US Craft Brewery Owners' Environmental Values, Involvement and Motivations Behind Environmentally Sustainable Practices and the Effect of Business Challenges

by

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Abstract

In 2018, 7,450 craft breweries across the US produced 25.9 million barrels of beer as part of an industry worth a cumulative $27.6 million and which employs over 456,000 workers. Craft brewery owners across the US have endeavored to optimize the efficiency of the brewing process in order to fulfil their twin goals of improving the quality of the product and boosting profits. In recent years, there has been a marked shift towards a tertiary goal of reducing the carbon footprint of an industry which uses significant amounts of water and energy through the implementation of sustainable practices.

The objectives of this dissertation are to investigate the role which the environmental values of US craft brewery owners play in their involvement in environmental practices and the environmental performance of the brewery as a whole. It also examined the concurrent impact that business challenges have on environmental performance. To achieve these objectives, the dissertation takes the form of three independent articles which answer six research questions via both qualitative and quantitative methods.

The first article reports on the integrated findings of an exploratory sequential mixed methods research design which aimed to identify the full scope of sustainable practices available to the US craft brewing industry as well as quantifying how many of those practices are actually being implemented within the breweries. Areas of concern which were repeatedly identified by the brewers included energy efficiency, involvement with the local community, paper and plastic recycling, repurposing used items, reusing spent grain, using recycled materials and conserving water.

The second article aims to identify the factors which influence craft brewery owners' involvement in environmental practices and efforts using an exploratory sequential mixed methods research design.

The conclusions reached by this study are in agreement with those of pre-existing literature which encompasses similar themes, such as owners' environmental involvement, regulations, financial consideration, community, employee involvement, and competition, albeit in a broader business sense.

The third article uses an online questionnaire to collect data pertaining to the environmental values of US craft brewery owners, the effect of those values on their breweries' environmental performance and the moderating impact of business challenges between the owners' environmental involvement and their breweries' environmental performance. The article uses structural equation modeling to detect and examine hypothetical relationships among these aforementioned factors. Implications, limitations and future research is discussed for each individual study.

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SEM	Structural equation modeling
CFA	Confirmatory factor analysis
CR	Composite reliability
AVE	Average variance explained
MSV	Maximum shared squared variance
GOF	Goodness-of-fit
GFI	Goodness-of-fit index
RMSEA	Root mean square error of approximation
SRMR	Standardized root mean residual
TLI	Tucker Lewis Index
CFI	Comparative fit index
AGFI	Adjusted goodness-of-fit index
QDA	Qualitative data analysis
IRB	Institutional review board
EV	Environmental values
EP	Environmental performance
BC	Business challenges
EI	Environmental involvement

CSR	Corporate social responsibility
BOD	Biochemical oxygen demand
HVAC	Heating Ventilation Air Conditioning
ST	Stakeholder theory

CHAPTER 1

INTRODUCTION

1.1 Introduction

In 1978, the United States (U.S.) president Carter ratified the legality of home brewing of beer throughout the country. The ratification enabled beer devotees to brew at their place for self-usage and generated the chance for minor breweries and brewpubs to make an entry to the market to compete with big-scale beer producers. The large fascination of these small breweries attained broad acceptance in the commercial brewing industry and along with popularity for craft beer, the new launching of breweries escalated during the latter part of the 1990s and hence, the competition level was fairly elevated. From the year 1997 to 2017, the number of licenses breweries was increased from 1,273 to a whopping number of 5,234 licensed breweries. While the bigger scaled brewers maintained their supremacy in the majority of the industry, craft beer producers also enjoyed the parallel fame. From the past 11 years, craft breweries were capable enough to surpass their large-scale competitors with regard to growth proportion and margin. (Kleban & Nickerson, 2012).

Beer is a beverage with the simplest ingredients as its primary recipe including, water, yeast, malt, and hops. The combination of these ingredients in a diversified quantity and appliance of different brewing mechanisms is all that represents a lucrative beer market worth millions of dollars. The presence of craft beers in the market has ensured and perpetuated the variety of the available beer flavors in the industry.

In the U.S., the craft beer market produced more than 25 million barrels in 2018, generating $68 billion revenue and more than 456,000 jobs. Meanwhile, while the total beer consumption in the U.S. is diminishing, craft beer producers have attained a milestone of dual figured progress over the past ten years.

Generally, beer is considered a sustainable product since the majority of the ingredients are organic which, are produced naturally (Schaltegger, Viere & Zvezdov, 2012). Nevertheless, the exceptional proportion of beer manufacturing and usage in the U.S. has a cost to the earth. It implies a brewing procedure consumes a lot of water and energy. Thus, the process leaves immense carbon footprint, damaging nearby water and soil (Fish, 2015). Furthermore, the brewing process is comprised of heating/cooling, cleaning, packaging, sanitation and a lot of good-quality water. Moreover, the production leaves significant amount of weak wort and residual beer (Fakoya & van der Poll, 2013).

In recent years, these challenges have been addressed by industry contributors. While brewery managers traditionally focused on the improvement of production processes to reduce costs, and increase the quality of beer, a shift towards more sustainable techniques to reduce environmental impact has been observed (Fillaudeau, Blanpain–Avet & Daufin, 2006). Additionally, breweries have opted to collaborate with volunteer and welfare enterprises to deal with environmental hurdles and formulate sustainable policies and rules for the entire industry (Ceres, 2015).

1.2. Statement of the Problem

Increasing concern regarding the problem of climate change, coupled with a rapidly growing consumer awareness of the issue, has precipitated a shift in corporate strategy with regard to the environment. Companies in all types of industries have transitioned towards more

sustainable practices by reducing their consumption of resources and minimizing their carbon footprint as best they can.

Pre-existing research on environmental management (EM) has concluded that sustainability has frequently become fully ingrained in the soul of a company's business plan, with the 1990s witnessing corporate recognition of the fiscal advantages of a proactive approach to sustainable practices (Porter & Van der Linde, 1995).

However, not all businesses have subscribed to the proactive approach; some companies prefer to take a reactive approach by simply fulfilling their environmental obligations when the law demands that they do so. The discrepancy between these two approaches has intrigued academics for years, with a number of different research studies having identified, categorized and evaluated key contributing factors which could aid companies in transitioning towards a more proactive or developed state of EM (González-Benito & González-Benito, 2006; Lozano, 2015). Certain studies have suggested that stakeholder pressure is one of the key contributing factors to proactive sustainability (Carroll, 2015; Henriques & Richardson, 2013), while others have assessed how upper management's eagerness to outperform the competition might affect EM (Milne & Gray, 2013; Reid & Gatrell, 2017). However, there are only a handful (Cabras Bamforth, 2016; Murray & Overton, 2016) of studies which have viewed upper management as the conduit through which stakeholder pressure is interpreted and evaluated to determine how proactive sustainability might afford their business a competitive edge. This deficit is one area of focus which this dissertation intends to satisfy.

As mentioned, in the previous section, the relationship between brewing and environmental performance is an important one. Despite this fact, there is a distinct scarcity of knowledge when it comes to understanding which sustainable practices are being undertaken by what percentage

of the US craft brewing industry, the reasons and motivating factors behind these practices, the environmental values of brewery owners and the business challenges and barriers which hinder the practices from being put into place.

Previous research has indicated that the individual beliefs and principles of a person are key driver when it comes to influencing their commitment to environmental responsibility. In particular, Nordlund and Garvill (2002) examined the hypothesis of whether there existed a direct relationship between an individual's environmental principles and their awareness of environmental issues, their everyday behavior and their commitment to environmental responsibility. The results of their study supported the hypothesis and implicitly suggested that the environmental principles of upper management could influence their sense of environmental responsibility and encourage them to take a more proactive approach to sustainability on moral grounds.

Managers or owners with a robust sense of their environmental responsibility are also more disposed to tackle environmental problems in an earnest manner, thereby facilitating the transition to a more sustainable corporate strategy for their company (Black and Hartel, 2004). Stern, Dietz, Abel, Guagnano, and Kalof (1999) argued that persons with a robust sense of environmental responsibility are more susceptible to embracing the principles of a societal or communal body and are more likely to feel an ethical duty to support sustainable actions. Lastly, the individual principles and beliefs of upper management are largely responsible for the extent to which a company is dedicated to incorporating sustainable practices into its corporate strategy. In their findings, El Dief and Font (2012) corroborated the idea that the principles and beliefs of upper management can have a substantial effect on their corporate strategy plans in environmental terms, resulting in the advent of sustainable business practices such as an annual

evaluation of the company's environmental performance or the incidence of conventions and talks to raise environmental awareness among employees. Thus, another aim of this dissertation was to examine the environmental values of craft brewery owners and the relationship between these values, the owners' environmental involvement and the sustainable practices they utilize in their breweries.

The various factors which contribute to a heightened sense of environmental responsibility are often counterbalanced by logistical challenges and difficulties that can impede or halt completely progress towards a more proactive EM policy. While the negative impact that these challenges has been investigated by many scholars (Murillo-Luna, Garcés-Ayerbe & Rivera-Torres, 2007; Post & Altma, 1994), there is little academic research encompassing a comprehensive review of both contributing factors and impeding challenges together. As a result, this paper intends to assess these challenges and investigate how much of an impediment for EM they can pose to individual motivations.

To sum up, the purposes of this dissertation are fourfold: (a) to analyze the environmental practices currently being utilized in the US craft brewing industry; (b) to analyze which factors act as drivers pushing companies towards environmental practices; (c) to analyze the owners' environmental values, environmental involvement and their impact on environmental practices within their company; (d) to complete the model by examining the intervening effect of business challenges which impede the process.

The research will have important implications from both a theoretical and a practical standpoint. In terms of academia, there is very little pre-existing research investigating environmental practices within the US craft brewing industry. Indeed, to the best of the author's knowledge, there is no other research which investigates the scope of environmental practices

being employed in US craft breweries, the motivating factors behind these practices, the environmental principles and beliefs of the brewery owners, how these affect the breweries environmental effort and how the policy itself is negatively impacted by challenges within the business. In theoretical terms, this paper encompasses a number of different theories (environmental consumption value theory, stakeholder theory, upper echelon theory) and assesses their relationship to EM within the burgeoning US craft brewing industry. Practically, the results should highlight the environmentally friendly practices employed in craft breweries, the motivational factors behind these practices, the environmental values and subsequent involvement of owners in their breweries' EM policy, as well as the impact of business challenges on environmental practices.

1.3. Purpose of the study and study objectives

This dissertation explores sustainability practices in the US craft brewing industry using a qualitative and quantitative research approach, which examines current practices and the motivations of the brewery owners which drive these practices. Additionally, the environmental values of the owners and the effect of business challenges during the implementation of these sustainable practices are also examined.

This dissertation is organized within the framework of three publishable academic articles. The purpose and research questions of the articles are provided in Chapter 3. These summaries are purposely brief, as each study contains its own abstract, introduction, literature review, methodology and detailed presentation of the results and implications.

Article 1: The purpose of this article is (1) to explore environmentally friendly best practices in the US craft brewery industry and (2) to examine the extent to which the industry utilizes them, via the use of a mixed-method study.

Article 2: The purpose of this article is to examine the reasons behind US craft brewery owners' environmentally friendly practices, via the use of a mixed-method study.

Article 3: The purpose of this article is (1) to determine the environmental values of US craft brewery owners, (2) to investigate the relationship between these values, the environmental involvement of the owners and the environmental performance of the company and (3) to investigate the intervening effect of business challenges on environmental performance.

1.4. Research Questions

Study 1:

1. What are the current environmentally friendly practices being employed in the US craft brewing industry?

Study 2:

1. What are the underlying motivational factors driving US craft brewery owners to engage in environmentally friendly practices?

Study 3:

1. To what extent do the environmental values of craft brewery owners affect their involvement in implementing environmentally friendly practices?
2. To what extent do the environmental values of craft brewery owners affect the company's environmental performance?
3. To what extent does the environmental involvement of craft brewery owners affect their company's environmental performance?
4. Do business challenges intervene between the environmental involvement of craft brewery owners and the environmental performance of their company?

CHAPTER 2

LITERATURE REVIEW

The following chapter is an overview of the research on sustainability practices as it relates to various of disciplines and fields of study. In the past, sustainability practices covered fields of study such as business, economics, public policy and administration, consumerism, hospitality, corporations and environmental management. This chapter will provide an overview of the sustainability literature, an overview of sustainability concern in the craft brewery industry and a review of literature on theories used in this dissertation. The theoretical framework for this study is grounded in stakeholder theory and theory of consumer value.

2.1. Sustainability

Sustainability is not to be treated as a course of study; it is to be accepted as a school of thought, a philosophical mindset for perceiving and analyzing the world (Mc Opp & Saunders, 2013). Using sustainability as a point of view, researchers can recognize the interdependence between a society and its economics (Weinstein et al., 2013). Some authors feel an increase in top-down strategies is recommended, as the solution for transforming the objectives and focus of society, environmentalists and local businesses (Weinstein et al., 2013). Other authors feel that businesses are the chief vehicle for promoting a sustainable society (Jabareen, 2011), while others recognize the challenge of implanting such sustainability practices, claiming that "Societal and industrial transformations are indeed needed, but establishing and enforcing clear rules of a new game through law are the key ingredients" (Ashford et al., 2012, p. 18).

The following review, of selected social sustainability literature, represents the principle of 'accounting for sustainability,' which most researchers will agree is relevant in any research on sustainability practices - involving assessing the value among the various categories of social innovations (Scerri & James, 2010). This multi-disciplinary approach has revealed that prior studies on different disciplines, using sustainability adaptations, have shown them to be highly beneficial (Scerri & James, 2010). The selected business management literature, considered for this review, depicts companies collaborating with one another with foundational objectives (Hodgson, 2006). In all the disciplines reviewed, there is a consensus on the importance of the impact of climate change on challenges concerning green practices.

2.2. Politics

Decision-making, and the implementation of policy development systems, were the primary issues addressed in the reviewed literature on public policy and administration. Political theorists, and other policy researchers, assert that many businesses adopted rules functioning as societal norms, in combination with various tools of motivation and restriction to influence human behavior (Hodgson, 2006). One study asserted that society is given the primary responsibility of shaping new laws, by developing and enforcing well-established rules (Ashford et al., 2012). Another study asserted that rules, functioning as societal norms, will help impact how policy-makers achieve policy objectives (Meijer & Homburg, 2009). However, it's legal sanctions, derived from social pressures, that influence human acceptance of laws in a society (Bartel & Barclay, 2011). For example, if the social pressures, against developing a sustainability model, are greater than the commitment to promote the model, the likelihood of the model being adopted becomes minimal (Bartel & Barclay, 2011). Studies stressed the importance of how social habits impacted laws, but the impact only materialized after frequent

application of the rules, which made the rules become a societal norm with moral legitimacy (Hodgson, 2006). Humans tend to be more inclined to alter their behavior when a rule is practiced frequently. Therefore, laws that influence human behavior must first start out as a habit before becoming a societal norm, which increases the likelihood of that habit becoming a law (Kollmuss & Agyeman, 2002). Some researchers felt that promoting voluntary adoption of sustainability practices is the best way to promote sustainability models (Baden et al., 2009), while others felt that unless social pressure from local environmental regulations was present, most businesses would elect not to adopt sustainability practices (Ashford et al., 2012; Graafland & Smid et al., 2017). Human behavior is believed to be highly influenced by regulations and interventions that are well defined and promoted (Ashford et al., 2012; Montalvo, 2008). However, it will take government assistance, and short-term incentives, to help and encourage small and medium-sized (SME) businesses to develop and implement effective sustainability practices (Struder et al., 2008). The environmental management theory agrees that environmental regulations, that foster the adoption of sustainability practices, need to also offset the expenses involved in adopting and maintaining such practices (González-Benito & González-Benito, 2005). Therefore, the factors influencing decision makers' decision to adopt (or not adopt) sustainability practices need to be identified to shape the regulations that promote more acceptance of developing sustainability practices (Choi & Parsa, 2006; Kasim & Ismail, 2002). Currently, there are no studies identifying the factors affecting hospitality businesses' decision to adopt sustainability practices (Tzschentke et al., 2004). Also, there is an implication that economic incentives influence the development and implementation of a business's sustainability practices. Other studies revealed that a variety of factors influence the adoption of sustainability practices (Biggart & Lutzenhiser, 2007). For example, research suggested that decision-makers

favor long-term benefits over short-term incentives, for adopting sustainability practices (Ditlev-Simonsen & Midttun, 2011). Also, this research revealed that decision-makers' views on the value of sustainability models were more complex than purely a response to economy-based incentives (Ditlev-Simonsen & Midttun, 2011).

In support of Porter's hypothesis, rigid environmental regulations tend to promote more advanced green practices that focus on quality enhancement, pollution reduction and expense reduction (Ashford et al., 2012). However, researchers discovered Porter's hypothesis failed to make distinctions between other variables, like the level of innovation implemented, the age of the company and the recognition of more progressive forms of innovation (Ashford et al., 2012, pp. 15-16). SMEs also claimed that regulations attempting to be universal were usually unsuccessful, and policymakers should consider multiple variables to create successful regulations (Baden et al., 2009).

Hindrances that prevented the exploration of incentives, for adopting sustainability practices, were identified in some of the reviewed literature (Lozano, 2012a). For example, structural barriers, such as limited distribution capabilities, prevented some companies from accessing locally-grown foods (Inwood et al., 2009). Conflicts between adopted Corporate Social Responsibility (CSR) methods and recognized barriers also decreased the success of CSR projects, in one study (Lozano, 2012a).

Another study revealed that the inability of local farmers to meet a hospital cafeteria's food inventory needs prevented the hospital, and other businesses, from utilizing local food sources (Dauner et al., 2011). Also, the business owners/managers reported that the time taken to establish rapport and working relationships with the farmers was too time-consuming, even though the barrier seemed to almost disappear when the food was from farmers' markets (Dauner

et al., 2011). In addition to networking barriers, limited financial, physical and human resources, poor research on available green practices and their overall impact; fear of unfavorable personnel feedback, and conflicts with conducting effective public relations were also identified as barriers to the cafeteria supporting local farmers (Dauner et al., 2011).

Other studies identified the government's involvement as being influential in fostering motivation to adopt sustainability practices (Assadourian, 2012). Revell and Blackburn (2007) concluded that government's active discourse with restaurants would encourage them to adopt more favorable attitudes towards implementing green practices, and this also pointed to the need for an increase in development of governmental regulations. Chou et al. (2012) asserted that a system for promoting public and consumer laws needs to be developed by both governments and businesses, and training should be given to hospitality personnel so that they will have a full understanding of the issues and gain confidence in using sustainability practices in restaurants. Other studies concluded that successful advocacy for sustainability practices must include government programs that focus on financial incentives for SMEs (Uhlaner et al., 2012). Moreover, compliance regulations can be adopted to encourage sustainable behavior (Bartel & Barclay, 2011).

Several studies suggested that several hundred thousand United States' (U.S.) businesses have demonstrated poor compliance with local, national and global environmental legislation in the past 20 years (Hu et al., 2010; Kasim & Ismail, 2012; Nielsen, 2004; Revell et al., 2010; Schubert, Kandampully, Solnet & Kralj, 2010). For example, one study revealed the public's reaction to a company's instances of non-compliance is often indifference, since there is an innate confidence that the government is doing everything possible to protect the world's natural resources (Sagarin & Turnipsee, 2012). The public trust doctrine stipulates that the government

oversees the protection of natural resources for the duration of the human race's existence (Sagarin & Turnipsee, 2012).

Bartel and Barclay (2011) pointed to the widespread non-compliance examples as signs of ineffective government sustainability regulations. The authors (Bartel & Barclay, 2011) recognized the ineffective government sustainability regulations as characteristic of the flawed environmental law approach (or deterrence approach), and that these will keep happening as long as the dialogue to create such regulations is limited to those who make environmental policy and law (Bartel & Barclay, 2011). Also, the researchers stated that the bigger issue is with how the sustainability models are designed rather than pinpointing the businesses in violation of the sustainability laws (Bartel & Barclay, 2011; Ryan, 2008).

The researchers believed that law-making officials were primarily responsible for the poor compliance with environmental regulations, claiming that the officials who promoted these laws needed to commit to the regulations themselves when companies fail to comply with the laws (Bartel & Barclay, 2011). They also believed that failure to enforce compliance gave the impression that law-making officials were indifferent to hospitality businesses disregarding environmental sanctions (Bartel & Barclay, 2011). The researchers concluded that the people who developed the regulations have a more thorough understanding of the laws than the hospitality businesses and therefore should be the main ones fully aware when companies are violating environmental regulations (Bartel & Barclay, 2011).

However, other researchers believed that the failure to stop violators was due to the law-makers anticipating a negative response from businesses for enforcing compliance that may also prove to be a negative political maneuver later (Bartel & Barclay, 2011; Meijer & Homburg, 2009). To combat this anticipated unfavorable effect, some law-making officials adopted

'disclosure' tools, that contained information offering incentives for company compliance (Meijer & Homburgh, 2009). Meijer & Homburgh's (2009) study detailed how law-making officials reported company violations, on the internet, that the public could retrieve. A disclosure policy that instituted public exposure of non-compliance was the alternative to command and control enforcement. The findings demonstrated a decrease in non-compliance and an increase in adopting sustainability practices, that surpassed government regulations, when disclosure tools were used (Meijer & Homburgh, 2009). Also, disclosure tools decreased the difficulty of enforcing compliance.

2.3. Economics

Two philosophies are prevalent in the U.S. sociopolitical environment: embedded liberalism and neoliberalism (Ditlev-Simonsen & Midttun, 2011; Harvey, 2005). The philosophy of embedded liberalism deals with how governmental regulations successfully protect the social environment—a sector that most business and marketing methods rarely consider (Harvey, 2005). Keynesian policies, that were influenced by embedded liberalism in the 1930s, fostered governmental promotion of social services (such as health care and proper educational training/certification) as intervention tools within the business model (Harvey, 2005). On the other hand, the neoliberal theory proposes that the release of funds tied up in projects, created from intervention tools (sanctioned by embedded liberalism), should be made available to increase economic growth (Harvey, 2005).

Therefore, economic systems within the U.S. promoted initiatives with limited government intervention (i.e. laissez-faire ideals) (Mikler, 2007). Milton Friedman, avid neoliberalism supporter and Mont Pelerin Society member, believed that when businesses make good profits, they are more able to create social initiatives that benefit society (Ditlev-Simonsen

& Midttun, 2011). The global economy began to flourish when corporations around the world embraced the neoliberal philosophy (Harvey, 2005; Hursh & Henderson, 2011; Mikler, 2007; Sifry & Watzman, 2004). President Reagan's administration was aggressive in de-regulation strategies and releasing funds from governmental constraints (Harvey, 2005). The Supreme Court established the concept of *corporate personhood*, which means businesses have a legal right to engage in political initiatives and lobby, with the intent of motivating legislators to act in accord with the well-being of society (Sifry & Watzman, 2004). Those who disagree with the Supreme Court ruling claimed that this political provision provided an unfair advantage to businesses—especially those functioning as limited liability corporations (Cousens, 1949).

Monopolies, inequities in business competition, asymmetric power relationships and project failures abounded when neoliberalism was accepted on a wider scale (Harvey, 2005). Nevertheless, neoliberalism is still the most widely accepted economic and political philosophy in America today (Hursh & Henderson, 2011). This loyalty to neoliberalism has also produced a notion in America that public resources are at the disposal of businesses, to use as they will without concern for the ethical, social or political consequences when adopting sustainability practices (Tomer & Sadler, 2007). The factors impacting a company's financial bottom line, and economic accomplishments, dictated the types of sustainability opportunities they developed (Mikler, 2007). Therefore, most economists concluded that U.S. companies' motives for many business initiatives was primarily greed or gain, even when it came to sustainability practices. (Farmer, 1995).

The literature also revealed insights from economists that indicated that these issues, found within the neoliberal economic system, were not trivial results from an ideal market system that could be overlooked; they are issues that point to an urgency for the government to

intervene and stop such negative results within the market (i.e., poor green practices, abuse of resources and formation of monopolies). As a response to the negative consequences of neoliberalism, various capitalist theories were developed and helped shape the nation's policy-making. Economist Paul Samuelson (2010) was a pioneer in the promotion of 'limited centrism', as a replacement for neoliberalism. This theory promoted the idea of pragmatism when corporations and the government developed projects for improving social welfare. Samuelson (2010) believed that because policymakers tended to make self-serving decisions, the best way to resolve social issues was to incorporate meaningful incentives into environmental regulations.

2.4. Consumption

In the beginning, capitalism was designed to meet social needs via the production of relevant goods and services (Barber, 2007). As the concept began to mature, consumers were inclined to demand products that solved their issues (Samuelson, 2010). Soon after (at the start of the 20th century), industrial competition increased to meet consumer demand for the products they desired (Barber, 2007). To establish a unique brand, companies adopted trademarks to promote their product as a good, with high quality and reasonable pricing (Barber, 2007). After the fall of Russia's communist regime, in 1991, U.S. corporations made consumer response and economic expansion their chief focus as they promoted the combining of democratic and capitalist ideals (Reich, 2007). Now, the concept of consumer capitalism dominates U.S. society, and social and environmental issues are now viewed as insignificant variables within an ideal market structure (Reich, 2007).

Nevertheless, marketing and advertising literature revealed several advocates of neoliberalism who feel the U.S.'s current level of consumption will not be sustainable many

years from now (Newman et al., 2012; Peterson, 2013; Vermeir & Verbeke, 2006). Two schools of thought have been adopted to categorize marketing scholars: the development school and the critical school (Peterson, 2013). The development school believes that marketing and marketing systems will be promising vehicles for long-term sustainability, and the critical school believes marketing and marketing systems are the reasons that societies are minimizing the importance of sustainability practices (Peterson, 2013). Vermeir and Verbeke (2006) believed the marketing systems need to become better informers, to the public, about the negative consequences of consumerism on society and the benefits of sustainable products to consumer, when they use them (Vermeir & Verbeke, 2006; Newman et al., 2012). Marketing professionals have unique insight in creating sustainability initiatives that appeal to consumers' current needs. Moreover, future dialogue for introducing green business practices needs to focus on simplistic goals that will allow the acceptance of these projects, within the hospitality industry, to become widespread before handling more complex sustainability issues (Smerecnik and Andersen, 2011).

Businesses that have sustainability practices as their primary goal tend to adopt a variety of communication tools and methodologies to market their sustainability (Inwood et al., 2009; Peterson, 2013; Vermeir & Verbeke, 2006). One restaurant study revealed how owners/managers incorporated erasable sign boards, cooking classes, flyers, signs and the use of wait staff testimonials into their marketing system, for promoting their sustainability practices to consumers (Inwood et al., 2009). Prior studies identified businesses using other communication tools (i.e., table tents, websites and menus with marketing information) to market their sustainability model and plan for preventing market failures (Hu et al., 2010). Many researchers recommended a more assertive approach to marketing sustainability practices or else the efforts will be lost to consumer indifference (Bohdanowicz et al., 2011; Hu et al., 2010; Revell &

Blackburn, 2007). Some owners/managers, in their desire to increase their customer base and promote a positive reputation, often neglect to provide a clear depiction of their sustainability practices to consumers and a more professional depiction to stakeholders (Bohdanowicz et al., 2011; Hu et al., 2010; Park & Lee, 2009; Revell & Blackburn, 2007). For example, one study concluded that the main reason some hospitality businesses are viewed as not having worthwhile sustainability practices is because the companies have not made an adequate investment in communicating the social benefits of their practices.

In short, researchers claimed that a wider acceptance of sustainability practices, and an increase in making such practices long-term, would occur if hospitality enterprises invested more effort in developing communication tools for their marketing systems (Park & Lee, 2009; Revell & Blackburn, 2007). Also, a greater investment in developing a more effective marketing system will provide a clearer understanding of the relationship between sustainable behavior and profitability and other mutually-beneficial business goals (Park & Lee, 2009; Revell & Blackburn, 2007).

2.5. Corporations

One of the greatest hindrances in the corporate world comes from the prevailing idea, taught in most U.S. business schools, that a business places top priority on stakeholder profits over any other business goal (Blount & Offei-Danso, 2013; Haigh & Hoffman, 2012). It was the 1919 Supreme Court ruling, in the *Dodge vs. Ford Motor Company,* in Michigan, that placed top priority on increasing stakeholder profits, and the resulting attitude was one that encouraged businesses to make profitability the primary goal of all business decisions (Haigh & Hoffman, 2012). Now that the idea of profitability is prevalent in U.S. business culture, stakeholders are reassured that their investments are well taken care of, through the acceptance of "fiduciary

duties" (Blount & Offei-Danso, 2013). The assumed legal obligation of profitability is so ingrained in American business that many companies feel that social objectives, that do not take into consideration profitability, should not be allowed because these type of objectives will promote "derangement of shareholder and corporate interests" (Blount & Offei-Danso, 2013, p. 619).

Newer and modified business models (often referred to as hybrid organizations) concerned about human contribution to greenhouse gas emissions pointed to a decline in Milton Friedman's 1970's economic philosophy that "the business of business is business" (Bocket et al., 2014; Haigh & Hoffman, 2012; Lozano, 2012b). Several terms for these newer business models were created in the reviewed literature: Blended Value, Values-Driven, Mission-Driven, For-Benefit, Benefit Corporation, Fourth Sector and more (Haigh & Hoffman, 2012). These business models incorporated a triple bottom line (TBL) philosophy that took into consideration the need for creating a balance between social/environmental issues and other economic variables, for developing effective company management processes (Bocket et al., 2014; Lozano, 2012b). According to Haigh and Hoffman (2012), newer and hybrid business models, that adopted sustainability practices, have modified the U.S. market by blending the for-profit and non-profit sectors.

Bocket et al. (2014) stated that these newer business models have discovered that "business as usual is not an option for a sustainable future … and responses to environmental changes will necessarily need to be in parallel with economic and social change" (p. 42). However, the blending of for-profit and non-profit initiatives will necessitate a re-evaluation of a company's overall goal and definition of corporate benefits (Bocket et al., 2014). Since the "business for business's sake" way of doing business is no longer relevant, researchers and business critics

agree that public policy and administration individuals need to define the criteria needed to promote and implement business involvement in green practices within the community at large (Ashford et al., 2012; Leach et al., 2012).

The B Corp designation (originating from Model Benefit Corporation Legislation) is usually granted by state government. Blount and Offei-Danso (2013) define the B Corp's overall goals as follows:

> (1) to offer consumers and financiers protection against misrepresentation and to encourage transparency by mandating disclosure of information to ensure that socially-driven companies are bound to their respective social purposes; (2) to clearly identify firms with socially-conscious ambitions and to align the interests of socially-conscious financiers, entrepreneurs and consumers; and (3) to create a legal framework which would be instrumental in achieving social goals that traditional corporations may be hindered from accomplishing (p. 627).

However, in the hospitality world, the focus on branding is a critical factor in business practices, and brand awareness in all business decisions is necessary when developing initiatives with the company's purpose (Hestad, 2016). Making sure sustainability practices coincide with a company's brand can become an expensive investment, but Hestad (2016) states that it becomes worthwhile when the company considers the long-term benefits of using such practices. Any plan to revise a business model to accommodate sustainability practices must take into consideration how branding will be influenced by the changes in company goals. Branding relies on promoting a message to the consumer that is constant, whereas implementing sustainability practices relies on promoting aggressive organizational and consumer changes, that may be met with resistance if anticipated problems are not carefully-handled (Hestad, 2016).

According to Kompella (2014), a management system, that contains the appropriate problem-solving abilities, will be able to blend branding with promotion of sustainability practices and set the tone for other businesses to follow, using their model for social welfare.

Kompella (2014) also believed that city-branding improves the quality of life and economic development, for that city, because the branding helps shape society's perception of the need for green practices. These types of environments—most often urban in nature—have governmental structures that create policies influencing human behavior to favor a city's goals (Zastrow & Kirst-Ashman, 2006). This influence helps a city stay on course for satisfactory economic development and improved social well-being (Zastrow & Kirst-Ashman, 2006). Kompella (2014) argued that a city's brand needs to focus on an initiative that ignites passion within the community to support that cause. An effective owner-manager will be able to measure consistent social improvement and economic development via witnessing consistent community growth and increased profits (Zastrow & Kirst-Ashman, 2006). If an owner-manager fails to meet consumers' needs, or uphold the city's brand, then the company will eventually deteriorate and close its doors for good (Zastrow & Kirst-Ashman, 2006).

The city and the hospitality businesses rely on their brand to maintain a viable business, and the reviewed literature on business revealed that the viability of these entities is also dependent upon the adoption of sustainability practices (Namkung & Jang, 2013). Sustainability practices were considered initiatives that created products and processes that protected the environment, and these initiatives included water conservation programs, instituting recycling programs and marketing renewable resources (DiPietro et al., 2013). Although there is limited research on how sustainability practices affect a company's brand, Namkung and Jang (2013) conducted research on how sustainability practices in the restaurant industry impacted on a company's brand quality.

They looked at how consumers perceived the company's quality of service, the company's commitment to the chosen green practices and the company's impact on improving the environment because of its adopted sustainability practices (Namkung & Jang, 2013 pp. 85-86). Brand equity was considered "a set of brand assets and liabilities linked to a brand, its name and symbols, that adds to, or subtracts from, the value provided by a product or service to a firm and/or to the firm's customers" (Namkung & Jang, 2013 p. 86). The researchers identified four parts to their definition of brand equity: brand image, brand awareness, perceived quality of business service and product and brand loyalty. Their research findings revealed that there was no noteworthy influence of sustainability practices on customer perceptions of the company and its overall performance, and they had no impact on customer perception of how the company upheld its sustainability branding (Namkung & Jang, 2013). Therefore, Namkung and Jang (2013) recommended that restaurant managers invest more time in developing effective communication tools to market their sustainability practices, so it will increase brand awareness of such practices (p. 94). Other sustainability studies emphasized companies' willingness to embrace sustainability practices (Lozano, 2012b). For example, Lozano (2012b) discovered that some businesses willingly embraced Corporate Social Responsibility (CSR) practices, such as renewable energy sources, recycling, LED lighting and assorted waste programs, which challenged owners to do thorough research on which CSR practices would work best for their business—especially if these practices produced economic benefits (Bohdanowicz et al., 2011). Other companies willingly embracing CSR practices were doing so to satisfy compliance with legal regulations or certification demands (e.g. SERP Codes of Conduct and EMS) (Hoejmose & Adrien-Kirby, 2012).

One study boasted that the hotel industry was a leader in utilizing CSR practices, with much-documented success (Bohdanowicz et al., 2011). However, some researchers believe that those companies willingly adopting CSR practices are doing so to improve public relations, by pretending to solve social and environmental problems (Lozano, 2012b; Reich, 2007). One study noted two problems with companies readily adopting CSR initiatives. For one, CSR adoption, under the pretense of increasing positive public relations, draws excess attention to stakeholders and increases costs while decreasing quality (Lozano, 2012b). Also, green practices adopted to improve public relations often forget to include the practices in the company's 'bottom line', which results in the projects being successfully promoted but unsuccessfully implemented (Lozano, 2012b). Moreover, Marquis et al. (2016) studied selective disclosure, which is "a symbolic strategy whereby firms reveal a subset of private information to create a misleadingly positive public impression" (p. 483). Therefore, a company's sustainability practices are shrouded in misleading environmental intents (Marquis et al., 2016). Marquis et al. (2016) studied the selective disclosure technique, called 'greenwashing', in which a company shares what looks like promising green practices but fails to disclose their business practices that add to environmental concerns, thereby creating the illusion of adhering to sustainability regulations. Marquis et al. (2016) pointed out that customers can consult third-party verifications to find out if a company is successfully adhering to appropriate sustainability practices, and if a company discourages consulting third-party sources, it could be the company's admittance of having symbolic compliance. These discoveries prove that CSR adoption, in the U.S., has the potential to improve social well-being if companies are authentic in their development of, and adherence to, such practices (Lozano, 2012b).

Voluntary certification initiatives tend to influence companies to adopt sustainability practices (B Lab, 2014; NRA, 2015). For example, B Lab utilizes a certification model that influences businesses to incorporate green practices into their product designs and use (2014). B Lab certification tells consumers that the business has made a sound commitment to creating products and services with consumer well-being in mind. However, some studies noted that consumers may not be as concerned about certifications as once thought (González-Benito & González-Benito, 2005). Instead, these studies concluded that consumers focus more on products that have little or no impact on the environment, when they are being made, in favour of products that can be recycled or re-used, when discarded (González-Benito & González-Benito, 2005).

2.6. Environmental Management

The environmental management literature covered a variety of studies, focusing on the resource-based view of business, and demonstrated that a company's performance was indicative of its resource heterogeneity (Klassen & Whybark, 1999). Therefore, a company's desire to implement a specific sustainability practice coincided with their ability to do so with a competitive advantage (Bansal & Roth, 2000; Christman, 2000; Klassen & Whybark, 1999). Research on the multi-dimensional view reported that there was not one single sustainability practice that equated to a promotion of increased environmental proactivity, in various industries (Kirwan & Brunori, 2017). When considering various motivational factors for implementing certain green practices, researchers were led to believe that a company's commitment to environmental initiatives could be measured by studying the company's diverse range of practices (Reilly & Hynan, 2014). In short, researchers in environmental management concurred

that a company's adoption of proactive green practices was a direct reflection of whether the company was willing to implement the plan successfully (Kasim, 2015).

Once researchers agreed that the diversity of green practices was the best measure of environmental proactivity, they began asking the individuals responsible for environmental management to identify the types of services that they implemented within their company (based on a list of practices chosen for the survey) (González-Benito & González-Benito, 2005). The researchers believed this approach, to measuring environmental proactivity, was most reliable due to its ability to measure a company's diversity in green practices, via analysis of the survey results (González-Benito & González-Benito, 2005).

Klassen and Whybark's (1999) study divided environmental practices into two categories (pollution prevention and pollution control) before analyzing any decreases or increases in a company's environmental proactivity. Prevention practices strive to decrease excessive consumption of resources and production of waste via renewable energy resources, production-planning strategies and adoption of clean technologies (Klassen & Whybark, 1999). The research revealed that the adoption of several pollution prevention practices often increased a company's environmental proactivity.

Lucas and Noordewier's (2016) study created four categories of environmental management practices. The first category is called planning and organizational practices which "reflect in some way the extent to which an Environmental Management System (EMS) has been developed and implemented" (i.e., the extent to which a company has established goals and procedures for carrying out the adopted practice). The second category consists of operational practices, which are changes that a company makes to carry out its green practices. The operations used to carry out the company's green practices are divided into two groups: product-

related (i.e., whether the product's design was eco-friendly) and process-related (whether the manufacturing processes used to produce products were environmentally-friendly).
The third category consisted of process-related practices, that have the goal of transforming operational practices of a company, for decreasing the negative effects of business processes on the environment. The fourth category consists of communication practices that encourage institutions to adopt environmental practices and commit to those practices. Research findings indicated the adoption of the vast variety of sustainability practices yielded unpredictable measurements of environmental proactivity, and this led researchers to conclude that there was no single type of sustainability practice that served as a necessary component for all environmental proactivity evaluations (Lucas & Noordewier, 2016).

There were also studies concerning a sub-category of environmental management that probed how management strategies considered the adoption and maintenance of sustainability practices (Denning, 2015). This type of management is considered innovative since it focuses on newer concepts of business practices and views the public sector as a greedy industry focused solely on institutional gain (Denning, 2015). Denning's (2015) desire to see public sector industry become extinct was met with much opposition, but the author insisted that "instead of traditional management being a set of linear mechanisms that can be transformed one-by-one through implementing tested remedial measures, it is proving to be more like an ingeniously morphing virus that steadily adapts itself to, and ultimately defeats, intended fixes and returns to its original state, sometimes more virulent than before" (p. 33). Denning's (2015) findings stressed the need for a more collaborative management system with employees, that will lead to better development and implementation of company goals.

The reviewed literature on environmental management facilitated other concerns from researchers about creating a common language. Although sustainability practice—as it relates to business management and human behavior—is still a novel concept, "it will become increasingly important to address the inconsistencies in the various definitions" (Ahi & Seary, 2013, p. 340). Conflicts from inconsistent vocabulary to how to define sustainability practices are hindering successful collaboration among the various disciplines (Denning, 2015). The need for decision-makers to implement a common language is critical to adopting successful multi-disciplinary sustainability practices (Denning, 2015).

2.7. Owner/Manager Characteristics

Only a few of the studies, in the reviewed literature, factored demographic information into their models (Ajzen, 2011). Although the theory of planned behavior (TPB) allows for the inclusion of demographic information, such as educational background and gender, in sustainability models, most researchers concluded that these demographic factors have little or no impact on shaping human behavior (Ajzen, 2011). No hypotheses were proposed since future studies are needed to consider the influence of demographic variables on these models (Le et al., 2006). Nevertheless, Kollmuss and Agyeman's (2002) findings identified a correlation between demographic information (educational background and gender) and human behavior, concluding that males with higher education tended to adopt attitudes about the environment that were pro-environmental. While studying CSR activities for SMEs, researchers discovered that the educational background of the manager had a significant impact on CSR projects (Hsu & Cheng, 2011). Other researchers (González-Benito & González-Benito, 2005) discovered an astonishing association between an interest in environmental initiatives and company size, suggesting that companies tend to be more concerned about environmental issues, and creative management

models, when their company is large. Other studies revealed a high correlation between company size and implementation of sustainability practices (Erdogan & Baris, 2007; Le et al., 2006; Uhlaner et al., 2012). One study's findings revealed that environmental initiatives for managing and minimizing waste are in dire need by large hotels that consume more water and create more waste (Erdogan & Baris, 2007). Another concluded that the tendency to adopt a green practice depended, in part, on what type of practice was needed by the organization and the size of the organization (Le et al., 2006). Therefore, future research needs to focus on identifying the kinds of sustainability practices that companies adopt, instead of just looking at the number of practices adopted (Le et al., 2006). Hsu and Cheng's (2012) research revealed that SMEs with a larger budget tended to be more inclined to commit to implementing sustainability practices versus companies with more limited resources. However, Uhlaner et al.'s (2012) study pointed to other factors not previously considered as having a considerable influence on an SMEs' adoption of sustainability practices, regardless of budget size (p. 425).

2.8. Small and Medium-Sized Enterprises (SMEs) and Sustainability

Craft breweries are considered as SMEs. Therefore, when we look at sustainability practices in craft breweries, we need to focus on SMEs as a starting point. There is a difference between how SMEs and larger businesses address social and environmental issues. SMEs usually don't have regulated environmental laws (Spence, 2007; Hamann et al*.,* 2009), which usually translates to little or no involvement in social and environmental projects (Lawrence et al*.,* 2006). One advantage of being SMEs is the freedom allotted to owner-managers when it comes to making decisions (versus the limited freedom that managers in larger businesses have) (Hamann et al*.,* 2009), and the daily operational duties of the SMEs are critical elements for the entire business structure and flow of the company, which may also help shape their commitment

to social and environmental affairs (Hamann et al., 2009; Vives, 2006; Jenkins, 2004). One disadvantage of being SMEs is the smaller customer base, which creates restricted financial resources and limits companies' investment in social and environmental initiatives (Hamann et al., 2009; Spence, 2007). However, one cannot get the impression that all SMEs across all socio-economic, industrial, cultural and ethnic backgrounds are equally restricted in their abilities to adopt sustainability practices (Jenkins, 2004). Therefore, the level of involvement in sustainability practices will vary according to business size (Brammer et al., 2011), sector context (Spence, 1999) and the anticipated competitive value of adopting green practices (Cambra-Fierro et al., 2008).

Current research is also suggesting that SMEs interest in pro-environmental initiatives is rapidly declining (Brammer et al., 2011; Cassells and Lewis 2011). There are many motivators that encourage businesses to adopt green practices. They are:- adherence to established environmental regulations (Paulraj 2009), moral or environmental motivations (Melnyk et al., 2003), the potential for financial benefits resulting from pro-environmental projects, consumer demand for pro-environmental practices, and encouragement from local pro-environmental interest organizations and advocates (Kehbila et al., 2009). A qualitative research project by Bansal and Roth (2000) examined the impact on motivators on pro-environmental actions. They identified three broad types of motivations. The first type dealt with competition to create certain pro-environmental initiatives (i.e., resource reduction, process intensification, and green marketing, source reduction, process intensification and new capital investment). Another motivation concerned maintaining legitimacy by achieving long-term compliance with environmental regulations. The third type of motivation concerned corporate social responsibility.

Management stressed the need for key business and government officials to assume the chief responsibility for fostering the adopting and maintaining of sustainability practices. It is understood that SMEs may see more financial opportunities from initiatives that are not environmental (Fineman, 2002; Purvis *et al.,*2000). There are some opportunities in environmental initiatives, but many SMEs may overlook the options available and resort to more competitive initiatives (Gadenne et al*.,* 2009). Thus, the need for a more aggressive strategy is critical for establishing effective environmental regulations because researchers believe the requirement of compliance is a high motivator for engaging in pro-environmental initiatives (Simpson et al*.,* 2004; Bradford and Fraser, 2008; Gadenne et al*.,* 2009).

When it comes to corporate social responsibility, people tend to let their moral values define their behavior (Nystrom, 1990; Rokeach, 1979). According to Fritzsche and Oz (2007), ethical decision-making is responsible for many initiatives created to serve community interests, and initiatives designed to benefit only individuals are discouraged. This is why Vives (2006) asserts that there seems to be a consistency in the ethical and religious morals influencing corporate social responsibility among SMEs. Sarbutts (2003) believes that SMEs are more prone to adopting CSR initiatives than larger companies, because of the personal involvement of the owner-manager in the decision-making, which suggests that their personal values are at work when it comes to selecting pro-environmental initiatives (Lawrence et al*.,* 2006; Collins et al., 2010; Battisti and Perry 2011).

2.9. The Beer Industry

Beer has been produced in America since the colonial age, back to when the pilgrims established brewing systems in taverns and their homes (Lewis, 2013). The late 1600s brought with it an improvement in production, that was heavily influenced by German immigrant

brewing techniques (Lewis, 2013; Thomas & Leeson, 2012). This advancement in beer production also increased consumption of alcoholic drinks in the U.S., which posed social concerns about people's health and safety. Therefore, government officials-imposed beer and liquor regulations, such as the Eighteenth Amendment of 1919 (Prohibition) to restrict the creation and consumption of alcoholic drinks (Kurtz & Clements, 2014). Between 1919 and 1933, there was no legal alcohol production.

Prior to 1920 (and before the Eighteenth Amendment of 1919), over 1,300 breweries existed in the U.S. An estimated 54.7 million barrels of beer (with one barrel equaling 31 gallons) was produced each year (Clemons, Gao, & Hutt, 2006; Reid, McLaughlin, & Moore, 2014). The local breweries that supplied beer suffered under Prohibition (Reid et al., 2014). The Twenty-First Amendment of 1933 canceled the Prohibition of 1919 and bestowed regulatory power of alcohol to the individual states (Kurtz & Clements, 2014). However, at that point fewer than three dozen breweries had survived the Prohibition (Clemons et al., 2006). New breweries did not come into existence until 1966, when San Francisco's Anchor Brewing Company was established (Murray & Kline, 2015).

By 1980, there were only eight breweries (Murray & Kline, 2015). However, this number grew exponentially over the next 20 years to over 1,450 (Brewers Association, 2017). The 1990s, especially, saw an influx of new craft breweries that temporarily surpassed consumer demand and produced beer of questionable quality (Reid et al., 2014). A downward spiral in demand prompted brewery closures until the demand increased again in the early 2000s, when the quality of beer improved (Reid et al., 2014). Only three breweries were highly successful during the 1990s: Anheuser-Busch, Miller, and Coors. In 1997, these companies produced over 80% of the 190 million barrels of beer sold in the U.S., thanks to aggressive advertising tactics (Clemons et

al., 2006). The success of aggressive advertising remained even in the 21st century as companies like Anheuser-Busch invested over $2 billion in advertisements, which yielded $15 billion in net sales, close to half of the U.S. beer industry sales in 2004 (Clemons et al., 2006). Consumer purchases of American beer remain strong. Overall U.S. beer volume sales were static in 2016, whereas craft brewer sales continued to grow at a rate of 6.2% by volume, reaching 12.3% of the U.S. beer market by volume (The Brewers Association, 2017).

Clemons et al. (2006) identified two factors that shaped the modern beer industry. The first identified factor was the response to meeting the demand for beer after the abolishing of Prohibition, which caused the surviving breweries of the time to resort to mass production of standardized alcohol. The second factor was the elimination of the need for local breweries with the help of advanced technology in refrigeration (Clemons et al., 2006). These factors helped boost the success of companies like Anheuser-Busch, Miller, and Coors because they were able to standardize beer in their advertisements. Companies like Anheuser-Busch, Miller, and Coors had at least 85% of the market by 2016 (Brewers Association, 2017). Thus, Clemons et al. (2006) revealed that barriers to entry into the market stemmed from good marketing strategies and not necessarily from premium quality product. Toro-Gonález, McCluskey, and Mittelhammer (2014) claimed that price was not a factor in influencing beer sales since cheaper substitutions, with the same quality, did not exist.

2.10. The Craft Beer Industry

The process of beer production is the same for small and large companies (Ambrosi, Medeiros Cardozo, & Tessaro, 2014). Murray and O'Neill reported that local brewers were attempting to rekindle the authenticity and appeal of home-brewed beer production, which sparked the creation of the craft brewery industry (2012). The Brewers Association states that

craft beer is either 100% malt or 50% malt with other flavors (2017). These beers have more flavor and are stronger than the mass-produced beers produced in the U.S. (Reid et al., 2014). After World War II, two transformations took place in the beer industry. The first transformation took place between 1950 - 1980, when the American beer industry was mostly mass-produced lager beers (Murray et al., 2012). Since 1980, a variety of flavors and types of brews arrived, with the increase of craft breweries (Murray et al., 2012), and these industries have seen exponential growth (Reid et al., 2014). Today, Anheuser-Busch and Miller are developing strategies for competing with the increasingly successful craft breweries (Reid et al., 2014).

The U.S. craft brewing industry consists of three segments: (a) brewpubs, (b) microbreweries and (c) regional craft breweries (Brewers Association, 2017). A brewpub is a restaurant that makes less than 15,000 barrels a year but sells at least a quarter of their beer on-site. According to the Brewers Association (2017), there were 1,916 brewpubs in the U.S. in 2016. A microbrewery is a small business that makes less than 15,000 barrels of beer a year and sells most of their beer off-site (about 75%) in bars, liquor stores and grocery stores. 3,132 microbreweries existed in the U.S. in 2016. Regional craft breweries make from 15,000 - 6 million barrels of beer per year (Brewers Association, 2015). According to the Brewers Association (2017), 186 regional craft breweries existed in the U.S. in 2016.

Most craft brewers produce their product on-site. Sometimes, a small company may need to contract with a larger brewery to help with meeting consumer demand. Contracting with other brewers has become a widespread practice when craft brewers need more capacity, to meet the demand for more flavors and styles, but do not have the financial resources to accommodate the expenses for expansion (Reid et al., 2014). From 2015 to 2016, retail dollar sales of craft beer increased 10%, up to $23.5 billion, and now account for nearly 22% of the $107.6 billion U.S.

beer market. Craft beer produced more than 24 million beer barrels in 2016 and yielded a 6.2% growth since 2015 (Brewers Association, 2017).

2.10.1. Sustainability in Craft Breweries

Brewers Association has some interesting guidelines on their website. There are manuals to help achieve better levels of sustainability among craft brewers, to achieve minimal levels of energy, water/wastewater and solid waste. There are also other artifacts available, such as best practices, case studies and white papers to help brewers reach consensus and make more calculated decisions. Next is a summary of the manuals and some green practice examples from industry professionals.

2.10.1.1. Energy

Craft brewers are a contemporary sector of the brewing business. It is well-known that many craft brewers have found advanced solutions for energy use and reduction of greenhouse gas (GHG) options at their amenities. Keeping in mind growing energy prices, lessening energy usage ought to be a big concern at all breweries. Owners and operators might believe energy costs to be something which is out of their control and believe that these prices increase and fall only with energy prices in the region. On the basis of costs, energy reduction might not be the highest concern in brewery operations, however, breweries that don't consider the prospects at each stage of their processes might lose out on possible cost-saving and revenue-producing methods. There are many practices for energy productivity and preservation, which could be simply included in everyday operations, and solutions, which could go beyond the reduction of GHG and result in extra income sources, new community plans, and reductions in operating costs. These aid brewers in saving money and turning into leaders in sustainable practices.

Energy is an operating cost, which frequently is treated like an indispensable evil. In its different forms, energy is used in all parts of the brewing industry. By getting to know how energy is made use of, all through the operation, procedures can convert an apparent indispensable evil into a competitive advantage.

The first step in handling energy costs is recognizing and comprehending how energy is made use of and where the major users live. This results in enhanced competence which will result in long-term cost savings, and a better competitive position.

Usage of energy in breweries differs on the basis of product, size and location. Refrigeration usually forms the leading electrical load, whereas brewing takes the biggest quantity of natural gas.

The below graph shows the energy percentage made use of throughout the operation. Also, usage of energy differs between brewpub operations. Heating, ventilating and air conditioning and food preparation takes the most energy.

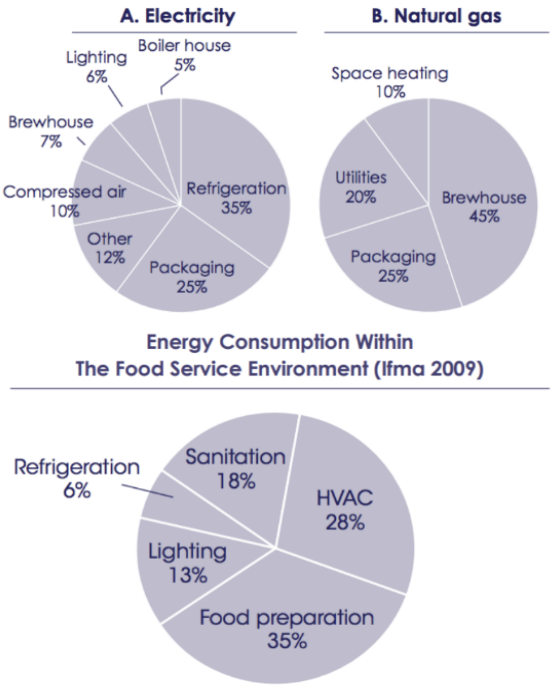


Figure 2.1. Consumption of energy in Breweries
Source - Brewers Association

Outline of Current Energy Usage/ Greenhouse Gas Performance and modes - Energy made use of in a brewery is divided into two main units. To generate steam and hot water, thermal energy (natural gas) is utilized. This is then made use of in general building heating, brewing and packaging. Electrical energy is utilized to power all apparatus, refrigeration being the major user. On average, 70% of the energy is consumed by the Thermal sources in the brewery; though, it typically reports as merely 30% of the total cost of energy. On the basis of this, top priority should be given to the efforts for lessening electrical energy, while taking into account opportunities for energy reduction, because they provide the biggest opportunity.

Generally, small-scale breweries have greater kWh/BBL numbers, as their small-scale sizes don't balance the base energy needed to brew a barrel of beer. The kWh/BBL signifies the quantity of energy made use of to yield one barrel of beer.

There are Regulatory and Non-Regulatory Drivers that assist in energy reduction. The Energy profiles aren't merely determined by everyday operations, but also by outside forces, which have an effect on the price of carrying on business. In the world of energy, these costs could be disguised as regulatory requirements. Regulatory drivers centered on energy usage could be put to Greenhouse Gas Emissions' necessities or direct energy productivity necessities, which would have a direct effect on usage of energy. Brewers should consider all the local and state regulatory necessities linked to these two regions, to completely comprehend the potential of energy reduction in the brewpub or brewery.

Non-regulatory drivers, which have an effect on usage of energy and cost, are in a position to help the brewers with reducing the cost and usage of energy. The diverse programs available offer direction, management practices and tools, which will result in the most effective usage of energy at the minimum cost possible. Programs such as LEED, ISO50001, Green

Building and EPA Energy STAR are provided by the private sector and government agencies, and by local environmental centers, such as the Chicago Center for Green Technology. These programs provide low or no-cost information on enhancing energy efficiency and preservation, and how to make and execute programs of energy management. This information would assist brewers to constantly apply practices that are energy efficient, ensuing a lower carbon footprint and lower operating costs. Shareholder recognition could be attained by reporting certifications, initiatives, and innovation and achievement awards (Climate Action Leader, Energy STAR and LEED). Exclusive prospects are provided by community ties to breweries for promoting energy proficiency, plus GHG reduction outside their facility walls, additionally backing the image and brand.

Energy could be a huge source of GHG discharges in the brewing area, irrespective of whether it is yielded on-site, from burning of fossil fuels, or bought from an electric supplier. GHGs are likewise produced throughout the supply chain, from raw materials and packaging production to transference of goods, refrigeration, and GHG discharges from waste (carbon footprint).

2.10.1.2. Waste

It is well-known that many craft brewers have ground-breaking solutions, when it comes to waste management. These solutions are much more than a simple lessening of waste to landfill and office recycling. In recent years, the conventional disposal route for solid waste (i.e., carrying ‘waste’ to landfills) has become very costly. Old landfills are full and closed, the few new landfills, which are allowed to open, are situated far away from populated regions, resulting in an increase in transference costs to the ultimate dumping zone. Like most of the businesses, breweries are also finding that decreasing the total waste produced can result in considerably

lessened operating costs. Moreover, keeping biodegradable materials distant from landfills could result in an important revenue source.

Four general solid waste streams are generated in craft breweries; brewing process wastes, packaging wastes, food service wastes, and wastes generated during special events, such as concerts or festivals.

Figure 2.2. Four main Solid Waste Generation Processes in Breweries
Source: Brewers Association

Reducing the quantity of the waste from the very beginning is the ideal way of handling the situation. Rather than merely knowing the weight or volume of the waste going to landfill, it is also important to comprehend the amount and kind of waste produced. Subsequent to lessening the quantity of the waste produced, possibilities for material recycling need to be considered. When these routes are expended, waste disposal routes should be looked into.

The obtainability of the recycling programs differs by authority in the U.S. Characteristically, no enforceable laws are there for households or businesses that opt to not recycle. Recently, regional and local guidelines have instituted compulsory recycling and/or waste minimization. Such actions have resulted in opportunities for communities, businesses, and households, such as increasing the lifetime of current landfills, decreasing the costs and

energy for carrying solid waste, and generating jobs at the community recycling centers. many resources is accessible to help in the improvement of a solid waste management program, such as www.earth911.com to find recycling centers and evaluate reduce, reuse, recycling regulation.

Usually, craft breweries have a positive image, a decent reputation, plus a powerful connection with the people. Breweries which share their dedication to sustainability stories of success have built trust between the community, customers and the regional and local administration. Sustainability acceptance by collaborative determination, innovating actions, achievement awards and certifications back a promise of breweries to decrease solid waste at the community and at the facility level. They can contact state offices, public interest groups, local waste authorities, or environmental offices, to recognize prospects to list the efforts of solid waste lessening, comprising actions and recovery statistics.

When breweries' waste management programs develop, its achievements are noted by local, national or international organizations. Sharing accomplishments fortifies the image of the breweries and motivates other breweries to embrace comparable procedures for their individual success. The community ties provide craft breweries with the exclusive prospect of showing recycling and reuse opportunities outside their individual facility, by means of information sessions, facility tours, backing community initiatives, and communicating growth and objectives; breweries could help and guide a community-wide acceptance of waste management.

Opportunities and costs both have risks related to waste management for craft brewers. There is a huge cost of resources and time in educating and training staff in appropriate waste management. A brewery might not find an instant return on effort and time spent for the program. For instance, the yearly billings for waste discarding might not validate the expenditures required to execute programs. Also, certain waste reduction programs may increase

the usage of water or energy. For instance, brewpub operations decreasing the usage of non-disposable tableware might increase the usage of hot water to wash them, or fitting hand dryers in restrooms might decrease the amount of waste produced, however the dryer would increase the usage of energy. A majority of the efforts for waste reduction are up-front and could be applied with a slight increase in use of energy and water, however it is important to completely apprehend the costs and uses prior to going with any program.

2.10.1.3. Water

In spite of major enhancements in the past 20 years, wastewater disposal and water consumption are the economic and environmental glitches, which unswervingly have an effect on breweries and brewing procedures. Numerous breweries have novel answers for water and wastewater management. The profusion of un-contaminated, inexpensive water in the U.S. has made users profligate. All sides agree that the present utilization rate might be untenable. All these concerns push brewers to be mindful about the upcoming risks of cost and supply - essentials of a developing business. Although the average water usage ratio for a brewery is about seven barrels of water to one barrel of beer, several craft brewers have ratios of less than three to one. Even though, typically the return for decreasing water use is lengthier than suggested, making use of standard financial calculations the long-term growth of a business might rely on the capability to effectively utilize water resources. The composition of beer is around 95% water; but, the quantity of water required to make a bottle of beer is much bigger than the quantity of water in the beer. Most craft brewers obtain their water from municipal suppliers (tap water), whereas some make use of well water. Other than the water in production, wastewater and disposal offers another development prospect for brewers. Most breweries release 70% of their received water as waste. This wastewater goes to the sewer system. In a

majority of cases, brewery waste disposal costs are considerable when compared to the costs of water.

In numerous societies, breweries might be the major user of water and the major source of organic waste, handled by the municipal treatment plant. This produces cost and supply concerns. In the U.S., the price of water from a municipal supplier is comparatively cheaper than other utilities. Water awareness and conservation practices offer an efficient instrument for brewers to contact communities. These struggles have many profits, comprising brand image and getting known as a vital section of the community.

In a brewery, water is used in four main areas, which are – utilities, brew house, packaging and cellars. Furthermore, auxiliary operations, like washrooms and food service cause more water usage.

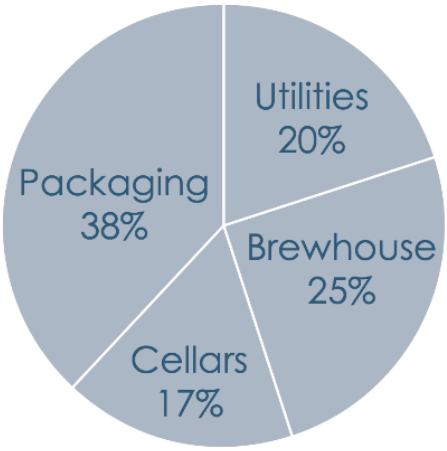


Figure 2.3. Water Usage Per Department Water/Total beer
Source: Brewers Association

From 1950 - 2000 the demand for water tripled in the U.S. The increase in demand has had a strain on water supplies. Specialists think that nowadays above 70% of the U.S. is going through, or would go through, certain kind of statewide, local or regional water scarcity. By the

year 2025, 4 billion individuals, around half of the world's populace, would be in 'severe water stress' circumstances. Other than human requirements, fortification of ecosystems and endangered species compete for accessible water. It is probable that the U.S. Environmental Protection Agency would present new laws and regulations, which will retain water "in-stream" for the protection of species. The continuing discussion on water for economic development, human intake, flood control, protection of species, tourism, and recreation will endure in the future. Extreme pollution of water could have an effect on ecosystems. The nature of wastewater of a brewery results in oxygen in surface water being exhausted at a speedy rate that negatively effects biodiversity and living species. Added guiding limitations are anticipated in the near future to solve this problem. The U.S. EPA has presented rules and Congress has approved laws to shield surface water bodies from contamination. The release of impurities into the waters of the U.S. is regulated by the Clean Water Act. Under this Act, the given rules might have an effect on the operations of craft brewers.

General permissible drivers in the Clean Water Act:

- Pre-treatment Streamlining Rule - pre-treatment plans for the regulation of manufacturing releases in waste collection systems.
- Waste Restrictions Advice -: national criteria for industrialized wastewater releases to water bodies.
- Total Maximum Daily Load and Impaired Waters Directions - territories, states, and lawful tribes are required to make lists of reduced waters which are extremely contaminated or tainted to fulfil fixed standards of water quality.
- Sewage Sludge Law - necessities for the concluding usage or dumping of waste sludge.

- NPDES Permit Program - regulating point sources which release toxins into the waters of the U.S.

Other than these rules, there are local agreements that administer water usage and wastewater sewage. Certain groups are also working to shield local watersheds.

Other than the regulatory drivers, positioning and brand image will help in numerous water and wastewater enhancement plans at craft breweries. These acts begin with workers and might reach the community. Numerous breweries teach and make workers participate in water-efficiency endeavors at the facility and inspire them to implement similar things at home (looking for leakages, making use of effective faucets and appliances, etc.) Modifying the water usage culture in a brewery could frequently be challenging. Incentives, visual or monetary acknowledgement, could have a vital role to play in this effort.

Certain breweries come together with local groups and community members to make projects which advance water management resources, quality of water, and/or usage of water. Together with the community arrangement, these policies might advance the effect that the facility has on water resources. Certain prominent international beverage businesses have set objectives to refill the local water supply with at least the quantity of water spent.

Decreasing the use of water and enhancing management procedures may offer a marketing advantage. Consumers and workers both find active efforts to enhance the environment as a significant and desirable attribute. This increases customer loyalty and improves a brewery's ability to attract and retain employees.

Individuals all over the world see water matters as a vital sustainability challenge. Certain businesses can achieve major market gains by proposing to consumers effective options and solutions. These community ties offer breweries the chance to endorse conservation of water

away from the facility. Educating staff and saving water could be done by projects such as rainwater harvesting. Speaking about water and wastewater subjects should be important issues on the agenda of any brewery. Connecting local struggles to bigger national and international action is an efficient method of educating employees and the community.

Water supply and wastewater discharges offer many risks and prospects for craft brewers. As with any other business investment, a cost benefit analysis should back any choice to spend resources in these areas. It needs a great deal of energy to transport and utilize water, therefore saving water means saving on costs. Around 20% of the entire energy use in California is for transport, utilization and treatment of water. Even though water-saving plans are frequently not cost-efficient, owing to the low cost of water in the U.S., once the savings on electricity are incorporated too, it adds an extra layer of savings. Decreasing the waste load and reducing the use of water would lessen bottom line costs. Brewers need to know that less water use would mean low wastewater releases; however, pollutants' concentrations in this case might be increased.

2.11. Theoretical Background

2.11.1. Stakeholder Theory

The stakeholder theory states that stakeholder pressures influence businesses to adopt certain sustainability practices (Eesley and Lenox, 2006). According to Freeman (1984), a stakeholder is ‘‘any group or individual who can affect, or is affected by, the achievement of an organization's objectives" (p. 46). Freeman's (1984) definition incorporates the belief that businesses create externalities that influence both internal and external entities to the business. Externalities produce motivational pressures to compel businesses to eliminate their negative impact on the environment and increase their positive ones. According to the institutional

theory, ‘stakeholder engagement’ justifies a business’s involvement in sustainability practices. Therefore, a company must consider their awareness of environmental issues, and their available resources, when determining their level of stakeholder engagement. Considering available resources also shapes a company’s response to stakeholder pressure, especially when stakeholders (both internal and external) apply pressure that conflict with one another (Roome and Wijen, 2006). Employees (internal stakeholders) are critical, for training in environmental practice, because they are the ones who must carry out the environmental work practices adopted by the company (Daily and Huang, 2001).

Also, upper-level management needs to be a strong motivator of employee desire to carry out environmental initiatives (Zhu et al., 2008). This motivation is needed when companies adopt new green practices or need to revise their existing environmental practices. Environmental values, managerial interpretations (Sharma, 2000), managerial perceptions (Cordano and Frieze, 2000) and leaders (Egri and Herman, 2000) all have an impact on how management makes decisions for environmental initiatives (Fernandez et al., 2003; Sharma, 2000). Therefore, workers play a critical role in a company’s decision to embrace environmental practices because they function as internal stakeholders. Increased pressures from internal stakeholders occur when businesses are influenced by them to adopt environmental management methods, and companies like this often incorporate this influence into the hiring process, recruiting employees who prefer working for businesses that are strongly pro-environmental. Therefore, companies adopting environmental management are in a better position to recruit skilled employees with proactive environmental preferences (Reinhardt, 1999). Furthermore, companies like this will embrace environmental audit programs to deal with employee pressure.

External stakeholders lack control of a company's available resources, so their influence involves motivating public opinions about a company's support or neglect of environmental practices (Sharma & Henriques, 2005; Freeman, 1984). External stakeholders comprise government regulators (chief external stakeholders), company shareholders, consumers and the entire community (Freeman, 1984; Backer, 2007). Government regulators are usually the most obvious members of the external stakeholder group, that create motivational pressure, because companies must adhere to their regulations to prevent legal consequences from the government and individuals (in the form of class actions and other lawsuits) and to prevent creating a negative image of themselves to the public (Zhu and Sarkis, 2007). Having appropriate environmental practices incorporated into operational practices and company training may serve as a proactive measure for avoiding regulatory threats.

Lesser regulatory pressures stem from voluntary initiatives (like pollution prevention programs) (Backer, 2007). Other initiatives that create regulations that go beyond governmental regulations may also gain credibility in the community. Therefore, it is to a company's advantage to embrace proactive environmental practices to foster relationships with government and other regulatory agencies that promote social welfare (Darnall et al., 2008). Capacity and rapport-building can arise from networking with regulators in the form of training programs and environmental program adoptions (Hoffman, 2000). An established rapport with regulators can give businesses a political advantage when regulators discuss new environmental procedures. Examples of other groups that exert external stakeholder pressures are labor unions, the media, neighborhood associations and environmental groups (Eesley and Lenox, 2006; Hoffman, 2000). External stakeholders also help shape the community's perception of a company's commitment to its environmental practices (Benn et al., 2009).

Businesses that ignore stakeholder pressures are usually rejected by the community (Hoffman, 2000). Sometimes, external stakeholders share information that motivates consumers to use companies that have a stronger commitment to their proposed ecological practices. In other words, these stakeholders establish the norm for companies to adhere to when adopting environmental initiatives (Gunningham et al., 2004). Supply chain stakeholders (customers and clients) encourage companies to establish a reputation for sound ecological management procedures and high-quality performance (Lee and Klassen, 2008). Having certifications (sometimes from third party companies like ISO 14000) of environmental compliance is also becoming a requirement for suppliers, since many clients desire assurance that the products they buy comply with environmental regulations, which also protects clients from having issues with their finished products (Delmas and Montiel, 2007; Handfield et al., 2002).

Other external (but sometimes internal) stakeholders who also have an important impact on a company's environmental practices are financial investors. These stakeholders are the foundational stakeholders of the company, and the company must reassure these stakeholders that their investments are being put to beneficial use (Reinhardt et al., 2008). Fortunately, companies practicing proactive environmental practices tend to demonstrate significant financial gain (Montabon et al., 2007). Also, regulatory compliance increases the shareholder value of a company (Goldstein and Wiest, 2007). Therefore, shareholder pressure from the financial investor group is usually for protecting monetary interests.

2.11.2. The Theory of Consumption Values

The theory of consumption values is the embodiment of three fundamental postulations: (1) consumer choice is governed by a variety of consumption values, (2) the contribution of a consumption value relies heavily on the situation involved, and (3) consumption values are not

dependent on one another. After being tested over 200 times, this theory has shown good validity (Sheth et al., 1991). Long and Schiffman (2000) applied the theory to a percentage of the population that had a specific relationship with service providers, to determine the motivational factors influencing consumer behavior. Sheth et al. (1991) applied it to decisions for product selection, purchases and brand selection. Sweeney and Soutar (2001) applied social value, emotional value and functional value to create a value scale assessment for consumer perceptions of a product's durability, based on its brand. This study implements all five consumption values. The following information introduces the values and corresponding literature.

Functional value: Sheth et al. (1991) concluded that functional value was the chief motivator of consumer behavior. Things like price, durability and reliability were all considered valuable factors when it came to functional value. For instance, a high price can be overlooked if the product has other positive factors, but studies have proven that this is not the case when it comes to green products (D'Souza et al., 2007). In Bei and Simpson's (1995) study, they argued that both quality and price are taken into consideration when purchasing recycled products. Because the price was held constant in Bei and Simpson's (1995) study, the researchers discovered there was a perceived difference in cost between non-recycled and recycled products that influenced a customer's desire to buy recycled products. For example, recycled toilet paper and baby wipes were low-priced items, but they were avoided because customers felt these products had inferior quality.

Laroche et al. (2001) performed a range of surveys between 1989 and 1991. In 1989, 67% of U.S. citizens claimed that they did not mind paying 5-10% more for products identified as ecologically safe. By 1991, the percentage increased to 15-20%, and by 1993, 79% of female participants said they were willing to pay 40% more for ecologically safe products with a proven

green practice reputation. Rahman and Reynold (2016) argued that consumers did not mind paying more for a product if it helped prevent harm to the environment—for example, paying a higher price to stay at a green hotel. Thus, it is clear that some consumers are willing to demonstrate a high concern for the environment by paying more for ecological products.

Social value is the value that certain social groups perceive to be present in society about what services are important (Sheth et al., 1991). The social pressure within society to engage in a specific behavior is called the subjective norm construct (Ajzen, 1991). People's behavior may take into consideration the perceived values within the subjective norm construct; however, people tend to make decisions based on their own personal norms and ethics because of perceived personal benefit or punishment (Arvola et al., 2008). Therefore, marketers of environmental products and services must convince consumers that their purchasing behavior will help benefit the environment. Because altruism is essential to successful sustainability practices, marketers must stress the benefit of the environmental practices on the environment while stressing the importance of both businesses and consumers being involved in practicing pro-environmental behaviors (Straughan and Roberts, 1999). It also becomes a powerful motivational tool when environmental experts provide needed information to concerned consumers when a social issue arises (Aqueveque, 2006).

Emotional value is when a value inspires certain feelings or psychological responses from people (Sheth et al., 1991). Based on this construct, the emotional value of goods and services are related to whether they elicit a feeling of practical use or pleasure (Sweeney and Soutar, 2001). MacKay (1999) stresses the importance of the relationship between emotional value and purchasing behavior when the author states that emotions influence all consumer

purchases. In Bei and Simpson's (1995) study, 89.1% of the participants felt they were being practical when they bought recycled products.

Conditional value is the value that comes from a set of circumstances being in place that prompt an individual to undertake a certain behavior (Sheth et al., 1991). According to Belk (1974), a conditional value is one in which a set of factors are connected to one specific point in time, and these factors work together to influence current behavior. Situational variables are circumstances that are presented to a person while they are reacting to an incentive that is perceived to be beneficial (Nicholls et al., 1996). When situational variables have been altered, the change could also affect a person's behavior (Laaksonen, 1993). When doing research on beer, breath fresheners, soft drinks and snacks, researchers realized that consumer eating habits influenced their purchasing behavior, and many products are bought because they meet a need for a specific occasion (Lai, 1991).

Epistemic value is the perceived value that comes from a product or service's ability to spark curiosity, interest or originality (Sheth et al., 1991). Knowledge about a product impacts all aspects of the decision-making process, including the decision to buy new products on the market (Laroche et al., 2001). Consumers use prior knowledge about a product and any new relevant information to determine if a product is worth buying (Lai, 1991). Therefore, the motivation to buy a new product stems from information about the quality of the product and the situational variables conducive to the need for buying the product. Those looking for products that spark originality are information seekers who like to store information until it is useful. Therefore, products bought for originality are intended to solve problems whenever they arise.

CHAPTER 3

METHODOLOGY

This chapter presents a complete description of the methodological procedures, including both qualitative and quantitative techniques, which were used for each of the three papers included in this dissertation. Article 1 employed inductive thematic analysis on qualitative interview data. Article 2 employed deductive thematic analysis on qualitative interview data. For both articles, the data from the qualitative phases was used to develop a survey instrument for the second quantitative phases of the studies. Article 2 applied stakeholder theory within the context of the craft brewing industry and utilized exploratory factor analysis as statistical techniques to analyze the data. Article 3 used only quantitative research and applied the theory of consumption values. This article utilized confirmatory factor analysis and structural equation modeling (SEM) as statistical techniques to analyze the data. As such, each individual methodology is discussed in detail throughout this chapter.

3.1. Ethical Consideration

Prior to starting the study, the researcher obtained approval from the Institutional Review Board (IRB) of the researcher's institution. Before the interview sessions, and the final surveys, an IRB modification was needed with the change in the survey and recruitment methods to collect the data. All the potential participants were under informed consent and an online information letter was posted as the first part of the online survey in Qualtrics.

Participants were informed that the data they provided was going to be processed without any identifying information. Following the regulations put forth by Auburn University IRB, both IRB's approved using the following protocol numbers.

The Qualitative study was approved for use from 2/9/2018; Protocol # 17-528 EX 1802

The Quantitative study was approved for use from 9/7/2018; Protocol # 18-160 EX 1807

3.2. Research Articles

Article 1. An Exploratory Examination of Environmentally Friendly Practices in the US Craft Brewing Industry.

Research Objectives

1. To understand and report on current environmentally friendly practices that the US craft brewery industry utilizes.
2. To compare the quantitative results with qualitative results.

Research Question

1. What are environmentally friendly work practices in the US craft brewing industry?

Article 2. Motivations behind US Craft Brewery Owners' Environmental Practices

Research Objectives

1. To examine the reasons behind US craft brewery owners' environmentally friendly practices.
2. To compare the quantitative results with qualitative results.

Research Question

1. What are the underlying motivational dimensions of US craft brewery owners to engage in environmentally friendly practices?

Article 3. US Craft Brewery Owners' Environmental Values, Involvement, and their Relationships with Breweries' Environmental Performance

Research Objectives

1. To determine US craft brewery owners' environmental values.
2. To investigate the relationship between owners' values, their environmental involvement and environmental performance.
3. To investigate the intervening effect of business challenges on environmental performance.

Research Questions

1. To what extent do US craft brewery owners' environmental values affect their utilizing of environmentally friendly practices?
2. To what extent do owners' environmental values affect environmental performance?
3. To what extent do owners' environmental involvement affect environmental performance?
4. How do business challenges intervene between owners' environmental involvement and environmental performance?

3.3. Study Sample

The target sample for this study is 30 owners of craft breweries in the U.S. representing all seven regions of the U.S., namely North West, West, South West, Midwest, South East, Mid-Atlantic, and North East.

3.4. Research Instrument

Articles 1 and 2 were utilized mixed method. The first phase of these studies was qualitative, involving in-depth semi-structured interviews. Therefore, the interview script (see

appendix A) was the research instrument. An interview guide was used to help guide each interview and kept the semi-structured format similar across participants. These articles, as well as the third article, used an online-based survey, and this was the research instrument.

3.5. Data Collection

Personal contacts were used to recruit potential participants. The researcher scheduled an interview at a time that was convenient to the participants. On some occasions, the researcher traveled to breweries to conduct on-site interviews; some of these breweries were located around 100 miles radius from the researcher's university, some of them were in different regions. In all other cases, the interviews were conducted over the telephone. The average length of the interviews was 40 minutes. The interviews were recorded using an electronic recording device, transcribed verbatim, and coded to identify certain themes. To maintain anonymity, each participant was assigned a unique ID, for example, Respondent 1 was labelled R1, Respondent 2, R2, and so on. Apart from the fundamental questions in the study, this investigation also sought to learn about the participating craft brewery owners' demographic characteristics, including the age of the owner and the breweries' production numbers. This procedure allowed for simplicity and straightforwardness in the identification of answers, and for providing structure and clarity. After the qualitative data was collected and the researcher received permission from the Institutional Review Board (IRB) at the researcher's institution, an online questionnaire was distributed by the directors of the non-profit organization, the Brewers Association, via email. There was also a blog on the Brewers Association website (http://www.brewersassociation.org). This blog is shared with commercially-oriented craft brewers. Through this blog, members read the information and instructions about the questionnaire and connected to the actual questionnaire with a link.

Potential respondents were provided with an informed consent letter that brought them to a uniform resource locator (URL) for the survey. This letter also provided a certain amount of background information on the survey and informed the potential participants that it was a research study, their participation was entirely voluntary, that there were no perceived risks to participate and that their participation was entirely anonymous with no identification markers.

3.6. Data Analysis

In order to adequately address the aims of this dissertation, article 1 and 2 employed the steps of thematic analysis, as described by Braun and Clarke (2019). The following six steps were adopted from Braun and Clarke (2019), to guide the studies: (1) Familiarization (2) Generation of initial codes (3) Searching for themes (4) Reviewing themes (5) Defining themes (6) Scholarly report. A detailed account of these steps can be found later in this chapter.

The data collected for qualitative phases, in articles 1 and 2, was analyzed using NVivo 11, a qualitative data analysis (QDA) computer software package used to conduct analysis. The program provides functions for text search, word frequency, coding, matrix coding and coding comparisons.

Data from the survey responses was downloaded from Qualtrics into the Statistical Package for Social Sciences (SPSS) 24. Descriptive and frequency analyses were used to describe the demographics of the sample. Reliability analysis was used to test the internal consistency of the measurement scales. Correlation analysis was employed to explore the strength of the relationships between the variables. Using AMOS, structural equation modeling (SEM) was used, including conducting confirmatory factor analysis, in order to run the holistic model all at once and determine which relationships were significant.

3.7. Qualitative Methodology

3.7.1. Interview Process

The Script: Before conducting an interview, a semi-structured interview script was required to be written. The semi-structured interview script was submitted to the IRB for sanction. After consent, the script was changed by arrangement, which supported bullet points with underlined keywords and room for reflexive notes (Kvale & Brinkmann, 2009). This approach let the interviews flow, although keeping certain structures to make sure that all of the interviewees were asked the same questions. Making room for the notes let me write down important points, to be looked into, and the vital themes to be questioned in the later part of the interview and in following interviews.

Opening: At the start of every interview, the researcher expressed gratitude towards every interviewee for taking the time for the interview. Also, I briefed them about the overall goal of the interview. For example, the reason for which they were selected, and their rights as an interviewee. Next to the interview bullet point procedure, I started with broad questions regarding environmental practices, to form a decent bond with the interviewees, prior to going into more thorough questions and answers (Galletta, 2013; Kvale & Brinkmann, 2009). I was careful to not offer any information regarding the issue, so the interviewees were not biased in any specific direction with their views. As proposed by Kvale and Brinkmann (2009), I was mindful to let there be silence after the interviewee stoped speaking, which may have resulted in further extension of their response. Moreover, I wrote down phrases or key words made use of by the interviewees and later applied them, to probe for further explanations (Kvale & Brinkmann, 2009).

Details: The middle section of a semi-structured interview was to discover the difficulty of the theme. In this section I looked for significant hints stated in the opening segment and made my questions more focused on meaning-making vs. general information. Before presenting precise theoretical questions, founded on the shareholder theory, I asked a common question regarding the advantages of green practices in their breweries (Kvale & Brinkmann, 2009). This let the interviewees talk about their own views on this theme, in place of set themes. Moreover, I asked questions to get an additional explanation about the themes.

Conclusion: This section of the interview offered me the chance to find any discrepancies in the interview and ask any theoretical questions. At this time, it was extremely significant to begin closing the interview by explaining everything and probing for further points and views. At the end of every interview, I asked interviewees if they had any other views about their experience and hoped that this resulted in advanced levels of dependability of the data. I concluded every interview by again thanking the interviewees and making them conscious of the subsequent measures in the procedure, if they would wish to fill in the questionnaire (2nd study) and/or go through the final report.

Thematic Analysis

Thematic study is a "technique for recognizing, examining and reporting outlines (themes) in the data" (Braun & Clarke, 2019 p. 17). Six steps were taken from Braun and Clarke (2019) to direct this analysis. The particulars of how every step was made viable could be seen below.

Familiarization: The familiarization stage of thematic study includes putting your own self in the data. Here, I would be the research tool; as a result, the procedure of involvement would start when I started conducting interviews. Once the interviews ended, every interview would be transcribed from audio to text. After the interviews were transcribed, I started

vigorously reading every interview, and looking for meanings and patterns in the data (Braun & Clark, 2019). I didn't directly ascribe priori codes to the records. I wrote down preliminary predominant themes, without being distracted by merely seeking themes recognized before the data collection. These themes were comprised of additional data analysis, when the procedure of coding was initiated. Braun and Clark (2019) claimed that it was best to go through the whole data set at least once, prior to starting the coding procedure.

Primary codes: Following familiarization with the records, I would start producing a primary list of notions that were to be linked to particular quotes in the records. Making use of NVivo 11, which is qualitative text mining software, I linked the codes to particular quotes in the records. The procedure of producing preliminary codes was carried out methodically for every interview and offered a primary footprint by which the subsequent stage could start.

Themes Search: When the whole of the data was primarily coded, I acquired a list of diverse codes to analyze. The procedure of looking for themes included grouping codes below diverse main themes, starting the procedure of meaning-making. The procedure should be to deliberate how diverse codes fit with each other, to elucidate a predominant theme (Braun & Clark, 2019). To visually signify this procedure, I formed what Braun and Clark (2019) called 'mind maps' to assist in the thought process concerning the relations between themes and codes.

Themes Review: This stage included studying every theme for internal homogeneity and external heterogeneity (Braun & Clark, 2019). Here, every theme/code grouping was reviewed and matched with an a priori theme to form a codebook. Afterwards, every a priori theme was provided with an operationalized description, particular to the setting of the craft brewery environmentally-friendly actions. Every recognized theme was revised at the level of the codebook and in the unique data set.

Defining Themes: This stage included revising the operational descriptions established in stage 4, then improving every theme to decide what feature of the data it takes. Braun and Clark (2019) maintain that it is vital at this stage to not try and make themes capture excessively or be extremely difficult. It would be established by reviewing the data and studying the explanatory codes and illustrative quotes for coherency and inner constancy with the principal theme (Braun & Clark, 2019). The consequence of this procedure was a thematic map linking themes and codes.

Scholarly Report: The last stage of thematic study takes place when the scholarly report is being made. The job of this phase comprises making an intense and multi-faceted story regarding the data, with simplicity entrenched for it to be clear to reviewers. At this point, assortments of the most convincing and illustrative excerpts were selected for showing in the last report. Braun and Clark (2019) proposed that instances should openly reveal the quintessence of the point that you want to make, without being too intricate. Associated analytic accounts, linking the results to earlier works and theoretical foundations, were made at this stage.

3.7.2. Reliability in Qualitative Study

Reliability relates to the scientific review, which is meant to "show true value, provide the basis for applying it and allow for external judgments to be made about the consistency of its procedures and the neutrality of its findings or decisions" (Erlandson, 1993, p. 29). Undertaking measures to look into reliability in qualitative research is similar to positivists' dependability and cogency concepts (Lincoln & Guba, 1985). Standards for honesty are given below.

Credibility: A piece of research could be said to be credible when the recommended connotation of the data is pertinent to interviewees and adapts to the qualitative data. It was

attained by the evolution of codebooks, tenacious opinion of developing themes and referential competence (making use of background information to back up data analysis) (Decrop, 2004).

Transferability: The term transferability could be equated with generalizability in quantitative research. Qualitative research is frequently criticised for small samples, without the capability to take a broad view of a bigger population. Though, it is significant to keep in mind that generalizing is not the goal or wish of qualitative academics. Relatively, an "analytical transfer of theoretical propositions to other objects is conceivable" and desired (Decrop, 2004, p. 159). Contextualization of facts from the analysis in existing literature resulted in transferability. Moreover, transferability was established by purposive sampling until a satiety of data and thick description was achieved.

Dependability: The knowledge produced by qualitative research can't be believed to be complete for the reason that it is of an unceasingly varying nature and directed in manifold diverse cultures and contexts. Consequently, dependability is about how well the data collected, in reality, matches with what took place in the arena (Decrop, 2004). In this research, dependability would start with a thorough research plan, including an audit trail recording the steps that would be taken during the data analysis procedure. The records will assist in augmenting the dependability of the facts.

Confirmability: Validation is a vital basis of social science study. To achieve a certain neutrality in the data analysis procedure, a hunt for a range of clarifications in the data adds confirmability to the study, therefore increasing general dependability (Decrop, 2004).

3.8. Quantitative Methodology

3.8.1. Assumptions of Multivariate Analysis

Normality: Assessments for normality should be taken to find out the suitability of data for multivariate analysis. Owing to the lack of fulfilment of this assumption, there is a possibility that your data will result in inflated chi-square statistics that would eventually have an effect on model fit. The dataset Normality was found on the base of skewness and kurtosis statistics. Skewness was found in the data, in case a variable consisted of an absolute value greater than 3. Kurtosis was discovered in the data when values were beyond the standard series of 10. Guidelines for the tests were taken from Kline (2005).

Multicollinearity: Multicollinearity is a statistical case where two or more variables are correlated. Pearson's *r* statistics were made use of to decide the height of correlation between variables. Accepting the guidelines stated by Kline (2005), a Pearson's r statistic above 0.850 was considered to be suggestive of concerns with multicollinearity. Latent variables in SEM are assigned "1" with standardized regression weights (+/- 1). Disrupting the assumptions of multivariate study in accordance to multicollinearity may increase the statistics therefore resulting in parameter approximations no longer being top linear unbiased estimations.

3.8.2. Principle Components Analysis vs. Exploratory Factor Analysis

Before taking the study, contemplation of the variances between principal components analysis (PCA) and exploratory factor analysis (EFA) was undertaken. Even though the principal components analysis is the standard way of extraction in SPSS, there is a big discrepancy between statistical academics in its usage. Although some are in approval of a true factor analysis method (Bentler & Kano, 1990; Floyd & Widaman, 1995), there are others who are of the opinion that there is a small to no difference amongst the two, or PCA is better (Guadagnoli

and Velicer, 1988; Schoenmann, 1990). Ford et al., (1986) state that the method of PCA doesn't account for the core structure result of latent variables, however it computes components on the basis of all of the discrepancies of the manifest variables that later come up in the solution. Definitely, a true factor analysis looks to reveal those latent variables which result in manifest variables to covary, showing merely the shared variance in the answer (Osborne & Costello, 2005). PCA, however, doesn't differentiate between the two.

Gorsuch (1997) states, uncorrelated aspects with moderate communalities may give increased variance values while making use of PCA. However, for the reason that factor analysis simply looks into shared variance, the possibility for inflation is dropped (Osborne & Costello, 2005). Floyd and Widaman (1995) propose EFA as the favored way of study for scales that have a priori expectations. Because of this, this paper will make use of exploratory factor analysis for the pilot test and confirmatory factor analysis for the main study.

3.9. Exploratory Factor Analysis

Exploratory factor analysis (EFA) is a multivariate statistical technique made use of to show the core structure of a series of measured variables. This method of factor analysis looks to explain the majority of probable variance, grouping together measured variables to describe latent constructs or factors. Primary scales selected for the research were taken from empirically-validated assessment tools. Even though every scale was validated beforehand, the scales were not tested in the setting of a craft brewery, consequently EFA was believed to be suitable to determine the degree to which the variables chosen for every scale calculated the projected concepts. The procedure of taking an EFA is quantitative and qualitative in nature. Quantitatively, the numerical relations between variables plus factors make the general strength of every item and every factor. Preferably, exploratory factor analysis is studied on the basis of

the issue of parsimony– looking for the least number of aspects to describe the biggest extent of variation. Qualitatively, the researcher's job is to find out the interpretation from the factor loadings produced and give every factor a general theme or name.

While taking an EFA, the subsequent deliberations must be formed:

Sample size: On the basis of recommendations from Hatcher (1996) and Foster (2001), sample size for the pilot study was taken. These writers suggest a minimum sample size of 100.

Factorability: Factorability accepts that a collinearity is there between the variables for the coherent aspects to be recognized. Factorability was studied by inter-item correlations. Correlations of more than 0.850 show problems with multicollinearity (Kline, 2005). Moreover, to check the correlation matrix, Barlett's test of sphericity and Kaiser-Meyer Olkin (KMO) were studied. Test of sphericity of Bartlett finds whether the correlation sizes are suitable for attaining an even answer. This test gives a degree of freedom, chi square statistic, and level of significance. A significant Chi-square test proposes that the data is appropriate for factoring. The KMO test is created on a link between partial correlations and the sum of squared correlations (Worthington & Whittaker, 2006). This statistic is from 0 – 1, with values reaching 1 signifying that the factor analysis should produce unique and dependable factors (Field, 2009). To go with factor analysis, a KMO of .60 is suggested (Tabachnick & Fidell, 2001).

Factor extraction method: There are quite a few factor analysis extraction approaches to pick from in SPSS, viz. generalized least squares, unweighted least squares, alpha factoring, maximum likelihood, image factoring and principal axis factoring. Though, the most extensively used are principal axis factoring and maximum likelihood (Osborne & Costello, 2005). Fabrigar, Wegener, MacCallum and Strahan (1999) propose maximum likelihood as the finest alternate if the assumption of multivariate normality isn't disrupted. They claim, "it allows for the

computation of a wide range of indexes of the goodness of fit of the model and permits statistical significance testing of factor loadings and correlations among factors and the computation of confidence intervals" (p. 277). Though, if the assumption of multivariate normality is disrupted, I am going to endorse making use of principal axis factoring (Fabrigar et al., 1999). Moreover, principal axis factoring is most appropriate for sample sizes which are smaller. Because of the smaller sample size of the pilot study, principle axis factoring with the maximum likelihood was selected.

Rotation method: The major aim of rotation is to streamline and clear up the data structure. Rotation methods can be either oblique or orthogonal. Orthogonal rotations generate factors which are uncorrelated, whereas oblique rotations let the factors correlate. Making use of orthogonal rotation will result in a loss of possible valued data in case the factors were correlated. Thus, an oblique method, Proxam with Kaiser normalization, was chosen.

3.10. Principles for factor retention

In exploratory factor analysis, there is no easy technique to decide the number of factors to uphold. Therefore, numerous criteria should be taken into account with respect to factor retention:

Eigen values: Factors that have eigen values bigger than 1 should be kept for study.

Total variance explained: Preferably, the factor structure should have 50-75% of the complete variance clarified by the minimum number of factors.

Interpretability of factors: The factors should be effortlessly interpretable. For instance, we should effortlessly name and define all sets of items as illustrative of their factor.

Number of items per factor: Every factor should keep a minimum of two items. Nevertheless, in case there are merely two items, they should have high loadings.

Factor correlations: In case the factor correlations are extremely high, e.g. more than .70, you might wish to try integrating extremely correlated factors.

3.11. Principles for item deletion and/or retention.

Generally, the goal is a factor structure that is the simplest possible – the minimum number of factors describing the maximum extent of variables. In this structure, you aim that your factors have comparatively elevated loadings (more than .50) with comparatively low cross-loadings (under .30). Nevertheless, the procedure of selecting items for retaining or removal is something of an art, concerning the subjective views of the scholar. The below measures could be seen as a guide.

Communality: Communalities show the discrepancy described in each item by factors. For this research, communalities of .4 or more were believed to be suitable.

Factor Loadings: These show how strongly every item load on its important factor. Preferably, every variable should load more than .50 or .60, however a least .40 is satisfactory.

Cross Loadings: They show how strongly every item load on every factor. There should be, as a minimum, .15 difference between any cross loadings and the target factor loading. Moreover, cross loadings more than .32 should be deliberated for removal.

Relevance of item to a factor: Evaluating each item's relevance needs qualitative methods. For instance, an item might be loading strongly on a factor, however it doesn't make a substantial impact. Here, rewording of items should be considered.

Reliability: Assessing the Cronbach's alpha for the items comprised in every factor is valuable information at the time of a factor analysis. Precisely, considering the "Alpha if item removed" is a valuable tool to know if the elimination of any particular items will advance reliability of a particular factor.

3.11.1. Confirmatory Factor Analysis & Structural Equation Modeling

Scale Reliability

Reliability is defined as the extent to which a scale consistently measures scores across multiple samples and testing conditions (Anastasi, 1988). Reliability could be tested by considering the strength and impact of the correlation between all the scale items (Robinson, Shaver & Wrightsman, 1991). This test refers to the internal consistency of the instrument, consequently evaluating the consistency of the responses. The coefficient alpha, with Cronbach's Alpha, is most usually made use of to evaluate the internal consistency of a data set in factor analysis. Construct reliability is another reliability coefficient often made use of in combination with SEM models. Construct reliability is calculated by the squared sum of factor loadings for every construct, plus the sum of the error variance terms for a construct (Hair et. al., 2010).

Hair et al (2010) state that values of 0.7 or more, for either reliability estimates, propose decent reliability. An alpha estimate of 1 indicates that the items in scale ratio have true reliability and little or no measurement error, showing an extremely elevated degree of internal consistency. Thus, it is advantageous if coefficients reach 1 and disproving the closer, they are to 0. An estimate of minimum 0.80 is desired, though scholars and statisticians have different views on the suitability of a Cronbach's alpha score. Certain scholars state that a Cronbach's Alpha between 0.30 and 0.70 is suitable for items to be in the test instrument (Henryson, 1971), whereas others claim that items should achieve an alpha score of a minimum of 0.70 to be in the instrument (George & Mallery, 2003). For the purposes of this research, values between 0.70 and 0.80 were considered as good, 0.90 excellent and 0.60 acceptable for inclusion.
Values falling below 0.60 were considered unsatisfactory and were evaluated for deletion.

Scale Validity

Validity assesses the readings made by a measure (Zumbo, 2005). More precisely, validity is "the underlying soundness of the instrument signaling sufficiency that the instrument does indeed measure what it is purported to measure" (Murray, 2009 pp. 71). The procedure of forming validity is absolutely vital, when making use of SEM, since this method includes multiple statistical methods comprising factor analysis, regression and path analysis (Zumbo, 2005). Two approaches of validity are made use of for this dissertation: construct and content. Content validity is "the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose" (Haynes et al., 1995, p. 238). The important goal of SEM and CFA is to assess the construct validity of a planned measurement model (Hair et. a., 2010).

Convergent Validity

Convergent validity relates to the fact that items which signify a latent factor should share an elevated proportion of variance (Hair et. al., 2010). A method to evaluate convergent validity, in SEM and CFA, is to assess factor loadings. Hair et al. (2010) propose factor loadings of a minimum 0.50, and preferably 0.70, to fulfil standards of convergent validity. Another way to assess convergent validity is by computing average variance extracted (AVE). This is calculated as "the mean variance extracted for the items loading on a construct" (Hair et. al., 2010, p. 687). A good convergent validity is believed to be shown by an AVE of 0.5 or greater.

Discriminant Validity

Discriminant validity is the "extent to which a construct is truly distinct from other constructs" (Hair et. al., 2010, p. 687). Also, it states that individual variables measured should

merely signify one construct. The hardest method to test for discriminant validity issues is by comparing the AVE values, in case of any two latent factors, with the square of the correlation approximation between the two constructs. The AVE should be greater than the squared correlation estimate. The rationale of this test is that the latent factor should describe much of the variance in its individual variables, in comparison to alternative latent factors (Hair et. al., 2010).

3.12. Structural Equation Modeling

Structural equation modeling (SEM) is a sequence of multivariate statistical approaches which describe the complex relations between one or more independent variables and one or more dependent variables. It can be considered as a mix of path analysis, factor analysis, and multiple regression analysis. The structural model assumes relations between theoretical constructs and suggests a structure for the covariances among manifest or observed variables (Hox & Bechger, 2007). The main step in recognizing a structural model is to test the recommended confirmatory factor analysis (CFA) model. Unlike EFA, measurement theory needs the investigator to state how the observed variables are believed to act in relation to the latent constructs (Hair et al., 2010). This, obviously, is on the basis of the theoretical foundations of the model and the EFA carried out beforehand. This dissertation will follow six stages to the structural equation modeling, as recommended by Hair et al., (2010).

Defining individual constructs: During this pre-test phase, expert reviewers aided in establishing content validity, and internal consistency of the scale, by conducting an exploratory factor analysis.

Making and stipulating the measurement model: Factor analysis undertakes to prove that the covariances between a series of manifest variables could be accounted for in a smaller group of latent constructs. Different to EFA, in SEM, the confirmatory factor model is put on the

data. Here, the CFA's aim is to find the approximations of the parameters in the model comprising covariances, factor loadings and variances of the factors and the residual error variances of the experiential variables (Hox & Bechger, 2007). CFA lets us test a structure and test if it is plausible because of its internal and external consistencies of unidimensional.

Making a study to generate empirical outcomes: When the basic model is stated, matters of model estimation and research design should be looked into. First, before gathering data for empirical study, a suitable sample size should be found. For this dissertation, suggestions between 5 and 10 cases for each parameter were accepted (Bentler & Chou, 1987). After the data is accumulated, the concern of missing values needs to be looked into. If 5% of the data is missing, a substitute with median method will be made use of, to substitute the missing data. After this, the estimation technique of maximum probability will be selected, as it is a popular technique.

Evaluating measurement model validity: To evaluate the model fit of the SEM and CFA, the modification indices, path estimates and standardized residuals will be examined. Hair et. al (2010) suggest that factor loading estimates with a minimum value of .50 would statistically significant and would be kept. Otherwise, items would be contemplated for removal. Moreover, factor estimates which lie outside the absolute value of 1.0 and standardized residuals of more than 2.58 should be contemplated for removal. Now, goodness-of-fit (GOF) for the complete model should be evaluated. GOF is a sign of how fine the model denotes the empirical data, which is how fine the stated model imitates the observed covariance matrix between indicator items (Hair et. al., 2010). GOF measures are made to denote three groups - parsimony fit measures, incremental measures and absolute measures.

Stipulating the structural model: Specifying the structural model comprises a mathematical procedure in which the paths recognized in the hypothesized model are described (Reisinger & Mavondo, 2007). Descriptions of the paths depends on whether or not a relationship has been stated.

Parameters required to be projected comprise covariances, directional effects and variances (Weston & Gore, 2006). One directional line signifies directional effects and hypothesizes a direct relationship between two variables. The effects could be signified between observed and latent variables and between many latent variables. Investigators would typically put the variance of the latent variable or the factor loadings of an observed variable to 1.0. Each endogenous variable in the model should be provided a residual error (E) term.

Evaluating the structural model validity: A good model fit in solitude is scarce to back an offered structural theory (Hair et. al., 2010). Individual parameter estimates should be studied. A theoretical model is believed to be effective to the degree that the parameter estimates are statistically important in the forecast direction.

Statistically important parameter estimates are bigger than zero in the positive direction and less than 0 in the negative direction (Hair et. al., 2010). Non-trivial estimates should be checked making use of the wholly standardized loading estimates (Hair et. al., 2010)

CHAPTER 4

ARTICLE 1: An Exploratory Examination of Environmentally Friendly Practices in the US Craft Brewing Industry

4.1. Abstract

In general, beer is perceived to be a sustainable product, comprising mainly water, malt, yeast, and hops, all of which are naturally occurring, renewable, and organic ingredients. However, the scale of the production of beer in the US has negative connotations from an environmental point of view, most notably with regard to the use and consumption of water, the production of solid and liquid waste, and the use of energy in the production and transportation of the product. This article reports on the integrated findings of an exploratory sequential mixed methods research design which aimed to identify the full scope of sustainable practices available to the US craft brewing industry and determine how many of these practices are actually being adopted by the brewery owners themselves. Specific areas which were consistently highlighted by the owners included energy efficiency, incentives to enhance involvement with the local community, paper and plastic recycling, the re-purposing of used items, re-use of spent grain, use of recycled materials and water conservation. Specific theoretical and practical implications are discussed, and suggestions for future research are provided.

4.2. Introduction

Over recent decades, a variety of social, political and economic pressures have emerged, and come to the fore, in the context of environmental issues, sustainability, and climate control, and companies and enterprises across the global business spectrum have been forced to take protection of the natural environment into consideration, when forming their strategic and operational plans. In this new environmentally-aware context, competitive advantage is derived not only from a superior product offering, greater profit margins, and a better service (Porter & Kramer, 2006), but from CSR – corporate social responsibility – and, within this, a demonstrated commitment to environmentally friendly and sustainable practices. Both individual clients and wider society will measure and evaluate a company or industry's commitment to, and engagement with, environmental protection efforts, expecting their practices to meet certain standards.

The brewing industry, and craft brewing specifically, is no exception. As a producer of a product that requires a water-intensive brewing process and the manufacture of packaging, in which to transport that product, craft breweries must find ways to make their practices and processes as sustainable as possible, to ensure they remain competitive. The popularity of beer has meant that it is now one of the most widely-consumed and appreciated beverages, globally, popular in countries with vastly different climates and cultures. The most recent figures, from the Brewers Association (2018), reveal that approximately 7,450 breweries were in operation for some, or all, of 2018, its highest peak since the 1880s. For a long time, artisanal-scale beer production was able to meet demand for the product, offering a range of different, high-quality beers. In the US, in 2018, craft breweries produced 25.6 million barrels, creating a $27.6 billion market and employing over 456,000 people. While total beer consumption is falling in the US,

craft brewers have managed to achieve double-digit growth over the last decade. For the last 12 years, craft breweries have surpassed their large-scale competitors, in terms of both growth and profitability (Kleban & Nickerson, 2012).

In terms of the sustainability of the brewing industry and production processes, in general, beer is perceived to be a sustainable product, being mainly constituted of water, malt, yeast, and hops, all of which are naturally occurring, renewable, and organic (Schaltegger, Viere & Zvezdov (2012). However, the scale of the production of beer in the US has negative connotations from an environmental point of view, most notably in regard to the use and consumption of water, the production of solid and liquid waste, and the use of energy in the production and transportation of the product. The process of brewing is (high quality) water and energy-intensive, which leaves a significant carbon footprint on the environment. The uses of water include heating and cooling, cleaning, packaging, sanitation. Nearby soil is also contaminated by the waste products (Fish, 2015), and a large volume of weak wort and residual beer is left over from the process (Fakoya & van der Poll, 2013).

Craft brewers in the US have long sought to improve the efficiency of beer production, though with the primary aim of improving the product, and increasing profit margins through reduced wastage. More recently, however, there has been a move towards adoption of more sustainable production techniques, aimed at reducing environmental impact (Fillaudeau, Blanpain-Avet & Daufin, 2006; Koroneos et al., 2005). Furthermore, some craft breweries are beginning to establish relationships and partnerships with non-profit organizations to address environmental issues and develop new, sustainable operational standards and guidelines for the wider industry (Ceres, 2015).

However, despite the wide interest in sustainable practices in business, globally, very limited academic research to date has focused on the issue of environmentally sustainable practices in the craft brewing industry in the United States. The motivation for this research is to fill this literature gap. Thus, the study aims to employ a mixed methods approach to critically analyze the environmental challenges faced in the craft brewing industry, in the US, particularly in regard to the brewing process itself, and to explore sustainable best practice in this context. In short, this study will seek to answer the primary research question: What are the current environmental sustainability practices utilized by the craft brewing industry?

4.3. Literature review

4.3.1. Beer production

Beer production is largely the same, no matter what type of beer is being made. The main stages of beer production, as shown in figure 4.1, are malting, milling, mashing, extraction (vorlauf, sparging), boiling, fermenting and ageing. The brewing stage begins with making mash, which is formed when a grist (milled from cereal grains, mostly barley in the US Craft Brewing Industry) is mixed with water, and heated to around 75 C, though the temperature will vary depending on the method. The water used may also be pre-treated, depending on the brewery. Wort—a liquid sugar extract—is then extracted from the grain in a wort filter or lauter-tun, when water is trickled through the mash in a process called sparging (Galitsky, Worrell & Ruth, 2003). Sparging methods include German/fly sparging, which involves adding water as the wort is drained, and English/batch sparking, which entirely drains the wort. The wort must then be boiled. Depending on the desired taste, the intensity, temperature, pressure and duration of this boiling process will vary, creating significantly different outcomes. This usually lasts one to one and a half hours. Hops may also be added, during or after the boiling process, depending on the

desired taste. Hop extracts can act as an alternative to reduce the duration of the boiling process. A substance called trub, which consists of proteins, fats, sediment and hops is then removed from the wort, in the whirlpool vessels, when the boiling is finished (Scheller, Michel& Funk, 2008).

Depending on the category of beer being brewed, the wort is cooled to a specific temperature—a lower temperature for lagers, and a higher temperature for ales. The cooling process can involve air or liquid cooling, which use air stripping columns or plate heat exchangers respectively.

Yeast is then added to the wort. The resulting liquid is fermented, producing CO2 and alcohol, as the sugars are metabolized by the yeast. When the fermentation process is complete, the beer is then chilled and stored. While in storage, the beer will settle. The length of the settling process depends on the type of beer being produced (a shorter time for ales or a longer time for lagers). Many breweries are also using mash filter presses that use less water, while creating a greater yield of wort without losing quality (Kunze, 2004, p.221). Carbonation will occur naturally on initial fermentation, but CO2 can be artificially added to conditioning tanks, or occur in a second fermentation. Lagers are generally filtered, before the conditioning stage, while ales are mostly cold-conditioned, (settled). The conditioning stage can last from a few weeks to several months. The temperature of the conditioning stage varies depending on the desired taste. The beer is finally conditioned and decanted into kegs, bottles, or cans, before being labeled and distributed.

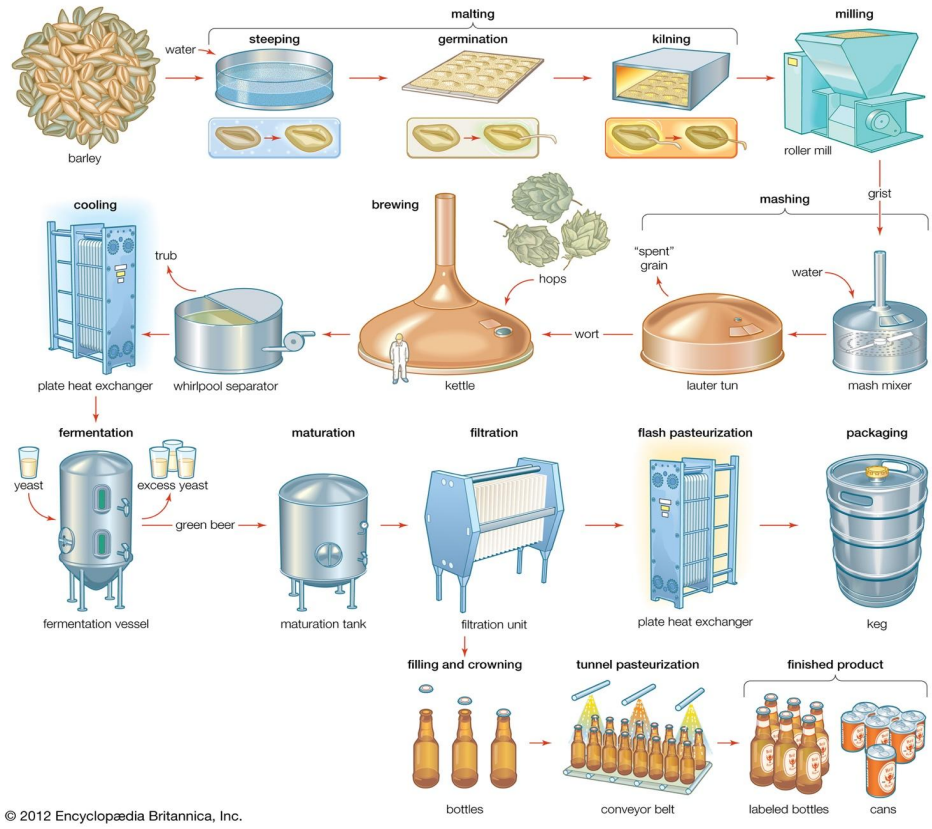


Figure 4.1. Beer making process

4.3.2. Sustainability and Brewing

4.3.2.1. Water

The production of beer consumes a significant amount of water, with water being the most important raw material used in brewing. An efficient brewery will use between 4 and 7 L of water to produce 1L of beer (Jaiyeola & Bwapwa, 2016).

Beer is 92% water, with the remaining 8% consisting of raw material extracts and ethanol (Simate et al. ,2011). Water is used in almost every step of the brewing process (van der Merwe & Friend, 2002). The chemical make-up of water affects both the taste and the efficiency of the brewing process and the water supplied is therefore essential when being converted into the

appropriate brewing liquor. Typically, the brewing industry sources water primarily from private wells, which is groundwater, and/or the municipal water supply. Only a small amount comes from surface water (Donoghue, Jackson, Koop, & Heuven, 2012).

Water usage also represents the main sustainability challenge faced by the brewing industry (Grunde, Li, & Mer 2014). In addition to the water used in the product itself, breweries require sanitary water for heating and cooling, and for cleaning various areas and equipment involved in processing. In addition, some water is lost, for instance with spent grains and through wort boiling – indeed, water is one of the most significant waste products of the brewing industry.

This wastewater is one of the main waste products of the brewing industry. Despite technological advancements and innovation aimed at improving efficiency, estimations are that between 4 and 7 L of waste effluent is produced per liter of beer. (Kanagachandran & Jayaratne, 2006). The total water wastage is dependent on the amount of water used in the production process; therefore, a more efficient process is more sustainable in terms of producing less waste. However, Van der Merwe and Friend (2002) carried out a water management investigation at a malted barley brewery and found that only 58% of the total water utilized was expended, during beer production, and the remaining 42% was used in relation to packaging.

Brewery processes produce liquids, such as residual beer and weak wort. Residual beer comes from various sources: pipes, diatomaceous filters, and process tanks, as well as beer found to be sub-standard at packaging, or leaked from broken bottles and returned. (Brewers of Europe, 2002). The pollution load of brewery effluent depends on the processes that take place within a brewery (Brito et al., 2007), but brewery wastewater is largely non-toxic, containing a high

content of organic matter which is biodegradable and typically does not contain notable levels of heavy metals (which can come from labels, inks, and herbicides). (Wen et al., 2010).

Breweries must comply with strict discharge regulations and dispose of, or treat, wastewater in the safest way, to protect the environment and human and animal life. Clearly, there is a cost associated with compliance (Simate et al., 2011). Ideally, the brewery should seek to re-use these liquids and not allow wastewater to flow into the effluent stream, thereby reducing both the amount of water wasted and the cost of safe disposal. There is, therefore, an incentive both to find ways of reducing the amount of water consumed during the brewing process -and thus the amount of wastewater produced- and to identify cost-effective means of safely treating wastewater to be recycled.

4.3.2.2. Waste

The brewing industry has other waste and by-products besides wastewater. In addition to liquid waste, the brewing process also produces solid waste, consisting of organic material residuals, such as spent hops and grains, sludge, surplus yeast, diatomaceous earth, slurry from filtration (Kieselguhr sludge), and trub, which is hop debris and material left in the whirlpool, as well as wasted packaging materials (Oloajire, 2012). The disposal and management of the high volume of waste and by-products produced in brewing, is a significant component of a brewery's operations, due to the associated costs and environmental considerations (Huige, 2006).

Of the total by-products created in brewery operations, spent grain can account for as much as 85%, and has been estimated at 16 kg or 36 lbs./barrel of wort (Fillaudeau et al., 2006). However, spent grain is not entirely a waste product, and can be used in agriculture as compost or to feed animals. Spent grain is also sometimes used as an additive in human food and although the nutritional value is lower than the equivalent weight in dried barley, spent grain is rich in

organic matter, containing fiber, carbohydrates, protein, amino acids, vitamins, minerals, and phenolic compounds. Furthermore, due to spent grain's moistness, it is easily digestible by livestock.

There are challenges associated with the disposal of spent grains. Wet spent grains spoil quickly, and must be re-purposed by the brewery rapidly, and storage of dry spent grain is expensive. Therefore, removal for use in the agricultural sector is not always the most convenient or cost-effective option. However, in addition to spent grains' agricultural applications, the grain can be also used in innovative ways to produce energy, such as being used as an alternative source of fuel to power a steam boiler, which can provide heat for use in the brewing and grain-drying process, or in a turbine to generate electricity. Alternatively, an agricultural anaerobic digester can be used to break down spent/leftover grain into methane, which can create a material energy loop that reduces costs, conserves energy, and minimizes waste.

After spent grain, the second largest by-product of brewing is spent yeast (Fillaudeau et al., 2006), which is typically produced at a rate of between 1.5 and 3% of the total volume of beer produced (Huige, 2006). Very little spent yeast can be re-used in production. Furthermore, spent yeast cannot be treated as liquid waste after being used in the brewing process as water effluents will be contaminated, and contribute to BOD (biochemical oxygen demand) in bodies of water (Doubla, 2007). However, like spent grain, surplus yeast can be used in agriculture to feed livestock. Indeed, surplus yeast is better suited than spent grain to feed livestock due to the high nutritional value; it is very high in fiber, protein, and B vitamins. Overall, the nutritional value is equivalent to approximately a fifth of the value of barley (Mathias, Alexandre, Cammarota, de Mello, & Sérvulo, 2015) Another waste product, trub, is a slurry made up of hop particles, entrained wort, and unstable colloidal proteins that have coagulated during the wort

boiling. The content of trub is approximately 15-20% dry matter (Fillaudeau et al., 2006), which constitutes between 0.2-0.4% of the wort volume and is separated out prior to cooling of the wort (Fillaudeau et al., 2006).

The traditional standard, dead-end filtration with filter aids (Kieselguhr), which has been in use for over 100 years (Hrycyk, 1997), uses a significant amount of diatomaceous earth (approximately 1-2 g/l of clarified beer), which has serious economic, environmental, and sanitary implications (Fischer, 1992). From a sustainability perspective, the diatomaceous earth used in the process must be recovered from open-pit mines and is a finite natural resource. Regeneration efforts are under way, but the industry is currently incapable of entirely reproducing new diatomaceous earth. Moreover, diatomaceous earth slurry, also known as Kieselguhr sludge, is produced in the filtration of beer, and represents a significant waste product, which is high in BOD and suspended solids that are difficult to recover, recycle, or dispose of, due to the polluting effect of the slurry. From a health perspective, diatomaceous earth slurry is classified as ‘hazardous waste’, both before and after filtration. All the previously mentioned filtration methods have economic implications, as consumption of diatomaceous earth and disposal of the slurry are the main cost contributors in the filtration process.

In addition to the main contributors to solid and liquid waste products, less significant solid wastes include wood, broken glass, cardboard, bottle caps, and label pulp from returned bottles, all of which is usually disposed of at sanitary landfill sites. Packaging waste is typically wet-strength paper treated with caustic solutions, rather than simple paper waste; therefore, wherever possible, efforts should be made to minimize packaging waste.

Closely associated, with the subject of distribution, is packaging. Making this part of the brewing process more sustainable is a major challenge for the industry, particularly for smaller

breweries. In this phase, the sustainability of the process typically depends on the packaging materials used, which are usually glass bottles, steel kegs, or aluminum cans. All of these are associated with both positive and negative implications for sustainability. Glass bottles are easy to fill and re-use but are heavy, adding to the cost of transport and are more energy-intensive to manufacture. Aluminum cans have an advantage over glass in that cans are light-weight, which reduces the energy used in transportation, while still being easy to recycle. However, like glass, the manufacture of aluminum to produce the cans consumes significant energy. Steel kegs can store greater volumes of beer and are the easiest type of packaging to re-use.

Overall, it is undeniable that packaging, specifically the manufacturing of packaging, and transportation combined, uses a significant amount of energy, which has an associated environmental impact. The extent of the impact depends greatly on the level of recycling and re-use that is practiced by the brewery.

4.3.2.3. Energy

Arguably, the most important consideration concerning sustainability in any industry −with brewing being no exception− is energy consumption (Galvin & Sunikka-Blank, 2018). Brewing is an energy-intensive process, requiring energy input at most stages, particularly for the boiling and cooling of wort, packaging of the beer, and transportation of the finished product (Lusk, 2016). Energy consumption has an environmental impact, and implications for climate change. Thus, various measures have been developed and implemented to improve the energy efficiency of the brewing process and promote the use of renewable energy systems (Michel & Vollhals, 2003).

The production and distribution of beer uses two main types of energy: natural gas (i.e., fossil fuels), which is used in brewing, packaging and transportation of the product, and heating

the buildings; and electricity, which is used to power the buildings and the brewing equipment (Brewers Association, 2013: 6).

In recent years, sustainability concerns and the cost of energy have incentivized the industry to reduce energy consumption, through the development of new processes and technical solutions (Unterstein, 1992). Examples in the wort-boiling phase include dynamic wort boiling using an internal boiler (Michel & Vollhals, 2003), and the 'Jetstar' internal boiler for a simmering boil, with submerged wort flow and a stripping phase that minimizes undesired volatiles. These methods also reduce thermal stress and increase wort quality (Michel & Vollhals, 2002).

Another driver of efficiency is increasing fuel prices, which are expected to continue to rise into the foreseeable future. In addition to the cost benefits of decreased fuel consumption, avoidance of fossil fuel energy sources will contribute to reducing C02 emissions from combustion and greenhouse gas emissions. Both types of emissions are associated with climate change risks. As previously discussed, thermal energy (i.e., heat) is primarily expended in the brewhouse; reducing consumption here requires a three-armed approach: better energy efficiency, implementation of energy recovery, and use of renewable energy sources (Scheller, Michel& Funk, 2008).

Aside from improvements in specific areas and processes, overall energy efficiency can be improved generally through the development and implementation of technology and innovation. Conservation of energy, in other words avoiding wasting energy, requires a shift in attitude and behavior, such as the practice of switching off lights and equipment when not in use, and making optimum use of transport and packaging. These are key issues in which breweries can save money and improve efficiency and sustainability.

In comparison to larger breweries, craft breweries, as small businesses, are typically less energy-efficient (Sturn, Hugenschmidt, Joyce, Hofacker & Roskilly, 2013), and face the greatest challenges regarding the effort and cost of sustainable practices. The factors driving craft breweries to lower energy-efficiency are numerous, including economies of scale, load factors, and access to innovation, technology, and up-to-date production processes. While cost may be a barrier to energy-efficient solutions, small breweries can still focus on energy conservation efforts to improve overall efficiency and sustainability.

4.3.3. Current literature on sustainability in the brewing industry

While literature on sustainability practices in the craft brewing industry, in the United States, is relatively sparse, and the issue under-explored, a few recent studies have been conducted. For instance, Hoalst-Pullen, Patterson, Mattord and Vest (2014) analyzed 21 regional craft breweries across the US, to assess the geographical variation in the sustainability of the craft brewing industry. The authors found that, overall, there is an emerging culture in which sustainability is promoted, and sustainable practices have begun to be adopted across multiple levels of the production of craft beer, such as reducing energy and water usage and increasing efficiency. Similarly, a study by Barry Ness (2018) explored the sustainability priorities and practices of small and medium-size craft beer enterprises. An online survey was distributed to craft breweries with a sustainability profile, which was followed up with in-depth analysis of 70 shortlisted craft beer company websites. It was found that, in general, craft brewers interpret the concept of sustainability broadly, to encompass various socioeconomic and environmental dimensions. However, the parameters most commonly highlighted by brewers were energy usage and climate change, water efficiency and conservation, re-use of spent grain, and various forms

of community involvement. These and other studies highlight the trends and practices in sustainability that have been adopted at craft breweries across the United States.

Another study by Simate et al. (2011) carried out a review and assessment of the current status of, and key challenges faced in regard to, the wastewater treatment processes employed in breweries, and explored potential re-use applications from an engineering point of view. They found that, when appropriately treated and properly recycled, wastewater can provide an alternative water source with the capacity to cost-effectively reduce the demand for fresh water.

Another study, by Patterson, Hoalst-Pullen and Pierson (2016), explored the social, environmental, and economic sustainability practices and attitudes demonstrated at urban craft breweries, brewpubs, microbreweries, and regional craft breweries, focusing on the differences and similarities between their attitudes and actions. The study findings indicated that there are a plethora of opportunities for breweries, of all kinds and sizes, to engage in sustainable practices, which can be implemented at various levels and stages of the production process. The comparison of the different types of breweries identified little difference in their responses describing their experiences of sustainability actions and attitudes. The major trend that emerged was that brewpubs scored lowest, compared to microbreweries or regional craft breweries. Regional craft breweries scored highest as these types of breweries have a greater production volume.

In another study of sustainability, in the craft beer movement, Jones (2018) confirms that innovative sustainable practices are being employed by some of the most popular US craft brewers, even if these are not immediately visible within the breweries or openly showcased or indicated on product labels. This, in turn, is laying the foundations for a wider transformation across the whole industry, providing hope that it could evolve into a leading force for more

environmentally friendly business strategies and operations. However, Jones' study was limited in that it failed to include the great majority of breweries in the US, meaning it was not able to capture and measure the sustainability efforts of smaller craft breweries. The sample was created based on mainstream media coverage, and thus consisted of only those breweries that were sufficiently large to be recognizable by most consumers nationally.

Outside of the US, a study by Sturm, Hugenschmidt, Joyce, Hofacker & Roskilly (2013) provides an overview of the production process followed in a typical medium-sized brewery in the UK, with the analysis showing that even those efficiency measures that are basic and easy to implement have thus far been neglected. The study identified key measures that can be implemented to reduce energy and water demand. Specifically, it is suggested that improvements to insulation and the implementation of basic heat recovery measures have the potential to reduce energy demand by up to 20% and would pay back the required investment in just 1.3 years.

Craft brewing is a dynamic industry that has emerged and evolved quickly across many parts of the US, particularly in the last 20 years. Craft brewing has also been praised over traditional, large-scale brewing, for its focus on sustainability (Duarte Alonso, Bressan, Sakellarios, 2017), and many such brewers have implemented measures and innovative practices to increase the sustainability of their operations. However, this positive attention has largely been seen in the non-academic arena, and little scholarly work has addressed sustainability in the craft brewing sector. Furthermore, of that research that does exist, the majority focuses on improvements in the efficiency of the brewing process, or on consumer preferences for sustainably-produced products (Carley, Yahng, 2018; Namkung, & Jang, 2017). All of the studies reviewed above are limited in some way; either they rely on a sample of just a few brewery operations, or they focus only on larger, established craft breweries that are marketed to

the public as ‘sustainable breweries’ engaged in environmental practices, or they rely on data collected from non-academic sources. Furthermore, no single study reviewed above studied the situation of the craft brewing industry as a whole, across all regions of the US; rather, they focused on either a specific geographic area, or one activity or component of sustainability, such as energy, or wastewater. Thus, there remains a significant gap in the literature that prevents a comprehensive understanding and complex interpretation of sustainability in this sector.

The present study aims to fill this gap by reviewing and providing an audit of sustainability practices proposed and implemented in the US craft brewing industry. Due to the lack of such research in the existing body of literature, the study is primarily exploratory in nature, and utilizes a mixed methods design. The empirical phase of the study draws on general, non-academic literature and sources of data, such as the Craft Brewery Association website, supported by subsequent in-depth interviews with the owners of craft breweries engaged with sustainability. This is followed by a quantitative assessment.

4.4. Methods

4.4.1. Mixed Methods Approach

Mixed methods research is often referred to as the “third methodological orientation” (Tashakkori & Teddlie, 2010,5). It has no clear, agreed definition, but according to Creswell and Clark (2017), its fundamental characteristic is the combination of both qualitative and quantitative data and methods, within a single study, to provide a more comprehensive response to a research question. The underlying premise and purpose, and indeed the greatest advantage, of a mixed methods approach to research is to mitigate the respective weaknesses and benefit from the combined strengths of both qualitative and quantitative approaches, to better address complex research problems and phenomena (Creswell & Clark, 2017). More specifically,

understanding of the phenomena under study is enhanced through the triangulation of qualitative results with quantitative ones, which increases the validity of the inferences and conclusions drawn, in comparison to a study that addresses a research question through a binary – qualitative *or* quantitative – lens.

The present study employs an exploratory sequential mixed methods design, where first qualitative, then quantitative methods, were utilized to explore and understand, in depth, the various sustainable and environmentally friendly practices that are followed in breweries in the United States. To achieve the research aims, an initial qualitative research stage was deemed appropriate, in light of the inconclusive findings presented in the literature on environmental practices in the brewing industry. The initial exploratory qualitative stage aimed to develop a number of hypotheses, which were then tested in the later, quantitative phase of the research.

When designing a mixed methods study, the two most important factors to consider are the priority and implementation of data collection (Morse, 1991; Morgan, 1998). In terms of the priority of data collection, in a mixed method design the research can either emphasize the qualitative or quantitative data or give equal priority to both types. In the present study, the qualitative data and phase of the study was given priority as, due to logistical limitations in the data collection process, it was necessary to develop an understanding of the qualitative data before moving on to the quantitative phase. Thus, in terms of the implementation of data collection, which refers to the sequence in which data is collected, for this study, the qualitative data was collected before the quantitative data – this is known as a sequential design.

4.4.2. Qualitative phase

In the initial, qualitative stage of the research, the main data collection technique used was semi-structured, in-depth interviews consisting of open-ended questions on a variety of

issues related to the environmentally friendly and sustainable practices employed in the craft brewing industry. The target sample was owners of craft breweries across all seven regions of the United States (the Northwest, West, Southwest, Midwest, Southeast, Mid-Atlantic, and Northeast), representing both small and large breweries, female and male genders. The purposive sampling method and the researcher's own contacts were used to build the sample.

A total of 31 interviews were conducted. The respondents who agreed to participate in the study were asked for a date and time that would be convenient for them to be interviewed. On some occasions, the researcher travelled to breweries to conduct interviews on-site; otherwise, the interviews were conducted via telephone. All respondents were given a guarantee of data confidentiality and anonymity, which, aside from being a requirement of ethical research, enhances trust and reduces the likelihood of interviewees attempting to give answers that they think the interviewer wants to hear, to be good subjects.

The interviews lasted for approximately 40 minutes, and respondents were asked about demographic characteristics, including the age of the respondent and various facts about the brewery itself (e.g. production volume, production system, tank size), as well as topics relating to the key questions explored in the study. The data collection process ceased once theoretical saturation was deemed to have been reached; in other words, when it was judged that no new insights into the phenomena being studied could be gained.

All interviews were audio-recorded – with the consent of the respondents – and subsequently transcribed verbatim, to assist in data analysis using NVivo 11 software. The transcripts were coded with numbers for each respondent (e.g. Respondent 1 was labelled R1), to maintain anonymity. Two separate stages of analysis, open-coding, followed by latent content analysis, were used, based on the content analysis technique of Miles, Huberman and Saldaña

(2014). First, the keywords and phrases, mentioned by the interviewees, were identified through open-coding, then the researcher summarized the main ideas of each paragraph, using either direct quotes or a summary of the primary message. Through continuous coding and labelling of the transcript data, the identified codes were compared, combined, reviewed, and finalized, so that themes could be identified. In the second stage, all participant responses were reviewed and compiled by theme.

To fulfil the aims of the research, and answer the research questions, the researcher followed the inductive thematic analysis steps recommended by Braun and Clarke (2019). The inductive approach was selected based on *a priori* themes that were identified before commencing the study. Drawing on Braun and Clarke's (2019) description, the following six steps were used to guide the study: 1) familiarization; 2) generation of initial codes; 3) searching for themes; 4) reviewing themes; 5) defining themes; 6) scholarly report.

4.4.3. Quantitative phase

In terms of the quantitative data collection and analysis, data collected and analyzed in the initial qualitative phase was used to develop the survey instrument used in the second, quantitative phase of the study. The interview responses thus served as a foundation for the quantitative phase of the research process, in the development of an online survey, which was distributed via the Brewers Association to 7,346 craft breweries, across the seven regions of the United States. The survey comprised a number of distinct sections and addressed a variety of themes, including respondent demographics, business operational information, business challenges, environmentally friendly activities and the motivations driving these. However, subsequent analysis focused on respondent demographics and environmentally friendly practices only, as the key themes explored in this study.

The variables were measured using a five-point Likert-type scale, with responses ranging from 1) Strongly disagree to 5) Strongly agree. To minimize the potential for ambiguity, a pilot study was undertaken wherein the survey was administered to members of a local home-brewing club and five founders of craft breweries. Feedback was requested on the relevance and clarity of the questions, the scaling technique used, construct validity, and the time required to complete the survey. Based on the feedback received, a number of modifications and refinements to the instrument were made, including grammatical changes. The modified questionnaire was shared with the Brewers Association for additional feedback, and a number of further changes were made (again, primarily grammatical).

For the purpose of this study, sample respondents were defined as founders or business partners in a craft brewing venture. Thus, the final questionnaire was distributed to a sample of craft brewers in the United States, via the Brewers Association's 'Brew Forum Blog', which is accessed by commercially-oriented craft brewers nationally. Along with the questionnaire, potential respondents were given a brief background to the study, its nature and aims, and asked to click on a link to the survey if they wished to participate. This link directed the respondents to an informed consent page, with the option to proceed, or not, to the survey. All responses were collected online using Qualtrics software. The survey was left open for 10 weeks, from February 2019 to April 2019. Survey reminders were posted in the forum on the Brewers Association website at weeks four and seven.

4.5. Results

4.5.1. Qualitative Results

Most of the respondents were in the craft brewing industry for more than five years. Two had been in the industry for less than one year. Two respondents suggested

that they were in the industry for more than 25 years. Considering all of the 31 interviewees, their average duration in the craft brewing business was eight years.

The average production size, and the annual volume of sales, of the breweries varied. The majority of the respondents had 5 to 15-barrel production system brewhouses and their average annual sales were 4000 barrels; 200 barrels was the lowest production, 40,000 barrels the highest. The first three most popular beers, that the respondents were producing and selling, were (1) American Wheat Ales, (2) Indian Pale Ales, and (3) Double Indian Pale Ales. Craft brewing was the second career choice for about 3/4 of the respondents. Their first career choices varied and included chemical engineering, public administration, supply chain professionals, operational and strategy consulting. One interviewee was an Air Force veteran.

Most of the interviewees had bachelor's degrees, three had master's and two of them had PhDs. Only three had a professional brewing certificate and/or diploma in brewing science.

The set of questions sought to determine the sustainable practices in which brewers currently engage. A range of topics emerged, with responses addressing what brewers do with waste products, such as spent grain and yeast; how general waste is disposed of or recycled; water usage; the technology employed, and the packaging and cleaning products that were used. Also discussed—community responsibility, social initiatives, and social actions including other relevant sustainable behaviors, practices, and policies.

Several brewers brought up the topic of spent grain, as one of the largest waste outputs of the brewing industry, with some stating that the waste is given to local farmers who use it to feed livestock.

> *"… of course, our biggest output of waste is spent grain. We go through about 4,000 lbs. spent grain every day and all of that grain is recycled through to the lifestyle and agricultural community through a series of partnerships with local farmers where they pick up the grain and use it to feed their cattle and other livestock."*
> *"We have a local farmer who is one of our mug club members at the brew pub, and he uses that spent grain to feed his livestock."*

One such brewer indicated that when the spent grain policy was considered the practice did not meet a minimum level of sustainability, since little effort was required, which was believed to be an insufficient level of commitment by the brewer.

> *"so, to be honest, the only thing that we do right now is, all of our spent grain, we take to a local farm and they feed their livestock, but other than that we are not doing much. It's something that we definitely want to think about in the years to come."*

Continuing on the topic of spent grain, some brewers indicated alternative routes of disposal/use. In addition to livestock feed, some brewers mentioned that spent grain was given to restaurant kitchens to create plant-based dishes, or that the meat reared on spent grain donated by the brewery was used in the brewer's on-site restaurant. The brewer explained that the use of meat in the restaurant was done in order to avoid any wastage of grain, wherever possible.

> *"…we are also low waste so the spent grain that we have from the brewery, there are a number of farmers, a chicken farmer, a cow farmer, and a pig farmer, and as much as possible, we don't throw the grain out. We also have projects that we work on in the kitchen as far as how to use our spent grain. In our restaurant, we are making a vegan spent grain burger from our spent grain, and over the years, we have done lamb spent grain meat balls, and the most recent thing we are working on is spent grain falafel. So, we don't throw anything out that we don't have to throw out."*
> *"…in addition to that, all our spent grain from our brewery goes to a rancher who feed it to pigs and cattle, and then periodically, throughout the year, we would buy some meat; pork or beef from that rancher and serve it in the restaurant in the brew pub."*

Another waste product of brewing is spent yeast. One brewer explained that they avoided wasting yeast by adding it to the spent grain, which prevents fermentation, and produces better livestock feed.

> *"…yeast is another opportunity…you can put it in your spent grain, it's best to kill the yeast cells and then put them in the spent grains, so they don't cause fermentation if you are feeding animals like cows or horses, but the big opportunity for yeast is down at the pig farms. Pigs are melanistic animals. They only have one stomach and they can pass gas so that's good feed going into hogs."*

In terms of general waste, one brewer described how sending waste to a landfill was avoided by stretch-wrapping waste and green banding to have the waste collected either for free or even at a small profit. This is not only more sustainable from an environmental perspective, but also from a business perspective.

> *"…it's one thing to keep the material out of the landfill and then to work on generating revenue so, right now, I collect stretch wrap and I basically give it away. They haul it away for me. It doesn't cost me anything. I'm not paying to put it in the landfill, and I am not paying somebody to haul it to a recycler, but I am not getting any revenue for it. And the same thing with green banding, you need to chop it. Right now, we collect the green bands up, the recycler picks them up for no charge, and we don't put them in the landfill but, if we chop them, you know, we can get upward of 25 – 30 cents a pound depending on the market. So, you know, it's basically PET plastic, and that's the key thing too is separating those strings."*

The brewing industry uses a huge volume of water, therefore, most of the brewers considered sustainable practices related to water usage and treatment of paramount importance. One brewer said that their brewery uses a water recovery method and equipment, which resulted in significant cost savings related to water and sewage.

> *"…I am going after water and effluent. The line that is set up to recover the container rinse water, which is the bottle or the can rinse, and then use that to rinse off the package after its been finished and you recover the rinse water from the bottle rinser, and that rinses the inside of the bottle, and you use that to wash off the outside of the bottle after it fobbed and crowned and is on the discharge of the crowner. Then the same thing with the can; you rinse the inside of the can. You recover that water and then you spray it over the can after its filled and seamed to wash the beer off it, otherwise that container is sticky and so brewers are using clean potable water in most cases for both applications: The internal rinse and the exterior rinse. I have actually had some of the equipment on site already and our maintenance team is going to be putting that together. So, here it's going to save us probably 10,000 dollars a year on water and sewer cost."*

Recognizing water as an area of high wastage, a number of brewers described efforts to recycle and conserve water. Several brewers described using similar water conservation systems based on the principles of thermodynamics which re-uses already heated water, and not only reduces water consumption but also leads to a significant reduction in energy usage.

> *"…we use the principles of thermodynamics to rub BTUs (British Thermal Units) from warmer water if we need to warm our beer during the boiling process and vice versa if we attempt to cool the coolant products we can use the offsetting cool temperatures to transfer those things to use as well so we're saving as much energy as we can in our boiler application. We have a gas fired steam boiler so of course, we are using the condensate return system so that we are not constantly burning through water like some industrial boilers. We actually heat the water up to stay hot, introduce it to our brew kettle, and then that water turns back into condensate. It's pushed back into the reservoir of the boiler to be reheated again. Obviously, that's efficient for a couple of reasons. You're not just blowing water down the drain constantly in the form of condensate but also the condensate water that you are bringing back in to the boiler is already at a relatively high temperature, much higher than city water. You reserve a tremendous amount of energy there. Just only having to heat the water back up a few degrees to get it back into its steamed state."*
>
> *"…Well, I try to recapture all the water that I can especially when we are cooling. That's our greatest 'I hate to use the word waste' but, that's where we waste the most amount of water, I think."*
>
> *"… the water that goes through our heat exchanger gets fed back into our hot liquor tank so we're reclaiming water that way."*
>
> *"…and then we of course, as most brewers, we reclaim the water from heat exchange, back into hot water for brewing or cleaning.*

One brewer related simply that the brewery makes every effort to reduce water consumption overall by assigning a high priority to water reduction in everyday operations. Pointing out that the brewery has already been able to make a significant reduction in the water use to beer production ratio.

> *"…I would say water reduction is a priority for myself and the brewery, So, our average, breweries earn about a 5:1 ratio as far as water use to beer produced. So, through my efforts and using a bare minimal amount of water to clean and everything, I am happy to say I am able to maintain a 3:1 ratio. So narrow that down comparatively to other places."*

In terms of recyclable materials, several sustainable practices were named regarding plastic, paper, cardboard, aluminum, and glass. Some brewers mentioned that all aluminum and glass is recycled as part of the production process.

> *"…we recycle all of our aluminum and glass and that has been in our production process."*

In terms of plastic usage, one brewer explained that plastic is avoided wherever possible, both in the products and in operations and events. When unavoidable, only natural compostable plastic is used. Another brewer explained that they had previously committed to using only recyclable plastic and are now seeking to eliminate as many paper and plastic products as possible through changing certain procedures, such as no longer providing napkins with drinks.

> *"…So, on earth day, we are launching a new initiative. We are not using straws anymore, no more straws. Before we were recyclable, but now we are using recycled material that can also be recycled again. So, we have changed our carry out containers. We are not going to be putting a cocktail napkin down for a drink. We will be reusing coasters and we are trying to cut down on as much waste as possible."*
>
> *"…we barely ever use any sort of plastic, not even for our events or anything like that, but when we do, we use only the composable natural plastic cups."*

Two other brewers described recycling practices, whereby an attempt is made to recycle as much packaging material as possible.

> *"…we are recycling all of our aluminum, all of our paper, all of our cardboard, all or our stretch wrap, green band, white and yellow band, keg caps, and keg collars--so those are the physical parts of recycling we are doing."*
>
> *"…we work with a local group here in town to recycle cardboard, aluminum, and any kind of our packaging type materials. There seems to be a lot of it here. We are trying to find avenues to… like the shrink wrap stuff or some of our bags that our grains come in--we are trying to find ways to use that."*

Continuing on the topic of packaging, one brewer explained that packaging of the product had changed from glass to cans, based on the fact that cans are more recyclable, and the final product requires less additional packaging.

> *"…we kind of transitioned. All of our main packaging is now in cans which are more recyclable and require less cardboard and paper. We were doing bottles before which bottles require us to seal up the glass but then you have the six-pack carrier and then you have the case box for every case of package beer. Cans are simply the cans and then a tray that holds them so, it's fewer packaging materials."*

Similarly, another brewer explained that in an attempt to avoid unnecessary packaging altogether, their product was distributed only in kegs which avoids the need for cans or bottles entirely. The brewer also raised the possibility of re-usable containers that customers can return to the brewery and re-fill.

> *"…We don't have any packaging really going on, we only do kegs, so there is no waste as far as generating cans or bottles, that may or may not get recycled. We use reusable stainless-steel kegs and we go with growlers. So, there are cans of beers. We don't do that, they are very popular, but we don't do that. We do the growlers and the crowlers, because the idea behind that is that people can reuse them and bring them back into the brewery and fill them with more beer as opposed to throwing them out."*

Three brewers described using composting systems to dispose of food and biodegradable waste, whether through maintaining a compost bin, donating to one, or by using compostable materials.

> *"…and then we work with the local city of (the city name where the brewery is located) recycling program to handle all of our cardboard recycling and then in our taproom and in our kitchen, we use the food waste and scraps to donate to local compost bin."*
>
> *"We also compost all of our food scraps from the kitchen and our food waste, so we have very little waste in that regard."*

One brewer described a novel and unique self-engineered system to avoid transferring beer into different tanks unnecessarily, which reduces the use of chemicals, water, and energy, creating a more efficient and sustainable process.

> *"…well, my degree is in environmental engineering so, that's really kind of the focus of the brewery and I use a system that nobody else uses, I designed this system myself. It's a system that doesn't require me to transfer beer to a whole bunch of tanks so there is less cleaning, there is less lost to transfer, there is less chemical use, there is less energy use because I use a hybrid of a direct resistance electric heating and high efficiency tanks with the water heater."*

The choice and use of cleaning products was another topic that emerged from the interviews, with two brewers stating that they try to use non-toxic, natural cleaning chemicals wherever possible.

> *"I use only cleaning chemicals that are most natural to the point where they work. One thing about brewing is that cleaning is very, very necessary, so it's very important to have things that protect. Otherwise the beer won't taste good. A lot of breweries use a very heavy toxic cleaner, instead of that I use a much less harsh oxygen based cleaner to clean, and then I use a combination of hydrogen peroxide and peracetic acids that turns into water for sanitizer."*
>
> *"You know there are certain chemicals that we have to use for cleaning. But we try to use cleaning products and things that aren't as bad for the environment."*

Also, in regard to energy-saving, one brewer explained that in seeking to reduce energy consumption only LED (Light Emitting Diodes) lightbulbs are used throughout the brewery. Another brewer expressed his plan to install solar panels.

> *"…and then for the rest of the brewery, we reduce energy with all of our lights; all throughout the brewery are LEDs and then when the brewery is completely lit up, it takes less energy than four-100-watt bulbs."*
>
> *"…I am also an electrical contractor with a solar installers certification, so I hope to install a large array on a south facing roof."*

Another brewer explained that using an HVAC (Heating Ventilation Air Conditioning) system and energy recovery unit to heat the building reduces energy consumption.

> *"…when we built this, we had to put an HVAC system in place and we installed its current energy recovery unit, so it essentially pre heats incoming make up air. So, with the warm air that's exiting the building, that preheats the incoming freshly make up air for the HVAC system."*

Similarly, a brewer reported using a wood-fired oven as the primary source of heat for cooking, so that wood, as a sustainable resource, can be used instead of fossil fuels, explaining that wood is also highly efficient and produces less emissions.

> *"…then our primary cooking source is a wood fired oven, so it's actually using a sustainable resource like wood, instead of burning a lot of fossil fuels and it burns super-hot, so it's very sufficient and pretty much zero exhaust."*

A brewer from a certified organic brewery explained that they ensure all ingredients purchased for the brewery are certified organic.

> *"…we are a certified all organic brewery so every ingredient that we purchase is also certified organic."*

Aside from the products used and produced in the actual production of beer, a number of brewers mentioned sustainability practices related to physical infrastructure, including repurposing buildings, and re-using or re-purposing other materials for furniture, such as building bars and tables from reclaimed wood and pallets, and using old barrels as décor.

> *"…The building that we are housed in is repurposed. It used to be the Y… V… Electrical Association--the local electric utility company. So, we source wooden cable spools from their waste and then we actually built our bar out of those wooden cable spools. We also built some tables outside our brew pub and the big community table that we have here is also made locally from local beetle kel pine and built by a local wood worker for tables and benches. We have a bunch of used whiskey and wine barrels that we have incorporated in our brewery for décor. We also have unfinished tree stumps that we use as stools for some outside seating and then we incorporated old used bicycle parts into our décor, like wheels, and spokes and spears and pedals. Then that also encourages people to use bicycles for transportation to come to the brewery."*
>
> *"…for instance, when we get pallets of grain, I usually end up using the pallets for something else, whether its new furniture or shelving or I give them away just to ensure they don't go in the garbage."*
>
> *"…much of the stuff that the brewery is made out of has been repurposed, the bar is made of old school lockers, the tables out front are repurposed lab tables from a technical college. Some of the stuff that we built uses the packaging materials that the brewing equipment came in. That's the kind of stuff we do to reduce waste."*

In terms of social and community practices, a variety of sustainable behaviors were discussed, including sourcing materials and produce locally wherever possible.

> *"…And then we source a lot of local and organic material and produce from local farmers, and there is some local cheese from cheese makers in Colorado."*

In addition, a brewer described some of the efforts made to contribute to the local community, through charity donations and non-profit community initiatives.

> *"…from the very first week that we were open, we hosted what is called Token Tuesdays, and for every beer purchased, the guest receives a token and then each month, we highlight four local nonprofit beneficiaries, and guests can pick whichever non-profit they choose and place a token in a box for each charity. We then donate a dollar to each of those non-profits and whichever one garners the most tokens at the end of the month, gets to stay on as King of the Mountain Tap for the following month. We've only been open a year and a half and we've donated, I think about $13,000 by now."*

Another brewer explained that employees are rewarded for volunteering in the community with financial incentives.

> *"…we reimburse employees if they volunteer in the community. So, for volunteer hours, we will reimburse them up to $100 per month for voluntary community time. Every single employee is eligible if they volunteer with a legitimate organization. Employees can do trial work or river clean up, that sort of thing. Then we will reimburse them up to $100 a month."*

Bike racks were also named as a sustainable initiative. One brewery had installed a large number of bike racks to encourage people to travel to the brewery by bike rather than other, less sustainable forms of transportation.

> *"…we have bike racks for up to 90 bikes, so we encourage people to ride their bike to our location."*

On the less positive side, some brewers described difficulties implementing and incorporating sustainable practices into the business operations. The brewers identified particular materials and products in which sustainable methods of disposal had not yet been found.

> *"…all our malt bags, the super-size sacks, and we haven't found an outlet for the 50 and 55 lbs. or 25 kgs bags yet. We haven't found an outlet for those yet because they are multi-material bags, some of them have plastic*

liners, some of them have a combination of plastic and like fiber, so they're a challenge and then obviously cardboard. We recycle hot boxes, but the real hot topic is recycling of hop bags."

Other brewers described limitations of space and budget, as a hinderance at attempts to recycle. Furthermore, these limitations would be a common problem faced by smaller craft breweries, who would lack the capacity in time and space to implement large-scale recycling processes. Although, on a more positive note, the possibility of a recycling cooperative would overcome limitations of space and budget

"…We were not able to implement the sustainability practices that I would like to use, mostly due to space limitations and our budgetary constraints."

"…I haven't been able to find a way to recycle glass. Glass recyclers want to put big 20, 30-yard dumpsters on your site, and collect a whole dumpster load of glass. We are right in the city of Detroit and we don't have that kind of footprint to do that, so with the outset or onset of more smaller craft breweries, a lot of them here are struggling to recycle because everything is so big in the recycle world, and they want full truck load pick-ups--they want all these things. So, in developing almost co-op recycling opportunities for brewers--I would see that as an opportunity for a lot of the really smaller ones to get together. We are looking at ways for the spent grain companies to pick up spent grains. There are a lot of breweries that are putting their spent grains in the landfill because they are not big enough and they are too far from farms to make it advantageous for farmers to pick it up. You get a decent size brewery, something over 20,000 barrels a year, they can generally get a farmer to come pick it up and they give it away at no charge, but if you install a spent grain tank and you can fill a truck load, which is what we have, of grain, then you can generate revenue from it."

Some brewers reported finding difficulty in incorporating sustainable practices and stated that in some cases sustainability is unrealistic and inefficient from a cost perspective, but these brewers also try to make small changes wherever possible, as conscientiously some effort is better than none.

"…But, just given the size and location, there aren't a lot of true ways to recycle. Obviously, you know, just for cost efficiency, I reduce as much as I can. I try not to use ingredients that I don't need to. Most of our cleaners go through a couple different cycles, from vessel to vessel before we dump them. It's a lot of little effort. I don't know how much it actually does but it makes me feel better."

"…like, we can't all be like Belgium where we recapture every drop of water and reuse it, like that's just not realistic, but yeah, to the extent that I can, I try to implement sustainable practices."

This links-in to a point made by a number of brewers relating to a general philosophy of sustainability that should be ingrained and enforced within the company. For example, that everyone should be consciously recycling at every opportunity

"…Everybody should be recycling. It is basically the philosophy of, "if you make a mess, you clean it up," instead of throwing the recycle material in the dumpster, you throw it in a recycle container. So, it shouldn't be an extra job, it should be everyone's job to do that."

"…we have funding for, and we are moving forward with plans to improve our structure. So, there is a lot of just going through some more steps that we have on the agenda, but virtually everything that goes into your landfill dumpster, you should be looking to recycle."

4.5.2. Quantitative results

4.5.2.1. Sample Characteristics

A total of 237 valid responses were received, over the ten-week period the survey remained open, representing a response rate of approximately 3% of all breweries registered with the Brewers Association.

Table 4.1 shows that, of the 237 respondents who self-identified as owner operators, 81% were male, 86% were Caucasian and were equally dispersed throughout the United States. Some 37% of respondents were between the ages of 37 - 46. The median (24%) income level was recorded at over $150,000 per annum (p.a.), with approximately 15% of respondents earning less than $54,000 p.a. in the year of the study. In terms of educational background, a majority of respondents (just over 52%) declared that they had earned a bachelor's degree and 33% of respondents declared that they held a masters (25%) or doctoral degree (8%). Just under 40% of the respondents indicated that they had been in business for 8 - 11 years, while 32% indicated that they had been in business for 12 - 15 years. Based on tank size, approximately 29% of the respondents declared that they sold 1001 - 5000 barrels (1 barrel=31 gallons) of beer in the year

of the study. A majority (62%) of the brewers stated that they are using a 15-barrel (32%) and 30 or more barrel (31%) system in their breweries. Only 5% of the brewers stated that they are using 1-barrel system.

4.5.2.2. Descriptive Analysis

Table 4.2 summarizes the mean, standard deviation, and skewness for each of the "Environmental Sustainability Practices" variables. The results point to, on average, a high level of agreement for most variables with a range spanning a low m = 2.23 for variable 39 (Harvesting rainwater), to a high m = 4.81 for variable 2 (Sending spent grain materials to farmers to feed their cattle) on the five-point agreement scale.

Table 4.1 Demographic profile of the participants

Demographics	N	%	Demographics	N	%
Age			**Education**		
27-36	74	31.3	Some high school	4	1.6
37–46	88	37.1	Some college	16	6.7
47–56	40	16.8	Associate degree	13	5.4
57-66	25	10.6	Bachelor's degree	124	52.3
67 and older	10	4.2	Master's degree	61	25.7
Gender			Doctoral degree	19	8.0
Male	193	81.4	**Years in business**		
Female	32	13.5	Less than 3 years	34	14.3
Prefer not to answer	12	5.0	4–7 years	19	8.0
Ethnicity			8–11 years	93	39.2
Caucasian	204	86.0	12–15 years	77	32.4
I prefer not to answer	22	9.28	More than 15 years	14	5.9
Asian/Pacific Islander	6	2.5	**Current annual volume of sales**		
Latino/Latina/Hispanic	5	2.1	(based on tank size)		
Income			1-500 bbl.	48	20.2
Under $25,000	8	3.3	501-1000 bbl.	35	14.7
$25,000–$39,999	10	4.2	1001-5000 bbl.	69	29.1
$40,000–$54,999	18	7.5	5001-10000 bbl.	50	21.0
$55,000–$75,999	36	15.1	10000 or more bbl.	35	14.7
$76,000–$99,999	55	23.2	**Size of production system**		

$100,000–$150,000	51	21.5	(based on tank size)		
Over $150,000	59	24.8	1 bbl.	12	5.0
			5 bbl.	56	23.6
			7 bbl.	20	8.4
			15 bbl.	76	32.0
			30 or more bbl.	73	30.8

4.5.2.3. Performance of the research instrument

While the overriding goal of this research was to identify the key sustainability practices, it was also deemed essential to test the psychometric properties of the research instrument for reliability. Reliability analyses were conducted on the scale and performed well ($\alpha = 0.89$, n =237). These reliability scores clearly exceed the usual recommendation of $\alpha = 0.70$ for establishing internal consistency of a scale.

The Environmental Sustainability Practices scale was then exposed to an exploratory factor analysis, using the principal component extraction technique. This was designed to attest to the scales' ability to discriminate between the variables explaining the underlying factor structure, by definition, water, waste, and energy practices among this respondent group. The analysis used the VARIMAX factor rotation procedure in SPSS 22. A component matrix was initially generated to ensure that the analyzed variables had reasonable correlations (greater than or equal to 0.5) with other variables. The result of the corresponding KMO of "sampling adequacy" was 0.410 and Bartlett's test for sphericity was 47.694. The results of these tests showed that the data was inadequate to generate a factor analysis.

Table 4.2 Environmental Sustainability Practices

	Variables	Mean	Std.	Skewness
v1—	Recirculating cooling water and use it for next batch of beers.	4.16	1.307	-0.624
v2—	Sending spent grain materials to farmers to feed their cattle	4.81	0.366	1.141
v3—	Recycling leftover grains.	3.71	1.572	-0.583
v4—	Reusing used (whiskey &wine) barrels-then use them for décor as well	4.08	1.416	-0.487
v5—	Encouraging employee to bike to breweries	3.29	1.151	-0.217
v6—	Helping non-profit green organizations	3.71	1.307	-0.863
v7—	Using as less chemical as possible for cleaning.	3.77	0.915	-0.200
v8—	Using less harsh chemical if possible.	3.61	1.243	-0.633
v9—	Using crowler	2.97	1.546	-0.056
v10—	Using growler	4.03	1.366	-0.743
v11—	Recycling paper, cardboard, napkin.	3.97	1.248	-0.461
v12—	Recycling plastic material and straws.	3.87	1.314	-0.981
v13—	Using recyclable materials.	4.02	1.175	-1.168
v14—	Collecting and reusing yeast from fermentation for other purposes	3.74	1.566	-0.855
v15—	Reducing packaging materials, using compostable materials	3.92	1.248	-1.014
v16—	Investing in reusable/ recyclable packaging	3.55	1.133	-0.433
v17—	Installing energy meters to measure and control consumption	2.65	1.301	0.257
v18—	Recovering heat (examples: from wort cooling, keg water systems)	3.52	1.48	0.621
v19—	Installing technologies to reduce energy use	3.42	1.251	-0.578
v20—	Installing water meters to measure and control consumption	3.32	1.375	-0.399
v21—	Embedding sustainability into business culture	3.71	1.074	-1.029
v22—	Having an environmental action plan	3.11	1.128	-0.352
v23—	Providing pro bono/voluntary services within local community	3.68	1.144	-0.703
v24—	Providing environmental education to staff or customer	3.35	1.13	0.352
v25—	Working with other local companies, investors with similar beliefs	3.58	1.218	0.633
v26—	Sourcing locally, as close to brewery as possible (to reduce food	3.55	1.192	-0.516
v27—	Buying and using eco-friendly products	3.55	1.163	-0.612
v28—	Looking for outside learning/support	3.84	1.187	-1.052
v29—	Having an environmental sub-committee including senior management	2.68	1.324	0.204
v30—	Receiving training from professionals for employees	3.39	1.304	-0.805
v31—	Raising the environmental awareness	3.77	1.15	1.039
v32—	Improving natural light	3.87	1.083	-0.853
v33—	Switching to low energy lighting	4.26	0.884	-0.951
v34—	Cleaning roof panels to increase natural light and reduce energy use	2.81	1.188	0.032
v35—	Using hand driers that automatically switch off and/or use cold air	2.94	1.511	-0.004
v36—	Using energy management systems to improve energy efficiency	3.10	1.272	-0.298
v37—	Using solar panels/solar heating	2.61	1.381	0.297
v38—	Reviewing energy contract to increase green energy	2.84	1.179	-0.301
v39—	Harvesting rain water	2.23	1.208	0.497
v40—	Using less water, low flow taps or that automatically switch off	3.32	1.324	-0.566
v41—	Providing filtered watered to reduce need for bottled	4.13	1.065	-0.297
v42—	Encouraging suppliers to reduce packaging	3.13	1.386	0.065
v43—	Reducing own packaging/use of compostable materials	3.55	1.304	-0.523
v44—	Composting (on site or take materials home)	2.94	1.534	0.175

4.6. Discussion

Attaining a comprehensive definition of sustainability within the brewing industry is a challenging proposition. In practice, implementing sustainability at breweries becomes a contentious issue due to the geographical distance between the brewery's physical location and that of its raw ingredients, the necessary consumption of substantial amounts of water and the generation of liquid or solid wastes at almost every phase of the production process. Despite these intrinsic weaknesses, however, it is possible to integrate sustainable practices into the craft brewing culture. Breweries and their owners are well-placed and willing to participate in fiscal, communal and environmental practices of sustainability that pursue innovative goals, in turn generating both financial and environmental benefits to the company, as well as sharing them with their workforce, customers and the wider community.

The purpose of this research paper was to identify the full scope of sustainable practices available to the US craft brewing industry and determine how many of these practices are actually being adopted by the brewers themselves. This aim was achieved through a two-stage (qualitative and quantitative) approach. The first stage involved 31 semi-structured interviews with Craft brewery owners, to identify the sustainable practices they undertook, while the second stage was comprised of a quantitative survey via which 237 brewery owners expressed their level of agreement with the practices identified in the first stage. The study concluded that, taken as a homogeneous group, craft brewers have a wide-ranging interpretation of the notion of "sustainability", which spans various different environmental factors. Specific areas which were consistently highlighted by the brewers included energy efficiency, incentives to enhance

involvement with the local community, paper and plastic recycling, the re-purposing of used items, re-use of spent grain, use of recycled materials and water conservation.

The research can be interpreted as having both practical and theoretical implications for academics, brewery owners and policy makers alike. With regard to those two latter groups, the study can provide valuable insight into the application of specific sustainable practices in the US craft brewing industry; while much has been written on the technical aspects of the craft brewing process and how these impact the global environment, very little (if any) work has been undertaken on the broader subject of sustainable practices in craft brewing in general. Taking into account the rapidly rising popularity of this industry across the nation, a greater understanding of the sustainable practices, currently employed by craft brewers, is critical to creating a more environmentally friendly industry in future. From an academic point of view, the results open up new areas of potential study for researchers interested in the field of environmental management.

The results of this study showed that Variable 2 (Sending spent grain materials to farmers for use as cattle feed) scored highest among the craft brewery owners surveyed. As well as re-using those spent grains for agricultural purposes, such as in compost, animal fodder or as human food additives, as denoted by Variable 3 (Recycling spent grains), there are also energy-related alternatives to enhancing the sustainability associated with this waste stream. As Grunde, Li and Merl noted, the spent grains can also be combusted and used as an alternative source of fuel which provides the heat necessary for the brewing or grain-drying processes, or to create electricity via the use of a turbine (Grunde, Li & Merl, 2014). Another technique involves using an agricultural anaerobic digester to transform the spent grain into methane, which can then be used to run parts of the brewery (such as the boiler) that are powered by natural gas. This

approach has the potential to reduce energy consumption, increase fiscal savings and minimize waste production.

In terms of water consumption, Variable 1 (Re-purposing cooling water for use with the next batch of beers), Variable 18 (Recovering heat - examples: from wort cooling, keg water systems), Variable 41 (Filtering water to reduce consumption of bottled water) and Variable 40 (Reducing water consumption through low-flow taps or those which automatically switch off) were among the highest-ranked variables in this category. However, it was somewhat surprising and disappointing to note that only some brewers indicated that they monitored levels of water consumption at all, as per Variable 20 (Fitting water meters to monitor and regulate consumption).

One solution for solving the problem of water consumption is through its re-use, either as the grey water suitable for restrooms or through the incorporation of modern innovations, such as low-flow cleaning and washing nozzles. Another sustainable solution, concerning water usage, is the construction of a filtration system capable of preventing the contamination of local waterways. However, this wastewater must still be treated to remove impurities and make it viable for safe re-use, or else disposed of in a safe and appropriate manner. Both of these outcomes can be expensive and logistically difficult to implement for many breweries, which has led them to actively look for means of reducing water consumption throughout the brewing process, as well as means of affordably and safely treating wastewater streams to render them viable for re-use. One such technique, which is often employed to minimize ionic content and purge the wastewater of any residual pesticides, is reverse osmosis.

Variable 15 (Minimizing the materials used in packaging and employing compostable materials whenever possible) had a reasonably high mean score from brewers; on the other hand,

Variable 43 (Composting onsite or at home) received a comparatively low score from those surveyed. Safely and sustainably disposing of waste streams can be most easily achieved through the practice of composting, which not only provides environmental benefits, but also offers farmers a natural form of fertilizer (Environmental Protection Agency, 2013). Another sustainable solution could be the use of an anaerobic digester, which is capable of transforming the waste into a source of fuel for use in any number of purposes at a later date (Strum et al, 2012).

In the field of energy efficiency, Variable 32 (Increasing the incidence of natural light") and Variable 33 (Transitioning to low-energy lighting sources) showed very high mean scores. However, Variable 34 (Keeping roof panels clean to maximize the intake of natural light and minimize energy consumption) and Variable 35 (Installing hand-driers in restrooms with automatic turn-off capabilities, or which use cold air) had a relatively low mean score. Variable 37 (Installing solar panels or solar heating facilities) scored surprisingly low among those surveyed, indicating that breweries would benefit from installing and employing more sources of renewable energy. In addition to solar power, this could also include wind, hydro and biofuels, as well as a transition to a more environmentally-minded energy supplier.

Variable 30 (Contracting professionals to educate and train employees) showed a moderate-to-high mean score from those surveyed. Educating employees about the benefits of employing sustainable practices can have many advantageous consequences; not only can it optimize the use of raw ingredients, resources and equipment, but it can also occasionally avert human errors. As a result, imparting an ethos of sustainability to brewery employees can conserve both water and energy, as well as produce less waste. One demonstrable example is the fact that the way in which brewing machines are used by their operators can have a significant

impact on the amount of energy they consume. Additionally, educating and empowering employees can encourage them to contribute their own innovative ideas on how to surmount specific challenges and can incentivize them to achieve specific aims and targets. As a result, this practice can have a sizeable effect on the environmental integrity of a craft brewery and could be introduced as a first step in the right direction across all facets of the business. Variable 28 (Searching for external education and support resources) showed a high mean score from those surveyed, demonstrating that craft brewery owners are already searching for sources of education and support and reflecting the optimistic outlook for the sector.

Variable 23 (Becoming involved with the local community on a pro bono or voluntary basis) returned a moderately high mean score from the brewers surveyed. Forging a bond with the local community can help brewers to boost their sustainability prospects by finding other individuals or organizations with whom they share common interests on the subject. Together, these individuals and entities can leverage more pressure on suppliers to employ more environmentally-friendly practices in their production processes or to build recycling and re-purposing systems. This is just one way in which a symbiotic relationship between the craft brewery and the local community can enhance sustainability; it's certain that there are many more possibilities for breweries to pursue via this avenue.

Incorporating innovative processes and protocols often requires both significant financial investment and dogged determination, but the implementation of better organized and more efficient processes (such as the installation of a heat exchanger to capture and use waste energy) can augment profits, minimize undesirable environmental consequences and pave the way for future innovations and improvements in the industry.

4.7. Future research and limitation

Due to the fact that this paper was essentially exploratory in nature, there is substantial scope for further study on the subjects involved. In the future, it would be beneficial to investigate how responses to the survey questions differ based on factors such as the age group and gender of the interviewees, production volume of their businesses and the varying geographical locations of the breweries in question. Moreover, it is likely that investigations into the effect that the amount of time a brewery has been in operation has on its sustainability profile could produce insightful results. Accompanying research can also focus on more all-encompassing breakdowns of the innovative attempts undertaken by individual brewers to overcome the sustainability challenges specific to their business. Brewers showed a high propensity or willingness to search for external support and this is one area of research which deserves further investigation.

It is likely that investments into sustainable practices will incur elevated costs that will be passed onto the consumer in the form of a higher price-per-unit of beer, at least in the short term. This has the potential to render more environmentally-friendly and energy-efficient breweries less cost-competitive in comparison to their less sustainable rivals. Given that previous research has proven inconclusive on whether consumers would be susceptible to paying more for beers made via sustainable means, it is suggested that studies into the consumer behaviors of craft brewery customers could provide a fruitful area for new research.

For the initial, qualitative stage of the research, we selected a purposive sampling method to obtain our results. One unavoidable consequence of this is that craft brewery owners are more likely to have already taken into account the potential advantages of interacting with their relevant target markets and, as a result, it is possible that the environmental standpoints and

habits employed by craft brewers may be exaggerated in the conclusions of this paper. With regard to the second, quantitative stage of the research, the use of self-administered questionnaires in the survey incurs the same caveats as they do with other studies; namely, they suffer from a lack of in-depth information, social desirability bias and non-response bias. These aspects of the paper may limit the potential of its conclusions to be extrapolated and used in other contexts. Moreover, low response rates are frequently observed in research papers dealing with small- and medium-sized companies (Acutt & Geno, 2000). The craft brewers who did take part in this paper, therefore, have a higher chance of already being actively engaged in environmental management practices than those who did not, and it could even be inferred that their readiness to participate may reveal their own implicit acknowledgement of this fact. Finally, it is possible that the conclusions of this study may be skewed as a result of regarding craft brewers as one single homogeneous group, rather than recognizing the many sub-divisions inherent within the industry.

CHAPTER 5

ARTICLE 2: Motivations Behind US Craft Brewery Owners' Environmental Practices

5.1.Abstract

In 2018, US craft breweries produced 25.6 million barrels of beer, creating a $27.6 billion market and employing over 456,000 people. Craft brewers in the US have long sought to improve the efficiency of beer production to achieve their primary aims of improving the product and increasing profit margins. More recently, however, there has been a move towards adoption of more sustainable production techniques aimed at reducing the environmental impact of the brewing process itself, which is water- and energy-intensive and leaves a significant carbon footprint on the environment. This article reports on the integrated findings of an exploratory sequential mixed methods research design which aimed to investigate the factors that drive engagement with environmental practices among US craft brewery owners. The findings of the present study are in alignment with those of previous studies conducted in a broader business context. This study also contributes to an understanding of the factors driving environmental engagement, as well as their relative significance to craft brewers, which is critical to increasing the ability to target financial and physical resources and make the brewing process more sustainable and environmentally friendly. Specific theoretical and practical implications are discussed, and suggestions for future research are provided.

5.2. Introduction

For a long time, the importance and value of the environment has been taken for granted, by both individuals and industry. Recently, however, businesses have come to acknowledge that consideration of environmental issues is critical to competitiveness in any industry, and both individual clients and society at large are looking to industry for a commitment to, and engagement with, efforts to protect the environment. The brewing industry is no exception. It has its own unique context and processes that require close examination in this environmentally-aware era. Amongst others, the re-design of brewing processes, recovery of by-products, and re-use of effluents are considered some of the more plausible steps towards an eco-efficient approach to brewing. Before moving on to discuss these in more detail, it is important to provide some context about the craft brewing industry in the United States, which represents the specific context of this study.

Over the period 1997-2018, the number of licensed breweries in the US increased from 1,273 to 6,372 (Brewers Association, 2018). Although, from a production volume and sales perspective, the larger-scale breweries have maintained a dominant position, craft beer producers have attracted a growing and engaged consumer market of their own. Consequently, over the last decade, in particular, craft breweries have come to outstrip their mainstream counterparts in terms of profit margin and growth (Sozen, O'Neill, 2018). In terms of the environmental issues related to the process of brewing, beer is generally considered a sustainable product, as it is constituted mostly of organic and naturally-produced ingredients (Schaltegger, Viere & Zvezdov, 2012). However, the processes used in the brewing industry, in the manufacture, packaging, and distribution of the product, leave a significant environmental and carbon footprint, something that is of increasing concern to consumers. The most notable environmental concerns relate to

the use of water, energy and other limited-supply resources, all of which are relied upon heavily in the production process, and means breweries have the potential to damage the nearby soil and water supply (Fish, 2015). In particular, the brewing process uses a large volume of (high-quality) water for heating and cooling, cleaning, packaging, sanitation, and produces a significant amount of liquid and solid waste (Fakoya & van der Poll, 2013).

As such, increasing attention has begun to be paid to how to make the brewing industry more sustainable and environmentally friendly, and craft brewery owners in the US have shifted their focus from efficiency efforts, aimed at reducing costs and improving quality, to the exploration of new and innovative techniques aimed at reducing environmental impact (Fillaudeau, Blanpain-Avet & Daufin, 2006). As part of this, some breweries have pursued partnerships and collaborations with volunteer and welfare enterprises with the task of overcoming environmental hurdles and developing sustainable practices and policies for the industry as a whole (Ceres, 2015). As a result, some breweries have adopted and adapted strategies and methods to make their practices more environmentally friendly, minimize their environmental impact, and use resources more efficiently.

There are, and have been, many drivers of this pro-environmental shift. A number of studies have explored this topic, and identified, classified, and analyzed the key drivers prompting businesses to move towards more proactive and/or advanced environmental behaviors (González-Benito & González-Benito, 2006; Lozano, 2015). One factor identified by a number of studies, as a key driver of environmental proactivity, is stakeholder pressure (Zhang & Yang, 2016; Buysse & Verbeke, 2003; Sharma & Sharma, 2011); another is the managers' hope of obtaining competitive advantage as a result of adopting an environmentally friendly stance (Babiak & Trendafilova, 2011; Bridges & Wilhelm, 2008; Papadopoulos, Karagouni, Trigkas &

Beltsiou, 2014). This line of research positions managers as interpreters of stakeholder pressures related to the expectation of obtaining competitive advantage.

In summary, the existing literature indicates that breweries are driven to adopt sustainable and environmentally friendly processes, behaviors, and attitudes based on a combination of corporate social responsibility efforts, legal requirements, and the pursuit of economic advantage of some form, whether through reduced costs, greater market share, or other financial benefit. Identifying exactly what it is that guides the decision-making processes of craft brewery owners, in regard to the adoption of new or improved practices, has several advantages. First, it serves as a guide to help breweries adapt to the evolving needs of a progressive society; second, it assists government and policy-makers in formulating effective and relevant legislation; and, third, it helps consumers to better understand their role and position in business processes and decision-making.

Despite the advantages stated above, very little academic research on the subject of sustainability in the craft brewing industry, in the US, has been undertaken. Indeed, no study has explored the drivers of environmental practices in this industry. As such, the present study aims to answer the following research question: what motivational factors drive US craft brewery owners to engage in environmental practices?

5.3. Literature review

As in all aspects of decision-making, in business, the adoption of innovative, advanced, and/or proactive strategies to improve environmental performance and increase sustainability is influenced by a range of factors that either promote or hinder their uptake. The factors that drive adoption of sustainable practices are diverse; some of those most commonly cited in the literature include: - stakeholder pressure, characteristics of the firm and/or owner, and favorable

external/environmental factors (Graham, 2017). Within these factors are specific determinants, which have been explored in past studies. Within hospitality research, several researchers have used Stakeholder Theory (ST) to analyze the variety of stakeholders in the adoption of environmentally friendly practices (Jones, Hillier & Comfort,2014; Timur & Getz, 2008; Prud'homme & Raymond, 2016; Krajnović & Gortan-Carlin, 2017). Of these studies, some focus on ST only, others combine it with other frameworks to study a particular group of stakeholders, and others acknowledge the theory in their literature review (Kim, Kim & Matilla, 2017).

More specifically, Kasim and Ismail (2012) used ST to highlight the impact that the food service industry has on the environment, and the barriers to, and drivers of, change in that sector. In another study, Marshall, Akoorie, Hamann and Sinha (2010) used ST, in combination with the theory of reasoned action, to investigate the perceptions of winery managers regarding the adoption of environmental practices in the wine industry. Like these studies, the present study uses ST as the theoretical foundation from which to study the drivers of environmental practices among craft brewery owners.

ST has been adopted in several environmental studies to explore the range of motivations, aside from financial and marketing or advertising benefits, for environmental practices and behaviors (Hoffman, 2000, p. 28; Tantalo & Priem, 2016), for example cost–benefit analysis, and perceived moral obligation. According to institutional theory, social pressures from other relevant actors, for example the general public and the government, have an important influence on a firm's intention to comply with environmentally friendly programs, or adopt further positive and proactive environmental behavior (Rivera, 2004). According to ST, a business will be motivated to adopt and engage in environmental practices, in response to pressure and influence

from its stakeholders. A ‘stakeholder’ here is generally understood to be an individual, organization, or group that has a mutual relationship with the business, from the perspective of responsibility and decision-making. However, it is important, in this context, to recognize that stakeholders are not limited to humans, and can include the natural environment (Phillips, 2003).

Stakeholders can be internal or external. Internal stakeholders have an explicit contract with the company, for example suppliers, employees, and shareholders. By contrast, external stakeholders have an indirect, non-contractual relationship with the company, for example competitors, customers, regulations, and wider society. External stakeholders exert pressure in a specific way, as they do not have any control or influence over internal processes and structures (for example, management). They can, however, raise awareness, and shape public opinion, of an organization’s environmental practices (or lack thereof) and, in the case of regulatory and governmental bodies, impose sanctions and standards.

Indeed, a study by Walton et al. (1998) identified government regulation as a major driver of environmental practices in business enterprises, and regulatory and government bodies as having the greatest impact on the environmental strategy a company adopts. Government bodies can threaten a company with legal action and sanctions for non-compliance with environmental regulation and sustainability standards, including penalties and fines. This would potentially have the additional effect of damaging the company’s public image, so the threat of legal action for regulatory non-compliance is both financial and reputational in nature. Thus, companies will seek to avoid such threats by engaging with training and initiatives, related to sustainability, that help them to remain compliant. They may also seek to build cooperative relationships and partnerships with governmental and regulatory bodies, in initiating sustainable processes and programs, and to explore non-regulatory routes to improved sustainability. Hall (2011)

challenges this view, questioning the extent of the actual contribution of regulators in driving sustainable development. Certainly, it is the case that regulation does not guarantee environmental improvement. Nevertheless, a positive correlation has been identified between companies' compliance with environmental regulation and their engagement with sustainable purchasing.

Management and ownership play a large role in driving and influencing pro-environmental initiatives and compliance with environmental regulation, and ensuring these are understood, committed to, and implemented across the whole organization. Thus, the attitude of top management to environmental strategy and regulation, and their interpretation of the same, has a critical top–down influence on decision-making in regard to pro-environmental initiatives, and on broader environmental attitudes throughout the organization. Furthermore, managers possess the outlook and resources to identify and seize opportunities for pro-environmental actions and processes, as these individuals typically have both decision-making power and authority, and a broad view of the whole organization and the wider industry. As such, the literature has identified managerial support for pro-environmental behavior as one of the most influential factors shaping an organization's environmental policy (Gupta & Sharma, 1996).

Some researchers have highlighted that, due to their power and authority, managers are often the focus of external pressures, for instance, from external stakeholders (Harrison & John, 1996). Thus, their analysis, interpretation, and prioritization of external environmental pressures is key to understanding the drivers of sustainable practices in breweries. Indeed, several studies have shown, drawing on the managerial theory of Fineman and Clarke (1996), that managers' analysis and judgement of incentives, threats and opportunities in regard to environmental initiatives, is a key factor determining their implementation. For example, if the brewery owner or manager

takes a positive view of pressure to be more environmentally friendly and sustainable, and sees it as an opportunity, for instance, to improve quality, lower costs, reduce waste, and enhance their reputation, they are more likely to adopt a proactive strategy and be incentivized to implement relevant initiatives. By contrast, if they perceive such pressure to be a barrier or threat, then they are more likely to adopt a reactive strategy. As a form of external stakeholder, this applies also to regulatory pressure, where companies that interpret and respond to regulation in a reactionary way, according to Handfield et al. (1997), "did not appear to add integrated environmental concerns in their value chain processes as thoroughly as companies that were initially motivated to do so." A contrasting view is expressed by Schaltenbrand, Foerstl, Azadegan, and Lindeman (2016), who argue that management's reaction to stakeholder pressure tends to be selective and proportional to the degree of influence a particular stakeholder has over the company. Nevertheless, it is agreed that the perceptions and attitudes of the management/owners of a brewery, toward stakeholder pressure, whether regulatory or public, is a key factor influencing their environmental policy and their response to environmental pressure. Furthermore, it is clear that regulation is a more effective and powerful driver, when viewed by brewery owners in a positive light, and when companies adopt a proactive strategy and view environmental initiatives as opportunities with win-win outcomes.

This relates to another group of factors that can be observed to have an influence on the adoption of environmentally friendly practices in the craft brewing industry. One of these is the incentive provided by reduced costs, which is a common driver of adoption of environmental practices across various industries. The waste that is left or produced, throughout a product's lifecycle, represents a cost in the form of wasted effort and resources (Porter and Van de Linde, 1995). Through efforts to reduce or avoid waste, through various methods and processes, these

costs can be diminished or eliminated. A study by Handfield et al. (1997) found that the companies that excelled in green supply chain management were not those driven by environmental compliance, nor by a desire to present a positive image to customers – indeed, their efforts were not always publicly visible – but by a focus on improving quality and reducing costs. However, some downplay the 'win-win' nature of environmental initiatives, suggesting that often the costs outweigh the benefits. For example, Walley and Whitehead (1994) argue that the benefits "will likely be overshadowed by the total cost of a company's environmental program." Hussain further argues that there is a conflict between profitability and environmentalism, and that companies will often interpret pro-environment initiatives as economically unfeasible, or unattractive.

Another significant driver of a pro-environmental attitude, within companies, is the collective attitudes of individual employees, which have been shown to impact on the overall environmental attitude of the company. Specifically, when the owner or founder of the company is environmentally conscious, this will influence the company's values and have a trickle-down effect throughout the organization. In terms of other employees, they might be motivated to pursue, and engage in, environmental initiatives for several reasons, including career advancement, and rewards, for example bonuses. Environmental training can be approached as a form of mutual cooperation between employees and management, and a process that is simultaneously bottom–up and top–down. As explained above, pro-environmental efforts often lead to lower costs, through reduced wastage, and more efficient use of resources; there is, therefore, an economic incentive for pursuing these objectives, which might be reflected in financial incentives offered to employees or departments.

Another key driver of environmental practices, within organizations, is competition, and the need to obtain competitive advantage in a crowded market. Pro-environmental strategies can be perceived, and used, as a route to achieving competitive advantage, and, by doing so, raise overall industry standards, with regard to environmentalism and sustainability, by shaping the policies and behaviors of the whole market, as all companies must raise their own standards in line with the industry leader, in order to remain competitive. Even if the motivation for this is entirely self-interest, the net result is that standards of sustainability are increased across the board. However, Hall (2011) challenges this view, arguing that improved environmental performance is not a means to gain competitive advantage.

It should be noted, though, that competitive advantage is, at least in part, driven and determined by consumer perception. This highlights the role of customers and the public as an external stakeholder. There is much discussion in the literature on the customer's influence on sustainability efforts, which can take various forms, including customer expectations, demands, and purchasing habits. Studies across various industries have demonstrated the significant influence of customers, and the pressure they can exert on manufacturers to produce more environmentally friendly products; this pressure is then passed on from the manufacturers to their suppliers, to ensure the materials they are purchasing are themselves being produced in a sustainable way. Suppliers are highlighted as only a minor factor in the literature, though there is a lack of empirical research that specifically explores their role; nevertheless, successful integration of, and cooperation with, sustainability standards and the maintenance of a 'green' supply chain, with this pressure being applied throughout the supply chain, raises overall standards. This point is also linked to another factor, accreditation, which attests to a company's environmental commitment and status; this is an important driver, as levels of customer trust can

be increased if companies obtain official certification that demonstrates their compliance with both regulatory and voluntary environmental standards. This was clearly demonstrated in a 1998 study by Handfield et al., of the furniture industry, and a 1996 study by Lamming and Hampson, of vehicle manufacturing.

Customers are, of course, a reflection of wider society; as social awareness of environmental issues has increased, so too has consumer demand for environmentally friendly products, and a desire to see sustainable policies and behaviors demonstrated in business. Social activists and organizations can also exert significant influence, and their power has increased in recent years; returning to the public image point, companies risk embarrassment by these groups if they are perceived to be acting in an environmentally unethical way. A damaged reputation, as described earlier, will impact on a firm's competitiveness in the market; by contrast, a reputation for being environmentally friendly might attract customers who are more conscious of sustainability in their purchasing choices, which could drive sales and generate positive publicity through word of mouth.

5.4. Methods

Frequently referred to as the "third methodological orientation" (Tashakkori & Teddlie, 2010,5), mixed methods research does not enjoy a definitive, unanimously-agreed definition. However, according to Creswell and Clark (2017), the defining characteristic of the practice is its integration of both qualitative and quantitative data and methods to produce a more comprehensive answer to a research question. Indeed, it is this integration which is the underlying premise, purpose and benefit of a mixed methods approach, since it can mitigate the respective weaknesses of both qualitative and quantitative methods, by combining their strengths to achieve a more rounded response to complex research problems and phenomena (Creswell

and Clark, 2017). In particular, it is the triangulation of qualitative results, with their quantitative counterparts, which can bring additional weight and validity to the inferences and conclusions drawn therein, as compared to a study which only uses a binary (qualitative *or* quantitative) lens to address a research question.

In this study, both qualitative and quantitative approaches were employed sequentially. This facilitated the in-depth exploration and understanding of the various sustainable and environmentally-friendly practices which are used in breweries in the United States. In light of the inconclusive findings presented in previous research on the topic, it was deemed appropriate to employ an initial exploratory qualitative research stage, in order to develop a number of working hypotheses. These were then tested, in the later, quantitative, phase of the research paper.

When designing a mixed methods research model, the two most crucial factors to consider are the prioritization of the two data subsets and the implementation of the data collection itself (Morse, 1991; Morgan, 1998). Due to its very nature, mixed methods research allows for either the qualitative or quantitative data to be given additional emphasis, or for each to be weighted equally. Given the logistical limitations inherent in the present study, it was decided to give priority to the initial qualitative phase of the research, as this would facilitate an essential understanding of the data before moving on to the second part. For the same reason, it was also necessary to collect the qualitative data before the quantitative data, making this is a sequential design in terms of the implementation of data collection.

5.4.1. Qualitative phase

In the initial, qualitative stage of the research, the main data collection technique consisted of semi-structured, in-depth interviews involving open-ended questions pertaining to a variety of environmentally-friendly and sustainable practices employed in the craft brewing industry. The target sample comprised craft brewery owners, from across all seven regions of the United States (the Northwest, West, Southwest, Midwest, Southeast, Mid-Atlantic and Northeast), with both male and female representatives from breweries, both large and small. The sample set was created using the purposive sampling method alongside the researcher's own contacts.

A total of 31 interviews were conducted at a date and time that was convenient for the respondents. On occasion, these interviews took place on-site at the brewery; in general, however, the interviews were conducted via telephone. In keeping with the fundamental requirements of ethical research, all respondents were issued with a guarantee of data confidentiality and user anonymity, which served the secondary function of enhancing trust between the parties and reducing the likelihood that interviewees might aim to be "good subjects", by only giving answers they believed the researcher wanted to hear, thus skewing the results.

Each interview lasted for approximately 40 minutes, during which respondents were asked about demographics and statistics pertaining to the brewery itself (such as age of the respondent, production volume, system of the brewery and tank sizes involved in its daily operations), as well as the key questions explored in the study. The interview was brought to a conclusion when the researcher determined that the elicited responses were becoming saturated, or repetitive, and no longer provided insight or value.

The audio of all interviews was recorded (with the consent of the respondents) and subsequently transcribed verbatim. These transcripts were coded with numbers for each respondent (for example, the first respondent was labelled R1) to maintain anonymity, before NVivo 11 software was employed, to assist in analysis of the data. This analysis was divided into two separate stages; the first used open coding, while the second employed latent content analysis, as per the accepted content analysis technique of Miles, Huberman and Saldaña (2014). Firstly, open coding was used to identify the keywords and phrases mentioned by the respondents, before the researcher summarized the main ideas of each paragraph, using either direct quotation or an approximated precis of their words. After all transcripts had been coded and labelled, the codes were then compared, combined, reviewed and finalized so that their underlying themes could be pinpointed. In the second stage of data analysis, the participants' responses were reviewed and categorized by theme.

To fulfil the initial aims of the project, and provide an answer to its questions, the researcher followed the deductive thematic analysis approach recommended by Braun and Clarke (2019). This approach was selected before commencing the study due to *a priori* themes identified in the pre-existing literature and stakeholder theory surrounding the subject. Following Braun and Clarke's example (2019), the following six stages were used to guide the study: 1) familiarization with data; 2) generation of initial codes; 3) search for themes; 4) review of themes; 5) definition of themes; 6) scholarly report.

5.4.2. Quantitative phase

Using the data collected and analyzed in the initial, qualitative phase of the study, the researcher created the survey instrument that would inform the second, quantitative phase. The questionnaire used in this phase was also based upon the earlier work of Kasim and Ismail

(2012), which investigated the motivations behind environmentally friendly practices within the restaurant industry in Malaysia. This study displayed robust reliability and validity and was an ideal template for the current investigation into the craft brewing industry. After the online survey had been finalized, it was distributed, via the Brewers Association, to craft brewery owners, across the seven regions of the United States. The survey consisted of a number of distinct sections, each addressing a different theme. These included respondent demographics, operational information about the business, challenges faced by the breweries, values held by their owners, environmentally friendly practices employed on-site and the motivations behind these practices. However, the subsequent analysis eschewed the majority of the answers to these questions, focusing on respondent demographics and the motivations behind environmentally-friendly practices, in keeping with the key themes explored in the study. In total, 246 respondents completed the survey (with 237 valid responses) and the data collected from their responses was analyzed with descriptive statistics, using SPSS version 22.

The variables were measured using a five-point Likert scale, with available responses ranging from 1) Strongly disagree to 5) Strongly agree. Prior to the commencement of the study, a pilot was undertaken with 30 participants wherein the survey was administered to members of a local home-brewing club and craft brewery owners. The pilot was conducted in order to minimize the potential for ambiguity during the study proper; with that in mind, respondents to the pilot were requested to give feedback on the clarity and relevance of the questions, the scaling technique used, the validity of the constructs and the time required to complete the survey. Based on this feedback, a number of modifications and refinements (including grammatical changes) were made to the instrument.

The modified questionnaire was then sent to the Brewers Association for additional feedback, at which point a number of other changes (again, primarily grammatical ones) were made to the instrument.

For the purposes of the study, sample respondents were defined as founders of, or business partners in, a craft brewing venture. Accordingly, the final questionnaire was distributed to a convenient sample of craft brewers in the United States, via the Brewers Association "Brew Forum" blog, which can be accessed by commercially-oriented craft brewers all over the country. Potential respondents were given a brief background on the study, its nature and its aims, as well as a link to the survey itself if they wished to participate. The link directed respondents to an informed consent page, where they were given the option to proceed (or not) to complete the survey. All responses were collected online, using Qualtrics software, and the survey remained open for a ten-week period between February 2019 and April 2019. Reminders about the survey's existence were posted in the aforementioned forum on the Brewers Association website at weeks four and seven.

5.5. Results

5.5.1. Qualitative Results

The majority of the respondents had been operating in the US craft brewing industry for over five years, with two of them having worked in it for over 25 years. Only two indicated they had been working in the industry for less than one year. The average duration of experience in the industry across all 31 respondents was eight years.

The annual volume of sales and production size varied across the breweries. The majority of the respondents use brewhouses with production capacity of between five and fifteen barrels, while average annual sales were around 4,000 barrels. 200 barrels was the lowest annual sale figure

reported, while 40,000 barrels was the highest. The top three beers in terms of popularity that were created and marketed by the respondents were American Wheat Ales, Indian Pale Ales and Double Indian Pale Ales.

Approximately 75% of respondents indicated that craft brewer was their second career choice. The first choice varied hugely; chemical engineers, public administrators, supply chain professionals and operational and strategy consultants were all represented, while one respondent was a veteran of the US Air Force. The majority of respondents held a bachelor's degree, three of them held a master's degree and two held PhDs. Only three of the respondents had a professional brewing qualification and/or diploma in brewing science.

One of the aims of the interviews was to identify the most common perceptions regarding legislation and legal requirements in relation to sustainability, and how the standards likely to be set into law would compare to the behaviors and practices willingly set by decision-makers in the industry.

The perceptions were varied; some respondents expressed the opinion that the standards for sustainability required by law would likely be lower than the standards the brewers would expect and demand of the industry. Indeed, one respondent stated that sustainability would be a natural focus of a 'mature' company in a secure financial position.

> *"I think that once we have a mature company and we have the time and finances to focus on sustainability, we can expect more than what the government would ever mandate. You know, as a brewery, it's sometimes a low margin business and so you have to balance environmental sustainability with financial stability. So, once you get that right from a financial standpoint it's something that you can practice."*
> *"I believe that monetary incentives are more productive than legal regulations, though that option certainly has its place. Legal regulations would definitely set a lower level than I would strive to attain."*

A similar view was expressed by another participant, who stated that the lack of regulation of sustainability in the industry was not a concern, as there was no urgent need for legislation due to the high standards and efficiency of industry members, who were already acting responsibly--in part, because of concern for reputation and outward appearance.

> *"I think the craft brewing industry is pretty much responsible and will actually go an extra bit to look better to almost anybody."*
> *"I would assume that in order to get a legal requirement imposed, push back from major corporations would dilute the effectiveness of the requirement."*

Other interviewees were less convinced, saying that in some area's regulation might be appropriate and beneficial, depending on the specific issue in question. Brewers also pointed out that there are other, non-legally binding, industry standards that supposedly held companies to account. However, brewers also indicated that these standards were lower than their own personal standards, and the motivations were different.

> *"For example, in order to be a Certified Organic Brewery, we work with a certification board, and they set standards based on the USDA's (United States Department of Agriculture) standards called, The Midwest Organic Services Association, and their standards, for example, for cleaning chemicals, are actually less stringent than my standards. So, for example, they do allow an organic brewery to use a harsh cleaning chemical. What they are concerned about is that you take measures to ensure that there is no residue left over from that chemical before you add an organic product. That's what they were concerned about, not the use of harsh chemicals, that's bad for the environment, in and of itself--which is surprising to me. So, I have gone above and beyond and found a better working cleaner. In this case., if there were laws, our certification board doesn't make laws about organic beer. If there were laws, and they found a way to make it better, I would still do it better."*

The respondents were also asked about customer expectations and social pressure as a motivation for adopting sustainable practices and whether sustainability was something that the brewers were commonly asked about in relation to the company's business activities and practices.

The brewers largely indicated that customers were concerned about sustainability, and voiced concerns and queries by asking where products and materials were sourced and how chemicals and waste were disposed of or recycled. When satisfactory responses were received, customers expressed support and approval.

> *"We live in a rural community, so we have a lot of people ask what we do with our grains, making sure that we don't dump it. Well, it's interesting that people want to make sure that the grain is going somewhere well. I have had people ask if we recycle our cardboard and, you know, it's interesting, very few people have asked what happens to our chemicals, and I have had people ask what we do with our yeast when we are done with it. "*
> *"…people often ask, and a lot of our customers support us because of that. Then as I mentioned also, we received the Sustainable Business Award from the (here the respondent gave the name of the city where the brewery is located) Sustainable Council."*

Other participants agreed that customers did have expectations of sustainability and would ask associated questions, but only customers who were environmentally conscious would ask, rather than sustainability being a typical customer concern.

> *"I had one customer, ask if we were a green brewery and I explained to them, that at this point, I couldn't declare such, but I did talk about the repurposing of the grain to feed livestock and we talked about water, but it was somebody who was clearly concerned…. that was important to them and they were fairly educated and knew enough about brewing that they could talk to us about it. It was a very nice conversation really."*

Aside from social and legislative factors, respondents were also asked if they had environmental motivations for adopting and implementing sustainable practices. The responses were largely positive, with several interviewees affirming that, either to a lesser or greater degree, environmental concerns were indeed a factor influencing decision-making in their organization. In particular, participants identified water use, treatment of sewage, and use and disposal of chemicals, as areas where attempts were made to try to behave responsibly.

> *"My sustainability desire stems from my knowledge of the current climate situation, as well as the obvious limited resources which are disappearing at an alarming rate."*
> *"…at this point, our size doesn't change the decisions that we make. I think as we grow, and we have the option of something sustainable or not sustainable, if it's there in the same financial ball park, we will go with the sustainable practice. Right now, we are small, so it doesn't sway the decisions that we make."*
> *"I think more about what we were doing to be a good steward of the water waste and water systems and I do that because of my concerns about environmental impact. So, we do things like waste water treatment and we make sure that we don't release large amounts of natural caustic acid down the drain during the fermentation process. So, yes we do implement things that are driven by environmental concerns."*
> *"…for instance, we don't fertilize either. We don't want that washing away into our storm sewage and then our storm sewer, and into our rivers. We also try to make sure that our plumbing is working well. We don't have drippy faucets, and we don't have over usage of the water. We do try to be responsible."*

Overall, a number of key issues regarding sustainability and environmental impact emerged from the interviews. One of which was that taking responsibility for and thinking about sustainability was part of the role and behavior of a leader and was key to understanding and participating fully in industry best practices.

> *"I want us to all be sustainable, maybe continue to make beer and not push ourselves closer towards extinction. I am motivated to be as much as I can, a leader in the sustainable community, I am an owner of a craft brewery, so I need to talk to people about organic beer and to be an advocate for organic and sustainable practices. That motivates me too. Talking to people, helps them understand how it can affect our overall change."*

Brewers also expressed personal concern for the environment, and a belief in sustainability as a responsible and 'right' lifestyle choice. Brewers acknowledged how reliant the industry was on water and energy, and the environmental responsibilities associated with sustainability, not the least of which is the possibility of resources being threatened and therefore the industry is threatened and thus the business and the brewer's livelihood.

> *"You know, the motivation for me is to do the best I can with as little as I can by using the least amount of power that I can because I know that most*

> *of our water and most of our power comes from here. I use as little water as I can, because, I know the impact it makes on the environment.*
> *Well, I believe firmly in implementing them and the main driver is that it's the right thing to do from an environmental standpoint."*
> *"I am entirely motivated in a few ways. First of all, by the fact that I realize that if all of us don't start doing or working towards more sustainable energy sources in general, and more sustainable breweries that we are going to feel very soon, a negative impact. I think we can argue that our motivation is intrinsic and again, part of it is being aware and having the discussions that we have as we go on our various field trips and site visits. I see operations where they are doing something where I am thinking, 'how on earth can we do something like that in our operation."*
> *"…but, we really, like I said, my husband and myself and general manager, we are pretty crazy about recycling at our home. We are pretty crazy about making sure that we don't waste. It's just a part of our life so that happens to go on over into the brewing. A lot of time, we take the recycle into our homes because we can't find a commercial garbage company that would recycle for our brewery, so a lot of times we bring it home."*

Respondents also acknowledged the importance of public perception, and the PR *(public relations)* benefits that are associated with openly and publicly demonstrating responsible, sustainable, and ethical behavior and practices. From a PR perspective, the brewers acknowledged that sustainability also has a financial incentive in that an environmentally conscious business attracts more customers.

> *"Since we have day jobs, we are not in the brewery business to make a ton of money, so the idea of creating sustainable practices is something that excites us. There is also a motivation behind the business, so when we show pictures of us donating our spent grain to a local farm, it definitely gets a lot of traffic, so there is some marketing associated with it."*

In addition to public perception, some participants had concerns about the perceptions of the staff in the brewing industry. Many employees, just like the general public, have personal concerns about sustainability and the environment, and do not want to be employed by an organization that is acting irresponsibly in regard to environmental issues.

> *"It's something that I know a lot of our staff is passionate about and have pointed out to us, so I think it will help with employee morale. I think it will help with marketing and it's just the right thing to do at the end of the day."*

Returning to financial motivations, a number of brewers pointed out that sustainable business practices can be associated with higher costs, which would then be passed on to the customer as a higher-priced product. Brewers noted that the cost-factor would be considered in any decision-making related to sustainable practices, emphasizing that sustainability would be of particular concern for smaller businesses. However, some brewers took a different perspective, explaining that sustainable practices were worth the associated cost if the amount of waste going to landfills, was reduced, since landfill waste also carries a business cost.

> *"The other side of why you don't implement them is business cost. If I am going to end up doing these sustainable practices and it makes my product be twice as much, then that's not a good business decision. "*
> *"As a business person, we can make an impact all day on the bottom line and try to cut costs and all those things, but the biggest payback in being environmentally responsible is that we reduce the amount of stuff going to landfills and get away from that treacherous cycle of just creating waste."*
> *"To an extent, cost that's always a consideration, especially when you are a small business owner. Like, I think a 5 gallon, 55lbs bucket of PBW (powder brewery wash) cost me like $160 so of course, you know I want to reuse that as much as possible. If I could transfer from the (unclear)to the boil kettle and I can get a couple of uses out of the PBW, I will. As long as I can keep things clean and somewhat sanitary, I am not going to sacrifice that obviously."*
> *"Because we know, as a business owner, when I see a dumpster full, every single thing that went into that dumpster cost me money, so when we see a full dumpster, those straws that were thrown away or those whatever it is--paper things, anything, we know that was money and now it's garbage. So, selfishly, we want to make sure we reduce that as well, so that we are not throwing away so much money."*

Other respondents confirmed that if sustainable business practices were proven to save the business money by reducing costs overall, the brewers would be very willing to adopt such practices provided the upfront cost could be managed.

> *"Any opportunity to save money is attractive. The challenge is the upfront cost."*
> *"I mean, that's part of any decision-making process that we make around here. It would be nice if we could prove that we can save money and that's certainly part of our action model. We need to see that done before making any decision."*

"Since we've done everything else, we are saving $12,000 per year in land fill fees by eliminating a dumpster pull per week, and we will soon justify eliminating another one."

Other brewers agreed that the opportunity to reduce costs and save money by adopting sustainable practices would be welcomed but would depend on whether or not lowering costs compromised quality. Brewers were not prepared to accept a lower quality product to implement cost-saving sustainability measures.

"…unless the money saving thing resulted in compromising quality. As long as it doesn't involve us compromising quality or integrity and results in saving money, then I think it's a no brainer that we would implement sustainable practices."
"As long as it doesn't affect the quality of what we are doing, we try to do our best to adopt practices."

The brewers were then asked about the kind of support they thought businesses would need to successfully implement sustainable business practices. Several forms and sources of support were identified.

Some respondents felt that the city should do more to support brewers as part of city-wide development efforts that focus on sustainability. Participants emphasized the need to catch up with other cities and countries in terms of the infrastructure that is in place to support environmentally friendly initiatives and behaviors. The brewers then gave examples of financial incentives for sustainability as one way in which the city could provide businesses with support.

"The biggest thing for us is the support from the city I think. Right now, (the name of the city where the brewery is located) is going through a bit of a resurgence and so it seems like the cities that are more focused on sustainable practices, especially from what I have seen in Europe--they are a little more advance than (the name of the city where the brewery is located) and so, they have gotten past things like broken down buildings, and crime, and they are able to focus on sustainability, whereas (the name of the city where the brewery is located) is not quite there yet. So, we need the city to kind of change the way they think about things. Because the infrastructure isn't really there right now. The water system in (the name of the city where the brewery is located) is really old and outdated, and a lot

> *of infrastructure is out dated. There is not really any financial incentives for sustainability, which isn't necessary but will definitely help as people are looking at what they are doing. So, looking at things like grants available to become more sustainable, would be awesome, but we don't have much support right now from the city of (the name of the city where the brewery is located) around sustainability."*

Other brewers agreed that financial support, in the form of loans and grants, regardless of the origin of the funds, were needed to meet the upfront costs of implementing sustainable practices. In the brewing industry sustainability can require the purchase or adaptation of expensive equipment. Storage, and the associated costs, were also named as a barrier to adopting more extensive recycling practices.

> *"The reality is that there are certain things that we like to do that are not always economically feasible for a brewery our size. You know, an example would be something like --- (here, the respondent gave a big nationally known brewery name as an example). They have a CO2 recovery system where they are able to recapture carbon dioxide coming off all their fermentation tanks, and they are able to then reuse it in the beer, but a system like that cost several million dollars, and it's not viable for a small craft brewery to do something like that."*
> *"A lot of sustainability practices that I have seen are geared towards larger production facilities. You know, when you are as small as we are it's hard to be able to afford the equipment they recommend, because storage is a premium. My entire space, to include tap room and production area is 1,800 square feet. For instance, if I was to recycle my carboard, how long would I have to store it before my truck has to come pick it up. I have no place to put it, and I cannot expect anyone to come and give me any space. I guess more information geared towards smaller facilities like me would be very helpful."*

Support in the form of education, information, and knowledge was also brought up as something that was lacking and that would help more businesses, especially smaller organizations, to implement sustainable practices and identify related opportunities more easily.

> *"The support that I think will help us out as brewery is education. The knowledge to understand opportunities and things that we can do. For a lot of us, we don't have professional background in brewing, so we don't fully understand all the standards that come into the industrial manufacturing aspect of brewing. So, knowing or having knowledge about opportunities and things that we can do to be more sustainable is important. Also, through*

> *that education are things that we might know about, but they are crazy expensive and crazy big for small operation. So, I guess that an understanding of what I can do at a small level, and what can I do at a medium level that are good or reasonable for my brewery size."*
> *"To some degree we work with (here the respondent gave the name of a big electricity company) and local utility providers to have their engineers give us perspective and gain some insights from them. Of course, we went heavily on the vendors and the suppliers of sustainable applications to come in with the knowledge to make sure that we are able to implement it and learn effectively or to do a real thorough analysis of what it actually cost to implement."*

Another respondent argued that both financial support and information were needed in order for businesses to adopt more sustainable practices and implement systems to reduce wastage and, for example, repurpose water. The brewer explained that with the right information and financial support there were many ways in which breweries could become more efficient, which in turn would have benefits for the environment.

> *"I think it would be nice if there was some funding available and obviously some information as well. I think that could make a smaller operation like ours more excited and more willing to entertain adopting certain measures. Even if it's something as simple as repurposing water. Our water goes into our septic system and then eventually back into our ground system. So, you can argue that's a kind of sustainable looping of itself. Having said that, I think we could become infinitely more efficient with the water that we use, particularly what's being pumped in the heat exchanger. If we have the ability to capture that and repurpose it, I think that would be a good move for the environment."*

One example of information that would support businesses in attempts to become more sustainable was given by a brewer concerning information regarding new products. The brewer suggested that informative support might be provided by the vendors and representatives of products and services that the brewers use. The vendors and representatives would be knowledgeable about innovations in the industry and possess sustainability credentials related to new products.

> *"I think that some of our vendors, could be more aware of new products. For example, we use (here the respondent gave the name of a big catering company). If they had an 'easy lift' and they train all of their reps, they could just say, 'hey, we've identified these products as less impactful on the environment.' If somebody could just kind of do that instead of us researching every single product. That would be helpful if the sales reps of our vendors knew more products."*

A concern was raised regarding excessive bureaucracy and paperwork. Some participants called attention "red tape" as a potential barrier to implementing sustainable practices, explaining that support that simplified and streamlined the bureaucratic process and provided practical guidance would make businesses more likely to pursue such efforts.

> *"I would say less bureaucracy and paperwork and more practical streamline support would be great, you know, if it was an easy initiative. We've already converted to LED (Light Emitting Diode) lighting, but something like that, they say, 'Ok, here is the incentive. We will give you a rebate.' You fill out this paper work, send us a picture of what you did, and we are done; without having to go through a whole energy audit or whatever."*

One brewer mentioned the possibility of using some form of recognition, reward, or accreditation for businesses that actively pursue sustainability efforts. For example, an industry award for sustainability could also be associated with a degree of exposure and free advertising. In this way, the efforts of responsible companies would be recognized and rewarded, which would also be communicated to the wider public, and in turn would contribute to attracting new customers.

> *"If there was some sort of recognition for breweries that operate as standardly as possible, some sort of campaign where you get free advertising for that sort of exposure, I think that that will drive better sustainability because there will be a customer-based incentive for it."*
> *"Like an awards thing that you can put in your window or you can put in your local paper. 'Hey, this brewery won the least amount of water during process award…' That type of thing would be great."*

5.5.2. Quantitative results

Sample Characteristics

A total of 237 valid responses were received, over the ten-week period the survey remained open, representing a response rate of approximately 3% of all registered breweries with the Brewers Association.

Table 5.1 shows that of the 237 respondents, who self-identified as owner operators, 81% were male, 86% were Caucasian and all were equally dispersed throughout the United States. Some 37% of respondents were between the age of 37 and 46. The dominant (24%) income level was recorded at over $150,000 per annum, with approximately 15% of respondents earning less than $54,000, in the year of the study. In terms of educational background, a majority of respondents (just over 52%) declared that they had earned a bachelor's degree and 33% of respondents declared that they held a masters (25%) or doctoral degree (8%). Just under 40% of the respondents indicated that they had been in business for 8 to 11 years, while 32% indicated that they had been in business for 12 to 15 years. Based on tank size, approximately 29% of the respondents declared that they sold 1001 to 5000 barrels (1 barrel=31 gallons) of beer, in the year of the study. A majority (62%) of the brewers stated that they were using 15-barrel (32%) and 30 or more barrel (31%) system in their breweries. Only 5% of the brewers stated that they are using a 1-barrel system.

Table 5.1 Demographic profile of the participants

Demographics	N	%	Demographics	N	%
Age			**Education**		
27-36	74	31.3	Some high school	4	1.6
37–46	88	37.1	Some college	16	6.7
47–56	40	16.8	Associate degree	13	5.4
57-66	25	10.6	Bachelor's degree	124	52.3
67 and older	10	4.2	Master's degree	61	25.7
Gender			Doctoral degree	19	8.0
Male	193	81.4	**Years in business**		
Female	32	13.5	Less than 3 years	34	14.3
Prefer not to answer	12	5.0	4–7 years	19	8.0
Ethnicity			8–11 years	93	39.2
Caucasian	204	86.0	12–15 years	77	32.4
I prefer not to answer	22	9.28	More than 15 years	14	5.9
Asian/Pacific Islander	6	2.5	**Current annual volume of sales**		
Latino/Latina/Hispanic	5	2.1	(based on tank size)		
Income			1-500 bbl.	48	20.2
Under $25,000	8	3.3	501-1000 bbl.	35	14.7
$25,000–$39,999	10	4.2	1001-5000 bbl.	69	29.1
$40,000–$54,999	18	7.5	5001-10000 bbl.	50	21.0
$55,000–$75,999	36	15.1	10000 or more bbl.	35	14.7
$76,000–$99,999	55	23.2	**Size of production system**		
$100,000–$150,000	51	21.5	(based on tank size)		
Over $150,000	59	24.8	1 bbl.	12	5.0
			5 bbl.	56	23.6
			7 bbl.	20	8.4
			15 bbl.	76	32.0
			30 or more bbl.	73	30.8

Descriptive Analysis

Table 5.2 summarizes the mean, standard deviation, and skewness for each of the "Environmental Sustainability Practices Motivation" variables. The results point to, on average, a high level of agreement for most variables, with a range spanning a low m = 2.32 for variable 23 (The community that I am based in demands that I run an environmentally friendly brewery) to a high m = 4.26 for variable 11 (I am aware of state and federal environmental laws and regulations) on the five-point agreement scale.

Table 5.2 Sustainable Practices Motivation Variables

Dimensions/variables	Mean	Std. dev.	Skewness
Top management			
v1—I consider environment preservation to be an important aspect of my life.	4.19	1.014	-1.03
v2—I consider myself educated about environmental issues.	4.23	0.845	-0.819
v3—I would consider establishing an environmental management system at my premise.	3.81	1.25	-1.033
v4—I would consider implementation of environmentally friendly practices to be in the top-three priority list in my business plan.	3.42	1.285	-0.464
Cost consideration			
v5—I believe implementing environmentally friendly practices would be beneficial economically in the long run.	4.02	1.265	-1.373
v6—I would only consider implementing environmental management system when defiance would cost me a penalty.	2.58	1.455	0.453
v7—I would consider spending on advertising to promote the brewery if I decide to be environmentally friendly.	3.39	1.132	-0.655
Employee			
v8—I intend to include environmental awareness in the training program.	3.55	1.338	-0.512
v9—I would reward employees if they contribute ideas that elevate the implementation of environmentally friendly practices.	3.92	0.978	-0.938
v10—I would encourage employees' involvement in the process of establishing environmental management system.	3.81	1.223	-1.126
Law and regulation			
v11—I am aware of state and federal environmental laws and regulations.	4.26	0.682	-0.374
v12—I feel restricted by the laws and regulations.	3.03	1.303	-0.256
v13—I feel that the local authorities are concerned about the environment.	2.97	1.197	-0.059
v14—I feel that the federal law is concerned about the environment.	2.94	1.181	0.132
Green suppliers			
v15—I select suppliers that practice sustainability management.	3.16	1.036	-0.921
v16—I would consider changing my 'non-sustainable' suppliers to sustainable suppliers.	3.29	1.189	-0.608
v17—I would educate my suppliers on the importance of being sustainable.	3.08	1.238	-0.377
v18—There is an abundance of sustainable suppliers to choose from.	2.42	0.992	0.348
Trade pressure			
v19—I feel that being an environmentally friendly establishment will give me an added advantage over my competitors.	3.29	1.101	-0.465
v20—I feel that there is a need to be a sustainable innovator in the brewing industry.	3.77	1.23	-1.031
v21—I feel that being an environmentally friendly establishment will increase the revenue of this brewery.	3.29	1.216	-0.602
Stakeholder pressure			
v22—My customers demand that I run an environmentally friendly brewery.	2.52	1.122	0.184
v23—The community that I am based in demands that I run an environmentally friendly brewery.	2.32	1.013	0.109
v24—I feel that the community that I am in is generally an environmentally aware community.	3.03	1.14	0.367

Performance of the research instrument

While the over-riding goal of this research was to identify the key sustainability practices, it was also deemed essential to test the psychometric properties of the research instrument for reliability and validity. The alpha coefficient for 24-items is 0.83 (=237), suggesting that the scale performed well. These reliability scores clearly exceed the usual recommendation of $\alpha = 0.70$ for establishing internal consistency of the scale.

The Environmental Sustainability Practices Motivation scale was then exposed to an exploratory factor analysis, using the principal component extraction technique. This was designed to attest to the scales' ability to discriminate between the variables explaining the underlying factor structure, by definition, the key motivators driving environmental practices in craft brewing among the respondent group. The analysis used the VARIMAX factor rotation procedure in SPSS 22. A component matrix was initially generated to ensure that the analyzed variables had reasonable correlations (greater than or equal to 0.5) with other variables. Un-rotated and rotated component matrices were inspected, and all variables were found to correlate well. The result of the corresponding KMO of "sampling adequacy" was 0.737 and Bartlett's test for sphericity was 625.925; significant at the level of 1 percent (sig. = 0.001). The results of these tests rendered the data factorable and consequently the factor analysis was generated.

Table 5.3 Exploratory factor analysis—Sustainable Practices Motivations

Variables	FI ENV	F2 REG	F3 FIN	F4 COM	F5 INV	F6 COMP
v.1	.816					
v.2	.743					
v.3	.727					
v.4	.577					
v.11		.790				
v.12		.779				
v.13		.698				
v.5			.760			
v.6			.750			
v.7			.553			
v.22				.847		
v.23				.699		
v.24				.503		
v.8					.759	
v.9					.716	
v.10					.589	
v.19						0.736
v.20						0.711
v.21						0.602
Eigenvalue	5.962	1.894	1.634	1.441	1.186	1.109
% of variation	29.812	9.472	8.169	7.204	5.929	5.546
α	0.79	0.76	0.72	0.69	0.68	0.64

Upon further analysis of the rotated component matrix, five variables (V14, V15, V16, V17, V23) were found to cross-load across multiple factors, and it was determined that a six-factor solution—using fewer variables and dimensions—better represented the underlying structure. The eigenvalue greater than one rule and the scree plot technique were performed, in order to determine the number of factors that needed to be extracted. Five variables were excluded in the final factor loading.

V14. I feel that the federal law is concerned about the environment.

V15. I select suppliers that practice sustainability management.

V16. I would consider changing my 'non-sustainable' suppliers to sustainable suppliers.

V17. I would educate my suppliers on the importance of being sustainable.
V18. There is an abundance of sustainable suppliers to choose from.

Factor analysis was re-run, with the same extraction and rotational techniques, after removing these five items. These six factors explained 66% of the total variance in the data. The factors were labeled as follows: (1) Environmental Involvement (EI), (2) Regulation (REG), (3) Financial(FIN), (4) Community(COM), (5) Involvement(INV), and (6) Competition(COMP). Accordingly, six factors were identified with the Cronbach's alpha values, ranging from $\alpha = 0.64$ for Competition, to $\alpha = 0.79$ for Environmental Involvement, (Table 5.3). The first factor was robust, with a high eigenvalue of 5.96, and it accounted for 29.8% of the variance in the data. This has been labeled "ENV" for Environmental Involvement and appears to be reflective of Kasim and Ismail's "Top Management" dimension. Factor two had an eigenvalue of 1.89 and accounted for a further 9.47% of the variance. This factor has been labeled "LAW" and aligns very well with Kasim and Ismail's "Law and Regulations" dimensions. The eigenvalues for factors three and four were 1.63 and 1.44 respectively, together accounting for a further 15.3% of the total variance. Factor three, "FINAN" for financial, aligns with "Cost Considerations" , and factor four, "INV" for involvement, also aligns very closely with the dimension labeled "Employee Connectedness". Similarly, the eigenvalues for factors five and six were 1.18 and 1.10 respectively, together accounting for a further 11.4% of the total variance. Factor five, "COMUN" for community, aligns with the "Stakeholder Pressure" and factor six, "COMP" for competition, seems to be aligned with "Trade Pressure".

5.6. Discussion

This study aimed to investigate the factors and motivations that drive engagement with sustainability and environmental issues and efforts among craft brewery owners in the US. The

study has theoretical and practical implications for craft breweries, policy-makers, and academics. From the perspective of policy, while there is a significant body of literature addressing environmental engagement and the psychological motivations driving it in the business sector, there is very limited work exploring this topic in the specific context of craft brewing. This study thus contributes to an understanding of the factors driving environmental engagement, as well as their relative significance to craft brewers, which is critical to increasing the ability to target resources, both financial and material, and make the brewing process more sustainable and environmentally friendly. From the academic perspective, the findings of the present study are in alignment with those of previous studies (ex: Kasim & Ismail, 2012) conducted in a broader business context and support the theory that craft brewery owners are driven by similar factors and motivations to owners and managers of businesses in other sectors.

More specifically, the first, qualitative phase of the study found that the owners' personal beliefs and environmental concerns were a factor that influenced their organizational decision-making. Indeed, several brewery owners expressed their belief in sustainability and environmentally responsible behavior as a morally 'right' lifestyle choice and were personally concerned about the environment. Another such belief, expressed by the participants, is that it is part of the attitude, behavior, and role of a leader to consider sustainability and to embrace industry best practice in this regard. The brewers acknowledged the heavy reliance of their industry on energy and water, and the responsibilities they and the industry had to use these resources in a sustainable way, as well as the threat the sector would face if these resources were threatened or became scarce.

The results of the second phase of the study, the quantitative phase, revealed that the most influential factor, impacting the implementation of sustainable practices and behaviors in the

brewing industry, is the attitude of top management. The data revealed that it is top management that ultimately takes decisions and has a fundamental influence on organizational practices. Both quantitative and qualitative findings suggested that the owner's attitude towards and knowledge of environmental issues and practices are reflected in the brewery's overall stance, in terms of the cost considerations and level of employee engagement in the implementation of sustainable practices. It is clear that an intrinsic sense of personal moral responsibility, among top management, in regard to the environment is critical to the implementation of environmental management and sustainable practices within an organization. This finding is in line with the conclusions of Kasim and Ismail (2012), and Stone, Joseph and Blodgett (2004), who claimed that managers see the implementation of sustainable practices as inherently profitable and harmonious to the aims of increased market share, cost control, and efficient production.

Regulation

Interviews were carried out to find out participants' perceptions of legislation and legal requirements related to sustainability, and how the proposed legal standards compare to the practices and behaviors already engaged in by industry decision-makers, and their opinions of relevant legislation. These opinions and perceptions were varied, from beliefs that legal standards of sustainability were likely to be lower than those the industry set for itself, even that sustainability would be a 'natural focus' of any established company in the sector, to the view that regulation would be inappropriate and ineffective in some areas. It was generally agreed that, if it was even necessary, the need for regulation was not urgent, as efficiency standards within the industry are high and most industry players are already acting in an environmentally responsible way, and in accordance with other, non-legally binding standards intended to hold the industry to account. It was mentioned, though, that this was motivated by various factors

beyond environmental consciousness, such as consumer expectations, outward appearance, and cost savings. The quantitative and qualitative results related to regulation were in alignment, suggesting 'regulation' as the second key factor influencing breweries' predisposition to adopting green behaviors.

Financial

The interview participants were also asked about the costs associated with sustainable practices, and highlighted that these are typically higher, an increase that is passed on to consumers in the form of a more expensive product. The brewery owners confirmed that cost would be a key factor in any sustainability-related decision-making, and that increased costs would be a more significant barrier for smaller-scale breweries. The majority of the respondents agreed that breweries with more financial resources were better able to bear the financial burden of improvements aimed at being more environmentally friendly, and indeed business improvements overall. Even where the respondents were confident that these investments would pay back over the long term, they expressed concerns about the time-scale in which benefits would be realized. Others perceived that the costs associated with sustainable practices were balanced out more quickly, for example if landfill waste was avoided or reduced, as waste disposal is also associated with financial cost. It was agreed, by several participants, that if sustainable practices led to efficiencies that generated cost savings, these practices would be welcomed by brewers, provided the upfront cost was not prohibitively high. It can be concluded, from the interview findings, that brewery owners are first and foremost business people, with priorities dictated by profit, revenue, and costs. It was indicated by a number of participants that opportunities to reduce costs, and thus increase profits by adopting sustainable practices, would be welcomed, a decrease in the quality of the product would not be accepted. These findings

were corroborated by the conclusions from the quantitative phase, which identified 'financial' factors as the third most important influence on the adoption of sustainable practices.

Community

The interview data showed clearly that participants were aware of consumer concerns regarding sustainability; indeed, they confirmed that they received enquiries about the sourcing of materials, the use of resources and chemicals, and recycling or disposal of packaging and waste products. When they were able to provide consumers with responses, they deemed satisfactory, they were met with praise, approval, and support. The brewery owners highlighted public perception as an important concern for them and noted the PR benefits that could be derived from a public commitment to, and demonstration of, environmentally friendly attitudes and behaviors. This links back to the financial dimension, as there is an expected financial benefit to being perceived as an ethical and environmentally aware business, in attracting more customers. Overall, the community factor was acknowledged as an important concern, which was confirmed in the quantitative data also, as the fourth most influential driver.

Involvement

The interview data revealed that most of the breweries had already incorporated environmental awareness in their employee training. The survey findings further revealed that several brewery owners rewarded employees for making suggestions for further green practices that could be implemented within the organization and would encourage them to engage in environmental initiatives and the implementation of green practices in the company. A few participants reported that, in addition to consumer perceptions, staff perceptions were also a driver of sustainability in the brewing industry, as many staff members held personal beliefs and concerns about the importance of environmental protection and wanted to be employed by a

responsible organization in this regard. The quantitative phase of the study identified staff involvement as the fifth strongest driver of sustainability practices, for the study participants. As such, it can be concluded that brewery owners who took part in this research are motivated to increase employee engagement in their future environmental management plans.

Competition

Schubert, Kandampully, Solnet and Kralj (2010) argued that hospitality and service organizations that demonstrate a strong engagement with environmental issues, and implement environmentally friendly practices, could derive competitive advantage by distinguishing themselves from their competitors on this point. The present study confirmed that brewery owners see a reputation for being an environmentally friendly and ethical company as a way of standing out in their industry; however, this was not the most important driver of environmental practices for the participants in this study.

Support

Although not one of the primaries aims of this research, it was interesting to hear from brewery owners what their opinions were on what support could be provided to increase and support their efforts to implement environmentally friendly practices in breweries. Various different types and sources of support were highlighted and are presented here to help guide policy-makers in their future decision-making.

Several respondents reported a belief in the role of the city in supporting breweries to become more sustainable, as part of more general, city-wide initiatives. Specifically, they mentioned financial incentives as one type of support the city could provide. Indeed, financial support was mentioned first by all respondents when asked about how they could be supported to implement and improve sustainable practices, and examples given included loans and grants to

cover the initial costs of, for example, purchasing or upgrading equipment. The cost of storage was also highlighted as a barrier to adopting more sustainable or extensive recycling/re-use practices, which financial support could contribute to solving.

Aside from financial support, education, and the sharing of information and knowledge, was cited as another area in which support is currently lacking. Respondents argued that this would help smaller breweries, in particular, to adopt, adapt, and implement sustainable practices and identify opportunities for more environmentally friendly behavior. In terms of the types of information needed, respondents cited information about new products and technology; this type of knowledge could be provided by vendors, representatives, and developers of these products and services. Their knowledge of industry innovation could increase the sustainability credentials of the industry, through the adoption of cutting-edge technology and products.

Another type of support mentioned was the removal of barriers created by excessive bureaucracy and paperwork; if policymakers were to facilitate a more streamlined, simple process and provide practical guidance, the adoption of sustainable practices would be made easier and more feasible for craft breweries, and thus increase the likelihood of it occurring. Another potential form of support for the adoption of sustainable practices, that was highlighted by several brewers, was incentivizing environmentally friendly behavior through recognition, for example in the form of accreditation, or even awards, for businesses demonstrating high standards in this area. As well as the reward itself being a motivation, initiatives of this kind could also provide opportunities for free advertising and exposure, as the efforts of the companies involved would be communicated to, and recognized by, a wider public, potentially driving new business.

The findings of the present study also confirm the reliability of Kasim and Ismail's (2012) instrument for measuring environmental motivation. In future studies it would be useful to test for variance between different groups of owners in the brewing industry, based on gender, owners' environmental knowledge, awareness, values, and new versus well-established owners.

CHAPTER 6

ARTICLE 3: US Craft Brewery Owners' Environmental Values, Involvement, and their Relationships with Breweries' Environmental Performance

6.1. Abstract

This study examines the role of US craft brewery owners' environmental values and involvement in advancing environmental sustainability. It also investigates the effects of business challenges on breweries' environmental sustainability. An online questionnaire was distributed to a convenience sample of US craft brewers through the Brewers Association Brew Forum Blog. A total of 237 valid responses were received. Structural equation modeling was used for testing hypothetical relationships among key constructs in the proposed research model: environmental values, environmental involvement, environmental sustainability practices and business challenges. The results showed that environmental values positively influenced environmental involvement and environmental practices, while environmental involvement also positively influenced environmental practices. Furthermore, business challenges were found to moderate the relationship between owners' environmental involvement and sustainable practices. The findings confirmed the significant role of brewery owners' environmental values and involvement in advancing environmental activities in breweries. The research demonstrates that the environmental decisions made in craft breweries appear to be mainly determined by the individual attitudes of brewery owners. Specific theoretical and practical implications are discussed, and suggestions for future research are provided.

6.2. Introduction

In recent years, environmental management (EM) considerations have increased in importance to now comprise a key facet of both the social responsibility and business strategy of a company. Scholars of the subject maintain that corporate EM is generally driven by how a company's upper management perceives the issue itself (Banerjee, 2001; Sharma, 2000). Past studies have investigated how the upper management of companies operating in a variety of different industries have taken a proactive approach to topical environmental issues of the day (Banerjee, 2001).

Given that the majority of this research has indicated that company approaches were largely dictated by the individual perceptions of their top managers, we expected to see similar results in our study; namely, that the individual values of brewery owners would be instrumental in determining their EM policy. Due to the fact that a substantial percentage of US craft breweries are small enterprises with only a handful of employees, we expected that the ideals of individual owners or managers would heavily influence their companies' EM strategy. Historically, craft brewers in the US have been primarily concerned with optimizing their production methods to enhance the flavor of the product, reduce expenses and increase profit margins, but a growing awareness of environmental issues in recent years has led to an increase in sustainable practices (Fillaudeau, Blanpain-Avet and Daufin, 2006). While past studies have shed some light on how top management influences corporate EM policy, previous work has revealed very little about how environmental values and involvement of upper management are formed in the first place. The particular perceptions of all kinds of EM issues and ideas are, by their very nature, based upon the personal prejudices, personality and psyche of the manager in question (Hambrick & Finkelstein, 1987).

It is widely accepted that upper management's individual beliefs surrounding environmentalism are a key contributing factor to the EM policy of their company (Bansal and Roth, 2000). However, there is very little empirical evidence to demonstrate the impact that these values have in a tangible sense. In order to satisfy this deficit in the research, our study aims to analyze the relationship between the individual manager's environmental outlook and the sustainability practices of their brewery, regarding the former as a key psychological characteristic which influences and motivates the direction of the latter.

However, discovering the nature of this relationship is not the only purpose of this research paper. Since the motivational factors of upper management are invariably counterbalanced by logistical challenges and difficulties in the implementation of green practices, it is logical that these obstacles can inhibit partially or preclude entirely the transition to a more sustainable brewery. While several papers have focused on these challenges in isolation (Post & Altma,1994; Murillo-Luna et al., 2008), there is minimal research encompassing both the motivating factors and the inhibiting obstacles in one single study.

Therefore, the objectives of this research are fourfold:
(a) to design and evaluate a conceptual model of environmental sustainability in the craft brewing industry in the US; (b) to assess the relationship between the environmental values of craft brewery owners and their involvement in the breweries' environmental management policies; (c) to appraise the overall role that owners plays in craft brewing environmental sustainability in the US; (d) to determine the extent to which challenges and difficulties within the brewing industry negatively impact the implementation of an EM policy.

6.3. Literature review

Given that even an efficient brewery consumes between four liters and seven liters of water for every one liter of beer produced (Scheller, Michel & Funk, 2008), it's unsurprising that water is the most abundantly consumed ingredient in the brewing process. Indeed, beer is composed of 92% water, with the remaining 8% made up of ethanol and raw material extracts (Kunze, 2004, p.219). In addition to its role as an ingredient in the product itself, sanitary water supplies are also vital for cooling and heating the brewery equipment, as well as cleaning both it and its surroundings. As a result, the conservation of water is the principal sustainability challenge facing the industry (Grunde, Li & Merl, 2014).

Furthermore, wastewater represents one of the main waste streams created by the brewing industry. There is strict legislation in place which requires breweries to treat and discharge the wastewater in a method that will not damage the environment or endanger the humans and animals which live in their vicinity. In an ideal scenario, the brewery will have systems in place which allow it to reuse the wastewater instead of discharging it as effluent. In this manner, a brewery can optimize its water conservation strategy and reduce the costs incurred by safely disposing of the wastewater, thus providing environmental and financial incentives to both decrease the amount of water that is used (and thereby diminish the amount of wastewater created) and to employ cost-effective methods of treating that wastewater so it can be repurposed.

As well as wastewater, the brewing industry is also responsible for the creation of a number of solid waste streams, including leftover organic matter (such as spent grains and hops), sludge, excess yeast, diatomaceous earth, slurry created by the filtration process (Kieselguhr sludge) and trub, alongside surplus materials left over from the packaging stage. Due to the environmental

obligations and monetary costs associated with waste disposal procedures, adequate management of these waste streams comprise a substantial part of a brewery's operations.

Other, less significant forms of waste generated in the brewing industry include bottle caps, cardboard, glass, pulp created by labelling and wood, each of which is generally disposed of via landfill. In particular, the distribution phase of the brewing process can represent a significant challenge for the industry, especially with regard to small businesses. This is due to the large amounts of packaging consumed and the sustainability of a company's operations is often dependent on the type of packaging they prefer, whether that be aluminum cans, glass bottles or steel kegs.

Aside from resource consumption and waste generation, energy consumption is arguably the single biggest contributing factor to the sustainability profile of a company in any industry and breweries are not an exception. Energy input is a necessity at almost every stage of the brewing process, with particularly substantial amounts required during the boiling and cooling of the wort, the packaging of the beer and the distribution of the finished product to stores, bars and restaurants. Given that energy consumption has a significant impact on the environment in general and climate change in particular, various sustainable practices have been incorporated into the brewing process to optimize energy use and encourage the uptake of renewable sources of power. Incentivized by the rising costs of energy and the growing awareness of its impact on the environment, the industry has looked to innovative processes and sophisticated technical solutions to minimize energy consumption (Unterstein, 1992).

As well as optimizing the efficiency of specific facets of the brewing process, breweries can also boost their energy efficiency through technological innovations and inventions. In general, craft breweries are comparatively less energy-efficient than their larger counterparts

(Sturm et al., 2013). This is due to a number of prohibitive factors which discourage a transition to sustainable practices, including economies of scale, restrictive load factors and limited access to innovations, technologies and cutting-edge production processes. Although financial considerations might be an obstacle to implementing energy-efficient solutions, craft breweries can still concentrate their efforts on other areas of energy conservation to enhance the overarching efficiency and sustainability of their company.

6.3.1. The influence of upper management on environmental policy

Upper management plays a significant role in influencing environmental initiatives within any organization, from their initial inception to their final implementation. Epstein and Buhovac (2014) stress the importance of leading by example with regard to developing and introducing sustainable practices into a company's business strategy, as well as communicating the necessity of corporate sustainability to both internal and external stakeholders. In the context of the US craft brewing industry, this upper management refers to individual brewery owners. Previous studies have suggested that the introduction of responsible leadership could be instrumental in enhancing a company's sustainable performance within the wider community (Voegtlin, Patzer & Scherer, 2012). This responsible leadership has been defined as the ability to mobilize internal and external stakeholders to achieve common business goals (Maak, 2007); in an environmental sense, this leadership would coordinate the efforts of stakeholders both inside and outside the company to achieve objectives related to improving its environmental performance.

Past research has also indicated that one of the biggest factors driving the environmental policy of a company is the support and impetus of upper management. How a manager or owner perceives environmental issues in relation to their business will determine whether they view

those issues as more of an opportunity or a threat, and as such will be instrumental in influencing the introduction of sustainable practices in the company's business model.

Environmentally responsible managers and owners are ones who have the foresight to take into account how their business practices will affect both internal and external stakeholders, as well as weigh up their individual concerns and more forward with them to create a corporate strategy which benefits all (Epstein & Buhovac, 2014; Voegtlin el al., 2012). Furthermore, an environmentally responsible manager or owner should also have the capacity to explain to the workforce that environmental responsibility is a key facet of the company's ethos and encourage them to incorporate sustainable strategies and practices into their daily routine (Banerjee, Iyer & Kashyapet, 2003).

Due to the smaller size of their companies and the comprehensive view of its operations that they enjoy, craft brewery owners command a greater ability to identify areas which could benefit from greater environmental awareness. However, this ability is largely dependent on the individual owners' abilities to respond positively to external environmental pressures. If an owner is capable of viewing these pressures as an opportunity to enhance the quality of their product while reducing waste and improving their corporate image in an environmental sense, their role in upper management is more likely to be effective in implementing sustainable practices. As a result, it was predicted that owners or managers who display robust environmental awareness are more likely to consider environmental issues when devising corporate strategy and to exhibit more dedication to achieving improved sustainability.

6.3.2. Theoretical background

The Upper echelon Theory

In their 1984 paper, Daft and Weick state that a company is defined by how it interprets the surrounding industry and environment, and that these interpretations are generally formed by a small number of upper management executives who wield the power in the company. Through the process of managerial discretion and decision-making, these individuals shape the company's corporate strategy (Hambrick & Finkelstein, 1987). This position has been repeatedly adopted by scholars on the subject, who have used it to investigate corporate reactions to environmental pressures (Banerjee et al., 2003; Ramus & Steiger, 2000). One concrete example can be observed in Sharma's 2000 study, which concluded that those individuals who viewed environmental pressures as an opportunity rather than a threat were far more likely to adopt a proactive approach to environmental management (EM). Moreover, a company's dedication to enhancing EM is directly proportional to how engaged its upper management is in the issue (Aragón-Correa, Matías-Reche & Senise-Barrio, 2004).

The upper echelon theory (Hambrick & Mason, 1984; Hambrick, 2007) offers a theoretical model which evaluates how the interpretations of upper management affect company strategy. The basic logic of this theory is underpinned by two fundamental tenets, both of which are interconnected. The first states that upper management bases its decisions and actions on how it interprets the external environment, while the second contends that these interpretations are colored by the individual personalities, beliefs and experiences of the manager or owner in question (Hambrick, 2007).

The Theory of Consumption Values

When speaking of values, we refer to the ideas and beliefs which are associated with a certain state of being which we wish to attain and, as such, which have a direct influence upon our actions (Schwartz and Bilsky, 1987). These values are responsible for affecting and altering our attitudes and impacting upon the decisions we make, aiding us in our daily activities and allowing us to categorize and classify various inanimate objects, real-world situations and life events (Long and Schiffman, 2000). One area of our consciousness in which values can play an instrumental part in defining our beliefs and behaviors is our notion of environmental responsibility (Kilbourne and Pickett, 2008).

Following years of research in a wide number of disciplines, including consumer behavior, psychology and economics, Sheth, Newman and Gross have developed a working theory of consumption values (1991). The authors categorized the consumption values which impact consumer choice behavior into five distinct categories: functional value, social value, emotional value, conditional value and epistemic value. These five different values operate autonomously and can have conflicting but concurrent effects upon consumer choices in any given situation.

This theory developed by Sheth et al. has stood the test of time, having been applied, examined and assessed in many different settings. In each instance, it has offered up dependably compelling results (Lin & Huang, 2012; Biswas & Roy, 2015). At its core, the theory has three central axiomatic propositions: (i) the choice of the consumer is dependent upon a variety of consumption values, (ii) the impact of these consumption values will vary in strength and in relation to one another depending upon the unique circumstances of the situation and (iii) the consumption values operate autonomously. In short, consumer choices can be impacted by any

or all of the five different consumption values, each of which will have a fluctuating effect depending upon the situation and each of which contributes independently of its counterparts. The functional value is the name given to the supposed utility or benefits relating to the physical or utilitarian performance of the product or service, through factors such as its longevity, dependability and affordability, and is often viewed as the driving force behind the consumer's choice (Sheth et al., 1991). Environmentally-minded consumers have been found to care enough about the preservation of the Earth that they will happily pay a premium price for green products or services (Lin & Huang, 2012), while consumers have also been found to weigh price against quality when buying recycled products (Laroche, Bergeron & Barbaro-Forleo, 2001). As such, the functional value clearly affects the environmentally-minded consumer (Khan & Mohsin, 2017).

The social value is the name given to the supposed utility or benefits of a product or service's perceived association with specific cultural, demographic or socioeconomic groups (Sheth et al., 1991). In this sense, the social value is closely tied to the importance attached to projecting an acceptable image of oneself to others and receiving their acceptance (Phipps et al., 2001) and can be observed affecting the decisions of the environmentally-minded consumer (Khan & Mohsin, 2017).

The emotional value is the name given to the supposed utility or benefits that a product or service may acquire due to the emotional response it provokes. Due to the fact that products and services contain both utilitarian and hedonistic facets in their composition, they often elicit emotional responses (Chung, Song & Lee, 2017). The presence of both utilitarian and hedonistic components is significant in determining consumer behavior, as noted by Mackay (1999), given that both reason and emotion dictate the outcome of every consumer purchase decision. When it

comes to buying recycled products, almost all of those who surveyed revealed that they believe they are helping the environment by doing so (Bei and Simpson, 1995). As such, the environmentally-minded consumer's decisions are affected by emotional value (Lin and Huang, 2012).

The conditional value is the name given to the supposed utility or benefits that a product or service may acquire in specific circumstances; for example, the consumption of organically-grown fruit by pregnant women. The conditional value of the product or service is dependent entirely upon the situation and the presence of certain physical or societal circumstances (Sheth et al., 1991). If the product or service is specifically marketed towards an audience likely to experience these circumstances, its conditional value rises (Wang, Liao &Yang, 2013). Conditional value has been observed to have an effect on the behavior of environmentally-minded consumers (Lin and Huang, 2012). Various studies on commodities such as beer, breath fresheners, snacks and soft drinks have highlighted the impact that consumption has on behavior, with sales of those products fluctuating as a direct consequence of particular conditions (Lai, 1991).

The epistemic value is the name given to the supposed utility or benefits that a product or service may acquire due to its ability to arouse curiosity, provide novelty or stimulate a thirst for knowledge (Sheth et al., 1991). In particular, knowledge has been identified as a factor which impacts upon each phase of the decision-making process (Laroche et al., 2001). Another scenario in which epistemic value could be attributed to a product or service is when it promises its purchasers the ability to gain new problem-solving skills. The environmentally-minded consumer's decisions are also affected by epistemic value (Lin and Huang, 2012).

Based on these principles, the hypotheses are formulated as follows (Figure 6.1):

H1: The environmental values of brewery owners positively and significantly influence their environmental involvement toward implementing environmentally friendly practices.
H2: The environmental values of brewery owners positively and significantly influence their environmentally sustainable performance.
H3: Brewery owners' environmental involvement positively and significantly influences their breweries' environmentally sustainable performance.

In terms of how a firm conducts its routine operations and makes strategic decisions, there are various and significant barrier that might affect or limit the efforts of management to implement change. In a review of both the published and unpublished case studies of service and manufacturing firms, Post and Altma (1994) identify two basic types of barriers: organizational barriers, which affect the firm's capacity to adapt to change and may include environmental issues; and industry barriers, which reflect the particular and unique characteristics of the business activities that the firm is engaged in. Examples of organizational barriers include employee attitudes, inadequate communications, poor management and leadership at the top level, and previous experience and practice. Industry barriers, on the other hand, could include capital costs, the configuration of current operations, technical know-how, industry regulations, and competitive pressures. Together, the combination of obstacles to change give rise to a wide range of both unique and generic challenges. Thus, there is a need for individual firms to initiate a combined effort to address industry-specific environmental challenges and organizational barriers to change, in order to improve their environmental outcomes and overall sustainability. Furthermore, the overcoming of organizational barriers to change can itself contribute to the overcoming of particular industry challenges.

Based on this discussion, the hypothesis is developed as follows:

H4: Business challenges moderate the relationship between environmental involvement and environmental performance such that the bigger the business challenges, the weaker the relationship between environmental involvement and environmental performance.

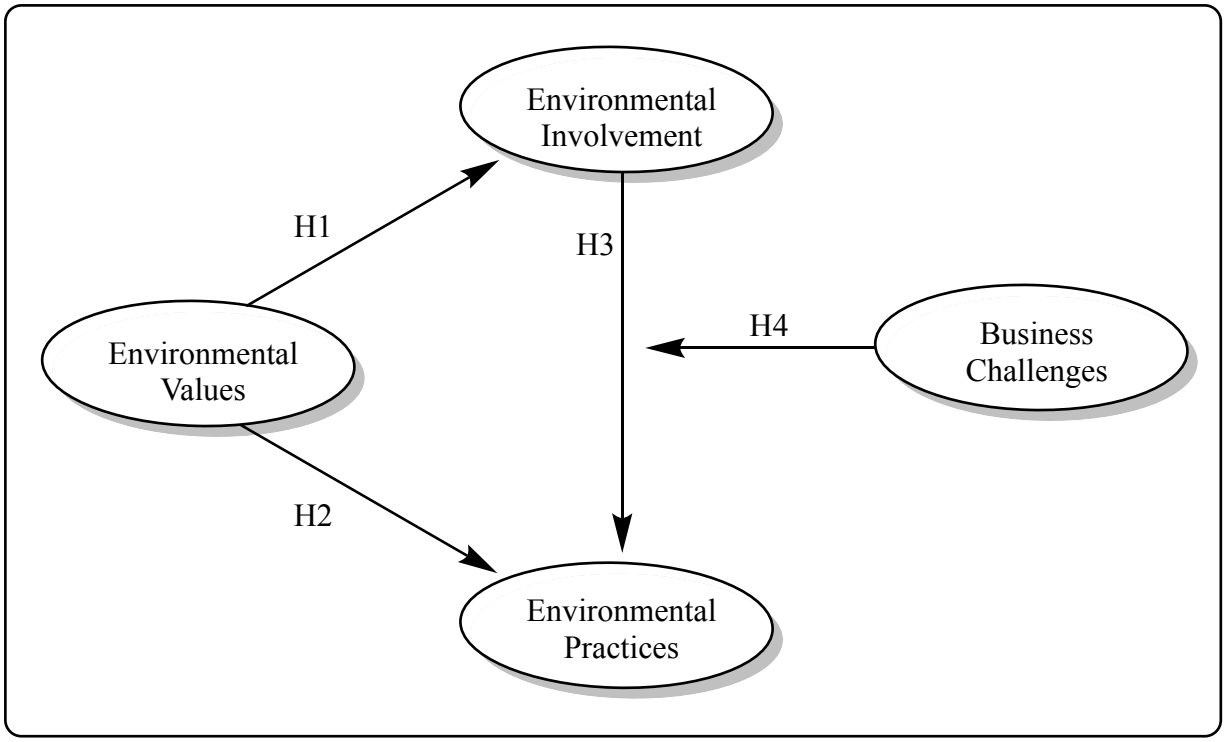


Figure 6.1. Hypothesized Model

6.4. Methods

A self-report survey was prepared using Qualtrics. The survey instrument consisted of a number of distinct sections, each addressing a different theme. These included, environmentally-friendly practices employed onsite, craft brewery owners' environmental involvement, their perceived environmental values, business challenges faced by the breweries, brewery owners' years in business, breweries' operational numbers such as production system, current annual

volume of sale and respondents demographics such as gender, age, ethnicity, education, and income.

Prior to the commencement of the study, a pilot was undertaken wherein the survey was administered to five graduate students and two craft brewery owners, and one expert from the industry. Respondents to the pilot were requested to give feedback on the clarity and relevance of the questions, the scaling technique used, the validity of the constructs and the time required to complete the survey. Based upon this feedback, a number of modifications and refinements were made to the instrument.

For the purposes of the study, sample respondents were defined as founders of or business partners in a craft brewing venture. Accordingly, the final questionnaire was distributed to a convenience sample of craft brewery owners in the United States via the Brewers Association "Brew Forum" blog, which can be accessed by commercially-oriented craft brewers all over the US. Potential respondents were given a brief background on the study, its nature and its aims, as well as a link to the survey itself if they wished to participate. The link directed respondents to an informed consent page, where they were given the option to proceed -or not- to complete the survey. All responses were collected online using Qualtrics software and the survey remained open for a ten-week period between February 2019 and April 2019. Reminders about the survey's existence were posted in the aforementioned forum on the Brewers Association website at weeks four and seven. As a result, 237 usable responses were collected. Reliability analysis, descriptive analysis, correlation analysis, and structural equations modeling were undertaken via SPSS version 22 and Amos 22. The variables were measured using a five-point Likert scale, with available responses ranging from 1) Strongly disagree to 5) Strongly agree. All the scales used came from existing literature and have been validated in prior research.

The environmentally-friendly practices scale was adopted from previous research (Sozen et al. in press) that was used to measure brewery owners' environmental practices that they use in their breweries. The scale includes 45 items such as "Sending spent grain materials to farmers to feed their cattle" and "Recirculating cooling water and use it for next batch of beers". Environmental motivation was measured by a scale consisting of 23 items, which was adopted from Kasim and Ismail (2012). The original scale was developed to examine restaurateurs in Malaysia. The statements were modified in order to be used in the context of craft brewing. The items include "I consider myself educated about environmental issues" and "I feel that the federal law is concerned about the environment". Perceived values scale was adapted from Lin and Huang (2012). The scale determined the influence factors on consumer choice behavior regarding green products. The statements were modified in order to be used in the context of craft brewing. The 19-item scale consisted of five dimensions, which are Functional, Social, Emotional, Conditional, and Epistemic. Examples of the items are, "Having sustainable practices would help me to feel acceptable" and "I would use sustainable product when there is a subsidy for it". The business challenges scale consisted of 14-items with five dimensions, composed of distribution and marketing, employee, legislation, financial, and product. These items were chosen as these are common challenges for every business no matter how big or small, they are. The scale included items such as "When I operate my business, one concept that challenges me is product quality" and "marketing and promotion".

6.5. Results

Demographic information of the respondents is presented in Table 6.1. Of the 237 usable samples gathered, about 81% were male. The participants' age fell within 27–71 years old. Their

mean age was 41.8 years old. Regarding the education level, about 64% indicated that they have a college degree. In addition, about 2% reported that they have a high school degree or less, and 34% indicated that they have a graduate degree. In terms of income level, about 25% reported that their annual income is over US$150,000, followed by between US$76,000–US$99,999 (23%). Just under 40% of the respondents indicated that they had been in business for 8 - 11 years, while 32% indicated that they had been in business for 12 - 15 years. Based on tank size, approximately 29% of the respondents declared that they sold 1001 - 5000 barrels (1 barrel=31 gallons) of beer in the year of the study. A majority (62%) of the brewers stated that they are using a 15-barrel (32%) and 30 or more barrel (31%) system in their breweries. Only 5% of the brewers stated that they are using a 1-barrel system.

Table 6.1 Demographic profile of the participants

Demographics	N	%	Demographics	N	%
Age			**Education**		
27-36	74	31.3	Some high school	4	1.6
37–46	88	37.1	Some college	16	6.7
47–56	40	16.8	Associate degree	13	5.4
57-66	25	10.6	Bachelor's degree	124	52.3
67 and older	10	4.2	Master's degree	61	25.7
Gender			Doctoral degree	19	8.0
Male	193	81.4	**Years in business**		
Female	32	13.5	Less than 3 years	34	14.3
Prefer not to answer	12	5.0	4–7 years	19	8.0
Ethnicity			8–11 years	93	39.2
Caucasian	204	86.0	12–15 years	77	32.4
I prefer not to answer	22	9.28	More than 15 years	14	5.9
Asian/Pacific Islander	6	2.5	**Current annual volume of sales**		
Latino/Latina/Hispanic	5	2.1	(based on tank size)		
Income			1-500 bbl.	48	20.2
Under $25,000	8	3.3	501-1000 bbl.	35	14.7
$25,000–$39,999	10	4.2	1001-5000 bbl.	69	29.1
$40,000–$54,999	18	7.5	5001-10000 bbl.	50	21.0
$55,000–$75,999	36	15.1	10000 or more bbl.	35	14.7
$76,000–$99,999	55	23.2	**Size of production system**		
$100,000–$150,000	51	21.5	(based on tank size)		
Over $150,000	59	24.8	1 bbl.	12	5.0
			5 bbl.	56	23.6
			7 bbl.	20	8.4
			15 bbl.	76	32.0
			30 or more bbl.	73	30.8

6.5.1. Items, measures, descriptive statistics, and reliability

Garver and Mentzer (1999) and Hoelter (1983) proposed that the minimum sample size for use of SEM should be about 200, suggesting that a sample size of 200 or more would provide sufficient statistical power with a given SEM model. This study was therefore targeted at collecting 200-250 responses. Table 6.2 presents the measures, list of items and their corresponding means, and the skewness and kurtosis of the variables. A total of 249 responses

were received, of which 12 were discarded for having missing data. Data was checked for normality, skewness, kurtosis, and for outliers. Skewness and kurtosis indicated univariate normality and a mesokurtic distribution (Table 6.2). It can be debated that our skewness values for "sustainable practices" variable is a little high. However, it is quite usual for studies in social sciences to employ structural equations modeling with similar data sets (e.g. Rocha & Fink, 2017). Moreover, the maximum-likelihood estimator is considered relatively robust for small violations of non-normality (Bollen, 2014).

Next, the reliability of the constructs was assessed. Cronbach's alpha was used to evaluate the internal consistency of the constructs in the proposed model. The alpha values ranged from 0.79 to 0.91 (see Table 6.2), exceeding the minimum of 0.70 (Hair, Black, Babin, Anderson & Tatham ,1995).

Table 6.2 Measures, list of items, descriptive statistics and reliability

Measure	Item	Mean	SD	Skewness	Kurtosis	Cronbach's Alpha
Environmental Values	The green product has consistent quality.	3.32	1.07	− 0.53	− 0.09	0.84
	The green product is well made.	3.78	0.91			
	The green product is reasonably priced.	3.91	0.90			
	The green product offers value for money.	3.87	0.97			
	Having sustainable practices would help me to feel acceptable.	3.97	0.93			
	Having sustainable practices would improve the way that I am perceived.	3.38	1.02			
	Having sustainable practices would make a good impression on other people.	3.56	0.96			
	Having sustainable practices would give its owner social approval.	3.44	0.95			
	Having sustainable practices would feel like making a good personal contribution to something better.	3.63	1.01			
	Having sustainable practices would feel like the morally right thing.	3.56	1.07			
	Having sustainable practices would make me feel like a better person.	3.72	0.95			
	I would use sustainable product under worsening environmental conditions.	3.79	0.92			
	I would use sustainable product when there is a subsidy for it.	3.56	1.14			
	I would use a sustainable product when there are promotional activities for them.	3.81	1.08			
	I would use a sustainable product when it is available.	3.76	1.03			

	Before using the product, I would obtain substantial information about the different types of products.	3.65	0.97			
	I would acquire a great deal of information about the different types before using the product.	3.71	0.98			
	I am willing to seek out novel information.	3.74	0.99			
	I like to search for the new and different.	3.72	0.90			
Environmental Involvement	I consider environment preservation to be an important aspect of my life.	3.85	0.91	− 0.45	− 0.23	0.79
	I consider myself educated about environmental issues.	3.82	0.97			
	I would consider establishing an environmental management system at my premise.	3.68	0.96			
	I would consider implementation of environmentally friendly practices to be in the top-three priority.	3.63	1.01			
Business Challenges	Product quality	2.86	1.28	− 0.64	0.47	0.82
	Limited distribution/wholesaler options	3.38	1.28			
	Distribution	3.66	1.22			
	State legislation	3.92	0.96			
	Marketing/promotion	3.48	1.01			
	Competition	3.05	1.15			
	Funding capital	3.48	1.32			
	Employee turnover	2.51	1.23			
	Employee training and development	3.11	1.11			
	Shelf space competition	3.41	1.26			
	Federal legislation	3.38	1.30			
	Recruiting qualified employees	3.47	1.12			
	Sufficient cash flow	3.63	1.12			
	Local zoning/regulations	3.29	1.41			
Environmental Practices	Recirculating cooling water and use it for next batch of beers.	4.16	0.63	-1.21	-1.08	0.91
	Sending spent grain materials to farmers to feed their cattle.	4.81	1.01			
	Recycling leftover grains.	3.71	1.11			
	Reusing used (whiskey &wine) barrels-then use them for décor.	4.08	1.26			
	Encouraging employee to bike to breweries.	3.29	1.15			
	Helping non-profit green organizations.	3.71	1.18			
	Using as less chemical as possible for cleaning.	3.77	1.20			
	Using less harsh chemical if possible.	3.61	1.10			
	Using crowler.	2.97	1.32			
	Using growler.	4.03	1.23			
	Recycling paper, cardboard, napkin.	3.97	1.23			
	Recycling plastic material and straws.	3.87	1.30			
	Using recyclable materials.	4.02	1.16			
	Collecting and reusing yeast from fermentation for other purposes.	3.74	1.20			
	Reducing packaging materials, using compostable materials.	3.92	1.18			
	Investing in reusable/ recyclable packaging.	3.55	1.27			
	Installing energy meters to measure and control consumption.	2.65	1.31			
	Recovering heat (examples: from wort cooling, keg water systems).	3.52	1.28			

Installing technologies to reduce energy use.	3.42	1.31
Installing water meters to measure and control consumption.	3.32	1.22
Embedding sustainability into business culture.	3.71	1.14
Having an environmental action plan.	3.11	1.25
Providing pro bono/voluntary services within local community.	3.68	1.19
Providing environmental education to staff or customer.	3.35	1.25
Working with other local companies, investors with similar beliefs.	3.58	1.22
Sourcing locally, as close to brewery as possible (to reduce food miles/energy/support local economy).	3.55	1.32
Buying and using eco-friendly products.	3.55	1.21
Looking for outside learning/support.	3.84	1.22
Having an environmental sub-committee including senior management.	2.68	1.25
Receiving training from professionals for employees.	3.39	1.32
Raising the environmental awareness.	3.77	1.14
Improving natural light.	3.87	1.18
Switching to low energy lighting.	4.26	1.19
Cleaning roof panels to increase natural light and reduce energy use.	2.81	1.29
Using hand driers that automatically switch off and/or use cold air.	2.94	1.28
Using energy management systems to improve energy efficiency.	3.10	1.23
Using solar panels/solar heating.	2.61	1.31
Reviewing energy contract to increase green energy.	2.84	1.28
Harvesting rain water.	2.23	1.34
Using less water, low flow taps or that automatically switch off.	3.32	1.32
Providing filtered watered to reduce need for bottled.	4.13	1.13
Encouraging suppliers to reduce packaging.	3.13	1.26
Reducing own packaging/use of compostable materials.	3.55	1.19
Composting (on site or take materials home).	2.94	1.36

6.5.2. Measurement model

Prior to testing the hypothesized relationships proposed in the hypothesized model (Figure 6.1), confirmatory factor analysis (CFA) was conducted to test the appropriateness of the measurement model (Anderson & Gerbing, 1988). The standardized maximum likelihood loadings and fit statistics that resulted are provided in Table 3.

The CFA results showed that the $\chi 2/df$ was 1.871. Other indices of the model's fit included a comparative fit index (CFI) of 0.967, which range from zero to 1.00 with a value above 0.90 indicating good fit (Byrne, 2016), and a root mean square error of approximation

(RMSEA) of 0.066, which should not exceed 0.1 and ideally lie between 0.05 and 0.08 (Hooper, Coughlan & Mullen, 2008). To sum up, given the sample size and the number of measured items, the measurement model was adequate.

6.5.3. Validity and reliability

Construct reliability was assessed using composite reliability (CR) values. CR values equal to or greater than 0.7 are recommended, although values approaching 0.90 indicate high levels of reliability (Kline, 2013). As shown in Table 6.4, the CR values of all constructs ranged from 0.72 to 0.84, indicating that all met the recommended minimum criterion of 0.70 (Hair et al., 2006). The internal consistency of the measurements was examined using Cronbach's alpha. Values ranged from 0.79 to 0.91, exceeding the suggested minimum cut-off of 0.70 (Kline, 2013) and reflecting internal consistency among the scale items. Convergent validity was evaluated using factor loading and average variance extracted (AVE) (Kline, 2013). All factor loadings from 0.63 to 0.85, exceeded the recommended minimum cut-off level of 0.5 (Hulland, 1999) and were significant at $p < 0.001$. Moreover, an adequate convergent validity should contain < 50% average variances extracted (AVE) (Fornell & Larcker, 1981). In other words, the AVE value should be 0.50 or above. As shown in Table 6.4, the AVE value for each construct is 0.55, 0.62, 0.67, 0.56 and 0.56.

Table 6.3 Confirmatory factor analysis results including standardized loading estimates

Measure	EV	EI	EP	BC
EV1 (Functional)	0.84			
EV2 (Social)	0.79			
EV3 (Emotional)	0.75			
EV4 (Conditional)	0.70			
EV5 (Epistemic)	0.64			
EI		0.79		
EP			0.82	
BC1(Distribution)				0.85
BC2 (Employee)				0.79
BC3 (Legislation)				0.75
BC4 (Financial)				0.70
BC5 (Product)				0.63
Cronbach's Alphas	0.84	0.79	0.82	0.91

$\chi 2$ =447.169; df =239; CFI: 0.967; RMSEA: 0.066.

Given these factor loadings and AVE values, the measurement items met conditions for convergent validity. Adequate discriminant validity means that the indicators for different constructs should not be so highly correlated as to lead one to conclude that they are measuring the same thing (Henseler, Ringle & Sarstedt, 2015). For discriminant validity, the square root of the AVE of the construct should be greater than the correlation value between the construct and other constructs (Fornell & Larcker, 1981). The AVE square roots of each construct exceeded the correlation values between a pair of constructs (as shown in Table 6.4). Thus, discriminant validity is achieved showing that each construct is statistically different from the other.

Table 6.4 Correlations among latent constructs [(1)] (squared) [(2)]

Measure	EV	EI	EP	AVE
EV	1			0.55
EI	0.44	1		0.62
	(0.19)			
EP	0.37	0.75	1	0.67
	(0.13)	(0.56)		
Mean	3.67	3.74	3.50	
Composite	0.76	0.72	0.75	

Notes.
(1) Correlation coefficients were estimated using AMOS 22.
(2) Squared correlation values.

6.5.4. Hypothesis testing

A structural model with the constructs was estimated using Maximum Likelihood (ML) through SPSS Amos 22. The relationships between each pair of variables as suggested in the model were examined by the Pearson correlation coefficient. Figure 6.2 and Table 6.5 shows the results of the path analysis. The path between environmental values and environmental involvement (.29, $p < .01$) shows that craft brewery owners' environmental values positively and significantly influences owners' environmental involvement. Similarly, the path between environmental values and environmental practices (.46, $p < .01$) shows that craft brewery owners' environmental values positively and significantly influences their breweries' environmental practices. The analysis further suggests significant direct effects of environmental involvement on environmental practices (.57, $p < .01$), the higher the level of owners' environmental involvement in breweries, the higher are the practices.

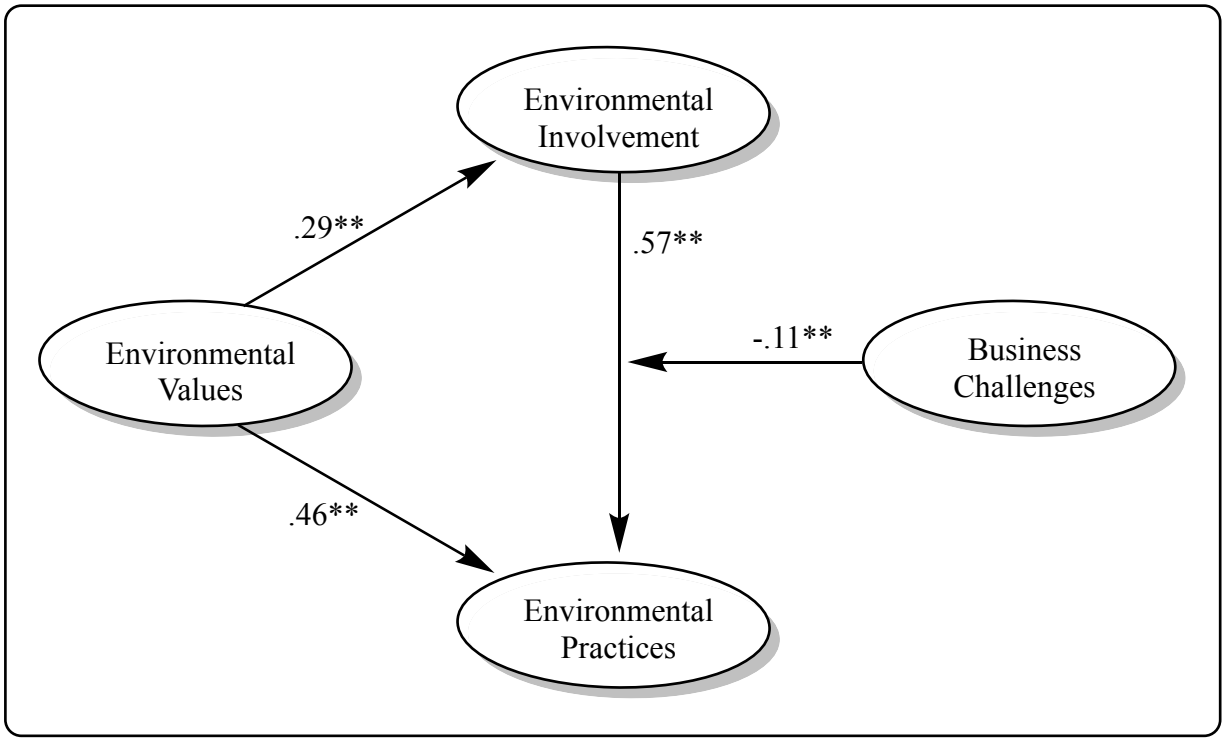
Table 6.5 The interaction of environmental involvement and business challenges on environmental performance

Variable	Environmental Performance					
	Step 1			Step 2		
	B	S.E.	ˇ	B	S.E	ˇ
Environmental Involvement	.43**	.05	.43**	.51**	.05	.51**
Business Challenges	.09*	.05	.09*	.13**	.08	.13**
R2	.25**					
Environmental Involvement × Business Challenges				-.08**	.03	-.11**
ΔR2					.02**	
Overall R2					. 27**	

Note. VIF values ranged from 1.014to 1.18.
All variables were standardized prior to running regression analysis.
* $p < .05$.
** $p < .01$.

To test the hypothesis that whether business challenges moderate the relationship between environmental involvement and breweries' environmental performance, a moderated regression analysis was conducted which tests the hypotheses using a mean-centering procedure or standardization of the independent and moderating variables to minimize multicollinearity (Aiken & West, 1991). In the first step, two variables were included: Environmental involvement and business challenges. Then interaction term between environmental involvement and business challenges was included in the second step (seen Table 6.6). Consistent with the results of the path analysis, while controlling for the effect of business challenges, environmental involvement had a significant positive effect on environmental performance. (β=.43, p<.01). The interaction between environmental involvement and business challenges on environmental performance in

step 2 was found to be significant ($\Delta R2 = .02$, $p<.01$), supporting Hypothesis 5. Aiken and West (1991) suggested plotting the interaction effects.



Values are standardized path coefficients.
*p< .05, ** p< .01

Figure 6.2. Path estimates for the proposed model.

Figure 6.3. depicts the interaction effects in graphical form. We also tested this moderation effect by employing bootstrapping with a sample of 2000 participants. Similar significant effects are revealed, confirming the strength of this moderation effect. We standardized our variables accordingly. The variance inflation factor for each regression

coefficient is below 2 (1.014–1.18), which is below than the usually recommended threshold of 10 (O'Brien, 2007) showing that multicollinearity was not an issue.

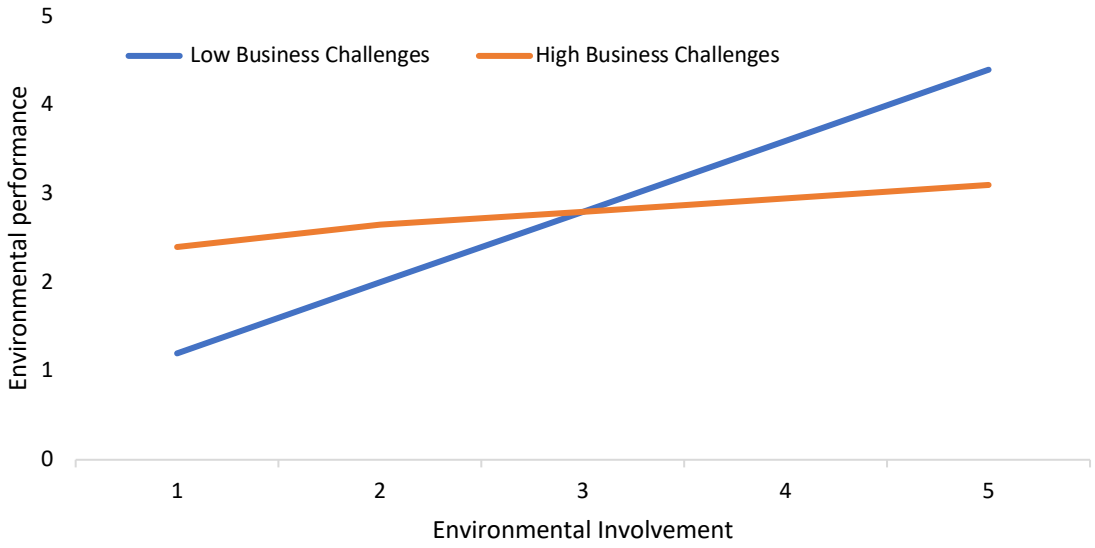


Figure 6.3. Effect of interaction between environmental involvement and business challenges on environmental performance

6.6.Discussion

This study was conducted because, despite widespread belief that top management's attitudes towards and perceptions of environmental issues are the primary driving force for organizational engagement in and responsiveness to environmental issues (Sharma, 2000; Starik & Rands, 1995), this view has not been subject to adequate empirical investigation and scrutiny. One possible reason for the historic lack of such research is the difficulty in accessing top-level managers and owners of organizations; thus, studies have relied on data collected from other individuals in more accessible positions, such as marketing, operations, or environmental managers (El Dief & Font, 2012; Henriques & Sadorsky, 1999; Murillo-Luna et al., 2008). While individuals in these positions may be able to provide information relating to the current

status of environmental strategy and practice within their organizations, they may not possess knowledge of what informed the decision-making that led to the current situation.

The present study thus makes a valuable contribution to the literature in presenting a substantial volume of data collected from craft brewery owners; although the number of respondents was relatively low, the difficult-to-obtain nature of this data makes this contribution significant. A further contribution is made in the provision of a specific perspective, in this case craft brewers located in the United States. This is particularly important, as, despite a large volume of literature in the field of management, marketing, and environmental psychology supporting both upper echelon theory and the theory of consumption values, not one study has tested the applicability of these theories in the context of craft brewing in the US. The findings of this study confirm that both theories are viable frameworks through which to understand environmental behavior in craft brewing organizations.

A final factor that makes this study uniquely valuable is that it explores industry with specific characteristics that make it an interesting case in environmental management research. It is widely held that the personal characteristics of owners of organizations influence their organizational behavior in regard to environmental practices. It is observed by Finkelstein and Hambrick (1990) that the effects of managerial discretion in large organizations are more marked in industries characterized by greater product differentiation, less government regulation, and higher demand instability. This is not the case for the craft brewing industry in the US – it is highly regulated, with little fluctuation in demand over the year. In addition, the products and services offered are broadly the same in every brewery.

The aim of this research was to study the effects of US craft brewery owners' personal environmental values on the implementation of and engagement with environmental

sustainability strategy within their organizations. To achieve this, four hypotheses were tested, and the consumption values and upper echelon theories were used to develop a conceptual model to analyze the relationships between the variables. The findings have shown that all hypothesized relationships were significant. Specifically, it was shown that 56% of the total variance is explained by the proposed model; this figure encompasses the effect of the control variables, nevertheless the high value indicates relatively strong empirical support for the theory of consumption values, and for upper echelon theory.

The findings of this study showed that, alongside various other strategic directions, the environmental decisions made in craft breweries appear to be largely determined by the owners' discretion. There is little existing research on management environmental values in the context of sustainability; however, this study confirms the results of a study by Tzschentke et al. (2008), who found that the concern of owner-managers for the environment is a key driver of the adoption of environmental management strategies. A study by De Hoogh and Den Hartog (2008) similarly identified significant effects of leadership on the implementation of CSR activities. The present study confirms the dominant role of owners in shaping the environmental values and engagement of craft breweries, where the environmental values and views of the owners were found to directly and positively influence the environmental sustainability practices adopted in breweries.

Han (2015) and Park et al. (2014) highlighted the important role of moderating variables in explaining the discrepancy between the values of members of an organization, and their environmental behaviors. Such variables might be the perceived advantages of environment management, or a perceived personal obligation to act in a pro-environmental way. The findings of the present study are consistent with research that posits a critical direct influence of personal

values on environmental practices (e.g. El Dief & Font, 2010). In terms of the effect of the owners (as founding members of the organization) specifically on the development of sustainability strategies, as mentioned previously this topic is under-studied. In the context of breweries, the present study has demonstrated the important contributing role played by owners' personal environmental involvement. Specifically, it was found that high-level management who showed a greater degree of environmental engagement were more receptive to the idea of environment management and led their organizations to greater adoption of sustainable and pro-environmental practices. In this way, the understanding of owners' involvement in environmental management literature has been increased, and a need for further, more in-depth research, has been identified.

This study also contributes to the literature on environmental sustainability in the specific context of craft brewing. Notably, it has identified the mechanisms that guide the relationship between owners' personal environmental engagement and values and the environmental sustainability of their breweries. Although the degree of influence of these values has been much studied, the mechanisms by which they translate into actual organizational practice and performance has been neglected in studies of environmental sustainability.

A further moderator (business challenges) between owners' environmental engagement and sustainable practices in their organization has also been introduced. This was tested to confirm a significant negative moderating role. This means that business challenges, such as financial issues, product, distribution, marketing, legislative, and employee-related challenges affect the relationship between the owners' environmental involvement and environmental practices of breweries. In other words, these industry challenges appear to decrease the owners' motivation to implement sustainable practices. Government may assist in addressing some of

these challenges through the use of incentives, bonuses, and informative workshops and panels. In addition, working in collaboration with different craft brewers, they can collect more detailed and relevant information about distribution, law and legislation, and the employee hiring and training process. Government should see these challenges not as purely financial problems faced by breweries but look closer to identify and understand the underlying issues so that brewery owners can implement more sustainable practices in their breweries.

This study makes an important first step toward identifying the leadership qualities needed to promote and increase environmental sustainability in the brewing industry and represents a solid foundation on which future studies can build. As confirmed in both existing literature and the findings of this study, top management is a critical internal driver for changing corporate attitudes regarding environmentalism and creating an organizational environment in which ethical environmental practices can be easily implemented. This indicates that, the more engaged and motivated owners are in environmental practices, the more likely it is that they will embed positive environmental practice and ethics into their company structure and culture, and, consequently, the better their adoption of environmental programs will be. Owners in possession of environmental awareness and engagement, strong environmental values and a sense of personal responsibility are more likely to seek to accommodate stakeholders' (employees, customers, the community, and wider society) interests and needs in regard to environmental issues, by prioritizing these when making decisions related to strategy and operational practices.

Furthermore, it is concluded that companies must acknowledge that the achievement of environmental sustainability goals requires strategic employee management (Jabbour & Santos, 2008). On this point, Jurowski (2001) showed that appropriate people management is key to promoting sustainability in breweries. Thus, craft breweries should seek to attract and retain staff

in possession of the competencies required for the development of sustainability efforts and continue to encourage and foster these traits within an environment that promotes environmental sustainability (Boudreau & Ramstad, 2005). Individuals qualified in and knowledgeable about improvement of corporate sustainability should exhibit strong environmental values and assume greater responsibility for environmental problems and related stakeholder concerns; they should also display cooperative behaviors, engaging key stakeholders in decision-making related to environmental practices. Furthermore, in terms of management personnel, either the owners or the HR department, depending on the size of the brewery, should develop management evaluation criteria detailing the leadership qualities needed for corporate environmental sustainability, and then recruit on this basis, continuing to provide ongoing education to reinforce those qualities (Jabbour & Santos, 2008).

In terms of its relationships with stakeholders, the study has shown that through active engagement with employees, the community, and customers, breweries can create and implement pro-environmental strategies that meet stakeholder demands for sustainability. Specifically, by engaging the community, customers, and employees is an effective means of identifying and developing policies and programs that promote sustainability and address environmental energies. Breweries should thus devise strategies for facilitating this engagement and for defining environmental performance indicators to measure and evaluate their policies, objectives, and programs in environmental management. A brewery performance evaluation tool that includes sustainability and/or environmental dimensions could promote sustainable practice and improve performance. In terms of communication, a brewery may create an environmental group to communicate with key customers and the community regarding their specific

environmental initiatives. Social media could also be used to create a diverse community and a space for sharing ideas on environmental initiatives that can be, or have been, adopted.

Actions such as those described above will assist breweries in setting goals related to specific sustainability initiatives and in measuring and evaluating their outcomes, which in turn will encourage continual reflection on and progress in environmental sustainability in the craft brewing industry.

6.7. Conclusion

In terms of future research directions, it is recommended that financial variables be used to measure performance outcomes of environmental sustainability efforts, and that the relationship between financial performance and environmental sustainability is examined. It would also be interesting to look at the effects of brewery production size and annual sales on sustainable practice, to identify whether this is consistent with the findings of existing research suggesting that companies implement more sustainable practices and become more involved in environmental management as they grow larger. Further exploration of the relationship between the personal values and pro-environmental behaviors of brewery owners and the environmental performance of their organizations would also add to the literature.

This study was limited in a number of ways. First, direct environmental performance was not observed, due to a lack of standard methods for measuring the overall environmental performance of craft breweries, or even methods for comparing performance in specific, more easily quantifiable practices. Thus, the study relied on self-reported data from craft brewery owners regarding their implementation of environmental practices.

A further limitation relates to the use of self-administered questionnaires, which are not able to provide in-depth information, and carry a risk of social desirability bias and non-response

bias. Furthermore, studies of small- and medium-size companies and their owners often suffer from low response rates. There is also a risk that the craft brewery owners who participated in this study were more likely to already be actively engaged in environmental management practices than those who declined to participate; their willingness to participate may reveal an awareness of that fact. All of the above might limit the ability to generalize the conclusions of this study to other contexts.

CHAPTER 7

CONCLUSION

7.1. General Conclusion

This article-based dissertation conducts three separate but related studies on environmental sustainability in the US craft brewing industry by interpreting data collected from craft brewery owners. The overall purpose of this dissertation is (1) to determine the environmental values of US craft brewery owners, (2) to investigate the relationship between these values, the environmental involvement of the owners and the environmental performance of the breweries and (3) to investigate the intervening effect of business challenges on environmental performance. In order to accomplish this, three independent articles address six research questions using both qualitative and quantitative methodologies.

Despite the fact that environmental management is one of the most heavily researched concepts in the sphere of management, marketing and business research, there is still substantial room for improving our theoretical understanding of this critical area of study. This rationale is the main motivation behind the overall purposes of this article-based dissertation. The next three sub-sections of the conclusion chapter will briefly summarize the theoretical and practical implications of the three dissertation articles. These summaries are purposely brief, since each article has already presented an in-depth conclusion within its appropriate section.

Reaching a conclusive definition of sustainability within the craft brewing industry is a difficult proposition. In practice, the incorporation of sustainable activities into a brewery's

operations becomes problematic, thanks in large part to the geographical distance separating a brewery and its raw ingredients, the substantial amounts of water that are necessarily consumed during the brewing process and the liquid and solid waste streams that are generated at nearly every stage of that process. Notwithstanding these shortcomings, it is still possible to incorporate sustainability into a craft brewery's corporate strategy. Breweries and their owners are both able and willing to participate in financial, social and environmental practices which pursue innovative objectives, which subsequently can deliver both economic and ecological rewards to the company in question, as well as sharing those dividends with their employees, clientele and wider society.

The first article, *An Exploratory Examination of Environmentally Friendly Practices in the US Craft Brewing Industry*, aimed (1) to understand and report on current environmentally friendly practices that the US craft brewery industry utilizes, and (2) to compare the quantitative results with qualitative results.

This aim was achieved through a two-stage (qualitative and quantitative) approach. The first stage was comprised of 31 semi-structured interviews with the owners of craft breweries across the US, with the purpose of ascertaining the sustainable practices they employed in their company. The second stage consisted of a quantitative survey answered by 237 brewery owners in the US who expressed the extent to which they agreed with the practices identified in the first stage. The study concluded that craft brewers (when viewed as a single homogenous group) have a far-reaching interpretation of the idea of "sustainability" which incorporates a diverse array of environmental factors. Particular areas of interest that were consistently identified by the survey respondents included energy efficiency, incentives to increase community involvement, plastic

and paper recycling, reuse of both spent grain and other miscellaneous items, use of recycled materials and water conservation.

The results of the study hold both theoretical and practical implications for scholars, brewery owners and politicians. From a practical perspective, the research offers valuable insight into the use of particular sustainable practices in the US craft brewing industry. Although there is substantial research into the technical aspects of the brewing process and the impact these have in environmental terms, there is very little (if any) pre-existing research on the broader subject of sustainability within the US craft brewing industry in general. Given that the industry is currently enjoying a rapid surge in popularity and growth across the US, understanding more about the current status of sustainable practices being employed by brewery owners is essential to improving the green credentials of the industry in the future. From a theoretical perspective, the conclusions of the study open up additional areas of research for academics interested in studying environmental management in a professional setting.

The research showed that "Sending spent grain materials for use as cattle feed" scored highest among the respondents of the survey. In addition to using those grains for agricultural ends, such as for use in animal feed, compost or human food additives, there are alternative energy-related strategies for improving the green credentials of dealing with this waste stream. The grains could be used as an alternative fuel source via combustion, thus providing the heat required during the brewing or grain-drying processes, or to power a turbine in order to create electricity. These new approaches offer the potential to minimize energy consumption, reduce waste production and increase financial savings all at once.

With regard to water consumption, "Repurposing water for use with the next batch of beers" and "Recovering heat from wort cooling, keg operation and other practices" were among

the highest scoring factors in this category. However, it came as something of a surprise to learn that only a handful of brewers indicated they monitored water consumption levels at all.

The installation of solar panels or solar heating technology received a surprisingly low score from the brewers, highlighting the fact that they may benefit from adopting more sustainable sources of energy. As well as solar power, this could also take the form of wind and hydro power or the use of biofuels, or else a transition to an energy supplier with better sustainable credentials.

Educating the brewery workforce about the potential advantages of a sustainable approach to operations can also offer many benefits. Not only can it encourage reduced consumption of ingredients, resources and equipment, but it also has the potential to minimize human errors. Therefore, brewery staff who are more motivated to pursue an environmental management strategy can help to save both water and energy, alongside generating less waste.

Creating a connection with the local community can also be instrumental in helping brewery owners to enhance their environmental profile. This is because uniting with other individuals or organizations with whom they share common beliefs can allow them to place greater pressure on suppliers to increase their own environmental efforts. This is just one example of how such a relationship could foster improved environmental policies; there is no doubt that brewery owners could uncover many other such possibilities as well.

Transitioning to a more environmentally-minded corporate strategy often involves both substantial financial backing and a determined will, but the introduction of better organized and more energy-efficient processes (such as the use of a heat exchanger to recoup and reuse waste heat) can boost profits, reduce environmental impacts and set a promising precedent for future innovations in the industry.

The second article, *Motivations Behind US Craft Brewery Owners' Environmental Practices*, aimed (1) to examine the reasons behind US craft brewery owners' environmentally friendly practices, and (2) to compare the quantitative results with qualitative results.

The research has both theoretical and practical implications for academics, politicians and the owners of craft breweries. In practical terms, there is already a substantial amount of research into environmental engagement and the psychological reasons behind it in business in general. However, there is very little research investigating the subject within the craft brewing sector in particular and the gap is one which this study hopes to fill, by offering insight into the factors driving environmental engagement and their relative importance to craft brewery owners. A greater understanding of these areas could be crucial to improving the environmental profile of the industry as a whole. In academic or theoretical terms, the conclusions of this study agree with those uncovered by previous research and suggest that craft brewery owners are subject to similar motivations and influences as upper management in other industries.

More specifically, the initial, qualitative stage of the study found that the owners' individual beliefs with regard to the environmental were a significant contributing factor to their corporate strategy. Indeed, several brewery owners expressed their belief that sustainable practices were a morally "right" lifestyle choice. Respondents also expressed the belief that it falls to the leader of a company to consider environmental concerns and adhere to industry best practices as a matter of duty. Those surveyed acknowledged their dependence on energy and water in their industry and the responsibilities they must shoulder to use those resources in an environmentally friendly way, as well as the danger the sector would find itself in if the resources became scarce.

The second, quantitative stage of the research revealed that the biggest contributing factor to a company's environmental policy is the attitude of upper management. Both qualitative and quantitative studies indicated that since the owner is ultimately responsible for the decision-making and corporate strategy of a company, their awareness of and attitude to environmental issues is reflected in the brewery's environmental performance. It is clear that the owner's personal sense of environmental responsibility is key to the implementation of sustainable practices within the brewery. This argument agrees with the findings of Kasim and Ismail (2012) and Stone, Joseph and Blodgett (2004), who concluded that upper management views the introduction of sustainable practices as conducive to the company's aims of increased market share, cost control, efficient production and enhanced profits. The findings of the present study also reinforce the reliability of Kasim and Ismail's (2012) instrument for measuring environmental motivation.

Lastly, the third article, *US Craft Brewery Owners' Environmental Values, Involvement and their Relationship with Environmental Performance*, aimed (1) to determine US craft brewery owners' environmental values, (2) to investigate the relationship between owners' values, their environmental involvement and environmental performance, and (3) to investigate the intervening effect of business challenges on environmental performance.

This study was undertaken because, despite widespread academic agreement that upper management's perceptions of and attitudes towards environmental issues are the biggest contributing factor for corporate engagement in and responsiveness to environmental issues (Sharma, 2000; Starik & Rands, 1995), this argument has not been subjected to adequate empirical investigation and scrutiny. One possible explanation for the shortfall in this area of research is the difficulty in accessing top-level managers and owners of companies. As a result,

previous research has been forced to rely on data harvested from other individuals in more accessible positions, such as those in environmental management, marketing or operations (El Dief & Font, 2012; Henriques & Sadorsky, 1999; Murillo-Luna, Garcés-Ayerbe & Rivera-Torres, 2008). While subjects in those areas may be able to provide insight relating to the current environmental policies in operation within their companies, they may not possess knowledge of what informed and motivated the decision-making process which precipitated those policies.

The present study therefore makes an important contribution to the literature by presenting a substantial volume of data collected directly from craft brewery owners, which remains significant despite the relatively low response rate among those surveyed due to the difficult-to-obtain nature of the data. A further contribution is made via its insight into a specific industry; namely, the US craft brewing sector. This is particularly important given the dearth of pre-existing research which tests the applicability of upper echelon or consumption values theory in the context of craft brewing in the US. The results of this study confirm that both theories are viable frameworks through which the environmental behavior of craft breweries in the US can be understood.

A final factor which makes this study uniquely valuable is that it explores an industry with specific characteristics, making it an interest case study in environmental management (EM) research. It is widely accepted that the individual beliefs of upper management influence their corporate strategy with regard to EM policies. Finkelstein and Hambrick (1990) observe that the impact of managerial input in large companies is more noticeable in industries which feature greater product differentiation, reduced government regulation and greater instability of demand. This is not applicable to the US craft brewing industry, which is highly regulated and

suffers from little fluctuation in demand throughout the year. Moreover, the products and services on offer are broadly similar in every brewery.

The objective of this study was to examine the effects of US craft brewery owners' personal environmental values and involvement on the implementation of and engagement with environmental practices within their breweries and to examine the effect of business challenges. To achieve this, four hypotheses were tested and both the consumption values and upper echelon theories were used to develop a conceptual model via which the relationship between different variables could be analyzed. The results of the study have shown that all hypothesized relationships were significant.

The research demonstrates that, alongside various other elements of corporate strategy, the environmental decisions made in craft breweries appear to be mainly determined by the individual attitudes of brewery owners. Despite a scarcity of pre-existing research into the environmental values of upper management, this study confirms results of a 2008 paper by Tzschentke et al., which concluded that upper management's sense of environmental responsibility is a key influencer in the adoption of EM policies.

This study also contributes to the existing research on EM in the specific context of craft brewing in the US. In particular, it has identified the factors which influence the relationship between owners' personal environmental values, their environmental involvement and the environmental performance of their breweries. Although the influence that these values can exert has been heavily studied, the mechanisms by which they translate into actual policies and practices has been neglected in previous studies of sustainable performance.

The various challenges which businesses face when implementing sustainable practices has also been introduced as a possible moderating factor between the owners' engagement and

their company's environmental performance. Financial, production, distribution, marketing, legislative and employee-related challenges can all adversely affect the relationship between the owners' environmental engagement and their brewery's environmental performance, with these challenges appearing to hinder owners from implementing sustainable practices. The government may assist in alleviating this adverse effect via the introduction of bonuses, incentives and informative workshops and panels. Additionally, the government would also be able to collect more detailed and relevant data about distribution, legislation and the employee hiring and training process by working closely with different brewery owners. As such, the government should not view these challenges as purely financial problems belonging to the breweries themselves but should also look closer to identify and understand the underlying issues in order to allow brewery owners to move towards a more sustainable approach in their corporate strategy.tlas

7.2. Future research

In future studies, it is recommended that researchers investigate how responses to the survey questions differ based on factors such as the age group and gender of the interviewees, the production volume of their breweries and the geographical locations of the breweries themselves. Furthermore, it also recommended that financial variables are introduced to measure the performance outcomes of specific environmental management policies, and that the relationship between environmental performance and financial performance is monitored. It would also be beneficial to examine the effects of brewery size and sales on environmental performance, to ascertain whether such a study supports the hypothesis of pre-existing literature which suggests that companies transition towards a more environmental mindset as they grow

larger. Further exploration of the personal values, pro-environmental behaviors, environmental concern, environmental knowledge of brewery owners would also add to the literature.

It is likely that investments into sustainable practices will necessitate higher costs which will be passed onto the consumer in the form of a higher price-per-unit of beer, at least in the short term. This has the potential to render more environmentally friendly breweries less cost-competitive in comparison to their less sustainable rivals. Previous research has proven insufficient to determine whether customers would be amenable to paying a premium for sustainably-produced beer; as such, studies into the consumer behaviors of craft brewery customers could be a fruitful area for new research.

7.3. Limitations

For the initial, qualitative phase of the research, we chose a purposive sampling method to obtain our results. It is logical that craft brewery owners are potentially more likely to have already considered the benefits of interacting with their relevant target markets and as such, it is possible that the environmental attitudes and habits employed by craft brewers may be exaggerated in this study. Concerning the second, quantitative phase of the research, the use of a self-administered questionnaire in the form of a survey incurs the same caveats as it does with other studies; namely, that it elicits minimal in-depth information and is prone to non-response bias and social desirability bias. These aspects of the study may hinder its findings from being extrapolated and used in other contexts. Given that low response rates are a common occurrence in research papers dealing with small- and medium-sized companies (Acutt and Geno, 2000), it is probable that the craft brewers who did participate in this paper have a higher likelihood of already being actively engaged in environmental practices than those who did not. Furthermore, it could even be inferred that their willingness to take part may point to their own implicit

acknowledgement of this fact. Finally, it is possible that the conclusions of this research might be distorted as a consequence of regarding craft brewers in the US as a single homogenous group, rather than recognizing the many sub-divisions inherent within the industry.

PUBLICATION NOTE

The articles presented in this dissertation will be prepared and submitted for review to the journals listed below.

Article 1. An Exploratory Examination of Environmentally Friendly Practices in the US Craft Brewing Industry.

Targeting: *Journal of Cleaner Production*

Article 2. Motivations Behind US Craft Brewery Owners' Environmentally Friendly Practices.

Targeting: *Journal of Business Research*

Article 3. Motivations Behind US Craft Brewery Owners' Environmentally Friendly Practices.

Targeting: *International Journal of Hospitality Management*

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APPENDIX A

Interview Script

1. Do you implement sustainable practices in your brewery?

2. What motivates you to implement or not implement sustainable practices?

3. Would an increase in legal regulations requiring you to implement sustainable practices increase or decrease your level of intrinsic motivation (matter of principle or individual belief)?

4. Do you think that imposed legal requirements would set a lower level of sustainable behavior than you would set yourself.

5. If you were shown that you would save money, would you be willing to implement more practices?

6. Do environmental issues concern you? If so, which issues?

7. Does your concern for environmental conditions factor into your decision to implement or not implement sustainable practices?

8. How do you think breweries can best be encouraged to implement sustainable practices?

9. Do customers ever ask if your brewery has sustainable practices?

10. What are your highest priorities on a daily, monthly, and yearly basis?

11. What are your biggest challenges on a daily, monthly, and yearly basis?

APPENDIX B

Survey Questionnaire

The following questions are about your demographics

1. Gender:

○ Male ○ Female ○ Prefer not to answer

2. Ethnicity

○ Hispanic ○ White ○ Black or African American

○ Asian American ○ American Indian or Alaskan native

○ Native Hawaiian or Pacific Islander

3. Age:

○ 19-26 ○ 27-36 ○ 37-46 ○47-56 ○ 57-66 ○ 67 and older

4. Highest level of education:

○ Less than high school ○ High School or equivalent ○ Some College

○ Associate Degree ○ Bachelor's Degree ○ Master's degree

○ Doctoral degree

5. Household Income

○Under $25,000 ○$25,000 to $39,000 ○$40,000 to $54,999

○$55,000 to $75,999 ○$76,000 to $99,999 ○$100,000 to $150,000 ○Over $150,000

6. Years in craft brewing business:

○ Less than 3 years ○ 4-7 ○ 8-11 ○ 12-15 ○ More than 15 years

7. Current annual volume of sales (based on tank size)

○1-500 bbl. ○501-1000 bbl. ○1001-5000 bbl.

○5001-10,000 bbl. ○10,000 or more

8. Size of production system (based on tank size)

○1 bbl. ○5bbl. ○7 bbl.

○15 bbl. ○30 or more bbl.

9. Live in (State)

10. To what extent do you agree or disagree with the following statements?

(Note that 1-Strongly Disagree, 2-Somewhat Disagree, 3-Neither Agree nor Disagree, 4-Somewhat agree,5-Strongly Agree.)

I implement following sustainable practice in place.

1.	Recirculating cooling water and use it for next batch of beers.	1	2	3	4	5
2.	Sending spent grain materials to farmers to feed their cattle	1	2	3	4	5
3.	Recycling leftover grains.	1	2	3	4	5
4.	Reusing used (whiskey &wine) barrels-then use them for décor as well	1	2	3	4	5
5.	Encouraging employee to bike to breweries	1	2	3	4	5
6.	Helping non-profit green organizations	1	2	3	4	5
7.	Using as less chemical as possible for cleaning.	1	2	3	4	5
8.	Using less harsh chemical if possible.	1	2	3	4	5
9.	Using crowler	1	2	3	4	5
10.	Using growler	1	2	3	4	5
11.	Recycling paper, cardboard, napkin.	1	2	3	4	5
12.	Recycling plastic material and straws.	1	2	3	4	5
13.	Using recyclable materials.	1	2	3	4	5
14.	Collecting and reusing yeast from fermentation for other purposes	1	2	3	4	5

15.	Reducing packaging materials, using compostable materials	1	2	3	4	5
16.	Investing in reusable/ recyclable packaging	1	2	3	4	5
17.	Installing energy meters to measure and control consumption	1	2	3	4	5
18.	Recovering heat (examples: from wort cooling, keg water systems)	1	2	3	4	5
19.	Installing technologies to reduce energy use	1	2	3	4	5
20.	Installing water meters to measure and control consumption	1	2	3	4	5
21.	Embedding sustainability into business culture	1	2	3	4	5
22.	Having an environmental action plan	1	2	3	4	5
23.	Providing pro bono/voluntary services within local community	1	2	3	4	5
24.	Providing environmental education to staff or customer	1	2	3	4	5
25.	Working with other local companies, investors with similar beliefs	1	2	3	4	5
26.	Sourcing locally, as close to brewery as possible (to reduce food miles/energy/support local economy)	1	2	3	4	5
27.	Buying and using eco-friendly products	1	2	3	4	5
28.	Looking for outside learning/support	1	2	3	4	5
29.	Having an environmental sub-committee including senior management	1	2	3	4	5
30.	Receiving training from professionals for employees	1	2	3	4	5
31.	Raising the environmental awareness	1	2	3	4	5
32.	Improving natural light	1	2	3	4	5
33.	Switching to low energy lighting	1	2	3	4	5
34.	Cleaning roof panels to increase natural light and reduce energy use	1	2	3	4	5
35.	Using hand driers that automatically switch off and/or use cold air	1	2	3	4	5
36.	Using energy management systems to improve energy efficiency	1	2	3	4	5
37.	Using solar panels/solar heating	1	2	3	4	5
38.	Reviewing energy contract to increase green energy	1	2	3	4	5
39.	Harvesting rain water	1	2	3	4	5
40.	Using less water, low flow taps or that automatically switch off	1	2	3	4	5
41.	Providing filtered watered to reduce need for bottled	1	2	3	4	5
42.	Encouraging suppliers to reduce packaging	1	2	3	4	5
43.	Reducing own packaging/use of compostable materials	1	2	3	4	5
44.	Composting (on site or take materials home)	1	2	3	4	5

11. To what extent do you agree or disagree that each of the following is challenging in operating your business? *(Note that 1-Strongly Disagree, 2-Somewhat Disagree, 3-Neither Agree nor Disagree, 4-Somewhat agree,5-Strongly Agree.)*

When I operate my business, one concept that challenges me is .....

1. Product quality	1	2	3	4	5
2. Limited distribution/wholesaler options	1	2	3	4	5
3. Distribution	1	2	3	4	5
4. State legislation	1	2	3	4	5
5. Marketing/promotion	1	2	3	4	5
6. Competition	1	2	3	4	5
7. Funding capital	1	2	3	4	5
8. Employee turnover	1	2	3	4	5
9. Employee training and development	1	2	3	4	5
10. Shelf space competition	1	2	3	4	5
11. Federal legislation	1	2	3	4	5
12. Recruiting qualified employees	1	2	3	4	5
13. Sufficient cash flow	1	2	3	4	5
14. Local zoning/regulations	1	2	3	4	5

12. To what extent do you agree or disagree that each of the following is challenging in operating your business? *(Note that 1-Strongly Disagree, 2-Somewhat Disagree, 3-Neither Agree nor Disagree, 4-Somewhat agree,5-Strongly Agree.)*

1. I consider environment preservation to be an important aspect of my life.	1	2	3	4	5
2. I consider myself educated about environmental issues.	1	2	3	4	5
3. I would consider establishing an environmental management system at my premise.	1	2	3	4	5
4. I would consider implementation of environmentally friendly practices to be in the top-three priority list in my business plan.	1	2	3	4	5
5. I believe implementing environmentally friendly practices would be beneficial economically in the long run.	1	2	3	4	5
6. I would only consider implementing environmental	1	2	3	4	5

	management system when defiance would cost me a penalty.					
7.	I intend to include environmental awareness in the training program.	1	2	3	4	5
8.	I would reward employees if they contribute ideas that elevate the implementation of environmentally friendly practices.	1	2	3	4	5
9.	I would encourage employees' involvement in the process of establishing environmental management system.	1	2	3	4	5
10.	I am aware of state and federal environmental laws and regulations.	1	2	3	4	5
11.	I feel restricted by the laws and regulations.	1	2	3	4	5
12.	I feel that the local authorities are concerned about the environment.	1	2	3	4	5
13.	I feel that the federal law is concerned about the environment.	1	2	3	4	5
14.	I select suppliers that practice sustainability management.	1	2	3	4	5
15.	I would consider changing my 'non-sustainable' suppliers to sustainable suppliers.	1	2	3	4	5
16.	I would educate my suppliers on the importance of being sustainable.	1	2	3	4	5
17.	There is an abundance of sustainable suppliers to choose from.	1	2	3	4	5
18.	I feel that being an environmentally friendly establishment will give me an added advantage over my competitors.	1	2	3	4	5
19.	I feel that there is a need to be a sustainable innovator in the brewing industry.	1	2	3	4	5
20.	I feel that being an environmentally friendly establishment will increase the revenue of this brewery.	1	2	3	4	5
21.	My customers demand that I run an environmentally friendly brewery.	1	2	3	4	5
22.	The community that I am based in demands that I run an environmentally friendly brewery.	1	2	3	4	5
23.	I feel that the community that I am in is generally an environmentally aware community.	1	2	3	4	5

13. To what extent do you agree or disagree that each of the following is challenging in operating your business? *(Note that 1-Strongly Disagree, 2-Somewhat Disagree, 3-Neither Agree nor Disagree, 4-Somewhat agree,5-Strongly Agree.)*

1. The green product has consistent quality.	1	2	3	4	5
2. The green product is well made.	1	2	3	4	5
3. The green product is reasonably priced.	1	2	3	4	5
4. The green product offers value for money.	1	2	3	4	5
5. Having sustainable practices would help me to feel acceptable.	1	2	3	4	5
6. Having sustainable practices would improve the way that I am perceived.	1	2	3	4	5
7. Having sustainable practices would make a good impression on other people.	1	2	3	4	5
8. Having sustainable practices would give its owner social approval.	1	2	3	4	5
9. Having sustainable practices would feel like making a good personal contribution to something better.	1	2	3	4	5
10. Having sustainable practices would feel like the morally right thing.	1	2	3	4	5
11. Having sustainable practices would make me feel like a better person.	1	2	3	4	5
12. I would use sustainable product under worsening environmental conditions.	1	2	3	4	5
13. I would use sustainable product when there is a subsidy for it.	1	2	3	4	5
14. I would use a sustainable product when there are promotional activities for them.	1	2	3	4	5
15. I would use a sustainable product when it is available.	1	2	3	4	5
16. Before using the product, I would obtain substantial information about the different types of products.	1	2	3	4	5
17. I would acquire a great deal of information about the different types before using the product.	1	2	3	4	5
18. I am willing to seek out novel information.	1	2	3	4	5
19. I like to search for the new and different.	1	2	3	4	5