FORUM

Submitted 31.07.2017. Approved 05.11.2017.

Evaluated by double blind review process.
Scientific Editors: Cristiane Biazzin, Elyn L. Solano Charris, and Jairo Alberto Jarrín Quintero

DOI: http://dx.doi/10.12660/joscmv10n2p44-55

TECHNOLOGY, PRODUCTION PARADIGM AND OPERATION: TRANSFORMATION OF BRAZILIAN BREWING SECTOR

ABSTRACT

Technology is one of the most relevant conditions for progress and development in society. Industrial technology generated a new development curve in several productive sectors, such as the alcoholic beverages. Beer is produced since 8000 BC, but its global popularization took place after the Second World War. Yet, brewing technology has been recently writing a new chapter: a paradigmatic transformation not only on instrumental principles, but also in terms of its economic and symbolic impact inside and outside organizations. This article aims to explore the new brewing paradigm and its pragmatic implications in terms of main concepts, management and operations in Brazil. Secondly, as a theoretical approach, it seeks to demystify technology and its social relationship. Technology, considering its material aspect, does not provide a broad understanding of field transformation. Therefore, the nuances of brewinng technology were captured by qualitative research. Secondary data and interviews with key elements were used as the main data collection strategy. Results indicate a brewing revolution, materialized by the offer of creative new products to mainstream markets, specialty beer shops and pubs. It is technological transformation in its essence, creating a new path from the craftman to the technique and demanding innovative management and operations forms. New brewing technologic paradigm rescues traditional techniques that in essence are concerned with producing "good" beer.

KEYWORDS | Brewing, craft beer, technology, production, operations management.

Guilherme Rodrigues Oliveira
guilherme.expimp@gmail.com
PhD Student in Administration at Universidade Federal do Rio Grande do Sul – Porto Alegre – RS, Brazil

Marcia Dutra de Barcellos
marcia.barcellos@ufrgs.br
Professor at Universidade Federal do Rio Grande do Sul – Porto Alegre – RS, Brazil

INTRODUCTION

Development and progress, in various sectors of society are associated with human capacity to materialize the knowledge of nature: technology. Ruy Gama (1985), in his book, *History of Technique and Technology*, has collected texts about technique and technology that help build the contemporary society puzzle, such as accounting, water mills and others. In the 17th century, techniques and technologies were strengthened by the Industrial Revolution (COSTA, 2000). Economist Joseph Schumpeter (1942) has already argued that the progress and development of a society are associated with advancement of technology. This reality is found regionally in different degrees (Nelson & Nelson, 2002; Pietrobelli & Rabellotti, 2011). Technology has a relevant impact on the industrial capitalist system and it has generally contributed to increase global performance and reduce operating costs in mass production.

Operations Management is focused on creating and delivering value, and in understanding the company's interfaces between marketing, finance, technology, human resources, and procurement (Russel & Taylor, 2008). From this perspective, technology is crucial for the development of new products and also contributes to increase productive performance; for example, the case of food sector in Brazil (Bröring & Cloutier, 2008; De Barcellos, Aguiar, Ferreira, & Vieira, 2009; Grunert, 2002; Matthyssens & Vandenbempt, 2008). Technology is a means to satisfy capitalist development standards. It can potentiate a transformation of consumption and develop certain regions. However, from another perspective, it can deeply influence society.

Recently, the Brazilian brewing sector has undergone a market transformation with the introduction of "craft beer" (Aranha, 2014; Barboza, 2014; Beck, 2014; Martins, 2014; Nobre, 2014; Nobre, 2015). This product is appreciated for providing a superior quality drink and new flavor experience compared to massive production of light beer (Brewers Association, 2016b; Cabras, Higgins, & Preece, 2016). According to Eurmonitor International (2014) craft beer has been gaining market share through increasing consumption at rates of 3% per year. Brewing revolution is an international movement that emphasizes regional and technological productive transformations. Craf beer production is therefore relevant in terms of academic and empirical research (Cabras & Higgins, 2016; Ferreira & Vasconcelos, 2011; Hindy, 2015; Matos, 2011; Mega, Neves, & Andrade, 2011; Poelmans & Swinnen, 2011c; Swinnen, 2011). Particularly, Latin America is an emerging market where this tecnhological phenomenon is happening (Toro-gonzalez, 2017).

The industrial paradigm in brewing sector was important to the global popularization of beer, but a new chapter is now being written in the history of this millennial food. What does this phenomenon mean? What are the characteristics of the craft beer production movement? Is there a renewal of the current production system? What beer technology really is? Could it be characterized as an advance of scientific research, i.e. a new mode of production or a quality product? And, what are the implications for operations management?

Anthropological research shows that brewing technology is millenar; the earliest evidence is found around 8000 BC in Mesopotamia (Hornsey, 2003; Poelmans & Swinnen, 2011a), where deep transformations of the eating habits of our nomadic ancestors took place (Dietler, 2006). Brewing production was linked to the cultivation of cereals. From this ancient period to the present days, brewing technology has experienced some changes and adaptations and different production techniques were identified according to the regions of natural sources (Hornsey, 2003). Regionality was an important factor impacting on the developmet of technology and social structures, but societal patterns historicaly influenced on brewing technology as well.

Adler (1991) highlights in his research the importance of the capitalist system for the popularization of this drink. The implementation of a set of machines and equipment allowed its massification and large productive "empires" were created. The rich history of brewing technology is far from ending with industrialization. In Europe and North America, there have been smaller scale productive enterprises which offered differentiated products (Cabras & Higgins, 2016; Cabras et al., 2016; Daniels, Sterling, & Ross, 2009; Murray & O'Neill, 2012; Poelmans & Swinnen, 2011c; Thurnell-Read, 2014) craftwork has been situated in recent debates as a possible antidote to some of the alienating features of work in modern capitalist societies. The revival of traditional beer in the UK, led by the Campaign for Real Ale (CAMRA. Regionalized microproducers are creating a similar movement in Brazil from the emergence of craft beer (premium beers) on supermarket

shelves in Brazil. Interestingly, several authors state that the new craft brewing paradigm is a movement against industrial production standards (Cabras & Higgins, 2016; Cabras et al., 2016; Poelmans & Swinnen, 2011b; Swinnen, 2011).

Research on modern technology, especially within the field of operations management, mostly addresses the implementation of new machinery for the development of new products by economic organizations. Yet, the new craft beer paradigm requires substantial changes.

From this perspective, this theoretical-empirical paper starts from the rise of craft brewing paradigm in Brazil and seeks to emphasize the social transformations in regional terms, as well as technology and peculiarities of its operation.

Considering the nature of this research, an exploratory, in-depth research is relevant and its methodological strategies will be further detailed. The paper has, therefore, four more sections besides this introduction: background theory, research methodology, results presentation and conclusions.

We invite you to have a glass of craft beer and, then, continue reading it.

BACKGROUND THEORY

Brewing technology and production

Brewing production has undergone several transformations throughout human history. Beer can currently be found in several localities, however, anthropologic investigation dated the first vestiges in the Neolithic period, around 8000 BC, in the region of Mesopotamia (Dietler, 2006; Eßlinger, 2009; Hornsey, 2003; Joffe, 1998). A historical era of great transformations in the habits of the human race: migrating from nomads to the constitution of villages with a new food system, agriculture.

Beer is a by-product from cereal cultivation: a fermented, uninduced, cereal-based drink. Like bread, beer, since its appearance around 8,000 BC in Mesopotamia, is enveloped in mystical experience and thought. A source of health in the ancient Egyptian culture, it was associated with fertility, death and resurrection. In Egypt, god Osiris is acknowledged for being the creator of beer, and Sumerians consider Ninkasi the ancient goddess of beer (Hornsey, 2003). These facts explain their presence and importance in religious rituals and celebrations in general. Beyond this connection with deities, beer was also embedded in spheres of human life in which mystical mysteries were less present. As it was one of the ingredients of the daily diet of these civilizations, the production and distribution of grains for brewing and baking was the basis of the old economy. Beer was also used as currency to pay for work done (Heath, 1987; Joffe, 1998). Horney (2003) highlights the importance of beer in Egypt: "Brewers were employed by the State or Temple, and were high-class members in the community - some of them were known to have slaves."

Signs of fermented beverage production were found in other regions, from Middle East to Western Europe. There are mentions of the word *beer* in the Bible. Each region showed variations in the beverage characteristic. The brewing technique became popular and, in the region of Babylon, e.g., there was a wide variety of beer variations: "black beer", "red beer", "barley beer", "spelt beer", "fine white beer", "fine black beer", "prima beer", among others. In some manufactures, there were signs of fruit inclusion. In other regions, women were responsible for beer production. Historians point out that, in the golden periods of the Roman Empire, there were indications of the earliest organizations of beer producers and distributors: the so called guilds (Eßlinger, 2009).

At the end of the Roman Era and intense turbulence in the European region, the monasteries played a major role in the brewing technology (Poelmans & Swinnen, 2011c). Monasteries were the major centers for beer production, distribution and innovation. They manufatured drinks with distinct qualities for the social stratification: noblemen, monks, pilgrims and indigents. In these centers in Germany region, there are traces of innovation in the drink production, such as the inclusion of hops as a component around 822 AD (Eßlinger, 2009). The Roman Empire and the Crusades played an important role in the expansion of brewing technology in Europe.

In the Middle Ages, private companies and guilds of professionalization of master brewers emerged, with documented proofs of their existence in London (1200 D.C.), Regensburg in 1230 and Munich in 1280 (Cabras et al., 2016; Heath, 1987; Hornsey,

2003). The guilds, in addition to their educational purposes, help in structuring productive operations in certain regions. Apprentices were relocated to specific regions for personal development and to ensure local supply according to natural resources.

The Great European Navigations influenced the diffusion and development of the brewery technology. The intensification of world trade induced the manufacture of a type of beer that could be conserved for a long time. This beer has gained its own personality, being designated as a style: Indian Pale Ale (IPA); striking beer with intense bitterness, resulting from a need of the English sailors in the period of India colonization. Due to the long sea route, there was a need for greater conservation, then a higher amount of hops was incorporated in the formulation (Hornsey, 2003; Poelmans & Swinnen, 2011a; Scholliers, 2001; Strong & England, 2015).

In the 18th century, the industrial revolution impacted on brewing technology. Reflecting a rational transformation of society, new tools and equipment have allowed productive expansion. And brewing technology in the 19th century was improved industrially and scientificaly (Eßlinger, 2009). Productive transformation also accompanied a social transformation of beer. Adler (1991), in his essay, highlights that beer technology was usurped for industrial purposes and the beer symbolim has been degrading over time.

The brewing industrial boom was post-World War II. Advances in transportation and communication technology have allowed industrial expansion. Large brewery corporations were created in Europe and in the United States. The alignment of economy, industrialism and modern science of nature enabled not only productive growth, but also a homogenization of the offered product and price on a world scale: incorporation of new equipment and natural resources. Brewing technology was at the service of capitalist enterprises. The ancient brewing organizations, the guilds, gave way to economic organizations of homogenized production and mass.

Recently, diverse studies have explored the transformation in industrial brewing reality and emphasized the relation of society rationality, beer production and technology (Cabras & Higgins, 2016; Cabras et al., 2016; Civil, 1991; Lamertz, Foster, Coraiola, & Kroezen, 2016; McGahan, 1998; Poelmans & Swinnen, 2011c; Stack, 2000; Toro-gonzalez, 2017; White, 2016)brewing and business history\u2019. Following the BEERONOMICS conference held at the University of York, 2013, and the subsequent approval of the editorial board of Business History, we received many submissions discussing beer, brewing, and their importance to business history (broadly defined. Steeve Hindy (2015), in a non-academical study, has explored the craft beer production "revolution" in USA, that is mainly a critique towards massive production. From this context, industrialization technologies impact on the omission of the potentialized and historically constructed brewers' know-how and on the deterioration of an ancient societal symbol.

Technology, modernity and production

We live in an advanced era with complex structures, including skyscrapers and nano electronic devices. The narrative of humankind is materialized from products, goods, artifacts, equipment and information systems. Technology, mainly industrial, has great impact on social organization (Brüseke, 2010; Habermas, 2014; Marx, 1996; Paraná, 2014; Weber, 2009). Some cultures are known by the tecnhology they use; others are impacted by technology and the consequent change in their lives. The *habitus* is a continuum.

Pierre Bourdieu define *habitus* as: "the principle that generates objectively classifiable practices and, at the same time, the classification system of such practices" (2007, p. 162). For Bourdieu (2005, 2006), the society is formed from several fields of action with a set of *habitus* both integrative and distinctive. However, such fields are not closed and are in constant interaction. The economic field is the engine of society and has several conditions to guide it: (1) financial capital: financial resources that condition the accumulation and conservation of all other capitals; (2) technological capital: a set of scientific and technical resources that can be transformed into a product or service; (3) commercial capital: it is related to the way of transacting with the market, i.e, channels to connect with the consumer; (4) social capital: it is not only related to relationships, but permeates the volume of different capitals that provide indirect advantages; and, (5) symbolic capital: it is based on knowledge and recognition. Inside the economic field several productive activities are guided by capitals spirit. Exemplifying, the Brazilian beverage sector which has preponderant rational financial guide-

lines: its industrial structure privileges the search for techniques and technologies capable of generating financial and commercial gains from the increase of productive scale. The other capitals are not omitted, but they are impacted by the main orientation. This point is observed, mainly, in the North American productive sector of beer that whose productive practices have been discussed over the years.

Heidegger technique and technology

Technology and human rationality are main elements to understand the modern structure and its transformation (Benjamin, 2014; Brüseke, 1998, 2010; Habermas, 2014; Heidegger, 2007; Paraná, 2014; Sell, Rüdiger, Brüseke, & Ferreira, 2012). The instrumental understanding of technology by its pragmatic knowledge and employment in the various fields of modern society is present in Max Weber's narrative and echoes in contemporary times. Costa (2000) investigated the productive evolution in the 19th century and affirmed the relevant role of technology to reduce costs and increase performance in order to provide progress and development for society. Engineering sciences advances have allowed the manipulation of natural resources for the sake of humanity and its form of organization. Economics, inspired by Schumpeter's (1942) studies, seek to study the development of new industrial technologies capable of materializing into new material, products or equipment, created from the modern science of engineering (Meijers, 2009).

Industrial technology, as a body of knowledge, has a direct impact on modern structure. A set of activities is necessary to support an economic-oriented society. And the economic agent is the central element that can organize it (Coase, 1992; Schumpeter, 1942; Williamson, 1996). The industrial model can offer a lucrative and developing society organization. Some classic examples are the automotive and agribusiness sectors, which combine social, economical and technological factors (Grover, 2003; Kühne, Gellynck, & Weaver, 2013; Lee, Gereffi, & Beauvais, 2012)

Nevertheless, economic orientation has suffered severe critics; while promoting prosperity, it can also cause the premature death of several technologies and lead to epistemological reductionism (Brüseke, 2014). It is argued that the use of technology is directed to the reproductive aspect of the modern capitalist structure (Brüseke, 2005; Sell et al., 2012) and significant technological advances for society may suffer institutional restrictions (Hadjimanolis, 2003; Oliveira, Vieira, Barcellos, & Hoppe, 2014).

The importance of technologies in the transformation of society not only inside the economic field must be emphasized. Technology has transformed our way of thinking and attitudes several times (Brüseke, 2002; Gadamer, 1983; Habermas, 2000, 2014; Heidegger, 2007). The instrumental aspect has been the target of several studies from areas such as management, economics and engineering for providing productive and financial gain. However, other areas, such as philosophy and sociology, have dealt with the subject from a broad perspective.

Philosopher Martin Heidegger, in the text *The Question Concerning Technology*, seeks to build a way for us to understand technology. He, influenced by classical philosopher Aristotle, seeks to escape from the anthropological-instrumental approach of technology (that he calls technique) that seeks to distinguish what is essential to the mode of production. His proposition lies in the separation of classical and modern technology from the transformation of the thought of society. "Technique (technology) is a way (means) of enlightening, not the end in itself. Technique shows itself in the realm where truth happens." (Heidegger, 2007, p. 381, our traduction) (Original sentense "Técnica é um modo de desabrigar. A técnica se essencializa no âmbito onde acontece o desabrigar e o desocultamento, onde acontece a " (Heidegger, 2007, p. 381)). For Heidegger (1969), technology is the finishing of metaphysics, a knowledge that mediates the understanding of this world (Rivers, 2005). The material result is the expected complement, but not the end in itself.

Modern technology, for Heidegger, is totally different from the classical one, since the transformation of science. In the old ages, nature was considered an entity to be feared by man. What man transforms from it reveals some truth, a poetic relationship. Truth is essentialized not by the subjectivity of the man who constructs it, but in the transmission of poetic truth; one becomes his or her work in the world. The truth that Goethe conveys by painting the peasant's shoe (Heidegger, 1990) as unique and universal. Heidegger does not hide the poetic *enlightening* that characterizes this craft production. The piece of art is the most sublime truth of the world that universally shows the "nature".

Modern technology, with advanced knowledge of natural sciences and equipment, is essential for proving that nature reveals the being of being: the conscious human calculation that imposes nature upon his will (conscious provocation called the "frame") to show the truth. The characteristic of modern technology is the imposition of man on nature. The social organization of man has demanded new results from technology. The capitalist production system, as a long historical process, has demanded new technology from technology. The industrial revolution is its greatest result, and perhaps most shocking in human history. Karl Marx, one of the main authors of modern capitalist society, highlights the social constructions mediated by materialism. Technology, from its knowledge and apparatuses, is placed as a function of the production system (Romero, 2005) and ideology (Habermas, 2014).

The focus of Heidegger's technology is ultimately a reflection on man. Who cultivates the *technique*? What is his/her direction for life? The analysis of the development of a given environment is inferred by the use of *technique*. The essence of technology influences the productive paradigm and industrial technology was potentialized by the capitalist spirit and its premises. It reflects a limited part of humanity, its activities and knowledge.

The transformation of the brewing environment could be understood by the concept of *habitus*. Instrumental elements and institutional economic standards guide the operations, however, the main transformation is inside technology's rationality. A new simbolic construtions of brewing is emerging and it has pragmatic implications, in business models, production plans and coordination activities (Renato, Pereira, & The, 2017; Silveira & Wegner, 2017). Beer is rewriting itself as more than a product, a simbol of a new way to look at technology. For instance, the sensory richness of brewing technology has been hardly explored in several markets due to institutionalized marketing standards. Therefore, the polarization between modern and classical technologies acts as the theoretical orientation to better understand the revolution of craft beer and how this movement promotes development and progress regionally.

METHODOLOGY

Craft beer, also called *premium* beer, is evident in the Brazilian market (Aranha, 2014; Barboza, 2014; Beck, 2014; Martins, 2014; Nobre, 2014; Nobre, 2015). The emergence of new styles of beer is the materialization of a paradigmatic transformation of the sector. Disseminated nationally, brewing enterprises are growing in number, mainly micro and small. Globally, the brewing movement is better known as a transformation of the *status quo* rather than an instrumental technological change. The craft brewery revolution, which features evidence in the United States and Europe (Cabras & Higgins, 2016; Cabras et al., 2016; Hindy, 2015; Swinnen, 2011; Thurnell-Read, 2014) is emerging in different regions of Brazil as a virtuous ethical rescue of the distinctive brewing technology of industrial capitalism. Brewing revolution is a phenomenon that illustrates the theoretical relation involving technology, humanity and the structure of modern society.

In order for us to explore these ideas, the research was guided by phenomenological principles. A narrative was constructed using essentially qualitative data and adopting some elements as guidelines: (a) technology: we comprehend technology as a body of knowledge. But it can only be used and well analyzed if we either understand (b) the firm or craftman's rationalities. In a capitalist economic society, certain productive sectors have institutionalized performance standards. It means that craft beer production has (c) origin and meaning for these individuals. Finally, it implies in (d) a new configuration in the operations management of the firm, including: process design, resources, marketing and supply chain coordination, among other important decision areas.

Data collection strategy involved: (1) secondary data, through research at international databases (Euromonitor International), magazines specialized in the subject (BeerArt and Beer Magazine), online platforms of information sharing (Home Brew Talk - Brazil and Facebook©), access to websites of regulatory agency (Brazilian Health Regulatory Agency - ANVISA and Ministry of Agriculture, Livestock and Supply - MAPA) and class associations (National Union of the Beer Industry, Association of Craft Brewers of Rio Grande do Sul State and Association of Craft Brewers of Santa Catarina State).

In the next step (2), we conducted interviews based on a semi-structured questionnaire following the elements previously cited. Four (4) industry experts, four (4) microbreweries and six (6) home producers were interviewed. For the selection of specialists, information collected in the secondary data was used.

Such strategy led to the participation of a manager from the School of Production of Craft Beer, of a Professor of the technical course on Gastronomy of the Federal University of Health Sciences of Porto Alegre, a Federal Prosecutor from MAPA and an editor of the Beer Art Magazine. For the selection of home producers and microbreweries the adopted criteria were the indication of experts and relevance according to data (magazines). The interviews were conducted during the second semester of 2014. All data were recorded and further transcribed. Content analysis was used to unveil the results.

RESULTS

Brewing modernity and craft revolution in Brazil

Contemporaneously, beer is a beverage of intense production and consumption both in Brazil and worldwide. According to Euromonitor International database (2014), Brazilian beer production reaches 13 billion liters. This market handled more than US$ 200 billion, being ranked as the third larger market (representing 6.44%.), just behind only China and the United States.

Brazilian beer market has oligopoly characteristic, where 97.3% of production is concentrated in four production companies. Cia Brasileira de Bebidas is the company with the largest market share (62.6%), and owns five brands. From these, two are the first in market share: Skol©, with 28.4%, and Brahma©, with 15.5%. The light beer is the product most offered in Brazilian market: 88.6% of the total market (Euromonitor International, 2014). Other styles, which represent 11.4%, have been gaining more space on the shelf. In 2010, premium beer market represented 9% of the total market, encouraged by the increase in imports that grew from 14.4 million liters in 2009 to 37.1 million liters in 2009, but especially due to the emergence of new breweries (Aranha, 2014, Barboza, 2013, Beck, 2014, Martins, 2014, Rocha, 2013, Tomaz, 2014).

However, other styles of beer have received prominence in Brazil. As described by Euromonitor International (2014), premium beer shows growth in sales volume annually. ANVISA, accompanying the brewing movement, through decree nº 8.442 (Brasil, 2015) defines premium beer (special) as: "beer having 75% (seventy-five percent) or more of barley malt, by weight, on the primitive extract, as source of sugars". Popularly defined as craft beer, it has received highlights in the main printed and electronic news that describe quality inputs, eccentric formulations and exotic flavors.

Few variations of beer styles were found at major national and regional bars, pubs and beaverages stores. Currently, not only a wave of import beer has invaded the markets, but there is a also growing supply of regional products. ANVISA has highlighted, at the national level, the increase in the number of registration of breweries enterprises.

In specialized magazines, craft beer production has been characterized by regionalized effort that runs all over Brazil. This business organization has a small and medium productive scale with strong appeal in the diversity of styles offered and better quality. There are some barriers for Brazilian craft beer considering the basic goods componets: water, barley, hops, yeast and additives. Despite the abundance of water, Brazil is not self-sufficient in components that guarantee beer quality: barley, hops and yeast (Nobre, 2010). Base barley for beer production does not satisfy the demmand for industrial brewing companies; most of it is imported from Argentina and European Union. Craft beer, according to the style, demands specific barley. Importer distributors are the main agents in the suply chain for craft beer. Hop and yeast are 100% imported. However, a few Brazilian studies are being undertaken to evaluate their productive skills in regional soils (Nobre, 2010). Some products are cultivated for personal purposes as indicated by some of the interviewed.

The manufacturing environment is part of the marketing strategy because it is the place to report the symbolic elements of craft production and a special place for entertainment, story telling and consumption. But this goes beyond the pure organizational character. This phenomenon is mainly charaterized by producing a *good* beer: the promise of a unique experience.

Craft beers are disseminated in several pubs and market places, mainly in Brazilian capitals. The striking quality and price of beers is the main distinctive feature of mass-produced beers. Apparently, the Brazilian roots of this movement are not related to industrial oportunities, but rather to the indepth symbolism of the beer. The passionate consumer describes beer as "[...] the nectar of the gods" or "[...] a piece of art". This feeling encourages the creation of confraternities with restricted access. Other beer

lovers travel to major brewing centers to discover the philosopher's stone of beer. Germany, Belgium, Holland and England are the most visited countries by brewers that seek to know the diversity of regional beers. In addition, these consumers have access to a distinct dynamic of offering qualified products when compared to their (national) reality.

The access to diverse beer styles has caused an enlightenment of brewery technology to the consumer. From the brewing technique, what is possible to materialize into a differentiated product? In testimony, one of the interviewees points out the meaning of beer when he could materialize his own beer: "[...] my father brew. I never liked beer, even the ones he did. When I made my beer, I began to like it [...] and didn't stop brewing [...]". Such thinking reflects a piece of deconstruction in consumption and production standards. In modern days, consumption provokes production and hence what is produced. The most enthusiastic beer lovers seek not only to know the beers, but to understand their production process. The interviewed specialists argued that beer production is a natural move: "Consumption is only the beginning [...] the production of beer itself is booming". The passion for this product is, initially, directed by individuals in two ways: homemade production and/or (small or medium scale) industrial production. The first is based on the purity of the brewing art in which the brewmaster is committed to producing the beer that satisfies him. Local associations of breweries were built and disseminate brewing technology's state-of-the-art purity: from regional meetings, collective productions, championships and open events. The second is market driven. The brewmaster promotes an orientation of dissemination of brewery technology by expanding the market. In most cases, emerging from the artistic state of production, brewers enter the beer market with the purpose of reproducing the potential of the learning technology. However, institutional barriers were reported by respondents. Due to better quality and full-bodied characteristics, craft beer has a higher cost and reduced units of consumption. In addition, production on a small scale makes it difficult to negotiate with suppliers and distributors as a reflexion of low bargaining power and local competition.

Yet, the emergence of these small enterprises with regional ties is somehow characteristic of this sector and represents a specific strength. Brewing operations management needs to change and adapt to such harsh environment. Brewing technology, as informed by interviewees, is many times based on open knowledge, allowing producers to define their operations according to their philosophy and share the results with peers. Collaboration set the stage for the current craft-beer boom (Sutton & Rao, 2014).

Contemporary socioeconomic dynamics have caused the brewer to choose the poetic or industrialization way. The interviewees pointed out that there is a technological commitment to produce quality beer. Representing the beer art, the interviewees comprehend that the brewing truth is not inside one formula. Promoting brewing in diverse styles reflects, in some way, the society around them. It means that the organizational strucutre, including investments in machinery and management operations, must be ajusted and reflects the symbolism of the brewing master and society. Opposite to that, industrial organization of mass production privileges cost reductions in the homogeneous manufactured volume. The main purposes and symbols are aligned with the capitalist perspective: profits and expansion.

The revolution of craft beer is related to individuals (brewers) that cultivate the technology. Different from Williamson's perspective, connection of craft brewers is natural, and reflects the individual necessity of common life. However, inside the business structure, lies the strategy. The producers' aliance, as a competitive strategy, is an important aspect: collective buying means cost reduction in production and distribution. According to interviewees, despite the eminent perspective of brewing, the Brazillian institutional market standard (sales, distribution and resources) privileges mega corporations. For instance, the minimun lot for bottles for a mega coroporation is the equivalent of one year of production of a small brewing.

The new brewing paradigmatic perspective is a reconstruction of beer symbolism. Deteriorated by the construction of poor quality marketing standards and nonconscious consumption, the brewer master is engaged in the purpose of rebuilding symbolism. Brewer and technology are intrinsically connected to create, regionally, a new market perspective. In terms of operations, it demands adjustments and learning: a supply chain that offers machinary and natural resouces to small scale production and cooperation for supply and distribution purposes. Brewers adopt integrative marketing strategies, such as guided visits to the factory, participation in fairs specialized in beer truck marketing, partnerships with specialized

bars and opening of their own gastronomic places. Small and medium corporations also imply an alternative management that integrates brewer virtue, production, and market opportunities.

DISCUSSION AND FINAL CONSIDERATIONS

Anthropological studies have emphasized the transformations of the symbolism of alcoholic beverages, especially beer, in human history (Adler, 1991; Dietler, 2006; Heath, 1987; Jennings et al., 2005; Joffe, 1998). New chapters have been added to the history of brewing technology. Capitalist organizations of the North hemisphere started to build such new chapter of this technology with the Industrial Revolution. Brewing technology only enhanced what society experienced: an industrial colonialism (Brüseke, 1998; Pinto, 2005a, 2005b; Romero, 2005; Rüdiger, 2014; Sell et al., 2012).

Theoretically, technology, studied from the instrumental aspect, has been a strong ally to reconstruct the cost curve and reduce the economic impacts of organizations. However, its association with capitalism has social impact: reduction of jobs and deterioration of knowledge (Benjamin, 2014; Brüseke, 1998, 2014; Ellul, 1968; Sell et al., 2012; Sennett, 1999, 2008).

According to Rivers (2002), not all technological progress is linked to its instrumental aspects. The brewing environment, in Brazil, is undergoing a process of technological transition that is independent of the advances of industrial organizations. This brewing revolution, which is materialized by the new product offerings in the main markets, specialty beer shops and bars, demonstrates a technological transformation in its essence: a new path craftmen are walking towards technology and organization forms. Steve Hindy (2015) points out that in the USA this movement has been viewed as a critique of the global institutional standards of the beer market. Brewing technology presents a wide variety of sensations and experiences to be shared through the beverage (Brewers Association, 2016a; Cabras & Higgins, 2016; Cabras et al., 2016; Swinnen, 2011) brewing and business history\u2019. Following the BEERONOMICS conference held at the University of York, 2013, and the subsequent approval of the editorial board of Business History, we received many submissions discussing beer, brewing, and their importance to business history (broadly defined.

In Brazil, the craft beer movement is writing its own chapter. Brewers are craftsmen who seek to exploit technology aiming to enlighten the new truth. Industrial strategy is one face of beer techonology. Craft brewers seek to expose their art using chiefly-two strategies: (1) individually or in associations and (2) or in the constitution of a small or medium-scale enterprise. Different from industrial corporations, these organizations forms are based on the brewer virtue and technological possibilities, resulting in diverse beer styles, according to consumers' demands and tastes.

In a different curve of development and production, structurally these enterprises have distinct patterns. To explore different beer styles, they demand several materials according to formulation and rely on a small scale of production to guarantee quality. This combination requires high quality resources, most of them imported, and purchased in small quantities, creating a disruptive pattern in the supply chain, if compared to the industrial mass production.

In that sense, the difference in patterns between craft brewers and industrial corporations brings opportunities to the supply chain: (1) local production development of beer compoments due to the demand for high quality hops and yeast, via improved private production and sound academic studies (Nobre, 2014). Different species of barley is so far a non-explored opportunity; (2) brewers' cooperation, production and knowledge, used for market penetration and competitiveness; (3) industrial operations management that surpasses lucrativity and brand appeal; Beer is a social symbol and management must integrate social, technological and productive aspects; (4) craft brewer is a central element that integrates technology to society. Local culture and tecnhology provide a unique combination of knowledge and exclusivity. Brewing development is peculiar in each region and can add value as a differentiation strategy.

Rivers (2002, 2005) emphasizes the importance of technology (technical material aspect) for society. And Costa (2000) reinforces its importance for the continuous evolution in a capitalist system. Industrialization provoked brewing technology to economical standards of new produts and markets development. New brewing technological paradigm rescues the traditional technology, which, in essence, is concerned with producing "good" beer.

This research aimed at highlighting a new technological brewing paradigm based on some social phenomelogical aspects. The classical economic paradigm, based on the rationale of human and technology,

presents several nuances, but only explores utilitarian aspects to society. Some technologies, including brewery, can only be studied if we properly appropriate the technological social elements; new machines, equipment and supplies as auxiliary elements.

Our objectives were: firstly, to explore the new brewing paradigm in a regional perspective, in Brazil, and pragmatic implications: What is the conception of brewing? What are the premisses that influence management and operations? The institutional patterns of industrial production are the basis for the creation of economic organization and are globally shared as best ways of production. However, a new conception implies new organization. Supply and operations must corroborate this rationality. Secondly, in theoretical terms, this study seeks to demystify technology and its social relations. In academic research, technology in brewing environment has been mainly highlighted in its instrumental aspect, i.e., in the set of machines and equipment that allow a new curve of economic gains from the homogenization of the product and reduction of costs. Technology is a knowledge that can be regionally absorbed allowing a transformation of habits and customs. The new brewing paradigm has focused on the symbolism of brewing technique and for that it needs a structure distinct from the industrial one.

This study included secondary data and in-depth interviews. The sample, although restricted, may reflect a reality. It is suggested for future studies the comparison of successful business models, in order to investigate institutional and legal obstacles, and assess changes in the behavior of the consumer of artisan beer, among others. Within the theoretical field there is a need for an epistemological expansion of studies on technology and its social impact.

REFERENCES

Adler, M. (1991). From symbolic exchange to commodity consumption.. In S. Barrows & R. Room (Eds.), *Drinking: Behavior and Belief in Modern History* (pp. 381–403). Berkeley: University of California Press.

Aranha, C. (201, sep.). Com o copo cheio. *Revista Exame PME*, São Paulo – SP. Retrived from http://exame.abril.com.br/revista-exame-pme/edicoes/0076/noticias/com-o-copo-cheio

Barboza, M. Q. (2013, Aug.). O negócio milionário das cervejas artesanais. *Revista Isto é*, São Paulo – SP. Retrieved from http://www.istoe.com.br/reportagens/319458_o+ negocio +milionario+das+cervejas+artesanais

Beck, M. (2014, sep.). Goles direto da fábrica. *Jornal O Tempo*, Belo Horizonte – MG. Retrieved from http://www.cervesia.com.br/noticias/949-goles-direto-da-f%C3%A1brica.html

Benjamin, W. (2014). *A obra de arte na era da sua reprodutibilidade técnica*. São Paulo: L&PM editores.

Bourdieu, P. (2005). O campo econômico. *Política & Sociedade*, *6*(abril), 15-57.

Bourdieu, P. (2006). *As estruturas sociais da economia*. Porto: Campo das Letras - Editores, S.A.

Bourdieu, P. (2007). *A Distinção: crítica social do julgamento*. Porto Alegre: Editora Zouk.

Brasil. Decreto Nº 8.442, de 29 de abril de 2015. Regulamenta os art. 14 a art. 36 da Lei nº 13.097, de 19 de janeiro de 2015, que tratam da incidência do Imposto sobre Produtos Industrializados - IPI, da Contribuição para o PIS/Pasep e da Contribuição para o Financiamento da Seguridade Social - Cofins, no mercado interno e na importação, sobre produtos dos Capítulos 21 e 22 da Tabela de Incidência do Imposto sobre Produtos Industrializados - Tipi. *Diário Oficial [da] República Federativa do Brasil*. Casa Civil, Brasília, DF. 30 abr 2015. Seção1, p. 2.

Brewers Association. (2016a). Craft Beer Industry Market Segments. *Brewers Association*. Retrieved from https://www.brewersassociation.org/statistics/market-segments/

Brewers Association. (2016b). Craft Brewer Defined. *Brewers Association*, 2017. Retrieved from https://www.brewersassociation.org/statistics/craft-brewer-defined/

Bröring, S., & Cloutier, L. M. (2008). Value-creation in new product development within converging value chains: An analysis in the functional foods and nutraceutical industry. *British Food Journal*, *110*(1), 76-97.

Brüseke, F. J. (1998). A crítica da técnica moderna. *Estudos Sociedade E Agricultura*, *10*(Abril), 5-55.

Brüseke, F. J. (2002). A modernidade técnica. *Revista Brasileira de Ciências Sociais*, *17*(49), 135-144.

Brüseke, F. J. (2005). Ética e Técnica? Dialogando com Marx, Spengler, Jünger, Heidegger e Jonas. *Ambiente & Sociedade*, *VIII*(n. 2), 18.

Brüseke, F. J. (2010). *A modernidade téccnica: Contigência, irracionalidade e possibilidade*. Florianópolis: Insular.

Brüseke, F. J. (2014). Sociologia da inovação técnica: Da crítica à técnica ao design sócio-técnico. *Tomo*, *25*(jul/dez), 131-156.

Cabras, I., & Higgins, D. M. (2016). Beer, brewing, and business history. *Business History*, *58*(5), 609-624. doi.:10.1080/00076791.2015.1122713

Cabras, I., Higgins, D., & Preece, D. (2016). *Brewing, beer and pubs*. (I. Cabras, D. Higgins, & D. Preece, Eds.). *Journal of Chemical Information and Modeling* (Vol. 53). London: Palgrave Macmillan UK. doi:10.1057/9781137466181

Civil, M. (1991). Modern brewers recreate ancient beer. *The Oriental Institute*, (132), 1-11.

Coase, R. H. (1992). The institutional structure of production. *The American Economic Review*, *82*(4), 713-719. Retrieved from http://www.jstor.org/stable/10.2307/2117340

Costa, A. B. da. (2000). Inovações e mudanças na organização industrial*. *Ensaios FEE, Porto Alegre*, *21*(2), 7-31.

Daniels, E., Sterling, C., & Ross, E. (2009). *Microbreweries and Culture in the Greater Madison Area*.Geography, 565.

De Barcellos, M. D., Aguiar, L. K., Ferreira, G. C., & Vieira, L. M. (2009). Willingness to try innovative food products: A comparison between British and Brazilian consumers. *BAR-Brazilian Administration Review*, *6*(1), 50-61.

Dietler, M. (2006). Alcohol: Anthropological/Archaeological Perspectives. *Annual Review of Anthropology*, *35*(1), 229-249.

Ellul, J. (1968). *A técnica e o desafio do século*. Rio de Janeiro: Editora Paz e Terra Ltda.

Eßlinger, H. M. (2009). *Handbook of Brewing*. In H. M. Eßlinger (Ed.). Freiberg: Wiley-VCH Verlag GmbH & Co. KGaA.

Euromonitor International. (2014). *Passport*. Retrieved from http://www.euromonitor.com/passport#/home

Ferreira, R. H., & Vasconcelos, M. C. R. L. (2011). Inovação na fabricação de cervejas especiais na região de Belo Horizonte. *Perspectivas em Ciências da Informação*, *16*(4), 171-191.

Gadamer, H.-G. (1983). *A razão na época da ciência*. Rio de Janeiro: Tempo Brasileiro.

Gama, R. (1985). *História da técnica e da tecnologia*. (T. A. Queiroz, Ed.). São Paulo: Ed. da Universidade de São Paulo.

Garavaglia, C., & Swinnen, J. (2017). The craft beer revolution : An international perspective. *Choices*, *32*(3), 1-8.

Grover, V. (2003). Transaction cost framework in operations and supply chain management research: theory and measurement. *Journal of Operations Management*, *21*(4), 457-473.

Grunert, K. G. (2002). Current issues in the understanding of consumer food choice. *Trends in Food Science & Technology*, *13*(8), 275-285.

Habermas, J. (2000). *O discurso filosófico da modernidade*. São Paulo: Martins Fontes.

Habermas, J. (2014). *Técnica e Ciência como Ideologia*. São Paulo: Editora Unesp.

Hadjimanolis, A. (2003). The Barriers Approach to Innovation. In L. V Shavinina (Ed.), *The International Handbook on Innovation* (pp. 559-573). Elsevier Science Ltd.

Heath, D. B. (1987). Anthropology and Alcohol Studies: Current Issues. *Annual Review of Anthropology*, *16*(1), 99-120.

Heidegger, M. (1969). *Introdução à Metafísica*. Rio de Janeiro: Tempo Brasileiro.

Heidegger, M. (1990). *A Origem da Obra de Arte*. Rio de Janeiro: Edições 70.

Heidegger, M. (2007). A questão da técnica. *Scientiæ Zudia*, *5*(3), 375-398.

Hindy, S. (2015). *A revolução da cerveja artesanal: Como um grupo de microcervejeiros está transformando a bebida mais apreciada do mundo*. São Paulo: Tapioca.

Hornsey, I. S. (2003). *A history of beer and brewing*. Cambridge: The Royal Society of Chemistry.

Jennings, J., Antrobus, K. L., Atencio, S. J., Glavich, E., Johnson, R., Loffler, G., & Luu, C. (2005). Drinking beer in a blissful mood: Alcohol production, operational chains, and feasting in the ancient world. *Current Anthropology*, *46*(2), 275-303.

Joffe, A. H. (1998). Alcohol and social complexity in ancient western Asia. *Current Anthropology*, *39*(3), 297-322.

Kühne, B., Gellynck, X., & Weaver, R. D. (2013). The influence of relationship quality on the innovation capacity in traditional food chains. *Supply Chain Management: An International Journal*, *18*(1), 52-65.

Lamertz, K., Foster, W. M., Coraiola, D. M., & Kroezen, J. (2016). New identities from remnants of the past: An examination of the history of beer brewing in Ontario and the recent emergence of craft breweries. *Business History*, *58*(5), 796-828.

Lee, J., Gereffi, G., & Beauvais, J. (2012). Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries. *Proceedings of the National Academy of Sciences of the United States of America*, *109*(31), 12326-12331.

Marx, K. (1996). *O Capital - Volume I*. São Paulo: Editora Nova Cultura Ltda.

Matos, R. A. G. (2011). *Cerveja: Panorama do mercado, produção artesanal, e avaliação de aceitação e preferência*. Trabalho de conclusão de curso - Centro de Ciências Agrárias, Curso de Agronomia, Universidade Federal de Santa Catarina. Florianópilis, p. 78.

Martins, R. (2014, Dec.) Fabricação de cerveja artesanal vira mania. *Correio do Povo*, Porto Alegre – RS. Retrieved from http://www.correiodopovo.com.br/ArteAgenda/542932/Confrariadacervejaartesanal>.

Matthyssens, P., & Vandenbempt, K. (2008). Moving from basic offerings to value-added solutions: Strategies, barriers and alignment. *Industrial Marketing Management*, *37*(3), 316-328.

McGahan, A. M. (1998). *The dynamics of the international brewing industry since 1800*. Business History Review (Vol. 72).

Mega, J. F., Neves, E., & Andrade, C. J. de. (2011). A produção da cerveja no brasil. *Revista Citino*, *1*(1), 34-42.

Meijers, A. (2009). *Philosophy of Technology and Engineering Sciences*. Amsterdam: Elsevier.

Murray, D. W., & O'Neill, M. A. (2012). Craft beer: Penetrating a niche market. *British Food Journal*, *114*(7), 899-909.

Nelson, R. R., & Nelson, K. (2002). Technology, institutions, and innovation systems. *Research Policy*, *31*(2), 265-272.

Nobre, A. (2014. Nov.). 100% nacional – O que falta para o país ter autonomia em malte lúpulo e levedura e assim produzir em larga escala uma cerveja 100% brasileira. *Revista BeerArt*, Porto Alegre – RS Ano 2, Edição 12.

Nobre, A. (2015, Mar.). Choque de Realidade – O avanço da gigante Ambev em direção ao consumidor de artesanais envia um aviso para as microcervejarias: Só as fortes (em gestão) vão continuar no jogo. *Revista BeerArt*, Porto Alegre – RS, Ano 2, Edição 16.

Oliveira, G. R., Vieira, L. M., Barcellos, M. D. De, & Hoppe, A. (2014). Institutional Barriers for Food Innovation: A Study of the Brazilian Functional Food Industry. *Journal of Operations and Supply Chain Management*, *7*(1), 1-14.

Paraná, E. (2014). Economia e racionalidade: A questão da técnica em Karl Marx e Max Weber. In *Seminário Nacional de Teoria Marxista* (pp. 1–15). Uberlândia.

Pietrobelli, C., & Rabellotti, R. (2011). Global value chains meet innovation systems: Are there learning opportunities for developing countries? *World Development*, *39*(7), 1261-1269.

Pinto, Á. V. (2005a). *O Conceito de Tecnologia - Volume I*. Rio de Janeiro: Contraponto.

Pinto, Á. V. (2005b). *O conceito de Tecnologia - Volume II*. Rio de Janeiro: Contraponto.

Poelmans, E., & Swinnen, J. F. M. (2011a). A brief economic history of beer. In J. F. M. Swinnen (Ed.), *The Economics of Beer* (pp. 3-28). Oxford University Press.

Poelmans, E., & Swinnen, J. F. M. (2011b). A brief economic history of beer. In J. F. M. Swinnen (Ed.), *The Economics of Beer* (p. 400). London: Orford University Press, Inc.

Poelmans, E., & Swinnen, J. F. M. (2011c). From monasteries to multinationals (and back): A historical review of the beer economy. *Journal of Wine Economics*, *6*(2), 196-216.

Renato, A., Pereira, L., & The, R. (2017). Open strategy in the beer industry: The case of contract breweries. In *3Es 2017* (p. 9). Curitiba: ANPAD.

Rivers, T. J. (2002). Progress and technology: Their interdependency. *Technology in Society*, *24*(4), 503–522. doi:10.1016/S0160-791X(02)00039-8

Rivers, T. J. (2005). An introduction to the metaphysics of technology. *Technology in Society*, *27*(4), 551-574. doi:10.1016/j.techsoc.2005.08.009

Rocha, R. (2013, Mar.) Com doze fábricas de cervejas artesanais, Minas Gerais vira a Bélgica brasileira. *Revista Veja*, Belo Horizonte – MG. Retrieved from http://vejabh.abril.com.br/comer-e-beber/bares/doze-fabricas-cervejas-artesanais-minas-gerais-vira-belgica-brasileira-729806.shtml

Romero, D. (2005). *Marx e a técnica: Um estudo dos manuscritos de 1861-1863*. São Paulo: Expressão Popular.

Rüdiger, F. (2014). *Martin Heidegger e a questão da técnica: Prospectos acerca do futuro do homem*. Porto Alegre: Sulina.

Russel, R., & Taylor, B.W. (2013). *Operations management: Creating value along the supply chain*. John Wiley & Sons Canada, Limited, 2008.

Scholliers, P. (2001). *Food, drink and identity: Cooking, eating and drinking in Europe since the middle ages*. (P. Scholliers, Ed.). Oxford: Berg.

Schumpeter, J. A. (1942). *Socialism, capitalism and democracy*. New York: Harper and Brothers.

Sell, C. E., Rüdiger, F., Brüseke, F. J., & Ferreira, J. (2012). *Teoria social e técnica*. Porto Alegre: EDIPUCRS.

Sennett, R. (1999). *A corrosão do caráter*. Rio de Janeiro: RECORD.

Sennett, R. (2008). *A cultura do novo capitalistmo* (2 ed.). Rio de Janeiro: RECORD.

Silveira, A. B. da, & Wegner, D. (2017). "A união faz a força": Coopetição interorganizacional nas microcervejarias artesanais gaúchas. In *3Es 2017* (p. 9). Curitiba: ANPAD.

Stack, M. (2000). Local and regional breweries in America's brewing industry. *The Business History Review*, *74*(3), 435–463.

Strong, G., & England, K. (2015). *Beer style guidelines*. Beer Judge Certification Program.

Swinnen, J. F. M. (2011). *The economics of beer*. London: Orford University Press, Inc.

Thurnell-Read, T. (2014). Craft, tangibility and affect at work in the microbrewery. *Emotion, Space and Society*, *13*(November), 46-54.

Tomaz, C. (2014, Sep.). Cerveja e Gastronomia formam combinação em Restaurantes de Campos. NetCampos.com, São Campos do Jordão – SP. Retrieved from ttp://www.netcampos.com/noticias-campos-do-jordao/2014/09/cerveja-e-gastronomia-formam-combinacao-em-restaurantes-de-campos.html

Toro-gonzalez, D. (2017). The Craft Brewing Industry in Latin America. *Choices*, *32*(3), 1-5.

Weber, M. (2009). *Economia e Sociedade: fundamentos da sociologia compreensiva* (4 ed.). Brasília: Editora Universidade de Brasília.

White, R. (2016). Death and re-birth of Alabama beer. *Business History*, *58*(5), 785-795.

Williamson, O. (1996). Economics and organization: A primer. *California Management Review*, 38 (2), 131-146.