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A Factor Analysis Methodology for Analyzing the Factors that Contribute to Economic Development in the state of Tennessee

Archana Niranjan
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Archana Niranjan entitled "A Factor Analysis Methodology for Analyzing the Factors that Contribute to Economic Development in the state of Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Industrial Engineering.

Dr. Adedeji B. Badiru, Major Professor

We have read this thesis and recommend its acceptance:

Dr. Don McDaniel, Dr. Denise Jackson

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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A FACTOR ANALYSIS METHODOLOGY FOR ANALYZING THE FACTORS THAT CONTRIBUTE TO ECONOMIC DEVELOPMENT IN THE STATE OF TENNESSEE

A thesis

presented for the

Master of Science Degree

The University of Tennessee, Knoxville

Archana Niranjan

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Abstract

Tennessee has been gifted with a good geographic location in Southeastern part of America and with abundant natural resources ready to be harnessed. Big companies such as Fedex, Saturn, etc. have their bases set up in Tennessee since it is accessible by rail, road and air and also because the cost of transportation is very competitive. In spite of the significant advantages, Tennessee has suffered and lost many big companies to neighboring states.

Understanding the factors that have shaped the industry's growth is relevant and quintessential to the design, planning and implementation of policies that support sustainability on a long-term basis for Economic Development of Tennessee.

This research is mainly focused on identifying the reasons or factors that help in

a) Attracting companies to Tennessee
b) Sustaining the existing companies in Tennessee.

The research takes us a step ahead by grouping the factors into common factors by using a new pathfinder statistical technique, unique to this type of research that will simplify the task of handling the many factors that influence the corporate decision process. The statistical analysis is further supported with specific discussions of the ideas provided by current industries and Economic Development boards that are located in the State of Tennessee and are focused on attracting new businesses into the state.

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Chapter 1

Introduction

Economic Development is quintessential for a region to grow and prosper. There are various critical factors that are associated with Economic Development. This proposed research provides the first formal analytical study of the factors that affect local industrial development in a long-lasting sustainable research framework.

Since Tennessee is located in the Southeastern part of USA, it enjoys many geographic, financial and regulatory advantages. In spite of these advantages, Tennessee has not had significant growth in many years. Though the focus for many years has been on Economic Development, a systematic methodology has not been developed to help facilitate economic growth. This research addresses this issue and a methodology is demonstrated to tackle this problem. Developing an Economic Development survey, sending the designed surveys based on the factors to industries and Chambers of Commerce all over Tennessee and analyzing the results have validated the methodology.

In addition, a detailed analysis has been documented for future use in expanding upon this research.

The statistical tool used in this research, Factor Analysis, is uniquely applied to this economic endeavor as the basis for the methodology. Factor analysis has not been previously applied in this area and the aim of this thesis is to demonstrate the viability of the tool in this arena and also to draw attention to the various applications of Factor Analysis in a number of similar explanatory research fields. This research opens the doors to exploiting Factor Analysis as a tool for use in the field of Economic Development.

The focus of the thesis is:

1) To show Factor Analysis is a viable tool for use in economic development research
2) To develop the methodology for the use of Factor Analysis
3) To develop and conduct a state wide survey and analyze the results using Factor Analysis to verify that the tool can be applied and finally produce meaningful results
4) To document the methodology for further use in the field of Economic Development or for other fields of study

1.1 Background

Historically, Tennessee has neglected some of the critical issues that have a negative effect on attracting new businesses. These issues include:

1) Reducing tax
2) Developing a better school system
3) Aiming to reduce brain-drain from the state
4) Paying special attention to growing competition from neighboring states
5) Improving the road, air, rail and water transportation within the state, etc.

Though Tennessee has focused on improving the economic state of affairs, there have not been significant reports of progress. Economic Development boards have been trying to work towards making Tennessee an ideal place for businesses to be set up but they have had limited success. A note-worthy exception is Blount county Economic Development

board. Blount county has succeeded in bringing businesses to Tennessee through its innovative and skilful endeavors to attract businesses to Tennessee.

1.2 Problem Statement

The widespread problem of developing industries in Tennessee continues to be a nagging problem for state and local government officials and business professionals. This is a problem that has long been recognized and widely reported [9, 10, 11, 12, 13, 14], but has not been adequately tackled. The approaches to attracting new industries to Tennessee remain largely at the whims of political manipulations as well as unsophisticated business dealings. Experience has shown that such seat-of-the pants approaches do not yield stable and sustainable industrial development. Even though it is well known that industrial development should be the cornerstone of Economic Development in Tennessee, not enough formal studies have been directed to the problem. This research provides the first formal analytical study of the factors that affect local industrial development in a long-lasting sustainable research framework [19].

This thesis highlights the following issues:

I. ***The factors, which are quintessential for industrial development in Tennessee.***
II. ***The impact the identified factors have on the economic development of the region.***

III. ***Grouping of factors under common and smaller categories in order to simplify the analysis and research for future use.***

1.3 Approach

Factor analysis has been chosen as the preferred statistical tool for this rigorous analytical methodology. It will be used to investigate and develop cross-correlation effects of the variables affecting industrial development in Tennessee. Factor analysis has been a tool that has been applied in social sciences for decades [15, 16]. But its use in general explanatory research, such as the type conducted in this thesis, remains largely unexplored. It is anticipated that this research will be a groundbreaking technique for researchers and practitioners in this exploratory research area of interest.

1.4 Challenges

As any research topic, this research has a multitude of challenges that were identified at the onset of the research. The challenges that called for special attention were:

- Selection of core factors and sub factors
- Selection of survey distribution method and the logistics behind it
- Striving for a good sample size from the survey results
- Selecting a statistical method to collect the sub factors into their respective factors from the raw data without losing the sensitivity of the data.

1.5 Summary

Chapter 1 provides an abstract of the research topic and also includes the rationale of the research design and development. Chapter 2 is a more detailed explanation of the research topic background and the literature review. Chapter 3 describes the methodology used to support the research and provides a tutorial on the use of the software for this particular research. Chapter 4 provides the discussion of the analysis of the results from the software. Chapter 5 provides conclusions about the research and also describes how this research can be used in various other fields and how this particular research effort can be expanded for further research and expanded results.

Chapter 2

Literature Review

It is important to consider the current economic condition of Tennessee as paramount to the background for this research. Literature review on the present economic scenario of Tennessee was conducted and was documented in the following pages.

2.1 Basic Facts about Tennessee

Tennessee has been deemed as the "Right to Work State". Some of the perks that Tennessee has to offer are:

- Consistently one of the lowest per capita taxed states in the nation
- No state sales tax on manufacturing equipment for qualified manufacturers
- No sales tax on pollution control equipment
- No sales tax on raw material
- No state property tax
- No property tax on work in progress or finished product inventories
- An investment tax credit of 1%
- A franchise tax jobs credit
- An accelerated depreciation on personal property
- Infrastructure and training grants up to $750,000
- Reduced sales tax on energy fuel and water for qualified manufacturers
- 70% of the U.S. marketplace is within a day's drive
- An excellent transportation network-I-40, I-75, I-81 juncture

- Easy access to nearly 40 major automotive and truck manufacturers and over 500 suppliers in the eastern US
- Readily available and talented workforce
- Customized workforce training
- Building costs 17% below national average
- A competitive, pro-business environment
- A high bandwidth telecommunications infrastructure
- A right-to-work state

Figure 2.1 is a graphic that symbolizes the manufacturing jobs categorization based on durables and non-durables. It is noticeable that the transportation equipment sector averages about 11%, the highest amongst the other sectors [1]. The red sector in the figure is the durable sector and the blue sector is the non-durable sector and can be located at: www.state.tn.us/ecd/pdf/jobdist.pdf

Figure 2.2 shows that the manufacturing employment rate was at its peak from 1994 (538.9) through 1995 [2]. As the graph clearly shows, there is a steep decline in the employment rate and an all-time low in the year 2001 (478.5) and can be located at: http://www.state.tn.us/ecd/pdf/mfgemp10.pdf

Table 2.1 shows the manufacturing growth in the state of Tennessee over a span of ten years. A total of 10,487 projects were taken up in Tennessee, which is inclusive of

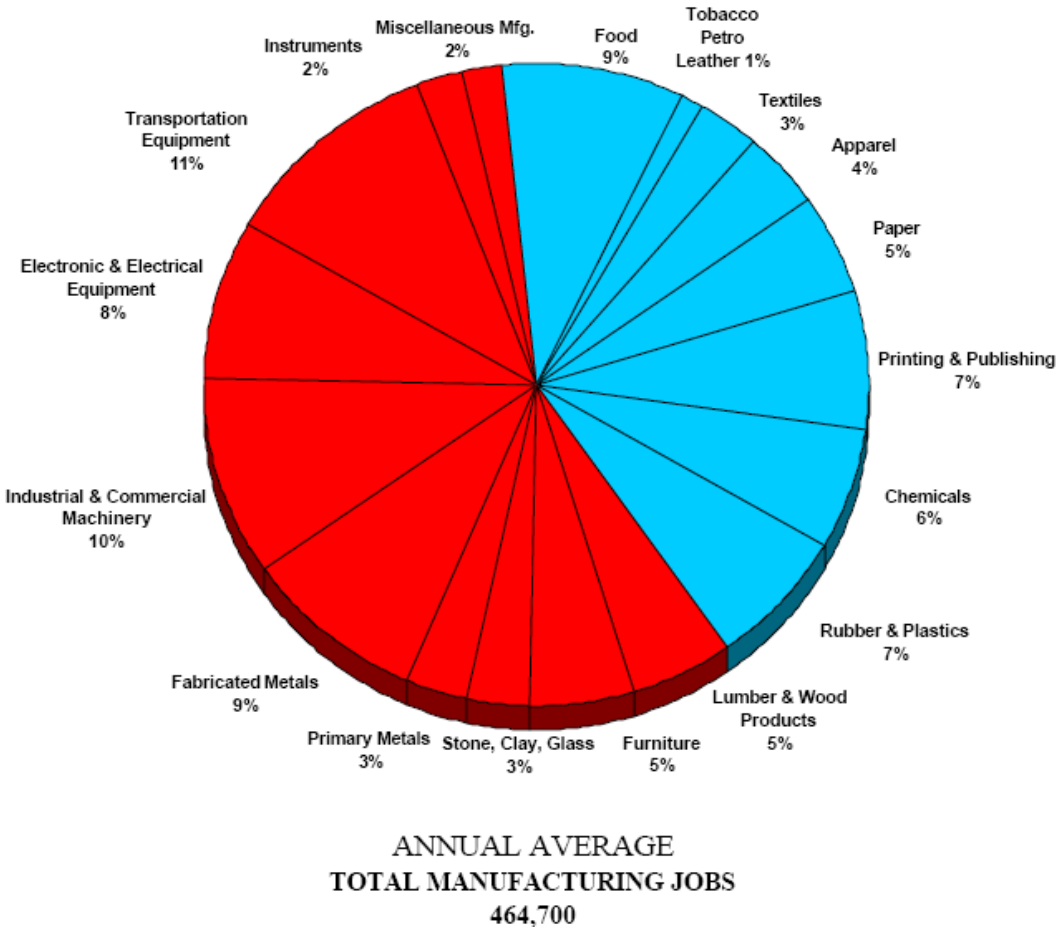


Figure 2.1: Distribution of Manufacturing Jobs Tennessee 2002

Source: Tennessee Department of Economic and Community Development.

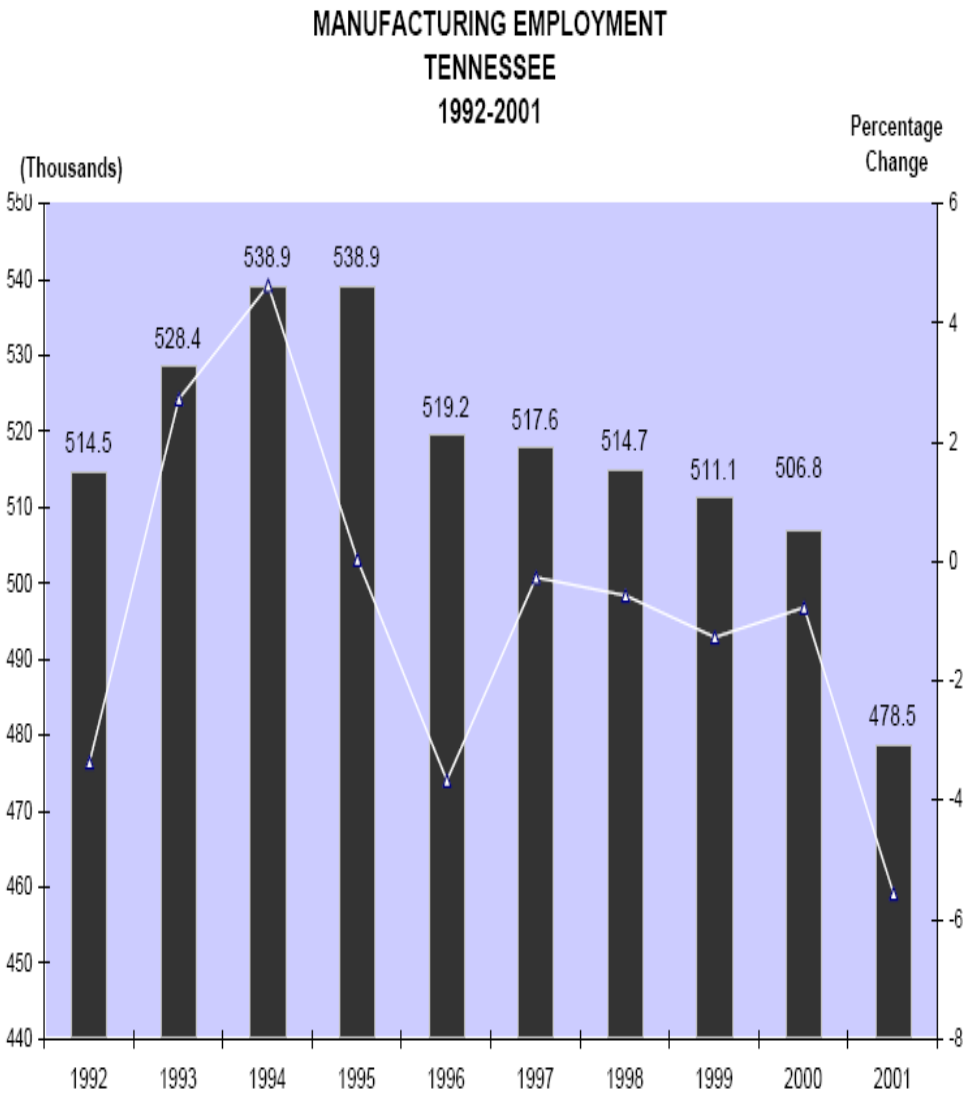


Figure 2.2: Manufacturing Employment Rates in Tennessee from 1992 through 2001

Source: Tennessee Department of Economic and Community Development.

Table 2.1: Ten-Year (1992 – 2001) Manufacturing Growth Report in Tennessee

Type of activity	Projects	Investments ($)	Job opportunities
New plants	738	5,179,036,746	57,842
Expansions	9,749	27,570,916,892	171,554
Total	10,487	32,749,953,638	229,396

new plant projects, and projects generated from existing plants and as the result of which job opportunities were opened up and it summed up to a total of 229,396 jobs.

Figure 2.3 indicates the unemployment rate in Tennessee and USA. We can see that the unemployment rate in TN is considerably less as compared to USA [3]. Service sector has seen the largest number of job openings and the manufacturing sector has seen the lowest job openings and can be located at: www.state.tn.us/labor-wfd/news/auguststate2002.pdf.

There is rapid restructuring of international, national, and state markets. Among the Southeastern states, Tennessee comes in second to North Carolina in its share of manufacturing employment, as related to exports. There is a shift of economy away from manufacturing employment both nationally and within Tennessee.

LABOR FORCE ESTIMATES SUMMARY - TENNESSEE

April 2002 (preliminary) - BM2001

				Unemployment Rate		Rate
Seasonally Adjusted	Labor Force	Employment	Unemployment	Apr.	Mar.	Change
UNITED STATES	142,570,000	133,976,000	8,594,000	6.0 %	5.7 %	0.3 %
TENNESSEE	2,890,300	2,736,600	153,700	5.3	5.7	-0.4
Not Seasonally Adjusted						
UNITED STATES	141,886,000	133,740,000	8,146,000	5.7 %	6.1 %	-0.4 %
TENNESSEE	2,860,200	2,718,000	142,200	5.0	5.7	-0.7

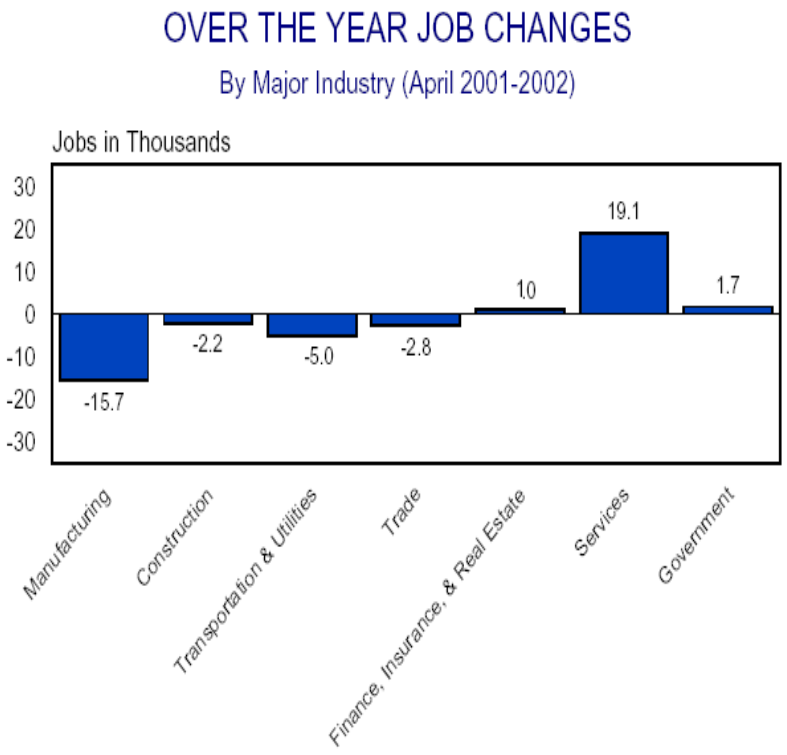


Figure 2.3: Labor Force Estimates and Jobs in Tennessee Based on Sectors

Source: The Tennessee Department of Labor and Workforce Development.

This continues to be a problem for Tennessee because the state has been manufacturing extensive. Also, it is commonly assumed by both regional economists and development specialists that the ultimate impact on the economic vitality of a region is larger when a manufacturing firm enters as opposed to a non-manufacturing firm entering. The reason for this assumption is the belief that a manufacturing firm entry will subsequently attract other non-manufacturing firm entry [25].

Figure 2.4 clearly indicates that the service sector has the highest gross product [5]. The mining sector has the lowest gross product and can be located at: http://www.mtas.utk.edu/Index.html

In the announced investment in manufacturing, headquarters, distribution and selected Services, it was a notable achievement by any standard that 34,000 new jobs were created. In 2000, Tennessee recorded a record $7 billion in private capital investment from new and expanding companies [4].

But 2000 was just the latest in a series of record years for investment. In 1999, the total was $6 billion, up from $5 billion the year before.

The essential nature of Economic Development is the creation of jobs. With this goal in mind, the Economic Development Department's role is to promote a positive business climate, promote tourism, work to retain and expand local businesses, attract new and expanding businesses in high value-added industry sectors, and foster new enterprises around the community's strengths with special emphasis on high technology companies.

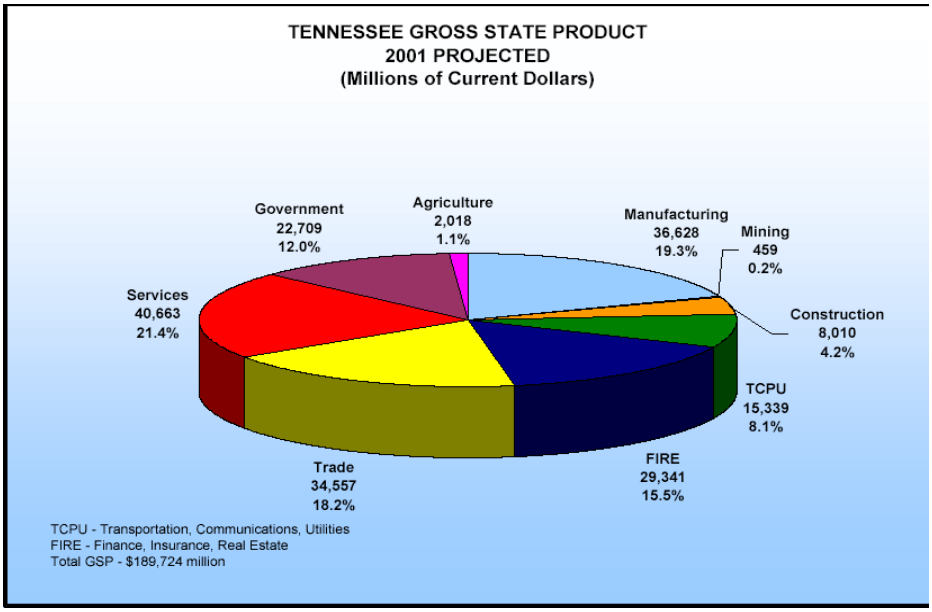


Figure 2.4: Tennessee Gross State Product

Source: Center of Business and Economic Research, UT-Knoxville.

2.1.1 Geographic Graphic viability of Tennessee

Tennessee has been gifted with efficient and convenient forms of transportation, which form an important part towards the state's quality of living. Good roads, public transit, commercial airline service, and access to the many recreational offerings provide residents of Tennessee with opportunities to enjoy work and leisure activities to the fullest.

Bordering eight states in the south central region of the United States, Tennessee is strategically located to facilitate prompt, efficient and economical transportation to the nation's principal markets and population centers. As a major intersection for air, road, rail and waterway transportation, Tennessee offers accessibility to deep-water ports on

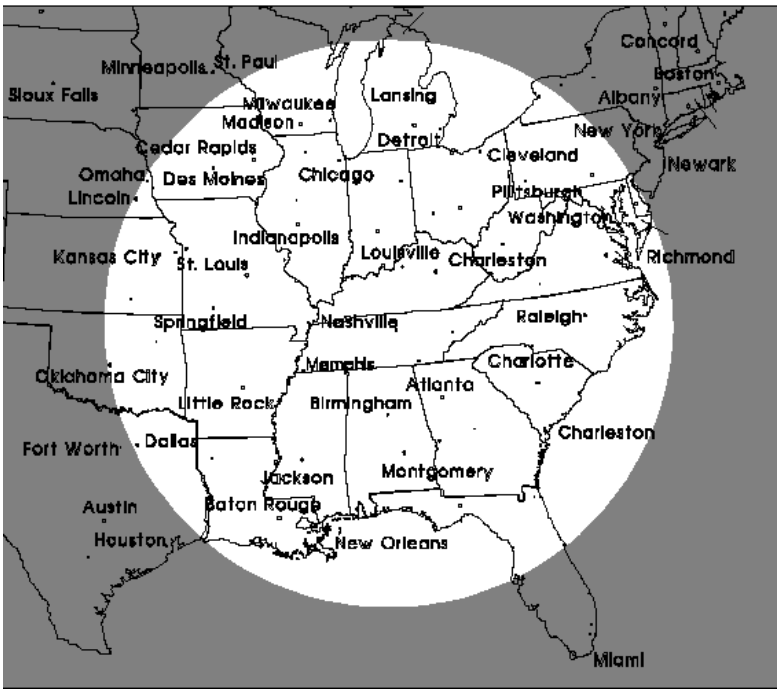


Figure 2.5: Twenty-Four States Fall Within the 500-Mile Radius of Tennessee

Source: Tennessee Department of Economic and Community Service

the Gulf of Mexico and the East Coast, and is a prime location for both domestic and international commerce.

Figure 2.5 shows that Tennessee is the centroid of US transportation system [6]. Firms like FedEx have their hub in Memphis because it is centrally located and can be located at: http://www.state.tn.us/ecd/

The list of states that are within the 500-mile radius is given below.

Alabama	Mississippi
Arkansas	Missouri

Florida	New York
Georgia	North Carolina
Illinois	Ohio
Indiana	Oklahoma
Iowa	Pennsylvania
Kansas	South Carolina
Kentucky	Texas
Louisiana	Virginia
Maryland	West Virginia
Michigan	Wisconsin

2.1.1.1 Air Transport

It is stated in Tennessee Department of Economic and Community Development, official site of Tennessee Economic Development that there are many advantages in the Air, Highway, Rail and Water transport.

General Aviation Airports in Tennessee are recognized as valuable resources for the communities they serve. The airport provides opportunity and options for local businesses, including transportation alternatives to meet their production and inventory requirements. Whether it is Maury County's 24- hour support for Saturn's "Just-in-Time" inventory control or "Next Day Service" for Johnson Controls from Lexington to Detroit, the local airport provides a critical link to national and international commerce. Tennessee communities recognize that to be competitive in today's marketplace, an airport is a necessary resource to service the demands of the business community. The

State of Tennessee works as a partner with local governments, the Federal Aviation Administration and the private sector to ensure that the entire state airport system is structured for the future.

2.1.1.2 Highway Transportation

Tennessee's extensive highway network provides for efficient transport within state boundaries as well as for direct routes to and from major population centers in every part of the United States. The state's strategic location offers the advantages of six different interstate highways, eight interstate spurs around the major metropolitan areas and an excellent system of federal, state and local highways to link every community. Interconnected streets and roads ensure a smooth flow of traffic within each community.

2.1.1.3 Rail Transport

Industries, which require rail transportation, find attractive options in Tennessee. Three major railroads traverse parts of the state: Norfolk-Southern, CSX and the Illinois-Central. Memphis is a gateway for three major railroads that serve points west of the Mississippi River. Fourteen short line railroads serve small communities and rural areas, offering unique advantages for industries seeking locations outside of heavily urbanized areas. The railroads that serve Tennessee provide reliable and innovative service.

2.1.1.4 Water Transport

Tennessee is centrally located on the nation's inland waterway system and enjoys the benefits of more than 1,062 miles of navigable waterways. The Mississippi, Tennessee and Cumberland Rivers and their tributaries supply economical energy-

efficient transportation to almost every community in the state. More than 200 existing Tennessee industries utilize the waterways with their own special purpose terminals. A number of well-equipped general-purpose terminals are also available. Most general-purpose terminals have a variety of equipment for handling cargo of all types and can accommodate the interchange of traffic between barge and rail.

2.1.2 Foreign Investment in TN

Table 2.2 is a graphic representation of the total foreign investment [7] and employment by county till date and can be located at:

http://www.state.tn.us/ecd/pdf/growth/forjul03.pdf

Figure 2.6 clearly indicates that 39,120 Japanese people are employed and this forms the largest group of foreign people employed in Tennessee.

Figure 2.7 is a sector graph indicating the percentage of direct investment by foreign firms in Tennessee and can be located at: http://www.state.tn.us/ecd/idg_forinv.htm [8].

2.2 Globalization of Economic Activity

The globalization of economic activity and the tendency for firms in related lines of business to locate and operate in close physical proximity have become dominant forces shaping Economic Development. Working in close proximity helps smoothen out the logistics problems. Globalization fosters Economic Development of a region and it is of paramount interest to the Economic Development Boards.

Table 2.2: Total Foreign Investment and Employment in Tennessee

Serial Number	**Country**	**Firms Investment $**	**Employment**
1	Australia	7 ,712,572,123	2,394
2	Austria	11, 179,311,000	643
3	Belgium	5, 488,632,158	1,545
4	Canada	61 1,992,111,075	22,890
5	Denmark	2 33,804,502	66
6	England	1,13 3,703,519,073	18,800
7	Finland	9 69,383,000	2,098
8	France	33, 682,412,700	4,165
9	Germany	53 1,560,565,492	9,964
10	Hong Kong	1 5,000,000	15
11	Ireland	1,5 30,902,203	1,240
12	Israel	2 5,000,000	89
13	Italy	15 ,559,326,656	2,490
14	Japan	1,55 8,618,907,307	39,120
15	Korea	6 93,684,015	383
16	Mexico	17 3,536,677	2,378
17	Netherlands	47 440,306,616	6,286
18	Sweden	9, 378,974,845	4,487
19	Switzerland	13, 223,621,547	3,219
20	Taiwan	4 12,286,000	319
21	Thailand	1 5,900,000	252

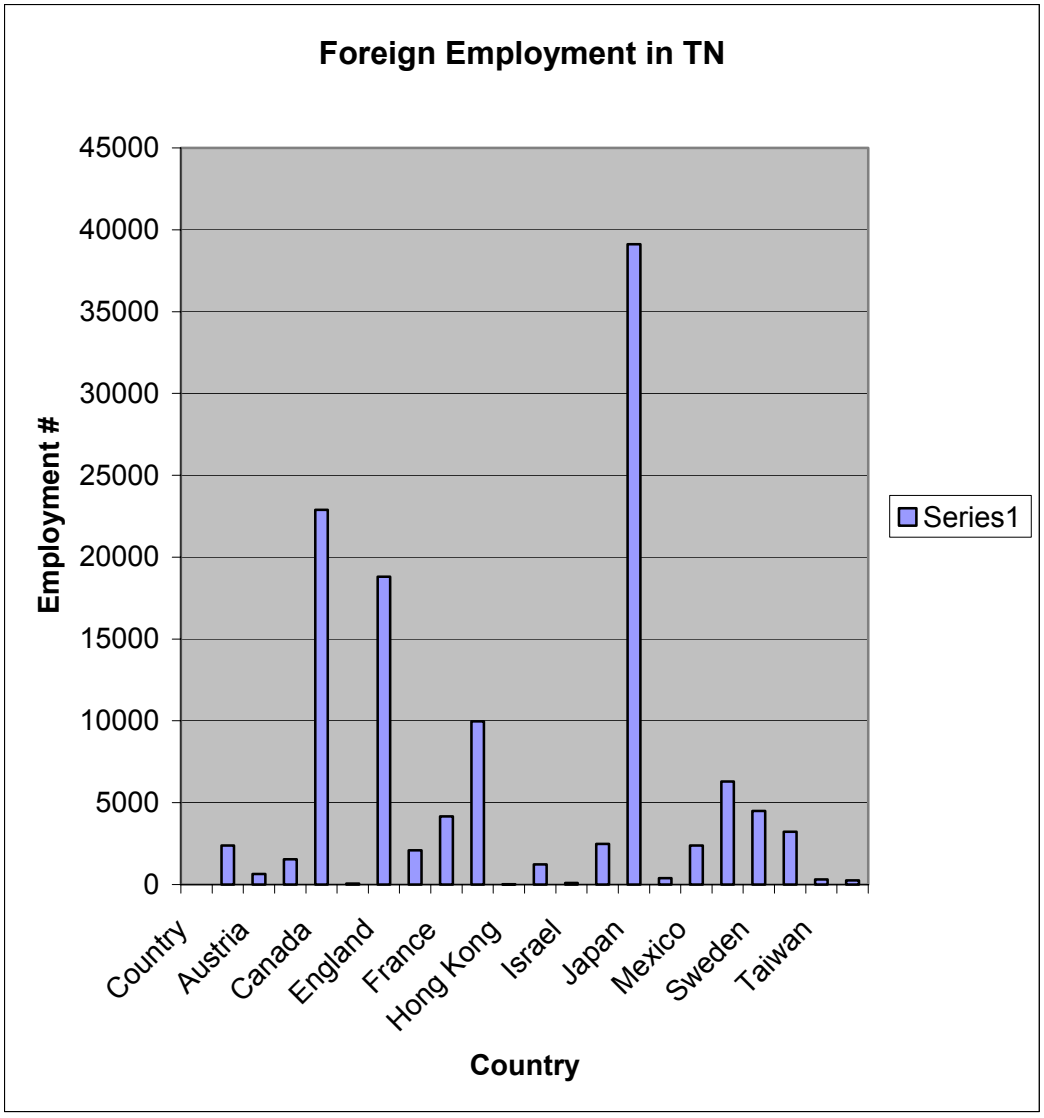


Figure 2.6: Employment of Foreign Nationals in the State of Tennessee

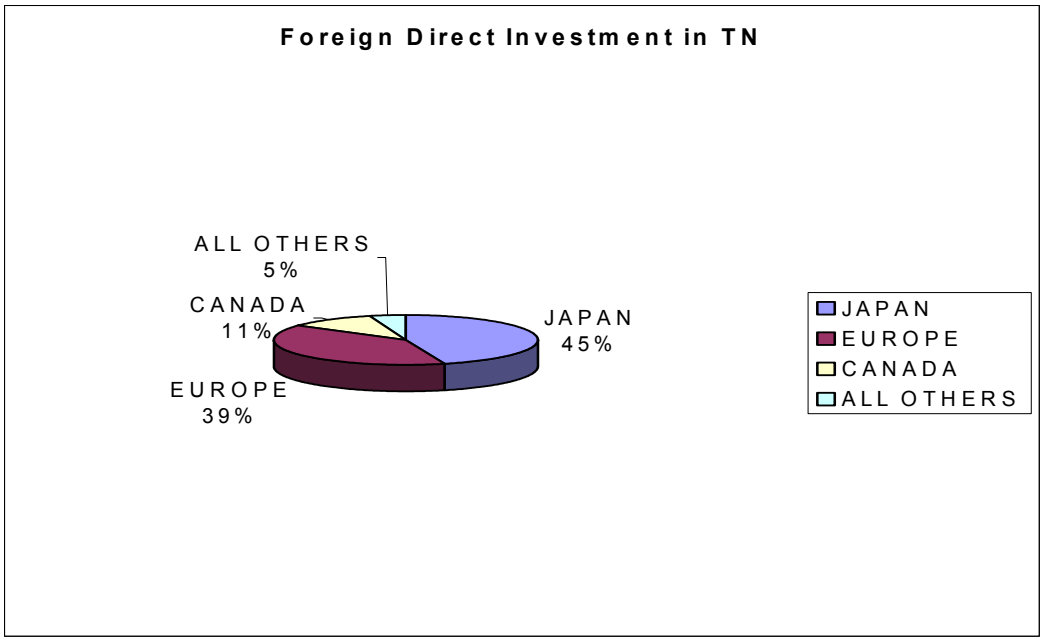


Figure 2.7: Foreign Direct Investment in Tennessee

Source: Tennessee Department of Economic and Community Development

Globalization is shown to be consistent with the localization of competitive advantage in various industries and activities. Increasingly, the need to adjust to global competition, and the examples of prosperous regions whose economies are built on localized groups of firms, have caused local, regional and national governments to turn to policies based on enterprise clusters (a cluster is an agglomeration of firms in a related line of business. A cluster can contain a small or large number of enterprises, as well as small and large firms in different proportions). Indeed, cluster development policies have proliferated in developed and developing economies, in central and peripheral regions, and in nations and regions with disparate philosophies on the role of government in Economic Development.

Another type of globalization involves extensive foreign direct investment to serve foreign markets by end goods or service producers or suppliers of intermediate goods and equipment. Some clusters globalize through simultaneous investments by several components of the cluster. Japanese auto companies, for example, have tended to reproduce their home clusters abroad by encouraging major suppliers to build facilities near their foreign plants, with the lead firms providing the opportunity for suppliers to internationalize [22, 24].

2.2.1 Origin of the Industrial Base

Cluster development programs can focus on the expansion and deepening of the indigenous economic base, on attracting activities of foreign firms, or on a combination of the two.

- Organic cluster strategies seek to broaden and deepen a region's existing economic base by identifying the region's clusters and then trying to promote development by improving information flows, increasing the interaction among local firms, removing infrastructure bottlenecks, developing human resources and fostering inter-firm collaboration. Most of the programs in the United States are in this category.

- Transplant cluster strategies attempt to build clusters by attracting outside companies and developing or attracting suppliers and related firms. Some such strategies resemble traditional enterprise recruitment strategies that have fallen into disrepute, while others use clustering to target activities well suited to the local economy. A refinement is the use of policies associated with cluster development to foster linkages among foreign

investors and local firms. Ireland, Scotland, Wales, Northern England, Malaysia, parts of Mexico, and Singapore, among others, have used this type of strategy

- Hybrid strategies result when organic cluster development programs actively recruit outside investment, or when transplant strategies become successful enough to create a critical mass of locally embedded facilities and firms that can be engaged in more organic programs [23].

2.3 Community Development Grants and Loans Offered for Tennesseans

The state and federal government grant and loan money in millions of dollars for those who come under these various programs and it has proven to be beneficial. Further, these grants and loans have been instrumental in creating new jobs and improving the quality of life [1]. Some of the grants and loans are listed below:

1) Private activity bond allocation
2) Appalachian regional commission
3) Community development block grant
4) Tennessee industrial infrastructure program

2.4 Conclusion

In chapter 2 a detailed scenario of the economic condition in the state of Tennessee is listed. Tennessee's geographic viability and how this factor can influence businesses to locate in Tennessee are also highlighted. Further the grants and such other premium perks offered by the state and local government to businesses is mentioned.

Chapter 3

Methodology

Factor Analysis is the primary analytical tool used in this research. The methodology included:

a) Collecting the data from an intensive survey of 2000 businesses in the state and Chambers of Commerce.

b) Entering the data into the Minitab version of Factor Analysis.

c) Analyzing and validating results.

3.1 Research Design

- A survey was drafted by CIDER, a research group at the Industrial Engineering department of University of Tennessee to suit the Economic Development climate in the state of Tennessee. The biggest challenge was to incorporate all the factors, which contributed towards Economic Development, and then rating the factors based on their importance to the analysis. Another survey was custom made for Economic Development (Chambers of Commerce) boards in TN and this survey incorporated factors that would help industries to establish their base in TN in the future. Further, a single set of rating scales for all responses was set up with a scale range of 1 through 5. 1 being the lowest importance in the scale and 5 being the highest. Refer to the Appendix for the survey on industries and the Chamber of Commerce survey.

- After the factors were selected, a number of dummy runs were conducted on FA using Minitab software. The dummy results were tabulated and determined the actual test to be conducted. This was a very valuable step because of the insight it provided into the types of results that could be expected.
- After the actual data from the survey was obtained, Factor Analysis was run on the survey data. The results were tabulated and analyzed to produce the final results.

3.2 Selection of Sample

The Social Sciences Research Institute at The University of Tennessee, Knoxville (UTK) mailed the survey to over 2000 industries all over TN. The survey was sent to the industries and the Chambers of Commerce in an envelope along with a self-addressed envelope so that the responders could complete the enclosed survey and mail it back. The identity of the responder was kept anonymous if they chose to keep it that way. A follow up letter was sent to the industries that had initially received the survey package in order to remind them and also thank them for their time to help in our research pursuit.

3.3 Instrument Used

The survey's objective was to determine the factors that influence and help industries to locate and expand in the state of Tennessee.

The survey was divided into 4 main parts. They were as follows:

1. Company Information
2. Product/Market Information

3. Location Attributes
4. Location Comparison

The company information section includes the background, statistics and basic investment questions. Product/market information includes details about market share, major customers, availability of raw materials locally, etc. Local attributes section is the major section of the survey. This section provided the data that was statistically analyzed by Factor Analysis using Minitab software. The factors that have been considered for the data analysis were as follows:

1. Market demand for products
2. Access to tangible and intangible resources
3. Access to land and housing
4. Business climate
5. Local taxes
6. Local school systems
7. Utilities
8. Environmental awareness
9. Sports and culture
10. Quality of workforce
11. Transportation infrastructure
12. Government Economic Development policies
13. Others

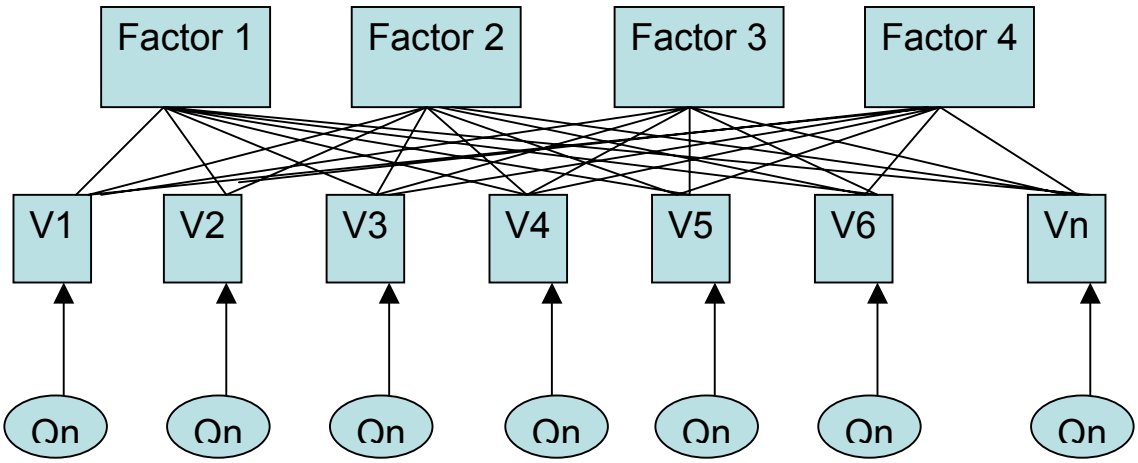


Figure 3.1: Industrial Development Model

3.3.1 Description of the use of Factor Analysis to Analyze the Survey Data

Figure 3.1 is a pictorial description of Factor Analysis. The 'Factor 1, 2, 3 and 4' are the unobserved factors and it represents the output that is procured after the analysis is completely run. V1, V2….Vn denoted the observed factors that had been identified for the thesis which essentially are the 13 factors. Q1, Q2….etc represent the variables questions that are essentially the sub questions under the observed 13 factors.

The questions were designed to account for adequacy, accessibility, importance, and quality of the factors. The sub factors under the main factors are as follows:

1. Market demand for products
    - Access to market for your products
    - Proximity to market for your products
    - Access to marketing and advertising services
2. Access to tangible and intangible resources
    - Access to engineering, research & development facilities

- Access to raw materials/inputs of production
- Access to manufacturing/industrial extension services

3. Access to land and housing
    - Cost of land
    - Availability of land
4. Business climate
    - Availability of financial capital in Tennessee
    - General business climate in Tennessee
    - Quality of life
    - Crime rate
5. Local Taxes
    - State taxes on business and individuals (franchise, excise, sales)
    - Local taxes on businesses (property, sales)
6. Local school systems
    - Quality of higher education and research facilities
    - Quality of technical training schools
    - Availability of continuing education opportunities for employees
7. Utilities
    - Quality of electric power service
    - Access to natural gas
    - Available water supply
    - Availability of high speed telecommunication services

8. Environmental awareness
    - Adequacy of liquid waste disposal
    - Adequacy of solid waste disposal
    - Adequacy of hazardous waste disposal
    - Availability of assistance to meet environmental regulations
9. Sports and culture
    - Availability of places of worship & fellowship
    - Availability of regional foods & restaurants
    - Availability of organized sporting events
10. Quality of workforce
    - Availability of skilled labor
    - Availability of unskilled labor
    - Quality of available workforce
    - Wage rates compared to other potential locations
    - Ability to train workforce to desired level
    - Literacy levels of available workforce
11. Transportation infrastructure
    - Quality & accessibility of interstate highways
    - Quality of state highways
    - Quality of local highways & roads
    - Availability of quality rail services
    - Quality of water transportation services

- Availability & cost of truck & and less than truck load carriers

12. Government economic development policies
    - Local governments policies
    - State government policies
    - Environmental regulations & requirements
    - Right – to – work laws
13. Others

The location comparison section has questions regarding the state government and local government's participation/help in retaining business in Tennessee.

The survey was sent out to more than 2000 companies all over the state of Tennessee. Postal mails were sent out with a self-addressed envelope to maintain the anonymity of the sender and the survey was also posted on CIDER (research group of IE, UTK) website. Over 300 responses were received from industries and Economic Development boards and the data was closely analyzed using factor analysis. The 13 factors are the variables in factor analysis.

3.4 Procedure

The procedure that had to be developed in order to conduct this Factor Analysis is explained in this section. In order to conduct Factor Analysis, the data should fit in a certain category where the data can be used for Factor Analysis.

3.4.1 Introduction to Factor Analysis

Factor analysis is a statistical technique used to identify a relatively small number of underlying dimensions, or factors, which can be used to represent relationships among interrelated variables. The emphasis in factor analysis is the identification of underlying "factors" that might explain the dimensions associated with data variability [18]. *Factor analysis can be best described as a tool to help identify the underlying factors that might explain the dimensions associated in large data variability.*

Factor analysis is not a new method of data analysis. It has been used extensively as a data analytic technique for the better part of the 21st century [21]. It has not been used for this type of exploratory research though Social scientists have used it extensively for examining patterns of interrelationships, data reduction, instrument development, classification and description of data, data transformation, hypothesis testing, exploring relationships in new domains of interest, and mapping construct space [20]. Factor analysis provides a geometrical representation that allows for a visual portrayal of behavioral relationships.

3.4.1.1 Application of Factor Analysis

There are two primary applications of Factor Analysis. They are:

- To reduce the number of variables
- To detect structure in the relationships between variables

3.4.1.2 Types of Factor Analysis:

There are two main types of Factor Analysis. They are:

1. Principal component analysis -- this method provides a *unique solution*, so that the original data can be reconstructed from the results. It looks at the total variance among the variables, so the solution generated will include as many factors as there are variables, although it is unlikely that they will all meet the criteria for retention. Running 11 observed variables in Minitab (statistical software) for factor analysis, a first set of output is procured. This output will have the same number of factors as the number of variables as the input. From the output, reading the variance or the Eigenvalue helps in deciding the number of factors to be extracted.

2. Common factor analysis -- this is what people generally mean when they say "factor analysis" is a family of techniques that uses an estimate of common variance among the original variables to generate the factor solution. Because of this, the number of factors will always be less than the number of original variables. So, choosing the number of factors to keep for further analysis is more problematic using common factor analysis than in principal components. This will help in recognizing the number of variables that are correlated. This step will help in grouping the variables under one or many factors (F1, F2, F3, etc.).

3.4.1.3 Steps in Conducting a Factor Analysis

There are four basic steps that have to be considered for a Factor Analysis experiment. They are:

1) **Data collection and generation of the correlation matrix**

Surveys were sent to industries in East Tennessee. The information obtained through the completed surveys served as the data for analysis. The data was used as an input for Factor analysis.

2) **Extraction of initial factor solution**

From the principal factor analysis, the number of factors that needs to be extracted can be found out. Kaiser and the Scree test help with this factor extraction.

3) **Rotation and interpretation**

After factor extraction, the analysis was run and the factors were inspected from different angles to see if the inference from all of them points to one output. If the rotation outputs vary then it means that the final factors are not consistent for all scenarios.

4) **Construction of scales or factor scores to use in further analyses**

The actual values of individual cases (observations) for the factors can be estimated. These factor scores are particularly useful in making a decision or whether to perform further analysis involving the identified factors.

3.4.1.4 Preparing Data for Factor Analysis

The data has to be in a certain format and it should have certain characteristics in order to use it as an input into Factor Analysis. They are:

- Do not include variables that are believed to be non-related to each other in any way.
- There should be a minimum of three observed variables for the analysis.

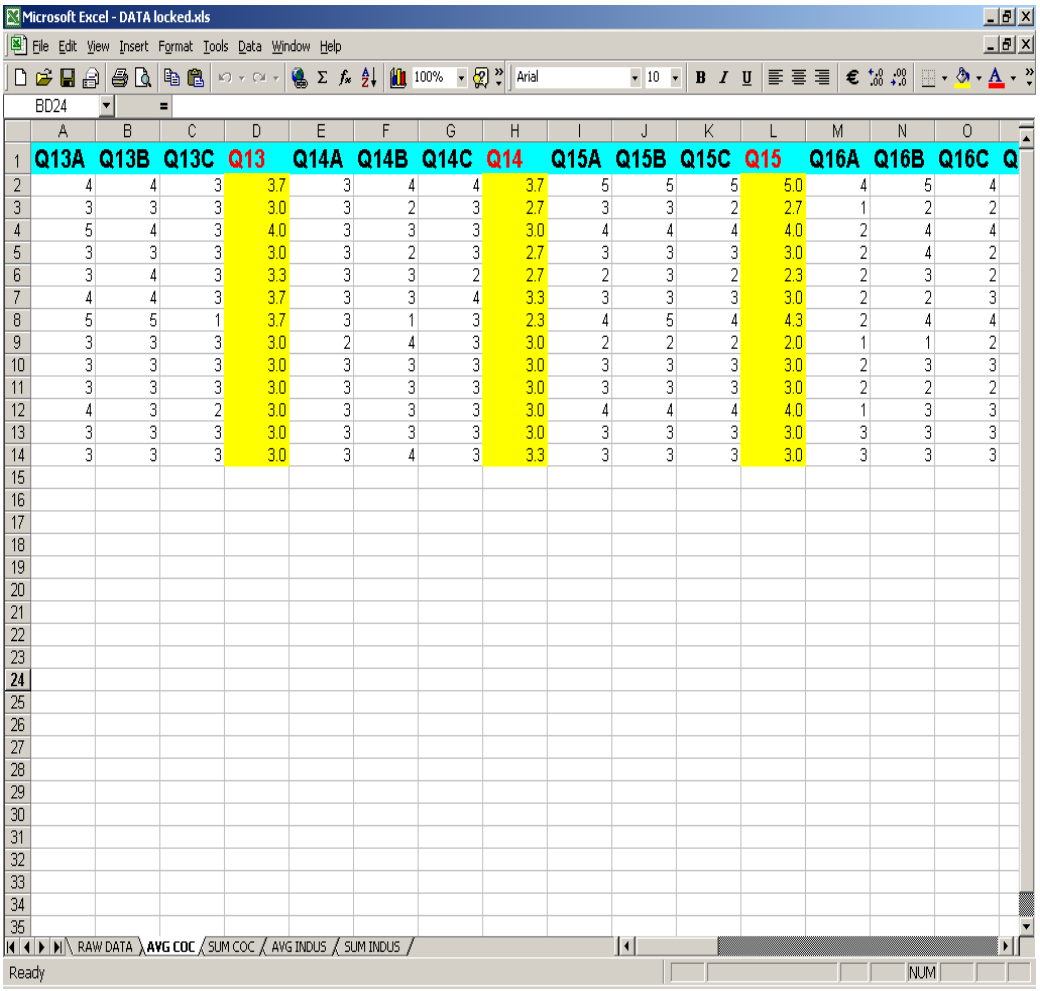
- The number of observations should be sufficient to guarantee a reliable estimation of the correlations between the variables; therefore, at least 50 observations should be considered. However, the more the observations, the more valid the results [17, 18].

3.4.2 Specific Research Methodology

Raw data from the survey was fed into Minitab as input. 13 main questions were identified as shown in Section 3 of the survey that composes sub questions under each of the main questions. The first step was to combine the results from the sub questions into one entry against each question and against each entry made by the industries and Chambers of Commerce. An average value of the raw data after scaling it was used to input into Excel and the results from which were used as the initial input for Minitab analysis. Another challenge was to take care of all the missing (non-entered) data in the survey. An average value of 5 was allocated for all the missing blanks in the survey, which would not influence the results in any way. Figure 3.2 captures a snap shot of the analysis conducted on the Chamber of Commerce data using Excel. For example consider question 13 as shown in the figure above. Further consider the first entry by one of the Chambers of Commerce, i.e., row 2.

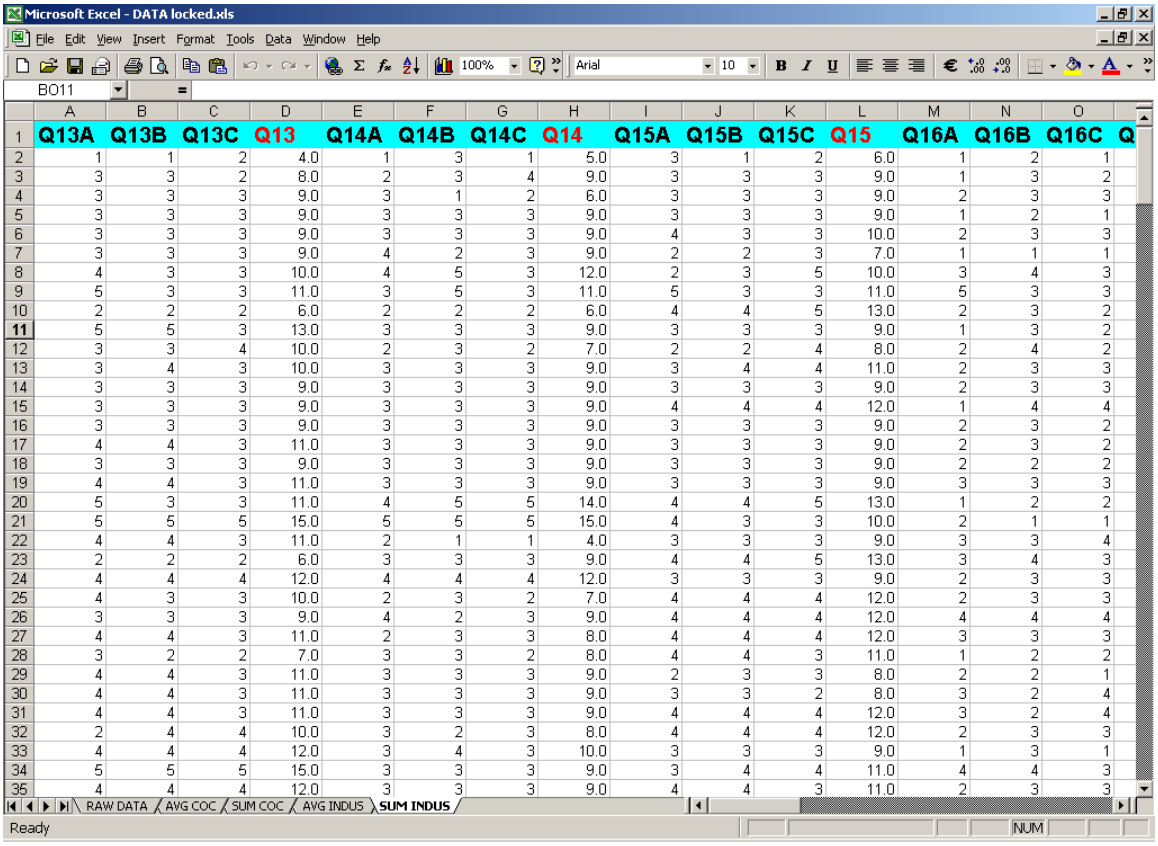
Q13A	**Q13B**	**Q13C**	**COMPUTATION**	**Q13**
4	4	3	AVERAGE (4,4,3)	3.7

The values obtained against each of the entries by Chambers of Commerce and industries were the starting data for Factor Analysis.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Q13A	Q13B	Q13C	Q13	Q14A	Q14B	Q14C	Q14	Q15A	Q15B	Q15C	Q15	Q16A	Q16B	Q16C
2	4	4	3	3.7	3	4	4	3.7	5	5	5	5.0	4	5	4
3	3	3	3	3.0	3	2	3	2.7	3	3	2	2.7	1	2	2
4	5	4	3	4.0	3	3	3	3.0	4	4	4	4.0	2	4	4
5	3	3	3	3.0	3	2	3	2.7	3	3	3	3.0	2	4	2
6	3	4	3	3.3	3	3	2	2.7	2	3	2	2.3	2	3	2
7	4	4	3	3.7	3	3	4	3.3	3	3	3	3.0	2	2	3
8	5	5	1	3.7	3	1	3	2.3	4	5	4	4.3	2	4	4
9	3	3	3	3.0	2	4	3	3.0	2	2	2	2.0	1	1	2
10	3	3	3	3.0	3	3	3	3.0	3	3	3	3.0	2	3	3
11	3	3	3	3.0	3	3	3	3.0	3	3	3	3.0	2	2	2
12	4	3	2	3.0	3	3	3	3.0	4	4	4	4.0	1	3	3
13	3	3	3	3.0	3	3	3	3.0	3	3	3	3.0	3	3	3
14	3	3	3	3.0	3	4	3	3.3	3	3	3	3.0	3	3	3

Figure 3.2: A Snap Shot of the Average Values from Chamber of Commerce Data



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Q13A	Q13B	Q13C	Q13	Q14A	Q14B	Q14C	Q14	Q15A	Q15B	Q15C	Q15	Q16A	Q16B	Q16C
2	1	1	2	4.0	1	3	1	5.0	3	1	2	6.0	1	2	1
3	3	3	2	8.0	2	3	4	9.0	3	3	3	9.0	1	3	2
4	3	3	3	9.0	3	1	2	6.0	3	3	3	9.0	2	3	3
5	3	3	3	9.0	3	3	3	9.0	3	3	3	9.0	1	2	1
6	3	3	3	9.0	3	3	3	9.0	4	3	3	10.0	2	3	3
7	3	3	3	9.0	4	2	3	9.0	2	2	3	7.0	1	1	1
8	4	3	3	10.0	4	5	3	12.0	2	3	5	10.0	3	4	3
9	5	3	3	11.0	3	5	3	11.0	5	3	3	11.0	5	3	3
10	2	2	2	6.0	2	2	2	6.0	4	4	5	13.0	2	3	2
11	5	5	3	13.0	3	3	3	9.0	3	3	3	9.0	1	3	2
12	3	3	4	10.0	2	3	2	7.0	2	2	4	8.0	2	4	2
13	3	4	3	10.0	3	3	3	9.0	3	4	4	11.0	2	3	3
14	3	3	3	9.0	3	3	3	9.0	3	3	3	9.0	2	3	3
15	3	3	3	9.0	3	3	3	9.0	4	4	4	12.0	1	4	4
16	3	3	3	9.0	3	3	3	9.0	3	3	3	9.0	2	3	2
17	4	4	3	11.0	3	3	3	9.0	3	3	3	9.0	2	3	2
18	3	3	3	9.0	3	3	3	9.0	3	3	3	9.0	2	2	2
19	4	4	3	11.0	3	3	3	9.0	3	3	3	9.0	3	3	3
20	5	3	3	11.0	4	5	5	14.0	4	4	5	13.0	1	2	2
21	5	5	5	15.0	5	5	5	15.0	4	3	3	10.0	2	1	1
22	4	4	3	11.0	2	1	1	4.0	3	3	3	9.0	3	3	4
23	2	2	2	6.0	3	3	3	9.0	4	4	5	13.0	3	4	3
24	4	4	4	12.0	4	4	4	12.0	3	3	3	9.0	2	3	3
25	4	3	3	10.0	2	3	2	7.0	4	4	4	12.0	2	3	3
26	3	3	3	9.0	4	2	3	9.0	4	4	4	12.0	4	4	4
27	4	4	3	11.0	2	3	3	8.0	4	4	4	12.0	3	3	3
28	3	2	2	7.0	3	3	2	8.0	4	4	3	11.0	1	2	2
29	4	4	3	11.0	3	3	3	9.0	2	3	3	8.0	2	2	1
30	4	4	3	11.0	3	3	3	9.0	3	3	2	8.0	3	2	4
31	4	4	3	11.0	3	3	3	9.0	4	4	4	12.0	3	2	4
32	2	4	4	10.0	3	2	3	8.0	4	4	4	12.0	2	3	3
33	4	4	4	12.0	3	4	3	10.0	3	3	3	9.0	1	3	1
34	5	5	5	15.0	3	3	3	9.0	3	4	4	11.0	4	4	3
35	4	4	4	12.0	3	3	3	9.0	4	4	3	11.0	2	3	3

Figure 3.3: A Snap Shot of the Average Values from Industry Data

Figure 3.3 captures a snap shot of the analysis conducted on Industry data using Excel.

3.4.2.1 Chamber of Commerce

The value obtained from Excel was used as input values and fed into a typical Minitab Factor Analysis worksheet. The first step was to run a Principal Component analysis on all the variables in our study.

A typical Principal Component analysis selection is shown in the Figure 3.4.

After the Principal Component Analysis is run, Eigen value and Eigen graph are analyzed to aid in selecting the number of factors that have to be extracted as part of the next step.

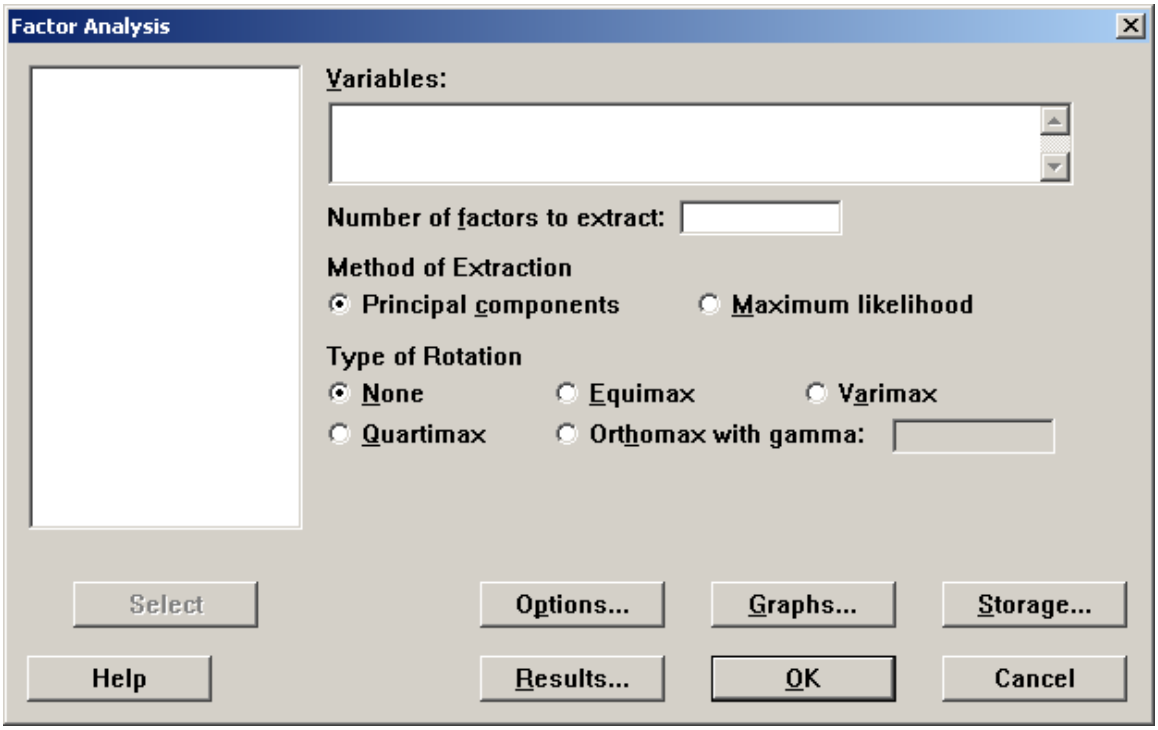


Figure 3.4: Typical Principal Component Analysis

Table 3.1 and Figure 3.5 aid in deciding the number of factors to be extracted. From Table 3.1, it is seen that variable 4 has a variance (Eigen Value) of 1.617 and variable 5 has a variance of 0.942. By rule of thumb in Kaizer extraction, a variance of 1.0 shows that there is considerate variability in the factor and the factors that have variance close to 1.0 should be extracted. Thus, it leads to conducting a 4 and 5 factor extraction. Figure 3.5 is also called an Eigen chart and the method of analyzing the number of extraction is Scree test. The Scree test rule of thumb indicates that importance should be given to the point where the graph levels out. Figure 3.5 indicates that 4 or 5 factors should be considered because the graph levels out after these factors.

Table 3.1: Output 1 from Principal Component Analysis

Variable	Variance	% Variance
Variable 1	4.4890	0.345
Variable 2	2.0177	0.155
Variable 3	1.8561	0.143
Variable 4	1.6175	0.124
Variable 5	0.9429	0.073
Variable 6	0.7138	0.055
Variable 7	0.4721	0.036
Variable 8	0.3935	0.030
Variable 9	0.2641	0.020
Variable 10	0.1871	0.014
Variable 11	0.0301	0.002
Variable 12	0.0158	0.001
Variable 13	0.0000	0.000

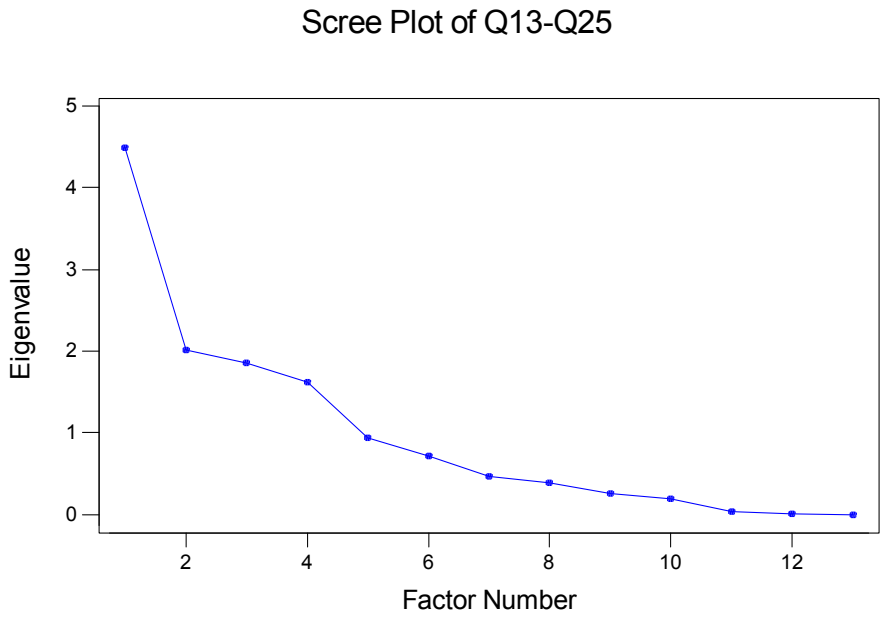


Figure 3.5: Scree Plot 1 from Principal Component Analysis

The Scree test confirmed the decision to go for the 4 and 5 factor extraction. Factor analysis was run for unrotated and 3 types of rotations (Varimax, Equamax and Quartimax) and the results were tabulated as follows.

The unrotated and 3 types of rotations output were analyzed and the variables were categorized under factors based on their maximum absolute value. The individual maximum absolute values were the criteria to place the variables under the different factors. Table 3.2 is the 4-factor extraction method for Chamber of Commerce data. The variables are well distributed and there is consistency in the distribution as well.

Table 3.2: Factor Extraction for Chamber of Commerce

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
4 FACTOR	*FACTOR 1*				
		MARKET DEMAND	MARKET DEMAND	MARKET DEMAND	MARKET DEMAND
				ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES
		BUSINESS CLIMATE	BUSINESS CLIMATE		BUSINESS CLIMATE
			QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	QUALITY OF WORKFORCE
		TRANSPORTATION INFRASTRUCTURES	TRANSPORTATION INFRASTRUCTURES		TRANSPORTATION INFRASTRUCTURES
		GOVT ED POLICIES	GOVT ED POLICIES		GOVT ED POLICIES
		SPORTS & CULTURE	SPORTS & CULTURE	SPORTS & CULTURE	
	FACTOR 2				
		ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING
		QUALITY OF WORKFORCE			SPORTS & CULTURE
		LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	LOCAL SCHOOL SYSTEM

Table 3.2: Factor Extraction for Chamber of Commerce (continued)

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
	FACTOR 3	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES		BUSINESS CLIMATE	
		LOCAL TAXES		TRANSPORTATION INFRASTRUCTURES	LOCAL TAXES
		UTILITIES		GOVT ED POLICIES	UTILITIES
		ENVIRONMENTAL AWARENESS			ENVIRONMENTAL AWARENESS
		OTHERS			OTHERS
	FACTOR 4				
			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ENVIRONMENTAL AWARENESS	
			UTILITIES	UTILITIES	
			LOCAL TAXES	LOCAL TAXES	
			OTHERS	OTHERS	

So, 4 –factor extraction (rotated equamax) is best suited for this analysis. The 5-factor extraction was not consistent and there were factors that did not have any variables placed under them. So, a decision to dismiss 5-factor extraction totally was taken. The highlights in the above table refer to the commonalities in the variables appearing in the same factor in spite of being subjected to different rotations.

3.4.2.2 Industry

Table 3.3 and Figure 3.6 lead to the conclusion that 3 and 4 factor extraction is the most advisable methods of extraction.

From the tables Table 3.4 and Table 3.5, it can be concluded that 4 factor extraction (rotated varimax or rotated equamax) suits the analysis best. The variables are evenly distributed between the four factors and there is consistency in the distribution.

3.5 Conclusion

Chapter 3 describes the use of the methodology that incorporates Factor Analysis as the preferred statistical tool for use in this research. The focus is also on the output after running the data in Factor Analysis. The viability of the model is tested in chapter 3 and it can be concluded that the methodology has been successful because the results obtained from factor analysis hold well with the understanding of the factors and its respective groupings.

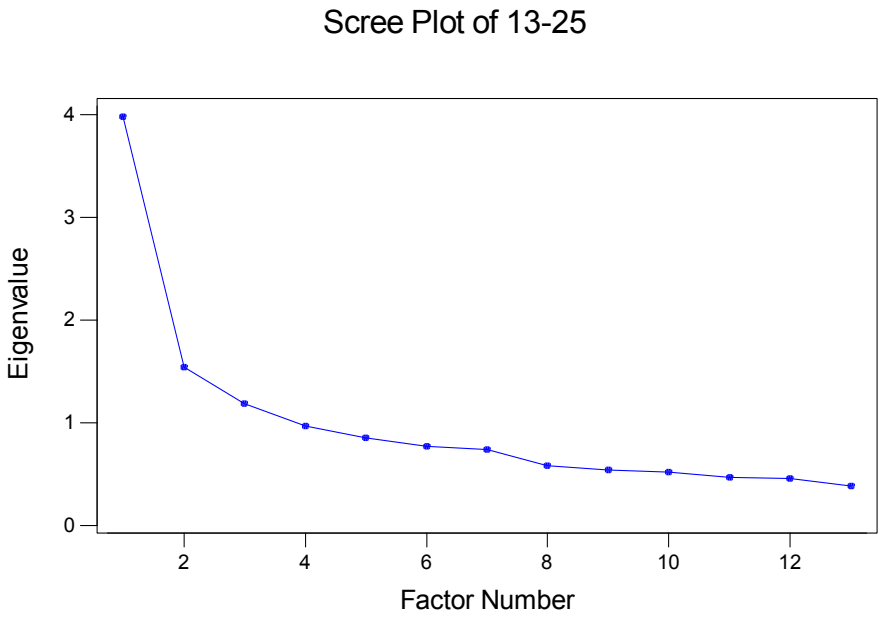


Figure 3.6: Scree Plot 2 from Principal Component Analysis

Table 3.3: Output 2 from Principal Component Analysis

Variable	Variance	% Variance
Variable 1	3.9772	0.306
Variable 2	1.5432	0.119
Variable 3	**1.1859**	**0.091**
Variable 4	**0.9695**	**0.075**
Variable 5	0.8516	0.066
Variable 6	0.7758	0.060
Variable 7	0.7415	0.057
Variable 8	0.5854	0.045
Variable 9	0.5379	0.041
Variable 10	0.5159	0.040
Variable 11	0.4685	0.036
Variable 12	0.4590	0.035
Variable 13	0.3886	0.030

Table 3.4: Three-Factor Extraction

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
3 FACTOR	*FACTOR 1*				
		MARKET DEMAND			
		ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES
		ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	
		QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	
		BUSINESS CLIMATE	BUSINESS CLIMATE	BUSINESS CLIMATE	
		TRANSPORTATION INFRASTRUCTURES			TRANSPORTATION INFRASTRUCTURES
		UTILITIES			UTILITIES
		LOCAL SCHOOLS SYSTEM			LOCAL SCHOOLS SYSTEM
		GOVT ED POLICIES	GOVT ED POLICIES	GOVT ED POLICIES	
		SPORTS & CULTURE			SPORTS & CULTURE
		ENVIRONMENTAL AWARENESS			ENVIRONMENTAL AWARENESS
			LOCAL TAXES	LOCAL TAXES	
	FACTOR 2				
					ACCESS TO LAND & HOUSING

Table 3.4: Three-Factor Extraction (Continued)

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
			MARKET DEMAND	MARKET DEMAND	
			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	
			TRANSPORTATION INFRASTRUCTURES	TRANSPORTATION INFRASTRUCTURES	QUALITY OF WORKFORCE
					BUSINESS CLIMATE
		LOCAL TAXES			LOCAL TAXES
					GOVT ED POLICIES
	FACTOR 3				
					MARKET DEMAND
			UTILITIES	UTILITIES	
			LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	
			SPORTS & CULTURE	SPORTS & CULTURE	
		OTHERS	OTHERS	OTHERS	OTHERS
			ENVIRONMENTAL AWARENESS	ENVIRONMENTAL AWARENESS	

Table 3.5: Four-Factor Extraction

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
4 FACTOR	*FACTOR 1*				
		ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES
		ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	
		QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	
		BUSINESS CLIMATE	BUSINESS CLIMATE	BUSINESS CLIMATE	
		TRANSPORTATION INFRASTRUCTURES			TRANSPORTATION INFRASTRUCTURES
		UTILITIES			UTILITIES
		LOCAL SCHOOLS SYSTEM			LOCAL SCHOOLS SYSTEM
		GOVT ED POLICIES	GOVT ED POLICIES	GOVT ED POLICIES	
		SPORTS & CULTURE			SPORTS & CULTURE
		ENVIRONMENTAL AWARENESS			ENVIRONMENTAL AWARENESS
			LOCAL TAXES	LOCAL TAXES	
	FACTOR 2				
		LOCAL TAXES			
			MARKET DEMAND	MARKET DEMAND	
			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO LAND & HOUSING
			TRANSPORTATION INFRASTRUCTURES	TRANSPORTATION INFRASTRUCTURES	QUALITY OF WORKFORCE

Table 3.5: Four-Factor Extraction (Continued)

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
					BUSINESS CLIMATE
					LOCAL TAXES
					GOVT ED POLICIES
	FACTOR 3				
		MARKET DEMAND			MARKET DEMAND
		OTHERS			
			UTILITIES	UTILITIES	
			LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	
			SPORTS & CULTURE	SPORTS & CULTURE	
	FACTOR 4		OTHERS	OTHERS	OTHERS
			ENVIRONMENTAL AWARENESS	ENVIRONMENTAL AWARENESS	

Chapter 4

Results

The raw data collected from the survey was used as data for Factor Analysis and after the extraction procedures; the results have been tabulated in the following pages. Tables 4.1 and 4.2 represent the factors from the industries.

4.1 Tabulation of Results

From the tables below, it is noticeable that 4-factor extraction (rotated varimax or rotated equamax) suits the analysis best. The variables are evenly distributed between the 4 factors and there is consistency in the distribution.

Table 4.3 is a summary of the factor categorization from the industry data collected through the survey.

The highlighted points in the tables to follow reflect the variables that are seen in the same factor in spite of subjecting it to different types of rotation. This technique helps in identifying the consistency in the grouping, which is essentially the way final results are drafted.

In Table 4.3 under Factor 1, access to land and housing, quality of workforce, business climate, government economic development policies and local taxes have been grouped. These form the intrinsic factors and are the most important factors for businesses. Extrinsic factors in this case are comprised of market demand, access to tangible and intangible resources and transportation infrastructure. Factor 3 is categorized as supporting factor and utilities, local schools system and sports and culture come under

Table 4.1: Three-Factor Extraction for Industries

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
3 FACTOR	*FACTOR 1*				
		MARKET DEMAND			
		ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES
		ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	
		QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	
		BUSINESS CLIMATE	BUSINESS CLIMATE	BUSINESS CLIMATE	
		TRANSPORTATION INFRASTRUCTURES			TRANSPORTATION INFRASTRUCTURES
		UTILITIES			UTILITIES
		LOCAL SCHOOLS SYSTEM			LOCAL SCHOOLS SYSTEM
		GOVT ED POLICIES	GOVT ED POLICIES	GOVT ED POLICIES	
		SPORTS & CULTURE			SPORTS & CULTURE
		ENVIRONMENTAL AWARENESS			ENVIRONMENTAL AWARENESS
			LOCAL TAXES	LOCAL TAXES	
	FACTOR 2				
					ACCESS TO LAND & HOUSING
			MARKET DEMAND	MARKET DEMAND	
			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	
			TRANSPORTATION INFRASTRUCTURES	TRANSPORTATION INFRASTRUCTURES	QUALITY OF WORKFORCE

Table 4.1: Three-Factor Extraction for Industries (Continued)

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
					BUSINESS CLIMATE
		LOCAL TAXES			LOCAL TAXES
					GOVT ED POLICIES
	FACTOR 3				
					MARKET DEMAND
			UTILITIES	UTILITIES	
			LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	
			SPORTS & CULTURE	SPORTS & CULTURE	
		OTHERS	OTHERS	OTHERS	OTHERS
			ENVIRONMENTAL AWARENESS	ENVIRONMENTAL AWARENESS	

Table 4.2: Four-Factor Extraction for Industries

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
4 FACTOR	*FACTOR 1*				
		ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES
		ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	
		QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	
		BUSINESS CLIMATE	BUSINESS CLIMATE	BUSINESS CLIMATE	
		TRANSPORTATION INFRASTRUCTURES			TRANSPORTATION INFRASTRUCTURES
		UTILITIES			UTILITIES
		LOCAL SCHOOLS SYSTEM			LOCAL SCHOOLS SYSTEM
		GOVT ED POLICIES	GOVT ED POLICIES	GOVT ED POLICIES	
		SPORTS & CULTURE			SPORTS & CULTURE
		ENVIRONMENTAL AWARENESS			ENVIRONMENTAL AWARENESS
			LOCAL TAXES	LOCAL TAXES	
	FACTOR 2				
		LOCAL TAXES			
			MARKET DEMAND	MARKET DEMAND	
			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO LAND & HOUSING
			TRANSPORTATION INFRASTRUCTURES	TRANSPORTATION INFRASTRUCTURES	QUALITY OF WORKFORCE
					BUSINESS CLIMATE
					LOCAL TAXES

Table 4.2: Four-Factor Extraction for Industries (Continued)

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
					GOVT ED POLICIES
	FACTOR 3				
		MARKET DEMAND			MARKET DEMAND
		OTHERS			
			UTILITIES	UTILITIES	
			LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	
			SPORTS & CULTURE	SPORTS & CULTURE	
	FACTOR 4		OTHERS	OTHERS	OTHERS
			ENVIRONMENTAL AWARENESS	ENVIRONMENTAL AWARENESS	

Table 4.3: Summary of the Factor Categorization for the Industry Input

FACTOR 1- INTRINSIC FACTOR	FACTOR 2- EXTRINSIC FACTOR	FACTOR 3- SUPPORTING FACTOR	FACTOR 4- MISCELLANEOUS FACTOR
Access to land and housing	**Market demand**	**Utilities**	**Others**
Quality of workforce	**Access to tangible and intangible resources**	**Local schools system**	**Environmental awareness**
Business climate	**Transportation infrastructure**	**Sports and culture**	
Government economic development policies			
Local taxes			

this bracket. It is noticeable that these factors only help or aid in the decision making process but these factors are not the reasons why businesses are located in the region. Miscellaneous factor encompasses environmental awareness and others. These factors are taken into consideration when the decision to locate in a region is already taken.

Table 4.4 is the 4-factor extraction method for Chamber of Commerce data. It can be observed that the variables are well distributed and there is consistency in the distribution as well. So, 4 –factor extraction (rotated equamax) for the analysis is chosen. Table 4.4 leads to the conclusion that 4 factor equamax is the best type of factor extraction and also the best rotation. This is further explained in table format in Table 4.5. Market demand, access to tangible and intangible resources, quality of workforce and sports and culture come under Factor 1. Access to land and housing and local school systems are grouped under Factor 2. Business climate, transportation infrastructure and government economic development policies come under Factor 3 bracket. Environmental awareness, utilities, local taxes and others are grouped under Factor 4

4.2 Inferences

There is a clear difference in the grouping for industry and for that of Chambers of Commerce. The way industry analyzes and foresees a problem is clearly different from the way the chamber of commerce people, who are into Economic Development, view the problem.

Table 4.4: Four-Factor Extraction for Chamber of Commerce

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
4 FACTOR	*FACTOR 1*				
		MARKET DEMAND	MARKET DEMAND	MARKET DEMAND	MARKET DEMAND
				ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES
		BUSINESS CLIMATE	BUSINESS CLIMATE		BUSINESS CLIMATE
			QUALITY OF WORKFORCE	QUALITY OF WORKFORCE	QUALITY OF WORKFORCE
		TRANSPORTATION INFRASTRUCTURES	TRANSPORTATION INFRASTRUCTURES		TRANSPORTATION INFRASTRUCTURES
		GOVT ED POLICIES	GOVT ED POLICIES		GOVT ED POLICIES
		SPORTS & CULTURE	SPORTS & CULTURE	SPORTS & CULTURE	
	FACTOR 2				
		ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING	ACCESS TO LAND & HOUSING
		QUALITY OF WORKFORCE			SPORTS & CULTURE
		LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	LOCAL SCHOOLS SYSTEM	LOCAL SCHOOL SYSTEM
	FACTOR 3				
		ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES		BUSINESS CLIMATE	
		LOCAL TAXES		TRANSPORTATION INFRASTRUCTURES	LOCAL TAXES
		UTILITIES		GOVT ED POLICIES	UTILITIES

Table 4.4: Four-Factor Extraction for Chamber of Commerce (Continued)

EXTRACTED FACTORS	VARIABLES	UNROTATED	ROTATED VARIMAX	ROTATED EQUAMAX	ROTATED QUARTIMAX
		ENVIRONMENTAL AWARENESS			ENVIRONMENTAL AWARENESS
		OTHERS			OTHERS
	FACTOR 4				
			ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	ENVIRONMENTAL AWARENESS	
			UTILITIES	UTILITIES	
			LOCAL TAXES	LOCAL TAXES	
			OTHERS	OTHERS	

Table 4.5: Summary of the Factor Categorization for the Chamber of Commerce Input

FACTOR 1- INTRINSIC FACTOR	FACTOR 2- EXTRINSIC FACTOR	FACTOR 3- SUPPORTING FACTOR	FACTOR 4- MISCELLANEOUS FACTOR
Market demand	**Access to land and housing**	**Business climate**	**Environmental awareness**
Access to tangible and intangible resources	**Local school systems**	**Transportation infrastructure**	**Utilities**
Quality of workforce		**Government economic development policies**	**Local taxes**
Sports and culture			**Others**

In Table 4.6 we can see comparison of the Chamber of Commerce and Industry results. So, it is suggested that the results Chambers of Commerce have to offer is appropriately relative to decisions currently being negotiated for locating in Tennessee. This decision can be substantiated by the following reasons:

1) Chamber of Commerce has more insight into the Economic Development of Tennessee.
2) COC not only considers the factors that have contributed towards the Economic Development but also considers the potential factors that will help improve the current scenario. As the survey indicates two sets of surveys have gone out, one to the industries and one to the Chamber of Commerce. The survey that was sent out to Chamber of Commerce is more current and deals with questions now occurring that help in further Economic Development.

Though, following the factor grouping of COC would be ideal, there is still validity in the groupings as seen from the industry analysis. Therefore, the best approach would be to incorporate ideas from industry analysis into the COC analysis.

4.3 Interpretation of the Written Response Provided through the Survey

In addition to the data that the survey provided, written responses were also obtained from the industries and Chambers of Commerce and the results have been tabulated. The written response helps in future planning of Tennessee and also sheds light on the issues that have to be addressed in future.

Table 4.6: Comparison between Industry and Chamber of Commerce Factors

	INDUSTRY	CHAMBER OF COMMERCE
FACTOR 1	ACCESS TO LAND & HOUSING	MARKET DEMAND
	QUALITY OF WORKFORCE	QUALITY OF WORKFORCE
	BUSINESS CLIMATE	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES
	GOVT ED POLICIES	SPORTS & CULTURE
	LOCAL TAXES	
FACTOR 2	MARKET DEMAND	ACCESS TO LAND & HOUSING
	ACCESS TO TANGIBLE AND INTANGIBLE RESOURCES	LOCAL SCHOOLS SYSTEM
	TRANSPORTATION INFRASTRUCTURES	
FACTOR 3	UTILITIES	BUSINESS CLIMATE
	LOCAL SCHOOLS SYSTEM	TRANSPORTATION INFRASTRUCTURES
	SPORTS & CULTURE	GOVT ED POLICIES
FACTOR 4	OTHERS	OTHERS
	ENVIRONMENTAL AWARENESS	ENVIRONMENTAL AWARENESS
		LOCAL TAXES
		UTILITIES

Figure 4.1 is a graphical representation of the year in which the companies were established. The question is “What year was your company established in Tennessee?”

Figure 4.2 is a graphical interpretation of the question in the survey. The question is “How many employees do you have at your Tennessee site

Figure 4.3 interprets the question in the survey “How would you classify your company?” The reason behind having such a broad classification is because the main interest and focus of the survey was to analyze the manufacturing sector. The service sector is more or less dependent on the manufacturing sector and thereby making it an important classification.

Figure 4.4 is a graphical representation of the question “Since start-up, what is the percentage of additional investment?”

Figure 4.5 is a graphical interpretation to the question “Since start-up, what is the percentage increase/decrease in employment?”

Figure 4.6 is a graphic representation of the importance of state government and local government to the overall business. This graph represents the question “Of what importance are these incentives to your overall business?”

Figure 4.7 represents the question “What percent of your business comes from the following locations?” in the survey. The green color in the graph represents the business from Tennessee, the yellow represents the business from the Southeast, the red represents the business from all over the US and the blue represents International business.

Figure 4.8 is a graphic representation of the question “Is the availability of these raw materials a major consideration to locate to Tennessee?”

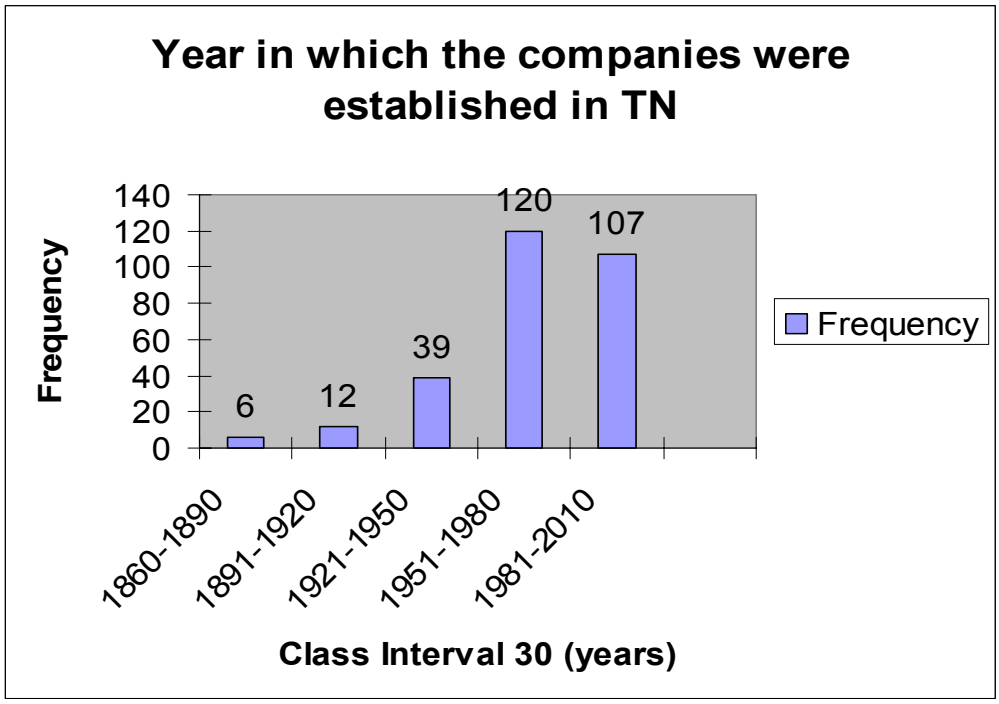


Figure 4.1: Year in Which the Companies Were Established in Tennessee

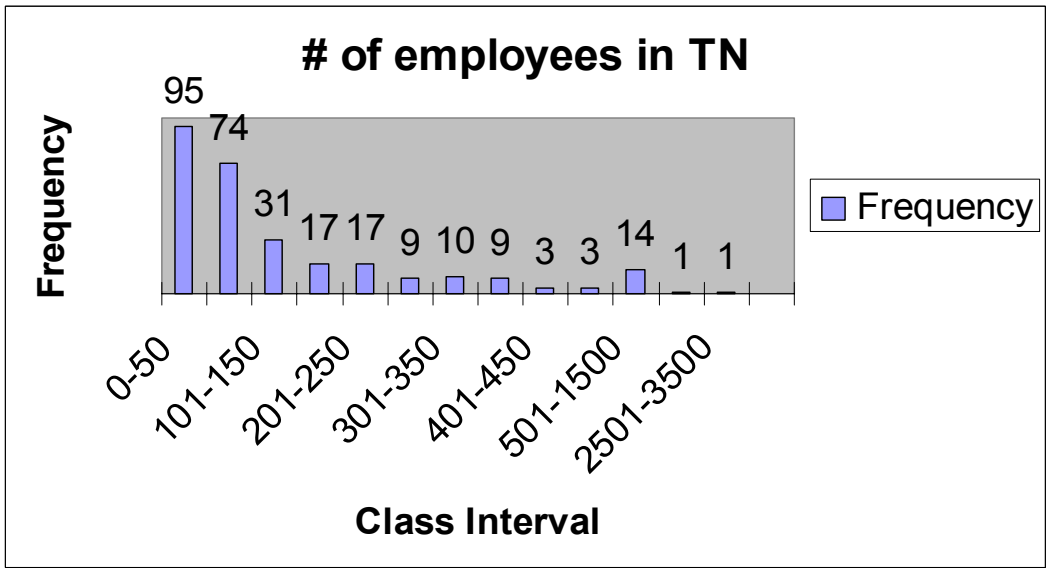


Figure 4.2: Number of Employees in Individual Firms in Tennessee

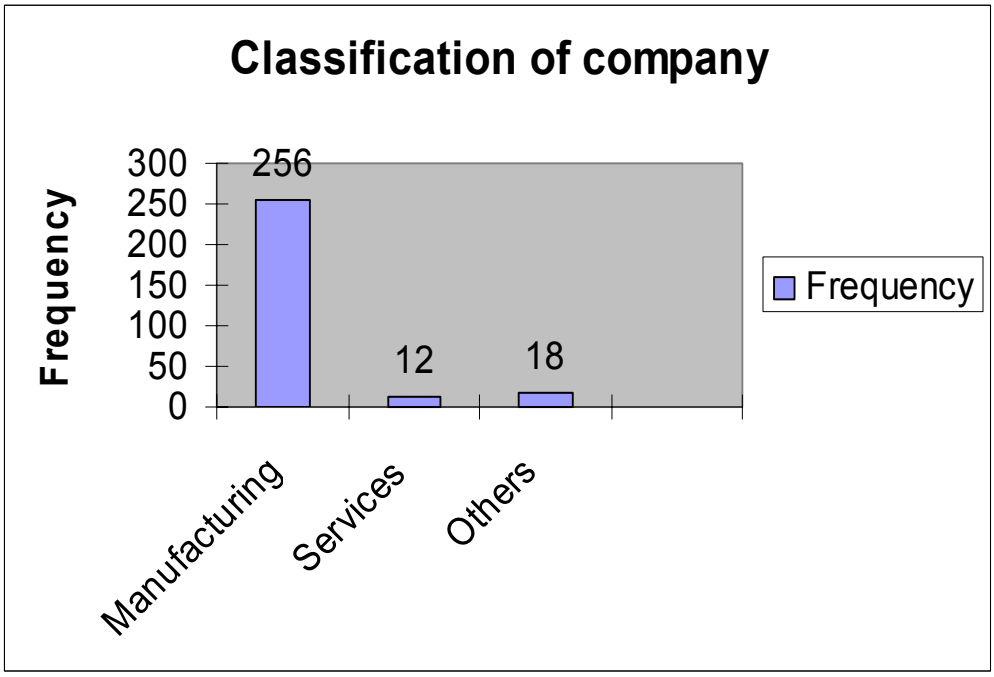


Figure 4.3: Classification of Company into Manufacturing, Services and Others

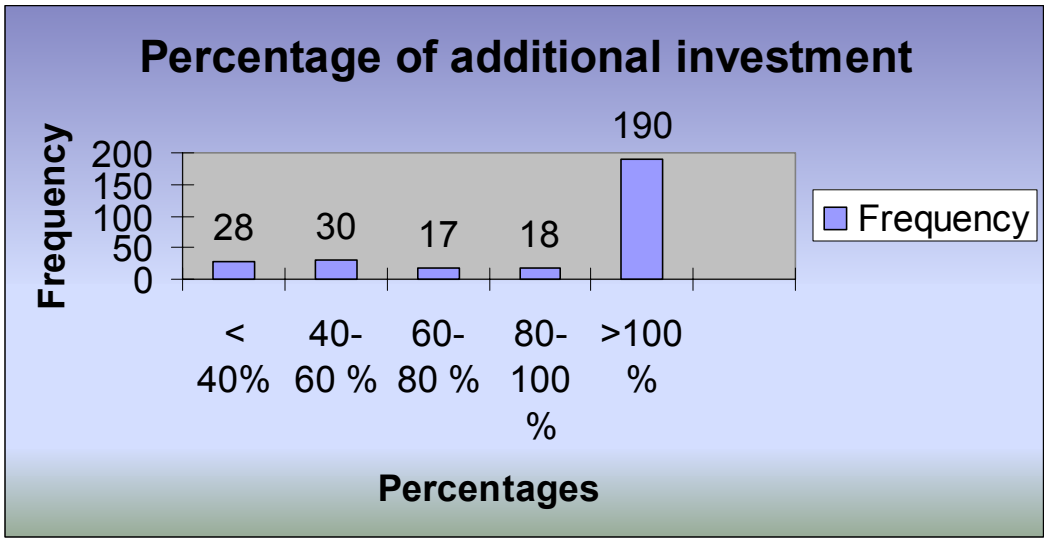


Figure 4.4: Percentage of Additional Investment since Start-up

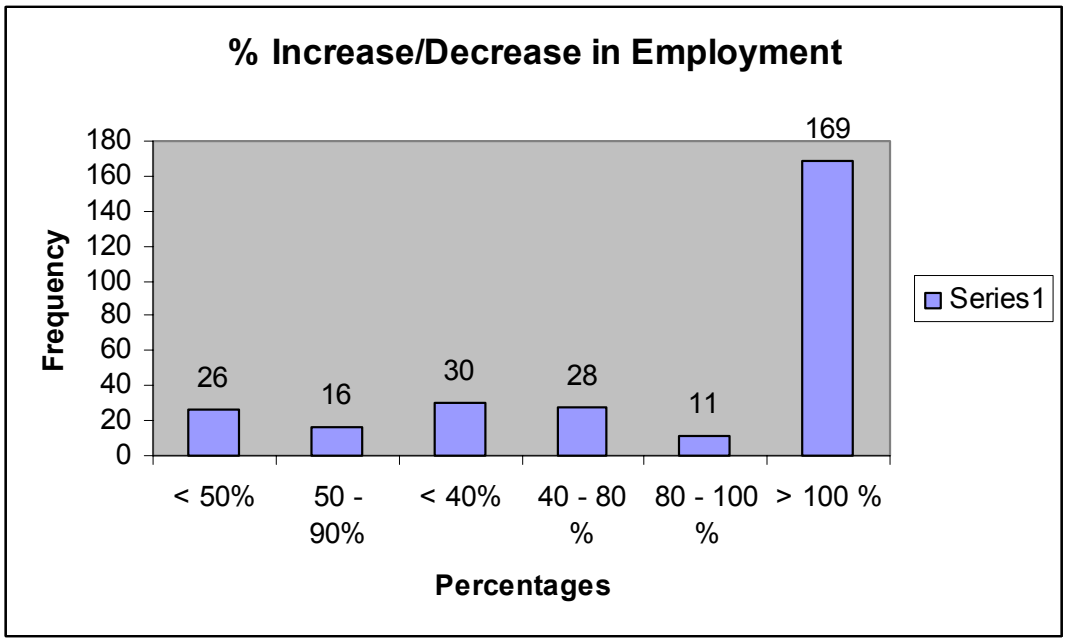


Figure 4.5: Percentage Increase/Decrease in Employment Rate

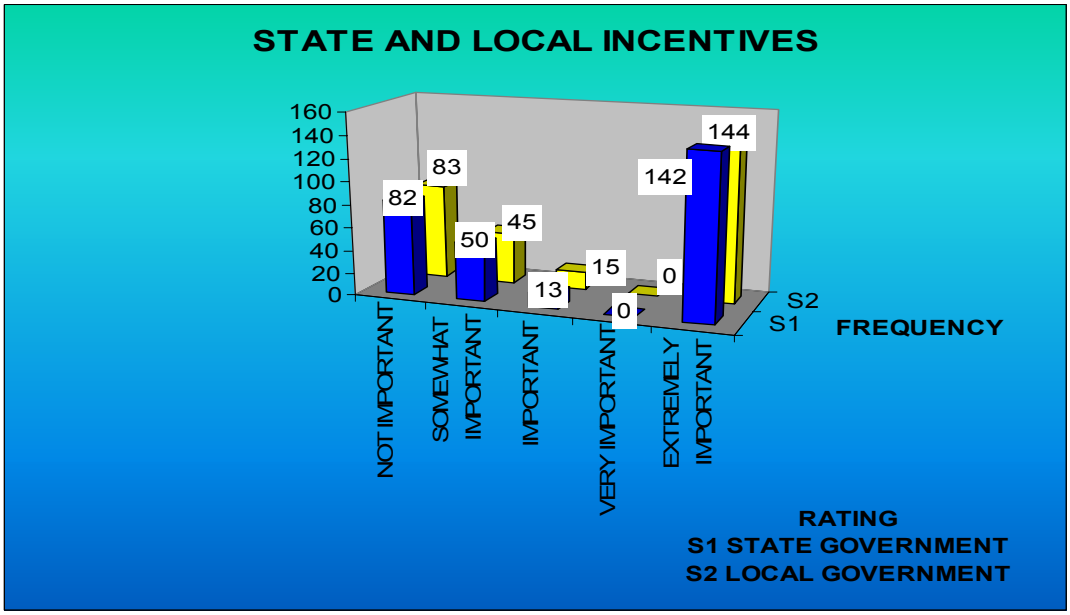


Figure 4.6: Importance of State and Local Government to the Overall Business Climate

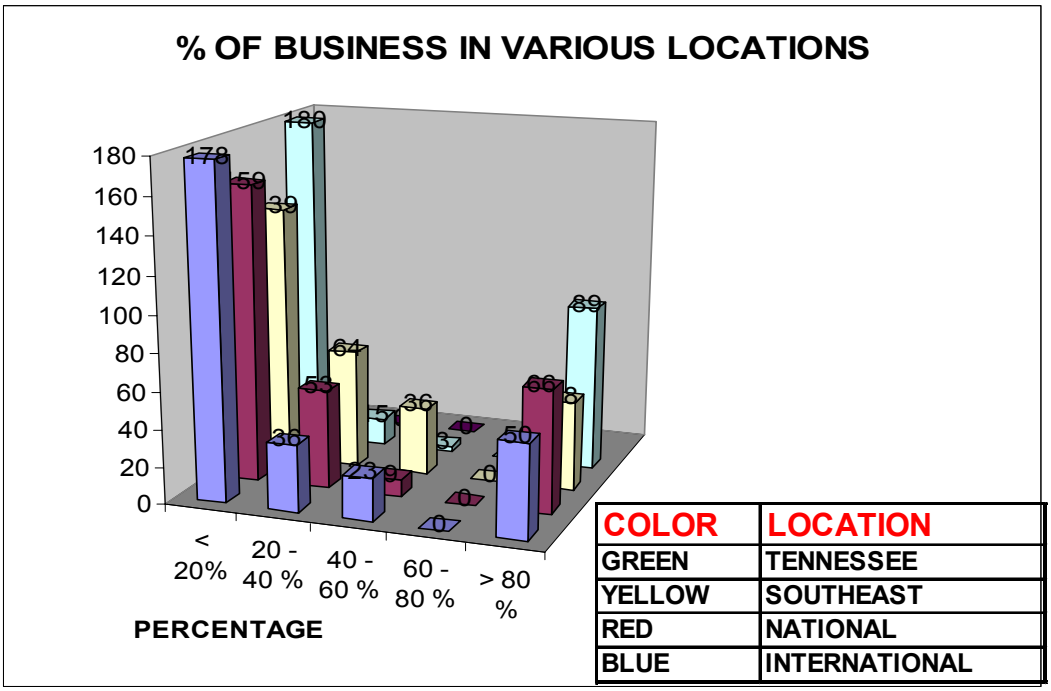


Figure 4.7: Percentage of Business from Locations such as TN, Southeast, USA & International

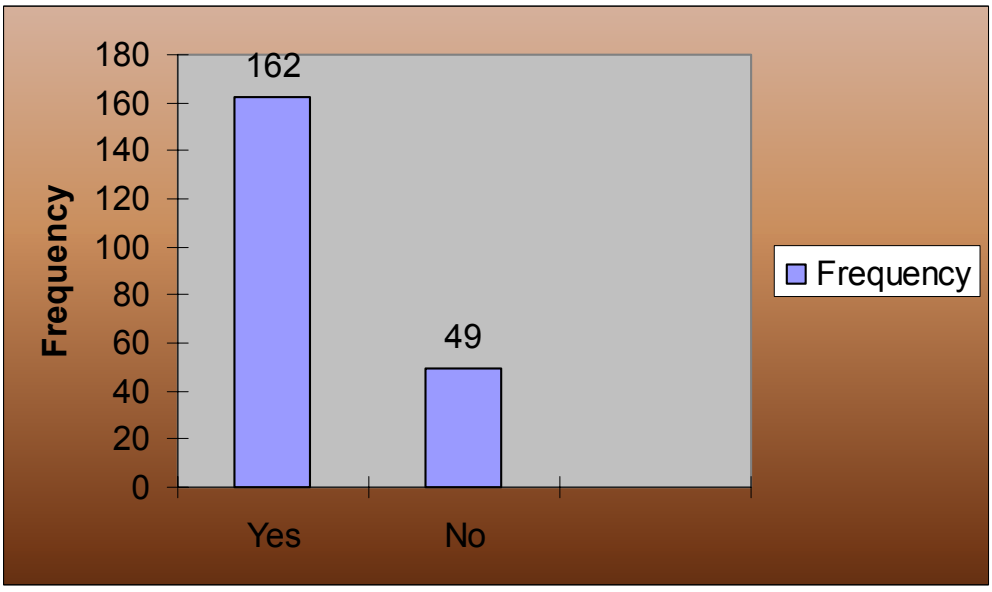


Figure 4.8: Importance of Availability of Raw Materials in Tennessee

4.4 Conclusion

Chapter 4 is a detailed listing of the output from Factor Analysis and sheds light on the 2 types of the obtained output, one set of output from the Chambers of Commerce data and the other set being company data. Further, the chapter deals with the comparison between the sets of output. The written responses obtained from the survey provided to companies have also been documented.

Chapter 5

Conclusions

Chapter 5 explains how Factor analysis output can be interpreted. As suggested in the last chapter (Chapter 4), a thorough blend of Chamber of Commerce and industry approach is needed in order for Tennessee to see growth in business. The primary hypothesis that is the focus for this research was to demonstrate the viability of Factor Analysis as a statistical tool for use in exploratory research. Analysis of the Economic Development survey data and providing insight into the factors influencing Economic Development validates the viability of the methodology. The course of action:

1. Selection a unique tool
2. Developed a method for use
3. Applied to the Tennessee economic survey
4. Demonstrated useful results

5.1 Results

Results derived from the research formed the basis for demonstrating the applicability of Factor Analysis in analyzing Economic Development factors. The results from the analysis were predicated from inputs from several hundred companies that are located in Tennessee and inputs from Chambers of Commerce who deal with companies, who in the future, would like to locate in Tennessee. The preferred design should be a combination of the analysis of Chamber of Commerce and industries with a bias towards Chamber of Commerce for having a more forward-looking cutting edge over others. The economic success is attributed to the programs of public and private sector professionals

dedicated to the state's Economic Development. The programs must evolve based on the change in the economic situation. Based on the current economic situation, some programs will become passé; while others will require modification and an initiative should be taken to launch new programs when necessary.

Group the Chamber of Commerce and company analysis into the groupings that places an emphasis upon factors grouped with consistence. Chambers of Commerce can then concentrate in these areas of focus:

1) Extrapolating the analysis to developing regions of the world

The analysis that was performed in the research is appropriate to use on underdeveloped countries and the studies should be extended accordingly. The results would be different for developing countries though the analysis method would be the same. Enhancing international competitiveness with several specific action initiatives aimed at improving the state's ability to tap global markets.

2) There was a considerable interest to know what the other states in Southeast are doing. So, the analysis should be extended to Alabama, North Carolina, Georgia, South Carolina, West Virginia, etc. that are in competition with Tennessee in Economic Development.

3) The analysis methodolology can be used in other states and regions of this country.

4) Further research can be conducted on the differences between Chamber of Commerce and company data that could document trends over time.

5.2 Recommendations

To improve the model and also to improve the economic situation in Tennessee a number of recommendations have been listed.

5.2.2 Economic Development Recommendations

To improve the competitive scenario of Tennessee, the following measures have to be undertaken:

1) Work towards achieving a Skilled and Capable Workforce – to adhere to the 21st century competition, Tennessee must take the steps necessary to provide a skilled and trained workforce. A better approach to education and training should be established, which in turn provides ways to upgrade employment skills throughout their business career.
2) Improve access to science and technology – competition within the state as well as in global scenario is driving firms to develop new products or new production processes. Although the focus has been on improving the state's technology, there is a vast scope for improvement in this area, which cannot be neglected due to a growing demand to be state-of-the art. R&D institutions should be promoted and there should always be a drive to develop new programs to have an edge over the competitors.
3) Physical infrastructure development- this has been critical for Economic Development to occur in a long time. Traditional forms of infrastructure such as highways and utilities remain important today but new forms are increasingly important as well. To be competitive today, firms need both the basics like

highway access as well as telecommunications and computer access to information.

4) Maintain a favorable business climate – It is of utmost importance to establish direct communication with business leaders and working with them to ensure that the tax and regulatory system is competitive. As it is indicated in the survey, the tax benefits and state regulatory system is of paramount interest for the companies to locate in a particular business location.
5) Conceptualizing and implementing a new Economic Development strategy that is feasible across the state focused at developing any industrial cluster.

5.2.1 Factor Analysis Recommendations

Factor Analysis was a unique application for analyzing Economic Development factors as an example of exploratory research and was proven to be effective in analyzing Economic Development.

1) The Factor Analysis methodology presented in this research can be refined to further the applications to Economic Developments. Uniform number of sub-factors (Q1,Q2…Qn) in each survey question could be targeted at the very beginning when the survey questionnaire is being conceptualized to lessen the complications in computation.
2) The Factor Analysis methodology provided with Minitab is an acceptable model for analyzing Economic Development factors and the model with the certain modifications to data collection techniques, didn't require any significant modification for use in this research methodology

3) The research supports and verifies the thesis hypothesis that Factor Analysis is an acceptable technique for use in exploratory research.

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Appendices

The University of Tennessee

Department of Industrial Engineering

IE Center for Industrial Development Research

(IE-CIDeR)

Survey of Industrial Development Factors

(Industrial Development Participants)

Introduction:

Understanding the factors that motivate companies' establishment in Tennessee is important for the formation and implementation of policies that can support these companies' expansion and retention. The objective of this research is to determine factors that influence where industries choose to locate and expand. In line with this objective, we have developed the survey below for your inputs. Thank you for your participation. This survey has four (4) parts:

1. *Incentives Information*
2. *Product/Market Information*
3. *Location Attributes*
4. *Location Comparison*

This is an anonymous survey. Your name or email address would not be sent with your submission.

PART 1 - Incentives Information

1. **What incentives are offered from STATE government?** ***(Please select all that apply)***

- ☐ Financial Capital
- ☐ Tax Incentives
- ☐ Site Acquisition/Development
- ☐ Training Programs
- ☐ Trade Zones
- ☐ None
- ☐ Others: _____

2. **What incentives are offered from LOCAL government?** ***(Please select all that apply)***

- ☐ Financial Capital
- ☐ Tax Incentives
- ☐ Site Acquisition/Development
- ☐ Training Programs
- ☐ Others: _____
- ☐ None

3. **Of what importance are these incentives to your overall success in bringing industries into your area?**

	Not Important	Somewhat Important	Important	Very Important	Extremely Important
State Government Incentive	☐	☐	☐	☐	☐
Local Government Incentive	☐	☐	☐	☐	☐

PART 2- Product/Market Information

4**. What is your estimate of the percent of business new companies look for in the following areas?**

	Less than 20%	20 - 40%	40 - 60%	60 - 80%	More than 80%
Tennessee	☐	☐	☐	☐	☐
Southeast	☐	☐	☐	☐	☐
National	☐	☐	☐	☐	☐
International	☐	☐	☐	☐	☐

5. **What is your estimate of the major customers new companies look for in the following areas?**

	Less than 20%	20 - 40%	40 - 60%	60 - 80%	More than 80%
Manufacturing	☐	☐	☐	☐	☐
Government	☐	☐	☐	☐	☐
Wholesalers/Retailers	☐	☐	☐	☐	☐
Final Consumers	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐

6. **What share of the new companies major raw materials (inputs) would likely be purchased in Tennessee?**

Raw Materials (Please List)	Less than 20%	20 - 40%	40 - 60%	60 - 80%	More than 80%
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

7. **Is the availability of these raw materials a major consideration to locate to Tennessee?**

☐ Yes ☐ No

PART 3 - Location Attributes

8. **Below is a list of attributes concerning companies in Tennessee** ***(Please evaluate each item by checking the appropriate column)***

FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Market Demand for Products	Access to market for your product(s)	☐	☐	☐	☐	☐
	Proximity to market for your product(s)	☐	☐	☐	☐	☐
	Access to marketing and advertising services	☐	☐	☐	☐	☐
Access to Tangible & Intangible Resources	Access to engineering, research & development facilities (e.g., ORNL, UT, NTRC, AMAT, CIS)	☐	☐	☐	☐	☐
	Access to raw materials/ inputs of production	☐	☐	☐	☐	☐

	Access to Manufacturing/Industrial Extension Services	☐	☐	☐	☐	☐
Quality of Workforce	Availability of skilled labor	☐	☐	☐	☐	☐
	Availability of unskilled labor	☐	☐	☐	☐	☐
	Quality of available workforce	☐	☐	☐	☐	☐
	Wage rates compared to other potential locations	☐	☐	☐	☐	☐
	Ability to train workforce to desired level	☐	☐	☐	☐	☐
	Literacy levels of available workforce	☐	☐	☐	☐	☐
Access to Land & Housing	Cost of land	☐	☐	☐	☐	☐
	Availability of land	☐	☐	☐	☐	☐
	Availability of affordable housing	☐	☐	☐	☐	☐
Business Climate	Availability of financial capital in Tennessee	☐	☐	☐	☐	☐

	General business climate in Tennessee	☐	☐	☐	☐	☐
	Quality of life	☐	☐	☐	☐	☐
	Crime rate	☐	☐	☐	☐	☐
Local Taxes	State taxes on businesses and individuals (franchise, excise, sales)	☐	☐	☐	☐	☐
	Local taxes on businesses (property, sales)	☐	☐	☐	☐	☐
FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Transportation Infrastructures	Quality and accessibility of interstate highways	☐	☐	☐	☐	☐
	Quality of state highways	☐	☐	☐	☐	☐
	Quality of local highways and roads	☐	☐	☐	☐	☐
	Availability of quality rail services	☐	☐	☐	☐	☐

	Quality of water transportation services	☐	☐	☐	☐	☐
	Availability and cost of truck load and less than truck load carriers	☐	☐	☐	☐	☐
	Proximity of air transportation services	☐	☐	☐	☐	☐
Utilities	Quality of electric power service	☐	☐	☐	☐	☐
	Access to natural gas	☐	☐	☐	☐	☐
	Available water supply	☐	☐	☐	☐	☐
	Availability of high speed telecommunication services	☐	☐	☐	☐	☐
FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Local Schools System	Quality of public schools	☐	☐	☐	☐	☐
	Quality of private schools	☐	☐	☐	☐	☐

	Quality of higher education and research facilities	☐	☐	☐	☐	☐
	Quality of Technical Training Schools	☐	☐	☐	☐	☐
	Availability of Distance Education Opportunities for employees	☐	☐	☐	☐	☐
	Availability of Continuing Education Opportunities for employees	☐	☐	☐	☐	☐
Government Economic Development Policies	Local governments policies	☐	☐	☐	☐	☐
	State government policies	☐	☐	☐	☐	☐
	Environmental regulations and requirements	☐	☐	☐	☐	☐
	Right-to-work laws	☐	☐	☐	☐	☐
FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Sports & Culture	Availability of places of worship & fellowship	☐	☐	☐	☐	☐

	Availability of regional foods & restaurants	☐	☐	☐	☐	☐
	Availability of organized Sporting Events	☐	☐	☐	☐	☐
Environmental Awareness	Adequacy of liquid waste disposal	☐	☐	☐	☐	☐
	Adequacy of solid waste disposal	☐	☐	☐	☐	☐
	Adequacy of hazardous waste disposal	☐	☐	☐	☐	☐
	Availability of assistance to meet environmental regulations	☐	☐	☐	☐	☐
Others	Other Factors (please specify):	☐	☐	☐	☐	☐

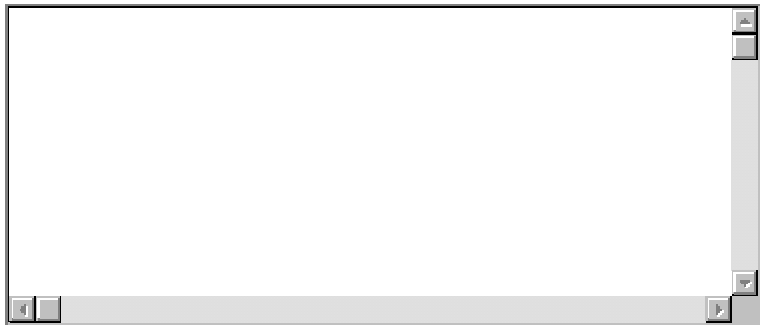
PART 4 - Location Comparison

9. **Which of these factors do you think are most important in your economic development activities?**

- ☐ Market Demand for Product
- ☐ Literacy of Workforce
- ☐ Business Climate
- ☐ Utilities
- ☐ Sports & Culture
- ☐ Local Schools System
- ☐ Access to Resources
- ☐ Access to Land & Housing
- ☐ Local Taxes
- ☐ Transportation Infrastructures
- ☐ Environmental Awareness
- ☐ Government Policies

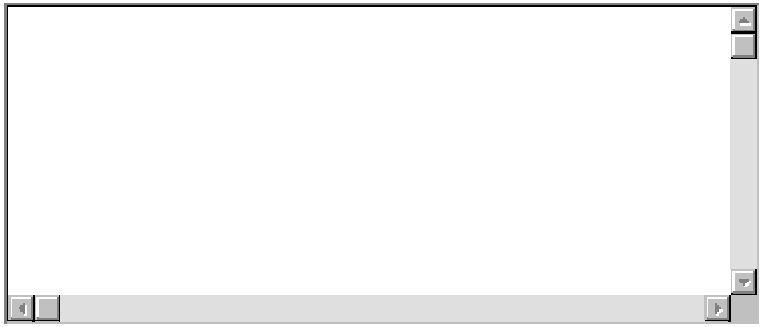
10. **What characteristics and/or policies discourage business retention and expansion in Tennessee?**

11. **What should Tennessee state government do to retain a business like yours?**



12. **What should Tennessee local governments do to retain a business like yours?**

13. **What other concerns do you have regarding company's expansion and retention in Tennessee?**



The University of Tennessee

Department of Industrial Engineering

IE Center for Industrial Development Research

(IE-CIDeR)

Survey of Industrial Development Factors

Introduction:

Understanding the factors that motivate companies' establishment in Tennessee is important for the formation and implementation of policies that can support these companies' expansion and retention. The objective of this research is to determine factors that influence where industries choose to locate and expand. In line with this objective, we have developed the survey below for your inputs. Thank you for your participation.

This survey has four (4) parts:

1. *Company Information*
2. *Product/Market Information*

3. *Location Attributes*

4. *Location Comparison*

This is an anonymous survey. Your name or e-mail address would not be sent with your submission.

PART 1 - Company Information

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1. **What year was your company established in Tennessee?** ☐

2. **How many employees do you have at the Tennessee site?** ☐

3. **How do you classify your company?**

☐ Manufacturing ☐ Services

☐ Others: ☐

4. **Since start-up, what is the percentage of additional investment?**

- ☐ Less than 40%
- ☐ 40 - 60%
- ☐ 60 - 80%
- ☐ 80 - 100%
- ☐ More than 100%

5. **Since start-up, what is the percentage increase/decrease in employment?**

- ☐ Decrease of less than 50%
- ☐ Decrease of between 50 & 90%
- ☐ Increase of less than 40%
- ☐ Increase of between 40 & 80%
- ☐ Increase of between 80 & 100%
- ☐ Increase of over 100%

6. **Which of these incentives has your company received from STATE government?**

(Please select <u>all</u> that apply)

- ☐ Financial Capital
- ☐ Site Acquisition/Development
- ☐ Trade Zones
- ☐ Others: _____
- ☐ Tax Incentives
- ☐ Training Programs
- ☐ None

7. **Which of these incentives has your company received from LOCAL government?**

(Please select <u>all</u> that apply)

- ☐ Financial Capital
- ☐ Tax Incentives
- ☐ Site Acquisition/Development
- ☐ Training Programs
- ☐ Others: _____
- ☐ None

8. **Of what importance are these incentives to your overall business?**

	Not Important	Somewhat Important	Important	Very Important	Extremely Important
State Government Incentive	☐	☐	☐	☐	☐
Local Government Incentive	☐	☐	☐	☐	☐

PART 2- Product/Market Information

9. **What percent of your business comes from the following locations?**

	Less than 20%	20 - 40%	40 - 60%	60 - 80%	More than 80%
Tennessee	☐	☐	☐	☐	☐
Southeast	☐	☐	☐	☐	☐
National	☐	☐	☐	☐	☐
International	☐	☐	☐	☐	☐

10. **Who are your major customers?**

	Less than 20%	20 - 40%	40 - 60%	60 - 80%	More than 80%

Manufacturing	☐	☐	☐	☐	☐
Government	☐	☐	☐	☐	☐
Wholesalers/Retailers	☐	☐	☐	☐	☐
Final Consumers	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐

11. **What share of your major raw materials (inputs) are purchased in Tennessee?**

Raw Materials (Please List)	Less than 20%	20 - 40%	40 - 60%	60 - 80%	More than 80%
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

12**. Is the availability of these raw materials a major consideration to locate to Tennessee?**

☐ Yes ☐ No

PART 3 - Location Attributes

13. **Below is a list of attributes concerning your company in Tennessee** ***(Please evaluate each item by checking the appropriate column)***

FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Market Demand for Products	Access to market for your product(s)	☐	☐	☐	☐	☐
	Proximity to market for your product(s)	☐	☐	☐	☐	☐
	Access to marketing and advertising services	☐	☐	☐	☐	☐
Access to Tangible & Intangible Resources	Access to engineering, research & development facilities (e.g., ORNL, UT, NTRC, AMAT, CIS)	☐	☐	☐	☐	☐
	Access to raw materials/ inputs of production	☐	☐	☐	☐	☐
	Access to Manufacturing/Industrial Extension Services	☐	☐	☐	☐	☐

Quality of Workforce	Availability of skilled labor	☐	☐	☐	☐	☐
	Availability of unskilled labor	☐	☐	☐	☐	☐
	Quality of available workforce	☐	☐	☐	☐	☐
	Wage rates compared to other potential locations	☐	☐	☐	☐	☐
	Ability to train workforce to desired level	☐	☐	☐	☐	☐
	Literacy levels of available workforce	☐	☐	☐	☐	☐
FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Access to Land & Housing	Cost of land	☐	☐	☐	☐	☐
	Availability of land	☐	☐	☐	☐	☐
	Availability of affordable housing	☐	☐	☐	☐	☐
Business	Availability of financial capital in Tennessee	☐	☐	☐	☐	☐

Climate	General business climate in Tennessee	☐	☐	☐	☐	☐
	Quality of life	☐	☐	☐	☐	☐
	Crime rate	☐	☐	☐	☐	☐
Local Taxes	State taxes on businesses and individuals (franchise, excise, sales)	☐	☐	☐	☐	☐
	Local taxes on businesses (property, sales)	☐	☐	☐	☐	☐
FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Transportation Infrastructures	Quality and accessibility of interstate highways	☐	☐	☐	☐	☐
	Quality of state highways	☐	☐	☐	☐	☐
	Quality of local highways and roads	☐	☐	☐	☐	☐
	Availability of quality rail services	☐	☐	☐	☐	☐

	Quality of water transportation services	☐	☐	☐	☐	☐
	Availability and cost of truck load and less than truck load carriers	☐	☐	☐	☐	☐
	Proximity of air transportation services	☐	☐	☐	☐	☐
Utilities	Quality of electric power service	☐	☐	☐	☐	☐
	Access to natural gas	☐	☐	☐	☐	☐
	Available water supply	☐	☐	☐	☐	☐
	Availability of high speed telecommunication services	☐	☐	☐	☐	☐
FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Local Schools System	Quality of public schools	☐	☐	☐	☐	☐
	Quality of private schools	☐	☐	☐	☐	☐

	Quality of higher education and research facilities	☐	☐	☐	☐	☐
	Quality of Technical Training Schools	☐	☐	☐	☐	☐
	Availability of Distance Education Opportunities for employees	☐	☐	☐	☐	☐
	Availability of Continuing Education Opportunities for employees	☐	☐	☐	☐	☐
Government Economic Development Policies	Local governments policies	☐	☐	☐	☐	☐
	State government policies	☐	☐	☐	☐	☐
	Environmental regulations and requirements	☐	☐	☐	☐	☐
	Right-to-work laws	☐	☐	☐	☐	☐
FACTORS	**Location Attributes**	Not Adequate/ Very High	Somewhat Adequate/ High	Adequate/ Average	Very Adequate/ Low	Extremely Adequate/ Very Low
Sports & Culture	Availability of places of worship & fellowship	☐	☐	☐	☐	☐

	Availability of regional foods & restaurants	☐	☐	☐	☐	☐
	Availability of organized Sporting Events	☐	☐	☐	☐	☐
Environmental Awakens	Adequacy of liquid waste disposal	☐	☐	☐	☐	☐
	Adequacy of solid waste disposal	☐	☐	☐	☐	☐
	Adequacy of hazardous waste disposal	☐	☐	☐	☐	☐
	Availability of assistance to meet environmental regulations	☐	☐	☐	☐	☐
Others	Other Factors (please specify):	☐	☐	☐	☐	☐

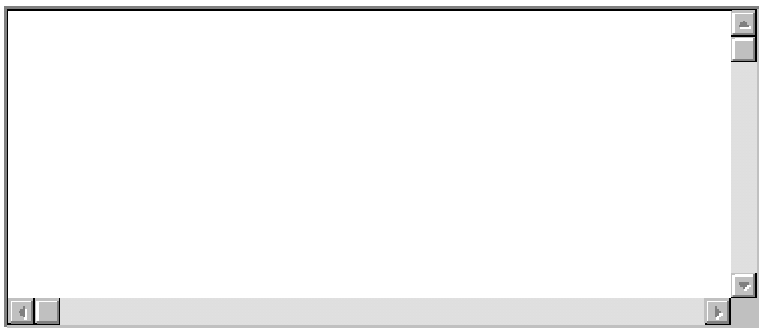
PART 4 - Location Comparison

14. **Which of these factors do you think would guarantee your business retention and expansion in Tennessee?**

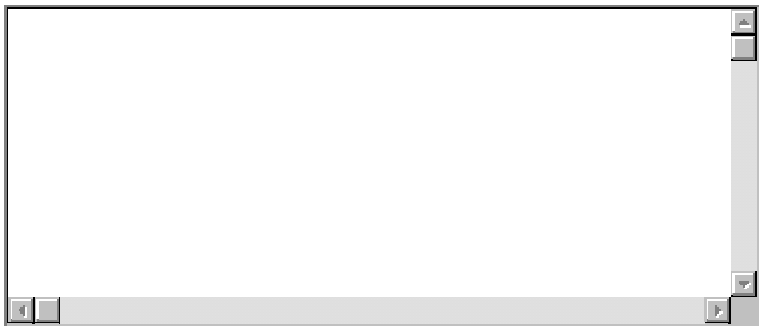
- ☐ Market Demand for Product
- ☐ Access to Resources
- ☐ Literacy of Workforce
- ☐ Access to Land & Housing
- ☐ Business Climate
- ☐ Local Taxes
- ☐ Utilities
- ☐ Transportation Infrastructures
- ☐ Sports & Culture
- ☐ Environmental Awareness
- ☐ Local Schools System
- ☐ Government Policies

15. **What characteristics and/or policies discourage business retention and expansion in Tennessee?**

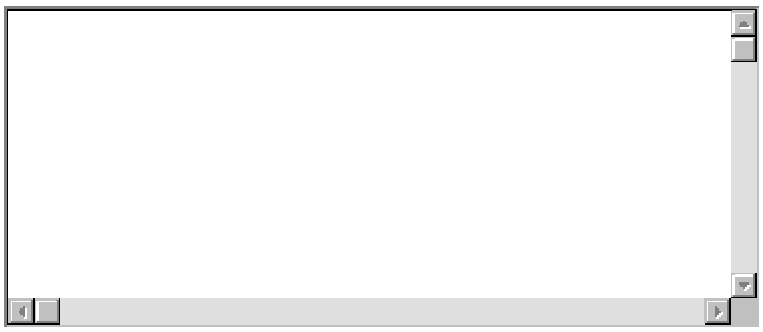
16. **What should Tennessee state government do to retain a business like yours?**



17. **What should Tennessee local governments do to retain a business like yours?**



18. **What other concerns do you have regarding your company's expansion and retention in Tennessee?**



Vita

Archana Niranjan was born in Bangalore, India on February 8th, 1978. She graduated from Sri Kumaran Children's Home – High School in 1995. She received her Bachelor of Science degree with a major in "Industrial Engineering and Management" from Bangalore University, India in 1999. She obtained her Masters of Science degree with a major in Industrial Engineering from University of Tennessee, Knoxville in May 2004.