

Innovation and Intellectual Property in Craft Breweries in the Metropolitan Region of Recife, PE

Inovação e Propriedade Intelectual nas Cervejarias Artesanais na Região Metropolitana do Recife, PE

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Abstract

Brazil is the third-largest beer producer in the world, within a market historically dominated by large corporations. In this context, the growth of the craft beer segment has fostered innovations that require intellectual protection, thus justifying this study. The objective was to analyze how innovation management and intellectual property (IP) are implemented in craft breweries in the Metropolitan Region of Recife, Pernambuco, Brazil, identifying strategies and challenges. This is a qualitative, exploratory study based on semi-structured interviews with craft brewers, document analysis, and a theoretical review on innovation and IP. Data were examined through content analysis. The results revealed incremental innovations in products, processes, and services, especially new beer styles, fermentation techniques, and tourism experiences. Regarding IP, trademarks and industrial designs predominate, while patents are rarely used. It is concluded that innovation and IP are strategic for competitiveness, although they are still underutilized as tools for sustainable differentiation.

Keywords: Innovation; Craft Brewery; Intellectual Property.

Resumo

O Brasil é o terceiro maior produtor de cerveja do mundo em um mercado historicamente dominado por grandes grupos. Nesse contexto, o crescimento do segmento artesanal tem impulsionado inovações que demandam proteção intelectual, justificando este estudo. O objetivo foi analisar como a gestão da inovação e da propriedade intelectual (PI) é implementada nas cervejarias artesanais da Região Metropolitana do Recife, PE, identificando estratégias e desafios. Trata-se de uma pesquisa qualitativa, exploratória, baseada em entrevistas semiestruturadas com produtores artesanais, análise documental e revisão teórica sobre inovação e PI. Os dados foram tratados por análise de conteúdo. Os resultados evidenciaram inovações incrementais em produtos, processos e serviços, com destaque para novos estilos de cerveja, técnicas de fermentação e experiências turísticas. Quanto à PI, predominam registros de marcas e desenhos industriais, enquanto as patentes são pouco utilizadas. Conclui-se que inovação e PI são estratégicas para a competitividade, embora ainda subutilizadas como diferencial sustentável.

Palavras-chave: Inovação; Cervejaria Artesanal; Propriedade Intelectual.

Technological Areas: Industrial Property, Trademarks, and Technology Transfer.



1 Introduction

Beer, produced since 4000 BC (Standage, 2005), is a beverage traditionally made from barley malt, water, hops, and yeast. In Germany, only barley is used for malt production; however, in other countries, the partial substitution of malt with adjuncts is permitted. In Brazil, current legislation defines beer as a beverage obtained through the alcoholic fermentation of brewer's wort derived from barley malt and potable water by the action of yeast, with the addition of hops. Malt may be partially replaced by brewing adjuncts, including brewing barley and other cereals suitable for human consumption, whether malted or unmalted, as well as starches and sugars of plant origin (Brazil, 2009).

Beginning in 1808, the substantial influx of foreign merchants into Brazil, particularly the English, contributed significantly to the demand for beer in the country, as England was home to some of Europe's largest beer producers (Köb, 2000).

Regarding national alcoholic beverage consumption, beer ranks first and is considered the world's most popular alcoholic beverage among adults (Viotti, 2012). According to the National Beer Industry Union (Sindicerv, 2023), Brazil continues to exhibit a growth trend in beer consumption and production.

With an annual production reaching 15.1 billion liters (Cervbrasil, 2021), Brazil stands out as the world's third-largest beer producer, surpassed only by the United States and China (Clube do Malte, 2019).

Consistent with trends observed in other countries, small-scale beer production has become increasingly prominent in Brazil. According to the 2022 Brazilian Beer Yearbook, a total of 1,729 breweries were registered with the Ministry of Agriculture, Livestock and Food Supply (MAPA), representing an increase of 11.6%, corresponding to 188 additional breweries compared with 2021 (MAPA, 2022).

Craft beers are characteristically produced on a small scale, allowing the development of beverages with more refined and distinctive flavors designed to satisfy a niche market of discerning consumers. Unlike large traditional breweries, whose primary focus is volume and market share, craft breweries emphasize flavor, whether derived from the final product itself or from the ingredients employed throughout the production process (Brewers Association, 2012; Gonçalves, 2010; McGrath, Palmgren, & Liljedahl, 2019).

Driven by changing consumer preferences, the emerging beer market has fostered the gradual and sustained growth of microbreweries. This expansion has encouraged empirical observations regarding industry development and

has motivated deeper investigations aimed at establishing the formal innovation linkages that contribute to its dissemination and consolidation.

The entry of craft beer into the marketplace has significantly expanded the diversity of beer styles available within the sector. This variety has been fueled by the creativity of small-scale craft brewers, whose identity is closely associated with their ability to solve problems creatively and effectively recognize new business opportunities.

The Second Census of Independent Brazilian Breweries, conducted by Sebrae and the Brazilian Craft Beer Association (Sebrae, 2022), reveals an expanding business environment for Brazilian craft breweries. The sector has witnessed the development of innovations and the consolidation of technology, particularly automation, as a fundamental ally for its future growth and competitiveness.

Cooperation and innovation are essential elements for competitiveness and survival in the brewing industry. These factors are also closely linked to the application of intellectual property mechanisms, which enhance visibility and legal certainty in business relationships. Intellectual property protection guarantees ownership rights over intellectual creations, enabling rights holders to derive economic benefits from their innovations while preventing competitors from copying or imitating products and services. Furthermore, intellectual property safeguards a company's unique identity and image, thereby protecting its reputation and strengthening customer trust and loyalty through the association of a brand with product or service quality.

Considering the specific characteristics of the craft brewing sector, this study addresses the following research question: How have craft breweries located in the metropolitan region of Recife managed innovation and intellectual property? To answer this question, the study investigates: (a) the types of innovation implemented, including product, process, and service innovations; (b) the intellectual property mechanisms adopted, such as trademarks, patents, and related protection strategies; and (c) the barriers and opportunities associated with technology transfer.

1.1 Craft Breweries

Beer ranks first among alcoholic beverages and is one of the most widely consumed drinks worldwide, surpassed only by water, tea, coffee, and milk. The Brazilian brewing industry is among the most significant in the global market.

The domestic beer market is dominated by three major brewing groups, which account for more than 90% of national production and are primarily based on large-

scale industrial manufacturing (Mello, Dourado, & Silva, 2017). In contrast, craft beers have emerged through microbreweries that prioritize small-scale production, employ higher-quality ingredients, incorporate distinctive regional flavors, and avoid the use of unmalted cereals, resulting in robust and unique products (Ferreira et al., 2011).

Although no specific legislation formally defines what constitutes a craft beer, the Brazilian Craft Beer Association (Sebrae, 2022) classifies breweries producing up to 5 million liters annually as craft breweries. Craft brewers emphasize differentiation and innovation. The primary distinguishing factors between craft beers and conventional beers are the beer styles employed, which can provide superior aroma and flavor characteristics (Brewers Association, 2012).

The criteria used for beer classification, as well as its sensory characteristics, depend fundamentally on its nature and on the characteristics of the raw materials used, in addition to the yeast strain and the fermentation process adopted, all of which directly influence the final product obtained (Cervesia Tecnologia Cervejeira, 2020). Beer categories are generally associated with: (a) alcohol content; (b) fermentation type; (c) malt and hop concentration; (d) aging duration; (e) final extract content; and (f) original extract content.

The development of new products establishes an innovative perspective within the brewing industry, as innovation may involve, among other approaches, the incorporation of new ingredients into a product, thereby enabling the creation of new varieties designed to meet consumer demands while ensuring business survival and growth. One of the distinctive features of the craft beer market is the behavior of consumers who are willing to pay a premium for products differentiated by aroma, flavor, color, and alcohol content. This scenario requires strategic marketing planning and highlights the relevance of innovation-related elements within the sector (Brown & Vergragt, 2016).

On the other hand, managing innovation remains one of the major challenges faced by entrepreneurs. According to Tidd and Bessant (2015), innovation management is both difficult and risky because most innovations fail to achieve commercial success. Within this context, innovation must be adequately protected, which underscores the relevance of intellectual property in the craft brewing industry. Intellectual property adds distinctive identification elements that promote differentiation and legal protection. When properly protected by law, intellectual property becomes an important strategic asset for enhancing competitiveness, as it adds value to a firm's innovative capacity (Paula et al., 2025a).

As a key dimension of innovation, technology transfer has increasingly assumed an open and collaborative character, enabling the dissemination of innovative practices and strengthening interactions among firms (Chesbrough, 2003). Because it requires formalization, technology transfer promotes greater alignment among participating organizations, thereby encouraging the assessment of innovations according to their structural and collaborative dimensions. Cooperation among microbreweries and its implications for open innovation, particularly in the context of technology transfer, appears to remain at an early stage of development. Consequently, these dynamics warrant further investigation and constitute an important focus of the present study.

1.2 Intellectual Property and Technology Transfer

Intellectual property is a branch of law concerned with ownership rights over intangible or incorporeal assets resulting from human intellectual activity (INPI, 2013). According to Do Valle et al. (2023, p. 2192), “[...] intellectual property consists of a temporary exclusive right over creations of the intellect, encompassing everything from artistic works to technological inventions.”

According to the definition provided by the World Intellectual Property Organization (WIPO, 2020), intellectual property comprises two major areas: (a) Industrial Property, which includes rights related to patents, trademarks, industrial designs, geographical indications, and plant variety protection; and (b) Copyright, which encompasses literary and artistic works, computer programs, and internet domains.

Barbosa (2002) explains that the term “Intellectual Property” refers to rights that invariably confer some form of exclusivity regarding the reproduction or use of a product or service. The branch of intellectual property that has traditionally been of greatest relevance to manufacturing industries and commercial activities, particularly rights associated with trademarks and patents, is known as Industrial Property.

The intellectual property system emerged from the need to establish a framework for appropriating the results of innovations in technology and knowledge-based products. Such appropriation is achieved through property rights mechanisms that encompass the rights to use (utilize and exclude third parties), enjoy (derive natural and economic benefits), dispose of (transfer or assign ownership), and recover (claim possession from those who unlawfully hold the asset) (Moreira, 2005).

This framework is grounded in the Brazilian Civil Code of 2002, which provides an analytical definition of property

as the right to use an asset, derive benefits from it, dispose of it, and recover it from anyone who unlawfully possesses it. Only through a relatively recent extension of this legal concept has it become acceptable to refer to intellectual, industrial, or commercial property when describing rights exercised over certain intangible assets.

Intellectual property law encompasses a set of rights and obligations governing the creation, production, dissemination, and transfer of tangible and intangible assets derived from human knowledge, whether in artistic, literary, scientific, industrial, or other intellectual domains. Creators are subject to obligations, including the public disclosure of their work and the techniques employed in its development after the expiration of the exclusive rights granted by the government for its use, enjoyment, and protection. Ownership rights confer legal protection against unauthorized reproduction, fraud, and unfair competition (Soares, 2004).

Intellectual property rights can serve as powerful instruments for promoting invention and fostering innovations that result in goods and services made available to society. From both commercial and competitive perspectives, intellectual property may be viewed as a strategic tool for achieving economic leadership. Intellectual activities have increasingly attracted support and investment due to their potential to generate technologies capable of fostering development not only within the communities directly involved but also at the international level.

Inventions that represent the creation of something genuinely new, previously nonexistent in nature, possessing originality and industrial applicability, are eligible for registration before the competent governmental authority. In this context, intellectual property rights are divided into:

- a) Copyright and Related Rights, which encompass literary, artistic, and scientific works, as well as lectures, speeches, sermons, adaptations, translations, and other intellectual creations. This category is primarily governed within the scope of civil law and provides legal protection to authors and other rights holders regarding the use, reproduction, distribution, and dissemination of their works; and
- b) Industrial Property Rights, which encompass inventions with industrial applicability protected through registration mechanisms that grant inventors exclusive rights to exploit their creations for a specified period. This category includes patents, trademarks, industrial designs, geographical indications, and other forms of industrial property protection, being more closely associated with the field of business and commercial law.

Rights classified as *sui generis* are those that do not fall within either the industrial property system or the copyright and related rights framework (Del Nero, 1998).

In a study conducted by Fernandes et al. (2017), the authors analyzed more than 200 patent applications filed with the Brazilian Patent and Trademark Office (INPI) and found that breweries showed a greater tendency to protect equipment-related innovations, such as the use of electronic noses, rather than recipes and production processes.

When attempting to define concepts within the field of technology transfer, several challenges arise (Paula et al., 2025b). The concept of technology itself constitutes a significant obstacle for researchers studying technology transfer processes. Zhao and Reisman (1992) argue that discussions concerning technology transfer are hindered by the difficulty of establishing a precise definition of technology.

Similarly, Bozeman (2000) highlights the challenges involved in accurately defining technology. Broadly speaking, technology transfer may be understood as the process through which scientific discoveries are transferred from one organization to another for the purpose of further development and commercialization (AUTM, 2018). In practical terms, it involves agreements for the assignment or licensing of technical or scientific knowledge intended to enhance the production capabilities of the acquiring party.

According to Roessner (1993), technology transfer refers to organizational and institutional interactions involving some form of exchange or transfer of know-how, technical knowledge, or technology from one environment to another.

Zhao and Reisman (1992) further argue that technology transfer can be defined from different perspectives, including economic, sociological, and anthropological viewpoints. Takahashi (2005) emphasizes that successful technology transfer depends on two essential conditions: the transferor must be willing to transfer the knowledge, and the recipient must possess the capacity to absorb and apply the transferred knowledge.

Technology transfer is understood in a broad sense, encompassing multiple mechanisms through which knowledge and technology can be exchanged. According to Van Gils, Vissers, and Wit (2009), such mechanisms include: (i) the temporary employment of an academic researcher by a company; (ii) the temporary placement of an academic within a firm; and (iii) research consortia involving universities or research institutes in collaboration with multiple companies.

Technology transfer possesses distinct characteristics and may involve various forms of knowledge, including production processes, business models, and proprietary know-how.

When technology transfer is analyzed from the perspective of industrial property, it is useful to employ technological maturity assessment criteria, such as the Technology Readiness Level (TRL) index, which measures the stage of technological development and maturity.

Furthermore, the technology transfer process requires a legal instrument capable of formalizing the exchange of information and knowledge, clearly establishing the obligations and benefits of the parties involved. Different types of negotiations require different contractual arrangements in order to accommodate the specific characteristics of each technology transfer process. According to INPI (2013), thirteen contractual models may be used for technology transfer activities: (a) trademark licensing agreements; (b) trademark assignment agreements; (c) patent licensing agreements; (d) patent assignment agreements; (e) compulsory patent licenses; (f) industrial design licensing agreements; (g) industrial design assignment agreements; (h) integrated circuit layout design licensing agreements; (i) integrated circuit layout design assignment agreements; (j) compulsory licenses for integrated circuit layout designs; (k) franchising agreements; (l) technology supply agreements; and (m) technical and scientific assistance service agreements.

2 Methodology

This study adopted a qualitative research approach, which is particularly appropriate when the objective is to explore and refine research questions and deepen the understanding of a phenomenon under investigation (Sampieri, Collado, & Lucio, 2013). Regarding its purpose, the study was both descriptive and exploratory in nature. Descriptive research seeks to characterize a given population or phenomenon and to identify relationships among variables (Gil, 1996). In the context of the present investigation, the descriptive component aimed to provide a realistic understanding of how craft breweries in the Metropolitan Region of Recife, Pernambuco, manage innovation, intellectual property, and technology transfer. The exploratory dimension of the research, in turn, emphasized the discovery of ideas and the generation of insights (Marconi & Lakatos, 2003).

With respect to the research method, a case study was conducted at Duvália Brewery. According to Cooper and Schindler (2011, p. 53), “case study research has evolved into an effective research methodology, combining individual and, at times, group interviews with the analysis of records and observations.” The selected microbrewery was chosen because it is a well-established and consolidated company with substantial regional and interstate market presence. The brewery has achieved significant product

distribution through bars and supermarkets across the Metropolitan Region of Recife, Pernambuco.

According to Dimer & Fialho, the first consulting firm in Brazil specialized in the brewing industry (Abril Branded Content, 2017), the Metropolitan Region of Recife is experiencing a period of strong growth in the beer market. Pernambuco stands out as a leading state in Northeastern Brazil, hosting the largest number of craft breweries and the highest production volume in the region, with an average output of approximately 100,000 liters of craft beer per month. According to data provided by the Ministry of Agriculture, Livestock and Food Supply (MAPA, 2022), Pernambuco has 14 breweries officially registered for the production and distribution of craft beer. Among breweries operating their own production facilities, Duvália Brewery has the highest production volume and offers a wide variety of beer styles, in addition to distributing its products throughout multiple regions of the state and across Brazil.

Regarding data collection, information for the study was obtained from both primary and secondary sources. Primary data were collected through semi-structured interviews, while secondary data were gathered through documentary research. Additional information was obtained from scientific articles, newspaper reports, and direct observations, with the aim of achieving a broader understanding of the case within a specific temporal context (Cooper & Schindler, 2011).

For the interviews, a structured interview guide was developed consisting of two sections. The first addressed the profile of the microbrewery and the interviewees, while the second focused on innovation, intellectual property, and technology transfer. In total, 45 questions were administered to the brewery’s strategic manager and to a consultant specialized in the brewing industry. This technique served as a research instrument for collecting information and data, enabling the researchers to understand the meanings attributed by the interviewees to a given phenomenon, within a context that had previously been based on assumptions from the researcher’s perspective (Martins & Theóphilo, 2009).

Documentary research involved the identification and analysis of documents related to the brewing sector, facilitating the collection of factual information relevant to the research objectives. Industry reports and studies, legislation and regulations issued by competent authorities, as well as websites and media reports involving relevant stakeholders, were examined. During the site visit, photographic records were also produced as part of the observational process.

Following the collection of primary and secondary data, the material was analyzed using categorical content analysis. According to Bardin (2011, p. 48), content analysis is,

[...] a set of techniques for analyzing communications, aimed at obtaining—through systematic and objective procedures for describing the content of messages—indicators (quantitative or otherwise) that allow for the inference of knowledge regarding the conditions of production/reception (inferred variables) of these messages.

3 Results and Discussion

Duvália Brewery was founded in 2013 and, three years after its establishment, became the first craft brewery in the city of Olinda and one of the pioneers in the state of Pernambuco. In 2019, the company inaugurated its current production facility, a milestone that symbolizes the consolidation of its growth and professionalization. According to interviewee E1, the company emerged from the convergence of expertise acquired through a hobby, namely homebrewing, shared personal interests among the founders, and the recognition of a business opportunity in an emerging market.

Currently, Duvália employs nine direct staff members and, during its first year of operation, achieved an annual production volume of approximately 60,000 hectoliters. Regarding business sustainability and growth strategies, E1 emphasized that the anticipated post-pandemic surge in consumer demand did not materialize. On the contrary, the market environment required craft breweries to adopt a high degree of professionalism, rigorous cost management, and substantial creativity to overcome industry challenges. The interviewee further highlighted that high tax and fiscal burdens currently constitute one of the principal barriers to the company's sustainable growth.

Consistent with the analysis published by Central Brews Blog (2022), the tax burden imposed on Brazilian craft breweries is among the highest in the world. Specifically, state value-added tax (ICMS) rates may reach 25% for breweries producing more than 200,000 liters of craft beer and draft beer per month. For breweries operating below this threshold, the rate may be reduced to 12%. In addition to ICMS, breweries are also subject to other taxes, including the Social Integration Program (PIS), the Contribution for the Financing of Social Security (Cofins), and the Tax on Industrialized Products (IPI), all calculated based on the volume of liters or units produced. These taxes directly affect competitiveness and final product pricing.

With regard to innovation practices and innovation management, the interviews and documentary analysis revealed the existence of several innovative initiatives. These initiatives include the continuous pursuit of change, the introduction of new products, both goods and services, and the implementation of new processes and marketing methods. Such practices are consistent with Drucker's

(2011) definition of innovation as the ability to do something new or differently in a manner that creates value for the organization.

Based on the innovation typology proposed by Tidd and Bessant (2015), Duvália's innovation posture can be classified as predominantly reactive. In other words, innovations are developed through observation and analysis of market behavior, enabling the company to respond strategically to emerging consumer demands and preferences. This characteristic suggests an approach based on continuous adaptation to the external environment, reinforcing the importance of constant market monitoring and operational flexibility.

Another notable aspect is the company's commitment to maintaining collaborative networks through strategic partnerships and information exchange with other craft breweries, including microbreweries, nanobreweries, and homebrewers. The company also maintains relationships with higher education institutions and research centers, increasing its participation in open innovation environments. Such partnerships strengthen organizational learning processes and knowledge dissemination, both of which are fundamental elements for the sustainable development of the sector.

From the perspective of product innovation classification proposed by Trías de Bes and Kotler (2011), the study identified several forms of innovation at Duvália. Among these, modulation innovations, also known as incremental innovations, stand out. These innovations are reflected in small adjustments and continuous improvements made to products, particularly from one production batch to another. Although subtle, such modifications are important for consumer perception and quality maintenance.

Innovations related to product size were also identified, including the commercialization of the same beer in different volumes, such as 300 mL, 600 mL, and 1 L formats. Packaging innovations are likewise present through the use of different container types, including cans, long-neck bottles, and larger glass bottles, thereby expanding the product's appeal to diverse consumer segments. In addition, the company regularly implements visual design innovations by modifying labels and packaging aesthetics to reinforce brand identity and attract consumer attention.

Other relevant innovations include the development of complementary products through the incorporation of new ingredients such as sugarcane honey, coffee, and tropical fruits. These additions introduce regional characteristics into the products, enhancing local terroir and promoting market differentiation. Furthermore, Duvália adopts initiatives aimed at reducing logistical effort through solutions that optimize transportation and storage processes, thereby contributing to operational sustainability.

In the field of marketing, the company repositioned its brand and redefined its relationship with consumers by adopting strategies associated with participation in events and festivals, as well as implementing new distribution channels. Consistent with Dornelas (2015), these practices demonstrate that innovation extends beyond the development of new products and also encompasses the reinvention of processes, changes in operational paradigms, and adaptation to evolving business environments.

Interviewee E2 emphasized that marketing innovation can be understood as the use of new methods and tools to promote products and services, ranging from significant changes in visual presentation to brand repositioning strategies. Duvália operates on two fronts in this regard: attracting new consumers to the craft beer segment while simultaneously meeting the expectations of consumers already familiar with the sensory and cultural characteristics of craft beer.

According to E1, the company's primary focus is product innovation, understood both as the creation of new products and the continuous improvement of existing ones. Beers produced with regional ingredients, such as sugarcane honey and coffee, exemplify the company's efforts to add cultural and sensory value to its product portfolio. Consumer acceptance of these innovations has been highly positive, as demonstrated by the success of products such as the dark beer brewed with sugarcane honey during Fenearte, one of the largest handicraft fairs in Latin America. Furthermore, initiatives such as the creation of the "Duvália RUN Beer Race," an event combining physical activity, music, entertainment, and beer tasting, have significantly strengthened the company's brand image by positioning it as innovative and aligned with contemporary trends in experiential consumption.

As argued by Coral, Ogliari, and Abreu (2008), innovation provides significant competitive advantages, particularly regarding the maintenance and expansion of market share. In Duvália's case, innovative activities are directly associated with the need to adapt and survive in a dynamic and challenging industry. The company responds to market stimuli through improvements in internal processes, product diversification, and the strengthening of its identity among consumers.

Regarding Intellectual Property (IP), the findings indicate that the company possesses knowledge of the subject, although its practical application remains limited. The protection of intangible assets is primarily achieved through trademark registration, both for the company itself and for its products. The Duvália trademark, for example, was identified as the most recognized brand in the craft beer segment in a brand recall survey conducted in Pernambuco, highlighting the symbolic and commercial strength of the company's identity.

Despite its market recognition, the company does not currently register industrial designs, even though its packaging exhibits distinctive characteristics. This lack of formal protection limits the legal safeguarding of aesthetic innovations, despite the competitive advantage associated with the uniqueness of the designs. This practice reflects a broader trend observed among small and medium-sized enterprises, where informality continues to characterize the management of intangible assets and knowledge circulation.

Knowledge transfer among breweries occurs predominantly through informal mechanisms, without structured or formalized processes. Nevertheless, this informality does not prevent the exchange of knowledge and experiences, particularly through partnerships, events, and collaborative initiatives. As argued by Begnis, Pedrozo, and Estivaete (2008), partnerships between organizations may take various forms, with cooperation serving as the central element. Similarly, Provan, Fish, and Sydow (2007) emphasize that participants in interorganizational networks establish connections through the exchange of information, resources, services, and even social support, creating an environment conducive to shared innovation.

With respect to innovation management and intellectual property management, Duvália does not maintain a dedicated team or strategic department responsible for these activities. Intellectual property matters are outsourced to a legal office, which limits the company's ability to fully leverage these assets as sources of competitive advantage. This gap highlights the need for a more structured and integrated innovation management system, consistent with the framework proposed by Tidd and Bessant (2015), which encompasses idea generation, implementation, and performance evaluation.

The absence of formalized innovation management processes may compromise the company's long-term sustainability and growth. Consequently, it is essential that company managers, particularly those operating at the strategic level, design and implement an innovation management system capable of capturing immediate value while simultaneously fostering the continuous development of organizational knowledge and capabilities.

Finally, the effective utilization of intellectual property emerges as a significant competitive differentiator. The legal protection of human creations grants individuals and organizations the right to exploit them economically, thereby encouraging investments in research, development, and innovation. Intellectual property can therefore be understood as a strategic instrument for achieving economic leadership, generating impacts that extend beyond local markets and possess the potential for international reach.

The analysis of the findings reveals that, despite the limitations imposed by structural and financial constraints, Duvália demonstrates a strong innovative capacity and

a high degree of integration within the craft brewery ecosystem. The strengthening of cooperative networks, the appreciation of tacit knowledge, and the adoption of incremental innovation practices position the company competitively within the regional market. The current challenge lies in the formalization and institutionalization of these practices in order to consolidate an innovation culture that is sustainable, scalable, and aligned with the demands of the contemporary marketplace.

4 Final Considerations

The craft beer segment in the Metropolitan Region of Recife is characterized predominantly by relatively mature entrepreneurs who entered this market niche largely through invitations from friends or from hobbies that subsequently evolved into business opportunities. The prospect of owning a business, combined with the growth of the market and a passion for beer culture, motivated these individuals to invest in the sector. Entry into the market generally occurred through a structured preparation process, including consumer market studies, technical visits to breweries and suppliers, participation in trade fairs, conferences and specialized events, as well as training courses focused on brewing production and management.

The present study revealed that the understanding of innovation among the actors involved is consistent with the principles established in the Oslo Manual, the leading international reference for the conceptualization and measurement of innovation. Although most breweries do not possess a formal innovation strategy, there is a clear awareness of the importance of encouraging idea generation and implementing innovative practices as sources of competitive advantage. This alignment demonstrates that the sector follows trends observed in other national and international contexts, particularly with respect to creativity-driven innovation. The regional craft beer market therefore exhibits this same pattern, characterized by its continuous capacity to launch new products and services while improving existing ones.

Additionally, the study highlights the importance of partnerships among firms within the sector, which demonstrate a strategy of “coopetition.” This approach, combining elements of cooperation and competition, is expressed through the sharing of production facilities among breweries, such as gypsy brewing arrangements, the joint organization of events aimed at promoting beer culture, and the collaborative development of products, including new beer styles and innovative consumer services such as pet growlers, growler stations, and crollers. These practices reinforce the notion of a collaborative ecosystem that supports collective industry growth. Furthermore, this cooperation reflects the increasing maturity of the sector,

whose participants recognize that joint efforts can generate both individual and collective gains, improve the quality standards of locally produced beers, and enhance the competitiveness of regional brands.

Regarding the innovation process, the study found that the search for information and inspiration relies on a variety of formal and informal sources. Participation in equipment trade fairs, targeted internet research, exchanges of experiences through WhatsApp groups, reading specialized magazines, gathering customer feedback, and continuously monitoring market demands are among the strategies employed by breweries to identify innovative opportunities. The idea selection phase generally relies on the intuition and practical experience of entrepreneurs, who determine the steps necessary for implementing innovations. The implementation stage is accompanied by the pursuit of new knowledge, technical training, experimentation with recipes and production processes, and the continuous exchange of information with other breweries and industry stakeholders. This ongoing cycle of idea generation, selection, implementation, and reassessment constitutes a process of continuous learning that is essential for business sustainability in a highly competitive market.

With regard to value perception, value is primarily realized through the commercialization of products and services and through workforce development initiatives that strengthen the relationship between breweries and consumers. This relationship promotes customer loyalty, as consumers come to appreciate not only the final product but also the processes, originality, and identity associated with artisanal production. The construction of narratives surrounding ingredient origins, brewery history, and the experiences provided through beer tasting significantly enhances perceived value, transforming craft beer from a simple beverage into a cultural experience.

Concerning intellectual property, the study revealed that entrepreneurs’ knowledge of the subject remains limited. The practices identified are concentrated primarily on the use of trademarks as a means of differentiation from competitors and on the application of industrial design to establish visual identity. Although these practices represent an initial stage of intellectual property appropriation, the absence of clear and structured policies for protecting technologies and methods developed by breweries is evident. Consequently, these firms should develop specific intellectual property strategies aimed at transforming accumulated tacit knowledge into intangible assets capable of generating sustainable competitive advantages. This process also requires training opportunities, access to legal and technical support services, and awareness campaigns emphasizing both the benefits of intellectual property protection and the risks associated with neglecting it.

The mapping of factors that facilitate or hinder innovation and the implementation of intellectual property practices revealed the existence of significant challenges. Among the economic factors, high production costs, the acquisition of specialized equipment, and difficulties in obtaining financing stand out. At the organizational level, shortages of qualified personnel, limited resources available for investments in innovation and training, and the lack of systematic market information hinder the advancement of innovative practices. From a structural perspective, the absence of sector-specific public policies and the weakness of technical and scientific support networks also represent important barriers. Addressing these challenges requires public policies focused on innovation promotion, tax incentives, subsidies, targeted financing mechanisms, and the establishment of innovation centers dedicated to the craft brewing industry.

On the other hand, several factors were identified as important drivers of innovation. The growing appreciation for local and artisanal products, increasing demand for differentiated and higher-quality products, the emergence of new consumer segments, and greater public knowledge about beer culture have all stimulated demand for novelty. This favorable environment encourages experimentation and the development of new proposals by craft breweries. The need to continuously launch new products, driven by the specificity and sophistication of consumer demand, has also stimulated innovations related to production processes and intellectual property protection. Moreover, the creative use of local ingredients and the incorporation of sustainable production practices have emerged as important competitive differentiators.

Other aspects identified as catalysts for innovation include the ability of companies to generate derivative ideas from their own products, such as the development of new beer styles or complementary products. This dynamic has produced significant impacts on research and development, marketing, and production activities, encouraging organizations to move beyond their comfort zones and explore new platforms and processes despite the risks inherent to innovation. As a result, experimentation has increasingly become embedded in the organizational culture of many breweries. This innovative behavior also drives the creation of new business models, unique sensory experiences, and customized services, contributing to the consolidation of the craft brewing segment as a constantly evolving field.

The study also highlights the importance of partnerships established among craft breweries and their direct competitors, which have fostered a broader and more collaborative understanding of the market. These interactions facilitate access to and adoption of technologies, whether embodied or non-embodied, while promoting the sharing of knowledge and best practices.

The growing interest of consulting firms, suppliers of ingredients, equipment manufacturers, and technical component providers has also contributed to the adoption of innovative practices, strengthening the productive chain as a whole. The establishment of technical and commercial cooperation networks enhances collective learning, diversifies sources of innovation, and expands opportunities for industry growth.

Furthermore, higher education institutions, governmental agencies, and industry associations play a significant role through the organization of events, exhibitions, and trade fairs that provide breweries with access to new equipment, ingredients, and production processes, as well as opportunities to exchange experiences with participants from more developed markets. These initiatives strengthen the sector's human capital and expand opportunities for innovation and competitive positioning in an increasingly demanding environment. Well-structured university-industry partnerships have the potential to accelerate innovation processes and foster a culture of applied research that is essential for the technical advancement of micro and small breweries.

Despite these positive findings, no formal technology transfer practices were identified within the sector. Although some evidence suggests the existence of informal permissions allowing the use of technologies, knowledge, and methods developed by one brewery by another, these practices remain unsystematized. This absence may be attributed to the early stage of market development, limited available resources, and the lack of formal technology management mechanisms. This gap reinforces the need to structure technology transfer processes that facilitate the organized dissemination of knowledge and its conversion into new products, services, and processes capable of generating positive impacts throughout the craft beer ecosystem. The establishment of innovation hubs, sector-specific incubators, and technology diffusion support programs could significantly contribute to overcoming this limitation.

Based on these findings, it can be concluded that there is a promising pathway for strengthening innovation and intellectual property practices among craft breweries in the Metropolitan Region of Recife. To fully realize this potential, entrepreneurs must develop a deeper understanding of the concepts and practical applications of innovation and intellectual property, adopting strategies that allow these practices to become systematically integrated into daily business activities. Overcoming the challenges identified will necessarily require coordinated action among the various actors that comprise the brewing ecosystem, including private companies, public institutions, academia, and consumers. Furthermore, the creation of specific public policies aimed at encouraging research, workforce development, access to credit, and the formalization

of innovative practices is essential for establishing an institutional environment conducive to the sustainable growth of the sector.

Finally, the craft beer segment is emerging not only as a sustainable market trend but also as a fertile field for the development of innovative solutions grounded in creativity, collaboration, and the appreciation of local production. Strengthening these practices has the potential not only to generate economic value for participating enterprises but also to contribute to regional development and to the consolidation of a distinct cultural identity associated with artisanal beer production. Craft beer therefore transcends its role as a consumer product and assumes a symbolic and cultural significance that enriches the social and economic fabric of the communities involved in its production and consumption.

5 Future Perspectives

Future research may further investigate the mechanisms through which craft breweries in the Metropolitan Region of Recife acquire and disseminate knowledge related to innovation and intellectual property. Considering the current reliance on informal and experience-based learning practices, such as participation in trade fairs, industry events, and visits to suppliers, it would be valuable to examine how structured training programs, university partnerships, and institutional support initiatives could enhance managerial capabilities in these areas. Comparative studies involving other Brazilian regions or international contexts may provide insights into best practices and regional specificities, thereby contributing to the development of more robust strategies for the sector.

Another promising avenue for investigation concerns the analysis of technology transfer practices and their potential formalization within the craft beer ecosystem. Although informal exchanges of knowledge and methods are common, the absence of structured processes highlights the need for studies assessing the feasibility and impacts of formal cooperation mechanisms. Future research could focus on the development of models or frameworks that systematize technology transfer and intellectual property management, particularly for small and medium-sized enterprises operating under resource constraints. Such efforts would be especially relevant for identifying scalable models capable of supporting the growth and diffusion of innovation throughout the sector.

Finally, given the significant role played by cooperation and strategic partnerships within the craft brewing segment, further studies may explore the dynamics of interorganizational networks involving craft breweries, bars, restaurants, and research institutions. In addition to fostering innovation, these networks contribute to value co-creation

and the cultural dissemination of the craft beer movement. Investigating how such collaborations are established, maintained, and leveraged may provide valuable insights into how small businesses operating within creative industries can collectively overcome structural limitations. Furthermore, future research should examine the role of public policies and fiscal incentives in reducing barriers to innovation and enhancing the competitiveness of the sector at both regional and national levels.

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