THE GEODEMOGRAPHICS IN LOCATION INTELLIGENCE: A STUDY IN CRAFT BREWERY PLACEMENT

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ABSTRACT

THE GEODEMOGRAPHICS IN LOCATION INTELLIGENCE:

A STUDY IN CRAFT BREWERY PLACEMENT

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Since the late eighties, an ever increasing number of American craft breweries have opened up across the United States. Although the industry has a relatively high success rate, there are still a number of craft breweries that fail. As craft brewing is an inherently location based business, the sites selected for new brewery locations are important to that business's success. This research aims to examine how geodemographic information plays a role in strategic location decisions for craft breweries. By building a consumer profile for Phoenix craft brewery customers and comparing the results to the actual demographics of trade areas surrounding craft breweries, we begin to get a picture of geodemographics role in the site selection process. The research looks specifically at two locations; Bad Water Brewing Company and a site they are interested in acquiring. An analysis is performed to compare the geodemographic and behaviors of craft beer consumers in Phoenix, Arizona and those of the Bad Water Brewing location and their potential new site. This analysis ultimately results in intelligent business information related to location. The information compiled in this study can be used to make informed site selection decisions.

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Chapter 1: Introduction and Overview

1. Introduction

Over the last 30 years, the US beer industry has seen small, entrepreneurial breweries open their doors all over the country (Wesson and Figueiredo, 2001). Due to the uniform flavor of big beer, many of these small breweries were able to cater to differentiated tastes of consumers and thus appeal to a new, specialized market. These types of breweries are now being referred to as "craft breweries" and are defined as being small, traditional and independent (Kleban and Nickerson, 2012). In recent years, "craft brewers" have come to be thought of as revolutionaries. They are deeply rooted in their communities and often market their beers to reflect this (Schnell and Reese, 2003). Often times these brewers put forth effort to support local businesses by purchasing local ingredients. Also, most of the larger craft breweries have developed an environmental consciousness and have sought out ways to reduce water and energy consumption. Some craft breweries do not distribute their beer to a wider market than their local community and in some cases, they do not distribute beyond their doors.

Although the number of craft breweries has increased exponentially over the last 30 years, many Craft Breweries have not survived. According to the chief economist at the Brewers Association, there is a 48.5% failure rate for Brewpubs and a 24% failure rate for microbreweries since 1980 (Bart Watson, 2014). This is a result of competition in the market. Other potential reasons for these closures

include changes in demand, low production, and in some cases the availability and acquisition of ingredients (Kleban and Nickerson, 2012). Aside from production, all of these factors are inherently location based.

Marketing is an important factor in the success of a craft brewery. However, there are many more factors to consider. The use of "location intelligence" for one, can add a competitive advantage for businesses (Francica, 2006). Location intelligence takes demographic, purchasing behavior and geographical information into account and can be used to determine best locations for businesses. There are several different location intelligence software packages out on the market including GeoVue's ISITE and Esri's Business Analyst to name a few. However, these types of software packages are expensive and require some analytical ability to be used successfully. Should a new brewery choose to hire a demography consultant to perform this type of work to help them chose their business location, it can easily eat up a great deal of the startup's budget (Dick Cantwell, 2013).

2. Research Statement and Purpose

The craft brewery industry has experienced rapid growth in recent years (Kleban and Nickerson, 2012). However, it has also experienced failures (48.5% for Brewpubs and 24% for microbreweries since 1980) (Bart Watson, 2014). The success of a craft brewery has a strong geographical focus (Wesson and Figueiredo, 2001), thus the site selected for a new brewery is an important aspect of a new brewery's success.

This research will examine craft breweries in the greater Phoenix Metropolitan area in order to identify demographic trends, consumer behaviors and spatial relationships in the craft beer market. The resulting information will be used to provide location intelligence to craft brewery entrepreneurs in an effort to reduce their risk of entering the market. This research aims to answer the following question: *How does geodemographic information play a role in strategic location decisions for craft breweries?*

In order to answer this question, this research will develop a consumer profile of the study area and examine the following questions:

- What are the demographic trends of Phoenix craft beer consumers?
- What are the main reasons why a consumer visits a craft brewery?
- How far is a consumer willing to travel in order to visit a craft brewery?
- Is proximity to home, work, shopping or something else an influence for visiting a craft brewery?

3. Craft Beer Terminology

According to the Brewers Association (2013), a craft brewery is a small, independent brewer following traditional brewing methods. Craft breweries can produce up to 6 million barrels of beer annually and must be less than 25% owned or controlled by someone who is not themselves a craft brewer. Furthermore, they must have either an all malt flagship, or have the majority (greater than 50%) of their beer production in all malt beers or beers which enhance their beers flavor with adjuncts. The term ”adjuncts” within the context

of craft beer refers to the addition of unmalted grains such as corn, rice, rye, oats, barley and wheat to supplement the malted barley/grist (Beckham, 2014). Adjuncts are used in very small quantities in order to create some sort of flavor enhancement or physical appearance of the beer.

A craft brewery can fall into one of several different designations; nanobrewery, microbrewery, brewpub, contract brewing company, a regional craft brewery or a large brewery (Kleban and Nickerson, 2012). These designations can be defined as follows:

- *Nanobrewery:* Produce less than 30 barrels of beer per year.
- *Microbrewery:* Produce less than 15,000 barrels of beer per year and sell more than 75% of their beer outside of the brewery.
- *Brewpub:* Breweries that also run a restaurant. At least 25% of the beer is sold on location.
- *Contract Brewing Company:* Breweries that do not have their own brewing facilities and contract established breweries to brew their beers.
- *Regional Craft Brewery:* Breweries that produce between 15,000 and 2,000,000 barrels of beer per year. These breweries focus on producing strong tasting beers with at least half of their beer falling into the category of all malt or malt flagship.
- Large Brewery: Breweries that can produce up to 6,000,000 barrels of beer per year. At this time, the only brewery meeting this categorization is Boston Beer Company.

4. Scope and Justification of Research

In today's economy, proper location strategy is a key element to succeeding as a small business owner. Location Intelligence software is on the rise and helping business find a competitive advantage based on geospatial information (Francica, 2006). The Great Harvest Bread Company of Montana for example, used Business Analyst and Tapestry Segmentation Data to strategically place new businesses as they were growing their franchise businesses (Esri, 2013). The software provided them with all the necessary tools to analyze the market and later determine where gaps existed within the market. The company was able to use the information to determine if potential franchises would succeed once they opened their doors. They also use Tapestry Segmentation data to rank and profile populations. This information was used to determine ideal new locations. Great Harvest is an excellent example of a company who has grown from the use of location analytics.

Nike of Beaverton, Oregon is another company that has benefited greatly from the use of Esri's Business Analyst (Esri, 2010). They have been using GIS to profile demographics in areas surrounding store locations to gain insight into their business from a geographical perspective. They have also used Business Analyst site selection capabilities to determine the best new business locations.

New craft brewery entrepreneurs do not typically have the scale of funding that a franchise might have, and need to be careful with the choices they make in spending their money. The demography of a potential location is an important part of any business site selection, though it is not a requirement in opening a

new brewery. However, it is still better to spend a little money on expertise that might save a lot of money down the road (p. 14 Cantwell, 2013).

5. Organization of Thesis

This thesis is broken up into 6 chapters. The 2nd chapter includes a review of literature. This chapter is meant to introduce the reader to the history of the United States craft brewing industry. Additionally, this chapter explains the "what" and "why" of location science, geodemographics and site selection modeling. The last section of this chapter explains the specific location requirements of a craft brewery.

Chapter 3 takes the reader into the methodologies of this research. This chapter is broken up into sections including the study area and why it was selected, the required datasets used to perform the analysis, the design of the sample used to create the consumer profile, the site selection modeling and analysis.

Chapter 4 provides the analysis and results. This includes the results from the survey, and how they were used to generate a consumer profile. Additionally, this chapter examines the profile of a specific site. One of the breweries that participated in the study is interested in a site near the baseball stadium. This site is compared to their current brewery location to determine if it better fits the consumer profile developed in this study. In Chapter 5, recommendations are drawn from these results. Additionally, this chapter examines the limitations within the study and ideas for future research within this field of study.

Chapter 2: Literature Review

1. Historical Background of Craft Beer

Before the start of prohibition in 1920, almost every neighborhood across the United States of America had its own brewery (Acitelli, 2013). It's not that the beer culture was necessarily any stronger in those days than it is now, but rather there was no distribution. Also, refrigeration was not yet technologically advanced enough to support the dissemination of beer far beyond where it was produced (Veitch, 2011). You could not pick up a six pack and bring it home with you. Rather you went down to the local pub or brewery for your beer (Acitelli, 2013). After prohibition, it took some time before the beer industry took hold. Until the late eighties/early nineties, there were only a handful of craft breweries in the United States. The market was dominated by the big commercial breweries like Coors, Miller and Anheuser Busch.

In 1965, a young Stanford graduate by the name of Fritz Maytag acquired the majority share of a little brewery in San Francisco called Anchor Brewing Company (Acitelli, 2013). Fritz Maytag made a risky move that day, as the brewery was about to close. However as the great grandson of Frederick Louis Maytag, the founder of the Maytag Washing Machine Company, this was a risk he could afford to take. Anchor Brewing Company has come to be known as the first post-prohibition craft brewery in the United States (Murray, 2012). In 1971, Anchor made a very wise decision to become the very first craft brewery to start bottling its beer (Acitelli, 2013). At the time, most pubs and bars only had one or two taps. Since most people were interested in industrial beer, it was not likely

that they would fill one of their precious taps with a craft beer like that made by Anchor Brewing Company. That said, bottling beer was a smart move during that time period. Anchor Brewing Company has had such a profound impact on the brewing industry that the very definition of a craft brewery is based on what was set forth by Fritz Maytag; Independent, traditional and small.

Since the late 1980's, craft breweries have started popping up all over the United States. Perhaps this is in part tied to the legalization of homebrewing. Prior to 1978, it was illegal to brew beer at home in the United States (Acitelli, 2013). We have President Jimmy Carter to thank for signing the legalization of Homebrewing into law on October 14th, 1978. This allowed people to legally pursue the love of brewing beer at home. Homebrewers could develop recipes to their liking, and many went on to open craft breweries of their own. In 1980 there were only eight craft breweries in the United States (Brewers Association, 2013). By 1994, that number had grown to 537 craft breweries. The growth in the craft beer industry during the decade between the mid-eighties and mid-nineties had been substantial (Schell and Reese, 2003).

By the late nineties, the "boom" took a turn as the market had become saturated with brewpubs and microbreweries (Schell and Reese, 2003). The industrial beer companies had also caught on to the lucrative nature of the craft beer segment and took extreme measures to prevent beer distributors from carrying craft beers. These big companies also began penetrating the craft beer sector by producing beers that looked and felt like craft beer. These beers included such labels as Coors' Blue Moon and Killian's Red. Miller also produced

Icehouse and Red Dog. Anheuser-Busch made strategic arrangements with craft breweries such as Widmer brothers and Redhook for purposes of distribution.

The industrial beer companies had finally recognized the high profit margin met by craft beer and wanted a piece of the market. People were simply willing to pay more for craft beer than they were for the industrial, big beer lagers. However, big industrial beer companies were not the only factor that impacted market growth during the mid to late nineties. Some of the larger, successful craft breweries started to get greedy. Many of them tried to expand nationally and regionally, while losing sight of their local roots. Their reason for succeeding in the first place had been their tie to their local communities. When they lost sight of this, their businesses floundered. Many of them went back to their original local structure and were able to flourish once more, others simply went out of business or lost significant market share.

The craft beer industry made a comeback as it entered the new millennium. By 2012, the number of craft breweries had grown to over 2,300 (Brewers Association, 2013). Connoisseurs of craft beer emerged as their own subculture, much like the wine industry many years prior. One might suggest that flavor is a large contributor to the success of craft beer. The light lagers produced by industrial beer giants such as Anheuser-Busch, Miller and Coors include a considerable amount of adjuncts, used to cut costs (Beckham, 2014). Craft breweries must adhere to traditional brewing practices, which limit the addition of adjuncts to be used only as flavor enhancers. For instance, a brewer might include oats in the process of brewing an oatmeal stout in order to create a very specific taste and texture. On the other hand, the industrial beer companies

might add rice or corn syrup to replace part of the malted barley, thus reducing the cost of ingredients. Although taste is important, the growth and success of the craft beer industry might also be in part due to a cultural shift in people wanting to move away from the homogeneity of popular culture and toward a mindset of living locally and supporting community (Schnell and Reese 2003).

Craft brewing by nature has a narrow geographical focus (Wesson and Figueiredo, 2001). This applies to the naming of beers, the purchasing of ingredients and the distribution of their beer. Simply put, craft beers are often marketed to their local community, reflecting the personality of its inhabitants (Schnell and Reese, 2003). This marketing approach can be quite effective in this age where "neolocalism" is quickly emerging. Many people are breaking away from the "cookie-cutter" American towns and seeking ways to connect with their local communities, local economies and local geography. Craft breweries appeal to this mindset and are deeply rooted in the neolocal movement.

The concept of "neolocalism" refers to a deliberate attempt to connect locally in one's community (Murray, 2012). The term, introduced by James R. Shortage, is thought to be a counteraction in response to the loss of "traditional bonds" with one's local community and family that has become prevalent in modern times. Craft breweries are a part of the neo-local movement, in that they are inherently local businesses. They cater to neo-local minded people by offering unique atmosphere and beer. They often express some aspect of the local community they reside in, thus creating a sense of place. The growth of farmers markets and local festivals across the nation are also great examples of the

neolocal movement (Flack, 1997). Sustainability has also become a focal point of many people within this movement (Veitch, 2011). A consciousness toward where your food comes from and how it was produced has become central to many peoples thinking, so much so that it has become a movement.

2. Location Science

When looking at a map of old cities around the world, one might notice that they are almost always located near a river or other water source. This is not by accident, as water was necessary for consumption, energy and cultivation as it still is today. When decisions are being made as to where a new hospital or fire station should be located, many components are considered (Church and Murray, 2009). There are political factors as well as demographic and economic implications that must be accounted for. With this in mind, the study of location emerged.

There are three varying approaches in which one can study location. The first approach is to visually interpret spatial relationships by mapping (Church and Murray, 2009). This is most often done with the use of Geographic Information Systems (GIS). The second approach is to analyze how or why certain location decisions were made in the past. This is referred to as a descriptive modeling. The third approach is to identify best locations for future use. This is referred to as prescriptive or normative modeling. From these three location analysis approaches, location science grew into its own field of study. This paper focuses on a normative modelling approach with the use of GIS.

Normative modeling emerged as a science in order to help people make informed decisions about location for present and future (Church and Murray, 2009). “Analytics” is the catch-all term that is used to describe the mathematical and statistical aspects of data analysis, used to predict what might happen in the future (Harper, 2014). Location analytics utilizes a conglomeration of demographic, economic, financial, geographic and other business information in order to identify trends and gain useful insight into a business as it relates to geographic location (Garber, 2013). Many businesses seek out ways to gain a competitive advantage. Location analytics is one way in which many businesses are gaining this advantage. It can benefit businesses by helping them determine who their customers are. Through location analytics, businesses can also examine purchasing behavior from a geographical standpoint. Additionally, they can examine the success of marketing campaigns or identify the optimal location for a new business site or activity. Overall, location analytics is the core of location science and its predictive capabilities make it advantageous for businesses making location decisions.

An increasing number of businesses of all shapes and sizes are now showing interest in the use of location analytics (Garber, 2013). A Large part of this may be the increased accessibility of location analytic software and the amount of bandwidth now available to the public. Several companies including Esri, Alteryx, Azavea, CoreLogic, Gartrell Group, SpatialKey, TerraGo, Omnisdata, Pitney Bowes Software and BroadMap have developed off the shelf products that already incorporate most of the required data in combination with

geographic technology to perform location analytics. This alleviates the need for an analyst to perform the integration of data, making the technology much more accessible to smaller businesses who may not have an in house GIS professional. Still, if a business is planning to use this technology, they need people that can understand how to extract the value out of the business and spatial information. Regardless of the advantages that this technology brings, businesses have been apprehensive to adopt it due to high costs and limited awareness (Miller, 2011).

Business Analyst is an ArcGIS extension that is an Integrated Business GIS solution developed by esri. Integrated Business GIS solutions (IBGIS) provide the tools for businesses to gain a competitive advantage (Miller, 2011). These tools provide the capabilities to examine the competition, customer base and the market of a business. Since esri has provided Northern Arizona University with a number of Business Analyst licenses for educational purposes, this research will utilize this software.

The heart of location science, location analytics, can be used to make site selection decisions. In order to perform site selection, one must first generate a customer profile. This is accomplished by compiling detailed information regarding the characteristics of a customer base (Miller, 2008). Customer profiling aims to simply understand a business's customers. Once compared to the characteristics of a general population, one can identify locations matching the most distinctive characteristics of that profile. Business Analyst has integrated data that allows a user to build a consumer profile, examine competitive factors and their spatial relationships with other businesses and

infrastructure (Miller, 2011). The software extension can also be used to generate market areas with consideration to many factors including travel time.

3. Geodemographics

Geodemography, also referred to as "spatial demography" is both an art and a science (Grubesic, Miller and Murray, 2014 and Weeks, 2012). As a form of analysis, it involves the examination of socio-economic and behavioral information within the context of location. This type of analysis requires the use of Geographic Information Systems (GIS) to examine geodemographic data (Weeks, 2012). Maps have long been used to analyze demographic data, and GIS has made it easier to do so (Weeks, 2012). When the demographic data is geo-referenced (tied to a place in space), it is referred to as geodemographic data. Spatial analysis of geodemographic data can be performed to identify patterns and trends, geographically speaking, that can provide insight into consumer trends (Grubesic, Miller and Murray, 2014). It is important to note that geodemography is often referred to as an exploratory spatial analysis tool. It cannot be used on its own to explain outcomes definitively, but rather to generate new ideas and insights into behaviors that have occurred or may occur in the future.

The most comprehensive demographic data in the United States is collected by the United States Census Bureau (Abramovich, 2012). When people refer to "the census", they are actually referring to the Census of Population and Housing and many related surveys that are brought together (Peters and MacDonald, 2004). Census data includes information about the size and

distribution of population, demographic structure and characteristics of the population (Weeks, 2012). Although the reason for conducting a census was originally intended to examine who the people were under a governments rule to target taxpayers, potential soldiers and potential laborers, its uses are now diversified (Weeks, 2012). In the modern sense, it is now understood to be a count of everybody or everything (Peters and MacDonald, 2004).

The United States Census Bureau conducts their primary census every 10 years (Abramovich, 2012). This decennial census collects information including such topics as age, ethnicity, household relationships, race, gender and housing information. As of 2010, only 10 questions are asked during this survey. The "long form", which was still used in the 2000 Census, has been eliminated. The more detailed questions that were once included in the "long form" are now asked through the American Community Survey (ACS). This survey is only administered to about 3 million homes, where the decennial census is administered more comprehensively. Depending on the size of the population in an area, the ACS is administered yearly, every 3 years or every 5 years.

Census data is collected at the street address level (Peters and MacDonald, 2004). However, the data has been divided into a geographical hierarchy. The smallest of these groups is the census block, bounded by roads, stream, railroad tracks or political boundaries. Very little census information is available at this level due to the confidentiality of the census. The next level of hierarchy is the Census Block Group. These are a conglomeration of Census blocks and usually contain about 600-3,000 people. A collection of Census Block Groups compose a

Census Tract. These tend to delineate an approximate neighborhood. Beyond the Census Tract level, the divisions are representative of political boundaries including counties and states. When performing analysis using census based data, it is important to consider the modified area unit problem (MAUP). When spatial analysis is performed, any alterations in scale or units of measure may impact the results (Church and Murray, 2009).

4. Site Selection Modeling

Site selection modeling is used to find existing customers and target new ones by examining market areas and customer profiles (Miller, 2008). In location science, there is no single model to perform site selection that considers all possible factors (Murray, 2010). However, the functionality of GIS has proven very useful in location science. When considering where to place a new business, it is vital to consider which location is going to be financially sustainable (Abramovich, 2012). By integrating location science and GIS modeling, business placement decisions can be made to optimize potential profits. The choice of location for a new retail store poses a huge financial risk (Roig-Tienro, Baviera-Puig, Buitrago-Vera, Mas-Verdu, 2013). GIS is immensely helpful in making strategic site selection decisions as it can be used to visualize complex datasets.

One approach to site selection modeling, suggested by Roig, Baviera, Buitrago and Mas (2013), is to examine both *geodemand* and *geocompetition*. *Geodemand* described the process of locating the people who would purchase a product, or rather establishing and locating the ideal market segment. On the other hand, *geocompetition* describes locating the competition. Upon combining

the *geodemand* and *geocompetition* results, potential sites can be located. Using Kernel Density Analysis can further aid in this site selection process, as it helps to find areas with high density populations matching the *geodemand*.

Another approach to site selection modeling, inclusive of market area analysis and customer profiling, is to analyze internal customer data in order to target new customers or examine existing ones (Miller, 2008). One might infer that this is how one establishes the *geodemand* and *geocompetition*. Once demographic, economic, financial, geographic and other business information is combined to identify trends or gain insight into a potential site location, this process is referred to as location analytics (Garber, 2013). It can further be used to examine characteristics of successful competitors and match those to potential new sites for best site selection (Miller, 2008).

Market Segmentation is another approach often used in location analytics. It refers to the clustering people based upon similar traits or behaviors (Musyoka, Mutyauvyu, Kiema, Karanja and Siriba, 2007). Segmenting a market can be extremely beneficial in the site selection process if executed correctly. It subsets the market in a way that allows you to target groups of people matching a customer profile that are highly likely to contribute to sales.

Market area, also often referred to as trade area describes the geography that encompasses existing or potential customers of a business (Church and Murray, 2009). By integrating location science and GIS modeling, business placement decisions can be made optimize potential profits. In order to determine a market area, one must first determine who their current and

potential customers are (Church and Murray, 2009). There are many ways to accomplish this. It is common to examine credit card purchases, or conduct a detailed survey to gain insight into consumer behavior. Once this information has been obtained, the market area can be delineated.

There are many approaches to defining market area. When defining a market area, one must either assume the boundaries, or create a comprehensive model (Church and Murray, 2009). If data is available that includes specific locations of known customers, the customer-spotting method can be used. When comparative data is available from competitors, the analog approach can be used. This research does have available data from competitors. However, competition in the craft beer industry differs from competition in other retail industries. As stone brewing puts it, it's "collaboration not competition" (Peterson, 2015. In an artisanal industry like craft brewing, people are interested in crafting the best beer possible. They gain ideas from one another and often share their wisdom when they find ways to better their craft. Due to this non-traditional "competition", this study has chosen to assume the boundaries of the market area.

Many retailers divide their market area into multiple zones (Church and Murray, 2009). The first zone is often delineated to represent roughly 50% of customers and is coined the "core" or "primary" zone. The next zone typically represents another 25% of customers and is referred to as the "secondary" zone. The third zone, or rather "tertiary zone" typically represents another 15% or less of customers. This zonal approach is loosely followed within this study. In the

Business Analyst software extension, the market area zones can be estimated and defined in a number of ways including simple rings, donuts and drive times (Miller, 2011). The simple ring approach, which delineates the market area with concentric circles, includes all houses and businesses within the designated radial distance. This approach is ideal when demographics are relatively consistent over the entire area. If they are not, the donut approach is a better fit. In this case, the demographics are examined for each ring, separately and excluding one another. The drive time approach is more sensitive to accessibility and of course, time rather than distance. The demographics examined will extend further down highways and interstates than they will residential streets, creating an irregular shaped market area. However, this approach does assume that everyone is driving to the location.

5. Craft Brewery Location Requirements

Start-up business people often make location decisions based on factors such as proximity to their home, cheap rent and being in or near busy places (Raeon, 2013). Additionally, people often make rash, emotional decisions on location because they feel a sense of urgency. This simplistic way of thinking could quite possibly contribute to the reasoning behind so many failing start-up businesses. There are many complex considerations to be made when selecting a successful business location.

Craft breweries have many factors to consider before making a location decision. For one, they require sturdy floors (Best, 2015). Due to this factor, often

times craft breweries locate themselves within industrial areas. Compatibility is another consideration (Raeon, 2013). It is important that a business can coexist with its neighbors and not negatively affect or be affected. This includes considerations such as shared parking, noise and in the case of a brewery, the smells emitted from the brewing process.

On a state level, craft breweries must consider laws and regulations. Each state looks at liquor production a little differently. Arizona liquor laws are based on a three-tier distribution system (Beer and Wine Distributors of Arizona, 2015). The first tier consists of the licensed producers of alcohol. This includes craft breweries. The second tier consists of licensed wholesalers, or rather the people who buy the beer directly from a brewery or other alcohol producer, then transport, store and sell the product to retailers. The third and final tier consists of the retailers that sell the products to consumers. This includes grocery and convenience stores, restaurants, bars, sporting venues, hotels and other similar retailers. The reasoning behind this structure is first and foremost to help the state regulate the products. It supports small and large businesses in an equal manner, and ensures that distributers (tier 2) are responsible for safety, tax collection, and product affordability. Furthermore, the distributers are able to partner with craft breweries, invest in and promote these new brands of beer and thus increase the options available to consumers (AZ Beer Bill, 2015).

Up until 2015, Arizona held a law that any brewery that produces over 40,000 barrels per year must be classified as a producer (Arizona Brewers Guild, 2015). This law limited the amount of beer a craft brewer could produce without penalty. In fact, once they reached this threshold of 40,000 Barrels per year, they

would be required to close any pubs, tasting rooms or restaurants that they might own. Once reaching the 40,000 barrels per year threshold, a craft brewery moves from “microbrewery” status to “producer”. A brewery with a producer license cannot also hold a retail license, meaning that they cannot operate a restaurant or tasting room. In other words, craft breweries were being punished for being successful. Fortunately, thanks to a collaboration between the Arizona Brewers Guild, the Beer and Wine Distributors of Arizona (BWDA) and the Arizona Wine and Spirits Wholesale Association (AWSWA), the Arizona Beer Bill, SB 1030 was brought to fruition. The bill passed the Senate on March 9th, 2015 and eventually made its way to the governor of Arizona. On March 31st, 2015, the bill was signed into law by Doug Ducey. This bill allows Arizona craft breweries to produce over 40,000 barrels per year and still maintain their retail licenses.

Chapter 3: Research Methodology

1. Introduction

Site selection analysis for craft breweries in Phoenix, Arizona requires input data from many sources. The Business Analyst software extension of ArcGIS provides many of the base layers required for this type of location analysis. Industry specific data was also available through the Brewers Association. Demographic data is freely available through the US Census Bureau, however preprocessed demographic data that is more convenient for analysis is also available through the esri Business Analyst data package. After all of base data layers are established, a market or trade area can be delineated. With these datasets, a consumer profile of craft beer consumers in the Phoenix Metropolitan area will be built. Moreover, to understand craft brewery consumer behaviors as well as to relate customer behaviors to site selection and demographic information, a field survey will be conducted using a visitor intercept methodology to gather information from craft brewery consumers. This chapter will introduce how the study area was crafted and discuss the sampling design under which these surveys were conducted. Additionally, this chapter will examine how the market area was delineated and used to help in making an intelligent site selection decision.

2. Study Area

This study started with the intention of visiting all 19 craft breweries that were registered with the Brewers Association at the end of 2013. However, Once

the study was under way and brewery owners/managers were contacted by phone, it was determined that the majority of them did not wish to participate in the study. Many of the craft breweries were actually corporations such as BJ's Restaurant and Brewery, Gordon Biersch Brewery, and Rock Bottom Brewery. In the end, 7 breweries agreed to participate in this study. Therefore, this study focused on 7 breweries; North Mountain Brewing Company, Fate Brewing Company, O.H.S.O. Eatery and Nano Brewery, Bad Water Brewing, Desert Eagle Brewing Company, The Phoenix Ale Brewery and Sonoran Brewing Company, who share a tasting room.

The breweries that chose to participate in the study were located across the Phoenix Metro area. Two of them were located in the affluent city of Scottsdale, Arizona, one was located in Mesa, Arizona and the others were located in the city of Phoenix (see Figure 1: Participating Craft Brewery Locations). In order to gain a basic perspective of the overall population within the study area, basic demographics relating to this study for the cities with breweries participating in the study were tabulated from the U.S. Census Bureau's QuickFacts (see Table 1: Demographic Profiles; Phoenix, Mesa and Scottsdale).

Table 1: Demographic Profiles; Phoenix, Mesa and Scottsdale

Demographic	**Phoenix**	**Mesa**	**Scottsdale**
Estimated 2013 Population	1,513,367	457,587	226,918
White Population (2010)	65.9%	77.1%	89.3%
Median Household Income ('09-'13)	$47,139	$48,547	$72,154
Bachelor's degree or higher, percent of persons age 25+, 2009-2013	26.3%	24.3%	52.7%
Female persons, percent, 2010	49.8%	50.8%	51.7%

Figure 1: Participating Craft Brewery Locations

3. Spatial Datasets

This study began in 2013. At this time, a list of US craft breweries operating in 2013 was provided by the Brewers Association. This list arrived in the form of an excel spreadsheet containing the names, addresses and type designation of the US craft breweries operating in 2013. According to this list,

there were 46 craft breweries in the State of Arizona in 2013, 19 of which were located in the greater Phoenix Metropolitan area (see appendix C, Figure 2: Phoenix Craft Breweries Operating in *2013*).

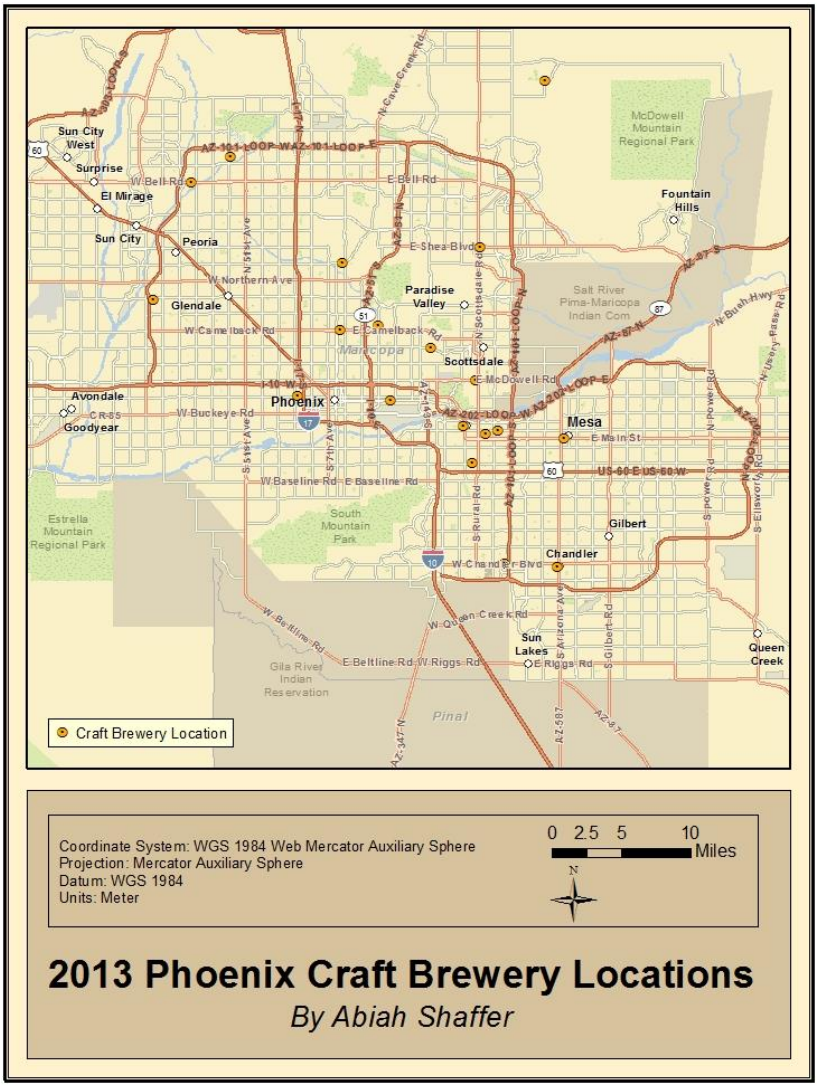

Figure 2: Phoenix Craft Breweries Operating in 2013

As the study evolved over a 2 year period, it became apparent that the list had become antiquated. Also, one brewery location had closed permanently, one had closed for construction, and two breweries had moved to new locations. This

goes to show that a great deal can change in this industry in just two years. Furthermore, it came to my attention that not all craft breweries register with the Brewers Association. It is likely that many more breweries were operational in 2013 that had not been accounted for in the list. Upon this realization, a new dataset was created by digitizing the addresses of the breweries listed on the local Arizona Craft Brewers Guild Website (See Figure 3: Comprehensive Map of Phoenix Craft Breweries). It was important to establish accurate locations of the breweries in order to later examine competition as a component of the analysis. All GIS work was performed in Arizona Central State Plane Coordinate System using the North American Datum 1983 with linear units of US Feet.

Through the Business Analyst software extension for ArcGIS, additional datasets were selected to use in this study. The Dun and Bradstreet Business File dataset included a point file of businesses operating in April, 2013 that include the business names, addresses, Standard Industrial Classification Codes (SIC) and North American Industry Classification Codes (NAIC). This dataset is licensed through the Business Analyst Extension for student use. It was used to determine classifications of businesses falling inside the market area of a potential site. Selecting a site with the right type of businesses in its market area may lead to increased lunchtime and after work business during the week.

Figure 3: Comprehensive Map of Phoenix Craft Breweries

Topologically Integrated Geographic Encoding and Referencing (TIGER) data is freely available through the US Census Bureau's website. The TIGER/Line data has already been processed and integrated into Business Analyst. This study utilized this resource in order to examine demographic information, specifically educational levels and unemployment numbers at the Block Group level. Unfortunately, it is very unlikely that a market area will ever match up with the extents of the block groups (Miller, Fred L., 2011). When these polygons overlap,

it becomes necessary to estimate the portion of households within the service area.

4. Field Survey

Field surveys were conducted using a convenience survey method in order to examine the demographics and consumer behaviors of customers that were visiting the participating craft breweries in the greater Phoenix metro area in the state of Arizona. This study was conducted during the second and third weeks of March. First, phone calls were placed to the managers and owners of each of the 19 craft breweries located in the greater Phoenix metro area that were registered with the Brewers Association in 2013. Email addresses of the managers or owners were obtained during these phone calls, when possible. Emails (see Appendix E) were then sent to each of the consenting breweries with additional information about the study that included the research abstract and objectives as well as a copy of the survey questions (see Appendix A). The emails requested that the consenting party respond with written approval including their name, title and contact information. This was a requirement set by the Institutional Review Board (IRB). In order to obtain IRB approval to conduct the surveys, the IRB required that I receive prior written consent. Unfortunately, due to the nature of the business, only a handful of businesses responded to the email.

This became a prohibiting factor in the attempt to gain approval to conduct the surveys under the Institutional Review Board (IRB). Instead, conditional acceptance was requested with the caveat that business owners and managers would be asked to sign a consent form on site prior to conducting the

surveys. The IRB eventually gave exempt approval of the project, and the research was able to move forward after considerable delay. However, in the end, only 7 of the 19 breweries provided their consent. As it transpired, only breweries who had communicated via email prior to in person visits were willing to participate.

The majority of the survey questions were developed by adapting questions from previous research. The survey included 14 questions in total. Many of the questions were in regard to demographics. The age and income ranges were established to match the 2013 census data used in this study. The income, ethnicity/race and employment status questions were also designed to match closely with the census data. This category of questions also included gender. In addition to the demographic questions, 3 questions were location based and aimed to establish the market area. These questions included where the consumer was from, where prior to arriving at the brewery, and how far they had travelled to visit the brewery. Another question, sought to know what industry a consumer's occupation falls under. This question was developed by using the North American Industry Classification Code (NAIC) designations (see Appendix B). In addition to these questions, which closely matched previous research, several questions were asked to gain more insight into a typical craft brewery consumers' attitude toward craft beer. Additionally, a question was posed to determine how much of their total consumption of beer was made up of craft beer. The last question asked if the consumer felt that they had an "outdoorsy" lifestyle. Although this question was not necessarily a relevant

question in regard to building a site selection model, perhaps it does provide insight into the market segment that a typical craft beer consumer falls into.

At first, surveys with pens and clipboards were handed out to customers willing to participate in the research. The clipboards turned out to be a hindering factor as people neglected to turn over the paper and see additional questions on the back. Having neglected to number the pages or add "turn over" to the bottom of the sheet was a flaw in the design. The fact that the survey was front and back was then verbally communicated to participants. Later, text was added to the bottom of the surveys to indicate that the participant should turn over the survey for additional questions.

The aim was to hand out 30 to 50 survey instruments at each of the breweries. However, since the number of participating breweries was significantly lower than the original expectation of 19 breweries, the number of surveys handed out at each brewery was increased. Additionally, the smaller breweries and those that did not serve a full dinner menu drew less visitors. In total, 325 valid surveys were collected from the 7 participating breweries (see Table 2: Survey Counts of Participating Breweries).

Once the surveys were collected, the results were tabulated in Microsoft Excel. The data was then "cleaned" and uploaded into IBM's Statistical Package for Social Sciences (SPSS) statistical software. This software was used to calculate the frequencies and percentages of responses.

Table 2: Survey Counts of Participating Breweries

Brewery Name	Returned Surveys (Count)
Bad Water Brewing	38
Desert Eagle Brewing Company	73
Fate Brewing Company	87
North Mountain Brewing Company	29
O.H.S.O. eatery and Nano Brewery	57
Phoenix Ale Brewery/Sonoran Brewing Company	41
Total:	325

5. Site Selection Analysis

Introduction

Having the "right" location is integral to the success of any business, including craft breweries. In the case of Bad Water Brewing Company, they opened their tasting room doors off "off the beaten path" in downtown Scottsdale, Arizona. Upon personal observation spanning over a two day period (Friday, March 13th and Saturday, March 14th), it became apparent that this site did not have a great deal of traffic. Although this could be due to the fact that this brewery did not offer a full dinner menu, it could also be a result of location (see Figure 4: Bad Water Brewing Co. Location. Photo courtesy of Google Maps). It was located on a very small side street in downtown Scottsdale. The area was chalked full of upscale hotels, and had a touristy feel to it. The brewery also had a

limited selection of their own beers, although they were all exceptional and distinguishably unique.

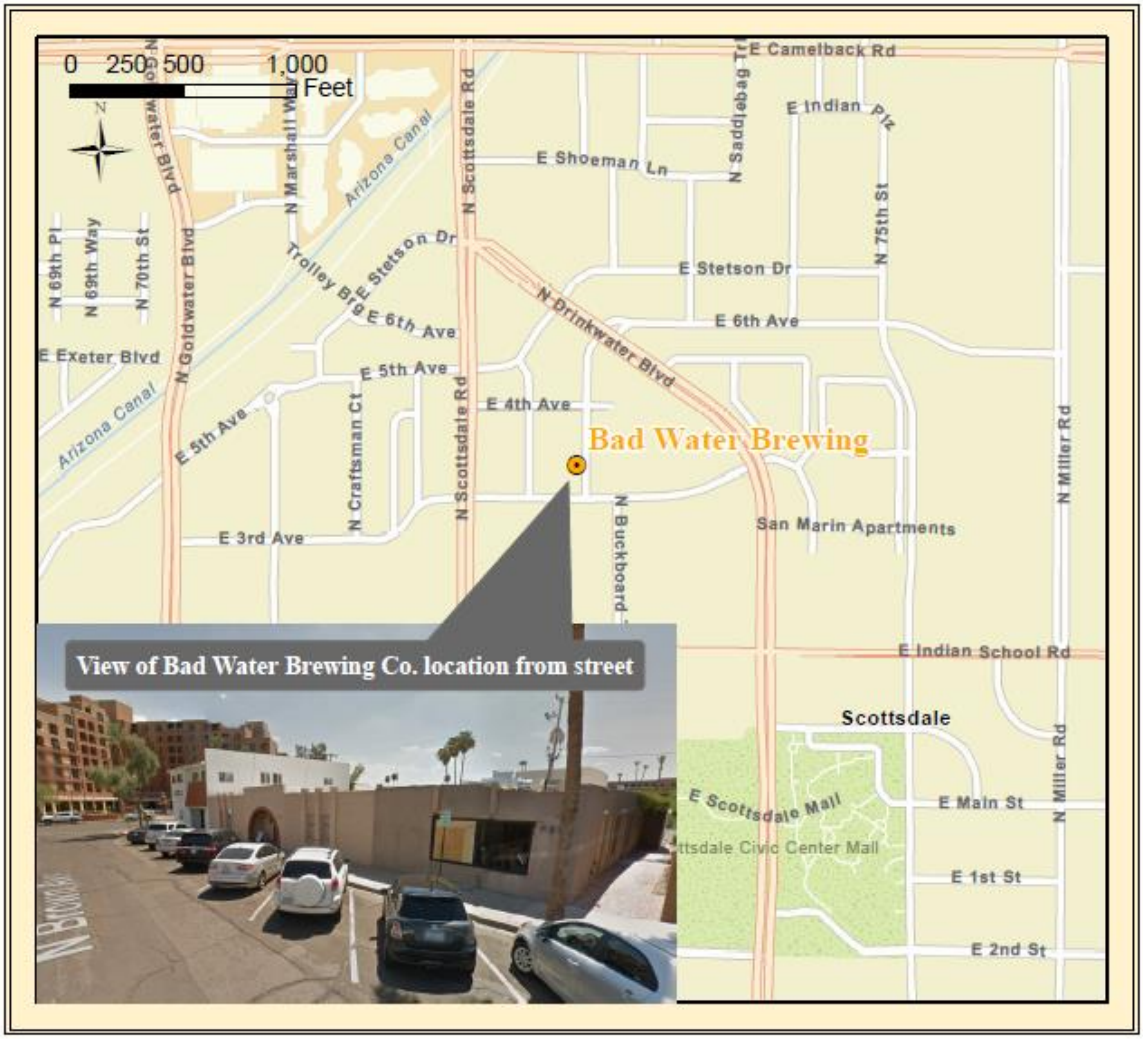

Figure 4: Bad Water Brewing Co. Location. Photo courtesy of Google Maps

The owner of brewery expressed interest in a new potential site near the sports arenas. This site was used in this study and is located at 101 East Buchanan Street in Phoenix (see Figure 5: Location of Tommyknocker Brewing Company). This location was previously renovated by Tommyknocker Brewing Company, based out of Idaho Springs, Colorado (Gonderinger, 1997). Tommyknocker had invested in the facility in the late 1990's, expecting the area

around the baseball stadium to develop in a similar manner to the way it occurred in Denver, Colorado. This was their second location, where they also planned to have a bottling plant in addition to the brewery. However, this facility has recently become available, and other breweries are interested in the site, with infrastructure already established (Torassa, 2015). The facility boasts 26,000 square-feet of space that is heavily retail focused, but also has a bar and full kitchen.

Figure 5: Location of Tommyknocker Brewing Company

Market Area Analysis

The trade area wizard is a Business Analyst tool that is designed to help define the geographical area under investigation (Miller, 2011). The wizard prompts the user to first select the desired technique such as customer derived areas, simple rings, drive time areas, threshold areas and hand-drawn areas. Next, the user is required to define inputs and parameters. The user must define the number of desired rings (zones), and the distances associated with them. The user can also select from a number of reporting functions that will be auto-generated for the geographical region delineated by the market areas (Hollander, 1998). Once the market area has been defined, a user can define the output layer and specify any desirable reports. The way in which the data will be summarized can be customized and the user can select from a number of different reporting templates. The resulting market area and reports can be used it to extract data or information and perform market area analysis. The analysis can vary depending on the available data and the users end goal.

The market areas for this study were delineated using the trade area wizard. This was performed for both the existing Bad Water Brewing site and the potential new site at the Tommyknocker location. The technique used was to generate simple rings. The required input layer was defined as the two brewery sites and Parameters were set to use the donut approach, with three distinct zones. The primary zone was set to 0-1 miles out from a site, which accounted for 10.8% of the consumer profile population. The secondary zones was established to be 1-5 miles out, which accounted for 34.5% of the consumer sample population. The tertiary zone was established to be 5-10 miles out, which

accounted for 19.7% of the sample population. The market area delineations can be seen in Figure 6: Market Area Delineation.

The reports generated from the Trade Area Wizard, and the applicable results were tabulated into a single Microsoft Office Excel spreadsheet (see Appendix F: Geodemographic Profile). The reports derived information from the census block group's data included in the Business Analyst data package. However, they did not appear to provide an option to include information on the businesses located within the market areas.

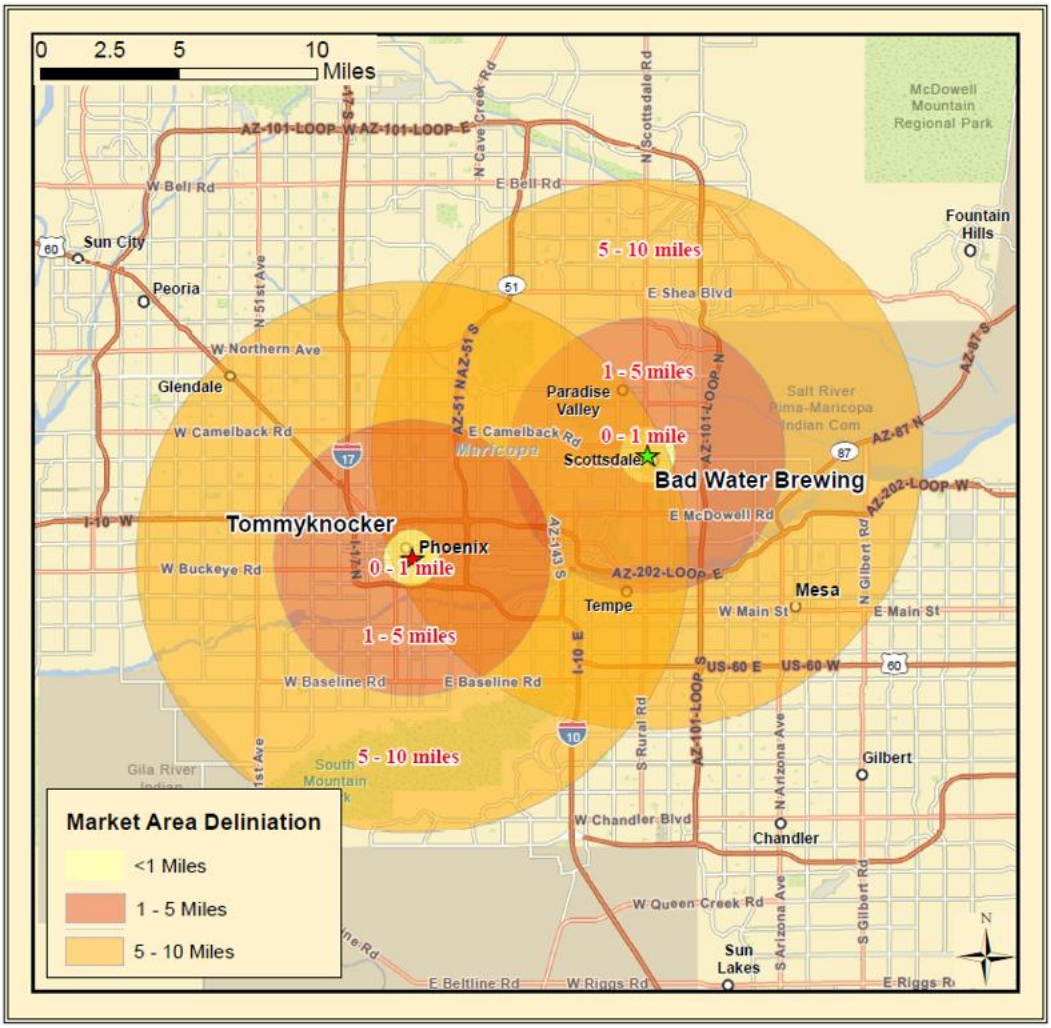

Figure 6: Market Area Delineation

Examining the Neighboring Work Force

The auto-generated trade wizard reports also excluded information on employment status and education level. In order to gather these details to relate the data back to the consumer profile, simple SQL location queries were performed. First, businesses inside each market area zone were isolated. Once the businesses were isolated, the Summarize function was run on the NAICS field for each of the market areas and included the sum statistic for number of employees. This allowed for a tabulation of the number of businesses falling under each NAICS code and the number of employees that work in those businesses. The same methodology was applied to both Tommyknocker and Bad Water Brewing for each of the market area zones of Under 1 Mile, 1-5 Miles and 5-10 Miles.

Isolating Block Groups

Since education level and employment status were not included in any of the auto-generated Business Analyst reports, an additional location query was implemented to isolate Block Groups (Census 2010) that intersected each of the market areas. It is important to note that since block groups are being used, they likely do not match up with the delineation of each market area. Therefore, it is necessary to make an estimation of the population falling within the defined areas. This is challenging because a population is

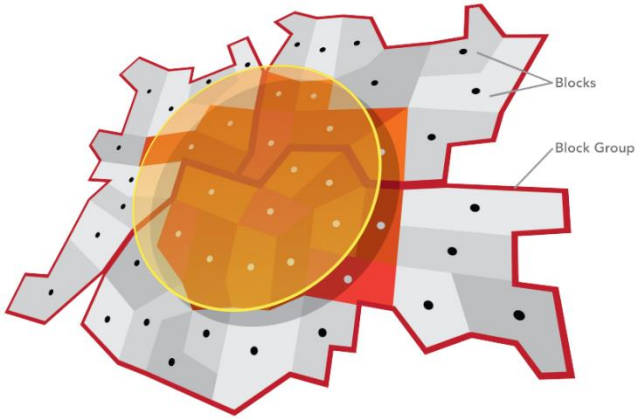

Figure 7: Data Allocation Method; Estimating Population Using Census Block Centroids. Source: Business Analyst Online, 2015.

rarely evenly distributed across a Block Group. A large number of apartment complexes might be found on one side of a block group, while the other side has a large park and industrial complexes. In order to perform a legitimate estimation, the methodology employed by the ESRI Business Analyst software was followed (see Figure 7: Data Allocation Method; Estimating Population Using Census Block Centroids). One can weight where the majority of the population falls within a block group by using blocks (Business Analyst Online, 2015). These centroids were used to portray the distribution of the population on a more granular level than the block groups. The Census Block Groups, which had Census Block centroids falling outside the market area were removed from the study area. An example of the selected block groups for the Tommyknocker 5-10 Mile market area can be seen in Figure 8: Block Group Selection in Tommyknocker Market Area (5 - 10 Miles).

Once the Block Groups were isolated, the statistics function was executed in order to extract the sum of population meeting each criteria. This included the population of people within the block groups that were over the age of 25 and had some or no high school education, a high school diploma, an associate's degree, a bachelor's degree and a graduate degree. The consumer profile was built to reflect the highest level of education achieved. The Block Group data had additional options for completing "some high school" and "some college". In these cases, the numbers were simply added to the sum of the highest level of education achieved. For instance, the sum of people who had completed "some high school" were added to the sum of people who had no high school degree. The remaining results were tabulated in Microsoft Excel.

Figure 8: Block Group Selection in Tommyknocker Market Area (5 - 10 Miles)

Examining the Competition

The last component of this analysis was to consider the "competition". Market areas were established for all of the breweries in the Phoenix Metropolitan area following the same methodology that was previously implemented for Bad Water Brewing and the Tommyknocker location. However, the geodemographics of these market areas were not evaluated in this study. They

were produced merely to determine shared market area. However, after conducting the surveys, it became apparent that many people enjoy brewery hopping, or in other words going from one brewery to the next to sample a number of different craft beer styles. In further discussion with brewery owners, many of them felt that proximity to other breweries was non-threatening to their business. Furthermore, upon evaluating the shared market area between the Bad Water site, Tommyknocker site and other breweries in the region, it became apparent that both sites share 100% of their market area with the breweries (see Figure 9: Shared Market Area with "Competition"). Rather than being in competition with one another, it might be the case that a clustering of breweries may bring more business. Back in 1990, Michael Porter of Harvard Business School presented his study on the concept of clustering (Reference for Business, 2015). In his research, he found that in certain industries, concentrations of like-minded companies sharing certain characteristics such as infrastructure, suppliers and distribution networks can combine resources and solutions to improve business. He explains that competitive advantage comes from innovation of products and discovering new and improved processes in support of business (Kuah, 2002). Craft brewing fits right into this cluster theory as this research previously explained the collaborative and inherently local nature of the industry.

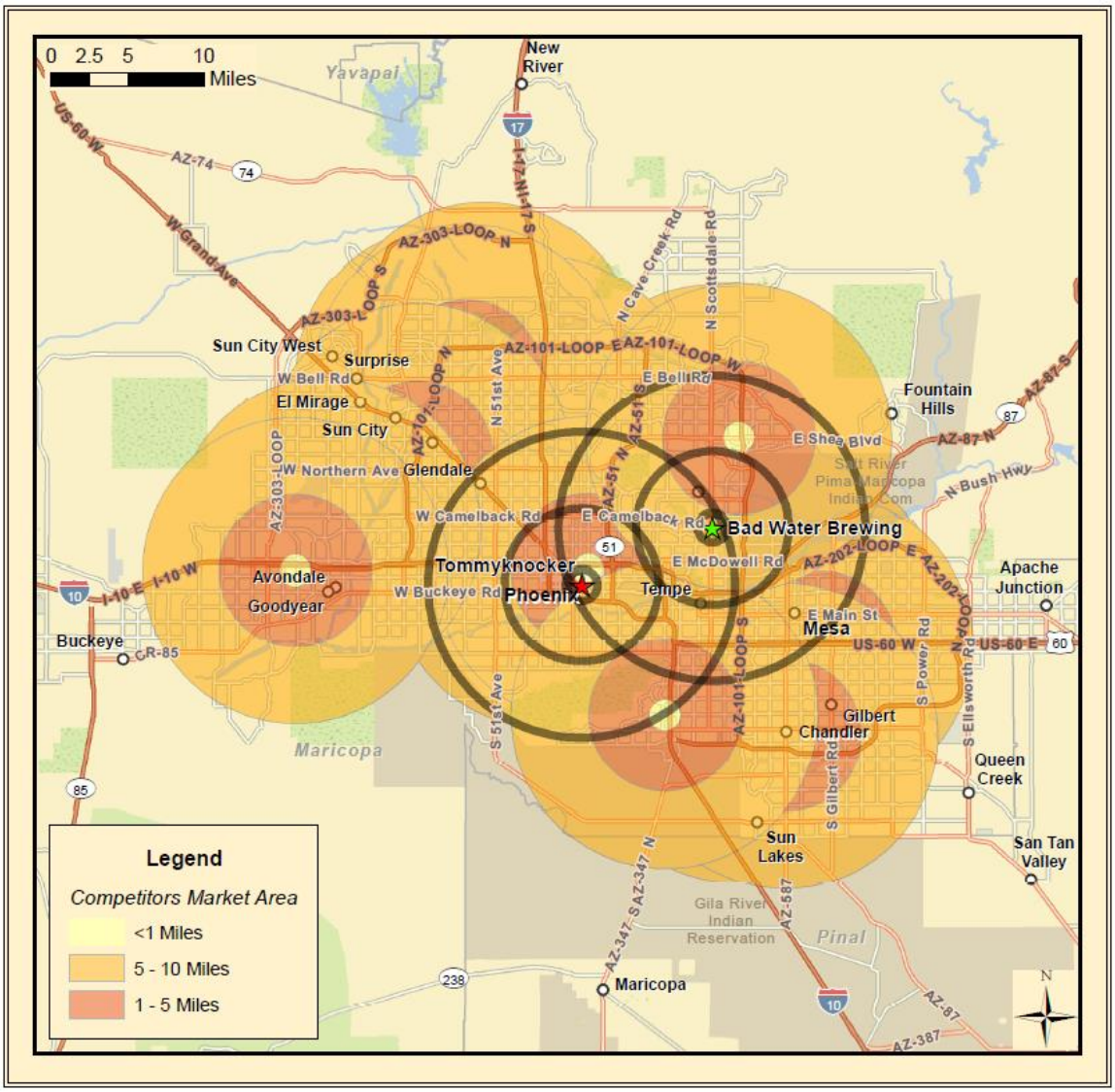

Figure 9: Shared Market Area with "Competition"

Chapter 4: Analysis and Results

1. Introduction

A consumer profile was built to establish who a "typical" Phoenician craft brewery consumer is. This was accomplished by examining and tabulating the results from the field surveys and using SPSS. Once the consumer profile was established, market areas were delineated to illustrate the geographical area encompassing the primary customer base of the breweries under evaluation. Geodemographic data for the market areas were then compared to the consumer profile. From this, an intelligent conclusion can be drawn. This section describes the analysis and results of this study.

2. Consumer Profile

Introduction

A consumer profile was created by examining the results of the surveys that collected 325 valid responses at the 7 participating craft breweries in the Phoenix Metropolitan area. This section is broken up by question type. The first block of questions relates to location. The second block of questions relates to basic demographic information. There is also a block of questions regarding employment and the last block is related to beer culture.

The survey results indicate that the majority of the participants lived in the Phoenix Metropolitan area (64%), came to the brewery directly from home (25.2%), work (14.2%) or a sporting activity (18.5%) and traveled between 1 and

10 miles to get to the brewery (34.5%). Additionally, the majority of participants hold a Bachelor's degree or higher (66.2%), are Caucasian (85.2%), between the ages of 25-39 (48.6%), male (61.5%), are employed full time (78.2%), have a median annual household income over $50,000 (70.8%) and work in the Professional, Scientific, and Technical Services sector (18.8%). Also, 85.3% of participants prefer craft beer to industrial or mass produced beer. In fact, 41.7% of all participants claim that between 81-100% of their total beer consumption is made up of craft beer.

Location Questions

The first group of field survey questions were related to location (see Table 3: Survey Results; Location Information). These questions were designed to determine if customers were local to the Phoenix Metropolitan area, and if not then where they were from. The study found that 63.8% of the sample population was local to the Phoenix Metro Area (see Figure 10: Percentage of Sample Population from the Phoenix Metro Area). The remaining sample population came from all over the country as well as Canada and Mexico. The highest percentage of visitors came from California and accounted for 6.1% of the population. This is no surprise given the proximity of California to Phoenix. One can reach the border of California from Phoenix in under 2.5 hours by way of car.

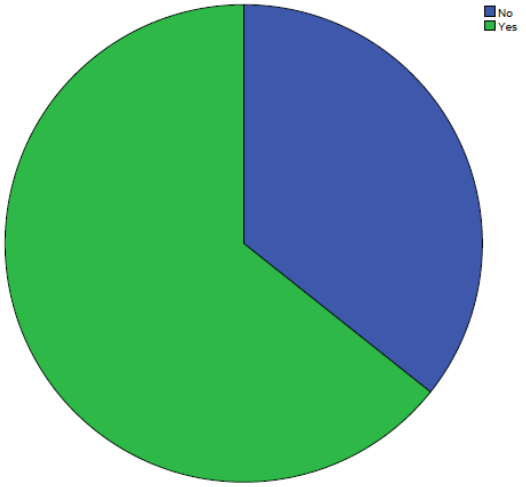

Figure 10: Percentage of Sample Population from the Phoenix Metro Area

Table 3: Survey Results; Location Information

Variables	Data Results
Residence of Respondents	
Phoenix Metropolitan Area	208 (63.8%)
Arizona, Outside Phoenix	13 (4%)
Alabama	3 (.9%)
Alaska	1 (.3%)
California	20 (6.1%)
Canada	10 (3.1%)
Colorado	1 (.3%)
Illinois	3 (.9%)
Indiana	1 (.3%)
Iowa	1 (.3%)
Mexico	2 (.6%)
Michigan	7 (2.1%)
Minnesota	2 (.6%)
Missouri	1 (.3%)
Nebraska	3 (.9%)
Nevada	1 (.3%)
New Mexico	7 (2.1%)
Ohio	2 (.6%)
Oregon	4 (1.2%)
South Africa	1 (.3%)
South Dakota	1 (.3%)
Texas	4 (1.2%)
Washington	5 (1.5%)
Wisconsin	5 (1.5%)
Did Not Specify	19 (5.8%)
Location/Activity before visiting brewery	
Home	82 (25.2%)
Work	46 (14.1%)
School	2 (.6%)
Shopping	21 (6.4%)
Other: Another Brewery	20 (6.1%)
Other: Friend's Home	14 (4.3%)
Other: Hotel	21 (6.4%)
Other: Movie Theater	10 (3.1%)
Other: Restaurant	10 (3.1%)
Other: Sporting Activity	60 (18.4%)
Other: Travelling	15 (4.6%)
Other: General	
Travel Distance	
Less than 1 Mile	35 (10.7%)
1-5 Miles	112 (34.3%)
5-10 Miles	64 (19.6%)
10-20 Miles	52 (16%)
Greater than 20 Miles	62 (19.1%)

This block of location based questions also established how far people travelled to get to the brewery and where had they come from. 25.2% of the population had come directly from home. 18.4% of the sample population had come from some sort of sporting activity, although this is a generalized category that included everything from watching a child's baseball game, to hiking or playing tennis. The other notable category includes those who came directly from work. This accounted for 14.1% of the sample population. Also, 34.3% travelled between 1 and 5 miles to the brewery, and 19.6% travelled between 5 and 10 miles. This shows that proximity is certainly a factor when visiting a craft brewery. However, another 19.1% of the sample population claimed to have travelled more than 20 miles before arriving at the brewery.

To examine this further, the sample population was grouped into local, regional and visitor populations. These designations were then cross tabulated against their locations before visiting the brewery (see Figure 11: Location of Local, Regional and Visitor Sample Population Prior to Brewery Visit). Another cross tabulation was performed to examine how far local, regional and visitor respondents had travelled (see Figure 12: Distance Travelled to Brewery). By examining these two cross tabulations, some trends begin to appear.

The majority of local respondents came directly from home, although a large number also came from work. It is no surprise that the majority of locals travelled only 1-5 miles to the brewery. Since they were mostly coming from home, it is likely that the majority of locals tend to visit breweries in their own neighborhoods. For the regional visitors, the majority of respondents came directly from home and it is of no surprise that the majority had travelled more

than 20 miles to get there. The majority of visitor respondents came from sporting activities, though a notable amount of them came from hotels. Most of them had travelled > 20 miles to the brewery. This is likely due to sporting activities outside of town such as hiking and mountain biking.

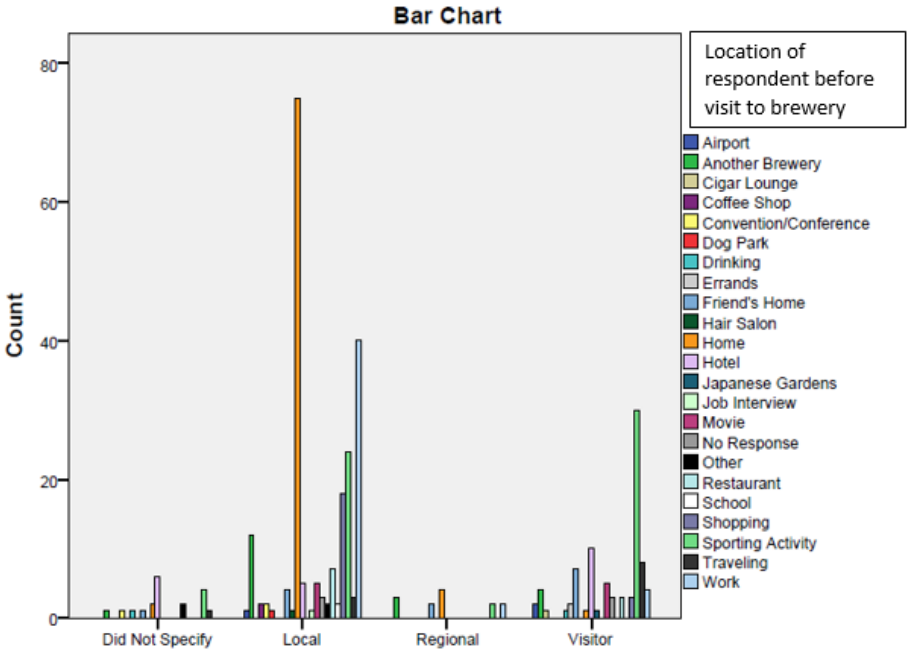

Figure 11: Location of Local, Regional and Visitor Sample Population Prior to Brewery Visit

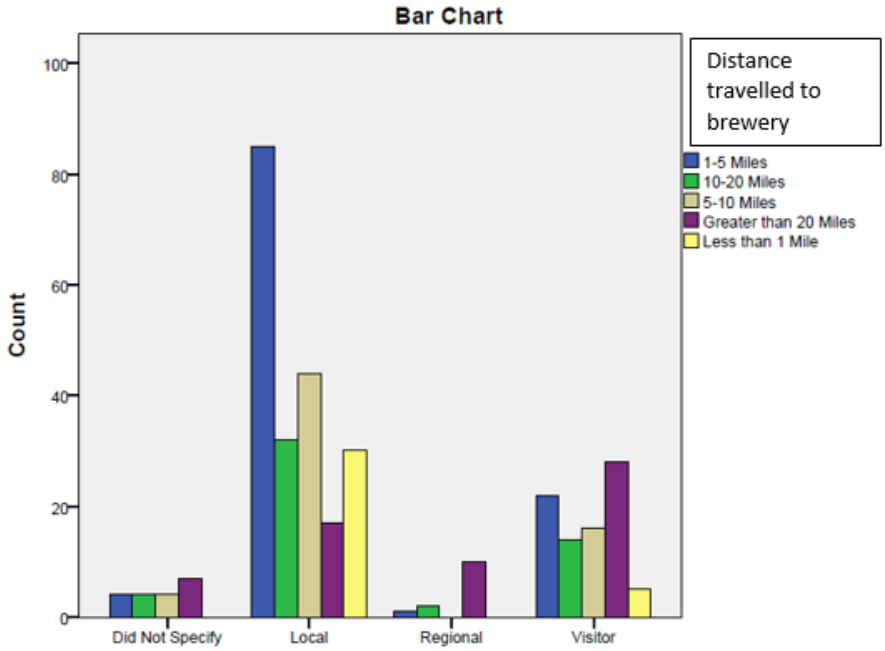

Figure 12: Distance Travelled to Brewery

Demographic Questions

The demographic block of questions included education, race/ethnicity, age and gender. The survey found that everyone had at least a high school diploma. A significant 42.6% of the sample population had a bachelor's degree, while 65.9% of the sample had a Bachelor's degree or higher. Clearly those who visit craft breweries are a well-educated bunch (see Figure 13: Education Level of Sample Population). Also, the majority (85%) of customers were Caucasian (see Figure 14: Race or Ethnicity of Sample Population).

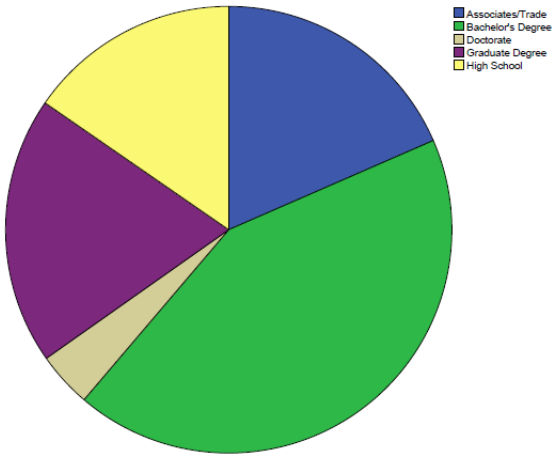

Figure 13: Education Level of Sample Population

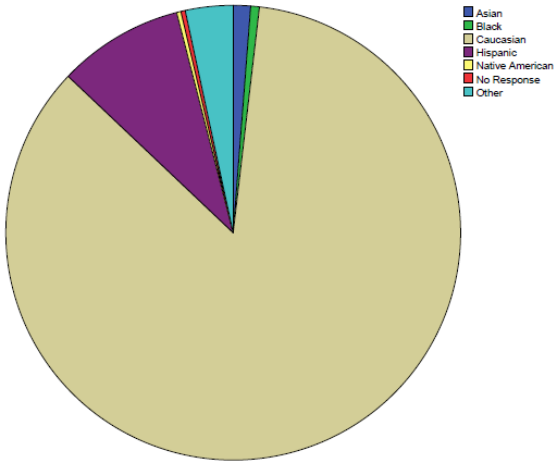

Figure 14: Race or Ethnicity of Sample Population

By cross tabulating the demographic findings from the field surveys with travel distance, we can start to pinpoint some trends (see Table 4: Survey Results; Demographic Information by Travel Distance). The results indicate that well educated people are traveling less distance to get to a brewery. This could be because the breweries are located in affluent areas, or it could be that they are simply willing to travel less distance. People in the 25-29 year old range also tend

to travel less distance to a brewery. This could perhaps be due to their willingness to walk, or even their technological savviness allowing them to utilize services such as Uber. You see this again with the 30-34 and the 35-39 age ranges, although there is a spike for the 30-34 age range who are traveling greater than 20 miles.

Table 4: Survey Results; Demographic Information by Travel Distance

Variables	Travel Distance (Miles)				
	<1	1-5	5-10	10-20	>20
Education					
High School	.9%	5.2%	2.8%	1.8%	4.6%
Associates/Trade	2.8%	4.6%	4.6%	3.4%	3.1%
Bachelor's Degree	4.9%	15.7%	8%	7.1%	7.1%
Graduate Degree	2.2%	8.9%	4.3%	3.7%	4.3%
Race					
Caucasian	8.3%	29.8%	17.5%	12.9%	16.6%
Asian	0%	.3%	0%	.9%	0%
Black	0%	.3%	0%	.3%	0%
Hispanic	1.8%	2.5%	1.2%	.9%	2.5%
Pacific Islander	0%	0%	0%	0%	0%
Native American	0%	.3%	.3%	0%	0%
Other	.6%	1.2%	.6%	.9%	0%
Age					
21- 24	1.5%	2.2%	.9%	1.5%	1.5%
25 - 29	.9%	6.2%	3.7%	2.8%	2.5%
30 - 34	3.4%	5.8%	3.1%	2.5%	4%
35 - 39	1.2%	4.9%	2.8%	2.8%	2.2%
40 - 44	.6%	3.4%	1.2%	.9%	3.1%
45 - 49	.6%	3.1%	.9%	1.8%	1.8%
50 - 54	1.5%	3.7%	3.4%	2.5%	2.2%
55- 59	.6%	2.8%	.9%	.3%	.9%
60 - 64	0%	2.2%	.9%	.6%	0%
65 - 69	0%	0%	.3%	.3%	.6%
70 - 74	0%	0%	.6%	0%	.3%
75 - 79	.3%	0%	.6%	0%	0%
80 - 84	0%	0%	.3%	0%	0%
85 +	0%	0%	0%	0%	0%
Gender					
Male	7.4%	22.2%	12.6%	7.7%	11.7%
Female	3.4%	12%	6.8%	8%	7.4%

Employment Questions

The results from the field survey employment questions were tabulated to give an overall idea of how the sample population fell into categories such as employment status, annual median household income and occupational industry (see Table 5: Survey Results; Employment Information). As one can see from Figure 15: Sample Distribution of Occupation, the majority of the sample population work in professional, scientific and technical services. This is no surprise when you consider that the majority of craft brewery visitors are very well educated, as discussed in the previous section, Demographic Questions. Additionally, the health care and social assistance and finance and insurance industries also employed notable numbers of respondents. These are also industries that require a higher education.

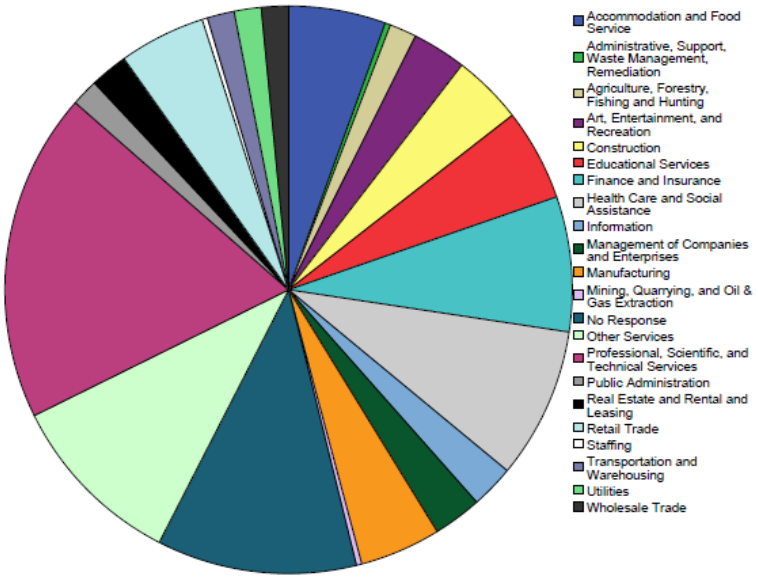

Figure 15: Sample Distribution of Occupation

Table 5: Survey Results; Employment Information

Variables	Data Results
Employment Status	
Student (full-time)	16 (4.9%)
Student (part-time)	6 (1.8%)
Employed (full-time)	71 (21.8%)
Employed (part-time)	20 (6.1%)
Unemployed	6 (1.8%)
Retired	24 (7.4%)
Annual Median Household Income	
Under $15,000	12 (3.7%)
$15,000 – $24,999	17(5.2%)
$25,000 – $34,999	27 (8.3%)
$35,000 – $49,999	21 (6.4%)
$50,000 - $74,999	60 (18.4%)
$75,000 - $99,999	45 (13.8%)
$100,000 – $149,999	60 (18.4%)
$150,000 – $199,999	31 (9.5%)
$200,000 +	34 (10.4%)
Occupational Industry	
Construction	13 (4%)
Mining, Quarrying, and Oil & Gas Extraction	1 (.3%)
Utilities	5 (1.5%)
Agriculture, Forestry, Fishing and Hunting	5 (1.5%)
Manufacturing	17 (5.2%)
Real Estate and Rental and Leasing	1 (2.4%)
Retail Trade	17 (5.2%)
Transportation and Warehousing	6 (1.8%)
Information	8 (2.5%)
Management of Companies and Enterprises	10 (3.1%)
Wholesale Trade	5 (1.5%)
Professional, Scientific, and Technical	61 (18.7%)
Finance and Insurance	25 (7.7%)
Administrative, Support, Waste	1 (.3%)
Educational Services	19 (5.8%)
Health Care and Social Assistance	28 (8.6%)
Public Administration	5 (1.5%)
Accommodation and Food Services	18 (5.5%)
Other Services	35 (10.7%)
Arts, Entertainment, and Recreation	14 (4.3%)

In order to examine any spatial trends within the employment industry, a cross tabulation was generated. This cross tabulation examines employment status, annual median household income and the respondent's occupational industry against travel distance (see Table 6: Employment Information by Travel Distance). The majority of all respondents were employed full time. Of those employed full time, the majority travelled only 1-5 miles, indicating that people with full time jobs are less likely to travel longer distances to visit a brewery. This is logical when one considers the limited personal time an individual has when working full time. Also, people making an annual median household income of $50,000 or more tended to be less willing to travel more than 5 miles to visit a brewery. This is perhaps easier to see in a graph (see Figure 16: Annual Median Household Income by Distance Travelled).

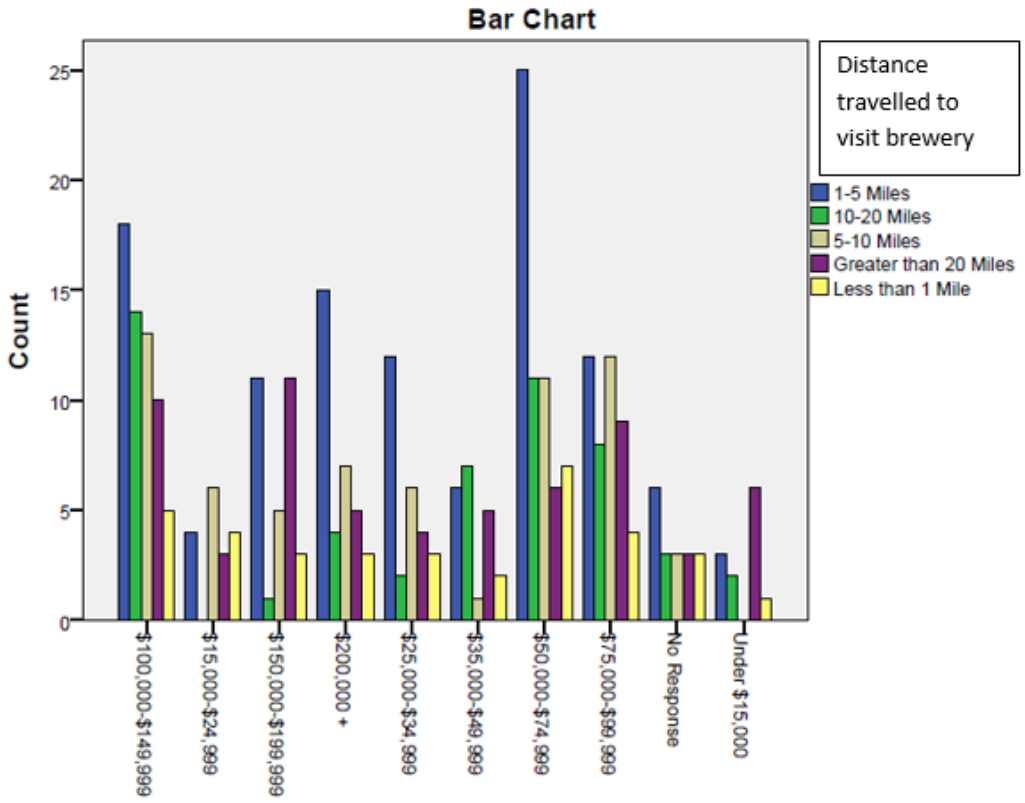

Figure 16: Annual Median Household Income by Distance Travelled

Table 6: Employment Information by Travel Distance

Variables	Travel Distance (Miles)				
Employment Status	**<1**	**1-5**	**5-10**	**10-20**	**>20**
Employed Full Time	8.9%	27.4%	14.8%	12.6%	14.5%
Employed Part Time	1.2%	2.8%	.3%	.9%	.9%
Unemployed	0%	.6%	.3%	.9%	0%
Student Full Time	.6%	1.8%	.9%	.6%	.9%
Student Part Time	.3%	.6%	0%	.6%	.3%
Retired	.6%	1.2%	3.1%	.9%	1.5%
Annual Median Household Income					
Under $15,000	1.8%	.9%	0%	.6%	.3%
$15,000-$24,999	.9%	1.2%	1.8%	0%	1.2%
$25,000-$34,999	.9%	3.7%	1.8%	.6%	1.2%
$35,000-$49,999	.6%	1.8%	.3%	2.2%	1.5%
$50,000-$74,999	2.2%	7.7%	3.4%	3.4%	1.8%
$75,000-$99,999	1.2%	3.7%	3.7%	2.5%	2.8%
$100,000-$149,999	1.5%	5.5%	4%	4.3%	3.1%
$150,000-$199,999	.9%	3.4%	1.5%	.3%	3.4%
$200,000 +	.9%	4.6%	2.2%	1.2%	1.5%
Occupational Industry					
Accommodation and Food Service	.3%	2.8%	.9%	.9%	.6%
Administrative, Support, Waste Management, Remediation	0%	0%	0%	.3%	0%
Agriculture, Forestry, Fishing and Hunting	.3%	.3%	0%	.3%	.6%
Art, Entertainment, and Recreation	.6%	1.8%	0%	.3%	.3%
Construction	.3%	2.2%	0%	.6%	.9%
Educational Services	.3%	2.2%	.3%	1.5%	.9%
Finance and Insurance	1.5%	4.3%	1.2%	.3%	.3%
Health Care and Social Assistance	1.5%	3.4%	2.2%	.9%	.6%
Information	0%	.9%	0$	.9%	.6%
Management of Companies and Enterprises	0%	.6%	.3%	.3%	1.5%
Manufacturing	1.2%	.9%	.9%	0%	1.5%
Mining, Quarrying, and Oil & Gas Extraction	0%	0%	0%	0%	.3%
Other Services	0%	2.5%	2.8%	2.5%	2.8%
Professional, Scientific, and Technical Services	1.2%	4.6%	3.7%	3.7%	4.6%
Public Administration	2.1%	0%	.6%	.3%	.3%
Real Estate and Rental and Leasing	.3%	.6%	.6%	0%	0%
Retail Trade	.9%	1.8%	1.2%	1.2%	.6%
Staffing	0%	0%	.3%	0%	0%
Transportation and Warehousing	0%	.3%	.3%	.3%	.6%
Utilities	0%	.9%	.3%	0%	.3%
Wholesale Trade	0%	.9%	.3%	0%	.3%

Beer Culture Questions

The beer culture questions provides insight into the general behaviors and attitudes of a typical craft brewery customer. The results are interesting and established that the majority of customers visited the brewery because they love the taste of craft beer (see Table 8: Survey Results; Behavioral Information). Additionally, 40.2 % of customers named supporting local business as a reason for their visit (see Figure 17: Percentage of Sample Population who).

In Chapter 2, this research examined how craft beer falls into the Neolocal social movement. In order to better understand if this is the case in Phoenix, a cross tabulation has been performed. The sample population has been grouped into local, regional and visiting respondents. The groups were then compared with their response to whether or not they visited the brewery to support local business (see Table 7: Visitors Supporting Local Business). The respondent percentages are based upon the percentage of the population of each group. Of all local respondents, 43.3% support local business, indicating that the craft beer movement is indeed part of the neolocal movement. Of the regional respondents, 69.2% support local business. This is unexpected since these are respondents that are not local to Phoenix. However, an individual can still support local business in localities other than their own. Of visitors outside of state, 30.6% of these respondents supported local business.

Table 7: Visitors Supporting Local Business

Visitor Group	Respondents Supporting Local Business (%)
Local	43.30%
Regional	69.20%
Visitor	30.60%
Did Not Specify	31.60%

Table 8: Survey Results; Behavioral Information

Variables	Data Results
Reasons for Supporting Craft Brewery	
Support Local Business	131 (40.2%)
Taste of craft beer	187 (57.4%)
Quality of ingredients in craft beer	70 (21.5%)
Meeting friends or family	91 (27.9%)
I'm a regular	56 (17.2%)
Close to home/work/shopping	81 (24.8%)
Music/Entertainment	11 (3.4%)
The food	43 (13.2%)
Meet new people	19 (5.8%)
Preference of Craft Beer to Industrial Beer	
Yes	278 (85.3%)
No	39 (12%)
Approximately percentage of your total beer consumption that is craft beer	
0-20%	45 (13.8%)
21-40%	35 (10.7%)
41-60%	38 (11.7%)
61-80%	63 (19.3%)
81 – 100%	136 (41.7%)
"Outdoorsy" lifestyle	
Yes	243 (74.5%)
No	73 (22.4%)

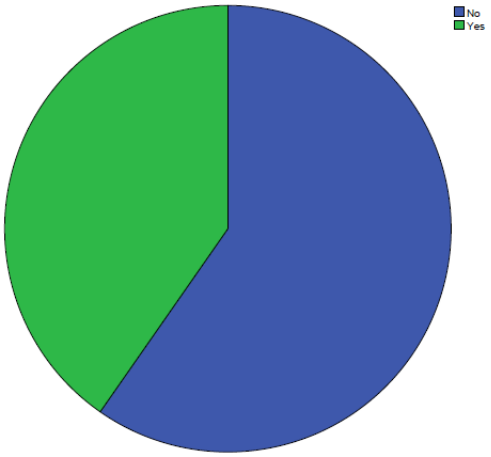

Figure 17: Percentage of Sample Population who Visited Brewery to Support Local Business

3. Market Area Analysis

Introduction

The market area analysis involves market areas for both the Bad Water Brewing Company's location and that of their potential new site located at the former Tommyknocker Brewing Company. This analysis involves a comparison of the two sites to one another and to the consumer profile developed in this study. The market areas have been broken out into 3 areas. The first market area extends 1 mile out from each site, the next extends from 1 to 5 miles out from each site. The last market area extends from 5 to 10 miles out from each site. This section is broken up by the demographic variables established in this study. This includes education, race/ethnicity, age, income, occupation, employment and gender.

Chi-Square Goodness of Fit Test

Bad Water Brewing Company is interested in acquiring the old Tommyknocker Brewery site discussed in Chapter 2. In order to evaluate the geodemographic suitability of the new site and compare it with the current brewery location, a Chi-Square Goodness of Fit test can be employed. By using this statistical test, one can examine the frequency of each variable, which was tabulated in an excel spreadsheet (see Appendix F: Geodemographic Profile).

The Pearson's Chi-Square Goodness of Fit Test comes from a family of chi-square tests developed by Karl Pearson in the early 1900s (Franke, Ho and Christie, 2012). The Goodness of Fit Test examines how well the distribution of a sample fits the distribution of a known population. In other words, one is

comparing a population with known variables against an observed population of interest. For example, if a survey has been conducted, one can apply the Goodness of Fit Test to compare the sample with the actual geodemographics of the area in which the survey was conducted to determine if they are consistent with one another. The statistic is calculated using the following computational formula:

$$x^2 = \sum_{i=1}^{n} \frac{(O_i E_i)^2}{E_i}$$

n represents the number of levels of categorical variables, O_i represents the observed frequency count for a categorical variable and E_i represents the expected frequency count for a categorical variable. The degrees of freedom are calculated by taking the number of levels of the categorical variable and subtracting 1.

The test is always conducted with a null hypothesis and an alternative hypothesis:

H_O = The data follows the expected distribution.

H_A = The data does not follow the expected distribution.

In order to interpret the results of the test, a P-value must be calculated using the degrees of freedom. This value represents the probability of the sample statistic being as extreme as the x^2 test statistic. The x^2 test statistic is compared to the P-value (Critical Value). If the p-value is less than the significance value, the null hypothesis is rejected. When the null hypothesis is rejected, this indicates that the observed distribution differs significantly from the expected distribution.

By employing the Chi-Square Goodness of Fit Test, the geodemographics of the consumer profile that was created from the field surveys can be compared to the actual geodemographics of the market areas delineated in this study. For example, the distribution of ages from the consumer profile can be compared to the distribution of ages within a market area, derived from the 2010 US Census data. 3 distinct market area zones were delineated for each of the two brewery locations under evaluation. This includes the current Bad Water Brewing Company site and the Tommyknocker Brewery site that they are considering as a new location. The test can be executing for each of the market area zones for each of the two breweries. Each of the observed geodemographic variables (i.e. Income, Age, Race, Education, etc.) can be compared separately against those of the expected (consumer profile) geodemographic variables. This allows one to see how well the distribution of the variables from the sample fits with the actual geodemographics of the market areas.

This test was executed for the Bad Water Brewing Company's current location and their potential new "Tommyknocker" site to examine which of the two sites is a "better fit" to the consumer profile. In other words, we are examining what the distribution is for each of the market area zones and comparing it with the expected distribution of the variables (the consumer profile). This statistical analysis was executed using 95% confidence. Not every variable that was examined in the field survey is applicable to the Chi-Square Goodness of Fit Test.

For each variable such as education or race, the hypothesis says that we believe the proportions of the actual population in the market area are the same

as the general proportions of the consumer profile. For example, we believe that 23.3% of the Bad Water Brewing Companies <1 Miles Market area zone population will have a graduate degree, 42.6% will have a Bachelor's, 18.4% will have an Associates or Trade degree, 15.3% will have a High School diploma, and 0% will not have completed high school because the consumer profile found this to be true. However, if we run the Chi-Square (x^2) statistic for this variable, we determine that x^2 equals 35.36 for this zone. With 95% confidence, we find the critical value to be 7.81 for this test. Since 35.36>7.81, we reject the null hypothesis because the observed distribution does not match the expected distribution. This indicates that people with different education levels (variable) are likely not choosing the brewery at random. Again we execute this test, but this time for the Tommyknocker site. We find the test statistic to be 68.63, which again is greater than the critical value of 7.81 and we reject the null hypothesis. This also indicates that a brewery is not selected at random. The test statistic for the Bad Water Brewing Company site is lower than that of the Tommyknocker site (35.36<68.63), indicating that the Bad Water site is a closer match to the consumer profile than Tommyknocker and thus a better fit. In general, the lower the x^2 value, the better the fit. A lower x^2 statistic indicates that the observed value differs less significantly from the expected value. Following this reasoning, a table has been constructed to illustrate the x^2 findings (see Table 9: Chi-Square Goodness of Fit Test Results).

Table 9: Chi-Square Goodness of Fit Test Results

Brewery	Zone	*CV*	x^2	Comments
Variable: EDUCATION				
Bad Water	<1 Mi	7.81	35.36	In all 6 cases the x^2 > CV, thus we reject the null hypothesis. For the <1 Mi, 1-5 Mi and 5-10 Mi market areas, Bad Water has a lower x^2 value than Tommyknocker indicating Bad Water is a better fit to the consumer profile.
Tommyknocker	<1 Mi	7.81	68.63	
Bad Water	1-5 Mi	7.81	46.25	
Tommyknocker	1-5 Mi	7.81	74.68	
Bad Water	5-10 Mi	7.81	52.70	
Tommyknocker	5-10 Mi	7.81	59.28	
Variable: RACE				
Bad Water	<1 Mi	11.1	24.05	In all 6 cases the x^2 > CV, thus we reject the null hypothesis. For the <1 Mi, 1-5 Mi and 5-10 Mi market areas, Bad Water has a lower x^2 value than Tommyknocker indicating Bad Water is a better fit to the consumer profile.
Tommyknocker	<1 Mi	11.1	742.17	
Bad Water	1-5 Mi	11.1	94.51	
Tommyknocker	1-5 Mi	11.1	694.60	
Bad Water	5-10 Mi	11.1	161.74	
Tommyknocker	5-10 Mi	11.1	333.33	
Variable: AGE				
Bad Water	<1 Mi	21	80.82	In all 6 cases the x^2 > CV, thus we reject the null hypothesis. For the <1 Mi and 1-5 Mi market areas, Tommyknocker has a lower x^2 value than Bad Water indicating Tommyknocker is a better fit to the consumer profile. For the 5-10 Mi market area, Bad Water has a lower x^2 value than Tommyknocker indicating Bad Water is a better fit to the consumer profile.
Tommyknocker	<1 Mi	21	39.35	
Bad Water	1-5 Mi	21	52.75	
Tommyknocker	1-5 Mi	21	25.04	
Bad Water	5-10 Mi	21	30.67	
Tommyknocker	5-10 Mi	21	32.70	
Variable: INCOME				
Bad Water	<1 Mi	15.5	144.06	In all 6 cases the x^2 > CV, thus we reject the null hypothesis. For the <1 Mi, 1-5 Mi and 5-10 Mi market areas, Bad Water has a lower x^2 value than Tommyknocker indicating Bad Water is a better fit to the consumer profile.
Tommyknocker	<1 Mi	15.5	532.60	
Bad Water	1-5 Mi	15.5	77.85	
Tommyknocker	1-5 Mi	15.5	197.60	
Bad Water	5-10 Mi	15.5	86.74	
Tommyknocker	5-10 Mi	15.5	98.09	
Variable: OCCUPATION				
Bad Water	<1 Mi	28.9	55.45	In all 6 cases the x^2 > CV, thus we reject the null hypothesis. For the <1 Mi, 1-5 Mi and 5-10 Mi market areas, Bad Water has a lower x^2 value than Tommyknocker indicating Bad Water is a better fit to the consumer profile.
Tommyknocker	<1 Mi	28.9	63.82	
Bad Water	1-5 Mi	28.9	55.13	
Tommyknocker	1-5 Mi	28.9	101.51	
Bad Water	5-10 Mi	28.9	70.05	
Tommyknocker	5-10 Mi	28.9	73.27	

The x^2 test revealed that in the case of race/ethnicity, Bad Water was the better fit to the consumer profile. The x^2 values were all significantly higher than the critical value of 11.1 indicating that the distribution of race/ethnicity is not evenly distributed in relation to brewery location. The Bad Water x^2 statistics for the 0-1 mile, 1-5 mile and 5-10 mile market areas were 24.05, 94.51 and 161.74 respectively. For Tommyknocker, they fell at 742.17, 694.60 and 333.33.

The age category again resulted in high Chi-Square values indicating that age is not randomly distributed as it relates to the brewery locations. The x^2 test found that for the 0-1 mile and 1-5 mile market areas, Tommyknocker was a better fit with x^2 values at 39.35 and 24.04 respectively, and a critical value of 21 with 12 degrees of freedom. In the case of Bad Water brewing site, the x^2 values were 80.82 and 52.75 respectively. For the 5-10 mile market area however, both Bad Water and Tommyknocker were very close to one another. Bad Water's x^2 statistic was 30.67 and Tommyknocker's was 32.70. However, since Bad Water's x^2 statistic was lower, this was the better fit for this market area. The frequency distributions for age can be seen in figures 34, 35 and 36.

The Annual Median Household Income category again resulted in high Chi-Square values indicating that age is not randomly distributed as it relates to the brewery locations. The x^2 test resulted in a critical value of 15.5 and 8 degrees of freedom. For all three market area delineations, 0-1 mile, 1-5 mile and 5-10 mile, Bad Water Brewing had the better fit with x^2 statistics of 144.06, 77.85 and 86.74 respectively. Tommyknocker's x^2 statistics were 532.60, 197.6 and 98.09 respectively. Although all of these x^2 statistics fall in the rejection region of a

distribution curve (>15.5), Bad Water has the lower values in all three cases, meaning it is a closer fit to the consumer profile.

The occupational industry category again resulted in high Chi-Square values indicating that age is not randomly distributed as it relates to the brewery locations. First, it is important to clarify that this variable refers to the occupation of people who live in the area. With a critical value of 28.9 and 18 degrees of freedom, x^2 statistics were calculated and Bad Water Brewing appeared to be the better fit again. In this case the x^2 statistic for Bad Water's 0-1 mile market area was 55.45. For the 1-5 mile market area it was 55.13 and for the 5-10 mile market area it was 70.05. The Tommyknocker x^2 statistics were 63.82, 101.51 and 73.27 respectively.

The Chi-Square Test was used to determine which of the two brewery locations, Bad Water Brewing and Tommyknocker fit more closely with the distribution of variables in the consumer profile. The null stated that the data follows the expected distribution. In other words, the null hypothesis was that the distribution of the observed variables for the Tommyknocker and Bad Water sites would follow the distribution of the consumer profile, or the expected. The null hypothesis was rejected in every case. Examining each of these variables has indicated that in all but two cases, the current Bad Water Brewing Company location has a lower Chi-Square statistic than Tommyknocker. This indicates that Bad Water Brewing Company is a better fit to the consumer profile of a Phoenix craft brewery consumer. However, it is again important to note that this assumption is built upon geodemographics and in no way considers the importance of other location factors such as visibility and street accessibility.

Frequency Distributions

In addition to occupation, this study gave consideration to businesses within each of the market areas. These businesses could in theory contribute to the customer base. Although the consumer profile did not find that many people visited a brewery directly from work, this may be a bias due to the limitations of the sampling. If the surveys had been conducted during lunch hours or during more weekday "happy hours", the proportion of people visiting a brewery during their lunch hour or after work may have varied in great significance. Therefore, we still give consideration to consumers whose jobs fall within the market areas. A Chi-square test was not conducted in this case, however the frequency distribution of these jobs is provided in Figure 18: Number of Employees in NAICS Industries (0-1 Mile Market Area), Figure 19: Number of Employees in NAICS Industries (1-5 Mile Market Area) and Figure 20: Number of Employees in NAICS Industries (5-10 Mile Market Area).

A Chi-Square test could not be conducted on unemployment because there is only one variable under consideration. Unemployment in the market areas was well below the state average of 6.5% (Bureau of Labor and Statistics, 2015). 1.85% of people in the consumer profile were unemployed. The Bad Water site had 3.86% unemployment in the 0-1 mile market area, 3.42 in the 1-5 mile market area, and .07 in the 5-10 mile market area. Tommyknocker had unemployment rates of 3.67, 3.63 and 4.65 respectively. The Bad Water Site has lower unemployment rates all around and thus makes for a more suitable site with regard to unemployment. The frequency distributions can be seen in Figure 21:

Unemployment (0-1 Mile Market Area), Figure 22: Unemployment (1-5 Mile Market Area), Figure 23: Unemployment (5-10 Mile Market Area).

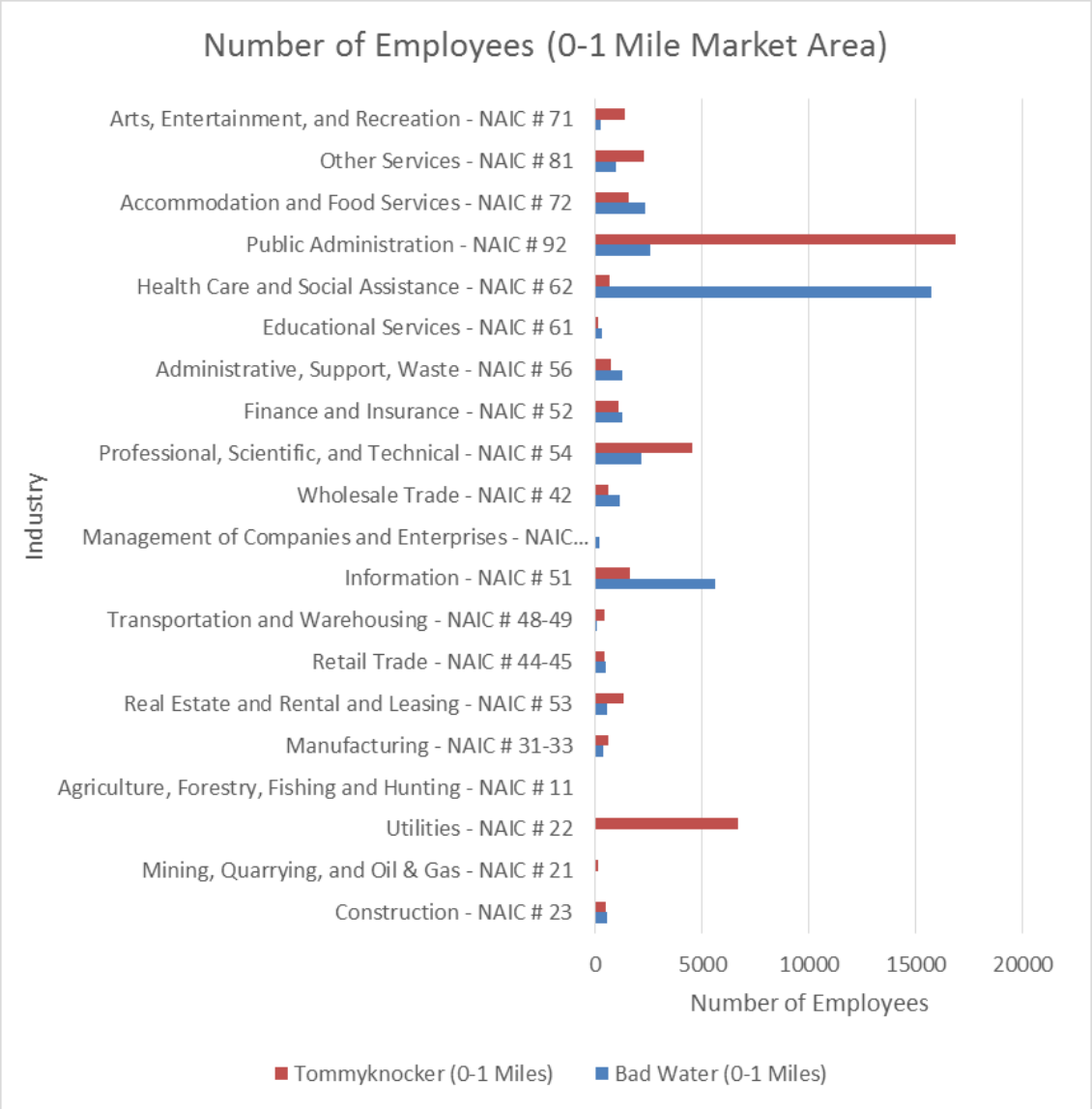

Figure 18: Number of Employees in NAICS Industries (0-1 Mile Market Area)

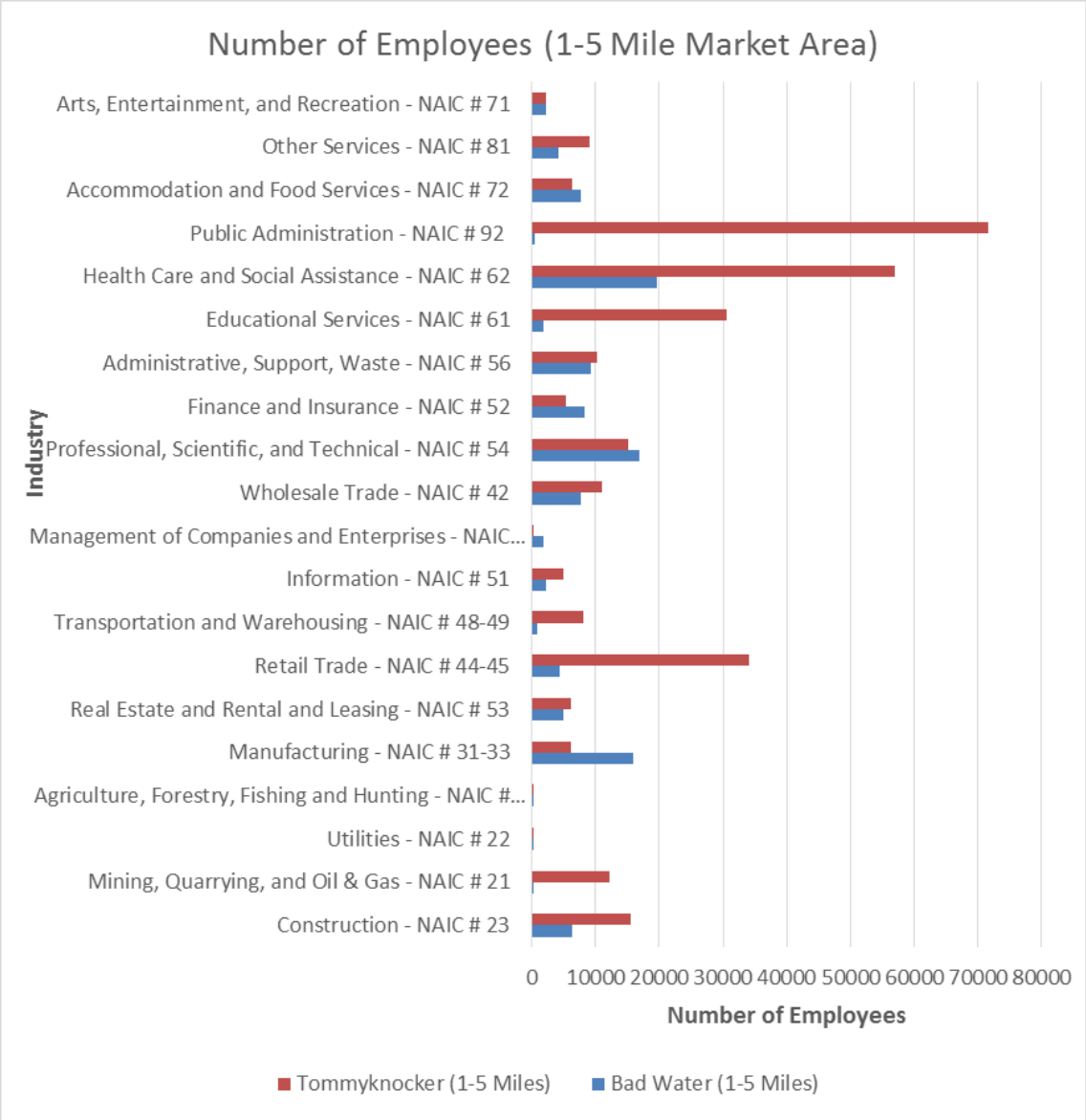

Figure 19: Number of Employees in NAICS Industries (1-5 Mile Market Area)

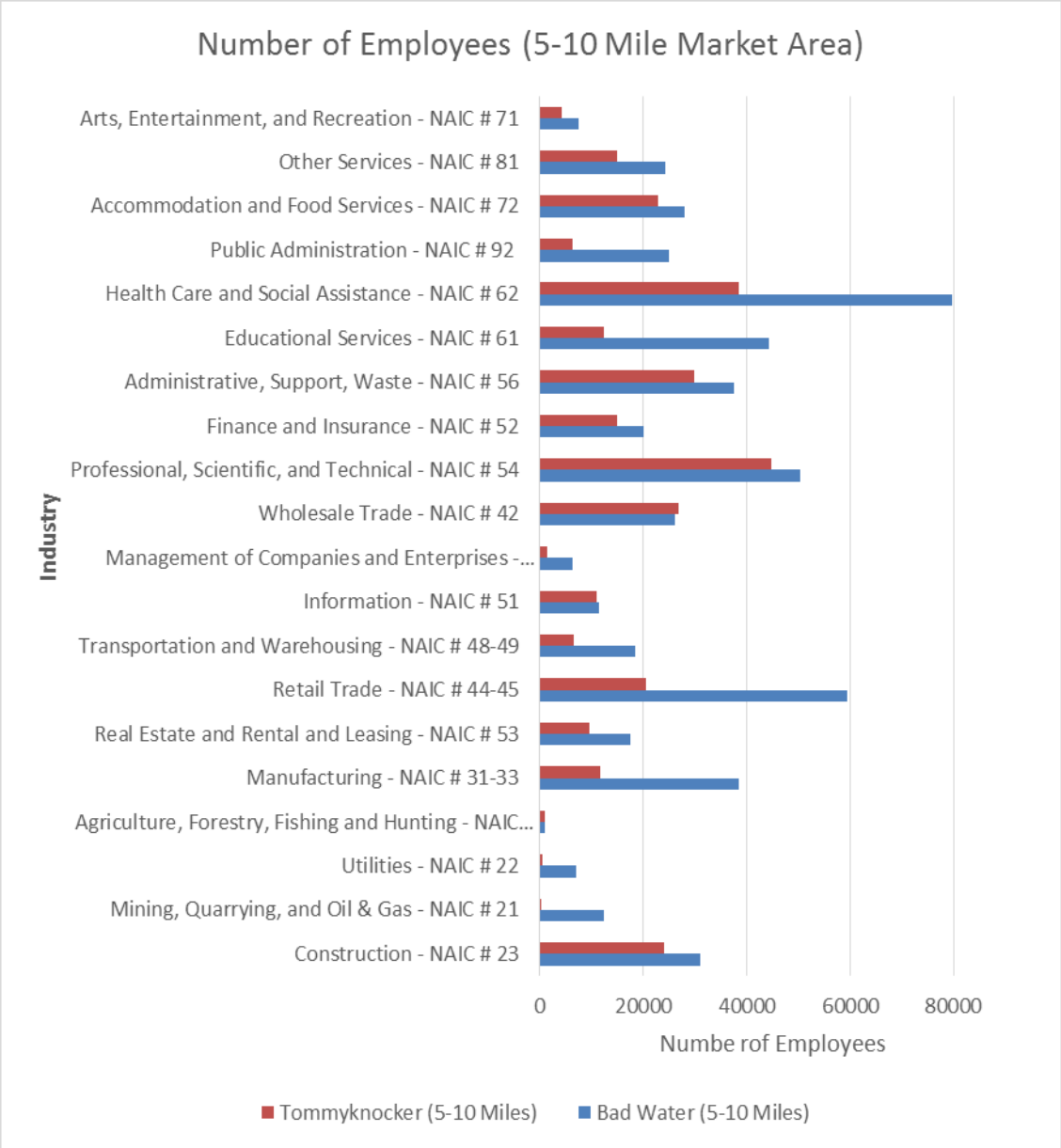

Figure 20: Number of Employees in NAICS Industries (5-10 Mile Market Area)

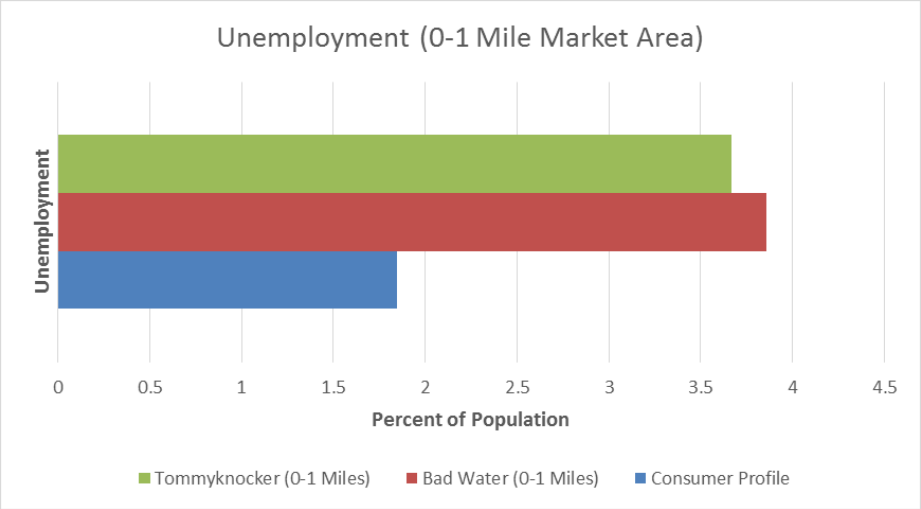

Figure 21: Unemployment (0-1 Mile Market Area)

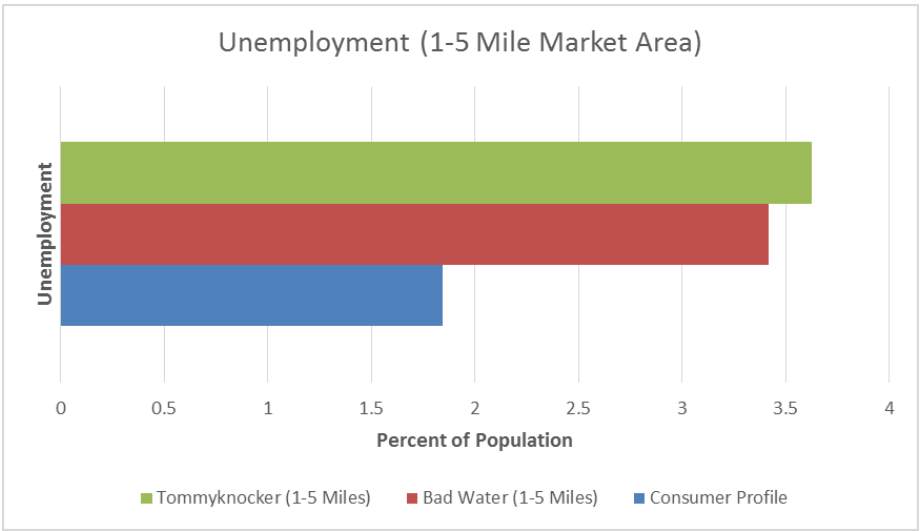

Figure 22: Unemployment (1-5 Mile Market Area)

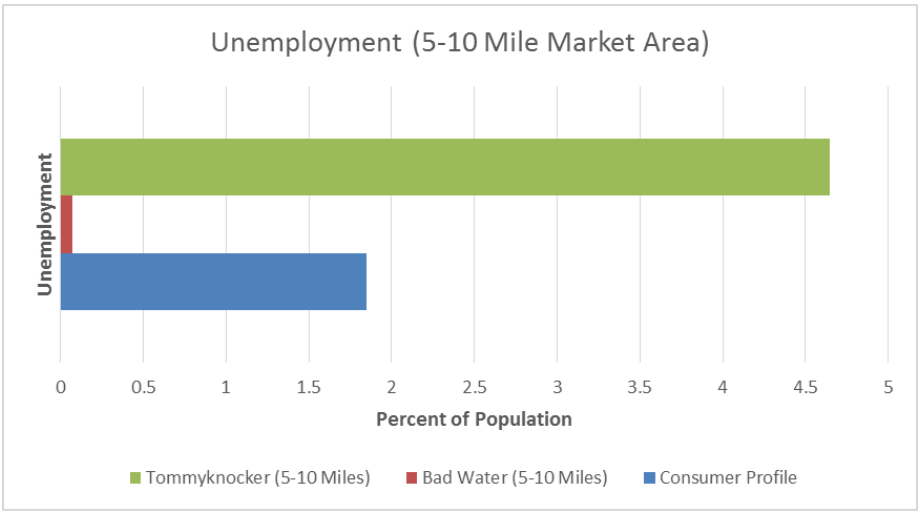

Figure 23: Unemployment (5-10 Mile Market Area)

Chapter 5: Conclusion and Discussion

1. Summary of Findings

This research set out to examine craft breweries in the greater Phoenix Metropolitan area in order to identify demographic trends, consumer behaviors and spatial relationships in the craft beer market. The resulting information was intended to provide location intelligence to craft brewery entrepreneurs in an effort to reduce their risk of entering the market. With this in mind, this study set out to determine how geodemographic information plays a role in strategic location decisions for craft breweries.

By first conducting a field survey to gather information regarding demographics, travel distance, information as to prior location before visiting the brewery and customer motivations. The survey was conducted at 7 breweries in the Phoenix Metro area and resulted in 325 valid responses. The results of the consumer surveys were tabulated in excel, then run through SPSS software to establish frequencies. The participating breweries were georeferenced, as well as the Tommyknocker site.

Bad Water Brewing Company was interested in a geodemographic study on a new site that they are interested in acquiring. In order to compare the geodemographics of their current site to the potentially new site (Tommyknocker), market areas were delineated using the Trade Area Wizard in Business Analyst. 3 Zones were delineated for each site. The primary zone was established at less than 1 mile outward. The secondary zone was established at 1

to 5 miles outward, and the tertiary zone was established at 5-10 miles outward. Once these market areas were established, the geodemographics could be examined and compared to the consumer profile. In most cases, report templates were utilized within Business Analyst. In some cases, the templates did not match the desired variables. When this occurred, the 201 Census Block Groups were overlaid with the market areas. Using a Census Block Centroid methodology, population was estimated for these market areas. In cases where the centroid fell outside of the market area, the census block group was deselected and the population was not included. The resulting geodemographics within the market areas were tabulated.

The geodemographics that were extracted from the market areas were used to perform Chi-Square Goodness of Fit Tests. These tests were executed to establish how well the actual distribution of the observed population within the market areas matched the expected distribution of the consumer profile. In all cases, the data did not follow the expected distribution portrayed by the consumer profile. With high Chi-Square values for all variables tested, one might conclude that the variables are not randomly distributed in relation to either of the brewery locations. With the Chi-Square statistics being lower for Bad Water Brewing in all but two cases, the resulting conclusion was that Bad Water Brewing Company's current location in Scottsdale, Arizona is a better fit, geodemographically speaking.

This research initially intended to consider competition as a factor within the analysis. During the visits to the breweries and upon tabulating the results of

the surveys, it became apparent that breweries may not be in competition with one another in the traditional sense. Upon further investigation, it was found that a clustering of craft breweries may bring more business. According to Michael Porter's research, concentrations of like-minded companies sharing certain characteristics such as infrastructure, suppliers and distribution networks can benefit one another in certain industries. Craft brewing fits right into this cluster theory. The nature of the business is collaborative and inherently locally minded. Therefore, the traditional analysis techniques for analyzing retail competition were not used.

Geodemographic information played a vital role in this analysis. By examining geodemographics, a picture was painted of the typical consumer. Coupled with the use of GIS, a comparison of two craft brewery locations was performed. By examining the geodemographics of the market areas and comparing them with the demographics found in the consumer profile, one can safely draw a conclusion as to which site will better cater to the appropriate customer base within its local. The geodemographic profiles can be provided to Bad Water Brewing Company, along with an intelligent business recommendation. Upon conclusion, it is recommended that Bad Water Brewing Company stay in their current location, or seek out a site in a better location than the Tommyknocker site. The previous Tommyknocker business closed. Perhaps this is due to poor location. As they say in the world of site selection, location, location, location!

2. Limitations of Methods

The most notable limitation of this study was the decision to use travel distance rather than drive time when delineating the market areas. When the survey was designed, the research focused on distance. Unfortunately, the average person is not confident in providing the distance they travelled. In a desert city like Phoenix, Arizona, most people use their air conditioned cars to get from one place to the next. Most anyone can also estimate how much time it took to get to a place. Using the drive time approach would have been advantageous as it places more emphasis on the actual access patterns rather than distance (Miller, 2011). This would have provided a more accurate market area delineation suited to the culture of the study area. As one might imagine, this approach will result in a market area that extends further down a highway or an expressway with consideration to travel speed. This would result in the addition of population along these areas.

With such a heavy focus on demography, this research could have benefited from an exploration of sociological factors. Namely, how the growth of the craft beer industry fits into the context of human and urban ecology. Human ecology focuses on how populations organize themselves within an environment and how they interact (Hawley, 1986). Urban ecology is closely tied to this as it examines the expansion, metabolism and mobility of an urban environment (Burgess, 1925). By examining how the urban environment and population has grown within Phoenix, one might gain additional insight into the ways of which the craft beer industry has developed. Phoenix, Arizona is notable for its urban

sprawl, perhaps giving insight into the growth of the craft beer market. Also, under human ecological theory, humans have a need to sustain a rhythm in life. This rhythm is met by satisfying needs for food, rest and a regulated allocation of time (Hawley, 1986). It would be interesting to examine how these aspects of human nature relate to the distance a human is willing to travel to a brewery within the given allocation of time within an individual's life rhythm.

All of the breweries that participated, served food in addition to their beer. Bad Water Brewing did not offer a full dinner menu, but they offered fancy meat and cheese plates. Phoenix Ale Brewery and Sonoran Brewing Company offered Paninis and chips. All of the other breweries provided full dinner menus. This was an unexpected occurrence, which likely contributed toward many craft breweries disinterest in participating in this study. While walking into a tasting room or bar to conduct surveys is relatively unobtrusive, approaching people at a seated meal may be construed as bothersome to the customers.

Additionally, the breweries that did participate were first and foremost concerned with their customers and sales. The data collection process had to remain flexible and fit in with the individual needs of each participating brewery. While some where happy to allow the surveys to occur during peak hours, others felt this was bothersome to the wait staff. Some participants allowed the surveys to be conducted over the weekend or even over multiple days. Others only allowed the surveys to be conducted on weekdays. This creates an unintentional bias as data is not available from each of the breweries over the same days of the week or times of day. However, when the data from all of the breweries are

combined, the dataset presents a very well rounded sample spanning from Friday at lunch through Monday night.

Another notable limitation was in the sampling design. The first question asked “Are you from the Phoenix Metropolitan Area”? This question turned out to be confusing to people. They were not sure if the question was asking if they currently lived in Phoenix, or if they were originally from Phoenix. After this realization, clarification was given verbally when each survey was distributed. Also, many people selected more than one industry group for their occupation, regardless of the instructions to select one. Furthermore, people were generally unhappy with the NAICS designated occupational industry options. They were unsure of where to place themselves. It would have been ideal to add an option to write in an occupation if unsure where to place it. Additionally, some people were confused by the request to provide annual median household income. It may have been more straightforward to ask people for their personal income, although this would not have tied into the census dataset. If I were to perform this study again, I would have asked for drive time rather than distance travelled to a brewery. People can easily tell you the amount of time it took to arrive somewhere, but they seem uncertain of distances. Also, a drive time derived market analysis would have been better suited to the cultural of Phoenix, which is a car centric city.

It is important to note that this study did not consider market area analysis factors such as transportation and distribution costs. Nor did it consider street accessibility and travel time. Additionally, this study did not consider the acquisition of raw materials, water quality, or structural suitability. Zoning and

other legal issues were also ignored. This study was limited to the spatial aspects of the site selection process. Also, with consideration to the Tommyknocker site, this study did not examine the demographics of the ball park visitors. This could drastically alter the business potential of the site depending on how many sports games occur during a given time and how many people pass through the stadium.

3. Directions for Future Research

This research was intended to examine craft brewery consumers in the Phoenix Metropolitan area and use the information to make intelligent business decisions related to location. This research examined methods used in previous site selection, location science, and beer tourism research. Previous research lead to this study, which ultimately focused on site selection for craft breweries. Apparent from the lack of available research and data specific to location science and craft beer, this research has forged a new path. This research could be built upon in many ways. Some ideas are listed below:

- Develop an automated GIS model for site selection
- Examine within the context of human or urban ecology, with regard to demographic expansion:
- Change the market area delineation approach to examine drive time rather than distance. This could result in a more accurate representation of the customer base in a car centric metropolitan area.
- Expand the consumer profile to cover breweries all over the State of Arizona.

- Create a heat map of the Phoenix metropolitan area emphasizing the block groups with the highest potential for craft breweries based upon the consumer profile.
- Use Tapestry Segmentation to predict clusters where craft breweries might be successful.
- Apply this research to the “neolocal” movement.
- Examine the implications of proximity between breweries. Are they in direct competition with one another? Or are they creating a brewery area that brings brewery hoppers!

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Appendix A: Consumer Survey Questions

Phoenix, Arizona Craft Brewery Visitor Study

You are being invited to participate in a research study titled *The geodemographics in location intelligence; A study in craft brewery placement*. This study is being done by Abiah Shaffer from Northern Arizona University.

The purpose of this research study aims to understand the "typical" Phoenix craft beer consumer. If you agree to take part in this study, you will be asked to complete a 14 question survey/questionnaire. This survey/questionnaire will ask about demographics and consumer behavior and it will take you approximately 5 minutes to complete.

You may not directly benefit from this research; however, we hope that your participation in the study may benefit the Arizona craft brewing industry as a whole.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach of confidentiality is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by not requiring you to write any personal identifiers on the survey. Once the surveys are completed, the results will be tallied and the surveys will be destroyed.

Your participation in this study is completely voluntary and you can withdraw at any time. You are free to skip any question that you choose. If you choose not to participate it not affect your relationship with Northern Arizona University or result in any other penalty or less of benefits to which you are otherwise entitled.
If you have questions about this project or if you have a research-related problem, you may contact the researcher, Abiah Shaffer at (928) 278-3553. If you have any questions concerning your rights as a research subject, you may contact Northern Arizona University IRB Office at irb@nau.edu or (928) 523-7288.

By submitting this survey, I affirm that I am over 18 years of age and agree that the information may be used in the research project described above.

Many thanks for your participation,

Abiah Shaffer
M.Sci. Candidate

Today's date:_____ Approximate time of visit:_____

1) Are you from the greater Phoenix metropolitan area?

☐ Yes ☐ No If no, please tell us where you're from:_____

2) Before you arrived at this brewery, where were you?

☐ Home ☐ Work ☐ School ☐ Shopping ☐ Other: _____

3) How far did you travel to get here today? (distance from question 2 selection)

☐ Less than 1 Mile ☐ 1-5 Miles ☐ 5-10 Miles ☐ 10-20 Miles ☐ Greater than 20 Miles

4) What is your highest level of education?

☐ High School ☐ Associates/Trade ☐ Bachelor's Degree
☐ Graduate Degree ☐ Doctorate ☐ No/Some High School

5) Which race(s), cultural group(s) or ethnicity do you most closely identify with?

☐ Caucasian ☐ Asian ☐ Black ☐ Hispanic
☐ Pacific Islander ☐ Native American ☐ Other

6) What is your age?

☐ 21- 24 ☐ 25 - 29 ☐ 30 - 34 ☐ 35 - 39 ☐ 40 - 44 ☐ 45 - 49 ☐ 50 - 54
☐ 55- 59 ☐ 60 - 64 ☐ 65 - 69 ☐ 70 - 74 ☐ 75 - 79 ☐ 80 - 84 ☐ 85 +

7) What is your gender?

☐ Male ☐ Female

8) What is your current employment status? *Please check all that apply*

☐ Student (full-time) ☐ Employed (full-time) ☐ Employed (part-time)
☐ Student (part-time) ☐ Unemployed ☐ Retired

9) What is your annual median household income?

☐ Under $15,000 ☐ $15,000 – $24,999 ☐ $25,000 – $34,999 ☐ $35,000 – $49,999
☐ $50,000 - $74,999 ☐ $75,000 - $99,999 ☐ $100,000 – $149,999 ☐ $150,000 – $199,999
☐ $200,000 +

10) **If you are employed, what is your occupational industry?**

☐ Construction ☐ Mining, Quarrying, and Oil & Gas Extraction
☐ Utilities ☐ Agriculture, Forestry, Fishing and Hunting
☐ Manufacturing ☐ Real Estate and Rental and Leasing
☐ Retail Trade ☐ Transportation and Warehousing
☐ Information ☐ Management of Companies and Enterprises
☐ Wholesale Trade ☐ Professional, Scientific, and Technical Services
☐ Finance and Insurance ☐ Administrative, Support, Waste Management, Remediation
☐ Educational Services ☐ Health Care and Social Assistance
☐ Public Administration ☐ Accommodation and Food Services
☐ Other Services ☐ Arts, Entertainment, and Recreation

11) **Why did you choose this craft brewery today?**

☐ Support Local Business ☐ Taste of craft beer ☐ Quality of ingredients in craft beer
☐ Meeting friends or family ☐ I'm a regular ☐ Close to home/work/shopping
☐ Music/Entertainment ☐ The food ☐ Meet new people

12) **Do you prefer craft beer over mass produced industrial beer (Coors, PBR, etc)?**

☐ Yes ☐ No

13) Approximately what percent of your total beer consumption is craft beer?

☐ 0-20% ☐ 21-40% ☐ 41-60% ☐ 61-80% ☐ 81 – 100%

14) **Do you consider yourself to have an "outdoorsy" lifestyle (hike, camp, run, etc)?**

☐ Yes ☐ No

Appendix B: NAICS Codes

NAICS CODE	INDUSTRY DESCRIPTION
23	*Construction*
21	*Mining, Quarrying, and Oil & Gas Extraction*
22	*Utilities*
11	*Agriculture, Forestry, Fishing and Hunting*
31-33	*Manufacturing*
53	*Real Estate and Rental and Leasing*
44-45	*Retail Trade*
48-49	*Transportation and Warehousing*
51	*Information*
55	*Management of Companies and Enterprises*
42	*Wholesale Trade*
54	*Professional, Scientific, and Technical Services*
52	*Finance and Insurance*
56	*Administrative, Support, Waste Management, Remediation*
61	*Educational Services*
62	*Health Care and Social Assistance*
92	*Public Administration*
72	*Accommodation and Food Services*
71	*Arts, Entertainment, and Recreation*
81	*Other Services*

Appendix C: Greater Phoenix Metropolitan Area Craft Breweries

Brewery	Brewery Type	Phone Number	Notes	Address	City
SanTan Brewing Co	Brewpub	(480) 917-8700	No response	8 S San Marcos Pl	Chandler
Rock Bottom Brewery - Arrowhead	Brewpub	(623) 878-8822	No	7640 W Bell Rd	Glendale
Fate Brewing Company	Brewpub	(480) 994-1275	Yes	7337 E Shea Blvd Ste 105	Scottsdale
Papago Brewing Co	Contract	(480) 425-7439	No	7107 E McDowell Rd	Scottsdale
Gordon Biersch Brewery Restaurant - Glendale	Brewpub	623-877-4300	No	6915 N 95th Ave	Glendale
North Mountain Brewing Co	Brewpub	(602) 861-5999	Yes	522 E Dunlap Ave	Phoenix
O.H.S.O. Eatery + Nano Brewery	Brewpub	(602) 955-0358	Yes	4900 E Indian School Rd	Phoenix
Gordon Biersch Brewery Restaurant - Tempe	Brewpub	480-736-0033	No	420 S Mill Ave Suite 201	Tempe
Old World Brewery Inc	Micro	(623) 581-3359	Closed for Construction	334 N 25th Ave	Phoenix
Sun Up Brewery	Brewpub	(602) 279-8909	No, too busy	322 E Camelback Rd	Phoenix
BJs Restaurant & Brewery - Chandler	Brewpub	(480) 917-0631	No	3155 W Chandler Blvd	Chandler
The Phoenix Ale Brewery	Micro	(602) 275-5049	Yes	3002 E Washington St	Phoenix
Four Peaks Brewery & Taproom	Micro	(480) 303-9967	No	2401 S Wilson St	Tempe
Rock Bottom Brewery - Desert Ridge	Brewpub		Location closed	21001 N Tatum Blvd #38 1350	Phoenix
Sleepy Dog Brewing Co	Micro	(480) 967-5476	No response	1920 E University Dr	Tempe
Desert Eagle Brewing Company	Micro	(480) 656-2662	Yes	150 W Main St	Mesa
Four Peaks Brewing Co	Regional	(480) 303-9967	No	1340 E 8th St Ste 104	Tempe
Sonoran Brewing	Brewpub	(602) 510-8996	Yes, moved to new location	10426 E Jomax Rd	Scottsdale
Bad Water Brewing	Contract	(480) 748-4460	Yes, moved to new location		Phoenix

Appendix D: IRB Approval Letter

NORTHERN ARIZONA UNIVERSITY

Institutional Review Board for the Protection of Human Subjects in Research

Northern Arizona University
PO Box 4087
Flagstaff, AZ 86011-4087

928-523-4340
928-523-1075 fax
www.research.nau.edu/vpr/IRB

To:	Abiah Shaffer, B.S., M.S. (in progress)
From:	John McGregor
Date:	May 1, 2015
Subject:	Amendment/Modification
Review Type:	Exempt Review
Project:	THE GEODEMOGRAPHICS IN LOCATION INTELLIGENCE; A STUDY IN CRAFT BREWERY PLACEMENT
Project Number:	719617-2
Expiration Date:	None
Review Category/ies:	*Exempt 2*

Your application of Amendment/Modification materials has been approved by the Institutional Review Board (IRB) at NAU. Your approval will expire on the date listed above. If you need to **extend** your research beyond the approval expiration date above, you must file an Application for Continuing Review at http://www.research.nau.edu/vpr/IRB/irb_forms.html.

If your project **changes** in any way, you must file a Research Amendment form (also available at website above) PRIOR TO implementing any changes. You may not implement the changes until you have written approval for the change from the IRB, unless the change is necessary to eliminate immediate hazards to participants. Failure to do so will result in noncompliance and possible suspension or termination of your research project.

Any unanticipated problems or unexpected **adverse events** must be reported to the IRB within 5 business days (within 24 hours for serious adverse events) of your becoming aware of the event by filling out an Adverse Reaction or Event Reporting form (also available at website above).

Quality Assurance/Quality Improvement Program: In an effort to improve quality and consistency across human subjects research at NAU, you may be contacted by the IRB Director to meet and discuss your procedures and methods of recruiting participants, providing informed consent, collecting and storing data, and other details of your research protocol.

Two copies of your informed consent form, which has been approved and stamped by the IRB, must be given to each study participant - one for them to keep and one for them to sign and return to you.

As you conduct your research, please remember that:
1. Participants are volunteers or are involved in regular educational programs; they are free to withdraw from the research at any time without penalty.

2. Participants must be informed through written or oral explanation and must sign or approve electronically or verbally an informed consent form (for minors and children the parent or guardian must sign, and, in medically related cases, a physician must sign for consent).

Appendix E: Initial Contact Email: Request for Brewery Participation

Research Title: The geodemographics in location intelligence: A study in craft brewery placement

Hello Manager/Owner,

My name is Abiah Shaffer and we spoke on the phone on _____ regarding my research project. I am conducting research in which I am seeking out demographic and behavioral information on craft beer consumers in the Phoenix metro area. This information will be used to develop a model that can be used to help craft brewery entrepreneurs make informed decisions on the best locations for their businesses. Furthermore, I would be happy to share my results with you at the end of my study.

I would like to hand out approximately 30 - 50 surveys to your customers. I would ideally approach customers as they enter the building or at their seats, depending on your preference. I have attached the survey instrument and a bit of additional information about the study.

Can you please respond to this email with your consent, name, title and contact information? This will aid me in gaining approval from the Institutional Review Board, which is required when conducting human research. I'm looking forward to meeting you!

Many thanks,

Abiah Shaffer

Candidate for M.S. Applied Geospatial Science

Northern Arizona University

Appendix F: Geodemographic Profile

Variables	Consumer Profile	Bad Water (0-1 Miles)	Bad Water (1-5 Miles)	Bad Water (5-10 Miles)	Tommyknocker (0-1 Miles)	Tommyknocker (1-5 Miles)	Tommyknocker (5-10 Miles)
Total Population (2010 BA Dataset)	325	*14,940 (2010)*	*159,546 (2010)*	*745,164 (2010)*	*13,992 (2010)*	*309,398 (2010)*	*788,776 (2010)*
Total Population (2013 Block Groups)	325	*13,795 (2013)*	*168,086 (2013)*	*795,207 (2013)*	*14,154 (2013)*	*322,127(2013)*	*811,747 (2013)*
Education							
High School	50 (15.3%)	4123 (29.89%)	50250 (29.9%)	227998 (28.67%)	3935 (24.98%)	84013 (26.01%)	222930 (27.46%)
Associates/Trade	60 (18.4%)	800 (6.8%)	7868 (4.7%)	36152 (4.55%)	316 (2.23%)	9185 (.28%)	32895 (4.05%)
Bachelor's	139 (42.6%)	3145 (22.80%)	28793 (17.13%)	104140 (13.1%)	904 (6.39%)	18428 (5.72%)	78019 (9.61%)
Graduate Degree	63 (19.3%)	1736 (12.58%)	17867 (10.63%)	62923 (7.91%)	439 (3.1%)	10195 (3.16%)	48470 (5.98%)
Doctorate	13 (4%)						
No/Some High School	0 (0%)	848 (6.15%)	12355 (29.90%)	79573 (10.01%)	2638 (18.64%)	64519 (20.02%)	53093 (6.54%)
Race/Ethnicity							
Caucasian	277 (85%)	12,686 (84.6%)	124,114 (77.8%)	530,594 (71.2%)	7,078 (50.6%)	159,892 (51.7%)	492,259 (62.4%)
Asian	4 (1.2%)	306 (2.2%)	3,737 (2.3%)	21,714 (2.9%)	378 (2.7%)	6,077 (2%)	25,998 (3.3%)
Black	2 (.6%)	426 (2.9%)	6,633 (4.2%)	39,394 (5.3%)	2,185 (15.6%)	28,971 (9.4%)	55,884 (7.1%)
Hispanic	29 (8.9%)	2,206 (14.7%)	34,754 (21.8%)	227,104 (30.5%)	6,934 (49.6%)	192,744 (62.3%)	347,047 (44%)
Pacific Islander	0 (0%)	22 (.1%)	280 (.2%)	2,232 (.3%)	28 (.2%)	546 (.2%)	1,755 (.2%)
Native American	1 (.3%)	243 (1.6%)	6,004 (3.8%)	29,691 (3.4%)	564 (4%)	10,290 (3.3%)	23,545 (3%)
Other	11 (3.4%)	856 (5.7%)	13,722 (8.6%)	99,601 (13.4%)	3,228 (23.1%)	91,062 (29.4%)	158,468 (20.1%)
Age							
21-24	25 (7.7%)	1,491 (9.9%)	12,897 (8.1%)	70,552 (9.5%)	2,191 (15.7%)	26,016 (8.4%)	74,580 (9.5%)
25-29	52 (16%)	2,107 (14.1%)	14,517 (9.1%)	63,239 (8.5%)	1,089 (7.8%)	1,143 (7.9%)	1,300 (8.4%)
30-34	61 (18.7%)	1,377 (9.2%)	11,213 (7%)	52,490 (7%)	890 (6.4%)	968 (6.7%)	1,045 (6.8%)
35-39	45 (13.8%)	1,061 (7.1%)	10,132 (6.4%)	48,307 (6.5%)	781 (5.6%)	760 (5.2%)	861 (5.6%)
40-44	30 (9.2%)	831 (5.5%)	10,068 (6.3%)	47,583 (6.4%)	828 (5.9%)	854 (5.9%)	836 (5.4%)
45-49	27 (8.3%)	804 (5.4%)	10,966 (6.9%)	50,563 (6.8%)	935 (6.7%)	895 (6.2%)	921 (6%)
50-54	43 (13.2%)	828 (5.5%)	11,073 (6.9%)	49,941(6.7%)	893 (6.4%)	938 (6.5%)	930 (6%)
55-59	18 (5.5%)	786 (5.2%)	9,656 (6.1%)	43,522 (5.8%)	674 (4.8%)	741 (5.1%)	830 (5.4%)
60-64	12 (3.7%)	773 (5.2%)	8,575 (5.4%)	37,252 (5%)	550 (3.9%)	600 (4.1%)	687 (4.4%)
65-69	4 (1.2%)	692 (4.6%)	6,938 (4.3%)	25,964 (3.5%)	383 (2.7%)	434 (3%)	542 (3.5%)
70-74	3 (.9%)	602 (4.0%)	5,611 (3.5%)	17,908 (2.4%)	315 (2.3%)	368 (2.5%)	491 (3.2%)
75-79	3 (.9%)	562 (3.7%)	4,926 (3.1%)	13,950 (1.9%)	208 (1.5%)	228 (1.6%)	298 (1.9%)
80-84	1 (.3%)	546 (3.6%)	4,068 (2.5%)	10,999 (1.5%)	124 (.9%)	136 (.9%)	162 (1%)
85+	0 (0%)	587 (3.9%)	3,573 (2.2%)	11,292 (1.5%)	109 (.8%)	118 (.8%)	140 (.9%)
Gender							
Male	200 (61.3%)	7437 (49.61%)	79038 (49.54%)	376872 (50.58%)	8512 (60.83%)	160341 (51.83%)	395420 (50.14%)
Female	122 (37.4%	7554 (50.39%)	80509 (50.46%)	368291 (49.42%)	5481 (39.17%)	149019 (48.17%)	393306 (49.86%)
Employment Status							
Student (full-time)	16 (4.9%)						
Student (part-time)	6 (1.8%)						
Employed (full-time)	71 (21.8%)						
Employed (part-time)	20 (6.1%)						
Unemployed	6 (1.8%)	532	5747	561	519	11683	37707
Retired	24 (7.4%)						
Annual Median Household Income							
Under $15,000	12 (3.7%)	1,707 (18.8%)	11,595 (15.6%)	50,498 (16.6%)	2,081 (44.3%)	25,524 (24.1%)	46,978 (16.1%)
$15,000 - $24,999	17(5.2%)	1,488 (16.4%)	8,658 (11.6%)	36,007 (11.8%)	657 (14%)	17,128 (16.1%)	37,502 (12.8%)
$25,000 - $34,999	27 (8.3%)	1,075 (11.8%)	8,437 (11.3%)	35,577 (11.7%)	565 (12%)	14,236 (13.4%)	37,502 (12.8%)
$35,000 - $49,999	21 (6.4%)	1,480 (16.3%)	11,008 (14.8%	44,676 (14.6%)	704 (15%)	16,356 (15.4%)	47,822 (16.4%)
$50,000 - $74,999	60 (18.4%)	1,636 (18%)	13,194 (17.7%)	53,508 (17.5%)	336 (7.1%)	16,730 (15.8%)	53,282 (18.3%)
$75,000 - $99,999	45 (13.8%)	669 (7.3%)	6,720 (9%)	29,262 (9.6%)	154 (3.3%)	7,549 (7.1%)	26,535 (9.1%)
$100,000 – $149,999	60 (18.4%)	580 (6.4%)	7,670 (10.3%)	31,403 (10.3%)	118 (2.5%)	6,089 (5.7%)	24,869 (8.5%)
$150,000 – $199,999	31 (9.5%)	220 (2.4%)	2,941 (3.9%)	11,112 (3.6%)	70 (1.5%)	1,345 (1.3%)	9,225 (3.2%)
$200,000 +	34 (10.4%)	237 (2.6%)	4,338 (5.8%)	13,028 (4.3%)	15 (.3%)	1,140 (1.1%)	9,392 (3.2%)
Occupational Industry							
Construction - NAIC # 23	13 (4%)	392	3,442	21,707	248	11,888	25,158
Mining, Quarrying, and Oil & Gas - NAIC # 21	1 (.3%)	0	200	745	81	383	682
Utilities - NAIC # 22	5 (1.5%)	54	298	1,899	9	540	1,658
Agriculture, Forestry, Fishing and Hunting - NAIC # 11	5 (1.5%)	55	249	1,802	21	652	1,705
Manufacturing - NAIC # 31-33	17 (5.2%)	341	4,358	24,687	294	9,452	28,019
Real Estate and Rental and Leasing - NAIC # 53	1 (2.4%)	488	3,039	9,605	94	2,555	8,722
Retail Trade - NAIC # 44-45	17 (5.2%)	995	7,646	36,917	384	9,755	35,324
Transportation and Warehousing - NAIC # 48-49	6 (1.8%)	208	3,126	12,816	188	4,562	16,500
Information - NAIC # 51	8 (2.5%)	155	1,337	5,991	123	1,583	5,270
Management of Companies and Enterprises - NAIC # 55	10 (3.1%)	0	31	96	0	8	101
Wholesale Trade - NAIC # 42	5 (1.5%)	196	1,947	8,930	114	2,897	9,708

Variables	Consumer Profile	Bad Water (0-1 Miles)	Bad Water (1-5 Miles)	Bad Water (5-10 Miles)	Tommyknocker (0-1 Miles)	Tommyknocker (1-5 Miles)	Tommyknocker (5-10 Miles)
Total Population (2010 BA Dataset)	*325*	*14,990 (2010)*	*159,546 (2010)*	*745,164 (2010)*	*13,992 (2010)*	*309,358 (2010)*	*788,776 (2010)*
Total Population (2013 Block Groups)	*325*	*13,795 (2013)*	*168,096 (2013)*	*795,207 (2013)*	*14,154 (2013)*	*322,127(2013)*	*811,743 (2013)*
Professional, Scientific, and Technical - NAIC # 54	61 (18.7%)	646	7,065	26,970	153	5,524	21,550
Finance and Insurance - NAIC # 52	25 (7.7%)	698	6,441	27,072	241	6,561	23,723
Administrative, Support, Waste - NAIC # 56	1 (.3%)	463	4,996	28,104	359	14,093	29,486
Educational Services - NAIC # 61	19 (5.8%)	510	5,692	29,182	387	6,486	26,899
Health Care and Social Assistance - NAIC # 62	28 (8.6%)	829	9,091	38,248	456	11,270	36,518
Public Administration - NAIC # 92	5 (1.5%)	351	2,987	12,153	206	4,873	14,203
Accommodation and Food Services - NAIC # 72	18 (5.5%)	1,019	8,469	35,927	437	12,879	33,770
Other Services - NAIC # 81	35 (10.7%)	293	4,281	19,832	282	8,159	20,827
Arts, Entertainment, and Recreation - NAIC # 71	14 (4.3%)	251	2,121	7,780	126	1,809	6,217
Number of Employees in Area							
Construction - NAIC # 23		593	6343	31125	519	15540	23955
Mining, Quarrying, and Oil & Gas - NAIC # 21		7	280	12434	161	12182	145
Utilities - NAIC # 22		16	79	7029	6671	38	430
Agriculture, Forestry, Fishing and Hunting - NAIC # 11		37	252	1019	21	202	1000
Manufacturing - NAIC # 31-33		373	15823	38481	643	6145	11746
Real Estate and Rental and Leasing - NAIC # 53		572	4945	17518	1358	6121	9620
Retail Trade - NAIC # 44-45		529	4455	59548	421	34088	20633
Transportation and Warehousing - NAIC # 48-49		81	909	18332	458	8063	6637
Information - NAIC # 51		5640	2181	11344	1665	4875	10861
Management of Companies and Enterprises - NAIC # 55		198	1873	6284	8	147	1309
Wholesale Trade - NAIC # 42		1150	7656	26223	629	10996	26742
Professional, Scientific, and Technical - NAIC # 54		2194	16882	50391	4541	15037	44810
Finance and Insurance - NAIC # 52		1281	8268	19955	1112	5274	14915
Administrative, Support, Waste - NAIC # 56		1305	9203	37651	765	10218	29784
Educational Services - NAIC # 61		327	1799	44198	132	30547	12352
Health Care and Social Assistance - NAIC # 62		15735	19676	79710	698	56953	38542
Public Administration - NAIC # 92		2614	446	24972	16880	71655	6205
Accommodation and Food Services - NAIC # 72		2378	7627	27978	1551	6288	22777
Other Services - NAIC # 81		970	4149	24268	2315	9150	14836
Arts, Entertainment, and Recreation - NAIC # 71		242	2146	7529	1372	2207	4160