenkel & Wallen, 2003). Also, this assumption is reductionist because its broad concepts are reduced into analytical ones and this process of testing is usually based on observation, verification, and measurement. A post-positivist assumption process involves identifying a theory or model, collecting data to validate or invalidate the theory/model, and making inferences about the model.

Data were collected for this study using the online survey program known as Qualtrics; the Structural Equation Model software known as Smart PLS was used for data analysis. This research had as its overarching question, how do stimulant contextual characteristics (supervisor's encouragement, work group support, freedom, resources, and challenging work) and impeding contextual characteristics (work load pressure, resources, task complexity, culture, work setting, relationships, and networks) mediate the effect of complexity context on faculty members' creativity in higher education? From this question, four sub-questions were presented:

1. How do collectivist dynamics influence faculty creativity?

2. How do creativity stimulants mediate the effects of collectivist dynamics on   creativity?

3. How do creativity inhibitors mediate the effects of collectivist dynamics on creativity?

4. How do stimulants and inhibitors together mediate the effects of collectivist dynamics on creativity?

These questions were analyzed through the theoretical the frameworks of complexity theory and the KEYS model constructs as a framework that helps to make meaning of data and findings of this study while the post-positivist philosophy is used to verify and refine our understanding of the process (Creswell, 2009). This research is important because the KEYS model constructs have been tested in a business environment but little or not thing has been done in the higher education environment. Testing this model in a higher education workplace should assess the suitability of this model for higher education organization with its complex dynamics. Also, very little empirical research exists on the collectivist dynamics that foster creativity among faculty members in higher education.

Additionally, very little literature exists on the patterns of interactions and interdependency that foster creativity among faculty. The KEYS model is based on entity based leadership and the complexity theory constructs are collectivist based. This research was based on the premise that creativity is fostered through interaction and that individual creativity is a product of the interaction of individuals within their social context.

Methodology

This research was situated in quantitative methodology using a survey design to "provide a quantitative or a numeric description of trends, attitudes or opinions of a population by studying a sample of that population" (Creswell, 2009, p. 145). In survey

design, the researcher uses the population sample to infer, theorize, and make claims based on the result of the sample population studied. The rationale for the use of a sample design is that it can be used to "determine the specific characteristics of a group" (Fraenkel & Wallen, 2003, p. 12). Survey design is also used to identify a subset of the population, providing a description of the trends, attitudes, and opinions suitable to confirm or test the model and theory being investigated.

This study examined the contextual characteristics of creativity of faculty members in a college of a research based university in a south eastern part of the United States. The college in which these teams were located emphasizes teaching, research, and service/outreach with a focus on building partnerships and creative collaborations across disciplines.

The Institutional Review Board (IRA) approval approval was received before the collection of data. The 59 item survey of 1-7 Likert scale consisted of five demographic constructs, stimulants, inhibitors, and creativity intrinsic motivation constructs. The independent variables used for this research were a measured through a set of stimulant variable questions (supervisory encouragement, work group support, freedom, sufficient resources, and challenging work); a set of organizational impediments (organizational culture, criticism of new ideas, unhealthy competition, cultural discouragement of risk taking, workload pressure; intrinsic motivation (goal, need for achievement, intellectual challenge, broad interests and fun) and complexity (interaction, interdependency, heterogeneity, process conflict, adaptive pressure, and psychological safety). The

dependent variables were faculty creativity. Table 1 below shows an overview of the

research questions, theoretical framework and variables used.

Table 1 *Overview of Research Questions, theoretical framework and Variables.*

Research Questions	Theoretical Framework	Independent Variables	Dependent Variable
How do collectivist dynamics influence faculty creativity?	Complexity theory (Uhl-Bien et al., 2007)	Complexity interaction and complexity pressure	Values assigned to creativity
How do creativity stimulants mediate the effects of collectivist dynamics on creativity?	Complexity and leadership theory (Uhl-Bien et al., 2007) The KEYS model (Amabile et al., 1996) and	Complexity interaction, complexity pressure, stimulant new-thing, stimulant resources, motivation and inhibitors	Values assigned to creativity
How do creativity inhibitors mediate the effects of collectivist dynamics on creativity?	The KEYS model (Amabile et al., 1996) and complexity theory (Uhl-Bien et al.,2007)	Complexity interaction, complexity pressure, and inhibitors.	Values assigned to creativity
How do stimulants and inhibitors together mediate the effects of collectivist dynamics on creativity?	The KEYS Model (Amabile, et al., 1996) and complexity theory	Complexity interaction, complexity pressure, stimulant new-thing, stimulant resources, motivation and inhibitors	Values assigned to creativity

Research Sample

This research adopted the purposeful sampling which identifies a sample that best represents or provides information about the research interest (Fraenkel & Wallen.2003; Gay, Mills, & Airasian, 2006; McMillan & Schumacher, 2001). The research sample chosen for this research were the tenured and tenure track faculty members in a college comprised of nursing, education, public health, human development and parks recreations and tourism management within a research university in the southeastern United States. The research university situated in a rural setting has a student population of about 19,000 students which offers 80 undergraduate and 110 graduate programs.

The criteria for selection of this sample for this research was based on criteria of tenure and tenure track faculty members in the college comprising the departments of education, public health, nursing, human resource development and park recreation and tourism in the research based university. The institutional goal of the college provides enabling research environments to faculty members to be creative, innovative, and transcendence of traditional boundaries. Also, there are pressures on professors from their disciplines to display professional, thorough and innovative outputs from these research based university coupled with greater demand for creativity among the various fields. These objectives met the goal of this study, thus, purposeful sampling was used.

Theorizing or Transforming Perspective: In this study, the theoretical perspective presented in Chapter 2 was examined. A theory is an "organized body of concepts,

generalizations, and principles that can be subjected to investigation" (Gay, Mills & Airasian, 2006, p. 35). The theoretical framework adopted for the inhibitors, stimulants, and outcomes are from the KEYS constructing by Amabile et al. (1996) which described the influence of individual perception of the environment and the influence of those perceptions on creativity in the workplace. According to de Vaus (2005), in the KEYS model, worker perceptions of the job and the work environment are considered.

In complexity theory, the environment and the interaction that takes place from collectivist lens is viewed. It is process oriented through interaction and interdependency among creative individuals. Complexity is the study of organic dynamic interaction through patterns of behavior called complexity mechanism (Uhl-Bien et al., 2007). Examined in complexity are; this process of interaction, the conditions fostering these outcomes, and the effects on the mechanism. Moreover, that is why complexity is relevant to this study, for not only does it consider the conditions that foster creativity, but also the process, outcome, and effects.

Uhl-Bien et al (2007) summed this idea up by suggesting that the outcome of complexity is creativity, adaptability, and learning. The predictors of of complexity theory used for this study are interaction, interdependency, pressure, heterogeneity, and psychological safety. These variables were used to examine faculty perceptions of the contextual characteristics of creativity as well as the mediating effects between faculty creativity and contextual characteristics to capture faculty member perceptions of their workplace environment. This study therefore is a theory testing of the KEYS model and the complexity theory constructs as well as examining their mediating effects through the

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lens of the post-positivist paradigm. This study is not making inferences about the population. The predictive relevance of this study's constructs generalizability therefore lies in its analyses and theoretical concepts and model (Yin, 2003).

Instrument

How contextual conditions foster creativity among faculty members in a higher education institution was examined in this study as faculty members engage in research. The instrument constructed consisted of six sections. The first section contained the participants' consent. In the second section, four demographic information like discipline, gender, employment status and length of experience was requested. The third section included fourteen questions on complexity which centered on time pressure, psychological safety, interaction, pressure, and independence. The fourth section included nine questions on the inhibitors of creativity. Respondents were asked what factors inhibited them from creativity, such as those involving freedom, pressure, time, and resources.

In the fifth section contained twenty one questions with respondents asked what stimulated their creativity. The questions included access to resources, facilities, confidence of supervisors, and sufficient time. The sixth section contained four creativity items which included the likelihood that one's research would be accepted for publication or the likelihood that one's research would be received by researchers and recognition from colleagues because of individual ways of work. The seventh section was made up of six items on the intrinsic motivation like, "I have fun doing academic research" and "Research gives me pleasure and is something that challenges and helps to improve my competence.".

This also included questions on goal, need for achievement, intellectual challenge, broad interests and fun.

The instrument determined not only the selection of the design to be used but also the condition under which the administration of the instrument was conducted (Fraenkel & Wallen, 1996). In accomplishing these ends, electronic surveys were sent out through an online survey instrument known as Qualtrics to 110 tenured faculty or tenure track faculty members. Data were collected within a space of eight weeks.

The collectivist dynamic constructs measured interaction, interdependency, process conflict, heterogeneity and psychological safety as created by Marion and Muntet (2012, unpublished research). The instrument used was based on criteria from the analysis of companies in the United States in the manufacturing, service, and educational sectors. However, the standardization of this tool was performed with factor analyses using data collected in Libya. The collectivist scale was tested using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) and factor analysis. Four subscales were identified in the EFA. These were confirmed by the CFA, with the CFA's and TLIs approaching 1.0 and RMSEA at less than 0.05.

The instrument used for this study was a 59 item survey Matrix table of 1-7 Likert scales (Wiersma & Jurs, 2005). The stimulant and inhibiting variables measured the KEYS constructs by Amabile et al. (1996). This construct consisted of 9 item variables for inhibitors (organizational impediments and workload) and 21 items for stimulants (work group support, resources, task complexity, culture, work setting, autonomy, risk-taking, and relationships). The creativity outcome variables were four

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variables while the intrinsic motivation consisted of six item variables and five items demographic variable.

Field Survey

A field pilot study to test the validity and reliability of this instrument among graduate students involved in research was done. This study was carried out among 100 graduate students involved in research from all disciplines in a south eastern research university. Data for this study was collected with a space of two weeks via the online data collection instrument called Qualtrics.

The Statistical Packages for Social Sciences (SPSS) toll was used for data analysis. The exploratory factor analysis (EFA) revealed that Kaise-Meyr-Olkin (KMO), which tests the strength of relationships among variables was .794 with a sample size of 109 above the recommended .5. The Cronbach's alpha was .897. Factor analysis for 17 items and Croncbach's alpha was .929. Second and third factor analysis with 6 items had a Cronbach's alpha of .832 and .737, respectively. The fourth factor with 5 items had a Cronbach's alpha of .681. Applying Confirmatory factor analysis on creativity with 4 items and one factor revealed a result of .695 for Cronbach's alpha and KMO was .733. Intrinsic motivation with 6 items and 2 factors had a Cronbach's alpha of .905 ans KMO of .751. And complexity with 30 items had a KMO of .840 and Cronbach's alpha of .898. The result confirmed the validity and reliability of the instrument used for this study.

Data Collection

Miles and Huberman (1994) identified four factors that involve important information needed in data collection, which are settings (site of research), actors

(participants to be interviewed or surveyed), events (what actors surveyed or interviewed will be doing) and process (a series of actions or procedure needed to collect data). As mentioned under the research sample, quantitative data were collected from among groups that were selected from a population that has identifiable similar qualities (Green, Camilli, & Elmore, 2006). The sample population was the tenure and tenure track faculty members in a research based university in the southeastern of the United States of America.

Data were collected using the survey design approach make up of a sample size of 73 responses after making appropriating for missing data. The selection of this sample size was based on the sample size recommendation of 59 responses with a significance rate of 5% for PLS-SEM for a statistical power of 80% for maximum amount of arrows in (path modeling) pointing at a construct (Hair et al, 2014).

An initial letter of introduction was sent to the respondents requesting their participation in the survey. The survey was administered using an online survey administration tool known as Qualtrics. Respondents were expected to follow the link provided through an email to the site of the survey by a click. The 59 items covered constructs like stimulant, inhibitor, creativity, intrinsic motivation, and creativity.

A follow-up letter was sent as reminder through a link in an email to Qualitrics once a week for 8 weeks to improve the return rate to encourage participation in the research. According to Yu and Cooper (1983), "The response rate (or responses as a percentage of the size of the contacted samples) is a universal measure of the

effectiveness of a technique" (p.36). Data analysis was done using the Structural Equation Model Partial Least Square software called SmartPLS.

The data collection process used 59 item matrix tables with a Likert scale of 1-7 that was administered using the KEYS, motivation and complexity constructs to capture the respondent's perception of their work environment of creativity.

Data Analysis

The Structural Equation Model of Partial Least Square (SEM-PLS) software of Smart PLS was used to analyze the data to identify the mediating effects of obstacles and stimulants. This approach is appropriate for this study because of the flexibility and ability of SmartPLS to analyze complex constructs with multiple indicators like higher education organizations. The initial step in the application of the SEM-PLS is drawing a diagram that identifies the research hypotheses/questions and variable relationships based on a path model diagram "that connects variables/constructs based on theory and logic to visually display the hypotheses/questions to be tested" (Hair et al. 2014, p.33). This diagram enables a visual representation of the relationships between variables in a most efficient way.

Path models consist of two elements, the structural model that involves relationships between latent (unobserved) variables and the measurement model which describes relationships between latent variables and their measures (indicators). Both models are displayed from left to right based on the researchers' theory or logic. These relationships are linked together through arrows pointing to the right to indicate the

sequence and relationships of the constructs. The independent variables are usually on the left and the dependent variables are on the right.

Partial Least Square-Structural Equation Model (PLS-SEM)

Partial Least Square is a predictive statistical approach "for modeling complex multivariable relationships among observed and latent outcomes" (Vinzi et al., 2010, p. 1). This approach allows for the estimation of a "causal theoretical network of relationships linking latent complex concepts, each measured by means of a number of observable indicators" (Vinzi et al., 2010, p. 2). This approach was selected because it can be used to analyze small samples like the research samples in this study, when data are not normally distributed and when data are complex and have multiple indicators and relationships (Hair, Hult, Ringle, & Sarstedt, 2014).

Partial least square's original work was developed by Herman Wold in 1982, who originally structured Partial Least Square as a *soft modeling* (Hair, et al, 2014, p.22) technique for estimating Structural Equation Model. Soft modeling refers to the ability with which PLS can be used to handle modeling with more flexibility than the traditional multivariate statistics would have permitted with the small sample size in this study. The traditional Structural Equation Model facilitates the estimation and analysis of relationships that exist between observed and latent variables.
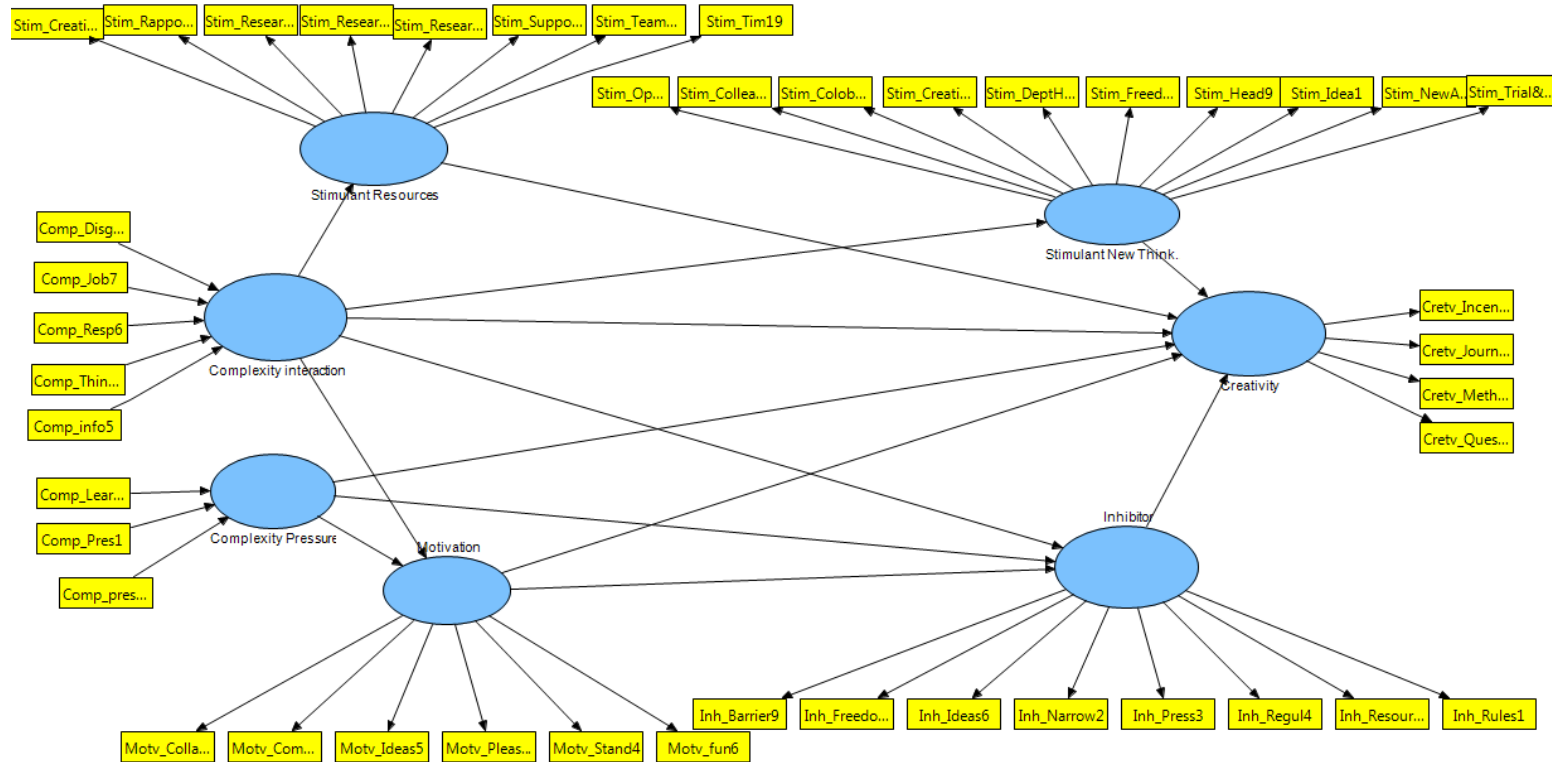
Figure 2. Latent variables (complexity, stimulants, inhibitors motivation and creativity and their connection to forty- four indicator variables) The structural model has six exogenous (independent) constructs namely complexity (Y1), stimulants (Y2), motivator (Y3), and inhibitors (Y4) and one dependent construct creativity (Y5). The complexity is the only formatively measured (arrows pointing from the indicators to the latent variables) while stimulants, inhibitors, motivation and creativity are all reflective measured (arrows pointing from the latent variable to the indicators). There are 44 Indicators stimulants 18, complexity 8, motivation 6, inhibitors 8, and creativity 4.

More recently, the popularity of the partial least squares (PLS) has increased and the attraction is based on the fact that PLS can be used when theories are less developed, and for explaining specific pre-specified constructs when causal effects are used as well as with complex models with different variables that are estimated without making assumptions about previous data distribution. There are four items associated with PLS-SEM applications: first are the data; second, model properties; third, the PLS-SEM algorithm; and fourth, model evaluation issues (Hair, et al, 2014).

PLS is a technique that enables formative measurement of constructs. The approach is best for researchers who get the best results with predictive modeling. Researchers tend to prefer PLS because it can be used to handle complex models with fewer restrictions and provide greater statistical power. It can be used to focus on prediction, exploratory research, theory development, theory testing, and interaction terms. It is not appropriate, however, for testing theory or when rigorous confirmatory structuring is required, neither of which apply in this study. Also, its global goodness-of-model fit measure may be inadequate for certain problems.

A PLS path model is divided into three parts: the structural model, the measurement model, and the weighting scheme. The structural model, also referred to as the inner model, is the set of latent variables (unobserved constructs) connected to each other through an applicable theory. Latent variables (LV) can further be divided into exogenous (having external cause) and endogenous (no external cause). Often times the model relationships involve more complex mediation or moderation relationships. A mediation effect is created when a third constructs intervenes between two relating

variables. The related variables (direct effects) have a single arrow linking them but the mediating effect is connected with sequences of two or more relationships or arrows (indirect effects) The moderating effect occurs when the independent variable changes or alters the strength of two relating variables in a model. This research applied the mediating effects on contextual characteristics to negotiate faculty creativity. In cases in which the construct researchers intend to use are complex, the multi-group analysis can be applied, which enables researchers to test for differences between identical models to ascertain if there are statistical differences between them.

The measurement model, also called the outer model, connects manifest variables (observed) to latent variables (LV). Manifest variables are also known as indicators while latent variables are also known as factors. The connection between constructs and manifest variable are known as weights or formative measures and the connection of constructs to indicator in reflective measures is called loadings. When indicator variables are connected to one latent variable, they are known as a block and a block can only contain a latent variable. Also, in PLS, indicator variables can only be related to one latent variable. Therefore, each latent variable connects to one block that has manifest variables. The connectedness of a block to latent variables can either be reflective or formative. In reflective measurement, each block of indicator variable reflects the latent variable (Monecke & Leisch, 2012).

Reflective measures suggest that causation is from the construct to the measures. Under the reflective measures, the indicators are the consequences and the items are mutually interchangeable, which means that all indicator items have the same connection

and are highly correlated. Regarding formative measures, it is assumed that constructs are caused by the indicators and the construct becomes the consequences (Rossiter, 2002). The next question is when do we measure reflectively or formatively? This is determined by the conceptualization of the construct and by what the researcher intends to achieve. Both the reflective and formative measures will be used for this research.

The variables to be measured with the PLS path model as latent variables (independent variables and exogenous) are organizational encouragement, supervisor's encouragement, work group support, freedom, resources, and challenging work for stimulants and inhibitors including work load pressure and, organizational impediments. The complexity constructs are interaction, interdependency, pressure, heterogeneity, psychological safety and motivation. The construct is creativity (dependent and endogenous).

The missing data are less than the conventional 15% allowed based on research rules and location of the missing data, the latter of which was handled by mean value replacement which suggests that the missing value of an indicator is substituted by the "mean valid values of the indicator"(Hair et al, 2014, p. 51), which is appropriate when missing data are less than 5%. For the missing values that are more than 5% casewise deletion is applied. When using the casewise deletion, caution must be taken not to delete data and thus reduce the total number of distributions in the data.

Before the analysis began, the researcher examined the data collected to identify response patterns and also the questions to screen for inconsistent answers, adherence to criteria of filling the survey, outliers, and removed incomplete answers.

SmartPLS Software: SmartPLS is specialized software used for path models. Path models are "diagrams used to visually display the hypotheses and variable relationships that are examined when a structuring equation model is applied" (Hair et al., 2014, p. 27). It enables a drag and drop drawing structural model of the unobserved (latent) variables and apportions them to the indicators to the unobserved variables. When the plot is assigned, coefficients are added to the design. Data from different formats can be loaded into the SmartPLS software.

The structural model which includes; the indicators to be measured with the PLS path model as latent variables (independent variables and exogenous) are organizational encouragement, supervisor's encouragement, work group support, freedom, resources, and challenging work for stimulants and inhibitors include workload pressure and organizational impediments. The complexity constructs are interaction, interdependency, pressure, heterogeneity, and psychological safety and motivation. The construct is creativity (dependent and endogenous).

The evaluation tools of SmartPLS include algorithm, bootstrapping and blindfolding methods. The algorithm "estimates the path coefficients and other model parameters in a way that maximizes the explained variance of the dependent construct" (Hair, et al, 2014, p. 74). It uses the known variable to estimate the unknown in the study. The calculation of the algorithm involves the estimation of the construct scores and then the calculation of the estimated weights and loadings. Bootstrapping is used to test coefficients for their significance without relying on distributional assumptions. It is a resampling approach that collects random sampling (with replacement) from the data

sample and uses the data to estimate the path modeling, making room for slight changes. At each run, samples produce different results because of their random process. Weights in formative model are the relationship between the indicator and constructs. Loading is the relationship between constructs in reflective models.

The weighting scheme estimates the inner weights, identifying three types of weighting schemes, namely: A centroid weighting scheme, factorial weighting scheme, and path weighting scheme. For the analysis of data for this study, we have used algorithm, blindfolding, and bootstrapping approaches.

In the formative measurement, the latent variable is created from the manifest variables through ordinary least multiple regressions (Monecke & Leisch, 2012). If all latent variables are measured reflectively, they are known as a reflective model, and if all latent variables are measured formatively, they are called a formative model. A mixture of both reflective and formative models is known as MIMIC or a multi-block model (Monecke & Leisch, 2012). The missing values are represented by -.99. The mean value replacement is used for missing values suggesting that indicators are substituted by the mean valid values of the indicator (Hair et al, 2014, p. 51).

Also after setting up the data matrix (input for indicators in the path model), the 10 times rule needs to be observed (that is, every indicator should have at least 10 observations). This protocol ensures a statistical power of 80% and a significance level of 5%. This research has 5 arrows pointing at the complexity interaction, three for complexity pressures, 8 for stimulant resources, 10 for stimulant new thinking, 8 for inhibitors, 6 for motivation and 4 for creativity respectively. It will need 59 observations

at significance level of 5% to have a statistical power of 80%. The observation for this study is 73 and therefore exceeds the minimum requirement of 59 observations (See Figure 2).

The analysis with SmartPLS examines the structural model which predicts the capacity of a model and the relationships between constructs (Hair et al., 2014). Structural models are examined to estimate path coefficient and the key measures are significant paths for the coefficients. The level of the R^2 values explains the amount of variance of the endogenous constructs in the model.

The Q^2 effect size is a blindfolding process of re-sampling that deletes and predicts the indicators data in a reflective model. The predictive error can be obtained by comparing the predicted values with the original values (Hair et al., 2014).

This research also employs SmartPLS to analyze mediation effects. The mediating examines the relationship between the independent variables and the dependent variable and the mediating construct. Certain important conditions for this medication to be considered include:

- The independent variable must reveal significant variation in the assumed mediation.

- The mediation must be revealed measurable influence on the dependent variable.

- A controlled effect on the path of the mediator should have an effect on the dependent and independent variables.

It is expected that these mediation effects should yield either a full, partial, or no mediation effect. The mediating effect question for this three constructs is whether stimulants, inhibitor and complexity serve as mediation to creativity.

- Is creativity significant when stimulants are excluded from the path model?

- Is the path leading to creativity significant after stimulants, inhibitors, and complexity are excluded?

- How much contribution do stimulants, inhibitors, and complexity contributes to create? Can there be partial or full mediation?

- If not significant: How are the strengths of the indirect effects (Hair, et al, 2014)?

Finally, "empirical measures enable us to compare the theoretically established measurement and structural models with reality, as represented by the sample data" (Hair et al., 2014, p. 96). The goal of using the SmartPLS for this research is not only to identify the significant path coefficient in the structural model but also its implications on direct and indirect effects.

Validity and Legitimization

Validity means the extent to which the research and the instrument measures what it was meant to measure. Validity refers to as the "appropriateness, correctness, meaningfulness and usefulness" of the instrument and data collected (Fraenkel & Wallen, 2003, p. 158). Legitimization means that the "research methods are consistent with the philosophical underpinning of research questions" (Newman & Benz, 1998, p. 29). This

study analyzed with Smart PLS, which estimates a causal network of relationships between latent and observed indicators.

The internal consistency reliability of the reflective measures included the Cronbach Alpha which measured the whether the indicators have equal outer loadings. The composite reliability was also used which is more commonly preferred for PLS-SEM because it accounts for the different outer loadings unlike the Cronbach which assumes that all indicators are equally reliable. The convergent validity and average variance extracted (AVE). These measures the extent that measures correlated with other measures within the same construct. The communality was also adopted which is equivalent to the AVE. The discriminant validity used in this study accounted for the distinctiveness of a construct from other construct by empirical standards (Hair, et al, 2014).

In the formative measures, the internal consistency reliability used included the content validity that ensures that the indicators capture all of the aspects of the constructs. The redundancy analysis is the extent with which the formative measures correlate with the reflective measures of the construct.

Also, there is a problem when variables are an aggregate of the observed variable, which is why indicators always involve some degree of measurement error. Error in latent variable results in bias estimates in the model producing a PLS-SEM bias, which implies that path model relationships among latent variables are usually underestimated while the measurement of the indicators are overestimated. However, research has revealed that this kind of bias is at a very low level (Reinartz et al., 2009). The path coefficients are also standardized, which means that the relationship between

constructs can be compared and is also overcome by the higher level of statistical power

exhibited compared to co-variate-based structural equation models.

CHAPTER FOUR

DATA ANALYSIS

The goal of the model in this study is to explain the effects of collectivist and entity variables on faculty creativity in higher education. The data analysis of this study is divided into two parts: (a) the analysis of the results of the structural model and (b) the analysis of the results of the measurement model. The structural model is the analysis of the results of the relationship among the latent variables or constructs. This analysis includes the coefficient of determination (R^2), the path coefficients, the predictive relevance Q^2 and the direct and indirect effects (mediating effects). (b) The measurement model involves the measurement of the indicators, their reliability and validity. The indicators examined include the reflective measurement, their reliability and validity and the formative measurement, their reliability and validity.

The analysis of this study was performed using factor analysis (to determine sub-groupings of variables), and partial least squares structural equation modeling (PLS-SEM). The structural model in the SEM (representing relationships among constructs) had seven latent variables; the measurement model had 44 indicator variables, or variables that were directly measured in the research sample (see Figure 3). The latent variables were creativity, complexity pressure, complexity interaction, motivation, inhibitors, new thinking stimulants and stimulant resources. Of the indicators in the measurement model, 36 are reflective variables and 8 are formative variables: the complexity variables were formative (i.e. the indicator variables define the construct)

and all others were reflective (the construct defines the indicator variables). This is represented by the direction of arrows from indicator to construct or vice versa.

The model hypothesized that the collectivist variables (the two complexities constructs) are contextual to the entity level variables, (motivation, stimulants and inhibitors and creativity (see Figure 2). Put differently, the entity level variables mediated the relationships between collectivist constructs and creativity.

For the creativity, stimulants and inhibitors constructs, because of the large number of the indicators, it was necessary to decide which of the items should be selected for inclusion in the study. To help make this decision, exploratory factor analysis (EFA) was used to determine which of the items would be selected based on pattern matrix coefficients from Statistical Package for Social Sciences (SPSS) software, or if the questions could be divided into sub-clusters. After running the EFA, complexity indicators were divided into two clusters or sub-constructs: complexity pressure and complexity interaction

The indicator variables in the complexity construct were measured by a seven-point Likert scale with 7 representing "high pressure" and 1 representing "low pressure" (see appendix A). Complexity was operationalized as two sub-groups: complexity interaction and complexity pressure. The inhibitors construct had eight indicators and was measured by a seven-point Likert scale with 7 representing " strongly inhibiting" and 1 representing "not at all inhibiting." (see appendix B). Indicators were selected if they had with rotated factor loadings greater than 0.50.

Figure 3. Indicators and constructs of the collectivist and entity based creativity.
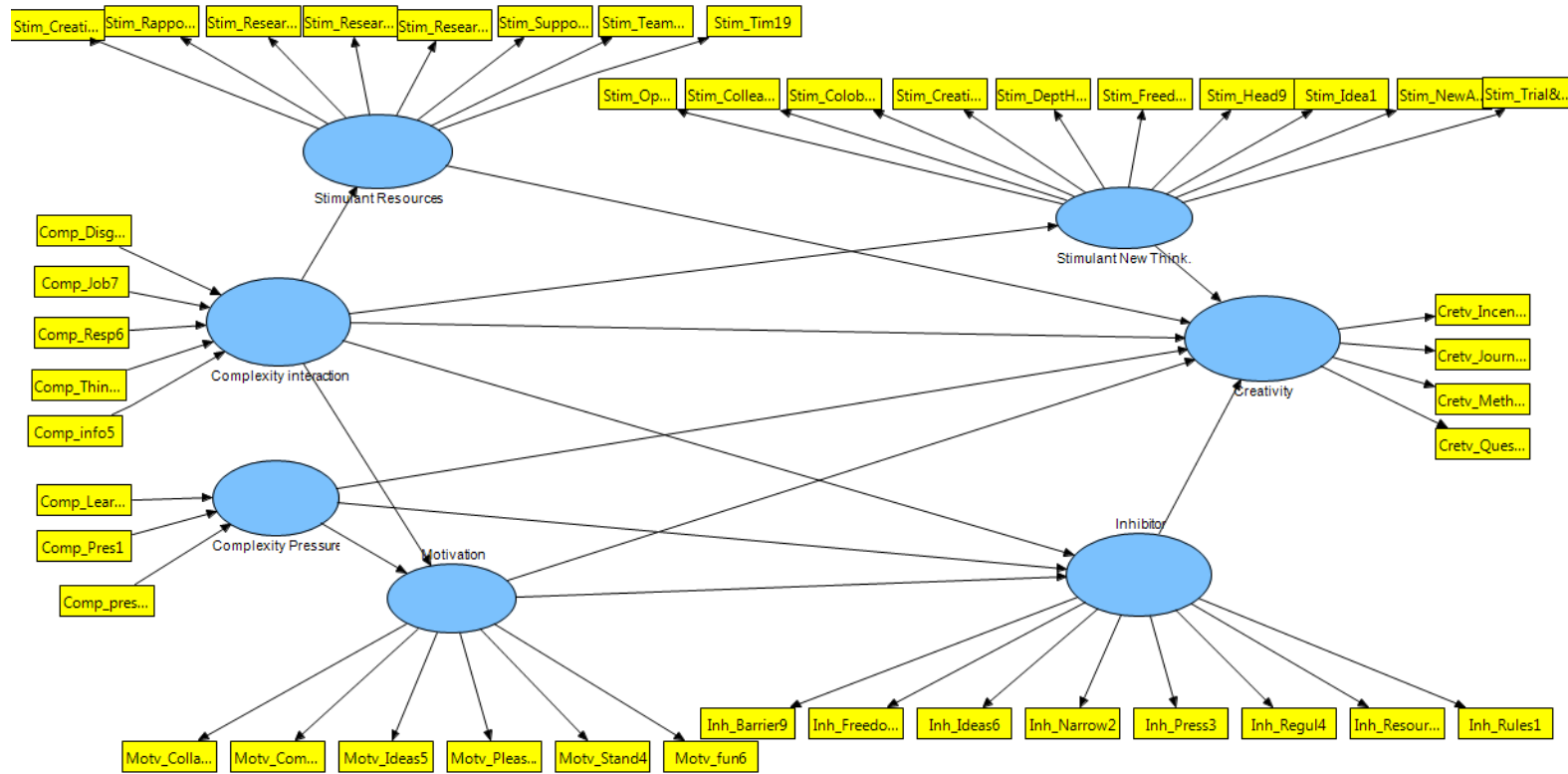
The overall stimulant construct was measured with eighteen indicators using a seven-point Likert scale with 7 representing "strongly stimulating" and 1 representing "not at all stimulating." The items were selected from SPSS using the pattern matrix to identify the most significant items for inclusion in the model. The EFA also identified two cluster groups: stimulant new thinking and stimulant resources.

In the EFAs,' the minimum rotated factor score accepted for inclusion of given items in the analysis was 0.5; anything under 0.5 was deleted. However, two items under 0.5 were included because of their importance to the model in answering the research questions; these were: stim_creative21 (0.439), "Encouragement from the department head/supervisor to be creative in research," and stim_new approach4 (0.353), "Inconclusive findings in the field of research, suggesting a need for a new approach." Table 2 shows the complete list of the constructs, survey questions and variable types.

According to Hair's et al. (2014) guidelines, the minimum number of respondents for this PLS-SEM study should be 50 observations. Further, for a power of 80% with 50 observations, the R^2 for the respective latent variable would have to be 0.50. The minimum acceptable N is calculated by identifying the reflexive latent variable with the largest number of the indicators, and multiplying that number of indicators by 10. In Figure 5, this would be the complexity latent variable, with 5 indicator variables, and 10 x 5 is 50. This study had an N of 73 observations, which exceeds the general rule requirement. With this sample size, an R^2 of 0.25 is sufficient to enable 80% power probability.

To carry out the analysis of this study, SmartPLS software was downloaded from the internet at http:/www.smartpls.edu.

The algorithm for PLS-SEM "estimates the path coefficients and other model parameters in a way that it maximizes the explained variances of the dependent constructs" (Hair et al., 2014, p. 74). It is the goal of PLS SEM to estimate unobserved variances. A weighted scheme generates the highest R^2 value for endogenous constructs

The SmartPLS software calculates standardized coefficients ranging from +1 and -1 for relationships in both the structural and measurement models (Hair et al., 2014). The relationships close to +1 are considered strong positive relationships and the relationships close to -1 are considered strongly negative. Coefficients of 0 are considered to have no relationship. Missing values were accounted for with the mean replacement method, since the number of missing values for any given variable did not exceed 5% (Hair,et al, 2014). The stopping criterion recommended was 0.00001, which was selected for this study. The stopping criterion is the stabilization limit or a convergence point; any drop below that point is considered to be too low. The number of iteration for the PLS_SEM algorithm in this study was 16.
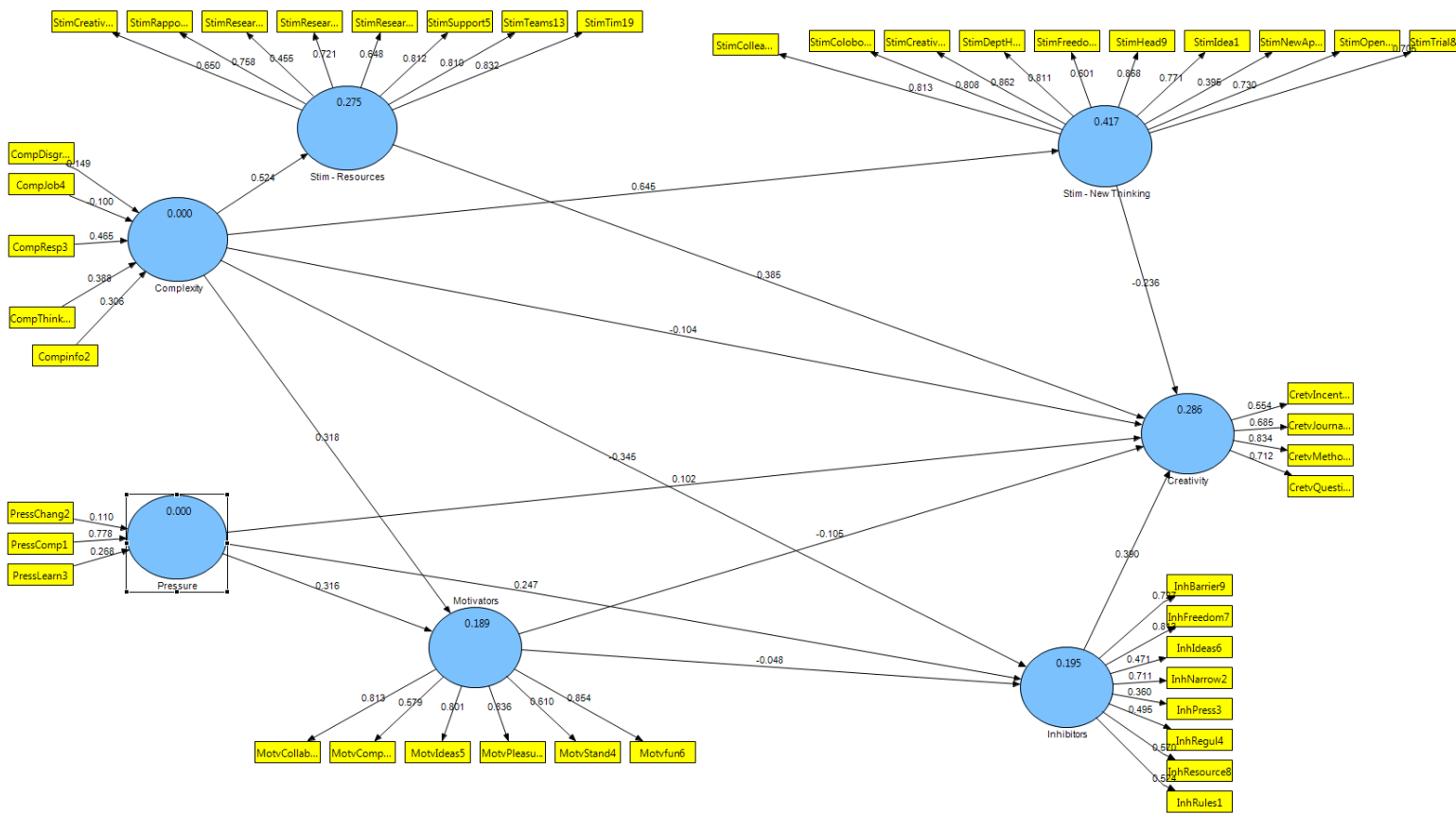
Figure 4: PLS-SEM Algorithm results of standardized coefficients

The paths between the latent variables in the structural model are shown as standardized coefficients. From the regression model in Figure 4, the structural model shows the endogenous variable as creativity, which also serves as the dependent variable; endogenous variables have arrows pointing into them. Other endogenous variables are motivation, stimulants resources, stimulant new thinking and inhibitors. The complexity interaction and complexity pressure variables are exogenous because no other variables affect them (they have no incoming arrows). In Figure 4, the R^2 value for each endogenous latent variable is printed within the circle representing the given latent variable. For instance, Figure 4 shows 0.417 for stimulant-new thinking thus indicating that 41.7% of that construct is explained by the complexity latent variable. The goal of the PLS_SEM algorithm would be to maximize the R^2 of the latent variable creativity thus enabling a credible prediction (Hair, et al, 2014).

The Analysis of Results of the Structural Model

The results for the structural model in this study are divided into four parts: first, the R^2 value of the endogenous latent variable (variables/constructs with arrows pointing into them are discussed in this model; the endogenous variables are creativity, motivation, inhibitor and stimulants). Second, is the path coefficients in the structural model are discussed; third is the predictive relevance Q^2 is presented and fourth, we discuss the mediating effects.

Coefficient of Determination (R^2)

Structural model results are used as predictive functions regarding the relationships between constructs. The PLS_SEM algorithm reports the variance

accounted for R^2 in these predictions. The result in figure 4 show that variables with the highest explained variances are stimulant-new thinking ($R^2 = 0.0417$), stimulant-resources ($R^2 = 0.275$), and creativity ($R^2 = 0.286$). The variables with the lowest R^2 are inhibitors ($R^2 = 0.195$), and motivation ($R^2 = 0.189$), but even their explained variation is considered high in the social sciences (although the power of these variables will be lower than desired; see discussion of power above).

The general rule for high R^2 is 0.20, and values below 0.10 are considered to have low levels of predictive accuracy.

Path Coefficients

Table 2 shows the construct path coefficients

Constructs Path Coefficients

	Complexity Interaction	Creativity	Inhibitors	Motivators	Pressure	Stim – New Thinking	Stim – Resources
Complexity Interaction Creativity		-0.104	-0.345	0.318		0.645	0.524
Inhibitors		0.380					
Motivators		-0.105	-0.047				
Complexity Pressure		0.102	0.247	0.316			
Stim - New Thinking		-0.236					
Stim - Resources		0.385					

Stimulant-resources ($\beta = 0.385$) and inhibitors ($\beta = 0.380$) have the strongest direct paths effects on creativity. While stimulant new thinking ($\beta = -0.236$), motivation ($\beta = -0.105$), complexity pressure ($\beta = 0.102$), and complexity interaction. -0.104) have the lowest direct path effects on creativity (See table 2).

Complexity interaction is a positive predictor of stimulant resources ($\beta = 0.524$) but a negative predictor of the inhibitor (β - -0.345) while complexity pressure is a positive predictor of inhibitor ($\beta =.247$). Also, complexity interaction ($\beta = 0.318$) and complexity pressure ($\beta = 0.31$) both have a positive significance regarding motivation.

Predictive Relevance Q^2

The Q^2 statistic helps to determine the predictive relevance of the reflective (but not the formative) construct in a SEM model. Values that is higher than zero connotes that the construct predicts its data points for the given construct; if it is a zero or less, the items for the given construct are not accurately predicted. The Q^2 predictive capacity in PLS_SEM is calculated using the blindfolding procedure. This is determined by omitting the nth data point of the endogenous construct indicator variable and estimating the effects of the remaining indicators. This study uses the cross-validated redundancy approach to determine the predictive relevancy of the constructs. I am focusing more on the cross-validated redundancy because it includes the elements of the path model, structural model, and predicted eliminated data points in its assessment (Hair et al., 2014). The column labeled 1-SSE/SSO (squared prediction error/squared observations) is Q^2. Table 3 shows the construct cross validated redundancy.

Table 3. Construct Cross-validated Redundancy

Total	SSO	SSE	1-SSE/SSO
Creativity	292.000	262.666	0.100
Inhibitors	584.000	564.448	0.033
Motivators	438.000	405.647	0.073
Stim - New Thinking	730.000	587.404	0.195
Stim - Resources	584.000	522.859	0.104

Case 1	SSO	SSE	1-SSE/SSO
Creativity	39.051	35.561	0.089
Inhibitors	86.086	76.579	0.110
Motivators	57.380	56.015	0.023
Stim - New Thinking	106.782	84.432	0.209
Stim - Resources	81.548	71.214	0.126

Case 2	SSO	SSE	1-SSE/SSO
Creativity	42.663	39.835	0.066
Inhibitors	86.166	84.630	0.017
Motivators	47.036	42.877	0.088
Stim - New Thinking	103.869	76.182	0.266
Stim - Resources	72.896	62.623	0.140

Case 3	SSO	SSE	1-SSE/SSO
Creativity	44.626	37.572	0.158
Inhibitors	66.429	67.547	-0.016
Motivators	69.785	63.095	0.095

Table 3 Continued

Stim - New Thinking	**109.180**	**90.651**	**0.169**
Stim - Resources	97.780	90.236	0.077

Case 4	SSO	SSE	1-SSE/SSO
Creativity	40.726	38.267	0.060
Inhibitors	71.935	65.338	0.091
Motivators	75.250	67.813	0.098
Stim - New Thinking	108.470	81.641	0.247
Stim - Resources	82.727	70.359	0.149

Case 5	SSO	SSE	1-SSE/SSO
Creativity	48.906	43.398	0.112
Inhibitors	102.302	98.429	0.037
Motivators	89.019	79.085	0.111
Stim - New Thinking	97.385	75.658	0.223
Stim - Resources	76.468	69.556	0.090

Case 6	SSO	SSE	1-SSE/SSO
Creativity	34.983	33.124	0.053
Inhibitors	82.616	82.576	0.000
Motivators	45.623	41.439	0.091
Stim - New Thinking	106.734	100.495	0.058
Stim - Resources	75.285	66.412	0.117

Table 3 Continued

Case 7	SSO	SSE	1-SSE/SSO
Creativity	41.043	34.907	0.149
Inhibitors	88.463	89.346	-0.009
Motivators	53.903	55.320	-0.026
Stim - New Thinking	97.570	78.343	0.197
Stim - Resources	97.292	92.455	0.049

The result in the last column of each of the seven tables is 1-SSE/SSO, which is the value of the predictive relevance of Q^2. A summary of the results is represented in the first sub-table (labeled Total) in table 3. The highest predictive relevance is calculated for stim_new thinking (0.195) and the lowest is for inhibitor with (0.033). Q^2 values that are higher than 0 suggest that the construct has predictive relevance and values less than zero suggest the construct lack predictive value. As can be seen in Table 3, all variables have predictive relevance.

Table 4 compares R^2 and Q^2 of all endogenous variables. This comparison is important to this study because while R^2 serves to determine the predictive relationships among constructs, Q^2 helps to determine the accuracy of that prediction. A comparison therefore judges the accuracy of the predictive relationships between endogenous constructs in the model.

Table 4. R^2 *and* Q^2 *Endogenous Variables*

	R Square	Q² Value
Creativity	0.286	0.100
Inhibitors	0.195	0.033
Motivators	0.189	0.073
Stim - New Thinking	0.416	0.195
Stim - Resources	0.275	0.104

The Mediating Effects Analysis

The mediating effects analysis was calculated in this study. Mediating analysis involves establishing the theoretical indirect relationship between constructs; that is, it determines the degree to which indirect effects through the mediating variables modify the hypothesized direct paths. In this study, the entity variables for stimulants, inhibitors and motivators were hypothesized to mediate the relationship between the collectivist complexity variables and creativity. The goal is not only to identify significant path coefficients but also to expose significant and important indirect effects of relationships.

Direct effects are relationships between two constructs that are connected by a single line while the indirect effects are relationships between constructs that pass through one or more other constructs. Calculating the mediating effect can enable the identification of a true total relationship between constructs. The purpose is to explain the total impact of exogenous constructs on endogenous constructs. In determining the total effects of the exogenous construct, the bootstrapping total effects (Mean, STDEV, T-Values) procedure was applied.

PLS_SEM provides t-test for the total effects in the model, which is the combination of both direct and indirect effects; Table 5 shows the results. The Original Sample column lists the total effect as a standardized coefficient, beta; the last column reports the t-statistics for the total betas. The table reveals complexity interaction to stimulant-new thinking had the strongest direct effect of all paths (0. 645; t =11.732). The lowest total effect t-value are Motivators -> Inhibitors (total effect = 0.343, t = 0.343).

The statistically significant paths (t > 1.96, p > 0.05) are Complexity Interaction to Inhibitors (β = -.360; t = 2.990), Complexity interaction to motivators (β = 0.318; t = 2.943); complexity interaction to stimulants-new thinking (β = 0.645; t = 11.732); complexity interaction to stimulants-resources (β = 0.524; t = 5.460); inhibitors to creativity (β = 0.389; t = 3.380), complexity pressure to motivators (β = 0.315; t = 2.197), and stimulants-resources to creativity (β = 0.384; t = 2.167). Complexity interaction, then, has a particularly consistent effect on the entity level mediators and Complexity Pressure affects Motivators. Additionally, Complexity interaction's total effect on creativity is significant (albeit negative) at the 0.10 probability level (β = -0.227; t = 1.734). The entity level variables that significantly affect creativity are Inhibitors and *S*timulants-resources.

Table 5: *Total Effects (Mean, STDEV, T-V) of Exogenous Variables* = 0.05 significance.*

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)
Complexity Interaction -> Creativity	-0.227	-0.200	0.131	0.131	1.734
Complexity Interaction -> Inhibitors	-0.360	-0.363	0.120	0.120	2.990*
Complexity Interaction -> Motivators	0.318	0.306	0.108	0.108	2.943*
Complexity Interaction -> Stim - New Thinking	0.645	0.663	0.055	0.055	11.732*
Complexity Interaction -> Stim – Resources	0.524	0.551	0.096	0.096	5.460*
Inhibitors -> Creativity	0.389	0.390	0.115	0.115	3.380*
Motivators -> Creativity	-0.123	-0.109	0.153	0.153	0.806
Motivators -> Inhibitors	-0.047	-0.039	0.139	0.139	0.343
Complexity Pressure -> Creativity	0.158	0.174	0.168	0.168	0.940
Complexity Pressure -> Inhibitors	0.231	0.226	0.167	0.167	1.379
Complexity Pressure -> Motivators	0.315	0.316	0.143	0.143	2.197*
Stim - New Thinking -> Creativity	-0.235	-0.197	0.217	0.217	1.086
Stim - Resources -> Creativity	0.384	0.351	0.177	0.177	2.167*

The Complexity Interaction to creativity link was statistically significant at the 10% level so we will evaluate the indirect paths that mediate this relationship more closely

Stimulant-new thinking is a mediator of the relationship between complexity interaction and creativity. As mentioned earlier regarding the path coefficient (see Table 2), the link between complexity interaction and creativity is -0.104. The indirect effects that mediate this link increase its negative impact to a total effect of - 0.152, which is significant at the 10% level (see Table 5). The significance of this indirect effect is determined by the

Variance Accounted For Statistic (VAF), which calculates the influence of indirect effects on a dependent variable, or how much of the dependent variable is explained by the indirect effects through mediators. A VAF that is above 80% is considered full mediation and a VAF between 20% and 80% is considered partial mediation. A VAF that is less than 20% is considered no mediation (Hair, et al, 2014).

Figure 5 shows the mediating effect of Stimulant New Thinking on the relationship between Complexity Interaction and Creativity.
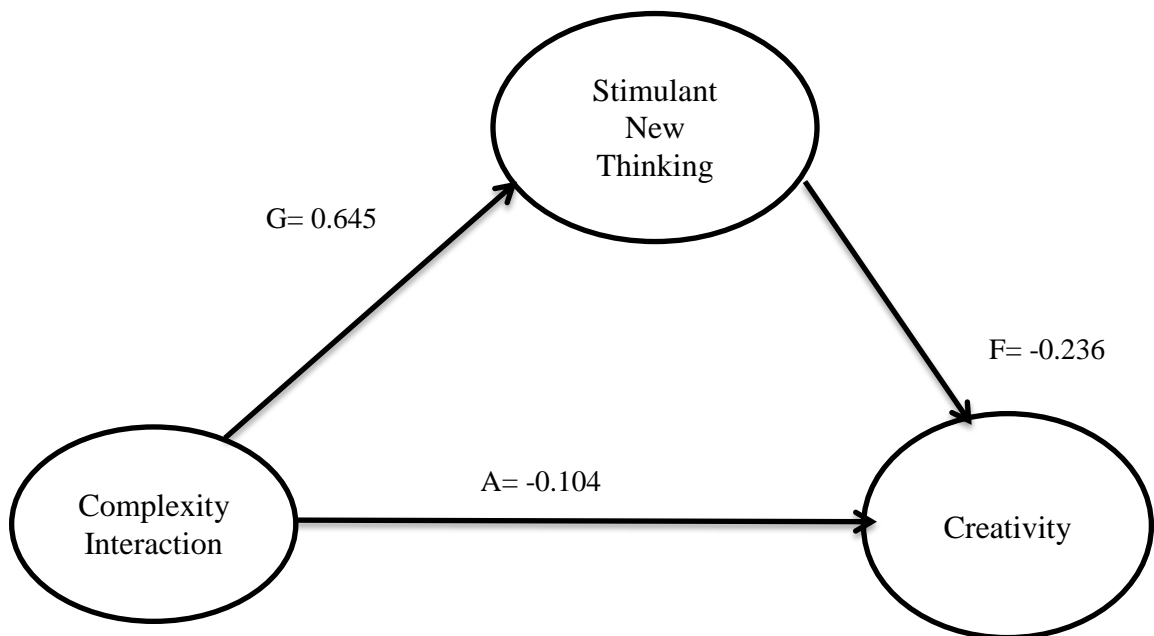
A = -0.104

G = 0.645

F= -0.236

Indirect effects = G x F

0.645 x – 0.236 = -0.152

Total effects = A + G x F = 0.104 + (-0.645) x (-0.236) = - 0.256

VAF (variance accounted for) indirect effects divided by the total effect =

-0.152/-0.256 = 0.594

With the VAF result of 0.594, one can conclude that there is partial mediation between complexity interaction and creativity mediated by stimulant-new thinking since it is between 20% and 80%. The letter A represents the direct effects between complexity interaction and creativity. G shows the indirect relationship between complexity interaction and stimulants new-thinking while F explains the indirect effects between creativity and stimulant new-thinking.
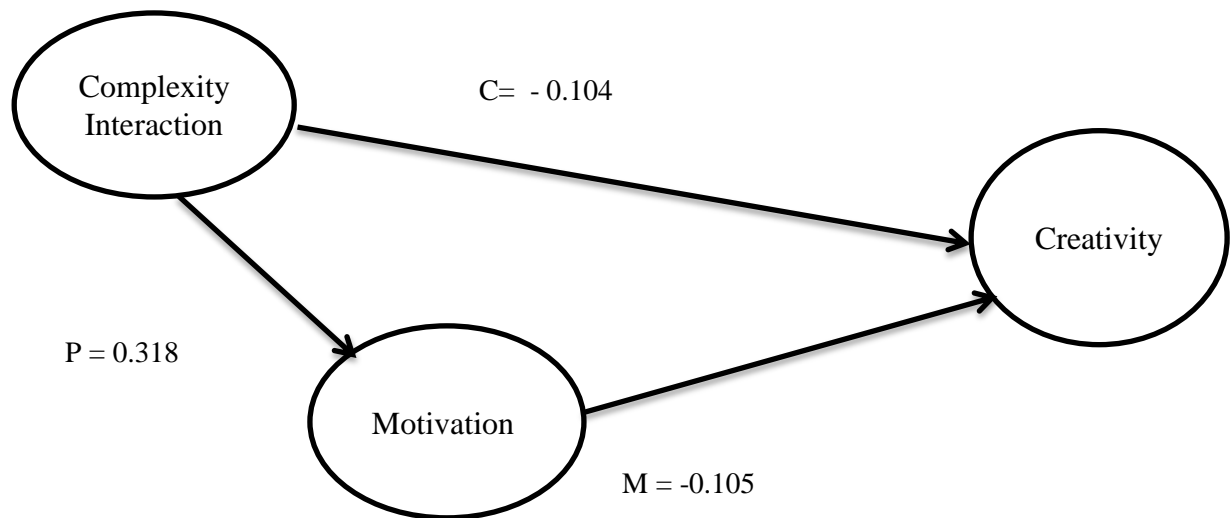
Figure 6: Mediating effects of motivation on complexity interaction and creativity

Motivators mediate the relationship between complexity interaction and creativity.

Indirect (P x M)

M = - 0.105

P = 0.318

A = - 0.104

Indirect effects = 0.318 x - 0.105 = - 0.033

The total effect is calculated as: M + P x A = -0.104 + (0.318) x (- 0.105) = -

0.137.

VAF = Indirect/total = - 0.033/-0.137 = - 0.241

The VAF (24%) calculated from Figure 6 shows suppressor effect in which after the application of the mediator effect, the direct effect become negative. This result suggests the partial mediation of the indirect relationship of motivation (entity based perspective) in explaining the direct effect between complexity interaction and creativity. A represents the direct relationship between complexity interaction and creativity. P explains the indirect connection between complexity interaction and motivation while M shows the indirect effect between creativity and motivation.
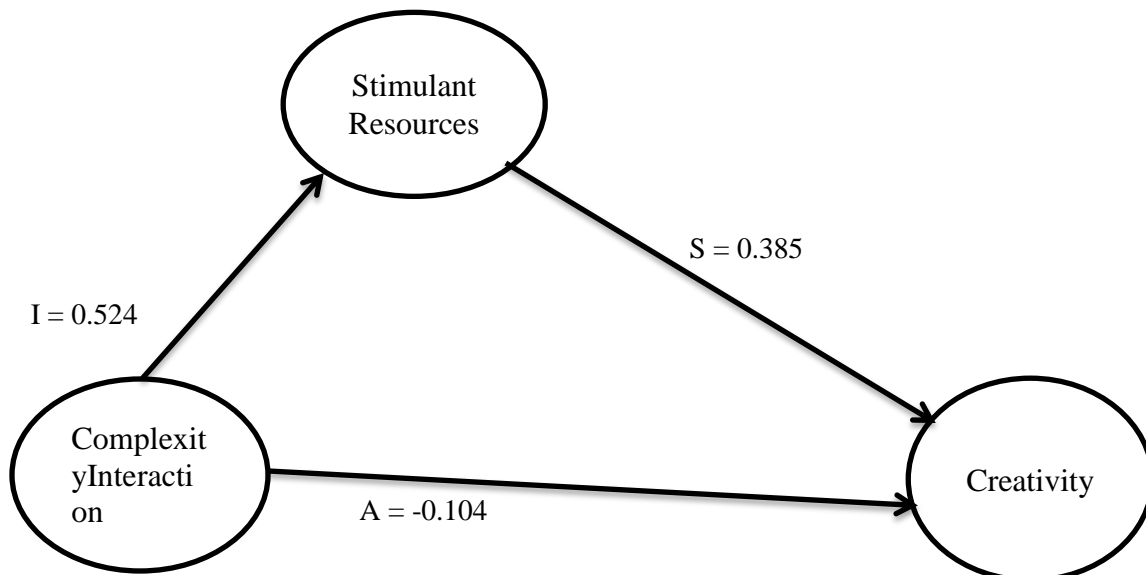
Figure 7: Mediating effects of stimulant resources on complexity interaction and creativity

Even though the direct effect of complexity interaction on creativity is negative (A = -104), stimulant resources can help mediate the effect on creativity by raising the total level of creativity among faculty members. Figure 7 shows the mediating effect of the stimulant resources on complexity interaction and creativity.

The VAF calculation for this relationship;

Indirect (I x S)

A = - 0.104

I = 0.524

S = 0.385

Indirect effects = 0.524. 0.385 = 0.202

The total effect is calculated as: A + I x S = -0.104 +0.524 x 0.385 = 0.098

VAF = indirect/total = 0.202/0.098 =2.06

Here the mediating effect acts as a reverse suppressor on the direct effect and the VAF cannot be interpreted, but according to Hair et al. (2014), "this kind of situation always represents full mediation" (p. 225). The letter A shows the relationship between complexity interaction and stimulant resources. The letter I represents the indirect effects between complexity interaction and stimulant resources while S shows the indirect effects between creativity and stimulant resources. This calculation shows the relevance of complexity interaction construct in explaining creativity. The result suggests the

importance of the direct relationship of complexity interaction (collectivist perspective) in explaining creativity when mediated by stimulant resources (entity perspective).

The Analysis of Results of the Measurement Model

The measurement model calculates the relationship between the constructs and their corresponding indicators. The analysis of the measurement model is divided into two parts: First, the reflective measures, which are represented by arrows pointing from the construct to the indicators (from the circles to the rectangles), are evaluated. The reflective measures are calculated in PLS by the outer *loadings*. The outer *loadings* also represent the relationship between the construct and the indicator. Second, the formative measures which are represented by arrows pointing from the indicator to the constructs (from the rectangle to the circle). The formative measures are calculated by their outer weights. The outer *weights* represent the relationship between the construct and the indicator.

Assessment of Reliability and Validity of Reflective Measurements

PLS does not provide goodness-of- fit statistics like is done in covariance-based structural equation models. Instead, it determines fit with measures of reliability. The internal consistency reliability measures used for the reflective measurement are composite reliability, convergent reliability, and discriminant reliability which help to confirm the suitability of construct indicators.

The composite reliability estimates the "reliability based on the inter-correlations of the observed indicator variables" (Hair et al., 2014, p. 101). A reliability score of 0.60

is considered minimally acceptable, with 0.70 to 0.70 preferred. Anything above 0.90 suggests that variables are redundant- they measure the same thing.

Convergent validity measures the extent of positive correlation between a measure and alternate measures of the same construct. Also known as the indicator reliability, it is based on the assumption that indicators of the same construct should share a lot of the same variance. A high convergent validity suggests commonalities among the indicators. A 0.70 outer loading is considered acceptable, while outer loadings between .0.40 and .070 should be considered for removal, but only if their removal increases composite reliability or AVE (below). The rule of thumb is that the latent variable should explain at least 50% of the indicator variance, which also means that the shared variance between construct and indicator is more than the measurement error variance. The explained variance is the square root of the composite validity measure, so accomplish the 50% explanatory power, the convergent validity must be at least 0.70.

The average variance extracted (AVE) "calculates the grand mean value of the squared loadings of the indicators" (Hair et al., 2014, p. 103). An average variance extracted (AVE) of 0.50 or higher is considered acceptable because it is deemed to explain more than half of the variance. An AVE of less than 0.50 is insignificant and suggests that there are more significant errors in the items not yet explained.

The PLS quality criteria overview (Table 6) shows composite reliability values for Creativity of = 0.793, Inhibitor = 0.810, Motivation = 0.887, Stimulants new thinking = 0.925 and Stimulants resources = 0. 893. All of the constructs have strong

100

composite reliability; 0.70 to 0.90 are considered strong. Usually values below 0.60 are considered unacceptable. This result shows a high level of internal consistency of this study.

Table 6. *PLS Quality Criteria Overview*

	AVE	Composite Reliability	R Square	Cronbachs Alpha	Communality	Redundancy
Complexity Interaction					0.563	
Creativity	0.494	0.793	0.286	0.665	0.494	0.018
Inhibitors	0.361	0.810	0.195	0.746	0.361	0.041
Motivators	0.573	0.887	0.189	0.848	0.573	0.047
Complexity Pressure					0.593	
Stim - New Thinking	0.560	0.925	0.416	0.909	0.560	0.220
Stim - Resources	0.518	0.893	0.275	0.868	0.518	0.108

The convergent validity assessment is calculated from the average variance extracted (AVE). The AVE for Creativity is = 0.494, Inhibitor = 0.361, Motivation 0.573, Stimulants new thinking = 0.560, and Stimulants resources = 0.518. The general rule is that AVE should be higher than 0.50. Motivation and stimulants constructs look strong. The inhibitors have a weak AVE of = 0.361. The other statistics for motivation are strong so we will keep motivation in the analysis (we feel comfortable with this in part because motivation does not affect creativity), but will interpret it carefully.

The Cronbach Alpha for the constructs are strong with creativity reported as 0.665, Inhibitor = 0.746, Motivators = 0.848, stimulant new thinking = 0.909, and stimulant resources = 0.868. Internal consistencies of 0.60 are minimally acceptable, and

all these scores are well above that. The R^2 for creativity is = 0.286, while the lowest R^2 is motivation 0.189 and inhibitor 0.169; the highest is stimulant new thinking (0.416). Anything above 0.20 is considered high as a general rule.

For discriminant validity, outer loadings values should be higher than loadings from other constructs (cross loading, a measure of the impact of an indicator when compared to all other indicators; Hair et al, 2014). For discriminant validity, if an indicators' loading has a higher value than all other indicators in the construct, it is considered a strong representation of the latent variable it describes. The highest cross loadings for complexity interaction is Comp_Resp6 (0.878), the complexity pressure question. Other cross loadings are: Comp_Press1 (0.959), Creativity cretv_Questions1 (0.711), Inhibitor Inh_Freedom7 (0.812), Motivation motv_fun6 (0.853), stimulants new thinking Stim_creative11 (0.867), and academic resources Stim_Tim19 (0.831). Table 7 shows the result of the cross loading table:

Cross Loading Table

	Complexity interaction	Creativity	Inhibitors	Motiva-tors	Com-plexity Pressure	Stim - New Thinking	Stim - Resources
Comp Disgree11	**0.749**	-0.212	-0.366	0.187	0.100	0.417	0.418
CompJob4	**0.558**	-0.254	-0.236	0.276	0.060	0.343	0.174
CompResp6	**0.878**	-0.240	-0.317	0.273	0.003	0.555	0.462
Comp Thinking10	**0.830**	-0.118	-0.263	0.276	-0.021	0.566	0.451
CompInfo2	0.697	-0.239	-0.304	0.211	-0.196	0.455	0.292
Cretv Incentive4	0.003	0.553	0.213	0.305	0.322	0.158	0.195
Cretv Journals2	-0.141	**0.684**	0.322	-0.041	0.034	-0.101	0.098
Cretv Methodology3	-0.260	**0.834**	0.427	-0.174	0.138	-0.204	-0.023

Table 7 continues

Table 7 Continued

	Complex-ity Inter-action	Creativity	Inhibitors	Motiva-tors	Com-plexity Pressure	Stim - New Thinking	Stim - Resources
Cretv Question1	-0.194	**0.711**	0.296	-0.118	0.069	-0.047	0.012
InhBarrier9	-0.391	0.304	**0.727**	-0.034	0.046	-0.155	-0.217
InhFreedom7	-0.361	0.396	**0.812**	-0.019	0.254	-0.252	-0.116
InhIdeas6	-0.222	0.338	0.470	-0.295	0.122	-0.175	-0.107
InhNarrow2	-0.183	0.386	**0.711**	0.008	0.173	-0.005	0.071
InhPress3	0.017	0.079	**0.360**	0.100	0.329	0.106	0.015
InhRegul4	-0.156	0.190	**0.494**	0.016	0.158	0.018	0.120
InhResource8	-0.101	0.178	**0.569**	0.044	0.034	0.109	0.050
InhRules1	-0.077	0.020	**0.523**	-0.083	0.184	-0.043	-0.076
Motv Collaboration2	0.147	0.039	-0.004	**0.813**	0.336	0.108	0.173
Motv Compete3	0.099	-0.077	-0.147	**0.578**	0.130	0.221	0.308
MotvIdeas5	0.345	-0.056	-0.046	**0.801**	0.211	0.366	0.368
MotvPleasure1	0.270	-0.053	-0.035	**0.835**	0.290	0.347	0.338
MotvStand4	0.139	-0.007	0.036	**0.610**	0.1480	0.216	0.310
MotvFun6	0.265	-0.147	-0.160	**0.853**	0.190	0.220	0.257
Comp PressChang2	0.047	0.142	0.065	0.239	**0.617**	0.177	0.080

CompPress1	-0.094	0.186	0.257	0.260	**0.959**	-0.145	-0.081
CompPress Learn3	0.038	0.041	0.169	0.254	0.691	-0.014	-0.052
Stim Colleagues12	0.460	-0.069	-0.159	0.200	-0.163	0.813	0.592
Stim Coloboration10	0.465	-0.100	-0.112	0.143	-0.196	0.808	0.553
Stim Creative11	0.486	-0.134	-0.072	0.163	-0.090	0.861	0.610
Stim Creativity21	0.414	0.061	-0.189	0.130	-0.171	0.470	0.650

The Default Report in SmartPLS shows the results of the calculation of the outer

loadings, and it indicates that for complexity interaction 3 out of five indicators are

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significant. The indicators below the 0.70 threshold are compjob7 (0.558), compinfo2 (0.697), creatvincentive4 (0.553), cretvjournal4 (0.684), InhIdeas4 (0.470), InhPress3 (0.360), InhRegul4 (0.494), InhResource8 (0.569), InhRules (0.532), MotvCompete3 (0.578), Motvstand4 (0.610), CompPressChang2 (0.617), Comppresslearn3 (0.691), StimCreativity17 (0.650), StimFreedom20 (0.601), StimNewAppr4 (0.395), StimResearch2 (0.454), and StimResearch7 (0.648). In all 26 were significant and 17 were not. The threshold for outer loading is 0.70. Table 8 shows the PLS calculation results in Outer Loadings.

PLS Calculation Results of Outer Loadings

	Complex-ity Inter-action	Crea-tivity	Inhibi-tors	Motiv a-tors	Complex-ity Press-ure	Stim - New Thinking	Stim – Re-sources
CompDisgree11	0.749						
CompJob7	0.558						
CompResp6	0.878						
CompThinking 10	0.830						
Compinfo2	0.697						
CretvIncentive4		0.553					
CretvJournals2		0.684					
Cretv Methodology3		0.834					
CretvQuestion1		0.711					
InhBarrier9			0.727				
InhFreedom7			0.812				
InhIdeas6			0.470				
InhNarrow2			0.711				
InhPress3			0.360				
InhRegul4			0.494				
InhResource8			0.569				
InhRules1			0.523				

Table 8 continued

	Comple x-ity Inter- action	Crea- tivity	Inhibi- tors	Motiva- tors	Complex- ity Press- ure	Stim - New Thinking	Stim – Re- sources
Motv Collaboration2				0.813			
MotvCompete3				0.578			
MotvIdeas5				0.801			
MotvPleasure1				0.835			
MotvStand4				0.610			
Motvfun6				0.853			
CompPress Chang2					0.617		
CompPress Comp1					0.959		
ComPressLearn 3					0.691		
StimColleagues 12						0.813	
StimColoboration10						0.808	
StimCreative11						0.861	
StimCreativity21							0.650
StimDeptHead 17						0.810	
StimFreedom20						0.601	
StimHead9						0.867	
StimIdea1						0.770	
StimNewAppr4						0.395	
StimOpenninded15						0.730	
StimRappourt16							0.758
StimResearch2							0.454
StimResearch6							0.720
StimResearch7							0.648
StimSupport5							0.811
StimTeams13							0.810
StimTim19							0.831
StimTrial&Error18						0.704	

Table 8 Continued

	Complex-ity Inter-action	Crea-tivity	Inhibi-tors	Motiva-tors	Complex-ity Press-ure	Stim - New Thinking	Stim – Re-sources
StimDeptHead 17	0.546	-0.183	-0.110	0.272	-0.025	0.810	0.522
Stim Freedom20	0.333	0.080	-0.000	0.314	-0.066	0.601	0.773
Stim Head9	0.598	-0.169	-0.158	0.230	-0.042	**0.867**	0.560
Stim Idea1	0.477	-0.002	-0.073	0.271	-0.169	0.770	0.644
Stim NewAppr4	0.109	0.221	0.129	0.175	0.138	0.395	0.241
Stim Openminded15	0.614	-0.080	-0.258	0.410	0.003	0.730	0.619
Stim Rappourt16	0.626	-0.124	-0.225	0.487	-0.057	0.696	0.758
Stim Research2	0.084	0.065	-0.016	0.204	0.1641	0.325	0.454
Stim Research6	0.208	0.196	0.128	0.288	0.0104	0.497	0.720
Stim Research7	0.185	0.260	0.110	0.076	-0.128	0.377	0.648
Stim Support5	0.318	0.125	0.005	0.231	0.054	0.524	0.811
Stim Teams13	0.375	0.004	-0.029	0.251	0.014	0.593	0.810
Stim Tim19	0.363	0.106	0.012	0.323	-0.117	0.643	**0.831**
Stim Trial&Error 18	0.460	-0.099	-0.055	0.317	-0.006	0.704	0.521

A higher outer loading construct is an indication that the indicators have much in common with the constructs, which is also known as indicator reliability. Outer loading should be above 0.70 (indicators between 0.40 and 0.70 should be considered for removal depending on how it affects the content validity). One should not use only R^2 to determine the predictive accuracy of a model, for such a determination can be biased. It should be substantiated by another approach

Table 9

Summary of Reflective Measurement Model

Latent Variable	Indicators / Items	Indicator Reliability	Composite Reliability	AVE	Discriminate Validity (Cross Loading)
Complexity Interaction	CompDisgree11	0.749	0.000	0.000	
	CompJob7	0.558			
	CompResp6	0.878			
	CompThinking10	0.830			
	Compinfo2	0.697			
Complexity Pressure	CompPressChang2			0.000	
	CompPressComp1				
	ComPressLearn3				
Motivation	MotvCollaboration2	0.813	0.887	0.573	Yes
	MotvCompete3	0.578			
	MotvIdeas5	0.801			
	MotvPleasure1	0.835			
	MotvStand4	0.610			
	Motvfun6	0.853			
Inhibitors	InhBarrier9	0.727	0.8102	0.361	No
	InhFreedom7	0.812			
	InhIdeas6	0.470			
	InhNarrow2	0.711			
	InhPress3	0.360			
	InhRegul4	0.494			

Table 9 continued

Latent Variable	Indicators / Items	Indicator Reliability	Composite Reliability	AVE	Discriminate Validity (Cross Loading)
Stimulants New Thinking	InhResource8	0.569	0.925	0.560	Yes
	InhRules1	0.523			
	StimColleagues12	0.813			
	StimColoboration10	0.808			
	StimCreative11	0.861			
	StimDeptHead 17	0.810			
	StimFreedom20	0.601			
	StimHead9	0.867			
	StimIdea1	0.770			
	StimNewAppr4	0.395			
	StimOpenninded15	0.730			
	StimTrial&Error18	0.704			
Stimulants Resources	StimRappourt16	0.758	0.893	0.518	Yes
	StimResearch2	0.454			
	StimResearch6	0.720			
	StimResearch7	0.648			
	StimSupport5	0.811			
	StimTeams13	0.810			
	StimTim19	0.831			
	StimCreativity21	0.650			
Creativity	Cretv_incentive4	0.553	0.793	0.494	Yes
	Cretv_Journal2	0.684			
	Cretv_Methodology3	0.834			
	Cretv_Questions1	0.711			

Assessment of Reliability and Validity of Formative Measurements

The appropriateness of the formative measures is calculated in PLS from the outer weight loadings. The outer weights and their standard deviations are reproduced in Table 10. The original estimate (standardized coefficients) of the weights (in the second column, Original Sample O) is divided by the bootstrap calculated deviation (in the

column Standard Deviation (STDEV). The last column shows the resulting empirical t value. The outer weights (indicators) with the highest empirical t values include: StimHead9 <- Stim _ New Thinking (9.105), Stim_Coloboration10 <- Stim _New Thinking (8.162) and for complexity Comp_Resp6 -> Complexity (2.797)   and the lowest Comp_PressChang2 -> Pressure (0.265).

Table 10: *Outer Weights (Mean, STDEV, t-Values)*

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/ STERR|)
CompDisgree8 -> Complexity	0.148	0.145	0.168	0.168	0.881
CompJob4 -> Complexity	-0.104	-0.126	0.216	0.216	0.463
CompResp6 -> Complexity	0.465	0.446	0.166	0.166	2.797
CompThinking10 -> Complexity	0.388	0.383	0.152	0.152	2.549
Compinfo2 -> Complexity	0.306	0.301	0.168	0.168	1.818
CretvIncentive4 <- Creativity	0.219	0.230	0.179	0.179	1.218
CretvJournals2 <- Creativity	0.378	0.348	0.091	0.091	4.133
CretvMethodology3 <- Creativity	0.478	0.446	0.094	0.094	5.052
CretvQuestion1 <- Creativity	0.308	0.315	0.092	0.092	3.350
InhBarrier9 <- Inhibitors	0.265	0.253	0.061	0.061	4.331
InhFreedom7 <- Inhibitors	0.341	0.324	0.056	0.056	5.998

Table 10 continues

Table 10 continued

InhIdeas6 <- Inhibitors	0.255	0.240	0.106	0.106	2.401
InhNarrow2 <- Inhibitors	0.261	0.259	0.059	0.059	4.363
InhPress3 <- Inhibitors	0.098	0.069	0.102	0.102	0.962
InhRegul4 <- Inhibitors	0.165	0.161	0.079	0.079	2.077
InhResource8 <- Inhibitors	0.113	0.117	0.066	0.066	1.723
InhRules1 <- Inhibitors	0.078	0.074	0.070	0.070	1.115
MotvCollaboration2 <- Motivators	0.223	0.226	0.081	0.081	2.744
MotvCompete3 <- Motivators	0.133	0.128	0.082	0.082	1.612
MotvIdeas5 <- Motivators	0.273	0.256	0.074	0.074	3.687
MotvPleasure1 <- Motivators	0.273	0.264	0.045	0.045	5.980
MotvStand4 <- Motivators	0.131	0.161	0.088	0.088	1.495
Motvfun6 <- Motivators	0.248	0.242	0.073	0.073	3.386
PressChang2 -> Pressure	0.109	0.065	0.414	0.414	0.265
PressComp1 -> Pressure	0.778	0.648	0.416	0.416	1.866
PressLearn3 -> Pressure	0.267	0.264	0.362	0.362	0.738
StimColleagues12 <- Stim - New Thinking	0.130	0.131	0.019	0.019	6.874
StimColoboration10 <- Stim - New Thinking	0.133	0.133	0.016	0.016	8.162
StimCreative11 <- Stim - New Thinking	0.141	0.141	0.017	0.017	8.070
StimCreativity21 <- Stim - Resources	0.213	0.202	0.054	0.054	3.904

Table 10 continued

|	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/ STERR|)
StimDeptHead 17 <- Stim - New Thinking	0.160	0.158	0.019	0.019	8.065
StimFreedom20 <- Stim - New Thinking	0.088	0.093	0.026	0.026	3.332
StimHead9 <- Stim - New Thinking	0.174	0.171	0.019	0.019	9.105
StimIdea1 <- Stim - New Thinking	0.132	0.132	0.018	0.018	7.240
StimNewAppr4 <- Stim - New Thinking	0.019	0.028	0.030	0.030	0.632
StimOpenminded15 <- Stim - New Thinking	0.174	0.168	0.023	0.023	7.524
StimRappourt16 <- Stim - Resources	0.306	0.293	0.088	0.088	3.475
StimResearch2 <- Stim - Resources	0.046	0.069	0.050	0.050	0.930
StimResearch6 <- Stim - Resources	0.118	0.119	0.047	0.047	2.488
StimResearch7 <- Stim - Resources	0.111	0.105	0.061	0.061	1.817
StimSupport5 <- Stim - Resources	0.169	0.166	0.036	0.036	4.699
StimTeams13 <- Stim - Resources	0.189	0.190	0.033	0.033	5.690
StimTim19 <- Stim - Resources	0.190	0.182	0.032	0.032	5.925
StimTrial&Error18 <- Stim - New Thinking	0.131	0.125	0.020	0.020	6.512
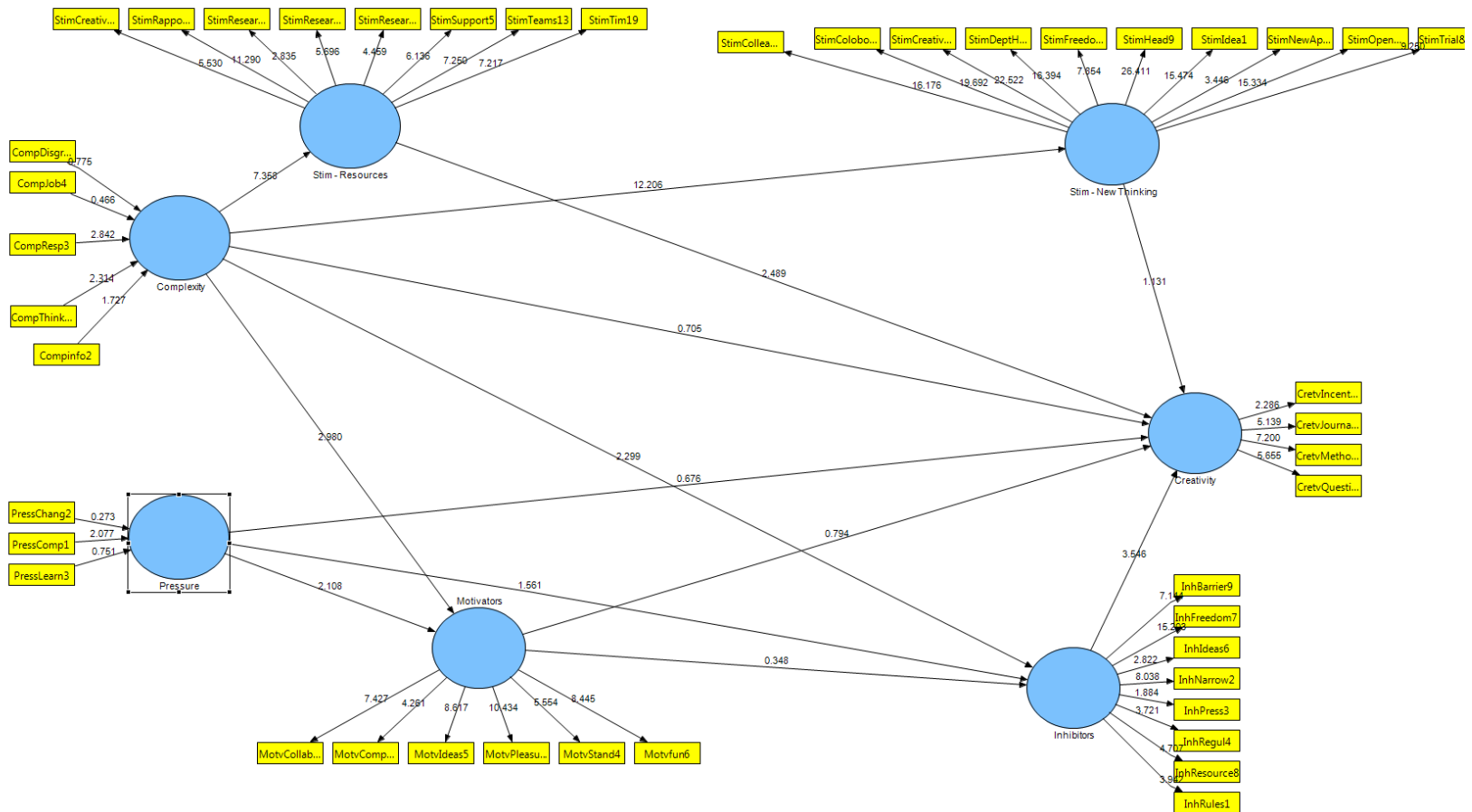
Figure 8. Bootstrap results from SmartPLS (t test for significance of path coefficients)

The SmartPLS bootstrapping routine was used to show the *t* values of the path loadings for both the measurement and structural model. The bootstrapping has been used in this study to determine the impact of the formative constructs (complexity interaction and complexity pressure) on related construct. Bootstrapping helps to estimate confidence levels for the purpose of establishing the stability of the parameter used (Ringle, Sarstedt, & Straub, 2012).

To decide whether a path coefficient is significantly different from zero, the critical value for significance is 5% (α=0. 05) probability of error. The result should be higher than the value of the critical value. The t values for the model paths are in Table 10. The result showed that all the indicators have significant critical values with the exception of InhResource8 <- Inhibitors (1.723), InhRules1 <- Inhibitors (0.115), MotvCompete3 <- Motivators (1.612), MotvStand4 <- Motivators (1.495), PressChang2 -> Pressure (0.265), PressLearn3 -> Pressure (0.738),   StimNewAppr4 <- Stim - New Thinking(0.632), StimResearch2 <- Stim – Resources(0.930) CompDisgree8 -> Complexity (0.881), CompJob4 -> Complexity (0.463), Compinfo2 -> Complexity(1.818), CretvIncentive4 <- Creativity (1.218) and InhPress3 <- Inhibitors (0.962). Those values that are not significant are retained because they help to answer other questions within the study.

 Figure 8 shows the model and the results of Bootstrapping. The result of bootstrapping results varies each time they are run (each run begins with a different set of value), therefore the results may change slightly after each run (Hair, et al, 2014). Table 11 shows the summary of the formative measurement model results.

The result from the outer weights significance testing showed that the only indicators that are significant at the 0.10 level (t=1. 65) are Comp_Thinking13 (β = 0.562, t = 2.549), Comp_infor5 (β = 0.151, t = 1.818), Comp_Resp6 (β = 0.249, t = 2.797), and Comp_Pres1 (β = 0.535, t = 1.866) The critical *t* value is the cutoff point on which significance of the coefficient is determined. Therefore if the empirical result is higher that the critical value, the null hypothesis is rejected (Hair, et al, 2014). Those outer weights that are not significant are retained because they help to provide answers to other variables in the study.

Table 11

Summary of Outer Weights Significance Testing for Formative Measurement Models

Formative Constructs	Formative Indicators	Outer Weights	*t* Value
Complexity Interaction	Comp_Thinking13	0.562	2.549
	Comp_Disgree11	0.027	0.881
	Comp_infor5	0.151	1.818
	Comp_Resp6	0.242	2.797
	Comp_Job7	-0.322	0.463
Complexity Pressure	Comp_LearnPres3	0.107	0.738
	Comp_Pres1	0.535	1.866
	Comp_presChang2	0.509	0.265

Discussion

Partial Least Square PLS suggests the use of theory to compare with data in order to predict and support a model's argument (Hair et al, 2014). It attempts to use data to confirm a model and to support the predictive relevance of a model. This approach supports the post-positivist assumption of this study that identifies a theory or model, collects data to validate or invalidate the theory/model, and making inferences about the model. PLS was used in this study to examine the effects of the exogenous variable (complexity interaction and complexity pressure) on creativity and the mediating effect of the entity based constructs (stimulant resources, stimulant new-thinking, inhibitor and motivation) on the interaction between complexity and creativity. The findings of this study revealed a positive significant effect of construct types like psychological safety, organizational impediment and freedom in explaining creativity.

The result of the study showed that the constructs stimulant new-thinking. stimulant resources and inhibitors have strong effects on creativity. The constructs have indicators like "open-mindedness of colleagues/research collaborators" (work group), encouragement from colleagues/research collaborators to be creative in research (work group), rapport with department head/ supervisor (work group), confidence from other colleagues/research collaborators (organizational encouragement), encouragement from department head/supervisor to be creative in research (organizational encouragement), freedom to try new ideas/processes (freedom), suggesting a need for a new approach (organizational encouragement) and willing to learn through trial and error (challenging work).

The stimulant resource indicators that have high significant imports in the study include: sufficient time to complete research endeavors (time) technical ability of team members (work group), access to other resources (software, books, etc.) necessary to conduct research (resources), access to the facilities needed to conduct research (resources).

It may however be instructive to look at the cross loadings of the contracts because this can help to explain which indicator have the strongest effect and also have the highest level of impact on a construct. Cross loadings normally indicate the level of correlation to other constructs. Comp_Resp6 with 0.878 ("my colleagues respect each other") had the strongest impact on complexity interaction. The implication of this is that the issues of respect and psychological safety (trust and confidence) are very important in the workplace of faculty members in the institution studied. The indicator with the highest impact on the creativity construct is creatv_question1 with 0.711, "To what degree is the research questions in your research different from anything other research in your field?" The implication of this can be explained as original, new and novel ideas.

The indicator for inhibitor with the highest level of significance is inh_freedon7 0.812: "Lack of freedom to exercise creativity". It can be argued that organizational impediments like lack of freedom are the results of politicking and rivalry which stifles creativity. This argument is supported by Secor (1995) who identified factors that demoralizes faculty in higher education as polarization of departmental issues,

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ideological positions and disrespect between junior and senior faculty members causing tensions and discouragements.

The indicator with the strongest impact of motivation is motv_fun6 (0.853) "I have fun doing academic research with others". The explanation for this may be that faculty members are not having enough fun on the job in terms of liking what they do or that organizations do not promote positive contextual conditions that can promote fun on the job. Many organizations like IDEO and Google have incorporated fun as an approach to enhancing creativity in their organizations. De Bono (1992) advocated for the *creative pause,* which he referred to as planned and intentional time set aside for thinking, encouraging, and boosting creativity. He not only advanced fun as means to boost creativity but suggested that a quiet time be set apart where workers rest and think creatively.

In complexity pressure, the indicator with the highest value is comp_press1 (0.959): "I experience pressure in my job because my department is in a highly competitive field". This explained the influence of pressure on faculty members. Pressure from within and without the organization promoting creativity. The implication of this is that pressure could determine how faculty members spend their time in higher education. This could have implications on the workload and pressure on teaching and research. Research has revealed that the average faculty spends about 52 hours a week at work. Pressure could also relate to work related conflicts. The pressure identified by complexity theory (uh-Bien et al, 2007) identified workplace conflict as part of the pressure. Conflict itself is not bad but it should be task related.

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The strongest indicator of stimulant new-thinking results is Stim_Head (9 0.867): "Confidence from department head/supervisor:" this reflects the importance of the department head/supervisor roles in fostering creativity in higher education organizations. This is also an organizational impediment problem that is largely contextual.

Under stimulant resources, the findings reveal that the most significant indicator associated with the construct is Stim_Tim19 (0.831) "Sufficient time to complete research endeavors". It is interesting that this comes up as an important consideration because, while policy makers and legislators may be arguing for accountability among faculty members, data results reveal that sufficient time to do creative work is a concern among faculty members. Other studies on time have described time both as a motivation and a stressor (Bellas & Toutkoushian, 1999). In the years ahead, to be able to excel in the midst of complexity, faculty members will be requested to do more with less time (Edgerton, 1993).

Table 12 shows the outer loading summary of the constructs, their path coefficient, indicator questions and type.

Outer Loading Result Summary

Constructs	Variable Code	Result	Indicator Questions	Indicator Type
Creativity	creatv_question1	0.711	"To what degree are the research questions in your research different from anything other research in your field?	Novel/Originality
Motivation	motv_fun6	0.853	"I have fun doing academic research with others".	Fun
Inhibitor	inh_freedon7	0.812	"Lack of freedom to exercise creativity"	Organizational Impediment
Complexity Interaction	Comp_Resp6	0.878	"My colleagues respect each other" has the highest level of significance of complexity interaction	Psychological Saftety
Complexity pressure	comp_press1	0.959	"I experience pressure in my job because my department is in a highly competitive field".	Pressure

Table 12 continues

Table 12 Continued

Stimulant Interaction	Stim_Head 9	0.867	"Confidence from department head/supervisor"	Organizational Encouragement
Stimulant Resources	Stim_Tim19	0.831	Sufficient time to complete research endeavors	Freedom(Time)

Examining the structural model and the influence of the exogenous constructs (independent variable) on the endogenous variables, the findings reveal that the three constructs with the highest influence on creativity are stimulant resources, stimulate new thinking and inhibitors. We have already discussed the influence of the stimulant new thinking and stimulant resources but the influence of the inhibitors on creativity is rather interesting. When people begin to generate new solutions in order to overcome challenges what Marion (2012) called, social dampening. This occurs when complex systems become more complex in order to deal with challenges that interfere with their efforts.

The results for formative measures using the bootstrapping method indicate
The outer weights (indicators) with the highest empirical t values include: StimHead9 <- Stim - New Thinking (9.105), Confidence from department head/supervisor; StimColoboration10 <- Stim - New Thinking (8.162), Confidence from other colleagues/research collaborators; and for complexity, CompResp6 -> Complexity (2.797) My colleagues respect each other; and the lowest, CompPressChang2 -> Pressure (0.265):

"I experience pressure in my job because the way my work is conducted or the field that I study changes often". These indicator types most consistently identify workplace creativity in higher education organizations.

The blindfolding Q^2 results indicate the 1-SSE/SSO which is the value of the predictive relevance of the Q^2. The predictive relevance with the highest impact is Stim_New Thinking 0.195 and the lowest is inhibitor 0.033. Q^2 values that are higher than 0 suggest that the construct has a predictive value and values less than zero suggest the construct lack predictive value. This result is consistent with all other results of the internal consistency reliability.

Discussion on Mediating Effects

The goal of the mediating analysis is to establish a theoretical indirect relationship between the paths and the constructs. This is done by determining the degree to which indirect effects through the mediating variables modify the direct paths that are hypothesized. The results of the mediating effects (in figure 5) showed the relevancy of complexity interaction (collectivist dynamics) construct in explaining creativity as mediated by stimulant new thinking (entity based). The result of 0.594 suggests that the link between complexity interaction and creativity is mediated by stimulant resources which is a full mediation since it is above 80% of the direct effects. Complexity interaction's link to creativity is negative at -0.104 but a mediation of stimulant new thinking (entity based) not only improves the total effect but produces in full mediation. This result is also applicable to policy where the introduction of stimulants

new thinking interventions can be used as a mediation between complexity interaction and creativity interventions.

The mediating effect between complexity interaction (collectivist) and creativity examines (figure 7) the relevance of complexity interaction constructs in explaining creativity. This result suggests the relevance of the direct relationship of complexity interaction (collectivist perspective) in explaining creativity. This direct effect is however mediated by the indirect effect of stimulant resources (entity based). Even though the direct effect is negative at -0.104, the indirect effects help to mediate this link.

CHAPTER FIVE

RECOMMENDATIONS AND CONCLUSION

This study examined the mediating effect of entity based creativity mediators (stimulant-resources, stimulant new-thinking, motivation and inhibitors) on the effects of collectivist contexts (complexity interaction and complexity pressure) on faculty creativity in higher education The findings from this study suggest that stimulant resources (entity variables) have a positive mediating effect on the relationship between complexity interaction (collectivist dynamics) and faculty creativity. The mediating effects of stimulant new thinking on complexity and creativity also resulted in a strong total effect (See table 5).

These results suggest a positive predictive relevance when stimulant-resources mediate the interaction between complexity interaction and creativity and when stimulant new thinking mediates the interaction between complexity interaction and creativity respectively. The findings support the hypotheses that the entity variables (stimulant-resources and stimulant new-thinking respectively) mediated the interaction between complexity interaction and creativity. Inhibitors likewise mediated the relationship between complexity interaction and creativity; this mediation was positive, and is explained by Marion (2012) social dampening phenomenon. The motivators was not a significant mediating variable, although the collectivist variables (complexity interaction and complexity pressure) did contextualize this entity variable as predicted. From the constructs in this study, the following specific 7 measured variables were identified as influences of creativity: organizational impediments, organizational

encouragement, psychological safety, pressure, fun, novelty/originality, and freedom (See Table 12).

The definition of creativity adopted for this study was suggested by Amabile (1996), which is relevant to diverse disciplines and is grounded in the creative product rather than the process:

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

The findings of this study confirm the perspective that creativity is seen as novel and original idea that is judged from the lenses of different disciplines who apply different methodological approach rooted in the traditional approaches of their field. This definition was used to operationalize creativity in this study. The result of this study is important because creativity can result in innovation which is the implementation of an idea. This idea can be innovative program, project or product with implications for our schools, community and nation. The findings in this study have implications for higher education faculty and administrators practices, policies and research.

Implications for Faculty Members:

For faculty members, this study focuses attention on necessary criteria for helping faculty members remain relevant and meet changing requirements in their field. This

includes the influence of culture and myths that define their departments and institutions. For junior faculty members, departmental requirements include the tenure process and maintaining values in regards to teaching, research and service.

The findings show that complexity interaction had the strongest effect in the model, but its effect was on mediator rather than on creativity. Complexity pressure too had a strong effect on creativity. These mediating variables measure, for instance, job pressures from the competitive field, time management and maintaining a work-life balance.

This study confirms what past studies have revealed of pressure- that it can be both a motivator and a stressor. Pressure, especially when viewed from the lens of task conflict (non-personal conflict over how tasks are to be performed), is good for the organization because it stimulates problem solving. Academic departments should encourage task-related conflicts in teams and collaborations to develop positive motivation that can generate solutions, ideas and creativity (Jehn 1997; Marion, 2012).

Other consequences of pressure include job satisfaction and turnover rate. How faculty members handle pressure may be an early indication of their job satisfaction level and whether they will remain on the job or at the institution. Kanter (1977) describes faculty morale as an important attitudinal response to workers' conditions which influences the employee's behavior. Excessive pressure can be debilitating, however, should be taken seriously by enabling leaders because of its implication to faculty member's health, family, work-life balance, productivity and turnover rate. Departments might periodically take the Pressure Evaluation Test (PET) to measure this phenomenon.

It is understandable that there are many causes of pressures; however early detection of excessive job stress and lack of satisfaction can help not only enhance creativity, but also keep the best people on the job.

Pressure can also arise from lack of time to perform a task or meet deadlines. This lack of time to meet deadlines can be a stressor in higher education organizations. Faculty time expenditures have various implications for retention, promotion, peer recognition, productivity, and productivity (Bella & Toutkoushian, 1999). A 1999 national survey reported that 86% and 80% of faculty participants claimed time pressure and lack of personal time, respectively, were a source of stress. The average faculty working week is 52.5 hours (Magner, 1999; NCES, 1993). This could have grave implication for junior faculty who need to work toward tenure and promotion and yet raise their family. Further research is needed to empirically determine the different categories of job related pressures and their influence on faculty creativity in higher education organizations.

Another important result of this study involves the psychological safety result which ranked second in terms of its impact on the stimulant-resource construct. Respect and recognition are concerns among faculty members in this study. Recognition of successes and senior faculty encouragement could serve as great motivation for junior faculty members. The respect between junior and senior faculty can be emphasized. Respect implies having trust and confidence from colleagues. Therefore, an atmosphere and culture that promotes respect, job-security, embracing new-thinking trust, recognition and confidence should be created as part of department's culture (Daniels &

Seth, 2003). It would be unfortunate if junior faculty members could not find a trusted network or confidant to trust while going through pressure or stress. This kind of relationship can only be fostered if enshrined in the organizational culture of institutions.

Psychological safety will require a structurally established culture of mutual respect, freedom from threats, lack of polarization, departmental partisanship, embracing change, a free flow of information and diversity. Again, an evaluation might be taken to understand the level of psychological safety among faculty and ascertain their level of trust, respect, embracing new-thinking and confidence in the institution.

This study found that many faculty members reported they had fun doing their jobs. This report supports other findings that faculty members love their jobs (Boyer et al., 1994). Liking one's job having fun doing the job should be sustained by an enabling institutional structure. This argument is also supported by the scholarly writings of De Bono (1992).

Implications for University Administrators

Higher education administrators in most institutions are supervisors of the department and are responsible for most departments and college policies. It is generally accepted that an effective leader-member exchange will positively enhance creativity more than a poor leader-member exchange (Graen & Uhl-Bien, 1995) . The findings of this study showed that confidence from the department head or supervisor had a high impact on faculty creativity. Confidence, trust and encouragement from department heads and deans in the form of positive reinforcement, non- judgmental feedbacks, a political disposition and modeling of best practices is crucial to creativity.

University administrators are responsible for creating an atmosphere that will enhance the psychological safety of faculty members. A Carnegie Foundation report reveals that 39% of faculty members' believe that the leadership is incompetent, 58% think top administrators are autocratic and 64% think the relationship between faculty and administration is poor (Boyer et al., 1994). Creating and supporting an organizational culture devoid of polarization and tension, non-judgmental and supportive of faculty members is imperative (Amabile & Conti, 1999; Deci & Ryan, 1985).

A departmental culture that promotes participatory leadership and improves faculty morale is important for stimulating creativity (Bowen & Schuter, 1986). Administrators should set attainable goals that will ensure the provision of resources needed by faculty. Three of the most significant responsibilities for university administrators are removing organizational impediments, fostering autonomy and ensuring psychological safety for all faculty members.

Implications for Policy and Practice

Bowen and Schuster, (1986) noted that most faculty members are not dissatisfied with their profession but with the institution. This suggests that most faculty concerns are structural and related to institutional policies. This study impinges on policy and practice in several ways especially because it suggests concerns of faculty members over organizational impediments, structural inhibitors, resources and pressures that emanate from structural obstacles.

One of the significant findings of this research was from the item "lack of freedom to exercise creativity," which is an organizational impediment issue. This is

identified both as a complexity problem and a structural inhibitor problem. This problem manifest where new approaches, and new thinking is stifled. Intentional policies should be initiated to enable faculty members to embrace new thinking, freedom to take on projects and resources to begin projects while reviewing policies that stifles freedom, unhealthy departmental rivalry and that eliminate political strife or antagonism while becoming deliberate about promoting diversity.

Implications for Research

This study has contributed to knowledge about how faculty members' conduct the business of creating knowledge. Complexity interaction, complexity pressure, stimulant-resources, stimulant-new thinking, structural inhibitors and especially the interaction of these as enhance or inhibit creativity in higher education. The direct effects paint an incomplete picture of creativity and must be understood by looking at their total effect on creativity. This study employed the collectivist and entity based paradigms using two theories: constructs of complexity theory and the KEYS model constructs. The relevance of this approach contributes not just the entity and collectivist perspective of creativity but also the contextual element of creativity.

Further study may be needed to examine the moderating effects between complexity and creativity and unobserved heterogeneities associated with their interactions. Additionally, a differentiation between tenured and non-tenured faculty and inter-generational differences among faculty might also be needed for greater understanding of faculty creativity in higher education organizations.

Finally, the contextualizing effects of complexity might be explored further, this suggests that the nature and quality of the networked dynamics significantly influence how people experience their work and it would be interesting to know more about this phenomenon.

Conclusion

The contextual characteristics of collectivist and the entity based creativity on faculty members in higher education were examined in this study. It used PLS-SEM method to investigate the effects of the complexity constructs and the KEYS model constructs in order to identify path coefficients and mediating effects among constructs. This study based on post-positivist assumptions argue that"examining the relationship between and among variables is central to answering questions and hypotheses through surveys and experiments" (Creswell, 2009, p. 145), hypothesized that entity based creativity (stimulant-resources, stimulate new-thinking, inhibitors and motivation) mediate the interaction between complexity theory and creativity. The generalizability of the study lies in its theoretical concepts and model and does not infer on the population.

The findings showed the predictive relevance of the constructs, stimulant new-thinking, stimulant-resources and inhibitors on creativity while organizational impediments, psychological safety, pressure, fun, novelty/ originality and freedom were identified as the most important indicator types. Stimulates new-thinking had the highest predictive relevance of creativity. The strongest mediating effect passed from complexity interactions through stimulant new-thinking to creativity.

Among the indicators, the findings revealed that job pressure as a result of competitiveness in a field is the most significant indicator of complexity. The most significant goal is the ability to gain recognition, legitimacy and fame. It is based on this that criteria and judging a colleague's academic work as legitimate or illegitimate or creative/not creative are considered. This finding is consistent with complexity theorists arguments that appropriate amounts of pressure can encourage workers to seek creative solutions to challenges in an effort to control that pressure (Marion, 2013).

Therefore, staying within the limits of this departmental boundary determines tenure, promotion, production and peer recognition for faculty. If pressure from the job seems to be significant, then we can ask questions that are related to the creativity and the legitimization of knowledge in higher education organizations (Kelly, 2006).

This research suggests that the questions that need to be asked involve the nature of the debate as it relates to creativity and the legitimization of knowledge in higher education, as well as what knowledge is considered creative and legitimate and how legitimate knowledge is decided (Kelly, 2006). We may begin to re-consider the way meanings are framed if data reveals that pressure is a catalyst to creativity. The call for policy-makers and legislators scrutinizing the time and productivity clearly exposes the gap between policy and practice if this data is to inform knowledge. This also explicates a lack of understanding about the criteria for what is considered legitimate by some constituencies. There is a need for research that policy makers and administrators will more accurately be able to decipher in order to construct meaningful policies.

If there is more pressure on the job then maybe it is time to begin to expand our criteria for what creative academic knowledge is or perhaps what creative academic practice entails? Further research may include qualitative studies to further understand the way faculty members feel about these issues.

Constructs, Survey Questions, and Variable Types

Variable Names	Research Questions	Indicator Type	Reflective/ Formative
	Complexity		
Comp_press1	I experience pressure in my job because my department is in a highly competitive field.	Pressure	Formative
Comp_pressChang2	I experience pressure in my job because the way my work is conducted or the field that I study changes often.	Pressure	Formative
Comp_pressLearn3	There is a lot of pressure to learn in my job in order to keep up with changing knowledge.	Pressure	Fomative
	Pressure		
Comp_Resp6	My colleagues respect each other.	Psychological Saftey	Formative
Comp_Job7	It is common for my colleagues and I to discuss job-related issues.	Interaction	Formative
Comp_Disgree11	I feel that my colleagues and I can disagree with each other about policies, initiatives, etc. without the disagreement becoming personal.	Heterogenity	Formative
Comp_Info5	I have colleagues with whom I can share confidential information.	Psychological Saftey	Formative
Comp_Thinking13	Divergent thinking is respected in my job.	Heterogenity	Formative

Table continues

Table continued

Variable Names	Research Questions	Indicator Type	Reflective/ Formative
Inhibitors Construct			
Inh_Rules1	Rules and regulations in place with respect to research	Organizational Impediments	Reflective
Inh_Narrow2	Narrow-mindedness of researchers	Organizational Impediments	Reflective
Inh_Press3	Pressure to meet deadlines	Work Pressure	Reflective
Inh_Regul4	Inability to meet with collaborative group on a regular basis	Pressure	Reflective
Inh_Conf5	Lack of confidence in trying a new approach or new way of thinking	Organizational Impediments	Reflective
Inh_Ideas6	Creative ideas generated prior have proven to be ineffective	Organizational Impediments	Reflective
Inh_Freedom7	Lack of freedom to exercise creativity		
Inh_Resource8	Lack of resources (financial or otherwise) to try new ideas	Organizational Impediments	Reflective
Inh_Barrier9	In general, I must overcome barriers to be creative where I work.	Work Pressure/ Organizational Impediments	Reflective
Stimulant Resources			
Stim_Research2	The rigor of the research	Challenging Work	Reflective
Stim_Creative 11	Encouragement from department head/supervisor to be creative in research	Organizational Encouragement	Reflective
Stim_Support5	Access to sufficient financial support	Resources	Reflective
Stim_Research6	Access to facilities needed to conduct research	Resources	Reflective

Table continues

Table continued

Variable Names	Research Questions	Indicator Type	Reflective/ Formative
Stim_Teams13	Technical ability of team members	Challenging Work	Reflective
Stim_Tim19	Sufficient time to complete research endeavors	Time	Reflective
Stim_Rapport16	Rapport with colleagues/research collaborators	Work Group	Reflective
Stim_Research7	Access to other resources (software, books, etc.) necessary to conduct research	Resources	Reflective
Stimulant New Thinking			
Stim_Head9	Confidence from department head/supervisor	Organizational Encouragment	Reflective
Stim_Coloboration10	Confidence from other colleagues/research collaborators	Organizational Encouragment	Reflective
Stim_Creative21	I experience opportunity and support for being creative.	Organizational Encouragment	Reflective
Stim_Colleagues12	Encouragement from colleagues/research collaborators to be creative in research	Work Group	Reflective
Stim_Openingmindedness15	Open-mindedness of colleagues/research collaborators	Work GRoup	Reflective
Stim_DeptHead 17	Rapport with department head/supervisor	Organizational Encouragment	Reflective
Stim_Idea1	Freedom to try new ideas/processes	Freedom	Relective
Stim_Trial&Error18	Willingness to learn through trial and error	Task Complexity/ Challenging Work	Reflective
Stim_New Approach4	Inconclusive findings in field of research, suggesting a need for a new approach	Challenging Work	Reflective

Table continues

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Variable Names	Research Questions	Indicator Type	Reflective/ Formative
Stim_Freedom20	Freedom from distractions to focus on research endeavors	Freedom	Reflective
	Creativity Constructs		
Cretv_Question1	To what degree are the research questions in your research different from anything other researches in your field?	Original/Novel	Reflective
Cretv_Journals2	Some established journals tend only to accept articles whose methodology/premise is grounded in traditional practices (for example, statistical analyses might be preferred over qualitative analyses). Rate the likelihood that the methodology or premise in the articles you produce would be published in such traditionalist journals.	Knowledge/ Expertise	Reflective
Cretv_Methodology3	To what degree is the methodology or premise for you publish so different that journal editors might have difficulty finding reviewers to knowledgeably evaluate your study?	Uncommon Ideas	Reflective
Cretv_Incentive4	To what degree has the research you produce drawn attention from your peersor colleagues because of the uniquenessof the study?	Uniqueness	Reflective

Table continued

Variable Names	Research Questions	Indicator Type	Reflective/ Formative
Motivation Construct			
Motv_Pleasure1	Research gives me please because it broadens my knowledge about subjects that appeal to me.	Intellectual Challenge and Broad Interest	Reflective
Motv_Collaboration2	I participate in collaborative research because I enjoyed the give-and-take of developing and studing ideas with other researchers.	Exchange of Ideas/Collaboratio n	Reflective
Motv_Compete3	I do research to improve my competence as an instructor.	Personal goals	Reflective
Motv_Stand4	I have high academic standards for myself	Need for achievement	Reflective
Motv_Ideas5	like the intellectual challenge of creating new ideas.	Intellectual Challenge and Broad Interest	Reflective
Motv_fun6	I have fun doing academic research with others	Fun	Reflective

APPENDIX B

Institutional Review Board Approval

Validation of IRB2013-187: The Mediating Effect of Collectivist and Entity Contextual Characteristics on Creativity among Faculty in Higher Education

Dear Dr. Marion,

The chair of the Clemson University Institutional Review Board (IRB) validated the protocol identified above using exempt review procedures and a determination was made on **July 12, 2013** that the proposed activities involving human participants qualify as Exempt under category**B2**, based on federal regulations 45 CFR 46. The approved consent document is attached for distribution. **Your protocol will expire on July 31, 2014.**

As of June 1, 2013, the Office of Research Compliance (ORC) started assign expiration dates to all IRB exempt protocols. The expiration date indicated above was based on the completion date you entered on the IRB application. If an extension is necessary, the PI should submit an Exempt Protocol Extension Request form, http://www.clemson.edu/research/compliance/irb/forms.html, at least three weeks before the expiration date. Please refer to our website for more information on the new procedures, http://www.clemson.edu/research/compliance/irb/guidance/reviewprocess.html.

No change in this approved research protocol can be initiated without the IRB's approval. This includes any proposed revisions or amendments to the protocol or consent form. Any unanticipated problems involving risk to subjects, any complications, and/or any adverse events must be reported to the Office of Research Compliance (ORC) immediately. All team members are required to review the "Responsibilities of Principal Investigators" and the "Responsibilities of Research Team Members" available at http://www.clemson.edu/research/compliance/irb/regulations.html.

The Clemson University IRB is committed to facilitating ethical research and protecting the rights of human subjects. Please contact us if you have any questions and use the IRB number and title in all communications regarding this study.

Good luck with your study.

All the best,

Nalinee
Nalinee D. Patin
IRB Coordinator
Clemson University
Office of Research Compliance
Institutional Review Board (IRB)
Voice: (864) 656-0636
Fax: (864) 656-4475
E-mail:npatin@clemson.edu
Web site:http://www.clemson.edu/research/compliance/irb/
IRB E-mail:irb@clemson.edu

Survey Introduction Letter

Information about Being in a Research Study

Clemson University

The Mediating Effect of Collectivist and Entity Contextual Characteristics on Creativity Among Faculty in Higher Education

Description of the Study and Your Part in It
Dr. Russ Marion, Leslie Gonzales and Anthony Olalere, are inviting you to take part in a research study. Dr. Marion is a faculty member at Clemson University. Mr. Olalere is a doctoral candidate in educational leadership at Clemson University, running this study with Dr. Marion and Dr. Gonzales as the chair and co-chair respectively of his dissertation committee. The purpose of this research is to examine the contextual characteristics that foster creativity among faculty members in higher education.

Your part in the study will be to complete a brief survey. It will take you about 15 minutes to be in this study.

Risks and Discomforts
We do not know of any risks or discomforts to you in this research study.

Possible Benefits
This research may help us to understand how we can better support faculty in their efforts to produce creative outputs.

Protection of Privacy and Confidentiality
We will do everything we can to protect your privacy and confidentiality. We will not tell anybody outside of the research team that you were in this study or what information we collected about you in particular. The survey is administered through the online program Qualtrics. Data will be destroyed after the research is concluded.

Choosing to Be in the Study
You do not have to be in this study. You may choose not to take part and you may choose to stop taking part at any time. You will not be punished in any way if you decide not to be in the study or to stop taking part in the study.

Contact Information
If you have any questions or concerns about this study or if any problems arise, please contact Dr. Russ Marion at Clemson University at Marion2@clemson.edu.If you have any questions or concerns about your rights in this research study, please contact the

Clemson University Office of Research Compliance (ORC) at 864-656-6460 or irb@clemson.edu.

SURVEY INTRUMENT

Survey for mediating effect of collectivist and entity contextual characterisitcs among faculty members in higher education

Indicate the degree to which you agree with each of the following statements:

1) I experience pressure in my job because my department is in a highly competitive field.
   (Circle a number 1-7, with 1 = low pressure and 7 = high pressure)

Little pressure from competition						High pressure from competition
1	2	3	4	5	6	7

2) I experience pressure in my job because the way my work is conducted or the field that I study changes often.

Little pressure from technology change						High pressure from technology change
1	2	3	4	5	6	7

3) There is a lot of pressure to learn in my job in order to keep up with changing knowledge.

Little pressure from changing knowledge						High pressure from changing knowledge
1	2	3	4	5	6	7

4) I feel that I can try new things at my work without fear of sanction if I fail.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

5) I have colleagues with whom I can share confidential information.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

6) My colleagues respect each other.

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

7) It is common for my colleagues and I to discuss job-related issues.

Strongly						Strongly

Disagree   Agree

1	2	3	4	5	6	7

8) It is easy for my colleagues and I to get together to talk.

Strongly Disagree   Strongly Agree

1	2	3	4	5	6	7

9) I must adjust decisions I make in my role to adapt to decisions that colleagues make in their roles.

Strongly Disagree   Strongly Agree

1	2	3	4	5	6	7

10) My work is compartmentalized and I don't need help from anyone else to get my work done.

Strongly Disagree   Strongly Agree

1	2	3	4	5	6	7

11) I feel that my colleagues and I can disagree with each other about policies, initiatives, etc. without the disagreement becoming personal.

Strongly Disagree   Strongly Agree

1	2	3	4	5	6	7

12) My colleagues and I have a friendly give and take relationship when we are working through differences of opinions.

Strongly Disagree   Strongly Agree

1	2	3	4	5	6	7

13) Divergent thinking is respected in my job.

Strongly Disagree   Strongly Agree

1	2	3	4	5	6	7

14) My work is dynamic and I and my colleagues frequently work through complex demands together.

Now we would like to capture what elements might possibly **inhibit** creativity in your research endeavors. Using a scale from 1 to 7 where 1 means "not at all inhibiting" and 7

means "strongly inhibiting," please rate the level each item has **inhibited** creativity in your research endeavors:

- Rules and regulations in place with respect to research ~~scope~~
- Narrow-mindedness of researchers
- Pressure to meet deadlines
- Inability to meet with collaborative group on a regular basis
- Lack of confidence in trying a new approach or new way of thinking
- Creative ideas generated prior have proven to be ineffective
- Lack of freedom to exercise creativity
- Lack of resources (financial or otherwise) to try new ideas
- In general, I must overcome barriers to be creative where I work.
  We would like to ask you about some items that might **stimulate** creativity in your research endeavors. Using a scale from 1 to 7 where 1 means "not at all stimulating" and 7 means "strongly stimulating," please rate the level each item has **stimulated** creativity in your research endeavors:

- Freedom to try new ideas/processes
- The rigor of the research
- The call for new ideas in field of research
- Inconclusive findings in field of research, suggesting a need for a new approach
- Access to sufficient financial support
- Access to the facilities needed to conduct research
- Access to other resources (software, books, etc.) necessary to conduct research
- Availability of data in field of research
- Confidence from department head/supervisor
- Confidence from other colleagues/research collaborators
- Encouragement from department head/supervisor to be creative in research
- Encouragement from colleagues/research collaborators to be creative in research
- Technical ability of team members
- Research endeavors are exciting
- Open-mindedness of colleagues/research collaborators
- Rapport with colleagues/research collaborators
- Rapport with department head/supervisor
- Willingness to learn through trial and error
- Sufficient time to complete research endeavors
- Freedom from distractions to focus on research endeavors

- I experience opportunity and support for being creative.
  Creativity

  The following scale evaluates the degree of creativity that was generated by your HEHD Innovation research. Please respond on a 7-point scale as indicated.

- To what degree are the research questions in your research different from anything other researches in your field?
- Some established journals tend only to accept articles whose methodology/premise is grounded in traditional practices (for example, statistical analyses might be preferred over qualitative analyses). Rate the likelihood that the methodology or premise in the articles you produce would be published in such traditionalist journals.
- To what degree is the methodology or premise for you publish so different that journal editors might have difficulty finding reviewers to knowledgeably evaluate your study?
- To what degree has the research you produce drawn attention from your peers or colleagues because of the uniqueness of the study?
- Rate the degree to which your research is creatve.
  Intrinsic Motivation

  Please indicate the degree to which you agree or disagree to each of the following.

- Research gives me please because it broadens my knowledge about subjects that appeal to me.
- I participate in collaborative research because I enjoyed the give-and –take of developing and studing ideas with other researchers.

- I do research to improve my competence as an instructor.
- I have high academic standards for myself.
- I like the intellectual challenge of creating new ideas.
- I have fun doing academic research with others.

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