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Community college faculty job satisfaction: A network approach

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COMMUNITY COLLEGE FACULTY JOB SATISFACTION: A NETWORK APPROACH

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ABSTRACT

This study addresses the question, "how do network dynamics and leadership behavior influence community college faculty job satisfaction?" Using ORA's dynamic network analysis (DNA) tools, this study investigates how network interactions relate to faculty job satisfaction, how beliefs about leader-member exchange (LMX) relationships relate to network interactions, and how beliefs about LMX relationships relate to job satisfaction. A faculty network is analyzed as a whole, then clusters are identified and analyzed using standard network measurements and a belief propagation algorithms.

Results indicate that job satisfaction and perceptions of relationship with leaders are co-created within networks. Cluster which have high network density (tightly coupled) and clusters which have low network density (loosely coupled) have lower co-created realities of job satisfaction and perceptions of quality of relationships with leaders than clusters with moderate network density (moderate coupling). Network theory asserts that networks which have moderate density also respond more adaptively to internal and external challenges, are more creative, and allow for more appropriate flow of information into and out of the network than those with low or high density. In other words, clusters with moderate density are not only adaptive systems, but also that members of moderately dense clusters have high levels of job satisfaction and perceive high quality relationships with leaders.

An additional finding is that larger, co-located clusters of agents are likely to have moderate network density. Agents within larger clusters are likely to have high job satisfaction and perceptions of high-quality relationships with leaders.

Furthermore, this study offers a new approach to studying job satisfaction though the use of in-depth analysis of the co-created network conditions under which satisfaction occurs. Changes in satisfaction are projected through modeling using a belief propagation algorithm.

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TABLE OF CONTENTS

Page

Table of Contents (Continued)

Page

LIST OF TABLES

List of Tables (Continued)

Table Page

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION TO THE PROBLEM

The short history of community colleges in the Unites States (US) reveals their responsiveness to environmental conditions (Diener, 1994). Since the technical, junior, and community college boom of the 1950's, colleges have met local needs by providing trained workers for industry and preparing students to be successful in four-year schools. Now community colleges face new challenges including increased competition for students from proprietary institutions, decreased funding from states, increased scrutiny from funding and accrediting bodies, decreased federal funding for student financial aid, and increased enrollment (Hagedorn, 2000; Tandberg, 2010). Clearly, community colleges have fewer resources and increasing demands.

Community college faculty (defined in this paper as a plural noun) work with college administrators and organizational leader to address current challenges. Despite obvious importance of the work of community colleges and the broader context of higher education, there is little research on community college faculty (Twombly & Townsend, 2008).

Purpose of the Study

The big picture issue of this study is *how do network dynamics and leadership behavior influence community college faculty job satisfaction?* This study will address the big picture through three lenses. One lens examines college faculty job satisfaction from a collectivist (network) perspective by addressing network interactions. The second

lens examines faculty job satisfaction from relational, complexity, and environmental perspectives. The third lens examines the role of leadership/member exchanges at the department and division levels of the community college in faculty job satisfaction. This study will address these issues using the process of dynamic network analysis (DNA).

Research Questions

In this exploratory study, the research questions are as follows:

1. How do network interactions relate to faculty job satisfaction?
2. How do beliefs about leader-member exchange (LMX) relationships relate to network interactions?
3. How do beliefs about LMX relationships relate to job satisfaction?

Theoretical Framework

This study pulls together multiple concepts to generate an understanding of community college faculty job satisfaction. They include complexity leadership theory as well as relational leadership, environmental conditions impacting satisfaction, and social network analysis. These concepts are filtered through the experience of community college faculty to result in a rich understanding of community college faculty job satisfaction. Figure 1.1 is a representation of the relationships among concepts addressed in the study.

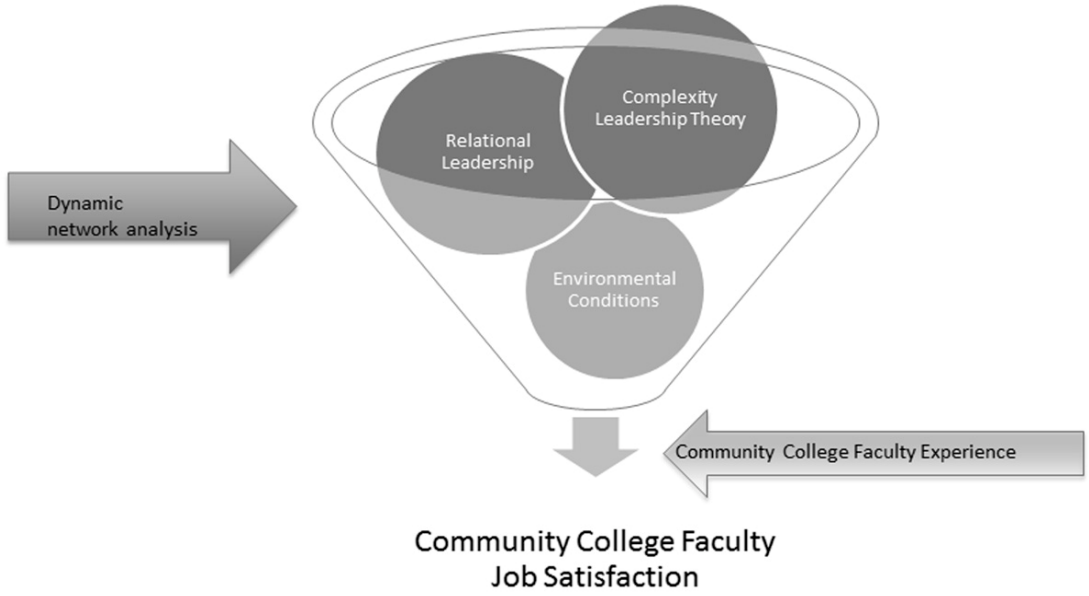


Figure 1.1

Conceptual Framework of the Study

Dynamic Network Analysis

Dynamic network analysis (DNA) offers a systematic approach to understanding the complex environments that influence community college job satisfaction. This study is based in DNA and the broader theoretical perspective of complexity leadership theory (CLT). DNA offers both a theoretical framework for studying networks and a methodology for studying networks (Schreiber & Carley, 2008). It is a computational organizational simulation that relies on network information (Meyer, Zaggl, & Carley, 2011). DNA has been used to study terrorist cells, drug trafficking, street gangs, disease transmission, belief propagation within organizations, and many other elaborate network interactions.

All organizations and institutions are made up of connections among individuals who are connected to locations, resources, and other entities (Carley, Diesner, Reminga, & Tsvetovat, 2007). These connections are called networks. Networks form as people and things move through time and space and develop relationships (Kilduff, Crossland, & Tsai, 2008). Networks are dynamic and they change over time. In DNA, people or things that make up networks are called nodes. Change always occurs in networks because time progresses and nodes change. Nodes can evolve naturally or can change due to intervention by an outside influence (Carley et al., 2007). The study of leadership within the DNA theoretical framework is complexity leadership theory (CLT) (Schreiber & Carley, 2008).

Complexity Leadership Theory

According to Marion (2008), "Complexity theory is the study of the dynamic behaviors of complexly interacting, interdependent, and adaptive agents under conditions of internal and external pressure" (p. 3). In other words, complexity theory studies the change that occurs when internal or external pressure is applied to a system made up of individuals who are interdependent with others within the system. When all of the individuals who make up the system continually change and adapt to new condition, the changes that occur are unpredictable as a result of the multitude of variables involved (Marion, 2008; Schneider & Somers, 2006; Uhl-Bien & Marion, 2009).

Organizations that are able to adapt and evolve as a result of internal and external pressures are called complex adaptive systems (CAS) (Schneider & Somers, 2006; Uhl-

Bien & Marion, 2009). One of the many characteristics of CASs is that the process of change can begin at any level of an organization (Marion, 2008). When individuals interact, they change, and as a result, the organization of which they are a part will change. Thus, individual change causes organizational change (Marion, 2008). Complexity leadership theory states organizational change does not only occur when designated leaders mandate change. Change happens all the time, without or despite the attempted influence of designated leaders.

Job Satisfaction and Relationships within Networks

Job satisfaction is, according to Spector (1997), how employees feel about aspects or factors of their jobs and how they feel about their jobs overall. Job satisfaction is the topic of thousands of studies and a subtopic of thousands of other studies (Spector, 1997). However, few studies address community college faculty job satisfaction (Hagedorn, 2000; Jackson, 2000).

Job satisfaction is important from an organizational perspective. First, employee job satisfaction is positively correlated with job performance (Spector, 1997). At this time, there is no consensus about whether employee job satisfaction leads to job performance or vice versa, but the correlation exists. Second, there is an empirical link between employee job satisfaction and behaviors that further organizational goals, such as job attendance, punctuality, being helpful to others, making creative suggestions that can improve organizational performance, and making appropriate use of work time

(Schnake, 1991). Indeed, from an organizational perspective, employee job satisfaction matters.

The environment within which an employee works influences job satisfaction. A significant contributor to the work environment is the employee's relationships with others, leaders with positional power and coworkers and those who take leadership roles (Cummings et al., 2008; Hagedorn, 2000; Spector, 1997).

Leader-Member Exchange Theory

Traditionally leadership has been seen as something that comes from the leader (Eddy & VanDerLinden, 2006). The role of leaders is, according to traditional leadership theories, to convince or cajole followers to adopt attitudes and engage in behaviors that are desirable to the organization (Marion, 2008). Early 20th century leadership research addressed leader traits and attributes, personal characteristics, leadership style, charisma, and the leader as a symbol of the values of the organization (Alvesson, 2003; Graen & Uhl-Bien, 1995; Uhl-Bien, Marion, & McKelvey, 2007). Today some researchers continue to study leadership as discrete, measurable traits or characteristics of a leader (Alvesson, 2003), while others perceive leadership as the result of relationships between leaders and followers (Graen & Uhl-Bien, 1995).

Graen & Uhl-Bien (1995) suggest leadership is not a "one size fits all" process. Leadership involves more than a leader engaging in specific behaviors that cause follower behaviors. Instead, leaders develop unique relationships with each follower, and leadership occurs within those relationships.

According to leader-member exchange theory (LMX), both leader and follower benefit from having a strong relationship (Graen & Uhl-Bien, 1995; Hunt & Dodge, 2001; Schyns & Day, 2010). Benefits include such things as trust, loyalty, better work assignments, and higher job satisfaction. Those benefits are not afforded to followers who do not have a strong relationship.

LMX changed the discussion of leadership from addressing leaders to addressing leadership as occurring within the relationship between a leader and a follower (Alvesson, 1996; Graen & Uhl-Bien, 1995; Liden & Maslyn, 1998; Osborn & Marion, 2009). Leadership rooted in relationships is further developed in relational leadership theory (RLT).

Relational Leadership Theory

RLT offers a leadership perspective based in the naturally occurring relationships among people within organizations. According to Uhl-Bien (2006), "this perspective does not restrict leadership to hierarchical positions or roles. Instead, it views leadership occurring in relational dynamics throughout the organization" (Graen, 2009, p. 655).

RLT is an interpersonal perspective of leadership that fosters greater understanding of leadership within organizations. RLT may be used to describe how the relationships between leaders and followers can impact employee commitment to the organization and feelings of empowerment, as well as benefit both people in the relationship (Graen & Uhl-Bien, 1995; Stringer, 2006). In this study, faculty will address perceptions of their relationships with their leaders.

Community Colleges

In the US, community colleges have a short history. The heyday of the establishment of public junior, community, and technical colleges was from the 1950s to the 1970s (Eddy & VanDerLinden, 2006). During this time, community college leaders had the need to differentiate from secondary schools and find a niche in the higher education arena. Community college leaders took on a "heroic leader" role as educational pioneers, developing and promoting their institutions (Eddy & VanDerLinden, 2006).

From the 1980s to 2000, colleges assumed a more bureaucratic, business model, incorporating strategic planning, accountability, and accreditation. Also during this time, competition increased as a result of an increase in federal financial assistance available to students attending private, for-profit two-year colleges (Provasnik, Planty, & National Center for Education, 2008). Community college leaders followed the national trend of the bureaucratic business model, and the community college bureaucracy became standard.

The Community College Today

Community colleges are now firmly established within the higher education realm. In the fall semester of 2006, "35% of all postsecondary students . . . were enrolled in community colleges across the country" (Provasnik et al., 2008, p. 2). In 2010, over 40% of postsecondary students attended two-year institutions (Dadashova, Hossler, & Shapiro, 2011). Although over a third of all students in undergraduate education attend community colleges, the community college is markedly different from other higher

education institutions. In the fall of 2006, more community colleges than public four-year institutions had a minority enrollment of greater than 50%, and while about 62% of community college students were enrolled part-time, only 27% of students at public four-year colleges and 25% of students at private four-year colleges were enrolled part-time. Also, most community colleges are open-door institutions, allowing all students, regardless of academic proficiency, to enroll. Compared with students in four-year colleges, community college students tend to be older and from lower-income families (Provasnik et al., 2008).

Community colleges differ from public and private four-year colleges in other ways as well. Community colleges tend to be smaller and distributed more evenly across rural and urban areas than four-year degree-granting institutions (Provasnik et al., 2008). Also, they cost significantly less per student. For example, in 2004-2005, community college instructional costs per full-time equivalent (FTE) student was $4,100, compared to $8,000 per FTE at public four-year colleges. Accordingly, the average tuition and fees for full-time, in-state, community college students is less than half that of students at four-year colleges.

Community colleges in general, and community college faculty specifically, differ from traditional colleges and universities. Their histories differ, and their leadership structures differ. They are located in different geographical areas from other colleges and universities. Their student populations differ by age, race. and enrollment status. Their funding sources differ. It stands to reason that the community college is a discrete type of institution and as such, requires specialized research.

Setting of the Study

This study takes place in a large community college in the southeastern US. Founded as a post-secondary technical school in the 1950s, it became a comprehensive community college in the 1960s. Now with multiple campuses and serving over 14,000 students, the college has become one of the five largest higher education institutions in its state.

One president led the college through most of its history. The current college president has served for less than five years and in that time implemented changes to the institution's organizational structure and called for a reexamination of the college's core mission.

The president has called for faculty and staff involvement in college initiatives far beyond that of previous administrations. To meet the dual challenges of increasing enrollment and decreasing funding, faculty are required to teach more classes per year. Faculty have greater responsibility in new student orientation and academic advising. Undoubtedly, the environment has changed for faculty at the community college.

Definition of Terms

- Agent: A person who is the object of study. In this study, agents are faculty members.
- Algorithm: "A finite list of well-defined instructions for accomplishing some task that, given an initial state, will terminate in a defined end-state" (Carley, Reminga, Storrick, & Columbus, 2011, p. 14).

- Belief Propagation algorithm: “Estimates belief propagation through social networks. This report contains the most common beliefs shared by most people, the most likely to change beliefs” (Carley et al., 2011, p. 606).
- Communication speed: “The average speed with which any two nodes can interact. This is based on the inverse of the shortest path lengths between node pairs” and can range from 0 (no communication) to 1 (fastest possible communication) (Carley et al., 2011, p. 425).
- Entity: “A who, what, where, how, why, or thing that is being studied such as people, agents, organizations, beliefs, expertise, resources, tasks, events, or locations. Node the representation of a single entity (a who, what, where, how why item)” (Carley et al., 2011, p. 19).
- Entity class: “A set of entities of one type” (Carley et al., 2011, p. 19).
- Faculty: College teaching staff, used in this document as a singular noun instead of “faculty member,” and as a plural noun referring to multiple faculty members.
- Faculty job satisfaction: The feeling of enjoyment or gratification faculty members have regarding their jobs.
- Key Entities report: In ORA, it “identifies Key Entities and groups who by virtue of their position in the network are critical to its operation” (Carley et al., 2011, p. 614).

- Leadership dynamics: Leadership behaviors exhibited by any person within a complex organization that furthers the knowledge or goals of the organization.
- Link: “The representation of the tie, connection, relation, edge between two nodes” (Carley et al., 2011, p. 21).
- Meta-Network: “The representation of a group of networks” (Carley et al., 2011, p. 22)
- Multimode Network: “Where the entities are in two or more entity classes” (Carley et al., 2011, p. 22).
- Network: “The representation of a set of nodes (including meta-nodes) of one type and the links (including meta-links) of one type between them” (Carley et al., 2011, p. 23).
- Network density: “Density compares existing links to all possible links in the employee communication network. It reflects the social level of organizational cohesion. This measure must be interpreted in relation to the size of the group and the type of work performed” (Carley et al., 2011, p. 465). Density ranges from 0 (no links) to 1 (totally linked).
- Network interactions: Communication or interfacing among agents in networks.
- Newman’s Grouping algorithm: Algorithm used by ORA “to find clusters in an network” (Carley et al., 2011, p. 273).

- Node: “A representation of a real-world entity (a who, what, where, how, why item)” (Carley et al., 2011, p. 23).
- Node class: “A set of nodes of one type. Note a set of nodes of one type can be represented as a meta-node” (Carley et al., 2011, p. 23).
- ORA: Organizational Risk Analyzer computer software program, designed by K. Carley at Carnegie Mellon University. ORA “is a network analysis tool that detects risks or vulnerabilities of an organizations’ design structure” by analyzing relationships among an people, tasks, resources, knowledge, and other categories of information (Carley et al., 2011, p. ii).
- Relation: “The way in which entities in one class relate to entities in another class” (Carley et al., 2011, p. 25).
- Social network: “The network of people to people, organizations to organizations mapping who knows, works with, communicates with whom” (Carley, 2009c).
- Social network analysis: “The process of analyzing a social network and identifying key actors, groups, vulnerabilities and redundancies, and changes in these” (Carley, 2009c).

Delimitations of the Study

Because the purpose of the study is to develop a rich understanding of faculty network interactions, the study sample is limited to the faculty of one division of a large southeastern community college. Studying multiple divisions or multiple colleges is

impractical due to time and resource constraints. All full-time faculty members of the division, including those who also carry administrative duties, were invited to participate in the study.

Significance of the Study

This study will add to the body of knowledge by addressing several topics upon which there is little research and about which there is little understanding: job satisfaction of community college faculty, the role of complex network interactions in faculty job satisfaction, and leadership dynamics within networks of faculty. Community college leaders will benefit from understanding how relationships among faculty function as a contributor to faculty satisfaction.

Furthermore, by using the tool of DNA, this study will offer a perspective of how faculty networks can evolve over time. This will allow community college leaders the ability to anticipate possible outcomes of changes in job satisfaction resulting from changes within faculty interaction networks, changes in leadership, or changes in shared beliefs.

On a larger scale, this study offers a unique approach to studying job satisfaction. Job satisfaction research has been criticized because of lack of adequate in-depth interpretation of outcomes (Christiansen, 2011b). Instead of using job satisfaction research as a tool for understanding the *processes* of satisfaction, it is typically used as a "report card" for the organization, a presentation of means and relationships among means with little discussion of the social mechanisms that underlie these outcomes. This

study addresses network processes that influence satisfaction, this it offers a deeper, richer approach to the understanding of this important dynamic.

Organization of the Study

Chapter One offers an introduction to the concepts of faculty job satisfaction, relational leadership theory, and complexity theory. Also, the community college is described as differing from other higher education institutions. Furthermore, the research questions, delimitations, and significance of the study are addressed.

Chapter Two is a review of literature about the concepts in this study, including job satisfaction, community college faculty job satisfaction in the community college, and a conceptual framework for understanding faculty job satisfaction. Next are descriptions of complexity theory, complex adaptive systems (CASs), and relational leadership theory (RLT). DNA is described, followed by a discussion of how DNA is used in this study.

Chapter Three is a discussion of the study's research method, location, participants, instruments and analysis process. Chapter Four is a description of the networks, review of the research questions, and description of outcomes for analysis addressing each question. Chapter Five is a discussion of the results, conclusion, and suggestions for future research.

CHAPTER TWO

REVIEW OF LITERATURE

In this chapter, I will introduce the reader to the study of job satisfaction. I will then focus on community college faculty job satisfaction. A review of the job satisfaction literature will offer a description of the organizational benefits that result from faculty job satisfaction, as well as consequences of faculty job dissatisfaction.

Next, I will describe complexity leadership theory (CLT). CLT, a relative newcomer to leadership science, offers a big-picture, systems perspective to post-industrial organizational behavior. CLT offers a framework for describing, explaining, and predicting organizational behavior in the information age (Schreiber & Carley, 2008).

Moving from an organizational perspective to an interpersonal perspective, I will address relational leadership theory (RLT). I will then clarify the relationship between faculty job satisfaction and relational leadership. Specific concepts of interest include the role of interpersonal relationships on employee attitudes and behaviors within the workplace, the relationships within work groups, and the special relationship between the leader and follower.

I will conclude this chapter with a description of Dynamic Network Analysis (DNA), the approach I will use to study faculty satisfaction. DNA is a method of viewing and analyzing networks and understanding information flow through complex networks (Schreiber & Carley, 2008).

Introduction to Job Satisfaction

Job satisfaction is an employee's satisfaction or contentment with a job (Spector, 1997). Job satisfaction can be a nebulous concept because, like any complex human cognitive or emotional state, "no appropriate metric capable of precisely categorizing or gauging levels of job satisfaction exists" (Hagedorn, 2000, p. 9). Despite the impossibility of precisely measuring job satisfaction, it has been the topic of research for half a century, and many job satisfaction instruments have been developed (van Saane, Sluiter, Verbeek, & Frings-Dresen, 2003).

Hagedorn (2000) stated there is a correlation between job satisfaction and job performance. A very satisfied employee has job appreciation. A very dissatisfied employee has job disengagement. An employee who has mediocre job satisfaction has job tolerance or acceptance.

Employees who are satisfied with their jobs behave in ways that are desired by employers (Hagedorn, 2000). An employee who has high job satisfaction may have appreciation for the job and pride in the employing organization. Such an employee is likely to have high productivity and be very engaged at work, although it is not clear if satisfaction influences work performance or if work performance influences satisfaction (Spector, 1997).

Satisfied employees are likely to engage in what Schnake (1991) refers to as Organizational Citizenship Behavior (OSB), which is behavior by the employee that benefits the organization but is not required as part of the employee's job. OSB can include arriving at work on time, using work time efficiently, assisting others, and

offering suggestions. These behaviors are also correlated with satisfaction with the work supervisor.

At the opposite end of the continuum from appreciation is disengagement. An employee who feels low job satisfaction disengages from work responsibilities, shows little excitement or initiative, and is not invested in the success of the employing organization (Hagedorn, 2000). When people do not like their jobs, they may avoid them. Job avoidance can take the forms of absenteeism and job turnover (Spector, 1997). Job absenteeism is negatively correlated with job satisfaction. Logically, when people are not happy, they may not go to work. Absenteeism can be costly to employers because when people are not at work, they are not producing goods or services. Job turnover can also be costly to employers because of the lost production time while a new employee is identified, hired, and trained. When organizations attend to job satisfaction, they may, therefore, reduce staff shortages and conserve resources (van Saane et al., 2003).

Another behavior negatively correlated to job satisfaction is burnout (Lee & Ashforth, 1993). Burnout can be described as an emotional response to a job wherein the person experiencing burnout has "symptoms of emotional exhaustion and low work motivation, not unlike depression" (Spector, 1997, p. 65). Employees who are dissatisfied are more likely to report that they are burned out. Lee and Ashforth (1993) theorized that employees experiencing emotional exhaustion, feeling tired and unmotivated, are likely to be dissatisfied with their jobs.

Components of Job Satisfaction

There is no consensus about which factors contribute to job satisfaction or how the factors contribute to job satisfaction. Qualitative and quantitative research methods have been used to classify and categorize components of job satisfaction (Hagedorn, 2000; Iiacqua & Schumacher, 1995; Marston & Brunetti, 2009). Perhaps the most influential model is one of the oldest, Motivation-Hygiene Theory (Herzberg, Mausner, & Snyderman, 1959; Ssesanga & Garrett, 2005). In the Motivation-Hygiene Theory, also called the two-factor theory of job attitudes, or the job satisfier-dissatisfier theory, Herzberg (1974) suggested that the components of job satisfaction are distinct from the components of job dissatisfaction.

Another theory addressing how job characteristics impact satisfaction is Hackman and Oldham's job characteristics theory (Spector, 1997). They identified five job characteristics "which, when present, improve employee work satisfaction and motivation" (Oldham, Hackman, & Pearce, 1976, p. 396). The characteristics are skill variety, task identity, task significance, autonomy, and feedback. The five characteristics are combined to result in one score: the Motivating Potential Score (MPS) that reflects the likelihood of the job enriching or providing a worker with internal motivation to a worker.

Hackman and Oldham later stated that not all employees have the same needs or motivators. They included the employee's knowledge, skill, and the growth need strength (GNS), a description of the employee's need for increasing challenge, in the revision of the MPS called the Job Diagnostic Survey (JDS) (Hackman, 1980; Hackman & Oldham,

1975; Spector, 1997). Employees who have high GNS and are satisfied with the environmental conditions of their employment (e.g., job security, pay, interaction with coworkers and supervisors, the work environment) feel enriched, however, through skill variety, task identity, task significance, autonomy, and feedback (Oldham et al., 1976).

The job satisfaction assessment used in this study is a modification of a portion of the Job Satisfaction Survey (JSS) (Spector, 1997). It contains 36 items and has nine sub-scales: pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, coworkers, nature of work, and communication. In their study of 27 job satisfaction instruments, van Saane, Sluiter, Verbeek, and Frings-Dresen (2003) found JSS to be reliable and have content validity. Further, they found each of the subscales to have content validity.

Each JSS item is a statement (Spector, 1997). Respondents use a six-point Likert-type scale to rate the degree to which they agree with the statement. The overall job satisfaction score is computed by adding the scores together, reversing some scores because of the negative wording of the statement. The supervision and coworker subscales will be used in this study.

College and University Faculty Job Satisfaction

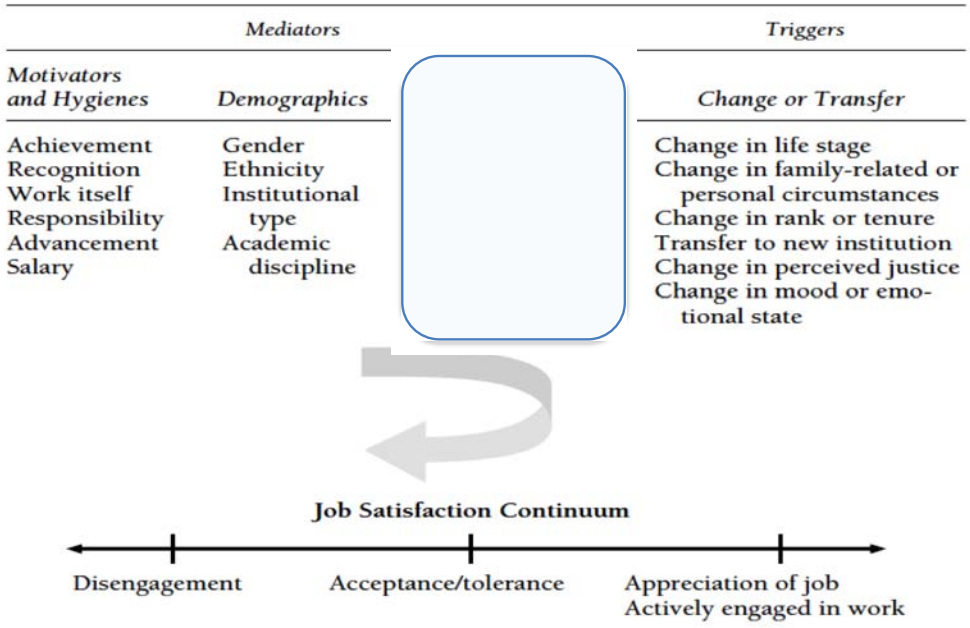
Just as industry leaders desire to understand worker job satisfaction, leaders in higher education can benefit from understanding faculty job satisfaction. The output, or product, of higher education is the development and dissemination of knowledge (Truell, Price, & Joyner, 1998). Faculty who have high job satisfaction "will generally be

innovative and motivated to establish and maintain an environment conducive to learning" (p. 12)

Faculty job satisfaction is studied for several reasons. First, it is important to know why faculty stay in the profession (Marston & Brunetti, 2009). Second, "such information could help trustees and administrators—and professors themselves—increase faculty satisfaction and effectiveness, with positive outcomes for the education of students" (Marston & Brunetti, 2009, p. 232). Third, having knowledge of faculty job satisfaction is important because with that knowledge, universities can better prepare future faculty for the realities of being a professor. Furthermore, institutions hiring potential faculty can provide applicants with a more realistic picture of what it is like to be a college faculty member.

Conceptual Framework of Faculty Job Satisfaction

Hagedorn (2000) synthesized leading theories and measures of employee job satisfaction with research on college faculty satisfaction in the model she calls the Conceptual Framework of Faculty Job Satisfaction (CFFJS). Drawing heavily from Herzberg et al. (1959), Hagedorn stated faculty job satisfaction results from the interaction of two types of constructs: triggers and mediators (see Figure 2.1). Permission to use the figure is found as Appendix A.



Hagedorn, L. S. (2000). Conceptualizing Faculty Job Satisfaction: Components, Theories, and Outcomes. [Article]. *New Directions for Institutional Research, 2000*(105), 5.

Figure 2.1

Hagedorn's Conceptual Framework of Job Satisfaction

Trigger is another term for life stressors, developmental or situational crises that can impact a person's functioning or perspective (Hagedorn, 2000). Triggers can be events such as "changes in life stage, change in family related or personal circumstances, change in rank or tenure, transfer to a new institution, change in perceived justice, and change in mood or emotional state" (Hagedorn, 2000, p.8).

The second construct is the mediator. A mediator is "a variable or situation that influences (moderates) the relationships between other variables or situations producing an interaction effect" (Hagedorn, 2000, p. 6). Mediators are conditions, factors, or states

of being that do not in themselves cause job satisfaction or dissatisfaction. Mediators become issues when they interact with triggers. The interaction of mediators and triggers can influence job satisfaction or dissatisfaction. Hagedorn described three categories of mediators: 1) motivators and hygienes, 2) demographics, and 3) environmental conditions. I will briefly describe each of the mediators and describe how this study focuses on the third meditator, environmental conditions.

The first mediator is motivators and hygienes (Hagedorn, 2000), concepts derived from the research of Herzberg, Mausner, Peterson, and Capwell (1957). Herzberg et al. suggested job satisfaction and job dissatisfaction could coexist. Job satisfaction is the result of factors called motivators, which are related to the job itself. Those factors are, in order of the frequency of response, as follows: achievement, recognition for achievement, the work itself, responsibility, advancement, and growth (Herzberg, 1974b). Job dissatisfaction is caused by completely different factors called hygienes. They relate not to the work, but to the job. The job dissatisfiers are company policy and administration, supervision, interpersonal relations, working conditions, salary, status and security. When employers can maximize the motivators (job satisfiers) while minimizing the hygiene factors (job dissatisfiers), workers are likely to be happy (Herzberg, 1965, 1974a, 1974b; Truell et al., 1998). In other words, "when a worker feels a high level of achievement, is intensely involved, and is appropriately compensated by recognition, responsibility, and salary, job satisfaction is enhanced and job dissatisfaction is decreased" (Hagedorn, 2000, p. 8).

The second mediator is demographics, both demographics of the individual faculty member and the demographics of the institution (Hagedorn, 2000). Demographic factors are static, unlike other mediators that might change across a professional's life or career. Individual demographic mediators are ethnicity, gender, age, and academic discipline type, and the institutional demographic mediator is the institutional type.

The third mediator is environmental conditions (Hagedorn, 2000). Environmental conditions include institutional climate or culture and interpersonal relationships within the college, such as relationships with supervisors, students and colleagues. Workers who have high-quality working relationships and high-quality working conditions are likely to report high levels of job satisfaction, while workers who have high-quality working relationships and low-quality working conditions are likely to report low job satisfaction.

It is beyond the scope of this study to explore all triggers and mediators that interact to result in faculty job satisfaction. Instead, this study will explore the networks within which faculty work and characteristics of relationships between faculty member and their leaders. This is a collectivist, rather than entity-based, approach to viewing job satisfaction. In other words, in this study, individual factors contributing to job satisfaction will not be addressed.

Previous Studies of Faculty Job Satisfaction

A 1999 United States Department of Education (USDOE) survey of college and university part- and full-time faculty stated 84.6% of faculty report overall job satisfaction (Clery & National Education Association, 2002). Forty-five percent of

faculty from two-year public institutions reported being "very satisfied" overall, much higher than the average 33% "very satisfied" rating offered by faculty at public doctoral granting, public four-year and private institutions. Job factors addressed in the study were the following: advancement opportunity, authority to decide course content, authority to decide courses taught, authority to make other job decisions, benefits, effectiveness of faculty leadership, freedom to do outside consulting, the job overall, job security, quality of facilities/resources overall, quality of graduate and undergraduate students, salary, spouse employment opportunity, time available for class preparation, time available to advise students, time to keep current in the field, and workload.

It is noteworthy that the topics addressed in the USDOE study are quantifiable, and the study failed to address complex interpersonal or environmental factors. Other than a single question addressing the effectiveness of faculty leadership, issues of leadership were not addressed. Also absent were issues that related to other relational factors, such as relationships with coworkers or relationships with students. The USDOE study implies each faculty member works in isolation and, job satisfaction due to individual, not collectivist, factors. A more comprehensive study would have addressed complex network interaction influences on faculty satisfaction.

Current Environmental Conditions Affecting Community College Faculty Job Satisfaction

In the dozen years since the USDOE study, the United States social and economic environment has changed, resulting in changes in community colleges (Dadashova et al., 2011). Community college funding has decreased while enrollment has increased

(Alexander, Harnisch, Hurley, & Moran, 2010; Dadashova et al., 2011; Tandberg, 2010; Taylor, Fry, Wang, Dockterman, & Velasco, 2009). Also, community colleges are increasingly challenged to show their effectiveness (Alexander et al., 2010; Truell et al., 1998). Furthermore, technological advancements have changed the way faculty teach and how students learn (Tandberg, 2010; Truell et al., 1998). Indeed, the landscape for community college faculty has changed since the 1999 USDOE study, resulting in increased stress for community college faculty.

Nationwide, the budget crisis of 2008 has resulted in decreased federal and state funding for higher education (Alexander et al., 2010; Dadashova et al., 2011; Tandberg, 2010). States have decreased their funding for higher education, forcing the burden of tuition on students and their families (Alexander et al., 2010). Students are coping with the decrease in tuition assistance by seeking more federal student aid and by attending lower-cost colleges (Alexander et al., 2010; Dadashova et al., 2011; Taylor et al., 2009; Truell et al., 1998).

The budget crisis and recession have severely affected the traditional college age student (Taylor et al., 2009). The unemployment rate for traditional college-age students in September 2009 was 53.9%, the highest rate ever recorded. Somewhat counter-intuitively, when unemployment increases, so does college enrollment (Dadashova et al., 2011). In difficult economic environments, people who might otherwise be in the workforce consider the option of higher education.

Further, students who might otherwise consider attending more expensive colleges attended community colleges because they are more affordable. (Dadashova et

al., 2011; Taylor et al., 2009). The cost of attending a community college is approximately half the cost of attending a four-year institution (Provasnik et al., 2008).

An outcome of the increase in community college enrollment is an increase in work load for community college faculty (Twombly & Townsend, 2008). Increased work may correspond with decreased satisfaction.

Another pressure on faculty is an increased expectation of participation in institutional assessment. Funding sources and accrediting bodies have higher expectations of accountability and continuous institutional improvement than ever before (Alexander et al., 2010; Truell et al., 1998).

Furthermore, advances in technology have made necessary rapid institutional change. Faculty are expected to use computer technology, including the Internet, online course delivery systems, institution-specific information systems, email, and classroom technology such as Smart Boards and i>clickers. Students expect their colleges to provide access to institutional information and, course materials via the Internet at all times (Tandberg, 2010; Truell et al., 1998). Students also expect faculty to be available day or night. Faculty may experience stress due to the need to learn and use new technology.

In summary, community college faculty experience stress due to decreased college funding, increased workloads and accountability, and new technology. Job-related stress is negatively correlated with job satisfaction, and environmental conditions are such that faculty may report low job satisfaction (Hagedorn, 2000; Trower, 2010). However, high-quality relationships with coworkers and supervisors and strong networks may mediate the stress caused by environmental conditions.

Complexity Leadership Theory

Complexity leadership theory (CLT), a modern leadership theory, is rooted in complexity theory (CT). CT is an organizational theory that perceives organizations as being composed of dynamic systems that evolve and change due to external pressures (Goldstein, 2008; Marion, 2008). Systems are composed of agents who are part of multiple, overlapping systems. Furthermore, systems "are empty abstractions apart from the several elements of which they are composed" (Emirbayer, 1997).

The scientific method, the template for science and social science experiments for the last two centuries, suggests that if a researcher could control and manipulate all variables, he or she could identity a cause and effect relationship among all the variables (Marion & Uhl-Bien, 2001). If organizations behaved in a linear manner, there would be a linear, predictable, verifiable relationship between or among organizational agents and items. Much of the study of leadership behavior has come from the social sciences, academic arenas embracing the "cause and effect" empirical research process involving isolating and manipulating variables. CT proposes that the behavior of systems is not quite so predictable: systems behave in non-linear fashions (Goldstein, 2008; Marion & Uhl-Bien, 2001; Uhl-Bien et al., 2007)

Organizations are usually perceived as bureaucracies that use top-down methods for disseminating knowledge (Marion & Uhl-Bien, 2007; Uhl-Bien et al., 2007), yet the environment within which modern business, industry, and educational institutions exist differs dramatically from that of even two decades ago. We have moved from an Industrial Era to a Knowledge Era (Uhl-Bien et al., 2007). In this knowledge-based

environment, the product created is often not a tangible item like a light bulb or an automobile tire but instead knowledge, ideas, and innovations. The top-down bureaucratic model may be effective for organizing workers on a factory production floor, where each employee has a discrete task to complete as a part of the manufacturing process. In such settings, leaders train workers to complete their tasks and the effectiveness of the work done is easily assessed: either the product was made correctly or not.

The top-down bureaucratic model does not work as effectively when the organization's product is knowledge (Goldstein, 2008; Uhl-Bien et al., 2007). An example of a knowledge-producing organization is a college. In a college, faculty and staff have immediate access to billions of bits of information, accessed via the Internet and gathered from interaction with others. The work done by faculty and staff is informed by this knowledge. There is no single "right way" to teach a class. There is no single "right way" to have a department meeting. Therefore, the assumption that a top-down model of information flow could be effective for a college (or other knowledge-based organization) is faulty.

Complex Adaptive Systems

Knowledge-based organizations that behave following the principles of complexity can be called complex adaptive systems (CAS) (Uhl-Bien et al., 2007). Complex systems have characteristics that differ from traditional systems in that they "involve interacting units, they are dynamic (complexity is the study of changing

behaviors), and they are adaptive" (Marion, 2008, p. 5). Complexity is an ideal, and studies of real-world organizations reveal the challenges of transitioning from a bureaucratic model to a complex model (Elsner, Hocker, & Schwardt, 2010).

The interaction of agents is the core of complexity (Marion, 2008). Some agent interactions are prescribed within the units of the organization structure. An example of this type of interaction is the communication at academic department meeting. In this example, agents interact within the structure of the formal unit, the academic department. In addition, units of agents develop spontaneously around a common belief or interest, or to accomplish a specific task. For example, faculty may gather as a book club, or may form a team to play trivia at a bar. The book club and trivia team are not units within the formal structure of the organization, but they are informal units. When agents interact within units and when units interact, all agents involved are changed in the process. Evolution and change resulting from interactions is beneficial to the CAS.

The second component of a CAS is that the system is dynamic; it changes over time (Marion, 2008). Changes occur as agents interact. Small changes can occur within the framework of the organization, but the organization as a whole does not become unrecognizable. The system remains intact yet changed.

The third component of a CAS is adaptability (Marion, 2008). Adaptation is making "strategic changes that adjust to individual or systemic responses to pressures" (p. 6), not unlike the biological adaptation of evolution. Organizational adaptation is essential for the organization's survival.

Leadership in Complex Adaptive Systems

CLT rejects the idea that organizational behavior is reliant on the personality, specific behaviors, or traits of individuals in authority (McKelvey, 2008; Plowman & Duchon, 2008). Followers do not automatically and blindly follow the decisions made by leaders. Instead, members of organizations are agents capable of making decisions, and those decisions impact the multiple dynamic systems of which they are a part. Within organizations, agents create their own order by self-organizing (Plowman et al., 2007).

Plowman and Duchon (2008) offered an overview of four myths relating to traditional views of organizational leadership. They then reframed the myths within the context of CLT.

The first myth was "leaders are the visionaries in organizations; they alone are responsible for seeing the future of the organization and are responsible for charting the destination and guiding others toward that future" (Plowman & Duchon, 2008). This myth reflected the perception that leaders can be classified as heroic, charismatic, visionary, transactional, transformative, mythic, and so forth, based on the role the leader plays within the organization (McKelvey, 2008; Plowman & Duchon, 2008).

The CLT response to Myth # 1, which Plowman and Duchon (2008) referred to as "New Reality #1," is "Leaders provide linkages to emergent structures by enhancing connections among organizational members" (p. 138). In other words, instead of a heroic leader controlling how an organization moves toward a goal, leaders enable formal and informal, planned and emergent processes to move the organization toward the goal.

CLT suggests that organizations are influenced by the structure, boundaries, and order imposed by the leader, which impact how the organization interacts with outside and inside forces, and organizations are also influenced by spontaneous, unplanned and uncontrolled forces (Marion, 2008). Rather than trying to control informational flow, organizations can use the creativity and information flow of the natural networks to move the organization toward its goals (Plowman & Duchon, 2008).

The second of Plowman and Duchon's myths of leadership is "Leaders direct change" (2008, p. 139). Complexity theory suggests it is fallacious for leaders or managers to think they are in control of their organizations and can implement changes. Inherent in complexity theory is the unpredictability resulting from the interactions of multiple factors and agents which compose organizations.

Plowman and Duchon's second New Reality was, "Leaders try to make sense of patterns in small changes" (2008, p. 141). The change can be the introduction of a piece of new software to a network, the loss of an employee, or even an increase of the cost of coffee in a break room. That change is interpreted and discussed, affecting the thoughts and feelings of organizational members. Those thoughts and feelings are transferred through networks and can impact the quality or quantity of work produced. Thus, an effective leader in a complex system observes and tries to understand how even small changes can result in systemic outcomes.

The third myth was "Leaders Eliminate Disorder and the Gap Between Intentions and Reality" (Plowman & Duchon, 2008, p. 141). Traditional management theories suggested that the leader's role is to create a balanced, stable, harmonious, tension-free

work environment. A good organization is one which is securely under the control of the leader. When there is an environmental threat or change, the leader makes decisions which result in organizational behavior that allows for restoring balance, harmony, and stability. The leader controls the correction of the problem.

New Reality #3 is "Leaders are destabilizers who encourage disequilibrium and disrupt existing patterns of behavior" (Plowman & Duchon, 2008, p. 142). CLT asserts that an organization that has equilibrium is one that is not changing or evolving, not responding to new information or knowledge. It is stuck. If the goal of a knowledge-based organization is the production of new knowledge, an organization in equilibrium is not producing new knowledge and has no value. It follows that leaders in complex organizations encourage interaction and innovation, allow for risk-taking, and inspire "what-if" thinking. It is only through constant change and adaptation and more change that knowledge is generated.

The fourth myth is, "Leaders Influence Others to Enact Desired Futures" (Plowman & Duchon, 2008, p. 143). Traditional leadership theories offered a cause-and-effect approach to leadership. They were formulaic. For example, if a leader perceives X condition, he or she should use Y approach to yield outcome Z. Leaders could use their power to communicate their vision and expectations to influence the setting of long- and short-term goals, and planning and assessment, and to control other organizational functions.

New Reality #4 is, "Leaders encourage processes that enable emergent order" (Plowman & Duchon, 2008, p. 143). Although each small change can result in large,

unpredictable outcomes, the role of a leader in a complex organization is to create environments and structural frameworks that encourage information flow and problem-solving. The authors stated, "when leaders focus on clarifying processes rather than clarifying outcomes, organizations function better" (Plowman & Duchon, 2008, p. 143).

Leadership Functions in Complex Adaptive Systems

In CLT, leadership is not limited to the administrator, supervisor, or designated leader. Instead, the function of leadership is to offer the structure to allow the complex adaptive system to work. CLT offers that there are three leadership functions leaders can use to reach organizational goals of adaptive, enabling, and administrative leadership (Uhl-Bien et al., 2007).

When structures, which may be networks or organizations, respond to change or threats, they show adaptive leadership (Schreiber & Carley, 2008; Uhl-Bien & Marion, 2009; Uhl-Bien et al., 2007). Adaptive leadership draws on the collective intelligence of the organization by encouraging the evolution of naturally occurring networks to develop human and social capital (Schreiber & Carley, 2006). Networks can be made up of people at any level within an organization, from a board of directors to a team of groundskeepers, or can be composed of people from across an organization. Networks can be planned, intentional structures, such as academic departments or naturally occurring social networks, such as a group of friends who get together for lunch.

Adaptive leadership involves encouraging interaction among agents and stimulating creativity (Schreiber & Carley, 2006). When organizations respond to

environmental threats or changes, they adapt or show adaptive leadership. Although adaptive leadership is not leadership by traditional bureaucratic leadership standards, within the context of complex organizations, the real leadership, the creative generation of ideas and the true origin of change within organizations, results from the adaptive leadership of groups (Schreiber & Carley, 2008; Uhl-Bien & Marion, 2009).

Administrative leadership is what is normally thought of as leadership within an organization. Administrative leadership involves the formal structure of an organization and ensures that the work of the organization is done with efficiency and effectiveness (Schreiber & Carley, 2008; Uhl-Bien & Marion, 2009; Uhl-Bien et al., 2007). Administrative leadership tasks include activities such as organizing workflow, developing budgets, assigning schedules, and communicating organizational vision, purpose, and goals. These are the top-down, bureaucratic tasks necessary for the system to exist. Administrative leadership is the work of those in positions of authority, those who can make decisions for the organization. In a complex organization, the top-down administrative function must be supported with the creativity of adaptive leadership.

The third function of leadership, enabling leadership, is of interest in this study. Enabling leadership balances the creativity of adaptive leadership with the bureaucratic tasks of administrative leadership (Schreiber & Carley, 2008; Uhl-Bien & Marion, 2009; Uhl-Bien et al., 2007). An enabling leader creates an environment for networks to communicate, adapting to threats and change, while maintaining the structure and function of the bureaucratic system. In other words, enabling leadership removes the bureaucratic hindrances to the emergence of creativity, innovation, and change, then

assures those adaptations become institutionalized, becoming part of the formal structure of the organization.

Summary of Complexity Leadership Theory

CT is a systems approach, and CLT is a description of leadership within CASs. CT proposes that organizations are made up of agents who relate to one another, ideas, resources, threats, change, and so forth, in unpredictable ways. Relationships between and among people are dynamic; each individual is changed while, and as a result of, interacting with others.

CLT states that leadership is not something a leader does. Instead, leadership is an influential process that happens within relationships (Uhl-Bien, 2006). Leadership spontaneously results from the interaction of agents (Lichtenstein et al., 2006). Leadership happens on every level of an organization, in formal and informal groups, and happens both within and outside of the hierarchical, bureaucratic structure.

Relational Leadership

Historically, leadership research involved identifying how leaders can best control others for the efficient production of goods (Graen & Uhl-Bien, 1995; Marion, 2008; Marion & Uhl-Bien, 2001; Schreiber & Carley, 2006). Leadership was perceived as something which occurred from the top down; leaders lead and followers followed. In contrast, relational leadership theory (RLT) is a developing leadership theory, which states leadership results from the relationships between and among agents (Uhl-Bien,

2006). Named "relationship theory" by Graen and Uhl-Bien (1995), RLT has its roots in both CLT, which was previously discussed, and the leader-member exchange theory (LMX).

LMX

LMX evolved from the vertical dyad linkage theory (VDL) (Graen & Uhl-Bien, 1995; Markham, 2010). First introduced in 1975, VDL suggested that the quality and type of relationship between the leader and follower, the vertical dyad, influenced followership behavior. VDL suggested that leaders developed closer relationships with some followers than with others, and leaders offered preferential treatment to followers with whom they had closer relationships (Brower, Schoorman, & Hwee Hoon, 2000; Graen & Uhl-Bien, 1995). VDL stated that followers were either favored by the leader, part of the "in group," or not favored, part of the "out group." Over time, VDL studies expanded beyond the in-group, out-group concepts, and the theory was renamed the leader-member exchange theory (LMX).

LMX is one of the most studied leadership concepts (Stringer, 2006). Central to LMX research is the dyadic relationship between a leader and a follower (Brower et al., 2000; Graen & Uhl-Bien, 1995; Markham, 2010; Stringer, 2006). Researchers have explored many characteristics of the leader-follower dyad, including how the relationships develop, characteristics of effective relationships, trust, the effect of how others perceive the relationships, and costs and benefits of differing qualities of

relationships between leaders and followers. This discussion of LMX will focus on how LMX has been applied to job satisfaction.

LMX suggests leaders and group members all benefit from high-quality relationships. From a leadership perspective, it behooves those holding formal leadership positions to develop, or attempt to develop, high-quality dyadic relationships with all followers, ensuring optimal benefits for those in the relationships and to the organization as a whole (Graen & Uhl-Bien, 1995). A meta-analysis of LMX studies revealed that high quality relationships between employees and leaders are positively related to high work performance and attitude (Gerstner & Day, 1997). Employees who report high LMX are likely to report higher role clarity, exhibit higher job performance, have lower job turnover, and report higher job satisfaction (Bolino & Turnley, 2009; Graen & Uhl-Bien, 1995). A strong relationship is also linked to employee vigor or enthusiastic job performance (Carmeli, Ben-Hador, Waldman, & Rupp, 2009), trust, and risk-taking (Brower et al., 2000).

While much LMX research has been focused solely on the dyadic relationship between the leader and follower, other addresses dynamic, complex relationships which exist in work groups, not only between the leader-follower dyad (Uhl-Bien et al., 2007). Leader-member dyadic relationships can be perceived as building blocks for relationships in larger work groups. Knowledge of the nature and strength of dyadic relationships can lead to understanding of how effectively members work together and the effectiveness of leadership within groups. For example, employees who perceive that leaders favor others within the work group are less likely to engage in organizational citizenship behavior

(Truckenbrodt; Vidyarthi, Liden, Anand, Erdogan, & Ghosh, 2010) and may feel resentment (Bolino & Turnley, 2009). Specifically relevant to this study, knowledge of complex relationships within work groups can assist in understanding job satisfaction (Stringer, 2006).

The measurement of the LMX relationship has been the topic of much discussion among researchers (Graen & Uhl-Bien, 1995; James & Henriques, 2009; Schyns & Day, 2010). Multiple measures have been used to measure the relationship and vary in length from two to 14 questions. Measures have been developed to measure the relationship from the follower perspective and from the leader perspective. Additional measures have been developed, which allow members of a group to assess the quality of relationships with peers (Uhl-Bien, 2006). Perhaps the most studied measure of LMX is the LMX-7 (Graen & Uhl-Bien, 1995; Stringer, 2006).

The LMX-7 is a seven-item measure of the LMX to be used by the follower to rate his or her perception of his or her relationship with a leader (Graen & Uhl-Bien, 1995). Each item is scored on a five-point Likert-type scale, with the low response on the left, in the 1 position, and the high response on the right, in the 5 position. The LMX-7 overall score is the sum of the values (Stringer, 2006). A score of 30-35 is a very high rating of quality of the LMX relationship. A score of 25-29 is high, 20-24 is moderate, 15-19 is low, and 7-14 is very low.

The next logical step was to merge CLT with LMX and recognize that relationships occur across all hierarchical levels and among all units of an organization. Researchers who study relational leadership theory (RLT) assert that leadership is the

outcome of the relationships that occur between and among agents within an organization (Uhl-Bien, 2006).

RLT

RLT states leadership is a process of influence (Uhl-Bien, 2006). Leadership is interaction between agents where the outcome of the interaction furthers organizational processes or knowledge. Leadership interactions "contribute to social order (i.e., emergent coordination) and new approaches, attitudes, goals, etc. (i.e., change)" (Uhl-Bien, 2006, p. 667). In other words, adaptive change results from leadership interactions.

Uhl-Bien (2006) offered four assumptions about RLT. First, relational leadership is not constrained to those in hierarchical leadership positions. Second, leadership can be identified as interactive processes which move the organization toward order and adaptation. Third, systemic change results from the interaction of agents within networks. Fourth, "all relationships occur in a context, and this context is important to the study of relational dynamic" (p. 668).

Leadership takes many forms, such as influencing face-to-face interactions, and through writing, nonverbal communication, and any interaction upon which actors can apply meaning (Uhl-Bien, 2006). Within the process of leadership, order is developed and maintained, meaning is given to events, and organizational history and culture are developed and maintained.

RLT suggests true leadership is not defined by organizational structures, but instead, organizational structures define roles of individual agents (Uhl-Bien, 2006).

Roles influence interpersonal relationships, and relationships facilitate work within organizations. The formal organizational structures are meaningless. Indeed, formal structures of organizations are, according to Emirbayer (1997), "empty abstractions apart from the several elements of which they are composed; societies themselves are nothing but pluralities of associated individuals" (p. 284).

Relational Leadership Theory and Leader-Exchange Theory Divergence

It is important to note not all leadership researchers, including those who continue to research LMX, have embraced RLT (Schneider & Somers, 2006). RLT is rooted in CLT, which counters the positivistic, linear, cause-and-effect approach of the scientific method (Lichtenstein et al., 2006). Schneider & Somers (2006) stated, "that the assumptions of Complexity Theory remain murky, despite much description of the theory, which hinders the development of its implications for leadership. Further, it is difficult to ascertain how Complexity Theory-based models of leadership could be developed and tested" (Schneider & Somers, 2006, pp. 351-352).

One explanation of the RLT-LMX divide is the conceptual versus empirical nature of the two streams of research (Markham, 2010). Much of RLT literature is conceptual, whereas there is a clearer empirical and historical path for the LMX research. Another explanation for the divide could be the "stakeholder gaps" that exist between academics who do scholarly research and managers who practice in the field or from a broader perspective, knowledge for the sake of knowledge versus knowledge that can be put into practice (Markham, 2010).

This study uses LMX measures of leader-follower relationships, along with traditional network measures, to develop an understanding of relational networks and faculty job satisfaction. RLT will inform understanding of dynamics within the networks. Thus, this study will bridge the RLT-LMX divide.

Measuring Leader-Follower Relationships

Researchers since the 1950s have found a positive correlation between high quality relationships among leaders and followers and high job satisfaction (Graen & Uhl-Bien, 1995; Hagedorn, 2000; Herzberg et al., 1959; Stringer, 2006; Uhl-Bien, 2006). A challenge is how to measure the quality or qualities of the relationships between leaders and followers and among members of a group.

The measure of the leader-follower relationships used in this study is a modification of the seven-item Leader-Member Exchange Theory scale (LMX-7) developed by Graen and Uhl-Bien (1995). The scale, composed of seven questions, has a single dimension and answers the question, "How effective is the working relationship with your leader?" (p. 236). Graen and Uhl-Bien (1995) stated an effective working relationship included mutual respect, the expectation of deepening trust over time, and the anticipation that, as the mutually satisfying professional relationship grew, the relationship would become a professional partnership. Although not specifically designed to address RLT, the LMX-7 measure is a proxy measure of followers' perceptions of their relationships with their leaders, and is therefore appropriate for this study.

Dynamic Network Analysis

Dynamic Network Analysis (DNA) is a process developed to study complexity leadership in CASs (Schreiber & Carley, 2008). DNA has theoretical and methodological roots in social network analysis (SNA) (Schreiber & Carley, 2006; Schreiber & Carley, 2008). DNA also uses computational modeling to analyze CASs (Schreiber & Carley, 2006).

SNA

Most people who use the Internet or watch television are familiar with the concept of social networks. Millions of people interact through social networking Web sites such as Facebook, LinkedIn and Twitter. These Websites allow people to connect with their families, friends, classmates, and coworkers via the Internet. The Web sites use complex algorithms to identify others who have similar histories, interests, or shared friends. The web of connections among people can be described as a social network.

More formally, a social network "is a specific type of relation linking a defined set of people, organizations, or communities" (Trotter, 1999) or according to Carley (2009) "the network of people to people, organizations to organizations mapping who knows, who works with, who communicates with whom" (slide 13). Another description of a social network is at least one set of objects or agents connected by at least one type of relationship observed at one point in time (Marsden, 2005). Through understanding an individual's social networks, researchers can better describe, explain, and predict the

person's behavior, thoughts, or beliefs because networks both constrain and enable behavior (Carley, 2009c).

According to SNA, a person's influence within a group is based on the relationships he or she has with others. Group performance is based on the types and qualities of interactions between people.

Researchers can also use SNA to understand group, network, or organizational behavior (Marsden, 2005; Schreiber & Carley, 2006). SNA allows researchers to understand better the ways people affiliate, communicate, problem-solve, and interact within organizations. Furthermore, through social network analysis, researchers can make the connection between interpersonal relationships and organizational factors.

SNA is based on three assumptions (Knoke & Yang, 2008). First, it is more useful to understand the structure of relationships between people than it is to understand demographic characteristics. Relationships between people are more important than the traits and factors of people. Knowledge, resources, leadership, and power are byproducts of relationships, not contributors to the relationships (Trotter, 1999). Second, social networks impact people's beliefs, attitudes, perceptions, and actions (Knoke & Yang, 2008). Third, social networks are dynamic, changing as a result of interactions with other individuals, networks, or events. Social network analysis addresses how individuals and social networks are influenced by others, groups, or events (Ashworth & Carley, 2006).

Social network research often uses quantitative methods, such as surveys or closed-ended questions, to gather information about relationships between people in large

networks (Trotter, 1999). The results can be used to identify network characteristics and influential people or objects.

Researchers use multiple methods for analyzing social network data, including graphs, matrices, and relationship measures (Knoke & Yang, 2008). Graphs allow for visual representations of data. Matrices are numerical representations of data and allow for mathematical analysis. Relationship measures are statistical analyses of data, which include network density, closeness centrality, betweenness centrality, clusters, and affiliation networks (Carley, 2009c; Schreiber & Carley, 2008).

Computational Modeling

Computational modeling is an approach first used by computer scientists, organizational sociologists, and organizational psychologists to understand social and organizational structures (Macy & Willer, 2002; Meyer et al., 2011). Computational modeling is now used by such diverse disciplines as education, management, business, sociology and economics. Most computational modeling involves adaptation, learning, and information processing within organizations, networks, and groups (Meyer et al., 2011).

The term "computational modeling," or alternately "computer simulation," is used to describe using a computer program or a network of computer programs to describe or operationalize a model of a social network (Carley, 2009a). In computational models, the relations between agents or entities are, according to Carley (2009a), "expressed in mathematical or symbolic terms, and processing is done by following an algorithm" (p.

48). Computational modeling combines real and simulated data, allowing a level of complexity not possible in purely mathematical models operating with real data (Carley, 2009a).

Use of DNA

DNA combines SNA and computational modeling. DNA differs from SNA in that it allows for dynamics, the natural change processes or strategic interventions occurring in complex systems (Carley, 2003; Carley et al., 2007). DNA also differs from SNA in that it can use large datasets of multi-node, multi-link, multi-networks (Carley, 2003; Schreiber & Carley, 2008). For example, DNA relational data can include large groups of people, resources, locations, beliefs, knowledge, and tasks. The complexity of DNA is important because single-relationship networks represented in SNA are incomplete for prediction of events (Carley, 2009a). It is only through computational analysis of multiple networks or Meta-Networks that social network information can be combined with other types of network data to offer more accurate understandings of complex dynamics.

Chapter Summary

In this chapter, I reviewed literature relevant to the study of community college faculty job satisfaction from a network perspective. Faculty job satisfaction is an important consideration for educational leaders. Faculty face many challenges, including reductions in public funding for higher education, increasing enrollments and

expectations of accountability, and new technology that has changed teaching, learning, and the expectations of students regarding faculty availability.

Community colleges are underrepresented in professional literature and few studies address community college faculty job satisfaction. Educational leadership literature does not address leadership at the level of the network, the level at which leadership can influence job satisfaction. Further, it is important to understand how networks develop and how leaders can encourage interaction within networks because high-quality relationships with coworkers and leaders correlate positively with job satisfaction.

CHAPTER THREE

RESEARCH DESIGN AND METHOD

This is a study of community college faculty job satisfaction and formal and informal leadership network dynamics. In this chapter, I will first discuss the theoretical framework for the study, then seat the research questions within the theoretical framework. Second, I will describe the research method, beginning with the broad category of qualitative research. I will address network analysis, a type of qualitative research, and describe its usefulness for addressing the specific research questions. Third, I will describe the process of dynamic network analysis, the network analysis approach used in this study. Fourth, I will introduce and describe the placement of the study, my role in the study, and ethical considerations. The chapter continues with the study method and descriptions of the instruments used.

Theoretical Framework

Introduction

This section of the chapter will present a review of the theoretical framework of the study. This study has two core theoretical orientations, community college faculty job satisfaction and RLT. A more comprehensive description of the theories underpinning the study can be found in Chapters 1 and 2. Also, there will be a description of how the research questions fit within the theoretical framework.

Community College Faculty Job Satisfaction

The primary topic of this study is community college faculty job satisfaction. The simple definition of job satisfaction is "how people feel about their jobs. It is the extent to which people like . . . their jobs" (Spector, 1997, p. 2).

Community college faculty job satisfaction can be conceptualized as being composed of the interaction of two types of factors, triggers and mediators (Hagedorn, 2000). According to Hagedorn (2000), triggers are life events that may or may not be related to the job, but influence, or trigger, "a change in reference, a change in self, as well as a change in work-related responses" (p. 6).

The other type of factors, mediators, influence or moderate relationships between other variables (Hagedorn, 2000). The three types of mediators are motivators and hygienes, demographics, and environmental conditions. The mediator of interest in this study is environmental conditions. Environmental conditions are faculty network interactions, the social and professional relationships with colleagues and organizational leaders (Hagedorn, 2000). This study addresses the influence of network interactions on community college faculty job satisfaction.

RLT

The second theoretical foundation for the study is RLT. Relational leadership is a dynamic "process through which emergent coordination (i.e., evolving social order) and change (e.g., new values, attitudes, approaches, behaviors, and ideologies) are

constructed and produced" within complex adaptive systems (Uhl-Bien, 2006, p. 655). The concepts of relational dynamics and social processes are synonymous.

An outcome of high-quality relationships between leaders and followers and among members of work groups is higher ratings of employee satisfaction (Graen & Uhl-Bien, 1995). Because employees who report high-quality relationships with others also report high job satisfaction, it makes sense to explore conditions that enable high-quality relational dynamics.

According to Uhl-Bien (2006), the purpose of the study of relational leadership is to enhance understanding of the relational dynamics that underpin leadership within organizations, specifically complex adaptive systems (CASs). As discussed in Chapter 2, CASs are systems that operate with complexity (Marion, 2008; Uhl-Bien et al., 2007).

Schreiber & Carley (2008) summarized five components of complexity and CASs. First, in CASs, the interaction of people results in organizational learning and adaptability. Organizational learning and adaptability are essential for organizational survival in the knowledge era. Second, the collective intelligence of an organization is the result of people with diverse knowledge sets interacting. Organizational change, learning, and evolution result from the interaction of people with differing knowledge and differing status within the organization. Third, in order for an organization to respond quickly to external or internal threats, the collective intelligence of the organization must be deployed. In other words, the success of an organization results from relational dynamics, not the actions of a charismatic or heroic leader. Fourth, in order for the collective intelligence of an organization to be useful, relational dynamics must be encouraged and

supported structurally. The traditional bureaucratic structure is optimized to maintain order and stability and does not effectively or efficiently respond to threats or implement creative solutions (Marion, 2008; McKelvey, 2008; Schreiber & Carley, 2008; Uhl-Bien et al., 2007). Finally, in order for an organization to be effective and efficient, methods must exist to implement the creative output of the collective intelligence. In other words, leaders must be able to apply the innovative ideas and processes to the work of the organization.

Summary of Theoretical Framework

As discussed above, Hagedorn's (2000) comprehensive framework for understanding faculty job satisfaction stated that quality relationships contribute to faculty job satisfaction. Complexity theory argues that CASs are effective because of the interactions that occur as a result of interpersonal relationships. High-quality relationships are a factor both of college faculty job satisfaction and effective CASs. Therefore, a study of the nature and quality of community college faculty job satisfaction and relationships is worthwhile.

Research Questions

The previous sections described the value of community college faculty job satisfaction and a framework for understanding how relationships influence job satisfaction. Furthermore, an argument was made for the organizational benefits of strong

workplace relationships. In Chapter Two, an argument was made for strong ties between leaders and followers.

The research questions for this exploratory study are:

1. How do network interactions relate to faculty job satisfaction?
2. How do beliefs about LMX relationships relate to network interactions?
3. How do beliefs about LMX relationships relate to job satisfaction?

Qualitative Research

Qualitative research is used in this study. Research methods can be categorized as qualitative, quantitative, or mixed methods (Creswell, 2009). Qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2007). The process of qualitative research involves emerging questions and procedures by collecting data in the participants' setting; analyzing the data inductively, building from particulars to general themes; and making interpretations of the meaning of the data.

Qualitative researchers generally have a social constructivist worldview (Creswell, 2009; Crotty, 1998). Social constructivism is a philosophy that people apply subjective and complicated meaning to their experiences. The term "social" is used because people influence and are influenced by others with whom they interact. The meaning people apply to their experiences is also influenced by the values and norms of society, religion, family, and so forth. The role of the researcher with a social constructivist perspective is an attempt to understand the meaning people give to their

experiences. According to Charmaz (2008), the constructivist approach "places priority on the phenomena of study and sees both data and analysis as created from shared experiences and relationships" (p. 130). Social network analysis (SNA) and grounded theory are both types of qualitative research with a social constructivist worldview (Creswell, 2009).

Qualitative research is used to understand the meaning participants give to a concept or experience (Creswell, 2007; Strauss & Corbin, 1998). It can be used to explore new ideas or gain new understandings of phenomena. Although the data gathered through qualitative research methods may be quantified (e.g., survey data), the qualitative research process is interpretative. According to Strauss and Corbin (1998), interpretation of data is "carried out for the purpose of discovering concepts and relationships in raw data, then organizing these into a theoretically explanatory scheme" (p. 11).

Community college faculty job satisfaction and faculty networks are an area ripe for exploration through qualitative research. Little is known about the experience of community college faculty, and the topic has not been studied from a collectivist perspective. The qualitative approaches most appropriate for this study involve grounded theory methods and dynamic network analysis.

Grounded Theory Process

Grounded theory research is a constructivist approach of theory development based in the subjective experience of participants (Creswell, 2007). Strauss and Corbin (1998) described grounded theory as "a set of well-developed categories (e.g., themes,

concepts) that are systematically interrelated through statements of relationship to form a theoretical framework that explains" a phenomenon of interest through describing relationships between concepts (p. 22).

The grounded theory process used in this study is one suggested by Creswell (2009) and Strauss and Corbin (1998). First, raw data are collected. Second, the raw data are organized into a manageable format. Third, the researcher reads through all the data to get an overall sense of the information and its meaning. The fourth step is coding. The last step is making the information available to others by presenting the information at conferences, by publishing it in journals, or through the use of other information-sharing technologies.

Theory development occurs in the core of grounded theory, the coding process. Coding is a process of analysis of data (Charmaz, 2006; Creswell, 2007; Schensul, LeCompte, Trotter, Cromley, & Singer, 1999). When information is gathered, the researcher begins looking for patterns or categories to emerge from the data. Identifying the categories is a creative process, and the constant comparison method of examining and interpreting data and examining emergent categories is an art (Strauss & Corbin, 1998).

Open coding is the beginning of theory development (Strauss & Corbin, 1998). Open coding involves "forming categories of information about the phenomenon being studied by segmenting information" (Creswell, 2007, p. 67). It involves taking concrete information and developing an abstract category or description for that information (Strauss & Corbin, 1998). The information is thus coded. The next piece of information is

then examined to see if it fits into the initial code. If not, there is another abstraction, or code, developed. This process is continued for each discrete piece of information until all information is coded. Throughout the open coding process, categories and subcategories will emerge.

After categories are identified, the properties and dimensions of each is described. According to Strauss and Corbin, the properties of a category are "the general or specific characteristics or attributes" of the category (p. 117). The dimensions of a category are the range along a continuum on which a concept can be placed. The property and dimensions of a category offer both a description and boundaries for the category.

The second coding process is axial coding (Strauss & Corbin, 1998). Axial coding is the process of "relating categories to subcategories along the lines of their properties and dimensions" (p. 124). The purpose of axial coding is to make sense of the big picture and reconnect concepts fragmented through open coding. The researcher approaches the data asking, "who, when, where, why, how, and with what consequences" (p. 127) to relate the structure of the phenomena with the process of the event or experience being studied.

The outcome of axial coding is a paradigm, an understanding of the data that integrates the structure and process of data (Strauss & Corbin, 1998). The paradigm includes conditions under which the phenomenon occurs, actions and interactions, responses to the phenomenon, and consequences, or outcomes, of the actions or interactions.

The third component of coding in grounded theory is selective coding (Strauss & Corbin, 1998). The outcome of selective coding is a central (or core) category, a few words or sentences explaining the research. The description can take the form of a storyline or a descriptive diagram. The storyline or diagram should contain all major categories or themes but should not be too detailed and should not exclude any major categories.

The theory should then be reviewed for internal consistency, looking for "gaps in logic, filling in poorly developed categories and trimming excess ones, and validating the scheme" (Strauss & Corbin, 1998, p. 156). To check for internal consistency, the researcher reviews the theory and its components and asks, "Does this make sense?" If something does not make logical sense, the researcher can return to the data and re-think the theory.

A poorly developed category may not have clearly defined properties and dimensions (Strauss & Corbin, 1998). To correct a poorly developed category, the researcher may return to the data or collect more data until the point of theoretical saturation is met. Sometimes researchers have too much data, data that does not seem to fit the central or core category. Strauss and Corbin (1998) suggest the researcher drop extraneous concepts that "clutter a theory" (p. 159).

Validating the theory is as important in qualitative research as it is in quantitative research; however, the methods of validation are very different. In grounded theory, validation can be done in several ways (Strauss & Corbin, 1998). One approach is to review all the raw data to see if the theory is able to explain most cases. Another

approach is to ask the respondents to read the theory and comment on how it fits their situations or state if they can see themselves in the explanation given.

In summary, grounded theory is a qualitative research method in which a theory, or explanation of the connection between events and outcomes, is developed based on information provided by participants. Raw data are coded to classify, then to connect, concepts. The outcome is a storyline or diagram showing the connections among concepts.

DNA

In this study, DNA is used both to structure data collection and as the method of data analysis. Specifically, data are analyzed using powerful DNA software called Organizational Risk Analyzer (ORA). ORA was developed by Carley and colleagues at the Computational Analysis of Social and Organizational Systems (CASOS).

ORA is a statistical network analysis tool for identifying relationships within networks (Carley & Reminga, 2004). ORA allows users to compute traditional social network measures like degree centrality, betweenness, closeness, Eigenvector centrality and network density, as well as more robust, rich, relational data based on multiple networks (Carley, 2009c; Carley et al., 2011; Schreiber & Carley, 2008). Also, ORA has a graphing function, allowing users to visualize networks. The graphic representation of networks can be manipulated. For example, graphs can be rotated in space and relationships can be identified by color and can be added or removed. The visualizer will be used in this study.

Another ORA component used in this study is the Meta-Network. The Meta-Network is a numerical representation of the network structure and tool for data storage for input into other ORA software components (Carley et al., 2011). Within the Meta-Network, node types are defined. Elements of networks within the Meta-Network include agent, knowledge, resource, task, organization, and location (Carley et al., 2007).

A node is an entity, such as a person (agent), knowledge, resource, belief or location (Carley et al., 2011). The interaction of two or more nodes is a network. For example, a node might be composed of the relationship between two people (agent-by-agent). Multiple agent-by-agent nodes would make up a social network. Agent-by-organization nodes would describe an organizational membership network.

The Meta-Network is visualized as a square, with each node type represented by columns and rows. An organizational network is made up of multiple, overlapping networks represented by the Meta-Network. ORA software allows for analysis of the organization based on any or all networks (Carley et al., 2007).

ORA has a belief propagation tool, which uses computational modeling to estimates belief propagation through social networks (Carley et al., 2011). It identifies the most common beliefs shared by most people, and the people most likely to change beliefs, and those who are likely to influence changes in belief.

Belief propagation generates projections not otherwise available (Carley, 2009a). It is faster than collecting longitudinal data, so it is convenient and cost effective. It is also an appropriate tool for understanding possible systemic changes because it uses complex, non-linear systemic data.

Research Design

This section of the chapter describes the research framework used in the study. A description of the participants and setting of the study and of my role as the researcher is presented first, followed by a description of the use of qualitative research in knowledge development. Finally, network analysis, the primary research method used in this study, is described.

Participants and Setting

This study takes place at a large, public, comprehensive, community college in southeastern USA. The college has approximately 300 full-time faculty serving over 15,000 academic students and 21,000 continuing educations students annually. Classrooms, labs, administrative offices, and support services are located on four campuses and in four centers (not full campuses) spread across the county. As a result, faculty, staff, and students are widely dispersed geographically.

Status of the community college faculty is determined by state law, which prohibits granting of tenure to community college faculty. In the specific institution of study, there is a system of faculty rank, but it is rank in title only. Faculty rank is based only on years of service and is not tied to salary, promotion, preferential teaching assignments, or job security.

Unlike faculty in some other states, faculty are not unionized. State law prohibits unionization of state employees. It could be argued that unionized faculty may perceive a

higher level of connectedness or collectivity than those for whom unionization is prohibited.

The community college has undergone significant organizational and leadership change over the past five years due to the retirement of a long-serving college president. Under the direction of the new president, the administrative structure was realigned. The academic leadership structure is important to this study and is, from the top down, the president, vice president for education, associate vice president, dean, assistant deans, department heads, and faculty. An academic division is the academic unit under the management of a dean. A simplified version of the organizational chart from the president to the faculty is shown in Figure 3.1

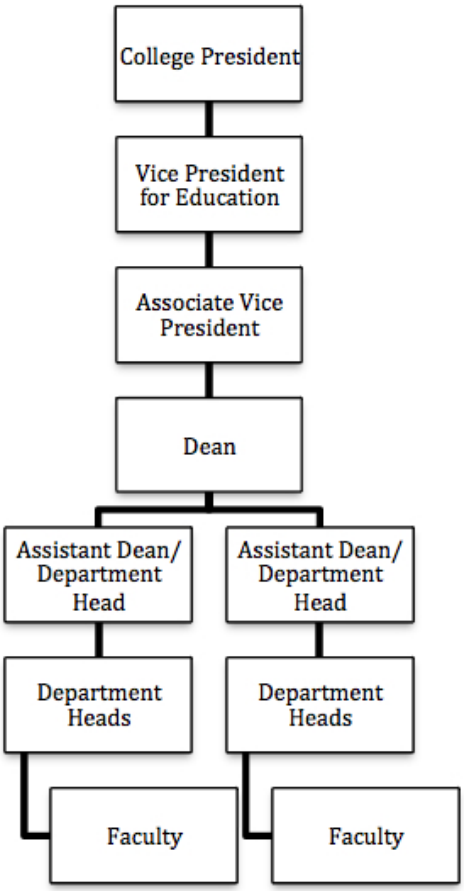


Figure 3.1

Formal Organizational Chart for the Community College

Within the division being studied, assistant deans and department heads have both administrative and teaching responsibilities and, therefore, are included in the study. Other participants in the study are all the full-time faculty members in the division. The purpose of the study is to understand job satisfaction and relationships; therefore, using the whole population of 44 people is more appropriate than using a sampling of the population.

Researcher's Placement in the Study

This study uses qualitative research methods. Qualitative studies inquire into the meanings people give to their experiences (Creswell, 2007). The outcome of such studies includes the voices of the participants as well as the interpretation and perspectives of those engaging in the research. Undoubtedly, researchers are very much a part of the qualitative research process (Charmaz, 2006; Creswell, 2007, 2009).

Furthermore, qualitative research is a process. The process involves the researcher contemplating, and enumerating for the reader, personal assumptions, world view, theoretical lenses, and other personal perspectives that can, and probably will, influence conclusions (Creswell, 2007).

Qualitative researchers address certain ontological and epistemological assumptions (Creswell, 2007). Ontology is the nature of knowing or perspectives of reality. Because qualitative researchers attempt to understand the perspective of others, an underlying assumption is that there are multiple realities within a given system. In this study, I take a collectivist approach explore collective realities. Crotty (1998) labels this perspective as constructionist. As was discussed in the introduction to qualitative research, constructionism states that reality is created through the interaction of people with their environment, and as such, constructed reality can only be understood within the context of social and environmental conditions.

Inasmuch as qualitative research makes an *a priori* assumption of constructed reality, it is essential that researchers reveal "their biases, values, and personal background, such as gender, history, culture and socioeconomic status, that may shape

their interpretations formed during a study" (Creswell, 2009, p. 117). Following Creswell's suggestion, I will describe who I am and my placement in the study.

I view the world, and this research, through my unique perspective. My perspective is composed of the many facets of me, such as my culture, personal history, biases and prejudices, education, values, and self-image. Although it is impossible (and inappropriate) for me to reveal all of me in this chapter, it is important to describe who I am relative to this study.

I identify as a white female, a social worker by vocation and an educator by trade. For 26 years, I have lived in the county served by the community college in this study, and I consider this area to be "home." I received a public school education in Florida, then moved north, to the county in the southeastern state where I currently live to attend a private, faith-based university. My major was psychology. A few years later I received a Master of Social Work degree from a land-grant university in my state, then worked as the program director for a group home for teenage girls in the foster care system for eight years before joining the faculty of the community college.

I am a faculty member, department head, and associate professor in the community college. There are two other faculty in my department, over whom I have administrative authority. I have been teaching full-time in my department for ten years. Before teaching full-time, I taught part-time for a year, and prior to teaching part-time, I was on the department's community advisory committee.

I decided to research the division and the college where I work for many reasons. First, I am curious about what contributes to the job satisfaction of my colleagues. I am

aware of many reasons why faculty may be dissatisfied, specifically the environmental stressors impacting everyone within the college, described in previous chapters. Despite the stressors, my gut feeling is that faculty within the division have high job satisfaction. I would like to know what contributes to their satisfaction.

As a department head, I can use the knowledge gained in this study when working with the faculty I supervise. Also, as a member of multiple campus-wide committees and part of the faculty "team," I hope to use knowledge I gain from this study to educate others about faculty job satisfaction.

Second, I am very familiar with the people and organizational structure of the community college. This insider knowledge allowed me access to develop survey instruments appropriate for the audience. Furthermore, my thorough knowledge of the college's history and current climate offers an informed framework within which to interpret results. Uhl-Bien (2006) suggested relational leadership research might be easier for insiders because insiders have access to information not available to outsiders.

Third, I studied the division of which I am a part because I hoped to use my relationships with others to elicit a high faculty response rate. I relied on my social capital.

Fourth, I studied the division because it is convenient. I had ready access to the population and had the complete support and encouragement of the division's dean.

Ethical Considerations

Creswell (2009) discusses the challenges of "backyard" research, research done using friends, colleagues, family, or the organization of the researcher. He recommends close attention to ethical issues of power, biased reporting, and incomplete disclosure of information. In addition, study participants can become confused when the researcher plays multiple roles, being both a group member and researcher (LeCompte, Schensul, Weeks, & Singer, 1999). The burden of assuring ethical practice and clarifying roles is on the researcher.

Prior to beginning research, I completed ethical treatment of human subjects training required by the Institutional Review Board (IRB) of Clemson University. The IRB approved the study's research protocol and surveys. Also, the vice president of education for the community college gave approval for the study.

Perhaps the most salient ethical consideration in research involving human subjects is that participants are protected from harm (Creswell, 2009). Two ways that I assured protection from harm were through the use of informed consent and through insuring participant (and non-participant) anonymity and confidentiality. Informed consent involves giving accurate information to potential participants about the sponsoring institution, how the participants were selected, the purpose and possible benefits of the research, what will be expected of participants, notification of any potential risks, guarantee of confidentiality of the participants, assurance that the participant can withdraw from the study at any time, and the name and contact information of the researcher (Creswell, 2007, 2009).

I assured anonymity and confidentiality by having a co-researcher, a person who has no knowledge of or vested interest in the community college, assist with data collection. The co-researcher, someone not employed by Clemson University or the community college, solicited participation, collected survey data, and removed all identifying information before giving me the data for analysis. With the help of the co-researcher, I could assure faculty, the community college administration, and the IRB, confidentiality and anonymity of participants and non-participants would be respected.

Method

Data were collected in two stages involving a preliminary and a main survey. Information gained from the first study was used to inform the development of questions for the second study. Data from the second survey made up the Meta-Network entered into ORA for DNA. An overview of the research process can be found in Figure 3.2.

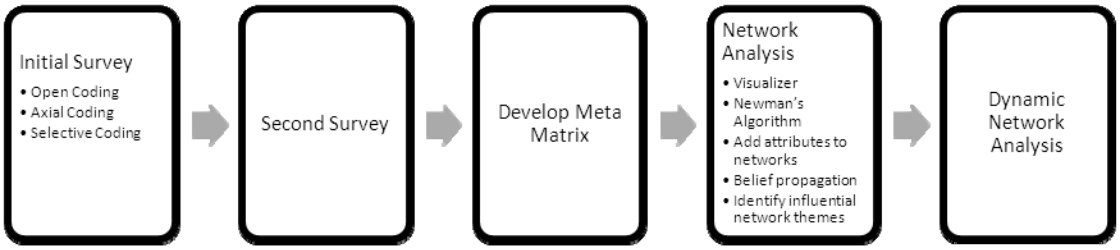


Figure 3.2

Overview of Research Process

Preliminary Survey

The purpose of the preliminary survey was to identify emergent themes that would inform question and response scale development for the second survey. This approach has been used successfully in recent DNA studies (Bennett, 2011; Christiansen, 2011a; Hanson, 2009). The questions were developed from predetermined thematic categories rooted in CLT and DNA. The categories are shown in Table 3.1. In addition, the survey included open-ended questions which allowed respondents to address the relationships between job satisfaction and job task, specialized knowledge, and resources using in their own words, all of which are important to consider in qualitative research (Creswell, 2009).

Table 3.1

Predetermined Thematic Categories for Survey One

Thematic Category	**Description**
Task	Tasks faculty members engage in when doing their jobs
Knowledge	Knowledge faculty members need to do their jobs
Resources	Resources faculty members need to do their jobs

The survey was designed to collect data for coding within the predetermined thematic categories and to provide narrative information to increase understanding of the relationships between faculty job satisfaction and tasks, knowledge, and resources.

Survey questions were:

1. What are the top five tasks you do as a regular part of your job (teaching, advising, serving on committees, etc.)?

2. In what ways do your job tasks influence your job satisfaction?

3. What are the top five types of specialized knowledge or expertise you use when doing your job (specialized academic knowledge, knowledge of technology, classroom strategies, etc.)?

4. How does having specialized knowledge or expertise influence your job satisfaction?

5. What are the top five resources you rely on to do your job (specialized tools, people who can do specific tasks, community resources, etc.)?

6. How do resources influence your job satisfaction?

All full-time faculty members in the division being studied were sent an email by the co-researcher, describing the study and inviting them to participate in a survey. As soon as 15 surveys were complete, the co-researcher removed all identifiers and sent me a spreadsheet containing the first 15 survey responses.

I coded this data using the coding process described by Strauss and Corbin (1998). Two other coders also coded the responses, providing cross-checking. Cross-checking is a qualitative research reliability strategy in which multiple people read data and agree on consistent codes (Creswell, 2009). The other coders identified fewer node

categories than I, possibly because they have less knowledge of the organization. Through discussion, the cross-checkers and I came to consensus about node categories. The 15 responses, which came from approximately 34% of the total population of 44, allowed me to achieve a saturation point, the point at which no new useful information was obtained (Schensul, LeCompte, Nastasi, & Borgatti, 1999; Strauss & Corbin, 1998).

Second Survey

The second survey included items relating to the leader-follower relationship, job satisfactions, interpersonal relationships, demographic data, and task, knowledge and resource questions which emerged from the first survey. Graen and Uhl Bien's (1995) LMX-7 was used to evaluate leader-member relationships, with question wording modified specifically for this study. To assess job satisfaction, questions representing the Job Satisfaction Survey (JSS) facets of supervision and coworkers were used (Spector, 1997). Four questions for each of the two JSS facets were used. In addition, an overall single-item job satisfaction question was included for triangulation.

I chose the LMX-7 and JSS instruments because of their conceptual connections with this study as described above, as well as their reliability and validity. LMX is the theory most often used when exploring relationships between leaders and followers (Schyns & Day, 2010). The LMX-7 survey tool was presented by Graen and Uhl-Bien (1995) as a valid and reliable measure of followers' perceptions of relationships with their leaders. Spector (1997) reports the JSS is reliable, as shown by high internal and

test-retest consistency. Also, the subscales of JSS correlate strongly with subscales within other workplace satisfaction surveys, indicating validity.

Survey questions were entered into an online survey tool and pilot tested by multiple testers who were not part of the faculty population. Once the survey was in its final form, it was re-submitted to the IRB for approval. Permission to do the study at Community College, IRB Approval, and content of the survey are in the Appendix.

Next, the co-researcher sent an email to each of the 44 faculty members, explaining the research, outlining the informed consent protocol, and asking for their participation in the 2nd phase online survey. After a week, 77% of faculty completed this survey. I determined that all who wished to participate had done so, and the survey was closed.

The co-researched anonymized the data and entered it into ORA as multiple data networks. A combination of all matrices is called the Meta-Network. The Meta-Network represents the data set for the multiple networks and is used in DNA.

To addresses research Question 1, "How do network interactions relate to faculty job satisfaction?" I used multiple ORA components. This question addresses Agent by Belief (Job Satisfaction) networks. I applied Newman Grouping algorithm group by Job Satisfaction to identify and analyze network differences across satisfaction. Next, I applied the beliefs propagation algorithm to estimate belief propagation within the social network.

To address research Question 2, "How do beliefs about LMX relationships relate to job satisfaction?" I followed a similar protocol. This question addresses Agent by

Belief (LMX) networks. I applied Newman Grouping algorithm to group agents by LMX categories to identify and analyze network differences across LMX categories. Then I applied the beliefs propagation algorithm to estimate belief propagation within the social network.

Research Question 3, "How do beliefs about LMX relationships relate to job satisfaction?" addresses Agent by Belief (Job Satisfaction) networks. First, I applied Newman Grouping algorithm to identify clusters of agents with similar responses to Job Satisfaction survey and examined the network for impact of the LMX categories. Then, I applied the Beliefs Propagation algorithm to estimate belief propagation within the social network.

Summary

I began this chapter with a discussion of community college faculty job satisfaction and described how relational factors contribute to job satisfaction. I discussed RLT, CLT, qualitative research, grounded theory approaches, and DNA. I described the setting of the study and my placement in it, and addressed relevant ethical considerations. I then outlined research methods used in the study, including administration and analysis of two surveys, and described how each research question would be addressed

CHAPTER FOUR

RESULTS

The big picture question addressed in this study is, "how do network dynamics and leadership behavior influence community college faculty job satisfaction?" The following research questions guide the study:

1. How do network interactions relate to faculty job satisfaction?
2. How do beliefs about LMX relationships relate to network interactions?
3. How do beliefs about LMX relationships relate to job satisfaction?

To answer these questions, Community College faculty were asked to respond to two surveys. The surveys were developed to provide information for dynamic network analysis, using the computer program ORA. Information is entered into ORA as networks of nodes. A network is the relationship between two node classes. Nodes are the things being measured in a network. For the purpose of this study, faculty are called agents or agent nodes. Other standard DNA node classes or categories used in this study are beliefs, knowledge, locations, resources and tasks (Carley et al., 2011).

The first survey of faculty had three open-ended questions asking for listings of the top five job tasks, types of knowledge, and resources needed to do the job. The other three questions asked faculty to discuss connections between job satisfaction and job tasks, job-related knowledge, and job-related resources. Through the use of grounded theory methods, listings of job tasks, job-related knowledge, and job-related tasks were coded into pre-determined thematic categories of knowledge, tasks and resources.

Analysis of survey responses revealed nine knowledge nodes, 17 task nodes, and 23 resource nodes.

On the second survey, faculty were asked to select the top five job tasks, resources, and types of specialized knowledge they use when doing their jobs in an average week. Other questions included faculty scores from a modified LMX-7 survey (Graen & Uhl-Bien, 1995) measuring faculty perceptions of their relationships with their leaders, and questions about job satisfaction (because the role to whom individuals relate to as their "leader" varied across departments, we allowed the respondent to decide for themselves who their leader was). Beliefs about job satisfaction were assessed in two ways. One was a single questions assessing overall job satisfaction (OSAT), and the other was way was the use of eight questions modified from Spector's (1997) Job Satisfaction Survey (JSS).

Demographic data were included on the survey and used as attributes for agents within ORA. Faculty were asked to identify gender, office location, highest degree attained, and faculty rank. For each of the demographic questions, respondents could select a "prefer not to answer" response.

All full-time faculty of the division (N=44) were invited to participate in the second survey. Thirty-four people responded, (n==34), representing a 77.3% response rate, which was lower than anticipated. For researchers to feel confident in their data, survey response rates for academic studies in behavioral sciences should be about 60%, +/- 20 (Baruch, 1999), so a response rate of 77.3% is more than adequate. Survey results were entered into ORA version 2.2.7 for analysis.

Characteristics of Faculty

Respondents included 12 women, 16 men, and six faculty did not reveal their gender. Two respondents have associates' degrees, seven have bachelors' degrees, 18 have masters' degrees, five have PhD/JD degrees, and two respondents did not state their highest degrees.

The physical location of each respondent is, like agent or knowledge, a standard DNA node class (Carley, 2009c; Schreiber & Carley, 2008), so faculty were asked to indicate the building and floor of their offices. Faculty in the division are located in eight possible locations. Six locations are in buildings on the largest campus and one is in a building on branch campus. Location is important because people who are in a similar physical location are likely to be affected by common environmental conditions, they are likely to use the same paths to access resources, and they are likely to be connected to the same people (Carley, 2009b).

Faculty were asked, "Who do you consider to be your leader?" Faculty selected one leader from a list of all faculty and administrators in the division's academic organizational chain of command, including department heads, assistant deans, the dean, the associate vice president, the vice president and the president of the college. Leaders were identified as follows: president, n=3 (9%), dean, n=10 (29%), assistant dean, n=7 (21%), department head, n=12 (35%). No one identified the associate vice president or vice president as leaders.

The majority of faculty identified their department heads as their leaders. It should be noted that as many as 12 respondents may be department heads who may have

indicated associate deans, dean, or president as leaders. Also, two of the department heads are also assistant deans, so they may have indicated the dean or president as leader.

Composition of the Meta-Network

The Community College Meta-Network is made up of nodes and multiple networks. There were 34 agent nodes (the faculty), 9 knowledge nodes, 1 overall measure of job satisfaction node, 6 perceived leader nodes, 23 resource nodes, 4 leadership belief nodes, 4 coworker nodes, 7 LMX nodes, and 17 task nodes. Sixteen networks, represented by matrices, or representation of dyadic relationships between nodes classes, are represented in Table 4.1. The Agent by Agent, Agent by Knowledge, Agent by Task and Agent by Resource networks came from the second survey. I generated the other networks based on my knowledge and experience working within the organization. These networks make up the Meta-Network in ORA and are available as information sources for data analysis.

Table 4.1

Networks Comprising Meta-Network

Network	**Node Class 1**	**Node Class 2**
Confide	Agent	Agent
Loyalty	Agent	Agent
Social	Agent	Agent
Knowledge	Agent	Knowledge
LMX (scores from LMX survey)	Agent	LMX
OSAT (overall satisfaction)	Agent	OSAT
Perceived Leader	Agent	Perceived leader
Resource	Agent	Resource
Leader	Agent	Leader belief
Assignment	Agent	Task
Knowledge Precedence	Knowledge	Knowledge
Resource Requirement	Knowledge	Task
Training	Knowledge	Resource
Knowledge Requirement	Knowledge	Task
Substitution	Resource	Resource
Task Precedence	Task	Task

Because of the number of nodes and networks, it is difficult to comprehend the complexity of the Meta-Network. The ORA visualization tool offers an image of the network, revealing the Meta-Network's entangled, spiky hairball-like structure (Figure 4.1).

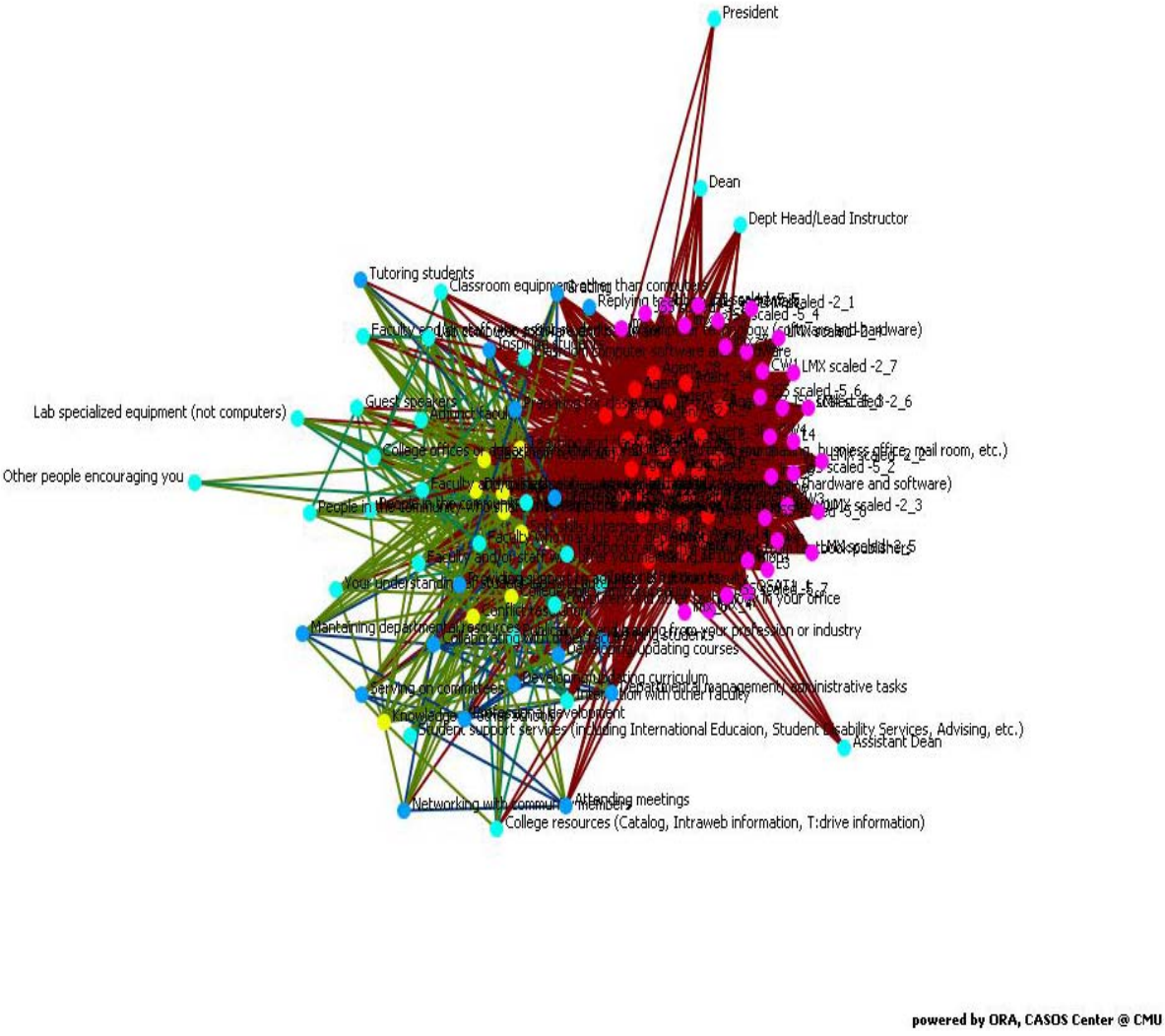


Figure 4.1

Visualization of Community College Meta-Network

Reports run within the ORA computer program provide information about the Meta-Network. The Key Entities report offers an overview of overall network interactions and statistics on various types of informal leaders. Selected Community

College Meta-Network measures of overall network interactions, along with descriptions of the measures, (Carley & Columbus, 2011) are displayed as Table 4.2.

Table 4.2

Community College Meta-Network Measures from ORA Key Entities Report

Measure	**Value (Scale 1-10)**	**Description**
Social Network Density	0.05	Density of Agent by Agent social network
Confide Network Density	0.04	Density of Agent by Agent confide network
Loyalty Network Density	0.09	Density of Agent by Agent loyalty network
Average Communication Speed for Social Network	0.34	Average speed with which two nodes can interact within social network
Average Communication Speed for Confide Network	0.35	Average speed with which two nodes can interact within confide network
Average Communication Speed for Loyalty Network	0.37	Average speed with which two nodes can interact within confide network

Analysis of the Community College Meta-Network reveals low Agent by Agent network density for all Agent by Agent networks (Social, Confide and Loyal; .04 - .08). Network density is a reflection of network cohesion based on social networks. It is a comparison of existing social links to all possible social links within a network (Carley et al., 2011; Knoke & Yang, 2008). Low Agent by Agent network density means faculty do not have many neighbors, or other agent nodes to whom they are connected by at least one link. In the division, faculty do not state that they interact with many others. They may not share information, ask for help, gossip, have lunch together or go out for drinks after work. Figure 4.2 is a visualization of all Agent by Agent networks. Each dot is

represents a person and each line represents a connection between the people. This representation does not reflect the direction or weight of the connection.

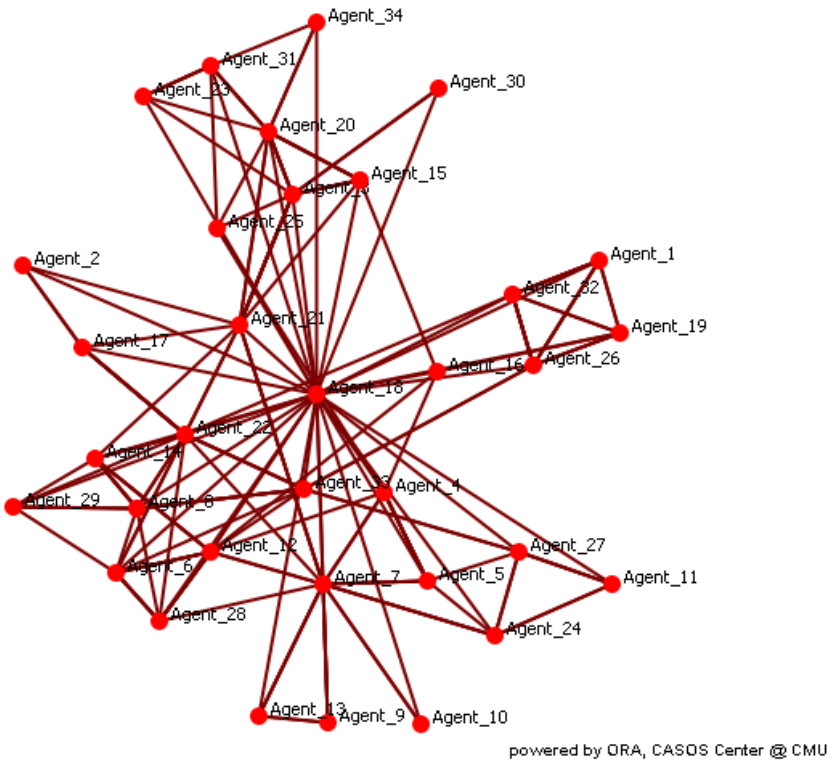


Figure 4.2

Visualization of All Agent by Agent Networks of Meta-Network

It appears that Agent 18, the node at the center of Figure 4.2, has many neighbors and is at the center of the Agent by Agent communication networks. This individual identified connections with everyone in the division. Nearly all other agent nodes have only two or three neighbors. For example, Agent 10 only has connections with agent 18 and Agent 7. Agent 2 is neighbor with Agents 18, 17 and 21. This means Agent 10 shares

social, trust and/or confide links with only two other people, and agent 2 shares social, trust, and/or confide links with three other people. Indeed, in a division of 44 people, Agents 2 and 10 are not very connected.

As a result of the low network density, communications speed is moderately low (.34 - .36). Low communication speed is not desirable in complex adaptive systems because it is through interactions among people that innovation and learning occur and informal organizational structures are developed (Marion, 2008).

The Key Entities report reveals a high level of knowledge congruence (.56). Knowledge congruence is a measure of whether or not agents have the knowledge they need to accomplish the tasks assigned. Faculty reported they have the knowledge they need to do the job tasks that they are assigned.

MetaNetwok: Agents

As was stated earlier, analysis of the Meta-Network reveals low degree centrality, meaning faculty do not have high levels of interaction. Nonetheless, it is valuable to know who is "in-the-know" and who the "movers and shakers" are—the informal leaders. The Key Entities report reveals top ranked Agents, the faculty who appear most often in network measures of informal leadership. Figure 4.3 reveals the percentage of measures for which the Agent was ranked in the top three.

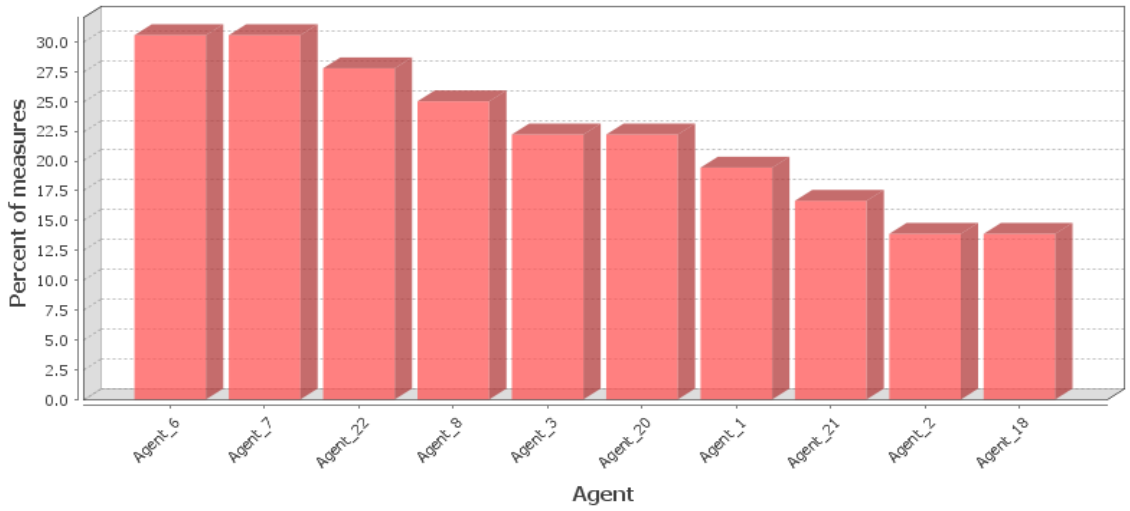


Figure 4.3

Recurring Top Ranked Agents

Informal leaders, whose relationships with others may not be evident on organizational charts, possess the potential for informal impact on the day-to-day effort of organizations.

The Key Entities report (Table 4.3) identifies agents who fulfill specific network roles. Emergent leaders are those who, according to Carley et al. (2010), "are likely to be not just connected to many people, organizations, tasks, events, areas of expertise, and resources; but also, are engaged in complex tasks where they may not have all the needed resources or knowledge and so have to coordinate with others, or have other reasons why they need to coordinate or share data or resources" (pp. 445-446). Agents with high total degree centrally, or those who are "in-the-know," are linked to many other agents, thus have access to the knowledge and resources of others. Agents with high Eigenvector centrality are connected to other highly connected people. Agents who have high hub

centrality or high authority centrality are similar to those with high Eigenvector centrality, with the addition of a directional component of influence. Agents with high hub centrality send information to influential others, and agents with authority centrality receive information from others who send information to influential agents (Carley et al., 2011).

In the Key Entities report (Table 4.3), Agent 8 appears five times in the Social Network, while Agents 6, 22, and 33 appear three times. With respect to the Loyalty Network, Agent 7 emerges as a key entity four times, while Agents 3 and 18 appear three times. In the Confide Network report, Agent 12 appears four times, and agent 14 appears twice. Emergent Leaders were consistent across all three Agent by Agent networks.

Table 4.3

Key Entities: Agents within Networks

	Social	**Loyalty**	**Confide**
Emergent Leader (Cognitive Demand)	Agent 6 Agent 20 Agent 31	Agent 6 Agent 20 Agent 31	Agent 6 Agent 20 Agent 31
In-the-Know (Total Degree Centrality)	Agent 6 Agent 8 Agent 20	Agent 18 Agent 7 Agent 3	Agent 12 Agent 7 Agent 14
Leader of Strong Clique (Eigenvector Centrality)	Agent 6 Agent 22 Agent 8	Agent 18 Agent 7 Agent 20	Agent 12 Agent 23 Agent 26
Acts as Hub (Hub Centrality)	Agent 6 Agent 8 Agent 28	Agent 18 Agent 20 Agent 3	Agent 12 Agent 15 Agent 21
Acts as Authority (Authority Centrality)	Agent 22 Agent 33 Agent 8	Agent 21 Agent 7 Agent 23	Agent 1 Agent 7 Agent 32
Potentially Influential (Betweenness Centrality)	Agent 33 Agent 8 Agent 3	Agent 21 Agent 3 Agent 7	Agent 22 Agent 14 Agent 12

Table 4.4 shows agents with the highest row degree centrality. These are the people who are perceived by others to have the most knowledge or access to the most resources.

Table 4.4

Agents with the Most Knowledge and Most Resources

Social	Loyalty	Confide
1	Agent 2	Agent 1
2	Agent 3	Agent 2
3	Agent 4	Agent 3
4	Agent 5	Agent 4
5	Agent 6	Agent 5
6	Agent 7	Agent 6
7	Agent 8	Agent 7
8	Agent 9	Agent 8
9	Agent 10	Agent 10
10	Agent 11	Agent 11

Although the focus of this research is network interactions−the relationships between and among people−it may be helpful to understand the knowledge, tasks, and resources that are part of the Meta-Network of Community College. People interact though knowledge, tasks, and resources, and those interactions make up the work environment.

Meta-Network: Knowledge

Specialized knowledge is not obviously related to faculty job satisfaction, but it can provide insight into the environment of the Community College. In the first survey, faculty were asked, "How does having specialized knowledge or expertise influence your job satisfaction?" Answers varied considerably from "Greatly" to "It does not." Other responses offer information that can better inform understanding of the role of specialized knowledge in job satisfaction. Some examples are:

1. "I first place myself in the student's role. What would make me want to learn the material and not just get a grade. I was a student myself not long ago so that part is easy. I also realize the student today has to grasp technology to be successful. If I cannot effectively grasp it and use it to teach, students may struggle also. I can also demonstrate most anything I am teaching my students. Practical application helps retention and absorption of the material. If I just read from the book or worse PowerPoints, the students do not learn as well."
2. "The specialized knowledge that I have keeps me working in the technical education field. Also, I get a positive feeling from demonstrating my technical skills, connecting with my students and helping them to understand my views about what is important in their profession. I enjoy helping them to formulate direct and logical answers to their technical issues."

3. "I use real-type scenarios to convey topics/ subject matters. I also get students involved in the learning process. Knowledge is received as intended and the students are able to retain the information because they understand verses trying to remember a topic without a connection. We have fun while we learn."
4. "It allows me to communicate effectively with both students and faculty in assisting with any challenges they may face in the classroom with instruction, with technology, and outside of the classroom."
5. "I must have these skills to do my job and having the skills allows me to do the job well. I want to do well to be satisfied with my job."

Clearly, faculty perceive having and using specialized knowledge, knowledge in of specific subject matter, knowledge of teaching methods, and knowledge of technology, as essential to effective performance and, consequently, to job satisfaction. The second survey further clarified the how faculty use specialized knowledge. Faculty were asked, "What specialized knowledge or expertise do you use most often while doing your job in an average week?" Figure 4.4 shows which types of knowledge faculty identified as being used during an average week. The figure shows the type of knowledge, and the percentage of measures for which the node was ranked in the top three.

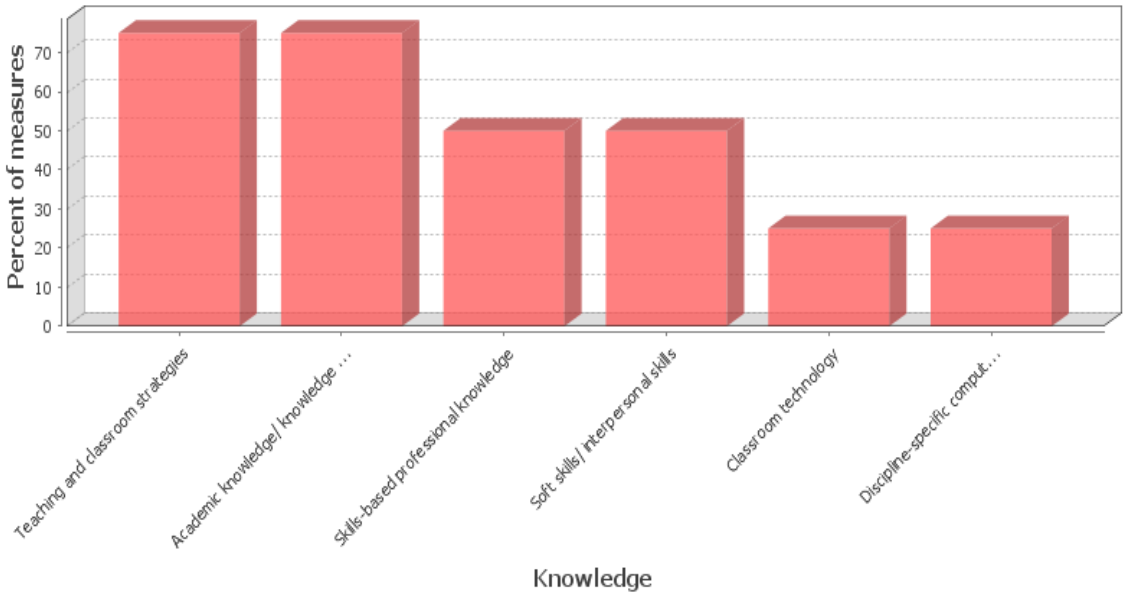


Figure 4.4

Recurring Top Ranked Knowledge

Teaching and classroom strategies and academic knowledge/knowledge of the discipline have the same occurrence rate. It seems logical that the two would appear together, because it is through teaching and classroom strategies that faculty convey the specific subject matter taught.

The next pair of recurring measures is skills-based professional knowledge—the knowledge faculty acquire while doing what they teach—and soft-skills/interpersonal skills. The hard skill/soft skill dichotomy reflects the yin and yang of teaching: faculty need specific discipline-based skill sets, yet they also need a universal set of interpersonal communication skills to be effective.

The last paring shown in Figure 4.4 reveals the role of technology in the community college. Faculty must have knowledge of classroom technology as well as discipline-specific computer hardware and software knowledge.

The Key Entities report for knowledge reveals the knowledge nodes that have the greatest connectivity to other nodes within the same network. Table 4.5 lists the knowledge nodes with the most connections within the same networks.

Table 4.5

Key Entities: Knowledge

Dominant Knowledge Node	**Total Degree Centrality**
Academic knowledge/knowledge of discipline	.66
Skills based professional knowledge	.60
Teaching and classroom strategies	.58
Soft skills/interpersonal skills	.49
Discipline-specific computer knowledge	.46

The order of knowledge in Table 4.5 differs from the order shown in Figure 4.4. Figure 4.4 is a measure of the of times given measures of importance listed given knowledge items as top three knowledge while Table 4.5 evaluates the centrality of given knowledge in the agent x knowledge network.

Meta-Network: Task

Tasks are the work faculty agents do as regular components of their jobs. In the qualitative survey, faculty were asked, “In what ways do your job tasks influence your

job satisfaction?" Faculty answers reflect passion for teaching and frustration with non-teaching job related tasks. Some examples of responses are:

1. "If given the time to teach, I am happy. If other duties interfere with the time to prepare and teach classes, I am not happy."
2. "If I like and enjoy what I am doing, it makes the job more enjoyable. For example, I enjoying teaching students based on my experience in this field and not just on what the textbook dictates. I like this combination and that leads to job satisfaction. These tasks also challenge me to improve daily and that drives satisfaction."
3. "I came here to teach. Teachers at this school do not get rewarded for their teaching. They get rewarded for the paper work and reports that justify other people's jobs. If the paper work, reports and meetings that have nothing to do with helping the students are done you are a hero. I love to teach. I find little satisfaction in filling out useless reports and answering stupid e-mails. My satisfaction based on what is expected of me is a zero. My job satisfaction from teaching in the classroom is a 10."
4. "My job satisfaction is improved when I am spending more time updating skills in my field as opposed to advising and serving on committees. Anything that I do in or outside of class that helps my students learn gives me satisfaction also since that is my primary goal and job function -–- to teach my students skills that they will need in the workplace."
5. "Teaching and interaction with faculty make my job the most satisfying."

6. "My job tasks have much to do with my satisfaction. Teaching is what I enjoy, all the bureaucratic posturing and paperwork that comes with it is what I loathe. There needs to be a balance of what happens from the top down, and what happens from the top up. I think that administration doesn't always have the understanding of what the actual end burden is to instructors when new forms, documents, or processes are required at the college level. Teaching my students and giving them feedback is my focus, all else is secondary."
7. "I love sharing and learning and I am a servant. I get to be me in the classroom (being instrumental in helping others achieve in their endeavors). I am constantly being amazed all over again sharing/learning new information with/ from my students."

The Meta-Network Key Entities is based on the second survey in this study, and reveals which tasks are most highly rated by respondents. The survey question used to generate this meta-network was, "Which tasks do you spend the most time on while doing your job in an average week?" The list of tasks from which faculty could chose were developed from answers to the first survey. Figure 4.5 shows the percentage of measures for which specific task nodes are ranked in the top three responses from faculty.

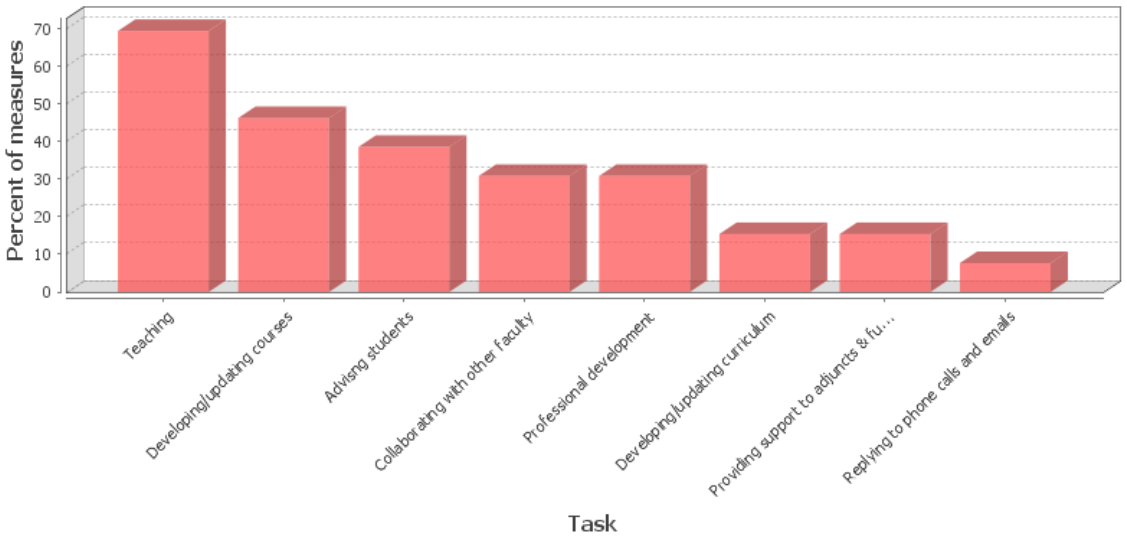


Figure 4.5

Recurring Top Ranked Tasks

It is not surprising that teaching is the task node most frequently listed in the top three because teaching is the primary role of faculty. Nodes listed as the second and fifth in occurrence, developing/updating courses and developing/updating curriculum, reveal that faculty perceive updating course and curricula content to be key components of their work. Faculty indicate interaction with others through advising students, collaborating with faculty, providing support to other instructors, and replying to phone calls and email is important. Finally, faculty perceive professional development: continuing education within academic disciplines, learning new technologies, learning pedagogical/ andragogical techniques, and so forth, to be important.

The Key Entities report of central tasks importance reveals different information than the network's top-ranked tasks, shown in Figure 4.5. Figure 4.5 shows the nodes

most frequently listed in the top three tasks, whereas Table 4.6 shows the nodes most connected to other nodes. Table 4.6 shows that teaching and collaborating with other faculty are connective nodes within networks (that is, they frequently connect individuals within the network). Other tasks that act as connections within networks are professional development and class preparation. Tasks listed in Table 4.6 bring together people, knowledge, resources, and more within the network.

Table 4.6

Key Entities: Task

Central Task Node	**Total Degree Centrality**
Teaching	.38
Collaborating with other faculty	.38
Professional development	.31
Preparing for class	.31
Developing and updating curriculum	.16

Meta-Network: Resources

Resources are what faculty need to do their day-to-day work. On the first survey, faculty provided information on the importance of resources. Faculty were asked, "How do resources influence your job satisfaction?" Responses ranged from a single word, "Greatly," to statements about how faculty use existing resources or wish they had more resources. Some exemplar responses are:

1. “These resources are tools to break up my lectures. All help me keep from sounding monotone and putting my students to sleep. These also introduce the student to outside opportunities.”
2. “I teach in a resource heavy program. The ability to get resources and supplies directly relate to what our students have hands on experience with. Our administration looks at numbers, but they only see what they want to see. They don’t see that our program doubled in student enrollment with only the addition of 4% to our budget. Again it is the fruit basket comparison. You can't look at me at the same way you look at other programs...so don’t try to make direct comparison. Put effort forth to understand what we are doing and why WE ARE SO SUCCESSFUL!”
3. “When I do not have the tools to complete my tasks, I feel frustrated. The policies and procedures at my college are not clear to me and lack consistency. Often I get conflicting advice on how to complete tasks. I feel that I lack the training to complete paperwork and other processes at my college.”
4. “I need access to the Internet to teach my class. The people listed provide me/keep me in access to my software. If I can keep them happy, they tend to keep me happy.”
5. “Would be nice to have higher up people to rely on or go to for advice. These people are over worked and under paid and can make it an unhappy place at times.”

The exemplars above reveal the importance of including resources in the Meta-Network. Clearly, the faculty make connections between resources and their job satisfaction. The faculty refer to people, the internet, information, advice, supplies and tools as resources, and several connect resources with both job satisfaction and leadership.

The Key Entities report from ORA identifies which resources faculty most often identified as necessary to their work. The resource nodes identified in Table 4.7 are those with the highest concentration of connections to other nodes within the same network. The resource node with highest total degree centrality is professional knowledge and expertise. This is a reiteration of the importance of professional knowledge, which was also shown in Table 4.5 and Figure 4.3.

Other resources that serve to connect people within networks are textbooks and other resources from publishers. Publisher materials, including online materials, and traditional textbooks often provide the framework within which faculty structure their courses, including lectures, assignments, and exams.

The resource node with the third-highest degree centrality is faculty who manage the department and/or division. Managers are resources that connect faculty with other faculty, knowledge, tasks, and resources. The last two nodes on Table 4.7 make reference to the role of technology available through the Internet and within faculty offices. Certainly computers and the Internet are tools necessary for faculty to do their jobs.

Table 4.7

Key Entities: Resource

Dominant Resource Node	Total Degree Centrality
Your professional knowledge and expertise	.58
Textbooks and other resources from textbook publishers	.35
Faculty who manage your department and/or division	.32
Internet resources	.31
Computers and other technology in your office	.27

Research Question One

The first question of study is, "How do network interactions relate to faculty job satisfaction?" Faculty job satisfaction is measured with two questions in the second survey. One question, OSAT, addresses overall job satisfaction: "What is your overall level of job satisfaction?" Faculty were asked to respond on a 10 point scale, with 1 representing "not satisfied" and 10 representing "highly satisfied." The second measure of faculty job satisfaction was a collection of eight questions from the Job Satisfaction Scale (JSS) (Spector, 1997). Specifically, subscales relating to beliefs about coworkers and beliefs about leaders were used. Faculty job satisfaction for the population of faculty respondents (n=34) is shown in Table 4.8.

Table 4.8

Faculty Job Satisfaction

Measure	Value	Description
OSAT	7.85	Average measure of overall faculty job satisfaction, scale 1-10
JSS	8.49	Average faculty job satisfaction from JSS instrument, scale 1-10

Faculty reported an average satisfaction score above the midpoint for both measures, indicating faculty have a moderately-high to high level of job satisfaction. Attributes of faculty with the highest average JSS scores are as follows: doctoral level education (JSS=9.18), male (JSS=8.66), teaching experience of at least 12 years as shown by faculty rank of Professor (JSS=8.89), and identification of the dean as leader (JSS=8.93). Identifying individual-level attributes contributing to job satisfaction is rudimentary and does not take in to account the complex interaction of network factors, however.

To understand the influence of multiple network factors on faculty job satisfaction, I applied the ORA Visualizer tool to the Agent by JSS Belief network, Agent by OSAT Belief network, added the Agent by Social Agent network, and then applied Newman Grouping algorithm. The Agent by Social Agent network was developed from the survey question, "Within an average week, with whom are you most likely to socialize?" Newman Grouping algorithm is "used to find clusters in a network" (Carley et al., 2011, p. 199). Within ORA, the Newman Grouping algorithm sorts the data into clusters one at a time until the optimal number is reached (Christiansen, 2011a). Sorting

is optimized when "each group is most homogenously aligned within the cluster group while heterogeneous from other groups" (p. 63).

Newman Grouping algorithm identified three clusters, thus revealing three distinct groups within the population. The clusters are visualized in Figure 4.6.

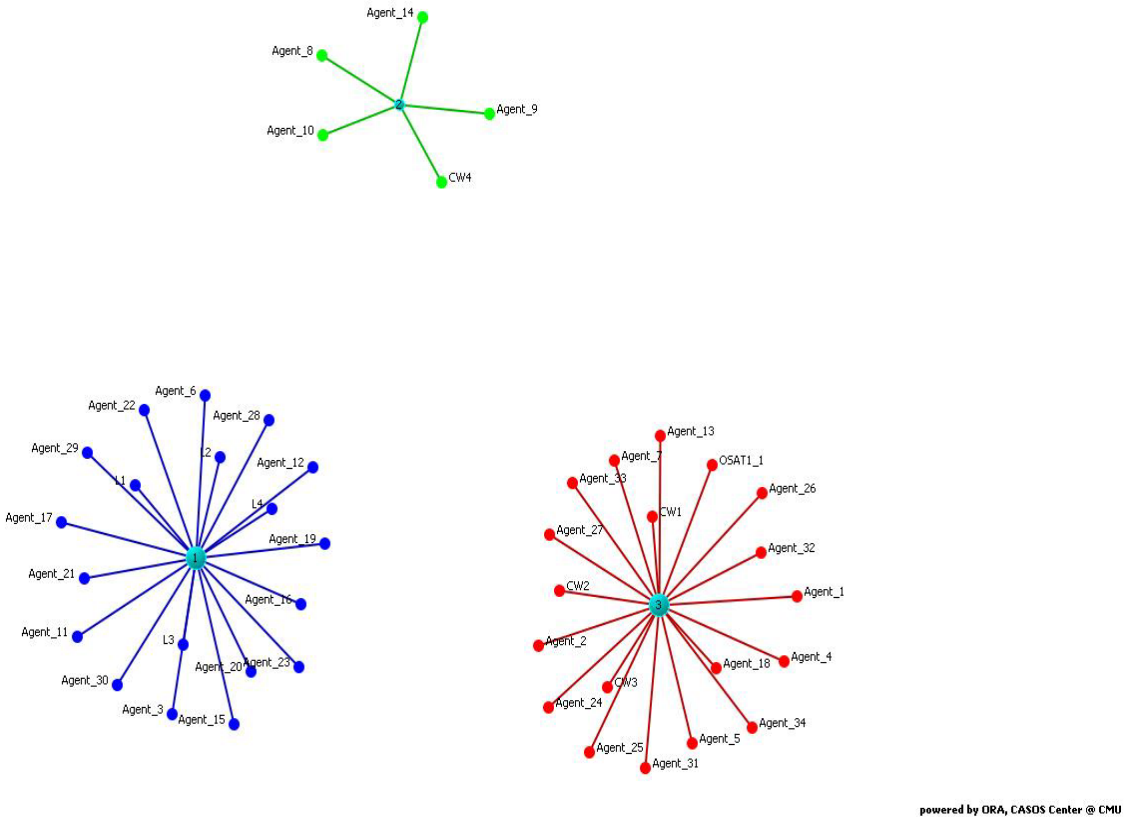


Figure 4.6

Visualization of Agent by Job Satisfaction Clusters

Visualization reveals clustering of agents around survey items. I will discuss how agents are clustered, the density and characteristics of each cluster, and will draw conclusions about collective behaviors and job satisfaction.

Clusters

Cluster 1 agents are grouped around job satisfaction items pertaining to perceptions of leaders, identified in the visualization as L1, L2, L3 and L4. The items are, "My leader is quite competent in doing his/her job," "My leader is unfair to me," "My leader shows too little interest in the feelings of subordinates," and "I like my supervisor."

Cluster 2 agents are grouped around one item pertaining to perception of coworkers, CW4. Item CW4 states, "There is too much fighting and bickering at work."

Cluster 3 agents are grouped around OSAT1, CW1, CW2, and CW3. OSAT1 addresses overall job satisfaction: "What is your overall level of job satisfaction?" The other items are, "I find I have to work harder because of the incompetence of the people I work with," "I like the people I work with," and "I enjoy my coworkers."

The Newman's Grouping algorithm revealed groupings relative to the leader and coworker items in the JSS scale. A closer examination of the leader and coworker subscales can be found in Table 4.9.

Table 4.9 reveals agents in Cluster 1, grouped around leader items on the survey, have high job satisfaction, strong positive perceptions of coworkers, but less positive perceptions of leaders. Agents in Cluster 2, grouped around a single coworker item, have

slightly lower job satisfaction than Cluster 1, higher perceptions of leaders, but lower perceptions of coworkers. Agents in Cluster 3, clustered around three coworker items and one overall job satisfaction item, have the lowest mean job satisfaction, high perceptions of leaders, and the lowest perceptions of coworkers.

Table 4.9

JSS Subscales by Cluster

Cluster	**Mean JSS**	**Mean Leader Subscale**	**Mean Coworker Subscale**
Cluster 1 n-=15	8.73	8.42	9.05
Cluster 2 n=4	8.69	9.00	8.37
Cluster 3 n=15	8.18	9.07	7.30

Clusters 1 and 3 each have 15 members, while Cluster 2 has four. An examination of network characteristics of clusters, and of faculty characteristics within clusters, reveals additional information: Clusters differ by network density, speed of information flow, perceived leader, co-location, and job satisfaction (Table 4.10).

Table 4.10

Summary of Job Satisfaction with Application of Social Network

Network	OSAT Mean (Scale 1-10)	JSS Mean (Scale 1-10)	Person Who Selected as Leader the:			
			Pres.	Dean	Assist. Dean	Dept. Head
Meta-Network	7.86	8.49	9% (n=3)	29% (n=10)	21% (n=7)	41% (n=14)
OSAT, JSS, & Social Network						
Cluster 1 (n=15)	8.50	8.73	7% (n=1)	27% (n=4)	7% (n=1)	60% (n=9)
Cluster 2 (n=4)	6.75	8.69	0% (n=0)	25% (n=1)	25% (n=1)	50% (n=2)
Cluster 3 (n=15)	7.40	8.18	13% (n=2)	33% (n=5)	33% (n=5)	20% (n=3)

Clusters also differ in Agent by Agent network density and the speed of communication within Agent by Agent networks within the clusters. Differences among clusters and with the Meta-Network are shown in Table 4.11.

Table 4.11

Summary of Job Satisfaction, Network Density, Congruence and Communication Speed

	Meta-Network	**Cluster 1**	**Cluster 2**	**Cluster 3**
Size	34	15	4	15
Measure				
OSAT Mean (scale 1-10)	7.86	8.50	6.75	7.40
JSS Mean (scale 1-10)	8.49	8.73	8.69	8.18
Social Network Density	0.05	0.08	0.08	0.10
Confide Network Density	0.04	0.06	0.08	0.07
Loyalty Network Density	0.09	0.13	0.17	0.10
Average Communication Speed for Social Network	0.34	0.73	1.00	0.49
Average Communication Speed for Confide Network	0.35	0.63	1.00	0.58
Average Communication Speed for Loyalty Network	0.37	0.86	1.00	0.55

Cluster 1 (n=15) is slightly denser than the Meta-Network across all Agent by Agent networks. Information flows through Cluster 1 more quickly than through the Meta-Network. Communication speed is nearly twice that of the Meta-Network in the Agent by Confide Agent network. Information travels more than twice as quickly through the Agent by Social Agent (.73) and Agent by Loyalty Agent (.86) networks than through the Meta-Network (.34 and .37, respectively).

Cluster 1 has higher mean job satisfaction than that of the Meta-Network, and has highest average OSAT and JSS scores of the clusters. Cluster 1 agents predominantly identify department heads as leaders (60%, n=9), followed by the dean (27%, n=4). The assistant dean and president each are identified as leader by one agent (7%).

Cluster 2 (n=4) has the lowest mean OSAT (6.75), lower than that of the Meta-Network. The mean JSS (8.69) is higher than that of the Meta-Network, however. In other words, agents in this cluster report low job satisfaction on the singe-item satisfaction measure, but report high satisfaction on the eight-item satisfaction measure. A closer examination of responses reveals the Cluster 2 OSAT mean is low because one member rated his or her overall job satisfaction very low, a 3 out of 10.

Half of Cluster 2 identifies department heads (n=2), one identifies the dean (25%), and one identifies an assistant dean (25%) as leader. Two members of the cluster are co-located.

Cluster 3 (n=15) network density is relatively high, higher than the network density of all Agent by Agent networks in the Meta-Network. The Agent by Social Agent network density is twice that of the Meta-Network. Communication speed of Cluster 3 is faster than that of the Meta-Network, but slower than either of the other networks.

Cluster 3 has a lower mean OSAT (7.40) and JSS (8.19) than the Meta-Network. Two agents identify the president (13%), three identify department heads (20%), and five each (33%) identify the dean and assistant deans as leaders.

Further information about the research question: "How do network interactions relate to faculty job satisfaction" can be obtained by examining the Key Entities report (which identifies the most influential people) the reports on most strongly held beliefs in networks, and the Belief Propagation report (dynamic analysis of belief propagation through social networks) (Carley et al., 2011). Key Entities report reveals a snapshot of

influence networks, while the Belief Propagation report show the influence of agents on Agent by Belief networks over time.

The Key Entities report reveals significant homogeneity in faculty responses to the JSS questions on the survey. Across the total network, each of the eight job satisfaction items are viewed positively. A few items do exhibit a moderate degree of contention, however (Table 4.11).

The most contentious nodes are items in the JSS survey labeled CW1, L3, and CW4. The CW1 survey item is, "I find I have to work harder at my job because of the incompetence of people I work with." L3 item is, "My supervisor shows too little interest in the feelings of subordinates." CW4 is, "There is too much bickering and fighting at work."

Table 4.12 shows the outcome of the Belief Propagation algorithm for belief contention and dispersion. *Contention* is a variance in belief values, while *dispersion* is dispersion of contention in the network (Carley et al., 2011).

Table 4.12

Faculty Job Satisfaction Belief Propagation Measures

Item	Initial	Final	Percent Change
CWI			
Contention	2.99	1.94	-35.18%
Dispersion	2.82	2.70	-4.27%
L3			
Contention	2.82	2.21	-21.66%
Dispersion	3.09	2.86	-7.56%
CW4			
Contention	2.735	2.24	-18.08%
Dispersion	3.03	2.98	-1.72%

ORA's Belief Propagation report projects changes in beliefs over time and identifies who is influential in changing the beliefs of others. Table 4.13 shows, for each item, who changed, the type of change, and the cause of change. While the Belief Propagation report can run for a maximum of 100 iterations, the table only reports changes for the first iteration of the analysis.

Table 4.13

Agent by JSS Belief Propagation: Who Changed Whose Opinion in First Iteration

Item	Who Changed	Type of Change	Cause of Change
CWI			
	Agent 3	Negative to positive	Agent 15 (42%) Agent 30 (42%) Agent 20 (12%)
	Agent 21	Negative to positive	Agent 2 (29%) Agent 7 (23%) Agent 15 (22%)
	Agent 22	Negative to positive	Agent 29 (63%) Agent 33 (23%) Agent 14 (14%)
L3			
	Agent 22	Negative to positive	Agent 17 (40%) Agent 14 (13%) Agent 29 (13%)
	Agent 26	Negative to positive	Agent 32 (49%) Agent 33 (45%) Agent 18 (4%)
CW4			
	Agent 3	Negative to positive	Agent 15 (31%) Agent 30 (31%) Agent 21 (25%)
	Agent 17	Negative to positive	Agent 2 (61%) Agent 22 (20%) Agent 21 (15%)
	Agent 26	Negative to positive	Agent 33 (51%) Agent 32 (44%) Agent 18 (4%)

The belief propagation report also reveals information about the collectivist dynamics involved with changing beliefs. In the next few paragraphs, relationships among the belief changers and those who are changed are explored.

For item CW1, Agent 3 is influenced from a negative to a positive belief due to influence of Agents 15, 30, and 20. Agents 3, 15, 20, and 30 are all in Cluster 3, described above. Also, agents 15 and 20 work in the same physical location as Agent 3.

Agent 21 is influenced from a negative to positive belief due to the influence of Agents 2, 7, and 15. Agent 21 is in Cluster 3 with Agent 15, and is co-located with Agents 15 and 2. Agent 21's relationship with Agent 7 is unclear.

Agent 22 is influenced from a negative to positive belief due to the influence of Agents 29, 33, and 14. Agent 22 is in Cluster 3 with Agent 29, and is co-located with Agents 29 and 14. Agent 22's relationship with Agent 33 is unclear.

Agents 22 and 26 are influenced to change beliefs on item L3. Agent 22 is influenced by Agents 17, 14, and 29. Agent 22 is in Cluster 3 with Agents 17 and 29, and is co-located with Agents 14 and 29.

Agent 26 is influenced to change beliefs on item L2 by Agents 32, 33, and 18. All four agents are in Cluster 1.

Contentious item C4 is the item around which Cluster 2 agents group, yet none of the agents in Cluster 2 are influenced to change beliefs. Agents 3, 17, and 26 are influenced to change their beliefs on item CW4. Agent 3 is influenced by Agents 15, 30 and 21, all who are in Cluster 3. Also, Agent 3 is co-located with agents 15 and 21.

Agent 17 is influenced by Agents 2, 22, and 21. Agents 17, 22 and 21 are all in Cluster 3, and Agent 17 is co-located with Agents 2 and 21. Agent 26 is again influenced by Agents 33, 32, and 18, all agents in Cluster 3.

ORA's Belief Propagation algorithm allows for identification of relationships within groups that might not otherwise be noticed. In this case, it revealed that 23 of the 24 influencers are connected to the influenced through cluster groupings, co-location, or both.

Summary

Research Question 1 is, "How do network interactions relate to faculty job satisfaction?" Because faculty generally report a high level of satisfaction and because agents within the network state they do not interact (the low centrality coefficients reported earlier), teasing out network dynamics relating to job satisfaction is difficult.

The Newman Grouping algorithm of components of job satisfaction reveals agents in Cluster 1, grouped around survey items relating to perceptions of leaders, have the highest job satisfaction, lowest perception of leaders and highest perception of coworkers. Agents in Cluster 2, clustered around a single coworker item, have slightly lower mean JSS and subscales than Cluster 1. Cluster 3, grouped around the single-item measure of job satisfaction and three items relating to coworkers, have the lowest level of job satisfaction, the highest perception of leaders, and the lowest perception of co-workers.

The Belief Propagation algorithm reveals that the influencing of beliefs happens in the presence of physical co-location and co-location within clusters. Also, co-location is correlated with ratings of job satisfaction. Faculty who work together tend to report similar levels of job satisfaction, and job satisfaction differs across locations.

Research Question Two

The second research question is, "How do beliefs about LMX relationships relate to network interactions?" Faculty perceptions of their relationships with leaders was assessed through a modified version of the LMX-7, the seven-item LMX instrument (Graen & Uhl-Bien, 1995). Each of the seven questions was answered on a five-point scale.

LMX scores can be used in two ways. The first method is to sum the answers yielding one LMX score, and the second is to use answers to each question as nodes for the Meta-Network. First I used the summary approach. Potential scores range from 7 to 35; the actual score range is 14-35 with a mean of 28.03, median is 29.5, and modes of 33 and 34 (n=4 for both).

The second way to use LMX scores is to use answers to each question as nodes. Use of individual item scores provides more data points and allows for understanding of specific items of agreement and items of contention within the survey. Therefore, in analysis of the Agent by LMX Belief network data, I chose to use each of the seven items as separate nodes.

Clusters

To understand the influence of network factors on faculty perceptions of their relationships with their leaders, I applied the ORA Visualizer tool to the Agent by LMX Belief network, added the Agent by Social Agent network to account for the influence of social relationships, and then applied Newman Grouping algorithm. Newman Grouping

algorithm identified four clusters, revealing four distinct groups within the population. A visualization of the clusters is found in Figure 4.7.

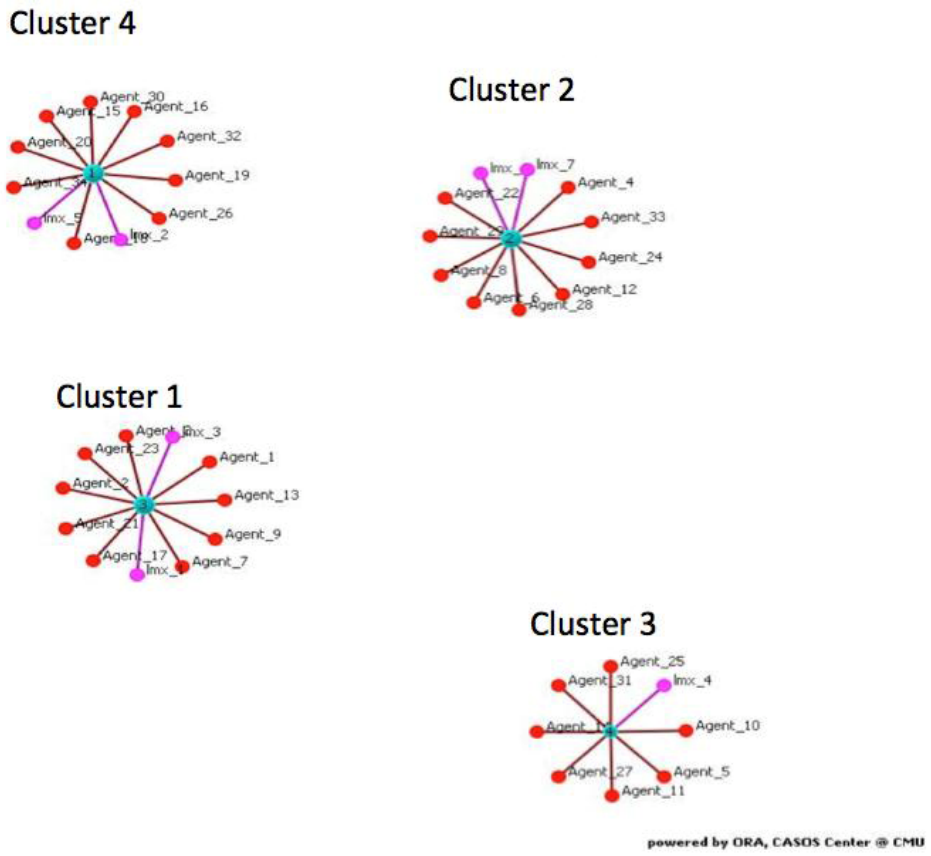


Figure 4.7

Visualization of Agent by LMX Belief and Agent by Social Agent Networks

Summary results of the Newman Grouping algorithm outcome are in Table 4.14, along with the results for the Meta-Network, provided for reference.

The mean Meta-Network score is 28.03, revealing faculty members overall have a high perception of the leader-member relationship. The mean LMX scores of Clusters 1

and 4 are above the Meta-Network mean, and the mean scores of 2 and 3 are below the mean. Table 4.13 reveals details, as well as who cluster members identified as leaders.

Table 4.14

Summary of LMX with Application of Social Network

Network	LMX Mean (Scale 1-35)	Person Who Selected as Leader the:			
		Pres.	**Dean**	**Assist. Dean**	**Dept. Head**
Meta-Network	28.03	9% (n=3)	29% (n=10)	21% (n=7)	41% (n=14)
LMX & Social Network					
Cluster 1 (n=9)	30.11	0% (n=0)	11% (n=1)	44% (n=3)	41% (n=14)
Cluster 2 (n=9)	27.78	0% (n=0)	44% (n=4)	11% (n=1)	56% (n=5)
Cluster 3 (n=7)	23.57	14% (n=1)	43% (n=3)	14% (n=1)	44% (n=4)
Cluster 4 (n=9)	29.67	22% (n=2)	33% (n=2)	11% (n=1)	33% (n=3)

Additional information about faculty perceptions of their relationships with their leaders can be found by comparing Agent by Agent network densities and average communication speeds. That information can be found in Table 4.15.

Table 4.15

Summary of LMX, Network Density, Congruence, and Communication Speed

	Meta-Network	**Cluster 1**	**Cluster 2**	**Cluster 3**	**Cluster 4**
Size	34	9	9	7	9
Measure					
LMX Mean (scale 1-35)	28.03	30.11	27.78	23.57	29.67
Social Network Density	0.05	0.08	0.24	0.10	0.13
Confide Network Density	0.04	0.07	0.13	0.02	0.42
Loyalty Network Density	0.09	0.15	0.14	0.00	0.19
Average Communication Speed for Social Network	0.34	0.80	0.64	0.83	0.75
Average Communication Speed for Confide Network	0.35	1.00	0.70	1.00	1.00
Average Communication Speed for Loyalty Network	0.37	0.51	0.81	0.00	1.00

Cluster 1 (n=9) is grouped around LMX items 1 and 3. LMX item 1 is, "Do you know where you stand with your leader…do you usually know how satisfied your leader is with what you do?" LMX item 3 is, "How well does your leader recognize your potential?"

Cluster 1 has the highest average LMX score (30.11). All Agent by Agent network density measures are above that of the Meta-Matrix. Speed for Agent by Social Agent is 0.80, Agent by Confide Agent network is 1.0 and Agent by Loyalty Agent is 0.51.

Eight faculty indicate assistant deans (44%) or department heads (56%) as leaders. One faculty (11%) identifies the dean as leader. Four respondents, all with

masters' degrees, are co-located on one floor. Three respondents, all with doctoral degrees are co-located on another floor.

Cluster 1 members perceive strong leader/member relationships with their leaders. There is higher network density and communication speed in Cluster 1 than for the Meta-Network as a whole, and seven of the nine members in this cluster are co-located with other members of the cluster.

Cluster 2 (n=9) is grouped around LMX items 6 and 7. LMX item 6 is, "I have enough confidence in my leader that I would defend and justify his/her decision if he/she were not present." LMX item 7 is, "How would you characterize your working relationship with your leader?"

Cluster 2 (n=9) has an average LMX score of 27.78, lower than that of the Meta-Network. Agent by Agent network densities are higher than those of the Meta-Network. The Agent by Social Agent network density is very high, 0.24, compared with 0.05 for the Meta-Network. Speed of communication is higher than the Meta-Network mean for all Agent by Agent networks.

Equal numbers of faculty in Cluster 2 identify the dean and department heads as leaders (44%, n=4), while 11% (n=1) identifies an assistant dean as leader. Six of the nine respondents are co-located on one floor. Five of the six are male with masters' degrees. The other respondent did not report educational attainment or gender.

Cluster 3 is grouped around a single LMX item, item 4. LMX item 4 is, "Regardless of how much formal authority he/she has built into his/her position, what are

the chances that your leader would use his/her power to help you solve problems in your work?"

Cluster 3, the smallest of the four groups (n=7), has the lowest average LMX score at 23.47. Agent by Social Agent network density (0.10) is twice that of the Meta-Network, but Agent by Confide Agent network density (0.02) is half that of the Meta-Network. Agent by Loyalty Agent network density is 0.00. Communication speed is high for Agent by Social Agent network (0.83) and for Agent by Confide Agent network (1.00), but is 0.00 for Agent by Loyalty Agent network.

This group has the greatest percentage of respondents identifying the dean as their leader (43%) and the lowest percentage of respondents identifying department heads as leaders (29%). The majority of respondents (57%) identified the president or dean as leader, while only 43% identified the department head or assistant dean as leader.

Six of the seven faculty in Cluster 3 are female. One person did not identify a gender. Six locations are represented in Cluster 3.

This cluster is grouped around a question involving trust in a leader to help solve problems, yet they lack network density for loyalty. No one in this cluster thinks anyone else in the cluster is looking out for them or will "have their backs." They do, however, think their leaders have their backs. The Meta-Network mean for LMX item 4 is 4.11, and the mean for Cluster 3 is 4.14, slightly above the norm for the population.

Cluster 4 is grouped around LMX items 2 and 5. LMX item 2 is, "How well does your leader know your job problems and needs?" LMX item 5 is, "Again, regardless of

the amount of formal authority your leader has, what are the chances that he/she would "bail you out" at his/her expense?

Cluster 4 (n=9) has an average LMX score of 29.67, higher than the average score for the Meta-Network (28.03). All Agent by Agent network densities are higher than that of the Meta-Network. The Agent by Confide network is especially high, with a cluster mean of 0.42, compared with the Meta-Network mean of 0.04.

Communication speeds are high also. Agent by Social Agent communication speed is 0.75, and communication speeds for Agent by Confide Agent and Agent by Loyalty network are both 1.0, the highest possible speed.

Equal percentages of respondents identified department heads and the dean as leaders (33%). One person (11%) identified an assistant dean as leader, while two (22%) identified the president.

Cluster 4 is predominantly male (n=5). Only two faculty report graduate level education (master's n=1, doctorate n=1). Cluster 4 has less complete attribute data than other clusters because faculty declined to provide information for seven attribute nodes. The sum of not-answered-questions for the other three nodes is seven. In other words, faculty that comprise Cluster 4 declined to answer as many attribute questions as the total for the other three clusters.

As with research Question 1, additional network data can be obtained from ORA reports. The Key Entities report reveals that the Agent by LMX Belief network views each of the seven LMX items positively. Nonetheless, two survey items, LMX items 3 and 5, are more contentious than others. Item 3 asks, "How well does you leader

recognize your potential?" Item 5 asks, "Again, regardless of the amount of formal authority your leader has, what are the chances that he/she would 'bail you out' at his/her expense?"

A belief propagation report of the Agent by LMX Belief network results in information about the belief distribution at initial and final time periods of the algorithms' iterations. The results are in Table 4.16.

Table 4.16

LMX Belief Propagation Measures

Item	Initial	Final	Percent Change
LMX3			
Contention	1.10	1.01	-7.86%
Dispersion	0.79	0.77	-3.55%
LMX5			
Contention	1.07	0.76	-29.25%
Dispersion	0.50	0.48	-4.06%
LMX2			
Contention	0.91	0.71	-21.34%
Dispersion	0.77	0.73	-4.98%

There was a small decrease over time in agents' contention about LMX3, which is, "How well does your leader recognize your potential?" There were no changes in iteration 1. In iteration 2, Agent 32's belief changed to a "strong positive" due to the influence of Agents 22 (88%) and 18 (11%). Agent 32 is in Cluster 4 with Agent 18 and is co-located with Agent 22.

Belief propagation resulted in greater change in agents' beliefs regarding LMX5, which is, "Again, regardless of how much formal authority he/she has built into his/her

position, what are the chances that your leader would use his/her power to help you solve problems at work?" It is around this item that Cluster 3 is grouped.

In the first iteration, Agent 1's belief changed from "negative to positive" due to interaction with Agents 19 (62%), 32 (26%), and 26 (9%). Agent 1 is not in Cluster 3, but in Cluster 1. All the influencing agents are grouped together in Cluster 4. Agent 1 is co-located with Agents 19 and 26. There is no obvious connection to Agent 32.

Agent 3 changed from "negative to positive" as a result of interaction with Agents 15 (45%), 30 (45%), and 20 (6%). Agent 3 is in Cluster 1, while Agents 15, 30, and 20 are in Cluster 4. Agent 3 is co-located with Agent 15 and 20. There is no obvious connection to Agent 30.

Agent 9's belief changed to "strong positive" because of interaction with Agents 7 (59%), 13 (35%), and 18 (4%). Agent 9 is in Cluster 1, along with Agents 7 and 13. Agents 9, 7, and 13 are also co-located. There is no obvious connection to Agent 18.

The third contentious item is LMX2, which is, "How well does your leader know your problems and needs?" In the first iteration, Agent 19 was influenced by Agent 32 (48%), Agent 26 (25%), and Agent 16 (21%). All four agents are in Cluster 4, and Agent 19 is co-located with Agent 26.

Agent 22 was influenced by Agent 17 (52%), Agent 14 (17%), and Agent 33 (17%). Agent 22 is in Cluster 2, along with Agent 33. Agent 22 is co-located with Agent 14. There is no obvious relationship with Agent 17.

Summary

The research question under consideration is, "How do beliefs about LMX relationships relate to network interactions?" Newman's grouping algorithm data reveals that the two clusters with the highest LMX means, made up of 18 of the 34 faculty, contain eight of the 14 (57%) faculty identifying department heads and four of the seven (57%) faculty identifying assistant deans as leaders. Only 22% (n=4) of faculty in the two clusters (n=18) identified the dean or president as leaders. The implication is that faculty who perceive their leaders to be at lower levels of the organizational structure, therefore more visible, accessible, and more likely to be co-located, have a higher perception of their relationships with their leaders than those who perceive their leaders to be higher in the organizational structure.

In support of the implication that faculty who perceive their leaders to be higher in the organizational structure have perceptions of lower-quality relationships with their leaders, eight agents in the two clusters with means LMX lower than that of the Meta-Network, Clusters 2 and 3, identify the dean or president as the leader. Eight of the 16 faculty in Clusters 2 and 3, 50%, identify individuals higher in the organizational structure, therefore are less likely to have frequent contact with their leaders.

A collectivist concept that appears from the both the Belief Propagation report and Newman Grouping algorithm is co-location. Co-location and grouping in clusters were present in belief propagation iterations.

Other clear collectivist dynamics are apparent from the use of Newman Grouping algorithm. Clusters 1 and 4, those with the highest LMX means have a total of 18 faculty.

Of those 18, seven are co-located. All faculty who work in that location are in either one of the two clusters. Clusters 2 and 3 are composed of 16 faculty. Seven of them are co-located. Only one person from that location is in another cluster, Cluster 4. Three of four faculty from another location are grouped in Cluster 1. A pair of two faculty who are co-located, the only survey respondents from that area, are grouped together in Cluster 4. Undoubtedly, collectivist dynamics are evidenced.

Research Question Three

The third research question is, "How do beliefs about LMX relationships relate to job satisfaction?" This question links the concepts of faculty job satisfaction with LMX scores, which reflect faculty perceptions of the quality of relationships with their leaders.

Clusters

To explore this relationship, I applied the Newman Grouping algorithm to the Agent by LMX Belief, Agent by JSS Belief, Agent by OSAT Belief, and Agent by Social Agent networks. Newman Grouping algorithm identified three clusters, as visualized in Figure 4.8. As in the previous Newman Grouping algorithm reports, clusters of agents are grouped around items from the survey. Conclusions can be drawn about collectivist dynamics impacting faculty job satisfaction and faculty perceptions of their relationships with leaders from the analysis.

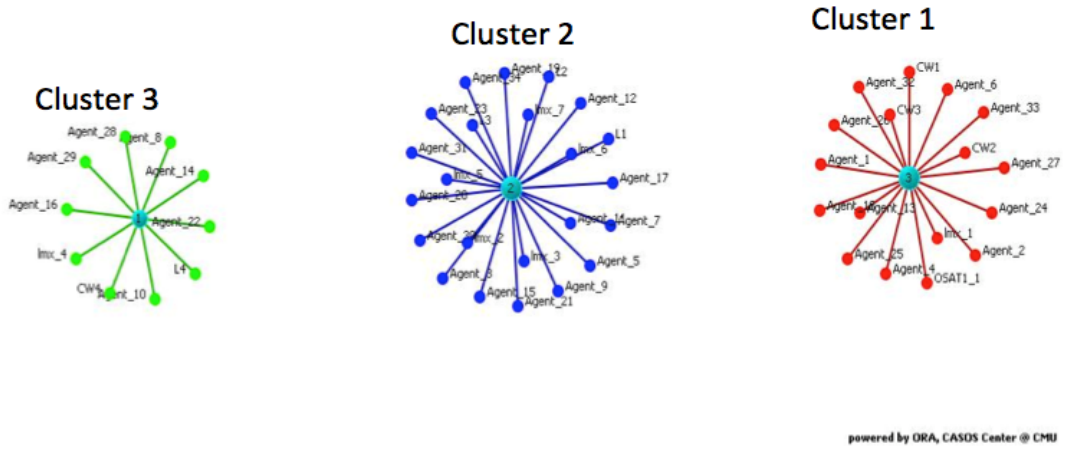


Figure 4.8

Visualization of Agent by LMX Belief, Agent by JSS Belief, Agent by OSAT Belief, and Agent by Social Agent Networks

Tables 4.17 and 4.18 provide additional valuable information about Clusters 1-3. Table 4.17 shows the LMX, OSAT and JSS for each cluster, as well as leader identification for each cluster. Table 4.18 shows Agent by Belief means, Agent by Agent network density, and Agent by Agent network communication speeds.

Table 4.17

Summary of JSS, OSAT, and LMX

Network	LMX Mean (Scale 1-35)	OSAT Mean (Scale 1-35)	JSS Mean (Scale 1-35)	Person Who Selected as Leader the:			
				Pres.	Dean	Assist. Dean	Dept. Head
Meta-Network	28.03	7.86	8.49	9% (n=3)	29% (n=10)	21% (n=7)	41% (n=14)
LMX, OSAT, JSS, & Social Networks							
Cluster 1 (n=12)	27.50	8.50	8.64	8% (n=1)	25% (n=3)	25% (n=3)	42% (n=5)
Cluster 2 (n=15)	29.53	7.87	8.52	7% (n=1)	27% (n=4)	20% (n=3)	47% (n=5)
Cluster 3 (n=7)	25.71	6.71	8.16	14% (n=1)	57% (n=4)	0% (n=0)	29% (n=2)

Key Entities report in ORA provides additional information on the clusters. That information is reported in Table 4.18.

Table 4.18

Agent by Belief Means, Agent by Agent Network Density, and Agent by Agent Network Communication Speeds

	Meta-Network	**Cluster 1**	**Cluster 2**	**Cluster 3**
Size	34	12	15	7
Measure				
LMX Mean (scale 1-35)	28.03	27.50	29.53	25.71
OSAT Mean (scale 1-10)	7.83	8.50	7.87	6.71
JSS Mean (scale 1-10)	8.49	8.64	8.52	8.16
Social Network Density	0.05	0.08	0.08	0.14
Confide Network Density	0.04	0.05	0.05	0.10
Loyalty Network Density	0.09	0.12	0.10	0.14
Average Communication Speed for Social Network	0.34	0.77	0.46	0.80
Average Communication Speed for Confide Network	0.35	0.88	0.81	0.83
Average Communication Speed for Loyalty Network	0.37	0.90	0.40	1.00

Cluster 1 is grouped around three survey items, LMX4, L4, and CW4. The items are:

1. LMX4: "Regardless of how much formal authority he/she has built into his/her position, what are the chances that your leader would use his/her power to help you solve problems in your work?"
2. L4: "I like my supervisor."
3. CW4: "There is too much bickering and fighting at work."

Cluster 1 has a mean LMX (27.50) lower than that of the whole Meta-Network (28.03), yet the mean OSAT (8.50) and JSS (8.64) are higher. This finding is consistent with those in research Question 1, where the Cluster 1, grouped around leader subscale items from the JSS survey, had lower mean leader scores than other clusters.

Cluster 1 Agent by Agent network densities are higher than that of the Meta-Network. Agent by Agent communication speeds are more than twice that of the Meta-network, revealing rapid information transmittal through the cluster.

The majority of faculty in this cluster identify an assistant dean or department head as leader (67%, n=8), while 33% (n=4) identify the dean or president as leader. Cluster 1 is predominantly male (n=7) and respondents have offices in six of the eight possible locations. All faculty ranks are represented.

Cluster 2 is clustered around eight survey items, all addressing faculty perception of leaders. Specifically, Cluster 2 is clustered around LMX2, LMX3, LMX5, LMX6, LMX7, L1, L2, and L3. The survey items are:

1. LMX2: “How well does your leader know your job problems and needs?”
2. LMX3: “How well does your leader recognize your potential?”
3. LMX5: “Again, regardless of the amount of formal authority your leader has, what are the chances that he/she would "bail you out" at his/her expense?”
4. LMX6: “I have enough confidence in my leader that I would defend and justify his/her decision if he/she were not present.”

5. LMX7: “How would you characterize your working relationship with your leader?”
6. L1: “My supervisor is quite competent in doing his/her job.”
7. L2: “My supervisor is unfair to me.”
8. L3: “My supervisor shows too little interest in the feelings of subordinates.”

Cluster 2, the largest cluster (n=15), has a mean LMX score (29.53) higher than that of the Meta-Network (28.03) and higher than the other clusters, revealing the highest quality relationship with leaders. The mean OSAT (7.87) is barely above that of the Meta-Network (7.86). Cluster 2 mean JSS (8.52) is also above the Meta-Network mean (8.49).

Cluster 2 Agent by Agent network densities are slightly above those of the Meta-Network. Speed of communication within the cluster by Agent by Agent networks is above those of the Meta-Network, but slower than that of the other two clusters.

Most faculty in this cluster identify assistant deans (20%, n=3) or department heads (47%, n=7) as leaders. Four identify the dean as leader (27%), and one identifies the president (7%).

One-third (n=5) of the members of Cluster 2 are co-located, and four of the five co-located faculty are male, while the fifth did not identify gender. Seven have masters’ and two have doctorate degrees.

Cluster 3 is grouped around five survey items, CW1, CW2, CW3, LMX1 and OSAT. The items are:

1. CW1: “I find I have to work harder at my job because of the incompetence of people I work with.”
2. CW2: “I like the people I work with.”
3. CW3: “I enjoy my coworkers.”
4. LMX1: “Do you know where you stand with your leader…do you usually know how satisfied your leader is with what you do?”
5. OSAT: “What is your overall level of job satisfaction?”

Cluster 3 (n=7) is least satisfied across all measures. Means of LMX (25. 51), OSAT (6.71) and JSS (8.16) are lower than those of the Meta-Network and lower than any other cluster. Agent by Agent network densities are higher than those of the Meta-Network and of any other cluster. Communication through Agent by Agent networks is high, especially for the Agent by Confide agent (0.83) and Agent by Social Agent (1.00) networks.

Two faculty identify department heads (29%), four identify the dean (57%) and one identifies the president (14%) as leaders. In other words, only 29% (n=2) identify the lowest level of leadership, the department head, as a leader.

The majority of Cluster 3 (57%, n=4) is co-located. Six of the seven in Cluster 3 have masters’ degrees, while one did not report level of education. None of the faculty in Cluster 3 reports the rank of Professor, indicating those in the cluster are beginning or mid-level teaching professionals.

Cluster 3, a tightly-knit cluster with low job satisfaction and low LMX (relative to other clusters), illustrate how network density can work to the detriment of individuals

within the network and to the institution as a whole. Cluster 3 is largely co-located. Communication is rapid, especially through the Agent by Loyalty Agent network, indicating faculty may feel they are united together against an opposing hostile force. They are united in their unhappiness, revealing that misery loves company, especially miserable company.

Summary

The research question discussed in this section is, "How do beliefs about LMX relationships relate to job satisfaction?" To address the question, Newman Grouping algorithm was applied to Agent by LMX Belief, Agent by JSS Belief, Agent by OSAT Belief, and Agent by Social Agent networks. Additional information is provided from the Key Entities reports from ORA. The Belief Propagation report is not helpful for understanding this meta-network because the report would reveal the three most contentious beliefs of the 16 included in this question, and they are identical to those of Question 1.

Two of the three clusters reveal a correlation between LMX and job satisfaction. Cluster 2, the largest cluster, has the highest mean LMX of the clusters and OSAT and JSS means above those of the Meta-Network. Cluster 3 has the lowest mean LMX and OSAT and JSS means well below those of the Meta-Network. The trend is not shown in Cluster 1 however, in which the LMX mean is below that of the Meta-Network, but there the OSAT and JSS means are high. Cluster 1 LMX mean is 0.53 below the Meta-

Network mean of 28.03. Nonetheless, evidence from Newman Grouping algorithm and Key Entities report shows a correlation between LMX and job satisfaction.

Analysis of data from the three clusters underscores collectivist themes addressed in the other two questions. The first theme is the relationship between network density and other measures. A moderately dense network such as Cluster 2 can be composed of agents who have high job satisfaction and positive perceptions about their relationships with their leaders, or a dense network can be composed of a tightly knit group of unhappy agents, such as Cluster 3.

Another collectivist theme evidenced in the results of these analyses is that of co-location. Faculty who are co-located tend to have similar perceptions of their environments, leaders, and co-workers.

Validity and Trustworthiness of the Study

Cresswell suggests the qualitative researcher avoid positivistic language used by quantitative researchers, such as objectivity, reliability, and validity in the traditional empirical sense, and instead describe research design and process so the reader can assess the accuracy of the conclusions drawn by the researcher (Creswell, 2007, 2009). A more acceptable term is trustworthiness of the conclusions, and multiple approaches to assuring qualitative validity (or trustworthiness) were used in this study.

Several people coded responses to the first study, cross-checked coding, and enabled me to achieve intercoder agreement (Creswell, 2009; Strauss & Corbin, 1998). Multiple data sources were used (triangulation; Creswell, 2009; LeCompte & Schensul,

1999), including two measures of job satisfaction (OSAT and JSS) and narrative descriptions of the connections between job satisfaction and knowledge, resources and skills. Furthermore, I explicitly described my position in the study, stating my role at Community College, my background, and my biases. As a participant researcher, I have spent extended time in the field thus have developed an in-depth knowledge of the dynamics described, as suggested by Creswell (2007, 2009). Finally, I was assisted in the study by external auditors, co-researchers not embedded in the study, who are experienced in qualitative research, satisfaction research, and dynamic network analysis. The use of external auditors enhances the overall validity of qualitative studies, according to Creswell (2009). Results were presented to several faculty members (member checking; Creswell, 2009), and their feedback was used to clarify concepts addressed throughout this paper.

Summary

The purpose of Chapter Four was to describe data collection and analysis addressing the exploratory question, "how do network dynamics and leadership behavior influence community college faculty job satisfaction?" Specifically, I addressed data collection and analysis for these three research questions:

1. How do network interactions relate to faculty job satisfaction?
2. How do beliefs about LMX relationships relate to network interactions?
3. How do beliefs about LMX relationships relate to job satisfaction?

Significant findings, additional questions, and implications of the study are addressed in Chapter Five.

CHAPTER FIVE

DISCUSSION

Throughout the study, the over-arching theme is the influence of network dynamics and leadership behavior on community college faculty job satisfaction. Previous studies have addressed faculty job satisfaction from a trait-and-factor approach, as if it were possible to deconstruct faculty job satisfaction by looking at specific characteristics of faculty or colleges (Castro, 2000; Isaac & Boyer, 2007; Jackson, 2000; Provasnik et al., 2008; Reynolds, 2006). This study uses a *collectivist*, network approach rather than a traditional *entity* approach. That is, the study does not focus on individual agents, job tasks, resources, and so forth, but rather addresses how *connections* between individuals, job tasks, resources, and leadership impact job satisfaction.

Faculty job satisfaction is of particular interest to me as faculty and a department head in the Community College being studied. The college is in a period of transition unlike any experienced by current faculty. A long-time professor summed up the transitions when he told me he remembers when the college had telephones installed in the faculty offices; the true scope of the recent changes have had much greater impact on faculty, however.

Current changes are due to a multitude of external- and internal-system factors. Some external factors include the nationwide economic recession, high unemployment, decreased federal and state funding for colleges, changing college enrollment patterns, and increased scrutiny from funding and accrediting bodies. Internal transitions include

the succession of a new college president, changing organizational structure, decreased department budgets, and increased teaching loads.

Within the stressful environmental context of Community College, it stands to reason that faculty would report widely varying levels of job satisfaction, which would have implications for leadership. Contrary to my expectations, most study participants reported high or very high levels of job satisfaction and perceptions of high quality relationships with their leaders. Indeed, statistical analysis found a strong relationship in our data between LMX scores and the JSS measure of job satisfaction ($r=0.66$, $p< 0.000$). Network analysis, however, does not depend on variation among variables but rather examines such things as the distribution of scores across subgroup and collectivist-influenced changes in personal attitudes across time. I report these results below.

Group Distribution and Network Characteristics

I used Newman Grouping algorithm, part of the ORA dynamic network analysis platform, to group or cluster faculty by their responses to items on the second survey. The algorithm uses two types of networks: Agent by Belief and Agent by Agent. The specific networks used, the group distribution, and the clusters clearly showing collectivist network characteristics are discussed below.

Research Question One

The first research question is, "How do network interactions relate to faculty job satisfaction? I applied Newman Grouping algorithm to the Agent by Social Agent

network and two belief networks addressing job satisfaction, the Agent by OSAT Belief and Agent by JSS Belief networks. Three clusters were identified, each with distinctive characteristics.

Cluster 1 has high job satisfaction, higher density than the mean for the Meta-Network, and high communication speed. Faculty in this cluster are able to communicate quickly through social, loyalty, and confide networks. In other words, they can use the paths of social interaction, interaction about work-related information, and interaction based on trust to communicate with each other. Corresponding with the higher-than-average density and high communication speed is a high level of job satisfaction across both job satisfaction measures.

Compared with the other two clusters, Cluster 3 has the lowest network density and the slowest communication. It also has a lower than average OSAT mean and the lowest JSS mean. In other words, faculty members in Cluster 3 are less connected, have lower communication speed within the network, and have lower job satisfaction.

Research Question Two

Research Question 2 is, "How do beliefs about LMX relationships relate to network interactions?" Newman Grouping algorithm identified four clusters.

Cluster 1 has the highest mean LMX and has higher than average Agent by Agent network densities. Communication speed is also higher than average. Communication speed in the Agent by Confide Agent network is as fast as is possible, a 1.0.

Cluster 4 has an above-average LMX mean as well. Network density is high across all Agent by Agent networks, and is very high in the Agent by Confide Agent network. Communication speed is high across all Agent by Agent communication networks. It is as high as possible, a 1.00, for both the Agent by Loyalty Agent communication network and the Agent by Confide Agent communication network.

Cluster 3 has the lowest mean LMX. The Agent by Social Agent network density for Cluster 3 is higher than average, the Agent by Confide Agent network density is as lower than average, and the network density of the Agent by Loyalty Agent network is 0.00. Communication speed is high for the Agent by Social Agent network, as high as possible (1.00) for the Agent by Confide Agent network, and 0.00 for the loyalty network.

Research Question Three

Research Question 3 is, "How do beliefs about LMX relationships relate to job satisfaction?" To explore this question, the Agent by Social Agent network was applied with the Agent by LMX Belief, Agent by OSAT Belief, and Agent by JSS Belief networks. Newman Grouping algorithm identified three clusters.

Cluster 3, the smallest of the three clusters (n=7), displays the most dramatic network effects. Faculty in Cluster 3 have the lowest mean LMX, OSAT, and JSS. They perceive the lowest-quality relationships with their leaders and coworkers, and they report the lowest level of job satisfaction. Cluster 3 has the highest density across all Agent by Agent networks. It has the highest Agent by Social Agent and Agent by Loyalty

Agent network communication speeds, and a very high Agent by Confide Agent network communication speed. Cluster 3 is the most densely connected network, yet the faculty that make up the network report the lowest levels of job satisfaction and lowest perception of quality of relationships with leaders.

In comparison, Cluster 2 has the highest mean LMX, higher than average OSAT and JSS means, close to average network density, and slightly higher than average communication speeds. Cluster 2 seems to have adequate network density and communications speeds to result in high faculty satisfaction.

Summary

As is evidenced above, there are correlations among network density, network communication speed, and network effectiveness. Networks that are too dense, too tightly coupled, are less able to generate new ideas, adapt to change, acquire new skills, or develop new knowledge (Kauffman, 1995). Group members are interdependent, often to the exclusion of others (Beekun & Glick, 2001). Question 2, Cluster 3 and Question 3, Cluster 3 demonstrate the effects of being too tightly coupled. In each of the examples, network densities are much higher than the Meta-Network means and communication across networks occurs at rapidly. As a result of the ease of and capacity for communication within the groups, it is difficult for the groups to receive new information or to respond to external changes. The communication speed, for example, suggests that any given change could tear through the system in a destructive way. Faculty within the

tightly-coupled clusters have co-created realities of low job satisfaction and low perceptions of their relationships with their leaders.

At the other extreme, when networks are too loosely coupled, members act independently and do not use each other as resources (Beekun & Glick, 2001; Kauffman, 1995), which can result in organizational inefficiency and individual feelings of isolation and dissatisfaction. Question 1, Cluster 3 demonstrates the effects of loose coupling. There is little network density: Faculty apparently do not talk to each other socially, or to address work-related problems. They do not feel they can trust each other. As a result of lack of communication, new information is transmitted slowly through the network. Such loosely couple networks are not pressured to generate new ideas or respond to environmental influences.

In order for networks to be effective and efficient (Schreiber & Carley, 2008), there should be a moderate level of coupling. Question 1, Cluster 1, Question 2, Clusters 1 and 4, and Question 2, Cluster 2 are examples of how moderate network density and higher than average communication speed can correlate positively with high job satisfaction and high LMX. In each of the examples from this study, network density and communication speed is higher than average for the Meta-Network. Information travels through *all* Agent by Agent networks. It is under these conditions that networks are able to make use of internal and external resources, recognize opportunities and challenges, and make appropriate and necessary changes.

Belief Propagation

Complexity theory, the theoretical foundation of this paper, argues that social outcomes are the product of complex interactive processes. The belief propagation function in ORA demonstrates how complex dynamics operate in shaping the opinions of network agents. This is essentially what is meant by the term, collectivist dynamic—attitudes and other such outcomes are heavily influenced by interactive dynamics within the group. By contrast, traditional studies examine how variables such as satisfaction and LMX relationships are influenced by other variables, such as leader traits or behaviors. In this belief propagation analysis, we see how constructed realities about leader-member exchanges and job satisfaction are influenced instead by group dynamics.

Research Question One

The Belief Propagation report for research question1 revealed that the three items of highest contention were CW1, L3, and CW4. In the first belief propagation iteration, three agents changed beliefs for CW1, two changed beliefs for L2, and three changed beliefs for CW4. Agents whose beliefs changed were significantly influenced by at least two others. It seems that influence is affected by network connections, because 23 of the 24 influencers are connected to the agent that is influenced through cluster groupings, co-location, or both.

Research Question Two

Research Question 2 addresses follower perceptions of the relationship between the leader and the follower, as measured by the seven-item Leader-Member Exchange survey. The three most contentious items are LMX3, LMX5, and LMX2. Consistent with analysis of belief propagation for research Question 1, nearly all the agents who influenced others to change beliefs were connected through cluster grouping, co-location, or both.

Summary

Belief propagation is a powerful tool for viewing the dynamic relationships within networks. Complex networks, such as complex adaptive systems (CASs), always take in new information and adapt to changing internal and external conditions. In this study, the belief propagation tool revealed the dynamic influence of cluster and co-location factors on changing agent beliefs.

Contextual Factors: Collaboration and Co-location

Co-location is logically and conceptually related to collaboration. Networks exist in space, and network interactions are related to people and resources in space (Carley, 2009c; Schensul, LeCompte, Trotter, et al., 1999). Physical distance limits or prohibits interaction. People who are in the same place at the same time are likely to interact, and to collaborate.

Co-location is a recurring theme for each of the research questions. Co-located faculty, agents who work together on the same floor of a building, are clustered together in each of the Newman Grouping algorithm reports. I will review, below, how co-location, job satisfaction, and perception of the quality of relationships with leaders are related, will add additional information about co-location and communication, and then will make connections with complexity leadership theory (CLT).

In the analysis of Question 1, in which the Newman Grouping algorithm clustered Agent by Social Agent, Agent by Belief (JSS), and Agent by OSAT Belief networks, I observed co-location in two clusters: Cluster 2 (n=13), has a higher OSAT mean than the Meta-Network, and five members of Cluster 2 are co-located.

Co-location is also a factor in belief propagation for the contentious items in this cluster. Most agents (all but one) who changed a belief did so under the influence of co-located agents.

Co-location occurs twice in the analysis of Question 2, in which the Newman Grouping algorithm analyzed Agent by Social Agent and Agent by LMX Belief networks. Cluster 1 (n=9) has the highest mean LMX of the clusters and a higher mean than the Meta-Network as a whole. Four faculty in Cluster 2 are co-located on one floor, and three faculty in this cluster are co-located elsewhere.

Cluster 2 (n=9) has a mean LMX score below the Meta-Network mean. Six of the nine faculty are co-located.

The belief propagation report for research Question 2 also exhibits the influence of co-location. All agents who changed beliefs did so under the influence of co-located agents.

Question 3 addresses job satisfaction, perceptions of leader-member relationships, and network factors. For the first grouping report, I used Agent by LMX Belief, Agent by JSS Belief, Agent by OSAT Belief, and Agent by Social Agent networks. Cluster 2 (n=15) has the highest mean LMX and the mean OSAT was higher than that of the Meta-Network and one other cluster. Five of the 15 faculty in Cluster 2 are co-located.

Additional Analysis

As I developed understanding of contextual and collaborational conditions of faculty job satisfaction, I realized the effects seemed stronger as the size of the co-located group increased. I was curious about the co-location effects, so I explored further.

I sorted agents by location, then divided them into two groups. Group A was composed of all faculty from the two locations with the largest number of survey respondents (n= 7 and n=8). Group B was composed of everyone else. I excluded one survey respondent who did not identify his or her location. I averaged LMX, OSAT and JSS scores for the groups and compared them with the mean scores of the Meta-Network. Table 5.1 summarizes the results.

Table 5.1

Average LMX, OSAT, and JSS, Grouping by Location

	Number of Locations Represented	Number of Agents	Mean LMX	Mean OSAT	Mean JSS
Meta-Network	n=8	n=33	28.03	7.86	8.49
Group A	n=2	n=15	30.27	8.27	8.98
Group B	n=6	n=18	25.94	7.39	8.03

Across all measures, Group A, made up of faculty from only two locations, has higher levels of job satisfaction and perceptions of quality relationships with leaders than does Group B, made up of faculty from the remaining six locations. Faculty in Group A share a floor with at least 6 other faculty. They have several peers in close physical proximity. Group B members are co-located with fewer co-workers. They have fewer faculty in their geographical areas, so have less opportunity to conveniently and frequently interact with multiple coworkers face-to-face.

When people are physically close to one another, they are likely to interact, share ideas, use similar resources, be connected to the same other people (Carley, 2009b). They can work together to solve problems and can feel they are part of a team. Connectedness, shown as links between nodes in Agent by Agent networks of Group A, is visualized in Figure 5.1.

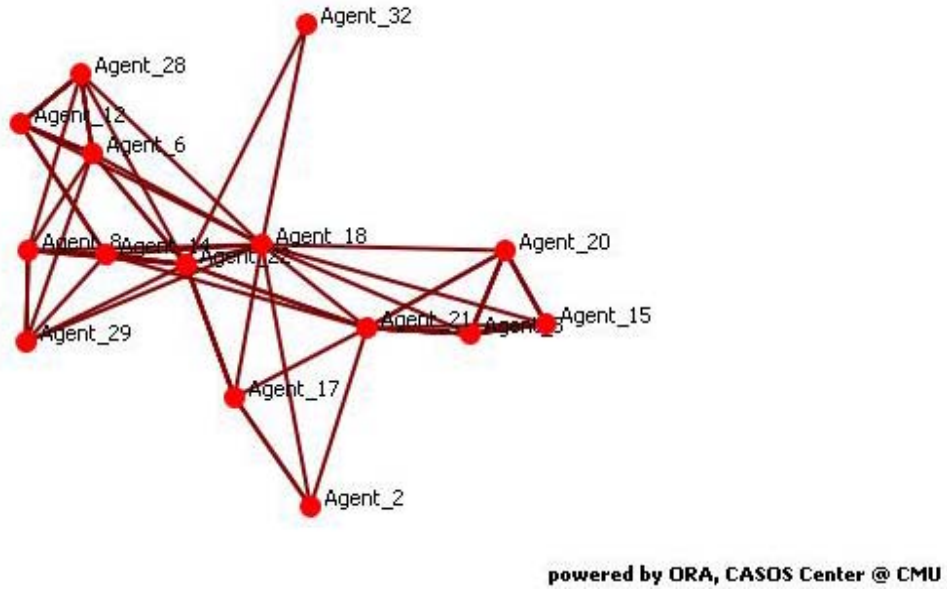


Figure 5.1

Visualization of All Agent by Agent Networks of Group A.

Although there are two nodes with only a few neighbors, most nodes in Group A have many neighbors. Faculty are connected to many other people through social, loyalty, and confide networks.

The Key Entities report for the Meta-Network, as described in Chapter Four, show influential agents for each Agent by Agent network. Agents in Group A, the two locations with the highest number of co-located agents, are 39 of the 54 (72%) Agent Key Entities (Table 5.2). More specifically, 12 of the 15 agents in Group A are Key Entities. In other words, 12 agents in Group A, 36% of agents in the Meta-Network, are 72% of Key Entities. This finding underscores the influence of co-location of agents

within networks, and shows that a few influential people can have a large influence on network dynamics.

Table 5.2

Group A as Key Entities

	Social	**Loyalty**	**Confide**
Emergent Leader (Cognitive Demand)	Agent 6 Agent 20 Agent 31	Agent 6 Agent 20 Agent 31	Agent 6 Agent 20 Agent 31
In-the-Know (Total Degree Centrality)	Agent 6 Agent 8 Agent 20	Agent 18 Agent 7 Agent 3	Agent 12 Agent 7 Agent 14
Leader of Strong Clique (Eigenvector Centrality)	Agent 6 Agent 22 Agent 8	Agent 18 Agent 7 Agent 20	Agent 12 Agent 23 Agent 26
Acts as Hub (Hub Centrality)	Agent 6 Agent 8 Agent 28	Agent 18 Agent 20 Agent 3	Agent 12 Agent 15 Agent 21
Acts as Authority (Authority Centrality)	Agent 22 Agent 33 Agent 8	Agent 21 Agent 7 Agent 23	Agent 1 Agent 7 Agent 32
Potentially Influential (Betweenness Centrality)	Agent 33 Agent 8 Agent 3	Agent 21 Agent 3 Agent 7	Agent 22 Agent 14 Agent 12

The need for connection is a basic human need. Data collected in this study cannot explain or describe how or what needs are met by working in an area with at least seven other co-workers, but data analysis shows faculty who are co-located with others are most satisfied with their jobs and their leaders.

Co-location with many other peers, then, overlaps with higher job satisfaction and higher perceptions of the quality of relationships with leaders. This suggests, as network

theorists argue (Carsten, Uhl-Bien, West, Patera, & McGregor, 2010) that social perceptions are a function of collectivist dynamics. Although we cannot determine the role of leadership in shaping the attitudes observed in this study, we can argue that satisfaction and LMX perceptions are constructed realities that are shaped by interactive dynamics.

The collectivist dynamic also increases the ability of agent within a network to communicate effectively. Table 5.3 shows network performance measures for Group A and those of the division's Meta-Network.

Table 5.3

Performance Measures of Group A Compared with Meta-Network

Measure	**Group A Value**	**Meta-Network Value**	**Description**
Social Network Density	0.11	0.0526	Density of Agent by Agent social network
Confide Network Density	0.10	0.0401	Density of Agent by Agent confide network
Loyalty Network Density	0.20	0.0856	Density of Agent by Agent loyalty network
Average Communication Speed for Social Network	0.56	0.340	Average speed with which two nodes can interact within social network
Average Communication Speed for Confide Network	0.41	0.347	Average speed with which two nodes can interact within confide network
Average Communication Speed for Loyalty Network	0.43	0.369	Average speed with which two nodes can interact within loyalty network

Optimal network density and communication speeds are of benefit to a complex adaptive system (CAS). In general, faculty in the division studied at Community College

report little interaction, resulting in low network density for all Agent by Agent networks. Group A shows higher levels of network density and, consequently, faster average communication speeds within networks, however (Schreiber & Carley, 2008).

In order for CASs to be effective, agents must be able to interact with each other within their work groups, with others in the organization, and with the environment (Uhl-Bien et al., 2007). CASs are more likely to function effectively if agents are interdependent, sharing knowledge, ideas, and resource, in order to be successful. Faculty acknowledged the interdependence by identifying collaboration with other faculty as an essential job task. Not only does collaboration and co-location benefit faculty by increasing job satisfaction and positive feelings about leaders, but it also increases efficiency and effectiveness of organizations.

When people share the same space, interact with each other, share resources, hear the same sounds, smell the same smells, they are part of the same reality. Shared experiences in space and time are the core of co-constructed realities, the experiences from which agents draw to make decisions and interpret information. This study has shown the influence of context on faculty job satisfaction and perceptions of the leader-member exchange.

Knowledge Implications

In community colleges, faculty job satisfaction matters. The satisfaction of faculty impacts the quality of teaching, an important consideration both for students and institutions. As budgets decrease and workloads increase, it will be incumbent upon

college leaders to create environments where faculty feel they have necessary resources and requisite knowledge to perform required work tasks. Most importantly, community college faculty need to have the opportunity to connect with other faculty because there is a relationship between faculty networking and a co-created reality of job satisfaction and satisfaction with relationships with leaders.

The implications for this are significant. We cannot, of course, exclude the possibility that the implied causal relationship flows from leadership to satisfaction, but the evidence from this analysis strongly suggests that satisfaction is a constructed reality that emerges from group dynamics. This supplements, if not contradicts, the entity-based assumption that organizational outcomes like satisfaction are created by individual attitudes and that the solution to poor satisfaction is for leaders to build positive relationships with those individuals (Graen & Uhl-Bien, 1995), to apply an appropriate leadership style (Bogler, 2001), or to improve contextual working conditions (McGregor, 1960). This study suggests instead that satisfaction is a dynamic, or the product of complex network interactions among coworkers, leadership, tasks, knowledge, and resources. Satisfaction is a product of the collective rather than individuals. It is tempting to focus one's efforts on individuals who may be dissatisfied, but leaders who aspire to building positive satisfaction must deal with group dynamics and the interactions of groups with contexts. They need to see patterns emerging in organizational dynamics, to recognize informal leaders who might help leverage a more positive group response, and to analyze the health of the network dynamic itself (e.g., is the inter-personal network capable of spawning sufficient informal leaders who could

leverage positive responses?). Satisfaction in organizations is the result of a complex social dance and leaders need to improve their "dancing" skills.

Perhaps future research could explore the mechanisms of community and faculty job satisfaction. What would a happy and engaged community college faculty look like? How would such an educational community function? Another area of research could be how colleges can increase job satisfaction for faculty who are physically separated from larger groups of faculty, as is increasingly the case with the rise distance-learning and use of other non-traditional teaching methods such as engaged learning and study abroad. Furthermore, as meanings are co-created, what are the mechanisms of satisfaction creation, and how do formal and informal leaders influence satisfaction within networks?

Job satisfaction research requires more than statistical analysis of survey data. Meaningful understanding comes from analysis of the network dynamics that contribute to, or dampen, the emergence of satisfaction in an Future studies could continue to explore the mechanism of job satisfaction within networks using a complex, site-specific perspective.

In conclusion, this exploration of a workplace is one division of a large southeastern community college is a snapshot of areas of strength and areas of potential growth. As the organization continues to change, faculty will face unforeseen challenges. It is my hope that faculty embrace the process together, as a community.

APPENDICES

Appendix A

Approval to Use Table: Hagedorn, L. S.

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Appendix B

IRB Notice of Approval

Dear Dr. Marion,

The Clemson University Institutional Review Board (IRB) reviewed the protocol entitled **"Community College Faculty Job Satisfaction: A Network Perspective"** using expedited review procedures and has recommended approval. We will follow-up with a formal approval letter via interoffice mail.

Please remember that the IRB will have to review all changes to this research protocol before initiation. You are obligated to report any unanticipated problems involving risks to subjects, complications, and/or any adverse events to the 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.

We ask that you notify the ORC when your study is completed or terminated. Please let us know 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

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Appendix C

Letter of Support from Study Institution

Laura Moll, IRB Administrator
Clemson University Office of Research Compliance
223 Brackett Hall
Clemson, South Carolina 29634-5704

Dear Ms. Moll:

This letter is to inform you that my signature below attests to our granting permission for Principal Investigator Russ Marion, PhD, Clemson University graduate student and Co-Investigator Bonnie Smith and, and Co-Investigator Jon Christiansen, PhD, to conduct research at [redacted] in support of the study "Community College Faculty Job Satisfaction: A Network Approach."

This purpose of this study is to explore how network dynamics and leadership behavior influence community college faculty job satisfaction. The study will be composed of two surveys sent to full time faculty in the [redacted] Division. The first survey will take approximately 15 minutes to complete, and the second survey will take approximately 20 minutes to complete.

I understand the researchers will do everything they can to protect the privacy of the participants. Neither participants nor the college will be named in any publication that might result from this study. I understand these processes will be in place to assure anonymity of participants:

> First survey: Dr. Jon Christiansen, a statistical analyst and recent Clemson PhD graduate who has [redacted] and ORA experience, will send the attached informed consent email to a random sampling of 15 faculty members from the list of all faculty members in the division. The email will also provide a link to a [redacted] survey. [redacted] will be set to collect data anonymously. Bonnie Smith will not know who was invited to participate in the study, who responded, or be able to link the responses with any participant. If the response rate is low or if analysis of responses show a need to collect more information, the Dr. Christiansen will send the invitation email to additional randomly selected faculty members,
>
> Second survey: Dr. Jon Christiansen will send the attached informed consent email to all full time faculty members in the division to request their participation in the study. He will collect responses and follow up with non-responders. Once responses are collected for analysis, Dr. Christiansen will import the data to ORA . Within ORA, the data will be anonomyzed in random order (e.g. 1=A, 2=D, 3=F, 4=B, etc.) so no direct patterns within the data will be observed that would allow the identification of participants. A copy of the original, non-anonymized data will be maintained by Dr. Christiansen only until the anonymized version is secure after which the non-anonymized data will be destroyed. At no point will the names of the participants be used for analysis. During all phases of collection, anonymization, and analysis, data will be housed in a secure password protected and encrypted file on a password protected USB drive. The only individuals who will have access to the anonymized, analyzed data are the Principal Investigator, Dr. Russ Marion, Co-Investigator Bonnie Smith and Co-Investigator, Dr. Jon Christiansen.

No compensation will be offered to participants or to the College for participating in the study.

[redacted] Date [redacted]

Who do you consider to be your leader?

>>

Appendix D

Survey Two

Information Concerning Participation in a Research Study
Clemson University

Community College Faculty Job Satisfaction: A Network Perspective

Description of the Study and Your Part in It
Russ Marion, PhD, and Bonnie Smith are inviting you to take part in a research study. Dr. Russ Marion is a Professor of Educational Leadership at Clemson University. Bonnie Smith is a doctoral student at Clemson University, and is running this study with the help of Dr. Russ Marion and Dr. Jon Christiansen, a recent Clemson PhD graduate who does statistical analysis for a private market research firm.

The purpose of this research, a portion of Bonnie Smith's doctoral dissertation research, is to explore how faculty networks and faculty perceptions of their relationships with supervisors influence faculty job satisfaction.

Your part in the study will be to participate in a survey that will allow the researchers to develop an understanding of the tasks, resources, and areas of specialized knowledge of used by faculty members as they do their jobs. This information gathered will be used to develop survey items for the next portion of the study. All Business/Public Services Faculty will be invited to participate in the second portion of the study.

It will take you about 15 minutes to complete this survey.

Risks and Discomforts
We do not know of any risks or discomforts to you in this research study. No one from Greenville Technical College, including Bonnie Smith, knows who was invited to participate in this survey or who replied the survey.

Possible Benefits
We do not know of any way you would benefit directly from taking part in this study.

Protection of Privacy and Confidentiality
We will do everything we can to protect your privacy. Your privacy is protected in several ways. First, a co-researcher not affiliated with Greenville Technical College or Clemson University, Dr. Jon Christiansen, is assisting with the study to provide participant anonymity. He will assure no personally identifying information is included in the data used by Bonnie Smith.

Second, you were randomly selected from a list of Business/Public Service division full time faculty members to be invited to participate in this survey.

Third, all survey results are saved within the survey tool, SurveyGizmo, without identifying information. We will not know who responded to the survey and no response is linked to any individual.

This study is part of Bonnie Smith's doctoral dissertation research and is not sponsored by Greenville Technical College.

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 Russ Marion at Clemson University at 864-656-5105. 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. If you are outside of the Upstate South Carolina area, please use the ORC's toll-free number, 866-297-3071.

I have read this consent form and recognize that consent is implied by choosing to complete this survey. Please feel free to print a copy of this form for your records.

- ○ I Accept
- ○ I Decline

Who do you consider to be your leader?

>>

Now we would like you to think about your overall satisfaction with your current job. Using a scale from 0 to 10, where 0 means "Extremely Dissatisfied" and 10 means "Extremely Satisfied," please rate your overall satisfaction with your job.

	Extremely Dissatisfied 0	1	2	3	4	5	6	7	8	9	Extremely Satisfied 10
Would you say you are...	O	O	O	O	O	O	O	O	O	O	O

>>

How well does your leader recognize your potential?

- O Not at all
- O A Little
- O Moderately
- O Mostly
- O Fully

>>

How would you characterize your working relationship with your leader?

Extremely Ineffective	Somewhat Ineffective	Neither effective nor ineffective	Somewhat Effective	Extremely Effective
O	O	O	O	O

>>

Regardless of how much formal authority he/she has built into his/her position, what are the chances that your leader would use his/her power to help you solve problems in your work?

None	Small	Moderate	High	Very High
O	O	O	O	O

>>

How well does your leader know your job problems and needs?

- O Not at all
- O A Little
- O A Fair Amount
- O Quite a Bit
- O A Great Deal

>>

Please rate your agreement with the following statement: "I have enough confidence in my leader that I would defend and justify his/her decision if he/she were not present."

Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
O	O	O	O	O

>>

Using a scale from 0 to 10, where 0 means "Strongly Disagree" and 10 means "Strongly Agree," please rate your agreement with each of the following statements:

	0 = Strongly Disagree	1	2	3	4	5	6	7	8	9	10 = Strongly Agree
My leader is quite competent in doing his/her job.	O	O	O	O	O	O	O	O	O	O	O
My leader is unfair to me.	O	O	O	O	O	O	O	O	O	O	O
My leader shows too little interest in the feelings of subordinates.	O	O	O	O	O	O	O	O	O	O	O
I like my leader.	O	O	O	O	O	O	O	O	O	O	O
I find I have to work harder at my job because of the incompetence of people I work with.	O	O	O	O	O	O	O	O	O	O	O
I like the people I work with.	O	O	O	O	O	O	O	O	O	O	O
I enjoy my coworkers.	O	O	O	O	O	O	O	O	O	O	O
There is too much bickering and fighting at work.	O	O	O	O	O	O	O	O	O	O	O

>>

Again, regardless of the amount of formal authority your leader has, what are the chances that he/she would "bail you out" at his/her expense?

None	Small	Moderate	High	Very High
O	O	O	O	O

>>

Do you know where you stand with your leader? In other words, how often do you know how satisfied your leader is with what you do?

- O Never
- O Rarely
- O Some of the time
- O Most of the time
- O Always

>>

What specialized knowledge or expertise do you use most often while doing your job in an average week? Please select up to 5 types of specialized knowledge or expertise.

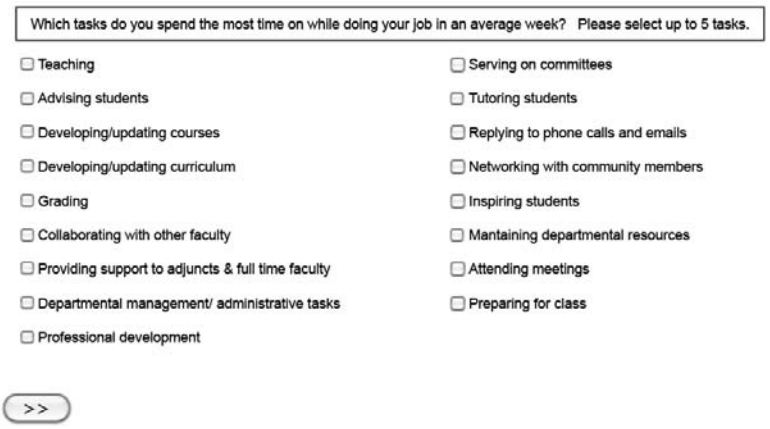
- ☐ Knowledge of teaching and classroom strategies
- ☐ Knowledge of classroom technology
- ☐ Knowledge of discipline-specific computer technology
- ☐ Academic knowledge/ knowledge of your discipline
- ☐ Skills-based professional knowledge
- ☐ Soft skills/ interpersonal skills
- ☐ Knowledge of college policy and procedure
- ☐ Knowledge of other schools
- ☐ Knowledge of conflict resolution

>>

Within the average week, which of these resources do you most often rely on to do your job? Please select up to 5 resources.

- ☐ Faculty and/or staff who assist you with computer technology (hardware and software)
- ☐ Faculty and/or staff who assist students with computer technology (software and hardware)
- ☐ Faculty who manage your department and/or division
- ☐ Faculty and/or staff who offer you mentoring or supervision
- ☐ People in the community who share their expertise and/or resources with you
- ☐ People in the community who share their expertise and/or resources with students
- ☐ Guest speakers
- ☐ Classroom equipment other than computers
- ☐ Classroom computer software and hardware
- ☐ Your professional knowledge and experience
- ☐ Other people encouraging you
- ☐ Lab computer software and hardware
- ☐ Lab specialized equipment (not computers)
- ☐ Internet resources
- ☐ Textbooks and other resources from textbook publishers
- ☐ Interaction with other faculty
- ☐ Publications and training from your profession or industry
- ☐ Student support services (including International Education, Student Disability Services, Advising, etc.)
- ☐ Computers and other technology in your office
- ☐ Adjunct faculty
- ☐ College offices or departments that get you items you need (purchasing, business office, mail room, etc.)
- ☐ Your understanding of student learning outcomes
- ☐ College resources (Catalog, Intraweb information, T:drive information)

>>



Who do you consider to be "on your team?" In other words, who supports you and "has your back"?

Within an average week, with whom are you most likely to socialize?

Within an average week, with whom are you most likely to confide over work related issues?

What is your gender identification?

- Male
- Female
- Prefer not to answer

In which building and on which floor is your office?

What is your highest academic degree?

- Associate's Degree
- Bachelor's Degree
- Master's Degree
- Doctoral Degree
- Prefer not to answer

What is your highest academic rank?

- Instructor
- Assistant Professor
- Associate Professor
- Professor
- Prefer not to answer

>>

Appendix E

Question 1: Agent by JSS Belief, Agent by OSAT, and Agent by Social Agent Clusters

Agent	Rank	Gender	Degree	Location	Cluster
Agent 1	Professor	M	Doctorate	Violet	3
Agent 2	Instructor	M	Masters	Yellow	3
Agent 4	Asst. Prof.	F	Masters	Green	3
Agent 5	Assoc. Prof.	F	Masters	Green	3
Agent 7	Professor	F	Doctorate	Green	3
Agent 13	Instructor	M	Doctorate	Green	3
Agent 18	Professor	M	Doctorate	Yellow	3
Agent 24	Instructor	F	Bachelors	Teal	3
Agent 25	NA	NA	Masters	Orange	3
Agent 26	NA	M	Bachelors	Violet	3
Agent 27	Instructor	F	Bachelors	Teal	3
Agent 31	Assoc. Prof.	F	Masters	Violet	3
Agent 32	Professor	F	Associates	Blue	3
Agent 33	Asst. Prof.	M	Masters	Orange	3
Agent 34	Instructor	NA	Associates	NA	3
Agent 3	Assoc. Prof.	M	Masters	Yellow	1
Agent 6	Assoc. Prof.	M	Masters	Blue	1
Agent 11	Asst. Prof.	F	Bachelors	Teal	1
Agent 12	Asst. Prof.	M	Masters	Blue	1
Agent 15	Professor	M	Bachelors	Yellow	1
Agent 16	NA	F	Masters	Red	1
Agent 17	Instructor	NA	Masters	Yellow	1
Agent 19	Instructor	M	Bachelors	Violet	1
Agent 20	Assoc. Prof.	M	Bachelors	Yellow	1
Agent 21	Professor	M	Masters	Yellow	1
Agent 22	Assoc. Prof	M	Masters	Blue	1

Agent	Rank	Gender	Degree	Location	Cluster
Agent 23	Professor	F	Masters	Orange	1
Agent 23	Asst. Prof.	M	Masters	Blue	1
Agent 29	Instructor	NA	NA	Blue	1
Agent 30	NA	NA	NA	Red	1
Agent 8	Instructor	NA	Masters	Blue	2
Agent 9	Asst. Prof.	M	Doctorate	Green	2
Agent 10	Instructor	F	Masters	Mauve	2
Agent 14	NA	F	Masters	Blue	2

Appendix F

Question 2: Agent by LMX Belief and Agent by Social Agent Clusters

Agent	Rank	Gender	Degree	Location	Cluster
Agent 7	Professor	F	Doctorate	Green	1
Agent 9	Asst. Prof.	M	Doctorate	Green	1
Agent 13	Instructor	M	Doctorate	Green	1
Agent 23	Professor	F	Masters	Orange	1
Agent 1	Professor	M	Doctorate	Violet	1
Agent 2	Instructor	M	Masters	Yellow	1
Agent 3	Assoc. Prof.	M	Masters	Yellow	1
Agent 17	Instructor	NA	Masters	Yellow	1
Agent 21	Professor	M	Masters	Yellow	1
Agent 6	Assoc. Prof.	M	Masters	Blue	2
Agent 8	Instructor	NA	Masters	Blue	2
Agent 12	Asst. Prof.	M	Masters	Blue	2
Agent 22	Assoc. Prof.	M	Masters	Blue	2
Agent 28	Asst. Prof.	M	Masters	Blue	2
Agent 29	Instructor	NA	NA	Blue	2
Agent 4	Asst. Prof.	F	Masters	Green	2
Agent 33	Asst. Prof.	M	Masters	Orange	2
Agent 24	Instructor	F	Bachelors	Teal	2
Agent 14	NA	F	Masters	Blue	3
Agent 5	Assoc. Prof.	F	Masters	Green	3
Agent 10	Instructor	F	Masters	Mauve	3
Agent 25	NA	NA	Masters	Orange	3
Agent 11	Asst. Prof.	F	Bachelors	Teal	3
Agent 27	Instructor	F	Bachelors	Teal	3
Agent 31	Assoc. Prof.	F	Masters	Violet	3
Agent 15	Professor	M	Bachelors	Yellow	4
Agent 32	Professor	F	Associates	Blue	4

Agent	Rank	Gender	Degree	Location	Cluster
Agent 16	NA	F	Masters	Red	4
Agent 30	NA	NA	NA	Red	4
Agent 19	Instructor	M	Bachelors	Violet	4
Agent 26	NA	M	Bachelors	Violet	4
Agent 34	Instructor	NA	Associates	White	4
Agent 18	Professor	M	Doctorate	Yellow	4
Agent 20	Assoc. Prof.	M	Bachelors	Yellow	4

Appendix G

Question 3: Agent by JSS Belief, Agent by OSAT Belief, Agent by LMX Belief and Agent by Social Agent Clusters

Agent	Rank	Gender	Degree	Location	Cluster
Agent 1	Professor	M	Doctorate	Violet	1
Agent 2	Instructor	M	Masters	Yellow	1
Agent 4	Asst. Prof.	F	Masters	Green	1
Agent 6	Assoc. Prof.	M	Masters	Blue	1
Agent 13	Instructor	M	Doctorate	Green	1
Agent 18	Professor	M	Doctorate	Yellow	1
Agent 24	Instructor	F	Bachelors	Teal	1
Agent 25	NA	NA	Masters	Orange	1
Agent 26	NA	M	Bachelors	Violet	1
Agent 27	Instructor	F	Bachelors	Teal	1
Agent 32	Professor	F	Associates	Blue	1
Agent 33	Asst. Prof.	M	Masters	Orange	1
Agent 3	Assoc. Prof.	M	Masters	Yellow	2
Agent 5	Assoc. Prof.	F	Masters	Green	2
Agent 7	Professor	F	Doctorate	Green	2
Agent 9	Asst. Prof.	M	Doctorate	Green	2
Agent 11	Asst. Prof.	F	Bachelors	Teal	2
Agent 12	Asst. Prof.	M	Masters	Blue	2
Agent 15	Professor	M	Bachelors	Yellow	2
Agent 17	Instructor	NA	Masters	Yellow	2
Agent 19	Instructor	M	Bachelors	Violet	2
Agent 20	Assoc. Prof.	M	Bachelors	Yellow	2
Agent 21	Professor	M	Masters	Yellow	2
Agent 23	Professor	F	Masters	Orange	2
Agent 30	NA	NA	NA	Red	2
Agent 31	Assoc. Prof.	F	Masters	Violet	2

Agent	Rank	Gender	Degree	Location	Cluster
Agent 34	Instructor	NA	Associates	White	2
Agent 8	Instructor	NA	Masters	Blue	3
Agent 10	Instructor	F	Masters	Mauve	3
Agent 14	NA	F	Masters	Blue	3
Agent 16	NA	F	Masters	Red	3
Agent 22	Assoc. Prof.	M	Masters	Blue	3
Agent 28	Asst. Prof.	M	Masters	Blue	3
Agent 29	Instructor	NA	NA	Blue	3

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