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TRANSPORTATION MANAGERS' PERCEPTIONS OF THE DIFFUSION OF INNOVATION WITHIN LOGISTICS CLUSTERS

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by

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ABSTRACT

The human capital capacity for innovation is crucial for business success. Cluster theory posits that this capacity for innovation is enhanced by industrial clustering geographic proximity. The innovative capacity is expected to be facilitated by institutions for collaboration, informal knowledge flow, short feedback loops, and collective action regimes. Research on logistics clustering has supported this supposition. Still, no research has explicitly examined whether being physically located in a logistics cluster enhances a company's human capital capacity for innovation.

This study uses the Interpretive Phenomenological Analysis (IPA) approach to determine the innovative operational processes involved in the diffusion of innovation within logistics and non-logistics clusters, particularly for vehicles engaged in commercial transportation use. This research conducts 18 semi-structured interviews of managers of commercial trucking companies regarding the diffusion of innovation (e.g., alternate fuels, autonomous vehicles, the Internet of Things, big data/artificial intelligence) in the trucking industry. Interviews were conducted in three logistics clusters, including Memphis, Atlanta, and Dallas, and non-logistic clusters in Mississippi, Alabama, and Louisiana. The interviews results were triangulated and compared between cluster and non-cluster regions.

The primary finding is that no noticeable difference exists regarding the diffusion of innovation in the trucking industry for companies in logistics clusters versus those not in logistics clusters. Without adequate, open, honest communication, innovation does not occur. Truck drivers want to be a part of a change in their work. Finding innovative, primarily managerial, solutions for trucker driver turnover is a common theme across all

trucking companies, with turnover at greater than 100% in some companies; great focus has been directed to this issue. Although not the focus of this research design, hierarchical company structure and the number of terminal driver locations appear to influence the human capital capacity for innovation, which should be examined in future research.

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DEDICATION

This dissertation, and the efforts that went into it, are dedicated first and foremost to my wife, Barbara B. Puryear. Her support of my dream to earn a Ph.D. has been 48 years in the making since we got married in 1975. Even though she has been battling Stage IV Pancreatic Cancer, she has found time to encourage and help me. I promised my mother I would pursue a higher degree shortly before her death. I am glad that this worked out for her.

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LIST OF ABBREVIATIONS

HCD	Human Capital Development
IRB	Institutional Review Board
IPA	Interpretive Phenomenological Analysis
NAICS	North American Industry Classification System
MSA	Metropolitan Statistical Area

CHAPTER I – INTRODUCTION TO THE STUDY

Great ideas require great implementation (Samit, 2020). Companies must be innovative in today's globally competitive environment, and industrial clustering facilitates innovation (Anthony, 2018). The geographic proximity of complementary and competing firms and supporting infrastructure supports human capital innovation through improved knowledge dissemination (Zhang et al., 2020). However, researchers have not studied the effects of the knowledge diffusion phenomenon on logistics clusters (Rivera et al., 2016; Sheffi, 2013). This qualitative study uses the Interpretive Phenomenological Analysis (IPA) approach (Smith & Osborn, 2015) to determine the innovative operational processes involved in the diffusion of innovation within logistics and non-logistics clusters, particularly for vehicles engaged in commercial transportation use. In this chapter, the study's background is discussed, followed by the problem, purpose, research questions, theoretical framework, nature of the study, definitions, assumptions, scope, delimitations, and significance of the study. Chapter 1 concludes with a summary of the chapter.

Marshall (1890) described clusters as a "concentration of specialized industries, in particular, localities" (p. 242). Garelli (1997) defined clusters as aggregation in a location with related and competing companies where performance has improved. Other variables must be considered when examining clusters (Avnimelech & Teubal, 2010; Porter, 2000); more connection is necessary (Eriksson, 2011).

Cluster is the analysis unit in the present study since a cluster is commonly associated with proximate business operations' economic success. Marshall (1890) identified the advantages of clustering industries close to each other, which include: (a)

higher profits and less competition, (b) a regular customer base for consistent business and steady income, and (c) stable suppliers who provide cost savings as well as an adequate supply. The success of the companies within the cluster depends on the success of each other. The company proximity encourages greater social and professional interaction. Effective communication and collaboration among companies lead to improved innovation (Bell, 2016). Additionally, sharing research expenses is possible since innovation benefits all involved (Rivera et al., 2016).

A *logistics cluster* is a transportation-based and distribution-based cluster of services and products between different organizations to improve economic growth (e.g., agglomeration; Eriksson, 2011; Pisa, 2019; Rivera et al., 2016). It is unknown whether innovation similarly diffuses in logistics clusters to other extensively studied industrial clusters (e.g., Silicon Valley's technology cluster; Pisa, 2019). This human capital innovation knowledge gap hinders effective logistics cluster development policy (Bolumole et al., 2015; Porter, 2000).

This research's central concept is that human capital development (HCD) remains essential to innovation and change. Kenton (2020) defines *human capital development* as "the nurturing of an employee's experience and skills" (p. 3). Since all labor experiences and skills are unequal, employers can promote human capital growth by investing in training, education, and benefits (Kenton, 2020).

Economic growth, improved profits, and increased productivity are related to trained human capital (Zhang et al., 2020). Mincer (1989) argues this point by stating that the need for human capital complements the demand for innovation, and Lillard and Tan (1986) and Bartel and Lichtenberg (1986) also support this theme. O'Sullivan and

Steven (2003) opine that human capital encompasses investment in the labor force skill, including education and vocational training to develop specific skills and encourage innovativeness in the workplace.

Baldwin and Johnson (1995) further state that firms most receptive to training policies exist where innovation, quality management, and human resources exist. Training relates to innovation, according to Pisa (2019). Innovation and technology require specific knowledge and skills that require frequent training to update employees' skills (O'Sullivan & Steven, 2003; Rivera et al., 2016).

The effort to discover and respond to the overall research question concerning innovation diffusion differences between firms within logistics clusters and firms not in logistics clusters, as perceived by its human capital, encompasses five areas of study. The first objective is to describe the characteristics of study participant transportation companies adopting innovative operational processes. The next step is to describe the geography of logistics clusters used in this study.

Subsequently, examining the innovation processes in logistics clusters was undertaken. The interviewer similarly examined the innovation process for transportation companies outside of clusters by modeling the logistics clusters' innovation process analysis. The last step compared the innovation processes inside and outside logistics clusters to each other.

Non-innovative businesses, and the geographic regions in which they reside, cannot remain as competitive in today's global economy as innovative ones (Lucena-Lucena-Piquero & Vicente, 2019; Rogers, 2003). Why a logistics cluster considers

innovating was examined to gain insight into the use of innovation diffusion as perceived by transportation logistics managers. The study explored the decision-making processes.

Scholars have called for research using in-depth case studies that focus on the experiences of individuals involved in diverse types of cluster operations (Jahre & Jensen, 2010). No definition or measure of innovation exists more correctly than others (Bolumole, 2015). Instead, the literature identifies various definitions of innovation (Joshi, 2013). Addressing the information gap will contribute to advancing knowledge by providing information about the innovation diffusion process in logistics clusters. The research extends the existing literature regarding the diffusion of innovation in logistic clusters (as illustrated by recent innovations in the commercial transportation industry).

Concerning innovation and logistics clusters surrounding commercial transportation, some literature focuses on innovation theory and logistics cluster theory. Rivera et al. (2016) find that clusters of logistics and transportation companies tend to group over time rather than disperse, with businesses inside logistics clusters growing faster than those businesses outside the cluster. However, other scholars provide evidence for dispersing logistics clusters over time (Shaver & Flyer, 2000). Appendix A (Logistics clusters) lists the top sixty logistics clusters in the United States, according to research by Rivera et al. (2016). Only the logistics clusters listed in Appendix A are clusters for this research. Rivera et al. (2016) report that logistics operations, which took place in counties inside clusters, exhibited higher growth levels than those outside of the clusters.

In another related study, Bolumole et al. (2015) explored local governing bodies' efforts to take advantage of logistics transportation clusters. Findings included evidence of multi-jurisdictional and multi-agency economic development governance models,

representing collaborative efforts between government agencies, private sector organizations, and academic institutions within European and U.S. logistics hubs.

The research gap addressed by the present study provides in-depth information through interviews concerning transportation and logistics companies' use of innovation in commercial transportation. The study also includes the experiences of individuals involved in cluster operations, expressing various viewpoints from a managerial perspective (Jahre & Jensen, 2010). Previous studies have identified the need for in-depth case studies of logistics clusters that involve the perceptions of workers in the clustering of goods and services (Jahre & Jensen, 2010) and analyses involving product or process innovation and the conceptualization of innovation (Camacho & Rodriguez, 2008; Joshi, 2013).

Conceptual Underpinnings

Cluster theory (focusing on logistics clusters) and theories regarding the diffusion of innovation frame this study. Innovation theory is used to study perceived innovation within a geographic location. Cluster theory assumes businesses have an economic incentive to pool (e.g., clustering) goods and services (Sheffi, 2013). The basis of theories of the diffusion of innovation is that innovation is of benefit (Rogers, 2003).

Scholars present various innovation definitions, with no consensus on the best based on a person’s insight into the innovation. Any new practice, idea, or product could be considered an innovation. Sweezy (1943) defined *innovation* as "doing things differently in the realm of economic life" (p. 86), while Dutfield (2006) maintained the idea that an innovation’s definition includes economic growth, particularly in developing countries.

Disagreement exists in the literature about the benefits of clustering. While Cooke and Huggins (2003) support clustering because of the benefits, Knight et al. (2020) found clustering to be less beneficial to businesses that have competitive advantage. Businesses without reliable suppliers and distributors, decreased human capital supply, ineffective educational programs, and decreased use of technology are more motivated to be in logistics clusters and improve from engaging in logistic cluster activities (Cooke & Huggins, 2003; Martin & Sunley, 2003). Cluster theory assumes that businesses with better capacity of operation avoid clustering related to a concern of competitive advantage loss and possible spillover (Knight et al., 2020).

Investigating factors influencing innovation and indicators available to evaluate logistics clusters' success levels is necessary to better understand innovation diffusion within clusters. Clusters benefit firms collaborating to improve their performance (Breschi, 2008). Innovation within the cluster impacts all levels of employment and the clients (Sheffi, 2013). Innovation diffusion examines idea implementation and the impact on a logistics cluster's success (Rogers, 2003). These theories combined form the basis for investigating the diffusion of innovation inside and outside logistics clusters.

Statement of the Problem

People who manage businesses, whether investors, owners, paid employees, or contractors, are not consistently innovative in operating a profitable and successful business (Mottrie, 2020). Further, existing ideas, concepts, and improvements do not all seem to share the most appropriate method or set of effective practices for diffusing innovative activities (Davis, 2017). Additionally, a lack of efficient and effective innovation diffusion is as problematic as no innovation (Dodgson et al., 2015). Creative

or innovative ideas are needed to change transportation dependence on current methods and technologies (Department of Energy, 2015).

Cluster theory maintains that the effectiveness of the organizational human capital system to diffuse innovation is contingent on its proximate geographic environment (e.g.., within a logistics cluster or not). Logistics clusters generate changes and innovativeness within the industry and its associated transportation and support groups (Kapoor & Klueter, 2020). Economic success creates inequality between successful and yet-to-be-successful businesses (Santacreu, 2015). The more successful companies survive. The diffusion of innovation theory states that innovation increases the company's success (Rogers, 2003).

This study examines how the human capital systems within organizations effectively diffuse innovation (e.g., become introduced to, evaluate, develop, and implement new knowledge). Thus, understanding the impact of the organizations' geographic location on the ability to adjust human capital innovation diffusion processes is important. The study examines the effects of location within logistics clusters on innovation by comparing the diffusion of innovation perceived by transportation/logistics company managers in logistics clusters to the diffusion of innovation in non-logistics clusters.

Insights from the present study will add to the existing knowledge regarding innovation and logistics clusters. They will help businesses become more innovative and efficiently adapt to new methods and opportunities (Kapoor & Klueter, 2020). Knowing how the innovation diffusion process works in different circumstances allows firms to reduce trial-and-error efforts that waste time, energy, and resources (Sheffi, 2013).

Innovation is related to anticipating future needs rather than short-term economic needs that drive clustering practices and affect a logistics cluster's levels (Sheffi, 2013).

Scholars desire more research on logistics clusters involving in-depth case studies (Jahre & Jensen, 2010; Ogden & Nicholas, 2019) and focusing on individuals' perceptions of working in a logistics cluster. This research uses semi-structured interviews for an in-depth study.

Purpose of the Study

In this research, cluster theory and innovation diffusion theories guide the investigation into the transportation industry by comparing transportation companies within logistics clusters of Atlanta, Memphis, and Dallas within the non-cluster region of Alabama, Louisiana, and Mississippi. The perceptions of transportation managers provided insight into the processes involved in the diffusion of innovation and its impact on human capital within their respective transportation companies. Through a literature review, followed by an analysis of results from the present study, the findings will provide insights relevant to practice and guide future research efforts. This study aims to answer the question: Does location in a logistics cluster affect innovation in the transportation industry?

Significance of the Study

The value of this study is its focus on the connection between innovation and improved operations. The present study falls within these identified research gaps. The potential contributions of the present study include the following:

1. Advancing knowledge by providing foundational information regarding innovation diffusion in logistics and non-logistics clusters.

2. Guiding businesses to participate in logistics clusters that use innovative processes to improve operations.
3. Promoting the proliferation of logistics clusters that innovate to reduce vehicle carbon emissions.
4. Identifying effective strategies used in logistics clusters that use innovative operational processes to promote economic success, innovation, and growth in other clusters.

Research Objectives

This research seeks to answer the question, “Is there a difference between the innovative operational processes involved in the diffusion of innovation for commercial transportation in logistics and non-logistics clusters?” The research centers around five objectives to discover and respond to the overall research question concerning transportation/logistics managers' perception of successful innovation diffusion practices within and outside logistics clusters.

RO1. Describe the characteristics of study participant transportation companies that have adopted innovative operational processes.

RO2. Describe the characteristics of the six study regions (logistics and non-logistics clusters).

RO3. Explore the diffusion of innovation as perceived by managers in the transportation/logistics companies within a logistics cluster.

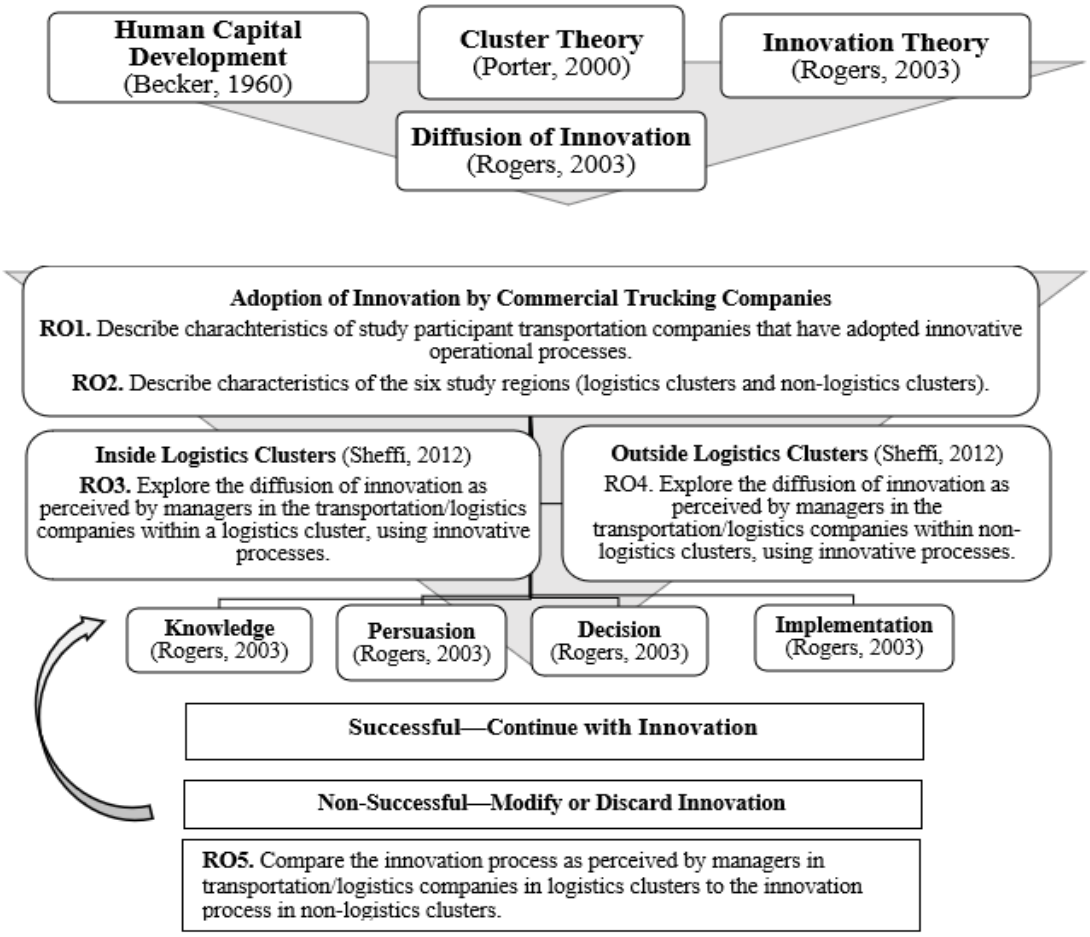
RO4. Explore the diffusion of innovation as managers perceive it in the transportation/logistics companies within non-logistics clusters.

RO5. Compare the innovation process as perceived by managers in transportation/ logistics companies in logistics clusters to the innovation process in non-logistics clusters.

Conceptual Framework

A conceptual framework shows what the research expects to find (Swaen, 2020). It defines the study's relevant variables, maps relationships, and illustrates how the process might work (Merriam & Tisdell, 2016). This study's conceptual framework, developed before data collection begins, examines the diffusion of innovation within logistics clusters and non-logistics clusters. Diffusion of innovation includes how ideas are introduced and incorporated into the logistics cluster's success, the speed of incorporation, and the impact of the idea. (Sheffi, 2013). The principle applies equally to non-clusters (Rivera et al., 2016). The four steps in the innovation diffusion are (1) identifying the innovation as valuable (knowledge); (2) using communications channels to spread knowledge about the benefits of the innovation (persuasion); (3) allocating adequate time to spread the knowledge about the innovation (decision); and (4) using the social system to spread the knowledge and the resulting demand for the innovation (implementation; Rogers, 2003). Research questions identify the target of the research. The ultimate question for this study is whether being in a logistics cluster affects the process when considering innovation diffusion's speed, effectiveness, and efficiency. Figure 1 illustrates the foundations of the study.

Figure 1. Conceptual Model



Assumptions

Researchers and peers who read this research accept assumptions as accurate or at least plausible (Pisa, 2019). The assumptions of this research include the following: (a) the participants answered questions honestly to the greatest of their abilities, (b) the differences observed among the logistics clusters are related to the processes that took place within the cluster, and (c) every firm is self-interested and interested in cost-savings. These assumptions are appropriate for this research because participant responses are challenging to assess for truthfulness (Davis, 2017). The second assumption is essential, as the comparison between the practices and processes involved

in logistics clusters is the focus of this study. The assumption that participants answer honestly can be problematic if asking about criminal history instead of favorite restaurants in the area (Merriam & Tisdell, 2016).

Delimitations

Delimitations are the boundaries of this research and are controlled by the researcher (Merriam & Tisdell, 2016). The delimitations set assist study goals not becoming too large to complete. Examples of delimitations include objectives, research questions, variables, and study populations (Pisa, 2019). The delimitations for this study are the five research objectives, the commercial vehicle segment of transportation that this study limits itself to, three logistics clusters and one non-cluster region chosen to conduct the study, and the participants' innovation experience required.

Design Controls

Design controls set parameters within which the study will take place (Zhang et al., 2020). These controls limit the study of existing variables. This study will consist of three logistics clusters using innovative operational processes in their transportation fleets. Each logistics cluster had three interviews. Additionally, nine companies in the non-cluster region were interviewed. In total, eighteen managers are part of this study. Next, the key terms used in this writing are defined.

Definition of Key Terms

This section presents the definition and citation of terms and concepts used in this study.

1. *Alternate Fuels.* In this study, alternate fuel groups over-the-road transportation options to gasoline or diesel, the largest transportation fuel sources currently used.

This grouping includes compressed natural gas, liquid natural gas, propane, butane, electricity/battery, solar power, and hydrogen cell technology (Kolodziej, 2013).

2. *Cluster.* Marshall (1890) considered clusters as groups of industries specializing in a particular service and product. Garelli (1997) described clusters as an agglomeration (geographically) of industries that evidenced improved economic performance and growth. Aage (2001) and Lucena-Piquero and Vicente (2019) noted that specialized firms tend to be close to one another. Clusters develop when they increase productivity. Cluster development is influenced by local assets and the infrastructure surrounding it (Porter & Ketels, 2019). This research only recognizes agglomerations listed by Sheffi (2013) as the “top sixty in the U.S.” as clusters (Rivera et al., 2016).
3. *Cluster Theory.* Cluster theory details the advantages of businesses working together to group the goods and services they receive and ship, promoting savings (Marshall, 1890). The benefits of clustering or concentrating businesses in similar locations or regions as follows: "less competition results in higher profits; an unchanging customer base yields steady business and steady income; unchanging suppliers yield lower costs and lower supply uncertainty" (Marshall, 1890, p. 243).
4. *Diffusion of Innovation.* The diffusion of innovation is how ideas' spread, become introduced and are incorporated into the logistics cluster's success (Sheffi, 2013).
5. *Human Capital.* Human capital is not an asset on the balance sheet but rather an intangible quality (Kenton, 2020). Human capital is the economic value of an

employee including experience, skills, education, training, intelligence, health, experience, social qualities, creativity, moral character, and other things employers value, such as loyalty and punctuality (Kenton, 2020; Longley, 2020).

6. *Human Capital Development.* Human Capital Development is "nurturing an employee's experience and skills" (Kenton, 2020, p 3). Since all labor experiences and skills are unequal, employers can improve human capital by investing in their employees' training, education, and benefits (Kenton, 2020).
7. *Innovation.* Any new practice, idea, or product is considered an innovation (Rogers, 2003).
8. *Interpretive Phenomenological Analysis (IPA).* Interpretative phenomenological analysis (IPA) is a qualitative research approach that examines firsthand experiences (Smith et al., 2009). It produces an account of experiences in its terms rather than those prescribed by pre-existing preconceptions and recognizes that this is an interpretative endeavor because humans are thinking organisms (Merriam & Tisdell, 2016). It is explicitly specific and concrete in its commitment to examining each case's detailed experience before moving to more general claims. IPA is beneficial for examining complex, ambiguous, and emotionally laden (Smith et al., 2009).
9. *Knowledge Spillover.* Knowledge spillover is sharing ideas and implementation methods that inspire others to adopt those ideas in different settings. Knowledge spillover occurs when an idea is adapted for use in different situations (Tatum, 2021).

10. *Logistics Cluster.* A logistics cluster is a transportation-based and distribution-based cluster of services and products between various organizations to enhance economic success (e.g., agglomeration). An area's economic geography relates to national, regional, and local economic growth (Eriksson, 2011).
11. *NAICS Code.* The North American Industry Classification System, or NAICS, is a classification of businesses by their economic activity. NAICS replaced the Standard Industrial Classification (SIC) system, except in some government agencies, such as the U.S. Securities and Exchange Commission (SEC). A business is considered one location. Each business is part of the industry according to the main activity (NAICS.com, 2020).
12. *Saturation.* Corbin and Strauss (2008, p. 263) define *saturation* as: "The point in analysis when all categories are well developed in properties, dimensions, and variations. Although gathering additional data and further analysis adds little new to the conceptualization, variations are still occasionally discovered." Charmaz (2014) further defines saturation as the point at which "your categories are robust because you have found no new properties of these categories and your established properties account for patterns in your data… you have defined, checked, and explained relationships between categories and the range of variation within and between your categories" (p. 213).
13. *Technology Spillover*. The beneficial effects of new technological knowledge on other firms and geographical regions' productivity and innovative ability (Griffin, 2021). When an event or process has a ripple effect on the economy of another business or business, technology spillover is the estimate of the effect of R&D

spillovers on sales or operational efficiencies identified by users of the new products or processes (imitation) or new to the market (innovation). Rival spillovers tend to lead to imitation, while customers and research tends to lead to original innovation (Tambe & Hitt, 2014). The social benefits of innovation consider the value of beneficial spillovers of the new idea or product and the benefits to the developing firm (Griffin, 2021).

14. *Triangulation.* In research, triangulation uses multiple resources or practices (Denzin, 2009; Merriam & Tisdell, 2016). The term originates from a navigation concept that uses multiple observation points to determine a location (Farmer et al., 2006; Merriam & Tisdell, 2016). Triangulation is important in qualitative research comprised of few interviews (Merriam & Tisdell, 2016).

Summary

Chapter 1 introduces a discussion of the foundations of the present study. It presents an introduction and background, problem, purpose, research question, theoretical framework, nature of the study, definitions of key terms, assumptions, limitations, and summary. In the existing literature, an inquiry into logistics clusters involving in-depth case studies identifies future research and consideration of working in a logistics cluster, including various perspectives (Jahre & Jensen, 2010).

Future analyses of the conceptualization of innovation in the commercial transportation industry are necessary (Camacho & Rodriguez, 2008; Joshi, 2013; Schleper et al., 2017). The literature has a void in this area as there are few identifiable studies identifiable in this area. The present study will contribute to this research gap, as reflected in the problem, purpose, and research questions.

Chapter 2 discusses the research surrounding clusters, logistics clusters, innovation, diffusion of innovation and significant variables in the present study. While Chapter 3 describes the study's parameters. Chapter 4 presents the results of the study. Chapter 5 concludes the study with findings, conclusions, and recommendations.

CHAPTER II – REVIEW OF RELATED LITERATURE

This research will study the effects of clustering on the diffusion of innovation in the logistics industry. The adoption of, or development of innovation, is utilized to compare how innovation occurs for transportation companies in logistics and non-logistics clusters. This research builds on the shared knowledge of industrial clustering behavior, firm innovation processes, and innovation within the transportation industry. A review of these three literature pieces identifies a gap in the knowledge regarding empirically understanding the influence of logistics clusters on innovation. This research will provide data to fill this knowledge gap and be the basis for the next chapter's methodological approach.

Schleper et al. (2017) noted that people who manage businesses, whether investors, owners, or paid employees/contractors, are not consistently innovative in operating a profitable and successful business, especially in the transportation industry. Further, existing ideas, concepts, and improvements do not all share a single method or set of effective practices for diffusing these innovative activities (Zhang et al., 2020). A lack of efficient and effective innovation diffusion is as problematic as no innovation (Schleper et al., 2017).

There are many in-depth case studies of logistics clusters (Jahre & Jensen, 2010) focusing on the perceptions of individuals working in a logistics cluster (Camacho & Rodriguez, 2008; Rowley, 2011). The advancement of knowledge for logistics clusters, cluster theory, and diffusion of innovation is attainable by addressing the research gap involving innovation in logistics clusters. Background research focused on the diffusion

of innovation, clustering effect, and innovation in the transportation industry. This study examines clustering effects on idea diffusion and idea implementation.

The theoretical framework presented in Chapter 1 derives from the literature review. This literature review discusses the diffusion of innovation, the clustering effect, and innovation in the transportation industry. The review identifies the gap in research of innovation in logistics clusters. Conclusions from the comparison and contrast of the literature reviewed are summarized, and the research gap is addressed in the present study. This research examines the use of innovation diffusion theory to increase success within a logistics cluster and compares that to the use of innovation diffusion theory outside the logistics cluster.

Innovation

Innovation is defined differently among researchers, and no one theory of the diffusion of innovation identifies as the most accurate. While Rogers (2003) considers innovation conditional to the view of the persons involved in the development of the innovation, Sweezy (1943) defined innovation as "doing things differently in the realm of economic life" (p. 43). Dutfield (2006) further defined innovation by stating that innovation promotes economic development, even in developing countries. Each aspect of development is unconnected to others in the innovation theory presented by Mashelkar (2005). Bottazzi and Peri (2007) theorized that innovation occurs when demand and technology exist concurrently. This research acknowledges Rogers' (2003) definition of innovation. It indicates that "an innovation is an idea, practice or object perceived as new…whether or not the idea or object is 'objectively' new" (p.12).

Diffusion of Innovation

Diffusion occurs when innovation spreads throughout organizations, clusters, and industries. According to Sheffi (2013), innovation diffusion is a concept used to examine the impacts and speed of idea development on a logistics cluster's success. The spread of existing ideas and technology is the basis of the diffusion of innovation, and the process for an innovation to spread (diffuse) successfully is composed of several components. First, the innovator generates the idea. Second, the idea, or innovation, is analyzed or evaluated by individuals within an organization. Effective communication lines are necessary for the diffusion or spread, and all the process occurs within a timeframe and social system.

Recent research has expanded the practical application of the diffusion of innovation. Akca and Ozer (2014) found variables related to diffusion associated with the speediness of adopting and implementing innovative activities. While Schleper et al. (2017) found stakeholder participation essential for success, Chen and Chen (2013) found that "innovation resource synergy" explained the success of small firms versus the decline of large ones. Similarly, Corsi and Di Minin (2014) analyzed the existing literature regarding innovation activities and factors disrupting innovation in emerging economies. They concluded that innovation interacts with economies to influence new technological solutions and innovative products and propose a geographical dimension as a characteristic of innovation.

Keller et al. (2015) analyzed foresight support systems (designed to facilitate an embedded and continuous foresight of members in a cluster). Foresight support systems' ability to connect stakeholders and foresee business operations changes fostered

regionally based innovation systems (Keller et al., 2015). Innovation diffusion comprises four steps: introduction, evaluation, development, and implementation (Rogers, 2003).

Introduction of Innovation

Johannessen (2013) partially explained introducing and realizing an innovative idea by integrating five disparate innovation theories (systemic, institutional, living systems, motivation, and action) to propose a unified innovation theory. He stated that integrating theories helps further the understanding of processes-driven innovation. The stimulus for developing an innovation usually occurs due to an identified problem that does not have a readily apparent solution. As Rogers (2003) noted, most information about innovation introduction has been obtained by interviewing innovation users and soliciting information at conferences and general interest gatherings. There is little information found that identifies top practices of innovation introduction. The purpose of this research is to contribute to that body of knowledge.

Evaluation of Innovation

Initially, its first user is the firm that develops the idea (innovation). The viability of the innovation will be evaluated and analyzed for its feasibility and then evaluated for commercial use. Commercialization includes producing goods or services and introducing and marketing the product to others. The innovator then evaluates the innovation as a potential solution to the identified problem (Rogers, 2003). Innovation's economic impact is one consideration when evaluating a new product (Rodriguez, 2018).

The relationship between open innovation and its cost/benefit has limited descriptive power and raises doubts about the value provided (Remneland-Wikhamn & Knights, 2012). Rogers (2003) agrees, stating that "an overemphasis on the calculative

reduction of transaction costs, together with a focus on governance and rationality, leaves little space for an innovative climate, thus diverting attention away from the creative potential of transactions" (p. 115). Remneland-Wikhamn and Knights (2012) further stated that adhering to the often-inappropriate assumptions of transaction cost economics limits innovation and, in many cases, can undermine innovative activities.

Development of Innovation

Once the innovator develops the innovation, a decision about accepting it is made, according to Rogers (2003). Grant et al. (2013) stated that the organization knows the idea (or product) and its development and acknowledges where an interest exists in making the decision and adopting the innovation. Then, further information is acquired as needed (Rogers, 2003). The organization then weighs the pros and cons of the innovation and decides whether to adopt the idea based on its merits and expected benefits. When accepted, the organization will deploy the innovation and further evaluate its usefulness in a pilot project. When gathering information is completed, the organization will decide whether to adopt and place the innovation in broad-scale use (Rogers, 2003).

Implementation of Innovation

Implementation starts with the organization that embraces the new idea or technology. As innovation begins, behavior changes and uncertainty exist (Rodriguez, 2018). Regardless of implementing the innovation as designed or used by other adopters, the innovation may require modification (Dutfield, 2006). As time progresses, the innovation becomes a part of regular daily operations. The implementation phase is complete when innovation is no longer considered new (Rogers, 2003).

As a part of implementing the innovation, a confirmation stage occurs. During this phase, the organization reviews the decision and input from others (Rogers, 2003). Individuals' dissonance can affect innovation implementation and movement toward regular operation adoption (Rodriguez, 2018). Initially, a need is recognized, and the innovator seeks information about a solution that relieves dissonance. When the individual has knowledge of an idea, but the idea is not adopted, dissonance may spur the adoption of a novel approach. Dissonance reduction with innovation effectively reduces the gap between attitudes and behaviors (Dutfield, 2006). During confirmation, the organization seeks information to reduce potential dissonant behavior (Rogers, 2003).

The implementation of innovation is reversed or discontinued if deemed appropriate. Also, rejection of the innovation may occur after being adopted. Discontinuation of the innovation can result from rejecting the innovation to choosing a new, improved innovation. Discontinuation can also result from disenchantment with innovation performance (Rodriguez, 2018). Disenchantment discontinuation is more likely with late adopters of the innovation because late adopters have less formal training, less formal education, lower socioeconomic status, less contact with the change, and do not consistently implement the innovation as proposed and recommended (Rogers, 2003).

Effects of the Surrounding Geographic Environment

The easiest way to encourage positive attitudes toward innovation is though opinion leaders (Rogers, 2003). The social system of the organization determines the opinion leaders (Rogers, 2003). Social systems identify as either heterophilous or homophilous. In a heterophilous environment, the diffusion of innovative ideas and concepts is more straightforward. Since the basis of interaction is with people of different

viewpoints, they accept the latest information, process it, and allow its influence or change to previously held beliefs. As such, heterophilous social systems encourage change from social norms. More interaction among people from various backgrounds suggests a greater interest in living exposed to new concepts. The heterophilous systems have opinion leaders who are more innovative because the opinion leaders want to innovate (Rivera et al., 2016; Rogers, 2003).

Those in homophilous social systems want to keep social norms. Most interaction within them is among individuals from similar experiences. Individuals and ideas falling outside the norm are odd and unwanted to homophilous social systems (Santacreu, 2015). Homophilous systems have opinion leaders that are not innovative because they do not want innovation (Rogers, 2003; Santacreu, 2015).

Clusters

According to Sheffi (2013), clusters are "regional economic booms that attract workers, entrepreneurs, investment, companies, political interest, and intellectual capital" (p. 12). Clusters share many common characteristics, such as being geographically "clustered" to serve a market. Casinos in Las Vegas, cork products in Portugal, furniture in High Point, NC, film production in Hollywood, and corporate innovation centers in Silicon Valley, are also examples of clusters. In *Principles of Economics,* Marshall (1890) stated that "industrial complexes' development suggests that multiple grouped assets result in positive externalities."(p.132) Porter (2000) and Lucena-Piquero and Vicente (2019) noted that clusters offer competitive advantages and increased innovation.

This research will study the effects of clustering on the diffusion of innovation in the transportation and logistics industry. The adoption of, or development of innovation,

is utilized to compare how innovation occurs for transportation companies in logistics and non-logistics clusters. This research builds on the shared knowledge of industrial clustering behavior, firm innovation processes, and innovation within the transportation industry. A review of these three literature pieces identifies a gap in the knowledge regarding empirically understanding the influence of logistics clusters on innovation. This research will demonstrate how to fill this knowledge gap and be the basis for the next chapter's methodological approach.

Schleper et al. (2017) noted that people who manage businesses, whether investors, owners, or paid employees/contractors, are not consistently innovative in operating a business, especially in the transportation industry. Further, existing ideas, concepts, and improvements do not all seem to share a single top method or set of effective practices for diffusing these innovative activities (Zhang et al., 2020). A lack of efficient and effective innovation diffusion is as problematic as no innovation (Schleper et al., 2017).

There are many in-depth case studies of logistics clusters (Jahre & Jensen, 2010) focusing on the perceptions of individuals working in a logistics cluster (Camacho & Rodriguez, 2008; Rowley, 2011). The advancement of knowledge for logistics clusters, cluster theory, and diffusion of innovation is attainable by addressing the research gap involving innovation in logistics clusters. Background research focused on the diffusion of innovation, clustering effect, and innovation in the transportation industry. It follows the innovation's introduction, assessment, feasibility, development, and implementation.

How Clusters Work and Influence Innovation

Marshall (1890), who described clusters as a "concentration of specialized industries in particular localities" (p. 242), first identified the clustering effects in the nineteenth century. He went on to “identify the advantages of clustering industries in proximate locations/regions to each other, including (a) higher profits and less competition, (b) an unchanging customer base yields steady business and steady income, and (c) stable suppliers will enable cost savings as well as lowered uncertainty regarding the supply” (Marshall, 1890, p. 243).

An additional definition of clusters is an agglomeration in a geographic area of related and competing firms where clustering industries improve performance (Garelli, 1997). Aage (2001) added that businesses that performed specialized functions locate near each other. Clusters have been present in the United States since the late twentieth century (Porter, 1990). Cluster innovation affects all logistics cluster levels, from management teams to employees and clients, daily practices, and procedures (Sheffi, 2013).

Clustering is vital to economic success and growth, especially for industries that could benefit from clustering (Bergman, 2008; Brenner & Gildner, 2006; Tokatli, 2020). The clusters are a quantifiable unit of study for economic success (Sheffi, 2013). The clustering effect is present both in industry and in logistical business operations. Therefore, the impact of clustering will be a basis for analysis in the current research.

Logistics Clusters

Garelli (1997) defines logistics clusters as a geographical agglomeration of competing and related industries. There is evidence of improved performance, including

growth and profitability, from the pooling of regional services. Sheffi (2013) defined the same logistics cluster as "a region with a very high concentration of logistics activities relative to the local population or economy" (Sheffi, 2013, p.79). Sweezy stated that this pooling of services allows for more efficient and economical transportation of industry-related goods (1943)**.** Eriksson (2011) further defined logistics clusters as groups of products and services, usually coordinated among various businesses to improve their economic gain through the efficient transportation of products needed by the firms involved (e.g., agglomeration).

Although proximity and linkages are the main factors in realizing cluster innovation among logistics clusters, employees' and senior-level decision-makers' motivation is also essential (Dutfield, 2006). Investigating factors that influence innovation is needed for better understanding of innovation diffusion in logistics clusters. Investigation of indicators of success in logistics clusters is also necessary (Clark et al., 2018) According to Breschi (2008), logistics clusters offer the most effective benefits to firms that work with one another to improve both firms' performances.

Presence of a Logistics Cluster

In logistics clusters, the physical space involved generally ranges from a few square blocks to a few square miles but can cover parts of several states (Sheffi, 2013). Logistics clusters converge into networks, industrial districts, innovative milieus, and other clusters. They tend to arise in locations "where the economic geography of an area is related to the economic growth at national, regional, and local levels" (Eriksson, 2011, p. 94). It is not only the geographic proximity of firms that qualifies them as logistics clusters (Avnimelech & Teubal, 2010; Porter, 2000). Firms must have an additional

degree of connection, particularly in pooling services and products that enhance efficiency and economic benefit (Eriksson, 2011; Zhang et al., 2020).

Even with the agreement that clusters exist, the literature does not agree that clustering is of benefit. Cooke and Huggins (2003) believe clustering is beneficial. Clark et al. (2018) found clustering less beneficial to businesses with a competitive advantage. Although this exception is present, the existing literature establishes logistics clusters as beneficial to most firm types (Dutfield, 2006; Rogers, 2003; Sheffi, 2013). Tokatli (2020) expanded on the benefits by saying that the cluster relationship is fundamental to the success, survival, and growth of all businesses associated with each other. Also, Tokatli (2020) affirmed that such a consideration yields a more refined research plan with a larger pool of specialized talents. As such, a process of new knowledge deployment often results from clustering (Sheffi, 2013; Tokatli, 2020). However, Theys et al. (2008) and Tokatli (2020) overemphasize the need to consider firm connections at the expense of examining factors that link firms to realize clusters and future innovations. These are aspects that Tokatli (2020) and Theys et al. (2008) could have considered in their research.

Geographic Clustering Effect on Diffusion of Innovation.

Diffusion has been addressed by several scholars. “Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system” (Rogers, 2003, p. 11). For diffusion to occur, followers must adopt the introduction's innovation (Akca & Ozer, 2014, Casanueva et al., 2013). “The most striking feature of diffusion is that, for most members of a social system (cluster), the innovation-decision depends heavily on the innovation decisions of the other

members of the cluster" (Rogers, 2003, p. 23). Said another way, proximity to each other speeds and encourages the innovation process.

Innovation diffusion is more challenging to achieve without geographic proximity and is more time-consuming (Rogers, 2003; Tokatli, 2020). Research has shown that corporate attitudes develop through communication exchanges about a specific innovation with peers and opinion leaders. This communication occurs more readily and easily when geographic proximity occurs (Rivera et al., 2016).

Processes of Innovation in Clusters

According to Porter and Stern (2001), the four most essential processes of innovation in clusters are (a) institutions for collaboration, (b) informal knowledge flow, (c) short feedback loops, and (d) collective action regimes and quality governance. There is a possibility that no two clusters compared will weigh these four factors precisely the same (Casanueva et al., 2013; Ogden & Nicholas, 2019; Simmie & Sennett, 1999). Institutions for collaboration are chambers of commerce, industry associations, professional associations, trade unions, alumni associations, etc. Informal knowledge flow is a slow transfer of knowledge to individuals and small groups typical of social interactions. Short feedback loops in innovation analyze the general understanding of the operation including positive and negative results. Collective action regimes and quality governance rely on trust among firms working together, intermediaries, the presence of leader firms, and the quality of follow-up activities that encourage collaboration among all firms involved. These four processes of innovation are the foundation for this study.

Logistics Clusters Influence Innovation

Clusters in innovation diffusion are essential to investigating businesses' logistics clusters (Rogers, 2003). The diffusion of innovation is more common in logistics clusters than in non-logistics clusters (Sheffi, 2013). Therefore, cluster and innovation diffusion theories are critical when studying innovation in logistics clusters. Also, Sheffi (2013) noted that logistics clusters often share production costs through mutually supporting certain services.

Rivera et al. (2016) performed a study of logistics clusters that informs the methodology used in the present study, which conducted exploratory research with subjects located in and around logistics clusters. Their research consisted of two parts. The first part of the study consisted of open interviews to collect data, and the second stage gathered more data through semi-structured interviews to confirm preliminary findings (Rivera et al., 2016). This stage is like that Babbie (2009) used in his research. This stage of data gathering (used previously) identified logistics clusters.

Delgado et al. (2010) analyzed the clusters in a geographic region using the U.S. Census Bureau's Longitudinal Business Database and data from the U.S. Cluster Mapping Project. They found evidence of the association between clusters and innovation. Sheffi (2013) stated that cluster innovation's underlying effects affect logistics providers' operations, ranging from clients and employees to the management teams involved.

Sheffi (2013) also said, "regions that rise to become renowned centers for a specific skill or industry are referred to by academics, historians, and economists as economic clusters, industrial clusters, agglomerations, and industrial districts" (Sheffi,

2013, p. 132). As Dutfield (2006) further explained, clusters show how a concentration of resources, innovation, culture, and knowledge can form a positive feedback loop, which leads to sustained economic growth, regardless of the product or service involved.

Innovation in the Transportation Industry

The past three decades have brought about various innovations in everyday life, most notably in scheduled train service, the rise of international freight transportation, speed limiters, GPS tracking, energy-efficient engines, and transportation management software systems (Rivera et al., 2014). In the past decade, Jentzsch (2023) noted that many innovations have become integral to the transportation industry. Table 1 displays, in broad categories, what Jentzsch reported.

Table 1 *Jentsch Innovations in the Trucking Industry*

Innovation	Concepts Included
Autonomous Vehicles	Self-driving vehicles, self-delivery vehicles for last-mile deliveries
Green Energy	Electric, CNG, LNG, Hydrogen, and Battery Improvements with enhanced charging, Solar
Artificial Intelligence	Safety Warning Equipment, Optimized Load Routing, License Plate Scanning, LIDAR, Exterior Cameras, Interior Cameras
Internet Use in Trucks	Ability to Access Internet On-The-Road
Mobility as a Service	In-cab Communications]
Blockchain	Asset Tracking, Port Security, Transaction Recording
Table 1 (Continued)	
Transport Management Systems	GPS, Navigation Systems, Incident Reporting
Last-Mile Delivery	Rail Intermodal, Driver Team Efficiency

Innovation	Concepts Included
Hyperloop	Transportation by Way of Pressurized Track
Expansion of Intermodal Transportation	Water, Rail
Expanded Lane Capacity of Highways	Includes Improved Infrastructure (Bypasses)
Fuel Efficient Engines	Reduce emissions and pollution, turn emissions into an added source of energy.
Smart Roads	Communicates danger to vehicles

As the importance of these innovations illustrates, firms must feature traditional considerations in their business practices and remain relevant and helpful in the face of new challenges. The proliferation of innovations requires the prioritization of innovative business practices.

In their study, Radosevic and Yoruk (2013) explored the ability of innovation systems to engage in entrepreneurial activities. In another study focusing on innovation, Eriksson et al. (2012) analyzed the innovation systems and related innovation-focused policies regarding the transportation sector. These studies revealed that knowledge and the support of governmental agencies and procedures influence innovation. Although large transportation systems have great innovation potential, prior research has shown a lack of innovative practices associated with this industry (Dodgson et al., 2015).

Summary

This literature review revealed a need for additional study focusing on innovation diffusion, particularly as it relates to evolving industries, that address areas of concern such as the natural gas-powered transportation industry that has the potential to decrease carbon emissions (Camacho & Rodriguez, 2008; Rowley, 2011; Rodriguez, 2018). Also, Jahre and Jensen (2010) noted a void in the literature regarding in-depth case studies

focusing on logistics clusters that include perceptions of participants working in businesses in logistics clusters. This study addresses this gap in previous research, reflected in the research questions and their purpose.

Chapter 3 discusses the research design, which involves 18 interviews. First-hand accounts from the sample population will be collected from the "pure and unencumbered" experiences of logistics cluster workers living in the studied areas (Sanders, 1982, p. 354). Chapter 3 will also describe the survey instrument, the study participants' location, and how the data will be collected and analyzed.

CHAPTER III – RESEARCH DESIGN AND METHODOLOGY

This study aims to determine the innovative operational processes involved in the diffusion of innovation within logistics and non-logistics clusters, particularly for vehicles engaged in commercial transportation. This chapter discusses the research design and methodology used in this dissertation study of logistical clustering effects on innovation diffusion. It describes the survey instrument, the study participants' location, and how the data was collected and analyzed.

This qualitative study aims to determine the innovative operational processes involved in the diffusion of innovation within logistics and non-logistics clusters, particularly for vehicles engaged in commercial transportation use. As stated in Chapter 1, five research objectives were established:

RO1. Describe the characteristics of study participant transportation companies that have adopted innovative operational processes.

RO2. Describe the characteristics of the six study regions (logistics and non-logistics clusters).

RO3. Explore the diffusion of innovation as perceived by managers in the transportation/logistics companies within a logistics cluster.

RO4. Explore the diffusion of innovation as managers perceive it in the transportation/logistics companies within non-logistics clusters.

RO5. Compare the innovation process as perceived by managers in transportation/ logistics companies in logistics clusters to the innovation process in non-logistics clusters.

Table 2 illustrates the four primary innovation processes using examples and explanations, the references used and the research question to which each is linked are noted. The four processes of innovation are the foundation of this study. Each process links to Research Objectives two, three, four, and five.

Table 2 *Process of Innovation Mapped to Research Questions*

The Four Processes	Explanation/Examples	Citations	Research Questions
Institutions for Collaboration	Chambers of Commerce Industry associations Professional associations Trade unions Alumni associations Others	Bolumole et al., 2015; Bouncken & Kraus, 2013; Casaneuva et al., 2013; Eriksson, 2011; Keller et al., 2015; Porter & Stern, 2001	RO2, 3, 4 and 5
Informal Knowledge Flow	Slow knowledge transfer between individuals and in small groups Social interaction Social gatherings Social media (Facebook, Twitter)	Carbonara, 2004; Casaneuva et al., 2013; Fitjar & Rodriguez, 2018; Porter & Stern, 2001; Simmie & Sennett, 1999	RO2, 3, 4 and 5
Short Feedback Loops	Innovation output analyzes the good, the bad, and the misunderstood of the operation just performed. Staff meetings Project review meetings Innovation focus groups Short-term evaluation reports	Letaifa &Rabeau, 2013; Wooten & Ulrich, 2017	RO2, 3, 4 and 5

Table 2 (continued)

The Four Processes	Explanation/Examples	Citations	Research Questions
Collective Action Regimes and Quality Governance	Relies on the Presence of Trust among firms working together. Intermediaries Leader firms Quality of follow-up activities that encourage collaboration among all firms	Bouncken & Kraus, 2013; Carbonara, 2004; Casaneuva, Castro, & Galán, 2013; Fitjar & Rodriguez, 2018; Porter & Stern, 2001	RO2, 3, 4 and 5

Research Design

The researcher conducted eighteen semi-structured interviews with nine managers in the Atlanta, Dallas, and Memphis logistics clusters, as defined by Sheffi (2013), and nine in Alabama, Mississippi, and Louisiana, which are not designated logistics clusters. Managers from transportation companies were interviewed via Microsoft Teams for approximately 30 - 60 minutes each (Cresswell, J. & Cresswell, J., 2018). Participants answered open-ended interview questions about which triangulation (using multiple observation points to obtain a fuller picture) occurred (Merriam & Tisdale, 2016).

Data collection triangulation was possible with three interviews conducted in each logistics cluster (Atlanta, Dallas, and Memphis; Merriam & Tisdell, 2016). Nine interviews were conducted in non-logistic clusters based in Alabama, Mississippi, and Louisiana, from which the researcher also assessed triangulation. The findings were triangulated by using the three managers from each cluster selected.

Triangulation

Triangulation was used to conclude the impact of geography on innovation. Triangulation is especially important with research consisting of only a few interviews (Merriam & Tisdell, 2016). The researcher triangulated the participant interviews in three logistics clusters and nine non-cluster locations, all in the southern United States (Merriam & Tisdell, 2016). Sampling bias was minimized by selecting the initial participants from recommendations from the Trucking Associations in Alabama, Georgia, Louisiana, Mississippi, Tennessee, and Texas, as well as the University of Memphis Southeast Transportation Workforce Center.

Each participant was asked to recommend another participant employed by another commercial truck line (snowball sampling). The participants were provided the option to participate, and no pressure was placed on them to provide information; if the participant did not want to elaborate on a question, the interviewer moved to the next question. The data were coded according to the participant interviews' innovative operational processes and recurring themes. The researcher qualified all participants and conducted all the interviews. The participant interview was the only method of data collection.

Saturation

The goal of the interviews was to achieve saturation. Corbin and Strauss (2008) define saturation as "The point in analysis when all categories are well developed in properties, dimensions, and variations. Additional data gathering and analysis may add little new to the conceptualization. However, differences are still occasionally discovered (p. 263)." Charmaz (2014) further defines saturation as the point at which "your

categories are robust because you have found no new properties of these categories and your established properties account for patterns in your data… you have defined, checked, and explained relationships between categories and the range of variation within and between your categories" (p. 213).

Saturation was complete with three interviews within each logistics cluster as the sample pool was cohesive. Three different logistics clusters helped provide more complete data. The interviews in various non-cluster regions were assessed after six interviews to determine if the results were the same from each interview. The results were not the same, so saturation did not occur. All nine interviews were conducted. The researcher determined the presence of saturation. While additional data may have arisen from a larger sample, similar data in all interviews confirms that saturation occurred.

Research Approach

This research utilized Interpretive Phenomenological Analysis (IPA), an accepted framework with which a researcher attempts to understand what it is like to look through the eyes of the participants and the researcher interprets of the participant's reality (Smith & Osborn, 2015). This study's approach has characteristics of a phenomenological approach, using IPA to allow the researcher to view logistics cluster managers' social phenomena and those individuals' collective experiences. First-hand accounts from the sample population come from the "pure and unencumbered" experiences (Holstein & Gubrium, 2016; Sanders, 1982, p. 354) of logistics cluster managers working in the studied logistics cluster areas.

Informed Consent

Before beginning the data collection using interviews, The University of Southern Mississippi's Institutional Review Board granted authorization for the study and issued IRB number IRB-21-239. The authorization included a provision for informed consent of study participants. The main components of informed consent include relevant information about the study, the risks, and benefits of participating in the study, the confidentiality of participants, uses of the data, and data security. Verbal instruction and follow-up emails about participation in the study were provided to potential participants. Each potential participant agreed to participate in the study. The researcher asked each participant to ask questions to clarify the information provided. Each participant made an informed decision and voluntarily agreed to participate.

Population and Sample

Nine managers of commercial vehicle fleets from logistics clusters, as defined by Sheffi (2013), and nine managers of commercial transportation vehicle fleets from non-logistics clusters, as defined by Sheffi (2013), were interviewed. (See Appendix A for a list of 60 successful logistics clusters for the United States). Non-cluster regions are not part of this listing. Appendix B shows the NAICS (North American Industry Classification System) codes Sheffi (2013) used to identify Logistics Clusters' transportation members. The researcher chose Memphis, Dallas, and Atlanta as representative logistics clusters as each cluster met the criteria of location in the Southern United States; the logistics cluster is either located in or conducts a significant portion of business in the Central Time Zone; multiple transportation modes serve the cluster; the clusters have much the same weather patterns.

According to EMSI, a labor market data company headquartered in Idaho, there are 3,150 business locations for General Freight Trucking (4841) in these three logistics clusters. The researcher chose participants from Mississippi, Alabama, and Louisiana, nine areas outside the logistics clusters. These states have 3,031 business locations for General Freight Trucking (4841; NAICS Association, 2020).

Population

Participants in the study were identified as managers working within or outside a logistics cluster, having at least one year of tenure in commercial trucking, having a decision-making or advisory role, and identifying their overall responsibilities to include transportation logistics.

This study's participants and locations represented various transportation sectors, work experiences, resource access, and years in business or entrepreneurial endeavors. The researcher validated that the participants represented the study population, location criteria, and responses. The researcher verbally pre-qualified each participant before the interview commenced and secured recorded verbal permission to continue.

Sample

Participants are from the United States' southern region to maintain geographic consistency. The researcher chose companies within or working within the Central Time Zone so that work hours were as consistent as possible (daylight, rush traffic, business end-of-day, etc.). The researcher chose participants from the south as weather patterns across the south tend to be more comparable, thus removing weather variables (Rivera et al., 2016). Seasonal weather patterns are not a significant variable in this study.

There are differences among the populations of the logistics clusters. Many researchers postulate that location is a study variable that deserves study when examining differences among clusters (Low et al., 2005; Shane, 2005). Each logistics cluster has a large Metropolitan Statistical Area (MSA), though populations vary. All participants were from companies in MSAs to eliminate being in, or not in, MSA as a difference. The companies outside the logistics clusters ranged from urban to rural settings.

Purposeful sampling and snowball sampling were used to select the sample for this study. Purposeful sampling is based on the thought that if you determine the criteria for your sample, then the sample will provide more information. The purposeful sample selected a homogenous group (reduce variation within the group and aid in interviewing) to describe what s typical (Palinkas et al., 2015).

Snowball sampling is another type of purposeful sampling used in the study. Snowball sampling involves securing the names of additional participants from the participants (Palinkas et al., 2015). The researcher used purposeful sampling for homogeneity by asking professional associations or a regional training center for the names of participants (Palinkas et al., 2015). Snowball sampling techniques were used when each participant was asked to refer another participant (Merriam & Tisdale, 2016).

All selected participants were contacted by email with a follow-up phone call. The researcher conducted three interviews at each logistics cluster and nine interviews outside the logistics clusters using Microsoft Teams to record and transcribe the interviews.

Research Procedures

Previous research to study innovation diffusion supported the use of semi-structured interviews. Specifically, prior research studying phenomena within logistics clusters used open interviews (Rivera et al., 2016), semi-structured interviews (Babbie, 2009), grounded theory approaches (Glaser, 1978; Glaser & Strauss, 1967), consultant-assisted interviews, and surveys (Carr, 2017). This study used the semi-structured interview process to compare innovation in commercial trucking companies within and outside logistics clusters.

Data collection for this study was comprised of several steps. First, locations and potential participants were reviewed and analyzed. Next, the researcher contacted the potential participants and gained consent to participate. Then the researcher established rapport and interviewed each participant using an interview guide to collect data; the interview was transcribed after each interview (Stake, 2010). The researcher analyzed the data after completing all interviews (Figure 2).

Figure 2. Data collection plan

Study Regions

The study focused on three logistics cluster regions and non-cluster regions. The characteristics of the study regions were identified using *JobsEQ Industry Spotlight for Truck Transportation* and 2022 United States Census Bureau Statistics. The areas selected were Atlanta MSA, Dallas MSA, Memphis MSA, and Non-Cluster Regions.

Institutional Review Board

The researcher followed the protocol set forth by the Institutional Review Board (IRB) – Human Subjects Protection Review Committee at The University of Southern Mississippi. This protocol specifies receiving written approval before beginning interviews (Appendix C; The University of Southern Mississippi, 2020). As a result of COVID-19, the IRB protocol required careful adherence to established guidelines about mask-wearing, self-distancing, and interview protocols. Consequently, there were no face-to-face interviews; virtual interviews via Microsoft Teams were used instead.

The *IRB Informed Consent* document (Appendix C) included the IRB number IRB-21-239, project title, the interviewer's name and contact information, a description of the research to be done, the benefits and risks of the research, and protection of the confidentiality of the participant and the responses. After each participant was recorded verbally agreeing to participate, the interview was scheduled.

Access to Participants

The initial contact in each region was the Alabama, Georgia, Louisiana, Mississippi, Tennessee, and Texas State Trucking Associations, or the University of Memphis. The initial contact started the snowball sampling process and served as a receptive and influential contact in the area to recruit potential participants. The snowball

sampling technique was successful. All potential participants except one agreed to participate in the study.

The researcher used the Potential Participant's Initial Contact Protocol (Appendix D) for telephone contacts, the Potential Participant's Email Inquiries (Appendix E) for participant-initiated email contacts, or the Participant Referrals with an Email Address (Appendix F). After completion of the initial contact, the researcher scheduled and then interviewed the participant.

Building Rapport

Building a rapport with participants is advantageous for researchers to help return and complete consent forms (Von Rosenstiel et al., 2015). For this researcher, rapport with participants helped snowball sampling. Participant suggestions of potential participants were “warm introductions” instead of a disinterested, neutral recommendation (iThink Logistics, 2019). Additionally, by building a rapport with participants, questions were more thoroughly answered, and the participants shared additional information from their personal experiences (Von Rosenstiel et al., 2015)

Instruments

The researcher used semi-structured interviews for this research. The interview guide contained the survey questions and qualifying information (Appendix G). Before the interview, each participant received the participant criteria (Appendix H), the pre-survey memo of understanding (Appendix I), and consent from participating (Appendix J). The researcher provided a guide to each participant to allow the participant to consider the questions before the interview, to facilitate recording responses from the respondents, and to assist with uniformity in the interview. No follow-up interviews were required.

The interview is a fundamental data collection method for qualitative research. The next section addresses the tenets of qualitative research.

Qualitative Research

Qualitative research is best suited to analysis when endeavoring to gain in-depth knowledge of underlying reasons and motivations. This research was a "deep dive" into the responses of a few participants, of which the researcher asked open-ended questions to gather comprehensive and complete data. The literature notes the advantages and disadvantages of qualitative research.

Advantages

The researcher identified qualitative research as the preferred research design for this study. First, the subject material was evaluated more thoroughly because fewer data sources were studied. Next, the research frameworks adapt to available data instead of the data fitting into predefined questions and selected answers. The adaptive research framework is preferential when empirical data focuses on human experiences and observations (Walia, 2019). The study data was predictive (Merriam & Tisdell, 2016), open-ended, and made attitude explanations possible (Gaille, 2021). The smaller sample size provided data-gathering cost savings (Gaille, 2021). The researcher had industry-related expertise in gathering data (Chetty, 2016; Gaille, 2021).

Disadvantages

The researcher identified disadvantages to conducting qualitative research. The data gathered was subjective and might lead to incorrect generalizations (Chetty, 2016). The researcher found data rigidity difficult to assess and challenging to demonstrate data validity (Gaille, 2021). Mining data was time-consuming (Chetty, 2016).

Another disadvantage is that the scientific community does not readily accept qualitative data (Giorgi, 1997). Researchers can influence the data collection without realizing it (Giorgi, 1997). Replicating results can be challenging, leading to research that is not statistically significant (Chetty, 2016) or statistically representative (Walia, 2019).

Data Collection

The data collection process builds on each preceding step. Each step supported the next, answered research questions, and improved the study's ability to be reproduced (Creswell, 2007). The firsthand experiences of participants were accurately captured. No single tool has been identified for data collection in qualitative studies. The chosen mechanism must support the research appropriate for the study, considering the design and study questions (Merriam & Tisdell, 2016).

The literature review verified the interview instrument's validity and reliability for this study. A validity analysis increased the probability of the interview instrument measuring what it intends, including content validity and face validity (Litwin, 2003). First, content validity performed on the interview instrument required participants to know the subject matter of innovation in transportation and transportation operations (Litwin, 2003). Content validity refers to questions asked to measure all facets of a given construct. “Did the survey fully explore what it intended to measure” (Clark et al., 2018)? Then, face validity assesses whether the survey or interview content appears suitable to its aims (Rodriguez, 2018).

A member of the Mississippi Trucking Association volunteered for a pilot interview to provide an alternative to overusing the study participants. This interview assessed the content validity of the interview instrument. The researcher used this data as

a source to triangulate research findings. The researcher analyzed the interview content and assessed for face validity by asking the participant to provide input about the interview questions' readability, understandability, and the flow of each item on the instrument (Roberts, 2010).

Face validity allowed an untrained individual to provide an informal assessment of the study's instrument questions (Litwin, 2003). To achieve high reliability, the researcher verified the interview instrument during the test interview to help reduce the number of errors (e.g., random and measurement errors) resulting from a faulty instrument. The researcher measured internal consistency reliability by testing the interview instrument to ensure it measured and focused on innovation within the trucking industry (Creswell, 2007; Litwin, 2003).

Data Collection Plan

Table 3 outlines the study's data collection process. The process began with The University of Southern Mississippi Institutional Review Board approval letter and a Mississippi Trucking Association member's pilot study. The participant selection and data collection progressed over several weeks of participant identification, procurement, and interviews with transcription.

In Week One, the researcher contacted the State Trucking Association officials and requested participant suggestions. The researcher contacted the referred prospects to pre-qualify them and schedule interviews. Week One focused on logistics clusters and included one preliminary participant interview. Microsoft Teams® software provided a transcription of the interview. Week Two continued with Trucking Association contacts and participant referrals from Week One. Data collection started from Week One referral

with data transcription after the interview. Personally identifiable information was removed.

In Week Three, additional interviews were completed, and more interviews were scheduled, with non-logistics cluster participants as the focus. During Weeks Four and Five, the researcher scheduled and completed the remaining interviews reviewed completed interview transcripts, and arranged for interviews during the following weeks. In Weeks Six and Seven, all completed interviews were transcribed in Microsoft Teams® and reviewed. Data that could identify the participant was removed. During the latter part of Week Seven, data analysis began. During Week Eight, the data analysis process continued. Table 3 provides an overview of the data analysis process.

Table 3 *Data Collection Process*

Timeframe	Activity
Pre-Study	The University of Southern Mississippi Institutional Review Board Approval Letter
	Complete Pilot Study
Week 1	Contact State Trucking Association executives in MS, TX, GA, TN, LA, and AL to confirm willingness to provide the researcher with potential participant contact information
	Schedule and conduct initial interviews with potential participants.
	Remove personally identifiable information from recorded interviews and send for transcription
Week 2	Contact Trucking Association executives to confirm receipt of study documentation and verify any potential participant contact information
	Schedule interviews with potential participants
	Conduct scheduled interviews.
	Remove personally identifiable information from recorded interviews and send for transcription
Week 3	Follow up on participant referrals for interviews.
	Conducted scheduled interviews.
	Remove personally identifiable information from recorded interviews and send for transcription

Table 3 (continued).

Timeframe	Activity
Weeks 4-5	Schedule and conduct initial Interviews with new participants.
	Remove personally identifiable information from recorded interviews and send for transcription.
	Review interview transcripts completed thus far for accuracy
Weeks 6-7	Remove personally identifiable information from final recorded interviews and send for transcription.
	Notify State Trucking Associations that interviews are complete.
	Review interview transcripts for accuracy
	Begin data analysis plan
Week 8	Receive all outstanding transcripts.
	Complete data analysis plan

Transcribing Data

Each interview was conducted through the Microsoft Teams® platform, which included a recording and a transcript, using the interview protocol form. Microsoft Teams® recorded all meetings and was the interview transcription source for manual grouping and analysis. Recordings allowed the interviewer to give the participant undivided attention and "probe systematically and in-depth without the distraction of note-taking" (Sanders, 1982, p. 357). Participants' confidentiality was safeguarded by storing identity and response information in a locked filing cabinet and password-protected computer hard drive. This storage included documents used in interviews, the dedicated external drive, and backup copies of computer files. After three years of safeguarding the information, the researcher can utilize it for future educational, testimonial, or research purposes only. Participants' identity and confidentiality are perpetual unless written consent is obtained from the participants to share it. The

researcher used the verbatim transcripts of the data to code the innovative operational processes and to determine the themes of the interviews.

Data Analysis

A data analysis strategy is essential when the researcher searches for significant statements clearly describing the phenomenon described in a written report (Creswell, 2007; Creswell & Creswell, 2018). The researcher had an unbiased appreciation of the data, while the subject's perspective was acknowledged. The researcher approached each interview freshly and impartially. The verbatim transcription and the recorded interview helped ensure control of researcher bias. Analyzing and coding data differs in all circumstances and should be explicitly adopted for all research (Roberts, 2010). The interviewer coded the data after comparing it with innovative operational processes and reviewing the data for emerging themes (Creswell, 2007).

Data Analysis and Display

The researcher reviewed the data to identify innovative practices based on participants' perceptions (Giorgi, 1997). Even though participants had knowledge and expertise in commercial trucking, their opinions on the topic differed. The researcher analyzed the interview data using an Tesch's eight steps for analyzing qualitative data (1990). The researcher established codes and reduced the data to themes and categories (Roberts 2010).

Tesch (1990) outlined eight steps for analyzing qualitative interviews (as cited in Roberts, 2010, p. 159). The researcher used those steps to analyze the data in this study. Step 1. The researcher read the transcripts, identified the innovative operational

processes, and looked for themes. The researcher acquired Tesch's "sense of the whole" (Roberts, 2010, p. 159).

Step 2. The researcher searched for the underlying meaning in several random interviews by asking, "what is this about" in search of "underlying meanings." Keywords and statements were recorded in the margins (Roberts, 2010, p. 159).

Step 3. The researcher reconsidered what was read in step two to create significant "topic clusters" (Roberts, 2010, p. 159). The topic cluster can become column or row headings for the themes (e.g., major topics [MT], unique topics [UT], and leftovers [LO]).

Step 4. Using the codes for abbreviated major topic headings, the researcher reviewed each interview and "wrote codes next to the appropriate text segments" (Roberts, 2010, p. 159). These codes were summarized into a rough working chart that could be sorted.

Step 5. The researcher reduced the categorical statements from step four by grouping "topics that relate to each other" (Roberts, 2010, p. 159). The researcher created codes for the related clusters identified in step five.

Step 6. The researcher created codes for the themes identified in the interview transcripts. The working chart was used to identify the themes more readily.

Step 7. The researcher arranged the data, placed it into the associated groups identified in step six, and began the preliminary analysis.

Step 8. After completing steps 1 through 7, the researcher recorded the existing data by repeating the necessary steps and comparing the findings to the expected

outcomes from the literature. Appendix M is an example of a completed survey with notations in the margins.

The researcher analysis determined similarities and differences in agency and structural factors facing logistics and non-logistics clusters in the study areas. The researcher obtained rich information from the descriptive approach (Giorgi, 1997) to have a "complete understanding of the phenomenon" (Roberts, 2010, p. 143).

Comparison tables of innovative operational processes were created based on current literature findings (Tables 10, 11, and 12) and the themes identified through data analysis (Tables 13, 14, and 15). These tables helped in answering the research objectives of this study. After the data were analyzed (Table 4) and the post-research column was completed, the results generalized logistics cluster hierarchy and effective and ineffective innovation practices.

Table 4 *Data Analysis Procedures*

Procedure	Action
Step 1-Get a Sense of the Whole Method	Sort all raw data by type and collection method.
	Transcribe recorded interviews with Microsoft Teams
	Assign participants codes.
	Remove all personally identifiable information from recorded interviews and relabel it with the participant's code.
	Review all collected data.
	Preliminary sort and categorize data by innovative operational processes and emerging themes.
Step 2-Search for the Underlying meaning	Assess data related to research objectives and innovative operational processes.
	Avoid considering the data’s initial meaning.
	Record initial researcher thoughts.

Table 4 (continued).

Procedure	Action
Step 3-Create Major Topic Clusters	Repeatedly review all transcripts and notes
	Chart full immersion observations
	Refine data for innovative operational processes.
	Modify transcripts to remove extraneous information, highlighting participant responses to questions
Step 4-Write Codes	Review charts for clustering opportunities
	Begin clustering manually.
	Identify major cluster groups.
Step 5-First Cycle Codes and Coding	Assign initial labels to chunks of data.
	Assign labels.
	Analyze coding statements, phrases, or quotes that explain a process
Step 6-Second Cycle Coding and Pattern Codes	Reduce coding into smaller themes.
	Place on working chart.
Final Analysis	Review and verify results.
	Complete documentation of findings
Post Study	Prepare and distribute participant summary report.
	Restrict access to data with a password-protected computer and hard drive

Interview questions. Table 5 displays the six basic interview questions from which all subsequent questions stem. The interview questions from Table 5 were shared with the participants after they agreed to participate but before the actual interview. This way, the participant had time to consider the questions and the answers and make notes before the interview.

Table 5 *Interview Questions*

Question Number	Interview Questions
IQ1	Tell me about your company's process for developing new processes and preparing for change.
IQ 2	Describe the impact of your location on implementing innovative changes. What about your location helps with being innovative?
IQ 3	Discuss your company's process in introducing, evaluating, developing, and innovative operational processes.
IQ 4	Describe the roles of various individuals in the success of innovation in your company. Include the roles of upper management to beginning employees.
IQ 5	Discuss the most/least successful means to implement innovative ideas within your company.
IQ 6	Identify the major obstacles or roadblocks to implementing change or innovation within your company.

The relationship between each research objective and interview question, including the literature references that support the relationship is illustrated in Table 6. This chart was used in the analysis of the data.

Table 6 *Research Objectives Mapped to Interview Questions with References*

Research Objectives	References	Interview Questions
RO1	Bolumole et al., 2015; Bouncken & Kraus, 2013; Casaneuva, Castro, & Galán, 2013; Eriksson, 2011; Fitjar & Rodriguez, 2018; Keller et al., 2015; Motoyama, 2008; Letaifa & Rabeau, 2013; Porter & Stern, 2001; Simmie & Sennett, 1999	IQ 1, 2, 3, 4
RO2	JobsEQ®, http://www.chmuraecon.com/jobseq	JobsEQ®, Industry Spotlight. Truck Transportation: Atlanta, MSA Dallas-MSA Memphis, MSA Non-Logistics Cluster Region*
RO3	Bouncken & Kraus, 2013; Carbonara, 2004; Casaneuva, Castro, & Galán, 2013; Fitjar & Rodriguez, 2018; Porter & Stern, 2001	IQ 3
RO4	Bouncken & Kraus, 2013; Carbonara, 2004; Casaneuva, Castro, & Galán, 2013; Fitjar & Rodriguez, 2018; Porter & Stern, 2001	IQ 3
RO5	Bolumole et al., 2015; Bouncken & Kraus, 2013; Carbonara, 2004; Casaneuva, Castro, & Galán, 2013; Eriksson, 2011; Fitjar & Rodriguez, 2018; Keller et al., 2015; Motoyama, 2008; Letaifa & Rabeau, 2013; Porter & Stern, 2001; Simmie & Sennett, 1999	IQ 1, 2, 3, 4, 5, 6

*Interview questions did not address; this resource was used.

Table 7 displays the interview question related to the categories identified in the literature. Interview question prompts are included to assist with coding and organizing data for analysis. The researcher used the prompts to determine the appropriate innovative operational processes interview categories.

Table 7 *Interview Questions Mapped to Innovative Operational Processes and Prompts*

Interview Question	Innovative Operational Process	Prompts for Discussion
IQ1 Tell me about your company's process for developing new processes and preparing for change.	Institution for collaboration	Diffusions of innovation used by the company Peer networks impact the success
	Informal nature of knowledge flow	Social gatherings Social interactions Social Media How do you participate Impact of peer-to-peer conversations on job success
	Short feedback loop	The ongoing evaluation process for new innovations at each stage. Staff meetings Project review meetings Innovation focus groups Written reports
	Collaborative action programs	Leaders present in the cluster, "innovation," business, and importance. Equal? Influential people? Does the company actively seek to innovate? How close are leaders geographically? Collaboration in the community? How?

Table 7 (continued).

Interview Question	Innovative Operational Process	Prompts for Discussion
IQ2 Describe the impact of your location on implementing innovative changes. What about your location helps with being innovative?	Geographical Location Influence	Local community colleges/universities, trade schools Informal means of collaboration with schools? Formal? Recognized innovation leaders in the community. Develop innovation by partnering with schools. Sustainable partnership with community members---how Informal patterns of communication and knowledge transfer Timely responses to questions and concerns among the business community (short feedback loop) Collective action regimes (individuals join in negotiating) Quality governance
	Shared specialized workforce	Does your company share a specialized workforce, such as consultants, to assist in implementing new processes?
	Specialized local suppliers of industry-specific intermediate inputs and services	Innovative tools in the community, such as shared resources, suppliers, human networks, knowledge sharing, communication styles Knowledge creation centers, universities, consulting firms, think tanks

Table 7 (continued).

Interview Question	Innovative Operational Process	Prompts for Discussion
IQ3 Discuss your company's process in introducing, evaluating, developing, and innovative operational processes.	Length of time from problem identification to implementation	When did you identify that there is a problem? Were there any false starts to implementing the innovation? What was the time frame for implementation? Were there changes in the time frame? What was the time from the idea's start to the completion of the project? Were there any false starts? Change dates, tried on a limited scale, and then full implementation postponed?
	The stimulus for the innovation	Your experience with innovation Qualities that make innovation spread successfully. Business cluster location consolidates transportation modes. Role of other companies in dealing with demand fluctuations Sharing spillover capacity
	Advancing through the process of innovation from a solution to the problem of accepting the innovation	Introduction of latest ideas, products, and concepts introduced: frequency and how Who introduced the innovative processes, and how was the idea received? Innovative tools used, such as shared resources, suppliers, human networks, knowledge sharing, communication styles Summit meetings among companies
	Repositories of scientific and technical knowledge, as well as market knowledge (e.g., research universities)	Research articles Consultation with universities University professors on the board of directors

Table 7 (continued).

Interview Question	Innovative Operational Process	Prompts for Discussion
IQ4 Describe the roles of various individuals in the success of innovation in your company. Include the roles of upper management to beginning employees.	Motivators for both employees and senior-level decision-makers	Impact of innovation on the consistency of purpose Impact of innovation on future success Impact on employee satisfaction Is innovation perceived as an improvement of economic advantage? Social prestige? Convenience? Satisfaction? Are users partners in a continuous process of redevelopment? Where do ideas of innovation arise? Workers, think tanks, C-Suite, colleges, universities Is personal contact used rather than impersonal media used to spread information?
IQ5 Discuss the most/least successful means to implement innovative ideas within your company.	The components of the logistics cluster work with each other to improve the performance of all	Collaboration in the community Technical innovation Sources of information for the innovation process: peer groups, continuing education, periodicals, social gatherings, seminars, social media, professional associations, etc.
	Pooled effort and buying power for products and services enhance efficiency and economic benefit	Companies have a cooperative to enhance buying power for goods and services
	The cost of development of innovation is shared in the logistics cluster through mutual support	Companies shared the cost of installing refueling stations
	To increase success, you must have the support of governmental agencies and procedures	Government agencies acted promptly. Government agencies changed policy. Government agencies offered financial incentives

Table 7 (continued).

Interview Question	Innovative Operational Process	Prompts for Discussion
	The transition to innovation was economically possible through the direct financial support of the company, the pooling of resources among several sources, or governmental programs	Direct financial support of the company Several companies have pooled their resources. The government supported the innovation and actively participated by:
IQ6 Identify the major obstacles or roadblocks to implementing change or innovation within your company.	Obstacles to success included lack of workforce education, local authority support, cooperation, or service integration	Collaboration among firms in the community Informal communication practices Feedback loops Innovation tools availability Colleges, universities, trade schools No collective action regimes

The researcher determined that the interview protocol was credible since the protocol guided the data collection. Before conducting the interviews, academic advisors on the researcher's committee helped ensure that the questions were straightforward and not interpretable in alternate ways. The interview protocol structured the interviews, allowing flexibility and an informal tone during data collection. A limitation of the interview protocol is that only a limited number of participants were in the research because of the interviews' in-depth nature. This qualitative research was not to "prove" but explore issues and problems (Creswell & Creswell, 2018; Symon & Cassell, 2012). This study subscribes to validity and reliability equivalents in qualitative research.

Coding

The researcher employed two coding processes: innovative operational processes and themes from the interviews. Using Table 8, the researcher identified which

innovative operational processes were appropriate for each answer to the interview questions. Since the participants tended to provide additional information when answering questions or discussing topics, each answer could refer to multiple categories. The number of participants who provided information in each category was tallied by logistic and non-logistic clusters (Tables 10 & 11) and placed in a comparison chart (Table 12).

The researcher identified themes in the interview that were not part of the innovative operational processes. The researcher noted statements made in the interviews for clusters and non-clusters and placed them by cluster and non-cluster in a rough working chart that could be sorted by column. The columns were sorted, and the statements were grouped into themes. The themes were reviewed again and grouped for like characteristics. The themes were narrowed. The themes were displayed by cluster and non-cluster regions in (Tables 13 & 14) and compared in (Table 15).

Validity

The researcher validated the data to ensure credibility, accuracy, and trustworthiness (disclosure of researcher bias) in the results (Creswell & Creswell, 2018; Miles et al., 2014). The researcher considered participant views and possible biases in the research. The researcher examined the research methods "within methodological and theoretical paradigms" (Birt et al., 2016, p. 1803).

Reliability

Utilizing different analysis methods contributes to rigor (Pritchard, 2012; Sinkovics & Alfoldi, 2012). Valid and reliable qualitative research includes detailed written analysis, use of accurate data, and maintaining the data (Miles et al., 2014). In

qualitative research, reliability equates to "reasonable care" (Miles et al., 2014, p. 312). One researcher conducted all interviews. This researcher took reasonable care to eliminate or identify biases, interviewed from various regions, and interviewed from diverse commercial truck lines with varying attributes.

Conclusion

The methodology of the current study involved eighteen interviews with managers working in logistics and transportation. Specifically, three research participants were from Atlanta, three from Dallas, and three from Memphis. Nine were from at least three locations that were not logistics clusters but were in the non-cluster region of Alabama, Mississippi, or Louisiana (Sheffi, 2013).

This research compared innovation in commercial trucking companies within a logistics cluster to innovation in commercial trucking companies outside the logistics areas. Said another way, this qualitative comparative study aimed to determine the diffusion of innovation within transportation logistics clusters and compare those processes to companies outside the logistics clusters. All were in the same region of the country.

Determining the innovation methods was achieved by exploring the best practices of logistics professionals' perceptions of innovation diffusion. Research results were summarized and interpreted against the study's problem, purpose, and guiding research questions. The description of the results begins in Chapter 4, followed by a discussion of the findings compared to the existing literature in Chapter 5.

CHAPTER IV – RESULTS

This study explores innovativeness within logistics and non-logistic clusters and compares innovativeness in each using the self-assessment of transportation managers of companies in the Southeastern United States. This study aims to determine the innovative operational processes involved in the diffusion of innovation within logistics and non-logistics clusters, particularly for vehicles engaged in commercial transportation. The data were interpreted manually using Tesch's (Rogers 2003) method of data analysis.

As stated in Chapter 3, saturation was achieved with the interviews conducted as the participants provided similar information with occasional new information. Triangulation was accomplished using three cluster regions, Atlanta, Dallas, and Memphis, and a non-cluster region across Alabama, Mississippi, and Louisiana.

The presentation of the research study results includes answers to the research objectives. The research objectives are as follows:

RO1 Describe the characteristics of study participant transportation companies that have adopted innovative operational processes.

RO2 Describe the characteristics of the six study regions (logistics and non-logistics clusters).

RO3 Explore the diffusion of innovation as perceived by managers in the transportation/logistics companies within a logistics cluster.

RO4 Explore the diffusion of innovation as managers perceive it in the transportation/logistics companies within non-logistics clusters.

RO5 Compare the innovation process as perceived by managers in transportation/ logistics companies in logistics clusters to the innovation process in non-logistics clusters.

The characteristics of the participant transportation companies are described by cluster and non-cluster innovative operational processes. The research data compares the results of the innovative operational processes between the clusters and non-clusters. Common themes that emerged in the participant interviews are presented for clusters and non-clusters, then the themes of clusters and non-clusters are compared.

RO1 – Characteristics of Innovative Transportation Companies

Research Objective 1 examines the innovative characteristics of innovative transportation. The characteristics of the companies interviewed are listed in Table 8.

Table 8 *Characteristics of Participant Companies*

Company Code	Region	Type of Company	Participant Position	Approximate Company Size in Trucks
Atl 1	Cluster	Van/Flatbed	Vice-President	1000
Atl 2	Cluster	Van/Flatbed	Regional Manager	200
Atl 3	Cluster	Van/Flatbed	Vice President	100
Dal 1	Cluster	Van/Flatbed/Intermodal	President	200
Dal 2	Cluster	Intermodal	Vice President	200
Dal 3	Cluster	Van/Flatbed	Regional Manager]	100
Mem 1	Cluster	Tank/flatbed/ Intermodal	President	100

Table 8 (continued).

Company Code	Region	Type of Company	Participant Position	Approximate Company Size in Trucks
Mem 2	Cluster	Intermodal	President	100
Mem 3	Cluster	Van/Flatbed	Vice-President	500
AL 1	Non-Cluster	Van/Flatbed/Tank	Vice-President	500
AL 2	Non-Cluster	Van/Flatbed	President	100
AL 3	Non-Cluster	Van/Flatbed	Vice-President	500
LA 1	Non-Cluster	Van/Flatbed	Regional Manager	300
LA 2	Non-Cluster	Van/Flatbed/Tank	Regional Manager	300
MS 1	Non-Cluster	Van/Flatbed	Terminal Manager	100
MS 2	Non-Cluster	Van/Flatbed/Intermodal	Operations Manager	300
MS 3	Non-Cluster	Van/Flatbed	Regional Manager	400
MS 4	Non-Cluster	Van/Flatbed	President	400

Flatbed carriers employ 11 participants, with two others employed in carriers with vans, flatbeds, and tanks. Another two participants represent companies with van, flatbed, and intermodal carriage, and two others are strictly intermodal. One participant is from a company that uses tank, flatbed and intermodal carriage. Three intermodal carriers are from clusters, while one non-cluster carrier is intermodal. One cluster company is a tank carrier, and two non-cluster companies are tank carriers.

Five participants are company presidents, three from clusters, and two from non-clusters. Six participants are vice presidents, four from clusters and two from non-clusters. Two participants are regional cluster managers, and four are non-cluster. One participant is the operations manager of a non-cluster carrier. One participant is a terminal manager from a non-cluster region.

The company size varied from approximately 100 trucks to over 1,000, with size distributed over the cluster and non-cluster regions. The largest carrier, with over 1,000 trucks, is in Atlanta. Companies with about 500 trucks are in a cluster, one, and non-clusters, two. The 300-truck and two 400-truck-size carriers are the non-cluster regions. The three 200 truck-size carriers are in clusters. Four of the 100 truck-size carriers are in clusters, with the remaining two being in the region outside the cluster.

RO2 – Characteristics of Study Regions

Research objective two examines the characteristics of study regions. The three cluster regions include Atlanta, Dallas, and Memphis, all metropolitan statistical areas within the south. Table 9 provides an overview of the regions (JobsEQ, 2023; Census Bureau Statistics, 2022).

Table 9 *Overview of Study Regions*

Characteristic	Atlanta	Dallas	Memphis	Non-Cluster AL/MS/LA
Population	6,144,050	7,637,397	1,341,339	12,643,315
Size in square miles	8,376	8,675.3	4,599	140,739
Employment	39,569	53,660	15,163	69,116
Average Wages	$61,634	$68,244	$66,953	$61,049
Forecast Annual Growth Rate	0.8%	1.3%	-0.2%	-0.3%
Commercial Trucking Companies	2,465	3,055	672	6,544
Colleges/Universities with Post-Secondary Programs	5	8	6	9
MSA counties	29	11	8	217
Location Quotient (LQ)	1.26	1.25	2.15	1.21

The metropolitan statistical areas range in population, with Dallas and Atlanta being over six million while Memphis is around 1.3 million. Dallas and Atlanta cover over eight thousand square miles, with Memphis slightly over half that size. The Memphis MSA area has counties in three states. Dallas's forecast annual growth rate is 1.3%, Atlanta's 0,8%, and Memphis's negative 0.2%. The number of commercial transportation companies in Dallas is 3,055, in Atlanta, 2,465, and in Memphis, 672. The areas have colleges and universities with postsecondary programs (Table 9). All have similar weather patterns.

The non-cluster region of Alabama, Mississippi, and Louisiana covers 140,739 square miles with a total population of 12,643,315. The locations of each participant company within the region are diverse in a local population ranging from small towns to small cities to small-medium metropolitan areas. The non-cluster region has a negative

0.3% annual growth rate while employing 69,116 workers in the transportation industry. The weather patterns are like clusters. The workforce is adequate, but not all employees are local. The non-cluster companies had at least one community college and technical school nearby, while several had a research university in the immediate area (Table 9).

The location quotient (LQ) measures the concentration of the transportation industry compared to the national concentration (JobsEQ, 2023). Atlanta, Dallas, and the non-cluster region of Alabama, Louisiana, and Mississippi all have similar concentrations of 1.26, 1.25, and 1.21, respectively. All three were above the national average by around 0.24 points, indicating a greater than national concentration. Memphis is significantly greater, with an LQ of 2.15, indicating more than double the transportation concentration.

RO3, RO4, RO5 – Diffusion of Innovation

This research addresses innovativeness within logistics and non-logistic clusters by comparing innovativeness using the self-assessment of transportation managers of companies in the logistics clusters in Atlanta, Dallas, Memphis, and the non-cluster regions of Alabama, Mississippi, and Louisiana. The study seeks to provide data in an area where little research has been produced.

The results of this study are organized by the stages of innovation observed and the identified innovation themes identified in the interviews. Each area is addressed by discussing participant response in the cluster and the region outside clusters and comparing the two.

RO3 – Cluster Regions

Research objective three concerns the diffusion of innovation as perceived by managers in three (Atlanta, Dallas, Memphis) of Sheffi's (2013) top sixty transportation/logistics clusters. Table 10 displays the number of cluster participants' responses in the various stages of innovation broken down into the areas of the innovation process mentioned in those responses. The participants' responses to each innovative process are discussed in the following sections.

Table 10 *Stages of Innovation Observed in Cluster Regions*

Innovative Operational Process	Innovation Process				
	Introduction	Evaluation	Development	Implementation	Innovation in General
Geographical Location Influence	9	-	3	-	9
Institution for Collaboration (Porter & Stern, 2001)	9	3	2	-	7
Informal nature of knowledge flow (Porter & Sten, 2001)	9	5	3	3	9
A short feedback loop (Porter & Stern, 2001)	9	4	-	-	9
Collaborative Action Programs (Porter & Stern, 2001)	6	3	3	-	9
Shared specialized workforce (Tokatti, 2010)	5	-	-	-	9
Specialized local suppliers of industry-specific intermediate inputs and services	4	3	2	-	9
Repositories of scientific, technical as well as market knowledge (e.g., research universities)	6	3	3	4	9
Length of time from problem identification to implementation (Akca & Ozer, 1024)	6	4	3	-	6
The stimulus for the Innovation (what was the problem) (Johannessen, 2013)	5	4	-	-	7

Note: - the participants made no comments in this area; 9 total participants.

Table 10 (continued).

Innovative Operational Process	Innovation Process				
	Introduction	Evaluation	Development	Implementation	Innovation in General
Advancing through the process of innovation from the solution to the problem of accepting the innovation (Rogers, 2003)	7	3	-	-	7
Motivators for both employees and the senior-level decision-makers (Dutfield, 2006)	7	4	-	-	7
The components of the logistics cluster work with each other to improve the performance of all (Breschi, 2008)	8	-	-	-	7
Pooled effort and buying power for products and services enhance efficiency and economic benefit (Eriksson, 2011)	6	-	3	-	8
The cost of development of innovation is shared in the logistics cluster through mutual support (Sheffi, 2013)	7	-	3	-	7
To increase success, one must have the support of governmental agencies and procedures (China et al., 2012; Radosevic & Yoruk, 2013)	5	-	-	-	6
The transition was made economically possible	6	3	-	-	5
Obstacles to success included a lack of workforce education, local authority support, cooperation, or service integration (Sheffi, 2013; Harger, 2015)	9	-	-	-	9

Note: - the participants made no comments in this area; 9 total participants**.**

RO4 – Non-Cluster Regions

Examining the diffusion of innovation as perceived by managers in transportation/ logistics companies, not in logistics clusters, is research objective 4. Table 11 displays the number of non-cluster participants' responses in the various stages of innovation broken down into the areas of the innovation process mentioned in those responses. Most participants discussed the innovation in general terms and how innovation was introduced, information in the areas of evaluation, implementation, and development was

also provided. The participants' responses to each innovative process are discussed in the following sections.

Table 11 *Stages of Innovation Observed in the Non-Cluster Region*

Innovative Operational Process	Innovation Process				
	Introduction	Evaluation	Development	Implementation	Innovation in General
Geographical Location Influence	9	5	2	3	9
Institution for Collaboration (Porter & Stern, 2001)	9	5	2	-	7
Informal nature of knowledge flow (Porter & Stern, 2001)	9	8	4	5	7
A short feedback loop (Porter & Stern, 2001)	9	7	4	4	5
Collaborative Action Programs (Porter & Stern, 2001)	9	9	4	2	8
Shared specialized workforce (Tokatti, 2010)	7	3	6	3	7
Specialized local suppliers of industry-specific intermediate inputs and services	9	4	6	5	9
Repositories of scientific, technical as well as market knowledge (e.g., research universities)	9	4	7	2	9
Length of time from problem identification to implementation (Akca & Ozer, 1024)	9	3	5	1	9
The stimulus for the Innovation (what was the problem) (Johannessen, 2013)	9	4	6	3	9
Advancing through the process of innovation from solution to the problem to accepting the innovation (Rogers, 2003)	9	3	5	2	5
Motivators for both employees and the senior-level decision-makers (Dutfield, 2006)	8	5	5	5	8
The components of the logistics cluster work with each other to improve the performance of all (Breschi, 2008)	6	5	5	5	8

Note: - the participants made no comments in this area; 9 total participants

Table 11 (continued).

Innovative Operational Process	Innovation Process				
	Introduction	Evaluation	Development	Implementation	Innovation in General
Pooled effort and buying power for products and services enhance efficiency and economic benefit (Eriksson, 2011)	6	2	3	2	6
The cost of development of innovation is shared in the logistics cluster through mutual support (Sheffi, 2013)	5	-	-	-	5
To increase success, you must have the support of governmental agencies and procedures (China et al., 2012; Radosevic & Yoruk, 2013)	7	-	3	-	6
The transition was made economically possible	3	2	2	2	5
Obstacles to success included a lack of workforce education, local authority support, cooperation, or service integration (Sheffi, 2013; Harger, 2015)	9	4	4	5	8

Note: - the participants made no comments in this area; 9 total participants

RO5 – Comparison of Cluster and Non-Cluster

The final research objective concerns comparing the innovation process in three of Sheffi's (2013) top sixty logistics clusters with the innovation process in non-logistics clusters. Table 12 compares the responses to the stages of innovation observed in logistics clusters and the non-logistics cluster region. The observed stages of innovation differed between the logistics and the non-logistic cluster regions. The responses are compared at the end of each section.

Table 12 *Comparison of Stages of Innovation Observed*

Innovative Operational Process	Innovation Process									
	Introduction		Evaluation		Development		Implementation		Innovation in General	
	C	NC	C	NC	C	NC	C	NC	C	NC
Geographical Location Influence	9	9	-	5	3	2	-	3	9	9
Institution for Collaboration (Porter & Stern, 2001)	9	9	3	5	3	2	-	-	7	7
Informal nature of knowledge flow (Porter & Stern, 2001)	9	9	5	8	3	4	3	6	9	7
A short feedback loop (Porter & Stern, 2001)	9	9	4	7	-	4	-	4	9	6
Collaborative Action Programs (Porter & Stern, 2001)	6	7	3	3	3	3	-	5	9	7
Shared specialized workforce (Tokatti, 2010)	5	9	-	4	-	6	-	5	9	9
Specialized local suppliers of industry-specific intermediate inputs and services	5	9	3	4	2	7	-	3	9	9
Repositories of scientific, technical as well as market knowledge (e.g., research universities)	6	9	3	4	3	7	4	2	9	9
Length of time from problem identification to implementation (Akca & Ozer, 1024)	6	8	4	3	3	3	-	3	6	9
The stimulus for Innovation (what was the problem; Johannessen, 2013)	5	9	4	4	-	3	-	3	7	9
Advancing through the process of innovation from solution to the problem to accepting the innovation (Rogers, 2003)	7	9	3	1	-	7	-	2	7	9

Note: C-Cluster; NC-Non-Cluster ; - the participants made no comments in this area; 18 total participants; 9 Cluster, 9 Non-Cluster

Table 12 (continued).

Innovative Operational Process	Innovation Process									
	Introduction		Evaluation		Development		Implementation		Innovation in General	
	C	NC	C	NC	C	NC	C	NC	C	NC
Motivators for both employees and the senior level decision-makers (Dutfield, 2006)	7	8	4	5	-	5	-	5	7	8
The components of the logistics cluster work with each other to improve the performance of all (Breschi, 2008)	8	6	-	2	-	-	-	-	7	7
Pooled effort and buying power for products and services enhance efficiency and economic benefit (Eriksson, 2011)	6	6	-	2	3	3	-	2	8	6
The cost of development of innovation is shared in the logistics cluster through mutual support (Sheffi, 2013)	7	5	-	-	3	-	-	-	7	5
To increase success, you must have the support of governmental agencies and procedures (China et al., 2012; Radosevic & Yoruk, 2013)	5	7	-	-	-	3	-	-	6	6
The transition was made economically possible	6	3	3	2	-	2	-	2	5	5
Obstacles to success included a lack of workforce education, local authority support, cooperation, or service integration (Sheffi, 2013; Harger, 2015)	9	9	-	4	-	4	-	5	9	9

Note: C-Cluster; NC-Non-Cluster ; - the participants made no comments in this area; 18 total participants; 9 Cluster, 9 Non-Cluster

Geographic Location Influence

The geographic influence of location has several components (Table 7). The study included examining these variables. One variable is the presence of local community colleges/universities and trade schools with which a collaborative relationship and or partnering exists; recognition as innovation leaders in the community is another variable. Having a sustainable partnership with community members is impacted by the location, as are the informal communication patterns and knowledge transfer within the community. Timely responses to questions and concerns among the business community (short feedback loop) are impacted by the geographic location, as are collective action regimes (individuals join in negotiating) and quality governance. The responses indicated varying degrees of geographic influence.

Cluster. Nine cluster participants discussed the influence of geographic location: nine discussed introduction, none evaluation, three development, and none mentioned implementation (Table 10).

Statements concerning location varied. Overall, location does not have a significant difference with today's technology, but location is essential if you meet with customers in a particular area. The internet keeps the company connected regardless of location, but having the software vendors nearby is helpful to assist with hands-on training and problems. A larger pool of potential employees is available in the clusters. Being in a “big city” improves employee morale. Company size impacts innovation as much as location, as the company is more able to afford innovative technology and change in general. The prevailing theme is that the location is not as significant with technology.

Non-Cluster. Nine non-cluster participants discussed geographic location: nine discussed introduction, five evaluation, two development, and three mentioned implementation (Table 11). The influence of geographic location on the non-cluster participants varies.

The comments about location range from definite advantages to the location is not as important as the employees, to the location is not big, and to the location being of zero importance. Recruiting and dispatching are often done over the internet. Having the terminals located near the major shippers is important to several participants. Being located near driver training and technical schools is advantageous. A location near equipment dealerships, community colleges, and easy interstate access is fantastic. Location is important to a company's needs, such as recruiting, maintenance and mechanic schools, and trained/educated employees, or there is a scarcity of drivers or a long distance to available freight.

Comparison. All the participants addressed the role of location in the trucking industry (Table 12). The importance of physical location varied between companies in clusters and companies in the non-cluster region. The consensus is that with the internet, location is not as important. Both cluster and non-cluster indicate that proximity to shippers, training providers, and vendors is important when considering the location. The cluster and non-cluster participants noted that the recruitment of drivers is easier in highly populated areas.

Institution for Collaboration

The institution for collaboration focuses on peer networks impacting success. All the companies had peer networks to some extent (Table 7). Professional associations were one of the most frequently used peer networks.

Cluster. All participants collaborate, at least when introducing ideas. Nine cluster participants discussed collaborative action: nine discussed introduction, three evaluation, three development, and none mentioned implementation (Table 10). One participant collaborates with branch managers to discuss innovation and change but does not collaborate with the community. Collaborating with a research university is practiced. Social conversations among trucking friends, professional associations, and traffic clubs provide opportunities for collaboration. Talking with shippers and employees who have worked for other trucking companies are other ways to collaborate. A manager who serves on a board with a colleague at another trucking company talks together three to four times a week. Collaborating with competitors about mutual software problems and solutions or sharing safety improvement methods is also used to collaborate. Sharing information among peers in different companies is limited to generalities. Collaboration is common with professional associations. One participant engages in a nationwide study group.

Non-Cluster. All participants outside the logistics clusters mentioned the institution for collaboration. Nine non-cluster participants discussed collaborative action: nine discussed introduction, five evaluation, two development, and none mentioned implementation (Table 11).

As with clusters, the type of collaboration varies. Collaboration with other carriers happens at traffic clubs, informal gatherings, vendor-organized meetings, social gatherings, and peer-to-peer visiting. This collaboration is more of a grassroots effort, with consultants used for specific problems and Facebook, Instagram, and Twitter also used. Driver meetings and driver emails are used to establish a collaborative effort. Vendors help generate innovative ideas as well as solutions to problems. Driver safety meetings are a source of good and bad ideas for innovation. Creating a comfortable area at staff and driver meetings encourages collaboration and leads to innovative ideas. Collaboration works best if the collaborators are close geographically. Available funds can be a limiting factor in collaboration. Books, podcasts, and magazine articles are reliable sources for innovative ideas, as are colleges, trade schools, classes, or continuing education. Most collaboration comes from within the company.

Comparison. All participants mentioned the institution for collaboration and found value in collaborating (Table 12). The degree of collaboration varied, but all participants collaborated within the company, including all levels of employees. Driver inclusion occurs frequently. Equality of meeting participants is important to the generation of ideas. Talking with other trucking companies occurs at gatherings, is informal, or happens to solve a mutual problem. Peer-to-peer interactions can occur but happen when another professional relationship exists.

The use of social media as a collaborative method is mentioned by non-cluster participants, but not cluster. One non-cluster participant discussed the value of using a consultant, from which he saw a marginal benefit. He reported using books, podcasts, and magazine articles to collaborate with one non-cluster participant. A collaborative

relationship exists between one cluster participant and a research university. Cluster participants also served on various community boards with other trucking industry representatives.

Informal Nature of Knowledge Flow

All participants addressed the informal nature of knowledge flow. The use of social gatherings and interactions, social media, types of participation, and peer-to-peer interactions are components of informal knowledge flow (Table 7). Communication emerged as a primary theme for innovation success.

Cluster. The informal nature of knowledge flow is vital to the innovation process in the cluster regions. Nine cluster participants discussed informal knowledge flow: nine discussed introduction, five evaluation, three development, and three mentioned implementation (Table 10). This is one of the most descriptive interview areas, as communication is crucial to success. One participant meets in the bar after a meeting and listens to conservations around him and his own. LinkedIn is a way of communicating on social media. Professional newsletters and the Wall Street Journal are important to knowledge flow. iPads or laptops enhance driver communication, and all platforms communicate one organization's mission statement, vision, values, and goals. General conversations among managers and drivers, among drivers, among dispatchers, among dispatchers and drivers, etc., are some of the best methods of informal knowledge flow. A formal group that brainstorms or bounces ideas off each other enhances one company’s communication. Drivers use Facebook to communicate, and Facebook becomes family. The companies are community aware and socially engaged, which enhances employee

satisfaction. At least one company does not have any active social media. Face-to-face conversations are preferred by some carriers, while others prefer emails and texts.

Non-Cluster. The participant in the non-cluster region discussed the informal nature of knowledge flow. Nine non-cluster participants discussed collaborative action, nine discussed introduction, eight evaluation, four development, and six mentioned implementation (Table 11). This was one of the most descriptive interview areas for the non-logistics clusters, as communication is essential for success. Twitter, LinkedIn, and Facebook are means of informal knowledge flow. Drivers are the best source of information and provide the quickest feedback. Most ideas are from the bottom up, which is informal communication. Bulk Transport Magazine and Transport Topics are sources of valuable information. Face-to-face employee meetings, driver suggestion boxes, traffic meetings, traffic clubs, social gatherings, and peer-to-peer conversations are good sources of information. Competitor experiences are a source of information, as are children's school activities. Associations such as trade, marketing, and sales allow informal knowledge flow. Additionally, social gatherings are important means of informal communication. Professional print media is a source of knowledge for both groups.

Comparison. The informal nature of knowledge flow is important to all participants (Table 12). Most companies in clusters and not in clusters use informal knowledge flow to generate ideas for innovation. The informal flow of information is improved by positive communication and collaboration. Social media is important to knowledge flow in clusters and non-clusters. Community involvement is important to each group. The non-cluster participants rely more heavily on driver input, while the cluster participants in clusters mentioned interactions among several groups of

employees. One non-cluster has formal groups that conduct brainstorming sessions to share information.

Short Feedback Loop

The short feedback loop is the ongoing evaluation process from idea to project completion and includes staff meetings, project review meetings, innovation focus groups, and written reports. The feedback loop includes formal councils or boards bouncing ideas off each other and then evaluating those ideas to executive teams reviewing and evaluating ideas (Table 7). The feedback loop was described to varying degrees by the participants, but all participants mentioned feedback loops.

Cluster. Nine cluster participants discussed collaborative action: nine discussed introduction, four discussed devaluation, none development, and none mentioned implementation (Table 10). All cluster participants discussed short feedback loop strategies as part of introducing the innovation and in general terms of use. Almost half discussed the feedback loop in terms of evaluation.

Project teams evaluate as the innovation progresses to full implementation and modification. Open forum phone calls are used to generate information and ideas, and a follow-up meeting of managers prioritizes and evaluates the ideas. Executive weekly meetings review and prioritize all the projects; informal team discussions about project progress occur throughout the company. Open communication among all participants in the innovation is a significant component of the feedback loop. Collaboration is essential.

Non-Cluster. All non-cluster participants discussed short feedback loop strategies to introduce the innovation. Nine non-cluster participants discussed collaborative action:

nine discussed introduction, seven evaluations, four development, and four mentioned implementation (Table 11).

Driver meetings and answering driver complaints are sources for innovative ideas, then senior management decides on whether to change. Seminars and vendor displays can introduce innovative ideas, as does networking with other companies. The government demands change, and the companies must react with innovation. Weekly meetings and progress reports enhance project feedback. Open lines of communication, soliciting input from all involved, listening to feedback, and being open to all information are necessary for success. Professional organizations, such as the national and state trucking associations, and professional literature are important for the accuracy of the feedback loop.

Comparison. Open communication is emphasized in both clusters and non-clusters and is central to success. Both indicate that listening and addressing problems is necessary for success. Executive meetings to prioritize and evaluate are part of the feedback loop. The cluster participants use formal and informal team meetings for feedback, while the non-cluster use general meetings, including progress notes. Innovation can be a response to government policies for the non-cluster participants (Table 12)

Collaborative Action Programs

Collaborative action programs examine several work practices. The leaders, innovation practices, and businesses that are present, and the overall importance of these concepts are significant. Equality in the programs, influential people, and the company's innovation practices are examined. Geographic proximity of the business and the leaders

are explored. The company's community collaboration efforts are studied, as well as intra-company collaboration (Table 7). Intra-company collaboration is where a difference between clusters and non-clusters is expected.

Cluster. Nine cluster participants discussed collaborative action: six discussed introduction, three evaluation, three development, and none mentioned implementation (Table 10). The company puts together an internal subset of leaders to enhance collaboration. Vendor input and university professors are collaborators with the company. Focus groups collaborate to enhance creativity. All platforms of communication are used to enhance collaboration. The American Trucking Association sponsors collaborative symposiums. Vendors, customers, and carriers collaborate to discuss and improve operations and make the process easier. Product advisory boards are a means of forming a collaborative partnership. Building relationships create collaborative programs that share successes, failures, and solutions, and the carrier collaborates with intermodal to make intermodal processes easier. Collaboration aids in ongoing evaluation by assisting in pinpointing solutions. Personal contact is needed to develop collaborative efforts.

Non-Cluster. Seven non-cluster participants discussed collaborative action: seven discussed introduction, three evaluation, three development, and five mentioned implementation (Table 11). The interviews included such comments as collaborative action is frequently a trial-and-error process. The carrier discusses problems and solutions with vendors and community colleges. Vendors and colleges help with problem solutions. Personal contact is important in developing collaborative relationships. Professional organizations/trade associations are important collaborators as they organize and provide meetings and workshops. Friendly competitors can be collaborative partners.

Carrier meetings can be a source of collaboration when the innovation affects all equally. Collaboration is most successful when all participants are included, and quality time is spent on the task. Companies develop allies in the community to enhance collaborative efforts. Influential people, including opinion leaders, make the collaborative effort work. The successful collaboration includes people from all levels of employment. And successful collaboration conveys that it is okay to fail.

Comparison. The number of responses indicated slight difference in the collaborative action between cluster regions and non-cluster. Still, the non-cluster regions addressed more about the process of innovation more. Analysis shows vendors, customers, colleges/universities, professional organizations/trade associations, friendly competitors, and community members collaborating with the trucking industry to help generate problems, ideas, and solutions. Personal contact is important for successful collaboration. Input from all employees is encouraged and viewed as a collaborative effort within the company. The non-cluster participant included, "it is okay to fail," collaborative efforts must be adequately funded, collaboration works better when the collaborators are near each other, and influential people are needed to collaborate. "Collaborating with intermodal makes the process easier," mentioned one cluster participant (Table 12).

Shared Specialized Workforce

A shared specialized workforce includes consultants to assist in implementing new processes (Table 7). Educators/trainers who go into companies are also included in this category. Professional associations provide a shared workforce through consultation services and training. The expense of using a shared workforce is a consideration.

Cluster. All cluster participants mentioned a shared specialized workforce but did not elaborate. Nine cluster participants discussed shared specialized workforce: five discussed introduction, no evaluation, no development, and none mentioned implementation (Table 10). One company uses a safety consultant. Software and other equipment vendors serve as training consultants for their products. One company helps other companies. Professional associations provide specialized assistance. One participant said consultants are too expensive.

Non-Cluster. A shared specialized workforce was discussed by most outside the non-cluster participants. Nine non-cluster participants discussed a shared specialized workforce: nine discussed introduction, four evaluation, six development, and five mentioned implementation (Table 11). IT consultants, vendor equipment experts, driver training schools, software specialists, former employees of other specialty carriers, and vendors specializing in logs, permits, and fuel tax are all parts of a shared specialized workforce. The drivers are a specialized workforce and especially customer-trained dedicated equipment drivers.

Comparison. Non-logistics cluster participants listed IT consultants, vendor equipment experts, driver training schools, software specialists, former employees of other specialty carriers, and vendors specializing in logs, permits, and fuel tax as parts of a shared specialized workforce, while the clusters listed software and equipment vendors and professional associations. Drivers are part of the specialized workforce for non-cluster participants. One cluster carrier used a safety consultant (Table 12).

Specialized Local Suppliers

Specialized local suppliers of industry-specific intermediate inputs and services refer to innovative tools in the community, such as shared resources, suppliers, human networks, knowledge sharing, knowledge creation centers, universities, consulting firms, and think tanks (Table 7).

Cluster. All nine participants at least mentioned this as a casual comment or verbal yes or no; four discussed the introduction of the concept, three the evaluation, and two the development (Table 10). Tank repair and materials are local to the carrier, as is engine overhaul and repair, and a supply of truck parts and the technology required. Technology vendors are local. Merchants are customers. Truck driving schools and diesel mechanic schools are local. The area is available for trailer rental, commercial tire vendors, mobile tire service, and truck washing facilities. Product and material silos are plentiful. The loading and unloading at intermodal facilities are adequate.

Non-Cluster. All participants outside the cluster mentioned this as an introduction and general comments; four discussed evaluation, six development, and five the implementation (Table 11). Tractor dealerships are in proximity for parts and labor, fuel haulers are short-run vendors, and technology suppliers and consultants are nearby. Coops are available for quick deliveries of driver equipment, company maintenance, and supplies. Transportation accounting services, commercial tire vendors, and truck wash facilities are nearby for other needs. Additionally, truck driving schools and alternate fuel vendors are close.

Comparison. The lists of specialized local suppliers of industry-specific services have many commonalities with few major differences. The question arises if all

participants would select all the items if a list were provided. Tractor and tank repair, vendors for tractors and trailers, parts, commercial tire vendors, truck washing facilities, and driver training schools are specialized local suppliers of industry-specific services. Cluster participants also identified merchants as being customers and intermodal facilities. The non-cluster participants mentioned alternate fuel vendors, fuel haulers as short-term vendors, technology suppliers and consultants, and transportation accounting services as specialized local suppliers of industry-specific services (Table 12).

Repositories of Scientific, Technical, and Market Knowledge

Repositories of scientific, technical, and market knowledge (e.g., research universities) refer to research articles, consultation with universities, and university professors on the board of directors. The use of community colleges and technical schools is also in this category (Table 7).

Cluster. Nine cluster participants discussed repositories of scientific, technical, and market knowledge: six discussed introduction, three evaluation, three development, and four mentioned implementation (Table 10). The cluster companies have technical schools, colleges, and universities in the logistics clusters.

Non-Cluster. Nine non-cluster participants discussed repositories of scientific, technical, and market knowledge: nine discussed introduction, four evaluation, seven development, and two mentioned implementation (Table 11). The non-cluster companies mentioned the state universities being in proximity. Mechanic schools, technical schools, diesel mechanic schools, community colleges, American Association of Highway Transportation Officials (ASHTO), Transportation Research Board, and the State

Department of Public Safety are repositories of scientific, technical, and market knowledge by participants in the non-cluster region.

Comparison. Universities and community colleges are repositories of scientific, technical, and market knowledge by both participants. Mechanic schools, technical schools, diesel mechanic schools, community colleges, ASHTO, Transportation Research Board, and the State Department of Public Safety are repositories of scientific, technical, and market knowledge by participants in the non-cluster region (Table 12).

Length of Time from Problem Identification to Implementation

The length of time from problem identification to implementation includes when a problem was identified, false starts to implement the innovation, time frame for implementation, changes in the time frame, and length of time from the start of the idea to completion of the project (Table 7).

Cluster. The time from problem identification to implementation is not widely elaborated. Six cluster participants discussed the length of time from problem identification to implementation: six discussed introduction, four evaluation, three development, and none mentioned implementation (Table 10). The time for process completion can depend on whether the problem was internally or externally generated, with internal identification taking less time.

Weekly committee meetings guide the process, which can take months to complete. The process should fail fast/fail cheap, but that is not the case; technology innovation can take over a year and is expensive if it fails. When the owner commands the change, the length of time is shortened. Time for process completion is longer than normal since intermodal drayage changes have benefited the carrier, the rail, and water

transport. When technology is not involved, implementation occurs within one month. The company aims to complete the implementation within 60 days when the innovation is not purchased and no training is involved. The length of time depends on cost and manpower requirements.

Non-Cluster. Nine non-cluster participants discussed the length of time from problem identification to implementation: eight discussed introduction, three evaluations, three development, and three mentioned implementation (Table 11). The innovation process can take over a year if the idea is bottom-up. The time is shortened if the process is trial and error, but the solution may be faulty. Formal processes take longer and are more thorough, but informal shorter processes are for tweaks in small issues. The length of time is affected by the number of departments involved and if IT is one of the departments. Packaged software takes six-nine months. Fail fast/fail cheap is not used. The goal is six months from start to finish with drivers and one to three months with office and administration. Go as fast as possible and tweak the implementation if problems arise. Do the process right the first time; the time from start to finish does not matter. The company has only one greater than a three-month project at a time. Several one-to-three-week projects can be ongoing, with the exact number being dependent on the departments involved. A cost-benefit analysis determines the time and money a project is worth and if funding can be allocated. The length of time for the process depends on available manpower and funding. Turnaround time is shorter for government-mandated change and longer for voluntary.

Comparison. The responses regarding the time required to complete the innovation process vary widely among the cluster participants, participants in the non-

cluster region, and between the clusters. The commonality that stands out is that the concept of fail fast/fail cheap is not used by anyone. Cluster and non-cluster indicated that more complex technological innovations could take over a year. More time is required if training and education are involved. Simple innovations take about 60 days in both groups, while dictated change by the owner or government takes less time. Manpower and funding affect the time required for the innovation process. The cluster participants also mentioned trial and error, the number of projects simultaneously, and formal versus informal processes. A cluster participant mentioned the effect of intermodal drayage on the innovation process (Table 12).

Stimulus for Innovation

The stimulus for innovation refers to identifying the problem. Clarifying comments include experience with innovation, qualities that make innovation spread successfully, consolidation of transportation modes, the role of other companies in dealing with demand fluctuations and sharing spillover capacity (Table 7).

Cluster. Seven cluster participants discussed stimulus for innovation: five discussed introduction, four evaluation, none development, and none mentioned implementation (Table 10). Competitiveness in the industry is one reason to innovate, as is providing services faster, better, and cheaper. Additionally, safety on the road pushes for increased use of technology. Innovative technology in trucks leads to a greener fleet. Making truck driving more attractive to women is another stimulus. Decreasing administrative overhead, maintenance costs, and on-road breakdowns are economic stimuli. Seeking innovations to decrease driver turnover. Regulatory compliance with fewer errors is yet another stimulus.

Non-Cluster. Nine non-cluster participants discussed collaborative action: nine discussed introduction, four evaluation, three development, and three mentioned implementation (Table 11). Government-mandated change is a primary stimulus of innovation. Increasing efficiency among drivers, dispatch, accounting, administration, and meeting legal requirements is another stimulus. Cost reduction, service improvement, and increased safety are stimuli, as is going green. Driver satisfaction, including automatic transmissions and in-cab amenities, is a big stimulus for change. Decreasing driver turnover is another stimulus. Some stimuli are customer encouraged. Making better use of technology is always a driving force. Becoming a trendsetter is another stimulus for innovation.

Comparison. Both cluster and non-cluster participants identified driver turnover as a stimulus for innovation. A problem that needs to be solved along with making truck driving more attractive and satisfying. Using technology to enhance safety, better use of technology, and improving safety are all categories that stimulate change. Reducing costs and improving efficiency are concerns of all participants as is going green. Both areas viewed government compliance with fewer errors as stimuli. Service improvement is another common stimulus. Outliers for the non-cluster region are the customer-encouraged change and becoming a trendsetter (Table 12).

Advancing through the Process of Innovation

Advancing through the process of innovation from the idea and identification as a solution to the problem to incorporating the innovation into the culture of the company includes the concepts through the introduction of ideas, products, and concepts; the source of the ideas, products, and concepts; innovative tools, such as shared resources,

suppliers, human networks, knowledge sharing, communication styles, etc.; and summit or other type meetings within the company or among several companies (Table 7).

Cluster. Several participants shared this process. Seven cluster participants discussed advancing through the innovation process: seven discussed introduction, three evaluation, none development, and none mentioned implementation (Table 10). An implementation team sells the solution and begins the innovation process. The solution is announced, and local management manages the process. Podcasts and videos are used to convey information and provide instruction. Trainers are assigned to terminals to communicate the process, educate, and listen to feedback. General conversation between drivers and "change agents" helps move through the innovative process. Through video, the president of the company explains changes and encourages feedback. The basic process includes introducing the solution, encouraging questions, and addressing issues. Another process is a weekly meeting to address problems and modify the solution when indicated. Making change a part of the corporate culture and communicating well is essential to the innovative process.

Non-Cluster. Nine non-cluster participants discussed advancing through the innovation process: nine discussed introduction, one evaluation, seven development, and two mentioned implementation (Table 11). A driver or a customer has a problem; a committee is formed; the problem is addressed; research is done; resources are allocated; the solution is introduced; and the workforce is educated; trainers or implementation teams monitor the progress. Networking with other carriers to determine their solutions and accepting one of the solutions. The company's owner decides on the change, made with minimal instruction. Small companies have difficulty innovating based on funding

and manpower limitations. After innovation is identified, small trials are done and rolled out to the entire company.

Comparison. Effective communication is the overriding theme for successfully implementing the innovation process. Collaboration among team members and employees is a more subtle theme implied by the responses. The non-cluster participants provided more detail regarding the process: problem identified, a committee formed, the problem addressed, research done, resources allocated, the solution introduced, workforce educated, and process monitoring. The cluster participants were much more general and briefer in their descriptions, but the same process was followed. The cluster participant also included videos by the company president to explain changes and encourage feedback, podcasts, videos to discuss and educate, assigned trainers, weekly meetings to discuss progress, and making change a part of the corporate culture. A non-cluster participant uses small trials before company-wide implementation. A non-cluster participant also mentioned that innovation is more difficult for small companies (Table 12).

Motivators for Both Employees and Senior Level Decision-Makers

Motivators for both employees and senior-level decision-makers may include such items as the impact of innovation on the consistency of purpose, on future success, and employee satisfaction; the perception of innovation as an improvement of such items as an economic advantage, social prestige, convenience, satisfaction, etc.; the users of the innovation being partners in a continuous process of development and redevelopment; the sources of innovative ideas; and the methods utilized to spread the innovative change (Table 7).

Cluster. Seven cluster participants discussed motivators for employees and senior-level decision-makers: seven discussed introduction, four evaluation, none discussed development, and none mentioned implementation (Table 10). The motivators mentioned by the cluster participants include peer recognition, salary increases, the satisfaction of being a part of the solution, job security and promotions, reliance on innovative technology, opinions being listed to and valued, the efficiency of operations with drivers, and clear and effective communication.

Non-Cluster. Eight of the non-cluster participants discussed motivators for both employees and senior-level decision-makers: eight discussed introduction, five evaluation, five development, and five mentioned implementation (Table 11). The motivators mentioned by the non-cluster participants include valuing all opinions, effective communication, recognition as an innovator, improved customer service, improved profitability, recognition as environmentally responsible or as an innovative company, job satisfaction, career advancement, successful employer, accomplishment in the job, and improved driver since of worth when their ideas are used as innovation.

Comparison. Again, effective communication is a consistent theme. Both the cluster and non-cluster participants view job satisfaction as a motivator. Along those lines are feelings of accomplishment, recognition, and career advancement. Opinions and ideas being listened to, valued, and seriously considered motivates both regions. Other cluster motivators included the efficiency of driver operations and salary increases. The Non-cluster outliers are improved customer service and profitability (Table 12).

Components of Clusters Work to Improve the Performance of All

The components of the logistics cluster work with each other to improve the performance of all, which includes collaboration in the community, technical innovation, and sources of information for the innovation process. Sources of information include peer groups, continuing education, periodicals, social gatherings, seminars, social media, and professional associations (Table 7). The concept has its basis in the theory of logistics clusters.

Cluster. Eight of the cluster participants discussed how the logistics cluster works with each other to improve the performance of all: none discussed introduction, no evaluation, no development, and none mentioned implementation (Table 10). Truckers offer mutual aid when trucks break down, or there are minor equipment needs. Early identification of problems leads to roundtable discussions with all involved to problem solve. Shippers, carriers, and equipment providers collaborate to secure new business. Developing business that uses green carriage to lower costs to all, attracting new business to the cluster to benefit all, and pooling fuel needs to lower the fuel cost for all are all examples of working together to benefit the logistics cluster. Encouraging talented employees to stay in the logistics cluster, supporting labor, and supporting human capital development by providing increased employment opportunities benefits all. Supporting infrastructure development is another way of working together.

Non-Cluster. Six non-cluster participants discussed how the logistics cluster works with each other to improve the performance of all: two discussed introduction, no evaluation, no development, and none mentioned implementation (Table 11). The non-logistics cluster region is, by definition, not within a cluster, so the non-cluster

participants addressed how they work together. The non-logistics cluster participants support and participate in community activities, where mutual aid is provided among the carriers. The carriers attract other businesses to the community and support infrastructure development. Customers provide work for the carriers and support businesses; ultimately, keeping job talent in the community is important. Buying supplies and materials in volume is of benefit for those purchasing together. Locations of fuel, specialized labor, and equipment are better when they are close to the carriers is the location of the shippers.

Comparison. Comparing the cluster and non-cluster regions in this area is difficult as the category refers to working in the logistics clusters. The non-clusters used the community as the primary reference point. Comparing logistics cluster components' working together helps determine how the non-logistic region interacts in the community. Mutual aid is a significant way that trucking companies support each other. Both groups support infrastructure development. Both groups stated that job talent needs to stay in the area. Fuel, carriers, customers, equipment providers, and specialized labor being located within the area is helpful. Both groups mention the benefit of purchasing in bulk with those in the community (Table 12).

Pooled Effort and Buying Power Enhance Efficiency and Economic Benefits

Pooled effort and buying power for products and services enhance efficiency and economic benefit, which is synonymous with using cooperatives to enhance buying power for goods and services (Table 7).

Cluster. Eight cluster participants discussed pooled effort and buying power for products and services to enhance efficiency and economic benefit: six discussed

introduction, none evaluation, three development, and none mentioned implementation (Table 10). Pooled effort and buying power stayed within the carrier divisions, among terminals, and between sister companies, though the benefit of pooled buying is recognized. Not all companies participated in pooled buying.

Non-Cluster. Seven non-cluster participants discussed or mentioned pooled effort and buying power for products and services to enhance efficiency and economic benefit: six discussed introduction, two evaluation, three development, and two mentioned implementation (Table 11). The participants did not widely elaborate on this category. The participants in the non-cluster region noted pooled buying with terminal, among sister companies, and locations and ventures under the same ownership. Most did not participate.

Comparison. Both groups of participants did the same thing. Pooled effort and buying power were used in businesses under the same ownership or not used at all (Table 12).

The Developmental Cost of Innovation is Shared in the Logistics Cluster

The cost of innovation development is shared in the logistics cluster through mutual support. An example of this strategy from the literature would be companies sharing the cost of installing stations for alternate fuels (Table 7).

Cluster. Seven cluster participants discussed sharing the cost of innovation development in the logistics cluster: seven discussed introduction, none evaluation, three development, and none mentioned implementation (Table 10). The cost of innovation development is not widely shared within the logistics clusters. The cost of supporting an autonomous delivery vehicle and using electric vehicles is shared with the logistics

cluster. A GED program cost is shared among the logistics cluster. The outside maintenance of common grounds with industrial parks is shared. The rent for restaurants and shops is subsidized to operate within the cluster.

Non-Cluster. Five non-cluster participants discussed sharing the cost of innovation development outside the logistics cluster: five discussed introduction, no evaluation, no development, and none mentioned implementation (Table 11). No participants in the non-cluster region shared the cost of innovation development.

Comparison. With very few exceptions, the cost of innovation development is not shared. The cluster region shared costs incurred in an industrial park location, a GED program, and vehicle development. Rent in one cluster is subsidized for restaurants and shops within the region (Table 12).

Support of Governmental Agencies and Procedures

To increase success, the company needs the support of governmental agencies and procedures. The literature includes such actions as government agencies acting promptly, changing policy, and offering financial incentives (Table 7). None of the participants indicated that governments offered them any financial incentives, such as tax cuts or decreased regulations, to locate their businesses in a particular area or to service a business or group of businesses.

Cluster. Six cluster participants discussed the support of governmental agencies and procedures: five discussed introduction, no evaluation, no development, and none mentioned implementation (Table 10). The participants had varying views about government regulation. Most participants indicated that government regulations harm change, but the resulting innovations can be positive overall. The support of government

agencies is identified as very important, necessary for interstate commerce, not intrastate commerce, not providing a great benefit, serving a good purpose, and glad they are there. Developing a positive relationship with the government enhances the company. Consolidating the number of government agencies so the trucking company only works with one or two is perceived as a potential benefit. The government forms take too much time to complete and file.

Non-Cluster. Seven non-cluster participants discussed the support of governmental agencies and procedures: seven discussed introduction, none discussed evaluation, three development, and none mentioned implementation (Table 11). The participants had varying views about government regulation. Most participants are skeptical of government intervention and are slower to embrace government-mandated change. Government support is important for transportation. Government agencies are described as a necessary evil that does as much harm as good. The government is meant to protect, but sometimes they make it worse. Trucking has a love-hate relationship with the government as change is required quickly without consideration of the impact on the company. Government intervention is inevitable, and no financial incentives are offered to help pay for those interventions. Government help is needed for hurricane relief. The United States Department of Transportation attempts to level the playing field by enforcing rules. The state department of transportation is a good friend to have.

Comparison. The opinions about the government varied among participants within the logistics clusters and among participants within the non-logistic cluster region. Some in both regions viewed the government as necessary and having a purpose. The participants in both regions identified that having a good relationship with the

government is smart, and they are glad the government is there. Both groups noted the reports are too time-consuming. The non-cluster participants also mentioned disaster relief, leveling the playing field by enforcing rules and creating a financial burden by requiring change without subsidy or knowing the impact on individual companies (Table 12).

The Transition Made Economically Possible

The transition to innovation is economically possible through the direct financial support of the company, the pooling of resources among several sources, or governmental programs (Table 7).

Cluster. Six cluster participants discussed the economic possibility of the transition to an innovation: six discussed introduction, three evaluation, none development, and none mentioned implementation (Table 10). The innovative transition was made possible through different means, with the direct financial support of the trucking company being the primary method for funding innovation. None of the companies mentioned governmental support or research grants as funding sources for innovation within the company. The ability to afford current ideas significantly impacted the implementation of innovation overall. The cluster participant comments include helping with roads, the highway program, fuel tax subsidies, no incentives, and dredging the river yearly.

Non-Cluster. Five non-cluster participants discussed the economic possibility of the transition to an innovation: three discussed introduction, two discussed the evaluation, two discussed development, and two mentioned implementation (Table 11). For the non-cluster participants, the innovative transition was made possible by the direct financial

support of the trucking company. None of the companies mentioned governmental support or research grants as funding sources for company innovation. The ability to afford the implementation of innovative ideas significantly impacted innovation overall. The participant comments include location as too small, rural, and large enough but no programs available.

Comparison. The response in all regions to the government making the transition possible is that the government does not. The cluster participants did identify road repair, new roads, highway programs, and river dredging as areas of government financial involvement that affect the trucking industry (Table 12).

Obstacles to Success

Obstacles to success include a lack of workforce education, local authority support, cooperation, or service integration. Obstacles are identified by exploring collaboration among companies within the community, informal communication practices, feedback loops, the availability of innovation tools, relationships with colleges, universities, and trade schools, and collective action regimes (Table 7).

Cluster. Nine cluster participants discussed obstacles to success: nine discussed introduction, no evaluation, no development, and none mentioned implementation (Table 10). Several obstacles to success were identified, the most frequent being resistance to change among the company's workforce. The cluster participants mentioned a silo mentality, reluctance to change, we have always done it this way, lack of willing workers, negative employee attitudes, and failure to see the importance of change. Another obstacle is getting everyone involved to understand the vision and where the company is headed; to adopt the corporate culture. Lack of effective communication, as is a lack of

workforce education, is another block to success. Inadequate transportation job sites on the internet create difficulty in locating employees. Restrictive business zoning is an obstacle.

Non-Cluster. Nine non-cluster participants discussed collaborative action: nine discussed introduction, four evaluation, four development, and five mentioned implementation (Table 11). Several obstacles to success were identified, the most frequent being resistance to change among the company's workforce. Reluctance to change, we have not done it that way before; employees do not want change, routine, negativity, fear of change, and failure to see the importance of change were all mentioned by the non-cluster participants. The cost of innovation is an obstacle. The lack of qualified people to employ is another block to innovation. Inadequate communication is an obstacle. Inadequate allocation of funds, time, and workforce is also an obstacle.

Comparison. The cluster and non-cluster participants indicated that a primary obstacle is a reluctance to change, which had different descriptors, including a lack of desire, negativity, fear of change, resistance, understanding of corporate vision, and a lack of willingness of workers. A lack of communication was identified as an obstacle in both groups. Both groups mentioned the need for human capital development (lacking a qualified workforce/workforce education; (Table 12). The cluster listed business zoning and inadequate transportation to worksites. Non-cluster listed not allocating sufficient time, money, and workforce to complete the job and the cost of innovation, making it impossible to innovate.

Summary of Comparison

Analysis of the interviews with the innovative operational processes revealed that the logistics cluster regions and the non-cluster region had more similarities than differences in each of the observed stages of innovation, as stated in the comparisons above. Effective communication was mentioned throughout the data as the key to success. Human capital availability and education were important as they yield a consistent driver workforce with little turnover. Maintaining job talent/talented employees is another broad area of interest.

Identified Themes of Innovative Companies

The interview analysis identified various themes or attributes regarding successful innovation in the commercial transportation industry. The most common themes for clusters are displayed in Table 13, non-clusters in Table 14, and a comparison of clusters and non-cluster in Table 15.

Clusters

Table 13 identifies the themes found in the interviews from the cluster regions and labels them as an asset or obstacle. The themes were generated from the nature of recurrent comments in the interviews. The participants made pertinent comments regarding the themes. The theme development is discussed in more detail after Table 13.

Table 13 *Themes of Innovation within Logistic Clusters*

Cluster Themes	Asset/Obstacle
Communication and collaboration are keys to success	Assets
All opinions are valuable; ideas for innovation need to come from multiple sources	
Employee satisfaction is a driving force for innovation	
Implementation occurs after research, development, and evaluation	
Ideas are made better by a team including all levels of employment	
Innovation needs to become a part of the organizational culture to survive; innovation is a formal process	
Location is not essential to innovation opportunities	
Technology is the major source of innovation	
Government regulations harm change, but the resulting innovations can be positive overall	
Reluctance to change	Obstacles
Driver turnover	

Communication. Communication and collaboration are keys to success. Communication is an area on which most participants commented. “We provided iPads to drivers so we can communicate with them in real-time,” one participant commented. Another participant stated, “When you are visiting shippers or competitors, you ask what others are doing to be better carriers.” Another participant mentioned, “We try to interact face-to-face with our employees as much as possible.” “We have a little bit of collaboration within the community; I already get enough emails and such,” expounded one manager. One manager interviewee interjected, “I don't want any more from Facebook, Twitter, or any of those things.” “We still do not have the best way to

communicate with drivers. Email and text are impersonal," opined another administrator. While another administrator offered, "We participate in customer-led user groups or in traffic clubs to see if we are the only ones with a particular situation." "It helps us be supportive in our community and efficient in our operations," observed a cluster manager. An administrator acknowledged, "We collaborate with others through the State Trucking Association and American Trucking Association." One participant pointed out, "Communication regularly keeps you grounded in the reality of your circumstances." "There are not enough communications with drivers by dispatchers and managers," interjected a cluster manager. Lastly, a participant discerned, "Communication can always improve; we constantly try to do better listening and communicating." The breadth of the communication comments illustrates communication as a theme.

Ideas for Innovation. All opinions are valuable; ideas for innovation must come from multiple sources, a second theme identified in the data. "All employees are part of an innovation focus group at one time or another. We encourage it," remarked one cluster participant. A manager offered, "We listen to our drivers… they are better employees when we give them some attention." Another participant quickly mentioned, "We listen to those in the field because they have good ideas and know how to bring them up for discussion." An administrator remarked, "We socialize with a council comprising employees, and they discuss everything good and not so good. Many innovative ideas come from this group." From these remarks and others, the researcher concluded that all opinions are valuable among the participants.

Employee Satisfaction. As a corollary to valuing employees' opinions, employee satisfaction is a driving force for innovation. One cluster participant stated, "It is a matter

of having employees feel comfortable and valued in our business and sharing their thoughts and insights." "Younger drivers want the new gadgets and technology; older drivers want the new truck" was described as a way of increasing employee satisfaction. The number of different discreet comments in this area was not as great. Still, more general phrases include trying to include employees, making the employees happy, and being an inclusive workplace.

Implementation. Overall, implementation was not discussed in as much detail as other items in the study. Implementing innovation after research, development, and evaluation was recurrent throughout the interviews. Examples of the comments include, "We take our time before making a change," and "Our biggest failures are where we fail to implement without tryouts and when we don't allow evaluation of results." Other comments fell within these parameters.

Teams. Working in teams derives from research, development, evaluation, communication, and collaboration. Ideas are made better by a team including all levels of employment. Regarding using teams, one participant stated, "We introduced ourselves to a small group, and that group came back after trying the proposed improvement. Their evaluation was 'no go.'" Another participant stated, "We turn all innovative ideas over to a team of drivers and managers to discuss and decide whether to pursue them. Upper management has a right to 'pull rank.'" Other participants mentioned using teams in general terms, which led to including teams as a research theme.

Organizational Culture. The previous themes emerged that innovation needs to become a part of the organizational culture to survive; innovation is a formal process. "The world is changing faster and faster. Those days are gone when you can do it the

same way day in and day out," is a profound statement made by one cluster manager. Another administrator said, "It is needed to survive in the long run; maintain a competitive advantage." When discussing incorporating technology and its associated innovations into the corporate culture, another participant stated. "Tablets for drivers was our first real improvement in technology, and it has only gotten better and more frequent from there." The idea of incorporating innovation into the corporate culture may best be expressed by saying, "Being able to listen and respond is a part of our culture, whether shipping freight or keeping the company successful."

Technology. Incorporating technology into businesses builds on the theme of organizational culture and innovation success. The next theme is that technology is the major source of innovation. Technology has brought many changes to the transportation industry and is at the heart of the most innovative ideas shared in the interviews. One participant described technology by stating, "We love how smart our equipment has become; it lets us concentrate on exceptions rather than day-to-day." Another stated, "…especially when it comes to power units and trailer improvements." A third participant expressed the ideas of many, "Most of our innovations have been with the software on the tractors and trailers." Others discussed how the emergence of technology has led to increased internet use.

Location. The emergence of the internet has been attributed to the decreased importance of location. The next theme is location is not essential to innovation opportunities. One manager indicated, "With the internet available all over, educated people and innovators are only a text away." "Location helps a little with innovativeness, but not as much as it once did." "I don't think it is as big a deal as it used to be" are two

statements reflective of the opinions of several participants. An administrator in a large cluster opined, “Location is only as good as the size of your yard for parking and how easy it is to avoid early morning traffic.”

Government Regulation. Government regulation is controversial and is the next theme. Government regulations harm change. Government imposed regulation can be positive overall. This example best reflects the comments leading up to this statement: “The government does not do a good job initiating change; most of the changes are beneficial, however.” Other participants started with such statements as, “I can't think of an instance that government change did not do more damage in the implementation,” and “The more that the government can get out of the way, the better changes are received.” After talking about government-imposed change, the participants indicated that the changes were positive over time.

Reluctance to Change. The idea of poor initiation of change reflects that reluctance to change is the major obstacle to change, the next theme. Reluctance to change was repeatedly given as the major reason for the difficulty in implementing change and the success of innovations overall. One manager described obstacles: “Change is difficult, even at the best-run companies.” Another remarked, “Some of the changes are forced on us by corporate management, and the drivers/dispatchers/ mechanics don't like it,” Other participants described the response to innovation as, “People get comfortable in what they are doing and don't want to take the time to learn a better way” and “Drivers tell us they are tired of constant change,” “We will not consider an idea or change if it is prohibitively expensive,” is a remark that reflects

administration's reluctance to change as well as the employee. Reluctance to change impacts all levels of the innovation process.

Driver Turnover. Driver turnover is a significant problem among many of the participant companies. Several participants provided distinct reasons for this obstacle theme. The following comments are examples of this concern. "Driver turnover has decreased since we provided iPads to drivers so we can real-time communicate with them." "Driver turnover is still a problem for us, but we are doing better than some carriers around us." "We fight driver turnover by focusing on employee morale as a priority." "Work ethic of employees is a problem. They do not show up one day when they want to take off work." "Sure, we have driver turnover. Who does not? The key is to keep it manageable." The comments indicate managers are often settling to improve the problem.

Non-Clusters

The interview analysis of the non-cluster regions led to the identification of various themes across innovative operational processes and the categories and components of the innovation process. The most common of those themes are displayed in Table 14. The participants made pertinent comments regarding the themes. The theme development is discussed in more detail after Table 14.

Table 14 *Themes of Innovation for Non-Logistic Cluster Region*

Non-Cluster Region Themes	Asset/Obstacle
Communication and collaboration are keys to success	Asset
All opinions are valuable; ideas for innovation are beneficial from the bottom up	
Employee satisfaction is a driving force for innovation	

Table 14 (continued).

Non-Cluster Region Themes	Asset/Obstacle
Implementation occurs after research, development, and evaluation	
Ideas are made better by a team including all levels of employment	
Innovation needs to become a part of the organizational culture to survive; innovation is more of an informal process, often a reaction to a complaint	
Implementation occurs after research, development, and evaluation	
Location is not crucial to innovation opportunities	
Technology is the primary source of innovation	
Companies are skeptical of government intervention and are slower to embrace	Obstacle
Reluctance to change	
Driver turnover	

Communication. As with the cluster participants, the most common theme is communication and collaboration as keys to success. One manager identified, "Every week, we have an open-forum phone call with all drivers just to listen." While another manager identified his communication as less direct, "Our communication is through email, bulletin board, and driver safety meetings." A more social participant stated, "Where there are several carriers servicing a company, there is collaboration at the bar or golf course." Another participant mentioned, "There are no real secrets for long. Driver turnover helps inform everyone." Another communication/collaboration was included,

"We use the Trucking Association in our state for collaboration and training." Communication impacts all the themes identified in this research.

Ideas for Innovation. The next theme, all opinions are valuable; ideas for innovation are beneficial from the bottom up and hinge on communication and collaboration within the organization. Examples of this concept include: "Ideas are presented formally and informally. Each is equally important," and "We have driver trainers that go around to all the terminals so they can get caught up on ideas and issues." Many mentioned that the most successful innovations come from the drivers, and several used the term from the bottom up instead of the top down, as so many decisions are made. Using employees doing the work (drivers) implies increased employee satisfaction.

Employee Satisfaction. Employee satisfaction is a driving force for innovation is theme number three. One participant commented, "Our drivers like a new technology as long as it doesn't spy on them. They are always willing to evaluate new equipment on their trucks." While another stated, "If the driver likes the innovation or idea, he seems happier as a driver." Other comments referred to general concepts of employee satisfaction and were similar. To build on the importance of employee satisfaction, the participants identified that research is used before implementing innovations.

Implementation. That leads to the next theme. Implementation occurs after research, development, and evaluation. One manager described the company process as, "Our company has a test group for all ideas and changes before implementation. It works pretty well." Another stated, "We use focus groups, trials, evaluations, and go or no-go

decision-making.” Other statements within the non-clusters were similar in content. Several mentioned the use of teams.

Teams. Ideas are made better by a team including all employment levels, which builds on the previous themes. Two ideas surround this concept: "All good ideas are made better by a team” and “An idea is discussed, researched, and improved before it is implemented. But we still have to keep adjusting even after implementation.” Most comments in the non-cluster region alluded to the teams in their company were not direct. The use of teams contributes to the organizational structure.

Organizational Culture. The organization's culture is important, whether positive or negative, as identified in this theme. Innovation needs to become a part of the organizational culture to survive; innovation is more of an informal process, often a reaction to a complaint. One participant stated, “There is a need for continued improvement to survive.” Another indicated, “Unless our drivers are at least as well equipped as our competitors, we are not the best carrier in the customer’s eyes. We must be the leader in skill, technology, service, and availability.” A third participant said, “Unless the boss likes the idea, it ain’t happening. We will address the issue when our people complain, or the customer reports problems. Until then, it is business as usual.” The innovation process occurs within the organization, and whether in a highly motivated or a reactive organization, most of the innovations relate to technology.

Technology. The theme of technology as innovation emerges in the non-cluster region. Technology is the primary source of innovation. One of the participants stated, “Our best innovations come from newly available technology and software for tractors and trailers.” Another indicated, “Without technology advances, we have experienced,

our innovation scorecard would look pretty bad." Other participants had similar responses, with few mentioning other specific innovation activities. The non-cluster region did indicate that the internet affords them opportunities of location without changing locations.

Location. The theme for locations in the non-cluster region's influence on mediation slightly differs from the theme for the clusters. Location is not crucial to innovation opportunities. One person addressed location by stating, "Location influence on innovation depends on the culture of the innovation." Another participant candidly replied, "Location influence on innovation depends on the culture of the innovation. We are only located here because the owner started here. How that helps innovation, I have no idea." Most non-cluster participants indicated that internet use accounted for location differences.

Government Regulation. The regulations imposed by government agencies on the transportation industry were viewed less positively by the non-cluster region than by the cluster regions. Companies are skeptical of government intervention and are slower to embrace the regulations and innovations associated with them. Three comments to illustrate this point are, "Government changes are not handled very well by the government," "It is like they want to antagonize us," and "Government intrusiveness is tolerated. Some government regulations complicate the acceptance of innovation." Most participants agreed that most innovations were a burden after a while.

Reluctance to Change. Reluctance to change is an obstacle for the non-cluster region. The participants agreed that people do not like change. One manager stated, "No one likes change, but we have to deal with it anyways." Another indicated, "A major

obstacle to innovativeness is the driver's resistance to change their routine." "Employees resist change that has not been introduced to them correctly. They don't like the 'shove down' method," answered one participant. A different participant linked the change to driver turnover, "Drivers want things to stay the same as when they were hired. They leave when things change too much." This leads to the final identified theme, another obstacle.

Driver Turnover. Driver turnover is viewed as an innovation obstacle or an obstacle for the transportation industry. "Driver turnover is high because drivers think the dispatchers play favorites when assigning good-paying loads," offered one manager when discussing obstacles to the success of innovation. Another participant had a different opinion, "Some of our turnover is because of innovations and new ideas, and some of our turnover is because we don't keep up with the carrier next door in making the driver happier and better paid at his job." Both opinions reflect other responses about driver turnover. Driver turnover is an expense to the company and a drain on longer-term employees.

Comparison

The themes in the logistics cluster companies were similar to those in the non-cluster region. These similarities and differences are illustrated in Table 15.

Table 15 *Comparison of Innovation Themes*

Theme Cluster	Asset/Obstacle	Theme Non-Cluster	Asset/Obstacle
Communication and collaboration are keys to success	Asset	Communication and collaboration are keys to success	Asset

Table 15 (continued).

Theme Cluster	Asset/Obstacle	Theme Non-Cluster	Asset/Obstacle
All opinions are valuable; ideas for innovation need to come from multiple sources	Asset	All opinions are valuable; ideas for innovation are beneficial from the bottom up	Asset
Employee satisfaction is a driving force for innovation	Asset	Employee satisfaction is a driving force for innovation	Asset
Implementation occurs after research, development, and evaluation	Asset	Implementation occurs after research, development, and evaluation	Asset
Ideas are made better by a team including all levels of employment	Asset	Ideas are made better by a team including all levels of employment	Asset
Innovation needs to become a part of the organizational culture to survive; innovation is a formal process	Asset	Innovation needs to become a part of the organizational culture to survive; innovation is more of an informal process, often a reaction to a complaint	Asset
Location is not essential to innovation opportunities	Asset	Location is not crucial to innovation opportunities	Asset
Technology is the major source of innovation	Asset	Technology is the primary source of innovation	Asset
Government regulations harm change, but the resulting innovations can be positive overall	Asset	Companies are skeptical of government intervention and are slower to embrace	Obstacle
Reluctance to change	Obstacle	Reluctance to change	Obstacle
Driver turnover	Obstacle	Driver turnover	Obstacle

Similarities. The primary theme is that effective communication is essential for innovation success; poor communication hinders success. Building on good communication with collaboration is a key to success. As all participants indicated, technology is a major source of innovation within the transportation industry. Location is not as significant as it once was because the internet and recent software are available in many areas. With technology, the daily operations of the transportation industry change and allow for the development of human capital by increasing driver autonomy, job satisfaction, ease in completing paperwork, safety, etc. The goal is to decrease driver turnover.

Differences. The comparison of cluster and non-cluster companies had two significant differences. The first difference was the view of governmental controls. While both viewed regulation as unfavorable initially, the clusters noted that the result was positive considering the innovative changes. The non-cluster companies tended to be skeptical of the government regulations, were slower to implement, and viewed government regulations as a burden.

The other area of difference regarded the implementation of change. The logistic cluster companies tended to have more formal processes for change and used pilot projects to evaluate new ideas. The non-logistic clusters were more likely to implement a new idea based on an individual's research and discussions with vendors, leading to an informal process that involved more trial and error.

Concluding Summary

The research data describes the 18 innovative operational processes (Table 7) defined as part of innovation diffusion. Most participants did not consider location as a game changer but viewed the internet as decreasing the impact of location on profitability and success. Each region had times when they believed location enhanced success, i.e., a terminal next to a dedicated carrier.

The participants value the institutions of collaboration. They value collaboration within the company and use it as a recurrent theme for success. Collaboration occurs at all employment levels in formal and informal groups and with various forms of media: social media, print, podcasts, and consultants. Colleges and universities are also collaborators.

The informal nature of knowledge flow addressed multiple information-sharing methods, including in-person, social media, print media, meetings, social gatherings, associations, and suggestion boxes.

The short feedback loop emphasized open communication, an identified theme for innovation. Communication includes listening. Addressing problems is a component of the short feedback loop. Feedback occurs in both formal and informal meetings.

Collaborative action programs examine workplace practices. Vendors, customers, colleges/universities, professional organizations/trade associations, friendly competitors, and community members collaborate with the trucking industry and help generate problems, ideas, and solutions.

A shared specialized workforce includes using consultants to assist in implementing new processes. The shared workforce included IT consultants, vendor

equipment experts, driver training schools, software specialists, former employees of other specialty carriers, software and equipment vendors, professional associations, and vendors specializing in logs, permits, and fuel tax.

Specialized local suppliers of industry-specific intermediate inputs and services refer to innovative tools in the community, such as tractor and tank repair, vendors for tractors and trailers, parts, commercial tire vendors, truck washing facilities, and driver training schools are specialized local suppliers of industry-specific services.

Scientific, technical, and market knowledge repositories include universities and community colleges. Mechanic schools, technical schools, diesel mechanic schools, community colleges, ASHTO, Transportation Research Board, and the State Department of Public Safety are included in this area.

The length of time from problem identification to implementation varies widely. No companies use the fail-fast/fail-cheap philosophy. Simple innovations take less time than complex or technological innovations. The number of innovative projects impacts the length of time to completion.

The stimulus for innovation refers to identifying the problem. Driver turnover is a stimulus for innovation and a theme of the innovative process. The turnover problem needs to be solved. Uses of technology, reducing costs, improving efficiency, and government compliance are also stimuli.

Advancing through the process of innovation from idea to identification to a solution to incorporating the innovation into the company's culture is guided by effective communication and collaboration. The process includes problem identification,

committee formation, problem research, resource allocation, solution introduction, workforce education, and process monitoring.

Motivators for employees and senior-level decision-makers include effective communication, job satisfaction, feelings of accomplishment and recognition, being listened to and valued, efficiency, and salary increases.

The components of the logistics cluster work with each other to improve the performance of all refers to logistics clusters. The non-cluster region referred to the community, so these two variables were compared. Infrastructure, mutual aid, maintaining job talent, and proximity to fuel, customers, equipment providers, and a specialized workforce were all important.

Pooled effort and buying power for products and services enhance efficiency and economic benefit. Pooled effort and buying power are used in businesses under the same ownership or not used at all.

The participant companies do not share the cost of innovation development with other companies or governments in their respective areas. Costs that are shared do not reflect a company's innovation.

Support of governmental agencies and procedures is a hot topic. The government is necessary, and trucking companies must have a good relationship. Government reports are too time-consuming. The government requires change without considering the impact on the companies involved.

The transition to innovation is economically possible with the direct financial support of the company. The government does not make the transition possible, but the

government does road repair, builds new roads, manages the highways, and dredges rivers.

Obstacles to success include a lack of desire, negativity, fear of change, resistance, understanding of corporate vision, and a lack of willing workers. A lack of communication is an obstacle to success. There is a lack of a qualified workforce/workforce education.

The themes of successful innovation included the following: communication, collaboration, ideas for innovation are better from the bottom up, innovation is part of organizational culture, innovation is constant and intentional, location, technology, employee satisfaction, government intervention, silo mentality, reluctance to change, change implementation, and driver turnover.

From this data analysis, findings, conclusions, and recommendations are drawn. The innovative operational processes generated themes of successful innovation. The themes of innovation led to the findings of the study. From the findings, conclusions and recommendations were developed. The findings, conclusions, and recommendations are presented in Chapter 5.

CHAPTER V – FINDINGS

The evolution of innovation in the transportation industry began as an attempt to provide greater efficiency to the railroad industry (Encyclopedia Britannica, 2023). This qualitative research explores the perceptions of transportation managers and executives in innovation. This study aims to determine the innovative operational processes involved in the diffusion of innovation within logistics and non-logistics clusters, particularly for vehicles engaged in commercial transportation.

Comparison groups were divided into participants from logistics clusters, including Atlanta, Dallas, and Memphis, and within a non-cluster region comprised of Alabama, Louisiana, and Mississippi. Interview data were analyzed for content and then compared between the two study groups. The research helps fill the knowledge gap discussed in chapter one, as researchers have not studied the effects of innovation diffusion in commercial transportation. Table 16 presents highlights of the data through the innovative operational process comparing cluster and non-cluster regions.

Table 16 *Highlights of Data by Innovative Operational Processes*

Innovative Operational Processes	Logistic Cluster Regions	Non-Logistic Cluster Region
Geographical Location Influence (Sheffi, 2012)	Location does not impact because of the internet, except to meet with customers or attract employees.	Location can be important in terminals located near shippers near driver training. Internet is used for recruitment.
Institution for Collaboration (Porter & Sten, 2001)	Collaborative communication includes, among branch managers, with universities, social conversations with shippers, peers in other companies, and professional associations.	Collaboration occurs at traffic clubs, informal gatherings, vendor meetings, social gatherings, social media, consultants, driver meetings, books, podcasts, and magazines.

Table 16 (continued).

Innovative Operational Processes	Logistic Cluster Regions	Non-Logistic Cluster Region
Informal nature of knowledge flow (Porter & Sten, 2001)	Communication is crucial, including social gatherings, professional print media, electronic devices for email and texts, individual conversations, and formal brainstorming groups.	Communication is essential for success, including social media, driver feedback (bottom-up), print media, face-to-face meetings, suggestion boxes, social conversations, community activities, and competitor experiences
A short feedback loop (Porter & Sten, 2001)	Project teams evaluate the progress of innovation through open forum phone calls, manager or executive meetings, informal discussions, communication, and collaboration.	Driver meetings are sources of ideas, with senior management selecting the idea to implement. Weekly meetings, progress reports, communication, input with all, listening, open to all information, and professional organizations' sources of feedback
Collaborative Action Programs (Porter & Sten, 2001)	The collaborations include an internal subset of leaders, vendors, university professors, focus groups, all communication methods, American Trucking Association symposiums, customers, customers, and personal contact.	Collaboration can be trial-and-error and include vendors, community colleges, personal contact, professional associations, friendly competitors, carrier meetings, all participants, community allies, and all employment levels.
Shared specialized workforce (Tokatti, 2010)	Consultants, software and equipment vendors, and professional associations were considered a shared specialized workforce.	The shared specialized workforce included IT consultants, vendors, driver training schools, software specialists, and former employees of other carriers, especially drivers.
Specialized local suppliers of industry-specific intermediate inputs and services (Porter, 1990)	Specialized local suppliers included repair materials, engine repair, truck parts, tires, technology, technology vendors, merchants as customers, truck driving and diesel mechanic schools, truck washing, and loading and unloading facilities.	Specialized local suppliers included tractor dealerships, fuel haulers, coops for quick delivery of driver equipment, maintenance, and supplies, accounting services, tire vendors, truck washing facilities, truck driving school, and alternate fuel vendors.

Table 16 (continued).

Innovative Operational Processes	Logistic Cluster Regions	Non-Logistic Cluster Region
Repositories of scientific, technical as well as market knowledge (e.g., research universities) (Sheffi, 2012)	Technical schools, colleges, and universities are present.	Mechanic, technical, and diesel mechanic schools; ASHTO; Transportation Research Board; State Department of Public Safety are included.
Length of time from problem identification to implementation (Akca and Ozer, 2014)	Time to completion can depend on the point of origin; weekly meetings can guide progress, time is shortened when the owner demands change, technology takes longer, cost and workforce,	Time to completion can depend on the origin of an idea, time, trial-and-error method; government regulation can affect, technology takes longer, goal takes six months or less, cost-benefit analysis, manpower, and funding
The stimulus for the Innovation (what was the problem) (Johannessen, 2013)	Stimuli for innovation include competition (better, faster, cheaper), safety on the road, greener fleet, women drivers, decreased overhead, decreased breakdowns, decreased driver turnover, and accuracy of regulatory compliance.	Stimuli for innovation include government-mandated change, increased efficiency, meeting legal requirements, cost reduction, going green, driver satisfaction, decreased driver turnover, customer requests, and becoming a trendsetter.
Advancing through the process of innovation from the solution to the problem of accepting the innovation (Rogers, 2003)	Advancing through the innovation process includes introducing the innovation by teams, podcasts and videos, trainers, or managers. Weekly meetings can be held. Communication is essential. Change the corporate culture.	Advancing through the innovative process includes identifying the problem, addressing the problem, researching the problem, allocating resources, introducing the idea, educating, and giving feedback. Weekly meetings are used to address problems. Small companies have difficulty with funding and available workforce. Small trials may be done.

Table 16 (continued).

Innovative Operational Processes	Logistic Cluster Regions	Non-Logistic Cluster Region
Motivators for both employees and senior-level decision-makers (Dutfield 2006)	Motivators include peer recognition, salary increases, being part of the solution, job security, promotion, recent technology, listening to and valuing opinions, the efficiency of operations, and effective communication.	Motivators include valuing opinions, effective communication, recognition as an innovator, improved customer service, profitability, being environmentally responsible or innovative, job satisfaction, career advancement, successful employer, job accomplishment, and improved driver morale.
The components of the logistics cluster work with each other to improve the performance of all (Breschi, 2008)	Work together to improve by offering mutual aid, early problem identification, collaborating to secure new business, lower costs by pooling, encouraging employees to stay, supporting human capital development, and supporting infrastructure development.	Work together in the community to improve by offering mutual aid, attracting other businesses, and supporting infrastructure development; customers provide work and support businesses, keep job talent, and buy supplies in volume. The location of fuel, specialized labor, and equipment are better when in proximity.
Pooled effort and buying power for products and services enhance efficiency and economic benefit (Erickson, 2011)	Pooled effort is within the carrier divisions, among terminals, and between sister companies	Pooled buying was noted among terminals, sister companies, locations, and vendors under the same ownership.
The cost of development of innovation is shared in the logistics cluster through mutual support (Sheffi, 2012)	Shared development cost is not widely shared but falls on the company. The cost of autonomous vehicle development, a GED program, maintenance of common grounds, and government subsidy for restaurants and shops were mentioned as shared development costs.	No development costs were shared, and the cost fell on the company.

Table 16 (continued).

Innovative Operational Processes	Logistic Cluster Regions	Non-Logistic Cluster Region
To increase success, one must have the support of governmental agencies and procedures (China et al., 2012; Radosevic & Yoruk, 2013)	Government regulation increasing success is a mixed opinion. Government hinders change implementation but, ultimately, is beneficial. Government is needed for interstate commerce, not intrastate. The number of government agencies should be combined. Government forms take too long to complete.	Varying views about government regulations, with most views being skeptical, is the primary opinion. Government support is important for transportation, a necessary evil. Government change does not consider the impact on the company. Financial incentives for implementing government-mandated change would help. The government tries to level the playing field.
The transition was made economically possible (Bell, 2016)	Transportation companies pay for their innovations, and the perceived ability to afford them impacts the innovative process.	Transportation companies pay for their innovations, and the perceived ability to afford them impacts the innovative process.
Obstacles to success included a lack of workforce education, local authority support, cooperation, or service integration (Sheffi, 2013; Harger, 2015)	Obstacles to success are resistance to change (most important), understanding the company vision, adopting the corporate culture, lack of effective communication, lack of workforce education, inadequate internet job sites, and restrictive business zoning.	Reluctance to change is the primary obstacle. Other obstacles include the cost of innovation and inadequate communication, funding, workforce, and time.

Chapter 5 focuses on this research's findings, conclusions, and recommendations. The findings are drawn from the data in Chapter 4. The study's conclusions are based on the research objectives compared to the literature review. The limitations of the study are included next. Suggestions for future research include questions arising from the literature review and data analysis of the participant interviews. The final section is a summary with an overview of the purpose of the study, the findings, and the conclusions.

Findings, Conclusions, and Recommendations

This study aims to determine the innovative operational processes involved in the diffusion of innovation within logistics and non-logistics clusters, particularly for vehicles engaged in commercial transportation. Companies need to be innovative to survive. The research focused on innovation practices in commercial transportation in logistic cluster regions and a non-cluster region. This study did not find a difference in the innovation practices of the logistics cluster companies and the non-cluster region.

Finding 1: No difference exists in how clusters and non-clusters utilize the innovation process.

Whether cluster or non-cluster, trucking companies go through the same processes to innovate. No significant difference was identified between the cluster regions and the non-cluster region. The participants had similar perceptions regarding the innovative process, with technology being at least part of what each considered current innovations. Participants acknowledged using knowledge of the idea, persuasion to get the idea into a review process, deciding to follow through, and finally implementing the innovation.

A significant differing variable was not identified in any innovative operational processes measuring innovation diffusion. Effective communication is the overriding theme for successfully implementing the innovation process. Collaboration among team members is also important. All participants agreed that the process starts with an idea and becomes a new or better operation method. Location was not considered of major importance by either group. Participants often viewed the shared specialized workforce as employees moving back and forth, including diesel mechanics, software representatives,

and other vendors. The specialized local suppliers were identified in the same context. Knowledge repositories were important and used by all groups.

Both groups used remarkably similar processes of advancing through innovation, though it was more of a formal process within the logistics cluster participants. Motivators for employees and senior-level administration were similar. Both groups worked to improve performance when comparing the logistics cluster with the community. The pooled effort and buying power were only within the company or companies under the same ownership. The participating companies paid for their innovation. The government is concerned for all companies and is viewed positively and negatively, with the non-logistic cluster region being more negative. The transition to innovation is economically possible with the direct financial support of the company, and the government does repair and build roads and dredge rivers. The obstacles to success are similar, including resistance to change and driver turnover.

Conclusion 1. The literature review indicates that a difference is expected between the cluster regions and the non-cluster region. This study did not show causation, but several factors could contribute to the lack of a difference. These include the non-cluster region in the middle of the states with the clusters.

The lower cost of living and increased rural nature of "The South" leads to a different outlook on life. Even people within the logistics clusters often choose the slower-paced rural lifestyle. The values of rural life can also influence perceptions.

Truck driver flexibility and fluidity of movement act like geographic proximity. Transportation companies are not always local and often hire drivers from different regions of the country. The drivers move from one geographic location to another. The

drivers in commercial transportation can overlap on the loads that are hauled. The internet increases the ability of drivers to haul loads from several areas.

A second conclusion is that the internet has connected people regardless of geographic location. The onset of the COVID-19 pandemic led to more and more people using the internet for work. Offices were closed, and customary operating systems were disrupted. The significance of location seemed to diminish in importance. The internet brought goods and services together.

Sheffi (2013) noted that diffusion of innovation is more common in logistics clusters than in non-logistics clusters and cluster innovation's underlying effects affect logistics providers' operations, ranging from clients and employees to the management teams involved. As Dutfield (2006) further explained, clusters show how a concentration of resources, innovation, culture, and knowledge can form a positive feedback loop, which leads to sustained economic growth, regardless of the product or service involved. From the number of packages purchased and the backup of goods in harbors, transportation moved into a new role of prominence. The delivery of goods became even more important. Proximity to the origin of a load developed new importance so drivers could quickly pick up the loads and move to the next destination.

The third conclusion is that the smaller metropolitan areas within the non-cluster region in the study have similar services to the logistic cluster but on a smaller scale. The states include large metropolitan areas such as New Orleans, Birmingham, and cities such as Jackson, Mississippi; Montgomery, Alabama; and Baton Rouge, Louisiana. With these cities being in proximity, the non-logistic cluster participants may have viewed

themselves on equal footing with the logistics cluster. This view was not an area addressed in the literature review.

The participants in the study did not have a good understanding of the breadth of logistics clusters. Since the cities in the non-cluster region included New Orleans and Birmingham, the participants likely believed that these cities offer as much as the logistics clusters. The participants did not clarify the belief that a logistics cluster is just a metropolitan area. With building automobile factories in "The South," some likely viewed those plants and the associated industries as emerging clusters. This view was not an area addressed in the literature review.

Recommendation 1. The first recommendation is to advise trucking companies seeking locations that sites within a logistics cluster is not always necessary to be innovative as the internet has made the world more accessible. A second recommendation is to instruct company managers about logistics clusters, their purpose, and their advantages and to develop a more educated managerial workforce. Another recommendation is to provide educational offerings at professional meetings such as the symposium offered through the American Trucking Association or state trucking associations and submit findings for publication in trade journals.

Finding 2. Communication and collaboration are essential for the successful implementation of innovation.

The primary theme of this research is that effective communication is essential for innovation success; poor communication hinders success. Effective communication lines are necessary for the diffusion or spread, and all the process occurs within a timeframe and social system. Building on effective communication and collaboration is a key to

success. Effective teams cannot be built without effective communication, including respectful listening. With listening comes valuing all opinions. People are respected, valued, listened to, and communicated with; all are willing to share ideas. Sharing ideas for innovation from all company areas is important for innovation success. An organizational culture of inclusiveness and openness is created from multilevel communication, sharing from the bottom up and the top down, and building diverse teams. Communication is viewed as a means of combating the biggest obstacle to success, reluctance to change. Reluctance to change includes fear and negativity. Statements such as, "We have always done it this way," "I do not understand," and "Why is this important," are all examples of resistance to change. The silo mentality is also combated best with open and effective communication.

Conclusion 2. The transportation managers perceived communication as essential but did not recognize that high driver turnover indicates ineffective communication. Most information about innovation introduction has been obtained by interviewing innovation users and soliciting information at conferences and general interest gatherings (Rogers, 2003). Since the basis of interaction is with people of different viewpoints, they accept the latest information, process it, and allow its influence to change previously held beliefs (Rivera et al., 2016). Effective communication lines are necessary for the diffusion or spread, and all the process occurs within a timeframe and social system (Sheffi, 2013).

The participants from cluster and non-cluster regions seek a solution for driver turnover. Listed as one of the biggest obstacles to innovation was a constant need to hire and train drivers. Workplace culture, scheduling, and burnout are major contributors to employee turnover (Zang et al., 2020). Included with driver turnover is a lack of an

educated workforce. Research has shown that corporate attitudes develop through communication exchanges about a specific innovation with peers and opinion leaders. This communication occurs more readily and easily when geographic proximity occurs (Rivera et al., 2016).

One of the participants reported “success” because the annual turnover rate at his company was “only 84%.” Compared to 150%, 84% is good. However, “when more effort goes into hiring and training drivers than retaining them and improving their job performance, no wonder it is hard to find time and money to innovate,” said one prominent carrier participant. Driver turnover is included as an obstacle to successful innovation and is a recurrent theme throughout the interviews.

Participants mentioned helping to pay for a GED program in the cluster. Other participants mentioned being located close to driver training schools. Driver recognitions, such as taking them out to dinner or providing cash bonuses, are a practice to decrease driver turnover.

Another conclusion is that diffusion of innovation is how the speed and impacts of ideas introduce and incorporated into the logistics cluster's success (Sheffi, 2013). Participants from within clusters and in non-cluster regions pointed out that innovations work best if it is an idea from the drivers. Several methods are used to solicit driver input. One of the most creative is having weekly on-the-road conference calls with the drivers, followed by a team leader meeting to discuss the ideas. The teams collect the ideas and respond to each of them. The literature indicated existing ideas, concepts, and improvements do not all seem to share a single top method or set of effective practices for diffusing these innovative activities (Zhang et al., 2020); there is no one best way. A

lack of efficient and effective innovation diffusion is as problematic as no innovation (Schleper et al., 2017).

Recommendation 2. Train managers and administration in effective communication strategies. Provide educational training activities such as workshops or YouTube videos to all levels of employees. Hire a communication consultant to enhance the communication flow. Establish a short feedback loop to increase the use of improved communication techniques. Institute a reward program for those who use effective communication strategies. Reviewing the communication practices of major companies with high retention of employees is a second recommendation. Determining the best practices of other companies and then incorporating them into the corporate culture is an effective method of improving a process. Another recommendation is to develop best practices for communication. By combining the education of employees and examining the best practices of other companies, the company can develop its own set of best practices,

Another recommendation is to develop a procedure for including all employees in communication. Including all levels of employees when developing new policies will help ensure that the new policies will be adopted. This inclusion, in effect, is an idea for innovation and should follow the process of innovation diffusion.

Finding 3. The implementation of innovations is affected by the company's structure, innovation philosophy, and corporate culture.

Implementation of innovation is easier in companies with one terminal location where decision-makers can meet face-to-face with each other and drivers to discuss problems and observations that might be innovative ideas that can be acted upon.

Companies with numerous terminal locations have a challenge being accessible to the many drivers and logistics managers not in the exact location as executives that might also be decision-makers in the innovative process.

For companies to be their best at implementing innovation, their corporate culture must include a spirit of innovation. All participants agreed that this spirit and the culture were necessary to survive. The two company respondents that admitted to not having innovation in the corporate culture also identified the tendency to not communicate changes before beginning the implementation process.

Conclusion 3. Companies do not want to fund innovation unless they see results/profit within a few months. In companies that innovate, some teams comprise all affected areas from which the innovation will benefit. All opinions are valued in the team, and a high emphasis is placed on team collaboration. Influencing opinion leaders is the easiest way to encourage positive attitudes toward innovation (Rogers, 2003).

Rogers (2003) clarifies that the opinion leaders that change agents should approach depends on the business's culture. Social systems identify as either heterophilous or homophilous. In a heterophilous environment, the diffusion of innovative ideas and concepts is more straightforward. Since the basis of interaction is with people of different viewpoints, they accept the latest information, process it, and allow its influence or change to previously held beliefs. As such, heterophilous businesses encourage change. More interaction among people from various backgrounds suggests more interest in new concepts. Heterophilous businesses have opinion leaders who are more innovative because the businesses welcome innovation (Rivera et al., 2016; Rogers, 2003, p. 289).

Those in homophilous businesses keep social norms. Most individuals are from similar experiences. Individuals and ideas that are outside normal are considered strange and undesirable to homophilous businesses (Santacreu, 2015). These businesses have opinion leadership that is not innovative as they oppose change (Rogers, 2003; Santacreu, 2015). This literature finding substantiates that reluctance to change is the largest obstacle for transportation companies to overcome.

A second conclusion is that government regulations harm innovativeness, but the regulations can ultimately produce a positive outcome. According to all participants, government agencies are a necessary evil, but an evil, nevertheless. There is a consensus that mandated changes do not effectively allow enough time to implement within the government's timeframe. Both knowledge and the support of governmental agencies and procedures influence innovation (Dodgson et al., 2015). The participants noted that the companies were seldom consulted during the development phase of changes and that their input was ignored when the change was made known to the transportation companies. One participant noted that he would respond more positively to the changes if his company were compensated for their change efforts, such as a credit against highway use tax.

The non-cluster participants were more skeptical of the government and were slower to embrace new regulations. All implemented the change and indicated that having a friendly relationship with the government is good. Positive relationships with state departments of transportation are an especially good idea.

Another conclusion is resistance to change is the biggest obstacle to innovation. Resistance to change is described in many ways, including a lack of desire, negativity,

fear of change, resistance, silo mentality, a lack of understanding of corporate vision, and a lack of willingness in workers. One participant described “not wanting to change” as basic human nature to keep doing things as they have always been done. Companies showing employees they have worth and that their opinions are valued can help combat resistance to change. As innovation begins, behavior changes and uncertainty exist (Rodriguez, 2018). Regardless of implementing the innovation as designed or used by other adopters, the innovation may require modification (Dutfield, 2006). Disenchantment discontinuation is more likely with late adopters of the innovation because late adopters have less formal training, less formal education, lower socioeconomic status, less contact with the change, and do not consistently implement the innovation as proposed and recommended (Rogers, 2003).

Recommendation 3. Educate the managerial staff and administration regarding the benefits of innovation and set realistic goals accordingly. Since all labor experiences and skills are unequal, employers can improve human capital by investing in their employees' training, education, and benefits (Kenton, 2020). Due to the specificity of knowledge and rapid change associated with innovation and technological change, training remains necessary to upgrade employees' skills (O’Sullivan & Steven, 2003; Rivera et al., 2016).

Another recommendation is to analyze prior changes for positive and negative results of the innovation process, including financial and operational aspects. By reviewing the success and failure of previous innovative activities, a company can evaluate the effectiveness of innovation diffusion. The analysis provides to process problems and the need for establishing training and education parameters. By examining short and long-term financial impacts, the true value of the innovation can be established.

The human capital component should be evaluated in evaluating the financial benefit value.

A third recommendation is to institute a regular review of innovation progress and adjust as indicated. As noted in the conceptual model, Figure 1, ongoing evaluation of the implementation process is essential to stay on course. If the innovation is meeting the goals, then no change is indicated. If the innovation diffusion is not successful, then the approach requires modification.

Limitations

Limitations represent factors and variations that may impede a study or the study's results (Connelly, 2013; Lunenburg & Irby, 2008). Qualitative studies have unique limitations (Connelly, 2013). When identifying limitations, researchers also identify efforts to address limitations. Limitations of a study are potential weaknesses that are out of the researcher's control, a restriction not to be ignored, which can impact the results (Merriam & Tisdell, 2016).

Qualitative Research

While qualitative research is an accepted and necessary research method, qualitative research has limitations associated with the methodology (Ogden & Nicholas, 2019), which are often not accepted by the scientific community. Research participants' perceptions are measured rather than logistical processes (Swaen, 2020). Identification of perceptions is important as they help define problems for future research by contributing to the knowledge base and filling in information gaps. In qualitative research, factors that could moderate, mediate, or otherwise affect interest variables in this research are difficult to control (Merriam & Tisdale, 2016).

In qualitative research, replicating the results is challenging since the data is subjective and can lead to incorrect generalizations (Chetty, 2016). When assessing participants' experiences, social desirability bias, memory problems, and honesty of responses can impact the results (Swaen, 2020). Qualitative research does not generalize to other regions and diverse populations, affecting transferability (Pisa, 2019), nor does it allow for inferences relating to causality (Mitchell, 2015). The researcher can negatively influence data. Data rigidity is difficult to assess and challenging to demonstrate data validity (Gaille, 2021). The researcher needs industry-related expertise to gather research data (Chetty, 2016) accurately. This study mitigated these variables by clarifying participant responses and having a transportation industry professional as the researcher. The research has not been generalized outside this population sample, and no inferences for causation were drawn.

Sampling. The sampling methods used in qualitative research are not randomized and are purposeful (Creswell & Creswell, 2018; Symon & Cassell, 2012), as is the case for snowball sampling used in this study. Qualitative research guidelines do not consistently specify optimal sample sizes for a given qualitative approach (Mason, 2010; Saunders, 2012). To decrease the influence of sampling biases, the researcher used participants with more than one degree of separation, participants from different trucking companies, and participants from a large geographic area (which prevents over-sampling). Asking the same questions of several participants hailing from similar geography stimulates triangulation, increasing validity (Creswell, 2007).

The phenomenological research design contributes to sample size uncertainties. To decrease limitations in determining the sample size, the researcher used the principles

of saturation, the research objectives, the selection of participants, and the feasibility of establishing a target sample size of 18, with the final number of participants being 18. The sampling is only representative of the companies surveyed. Snowball sampling could result in choosing people of like-mindedness or who may have worked together in the past. The researcher does not think the sampling affected the results but could create a sample bias.

Snowball sampling could encourage state trucking association executives, economic developers, and participants to recruit like-minded participants or participants working for the same trucking firm (Merriam & Tisdale, 2016). To mitigate this limitation, the researcher enlisted the trucking association executives for each state and economic developers with different relationships to the target population.

Study Specific Limitations

Limitations specific to this study included population selection, participation criteria, and the interview process. The logistics clusters and non-cluster region were purposefully selected, with leaders contacted. Since the leaders of the chosen logistics clusters referred the interview participants, it is possible that the individuals referred could be the manager's favorite. As a result, this research sample might provide a more positive picture of selected logistics clusters than is the case. Criteria for participation in this research were participants with at least one year of managerial background in trucking/logistics, to live or work in Dallas, Atlanta, or Memphis; or work in companies located in Alabama, Louisiana, and Mississippi.

There is a possibility for skewed results due to some interview answers. One participant from a cluster area had lived and worked in many cities in the northeastern

and southeastern United States. The possible bias from living in different parts of the country is unknown. Other participants had worked for several transportation companies, which could provide bias. There is also possible data skewing from companies of different sizes. The study results were likely affected by each of these.

Implications for Future Research

Future research is important for the transportation industry. Industry-specific research is not as vast as in other industries. This research opens the door for additional studies.

Knowledge Gap

This study addressed a knowledge deficit regarding innovation in the transportation industry. The knowledge gap can be expanded to include more research on the transportation industry. Basic information regarding problem-solving strategies, effective communication methods, alternate fuel adaptability, problems within the industry, and human capital development best practices used to mitigate driver turnover and provide a prepared workforce. When the knowledge gap is filled, quantitative research can more readily be conducted.

Location

The study could be replicated in different locations to improve the external validity of the research. This future research could include interviews in logistics clusters and non-clusters in areas in other parts of the continental United States. Studying logistics and non-logistics clusters in different parts of the country would help determine their similarities and differences. The geographic features could be examined for possible

effects and the characteristics of the metropolitan statistical areas such as race, the average income of residents, crime rate, employment rate, etc.

Controlling Variables.

Another suggestion would be restricting company size to control this variable's influence. A larger sample size to include more clusters and non-clusters in each geographical area may yield differing results. The study's sampling criteria did not account for a participant's work history in other geographical regions. The number of years in the supervisory role is a variable that could have affected the study results. Studying these factors broadens the scope of information which could lead to the development of a questionnaire and quantitative research. Control variables such as trailer type, area of carriage (local, regional, national), driver supervisor, or driver adjacent positions only. The methods of conducting business could also be compared, as well as the corporate structure.

Themes

Future research could explore in more depth the use of technology, driver turnover, effective methods of communication, the impact of women truck drivers on innovativeness, the diversity of managers on innovativeness, and whether more than one mode of transportation in a cluster or area makes a difference in overall innovativeness. These were major themes of the participants that could benefit from more in-depth knowledge.

Mixed Methods/Quantitative Study

Employ quantitative and qualitative methods for depth, detail, and richness (Fink, 2003). Further, investigate why there is no difference in diffusion methodology between

cluster and non-cluster. Another area of research could be a qualitative study to determine the knowledge transportation managers and executives have regarding specific technology areas such as alternative fuels and autonomous vehicles. This study would enhance knowledge and direct education needs. The information is important as it illustrates adaptability and forward thinking. Great ideas require great implementation (Samit, 2020).

Summary

The research aims to explore innovative processes in commercial transportation by companies within logistic cluster regions and in the non-cluster region. The study was conducted in the southern United States, specifically in Atlanta, Memphis, and Dallas cluster regions and the non-cluster region of Alabama, Louisiana, and Mississippi. This research provides another approach for exploring and expanding knowledge of the commercial transportation's human capital risks of high driver turnover and employee shortages. The study also expands human capital research beyond the business structure. In prior studies, researchers have not studied the effects of the knowledge diffusion phenomenon on logistics clusters (Rivera et al., 2016; Sheffi, 2012).

The researcher hopes this research attracts the interest of professions beyond the scope of commercial transportation. Nothing escapes transportation (Theys et al., 2008). Transportation costs can easily account for 10% of the total cost of a product (Pisa, 2019). To be the best that you can be in commercial transportation, the transportation entity must successfully innovate and move toward an ever-changing future. Commercial transportation touches all aspects of the global economy and is the least studied industry. The industry must be diverse, plentiful, cost-effective, and ecologically friendly.

APPENDIX A – Self-Sustaining Transportation and Logistics Clusters

Cluster Name	Transp. Workers		Cluster Name	Transp. Workers
New York/New Jersey	99,959		Cleveland, OH	9,714
Chicago, IL	91,186		Green Bay, WI	8,668
Dallas, TX	79,707		El Paso, TX	6,951
Los Angeles, CA	68,980		Springfield, MO	6,794
Atlanta, GA	60,354		Birmingham, AL	6,216
Houston, TX	45,774		Greensboro, NC	6,027
Phoenix, AZ	35,778		Omaha, NE	5,760
Detroit, MI	35,649		Camden, NJ	5,653
San Francisco, CA	29,231		Grand Rapids, MI	5,414
Charlotte, NC	28,306		Fort Wayne, IN	5,251
Dulles, VA	28,268		Buffalo, NY	5,107
Norfolk, VA	28,268		New York/New Jersey Extension	5,061
Seattle, WA	25,362		Milwaukee, WI	4,996
Philadelphia, PA	22,745		Chattanooga, TN	4,629
Minneapolis, MN	21,624		Allentown/ Harrisburg, PA	4,336
Denver, CO	21,432		New Orleans, LA	4,221
Indianapolis, IN	18,067		Iowa City, IA	3,889
Boston, MA	17,426		Charleston, SC	3,234
Orlando, FL	16,663		Wichita, KS	2,824
Madison Co/Saint Louis, IL	16,182		Boise, ID	2,822
Memphis, TN	16,142		Sioux Falls, SD	2,696
Salt Lake City, UT	16,014		Reno, NV	2,602
Louisville, KY	14,333		Wilkes-Barre, PA	2,491
Columbus, OH	14,153		Savannah, GA	2,472
Cincinnati, OH	13,713		Mobile, AL	2,301
Portland, OR	12,870		Greenville, SC	2,181
Nashville, TN	12,605		Spokane (395route), WA	2,157
Jacksonville, FL	10,922		Harlingen, TX	2,003

Rivera, L., Sheffi, Y., Welsch, R.: Logistics Agglomeration in the US. https://doi.org/10.1016/j.tra.2013.11.009

APPENDIX B – NAICS Codes Used to Identify Logistics Clusters

NAICS 2012	Label	Cluster Code	Cluster Name	Subcluster Code	Subcluster Name	
488999	All Other Support Activities for Transportation	45	Transportation and Logistics	3	Ground Transportation Support Activities	
488991	Packing and Crating	45	Transportation and Logistics	3	Ground Transportation Support Activities	
488510	Freight Transportation Arrangement	45	Transportation and Logistics	3	Ground Transportation Support Activities	
488490	Other Support Activities for Road Transportation	45	Transportation and Logistics	3	Ground Transportation Support Activities	
488210	Support Activities for Rail Transportation	45	Transportation and Logistics	3	Ground Transportation Support Activities	
488190	Other support Activities for Air Transportation	45	Transportation and Logistics	1	Air Transportation	
488119	Other Airport Operations	45	Transportation and Logistics	1	Air Transportation	
488111	Air Traffic Control	45	Transportation and Logistics	1	Air Transportation	
485510	Charter Bus Industry	45	Transportation and Logistics	5	Bus Transportation	
485210	Interurban and Rural Bus Transportation	45	Transportation and Logistics	5	Bus Transportation	
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance	45	Transportation and Logistics	4	Trucking	
484121	General Freight Trucking, Long-Distance, Truckload	45	Transportation and Logistics	4	Trucking	
481219	Other Nonscheduled Air Transportation	45	Transportation and Logistics	2	Specialty Air Transportation	

481212	Nonscheduled Chartered Freight Air Transportation	45	Transportation and Logistics	1	Air Transportation	
481211	Nonscheduled Chartered Passenger Air Transportation	45	Transportation and Logistics	2	Specialty Air Transportation	
481112	Scheduled Freight Air Transportation	45	Transportation and Logistics	1	Air Transportation	
481111	Scheduled Passenger Air Transportation	45	Transportation and Logistics	1	Air Transportation	

APPENDIX C – IRB Approval Letter and Oral Presentation of Research Procedures

Subject: IRB-21-239 - Initial: Sacco Committee Letter - Expedited and Full

Office *of*
Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

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NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER: IRB-21-239
PROJECT TITLE: TRANSPORTATION MANAGERS' PERCEPTIONS OF THE DIFFUSION OF INNOVATION WITHIN LOGISTICS CLUSTERS: UNDERSTANDING THE INNOVATION PROCESS USING INNOVATIONS FOR COMMERCIAL VEHICLES
SCHOOL/PROGRAM: Human Capital Development, Trent Lott National Center for Excellence in Economic Development
RESEARCHER(S): Stephen Puryear, Chad Miller

IRB COMMITTEE ACTION: Approved
CATEGORY: Expedited
7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

PERIOD OF APPROVAL: June 21, 2021

Donald Sacco Jr.

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

APPENDIX D – Oral Consent to Participate

Demographic Information:

Name: _____ Date: _____

Participant Initiated: **Yes** **No** Time: _____

Introduction of Study

1. *Participant Initiated Contact*: I am Steve Puryear, a doctoral student at The University of Southern Mississippi. Before providing the details of the study participation, please tell me how you found out about the study.

2. *Researcher Initiated Contact***:** I am a University of Southern Mississippi doctoral student, Steve Puryear. I received your name and phone number from _____. _____ thought that you would be able to assist me in finding information about the transportation industry. Do you have a moment that I can provide you with information about the study?

3. Thank you for talking with me. I need to get some preliminary information. Please confirm your name's spelling, job title, place of employment, and residence (city).
4. As part of this study, I want to learn about your perceptions of innovation within the logistics community, particularly innovations or improvements in commercial transportation (for-hire, dedicated service, contract).

5. *Purpose of this study*: This study explores the processes involved in the diffusion of innovation in a logistics cluster—the results further the understanding of transportation management about the diffusion of innovation practices.

6. *Description of study:* Approximately 18 managers of commercial vehicle fleets will be interviewed to explore their perceptions of the most effective innovation diffusion methods in logistics clusters.

7. *Benefits of study:* The study includes providing transportation fleet managers a voice in identifying successful methods to foster and spread innovation in logistics clusters. In addition, participants receive a summary report of the study's results.

8. *Risks of study:* There are no known or anticipated risks.

9. *Does Not Meet Criteria*: At this time, I am interviewing transportation logistics managers of commercial vehicles. Thank you for being willing to participate, but you do not meet the eligibility requirements. Do you know anyone who might be ready to participate in the study?

10. *Meets Criteria*: Thank you for agreeing to participate in this study. I want to provide the benefits of participation, confidentiality measures, informed consent information, and The University of Southern Mississippi's IRB guidelines that approve this study.

11. Are you still interested in participating in the study? **Yes** **No**

12. *Not Interested*: Thank you for your time today. Do not hesitate to contact me if you change your mind about participating or think of someone who may want to participate.

13. *Interested*: Thank you for agreeing to participate. Participation in the study is voluntary and will consist of a virtual interview, which will last no longer than an hour and be recorded for accuracy. Personal information is confidential and will not be disclosed. Company information will also be kept confidential. I am available for questions regarding the study. A written response is available on request. The Institutional Review Board has reviewed and approved this study and ensures that this study follows federal regulations. Questions or concerns about your rights as a research participant may be directed to the following:

    Chair of the Institutional Review Board
    The University of Southern Mississippi
    118 College Drive #5116
    Hattiesburg, MS 39406-0001
    Phone: 601-266-5997
    Email: irb@usm.edu

14. Do you grant your consent to participate in an interview? **Yes** **No**

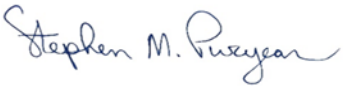
15. *Not Interested*: Thank you for your time. Do not hesitate to contact me if you have questions about the study, wish to participate, or want to refer someone for participation.

16. *Interested*: Thank you. Let us go ahead and schedule a convenient time for the interview. These are times that I have available for interviews. Will one of them work for you? What time will work best for you?

APPENDIX E – Email Response to Potential Email Inquiries

Dear_____

Thank you for your message and interest in my research study on innovation in the commercial transportation industry! I want to talk with you directly about the research and confirm your participation in an interview which will be conducted via Zoom or Teams. **Please reply with your phone number and a good time to reach you, or feel free to call me at 601-259-6629.**



Stephen M. Puryear
Stephen.Puryear@usm.edu
601-259-6629

The Institutional Review Board of The University of Southern Mississippi reviewed and approved this project (protocol number 21-239), ensuring research projects involving human subjects follow federal regulations. Direct any questions or concerns about rights as a research participant to the IRB Chair at (601) 266-5997 or irb@usm.edu. Participation in this project is entirely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits.

APPENDIX F – Initial Email to Participant Referrals with an Email Address

Dear_____

_____sent me your name because of your experience as a transportation logistics manager of commercial vehicles.

My name is Stephen Puryear. I am a doctoral student at The University of Southern Mississippi. I want to explore innovations and innovation diffusion in the transportation logistics sector.

I could use your help by setting aside some time for an interview.

If you would like to talk more, please call me at 601-259-6629 or reply with your phone number and a good time to reach you.

I look forward to speaking with you.

Stephen M. Puryear
Stephen.Puryear@usm.edu
601-259-6629

The Institutional Review Board of The University of Southern Mississippi reviewed and approved this project (protocol number 21-239), ensuring research projects involving human subjects follow federal regulations. Direct any questions or concerns about rights as a research participant to the IRB Chair at (601) 266-5997 or irb@usm.edu. Participation in this project is entirely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits.

Interview Guide for Participant

The following questions and information represent the actual content of the interview I will conduct about innovation within logistics clusters, mainly how new ideas and processes are introduced to commercial transportation. Please remember to speak clearly; this interview will be recorded for accuracy. Confidentiality of your identity and that of your company will be strictly maintained. After the interview, you can review a written transcript and make any appropriate changes.

Please provide your:

- Name
- Type of Business
- Residence (in case you do not live in the city where your company is located)
- Location of Employer
- Employment Responsibilities
- Experience with commercial transportation innovation
- Suggestion for another transportation manager with retail transportation experience
    - Name
    - Location
    - Email Address
    - Phone Number

General Interview Questions

1. Tell me about your company's process for developing new processes and preparing for change in the industry. What improvements have you seen in the industry?
2. Describe the impact of your location on implementing innovative changes or improvements. What about your site that helps with being creative in this industry?
3. Discuss your company's process in introducing, evaluating, developing, and implementing innovations.
4. Describe the roles of individuals in the success of innovation in your company. Please include the roles that upper management plays in innovation in your company.
5. Discuss the most/least successful means to implement innovative ideas within your company. What works and what does not work?
6. Identify the major obstacles or roadblocks to implementing change or innovation within your company.
7. Is there anything else you would like to add regarding your experiences with innovations in the commercial transportation industry?

APPENDIX H – Participation Criteria

1. Being in business or engaged in entrepreneurial endeavors for at least one year (current or past)

2. Live in, or work in, the areas designated as the study area.

3. Acknowledged experience with innovative operational processes.

4. Fulfill decision-making or advisory role with innovative operational processes.

5. Identify the participant's overall role as being in transportation or transportation logistics.

APPENDIX I – Pre-Survey Memo of Understanding

Subject Title: The Diffusion of Innovation Survey!

Greetings, Mr. or Ms. _____:

My name is Steve Puryear. I am a doctoral candidate in Human Capital Development at The University of Southern Mississippi.

The proposed research is part of a doctoral dissertation to assess innovation diffusion within logistics clusters. **Your signature at the bottom of this pre-interview disclosure signifies that you have read this message and agree to the interview.** By completing the survey, you agree to participate in baseline information gathering regarding best practices for stimulating a culture of innovation, diffusion of ideas and concepts, and strengthening each component business's logistics cluster.

The Institutional Review Board (IRB) has approved the research from The University of Southern Mississippi. Suppose you have any questions concerning the study from the human rights perspective. In that case, you may contact the Chair of the Institutional Review Board at The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS, 39406, (601) 266-5997, or IRB@USM.edu. If possible, I would like to complete this survey during working hours within the next few weeks. To accomplish that, I need your help by participating!

By completing the survey, you agree that you have read and understood the above information and understand that participation is voluntary. If you choose to refuse or withdraw from participating, there is no penalty to you in any way. Should you be asked a question you do not want to answer, your refusal is a right without penalty, stigma, or repercussion.

The researcher guarantees the confidentiality of the data. The data will be analyzed and aggregated to provide a general assessment of your logistics cluster. Your name is not used for quotations unless you authorize the researcher to do so. If you prefer your identity to remain anonymous, you will be Ms. or Mr. B, etc. There is no compensation for participation in this study. The survey takes about an hour and is in an interview style.

Thank you in advance for your consideration and participation. Your input is crucial to the success of the project. If you have any questions about this research or the interview process, please contact me, Steve Puryear, at W881075@usm.edu or 601.259.6629 (cell).

The following are pre-requirements for survey eligibility. Please sign that you meet these requirements by signing the Consent Form (attached) and returning it to me by

email, mail, or text. Then, I can schedule our interview time to complete the survey.

PRELIMINARY CRITERION: FOR PARTICIPATION

The following questions will establish the criteria for participating in this study.

1. Residential Location: In which area do you **currently reside or work**? *Check one*

___ Memphis Area
___ Dallas Area
___ Atlanta Area
___ Mississippi
___ Other (Specify)

2. How long? ____ Less than a year ____More than a year

3. How much experience using alternative fuels do you have?

____None ____Less than one year ____Greater than one year

4. Does the company that you work for/with use commercial vehicles?

Yes_____ No_____

5. Do you have decision authority overusing or not using alternative fuels?

None_____ Yes, I have authority_____

Sincerely,

Steve Puryear, Ph.D. Candidate at the University of Southern Mississippi
Voice: 601.259.6629
Email: W881075@usm.edu

APPENDIX J – Consent to Participate in Research

CONSENT TO PARTICIPATE IN RESEARCH

Participant's Name: _____

I consent to participate in this research project. All procedures and investigations to be followed and their purpose, including experimental methods, were explained to me. Information about all benefits, risks, inconveniences, or discomforts that might occur was previously provided to me by email.

The opportunity to ask questions regarding the research and procedures was given. Participation in the project is entirely voluntary, and participants may withdraw at any time without penalty, prejudice, or loss of benefits. All personal information is confidential, and no names are disclosed without prior authorization. Any latest information that develops during the project will be disclosed if that information may affect the project participant's willingness to continue participation.

Questions regarding the research occurring during or after the project should be directed to the Principal Investigator with the contact information provided above. This project and this consent form have been reviewed by the Institutional Review Board, ensuring that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be addressed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-5997.

The University of Southern Mississippi has no mechanism to compensate participants who may incur injuries from research project participation. However, efforts will be made to make available the facilities and professional skills at the University. Information regarding treatment or the absence of treatment has been given above.

Please return this signed form by any of the following methods:

Email or scan W881075 @USM.edu Fax 601-407-2701

_____	_____
Research Participant	Steve Puryear, Ph.D. Candidate
_____	_____
Date	Date

Interview Protocol

Exploring Innovation Diffusion Process Used in companies Utilizing Commercial Vehicles

Date _____ Time of Interview_____

Method _____ Duration of Interview_____

Interviewee _____ Business City _____

Type of Business: Logistics Trucking Warehouse Distribution Other_____

Suggestion for another Transportation Manager with Operations Experience

Name _____ Location _____

Email Address _____ Phone # _____

Interview Preamble Script

1. I am Steve Puryear, and I want to learn about your perceptions of innovation within the logistics community, particularly the diffusion of innovation in commercial transportation (for-hire, dedicated service, and contract).

2. Thank you again for agreeing to help me with my study. Your knowledge and experience will help me further understand how companies using commercial vehicles explore and implement innovation. Before we begin, I would like you to confirm your name. (Note confirmation)

3. Do I have your permission to record this interview and to proceed with the pre-interview questions? ____**Yes** ____**No**

    a. If **No**, please explain why you do not want the interview recorded. *Based on the response, provide a confidentiality strategy. With continued refusal, take notes.*
    b. If **Yes**, begin recording. Thank you for your permission to record this interview. Before the interview, I will provide an overview of the study, confidentiality, informed consent, and participation guidelines. Ask questions as they arise. Discuss *Oral Presentation of Research Procedures.*

4. Please confirm that you understand that your participation and interview are voluntary and of no cost to you. All your personal information is confidential, and your name will not be disclosed. If you have any questions, contact me during and after the study. You may request a written response. The Institutional Review Board reviewed this project and consent procedures, ensuring that human subjects research projects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5116, Hattiesburg, MS 39406-0001, 601-266-5997, irb@usm.edu.

5. Do you consent to participate in this study and proceed with the interview? ____**Yes** ____ **No**
    a. If **No**, then thank you for your time. Don't hesitate to get in touch with me regarding any questions about the study if you decide to participate or refer someone to participate in the study.
    b. If **Yes**, then proceed to interview questions.

6. This interview asks about innovation within logistics clusters, particularly using innovative methods and improvements in your work community. The first series of questions I ask is about the criteria for participation. If you qualify for the study, we will proceed to the questions concerning your company and the innovation process that led to your transportation fleet using innovations and innovative processes.

Demographics/Criteria for Participation

- Tell me about yourself and how you became employed in your current position.

- Where do you currently reside?
    - _____Memphis Metropolitan Area
    - _____Dallas Metropolitan Area
    - _____Atlanta Metropolitan Area
    - _____Other _____

- What is the location of your current employer?
    - _____Memphis Metropolitan Area
    - _____Dallas Metropolitan Area
    - _____Atlanta Metropolitan Area
    - _____Other_____

- Do you have overall employment responsibilities that include transportation/ logistics? _____ Yes _____ No

- What is your experience with innovating within commercial transportation?

- Has your experience been positive or negative? Explain

- Work Experience: How long have you been in transportation/logistics? _____

- How are you involved with innovation decisions?

- What is your current employment position? How did you arrive at this position?

- Pick 3-5 words to describe innovation in transportation logistics.

- Do you have any comments or questions thus far?

- Decide if they are eligible to participate or not.

The Interview

1	Tell me about your company's process for developing new processes and preparing for change.		
	Prompt	**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
	• What diffusions of innovation are used by the company		
	• How do peer networks impact the success	Institution for collaboration	
	• Social gatherings • Social interactions • Social Media (Facebook, Instagram, Twitter) • How do you participate in these? • How do peer-to-peer conversations impact job success	Informal nature of knowledge flow	
	• What is your ongoing evaluation process for new innovations at each stage of the innovation process? • Staff meetings • Project review meetings • Innovation focus groups • Written reports	Short feedback loop	
	• Are leaders present in the cluster, "innovation" business? • Are all equal in importance/influence? • Who are influential people by position or influence? • Does your company actively seek to innovate? • How close are opinion leaders geographically? • Is there collaboration in the community? What form?	Collaborative action programs	

2	**Describe the impact of your location on implementing innovative changes. What about your location helps with being innovative?**		
	Prompt	**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
	• Local community colleges/universities, trade schools • Informal means of collaboration with schools? Formal? • Recognized innovation leaders in the community • Develop innovation by partnering with schools. • Sustainable partnership with community members---how • Informal patterns of communication and knowledge transfer • Timely responses to questions and concerns among the business community (short feedback loop) • Collective action regimes (individuals join in negotiating) • Quality governance	Geographical Location Influence	
	• Does your company share a specialized workforce, such as consultants, to assist in implementing new processes?	Shared specialized workforce	
	• Innovative tools in the community, such as shared resources, suppliers, human networks, knowledge sharing, communication styles • Knowledge creation centers, universities, consulting firms, think tanks	Specialized local suppliers of industry-specific intermediate inputs and services	

3	**Discuss your company's process in introducing, evaluating, developing, and implementing innovation diffusion.**		
Prompt		**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
• When did you identify that there is a problem? • When did you identify innovation possibilities? • Were there any false starts? Change dates, tried on a limited scale, and then full implementation postponed?		Length of time from problem identification to implementation	
• Your experience with innovation possibilities • Qualities that make innovation possibilities spread successfully. • Business cluster location consolidates transportation modes. • Role of other companies in dealing with demand fluctuations • Sharing spillover capacity		The stimulus for the innovation	
• Introduction of new ideas, products, and concepts introduced: frequency and how • Who introduced the last innovation possibility, and how was the idea received • Innovative tools used, such as shared resources, suppliers, human networks, knowledge sharing, communication styles • Summit meetings among companies		Advancing through the process of innovation from solution to the problem accepting the innovation	

4	**Describe the roles of different individuals in the success of innovation in your company. Include the roles of upper management to beginning employees.**		
Prompt		**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
• Impact of innovation on the consistency of purpose • Impact of innovation on future success • Impact on employee satisfaction • Is innovation perceived as an improvement of economic advantage? Social prestige? Convenience? Satisfaction? • Are users and partners in a continuous process of redevelopment? • Where do ideas of innovation arise? Workers, think tanks, C-Suite, colleges, universities. • Is personal contact used rather than impersonal media used to spread information?		Motivators for both employees and senior-level decision-makers	

5	**Discuss the most/least successful means to implement innovative ideas within your company.**		
Prompt		**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
• Collaboration in the community • Technical innovation • Sources of information for the innovation process: peer groups, continuing education, periodicals, social gatherings, seminars, social media, professional associations, etc.		The components of the logistics cluster work with each other to improve the performance of all	
• Companies have a cooperative to enhance buying power for goods and services		Pooled effort and buying power for products and services enhance efficiency and economic benefit	
• Companies shared the cost of innovation diffusion methodologies		The cost of development of innovation is shared in the logistics cluster through mutual support	
• Government agencies acted promptly. • Government agencies changed policy. • Government agencies offered financial incentives		To increase success, you must have the support of governmental agencies and procedures	
• Several companies have pooled their resources. • The government supported the innovation and actively participated by:		The transition was made economically possible by refueling station availability, pooling of resources, government programs	

6	**Identify the major obstacles or roadblocks to implementing change or innovation within your company.**		
Prompt		**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
• Collaboration among firms in the community • Informal communication practices • Feedback loops • Innovation tools availability • Colleges, universities, trade schools • No collective action regimes		Obstacles to success included lack of workforce education, local authority support, cooperation, or service integration	

Do you have anything else you want to add to the survey?

Thank you for your time and information. As the study progresses, you will receive my preliminary analysis of all interviews. You will have the opportunity to review and provide feedback on this analysis.

Please help me recruit additional managers to participate in the study. I will get the information now, or you can send me their contact information. You are under no obligation to help with recruitment.

Thank you for your help and participation, without which this study would not be possible.

APPENDIX L – Thank You Email

Subject Title: Thank You for Participating in the Innovation Diffusion Survey

Hello XXX,

Thank you for completing the survey assessing a culture of innovation leadership and its impact on the workforce inside and outside logistics clusters. All participants will receive a copy of the survey results. You have agreed to participate in this research by completing the survey and understand that participation is voluntary. If you choose to refuse to complete the survey or withdraw from participating, you are not penalized in any way except that you will not receive a copy of the finished report.

The Institutional Review Board (IRB) from The University of Southern Mississippi has approved the research. Suppose you have any questions concerning the research from the human rights perspective. In that case, you may contact the Chair of the Institutional Review Board at The University of Southern Mississippi, PO BOX 5147, Hattiesburg, MS, 39406, (601) 266-6820.

If you have any questions about this research or how it is being conducted, please feel free to contact Steve Puryear at W881075@.usm.edu or 601-259-6629 (cell)

Sincerely,

Steve Puryear, Ph.D. Candidate at The University of Southern Mississippi

Voice: 601.259.6629

Email: W881075@usm.e

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APPENDIX M – Sample of Completed Interview Protocol

Interview Protocol

Exploring Innovation Diffusion Process Used in companies Utilizing Commercial Vehicles

Date: April 15, 2021 Time of Interview: 4:00 pm

Method: Zoom Duration of Interview: 1 hour

Interviewee: John Brown Business City: Anytown, MS

Type of Business: Logistics Trucking Warehouse Distribution Other_____

Suggestion for another Transportation Manager with Operations Experience

Name: Lou Jones _____Location: Dallas _____

Email Address: _____ Phone # _____

Interview Preamble Script

7. I am Steve Puryear. I want to learn about your perceptions of innovation within the logistics community, particularly the diffusion of innovation in commercial transportation (for-hire, dedicated service, contract).

8. Thank you again for agreeing to help me with my study. Your knowledge and experience will help me further understand how companies using commercial vehicles explore and implement innovation. Before we begin, I would like you to confirm your name. (Note confirmation)

9. Do I have your permission to record this interview and to proceed with the pre-interview questions? **Yes** **No**

   a. If **No**, please explain why you do not want the interview recorded. *Based on the response, provide a confidentiality strategy. With continued refusal, take notes.*
   b. If **Yes**, begin recording. Thank you for your permission to record this interview. Before the interview, I will provide an overview of the study, confidentiality, informed consent, and participation guidelines. Ask questions as they arise. Discuss *Oral Presentation of Research Procedures.*

10. Please confirm that you understand that your participation and interview are voluntary and of no cost to you. All your personal information is confidential, and your name will not be disclosed. If you have any questions, contact me during and after the study. You may request a written response. The Institutional Review Board reviewed this project and consent procedures, ensuring that human subjects research projects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5116, Hattiesburg, MS 39406-0001, 601-266-5997, irb@usm.edu.

11. Do you consent to participate in this study and proceed with the interview? **Yes** **No**
    a. If **No**, then thank you for your time. Don't hesitate to get in touch with me regarding any questions about the study if you decide to participate or refer someone to participate in the study.
    b. If **Yes**, then proceed to interview questions.

12. This interview asks about innovation within logistics clusters in your work community. The first series of questions I ask is about the criteria for participation. If you qualify for the study, we will proceed to the questions concerning your company and the innovation process that led to your transportation fleet using innovations and innovative processes.

Demographics/Criteria for Participation

- Tell me about yourself and how you became employed in your current position.

I inherited the trucking company from my father and have worked through dispatch.

- Where do you currently reside?
    - _____Memphis Metropolitan Area
    - _____Dallas Metropolitan Area
    - _____Atlanta Metropolitan Area
    - _X___Other Anytown, TX_____

- What is the location of your current employer?
    - _____Memphis Metropolitan Area
    - _____Dallas Metropolitan Area
    - _____Atlanta Metropolitan Area
    - _X___ Other Anytown, TX_____

- Do you have overall employment responsibilities that include transportation/ logistics? __X___ Yes _____ No

- What is your experience with innovating within commercial transportation?

We have implemented using electric vehicles for van deliveries within a 50-mile radius.

- Has your experience been positive or negative? Explain

Positive. This has saved us money, and we got a grant.

- Work Experience: How long have you been in transportation/logistics? 25 *years*

- How are you involved with innovation decisions?

  I am head of the committee investigating upgrading our operating systems and fleet.

- What is your current employment position? How did you arrive at this position?

  I was promoted about five years ago to the chief operating officer.

- Pick 3-5 words to describe innovation in transportation logistics

  Challenging,

- Do you have any comments or questions thus far?

  no

- Decide if they are eligible to participate or not.

  Eligible to participate

The Interview

1	Tell me about your company's process for developing new processes and preparing for change.		
	Prompt	**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
	• What diffusions of innovation are used by the company		
	• How do peer networks impact success	Institution for collaboration	
	• Social gatherings • Social interactions • Social Media (Facebook, Instagram, Twitter) • How do you participate in these • How do peer-to-peer conversations impact job success	Informal nature of knowledge flow	*Attending the trucking convention and golf tournaments each year.*
	• What is your ongoing evaluation process for new innovations at each stage of the innovation process? • Staff meetings • Project review meetings • Innovation focus groups • Written reports	Short feedback loop	*We use Lean Process evaluation each year and performance evaluations. We have a suggestion box for our employees.*
	• Are leaders present in the cluster, "innovation" business? • Are all equal importance/influence • Who are influential people by position or influence? • Does your company actively seek to innovate? • How close are opinion leaders geographically? • Is there collaboration in the community? What form?	Collaborative action programs	*The company actively seeks to innovate by offering a bonus for all implemented suggestions.*

2	**Describe the impact of your location on implementing innovative changes. What about your location helps with being innovative?**		
	Prompt	**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
	• Local community colleges/universities, trade schools • Informal means of collaboration with schools? Formal? • Recognized innovation leaders in the community. • Develop innovation by partnering with schools. • Sustainable partnership with community members---how • Informal patterns of communication and knowledge transfer • Timely responses to questions and concerns among the business community (short feedback loop) • Collective action regimes (individuals join in negotiating) • Quality governance	Geographical Location Influence	*We are in an industrial park, and the local community college offers training on new processes. We are near suppliers, which is where our van transport is beneficial, as we can quickly move supplies from one area to another. We communicate well with the businesses in the area and eat lunch together at the meat and three down the street.*
	• Does your company share a specialized workforce, such as consultants, to help implement new processes?	Shared specialized workforce	*We share part-time workers with other businesses in our complex.*
	• Innovative tools in the community, such as shared resources, suppliers, human networks, knowledge sharing, communication styles • Knowledge creation centers, universities, consulting firms, think tanks	Specialized local suppliers of industry-specific intermediate inputs and services	

3	**Discuss your company's process in introducing, evaluating, developing, and implementing diffusion of innovation.**		
	Prompt	**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
	• When did you find that there was a problem? • When did you find the innovation possible? • When did your company start using alternative fuels? • Were there any false starts? Change dates, tried on a limited scale, and then full implementation postponed?	Length of time from problem identification to implementation	*We found a grant to help pay for the electric vans and fleet changeover purchase, reviewed results over 12 months, and determined the most effective use of the vehicles.*
	• Qualities that make innovation possibilities spread successfully. • Business cluster location merges transportation modes • Role of other companies in dealing with demand fluctuations • Sharing spillover capacity	The stimulus for the innovation	
	• Introducing new ideas, products, and concepts: frequency and how. • Who introduced innovative possibilities, and how was the idea received • Innovative tools used, such as shared resources, suppliers, human networks, knowledge sharing, communication styles • Summit meetings among companies	Advancing through the process of innovation from solution to the problem accepting the innovation	*A young driver asked about using electric vehicles as he was freezing fueling the fleet. One of the computer guys investigated the cost and available grants as part of a college class.*

4	**Describe the roles of different individuals in the success of innovation in your company. Include the roles of upper management to beginning employees.**		
Prompt		**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
• Impact of innovation on the consistency of purpose • Impact of innovation on future success • Impact on employee satisfaction • Is innovation perceived as an improvement of economic advantage? Social prestige? Convenience? Satisfaction? • Are users partners in a continuous process of redevelopment? • Where do ideas of innovation arise? Workers, think tanks, C-Suite, colleges, universities • Is personal contact used rather than impersonal media used to spread information?		Motivators for both employees and senior-level decision-makers	*The maintenance director looked for more efficient, more easily repaired vehicles, and my committee considered alternatives. The controller and/or director of human resources is on the committee. We explored the benefits. Drivers of the test vehicles gave positive feedback.*

5	**Discuss the most/least successful means to implement innovative ideas within your company.**		
Prompt		**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
• Collaboration in the community • Technical innovation • Sources of information for the innovation process: peer groups, continuing education, periodicals, social gatherings, seminars, social media, professional associations, etc.		The components of the logistics cluster work with each other to improve the performance of all	*When my father mandates change or no change as the board chairman, it just does not work. We need to collaborate with our community and groups in our country.*
• Companies have a cooperative to enhance buying power for goods and services		Pooled effort and buying power for products and services enhance efficiency and economic benefit	
• Companies shared the cost of installing refueling stations		The cost of development of innovation is shared in the logistics cluster through mutual support	*Our neighbors have also added electric vehicles, and several employees drive them. We shared the cost of the refueling stations.*
• Government agencies acted promptly. • Government agencies changed policy. • Government agencies offered financial incentives		To increase success, you must have the support of governmental agencies and procedures	*The government offered financial incentives for our changing fleet to more environmentally friendly vans.*
• Several companies have pooled their resources. • The government supported the innovation and actively participated by:		The transition was made economically possible by refueling station availability, pooling of resources, government programs	

6	**Identify the major obstacles or roadblocks to implementing change or innovation within your company.**		
Prompt		**Comment Category**	**Response Comments** Introduction, Evaluation, Development, Implementation
• Collaboration among firms in the community • Informal communication practices • Feedback loops • Innovation tools availability • Colleges, universities, trade schools • No collective action regimes		Obstacles to success included lack of workforce education, local authority support, cooperation, or service integration	*The bottom line. How much does it cost, and what traditions have we held as a family-owned company?*

Do you have anything else you want to add to the survey?

Thank you for your time and information. As the study progresses, you will receive my preliminary analysis of all interviews. You will have the opportunity to review and provide feedback on this analysis.

Please help me recruit additional managers to participate in the study. I will get the information now, or you can send me their contact information. You are under no obligation to help with recruitment.

Thank you for your help and participation, without which this study would not be possible.

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