IOSR Journal Of Humanities and Social Science (IOSR-JHSS)
Volume 31, Issue 2, Series 2 (February, 2026) 20-24
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Social Technologies Produced And Patented In Brazil: A Patentometric Study

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Abstract
Social technologies emerge as methods to address economic and political issues within society. They are understood as sustainable, profitable, lasting, and cost-effective actions aiming to promote technological innovations that impact the quality of life of a given community. In Brazil, social technologies are produced by higher education institutions, entrepreneurs, and enthusiasts of a solidarity-based economic culture—individuals driven by ideals of solidarity. This research investigates which social technologies have been produced and patented within the National Institute of Industrial Property (INPI) database. The objective is to identify regions, classifications, and specific social technologies filed in this database. To achieve this, a patentometric study was conducted, analyzing 197 patent processes. The findings indicate a higher concentration of patent filings in "green" areas, particularly in the environmental field. The Southeast region shows the highest incidence of filings, and Section G (Physics) of the International Patent Classification (IPC) presents the highest concentration. The study identifies key areas and regions of patent concentration and is intended for readers, researchers, and students in Intellectual Property and related fields.

Keywords: *Social technologies; technological innovation; patents; society.*

Date of Submission: 29-01-2026 Date of Acceptance: 09-02-2026

I. Initial Scenario

Joint actions that seek to solve social problems, include the underserved, and promote social transformation are the structural pillars of social technologies (ST). Within the context of higher education institutions (HEIs), social technologies establish themselves by offering solutions, techniques, products, and innovative methodologies that are applicable and tangible, aiming to remedy social ills. These are developed in conjunction with the community surrounding the educational institutions (De Carvalho Guimarães, 2025).

A prominent author in the field of social technology is Dagnino (2019), who conceptualizes STs as recyclable methodologies, products, or techniques developed through community interaction that offer effective social transformation solutions. In his definition, the author points out the necessity of applying three basic elements: replicability, as these technologies must be reproducible in any social context by different communities without requiring high investment or advanced technical levels; community interaction, understood as the essence of ST where co-creation resides—it is fundamental to apply local concepts and experiences; and the solution for social transformation, which targets various segments and needs of the community involved.

Higher Education Institutions (HEIs) play a leading role in the development, maintenance, and structuring of STs. HEIs produce scientific knowledge, contributing to the R&D process of STs. Through university outreach (extension), they serve as bridges between academia and society, facilitating communication and interaction. They also train skilled professionals and disseminate knowledge to other community actors. Furthermore, some institutions provide incubation and acceleration for technological projects focused on ST, offering technical, scientific, and sometimes financial support (Furlan et al., 2021).

The fact is that HEIs are fundamental to the ST process, representing a commitment to social innovation and using academic knowledge as a driving force for the equitable and sustainable emergence of actions that bring

lasting social transformations. This study aims to answer: Which social technologies were produced and patented in the database of the National Institute of Industrial Property (INPI)?

II. Method

This study is based on patentometric research, a technique within the analytical groups of bibliometric research used here for the analysis of patent documents.

The data collection process followed these steps: Accessing the INPI homepage, selecting the "Patents" tab, accessing the database via "Anonymous Search," and then using "Advanced Search." The descriptor "Social Technologies" (tecnologias sociais) was used as a keyword, yielding 197 patent processes. Following the methodological process, an individual analysis of the filings was conducted to verify the relationship between the patent and social technology. After analysis, a sample of 12 patent processes was reached, which were subsequently grouped and presented in Table 1.

III. Results And Discussion

Table 1 consists of the technologies and patent applicants found in the INPI database, identifying the title, technology, and applicants. Notably, there was a higher incidence of "green technologies." Other observed spheres included assistive technologies and process technologies.

Table 1: Production of Social Technologies in the INPI Database

Title	Technology	Applicant
Project management process for valuing natural products	Low-cost technologies	Marcos Rogério Azieri et al.
Production of PHAs biopolymers from Euterpe seeds	Green technologies	Federal University of Pará (UFPA)
Integration of sustainable technologies in regenerative support	Regenerative support	Endelevo Fachadas Eficientes Ltda
Electronic cane with wearable haptic device and Smart City connection	Electronic cane	Caio Henrique Marques Texeira et al.
Integrated set of technologies for effluent treatment and biomethane production	Effluent treatment/Biomethane	Nicola Isidoro Martorano Filho
Sensing system applied to vehicular/robotic platforms and assistive technologies	Proximity sensing	UFSJ / FAPEMIG
Hydroelectric plant without rivers/dams using aeronautical theories	New hydroelectric model	John Britt Branko Lazarevic
Electric motor system for vehicular, robotic platforms, and assistive technologies controlled via Bluetooth	Electric motor system	Federal University of São João del-Rei (UFSJ)
Intelligent global system for increasing energy matrices, co-generation, and energy balances, based on alternative, unconventional, clean, and self-sustainable technologies to reduce the greenhouse effect	Intelligent global system of alternative technologies	Nisio de Souza Armani / Caio Leonor Pereira

Source: INPI (2025).

In a study titled Technology and Society: Analysis of Social Technologies in Contemporary Brazil, conducted by Corrêa (2010), it was identified that the social technologies produced at the time were related to themes such as the environment, water, health, and renewable energy. That study utilized a documentary methodological approach. This fact aligns with the data presented and identified in Table 1. Fifteen years after Corrêa's research, the present study confirms a higher prevalence of patents in the field of environmental technologies.

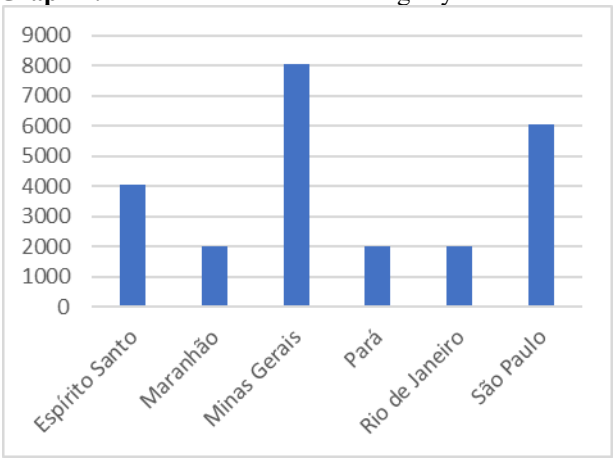
Another study by Zucoloto & Pereira (2020) provides even more robust data regarding technological production in Brazil, presenting information from the Banco do Brasil Foundation—an institution that develops actions to encourage and stimulate the production of social technologies. It was evidenced that between 2001 and 2007, more than 1,000 technologies were developed, with the vast majority directed toward the environment, education, income generation, water resources, and health.

According to Pozzebon et al. (2025), social technologies can be perceived and conceptualized in two dimensions. The first is related to social construction or the political process, where these technologies, to be considered "social," must meet two criteria: being inclusive and emancipatory, connecting to social values and the solidarity economy. The other dimension is linked to what the authors call the "thing" or "replicable product." For the authors, this perspective contributes to the low level of interest in patenting, mainly because these technologies are often considered to have low economic value or to be disposable. This information may explain the limited number of patents filed and identified in the INPI database, as shown in Table 1.

In Brazil, there is a shortage regarding the production of social technologies; there are few training incentives for thinking about this type of project, and low academic production is still noted, which hinders a better understanding of the impacts of social technologies (Rollemberg & Farias, 2021). For Do Nascimento, Benini & Petean (2021), education on the solidarity economy is necessary, as is the development of a political culture that values principles such as social collectivity, self-management, and social inclusion. According to these authors, factors such as technological determinism and technological neutrality imply a weakness in the production of social technologies.

Further information identified in the present study is displayed in Graph 1, where it is possible to verify and analyze the distribution of patent filings in the INPI database across Brazilian states. It is observed that the states of Minas Gerais and São Paulo have the highest incidence of filings, followed closely by Espírito Santo, and further below, the states of Maranhão, Pará, and Rio de Janeiro.

Graph 1: Distribution of Patent Filings by Brazilian State



Source: INPI (2025). Prepared by the authors.

Mapping the regions that generate production and social technological innovation can provide indicators of the relationships involved, the triggers, the incentives, the generated impacts, and the cultural reality of the environment. In the study by Cultri & Bazilio (2021), it was found through the Banco do Brasil Foundation for Social Technology that São Paulo is the state in Brazil that receives the largest quantity of digital social technology—meaning the study focuses on the recipient state. However, when comparing this to Graph 1, a relationship is noted; it is possible to infer that the level of technological development in the state may stimulate the creation of new technologies.

Another observed data point concerns the Southeast region, where Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo present the highest number of patent filings. This information can be corroborated by the research of De Jesus, Menezes & Santos (2023), which identified the Southeast region as a hub for social technologies. Furthermore, it was observed that these technologies are primarily in the fields of environment and education.

A factor that must be considered is that social technology occurs primarily due to solidarity economy issues, through an ideal of strategies aiming to improve and expand the possibilities of a given region. It also aims to generate inclusion and opportunities for the community. Elements such as poverty, inequality, income distribution, and basic sanitation appear to be attractors for social technologies, as these problems spark scientific, political, and social initiatives and movements (Nachtigall et al., 2020).

According to IBGE data (2025), the Southeast region has the highest population concentration in Brazil. This may be an indicator of the concentration of patent filings in that region because a higher urban concentration leads to greater needs, thereby stimulating technological production and innovation.

The following section highlights the International Patent Classification (IPC), a universal code that allows for the identification of the section and classification of patents, trademarks, copyrights, and other types of Intellectual Property (Nunes, 2013). In Table 2, it is possible to visualize the sections, subsections, classes, subclasses, and groups/subgroups. It is also verified that Section G, which refers to Physics (physical elements), has the highest incidence. Sections C (Chemistry; Metallurgy), F (Mechanical Engineering; Lighting; Heating; Weapons; Blasting), A (Human Necessities), and E (Fixed Constructions) are also evident.

Table 2: International Patent Classification (IPC)

IPC
G06Q 50/00 (2006.01) Systems or methods especially adapted for specific business sectors, e.g., public services or tourism.
G06Q 10/00 (2006.01) Administration; Management.
C12P 1/00 (1980.01) Preparation of compounds or compositions, not provided for in groups, by using microorganisms or enzymes; general processes for the preparation of compounds or compositions using microorganisms or enzymes.
F03D 1/00 (1968.09) Wind motors with the axis of rotation substantially parallel to the airflow at the rotor inlet.
F03G 6/06 (1990.01) Devices for producing mechanical power from solar energy; with solar energy concentrating means.
A61H 3/06 (1968.09) Devices for helping physically disabled persons to walk; walking aids for the blind.
G01S 15/93 (1980.01) Systems using the reflection or reradiation of acoustic waves, e.g., sonar systems; sonar systems specially adapted for specific applications; for anti-collision purposes.
E04B 2/96 (1985.01) Walls or partitions for buildings; wall structures with regard to insulation; joints specially adapted for walls; curtain walls; comprising panels fixed to the structure by means of mullions or transoms.
G08B 25/00 (1968.09) Alarm systems in which the location of the condition causing the alarm is signaled to a central station, such as fire telegraph or police call systems.
E04H 3/06 (1968.09) Buildings or groups of buildings for public or similar purposes; institutions, e.g., infirmaries, prisons; museums; libraries.
C02F 3/30 (1980.01) Biological treatment of water, wastewater, or sewage; aerobic and anaerobic processes.
G01B 11/14 (1968.09) Measuring arrangements characterized by the use of optical means; for measuring distance or clearance between spaced objects or spaced apertures.
E02B 9/06 (1968.09) Hydraulic-power plants; layout, construction or equipment, methods or devices for their realization; water conduits; pressure galleries or pressure conduits; galleries specially adapted to house pressure conduits; means specially adapted for use with these conduits, e.g., housings, valves, gates.
G05D 1/02 (1968.09) Control of position, course, altitude, or attitude of land, water, air, or space vehicles, e.g., automatic pilots; control of position or course in two dimensions.
B01D 53/00 (1968.09) Separation of gases or vapors; recovery of vapors of volatile solvents from gases; chemical or biological purification of waste gases, e.g., engine exhaust gases, smoke, fumes, or exhaust gases, aerosols.

Source: INPI (2025)

The technologies with the greatest predominance and appearance are in the field of Physics, or Section G. As shown in Table 1, there is a higher prevalence of green technologies, which are aimed at reducing environmental impact, promoting a culture of responsible and sustainable use, and contributing to the development of innovations such as solar energy, sustainable energy production, and environmental balance. This explains the relationship between the filings and Section G, as presented in the figure below.

Source: FAPESP virtual library, (2025).

The IPC is a relevant and significant instrument that assists and facilitates the search for technologies; through it, it is possible to retrieve documents such as patents and trademarks, as well as promote the protection of copyrights (Proner, 2007). It is fundamental for understanding the classification of the social technologies identified herein.

IV. Final Considerations

Social technologies emerge in the search to resolve social ills and problems, bringing with them the necessity of community participation and proposing impacts on social inclusion and the quality of life of the population. Through innovative, sustainable, and profitable actions, companies, institutions, entrepreneurs, and scientists, among others, can develop and contribute to underserved regions and communities, directly impacting their quality of life.

Through this study, it was possible to find that there is a higher incidence and interest in social technologies focused on the environmental area, with green technologies being the most prominent. Assistive and educational technologies also show significant evidence.

The Southeast region has the highest number of patent filings, where the states of São Paulo, Minas Gerais, Espírito Santo, and Rio de Janeiro concentrate the highest predominance of patents.

In the International Patent Classification (IPC), there is greater interest in Class G, which is based in the field of physics, with green patents being particularly noteworthy.

This study is of interest to Intellectual Property students, researchers, the academic community, and those interested in social technologies. It allows for a reflection on a solidarity economy and provides a portrait of investment in social technologies in Brazil. It is also important to highlight the need for further investigation and deeper analysis to expand information and understanding of the mechanisms of social technologies. Therefore, the continuity of research and new studies in this area are essential.

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