Theoretical-empirical Article

Communities and Social Technologies in the Development of Sustainable Business Models in the Amazon — Da Tribu's Case

Comunidades e Tecnologias Sociais na Concepção de Modelos de Negócios Sustentáveis na Amazônia — O Caso Da Tribu

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ABSTRACT

Objective: the bioeconomy has been repeatedly highlighted as the main path to sustainable development for the Amazon. However, the advancement of this movement faces numerous challenges, such as the creation of sustainable business models (SBMs) and the change of perspectives regarding old social technologies (STs) and local communities, which are sometimes seen as mere suppliers of raw materials. In order to better understand these challenges, this article aims to identify the role of the community and its social technologies in the design of an SBM. **Theoretical approach:** based on a single case study of Da Tribu, a biojewelry company located in the state of Pará, in the Brazilian Amazon, we demonstrate the recursive nature of the relationship: ST-communities-SBM. **Method:** through various primary and secondary data sources (interviews, non-participant observation, and online materials), we demonstrate the relevance of considering social technologies and other particular aspects of Amazonian communities in the design of a business. **Results:** conceptually, the research contributes to the discussion that brings ST and SBM closer together; the contribution to practice is based on essential points of attention for the creation and management of companies involved in the development of the Amazonian bioeconomy. With regard to communities, the study seeks to highlight voices that have been historically silenced and treated only as resources to be exploited. **Conclusions:** finally, the discussion highlights points that can also be considered in public policies aimed at the context under discussion.

Keywords: sustainability; local knowledge; bioeconomy.

RESUMO

Objetivo: a bioeconomia tem sido recorrentemente apontada como a principal via de desenvolvimento sustentável para a Amazônia. Contudo, o avanço desse movimento passa por inúmeros desafios, como a criação de modelos de negócios sustentáveis (SBMs, da sigla em inglês) e uma mudança de perspectiva em relação às tecnologias sociais (TS) ancestrais e às comunidades locais, historicamente encaradas como meras fornecedoras de matéria-prima. A fim de compreender mais a fundo como essas questões podem ser superadas, este artigo busca identificar o papel da comunidade e suas tecnologias sociais na concepção de um SBM. **Marco Teórico:** com base no caso Da Tribu, um empreendimento de biojoias localizado no estado do Pará, na Amazônia brasileira, demonstra-se o caráter recursivo da relação: TS-Comunidades-SBM. **Método:** por meio de diferentes fontes de dados primários e secundários (entrevistas, observação não participante e materiais on-line), descortina-se a relevância das tecnologias sociais e de outros aspectos particulares das comunidades amazônicas na concepção de um empreendimento engajado com o desenvolvimento de uma bioeconomia inclusiva na região. **Resultados:** conceitualmente, a pesquisa contribui para uma aproximação entre as literaturas de TS e SBM, reforçando elos existentes entre ambas. Com isso, o estudo também se posiciona como uma contribuição eminentemente prática, destacando pontos de atenção essenciais para a criação e a gestão de negócios engajados com as cadeias da sociobiodiversidade, úteis não apenas para os empreendimentos em si, mas também para as políticas públicas que emergem atualmente nesse campo. **Conclusões:** ao enfocar as comunidades, são trazidas à tona vozes historicamente silenciadas e tratadas apenas como recursos a serem explorados.

Palavras-chave: sustentabilidade; saberes locais; bioeconomia.

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INTRODUCTION

Although it is a universal common good and essential for facing major challenges in contemporary society (Aragón, 2018), the Amazon rainforest has been the stage of increasingly destructive practices, which could lead us to a point of no return in the coming decades (Lovejoy & Nobre, 2018). Changing the direction of this fate involves not only combating deforestation, but also strengthening a working forest economy. By promoting the sustainable use of biodiversity resources, forest restoration, and income generation for local populations, the bioeconomy has been recognized as the major actor of this movement. According to studies, value chains based on the region's immense diversity of oils, fish, fruits, and fibers could generate approximately BRL 38.5 billion annually by 2050, employing approximately 947,000 people (Nobre et al., 2023) and addressing both local emergencies and global socio-environmental problems (Abramovay et al., 2021).

In the wake of these estimates, government agents, the private sector, and the third sector — often gathered in multi-sector coalitions — are trying to support the bioeconomy in the Amazon rainforest. Initiatives that seek to leverage the emergence and expansion of bioeconomy ventures include, for example, state strategies, decrees, new structures within the federal government, mega-events, courses, and publications supporting bioeconomy. However, in order to ensure the orderly exploitation of natural resources and act as true mechanisms of social transformation, these ventures need to envision not only the creation of new products and markets, but also to build sustainable business models (SBM), aligning financial, environmental, and social elements in their operations (Bocken et al., 2015). Do contrário, eles podem inclusive se tornar novos vetores do desmatamento, agravando a superexploração dos recursos naturais (Haussman, 2024) and the social inequalities common to the Amazon rainforest reality (Castro, 2010).

At the same time, there is also an urgent need to change the way local communities are approached in value chains and bioeconomy ventures, considering them as central actors, respecting their organizational forms, and valuing the solutions they design and have. In particular, this concerns the numerous social technologies developed by these communities, since they can guide countless responses on the sustainable use of forest resources and open up new perspectives for the conservation of the Amazon rainforest. In short, in addition to an ethical commitment, placing these communities and their social technologies in the center is fundamental to the orchestration of an inclusive and sustainable bioeconomy (Fernandes et al., 2022). Any disregard of these elements results in the bioeconomy only reproducing colonial models of entrepreneurship.

In line with Souza and Pozzebon (2020), social technologies are conceived as the result of political processes (in which sociotechnical reconfiguration occurs) capable of creating spaces and benefits for redefining agreements between social groups, the artifacts, and methods they mobilize in everyday life, especially for production and consumption. Theorizing about social technology (ST) alongside the discussion on SBM implies some theoretical-conceptual challenges, since it involves comparing perspectives that start from different onto-epistemological aspects. It can be understood that ST proposes a movement of radical sociotechnical transformation (Dagnino, 2009, 2014; Feenberg, 2002) whereas SBM promotes a reconciliation of contradictions between business and socio-environmental aspects that result in the conception of a model more consistent with a sustainability perspective (Bocken et al., 2014; Lüdeke-Freund, 2010). However, it is important to recognize that this also offers theoretical opportunities for both fields, as well as contributing to the strengthening of the bioeconomy.

In this sense, and far from wanting to hinder the political and emancipatory proposition of social technology, this research seeks to find in this concept and in the concept of SBM discussion points to think about how it is possible to respect local and ancestral knowledge, even when proposing business in the Amazon rainforest. If it is ambitious — or even laudable — for businesses to set up in this territory, it should be by mobilizing alternatives to conventional models, respecting the communities and their natural and cultural riches. Therefore, the objective of this study is *to identify the role of the community and its social technologies in the conception of a sustainable business model (SBM)*, seeking to highlight the relevance of communities and local knowledge and offer a contribution that brings these concepts closer to each other.

To this end, the case of Da Tribu is analyzed, a business founded and managed by people from the Brazilian Amazon rainforest region (Pará) that demonstrates the presence of SBM elements, configuring itself as such. This is considered an instrumental case (Stake, 1995) that allows theorizing based on its characteristics. An inductive approach was adopted, addressing a particular case study for a broad aspect of theoretical approach (Hyde, 2000). As it is a qualitative research, the study aims at an inductive analysis, based on the empirical study done in an Amazonian riverside community.

RAC, Rev. Adm. Contemp., v. 28, n. 6, e240180, 2024 | doi.org/10.1590/1982-7849rac2024240180.en | e-ISSN 1982-7849 | rac.anpad.org.br

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Thus, this study offers theoretical contributions by seeking to bring SBM and TS closer together, providing a new perspective for literature and contributions to practice. Through its findings, we were able to demonstrate a better understanding of the journey and the results of the exercises of a venture that, engaged in the development of the inclusive bioeconomy in the Amazon rainforest, developed a sustainable business model with intense participation of local communities, respecting their social technologies.

This article is divided into six sections, starting from this introduction. The theoretical framework section highlights the discussion on social technology and sustainable business models, seeking to establish a possible stage for approximation. The third section of the text presents the methodological procedures used and the specificities of the chosen case. Section four highlights the analysis and discussion of the research results. Finally, it ends with final considerations and limits for future research.

SOCIAL TECHNOLOGY

Throughout history, there have been some efforts to rethink technology. The concept of appropriate technology, for example, has its roots in the social movement initiated by Mahatma Gandhi in the 1930s against British rule (Dagnino, 2009). As a result of this movement, Neder and Thomas (2010) point out that the spinning wheel became a symbol of national unity in India and resistance against English domination. It is noteworthy that Gandhi did not apply the terms 'appropriate' and 'social' to this technology; however, his confrontation, as a social movement, enabled the definition of what became the foundation for the emergence of such concepts (Herrera, 1983).

In the 1960s, critical perspectives emerged to consider the role of technology in social development that preceded the definition of social technology. These included terms such as 'appropriate technology,' 'intermediate technology,' 'democratic technology,' 'alternative technology,' among others (Jecquier, 1976; Kohr, 1981; Thomas, 2009). The focus was on the need for technology production on a small scale, family or community-based technologies, low-complexity technologies, technologies that involve low intensive human labor and low energy consumption, and, finally, accessible scientific and technological knowledge (Thomas, 2009). Despite documented efforts, it is noticeable that throughout the 1980s the accepted argument was that large-scale production was the means to speed up economic development. Considering these

movements, efforts to define social technology emerged. For Thomas (2009), social technologies are ways of creating, developing, implementing, and managing technologies aimed at solving social problems, generating social inclusion and sustainable development.

In the publication of a book that results in the compilation of different texts, Renato Dagnino provides his contribution, something he understands as the cognitive launch pad for the solidarity economy, that is, social technology. Dagnino (2014) defines social technology as "any product, method, process or technique created to solve some type of social problem and that addresses issues of simplicity, low cost, easy applicability (and re-applicability), and has proven social impact." (p. 157). According to Andersen et al. (2013), social technology, from the perspective of South American authors, bears empowerment as its central factor. For that purpose, the concept of empowerment by Paulo Freire in *Pedagogy of the Oppressed* is considered as an incentive to the potential of social actors.

In their analysis of the concept of social technology in Brazilian manufacturing between 2002 and 2015, Duque and Valadão (2017) reached two main conclusions: social technology as social practices in themselves, which provide social transformations in and for a community, through social construction and sociotechnical adaptation; and technologies as artifacts that generate social change, understood as technologies for the social sphere. Therefore, there is a perspective of practices that are, in themselves, social technologies; it is a perspective that mobilizes technologies, even conventionally, to meet a social demand.

Pozzebon and Fontenelle (2018) argue that the concept of social technology points to political processes that create space and opportunities to redefine arrangements and rules between social groups, artifacts, and methods used in everyday life, triggering social transformation. For the authors, the term 'technology' goes beyond physical artifacts and includes methodologies and ways of 'organizing.' In line with this, Souza and Pozzebon (2020) understand social technology as the result of a political process of sociotechnical reconfiguration in which social practices employ methods and tools in order to promote social transformations to solve problems and meet needs related to exclusion and poverty.

In Brazil, the field of social technology has a strong presence at Banco do Brasil Foundation (https://transforma.fbb.org.br/), which understands ST as projects that transform reality, supporting and rewarding initiatives that are aligned to its mission to finance social projects focused on sustainable development (SD), socio-productive inclusion, and the reapplication

of social technology (this is considered a transversal axis), in connection with five other axes: future-oriented education, environment and income, health and well-being, and humanitarian and voluntary aid. Nonetheless, there is a tension point, as ST draws near to the discourse of sustainable development, considered by critics as a reformist, non-transformative solution. Finally, to illustrate another Brazilian perspective, for the Ministry of Science, Technology and Innovation (MCTI), (https://antigo.mctic.gov.br/mctic/opencms/ciencia/politica_nacional/_social/Tecnologia_Social.html) social technology assists in meeting the UN's 2030 Agenda and achieving the Sustainable Development Goals (SDGs).

Lastly, Pozzebon and Fontenelle (2018) emphasize that the appeal to social technology does not refer to countries classified as 'underdeveloped,' 'developing,' or 'emerging,' as these terms are misleading as the connotation of development found in Western societies is neither universal nor interesting. In fact, for the authors of social technology, a postcolonial reasoning toward some 'other' development remains in their DNA. Thus, considering the reflection on other possible worlds, intertwined with the concept of social technology, its understanding can play a positive role in the design of business models that are not directed solely toward profit.

SUSTAINABLE BUSINESS MODELS (SBM)

Essentially, a business model consists of a tool to logically and objectively outline how an enterprise delivers value to its customers through infrastructure, integrating partners in a relationship network with the aim of delivering this value and obtaining sustainable revenues (Osterwalder & Pigneur, 2002). It is "a conceptual tool that contains a set of related elements and allows expressing the business logic of a specific company" (Osterwalder et al., 2005, p. 10). With this, they help in understanding aspects underlying the existence and dynamics of an organization, such as its target audience, what it does now and what it will do in the future, and how, where, and what it does, as well as how to define and measure its success (Upward & Jones, 2016).

Although the classical notion of a business model has helped articulate the concept of value, especially considering three components (value proposition, value creation and delivery, and value capture) and provided a simplified representation of the value chain and its elements in an organization (Geissdoerfer et al., 2017; Richardson, 2005), it has become increasingly evident that it is not enough to address complex social challenges. In a context marked by multiple crises (global warming, loss of biodiversity, environmental catastrophes, lack of

access to water, social inequalities, etc.), it is essential that organizations incorporate sustainability principles into the structuring of their businesses, directing efforts to design what the literature recognizes as sustainable business models (herein also referred to as SBMs) (Bocken et al., 2015).

Seeking to develop a conceptual table for business models focused on socio-environmental sustainability, Lükede-Freund (2010) states that a sustainable business model allows the creation of a competitive edge through superior value for the customer and contributes to the sustainable development of the company and society. In line with this, Bocken et al. (2014) understand that sustainable business models envision triple results (economic, social, and environmental) and involve many stakeholders. In general, the main characteristics found in these models tend to be: (1) the incorporation of concepts, principles, or goals that aim at sustainability; or (2) the integration of sustainability into the value proposition, as well as into value creation and delivery activities and/or value capture schemes (Geissdoerfer et al., 2017).

By helping to understand the evolution of new and established enterprises that decide to develop a business model focused on promoting sustainability, the notion of sustainable business models has emerged as a theoretical framework of great relevance. As explained by Schaltegger et al. (2016), such models allow describing, analyzing, managing, and communicating a set of fundamental issues: (a) the sustainable value proposition of an enterprise for its stakeholders; (b) how value is created and delivered; and (c) how economic value is captured in parallel with the regeneration of natural, social, and economic capital, beyond organizational limitations.

In order to expand the debate on the concept of SBM and guide the construction and implementation of these models, several studies are requested to address the understanding of the topic. Upon noting the existence of several approaches dedicated to the analysis and description of business models engaged with sustainability, Bocken et al. (2014) sought to organize them around innovations that create positive impacts and/or reduce negative impacts in the social and/or environmental spheres, either through the transformation in the way the business structures its value chain (its business model) or by changing its value proposition. As a result, the authors reached eight SBM archetypes, defined and grouped according to the social themes (offering functionality instead of ownership, adopting a stewardship role, and encouraging sufficiency), technological themes (maximizing the efficiency of materials and energy, creating value from waste and replacing conventional

modes with renewable energies and natural processes), and organizational themes (giving back to society/the environment and developing solutions for expansion).

Lükede-Freund et al. (2018). provide another classification. Based on a multi-method study, from a literature review and a Delphi survey, the authors point out the existence of 45 patterns, categorizing them into 11 groups that classify SBM in the social, ecological, and economic spheres (Table 1), contributing to the understanding of how SBMs work and how they can solve, in parallel, a market and sustainability problem.

Table 1. Sustainable business model standards.

Standards	Definition
Price and revenue	Standards that primarily address the revenue model of a business model, i.e., how offerings are priced and revenues generated.
Service and performance	Standards that emphasize the functional and service value of products and that offer performance management, that is, how value propositions are defined and delivered.
Providing access	Patterns that create markets for otherwise neglected target groups; they consist of modified value propositions, channels, revenues, pricing, and cost models, i.e., how value propositions are designed, delivered, and to whom.
Cooperative	Standards that integrate a wide range of stakeholders, such as co-owners and co-managers, discuss how partners are defined, and how the organization is managed.
Financing	Standards that address the financing model within a business model, i.e., how equity, debt, and operating capital are acquired.
Donation	Standards that help make products or services to target groups in need, i.e., how costs are covered and social target groups are reached.
Social mission	Standards that integrate social target groups in need, including otherwise neglected groups, whether as customers or production partners, i.e., how customers, partners, and employees are defined and integrated.
Ecodesign	Standards that integrate environmental aspects into key activities and value propositions, i.e., how processes and offerings are designed to improve their environmental performance throughout their entire life cycle.
Closing the cycle	Standards that help integrate the idea of circular flows of materials and energy and partnerships, key activities, and customer channels, i.e., how materials and energy flow into, out of, and back into a company.
Community platform	Standards that replace ownership of resources or products with community access to resources and products as value propositions are defined and delivered.
Supply chain	Patterns that modify the upstream (partners, resources, capabilities) and/or downstream (customers, relationships, channels) components of a business model, i.e., how inputs are obtained and target groups are reached.

Note. Source: Lüdeke-Freund, F., Carroux, S., Joyce, A., Massa, L., & Breuer, H. (2018). The Sustainable Business Model Pattern Taxonomy – 45 Patterns to Support Sustainability-Oriented Business Model Innovation. *Sustainable Production and Consumption*, *15*, 145-162. https://doi.org/10.1016/j.spc.2018.06.004

Together, these findings have enabled several analyses, classifications, and associations between SBM patterns, as well as supporting the creation of new business models and different value creation processes. For Olusola-Christwealth and Kiaušienė (2023), this is a developing process, through which profit-based conventional models and financial performance are giving way to models that allow a holistic view of different interested parties (generally referred to as stakeholders in conventional management literature), as well as sustainability analyses that encompass social and environmental issues.

Despite the notoriety of this movement, it is observed that many companies face difficulties in implementing SBMs that truly comply with the approach and respect the principles of sustainability. Furthermore, organizations that employ them also face difficulties to manage and assess the results provided by these business models, especially with regard to the effects on interested parties that are related to the company, such as the communities involved in the production process.

Considering the discussions present in the field of social technologies and sustainable business models, with special attention to the leading role of the community in these processes, it is clear that there is a need to strengthen the line of communication between these fields in order to have new conceptual and practical contributions.

RAC, Rev. Adm. Contemp., v. 28, n. 6, e240180, 2024 | doi.org/10.1590/1982-7849rac2024240180.en | e-ISSN 1982-7849 | rac.anpad.org.br

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METHODOLOGICAL PROCEDURES

By seeking new relationships to better understand the issue and the characteristics of a given scenario, this research has an exploratory-descriptive character (Creswell, 2013). In line with its objective, a qualitative approach was adopted, from which the researchers formulated questions and procedures for data collection, recursively constructing, aligning with the empirical data in the literature, an inductive analysis that generated interpretations and meanings of the explored data (Creswell, 2021).

As a research strategy, we used a single case study of the instrumental type. According to Stake (1998), this procedure considers the possibility of analyzing one point of interest through a specific case. In this research, the case analyzed allowed us to further develop the role that a community and its social technologies play in the design of an SBM. Thus, this phenomenon is understood through the analysis of the case of Da Tribu, a company founded in 2009 in the Brazilian Amazon rainforest region, which focuses on sustainability in its products and processes, as well as the engagement and appreciation of communities and their ancestral and local knowledge. In addition, its mission is to make forest fashion the sustainable path to weave the future, generating prosperity and social transformation.

Regarding data collection, we used different sources (primary and secondary) that allow us to identify and understand the analytical categories that emerged from the case (Richardson, 1999). To understand the genesis and design of the business model, we conducted five semi-structured interviews with different actors, all of whom had extensive history of involvement with the venture. Of particular note were the founder of the venture, the founding partner, and three members of the partner community. In all of these interviews, we worked with questions about aspects of SBM, ST, and communities, such as the process of bringing the venture closer to the community and the importance of social technologies for business development. In addition, the subjects involved were always allowed to provide additional information that they deemed relevant to understanding the context and activities involved. These testimonials were obtained between October and November 2023, and had an average length of 1h30min. Through the notes taken during the interaction with the interviewees and the answers provided, these moments also allowed for an in-depth understanding of the obstacles faced, in addition to a more systemic view of the decisions and strategies that made the development of the enterprise possible. In addition, internal documents and content from the enterprise's website and social networks were obtained, as well as articles published in newspapers, blogs, and magazines, and several videos available on virtual platforms, in which the entrepreneurs narrate aspects related to the purpose and journey of the enterprise. The information contained on the website, institutional videos, and internal documents of Da Tribu indicated how the enterprise positioned itself for the target audience, enabling comparisons with the data found in interviews and observations.

Other complementary data, in turn, were the result of non-participant observations, which occurred during events in which the enterprise took part over the last year and through field research on Cotijuba Island, Pará, where the studio and production center are established. Over the course of two consecutive days, the work and daily routine of the group in their original context were carefully, ethically, and descriptively observed, enabling a deeper understanding of the context of the community and the relationship of collaboration and co-creation established with the enterprise. During this experience, it was possible to listen to and record with images a rubber tapper during the extraction of latex, as well as to talk with other members of the community about life in the middle of the forest, the management of resources, and the relationships with the enterprise.

From this combination of sources and data collection procedures, a comprehensive and detailed view of both the group and the environment addressed in the research was obtained. To systematize these findings, the data analysis was performed using an inductive approach, guiding the discussion based on the fundamental questions about SBM proposed by Schaltegger et al. (2016): (1) the sustainable value proposition of the enterprise for its specific parties; (2) the delivery of the value created; and (3) the capture of economic value in parallel with the regeneration of natural, social, and economic capital, beyond organizational boundaries. Throughout this process, we sought to extract from the data an understanding of the conceptual relationships addressed by the research, enabling a more robust understanding of the role of communities and their social technologies in the design of the Da Tribu enterprise.

The Da Tribu case

By converting latex (the 'white gold of the Amazon rainforest') into innovative and sustainable products in the fashion industry, Da Tribu (https://datribu.com/) is a unique case among the sociobioeconomy ventures in the Amazon rainforest. By manipulating organic cotton thread dipped in latex, this venture has given new uses to local inputs and manufactured biodegradable pieces, providing an alignment between environmental, economic, and social demands in contexts marked by inequality of opportunities and respect for nature.

RAC, Rev. Adm. Contemp., v. 28, n. 6, e240180, 2024 | doi.org/10.1590/1982-7849rac2024240180.en | e-ISSN 1982-7849 | rac.anpad.org.br

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The business was founded in 2009 by artisan Kátia Fagundes, for whom respect for the environment and local communities has always been a fundamental value. It is no coincidence that the name Da Tribu was chosen, a tribute to the struggle of the indigenous peoples of Brazil to preserve the Amazon rainforest. Although it began its activities by producing crochet accessories, the company soon started creating other products, such as clothing and decorative items, all of which value local materials and the Amazonian identity. Today, in addition to various accessories made with latex, such as earrings, necklaces, bracelets, and rings, Da Tribu also works with recycled paper and reclaimed lumber in its creations, thus demonstrating the application of different principles of the circular economy.

Thanks to this innovative and sustainable approach, the company has stood out on the local and national scene. As this process progressed, new opportunities emerged, but also an even greater set of demands, leading to the search for improvements and enhancements in management. It was in this context that the founder's daughter, Tainah Fagundes, joined the company as a partner, taking on the responsibility for the marketing and communication activities of the company. In addition to expanding the company's vision to the sustainable biojewelry market, this helped build partnerships with local communities, which became the values of trust central to its development.

Throughout its journey, Da Tribu has been widely recognized for its work in favor of an inclusive and sustainable bioeconomy, with emphasis on acceleration events and programs. Through different awards, the company has managed to refine its business model and raise funds to contribute to its activities, increasing its impact on the communities where it operates. Among the recognitions is the Brazilian Object Aware (*Prêmio Objeto Brasileiro*) in the Collective Production Category and the RedBull Amaphiko Award. In addition, the business has obtained the Amazon Wild Rubbe certification and it was a finalist in the Undertaking with Impact (*Empreender com Impacto*) and Inovativa Impact Brasil (*Inovativa Brasil de Impacto*) programs, as well as participating in events such as Creative and Business Connection (*Conexão Criativa e Comercial*) — APEX/Assintecal and Brasil Eco Fashion Week. Together, these achievements strengthened the work carried out by the company, demonstrating the value of collaborative and co-creative relationships with local communities. Formed from a recursive process of learning and experience sharing, these interactions cover topics ranging from latex handling practices to the creative production of original and organic pieces, forming one of the main pillars of the business.

To operate its business model, Da Tribu has built a production chain based in the community that extracts the latex and in its social and sustainable handling technologies, producing latex threads and making pieces that reflect their ancestral knowledge. At the same time, the company has also built strategic partnerships with different organizations, such as the University of Brasília (UNB), through which it has been possible to develop fabric additives for the production of threads. The most vigorous partnership today is with the communities themselves, due to their central position in the business model. Through collaboration with the riverside communities of Cotijuba Island, Pará, the company expanded the production process and experienced continuous improvement that allowed it to increase the standard of quality, durability, supply stability, and defined aesthetic characteristics. To this end, several training sessions were held and a support network was built among the island's inhabitants, focusing on promoting the techniques for operating machinery and yarn production, but also on disseminating the logic that drives the production of biojewels, based on a historical, sociocultural, sustainable, and collective framework.

As for its target audience, Da Tribu has opted to sell through different channels, with emphasis on a wide range of cultural events, fashion fairs, exhibitions, and orders, as well as e-commerce (B2C) and retail partners (B2B). Regardless of the channel, the fact is that the company has always been guided by the principles of fair trade, sociocultural history, sustainability, and collectivity. With this approach, it has managed to deliver a product with an added value that is hard to measure, which transforms communities and rescues ancestral knowledge, keeping a living and powerful history from the perspective of a difficult production that goes beyond the product itself. These are values, principles, and stories told through the intersection of materials with Amazonian identities, but with a more contemporary and organic design, as the entrepreneurs state. Thus, the company has operated as a vector of sustainable development, emphasizing the protection of the forest and respect for its people.

Through her network of contacts, entrepreneur Kátia Fagundes had the opportunity to visit social technology fairs, from which she conceived her journey with local communities. It was then that, in 2013, she made her first attempt at working together in Mosqueiro, in the metropolitan region of Belém. At the time, the ideas and use of latex were still quite incipient, until new possibilities for products emerged that strengthened relations with the community. This process contributed to the venture of partnership with communities on Cotijuba Island, where the studio and production unit are located. As an environmental protection area close to the capital, the region allowed to bring back the extraction of latex in the community from the rubber trees that still remained standing, thus establishing a process of knowledge,

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discoveries, and connection with the local community. To establish this partnership, the first step was to approach the community, and only after the first six months was the first joint collection launched, the Pontear Collection.

In the meantime, Da Tribu provided training to more than 30 community residents, helping them understand the real value of the raw material and engaging them in both its production and the search for regularity in quality. After all, it was necessary that, even in times of irregular collections, the community obtained a fair socioeconomic return.

Over the course of seven years of partnership, the company managed to gain the trust of local populations and increase latex production in the region, enabling market growth and increased visibility. This was only possible because Da Tribu opened the doors for the community to take over leadership of part of the production of latex threads, working more independently and becoming increasingly familiar with the production process. From this point on, the case analyzed is aligned with what SBM presupposes according to Lükede-Freund (2010), that is, the creation of a competitive edge by mobilizing a value that the customer recognizes as superior, by contributing to sustainable social development.

If, on the one hand, the trajectory of the enterprise reveals how it has helped preserve local biodiversity and promote socioeconomic improvements for its main partners, on the other hand, it reinforces the need to identify, based on a more in-depth analysis, the role that social technologies and local communities have played in the development of this example of SBM. In order to meet the proposed objective, 'to identify the role of the community and its social technologies in the conception of a sustainable business model (SBM)', this analysis is organized into topics, according to the fundamental questions about SBM proposed by Schaltegger et al. (2016). Initially, we sought to identify in the primary and secondary data how the enterprise's value proposition aligns in a sustainable way with its stakeholders. The value proposition stated by Da Tribu focuses on "the development of sustainable fashion products that value the conservation of Amazonian sociobiodiversity, generating income for riverside families in Pará, ensuring sustainable latex management and transparency in its value chain," as established in the business model, structured internally by the entrepreneurs. In the analysis, due to the focus of the research, we highlight as stakeholders, especially, the actors of the communities with which the enterprise is related.

ANALYSIS AND DISCUSSION OF RESULTS

The sustainable value proposition of the enterprise for its interested parties

In addition to demonstrating that it meets the demands of its consumers, the analyzed narratives reveal the existence of a close relationship between Da Tribu and local communities, especially with regard to raw material suppliers and employees who work directly in production. Through this relationship, the enterprise fosters the combination of ancestral social technologies (such as the latex handling methodology) and contemporary ones (such as the development of artisanal machines for the production of latex threads), reinforcing the importance of not separating local knowledge from business conception, as commonly occurs in the context of other bioeconomy value chains in the Amazon rainforest. Thus, the enterprise demonstrates alignment with some SBM principles highlighted by Bocken et al. (2014), such as the engagement of these business models with the achievement of triple results (economic, social, and environmental) and with the involvement of various interested parties.

Some statements on the Da Tribu website (https://datribu.com/sobre-nos/) confirm this commitment, detailing how the venture's approach aligns with the focus of this research:

> With rubberized threads, we have improved production, seeking partnerships with riverside communities that produce them and, in addition, other creations using recycled materials in our collections. In the past 10 years, we have understood social technology as an inseparable part of our products, making our pieces direct fruits of sociobiodiversity. Thus, those who choose our brand know that they are part of a network that celebrates the ecosystem, the protection of the forest, and the appreciation of traditional knowledge from the Amazon rainforest. More than just adornments for a sustainable future, we are part of the solutions for the planet in each of our relationships.

We can see in the statement quoted above the relevance of traditional communities, social technology, and the self-perception of the enterprise as a sustainable business model. Additionally, we can see that ST, in the conception of Da Tribu, is aligned with one of the visions highlighted by Duque and Valadão (2017), referring to social practices that enable social transformations in and by a community, through social construction and sociotechnical adaptation. In this sense, the ancestral extraction of latex and the contemporary methodologies

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for its handling and maintenance of the forest are passed on to the communities as social practices under the control of the peoples in these territories.

In a related way, the understanding of the founder of Da Tribu about what sustainable development is also makes it clear that this concept cannot be dissociated from the preservation of the community, the forest, and its knowledge. For Kátia, this means strengthening the standing forest, but also making the rubber plantation productive, generating income and bringing financial resources to the community that not only extracts its latex, but is also responsible for its preservation. 'This is sustainable development,' says the entrepreneur, for whom, 'generating income for the community and generating income in the business helps strengthen a greater purpose, to dream of a good life for the community.' This perspective aligns with the concept of social technology in which 'another' development is possible, from a post-colonial perspective, which does not adhere to the conventional notion of sustainable development but connects with the wisdom and knowledge located in the territory (Pozzebon & Fontenelle, 2018).

Going further, Kátia also emphasizes the importance of giving women a leading role in the production process, an essential aspect when it comes to sustainability, given that, historically, women have taken on exhausting care tasks without pay. According to the entrepreneur, strengthening the women in a community is strengthening its most fundamental foundations.

> I think the coolest thing of all is to shed light, to give women a leading role. The work of a rubber tapper was predominantly male. Bringing the thread, bringing the biomaterials of what is in fashion and the production of biomaterials, of crafts, gives women a leading role. Seeing women looking at themselves in a different way, bringing resources to the homes, discovering... Also discovering that they have other talents, besides washing their husbands' clothes (Kátia Fagundes).

This is also part of the SBM's own standard, highlighted by Lükede-Freund et al. (2018), when emphasizing the social mission of this model, according to which there is the integration of social target groups in need, in some way neglected, who can be productive partners of the enterprise. Thus, associating the entrepreneurs' speech with the reports found in the Flexeiras Community, it is possible to observe the alignment between what they seek as connection and respect and what the inhabitants of the territory expect from a partnership of this nature.

> When I arrived, I kept looking around and thinking, will I be able to do it, will I learn? I started looking.

> It didn't even take a week, and I was already getting the hang of it. I said, wow, I got the hang of it really quickly. Done and done. Look, on the first day I made three paper necklaces. On the second day, I made six. Wow, I really liked your work! Thank God, after that, others came. It's a very stable income. She pays us properly. I really, really liked Mrs. Kátia. She treats us like we were part of her family (Mrs. Rosie).

Likewise, the venture highlights its concern with the expectations created by the community regarding the impacts on their territories and income generation through the partnership, aligning what it can meet according to the size of the business. Regarding the venture, this observation allowed us to notice how the business works and relates to suppliers, service consultations, and partners in the community. Thus, in the practical exercise of its fundamental values, Da Tribu created products that combine creativity, respect for nature, and the empowerment of local communities, mixing, in the same business model, the reuse of different bioresources (such as latex, wood, and natural dyes), the generation of social well-being, and the improvement of the local economy. Among the groups for classifying SBMs proposed by Lükede-Freund et al. (2018), there is the 'cooperative' pattern, which concerns the integration of a range of interested parties who are allocated to the venture as co-owners and co-managers, jointly defining the partners and how the organization is managed. In this case, the members of the communities that are partners in the venture influence the management of Da Tribu through daily dialogues and strong interaction with the entrepreneurs, which results in partnerships that go beyond the business. Together, they organized several popular education and political and environmental awareness events on the island of Cotijuba, seeking to improve the quality of life in the territory.

In short, although it is not a self-management model as in the solidarity economy, there is an approximation to this ideal through openness to active participation. Furthermore, as a way of further expanding its impact, the enterprise has not only met the demands of consumers engaged in the environment, but also raised awareness among a wider audience about the importance of a conscious and responsible stance in the field of fashion, demonstrating that it is possible to be sustainable in this sector.

The second topic of this analysis, not dissociated from the first, addresses a greater specificity: the value created by the enterprise. Thus, based on the understanding of how the value proposition is established jointly with the interested parties, especially integrating ST and communities into the proven SBM, there is a discussion regarding the delivery of this value envisioned by Da Tribu.

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Delivering the value created to beneficiaries and consumers

The eight SBM archetypes proposed by Bocken et al. (2014) focus on social, technological, and organizational themes. In the case of Da Tribu, the active participation of the community indicates a work of strengthening roles and not a relationship in which the position of ownership prevails. Likewise, the technological aspect, permeated by social technologies of latex harvesting, the production of threads and final products, points to the creation of value from what could be waste in the process and the valorization of traditional ways of treating nature.

Some common topics were identified in the interviews and corroborate the notion of the power of the community and its social technologies. The story of Kátia Fagundes, the brand's founding artisan, highlights her concern of always using sustainable materials in the pieces she produces, such as reclaimed pieces of lumber, recycled paper, and natural dyes. It was during this process of exploring other possibilities for raw materials, at a social technology fair, that an entrepreneur became aware of an even closer relationship with communities and other horizons of exchange.

> So, I started making fashion accessories, always using sustainable materials. I had already worked with paper and cotton, and one day, while talking to a friend, he said that there was going to be a social technology fair at UEPA, so I went. When I got there, I met the Mosqueiro group from the Paulo Fonteles settlement, who worked on a project called Encalhado Vegetais da Amazônia. All the technology, the innovation and research part was theirs. I started going there. I started testing latex on wood, on various supports... Until I tested it on thread and it worked (Kátia Fagundes).

Initially, the threads were purchased without any real engagement with the community and without understanding that this was a technique that could be described as social technology. This characterization would be appropriate given that, at Da Tribu, we can observe a local change that involves the agency of local social groups throughout the process; the combination and integration of local knowledge with technical expertise; the process benefits from local skills, knowledge, and resources; and the development processes to minimize disruption to natural, social, and cultural environments (Pozzebon & Fontenelle, 2018). Over time, the entrepreneur explored the possibility of latex further and connected with the Seringal community, with whom she has been working for about seven years. Although they had not extracted the input for commercial purposes for 20 years, some more experienced members were still alive, and this ancestral knowledge passed down by their parents. In a joint effort with the community and the university, the entrepreneur found a way to develop a machine to make latex threads. In this sense, social technology is evident in ancestral and contemporary practices, with the development of a sociotechnical adaptation that allows resuming latex extraction in the territory and its transformation into thread, which also highlights a connection between the community and its productive potential. This perspective is in line with Thomas (2009) understanding when considering social technologies as ways of creating, developing, implementing, and managing technologies to meet demands that aim not only at solving problems, but also at proposing solutions that generate dynamics of social inclusion and sustainable development. The central role of the community in this conception and mastery of technology is critical.

To further understand this process, we can refer to one of the speeches by the founding partner, Tainah. Specifically, when she recalls her journey, highlighting her community ties and connections in the territory, the manual skills inherited from her grandmother and mother, and the different paths she took to start a business in search of income for her family. Among some aspects emphasized by the entrepreneur is the importance of knowing the pain points of the local communities with whom they establish partnerships, because, although she is from Belém, she has interacted with local communities since she was a child:

> So, as a business, I understand the pain of living on an island that has no electricity, no diesel power, no regular public transportation, which is limited and expensive, BRL 10.00, BRL 20.00, where we live it costs BRL 20.00 for a moped to drop us off and pick us up, each trip. So, imagine, BRL 20.00! To leave the island we will spend BRL 30.00, because the boat on the weekend is BRL 10.00. So, we needed to understand the reality of these people to be able to understand how to price the product and the payment for them, how we built this fairer relationship (Tainah Fagundes).

When highlighting the presence of social technologies mobilized by the community in the relationship with the enterprise, it is worth noting how much these points of attention allow the design of an SBM like Da Tribu's. The way in which the enterprise interacts with interested parties aligns with the main characteristics of this business model, highlighted by Geissdoerfer et al. (2017), when discussing the process of incorporating concepts, principles, or goals that aim at sustainability, as well as the integration of sustainability in the value proposition, development of

value creation, delivery activities, and/or value capture mechanisms.

Tainah speaks with great knowledge about life in the forest, emphasizing the role of the rubber tree not only as a tree, in a disconnected sense, but as a representative of an ecosystem that co-evolved from the relationship between communities and nature. With this, the entrepreneur reveals how intertwined the value delivered by the business and the relationship with the community in its broadest sense are, from which trees are beings that should also be considered.

We work with a rubber tree, which is native to the Amazon rainforest. The more the rubber tree's milk bleeds, the healthier it becomes. It renews itself like our heart does when pumping blood. It passes through the veins, through all the arteries. Otherwise, it expels, it bursts, it creates little bumps and even kills the tree. So, making this first cut in the first layer doesn't hurt the tree. This is ancestral indigenous knowledge that the native peoples discover in their daily lives in the forest, altered by forest peoples. Today, the Amazon rainforest loses its title as the largest rubber producer in Brazil to São Paulo. What's the difference? There, there are monoculture rubber plantations, farmers who plant rubber plantations. Here it coexists with chestnut trees, andiroba, priprioca, breu branco, *açaí*... (Tainah Fagundes).

Furthermore, during participant observation in the rubber plantation, it was possible to survey the forest in the company of the partner rubber tapper. In this dialogued exploration, the rubber tapper demonstrated how the latex extraction process occurs in a careful manner through appropriate handling of the tree, but also with the objective of guaranteeing the quality of the raw material sought to manufacture the products. Thus, from the beginning, it was possible to connect with the community narrative and with an ancestral method of latex extraction, which already announces the presence of a social technology passed down between generations. Pozzebon and Fontenelle (2018) point out that ST points to methods used in everyday life, going beyond physical artifacts and including ways of 'organizing'.

In the demonstration of the latex collection process by the partner rubber tapper, it was possible to observe the value that the enterprise gives to the knowledge of the community presented in techniques and methodologies that are protected social technologies, so that it is not just a matter of adopting an efficient way of extracting latex, but an ancestral one that respects the forest, which indicates

the existence of technical and specialized knowledge within the organization.

A point highlighted in the literature and presented in Da Tribu concerns the particularities that deserve attention in sustainable business models, since according to Freudenreich et al. (2020), the process of designing and developing SBM takes place continuously in the relationship with its stakeholders, a fact that denotes the complexity of each relationship. Thus, the value delivered also requires continuous attention to keep it consistent with the core value of the enterprise. The third point of this analysis focuses on value, but highlights the challenge of reconciling, in parallel, the natural and social aspects in capturing economic value.

Capturing economic value in parallel with the regeneration of natural, social, and economic capital, beyond organizational boundaries

In line with the elements discussed above, it is also necessary to understand how sustainable business models capture economic value (Schaltegger et al., 2016). In the case of Da Tribu, this value is captured by selling pieces jointly produced with the local community. To this end, the company operates in different sales channels: designer fashion fairs, events, partner establishments, online stores, social networks, and many virtual platforms. In this way, entrepreneurs are focused on ensuring that other businesses engaged in bioeconomy value chains also capture value, generating a positive economic impact beyond their own financial results.

Based on the data collected, it can be seen that this entire process is strongly aligned with socio-environmental aspects, especially with regard to the community and the territory in which the enterprise operates. To enable this process of capturing economic value to reach a capillary action level in the community, the enterprise is actively involved in communities in the development of the pieces, inserting them in value-adding processes that pay a higher price and not treating them as mere suppliers of raw materials.

To better understand how this capture of economic value actually occurs, there are some nuances that must be highlighted. In particular, it is important to note the day-to-day involvement of the enterprise with the community. When asked about the reason for engaging with the communities and not remaining in Belém, only outsourcing the service and access to raw materials, Kátia highlights the value placed on local knowledge of extraction, maintenance of latex and sustainable management of the

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environment, represented in the communities, and social technologies.

> Other people say we are stupid, because I could keep this machine in Belém, I would only buy the latex to pay a few monthly payments for someone to monitor this machine. I would certainly be much better off financially. For me, as a person, it is a very powerful difference. So, I cannot separate my view of the world, as a person, from my view of my business, as if I were disconnected, right? These were the issues. I believe that, even if I have a small impact, it is still an impact. With humanity, with a transparent chain, sharing each little step, learning together, sharing colors (Kátia Fagundes).

The permanence of the business in the community communicates to local residents that there are ways to empower themselves, preserving their territories and knowing and expanding the possibilities for generating income. The impact highlighted by Kátia goes beyond the immediate results of the products sold; it is about social transformation, albeit regional. This directly addresses how this supply chain is orchestrated. In SBM, Lükede-Freund et al. (2018) highlight that there are patterns that modify the upstream (partners, resources, capabilities) and/or downstream (customers, relationships, channels) components of the business model, which is related to the way inputs are obtained and the target groups are reached. In this sense, Da Tribu seeks the potential balance between capturing economic value and distributing this process in the communities, considering the effects on the environment and their ways of life.

Regarding the commitment to building a sustainable chain, the reuse of materials throughout the process stands out, expressing a concern with the waste generated and with reverse logistics, as explained by one of the entrepreneurs.

> The final product is made from recycled lumber, received from workshop and carpentry waste. So, nothing synthetic or metal is used. The biomaterials are delivered in cardboard boxes with masking tape and no paper. The jewelry is delivered in a cloth bag. There is a postcard that tells the manifesto, how this chain works. There is reverse logistics in all of this. We invite the customer who wants to return a piece. We take care of its disposal and they also receive a BRL 60.00 discount coupon on their next purchase. In short, we find solutions along the way (Tainah Fagundes).

Through consistent work, the enterprise has achieved a robust operational structure over the years, becoming increasingly well-known and acquiring legitimacy in the

field of the Amazon rainforest bioeconomy. The option to respect the process of drying the pieces outdoors and then following a design and finishing stage demonstrates that the enterprise does not seek to accelerate the process by using local knowledge and techniques, methodologies, and social technologies, paying attention to and valuing craftsmanship in the production of the pieces. In this way, the business model is also sustainable because it supports previous and ancestral knowledge. A sustainable business model that does not protect local subjects, beings, and knowledge disconnects from what is most fundamental for the preservation of the environment, namely, those who have always been there. Coexistence, as Krenak (2019), points out, configures another type of possible humanity.

FINAL CONSIDERATIONS

The Amazon rainforest region has been exploited as a source of raw materials for centuries. However, much of this process occurs without considering the long-term natural impacts and the importance of preserving communities and their local knowledge, commonly materialized in social technologies passed down as ancestral wealth. Due to the demands that cross economic, social, and environmental issues, the so-called sustainable business models indicate a more coherent path for entrepreneurship in the region. Although this is not the focus of SBM, this research sought to identify, through a single case study, the role of the community and its social technologies in the design of a sustainable business model. To this end, multiple data sources were used, analyzing them based on the theoretical framework on ST and SBM and cross-referencing them with discussions about the community that permeate these concepts.

By systematizing the results based on three fundamental questions about SBM (Schaltegger et al., 2016), it was understood that, regarding the 'sustainable value proposition of an enterprise for its stakeholders,' Da Tribu places the community as a central link in the interrelations foreseen for the extraction of latex and production of biojewels. Sustainability in the process establishes the definition of the business, since the founder, in addition to being a local artisan, has strong ties with the communities, respecting their social technologies of latex extraction, preparation, and handling. Regarding the 'delivery of the value created,' the enterprise reaches the communities by integrating their knowledge and social technologies in all processes, marketing products through a fair and sustainable process. Finally, concerning the 'capture of economic value in parallel with the regeneration of natural, social, and economic capital, beyond organizational boundaries', the research highlights that, although it is a business (and, as such, meets exactly the demands of the

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market), Da Tribu reconciles the capture of economic value with respect for communities, their social technologies, and the environment where they live.

Thus, the study contributes to the conceptual discussion that brings together social technology and the sustainable business model (SBM), although it recognizes the ideological distance that underpins each one. The element

'communities' was brought in as essential to the construction of the argument presented. It is considered that the Da Tribu case enabled the illustration of the proposed discussion due to the richness of its practices and its business model. For future research, we suggest an analysis of other SBM cases in the region in which other social technologies and community dynamics can be observed, seeking to advance the fundamental debate on Amazon rainforest preservation.

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Authors' Contributions

1st **author:** project administration (lead), formal analysis (equal), conceptualization (equal), data curation (lead), investigation (lead), writing - original draft (equal), writing - review & editing (equal).

2nd **author:** project administration (support), formal analysis (equal), conceptualization (equal), investigation (support), writing - original draft (equal), writing - review & editing (equal).

Conflict of Interests

The author informed that there is no conflict of interests.

Funding

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The authors claim that all data used in the research have been made publicly available, and can be accessed via the Harvard Dataverse platform:

Fernandes, José Augusto Lacerda; Souza, Ana Clara Aparecida Alves de, 2025, "Communities and Social Technologies in the development of Sustainable Business Models in the Amazon - The Da Tribu case published by RAC-Revista de Administração Contemporânea", Harvard Dataverse, V1. https://doi.org/10.7910/DVN/2DUVHE

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RAC, Rev. Adm. Contemp., v. 28, n. 6, e240180, 2024 | doi.org/10.1590/1982-7849rac2024240180.en| e-ISSN 1982-7849 | rac.anpad.org.br

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