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THE POTENTIAL OF INNOVATION IN BIOTECHNOLOGICAL DEVELOPMENT RESEARCH IN INDIGENOUS ENTREPRENEURSHIP IN THE STATE OF AMAZONAS

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ABSTRACT

The objective of this article is to identify potential for innovation in biotechnological development research in indigenous entrepreneurship in the state of Amazonas. The research in question begins with a qualitative approach, as it allows and values the researcher's direct contact with the "researched environment or situation". For the understandings around entrepreneurship, there was the use of Lean Startup, where we were able to structure a biobusiness idea in the Amazon, based on the A3 Concept Paper tool, from the use of biodiversity seeds for the production of bio/ecojewelry. It was then evidenced that the management of innovation and indigenous entrepreneurship of bio/ecojewelry in the city of Manaus represent an opportunity for indigenous entrepreneurship in the context of economic, social, cultural and environmental development for the region, which can become a reference of creativity, diversity and reproducibility for Brazil and the world.

Keywords: Innovation. Biotechnology. Entrepreneurship. Indigenous.

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Revista ARACÊ
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INTRODUCTION

From the potentiality of the activity of the production of Biojewelry in the region of Manaus and throughout the research we found some difficulties, such as gathering an adequate bibliographic material referring to the production process of Biojewelry in a peripheral area of the technical-scientific informational system, in this case, the region of Manaus. One of the reasons is the novelty of research under the aspect of productive spatial circuits. Also for its inherent aspects with sociotechnical, socioeconomic and socio-environmental dimensions of studying dynamic processes of Biojewelry production and the processes with multiple speeds (fast and slow) of structuring the territory to be used with such.

Innovation plays a key role in strengthening indigenous entrepreneurship, enabling the creation of new products, services, and processes that meet the needs of communities and are socially and ecologically healthy. Innovation can occur both in the scope of the products and services offered by indigenous entrepreneurs, as well as in the ways of organizing and managing businesses (MORHY, COSTA: 2023).

Indigenous people have unique potentialities that can drive innovation in their enterprises. Among these potentialities, traditional and ancestral knowledge, connection with the environment, appreciation of indigenous culture and handicrafts stand out. These potentialities can be explored in a creative and innovative way, resulting in the creation of differentiated products and services with added value, thus with a spatial distribution that, technically qualified for this, enables the reproduction of the activity (MOHRY; COSTA: 2023).

In certain contexts, a set of interactions are concretized, based, empowered and potentiated in connections whose objective is to structure the forms of integrative communication on a larger scale of spatial distribution in the ramifications and derivations of innovations and their respective management, connecting different places, that is, in an innovative space, in the logic of technical, scientific and informational systems (SANTOS; 1994). The spatial productive circuit of bio/ecojoia polarized by Manaus-AM is a heterogeneous grouping with different scales and circuits in different spatial distributions and with various territorial forms in front of the circles of cooperation. The constitution of a productive spatial circuit based on processes of biotechnological innovation is projected in the forms of circulation of already existing material and immaterial objects, hitching a ride on already existing paths of other similar goods or that use the same ways of circulating in

Revista ARACÊ
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space, whether boats, trucks, among others existing in the municipal geographic structure, state and federal and at different times the specific legislation of each administrative political entity, from the raw material, production, distribution, circulation and consumption of the production of Biojewelry, is an intense process historically demarcated in space and is sui generis using the existing territorial equipment, public and private.

The spatial productive circuit of bio/ecojoia polarized by Manaus-AM is a heterogeneous grouping with different scales and circuits in different spatial distributions and with various territorial forms in front of the circles of cooperation. The constitution of a productive spatial circuit based on processes of biotechnological innovation is projected in the forms of circulation of already existing material and immaterial objects, hitching a ride on already existing paths of other similar goods or that use the same ways of circulating in space, whether boats, trucks, among others existing in the municipal geographic structure, state and federal and at different times the specific legislation of each administrative political entity, from the raw material, production, distribution, circulation and consumption of the production of Biojewelry, is an intense process historically demarcated in space and is sui generis using the existing territorial equipment, public and private. (COSTA, NUNEZ: 2017).

During the research, two groups were identified projecting themselves in the bio/ecojewelry circuit, the simple innovative producers (PIS) and the entrepreneurial innovative producers (PIE), warning that the terms, the denominations are merely to identify the differences, since the acts of research and the business are in both, but in different compositions. Business producers already have a history of working with companies and continue with business action, whether as employees, managers or even owners, they have assumed the idea of innovation as an element of their productive activity together with biotechnological management. In addition, the potential of biotechnological innovation has a catalytic effect on innovation businesses, here as new forms of economy and market involving everything from the geography of innovation, the bioeconomy, creative economy, circular economy among other windows of business opportunities with specific government development plans.

Thus, the general objective of the article is to identify potential for innovation in biotechnological development research in indigenous entrepreneurship in the state of Amazonas.

Revista ARACÊ
ISSN: 2358-2472

METHODOLOGY

The research in question begins with a qualitative approach, as it allows and values the researcher's direct contact with the "researched environment or situation", in addition to being part of the process, it becomes a reliable instrument of the research, performing selections, analyses and interpretations of the data collected (GODOY, 1995, p. 62).

We participate in events and craft fairs, with the aim of observing the urban indigenous people, in their active moment, as entrepreneurs, thus corroborating to describe and characterize the indigenous way of undertaking and also capture images of their bioproducts to have material and data that collaborate in the structuring process.

For the understandings around entrepreneurship, there was a partnership with Professor Alvair Silveira Torres Júnior (FEA/USP) in his discipline EAP5001 – Lean Startup and Product Development Model, in the Professional Master's Degree in Entrepreneurship, where we were able to structure a biobusiness idea in the Amazon, based on the A3 Concept Paper tool, from the use of biodiversity seeds for the production of bio/ecojewelry. This topic will present the results of this work, developed from this partnership.

RESULTS AND DISCUSSIONS

POTENTIAL FOR INNOVATION: A WAY TO CONTRIBUTE TO INDIGENOUS ENTREPRENEURSHIP

The circles of cooperation are structured as processes inherent to the technical constitution that requires a territorial and unequal division of labor and that this enables the fragmented, fractional production to be done in combined stages of different works that assemble the commodity as a reality empirically observed and analyzed via the theory of spatial productive circuits, which explains how theory and method under an approach of geoeconomics applied in an area and sector with low technical/technological structuring and composition of specific capital (MOHRY; COSTA: 2023).

In this context, they are structured by geographical proximity, that is, the relationships that occur in circuits and scales, including those of solidarity and belonging to some spatial circuit and its territory, in the case of the production of Biojewelry, which occur in the form of cooperation circles that have been part of the productive structures since their creation, innovation process, from the idea of the product, consumer public, constituent parts, among others, in the production of Biojewelry, including its forms of distribution and consumption. Therefore, with the circles of cooperation, we have the

Revista ARACÊ
ISSN: 2358-2472

productive processes that set up, which directly structure the constitution of a productive spatial circuit and its territorial form (FREIRE; GONÇALVES, 2022).

Here it is necessary to include an identification process that involves creating specific approach categories, due to some new elements that come into play, in our approach bio/ecojewelry is not in natura, biotechnology and innovation could be added to it (CHART 1) that is, there are changes in metabolism and functionalities oriented to different objectives of the use of bio/ecojewelry. We started from the search for potentialities from the dialogues with the entrepreneurs and with the CNSAM (National Center for Seeds of the Amazon) and from the observations in the various spaces in which the research enabled us to be.

Table 1: Potential for adding biotechnology and innovation in bio/eco-jewelry

Potential of Biotechnology and Innovation added to Bio/ecojewelry (Not yet inserted in the bio/ecojewelry market)	Description of Potentialities	References
Use of biodegradable materials	Through biotechnology, it is possible to develop biodegradable and sustainable materials for the production of jewelry. For example, biopolymers produced from renewable sources, such as corn starch or plant cellulose, can replace the non-biodegradable synthetic materials traditionally used.	Michael Braungart and William McDonough: Authors of the book "Cradle to Cradle: Remaking the Way We Make Things; 2002" ("From Cradle to Cradle: Rethinking the Way We Do Things"), they advocate the use of biodegradable and compostable materials in industrial products, promoting a sustainable cycle of production and disposal.
Natural pigment extraction	Biotechnology can be employed to extract natural pigments from plants, algae, fungi, and microorganisms. These pigments can be used to color jewelry sustainably, without the need for synthetic dyes that can be harmful to the environment. Since, currently, wall varnish is used on seeds, which is not ideal, because over time there is a wear and tear of the bio/ecojewelry, the paints used are those of the textile industry.	Sandra P. Clark: Author of the book "Natural Colorants: Industrial Applications for Improved Sustainability," Clark explores the extraction and application of natural colorants in different industrial sectors.
3D Bioprinting	3D bioprinting is a technique that uses living cells to build three-dimensional structures. This technology can be applied in the creation of personalized jewelry, where living cells are incorporated into the printed material, resulting in unique and eco-friendly pieces.	Ozbolat, I.T., & Dey, M. (2020). 3D bioprinting of cells, tissues and organs. Scientific Reports, 10(1), 14023. https://doi.org/10.1038/s41598-020-70086-Y. In this article, the authors present a comprehensive review of the concepts, techniques, challenges, and applications of 3D bioprinting. They also discuss the future prospects and opportunities for advancing 3D bioprinting in regenerative medicine and tissue engineering.

Revista ARACÊ
ISSN: 2358-2472

Traceability and certification	Biotechnology can be used to develop methods of traceability and certification of bio/eco-jewelry, allowing consumers to have accurate information about the origin and quality of the materials used. This provides transparency and trust, making jewelry more valued in the market	Stefano Boccaletti and Jay Golden: Authors of the book "Sustainable Value Chains: A Research Anthology; 2016" ("Sustainable Value Chains: A Research Anthology"), they discuss the importance of traceability and certification in sustainable supply chains, highlighting the environmental, social, and economic benefits of these practices.
Integration of digital technologies:	Apply digital technologies, such as 3D modeling, 3D printing, and augmented reality, in the creation and presentation of bio/eco-jewelry. This allows for the production of rapid prototypes, on-demand customization, and immersive experiences for consumers.	Erik Brynjolfsson and Andrew McAfee: Authors of the book "The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies; 2016" ("The Second Machine Age: Work, Progress and Prosperity in an Age of Brilliant Technologies"), they discuss the impact of digital technologies, such as artificial intelligence and automation, and their integration into organizations and the economy.
Potential of Biotechnology and Innovation added to Bio/ecojoia (Already inserted in the market, but with existing gaps)	Description of Potentialities	References
Creative and conceptual design	Develop unique and innovative designs that reflect the identity of bio/eco-jewelry. Explore shapes, textures, and material combinations that convey a sustainable and eco-conscious message.	Viktor Papanek: Author of "Design for the Real World; 2005" ("Design for the Real World"), Papanek advocates a socially responsible and sustainable approach to design. It highlights the importance of creative and conceptual design in solving real-world problems.
Use of innovative materials	Use of alternative and sustainable materials for the production of jewelry. For example, plant fibers, seeds, certified wood, recycled materials, and upcycling can be used creatively to create original and environmentally friendly pieces.	Janine Benyus: Author of the book "Biomimicry: Innovation Inspired by Nature; 2002" ("Biomimicry: Innovation Inspired by Nature"), Benyus addresses the use of nature-inspired materials to create sustainable and innovative solutions in various fields.
Communication and marketing	Highlight the story behind bio/eco-jewelry, emphasizing its sustainable values, the techniques used, and the positive impact on communities and the environment. Use digital marketing and storytelling strategies to engage consumers and convey the message of innovation and sustainability.	Santos, A.C., & Silva, M.A. (2018). Integrated marketing communication: a study on the dissemination of handicrafts in the Cariri region of Ceará. Revista Brasileira de Marketing, 17(4), 557-571. https://doi.org/10.5585/remark.v17i4.3629. In this article, the authors analyze the integrated marketing communication strategies used by artisans in the Cariri region of Ceará to promote their products. They conclude that artisans mainly use word-of-mouth advertising and social media as forms of communication with their customers, but that there is a lack of planning and professionalization of communication and marketing actions.

Revista ARACÊ
ISSN: 2358-2472

Sustainability throughout the production chain	In addition to the use of sustainable materials, it must be made sure that the entire production chain of bio/eco-jewelry is environmentally responsible. This includes ethical seed collection practices, reducing material waste, using sustainable packaging, and transporting with a low environmental impact.	Peter Senge: Author of "The Necessary Revolution: How Individuals and Organizations Are Working Together to Create a Sustainable World; 2010" ("The Revolution Needed: How Individuals and Organizations Are Working Together to Create a Sustainable World"), Senge addresses the need for systemic transformation to promote sustainability in the supply chain.

Fonte: Morhy, 2023

The innovation and biotechnology potential of bio/ecojewelry is in line with Marshallian thinking, proposed by economist Alfred Marshall to explain the advantages of the spatial agglomeration of companies in the same sector or activity (COSTA, 2017). According to Marshall, there are three sources of positive externalities that favor industrial concentration: knowledge *spillovers*, the sharing of inputs, and the formation of a *pool* of specialized labor. These sources increase the productivity, innovation, and competitiveness of companies located in the same region. Marshallian thinking can be related to the bio/eco-jewelry market, due to the greater awareness of consumers about the environmental and social impacts of the traditional jewelry industry, which uses precious metals and stones extracted in a predatory way and often associated with armed conflicts and human rights violations. In addition, the bio/eco-jewelry market also benefits from the appreciation of cultural diversity and the search for exclusive, personalized and meaningful products that express the identity and values of consumers.

In this context, bio/ecojewelry entrepreneurs can benefit from the externalities generated by the Marshallian base by locating in regions where there are other companies in the same sector or complementary activities. For instance:

- Knowledge *spillovers* can occur when bio/ecojewelry companies interact with each other or with other institutions, such as universities, research institutes, non-governmental organizations, among others, that can provide information, knowledge, or technologies relevant to the development of new products, processes, or services. These *spillovers* can stimulate innovation and differentiation of bio/eco-jewelry companies in relation to competitors.
- Input sharing can occur when bio/eco-jewelry companies have access to a variety of suppliers of raw materials, equipment, services, or infrastructure that can meet their specific needs. These suppliers can offer better price, quality, quantity and deadline conditions to the bio/ecojewelry companies that are located near them. In addition,

Revista ARACÊ
ISSN: 2358-2472

the sharing of inputs can facilitate the traceability and certification of the materials used in bio/eco-jewelry pieces.

- The formation of a pool of specialized labor can occur when bio/ecojewelry companies have access to a labor market that offers qualified and experienced professionals in the sector or related activities. These professionals can contribute to increasing the efficiency, quality and creativity of bio/ecojewelry companies. In addition, the formation of a pool of specialized labor can favor the transmission and preservation of the knowledge and artisanal practices that characterize the sector.

Starting from this base, we envision an innovation ecosystem as a way to contribute to the bio/ecojewelry market, Innovation is an essential factor for the economic and social development of a country, as it allows the creation of new products, services, processes and business models that meet the needs and expectations of consumers and society. However, innovation is not an isolated phenomenon, but rather the result of interaction and cooperation between various agents that make up an innovation ecosystem, that is, socio-technical networks.

According to Sebrae (2023), an innovation ecosystem is a collaborative environment formed by different agents (companies, universities, startups, government, etc.) that seek to develop innovative projects, generating economic, social, and environmental value. In this sense, an innovation ecosystem favors the exchange of knowledge, experiences, resources, and opportunities among its participants, stimulating creativity, learning, and competitiveness.

An example of a successful innovation ecosystem is Silicon Valley, in the United States, which concentrates cutting-edge technology companies and renowned universities, in addition to having an entrepreneurial culture and a network of support and financing for innovation (AEVO, 2022). In Brazil, there are several innovation ecosystems in different regions and sectors, which seek to foster a culture of innovation and local development. One segment that can benefit from an innovation ecosystem is the bio/ecojewelry market, which are adornments and accessories made with natural and organic materials, such as seeds, fibers, wood, shells, stones, etc. Bio/eco-jewelry has as a differential the appreciation of nature, culture and sustainability, in addition to being exclusive and creative pieces. According to Aurha (2021), biojewelry is made with combinations of natural stones with organic materials, while ecojewelry involves a totally sustainable process from the

Revista ARACÊ
ISSN: 2358-2472

extraction to sale of the jewelry. The bio/ecojewelry market has the potential to grow in Brazil, which has a great diversity of natural resources and a demand for more conscious and personalized products. According to a report by Mordor Intelligence (2022), the jewelry market in Brazil is expected to grow at a compound annual rate of 1.79% between 2022 and 2027.

Here we understand the innovation and entrepreneur ecosystems as circles of cooperation, referring to the circles of cooperation, what we have are related to the processes of communication, information, circulation, norms and regulations, specific capitals and institutions, among many others, such as the ideological composition very close to the fetish of technologies and led to the ideals of regional development or with the valorization and preservation of biodiversity It is not the technology itself that will bring about some kind of development, it is how it is in the socioeconomic process (SANTOS: 1994).

Such components act in the organization of space, as occurs in streets or commercial districts, industrial districts, among other components such as ports, warehouses, labor and commerce centralities; Such composition contributes to the existence of the productive spatial circuit, enabling the productive specialization and territorial organization of the places that are articulations, including as hubs that connect places to the world, giving evidence to places and places as a concretion of the world, because it is in them where things happen as objects and facts of the world. Cooperation circles are capacities that certain structured production contexts have the capacity to be elaborated with various components, from the classics to those with biotechnological innovation in certain territories, acquiring equipment strategically placed in the productive territory itself, and this occurs with public or private capital or with both, under a specific ideology and public policies. (PECQUEUR: 2008; CAZELLA et all.: 2022).

The existing connections between the spatial circuit of biojewelry production and its respective circle of cooperation are constituted by the members who make use of the technical-scientific and informational structuring with the objective of strengthening and even expanding the vertical structures, so that there is a basis on which the production process has the minimum constraints required by the regulations required for consumption. including assistance and after-sales, warranties among others. The agents (economic, social, political, ...) that make up the circle of cooperation in the territory polarized by Manaus (vertical) are grouped with other agents and with other scalar bases, whether

Revista ARACÊ
ISSN: 2358-2472

local, state, regional, national and international (horizontality), where they are characterized by public and private institutions that carry out the production of biojewelry already on scales and spatial distribution with greater capillarity and reach network seeking a totality or the largest possible slice of the consumer market.

There are several components of cooperation circles, here in our study they involve the conditions and structures of technical training for labor, financial institutions with specific lines of development, use or even construction of engineering systems with specific logistical peculiarity of the goods. Institutions already known in Manaus as CIDE and DIMPE are incubator bases for companies that apparently have few relationships with biojewelry producers, especially with regard to business promotion and opportunity, aiming at a business structuring to strengthen, disseminate and even contribute to consolidate the biojewelry market from Manaus, remembering that here there is freshwater biojewelry, In other words, a peculiarity of the merchandise that involves Amazonian biodiversity. It is important to note that in countries like Brazil and especially the context of Manaus, the process of setting up businesses, especially the new ones, needs the supportive action of the public authorities, with this the public institutions contribute directly to the structuring of cooperation circles, either by aggregating, financing and training end and satellite activities with their regulation systems, promotion, accounting assistance and even facilitating the purchase by other public institutions of the product it supports, logic of institutional markets, so they are circles of cooperation, since they collaborate, contribute and assist.

The area polarized by Manaus is a centripetal and centrifugal force for the productive spatial circuit, it dynamizes biojewelry as a commercial agent and with the use of cooperation circles, including the proximity factor of the institutional structures and decision-making located in the capital of Amazonas, which in a summarized way, has a mosaic of structural support potentialities for qualified and integrated uses in various institutions. The territory equipped for use acts in a space transformed to enable the production process, the equipment installed is peculiar, and here specific to biojewelry, which involves productive specificity.

To take advantage of this opportunity, we emphasize that bio/ecojewelry producers can integrate into an innovation ecosystem that offers support, training, financing, partnerships and access to new markets. In addition, they can be inspired by successful examples such as that of designer Maria Oiticica, who uses seeds from the Amazon to create sophisticated and sustainable jewelry (SEBRAE, 2014) or even with partnerships

Revista ARACÊ
ISSN: 2358-2472

with Universities to develop startups that contribute to the handicraft market. However, in the dialogues with the indigenous people, it is evident the lack of support, financing and partnerships so that they can enter new spaces that enhance the commercialization of their bioproducts in the city of Manaus/AM.

INDIGENOUS ENTREPRENEURSHIP FROM THE PERSPECTIVE OF LEAN STARTUP

Biobusinesses are structured in the production chains of bioproducts, valuing traditional knowledge, their techniques and their culture, based on the idea of the reproduction of natural resources, scientific and technological knowledge. Bio/ecojewelry fits, specifically, in group I (FIGURE 1) of biobusiness, as they are products developed with seeds from biodiversity and require a technological level considered minimum in the production process of their bioproducts.

Figure 1 - Characterization of the Different Types of Biobusiness

Tipologia dos Bionegócios	Características
Grupo I	Uso da biodiversidade no estado *in natura* ou submetida a processos de beneficiamento simples, centrados em características mecânicas (cortar, polir, lixar, pintar, secar etc.); inclui atividades com uso econômico do valor "cultural" da biodiversidade. São exemplos de bionegócios classificáveis neste Grupo a comercialização de frutos e peixes frescos, folhas, raízes, cascas, flores, artefatos com ênfase estética ou decorativa, moda, turismo.
Grupo II	Produtos que utilizam processos baseados em conhecimento consagrado, com domínio disseminado (extração, concentração, filtração, destilação, separação etc.), que podem demandar o uso de boas práticas (nas etapas de coleta, manuseio ou conservação, por exemplo). Neste Grupo incluem-se produtos como bebidas, concentrados, doces, polpas, pós.
Grupo III	Abrange processos químicos e/ou biológicos de maior complexidade, cuja demanda por conhecimento especializado implica em aumento de risco técnico; o desenvolvimento do produto exige testes ou ensaios. Alcança matérias-primas e produtos de perfumaria, cosméticos, fitoterápicos e fitocosméticos, bioenergia, reprodução de plantas, alimentos industrializados.
Grupo IV	A classificação neste Grupo é assegurada pelo uso de processos associados à chamada biotecnologia moderna, que tem como base a biologia molecular e a engenharia genética (ainda que outras características do bionegócio aqui classificado possam estar descritas nos demais Grupos). Organismos geneticamente modificados, microorganismos industrializados e alimentos funcionais são exemplos de produtos deste Grupo.

Source: ARAÚJO FILHO, 2010.

Although we are located in a region with great biological diversity, businesses that use biodiversity resources are still inexpressive, and it is in this bias that the concept of biobusiness emerges to characterize a "less sophisticated reality", and still little valued in the market as a whole (SOUSA, 2014, p.06).

Thus, biobusiness is considered "economic activities aimed at the extraction, processing and commercialization of inputs or products that present in their composition

Revista ARACÊ
ISSN: 2358-2472

biodiversity resources that condition the added value of the product, whether in its most raw form or technologically modified", it is a fact that both more "rustic" companies and those that have a more elaborate process are inserted in the concept of biobusiness, because everything will depend on the use of biodiversity resources, as well as the value added by it in its bioproducts, we emphasize the importance of this terminology and its insertion in the market, since it makes it possible to glimpse the "regional reality" (SOUSA, 2014, p. 07).

According to Frickman and Vasconcelos (2010), the production chains of bioproducts are drivers of biobusiness, therefore:

> The development of this market, on a sustainable basis, with scientific and technological support, induces the social inclusion of Amazonian populations, valuing their knowledge and inserting the population in a cycle of economic activity traditionally practiced, with technological improvements capable of adding value to bioproducts. The associated scientific research supports social and environmental sustainability strategies, ensuring the conservation of these systems (SOUZA, 2014, p.08).

Developing and thinking about new products and how to systematize them in a new business, within the *lean* perspective is not simple, however the A3 *concept paper* is considered "a fundamental mechanism to start a new project" (FERRO, 2008, n.p), which provides a path to solving problems, and a new way of thinking about it. Thus, "the A3 Report is the tool used to document this thinking process. Toyota uses several types of A3 Reports including problem-solving, project status, and proposals. The A3 Report is intended to be flexible and adaptable to the problem at hand" (ANDERSON et al., 2010, p. 03).

It is important to note that the A3 tool, or A3 thinking as it is known, was developed by Toyota in order to improve processes and solve problems more effectively in all areas of the company, and still has this name to the detriment of the paper that is used in its formulation. We use the A3 as a model and, therefore, we made adaptations in the elaboration of a business plan, a *lean startup* business plan, because, "with scientific learning as our parameter, we can discover and eliminate the sources of waste that plague entrepreneurship" (RIES, 2012, p. 20).

We emphasize that startup is the entire beginning of a business, it is "an approach that seeks to eliminate the waste of time and resources spent on the effort of trying to understand what customers really want" and can still be applied in any segment of products, services and technologies (SILVA, 2016, p. 03). In this sense, since we use the

Revista ARACÊ
ISSN: 2358-2472

lean *srtatup construct* as a basis to develop, from an A3 tool, the bio/ecojewelry biobusiness of the Amazon, which has the vision of representing the appreciation of the culture of the Brazilian Amazon region through the exploration of bio/ecojewelry, based on pillars of sustainability and local culture, favoring the economic and social well-being of the communities involved. Thus, the concept that best fits this vision is that of the Lean Startup because:

> The lean startup asks people to start measuring their productivity differently. Since startups often accidentally develop something that no one wants, it doesn't matter much whether people do it on time and within budget. The goal of a startup is to figure out the right thing to create – the thing that customers want and will pay for – as quickly as possible. In other words: the lean startup is a new way of considering the development of new and innovative products, which emphasizes rapid interaction and consumer perception, a big vision and big ambition, all at the same time (RIES, 2012, p. 20).

In addition to being essential to show that we are on a sustainable path based on the vision of the business and what we want to produce and offer to the market (RIES, 2012), the *lean method* makes explicit the importance of adding value to the product, minimizing waste and reducing the company's cost (SILVA, 2016), based on the five principles of lean startup, which are:

> 1. Entrepreneurs are everywhere;
> 2. To undertake is to manage;
> 3. Validated learning [...} - startups exist to learn how to develop a sustainable business and this learning can be scientifically validated [...];
> 4. Build-measure-learn [...] – transform ideas into products, measure how customers react and learn from them [...];
> 5. Accounting for innovation [...] – measure progress, set milestones and prioritize work [...]" (RIES, 2012, p. 07-08).

In this way, we present nine fundamental points used from the perspective of our biobusiness within the lean methodology, which are: 1 - The vision of the product that is related to the purpose of existing; 2 - Customer segments; 3 - Key attributes aimed at the customer; 4 - Competitors, whether current or what we call adjacent, who do not necessarily compete within the bio/ecojewelry niche, but rather for the attention or financial resources of the same customer; 5 - Value proposition: what you have to offer; 6- Strategy that connects the value proposition to customers, with its customer segment; 7- General Concepts aimed directly at the business and bio/ecojewelry; Key performance is the way I measure the development, implementation, and execution of the entire business idea.

Revista ARACÊ
ISSN: 2358-2472

Project Tactics and Objective provide information and details about the unfolding of the entire project.

This set of nine fundamental points is often referred to as the "Business Analysis Matrix" or "Product Analysis Matrix." It is used to assess the potential for success of a new product or business, and is based on product management and business strategy concepts. The Business Analysis Matrix does not have a specific author or a single article that is considered the reference for the topic. It is a broad and widely used approach in the product development industry and business management.

Based on this principle, we emphasize that the *Vision* of the product in the context of bio/ecojewelry brings with it the appreciation of culture, the issue of *sustainability* and the economic-social aspect of the indigenous people, and, consequently, the Customer Segment, here we resignify them, and they are now called stakeholders, who are beyond the customers who buy and pay for the product and service, also producers, collectors, intermediaries, in addition to final consumers.

The *stakeholders* (internal or external customer segments) were evaluated according to the production chain for bio/ecojewelry, respecting the regional characteristic of the project. On the other hand, the Key Attributes mapped (FIGURE 2) for bio/ecojewelry are characterized by a *sustainability* group, formed by the concepts of valuing local culture, well-being in communities and defense of the Amazon biome and reproduction of a way of life (COSTA, RODRIGUES, HOHN, 2006; CAROLINO et al., 2013; LOPES, SCHIERHOLT, 2018) and by a business group, formed by the concepts of *status*, product differentiation and marketing price (MACEDO; ITOZ; SOUZA, 2020).

Figure 2: Matrix of value attributes by customer segment (stakeholder)

Atributos de valor	Coletor	Vendedor	Indígena	Cliente	Total (soma)
Status	1	2	1	3	7
Diferenciação do produto	1	3	1	3	8
Preço de venda	1	2	1	2	6
Sustentabilidade	2	1	2	3	8
Bem estar das comunidades	2	2	3	2	9
Valorização da cultura local	2	2	3	2	9
Subsistência	3	3	3	0	9

Legend: (0) Non-existent/Not applicable; (1) Low; (2) Medium; (3) Alto/Source: SATO et al., 2020

Revista ARACÊ
ISSN: 2358-2472

From this perspective, economies of scale are the main competitor, due to its capacity to scale and, consequently, a lower sales value for the final consumer (MACEDO, ITOZ, SOUZA, 2020). Bio/eco-jewelry also competes with the jewelry and semi-jewelry market, which have different characteristics, but within the same value proposition (FIGURE 2).

These two attribute matrices (FIGURE 2 AND 3) are a way to objectively quantify what is more important and for whom, the Matrix is widely used in management practice, thus, it is defined what is the priority or, in this case, what is the most important value attribute for each cluster or for each segment.

Figure 3: Value attribute matrix by competitor

Atributos de valor do produto	Biojoias	Joias (HStern, Vivara)	Bijuteria (Dafiti)	Ecojoias (Carol Barreto)
Preço (peso 2)	2	1	3	2
Qualidade (peso 3)	2	3	1	2
Sustentabilidade (peso 4)	3	1	1	3
Durabilidade (peso 1)	2	3	1	3
Disponibilidade (peso 1)	1	2	3	2
Variedade (peso 1)	1	2	3	1
Status (peso 4)	1	3	1	2
Total (ponderado)	1,9	2,1	1,5	2,3

Legend: (0) Non-existent/Not applicable; (1) Customer-indifferent attribute (2) Customer-attractive attribute; (3) Indispensable attribute for the customer./Source: SATO et al., 2020.

We show that there is competitiveness in this market, and therefore, we relate the bio/ecojewelry market with a possible application of Porter's (2009) competitive strengths, Porter's (1986) competitive strategies are a model that identifies and analyzes five forces that shape each industry and help determine the weaknesses and strengths of a sector. The five forces are: rivalry among competitors, the threat of new entrants, the bargaining power of suppliers, the bargaining power of customers, and the threat of substitute products. To this end, in the bio/ecojewelry market we have:

- Rivalry between competitors is high, as there are many companies that offer similar or differentiated products, with different levels of quality and price. Additionally, there

Revista ARACÊ
ISSN: 2358-2472

is stiff competition with the traditional jewelry industry, which has greater scale and brand recognition.

- The threat of new entrants is medium, as there are barriers to entry related to obtaining raw materials, product certification, distribution and *marketing*. However, there are also opportunities for new entrepreneurs who are creative, innovative, and sustainable.
- The bargaining power of suppliers is medium, as there are a variety of raw material sources available, but there is also a dependence on local or regional suppliers who may have supply or quality limitations. In addition, there is a need to guarantee the traceability and origin of the materials used, which is not yet the case in this market.
- The bargaining power of customers is low, as there is a growing demand for bio/eco-jewelry, especially from conscious and demanding consumers, who are looking for exclusive, personalized and meaningful products. Customers are also less price-sensitive as they value the intangible attributes of products more.
- The threat of substitute products is low, as there is a differentiation of bio/eco-jewelry products in relation to traditional or synthetic products. Bio/eco-jewellery products have an emotional, social and environmental appeal that makes them unique and desirable.

The model of the five competitive forces explains how they influence the strategy and profitability of companies in different sectors, and also suggests how companies can position themselves to obtain competitive advantage in their markets (PORTER, 1997).

Nevertheless, we have the Value Proposition, it is presented, from a phrase, that is, a phrase that represents what you have to offer that differentiates you for your final consumer, stakeholders, in this way, our Value Proposition is based on the Appreciation of local culture and the defense of the Amazon through sustainability, providing social inclusion to the production chain and the social and economic well-being of communities. So, it's the aspirational purpose, it speaks much more about mission, values than necessarily about business.

In the strategic context of a business, what is very important is price, so we carry out a sensitivity analysis, because price is an important attribute for the customer, so, from data collected on the internet (*desktop research*) which are secondary data where we search for public information available as a way to generate new knowledge, we highlight

Revista ARACÊ
ISSN: 2358-2472

that the sale prices for the final consumer of biojewelry vary, in the national market, from R$ 30 (thirty reais) to R$ 1,000 (one thousand reais); for eco-jewelry, from R$ 30 (thirty reais) to R$ 200 (two hundred reais), as well as there are implications for the customer, as the values are positioned among several categories of competitors such as jewelry, semi-jewelry and costume jewelry, making decision-making more complex and bringing risk to the business.

It is also possible, from the long tail theory/Pareto's Law (80-20), to identify the markets and their potentialities for which bio/ecojewelry is inserted, as we present in the graph (FIGURE 4), this is fundamental, as it guides the biobusiness with an emphasis on its potential customers, as well as contributes to a strategic vision of business where it is possible to reach other markets which are presented as unreachable. In terms of biotechnology and innovation, there is an extreme need and urgency in the bio/ecojewelry market, since it is essential that there are biotechnological processes that maximize the useful life of the seeds, as they tend to wear out quickly or even acquire fungi, which impairs the longevity in time of use of the bioproduct (SOUZA; LIMA JÚNIOR, 2016). This is just one of the examples of gaps regarding the potential of innovation in the bio/eco-jewelry market.

In this sense, costume jewelry has a wide range of coverage over the simple market, standard type, since it is one of the sectors that is always on the rise and with little impact related to seasonality, as the vast majority is produced by brass, aluminum and pewter, its stones are made of plastic, this contributes to the low cost in its production and, consequently, for affordable marketing values between R$10.00 and R$100.00.

Bio/ecojewelry is inserted in the market of handicrafts considered common/simple, which reaches diverse people nationally and internationally, given its cultural and sustainable value added in relation to the Amazon, carries with it the objective of consuming to belong, production costs vary for ecojewelry between R$ 5.00 and R$ 100.00 depending on the type of product, whether for personal use or not, as well as the type of seed used in its production process, which tends to make the artifact more expensive or not, as is the case of Jarina, one of the most valuable seeds with a collection price of "R$ 0.02 cents", but an artifact with only one seed worked as a simple keychain can be sold for R$ 17.00, that is, "a value-adding factor greater than 500 times" (COSTA et al., 2006, p. 370).

Revista ARACÊ
ISSN: 2358-2472

Biojewelry has the same market standard as ecojewelry, however, the cost of production also varies between R$ 10.00 and R$ 500.00, its market value tends to rise to the detriment of the insertion of precious metals (gold and silver) in its production process, fluctuating between R$ 25.00 and R$ 1000.00 for the final consumer.

Hstern and Vivara are precious gem jewelry stores, which corroborate the high cost in their production process and serve the national luxury market, they have stores spread throughout Brazil, within *shopping malls*, only the Vivara brand has 230 stores, its customers are extremely select, and its pieces are sold between R$ 250.00 and R$ 30,000.00.

Figure 4: Identification of markets

Fonte: MORHY; COSTA, 2024

Still, in this strategic context, we have the Market, as the offer of biojewelry is more present on the internet, through electronic catalog and sales pages (*ecommerce and marketplaces*). The face-to-face offer is more present in regions where the raw material is endemic (Amazon, Pantanal, Cerrado). The search volume is small and inexpressive compared to the search for jewelry and semi-jewelry, as well as the implications for the customer, since the potential customer is not aware of the value proposition of biojewelry. As a result, it becomes difficult to obtain information and, consequently, the decision to buy.

We made a comparison using the SEMrush website https://www.semrush.com/dashboard/, keyword volume (PC), connotes the maturity of the product and how much it is searched electronically. Biojewelry has 0.4% of the total CP for

Revista ARACÊ
ISSN: 2358-2472

the term jewelry, which indicates a low knowledge and low penetration in the consumer market, while for ecojewelry, the result was 0.0% total, this may be related to the understanding and meaning of the nomenclature, as many customers understand biojewelry as any artifact that uses seeds from biodiversity.

SOCIO-TECHNICAL NETWORK AND THE FLOW OF GOODS AND MANAGEMENT ELEMENT

When dealing with specific contexts with regard to approaches to land use, it is basic to identify and analyze social subjects, institutions and social relations of production. This theoretical-methodological procedure is an attempt to visualize the totality in actions and facts that make it possible to understand the socioeconomic and sociotechnical processes from an approach that involves spatial productive circuits, that is, a specific productive process in its socioeconomic context, in which not only socioeconomic data are addressed, we also address the relations (social, political, institutional, among others) between social groups, as well as their structures and power relations (State, public and private institutions, market, among others) which are part of the studied context. With the need to identify and analyze how the processes occur between the constituent subjects of a network in the geographical space, a capacity and need for development in the existing spatial distribution of the productive circuits, there is the constitution of a socio-technical network that acts in a type of support to the actions of fluidity of the processes, involving public policies and business nations identified in the use and management of the productive circuit of indigenous biojewelry entrepreneurs in Amazonas and its territorial resources, with this, we have the problem that each social group has a structure and an objective, so it has a specific logic of action. Hence the need for fieldwork to obtain information on how the dynamics occur.

Using socio-technical networks as an analytical element, we deal with a socio-technical network that is the bearer of specific social dimensions in indigenous entrepreneurship as a set integrated in a network with its activities that, from the moment they are concatenated, make up a management of the territory that still has fragilities. Thus, the territory as an analytical category is a basis and added to this is being a carrier of resources with their respective potentialities, at the same time that it receives the economic and social effects of the context in which it is. The process of commodity formation facilitates the analysis of the production relations that were shaped in the economic space

Revista ARACÊ
ISSN: 2358-2472

of handicrafts in Manaus. Under a systemic circuit aspect, we identify the process that marks the productive relations between the various subjects, institutions, in different places in space, but belonging to the same socio-technical network. For the purposes of analysis, we begin with the process of identifying groups, institutions and their functionalities and context, in addition to seeking the forms of organization in the geographic space, which involves the forms of management.

THE CONSTITUTION OF THE NETWORK: LOGIC OF EXISTENCE AND CONTEXTUALIZATION

The constitution and composition of the socio-technical network occurs when the processes come together, by objective or chance, with this goes to the process in which the groups, institutions and subjects have a common goal, and each one offers a type of solution to the various problems faced, such as: the current context of valuing the handicrafts of biojewelry and eco-jewelry made by indigenous artisan entrepreneurs in the city of Manaus, with its own associations and cooperatives, government agencies such as FEI, and others such as SEBRAE, among others, which are directly or indirectly interarticulated in an almost common interest, composing the socio-technical network.

MANAGEMENT

The management of innovation related to seeds worked by urban indigenous people for handicrafts involves a multidisciplinary approach that encompasses several aspects such as: cultural, technological, social, environmental and the dialectical pair planning and management. Some topics with potential in the management of innovation with biotechnological potential to promote innovation in the sector, a strengthened territorial base of the socio-technical network:

- Preservation, Cultural Appreciation and Market: The seeds traditionally worked by urban indigenous people for handicrafts are linked to their culture and identity, added to a business culture, there is an indigenous entrepreneurship that needs a set of strategies to preserve and revitalize traditional and modern practices of handicrafts and use of seeds. This involves the role of seeds in the transmission of ancestral knowledge and in the connection and resignification with cultural heritage, but within the modern context of the fashion market.

Revista ARACÊ
ISSN: 2358-2472

- Development and Preservation: The practices of harvesting and use of seeds, taking into account the impact on the environment is minimal, given the need for access and not destroying sources of raw material. There is an urgent need to implement management, cultivation and storage practices to ensure the continuous availability of seeds, thus enabling a process of integration of principles, including circular economy in the use of seeds, to minimize waste and promote reuse.
- Design and Innovation in Handicrafts: How seeds can be used in an innovative way in different types of handicrafts, the research of modern design and production techniques that preserve the traditional elements of seeds, as well as the incorporation of contemporary elements in handmade products to attract new audiences and consolidate in the fashion market, including training in seasonal and on-demand production.
- Entrepreneurship and Market: Planning and strategies to create market opportunities capable of integrating the peculiarity of the urban indigenous entrepreneur involved in working with seeds; Involving the process of developing and exploring business models, with the use of cooperatives or online marketplaces, to market handicraft products made with seeds, there are several approaches to balance the cultural appreciation and the commercial value of creations in a specific context of the indigenous entrepreneur.
- Collaboration and Partnerships: The establishment of collaborations between urban indigenous people, designers, researchers and organizations to boost innovation in the use of seeds, that is, the socio-technical network, with this the formation of intercultural partnerships that respect the values and knowledge of the indigenous communities, groups and subjects involved.
- Intellectual Property: As for legal issues related to the intellectual property of farms made with seeds, it is necessary to consider the preservation of rights regarding intellectual property and geographical indication of origin and fair remuneration, this involves the development of contractual and legal strategies to protect traditional knowledge associated with seed work practices, since such work is potential to be aggregated in other platforms such as biotechnology in the making of handicrafts and that the use of such modern instruments does not detract from the indigenous person's character, as well as the fact of entrepreneurship does not.

Revista ARACÊ
ISSN: 2358-2472

- Education and Awareness: It is a set of strategies to educate the general public about the cultural and environmental importance of indigenous seeds and handicrafts. With this, the idea of developing educational programs to transmit the techniques of working with seeds to the younger generations. And that each topic can be developed in greater detail, and the approach must take into account respect for the culture, tradition and rights of the indigenous communities involved.

Some topics for possible public policies that can act on the theme of innovation management and seed craftsmanship made by indigenous people

Public policies play a key role in promoting innovation management - especially in fragile socioeconomic and socio-technical systems such as those that occur in Manaus - and in supporting seed crafts made by indigenous people. Some public policy topics that may be relevant:

- Cultural Recognition and Appreciation: Creation of policies or policy practices that recognize and value seed craftsmanship as a meaningful cultural and labor expression of indigenous communities. Promotion of fairs, festivals, exhibitions and cultural events that highlight seed crafts and provide visibility to indigenous communities and entrepreneurs.
- Access to Territorial Resources: Implementation of territorial policies that guarantee access to areas for harvesting and collecting seeds, as well as other natural resources necessary for handicrafts. Structuring measures to protect the traditional territories of indigenous communities and their rights over natural resources, as well as the equipment and technical training existing in the territories used in the production circuit.
- Training and Capacity Building: Development of capacity building and training programs that transmit traditional techniques of working with seeds to the younger generations, in addition to encouraging formal and non-formal education that integrates seed crafts and innovation management into the curricula.
- Financial and Economic Incentives: Creation of economic incentive and financing programs to support the production, distribution, circulation and consumption of handicraft seed products, as well as the establishment of policies that promote fair remuneration of those involved for the work and knowledge involved.

Revista ARACÊ
ISSN: 2358-2472

- Protection of Traditional Knowledge: Elaboration of intellectual property policies that protect the traditional knowledge associated with seed craftsmanship, avoiding misappropriation and thus creating mechanisms for registration and official recognition of traditional practices and techniques to differentiate them from modern techniques.
- Promotion of Fair Trade and preservation: Development of policies that encourage the creation of production chains that preserve the environment for seed handicraft products, ensuring fair and clean trade relations, including certification of products that meet criteria of preservation and cultural origin and that do not pollute the environment, whether from the production process to the packaging of the final goods, for example, biodegradable plastic bags.
- Support for Innovation and Design: Creation of programs to support innovation, research and technological development in the use of seeds for handicrafts that involve encouraging collaboration between artisans, designers and research institutions.
- Development of Markets and Distribution Channels: Promotion of policies that facilitate access to national and international markets for handicraft seed products made by indigenous entrepreneurs and thus support the creation of e-commerce platforms and distribution networks that reach different audiences in different places.
- Education and Public Awareness: Development of education and public awareness campaigns regarding the cultural and economic importance of indigenous seed crafts and integration of the theme into formal and informal educational programs to expand understanding and respect for indigenous culture and how it occurs in urban daily life.
- Consultations and Participation of Indigenous Entrepreneurs: Establishment of policies that ensure the consultation and effective participation of indigenous entrepreneurs in the formulation and implementation of policies that affect their handicrafts and traditional knowledge. This is important for public policies to be developed collaboratively, with the active participation of indigenous entrepreneurs and experts on the subject. Respect for the autonomy, culture and vision of entrepreneurs is fundamental for the success of these policies.

Revista ARACÊ
ISSN: 2358-2472

FINAL CONSIDERATIONS

Indigenous entrepreneurship in bio/ecojewelry is an inspiring example of how it is possible to unite tradition, sustainability, and economic empowerment. By preserving nature, valuing their culture, and sharing knowledge, indigenous communities establish a model of entrepreneurship that goes beyond profit, prioritizing harmony with the environment and valuing cultural identities. This way of undertaking is a clear demonstration that it is possible to build a fairer, more balanced and diverse future.

In this context, innovation management can be applied consciously and sustainably and it encompasses not only the creation of new products and processes, but also the preservation of cultural traditions and the enhancement of natural resources. By introducing innovative practices in the production of bio/ecojewelry, Indigenous entrepreneurs find creative ways to preserve their culture and promote sustainability. They incorporate traditional goldsmithing techniques, ancestral knowledge about the use of natural materials and symbolic elements of their cultures, while exploring new methods of design, marketing, as well as structuring the production chain of these bioproducts.

Indigenous entrepreneurs involve community members throughout the creation and production process, providing opportunities for training and employment. This collaborative approach strengthens community ties, promotes gender equality, and supports the economic autonomy of indigenous peoples.

Innovation management proved to be fundamental for the improvement of production processes for the delivery to the market of a product with a longer useful life and better finish by indigenous entrepreneurs, who seek to combine traditional knowledge with new technologies and market trends. Innovation will also contribute with its potential to the differentiation and competitiveness of bio/ecojewelry, which stands out for its originality, quality, beauty and socio-environmental responsibility. In addition, innovation contributes to the creation of cooperation and learning networks between the various actors involved in the sector, who share experiences, knowledge and resources.

Therefore, the management of innovation and indigenous entrepreneurship of bio/ecojewelry in the city of Manaus represent an opportunity for economic, social, cultural and environmental development for the region, which can become a reference of creativity, diversity and sustainability for Brazil and the world. We recommend that more studies and research be carried out on this topic, as well as that public and private policies be implemented to support and encourage this economic activity.

Revista ARACÊ
ISSN: 2358-2472

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