TYPOLOGY OF CLUSTER CONCENTRATIONS BASED ON FACTOR CONDITIONS OF PRODUCTION AND EVOLUTION OF SUPPLY CHAIN INFRASTRUCTURES

by

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The Ability to Dream

Thank you and I love you.

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ABSTRACT

A TYPOLOGY OF CLUSTER CONCENTRATIONS BASED ON FACTOR CONDITIONS OF PRODUCTION AND EVOLUTION OF SUPPLY CHAIN INFRASTRUCTURES

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If the reader would imagine a 500 piece picture puzzle of which only one single piece is available for research, then it is obvious that any conclusions concerning the puzzle as a whole would at the very best be limited to what the researcher could extrapolate from that single piece of the puzzle. This study contends that to comprehend the puzzle it must be viewed as a whole picture, admittedly comprised of different pieces, but nonetheless only accurately understandable in regard to interaction and interconnectivities when viewed from a macro perspective. Accordingly, concentrations should be viewed from a holistic, macro perspective instead of the

current view that is isolationist and micro in both nature and practice. Only then can such characteristics as efficiency or effectiveness-seeking be understood in relation to the evolution of concentrations.

Contributions of this exploratory study include an empirically tested taxonomy of cluster concentrations which should preclude miscommunication, and provides practitioners tools for identification of concentration types. This study also conceptualizes the cyclical relationship of efficiency and effective-seeking characteristics in regard to concentrations, and further, provides a graphical illustration of those relationships. A previously unrecognized concentration, *Balanced Concentration,* is identified. Finally, this study identifies predictors of concentration types and types of infrastructure, and then utilizes these predictors and types of infrastructure in an analysis of differences between developed/developed and developed/developing borders. Further, analysis of borders differences in two time periods, 1990 and 2002, is performed.

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CHAPTER 1

INTRODUCTION

"Nations succeed not in isolated industries, however, but in clusters of industries connected through vertical and horizontal relationships. A nation's economy contains a mix of clusters, whose makeup and sources of competitive advantage (or disadvantage) reflect the state of the economy's development." (Porter, 1990; p. 73)

1.1 Introduction

Businesses operate for only one reason, to make money. In the process of making money, businesses also spend money. Where they spend money is of great interest to many people, but for different reasons. Not surprisingly, perspectives on business expenditures are relative to the individual.

For example, if a business in the refuse collection industry expresses interest in spending money to locate a land-fill in a specific geographic area that happens to be immediately adjacent to your home, you will be interested, but may be very unhappy over the prospect of having a garbage dump as your next door neighbor, and the potential financial expenditures the business may make probably would not affect your perspective. However, if you own the land that the business wants to acquire for its land-fill operations, you may be very happy, and very interested in how much money the business is willing to spend. If you are unemployed the prospect of working in garbage all day may not be very exciting to you, but you would be interested in the amount of money the business plans on paying to its employees. However, if you are

employed and concerned about the environment, then you may be unhappy about the prospect of a land-fill in a specific area and could possibly care less as to how much money the business will spend, and so on.

From a public interest perspective however, business expenditures are viewed as being good for the economy, be it at the local, county, state or federal level. Public officials as well as civic leaders are constantly competing for business operations to locate in their respective geographic areas.

From a pure economic perspective, the decision to locate any business operation within a specific geographic area should be driven by the prospects of gaining competitive advantage(s) and the resultant additional profit(s). Competitive advantage can include such items as that of increasing sales or reducing costs, as for example, gaining favorable tax benefits, accessing new markets, greater availability of labor and so forth, all of which should eventually convert into increased profits.

When a business organization realizes competitive advantage from operating within a specific geographical location it is quite possible that the organization's competition will also recognize potential advantages to be gained by locating in the same geographical area as well. A single business operation located within a specific geographic area is not especially unique, but when multiple business entities within the same industry, or related industries, locate in close geographic proximity to each other, an industry specific *cluster* then exists. These industry specific clusters are linked to other types of clusters, for example, clusters that provide resources or services to the companies within the industry specific cluster. In addition, there are clusters that

provide resources and services to the population employed by the companies that make up the industry specific cluster. As a result of these relationships there are concentrations of clusters in a geographic area.

Accordingly, cluster concentrations are a set of institutions that seek fulfillment of respective needs that may be mutually beneficial or competitively advantageous (Bathelt and Gertler, 2005). A cluster concentration holds great interest not only to the citizenry and their respective public officials, but perhaps more importantly, to business organizations engaged in the battle for profit, and significant research has been conducted in regard to the nature of clusters. A brief discussion concerning prior studies is therefore appropriate.

1.2 Background

Research of industrial districts (clusters) began in earnest with Marshall's (1997) interest in and focus on concentrations of people living around operating industries. While not identified by Marshall as a specific attribute of infrastructure, he found in 1922 that for an industrial district to form and evolve, the population concentration had to be within walking distance of the workplace. Marshall concluded that the lack of proximity in relation to resources, which included the workforce, was a constraint in the forming of clusters, and by inference, a viable infrastructure had to support not only the population but the industrial operations as well. With the advent of affordable transportation, immediate proximity to the workplace was no longer as significant in relation to the development or viability of industrial clusters. However, the importance

of infrastructure did not diminish and the study of infrastructure and its role in relation to cluster development continues to be of interest to researchers.

For example, Bathelt and Gertler (2005) concluded that viability of cluster formations depends on infrastructure linkage. These authors define linkage in regard to cluster concentrations as being the commonality of infrastructure utilized by individual organizations within a specific industry cluster. By extrapolation, linkage is also the shared infrastructures between cluster concentrations, and in general, depending on the perspective of the researcher, either infrastructure drives the formation of clusters, or clusters drive the development of infrastructures. In addition to the interest in the role of infrastructures, clusters have been studied from a multitude of perspectives and environments, with various levels of analysis being utilized in the identification of characteristics associated with types of clusters.

For example, clusters have been examined from an ***industry level*** (Porter, 1998a; Tortosa-Ausina, 2002), ***county level*** (Ketelhohn, 2002; Porter, 1998a), ***state level*** (Porter, 2003), ***country level*** (Porter, 1990), and ***metropolitan area level*** (Markusen, 1985; 1996). Knowledge concerning clusters continues to expand with new research, and cluster theory is far from being static, however current research is dominated by Dr. Michael Porter.

Porter has led the research in cluster theory in recent years. He finds that clusters do not form in isolation but rather in networks of clusters (1990). According to Porter (1990), companies locating in these networks of clusters are seeking efficiency and/or effectiveness in regard to their operations. Porter does not define the terms

efficiency-seeking or effectiveness-seeking in regard to either operations or clusters, however other researchers have. Jarillo (1988, p.36) states, "The conditions for the existence of stable networks are the same as the conditions for the existence of organizations. An organization is effective if it achieves the desired end. It is efficient if it does so while, at the same time offering more inducements to the members of the organizations than efforts they have to put into it." To paraphrase, effectiveness-seeking involves searching for benefits and outcomes whereas efficiency-seeking involves searching for synergistic effects. The importance of efficiency and/or effectiveness seeking characteristics in relation to cluster concentrations is critical to this thesis and will be expanded on in much greater detail in subsequent sections. The next section identifies the rationale, as well as anticipated values, of the study.

1.3 Purpose and Contributions

Past research concerning clusters holds an isolationist perspective as a result of researchers studying only a specific industry cluster, or specific industry related clusters. By their doing so, this thesis contends that past research has missed the gestalt of the collective, and accordingly explores clusters from a much broader, or macro perspective in order to gain a holistic assessment of cluster concentrations. Central to this research is the conceptualization that to fully understand cluster concentrations, all of the clusters within the concentrations must be viewed as parts of a whole, and that the characteristics and value of the whole must be studied, versus the current practice of looking only at specific member clusters.

From an operational perspective, the study of industry specific or industry related clusters in isolation is akin to attempting to analyze the characteristics of an automobile *sans* its transmission and brake pedal. While the engine would work by itself as long as it had fuel, the vehicle would not be fully functional without the integrated components and conclusions arrived at based upon the engine alone could not accurately describe the vehicles functionalities, capabilities, requirements or needs. A further difficulty exists in the field of study because of issues of classification.

The goals of this research include the development of a typology which will result in an empirically tested taxonomy of cluster concentration classification. In the process of developing the typology, characteristics that are indicative of cluster concentrations will be identified. Further, this research will analyze the differences between cluster concentration characteristics of developed-developing borders as compared to cluster concentration characteristics of developed-developed borders, to assess evolutionary changes and differences. In essence, this research will examine cluster concentrations within the United States (U.S.) in order:

- to classify concentrations
- identify constructs of efficiency and effectiveness as related to concentration types and characteristics
- identify relationships with infrastructures as related to concentration characteristics.

The level of research utilized in this analysis of cluster concentrations will be at the county level as counties are the most locally based jurisdiction that reflects the

characteristics relevant to this study (NACO, 2006). Meyer, Tsui and Hinings (1993, p. 1175) state, "Configurations may be represented in typologies developed conceptually or captured in taxonomies derived empirically. They can be situated at multiple levels of analysis, depicting patterns common across individuals, groups, departments, organizations, or networks of organizations." Accordingly, this research will first examine the typologies of cluster classifications developed by Porter (1990), Markusen (1996) and Eden (2002) as based upon their respective findings and then propose a ***typology of cluster concentration classifications*** as opposed to a typology of cluster classifications. This thesis also seeks to identify differences of characteristics between developed/developed and developed/developing borders.

In regard to the goal of assessing differences between cluster concentration characteristics in relation to developed-developed and developed-developing borders, Wolfe and Gertler (2004) criticize past work **stating that it is difficult to pinpoint an exact time of origin in the cluster evolutionary process** (emphasis added). As such, the exact time of origin is not a practical pursuit. However, this research contends that a unique opportunity exists to compare characteristics of efficiency and effectiveness for evidence of evolutionary change. Specifically, as the U.S. borders both a developed country (Canada) and a developing country (Mexico), the opportunity to examine efficiency and effectiveness characteristics may well lead to exciting insights. This comparison should provide insights in regard to the viability and evolution of efficiency and effectiveness characteristics as well as insights regarding strategies that may be pro-actively employed to drive changes in a planned manner.

Further, analysis of efficiency and effectiveness characteristics in relation to U.S. borders may identify characteristics of evolutionary changes in infrastructures. In addition, the analysis of relationships between efficiency and effectiveness characteristics and differing types of infrastructures may provide new insights in relation to evolution as well. As such, this study will also compare the two U.S. borders at two time periods, 1990 and 2002, and examine changes in infrastructure in relation to the evolution of efficiency and effectiveness characteristics by utilizing the resultant predictor variables of cluster concentration membership. The time periods were chosen based upon the availability of the most current census information (2002) for comparison with the previous decade's census (1990) data. This deliberate selection of relatively recent time periods was further motivated by concerns that going too far back in time would negate or obfuscate the importance of technological advances and changes that have occurred in the relative near term.

Additionally, and of special interest from an operational perspective, the analysis may also clarify relationships of efficiency-seeking and effectiveness-seeking characteristics as they relate to Porter's (1990) findings in regard to basic and advanced factor conditions of production. These clarified relationships may in turn suggest strategies for the best use of public and private resources in managing cluster concentration development, especially in relation to infrastructures. Finally, this research could provide new insights about the characteristics of efficiency and effectiveness that relate to developed-developed, as opposed to those of developed-developing, countries.

1.4 Thesis Format

This chapter provides an introduction to the topics of interest germane to this research as well as a brief historical perspective regarding the interest in cluster concentrations of business and non-business organizations and researchers. Chapter Two provides a detailed and comprehensive literature review of current published findings relevant to the topics of interest to this research. Chapter Three discusses in detail the methodologies to be utilized in this research and analysis. Chapter Four presents an analysis of the proposed typology as well as the development and testing of Hypotheses. Chapter Five discusses findings of this research and draws conclusions. Finally, a summation for the thesis as a whole is provided that offers insights, topics for future research, and identifies contributions of this research to the body of knowledge and to Cluster Concentration Theory.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A literature review was conducted with the objectives of gaining perspective and knowledge in regard to previously published research on types and classifications of clusters, cluster infrastructures and dynamic geographic areas in relation to cluster formations. Both objectives are accomplished through the review of existing work by researchers such as Eden, Markusen and Porter. Additional knowledge and understanding is gained by identifying and discussing various definitions of terminology previously utilized and then developing or identifying the definitions to be used in this study.

A difficulty soon realized was that previous researchers often interchangeably utilize the same or similar terminologies, but with different meanings. Some of the meanings are significantly and even radically different from that employed by other researchers. As if this is not confusing enough, in addition to the different meanings, the term *cluster*, or some derivative of the word, is used as a specific descriptive term for a multitude of subjects.

In the strategic management literature, for example, the terms *cluster* and *clustering* have been used to identify strategic groups from the perspective of

organizations in the same industry using similar strategies (McGee and Thomas, 1986; Fiegenbaum and Thomas, 1995; Barney and Hoskisson, 1990; Peteraf and Shanley, 1997). Abdekhodaee, Wirth and Gan (2006) in the human resources literature have used the term *cluster* to identify groupings of employment (jobs), while Reiter, Zanutto and Hunter (2006) use *clusters* to describe work practices and Yusuf and Saffu (2005) refer to resource allocation as *clusters*. Within operations literature some researchers use of the term *cluster* has been to describe subjects such as innovation (Asheim and Coenen, 2005; Tödtling and Trippi, 2005; Fromhold-Eisebith and Eisebith, 2005), while Masakure and Hensen (2005) use the term in relation to production, and Karlsen (2005) identifies the meaning of clusters as specialization. As the reader can appreciate, while far from being an exhaustive listing of the multiple usages of the term, it certainly is indicative of why confusion can and does occur.

For the purposes of this study, various terms specific to their respective topics require clarification or definition to assure a commonality of understanding. Accordingly, specific definition of terms used by and within this study will be identified at the conclusion of respective topic narratives. To further assure clarity, as well as assist the reader in differentiation, such topic definitions will also be italicized. The narrative will begin with cluster theory.

2.2 Cluster Theory

In order to define cluster concentrations an understanding and perspective of cluster theory must first be established. Porter (1990) has led the research in cluster theory in recent years. He finds that clusters do not form in isolation but rather in networks of clusters. According to Porter (1990), companies that comprise clusters are seeking efficiency and/or effectiveness in regard to their operations.

Porter's theory encompasses four interacting determinants: 1) organizations' strategy, structure, and rivalry; 2) demand conditions; 3) related and supported industries; and 4) factor conditions of production (Porter, 1990). O'Connell, Clancey and van Egeraat (1999) support Porter's findings when they found that interaction of these determinants is required for viable clusters. Porter's Diamond Theory of Competitive Advantage (Figure 2.1) graphically demonstrates the interaction of these determinants. Discussion of each determinant and its appropriateness to this study follows.

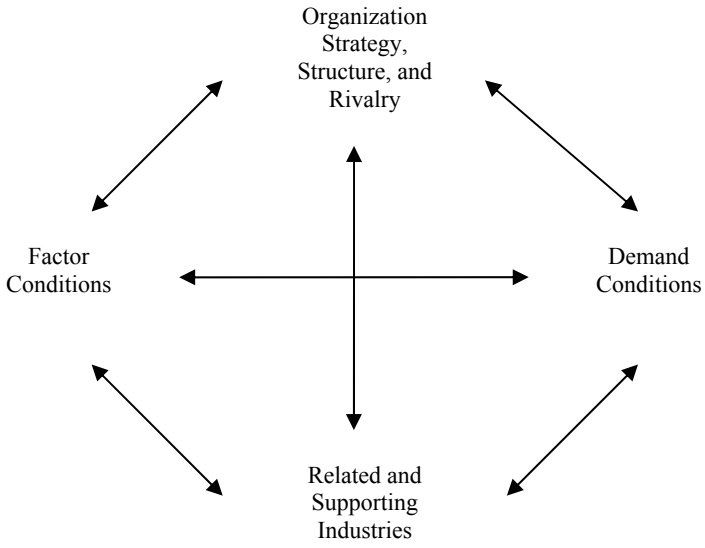

Figure 2.1 Porter's Diamond of Competitive Advantage (Porter, 1990, p. 72)

The first determinant, firm strategy, structure, and rivalry, are the conditions in the nation governing how companies are created, organized, and managed, and the nature of domestic rivalry (Porter, 1990). As this determinant is focused on the individual member organization, further discussion of this determinant adds no value to this study.

The second determinant, demand conditions, refers to the nature of demand for the industry's product or service at home. This determinant is specific to an organization's product or service and as such is also not applicable to this study.

The third determinant, related or supporting industries, refers to the presence or absence in the nation of supplier industries and related industries that are internationally

competitive. As this study has no focus on international competition, accordingly no additional discussion in regard to this determinant is offered.

The fourth determinant, factor conditions of production, refers to the position of factors of production such as requisite infrastructure and labor as necessary to compete or cooperate (Porter, 1990). This fourth determinant is a critical element of this research and significant discussion of factor conditions of production follows.

Porter identified two classifications of factor conditions of production; basic and advanced (Figure 2.2). According to Porter, basic factor conditions require the positioning of resources, such as natural resources, location, and unskilled or semiskilled labor to realize the benefits of efficiency and effectiveness. Porter (1990) also described basic factors as being passively inherited by geographic areas and important in extractive or agriculturally based areas where technology and skill requirements are modest. Porter further identified that without the positioning of basic factor conditions, efficiency and effectiveness cannot be actualized. As demonstrated in the following discussion, the characteristics of efficiency and effectiveness as they relate to advanced factor conditions of production are critical to competitive advantage.

Advanced factor conditions of production, such as modern communication systems, highly educated personnel, and university research institutions, are considered the most significant for developing a competitive advantage as well as the most difficult to procure (Porter, 1990). The competitive advantage produced by these factor conditions is dependent upon efficiency and effectiveness (Porter, 1990). Accordingly,

positioning of factor conditions of production, be they basic or advanced, are critical for the realization of efficiency and effectiveness.

Figure 2.2 Graphical Representation of Porter's Factor Conditions of Production (1990)

From a conceptual perspective, characteristics of Porter's factor conditions of production with emphasis on efficiency and effectiveness may lend to analytical classification of cluster concentration types. If so, then would these classifications correctly assess types of cluster concentrations in dynamic or non-dynamic geographic areas? Should this analytical method of classification prove true, the capability to classify cluster concentration type, regardless of the dynamism of the geographic area, would be important to practitioners in relation to investments of infrastructure dollars. Perhaps, more important to practitioners, such classification would be of exceptional value in location decisions. An additional value of classification would be that of assisting practitioners in establishing objectives that when realized would result in efficiency-seeking or effectiveness-seeking characteristics. This exploratory study begins to address these and other areas of interest with particular focus on the importance of efficiency and/or effectiveness-seeking characteristics in relation to

cluster concentrations. Previous studies have not researched these areas of interest, and therefore, for purposes of clarity, additional discussion regarding cluster concentrations and their characteristics as well as the need for a definition of cluster concentration follows.

2.3 Cluster Concentrations Defined

As previously identified, there are differing meanings in both definition and topicality in regard to the use of the terms cluster and cluster concentration in the literature. In order to arrive at a clear understanding of the term cluster concentration as it relates to this research, additional discussion is required.

Within business disciplines, the term 'cluster' conveys an almost universal concept involving some type of measurable density. This concept holds true regardless as to the type of measurable density, for example, be it one of specific industries, or markets, or labor pools, or competitive advantages, and so forth. The difficulty occurs from the term being too general in nature, so much so that to the casual reader a cluster, or cluster concentration, could mean literally any kind of grouping that consists of more than one entity or subject. Accordingly, this research will define the term cluster concentration based upon the most commonsensical elements of descriptions and definitions as used in the literature.

In order to accomplish this goal, previous definitions of clusters must first be examined. A synthesis of existing cluster definitions will then be constructed to allow for a working definition of cluster concentration.

Marshall's work, as previously discussed in Chapter 1, is the first to identify the clustering nature of organizations and attempted to identify the characteristics associated with this phenomenon. An analysis of Marshall's (1997) findings demonstrates three basic requirements necessary for cluster formation that are not identified by Marshall or other researchers in regard to Marshall's work. The first requirement is that there must be attractiveness to the geographic area to begin with. Otherwise, what would attract the population Marshall identified as being so necessary to the formation of industrial districts? It then appears that an essential element for the formation of clusters would have to be that of a hospitable geographic environment that was desirable to live in. Secondly, any geographic area containing a large population also requires an infrastructure that at minimum sustains both the general population as well as the industrial cluster members. Finally, and argumentatively a part of the attractiveness of the geographic area, is the need to provide economic opportunities for the populace.

These requirements, as identified by this thesis, are supported in part by Markusen and Park (1993) who concluded that a cluster or industrial district has a geographic element that includes trade activities that are economically oriented. They focused on the economic activity of specialization and identified that specialization could be resource, manufacturing, or service related. While not specifically identified by their findings, the existence of infrastructure systems capable of supporting activities that are economically oriented, as well as a local population, are necessary. In addition, Barkley and Henry (1997) found that clusters consist of industries, whose activities in

an area positively relate to employment growth, labor productivity and wage rates. Therefore, economic opportunities should expand in an ancillary manner coinciding with the formation of cluster concentrations.

Malmberg and Maskell (2002) also identify that cluster concentrations emerge in an area because of some natural or social factor associated with a particular geographic area. These natural or social factors trigger or stimulate activities that result in knowledge spillovers by local organizations. For example, a social factor designed to stimulate employment opportunities in a specific geographic area is triggered by offering preferential tax treatment to potential new entrants, the social factor also contributes to the emergence of cluster concentrations. This contribution occurs with the attraction of like industry entrants seeking the same benefit. As employee move from business organization to business organization, knowledge spillover occurs.

Accordingly, by extrapolation, these natural or social factors contribute to some type of dynamic that is particular to the specific environment. These factors and activities would be either self-renewing or capable of re-generation, otherwise the area would not remain dynamic but instead would degrade to a static nature. Support for this extrapolation is found with Bathelt and Gertler (2005; p.2) who examined clusters and concluded that networks, for example, can be thought of as "continuously evolving manifestations of institutional conditions and economic structures that support and influence one another in a reflective manner". Therefore, inherent to a geographic area's attractiveness is the requirement for the geographic area to be dynamic as opposed to being static.

Through inductive reasoning it can be argued that if a geographic area becomes or is attractive enough to gain population, that as population increases, infrastructure develops, as infrastructure develops commerce is established, and that at some point the interaction of these separate elements generates a dynamic environment conducive to the formation of cluster concentrations.

These dynamic environments have been identified by Pouder and St. John (1996) as hot spots and Markusen (1996) as sticky places. Bathelt and Gertler (2005) also found that dynamic geographic areas develop linkages between cluster formations therein creating a viable environment conducive to the evolution of cluster concentrations. Accordingly, some type of activities (interaction of elements or *linkages*) must therefore combine with natural or social factors to make a geographic area attractive and dynamic.

In regard to dynamic geographic areas, Bhatnagara and Sohal (2005) as well as Aydogan and Lyon (2004) found that close spatial proximity creates stability for clusters. Further, Doeringer and Terkla (1995) found that the co-location of firms is based on gaining some type of performance advantage which contributes to dynamism. As cluster concentration formation does not occur in static geographic locations, Krugman (1991) as well as Porter (1998a) both found that evolution of cluster formation is triggered by need (condition), such as skilled labor pools, market access, priority of demand, supplier industries, and/or natural resources, all of which contribute to the dynamic. Accordingly, as clusters begin to grow, the need arises for lower cost or higher quality inputs, or for easier or faster access to existing or new markets. As a

result of cluster growth, public investments within infrastructure systems will then increase, which benefits the community as a whole (Barkley & Henry, 1997). Accordingly, this benefit results in common infrastructure and regeneration of resources for cluster members, which contributes to stability and the ongoing dynamism which is conducive for cluster concentration evolution.

This extrapolation is supported by Doeringer and Terkla's (1995) findings that clusters are a dynamic phenomenon, characterized by interactions, and functional relationships between firms. These relationships, or shapes, are horizontal, vertical, or a combination (Rosenfeld, 1997; Doeringer & Terkla, 1995). The shape of these clusters is tied to the type of infrastructure systems available to the cluster as well as type of benefit or resource that is sought (Rosenfeld, 1997). Relationships are therefore critical to maintaining a dynamic environment and accordingly are beneficial if cooperative in nature.

According to Barkley and Henry (1997) a relationship is defined as cooperation among firms to take advantage of complementarities, exploit new markets, and integrate activities, or pool resources or knowledge in order to achieve economies of scale or address common problems. Extrapolating from Barkley and Henry's (1997) findings, taking advantage of complementarities and exploiting new markets to address common problems focus on increasing capabilities, or creating positive outcomes or benefits (**effectiveness-seeking**). Conversely, integrating activities and pooling resources or knowledge to achieve economies of scale focus on lowering cost of inputs or outputs and increasing cluster members' abilities (**efficiency-seeking**).

It is therefore apparent that in addition to the many different conditions that must exist in order for a geographic cluster to come into existence, evolution of the concentration is driven by either efficiency-seeking or effectiveness-seeking activities. In order to develop a definition of cluster concentrations, this study next looked at specific definitions of clusters.

For example, Birkinshaw and Hood (2000) defined clusters as an aggregation of competing and complementary firms that are located in relatively close geographic proximity. Rosenfeld (2003) identified that from a narrow perspective, clusters are groups of geographically bound businesses that pass some litmus test of quantitatively comparable criteria. However, Rosenfeld loosened the immediate geographic criteria for defining a cluster by stating that from a broad perspective, clusters are defined by systemic relationships among firms and organizations in a general region based upon common needs for nearby goods and knowledge. Further, Rogerson (1998) found that clusters are shaped and influenced by existing institutional structures such as infrastructure systems, and that a key focus should be placed on the role infrastructure plays in the formation of clusters.

Porter's definition of clusters is the most widely accepted in the literature today. Porter (1998a, p.78) defined clusters as "geographic concentrations of interconnected companies and institutions in a particular field," composed of organizations that are from *varied industries* (emphasis added). From a geographic perspective it can be inferred from Porter's findings that conceptually, if not in practicality, there could well be concentrations within concentrations, within concentrations and so forth. Porter

(1998b) further identified that clusters are a product of almost all national, regional, state, and metropolitan economies and that geographic location of the clusters is fundamental to competition. He found that cluster boundaries are defined by the linkages and complementariness across industries and institutions in relation to their fit into the political boundaries, and accordingly they can also cross state or national borders (Porter, 1998a; 1998b). According to Porter (1998b, p. 78), "Clusters encompass an array of linked industries and other entities important to competition." These arrays are composed of suppliers, vendors, and providers of specialized infrastructure systems (Porter, 1998b). Porter's findings are applicable to clusters regardless of national origins as demonstrated by the European Commission's (E.C.) (2000) modification of Porter's (1998a; 1998b) definition as follows:

> *Clusters are groups of independent companies and associated institutions that are:*
> *·Collaborating and competing;*
> *·Geographically concentrated in one or several regions, even though the cluster may have global extensions;*
> *·Specialised in a particular field, linked by common technologi*es *and skills*;
> *·Either science-based or traditional;*
> *·Clusters can be either institutionalised (they have a proper cluster manager) or non-institutionalised.*
> *The cluster has a positive influence on:*
> *·Innovation and competitiveness;*
> *·Skill formation and information;*
> *·Growth and long-term business dynamics.*

To summarize, the findings of these researchers can first be extrapolated, and then secondly synthesized, to form a working definition of cluster concentrations. Marshall (1997), Markusen and Park (1993), Bhatnagara and Sohal (2005), as well as Aydagon and Lyon (2004) found that clusters must be concerned with a geographic

element. Organizations in these geographic areas will be linked by common infrastructure (Barkley & Henry, 1997; Rosenfeld, 1997; Rogerson, 1998). Organizations and clusters within the cluster concentration will come from a variety of industries (Porter, 1998a; Rosenfeld, 2003). Further, these organizations and industries collaborate and compete (Barkley & Henry, 1997; Birkinshaw & Hood, 2000; & E.C., 2000). Accordingly these organizations will engage in activities (Bathelt & Gertler, 2005) to realize benefits (Barkley & Henry, 1997; Rosenfeld, 1997) that contribute to competitive advantage (Porter, 1990; Doeringer & Terkla, 1995).

As such for the purposes of this research, a definition of a **cluster concentration** can now be formulated *as a geographically delineated grouping of collaborating and competing organizations from varied industries, linked together through common infrastructure systems, engaging in activities that can be mutually beneficial and that may contribute to competitive advantage.*

2.4 Cluster Concentration Activities

With the definition of cluster concentrations now established, cluster concentration activities need to be understood and defined as well. Understanding cluster concentration activities is essential in order to comprehend the dynamic nature of cluster concentrations, as well as to identify evolutionary forces. By studying the role of cluster concentration activities in conjunction with the development and evolution of cluster concentrations, an understanding can be gained of the activity drivers necessary for successful cluster concentration formation. As such this thesis identifies that the role of cluster concentration activities in relation to the geographic

area remaining dynamic, which is essential in regard to cluster concentration evolution, needs to be further explored. This represents an area of future research.

Current research accepts that the motivational impetus for cluster concentration formation is that of creating alliances for business activities, such as supply chain networks (Eden, 2002). Both Markusen (1996) and Eden (2002) state that researchers must examine the formation of these cluster concentrations in relation to such business activities. The reason for examining cluster concentrations in relation to business activities is that alliances created for these activities result in interconnections (linkages) between the organizations involved in these alliances as can be seen in the definition of supply chain networks that follows.

According to Slack and Lewis (2003, p. 163), "A supply (*chain*) network is an interconnection of organizations which relate to each other through upstream and downstream linkages between different processes and activities that produce value in the form of products and services to the ultimate consumer."

Further, Baptista and Swann (1998), Markusen (1996), and Eden (2002) found that in the formation of cluster concentrations, business activities have critical drivers. Krugman (1991) describes these drivers as key tensions that pull to centralize activities in one location or that pull to disperse activities closer to factor and product markets. In relation to activities, Porter (1998a, p.80) states, "Clusters affect competition in three broad ways: first by increasing the productivity of companies based in the area; second by driving the direction and pace of innovation; and third by stimulating the formation of new businesses.".

Activities identified in the literature as stimuli for the formation of cluster concentrations include:

1) market access-seeking (Krugman, 1991; Porter, 1998a; Eden, 2002);

2) resource-seeking (Eden, 2002; Kalnins & Chung, 2003; Damijan & Mrak, 2005);

3) strategic asset-seeking (Baptista & Swann, 1998; Eden, 2002; Yang & Kang, 2005); and

4) innovative activity (Baptista & Swann, 1998; Simmie, 2004).

According to Eden (2002), market access-seeking is for defensive purposes. Organizations that are market access-seeking desire to take their product to areas where competition is not as intense, and accordingly are effectiveness-seeking. Cluster concentration formations that are market access-seeking are looking for the potential, or the benefit, of stabilizing or increasing sales (effectiveness) for the supply chain network as opposed to gaining efficiencies. For example, the region may seek domestic funding to improve infrastructure systems within the cluster in order to realize the benefits of better or easier access (Eden, 2002).

Eden (2002) describes resource-seeking as gaining access to needed inputs. Resource-seeking takes place primarily in domestic markets due to a lack of needed inputs. Damijan and Mrak (2005) describe resource-seeking as being characterized by efficiency-seeking. According to Kalnins and Chung (2005) resource-seeking organizations that co-locate will have spillovers which in turn attract other efficiency-

seeking firms because of the gains from transfer of knowledge, labor pools, and specialization.

Eden finds resource-seeking is related by inference to efficiency while strategic asset-seeking relates to effectiveness. In regard to strategic asset-seeking, Eden (2002) finds organizations will become effectiveness-seeking specifically in relation to strategic asset-seeking for competitive advantage. Strategic asset-seeking includes physical resources, human resources, and the politics and business conditions of the geographic area (Baptista & Swann, 1998; Yang & Kang, 2005). For example, freight services might locate on the Great Lakes because the inland ports are considered a strategic asset of benefit for competitive advantage (Porter, 2003).

Baptista and Swann (1998) identify innovative activity as a driver in the formation of cluster concentrations. These authors state that clusters are the result of a positive feedback process that creates a set of advantages such as transfer of knowledge. As the attractiveness of locating in a geographic area increases, a number of new firms that are efficiency-seeking will locate in the area as well (Baptista & Swann, 1998). Simmie (2004) stated that technological advances are the catalyst for innovative activity and that this activity is an efficiency-seeking driver of cluster formation.

Porter (1990) states that the resources for learning and gaining knowledge may be an endowment of factors that is incorporated into these four stimuli for cluster concentration formation. This finding by Porter is supported by Wolfe & Gertler (2004), who concluded the nature of learning and knowledge may be a key factor in the emergence of cluster concentrations and of evolution in terms of gaining efficiency or

effectiveness. The characteristics of efficiency and effectiveness are closely associated with cluster concentration activities and may demonstrate the evolutionary process. This conclusion is supported by Hunt and Duhan (2002) and Eden's (2002) findings that efficiency-seeking and effectiveness-seeking are characteristics of cluster concentration activities.

Accordingly, for the purpose of this study, cluster concentration activities are defined as *aspirations of organizational entities that seek competitive advantage through specific and measurable actions which include:*

- *Market access-seeking*
- *Resource seeking*
- *Strategic asset-seeking*
- *Innovative activity*

These activities can ultimately be differentiated as characterized by either efficiency-seeking or effectiveness-seeking. Accordingly, discussion of cluster concentration activity characteristics is warranted and follows.

2.5 Cluster Concentration Characteristics

As previously discussed, cluster concentration activities can ultimately be characterized by either efficiency-seeking or effectiveness-seeking. As such, this thesis argues that if, as previously identified, cluster concentrations are to remain dynamic, the characteristics cannot be static in nature. If true, then the correct assessment as to the type of characteristic exhibited will in turn identify the level of dynamism.

This argument is further supported by Porter's (1990) findings that clusters of linked organizations can offer efficiency and effectiveness. Porter (2003) also found organizations will choose to seek out clusters where they can gain the advantages of efficiency and effectiveness to facilitate competition and cooperation. Accordingly discussion of each characteristic follows.

2.5.1 Efficiency

Just as the term cluster has many different meanings, so does the term efficiency. In order to avoid ambiguity this study will define efficiency based upon the most commonsensical elements of prior research.

Drucker (1955) defined efficiency as *doing things right*. An attribute of efficiency as described by both Porter (1998b) and Drucker (2001) is the shortening of some aspect of the supply chain. Hanvey, Rexe and Scott (2003) found that concentrations should be concerned with innovative or resource-seeking activities that promote efficiencies. Hofer and Schendel (1978) define efficiency as the ratio of actual inputs of the system to its actual outputs. A secondary confirmation of Hofer and Schendel's findings is identified in a study by Walters and Rainbird (2004) that concludes focus should be on immediate resources and capacity constraints.

Hofer and Schendel's (1978) definition of efficiency can be expanded from that of the single organization to that of cluster concentrations, because clusters are engaged in activities that can be mutually beneficial and contribute to competitive advantage. Smart and Harrison (2002) and Mehta (2004) found that efficiency should also encompass adequate customer satisfaction through supply chain network activities.

This customer satisfaction could be gained for example, through reducing costs, and ultimately prices to the customer (Hunt & Duhan, 2002; Walters & Rainbird, 2004).

The decision organizations make to locate in a cluster is the result of seeking a characteristic offered by the activity drivers of that geographic cluster concentration (Baptista & Swann, 1998). These activity drivers generate dynamic geographic areas that offer characteristics such as efficiency-seeking. Hunt and Duhan (2002) state from a neoclassic economics perspective, competition is exclusively efficiency-seeking. These authors describe efficiency-seeking as maximizing profits while combining homogenous resources under the conditions of perfect information. Therefore, a catalyst for dynamism is efficiency-seeking. Eden (2002) added another effect when she indicated clusters that are already established will have the primary response of becoming efficiency-seeking and that this activity will become the catalyst for additional investment in that region, including current infrastructure systems. However, in accordance with Hunt and Duhan's (2002) findings of homogenous resources, established clusters that are efficiency-seeking should exhibit higher levels of specialization (Walters & Rainbird, 2004).

Accordingly, efficiency-seeking cluster formations are concerned primarily with inputs and outputs. Baptista and Swann (1998) state innovative activity and outputs are closely associated with the number of firms entering and the productivity growth within the geographic area. As such, firms entering the area in turn contribute to the dynamism of the area. Effectiveness makes different types of contributions to

dynamism and accordingly the following discussion identifies the salient points garnered from the literature in regard to effectiveness.

2.5.2 Effectiveness

Drucker (1955) defined effectiveness as *doing the right things*. Drucker (1955) concluded that *doing the right things* was far more important than *doing things right.* An attribute of effectiveness as described by Walters and Rainbird is having access to needed resources. Walters and Rainbird (2004) found that cluster formations that are focused on effectiveness are concerned with outcomes and benefits. Barnard (1968) and Hofer and Schendel (1978) found that effectiveness in and of itself should be concerned with market access and strategic asset-seeking activities. Hofer and Schendel (1978) and Barnard (1968) define effectiveness as the degree to which the actual outputs of the system correspond to desired outputs.

The neoclassical economist, according to Hunt and Duhan (2002), views effectiveness-seeking results as product differentiation. In addition, these authors describe effectiveness-seeking as delivering more added value for products and services. Effectiveness-seeking characterizes cluster concentrations that desire capabilities, outcomes and benefits (Eden, 2002). These concentrations would be characterized by vertical links that would exhibit high levels of complementariness. As these cluster concentrations require more organizations to aid in creating product differentiation and added value, they would exhibit high levels of diversity.

To summarize, for the purpose of this study, the following definitions will be utilized:

1) Efficiency-seeking will herein be defined *as characterizing activities that focus on the timely production of goods or services at lower costs.* Activities that are characterized by efficiency-seeking include:

- resource-seeking
- innovative activity

2) Effectiveness-seeking will herein be defined *as characterizing activities that have the intended or expected potential to enhance outcomes and benefits.* Activities that are characterized by effectiveness-seeking include:

- market access-seeking
- strategic asset-seeking

With the discussion of efficiency-seeking and effectiveness-seeking now complete, the relation of these characteristics in regard to cluster concentration dynamics requires discussion.

2.6 Cluster Concentration Dynamics

Initially, clusters tend to form in areas termed by Pouder and St. John (1996) as *hot spots*. *Hot spots* are described as dynamic environments of high growth (Pouder & St. John, 1996). Porter (1990) and Wolfe and Gertler (2004) state that cluster formations are seeded in many different ways but that their growth can only be facilitated by building upon existing resources. In effect, there must be 1) an infrastructure base that facilitates cluster formation and 2) resources that sustain life.

According to Wolfe and Gertler (2004), a cluster concentration can emerge as a result of one or two firms that have needs. As these needs emerge, smaller firms enter to satisfy the requirements. As these firms emerge, the dynamism of the environment would increase and competition would increase.

Massey and Wu (2005) find that not only does competition increase but that those dynamic environments result in markets, competitors and technology changing regularly, and that these changes result in efficiency or effectiveness. This assertion coincides with Barnard's (1968) findings that evolution of an organization's activities is based on effectiveness and efficiency. Further, Eisenhardt and Galunic (2000) found that there is a co-evolution of organizations that takes place in dynamic environments.

In the literature, there is significant agreement in regard to the importance of recognition that competitive advantage and efficiency and effectiveness are interrelated as identified by Porter (1990) and others. Jarillo (1988) identified that clusters must be effective to come into existence and then they must evolve to become efficient in order to survive. In effect, Jarillo (1988) is stating that clusters must first be concerned with capabilities and if successful will then focus on renewal. These findings are supported by other researchers that find that the success of cluster concentrations is an attribute of transitioning and/or regeneration through activities that exhibit the characteristics of efficiency-seeking and effectiveness-seeking (Mason-Jones, Naylor & Towill, 2000; Hofer & Schendel, 1978). Accordingly, the role of competitive advantage is important in regard to regeneration of dynamism.

Porter (1985; 1990), Baptista and Swann (1998), Hunt and Duhan (2002) and Bentgsson and Sövell (2004) concluded independently that competitive advantages gained by cluster concentrations are influenced by the seeking of efficiency and effectiveness. As such, the purpose of a cluster concentration in relation to activities is to provide efficiency and effectiveness to the organizations that are members of that concentration. Further, in order to provide efficiency and/or effectiveness through concentration activities, it is necessary for evolution to occur within cluster concentrations. Past research has focused primarily on efficiency which may have resulted in an unintentional bias that blurs the line between the two characteristics.

Past research has possibly over emphasized efficiency and may in fact confuse efficiency and effectiveness (Walters and Rainbird, 2004). As a result, the focus from a strategic perspective has been on the individual organization's ability to reduce time and costs. Both efficiency-seeking and effectiveness-seeking are necessary characteristics of cluster dynamics. According to Baptista and Swann (1998) clusters do not enjoy effectiveness indefinitely because attractiveness of the geographic area dwindles. This study will demonstrate that efficiency-seeking and effectiveness-seeking may in fact be repetitive and therefore cyclical. In addition, Grant (1993) purports that systems of infrastructure are the catalysts for the evolution of clusters in that if they are left to disintegrate then the geographic area will decline but if they are kept up and upgraded they revitalize and give new life to geographic clusters. Herman and Ausubel (1988) came to similar conclusions regarding infrastructure and found that infrastructure is not

stagnant simply because systems of infrastructure do not age well but will disintegrate and become obsolete, and in effect require regeneration to remain viable.

This study conceptualizes that effectiveness-seeking and efficiency-seeking activities are repetitive, interconnected and cyclical in regard to cluster concentration dynamics as shown in Figure 2.3. According to Herrera and Lora (2005), ongoing investment into maintaining and improving infrastructure is critical for the continued viability of clusters. Accordingly, the basis for any cluster concentration has to begin with an infrastructure capable of supporting member organizations and local populace. As the cluster concentration develops, the initial focus of the members is on effectiveness-seeking capabilities. As market share and customer base efforts succeed the cluster concentration attracts new entrants, as well as gains local population. Further, market success invites additional competition, and these conditions force cluster concentration members to move to the next stage of the cycle, that being of efficiency-seeking activities. As the cluster concentration members solidify customer base and market share, their needs begin to outpace existing infrastructure. Accordingly, as the cluster concentration continues to strengthen, improvements in infrastructure are forced by the demands and needs of the cluster members conjointly with local population. In conjunction with cluster concentration, members achieving results from the focus on efficiency-seeking abilities then gain additional capabilities and move to the next stage of the cluster dynamic cycle, effectiveness-seeking. The focus shifts to outcomes and benefits that are the result of the evolution or investment in infrastructure systems. As the cluster concentration members incorporate the potential

benefits and outcomes in this stage, the focus will once again shift to efficiency-seeking, and the cycle should repeat itself as long as investment in infrastructure continues. By not investing in infrastructure the result will be contraction or disintegration of cluster concentrations. As the role of infrastructure in relation to the formation, viability and evolution of cluster concentrations is so critical, additional discussion is required.

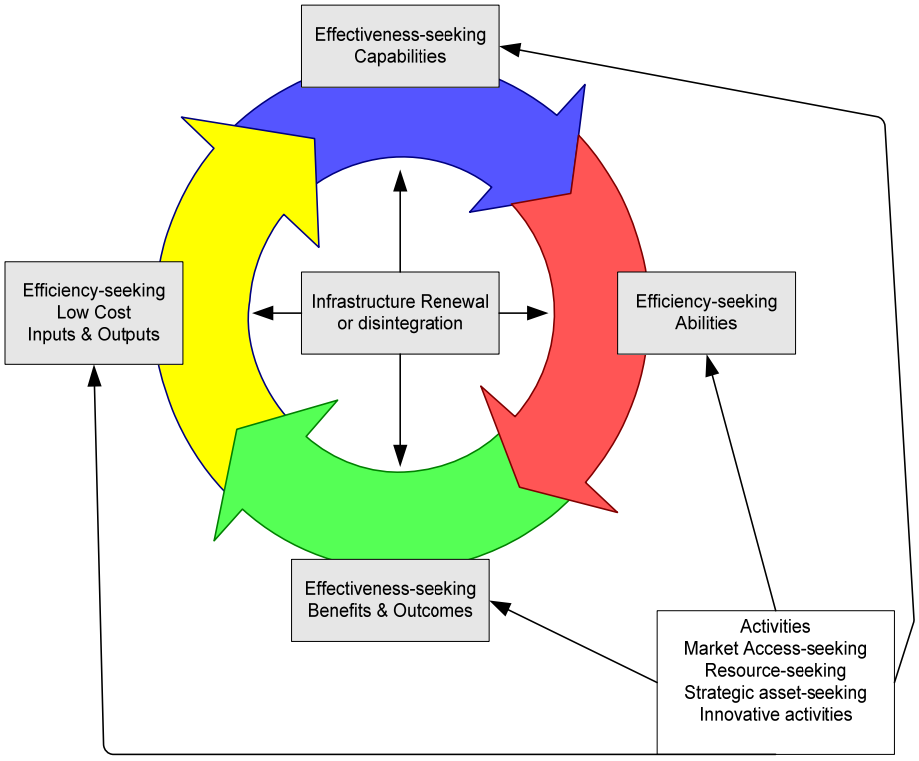

Figure 2.3 Dynamic Cluster Concentration Characteristic Cycle

2.7 Infrastructure

Herman and Ausubel (1988) and Grant (1993) found that infrastructure systems contribute to the vitality of a geographic area. Herman and Ausubel (1988) defined infrastructure as systems for the delivery of services that exhibit features such as quality, flexibility, adaptability, reliability and effectiveness. Infrastructure is defined in the literature as those services derived from the set of public works traditionally supported by the public sector to enhance private sector production and allow for household consumption (Pickering, Park, & Bannister, 1993). These authors also introduce the idea that infrastructure is not solely provided or produced by the public sector but instead sometimes is the result of joint efforts between the public and private sector. They also put forth the idea that there is a linkage between business activities and infrastructure systems. Grant (1993) found that these systems of infrastructure are not just in place to allow for the capability (effectiveness) of the geographic area but also can contribute to the efficiency of the area.

According to Porter (1990) infrastructure characteristics include: the type, quality, and user cost of available infrastructure that affects competition, including transportation systems, the communications system, mail and parcel delivery, payments or funds transfer, health care, etc. Infrastructure also includes housing stock and cultural institutions, which affect the quality of life and the attractiveness of a geographic area as a place to live and work (Porter, 1990).

Accordingly three types of infrastructure systems are identifiable: 1) physical infrastructure systems; 2) service delivery infrastructure systems; and 3) quality of life

infrastructure systems. Physical infrastructure systems are necessary for a cluster concentration to become effectiveness-seeking as well as transition to efficiency-seeking. Service delivery infrastructure systems can enhance or detract from efficiency-seeking efforts. Service delivery infrastructure systems that are constantly being upgraded have high levels of investment dollars resulting in better systems and methods for the delivery of those services (enhancement) (Herman & Ausubel, 1988). Failure to invest within service delivery infrastructure detracts from efficiency and contributes to the decline of dynamism. In addition, quality of life systems of infrastructure enhance effectiveness-seeking by creating greater capabilities related to lifestyle.

Accordingly, for the purposes of this work, infrastructure is defined *as being:*

1) *the plant and equipment that comprise physical systems, such as roads, railways, airports, ports, water and power plants, and communication systems*
2) *in some combination with service delivery systems such as payments or funds transfer, water and power distribution, technical services, trade services and communication services*
3) *together with quality of life system services such as health care, education, entertainment, cultural and religious resources.*

Having identified the essential terms necessary for a commonality of understanding in regard to cluster concentrations and their constituent elements this thesis will now discuss cluster typologies as identified in the literature.

2.8 Cluster Typologies

A review of previous research identified three cluster typologies: those of Eden (2002); Markusen (1996); and Porter (1990; 2003). The following narrative discusses the three typologies and expands upon them to identify a proposed typology of cluster concentrations. As Eden's typology is the most simplistic in construction, the discussion will begin with her work.

2.8.1 Eden's Typology

Eden (2002) said that clusters could be described as horizontal if firms engage in similar lines of activities in an effort to utilize or acquire resources (specialization). Clusters can be described as vertical when the linkages within the cluster are complementary (Eden, 2002). Eden's simplistic approach to clusters actually identifies constructs more so than cluster types (Figure 2.4). The level of specialization and complementariness in a cluster concentration is closely associated with efficiency and effectiveness.

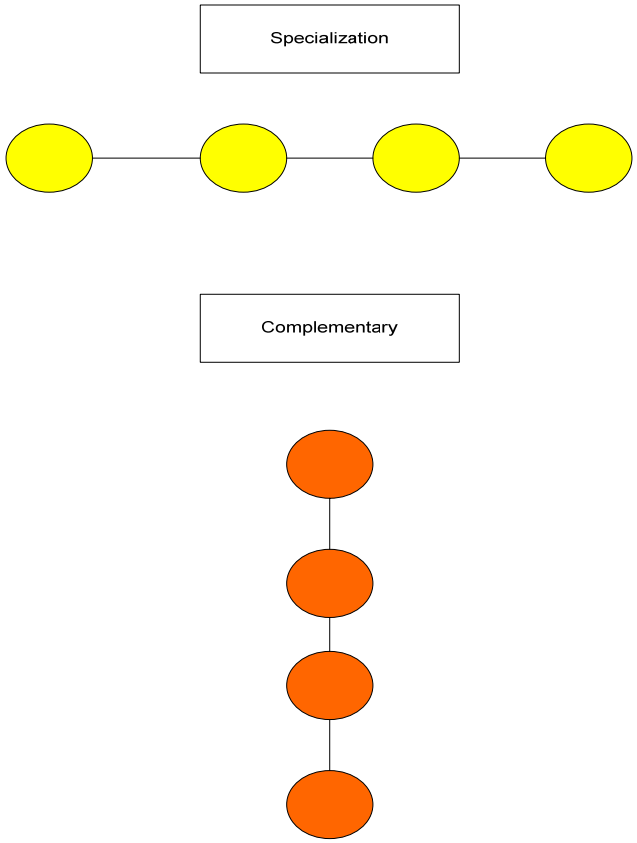

Figure 2.4 Graphical Representation of Eden's Cluster Types (2002)

In contrast to Eden's simplistic typology, Markusen (1986) was the first to develop a detailed typology with specifically defining characteristics. A discussion of her typology and those characteristics follows.

2.8.2 Markusen's Typology

As previously identified clusters have been examined from an economic perspective and classified according to geographic and economic characteristics. Markusen (1996) utilized these parameters in the study of the formation of clusters around oligopolic industries to identify the types of clusters or districts that form within metropolitan areas. Markusen (1985) found that in areas where old oligopolic

industries were located, suppliers and vendors tended to locate nearby. She identified types of clusters such as Marshallian Industrial Districts (Figure 2.5), Hub and Spoke Industrial Districts (Figure 2.6), Satellite Platform Districts (Figure 2.7) and State Anchored Industrial Districts (Figure 2.8). This typology was based on type of geographic area, public or private investment decisions, availability of labor, and amount of trade within and outside the district (Markusen, 1985). In later research, Markusen (1996) further classified clusters according to firm size, connectedness, and local versus non-local embeddedness.

The Marshallian Industrial District is comprised of small locally owned organizations with trade primarily within the region. Just as trade is primarily within the region, financing and investment is also kept within the region. Local government is the primary source of regulation (Markusen, 1996). Referencing Figure 2.5, an adaptation of Markusen's Marshallian Industrial District, it is apparent that some raw materials would have to enter from outside of the cluster to allow for the production of locally used products and services. As opposed to Marshallian Industrial Districts the reader will see that the focus of a Hub and Spoke Industrial District is on an organization that is central to the cluster.

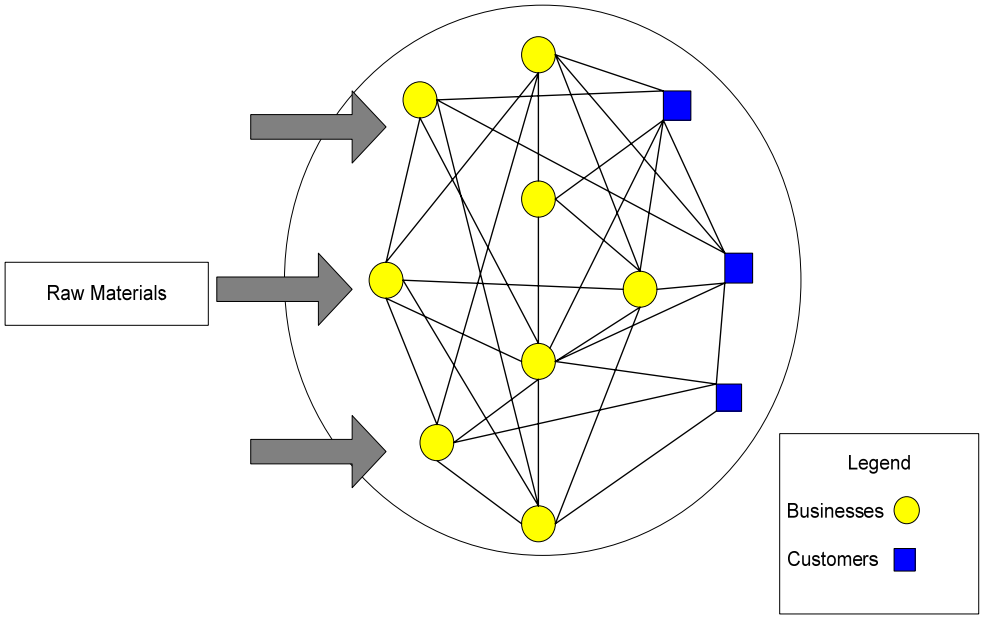

Figure 2.5 Adaptation of Markusen's Marshallian Industrial District (1996)

Markusen's (1996) Hub and Spoke Industrial Districts (Figure 2.6) are dominated by one or more large firms. Member organizations will have a substantial number of ties to suppliers and competitors outside of the regions. Investment decisions are made locally but have a global impact. Local, regional, and national government(s) will have an impact on regulation of these types of formations. While the Hub and Spoke Industrial District has as its focus a primary organization, the Satellite Platform District describes interactions of both internal and external branches and companies that are from the same organization.

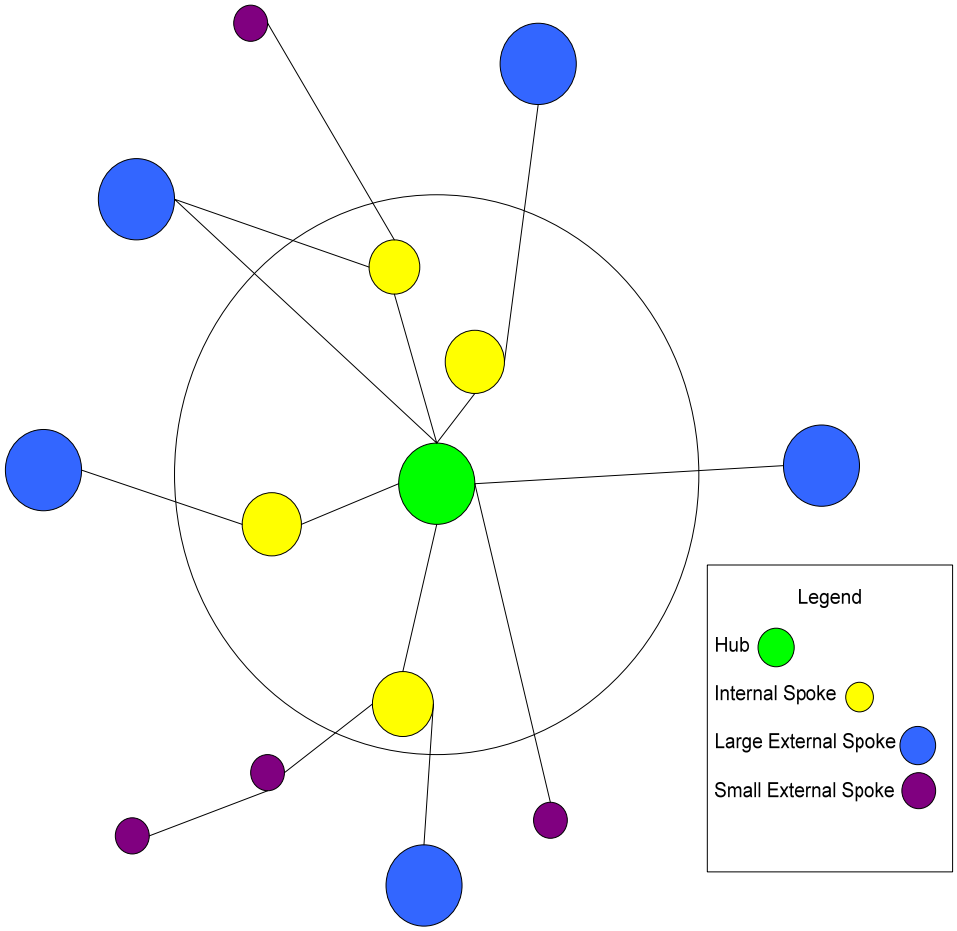

Figure 2.6 Adaptation of Markusen's Hub and Spoke Industrial District (1996)

The Satellite Platform District (Figure 2.7) is another formation identified by Markusen (1996). This type of formation is dominated by large externally owned and headquartered firms. Investment decisions are made externally and minimal intra-district trade occurs. Satellite Platform Districts are highly influenced by national levels of governmental decisions or regulations. While Satellite Platform Districts have both internal and external branches and companies that are from the same organization, State Anchored Districts are characterized by a central organization, such as a military base

or research facility much the same as the Hub and Spoke Industrial Districts with the exception that the hub is a private institution.

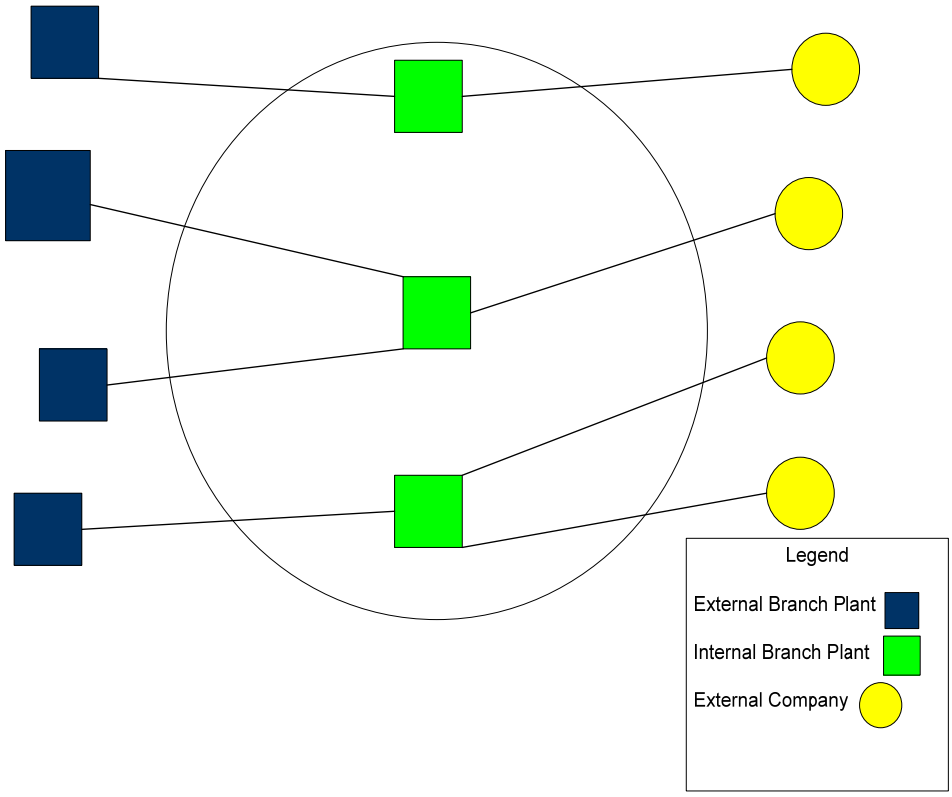

Figure 2.7 Adaptation of Markusen's Satellite Platform Industrial District (1996)

The fourth formation type identified by Markusen (1996) is the State Anchored Industrial District (Figure 2.8). This type of district is dominated by one or more governmental institutions, such as a military base or large public university. The government institution serves as a hub to the district. The other entities that develop will be highly dependent on the continued existence of the governmental institution. Trade will be high both internally and externally. As will be seen in the following

discussion of Porter's typology, there are marked similarities between Markusen and Porter's work.

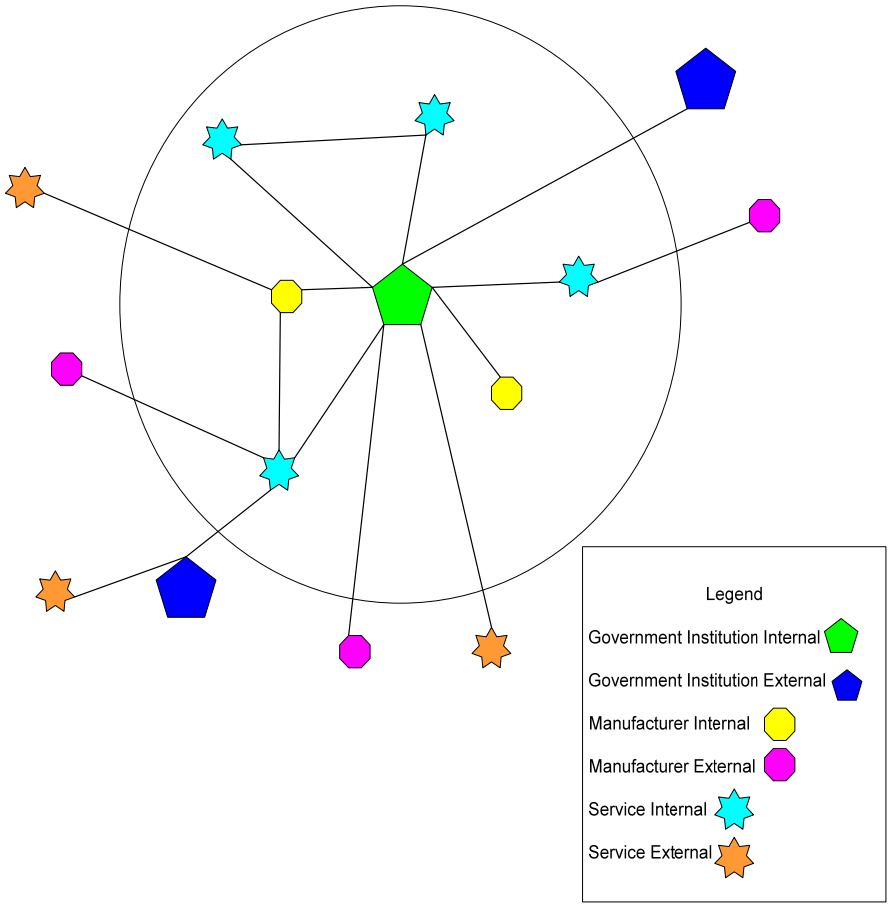

Figure 2.8 Adaptation of Markusen's State Anchored Industrial District (1996)

2.8.3 Porter's Typology

Porter's (2003) and Markusen's (1996) typologies, identified similar characteristics which Table 2.1 identifies. For example, Porter's Local Industry Clusters identify characteristics similar to those of Markusen's Marshallian Industrial Districts. The characteristics that Porter (1990) identified in these clusters included: employment evenly distributed across the cluster; goods and services provided mainly

to local markets; competition with other regions is limited; most companies provide services; and there are few goods producing industries (Porter, 2003). Services in these clusters consist primarily of health services, utilities, and retailers (Porter, 2003). These types of services traditionally are consumed locally. Goods producing industries within these clusters create products such as newspapers, soft drinks, and concrete which are consumed locally (Porter, 2003). As previously extrapolated from Markusen's findings, this study holds that in Porter's Local Industry Clusters as well, some raw materials would have to come from the outside. Porter, in his referenced works, did not provide a graphical representation of his findings. Accordingly this study will present a graphical adaptation of Porter's Local Industry Cluster to include outside sources of raw materials in Figure 2.9. While Local Industry Clusters are encapsulated, Resource Dependent Clusters are not.

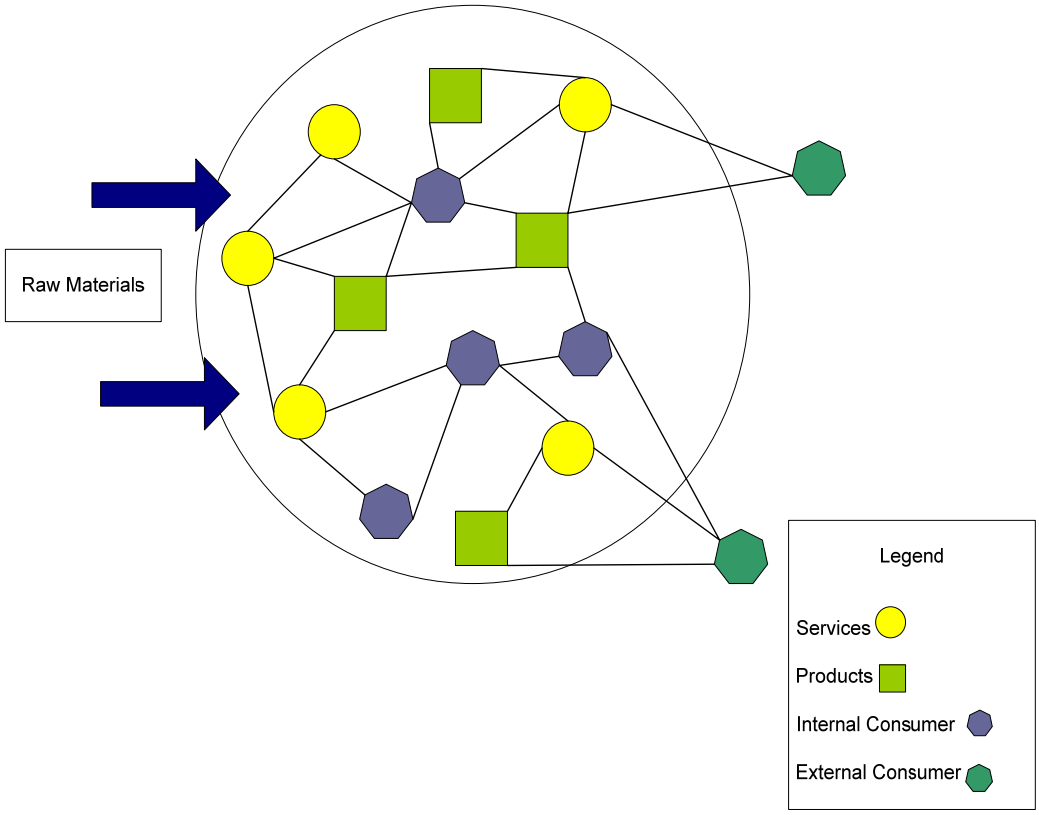

Figure 2.9 Adapted Representation of Porter's Local Industry Cluster (2003)

Porter's (2003) Resource Dependent Cluster is also similar to Markusen's Hub and Spoke Industrial District. Porter (2003) concluded that employment is located near the needed resources and that competition is both domestic and international. Resource Dependent Clusters are tied to the area because of the immobile resource (Porter, 2003) (Figure 2.10).

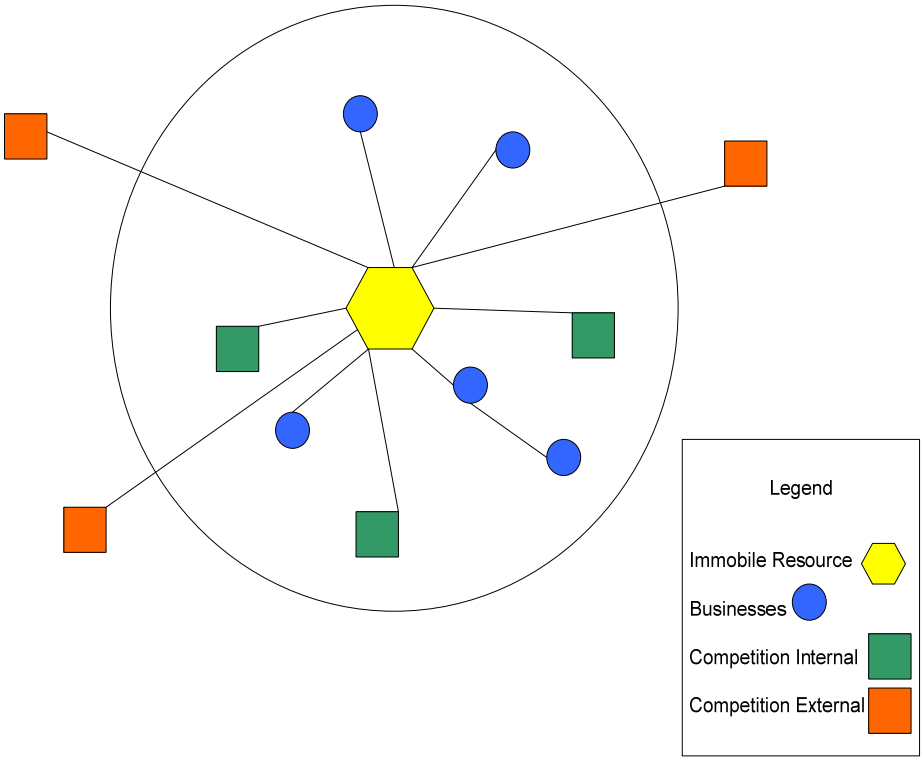

Figure 2.10 Adapted Representation of Porter's Resource Dependent Cluster (2003)

As Resource Dependent Clusters are tied to the immobile resource and any manufacturing associated with this cluster type is directly related to the resource, Traded Industry Clusters are characterized by manufacturing that is exported away from the geographic area.

Porter's (2003) Traded Industry Cluster is comparable to Markusen's (1996) Satellite Platform District. According to Porter, this type of cluster is characterized by the resource not being immobile; selling of products and services across regions and other countries; and locating in an area due to competition considerations, such as available labor concentrations (Figure 2.11).

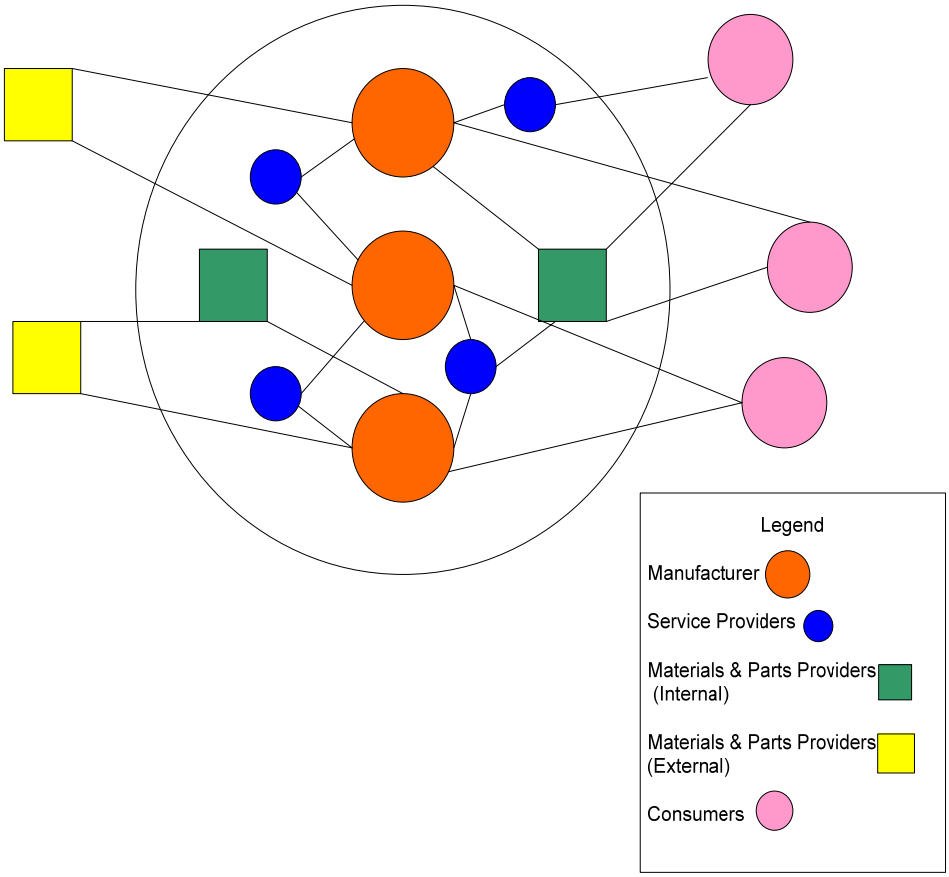

Figure 2.11 Adapted Representation of Porter's Traded Industry Clusters (2003)

While Eden (2002), Markusen (1996), and Porter (2003) concluded that clusters do not form in isolation, nonetheless their typologies categorize cluster formation in isolation. Although these clusters may initially form in isolation, as the cluster formations evolve, the types of clusters tend to become a mix within geographic areas.

Eden and Markusen describe clusters as forming in isolation, while this study suggests that the only time a cluster may truly form in isolation is if it is a State Anchored District. An example would be Los Alamos, New Mexico, which did not exist prior to the government developing an entire community and infrastructure for the sole purpose of research and development of nuclear weapons (Gosling, 2001). Other

than the State Anchored District, this study has previously identified the requirement for, at a minimum, a Concentration of Local Industry Clusters to be in place as a base for the emergence of other clusters, which in turn comprise cluster concentrations.

This study's premise is further supported by Martin and Milway's (2005) conclusion that traded industry clusters need the support of local industry clusters that provide, for example, financial and educational services in order for a cluster to continue to be viable. With this study's discussion of the typologies identified in the literature, coupled with the definition of critical terms the proposed typology of cluster concentrations follows.

Table 2.1 Comparison of Porter and Markusen's Typologies

Characteristics	Porter's Typology			Markusen's Typology			
	Local Industry	**Resource Dependent**	**Traded Industry**	**Marshallian Industrial District**	**Hub and Spoke District**	**Satellite Platform District**	**State Anchored Industrial District**
Geographic Area							
Population Density High			√			√	√
Population Density Low	√			√			
Investment Decisions							
Local	√	√		√	√		
Non-local			√			√	√
Availability of Laborers							
Adequate	√			√			
High			√		√	√	√
Amount of Internal Trade							
High	√	√		√	√		√
Low			√			√	
Amount of External Trade							
High		√	√		√	√	√
Low	√			√			
Firm Size							
Small	√			√			√
Large			√			√	
Government							
Local				√	√		
State					√		√
Federal					√	√	√
Competition in Other Regions							
High			√				
Low	√						√
Goods Produced							
Services	√	√		√			√
Products		√	√	√	√	√	√

2.9 Proposed Cluster Concentration Typology

This study proposes a cluster concentration typology based upon measurements of efficiency-seeking and effectiveness-seeking characteristics as identified in the literature. Further, this study proposes that such a typology provides a perspective based upon cluster formation in concentrations as opposed to Porter and Markusen's perspective of isolation. Martin and Milway (2005) suggest a typology for cluster concentrations be developed within their findings of Local Industry Clusters serving as the foundation for Resource Dependent and Traded Industry Concentrations. A Venn diagram can be used to illustrate the type of cluster concentration that results from an agglomeration of types of clusters (Figure 2.12).

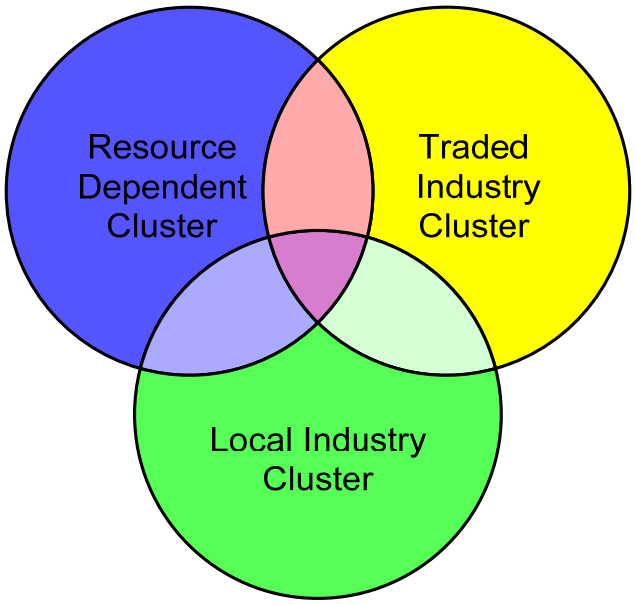

Figure 2.12 Cluster Concentration Development

While Porter states that clusters do not form in isolation, he nonetheless developed his typology based upon that very assumption. Porter (1990; 2003), Martin and Milway (2005), Markusen (1996), and Cumbers and MacKinnon (2004) all concluded that clusters do not develop in isolation, but they failed to develop a typology based upon their respective findings. Several researchers find that there are activities that are associated with the development of these clusters (Eden, 2002; Krugman, 1991; Porter, 1998; Damijan & Mrak, 2004; Kalnins & Chung, 2005; Baptista & Swann, 1998; Yang & Kang, 2005; and Simmie, 2004). These activities are characterized by efficiency-seeking and effectiveness-seeking (Hunt & Duhan, 2003; Eden, 2002; and Porter 1990). Several constructs relevant to efficiency-seeking and effectiveness-seeking have also been identified in the literature: 1) Transfer of Knowledge (Barkley & Henry, 1997; Rosenfeld, 2003); 2) Innovation (E.C., 2000; Porter, 1998); 3) Specialization (Markusen & Park, 1993; E.C., 2000; Porter, 1998; Ketelhöhn, 2002); and 4) Complementariness (Birkinshaw & Hood, 2000; Henry & Barkley, 1997). As such, these constructs will be discussed to identify measurements to be utilized in this study and begins with transfer of knowledge.

2.9.1 Transfer of Knowledge

Transfer of Knowledge has been studied throughout the business literature involving clusters. Primarily labor mobility and employment growth have been used as measurements (Porter, 1990; 1998). For example, Power and Lundmark (2004) examine transfer of knowledge and the dynamics of labor markets in terms of labor mobility. Barkley and Henry (1997) use labor mobility as a measure of transfer of

knowledge at the county level. In addition, past research has used education level, wage level, and employment growth as measurements for transfer of knowledge (Porter, 1990; 1998). *For the purposes of this study labor mobility, education level, wage level and employment growth will be utilized to measure the construct, transfer of knowledge.*

Next in the discussion of constructs comes innovation. Innovation also reflects the characteristics of efficiency and effectiveness.

2.9.2 Innovation

Innovation is spurred by technological opportunity and creates benefits such as spillovers of knowledge in geographic areas. Baptista and Swann (1998) examined innovation in clusters and the role it plays in cluster development. These authors find that innovation activity varies and can in fact foster clustering. As found in the literature, two of the most common measures of innovation are: number of new firms entering the geographic area and productivity growth (Baptista & Swann, 1998; Grossman & Helpman, 1991; Porter, 1990; Barkley, Henry & Kim, 1999). Other researchers have utilized patents to measure innovation however patents measure only the input instead of the results of innovation (Baptista & Swann, 1998). *Accordingly, for the purposes of this research, the number of new entrants and productivity growth will be used to measure the construct, innovation.*

In addition to the constructs transfer of knowledge and innovation, specialization is also identified in the literature as being related to efficiency-seeking and effectiveness-seeking. Accordingly, the following section discusses specialization.

2.9.3 Specialization

Porter (1990; 1998a), Markusen and Park (1993), and the E.C. (2000) all specify that specialization and diversity are important characteristics to measure as an indication of the type of cluster. Ketelhöhn (2002) developed an index that measures specialization and diversity at the county, state or national level on a continuum. Accordingly the reader can view one end of this continuum being specialization and the other end being diversity. The closer the measure is to 1 the more specialized the cluster is, the closer the measure is to 0 the more diverse the cluster is. Another measure suggested in the literature as indicative of specialization is available labor pool (Porter, 1990; 2003). For example, if the available labor pool is large and unskilled then specialization is low with the opposite being indicative of high specialization. *Ketelhöhn's (2002) index as well as available labor pool will be utilized in this study as measures of the construct, specialization.*

Finally, in this study's discussion of efficiency-seeking and effectiveness-seeking related constructs the role of complementariness also needs to be discussed. Porter's assessment of complementariness is identified in the following section.

2.9.4 Complementariness

Porter (1990; 2003) describes complementariness as overlapping industries within a geographic area. A method of measuring complementariness suggested in the literature is the utilization of the North American Industrial Classification System (NAICS) to assess the depth and width of the industry levels and types within the geographic area. Hunt and Duhan (2002) suggested using NAICS to develop a

Hirschman Herfindahl Index (HHI) to assess the type of behavior exhibited. *For the purposes of this paper the HHI will be utilized as a measure of the construct, complementariness.*

While transfer of knowledge, innovation, specialization and complementariness are constructs with measurements that are indicative of efficiency-seeking and effectiveness-seeking characteristics, this study's attention now turns to identification of cluster concentrations.

2.9.5 Concentration Identification

Power and Lundmark (2004), Gibbs and Bernat (1997), and Hoover (1999) use the percentage of wages paid in services, trade and manufacturing as measurements associated with cluster type. *Utilizing their methodologies to identify cluster concentration type, the percentage of wages paid as related to total wages paid for services; resource dependent; government; and manufacturing industries respectively, will be calculated for each county to be utilized in this study's analysis.* All of these constructs reflecting efficiency-seeking and effectiveness-seeking and methods of identifying types of cluster concentrations will be further discussed in Chapter 3.

While Porter (1990; 2003) did not propose a typology for concentrations, he concluded that industries do not develop in isolation, but in fact develop in concentrations that are connected through both vertical and horizontal relationships. According to Cumbers and MacKinnon (2004), clusters cannot be regarded as self-contained; instead they need to be examined from the perspective of being a mix of clusters. Separating the combinations of clusters as previously identified by the Venn

diagram (Figure 2.12), allows for a graphical representation of typology of cluster concentrations and is presented in Figure 2.13.

In conjunction with Cumbers and MacKinnon's (2004) findings, local industry clusters serve as a seed or base for cluster concentration development, therefore Concentrations of Local Industry Clusters are most likely required for cluster concentration formation. Accordingly, the blue and yellow segments in Figure 2.13 labeled ***Resource Dependent Clusters*** (top left) and ***Traded Industry Clusters*** (top right), because they cannot exist in isolation, are not included in the proposed typology. However, ***Resource Dependent Concentrations*** (bottom left) and ***Traded Industry Concentrations*** (bottom right), which includes ***Local Industry Clusters*** (serving as the seed) will be included in the proposed typology. Further discussion as to the graphical elements of Figure 2.13 will be found in the narrative that follows.

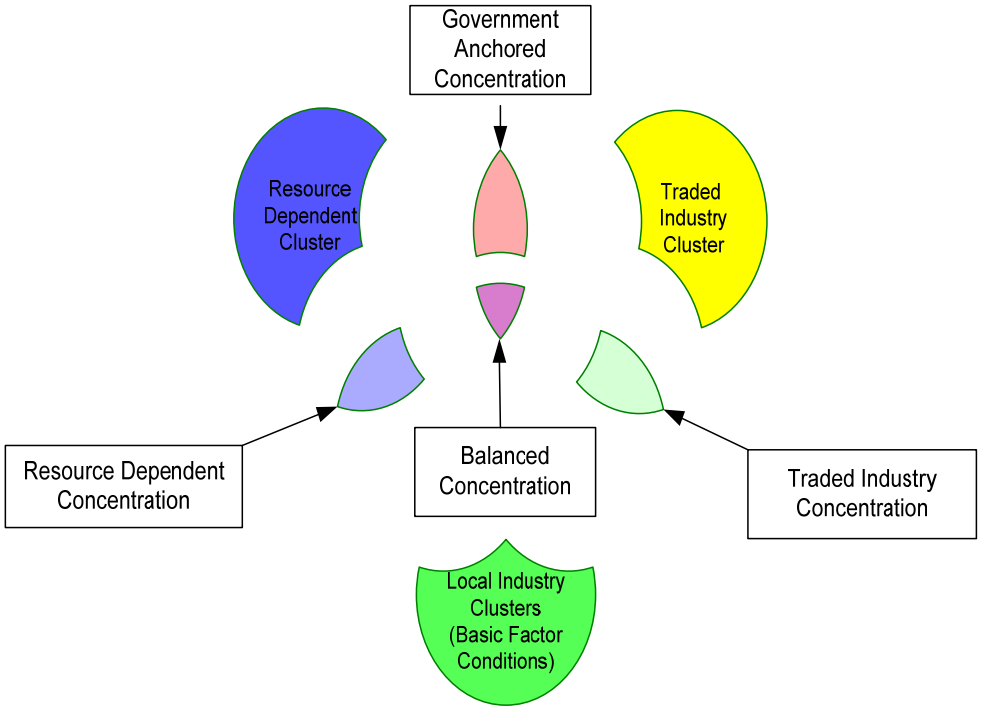

Figure 2.13 Graphical Representation of Proposed Cluster Concentration Typology

The proposed typology will be identified by type of concentration. As previous researchers have utilized similar terms interchangeably in their respective cluster research, this study, for the purposes of clarification, will italicize the proposed name of each classification at the beginning of its respective section. Accordingly, the reader is respectfully cautioned not to confuse clusters and cluster concentrations. With this in mind the proposed typology will begin with a discussion of Concentrations of Local Industry Clusters.

2.9.6 Proposed Typology: Concentrations of Local Industry Clusters

As the focus is internal, Concentrations of Local Industry Clusters are concerned primarily with characteristics of effectiveness-seeking. As extrapolated from Marshall (1997), such concentrations seek capabilities needed to sustain the organizations and

populations within the geographic area. Accordingly, Physical Infrastructure Systems should be adequate for the immediate requirements. While these types of concentrations exhibit similar characteristics to those of Local Industry Clusters in isolation as identified by Porter (1990; 2003), Markusen (1986) and Eden (2002) this study extrapolates that the significant exception is that they are comprised of multiple clusters within the geographic area.

In regard to transfer of knowledge, Concentrations of Local Industry Clusters should demonstrate that the pool of available workers is adequate to satisfy the labor requirements within the geographic area because excess workers would have to seek work in other geographic areas (Porter, 1990). Logically, this in turn means wage opportunities most likely will be low and labor mobility most likely will be below average because of limited opportunities within these concentrations. Accordingly, transfer of knowledge should also be low as a result of low wages and limited labor mobility.

Innovation should also be low in Concentrations of Local Industry Clusters because there are limited opportunities for new organizations to enter (Baptista & Swann, 1998). As a result of low labor mobility, productivity levels should remain flat. Productivity will remain flat because there is no need to produce more than the requirements of the geographic area as there is little external trade.

Specialization should be above average within these concentrations because of the isolation of trade within the geographic area (Markusen & Park, 1993). However,

there is a need for at least limited access to external resources for the products traded within the geographic area, which conceivably could affect specialization.

As a result of limited access to external resources, Concentrations of Local Industry Clusters will most likely utilize complementary resources to provide products and services internally (Porter, 1990). Accordingly, concentration complementariness should be average.

In summary, the interpolation that a Concentration of Local Industry Clusters provides the basis for the formation of other cluster concentrations is likely (Martin & Milway, 2005). Using Herman and Ausubel's (1988) definition of infrastructure for the delivery of services, coupled with Porter (1990) and Markusen's (1996) findings, these Concentrations of Local Industry Clusters deliver services and goods consumed within the geographic area, and therefore focus on Quality of Life Infrastructure Systems. Accordingly, these concentrations will be more effectiveness-seeking than efficiency-seeking because of the need to deliver diverse products and services internally. These Concentrations of Local Industry Clusters serve as the baseline infrastructure for Resource Dependent Concentrations.

2.9.7 Proposed Typology: Resource Dependent Concentrations

Resource Dependent Concentrations are dependent upon an immobile resource (Porter, 1990). Physical Infrastructure Systems within this type of concentration generally provide unique access to immobile resources (Grant, 1993). The Resource Dependent Concentration infrastructure should be more evolved than that of the Concentration of Local Industry Clusters, as the driver for this concentration is the

immobile strategic asset (resource) (Krugman, 1991). For example, a coal mine would most likely require access to a mass transportation system such as railway. While not specifically identified by Porter (1990) or Markusen (1996), this type of concentration should logically have a base equivalent to the Physical Infrastructure System previously identified in the Concentration of Local Industry Clusters.

Conceptually, transfer of knowledge may be low in Resource Dependent Concentrations as a result of limited wage opportunities which in turn detract from employment opportunities in smaller labor pools (Porter, 1990). Therefore, the pool of available workers may not be adequate to satisfy the needs of the concentration because of the limited wage opportunities.

As with Concentrations of Local Industry Clusters, innovation will be low in Resource Dependent Concentrations because of limited opportunities for new entrants. The immobile resource is generally limited in capacity, and accordingly, other than technological advances, productivity growth is not likely.

As the immobile resource is the center of this type of concentration, there should be higher levels of specialization than those found in Concentrations of Local Industry Clusters (Porter, 1990). The organizations and businesses that operate in Resource Dependent Concentrations do so because of opportunities provided by the immobile resource. In Resource Dependent Concentrations, complementariness should be high because of the need for resources and organizations that are related or tied to the immobile resource.

In summary, Resource Dependent Concentration infrastructures focus on the transport of products from immobile resources to geographically distant locations. Accordingly these concentrations should be focused on characteristics of efficiency-seeking. Just as Resource Dependent Concentrations have Concentrations of Local Industry Clusters as their baseline infrastructure, as described in the following section, so do Traded Industry Concentrations.

2.9.8 Proposed Typology: Traded Industry Concentrations

As this concentration demonstrates the ability to acquire outside resources as well as move products or services to the end user in a timely and cost efficient manner, it will be referred to as a Traded Industry Concentration. Accordingly, infrastructure should be more developed and exhibit greater capacity than those of previously discussed concentrations.

Traded Industry Concentrations seek efficiencies through gains in transfer of knowledge (Kalnins & Chung, 2005). Therefore, conceptually organizations tend to locate in these concentrations because of the potential gains in efficiency from transfer of knowledge. As such, labor mobility at minimum should be average and wage opportunity should be high because of the need for highly skilled workers.

Traded Industry Concentrations create opportunities to innovate because organizations are looking for efficiency gain through new technologies (Baptista & Swann, 1998). Members focus on technologies that decrease the amount of time needed or reduce the cost of the inputs or outputs.

Specialization should be high in this type of concentration because members locate near firms within the same industry in order to seek efficiencies. Organizations within Traded Industry Concentrations make location decisions because of competition considerations such as available labor pool (Porter, 2003). Traded Industry Concentrations bring needed resources from outside of the geographic area. These resources are needed to provide products and services to organizations and populace within the geographic area.

As requirements for resources, products and services develop, there may be cost advantages in meeting such requirements inside of the geographic area. As a result of these requirements, new organizations may form or enter the geographic area. Accordingly, these concentrations should exhibit some level of complementariness locally.

In summation, Traded Industry Concentrations focus on characteristics of efficiency-seeking. Damijan and Mrak (2005) suggest that areas of concentration that are characterized by trade outside of the region will seek to improve infrastructure and thus are enhancing efficiency-seeking. Physical Infrastructure systems in these concentrations are more defined than those of Concentrations of Local Industry Clusters and Resource Dependent Concentrations. Investments in the infrastructure systems will most likely focus on gains in efficiency. Thus, an inference can be made that a basic infrastructure equivalent to that of the Concentrations of Local Industry Clusters must exist prior to the evolution of infrastructure that will meet the demands of a Traded Industry Concentration. As such, the physical infrastructure serving Traded

Industry Concentrations most likely will evolve to facilitate efficiency-seeking. Unlike Traded Industry Concentrations and Resource Dependent Concentrations, only Government Anchored Concentrations can form without the baseline infrastructure provided by Concentrations of Local Industry Clusters.

2.9.9 Proposed Typology: Government Anchored Concentrations

Government Anchored Concentrations are closely related to Markusen's (1996) description of a State Anchored Industrial District. However, the concentration is unusual in that Concentrations of Local Industry Clusters do not serve as the basis for infrastructure. In this set of circumstances, the concentration is the result of a governmental entity such as a military base or research facility that is built in the area by the state or federal government. These concentrations are similar to Resource Dependent Concentrations in that if the government were to relocate or cease operations, such as recent U.S. military base closings, the surrounding clusters would dissipate or re-locate to another area.

Logically, transfer of knowledge should be average once operational performance has been achieved (Porter, 1990). Government Anchored Concentrations should demonstrate at least average labor mobility and wage opportunity because the government entities may transfer workers with skills specific to the requirements of the concentration type. In addition, wage opportunity will be average because most governmental entities are governed by wage guidelines that are tied to private sectors.

This type of concentration most likely provides limited opportunity for associated industry to enter into the geographic area (Baptista & Swann, 1998).

Accordingly, productivity will most likely be limited in potential growth and therefore, innovation may be low to average.

The government entity will have little to no competition for labor or other types of resources within the immediate geographic area. Therefore the environment should not be conducive to specialization in Government Anchored Concentrations. Most of the needed products will most likely be imported from outside of the geographic area for local consumption; therefore the need for complementary resources should also be low.

In summation, Government Anchored Concentrations are the result of a government investment decision to physically locate resources in a specific geographic area. As such, the physical infrastructure will be built by the government to satisfy the requirement of the government entity, and to fulfill the needs of its workers. Surrounding organizations and businesses which then develop will be dependent upon continuing operations of the government entity. This type of concentration is effectiveness-seeking in that the concern is most likely focused on the capabilities to perform to the requirements of the government. This study's research of Government Anchored Concentrations, Traded Industry Concentrations, Resource Dependent Concentrations and Concentrations of Local Industry Clusters, identified that a mix of concentrations may in fact exist, which are hereafter referred to as *Balanced Concentrations.*

2.9.10 Proposed Typology: Balanced Concentrations

This study proposes that a previously unidentified type of cluster concentration, hereafter referred to as *Balanced Concentration,* does exist. As a result of the realization that the previously discussed types of concentrations that exist will in some cases lead to highly developed areas of combinations of cluster concentrations, this study has identified the possible existence of a *Balanced Concentration.* Balanced Concentrations are the result of a combination of cluster concentrations, and accordingly there should be more defined infrastructures resulting in benefits to new and existing organizations. These benefits will be realized in terms of increases in efficiency and effectiveness.

The Balanced Concentration should also demonstrate average levels of labor mobility as well as employment growth. Further, based on availability of labor, wage levels should be average or higher in these concentrations.

These types of concentrations create an environment that is conducive to the entrance of new firms and rewards higher levels of productivity. Accordingly innovation in Balanced Concentrations should be high.

Balanced Concentrations should also foster an environment conducive to cooperation and competition. As these concentrations most likely require a variety of products and services. As a result, specialization should be high. Balanced Concentrations should also attract providers of complementary resources to the area. This attraction should result in above average levels of complementariness.

In summary, Balanced Concentrations consist of a combination of concentration types. This study suggests that Balanced Concentration viability occurs at some point in the early combination of concentration types and upon actualization will then act as an accelerant for additional growth of infrastructure. Accordingly, the geographic area should become more attractive to new entrants as well as continue to be viewed as attractive by existing members. The attractiveness to the area, coupled with new investment opportunities, should provide impetus for favorable and on going infrastructure improvements. Recognizing that Balanced Concentrations should seek parity between efficiency-seeking and effectiveness-seeking should facilitate making investment decisions for upgrading and maintaining infrastructure. This facilitation should arise based upon goals of maintaining or creating attractiveness from a macro perspective. Having now discussed the types of concentrations, some conclusions can be drawn.

2.9.11 Proposed Typology: Conclusions

A typology developed from a macro perspective, as opposed to the isolationist perspective, provides for a more definitive approach to the study of cluster concentrations. The comparison of this study's proposed typology based upon cluster concentrations, as opposed to typologies developed from clusters of industries, will demonstrate these differences. Further, the recognition of a previously unidentified type of concentration, that of the Balanced Concentration, demonstrates even more value for this proposed typology. In Chapter 4, percentiles will be established and

applied to exemplar counties to more definitively identify the level of each characteristic as they relate to this proposed typology.

Literature has also identified drivers of clustering activity. These drivers are the catalysts for the formation of cluster concentrations. According to Porter (1990), the characteristics of efficiency and effectiveness are sought by companies locating in those cluster concentrations.

2.10 Summation

The literature review has demonstrated that the focus of prior research in regard to clusters is isolationist in nature. In addition, multiple usages of terms lead to confusion and misunderstanding, and the commonalities exhibited within existing typologies further exacerbate the ability to view cluster concentrations from a holistic perspective.

Accordingly, drawing from the literature review, this study has defined specific terms in order to preclude the very difficulties previously discussed. In Chapter 3 which follows, the reader will find a narrative of the methodologies to be utilized in the analysis of data as it relates to this study's research focus.

CHAPTER 3

METHODOLOGY

This research utilizes specific methodologies in order to arrive at an empirically tested taxonomy. The variables used to complete the taxonomy and subsequently identified as predictors of cluster concentration membership, will then be utilized to assess differences between a developed/developed border and a developed/developing border in two different time periods. In order to differentiate between methodologies, the approach to be taken for the development of the taxonomy will be described as "Study One," and the analysis of differences in characteristics of cluster concentrations on borders at different time periods will be described as "Study Two."

3.1 Introduction

In the following narrative, detail is provided about the methodologies for both Study One and Study Two. In the analysis of the data, the order of the process to be employed is to first gather the data and examine it for missing observations, outliers and violations of the assumptions (Figure 3.1). Once this has been completed, Study One will utilize a stepwise discriminant analysis to determine which measurements of efficiency and effectiveness characteristics are good predictors of cluster concentration type membership (Figure 3.2). The resultant predictor variables will then be used in Study Two. Once again, the data for Study Two will first be gathered and examined for

missing observations, outliers and violations of the assumptions (Figure 3.1). Further, Study Two will employ the MANOVA methodology to examine differences in the measurements of the constructs for efficiency and effectiveness along the two borders of the U.S. as well as in assessing two differing time periods (Figure 3.3).

3.2 Data

As previously identified, stepwise discriminant analysis will be utilized to examine the proposed typology of cluster concentrations. As identified in the literature review, there are four constructs related to efficiency and effectiveness that are comprised of differing variables. In the stepwise discriminant analysis each variable will be tested against coded cluster concentrations to identify if the variable has discriminating power. According to Hair, Anderson, Tatham and Black (1998), discriminant analysis can be used to evaluate group differences on a multivariate profile, classify observations into groups, and identify dimensions of discrimination between groups. The resulting groups can then be compared to the proposed typology. The results of the stepwise discriminant analysis will identify variables that demonstrate discriminating power and will indicate a function or functions that can then classify cluster concentration membership. The following flow charts (Figure 3.1 and Figure 3.2) identify the procedures and methodologies that will be utilized to accomplish Study One.

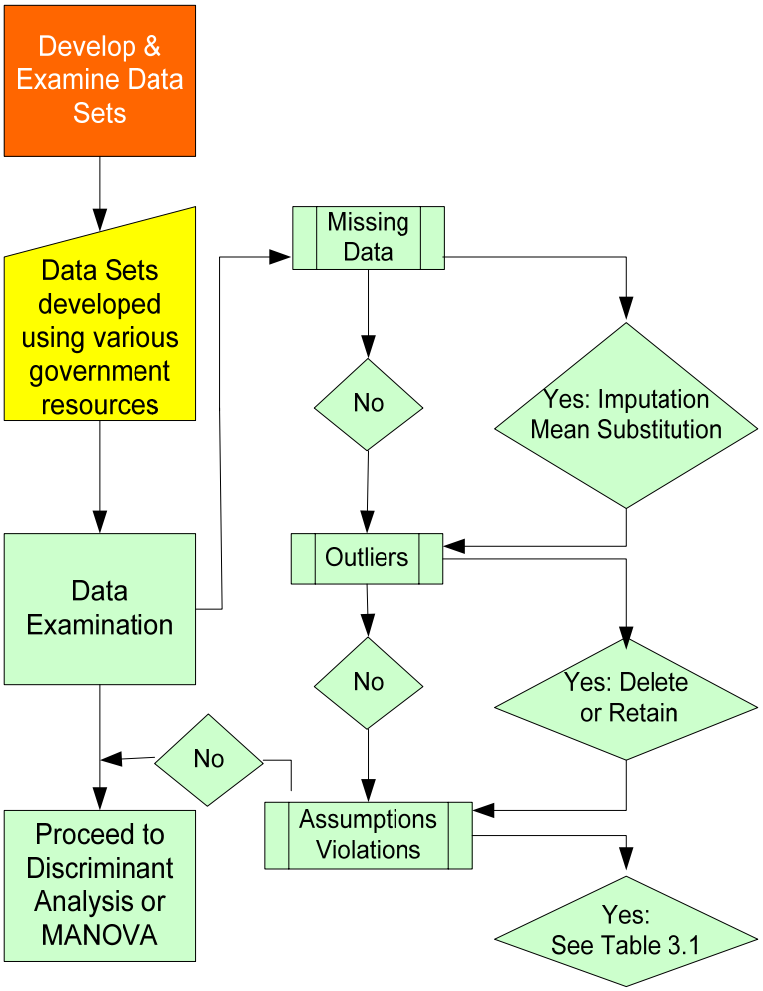

Figure 3.1 Flow of Data Examination

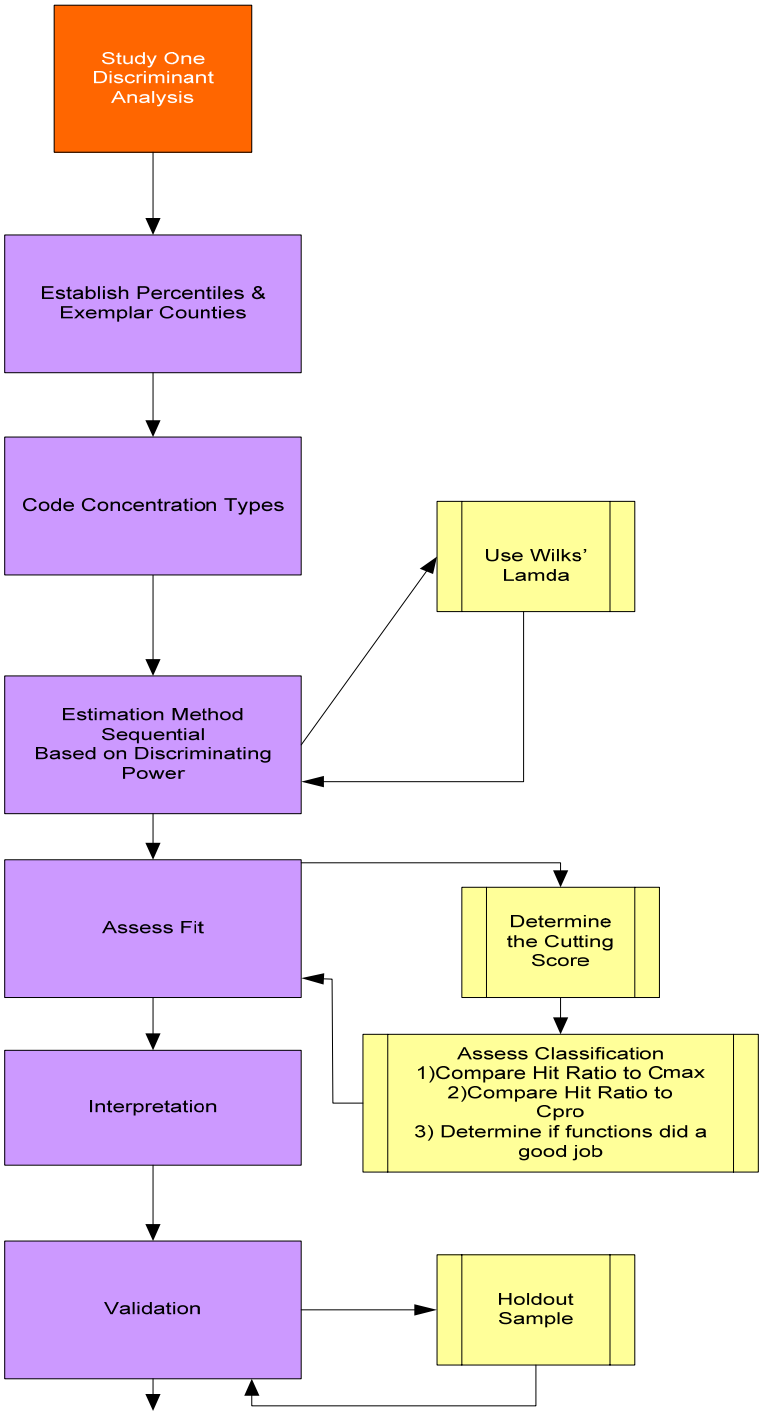

Figure 3.2 Flow of Study One: Discriminant Analysis

3.2.1 Develop and Examine Data

The following narrative discusses the development of and the examination of the data used in this research (Figure 3.1). Concerns regarding reliability and validity as well as how this study addresses those concerns will be discussed.

3.2.1.1 Level of Analysis

The level of analysis for this study is county level information. County level information has been used in previous research but for different types of analysis, for example cluster mapping. The National Association of Counties (NACO) (2006) identifies that counties are the lowest level of measure that is representative of geographic characteristics. As such, the county level of data for the measurements of the constructs of efficiency and effectiveness will be examined. For the specifics of county level information that the study will examine the reader is directed to Table 3.2.

3.2.1.2 Data Set

County level source information is available through the U.S. Census Bureau, the United States (U.S.) Department of Commerce: Bureau of Economic Analysis (BEA), NACO, and Fedstats. One data set of 300 counties will be developed for Study One and utilized to examine the proposed typology of cluster concentrations.

3.2.1.3 Missing Data

The data will be examined for missing observations to identify any patterns and/or how prevalent the problem of missing data is. This study uses secondary data gathered from governmental sources and as such the only reasons that observations

would be missing are non-response on the part of the business to the county, or researcher error.

If data is missing the researcher will check to ensure there were no errors and should errors be determined they will be corrected. If data is missing because of non-response then the imputation approach of mean substitution will be used (Hair et al, 1998). Accordingly, the mean of all valid responses will be substituted for the missing observations (Mertler & Vannatta, 2002).

3.2.1.4 Outliers

According to Hair et al (1998), an outlier is an observation that is substantially different from the other observations. Outliers can affect the outcome of the analysis. As such, univariate detection methods will be used to examine the data for outliers via the use of box plots and histograms (Mertler & Vannatta, 2002). If outliers are not entry errors, they will be retained for the value of their information. If they are entry errors they will be corrected.

3.2.1.5 Assumptions

The assumptions associated with multivariate techniques must be checked because the relationships are complex and any assumption violation may bias or distort these relationships (Hair et al, 1998). The interpretation could be problematic if the assumptions are not satisfied (Hair et al, 1998). The following table (Table 3.1) illustrates which assumptions will be tested.

Table 3.1: Assumption Transformations

Assumptions	Test
Normality	Skewness, Kurtosis, Ominbus, Normal probability plot
Equal Variance	Scatter plots, Modified Levene
Independence	Assume

3.2.2 Variables

As previously discussed in Chapter 1, and defined in Chapter 2, constructs of efficiency and effectiveness are the focus of this study, and include transfer of knowledge; innovation; specialization; and complementariness. In Chapter 2, measurements of these constructs were identified. Table 3.2 identifies the independent variables and methods of measurement used in this study. Also in Chapter 2, the measurements for coding the dependent variables were identified as well and can be reviewed in Table 3.3.

Table 3.2 Independent Variables and References

Independent Variables	Measurements	Formula	References
Transfer of Knowledge:			
1)Labor Mobility	% of worker crossing county and state lines.	county workers crossing/ total county workers	Power & Lundsmark (2004)
2)Education Level: High School	% of population high school	county population with less /total county population	Porter (1990)
3) College	% of population with some college	county population with/ total county population	Porter (1990)
4) Employment Growth	% of employment growth	Change in employment per county	Barkley & Henry (1997)
5) Wage Levels	Average wage	County average wage per populate	Barkley & Henry (1997); Porter (1990)
Innovation:			
6)New firms	% of new firms in the county	new firms/ total # of firms in the county	Baptista & Swann (1998)
7)Productivity growth	% of increase in productivity	% increase in productivity from previous year	Baptista & Swann (1998)
Specialization:			
8)Index	Top 5 county industries	**Specialization index***	Ketelhohn (2002)
9)Available Labor Pool			Porter (2003)
Complementariness:			
10)Product differentiation	HHI		Hunt & Duhan (2002)

**Specialization= $\frac{\text{Employment in 5 largest 2-digit NAICS in Geographic Concentration i at time t}}{\text{Total employment in geographic concentration i at time t}}$*

Table 3.3 Dependent Variables and References

Dependent Variables	NAICS: % of wages 2-digit	Reference
Services	% of wages in services	Hoover (1999)
Resource Dependent	% of wages in resource dependent	Hoover (1999)
Manufacturing	% of wages in manufacturing	Hoover (1999)
Government	% of wages in government	Hoover (1999)

3.2.3 Reliability

Reliability is the extent to which a variable, or set of variables, is consistent with what is to be measured (Hair et al, 1998). This study will collect secondary data from government sources and use that data to predict cluster concentration membership. One important reason for using discriminant analysis in examining the proposed typology is to determine the characteristics of efficiency and effectiveness and identify the constructs previously utilized in past research to serve as the basis for reliably and accurately classifying observations into groups (Mertler & Vannatta, 2002). Reliability is not an issue to this study as secondary data obtained from governmental agencies is utilized in the classification of counties into cluster concentration types. Further, literature has also established the validity of the constructs and variables as being appropriate to this research.

3.2.4 Validity

3.2.4.1 Internal Validity

Internal validity is the extent to which a measure or set of measures correctly represents the degree to which it is free from any systematic or nonrandom error (Hair et al, 1998). "Randomization is the only known way to control for unknown biases and to distribute them evenly among groups," according to Fink (1998; p. 58). Randomization helps to ensure that the researcher is measuring what they intended to measure (Hair et al, 1998). As the sample needs to be representative of the population, stratified random sampling will be used in this study because it allows for the sampling of the various geographic regions of the United States, producing a more representative sample (Sower, Savoie & Renick, 1999).

In Study One, the geographic regions defined by the U.S. Census Bureau will be utilized. The following four geographic regions from which the random samples will be selected are (Appendix A): 1) West; 2) Mid-west; 3) South: 4) and Northeast. A random number generator will be used to select 75 counties from each geographic region, in order to populate the sample.

3.2.4.2 External Validity

External validity is concerned with the results of a study possessing generalizability to other groups (Cook & Campbell, 1979). Some of the threats to external validity are the reactive effect of testing, the interaction effects of selection biases and experimental treatment, the reactive effects of experimental arrangements, and multiple treatment interference (Campbell & Stanley, 1963). According to Winer

(1999), secondary data can be used to generate higher levels of external validity. Accordingly, these threats to external validity are minimized in regard to this study because secondary data is used and no pre-test or post-test is given.

3.2.4.3 Construct Validity

Construct validity is the approximate validity with which generalizations can be drawn about higher-order constructs from research operations (Campbell & Stanley, 1963). There are several threats to construct validity, all having to do with the operationalization failing to "incorporate all the dimensions of the construct" (Cook & Campbell, 1979, p. 64). According to Rindlfleisch and Heide (1997) secondary data provides only an approximation for the constructs which can lead to construct validity issues. However, secondary data is often preferred over self-report measures (Houston, 2004). Carefully selected secondary data that relates directly and provides linkages can enhance research (Houston, 2004).

Houston (2004) finds that secondary data is more valid and reliable because it represents real decisions, avoids self report biases, and will save time and costs. For the purposes of this study constructs are matched to secondary data based on how the constructs have been measured in previous research and accordingly construct validity is not an issue to this study.

3.3 Study One

Discriminant analysis is useful in understanding group differences or in correctly classifying objects into groups or classes (Hair et al, 1998). Further, Hair et al (1998) explained that discriminant analysis can be thought of as a type of profile

analysis or an analytical predictive technique. Further, Stevens (1992) stated that this methodology can be referred to as descriptive discriminant analysis.

3.3.1 Discriminant Analysis: Objectives

Discriminant analysis can address a number of research objectives (Hair et al, 1998, p. 256). For example:

1) Determining whether statistical differences exist between the average score profiles on a set of variables for two (or more) a priori predefined groups.
2) Determining which of the independent variables account for the most difference in the average score profiles of the two or more groups.
3) Establishing procedures for classifying objects into groups on the basis of their scores on a set of independent variables.
4) Establishing the number and composition of the dimensions of discrimination between groups formed from the set of independent variables.

Discriminant analysis as a profile analysis should provide an objective assessment of differences between the five classifications of cluster concentration identified in Figure 2.13. To accomplish this objective, a stepwise discriminant analysis procedure will be utilized. Each variable will be entered based on the F-value, then if the variable discriminates between groups it will be retained, if not then that variable will be removed (Hair et al, 1998).

3.3.2 Discriminant Analysis: Research Design

The design of discriminant analysis involves several considerations (Hair et al, 1998) being the selection of the dependent and independent variables, the sample size needed and the division of the sample for validation.

The first consideration is the selection of the dependent and independent variables. For the purpose of this study, the ten independent variables identified in Table 3.2 will be used. The dependent variables will be concentration types as determined through coding results obtained by utilizing the criteria identified in Table 3.3. The second consideration is the sample size necessary. Hair et al (1998) recommends 15-20 observations per independent variable. Accordingly, Study One will exceed that requirement with 30 observations (counties) per independent variable. The third consideration is the division of the sample for validation purposes. The sample will randomly be assigned to two groups, an analysis sample (60 percent of the total sample) and a holdout sample (40 percent of the total sample). The analysis sample will be used to develop the discriminant function(s) and the holdout sample will be used for validation (Hair et al, 1998).

3.3.3 Discriminant Analysis: Assumptions

Discriminant analysis is robust to violations of normality, provided that the violation is due to skewness rather than outliers (Tabachnick & Fidell, 1996). However, if there are outliers, transformation or exclusion is vital to this methodology (Tabachnick & Fidell, 1996). This study is utilizing discriminant analysis for classification purposes and recognizes that violations of homoscedasticity can

negatively affect this process (Tabachnick & Fidell, 1996). Adequate sample size becomes increasingly important to the study and as previously identified this study will exceed Hair et al's (1998) recommendation, with 30 observations per independent variable. Prior to any analysis beginning, the assumptions will be assessed (Table 3.1).

3.3.4 Discriminant Analysis: Deriving Factors and Overall Model Fit

A stepwise estimation will be used to allow for entering each independent variable on the basis of its discriminating power (Hair et al, 1998). After the discriminant functions have been computed, Wilks' Lambda will be used to assess the differences between groups. While other methods of assessing differences exist, Wilks' Lambda is deemed the most appropriate because it assesses the amount of unexplained variance (Mertler & Vannatta; 2002).

Assessing the overall fit of the discriminant functions that are retained involves three tasks (Hair et al, 1998): calculating discriminant Z scores for each observation (county), evaluating group differences on the discriminant Z scores and assessing group membership prediction accuracy. The first task, calculating the discriminant Z score, provides a means of comparing each observation (county) on each function. The second task, evaluation of group differences on the discriminant Z scores, allows for the assessment of group differences using the centroids for each group. Finally, the last task, assessing group membership prediction accuracy, allows for assessment of how well the model predicts group membership (Hair et al, 1998).

3.3.5 Summation of Study One

With the conclusion of the analysis, a typology that presents a macro view of cluster concentrations will have been developed and empirically tested. With the completion of Study One the measures that are predictors of cluster concentration type will be utilized for Study Two.

3.4 Study Two

Multivariate Analysis of Variance (MANOVA) will be utilized to analyze the differences between developed/developed and developed/developing borders. This analysis will also include as well the comparison of borders in two different time periods. MANOVA is useful to test hypotheses concerned with the differences between groups using multiple dependent variables (Hair et al, 1998). From a practical perspective there are advantages to the inclusion of multiple dependent variables (Mertler & Vannatta, 2002; Stevens, 1992):

1) Any substantial characteristic will likely affect subjects in more than one way, creating a need for more than one dependent measure.
2) The use of several criterion measures allows the researcher to gain a more holistic view and therefore a more detailed description.

There are some disadvantages to the use of MANOVA. First, the use of MANOVA is far more complicated than ANOVA (Kachigan, 1986). Secondly, the

results are occasionally ambiguous in regards to the effects of independent variables on individual dependent variables (Mertler & Vannatta, 2002).

The preliminary examination of data and testing the assumptions will be accomplished as identified in Figure 3.1. The following flow chart identifies the procedures and methodologies that will be utilized to conduct the analysis in Study Two (Figure 3.3).

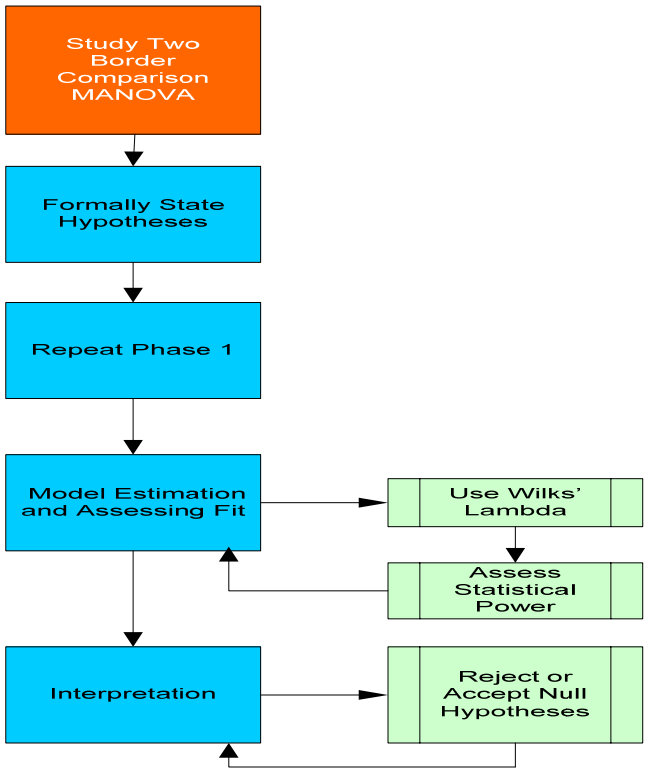

Figure 3.3 Flow of Study Two: MANOVA

3.4.1 MANOVA: Objectives

MANOVA will be utilized to identify differences that exist between border areas specific to this study. According to Kachigan (1986), MANOVA can be used to

analyze differences between intact groups. However, she cautions (1986, p.325), "We cannot infer any causal link between the variable(s) defining the groups and the criterion variable." The use of MANOVA's correlational data can uncover variables that are very probably related (Kachigan, 1986).

3.4.2 MANOVA: Research Design

Data sets will be constructed for two time periods, 1990 and 2002. Each data set will consist of 70 U.S. counties from the developed/developed border and 70 U.S. counties from the developed/developing border. Each of these data sets will have a total of 140 observations collected from the U.S. Census Bureau, B.E.A., NACO and Fedstats.

3.4.3 MANOVA: Assumptions

The data will be examined to ensure that the assumptions necessary for utilizing the MANOVA methodology are met. The best way to examine whether or not the assumptions are met is through the use of univariate analysis (Mertler & Vannatta, 2002; Hair et al, 1998). Normality will be assessed through the use of normal probability plots as well as the use of Skewness, Kurtosis, and Omnibus tests for skewness (Neter et al, 1996; Mertler & Vannatta, 2002). MANOVA is robust to moderate violations of normality when the violation is due to skewness and not outliers (Tabachnick & Fidell, 1996; Mertler & Vannatta, 2002).

Further, homoscedasticity is important to MANOVA. The variance of the data will be examined through the use of plots of the residuals (Hair et al, 1998). Patterns within the data would indicate that there may be problems with the variance (Mertler &

Vannatta, 2002). To test for equal variance, a Levene test will be utilized (Neter et al, 1996).

Independence is also a concern. Errors that are correlated may lead to biased results because an unspecified issue could impact the estimation (Hair et al, 1998). Once the data has been examined and corrected for outliers, missing data, and assumptions, if required, corrective transformation will be employed and the analysis will then be conducted.

3.4.4 MANOVA: Estimation of Model Fit

MANOVA will be used to identify differences in cluster concentration characteristics along the two borders. Wilks' Lambda will be used as the test statistic. Wilks' Lambda is an inverse criterion meaning that the smaller the value the more evidence there is for group differences (Stevens, 1992). MANOVA will be utilized to evaluate the hypotheses to see if the two intact groups differ. If the groups do not differ, it is common practice to end interpretation at that point, and the conclusion will be that the independent variables have no effect on dependent variables (Mertler & Vannatta, 2002). Should the groups differ the results will be discussed in Chapter 5.

3.4.5 Summation of Study Two

The analysis of the two borders should identify differences in measurements of the constructs of efficiency and effectiveness. Conclusions reached will then allow further analysis of the relationship(s) between efficiency and effectiveness-seeking and infrastructure development. A narrative of the analysis as well as hypotheses, are presented in Chapter 4.

CHAPTER 4

ANALYSIS

4.1 Introduction

This chapter discusses the analysis of Study One and will then utilize the resulting variables to complete the analysis of Study Two. Chapter 5 will discuss findings and conclusions as well as insights reached from information developed from Studies One and Two.

4.2 Study One

In Study One, counties are used as the unit of analysis. The primary reasons for choosing the county level are that counties have been used in previous work and are the most locally based jurisdiction that reflect characteristics relevant to this study (NACO, 2006).

4.2.1 Exemplar Counties

Based on coding criteria (Table 3.3), a data sort was conducted to identify the county closest to an ideal for each of the proposed typology classifications. The independent variables, as previously identified in Table 3.2 were analyzed at the county level to establish a percentile ranking based upon either county population or economic data pertinent to the specific analysis. The dependent variables previously identified in Table 3.3 were analyzed at the county level to establish a percentile ranking based upon wage data pertinent to the specific county. The percentiles are collectively identified in

Table 4.1 and were utilized to identify exemplar counties for use in Study One. The exemplar counties identified thusly are Custer County, Montana; Boone County, West Virginia; Union County, Ohio; Comanche County, Oklahoma; and Suffolk County, Massachusetts. These exemplar counties were then utilized as a standard to measure against as they represent the purest form of each type of concentration within the proposed typology. Further, these exemplar counties are best cases for their respective concentration types found among the 3,122 counties within the contiguous borders of the U.S. (Table 4.2). The following discussion of exemplar counties is by concentration type beginning with Concentrations of Local Industry Clusters. Expenditures for infrastructure will be included in the narratives for each type of concentration as the expenditures may correlate to the classification type.

Table 4.1 Percentiles

Independent Variables	10th (Low)	25th (Below Average)	50th (Average)	75th (Above Average)	90th (High)
Labor Mobility	.103	.175	.299	.427	.483
High School	.684	.75	.81	.854	.867
College	.102	.126	.165	.206	.21
Employment Growth	(-.058)	(-.013)	.033	.078	.098
Average Wage	21511	24575	27450	29388	29714
New Firms	(-.036)	.013	.063	.120	.143
Productivity Growth	(-.231)	.049	.166	.298	.391
Specialization	.413	.459	.495	.540	.557
Available Labor	.427	.461	.489	.519	.529
HHI	392.830	472.855	568.644	.764.788	851.750
Dependent Variable Coding Criteria					
Service	**.220**	**.333**	**.443**	**.576**	**.619**
Resource	**0**	**.0006**	**.005**	**.0234**	**.033**
Manufacturing	**.0435**	**.0912**	**1762**	**.3046**	**.3306**
Government	**.1326**	**.1818**	**.2492**	**.3357**	**.3789**

4.2.1.1 Concentrations of Local Industry Clusters

The exemplar county for Concentrations of Local Industry Clusters is Custer County, Montana. The county was founded in 1865, according to NACO (2006). In 2002 over 58 percent of the business conducted in Custer County was within service related industries (BEA, 2006). According to the U.S. Census Bureau (2006), most of the service jobs in the county were in the fields of education and health. There were no resource dependent industries and only a small portion of business was conducted within manufacturing industries. Manufacturing accounted for less than 2.5 percent of business within the county and was limited to nondurable products that are consumed locally (BEA, 2006). Porter's (1998a) findings support this exemplar county classification in that his description of Local Industry Clusters states that manufacturing

will be limited to products consumed within the county. In addition, over 32 percent of business was conducted with government entities (BEA, 2006). Of the 32 percent, the vast majority (64 percent of the 32 percent) was conducted by state and local governments. Markusen's (1996) findings support this exemplar county classification as well and in her description of Marshallian Industrial Districts identified that governmental spending was predominately on the state and local level.

Porter's (1990) description of an individual Local Industry Cluster included that the number of jobs in the geographic area would be approximately equal to the available labor force. Custer County exhibited this characteristic with 5,624 jobs within the county in 2002 and available labor for the same year at 5,844 (U.S. Census Bureau, 2006). In Custer County, the majority of public expenditures were focused on quality of life infrastructure with spending in 2002 at $2650 per person. Physical and service delivery infrastructures expenditures were $1032 and $462 per person, respectively (Fedstats, 2006).

4.2.1.2 Resource Dependent Concentrations

Boone County, West Virginia was identified as the exemplar for Resource Dependent Concentrations. This county was founded in 1847 (NACO, 2006). In 2002 over 61 percent of the business conducted in Boone County was in the mining industry (BEA, 2006). Non-mining manufacturing accounted for less than 1 percent of the business conducted within the county and was made up of goods consumed locally. In addition, government accounted for slightly more than 15 percent of business within the county. Of the 15 percent, the vast majority (87 percent of the 15 percent) was

conducted by state and local governments. Services within this concentration type accounted for over 18 percent of business activities (BEA, 2006). According to NACO (2006), the focus of infrastructure was on the ability to transport and warehouse the counties mining products. Interestingly, the number of jobs in 2002 was 9,559 which almost equaled the 9,615 workers available in the labor force. Accordingly, the priority was on physical and service delivery infrastructure to accommodate the immobile nature of the resource. In 2002, public expenditures in Boone County for physical, service delivery system, and quality of life infrastructure were $1232, $1059 and $13 per person, respectively (Fedstats, 2006).

4.2.1.3 Traded Industry Concentrations

The exemplar county identified for Traded Industry Concentrations is Union County, Ohio. This county was established in 1820 (NACO, 2006). In 2002, manufacturing accounted for in excess of 61 percent of the business done by the county. There were virtually no resource dependent business activities and government business activity accounted for less than 8.5 percent of total business. Of the 8.5 percent government spending, over 94 percent of the 8.5 percent was from state and local governments. In Union County, over 17 percent of business activities were in services (BEA, 2006). In relation to work opportunities, there were approximately 20 percent more laborers available than were jobs (U.S. Census Bureau, 2006). In addition, in 2002 public expenditures for physical, service delivery system, and quality of life infrastructures were $1706, $749 and $39, respectively (Fedstats, 2006).

4.2.1.4 Government Anchored Concentrations

Comanche County, Oklahoma was identified as the exemplar county for Government Anchored Concentrations. In 1869 the federal government established Fort Sill, Indian Territory as an army installation responsible for the administration, management, and control of Native American Tribes relocated to that area. The county was built around the government facility when Oklahoma became a state in 1907 (NACO, 2006). In 2002, for an available labor force of 86,873 people there were 54,971 jobs in Comanche County. Government business activity accounted for 60 percent of total business. Of the 60 percent the vast majority (75 percent of the 60 percent) was from the federal level. There were no resource dependent clusters, and approximately 11 percent of business activities were a result of manufacturing. Services accounted for over 26 percent of business activities in Comanche County (BEA, 2006). Public expenditures for physical, service delivery system and quality of life infrastructures were $950, $51 and $773 per person, respectively (Fedstats, 2006).

4.2.1.5 Balanced Concentrations

Suffolk County, Massachusetts was identified as the exemplar county for Balanced Concentrations. This county was founded in 1643 (NACO, 2006). In 2002, Suffolk County had more jobs available, 630,449 than available labor of 565,141 (BEA, 2006). This type of cluster concentration is characterized by high levels of service related businesses. In 2002 service business activities accounted for over 83 percent of the business in Suffolk County. Resource dependent business activity accounted for less than one percent. Manufacturing business activities accounted for approximately 5

percent. Government entities accounted for over 11 percent of total business activity. Of the 11 percent, state and local government business activity generated the vast majority (80 percent of the 11 percent) (BEA, 2006). Public expenditures for physical, service delivery system and quality of life infrastructures were $2189, $1879 and $1,601 per person, respectively (Fedstats, 2006).

Table 4.2 Table of Exemplar Counties*

Independent Variable	Concentrations of Local Industry Clusters (Custer County, MT)	Resource Dependent Concentrations (Boone County, WV)	Traded Industry Concentrations (Union County, OH)	Government Anchored Concentrations (Comanche County, OK)	Balanced Concentration (Suffolk County, MA)
Mobility	Low	Above Average	Average	Average	Low
High School	Above average	Low	High	High	Average
College	Above average	Low	Average	Average	High
Employment Growth	Low	Average	High	Average	Average
Average Wage	Below Average	Below Average	High	Average	High
# New Firms	Average	Low	Average	Average	Above Average
Productivity Growth	Average	Below Average	Below Average	Average	High
Specialization	Above average	Above Average	High	Below Average	Above Average
Available Labor	Above Average	Low	High	Average	High
HHI	Average	High	High	Low	Above Average
Coding Information					
Service	High	Below Average	Low	Below Average	High
Resource	Low	High	Low	Low	Average
Manufactur-ing	Low	Low	High	Low	Below Average
Government	Above Average	Average	Low	High	Low

**Levels were established using percentiles in Table 4.1*

4.2.2 Regions

Stratified random sampling was used to gather the data for Study One. This study used the regions of West, Midwest, South, and Northeast (Appendix A) as defined by the U.S. Census Bureau (2006). Seventy-five counties were then randomly selected from each of these regions. A contingency test using frequencies (Table 4.3) was utilized to assess any differences in distribution of cluster concentration types that might possibly exist because of location and to ensure that there are no differences between regions. Further discussion regarding frequencies follows.

Table 4.3 Frequencies of Cluster Concentration Regions

Concentration Type	Western Region (n=75)		Midwestern Region (n=75)		Southern Region (n=75)		Northern Region (n=75)		**Total**
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	
Concentration of Local Industry Clusters	17	5.67%	14	4.67%	18	6.00%	17	5.67%	22.33%
Resource Dependent Concentrations	18	6.00%	9	3.00%	10	3.33%	13	4.33%	17.33%
Traded Industry Concentrations	25	8.33%	36	12.00%	24	8.00%	28	9.33%	38.67%
Government Anchored Concentrations	5	1.67%	13	4.33%	10	3.33%	8	2.67%	13.33%
Balanced Concentrations	10	3.33%	3	1.00%	13	4.33%	9	3.00%	13.33%
Totals	75	25.00%	75	25.00%	75	25.00%	75	25.00%	100.00%

4.2.2.1 Frequencies

One of the concerns previously stated is the need for the sample to be representative of the population. To assure the representative-ness of the sample, stratified random sampling was utilized (Sower et al, 1999). As can be seen in Table 4.3 Traded Industry Concentrations are found in the largest number, making up 38.67

percent of the total sample. Concentrations of Local Industry Clusters came in second, and account for 22.33 percent of the total sample. Resource Dependent Concentrations is the third most identified type accounting for 17.33 percent of the total sample. Government Anchored Concentrations and Balanced Concentrations are the least frequently identified with each type accounting for 13.33 percent of the total sample concentrations. Accordingly, all cluster concentration types appear to be fairly evenly distributed across the four regions.

4.2.3 Data Screening

Continuing the analysis of Study One, data was screened for missing observations, outliers and violations of assumptions. The following narrative addresses these as appropriate.

4.2.3.1 Missing Data and Outliers

A visual inspection and screening of the data indicated that there were no missing observations however, the sample does have outliers. The outliers were checked for data entry errors and any identified errors were corrected. The data was then re-examined. Any remaining outliers were treated as extreme values and were retained in the sample because of the value of the information they may contribute to this study (Hair et al, 1998).

4.2.3.2 Assumptions

For the purpose of this study, univariate analysis was utilized to check for violations of the assumptions. The normal probability plots exhibited some violations to normality. Upon further statistical examination it was determined that the violations

were due to skewness and not outliers. As previously noted Hair et al (1998) identified that this methodology is robust to violations of normality when the violations are the result of skewness. Accordingly, no action was required. In addition, the data was examined for homoscedasticity using a Levene test. Two variables, College and HHI, violated homoscedasticity and therefore transformation by means of logarithms was utilized.

4.2.4 Discriminant Analysis

A stepwise discriminant analysis was conducted to determine the ability of the ten independent variables to predict type of cluster concentration. In accordance with Hair et al (1998), the sample of 300 observations was randomly split into two groups (60-40), the analysis sample and the holdout sample respectively. The analysis sample was used to conduct the initial stepwise discriminant analysis and the holdout sample was used to validate the findings. The stepwise procedure was utilized because it involves entering the independent variables one at a time based on their F-values. This selection is appropriate because of the need for parsimony as well as there being a large number of variables identified in the literature as relevant to the identification of the types of cluster concentrations. The concentration types were coded utilizing the percentage of total county wages paid in services; resource dependent; manufacturing; and government, in accordance with the percentiles established for this information in Table 4.1. The coding employed throughout the discriminant analysis is:

1 = Concentrations of Local Industry Clusters
2 = Resource Dependent Concentrations
3 = Traded Industry Concentrations
4 = Government Anchored Concentrations
5 = Balanced Concentrations

Three coders were instructed to assign each county within the study population to only one of the five concentration classifications. The criteria the coders were instructed to utilize was the comparison of the county dependent variables to the exemplar county of each concentration classification. Based upon the coders assessment of this comparison the coder then selected the concentration classification that best fit.

At the conclusion of the coding exercise all county classifications were sorted and those counties in which the coders were unanimous in their classifications were accepted *prima facia*. For the remaining counties, the coders were further instructed to jointly discuss their differing classifications with each other and to arrive at a consensus as to the most appropriate concentration classification for that county. These consensus classifications were then accepted for the purpose of analysis. Once the coders completed this task the stepwise discriminant analysis was then conducted. As a result of this analysis the Means and Standard Deviation of each independent variable in relation to each type of cluster concentration was determined and presented in Table 4.4.

Table 4.4 Discriminant Analysis Means and Standard Deviations

Predictor Variable	Concentrations of Local Industry Clusters		Resource Dependent Concentrations		Traded Industry Concentrations		Government Anchored Concentrations		Balanced Concentrations	
	Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Mobility	.2507	.0238	.3677	.0030	.2931	.0029	.2598	.0344	.2853	.0028
High School	.7819	.0010	.7093	.0013	.8015	.0012	.8306	.0014	.8122	.0012
College	.1652	.0104	.1108	.0132	.1875	.0127	.2186	.0797	.2235	.0125
Employment Growth	.0158	.0116	.0169	.0149	.0599	.0142	.0277	.0168	.0522	.0140
Wage*	27280	857	24237	1092	28145	1044	29068	1236	30359	1030
New Firms	.0576	.0217	.0152	.0277	.0557	.0265	.0559	.0313	.0677	.0262
Productivity	.0614	.1181	-.357	.1505	.1047	.1439	.2220	.1703	.2172	.1419
Specialization	.4942	.0189	.4798	.0138	.4859	.0132	.4172	.0157	.4945	.0130
Available Labor	.4777	.0075	.4479	.0096	.4942	.0092	.4781	.0109	.5071	.0091
HHI**	659	34	621	43	576	41	418	49	569	40

* Average wage in dollars ** HHI in points

Nine of the ten variables had significant mean differences (Table 4.5). Only productivity growth did not differ significantly across the concentration types ($p<.305$). Based on these variables the stepwise discriminant analysis established that four of these variables (mobility, college, wage and available labor) are predictors of concentration membership. Although high school had the fourth largest F-value, it did not contribute any discriminate power to the function. Therefore, the stepwise discriminant analysis eliminated high school as a predictor variable.

Table 4.5 Significance of Mean Differences

	Wilks' Lambda	F	df1	df2	Significant
Mobility	.345	83.137	4	175	.000
High School	.742	15.197	4	175	.000
College	.358	78.429	4	175	.000
Employment Growth	.909	4.388	4	175	.002
Wage	.416	61.360	4	175	.000
New Firms	.931	3.219	4	175	.014
Productivity	.973	1.217	4	175	.305
Specialization	.874	6.301	4	175	.000
Available Labor	.818	9.743	4	175	.000
HHI	.944	2.595	4	175	.038

Eigenvalues are a set of quantities, described by magnitude (scalars), and associated with a linear system of equations that are also known as characteristic roots (Hair et al, 1998). Based on the four variables, the analysis generated four functions that are all significant (Table 4.6), however Functions 1 (2.715) and 2 (1.944) have Eigenvalues over 1 and accordingly were used to predict concentration membership. Functions 3 (.322) and 4 (.075) have Eigenvalues under 1 and were not used. Function 1 accounts for the least amount of unexplained variation (Λ=.064, χ^2 (16, N=180)=478.716, p<.0001). Function 2 accounts for the second least amount of unexplained variation (Λ=.239, χ^2 (9, N=180) = 249.711, p<.0001).

Table 4.6 Discriminant Functions

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 4	.064	478.716	16	.000
2 through 4	.239	249.711	9	.000
3 through 4	.704	61.302	4	.000
4	.930	12.570	1	.000

Cumulatively, Functions 1 and 2 accounted for 92.2 percent of the variation in the variables retained (Table 4.7). Using the four variables, 1) mobility; 2) college; 3) average wage; and 4) available labor pool, Function 1 and Function 2 identified five types of cluster concentrations (Figure 4.1).

Table 4.7 Variation

Function	Eigenvalue	% of Variance	Cumulative %
1	2.715(a)	53.7	53.7
2	1.944(a)	38.4	92.2
3	.322(a)	6.4	98.5
4	.075(a)	1.5	100.0

Figure 4.1 graphically displays the centroids for each of the five concentration types. While the centroids are different there is some overlap between concentration types which was expected because of the basic premise that the cluster concentrations are the result of an agglomeration. In Figure 4.1, the red line represents the effectiveness-seeking function and the blue line represents the efficiency-seeking function. The point at which the lines intersect (.7118=effectiveness; .3064=efficiency) is the point of parity.

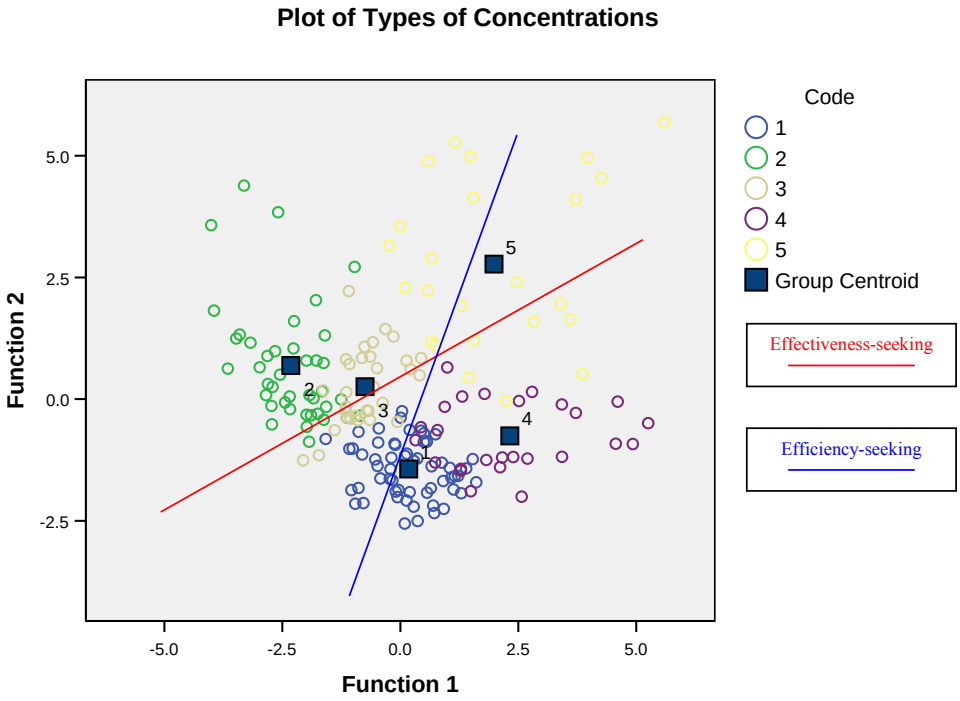

Figure 4.1 Concentration Type Centroids

Table 4.8 presents the correlation coefficients and standard function coefficients, respectively. The coefficients indicate that both Function 1 and Function 2 heavily weight the three variables (mobility, college, and average wage) used to measure Transfer of Knowledge. Function 1 indicates that mobility is negatively correlated to the other variables within that function. In addition, the Standard Function Coefficients for mobility and available labor are negatively weighted. The negative weights suggest that Function 1 is more closely associated with effectiveness-seeking. Therefore, Function 1 is named the Effectiveness-Seeking Function. Function 2 has all positive correlations within the function. The Standard Coefficient for available labor is also negatively weighted in this function but the weight is much less. The positive

weights in Function 2 are more closely associated with efficiency-seeking. Therefore, Function 2 is named the Efficiency-Seeking Function.

Table 4.8 Correlation Coefficients and Standardized Function Coefficients

Predictor Variables	Function 1		Function 2		Function 3		Function 4	
	C.C.	S.F.C.	C.C.	S.F.C.	C.C.	S.F.C.	C.C.	S.F.C.
Mobility	-.612	-.592	.648	.706	.453	.398	.001	-.063
College	.742	.767	.311	.263	.575	.689	.145	-.427
Average Wage	.377	.223	.677	.696	-.623	-.694	.105	.119
Available Labor	.206	-.148	.082	.-121	.307	-.029	.925	1.134

Classification results revealed that the original grouped observations were classified with 89.4 percent accuracy (Table 4.9). Accuracy by each group was 100 percent for Concentrations of Local Industry Clusters; 95.1 percent for Resource Dependent Concentrations; 83.9 percent for Traded Industry Concentrations; 73.1 percent for Government Anchored Concentrations; and 79.2 percent for Balanced Concentrations.

The Maximum Chance Criterion (*C-Max*) and Proportional Chance Criterion (*C-pro*) are used to assess the predictive accuracy of the discriminant function(s). *C-Max* is determined by computing the percentage of the total sample represented by the largest two groups. C-Pro is the proportion of all of the groups that are classified correctly. Once calculated, the resulting *C-max* and *C-pro* are then compared to the Hit Ratio. The Hit Ratio is the percentage of cluster concentrations correctly classified by the characteristics identified by the stepwise procedure as good predictors of cluster concentration membership (Hair et al, 1998).

C-max and *C-pro* were calculated to assess whether the model used was predicting well. *C-max* was calculated as 32.2 percent and *C-pro* was calculated as 56.2 percent. Comparing *C-max* and *C-pro* to the Hit Ratio of 89.4% demonstrates that the model predicts concentration membership well.

Table 4.9 Analysis Sample

Code	Predicted Group Membership					Total
	1	2	3	4	5	
1	58	0	0	0	0	58
2	1	39	1	0	0	41
3	5	0	26	0	0	31
4	7	0	0	19	0	26
5	2	0	2	1	19	24

The holdout sample of 120 observations was used to validate the model. Classification results revealed that the holdout sample observations were classified with 80.0 percent accuracy (Table 4.10). Accuracy by each group was 91.9 percent for Concentrations of Local Industry Clusters; 69.7 percent for Resource Dependent Concentrations; 81.3 percent for Traded Industry Concentrations; 71.4 percent for Government Anchored Concentrations; and 80.0 percent for Balanced Concentrations. *C-max* and *C-pro* were calculated to assess whether the model used was predicting well. *C-max* was calculated as 28.33 percent. *C-pro* was calculated as 79.6 percent. Comparing *C-max* and *C-pro* to the Hit Ratio of 80.0 percent demonstrates that the model was validated and predicts well.

Table 4.10 Holdout Sample

Code	Predicted Group Membership					Total
	1	2	3	4	5	
1	34	3	0	0	0	37
2	8	23	2	0	0	33
3	2	1	13	0	0	16
4	3	0	0	10	1	14
5	3	1	0	0	16	20

This concludes the analysis requirements of Study One and allows for this research to now focus on the analytical requirements of Study Two. Of note is that the variables of mobility; college; wage; and available labor pool are the variables that predicted cluster concentration membership and are of further interest in how they characterize borders. As previously identified these variables as well as three types of infrastructure, physical, service delivery systems and quality of life, will now be used to assess differences between developed/developed and developed/developing borders.

4.3 Study Two

In this portion of research, Study Two seeks to draw conclusions in regard to efficiency and effectiveness-seeking characteristics as they relate to the role of infrastructure. Further, Study Two seeks to clarify inferences regarding evaluation of borders with specific focus in regard to dynamism.

4.3.1 Hypotheses

As previously identified in the literature review, infrastructure is defined as those services derived from the set of public works traditionally supported by the public sector (Pickering, Park & Bannister, 1993). As such this study will look to physical infrastructure investment/expenditure as an indicator of dynamism in the

developed/developing border environment because the developed/developed border has experienced the stability as a result of longevity.

Further, conceptually this study anticipates that the role of dynamism will be more evident in the developed/developing border than in the developed/developed border. Therefore, in regard to physical infrastructure, the study hypothesizes:

H1: Physical infrastructure investment/expenditure in developed/developing borders will be higher than in developed/developed borders.

According to the World Trade Organization (WTO) (2005) developed/developed borders are characterized as having a more defined infrastructure. These border areas are more mature and subsequently should have more focus on maintaining infrastructure viabilities. Further, as also identified in the literature review, developed/developed borders focus on efficiency in relation to service delivery systems infrastructure whereas developed/developing borders focus on effectiveness. As such, it is logical that developed/developed borders will have more interest in upgrading service delivery systems infrastructure. Therefore:

H2: Service delivery infrastructure systems investment/expenditure in developed/developing borders will be lower than in developed/developed borders.

As investments in the physical infrastructure increase, border characteristics should transition from that of effectiveness-seeking to efficiency-seeking (Figure 2.3). With this transition, investment within physical and service delivery system infrastructures should also increase. As investment in physical and service delivery infrastructure increases along with population and concentration members, the demand for improvement and gain in Quality of Life Infrastructure Systems should intensify.

Developed/Developing borders are initially characterized by internal consumption of products and services produced locally. The focus of these borders is most likely that of survival which necessitates improving quality of life infrastructure in order to maintain dynamism. As previously inferred in the literature review, quality of life systems of infrastructure enhance effectiveness-seeking by creating greater capabilities related to lifestyle. This supports Marshall's (1997) work in which this study identified that the geographic area, of necessity, requires attractiveness in order to support dynamism. Therefore:

> H3: Quality of life infrastructure investment/expenditure in developed/developing borders will be higher than in developed/developed borders.

Mobility, college and wage are identified as measures of transfer of knowledge, and available labor is identified as a measure of specialization. Porter's premise is that transfer of knowledge and specialization are advanced factor conditions of production. Porter further states that for a geographic area to remain viable these factors conditions of production will transition from effectiveness to efficiency (1990).

Labor mobility as identified by Power and Lundmark (2004) has an important impact on transfer of knowledge. In addition, these authors also purport that transfer of knowledge impacts the efficiency and effectiveness of factor conditions of production. Malmberg and Sommestad (2000) stated that labor mobility is a prerequisite for young and growing areas (hotspots). Also according to Power and Lundmark (2004), labor mobility functions as a catalyst for structural changes within those areas. As the renewal and regeneration of hotspots demonstrates dynamism, labor opportunities

should expand. As labor opportunities increase, the population will be opportunistic. Therfore:

H4: Mobility will be higher along developed/developing borders than developed/developed borders.

Porter (1990) identified that level of education is important to the advanced factor conditions of production. According to Porter (1990), highly educated people are mobile, and this mobility increases transfer of knowledge. Inherent to this mobility, highly educated people will gravitate to areas having sophisticated infrastructure and transfer of knowledge should increase. As such:

H5: College will be lower along developed/developing borders than developed/developed borders.

Porter (1990) postulates that 'cheap' labor is closely associated with developing countries. Accordingly, extrapolating from Porter's (1990) research, the more developed the area the greater the competition for employee skills which in turn creates pressure on compensation structures. Therefore:

H6: Average wage will be lower along developed/developing borders than developed/developed borders.

According to Porter (1990), locating and outsourcing to areas with lower wage levels is considered a competitive advantage and accordingly demonstrates elements of both efficiency and effectiveness-seeking. As such, available labor contributes to the dynamism and attracts organizations to the area for the competitive advantage of lower costs. In addition, locating and outsourcing to these areas contributes to the attractiveness because of the available labor pool which results in increased capacity and capability for the organization locating or outsourcing to those areas. Therefore:

H7: Available labor will be higher along developed/developing borders than developed/developed borders.

4.3.2 Borders

The La Paz Agreement of 1983 defined the border area as being 62.5 kilometers (100 miles) on either side of the border. For the purposes of this study, only the U.S. side of the borders will be measured. By measuring only U.S. counties, any concern over the influence of other factors, or regard as to the consistency of data within the cluster concentration formations, is minimized.

There are a total of 160 border counties of which 70 are located along the developed/developing border and the remainder along the developed/developed border. Seventy of the developed/developed border counties will be selected using a random number generator. Two data sets from the two time periods will be constructed with 140 observations each (70 counties for each U.S. border) in order to evaluate the differences in characteristics along borders. The same counties will be utilized for observations in each time period.

4.3.3 Infrastructure

As identified in the literature review there are three types of infrastructure that are of concern to Study Two: Physical, Service Delivery Systems, and Quality of Life. Accordingly, these three types of infrastructure will be measured as illustrated in Table 4.11.

Table 4.11 Measurements of Infrastructure

Type of Infrastructure	Measurement
Physical (roads, railways,airports, ports, water and power plants, and communication systems)	Dollars spent annually per person on physical infrastructure
Service Delivery (payments or funds transfer systems, water and power distribution, technical services, trade services, and communication services)	Dollars spent annually per person on service delivery system infrastructure
Quality of Life (health care, education, entertainment, cultural and religious resources)	Dollars spent annually per person on quality of life infrastructure

4.3.4 MANOVA

Study Two of this research will examine the characteristics of borders based on the variables identified as predictors of cluster concentration membership in Study One. As identified by Herman and Ausubel (1988), Grant (1993), and Herrera and Lora (2005), infrastructure improves, develops, or declines as time passes. Study Two utilized measures of infrastructure identified in Table 4.1 to examine change in relation to evolution of borders at two time periods, 1990 and 2002, respectively. The geographic location of the counties used in this study will be along the U.S. borders because of the uniqueness of a developed country bordering both a developing country (Mexico) and a developed country (Canada).

4.3.4.1 Data Screening

The stepwise discriminant analysis utilized in Study One identified four variables, mobility, college, average wage and available labor. These four variables are

predictors of cluster concentration membership. These variables were then used in Study Two to evaluate changes along the borders. A sample of 140 observations was measured at two distinct time periods, 1990 and 2002. Seventy observations were gathered from the developed/developed border and seventy observations from the developed/developing border. MANOVA was utilized to assess differences between the two borders and at the two time periods. Prior to beginning MANOVA, the samples from 1990 and 2002 were assessed for any problems with missing data, outliers, or assumption violations and any errors were corrected.

4.3.4.2 Missing Data and Outliers

A visual inspection and screening of the data indicates that there are no missing observations but the sample does have outliers. Data entry errors were identified and corrected and the assumptions were re-evaluated. Outliers left were treated as extreme values and retained in the sample for the value of their information (Hair et al, 1998).

4.3.4.3 Assumptions

Univariate methods were utilized to assess any violations of assumptions. Normal probability plots, boxplots, and histograms were reviewed for violations of normality. Violations found were because of to skewness rather than outliers. The Modified Levene test was used to assess equal variance and the results demonstrated that the variables have equal variance.

4.3.5 Analysis

A repeated measures design was used to compare the U.S. borders at two specific time periods to assess differences and explore the dynamics in relation to

borders being more efficiency-seeking or effectiveness-seeking. In addition, Chi-Square was used as a contingency test, assessing any differences between the two borders for the two time periods (Nicol & Pexman, 1999). Using this methodology there are significant differences between the borders and the time periods ($p<.00001$).

Table 4.12 presents the means and standard deviations for each variable by time period.

Table 4.12 MANOVA Means and Standard Deviations

	1990				2002			
	Southern		Northern		Southern		Northern	
Variable	Mean	S.D	Mean	S.D.	Mean	S.D.	Mean	S.D.
College	.103	.012	.113	.012	.134	.012	.178	.012
*Wage	7551	369.43	9406	369.43	11770	369.43	13923	369.43
Mobility	.054	.007	.071	.007	.064	.007	.091	.007
Labor	.725	.009	.759	.009	.734	.009	.779	.009
**Physical Infrastructure	839.125	136.046	816.892	136.046	2026.694	136.046	1757.049	136.046
**Service Delivery Infrastructure	310.625	262.483	659.218	262.483	261.642	262.483	1829.629	262.483
**Quality of Life Infrastructure	713.678	75.597	807.144	75.597	1002.165	75.597	1345.834	75.597

* Average Wage in Dollars ** Dollars per populate

Table 4.13 indicates that there is some correlation between the variables. Collinearity is measured as correlation between two variables (Hair et al, 1998). This is not in and of itself a negative in that a degree of correlation between the variables can be an indication that they make sense as a set of measurements (Mertler & Vannatta, 2002). As identified in Table 4.13, Service Delivery Systems infrastructure is highly correlated with percent of population with some college and significant ($p<.0001$). As a result of collinearity there could be difficulty in assessing the effect of these variables

(Hair et al, 1998). However, in this analysis, these variables are being assessed on differences between borders rather than the linear relationship.

Table 4.13 Correlation Matrix

Variables	College	Wage	Mobility	Labor	Physical*	SDS**	QOL***
College	1.00						
Wage	.020	1.00					
Mobility	-.061	.141	1.00				
Labor	-.370	.026	.052	1.00			
Physical*	-.003	-.136	-.157	.049	1.00		
SDS**	.67	-.020	-.114	-.199	.182	1.00	
QOL***	.057	-.189	-.022	.170	.199	.562	1.00

*Physical Infrastructure
**Service Delivery Systems Infrastructure
***Quality of Life Infrastructure

MANOVA was assessed to look for interaction between borders and years, and none was found. The results of MANOVA demonstrated that there are significant differences between borders in college ($p<.020$); average wage ($p<.0001$); mobility ($p<.002$); available labor ($p<.0001$); service delivery system infrastructure ($p<.0001$); and quality of life infrastructure ($p<.004$) (Table 4.1.4). However there are no significant differences in physical infrastructure between borders ($p<.284$). A possible explanation of this finding may be from the federal government's method of accounting for expenditures for physical infrastructure by population.

Table 4.14 MANOVA Border Results†

Source	Dependent Variable	Sum of Square	df	Mean Square	F	Significant
Border	College	.051	1	.051	5.444	.020
	Wage	281143164.400	1	281143164.400	29.429	.000
	Mobility	.033	1	.033	9.323	.002
	Labor	.109	1	.109	20.008	.000
	Physical*	14908474.865	1	14908474.865	1.151	.284
	SDS**	64282376.656	1	64282376.656	13.329	.000
	QOL***	3344027.000	1	3344027.000	8.359	.004

†alpha = .05
*Physical Infrastructure
**Service Delivery Systems Infrastructure
***Quality of Life Infrastructure

Formal hypotheses were not stated for differences between years, since with a span of 12 years it would unrealistic to not expect differences (Table 4.15). Of interest however, is that available labor force shows no significant difference ($p<.102$).

Table 4.15 MANOVA Year Results†

Source	Dependent Variable	Sum of Square	df	Mean Square	F	Significant
Year	College	.161	1	.161	17.208	.000
	Wage	1335686355.000	1	1335686355.000	139.814	.000
	Mobility	.016	1	.016	4.598	.033
	Labor	.015	1	.015	2.688	.102
	Physical*	79226337.145	1	79226337.145	61.151	.000
	SDS**	22008056.419	1	22008056.419	4.563	.034
	QOL***	11973880.039	1	11973880.039	29.931	.000

†alpha = .05
*Physical Infrastructure
**Service Delivery Systems Infrastructure
***Quality of Life Infrastructure

With the conclusion of the analysis of Study Two, findings for both Study One and Study Two are discussed in Chapter 5. In addition, conclusions regarding hypotheses will be discussed as well. Chapter 5 will also discuss the contributions of

this research as well as a discussion of insights, conclusions and areas of future research as related to the thesis.

CHAPTER 5

CONCLUSIONS

5.1 Introduction

With the conclusion of analysis for Studies One and Two, this thesis can now present findings as appropriate to the topics. For clarity, the conclusions and findings are presented for Study One separately from Study Two. In addition, findings in regard to a Cross Study Analysis will also be presented. At the conclusion of the discussion of both studies and cross study analysis, areas for future research, limitations, and the summary with contributions are discussed.

5.2 Study One Findings

Through the use of discriminant analysis, the focus of Study One was to identify variables within constructs that could predict cluster concentration membership. As a part of the process, Study One identified exemplar counties for each of the proposed typology of cluster concentration types. These exemplar counties were then used as a benchmark in the classification of the counties identified as germane to the analysis.

5.2.1 Discussion

The variable values of exemplar counties by concentration classifications are found in Table 4.2. After completing the discriminant analysis, four variables, college, wage, mobility, and available labor, were found to predict membership of cluster

concentration classifications. With the completion of the analysis in regard to the study population, adjustments to the typology could then be made. This in turn allows for a more holistic perspective of the study population as opposed to the exemplar counties (best cases).

Using the means identified in Table 4.4 as compared to the percentiles identified within Table 4.1, necessary adjustments for the now tested typology can be accomplished. This in turn results in findings for an empirically tested Taxonomy of Cluster Concentrations. Specific discussion of these adjustments follows.

5.2.1.1 Concentrations of Local Industry Clusters

The analysis of concentration centroids as identified in Figure 4.1 clearly demonstrates that Concentrations of Local Industry Clusters are characterized by effectiveness-seeking. Custer County, Montana, the exemplar county for Concentrations of Local Industry Clusters demonstrates the values for the predictive variables as follows in Table 5.1.

Table 5.1 Concentrations of Local Industry Clusters

Predictive Variables	Exemplar Value	Resultant Value
Mobility	Low	Average
College	Above Average	Above Average
Wage	Below Average	Average
Available Labor	Above Average	Average

The analysis of counties classified as being Concentrations of Local Industry Clusters demonstrates corresponding resultant values as identified within Table 5.1. Three of the variables (mobility, wage, & available labor) differ between the exemplar county and the actual findings. Only percent of county population with some college

demonstrated the same value, that being above average. The most logical explanation for the differences is that the exemplar county was the best case. Conceptually these differences can most likely be explained by Martin and Milway's (2005) findings that Concentrations of Local Industry Clusters provide the basis for the formation of other types of cluster concentrations. Accordingly, an insight is that as Concentrations of Local Industry Clusters evolve, the available labor pool may expand or contract in direct proportion to available jobs. Of interest is that there may be a relationship between mobility and available labor in regard to the ebb and flow of employment opportunities resulting from evolutionary changes in concentration characteristics. Further the competition for available labor may in turn influence wage.

5.2.1.2 Resource Dependent Concentrations

The analysis of concentration centroids as identified in Figure 4.1, clearly demonstrates that Resource Dependent Concentrations are characterized by efficiency-seeking. Boone County, West Virginia, the exemplar county for Resource Dependent Concentrations, demonstrates the values for the predictive variables as follows in Table 5.2.

Table 5.2 Resource Dependent Concentrations

Predictive Variables	Exemplar Value	Resultant Value
Mobility	Above Average	Above Average
College	Low	Below Average
Wage	Below Average	Below Average
Available Labor	Low	Average

Analysis of counties classified as being Resource Dependent Concentrations demonstrate corresponding resultant values as identified within Table 5.2. The major

difference between the exemplar county and the analysis findings is that the exemplar demonstrates low available labor and the findings indicate that available labor is average. This finding is indicative of the nature of the immobile resource associated with this type of concentration, as the resource generally involves low skilled laborers. For example, the exemplar county is a mining area and the population with some college is low, wages are below average, and the available pool of laborers is low. It is logical that the labor mobility would be above average because of limited work opportunities and earnings potential within the concentration. This finding would explain the earlier identification of the exemplar county exhibiting the characteristic of having a roughly equal available labor to job ratio because only the workers willing to accept the available employment opportunities would remain in the county. An insight in relation to Resource Dependent Concentrations not providing opportunities of enough magnitude to attract higher skills to the geographic area could well be a negative effect on quality of life infrastructure. For example, if higher skills cannot be attracted there may well be a detrimental effect on such quality of life infrastructures as healthcare and education.

5.2.1.3 Traded Industry Concentrations

The analysis of concentration centroids as identified in Figure 4.1, demonstrates that Traded Industry Concentrations are characterized more by efficiency-seeking. Union County, Ohio, the exemplar county for Traded Industry Concentrations, demonstrates the values for the predictive variables as follows in Table 5.3.

Table 5.3 Traded Industry Concentrations

Predictive Variables	Exemplar Value	Resultant Value
Mobility	Average	Average
College	Average	Above Average
Wage	High	Above Average
Available Labor	High	Above Average

Analysis of counties classified as being Traded Industry Concentrations demonstrate corresponding resultant values as identified within Table 5.3. The differences between the exemplar county and the findings in relation to the variables are minor with the exception being in regard to college. An insight as to this difference may well be that wage opportunity within Traded Industry Concentrations may favor higher education.

5.2.1.4 Government Anchored Concentrations

The analysis of concentration centroids as identified in Figure 4.1 demonstrates that Government Anchored Concentrations are characterized by effectiveness-seeking. Comanche County, Oklahoma, the exemplar county for Government Anchored Concentrations, demonstrates the values for the predictive variables as follows in 5.4.

Table 5.4 Government Anchored Concentrations

Predictive Variables	Exemplar Value	Resultant Value
Mobility	Average	Average
College	Average	High
Wage	Average	Above Average
Available Labor	Average	Average

Analysis of counties classified as being Government Anchored Concentrations demonstrates corresponding resultant values as identified within Table 5.4. Resultant values for mobility and available labor correspond to the exemplar values and do not

require additional discussion. The exemplar county demonstrates that in this type of concentration the percent of population with some college would be average but the sample population mean indicates that the percent of population with some college in this type of concentration is high. This is most likely because there are high levels of government employment and the government promotes higher education for its employees. Wage also differs with the exemplar county being average and the resultant value of the sample population being above average. The primary reason for this finding is most likely that the government employee's benefit from standard wages and salaries paid. In turn with wages being above average, competitive compensation pressures increase within the concentrations. An insight is that it is conceivable that the exemplar county has an artificially inflated wage average because of the predominance of government employees.

5.2.1.5 Balanced Concentrations

The analysis of concentration centroids as identified in Figure 4.1 demonstrates that Balanced Concentrations are characterized by a balance of effectiveness-seeking and efficiency-seeking. Suffolk County, Massachusetts, the exemplar county for Balanced Concentrations, demonstrates the values for the predictive variables as follows in Table 5.5.

Table 5.5 Balanced Concentrations

Predictive Variables	ExemplarValue	Resultant Value
Mobility	Low	Average
College	High	High
Wage	High	High
Available Labor	High	Above Average

Analysis of counties classified as being Balanced Concentrations demonstrates corresponding resultant values as identified within Table 5.5. The resultant values for college and wage correspond to the exemplar values and do not require additional discussion. The exemplar county indicates that mobility would be low whereas the analysis demonstrates that in fact mobility is average. The difference in the proposed and actual findings could be an anomaly specific to the exemplar county. In this circumstance, the county has a large population with an abundance of available jobs. Accordingly, workers come into the county for employment whereas the measurement used looked at the number of people that left the county for employment. This anomaly may explain the difference in proposed and actual findings for available labor because there were more jobs available than labor force. An insight is that Balanced Concentrations may be characterized by both efficiency and effectiveness-seeking because of the mix of concentration types.

5.2.1.6 Post Hoc Test

To preclude bias, a blind post hoc test to determine if the exemplar counties are in fact representative of concentration type was conducted using the voluntary services of three business professionals (analysts). These analysts were given a description of each exemplar county (Appendix B) as well as a description of each concentration type (Appendix C). The analysts were then instructed to review the descriptions of the concentration types and to then use their best judgment to match the exemplars to concentration types. At the conclusion of this post hoc test independently of each other, all three of the analysts had correctly identified the exemplar counties with their

respective cluster concentration types. Accordingly there is a high level of confidence in the representative-ness of the exemplar counties as best case examples of cluster concentration type.

Accordingly, the variables identified as predictors of group membership fall under two constructs, transfer of knowledge and specialization. Both of these constructs are closely associated with efficiency and effectiveness-seeking. For review of the characteristics of cluster concentration types of the taxonomy, the reader should please refer to Table 5.6. In Study Two which follows, the relationship between infrastructure and the characteristics of efficiency and effectiveness will be discussed in terms of the measurements of the constructs.

Table 5.6 Concentration Efficiency and Effectiveness

Concentration Type	Efficiency	Effectiveness
Concentration of Local Industry Clusters		√
Resource Dependent Concentrations	√	
Traded Industry Concentrations	√	
Government Anchored Concentrations		√
Balanced Concentrations	√	√

5.3 Study Two Findings

The variables that predict group membership in the discriminant analysis as well as the three types of infrastructure were used to test the hypotheses identified in Chapter 4. The following narrative will discuss the findings of each hypothesis beginning with infrastructure.

5.3.1 Infrastructure Hypotheses

This section will discuss H1, H2 and H3, which all relate to infrastructure. Table 5.7 identifies that with the exception of H1: Physical Infrastructure, support for the remaining hypotheses was found. As such, physical infrastructure investment/expenditure does not differ between the two borders ($p<.284$). Possible explanation may be, as previously stated, that the physical infrastructure allocation methodology is based on population. In effect the government methodology of allocation of funds for physical infrastructure may have an affect on the findings. Further, another reason for this finding could well be the fact that only the developed country's side of the border was measured. Discussion of H2: Service Delivery Systems and H3: Quality of Life infrastructure follows.

In regard to H2: Service Delivery Systems infrastructure ($p<.0001$) and Quality of Life infrastructure ($p<.004$), investment/expenditures differ significantly between borders. These findings demonstrate support for these hypotheses. The significant differences found for Hypotheses 2 and 3, demonstrate the investments in infrastructure most likely to trigger the cyclical movement (Dynamic Cluster Concentration Cycle) are those made in Service Delivery Systems and Quality of Life Infrastructures (Figure 2.3). As investment/expenditure within these two types of infrastructure gyrate between the characteristics, the measurements mobility, college, wage, and available labor compress or expand in relation to whether the concentration infrastructure moves toward efficiency-seeking or toward effectiveness-seeking.

Table 5.7 Differences Between Borders

Hypotheses	Significant	P-value
H1: Physical Infrastructure	No	.284
H2: Service Delivery Infrastructure	Yes	.0001
H3: Quality of Life Infrastructure	Yes	.004
H4: Mobility	Yes	.002
H5: College	Yes	.020
H6: Average Wage	Yes	.0001
H7: Average Labor Pool	Yes	.0001

5.3.2 Transfer of Knowledge and Specialization Hypotheses

H4: Labor mobility differs significantly between the two borders ($p<.002$). However, as opposed to Hypothesis 4 which anticipated mobility being higher along developed/developing borders, findings demonstrate mobility is higher along developed/developed borders. The developed/developed border demonstrates higher levels of labor mobility, possibly in part to a more defined and stable employment opportunity as compared to developed/developing borders. Further, the role of attractiveness of the geographic area may affect labor mobility.

H5: Percent of population with college differs significantly between the two borders ($p<.020$). As anticipated in Hypothesis 5, population with some college is lower along developed/developing borders. Conceivably, the developed/developed borders have a higher level of quality of life infrastructure which includes educational opportunities.

H6: Average wage differs significantly between the two borders as stated in Hypothesis 6 ($p<.0001$). As anticipated wage levels are lower along

developed/developing borders than developed/developed borders. As with H5, a possible explanation could include that a highly educated population demands higher wages. The demand for higher wages could also possibly be the result of cost of living, tax rate and organized labor pressures.

H7: Available labor pool differs significantly between the two borders ($p<.0001$). However as opposed to Hypothesis 7, which anticipated available labor being higher along developed/developing borders, findings demonstrate that available labor is higher along developed/developed borders. A possible explanation may be that more defined and larger population centers along the developed/developed borders, as well as higher wages create an attractiveness to the geographic area, which in turn realizes more available labor for the area.

5.4 Cross Study Analysis

In completing the analysis of Study Two findings it became apparent that additional value could be gained from a further review of Study One percentiles in comparison to Study Two border characteristic means with regard to attractiveness. Using the percentiles established in Table 4.1, identification can be made as to level of each variable that characterizes these borders (Table 5.8). When percentile levels are compared, the measurement that is evolving the most noticeably is the percentage of population with some college. As discussed in Study One, this may be indicative of the willingness to relocate to areas that offer higher education opportunities, or because of the higher education programs offered through advanced technology such as the internet. The labor population may perceive education as a means of higher wages and

better quality of life, which could explain why percent of population with college is increasing. As Porter has postulated, highly educated people will relocate to areas with more defined infrastructures (1990). This relationship coupled with wage opportunities may well explain mobility, college and available labor differences.

Table 5.8 Border Characteristics

	1990		2002	
	Southern	**Northern**	**Southern**	**Northern**
College	Low	Below Average	Below Average	Average
Wage	Low	Low	Low	Low
Mobility	Low	Low	Low	Low
Labor	High	High	High	High

While not identified within this study as hypotheses because of expected differences in the two time periods (1990 and 2002), the border characteristics were tested nonetheless. On the surface, differences between time periods would be expected and seem obvious, however as Table 4.15 indicates, there is an interesting finding in that available labor does not significantly differ between 1990 and 2002.

As can be seen in Table 5.8 available labor is high across both borders and both time periods. This finding could be explained as the logical result of labor migration to geographic areas offering employment, wage and quality of life opportunities. These variables contribute to the attractiveness of the geographic area, which in turn supports the concept of ongoing regeneration of dynamism, of which investment in infrastructure is paramount.

As previously identified in the literature review, infrastructure systems that are static, decay, and if allowed to degenerate, dynamism dissipates. Should this occur,

conceptually, the border would no longer be attractive to existing organizations, which in turn would result in further dissipation. Accordingly the relationship between dynamism and infrastructure may identify the importance of ongoing infrastructure investment/expenditure, potentially an important tool for the practitioner.

This study's findings demonstrate that while investment/expenditure in physical infrastructure has increased for developed/developed borders, it has more than doubled for developed/developing borders. The most likely explanation is that infrastructure is relatively new on developed/developing borders whereas infrastructure on developed/developed borders is in need of rehabilitation or regeneration because of age. This large increase in investment/expenditure in physical infrastructure along the developed/developing border may also demonstrate effectiveness-seeking and simultaneously result in increasing attractiveness of the geographic area. Attractiveness results in growth for the geographic area which in turn increases the demand for new physical infrastructure, which correlates to this study's findings in regard to the Dynamic Cluster Concentration Cycle (Figure 2.3).

This study's findings further demonstrate that investment/expenditure in Service Delivery Systems Infrastructure is remaining flat along developed/developing borders while increasing along developed/developed borders. The most likely explanation for this finding is that physical infrastructure for all practical purposes is basically established for the developed/developed border and the area would therefore seek efficiency gains through additional investments in Service Delivery Systems Infrastructure. Additionally, this study extrapolates that spending has remained flat for

Service Delivery Systems infrastructure because in seeking effectiveness the focus of the developed/developing border is on physical infrastructure.

To continue, investment/expenditure for Quality of Life infrastructure systems while having increased on developed/developing border, demonstrates greater increases for the developed/developed border. This finding when extrapolated, may demonstrate a previously unidentified relationship between increases in college and demand for investment/expenditure in Quality of Life infrastructures. Equally likely, as population growth occurs, the study further extrapolates that population pressure may result in the demand for additional investment in Quality of Life infrastructures.

The differences identified in regard to the respective borders may validate the cyclical nature of cluster characteristics of efficiency-seeking and effectiveness-seeking in relation to infrastructure as identified in the Dynamic Cluster Concentration Cycle (Figure 2.3). As focus shifts from effectiveness-seeking to efficiency-seeking it appears that investment/expenditure focus will also shift from physical infrastructure to service delivery system and/or quality of life infrastructure. Conversely as focus shifts from efficiency-seeking to effectiveness seeking it appears that investment/expenditure focus will also shift from service delivery system and/or quality of life infrastructure to physical infrastructure. Additional comment regarding infrastructure relationships is offered in the future research section that follows.

5.5 Future Research

Triangulation is necessary to further support the findings and extrapolations identified within this study. In addition, several areas of potential future research are suggested as well.

In regard to the concept of attractiveness of a geographic area, the following questions should be addressed by future research.

1) Can attractiveness be quantified?
2) If so, can practitioners achieve attractiveness by means of planning?
3) What is the relationship between attractiveness and dynamism?

The role of Quality of Life infrastructure investment in relation to higher education in cluster concentrations and developing areas should also be researched. In addition, future research may focus on education and the mechanisms (types of infrastructure) employed by the population to gain advanced education in developing border regions.

In addition, future research should also examine effects of loss or gain of organization members within cluster concentrations in relation to maintaining and/or regeneration of dynamism. Additionally, an area of future research would also be the ebb and flow of labor to available jobs and labor pool expansion and contraction in relation to concentration evolution. Finally, future research should include the study of Balanced Concentrations as conceptualized in relation to being an accelerant of concentration growth.

5.6 Limitations

This exploratory study is limited by its nature therefore cause and effect cannot be definitively stated, although it can be suggested. In addition, variables such as politics, environment, geography and cultural differences could have confounding effects on this study. Further, generalizability of this study could be affected because of the geographic location in relationship to national differences based on these and other variables.

5.7 Summary and Contributions

In Study One, this thesis developed an empirically tested Taxonomy of Cluster Concentrations. Five types of concentrations were identified by means of concentration characteristics. This taxonomy empirically validated data that supports previous researcher's theory that clusters do not form in isolation but rather as concentrations or mixes. Further the taxonomy provides future researchers with a commonality of descriptive terms that should preclude miscommunication. In addition, the taxonomy provides practitioners a means of identification of cluster concentration types. The value of such identification is that it may assist practitioners in both short and long-term planning as related to achieving or maintaining dynamism.

This study conceptualized a cyclical aspect in relation to efficiency and effectiveness-seeking characteristics and their relationship to cluster concentrations was also identified and graphically illustrated (Figure 2.3). This conceptualization demonstrated the dynamism of cluster concentrations. The graphical representation demonstrates why cluster concentrations evolve or fail to evolve.

In the assessment of cluster concentration dynamics, a previously unidentified type of cluster concentration now termed Balanced Concentration was conceptualized and supported by this analysis. The identification of Balanced Concentrations provides researchers with an avenue to explore cluster concentrations from a holistic perspective. In addition, should future research find that parity between efficiency-seeking and effectiveness-seeking is the point at which balanced concentrations accelerate, practitioners will have additional tools to facilitate decision making in relation to dynamism.

In Study Two, an analysis of border differences was conducted using the characteristics identified as good predictors of cluster concentration membership in Study One. In addition, three types of infrastructure were evaluated to assess hypotheses identified in Chapter 4. This analysis demonstrates that developed/developed borders focus on maintaining infrastructure whereas developed/developing borders focus on building infrastructure. For researchers, this provides a new venue in regard to dynamism as it relates to infrastructure. From a practitioner perspective, in the mature environment, infrastructure investment strategy may now be viewed from a holistic perspective in relation to creating dynamism. Further, a cross-study analysis was conducted that analyzed relationships in regard to attractiveness and the dynamic cycle.

In conclusion, this thesis provides a holistic and comprehensive perspective of cluster concentration dynamism. For the researcher dynamism represents significant opportunity to define relationships between infrastructure types and evolution. For the

practitioner, these findings provide logical methods for planning, strategy, and investment decisions that facilitate achieving or maintaining dynamics from a macro perspective.

APPENDIX A

REGIONS

Appendix A Regions

APPENDIX B

DESCRIPTION OF CLUSTER CONCENTRATION TYPES

Appendix B Description of Cluster Concentration Types

Concentration of Local Industry Clusters

Concentrations of Local Industry Clusters are concerned primarily with characteristics of effectiveness-seeking. Such concentrations seek capabilities needed to sustain the organizations and populations within the geographic area. Physical Infrastructure Systems should be adequate for the immediate requirements.

In regard to transfer of knowledge, Concentrations of Local Industry Clusters should demonstrate that the pool of available workers is adequate to satisfy the labor requirements within the geographic area. Wage opportunities most likely will be low and labor mobility most likely will be below average because of limited opportunities within these concentrations.

Innovation should also be low in Concentrations of Local Industry Clusters because there are limited opportunities for new organizations to enter.

Specialization should be above average within these concentrations because of the isolation of trade in the geographic area. However, there is a need for at least limited access to external resources for the products traded within the geographic area.

As a result of limited access to external resources, Concentrations of Local Industry Clusters will most likely utilize complementary resources to provide products and services internally.

These Local Industry Concentrations deliver services and goods consumed within the geographic area, and therefore focus on Quality of Life Infrastructure Systems. Accordingly, these concentrations will be more effectiveness-seeking than efficiency-seeking because of the need to deliver diverse products and services internally.

Resource Dependent Concentrations

Resource Dependent Concentrations are dependent upon an immobile resource. Physical Infrastructure Systems within this type of concentration generally provide unique access to immobile resources. The Resource Dependent Concentration infrastructure should be more evolved than that of the Concentration of Local Industry Clusters, as the driver for this concentration is the immobile strategic asset (resource) (Krugman, 1991).

Transfer of knowledge may be low in Resource Dependent Concentrations as a result of limited wage opportunities. Therefore, the pool of available workers may not be adequate to satisfy the needs of the concentration.

As with Concentrations of Local Industry Clusters, innovation will be low in Resource Dependent Concentrations because of limited opportunities for new entrants. The immobile resource is generally limited in capacity, and accordingly, other than technological advances, productivity growth is not likely.

As the immobile resource is the center of this type of concentration, there should be higher levels of specialization than those found in Concentrations of Local Industry Clusters. The organizations and businesses that operate in Resource Dependent Concentrations do so because of opportunities provided by the immobile resource. In Resource Dependent Concentrations, complementariness should be high because of the need for resources and organizations that are related or tied to the immobile resource.

In summary, Resource Dependent Concentration infrastructures focus on the transport of products from immobile resources to geographically distant locations. Accordingly these concentrations should be focused on characteristics of efficiency-seeking.

Traded Industry Concentrations

As this concentration demonstrates the ability to acquire outside resources as well as move products or services to the end user in a timely and cost efficient manner, it will be referred to as a Traded Industry Concentration. Accordingly, infrastructure should be more developed and exhibit greater capacity than those of previously discussed concentrations.

Traded Industry Concentrations seek efficiencies through gains in transfer of knowledge (Kalnins & Chung, 2005). Organizations tend to locate in these concentrations because of the potential gains in efficiency from transfer of knowledge. As such, labor mobility at minimum should be average and wage opportunity should be high.

Traded Industry Concentrations create opportunities to innovate because organizations are looking for efficiency gain through new technologies. Members focus on technologies that decrease the amount of time needed or reduce the cost of the inputs or outputs, except when restrained by the demand for capital investment.

Specialization should be high in this type of concentration because members locate near firms within the same industry in order to seek efficiencies. Organizations within Traded Industry Concentrations make location decisions because of competition consideration such as available labor pool (Porter, 2003). Traded Industry Concentrations bring needed resources from outside of the geographic area, as well as provide products and services.

As requirements for resources, products and services develop there may be cost advantages in meeting such requirements outside of the geographic area. Accordingly, these concentrations should exhibit some level of complementariness locally.

In summation, Traded Industry Concentrations focus on characteristics of efficiency-seeking. As such, the physical infrastructure serving Traded Industry Concentrations most likely will evolve to facilitate efficiency-seeking.

Government Anchored Concentrations

In this set of circumstances, the concentration is the result of a governmental entity such as a military base or research facility that is built in the area by the state or federal government. These concentrations are similar to Resource Dependent Concentrations in that if the government were to relocate or cease operations, such as recent U.S. military base closings, the surrounding clusters would dissipate or re-locate to another area.

Transfer of Knowledge should be average once operational performance has been achieved. Government Anchored Concentrations should demonstrate at least average labor mobility and wage opportunity.

This type of concentration most likely provides limited opportunity for associated industry to enter into the geographic area. Accordingly, productivity will most likely be limited in potential growth and therefore, innovation may be low to average.

The government entity will have little to no competition within the immediate geographic area. Therefore the environment should not be conducive to specialization in Government Anchored Concentrations. Most of the needed products will most likely be imported from outside of the geographic area for local consumption therefore the need for complementary resources should be low.

In summation, Government Anchored Concentrations are the result of a government investment decision to physically locate resources to a specific geographic area. As such, the physical infrastructure will be built to satisfy the requirement of the government entity, and to fulfill the needs of the workers. Surrounding organizations and businesses are dependent upon continuing operations of the government entity. This type of concentration is effectiveness-seeking in that the concern is most likely focused on the capabilities to perform.

Balanced Concentrations

This concentration type is the result of the realization that the previously discussed types of concentrations that exist will in some cases lead to highly developed areas of combinations of cluster concentrations. As a result of the combination of the other concentration types, the Balanced Concentration should provide many opportunities for new and existing organizations. Balanced Concentrations facilitate making investment decisions for upgrading and maintaining infrastructure.

The Balanced Concentration should demonstrate low to average levels of labor mobility as well as employment growth. Further, wage levels should be average or higher in these concentrations.

These types of concentrations create an environment that is conducive to the entrance of new firms and rewards higher levels of productivity. Accordingly innovation in Balanced Concentrations should be high.

Balanced Concentrations should foster an environment conducive to cooperation and competition. Balanced Concentrations most likely require a variety of products and services. As a result, specialization should be high. Balanced Concentrations should also attract providers of complementary resources to the area. This attraction should result in above average levels of complementariness.

The geographic area should become more attractive to new entrants as well as continue to be viewed as attractive by existing members. The attractiveness to the area, coupled with new investment opportunities, should provide impetus for favorable and on going infrastructure improvements. Balanced Concentrations should seek parity between efficiency-seeking and effectiveness-seeking as previously identified in the discussion of the cluster concentration dynamic cycle.

APPENDIX C

DESCRIPTION OF EXEMPLAR COUNTIES

Appendix C Description of Exemplar Counties

County 1

This county was founded in 1643 (NACO, 2006). This county has more jobs available, 630,449 than available labor of 565,141. This county is characterized by high levels of service related businesses. In 2002 services accounted for over 83 percent of the business in the county. Resource dependent businesses account for a small portion of total business, with manufacturing accounting for approximately 5 percent. Government entities accounted for over 11 percent of which over 80 percent of the 11 percent was from state and local governments. Physical infrastructure was funded at $2,189 per person, service delivery system infrastructure at $1,879 per person and quality of life infrastructure at $1,601 per person.

County 2

This county was founded in 1865, according to NACO (2006). In 2002 over 58 percent of the business conducted within this county was within service related industries. There were no resource dependent industries and only a small portion of business was conducted within manufacturing. In addition, over 32 percent of business was conducted with government entities. Expenditures within the county by state and local governments exceed 64 percent of the 32 percent total. This county exhibited the characteristic of having 5,624 jobs within the county in 2002 and available labor for the same year at 5,844. Most of the service jobs in the county were in the fields of education and health, supporting the concept that the focus of infrastructure will be on quality of life. In the county, the majority of funding is focused on quality of life infrastructure with spending in 2002 at $2,650 per person. Physical infrastructure was funded at $1,032 per person and service delivery infrastructure was funded at $462 per person. Manufacturing accounted for less than 2.5 percent of business within the county and was limited to nondurable products that are consumed locally.

County 3

This county was established in 1820 (NACO, 2006). In 2002, manufacturing accounted for in excess of 61 percent of the business done by the county. There were virtually no resource dependent business activities and government accounted for less than 8.5 percent of total business. Of this 8.5 percent of government spending, over 94 percent was from state and local governments. There were approximately 20 percent more laborers available than jobs. Over 17 percent of business was accounted for in services for this county. In addition, in 2002 physical infrastructure was funded at $1,706 per person, service delivery system infrastructure at $749 per person and quality of life infrastructure at $39 per person.

County 4

This county was founded in 1847 (NACO, 2006). In 2002 over 61 percent of the business conducted in the county was in the mining industry (BEA, 2006). Non-mining manufacturing accounted for less than 1 percent of the business conducted within the county and was made up of goods consumed locally. In addition, government accounted for over 15 percent of business within the county with 87 percent of the 15 percent being from state and local governments. Services within this county accounted for over 18 percent of business. Interestingly, the number of jobs in 2002 was 9,559 which almost equaled the 9,615 workers available in the labor force. The focus on infrastructure was on the ability to transport and warehouse the counties mining products, which means the focus would have been on physical and service delivery infrastructure to accommodate the immobile nature of the resource tied to this mining county. Very little was spent on quality of life infrastructure. In this county, physical infrastructure in 2002 was funded at $1,232 per person, service delivery infrastructure at $1,059 per person and quality of life infrastructure was funded at $13 per person.

County 5

In 1869 the federal government established an army installation and the county was built around the government facility. In 2002, for an available labor force of 86,873 people there were 54,971 jobs in the county. Over 60 percent of the business in this county is the result of the government entity with over 75 percent of the government business coming from the federal level. There were no resource dependent clusters and approximately 11 percent of the business was a result of manufacturing. Services accounted for over 26 percent of the business in the county. Physical infrastructure was funded at $950 per person, service delivery system infrastructure at $51 per person and quality of life infrastructure at $773 per person.

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BIOGRAPHICAL INFORMATION

Pamela J. Zelbst, born in Portland, Oregon on November 22nd, 1957, grew up in various locations primarily between Northern California and Oklahoma before graduating from Lawton High School in Lawton, Oklahoma in 1975 at age seventeen. She attended Cameron University in Lawton, Oklahoma from 1979-1980. She then relocated to Europe for two years and upon returning to the United States successfully entered into private business and community service until returning to her studies at the University of Central Oklahoma from 1993-1994. Business opportunities brought her to Houston, Texas where she continued her education at Sam Houston State University (S.H.S.U.), completing a Bachelors of Business Administration and graduating Magna Cum Laude in 1997. Other honors included induction as a charter member of the S.H.S.U. chapter of Beta Gamma Sigma as well as the National Golden Key Honor Society. Immediately upon completing her undergraduate degree, she was accepted into graduate school at S.H.S.U. earning her Masters of Business Administration in 1998. In 2002, she began work on her Ph.D. at the University of Texas @ Arlington where her major focus is in Operations Management and her minor focus is Strategy. While at the University of Texas @ Arlington, extra-curricular activities included serving as president of the Ph.D. Business Student's Society.