

INNOVATING IS DEVELOPING THE INDUSTRY OF THE FUTURE

30 INNOVATION CASES IN SMALL,
MEDIUM AND LARGE ENTERPRISES



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INTRODUCTION

This new edition of our publication on outstanding innovation cases represents the continued efforts of the National Confederation of Industry (CNI) and SEBRAE to identify and disseminate successful and inspiring experiences among the finalist companies in the 2016-2017 National Innovation Award contest.

The 30 cases selected to be included here make up a rich and varied set of organizations of all sizes, operating in all regions of Brazil, from capitals to small cities in rural areas, of both national and foreign origin. Through innovative practices, these organizations achieved impactful economic and financial outcomes.

Most of these companies operate in the manufacturing industry, but there are examples of others operating in other segments, such as in the construction, power generation and distribution, and software production industries. Some of them stand out for how they use biodiversity, while others for turning waste into products, for applying new techniques and businesses, and for their final products.

Their cases show that, despite a challenging scenario, enterprises operating in a wide range of sectors can survive and, based on innovation, thrive with competitiveness.

Knowledge of emblematic cases of innovation adapted to the reality of each company and its own challenges and means can serve as inspiration for devising new, results-focused strategies.

Innovation is a necessary requirement for promoting Brazil's development, for reinvigorating its industry, for improving the financial health of its companies, for creating quality jobs, and for the country's insertion in the global economy.

Recognizing and inspiring: this is what the selection of *Industry Innovation Cases* is devoted to. If any of these examples encourages innovation to become part of the daily lives of the enterprises of those who become aware of them, then our mission will have been fulfilled.

Have a good reading.

Robson Braga de Andrade
President
CNI

Carlos Melles
President
Sebrae

EXECUTIVE SUMMARY

INNOVATING IS THE BEST MEDICINE FOR THE CRISIS

This collection brings together 30 success cases of innovative companies. These are small, medium and large enterprises operating in different industries from north to south of Brazil. What is striking is that these cases are about initiatives that took place during one of the most troublesome periods in all of Brazil's economic history, marked by the sharp retraction recorded in 2015-2016 and meager growth rates in 2014 and 2017-2018. Understanding how it is possible to innovate in such a difficult scenario as the one seen in recent years helps one understand the role of innovation for companies, its main drivers, and the paths they choose to develop innovations.

As we know, companies innovate by first looking at the market and focusing on their strategies. Even during crisis periods, companies don't stop innovating. This is when those that will recover more rapidly stand out. Taking the lead is the idea. And innovation can be the path for survival and success.

Several of the cases summarized here show how companies can stand out and lay the foundation for sustainable growth. How they can leverage market knowledge, in-house scientific and technological skills or those available in their ecosystem, partner with research institutions or other companies to come up with better processes or products, or how they can innovate in their business model.

Apart from the possibility of innovating during crisis periods, another current phenomenon has been drawing a lot of attention: the emergence of countless startups and high-growth companies that have been standing out for their very above-average performance in their industry. Startups and high-growth companies have become a major element of the business innovation environment. Along with them, incubators, accelerators, mentorship arrangements, venture funds and angel investors, or corporate venture from large companies have multiplied as supporting and strengthening mechanisms. These are small companies that, apart from innovating in their own business, become partners in the innovation processes of large companies. It is worth paying attention to the cases reported in this book: they are about many small innovative enterprises and many other companies that have been collaborating with large companies in their innovation efforts.

Partnership is another recurring topic in this collection of cases. We have long known that this is a recognized way of leveraging an innovative path. Years ago, in one of our collections of innovation cases, it was pertinently remarked that *nobody innovates alone*. New technical solutions, a new scientific basis or even a redefinition of the management model can often be sought outside a company in universities, research institutes, institutions such as the Brazilian Micro and Small Business Support Service (SEBRAE) and the National Industrial Apprenticeship Service (SENAI), or in other small innovative companies, as already mentioned above. Almost every case reported in this book reveals some form of partnership. But they include examples where partnership is the key element of innovation, such as those of the companies Biotecnologia Refrigeração Médica, Norvinco, Toctao Engenharia, Engpiso, or MM Optics. It is worth understanding the innovation logic behind each of them.



ENABLING PARTNERSHIPS

Biotecno Refrigeração Médica is a company from Santa Rosa (state of Rio Grande do Sul) that provides cold storage solutions for pharmaceuticals and biologicals. It provides safety solutions for transporting and storing vaccines and health products for humans and animals based on a detailed analysis of customer needs. Its innovation consisted in integrating a package of technologies: cold chamber sensors identify power outages and activate batteries that ensure the conservation of the materials for up to 72 hours, and at the same time the equipment is coupled to a tracking software program that enables remote monitoring. It took time for the company to adjust itself to the standards of the National Health Surveillance Agency (ANVISA), but this adjustment effort led to a leap in technical training in a highly demanding market. For this purpose, Biotecno relied on the collaboration of clients and developers and of an extensive network of partner STIs such as SENAI, Unijuí, IF Farroupilha, the Federal University of Rio Grande do Sul (UFRGS), the Federal University of Santa Maria (UFSM); the Science and Technology Park of the Catholic University of Rio Grande do Sul - PUCRS (TECNOPUC); the Federal Emergency Management Agency (FEMA) and the German Westphalian University of Applied Sciences, apart from being supported by SEBRAE, by the Brazilian Export and Investment Promotion Agency (Apex-Brazil), and by the Rio Grande do Sul State Development Bank (BADESUL). This resulted in a strong innovation culture, as evinced by the engagement of its employees with an Idea Bank and Innovation Mural and with a wide network of partners that add value to the company.

Norvinco is a medium-sized packaging company located in Maceió (state of Alagoas). It became known for being awarded the *Prêmio Artigo Destaque* (Best Paper Award) of the *Inova Talentos* program and the Green Seal of the Chico Mendes Institute for its environmentally sustainable solutions. Its most prominent product is an ecothermal box launched in 2017 as an innovative solution for the safe packaging and transportation of thermosensitive products. The box is an alternative to expanded polystyrene (styrofoam) packaging, which is known to have negative impacts on the environment. It is a hybrid solution that combines plant fibers with reusable and recyclable polystyrene boards. The innovative solution utilizes a polyethylene terephthalate or polyester (PET) thermal insulator produced from recycled plastics. It also reduces transportation costs, since its cubage is smaller than that of styrofoam packaging and, because it is demountable, the ecothermal box also allows for the storage volume to be reduced. A partnership between the company and the *Inova Talentos* program of the Euvaldo Lodi Institute (IEL) and the Development Agency of the State of Alagoas (DESENVOLVE) played a key role in ensuring the success of this initiative. This is the path Norvinco intends to follow in the coming years, combining innovation with social and environmental responsibility for improving its product portfolio and catering to the needs of its customers.

Toctao Engenharia is a medium-sized company from Goiânia (state of Goiás) that operates in the civil construction industry. It designs and implements large civil construction projects, such as shopping malls and hydroelectric power plants, and is active in the management of sanitation systems, in real estate development and construction, and in urban development projects. In addition to implementing projects swiftly, it relies on partnerships to create a lasting and sustainable business model. In the field of innovation, Toctao stood out by significantly reducing water consumption on construction sites by treating liquid waste. The Ecoágua project, jointly carried out with SENAI, made it possible to develop a small treatment plant for construction sites, with decanters and a mini sewage treatment plant. The pilot project of the treatment plant, which was implemented when the Aparecida Shopping Mall was built, showed the potential of the solution, as it saved approximately 5,000 liters of water a day and reduced water costs by about 70%, besides improving its image and social and environmental responsibility. In addition to being awarded the 2015 Social Responsibility Award granted by the Brazilian Chamber of the Construction Industry (CBIC) for wastewater use and reuse in construction projects, the case was also selected during the 15th Conference of the National Association for Research and Development of Innovative Companies (ANPEI) on Technological Innovation. In the 2016-2017 edition of the National Innovation Award contest, Toctao was the winner among medium enterprises in the Process Innovation category and was awarded the Sullivan Silvestre de Oliveira Ecological Merit Medal, the Environmental Merit Diploma, and the title of Environmentally-Friendly Company.

Engpiso is a small engineering company located in Salvador (state of Bahia) that operates in the civil construction industry. It specializes in differentiated flooring solutions for large public and private construction projects, a niche that has been showing great promise. Its most innovative project is that of a cement-based mortar with acoustic and self-leveling properties, which does not require the use of blankets, thus reducing by 70% the number of people required to carry out the work. This innovation has earned Engpiso several awards, such as the state-level 2014 MPE (small and micro enterprises) Brasil Award for Innovation Management or the 2017 National Innovation Award in the Organizational Innovation category, and the company was also finalist in the Process Innovation and Innovation Management categories. To achieve such success, Engpiso has relied on several partners such as SENAI-CIMATEC, the Catholic University of Salvador (UCSAL), and the Federal University of Bahia (UFBA), which assisted it in developing its strategic planning. It was also supported by the Bahia State Research Support Foundation (FABESP) and by the Fund for Studies and Projects (FINEP), through the Research Support Program for Innovation in Companies (PAPPE), by SEBRAE, via SEBRAETEC, and by the National Council for Scientific and Technological Development (CNPq), with grants for SEBRAE's Local Innovation Agents (ALIs). Today, Engpiso is a company that has incorporated innovation into its core values for good.

MM Optics is a medium-sized medical and dental equipment company located in São Carlos (state of São Paulo). It develops technological solutions for services provided by healthcare



professionals drawing on the scientific knowledge base available in the city of São Carlos, which has been systematically providing inputs for innovation and new product development. Around its original core of technological competencies, MMO has developed a broad and diverse line of new optical products and solutions. MMO's most innovative product is a tooth whitener using a 405-nanometer wavelength laser that far outperforms other spectra and provides the benefit of reducing the time required for treatment without the inconvenience of pain. MMO also relies on the collaboration of various medical institutions and hospitals in the region, such as the Medical School of the University of São Paulo (USP) in Ribeirão Preto, USP's School of Dentistry in Bauru, and the Paulista State University (UNESP) in Araraquara, as well as the Brazilian Agricultural Research Corporation (EMBRAPA) in São Carlos. With these partners, it has been developing equipment for treating cervical cancer, controlling pests in citrus crops, or conducting soil analysis. Its two dozen solutions are the result of the company's ability to attract excellent professionals, make proper use of its knowledge, and preserve links with the scientific and technological cluster of São Carlos, apart from relying on financial support from public banks.

SENAI, SEBRAE, universities, research institutes, technology parks, hospitals, research support foundations, business associations, development banks, or even international institutions are all part of the history of the companies listed above. All of them operate in a local innovation environment of one kind or another and know how to take advantage of it. This is an interesting lesson, because although headquartered in very different locations – Santa Rosa (state of Rio Grande do Sul), Maceió (state of Alagoas), Goiânia (state of Goiás), Salvador (state of Bahia), or São Carlos (state of São Paulo) – they have always managed to secure the support they need for their innovation efforts outside their premises. This requires in-house skills, including technical and management skills. Managing these partnerships is not always easy: the institutions involved have different cultures and values, and their timing and focus also vary. Nevertheless, this increasing number of partnerships provides evidence that, in practice, they pay off, and pay off a lot.



SCIENTIFIC COMPETENCE

In addition to relying on partnerships, having strong scientific and technological competence can be a prerequisite for success and a means for innovating disruptively. A company's ability to recognize the value of new information, assimilate it, and apply it for business purposes has long been recognized as a key element of its ability to innovate. This *absorptive capacity* almost invariably requires the prior availability of some kind of knowledge and teams dedicated to research and development (R&D) efforts, particularly as the science or knowledge content embedded in the technological innovation in question is greater. Four companies of different sizes and operating in different industries provide examples of the role these skills can play in their innovative projects: Natura, Pharmakos D'Amazônia, Simbios Tecnologia, and Habitar Construções Inteligentes.

Natura is a Brazilian company operating in the cosmetics industry based in São Paulo city (state of São Paulo) and with operations at global level. Its history has always been associated with the sustainable use of Brazilian biodiversity. The company has used these elements as a platform for developing new products that have placed it at the forefront in Brazil when



it comes to industrial innovation. Recently, Natura raised its innovating capacity to a whole new level by incorporating scientific and technological knowledge in the fields of phytochemistry, molecular biology, and metabolomics, going far beyond the use of traditional knowledge. This strategy is the result of a structured process involving 350 highly skilled employees. It complements Natura's effort to tap into the potential of biodiversity. No wonder Natura is the private company with the largest number of authorizations for accessing Brazil's genetic heritage and associated traditional knowledge issued by the Genetic Heritage Management Council (CGEN). In addition, no other company shares the benefits of its efforts with traditional communities in Brazil as much as Natura does. Since 2001, Natura has been adopting an open innovation model and working with different partners such as research institutions, large companies, startups, specialists, government agencies,



communities, and professional associations. Since 2012, it has been keeping an innovation hub in operation in the Amazon region inside the Belém Ecopark (state of Pará) as part of its Amazon Program, which contemplates not only a science and technology dimension, but also the development of sustainable supply chains and institutional strengthening actions, especially with its suppliers and in the communities in which it operates.

Pharmakos D'Amazônia is a company based in Manaus (state of Amazonas) that produces and markets cosmetics derived from Amazonian biodiversity with a focus on preserving nature and promoting sustainability. Its starting point was a research project funded by FINEP that led to the production of four colognes with an Amazon look, taking advantage of the scientific knowledge of its founder, a professor at the Federal University of Amazonas (UFAM). With the support of SEBRAE and IEL, a small extract processing facility set up in the backyard of a family home led to the establishment, in 2001, of a unit at the Business Incubation and Development Center. Its first product was a copaiba oil-based refreshing gel for use mainly for massage. From creams, Pharmakos evolved to a diverse product line with biodiversity always at its core. The regulatory challenges posed by of a market under health surveillance have been identified and overcome through the skills of new professionals and of the second generation of the family. In 2008, Pharmakos moved to the Micro and Small Business Industrial District. Today, the company operates in three main market segments: perfumes (colognes with products and scents of the Amazon region); food (spices, herbs, fruits, oils, and aromas of the forest); and phytocosmetics. Its success can be gauged by the following awards won by the company: FINEP's Innovation Award, six times: 1st place in 2004, 2006, 2008, and 2010; 2nd place in 2005; and 1st place in 2012 in the Small Company and Sustainable Innovation category. But this success can also be gauged by the new steps taken by the company in the international market: it has five distributors in the US already and made its first

pilot export in 2017, in addition to having participated in the Beauty World Middle East, a beauty industry fair held in Dubai.

Simbios Tecnologia is a biotechnology company located in Cachoeirinha (state of Rio Grande do Sul) that is currently providing animal health services to protein production chains. The company was set up by three young researchers from the Biotechnology Center of the Federal University of Rio Grande do Sul (UFRGS). It began its activities with a project dedicated to addressing the quality problem of inoculants commonly applied to seeds used in agriculture. Today, it operates mainly in the animal health market. Its main technological innovation is a product line called NewGene designed for on-site molecular diagnostics, i.e. in its clients' own industrial laboratories, which was developed with the committed collaboration of its main clients, the companies Sadia and Perdigão (today BRF). Until 2014, BRF was its only customer. Today, it has 22 clients and has been growing at an average annual growth rate of 70% over the past three years. The financial support provided by FINEP and the Rio Grande Sul State Research Support Foundation (FAPERGS) played a key role in ensuring its success. Simbios' case shows how science originating in universities can solve problems faced by production systems to create innovative products and services in the form of a platform for new services and products with high growth potential and very consistent results.



Habitar Construções Inteligentes is a small company from Pindamonhangaba (state of São Paulo) focused on building low-cost housing. Its solution, based on a combination of its founders' varied experiences and professional training, makes it possible to build functional, customized, and low-cost housing with low environmental impact. The Habitar Building System is a factory model for in-line production of panels already provided with door and window frames and all the necessary elements for embedded electrical and hydraulic installations and thermal insulation. Together, all these factors make it possible for the company to build two houses in one day with reduced waste of materials. This enables the company to offer customers a distinctive finish, with architectural details and using nobler materials. A patent application for the system is being drafted with the support from institutions such as USP and the Institute for Technological Research (IPT) through programs of the Brazilian Agency for Industrial Research and Innovation (EMPRAPII). The profitability reported for projects delivered last year exceeded 25%. And its commitment to promoting innovation has remained constant, including through an internal program designed to reward innovations suggested by employees.

Natura, Pharmakos, Simbios, and Habitar are examples of how in-house competencies are key for innovation. These competencies may be based on science or on specific technical knowledge or derived from the professional experience of employees. These capabilities allow for new solutions to be produced or for technology and scientific knowledge already available to be absorbed. For all four of these companies, in-house competencies are key differentiators in the market. They define one of the fundamental pillars of their innovation strategies.



PERCEPTION OF NEEDS

Knowing the market and customer needs in detail can be the differential of success. Many of the companies mentioned in this book structured their innovation strategies around this knowledge. Three of them provide a good example of this fact. MRV created a solution tailored to the profile of residents of condominiums by associating their image with sustainable and low-cost solutions. SOS Alergia was born from the personal experience of its founder and from a network of clients organized around it, as a result of which the company is deeply aware of the needs of allergic people. Ambiente Verde has consolidated itself by offering to footwear manufacturers in the Vale dos Sinos area the possibility of recycling their waste, also turning the needs of its customers into a business opportunity.

MRV Engenharia is a large construction company based in Belo Horizonte (state of Minas Gerais). The many innovations that MRV designed and implemented as it grew and consolidated itself include generating renewable energy from systems installed on the roofs of buildings. With this, the company intends to promote more sustainable and economical construction approaches, a business model that does not exhaust itself after the product is sold. The concept was born from the *Maratona de Ideias* (marathon of ideas) project, which every year captures 300-400 ideas from its employees and rewards the most promising ones proposed by people holding positions under that of coordinator. In 2016, 22 of these ideas were implemented, including a prefabricated restroom and a study for defining an optimal price for selling and generating photovoltaic energy. The panels capture sunlight and generate energy to meet the needs of common areas of condominiums initially. This is the first step toward a model in which the surplus energy generated by the system may be sold to the local utility. Today, this arrangement is already helping to reduce the costs of condominiums. This initiative is complemented by investments made by the construction company in training and qualifying professional condominium managers with the aim of ensuring the sustainability of its buildings and residents in the long term. It was an innovation that led to a huge differential in the company's positioning in the market and was consolidated in 2017, when it set up an Innovation Department reporting directly to the vice president for production, currently with a staff of six, including engineers and business administrators.

SOS Alergia is a company from Marília (state of São Paulo) dedicated to developing and marketing hypoallergenic and natural products to meet the demand for food and personal care items for allergic individuals, especially children. It markets over 300 recipes today: food products (breads, cakes, cookies, crackers, butters, and chocolates); products for respiratory allergies; products for insect bite allergies; and products for contact allergies. SOS Alergia was born from the experience of its creator, a multi-allergic person who experienced the difficulties involved in finding suitable commercial solutions for



her condition. The initial technical training, which was provided by the State School of Technology (FATEC) of Marília, was complemented over time by support arrangements made available by SEBRAE (EMPRETEC and SEBRAETEC), FINAME (Caixa Econômica Federal operation), and Brazil's Development Bank (BNDES) card. The success achieved by the company made it possible for it to create a business model based on a franchise marketing system. In some cases, this success required developing its own equipment, such as for producing chocolate, for example. A well-structured decision-making process was the recipe for new product launches: need, feasibility, market potential, testing with employees and potential customers, and only then moving on to the packaging development and distribution stage.

Ambiente Verde is a company based in Taquara (state of Rio Grande do Sul), in the Vale dos Sinos footwear cluster, dedicated to recycling waste from footwear production generated by other companies. The huge volume of materials that are discarded in the footwear production process constitutes a serious problem for producers and the environment. Ambiente Verde set out to buy this waste at symbolic prices and to produce laminates for footwear lining without generating new waste. This required the development of a specific equipment item produced by a machine manufacturer designed to separate polyurethane from fabrics, making its reuse feasible. It was a solution derived from the knowledge of partners about the footwear industry and about the properties of the materials used in it. This shows how in-depth market knowledge is a source for innovation, even in technologically mature segments. Ambiente Verde is now taking other steps to develop new uses for the laminates it produces.

CREATIVE INNOVATION

Creativity is also a recipe for success. This has been the inspiration for the innovations developed by many companies. Art and design can differentiate products, draw consumer attention, or create a valuable unique identity. The look of the products, their colors, and their packaging are important aspects in many of the cases presented here. But the cases of Cerâmica Portobello and Monthal Lingerie stand out as examples of how an additional touch of creativity can mean a lot to a company. Monthal's ReBOARD project makes design the unique element of its second product line. Portobello is characterized by the creativity and variety of its ceramic products, which are adapted to a wide range of architectural solutions. For the company, art, aesthetics, history, and design are sources of inspiration.

Cerâmica Portobello is a large company operating in the ceramics industry based in Tijucas (state of Santa Catarina) and with another production unit in Marechal Deodoro (state of Alagoas). Its product lines have incorporated a well-structured innovation process in which the development cycle includes stimulating new ideas, building identities for each new line, a marketing strategy based on brand differentiation – quality, technical reputation, design – and associated services. Research into materials and manufacturing techniques is the first cornerstone of its R&D activities, which are carried out by a team of 18 professionals. It's hard work, as Portobello renews 25% of its product portfolio every year. The processes involved in installing its lining parts are the second cornerstone. Developing new collections with elements of history, art, and culture that create lasting affective bonds between customers and the brand is the third cornerstone. It is a robust innovation process involving technological development in products, manufacturing, construction techniques and the creation of new collections, always with a unique identity. The company's initiatives are complemented by the development of four clearly defined marketing channels: stores, resellers, engineering, and export.

Monthal Lingerie is a small company from Bom Jardim (state of Rio de Janeiro) that operates in the clothing industry. It focuses on designing, manufacturing, and marketing apparel primarily, but not exclusively, intended to be worn at home. By exploiting this versatile clothing market, the company has built a diversified product line, opened its first store, and then developed a network of six stores of its own. It is also active in many regions through sales representatives and is analyzing the possibility of operating in markets abroad. The company is already selling 72,000 clothing items every year. At the same time, based on a postgraduate thesis on Production Engineering intended to study how fabric waste generated by Monthal could be reused, the company developed a second product line: the ReBOARD product line. By combining virtually zero-cost fabric remnants with resins, it creates numerous design objects such as costume jewelry and

pieces of furniture. The scaling up of the ReBOARD project, which began as an artisanal activity, is also a bet on the sustainability of the company's processes based on reusing leftovers of synthetic polyamide fabrics.

FOCUS ON THE MARKET

Companies innovate for the market. Usually, products or processes are created or modified to cater for the needs of Brazilian consumers. Some companies stand out for coming up with initiatives that are also new globally, either because they aspire to operate in the global marketplace or because their innovation is unique and its impact goes far beyond the domestic market. The case of the company Whirlpool Corporation is exemplary: its Double Wash washer is a local innovation, but with a global reach. Another set of innovations that stands out globally is the one introduced by Fibria¹ when it expanded its plant in Três Lagoas (state of Mato Grosso do Sul) to implement automated seedling production, promote greater energy efficiency, and improve the logistics of raw material transportation. Even though it develops products focused on meeting the needs of its local clientele, Avon also stands out for mobilizing global competencies around its innovations or for the unique positioning of its Brazilian unit within the company as a whole.

Whirlpool Corporation is a global company based in the United States. In Brazil, it has four technology centers and three factories. Its factory in Rio Claro (state of São Paulo) is the one where its washing machines are produced. The company has been launching 80-100 new products every year as a result of the work of an R&D team made up of 250 professionals in charge of redesigning traditional products or of designing entirely new products. It was in Rio Claro that the company developed a washer that makes it possible for two loads of clothes with different characteristics to be washed at the same time but separately. It took 18 months for this washer to be designed, developed, and launched. The Double Wash washer saves water, energy, and other inputs: it consumes 20% less water, 43% less energy, 30% less soap, and 29% less time by doing away with the need to separate clothes. The team in charge of this project included 10 managers with different expertise who came up with 11 possible solutions to problems pointed out by the qualitative research team. The complexity of the solution required the filing of 17 patent applications covering a wide range of elements, including the concept of using two baskets, revolutionary water supply and drainage processes, and an algorithm for the washer's embedded intelligence, which was jointly developed with other units of the company. In addition to a core group and a core team made up of functional leaders, the project relied on the collaboration of an extended team of approximately 150 people.

1 Since January 2019, Fibria has been operating as a subsidiary of the company Suzano and was renamed Suzano S.A.

Developing innovative and well-adapted solutions in light of new consumption conditions ensures the leading position of the company in betting on product diversification and on more sustainable use standards.

Suzano S.A. is a Brazilian pulp and paper company that is the world leader in the production of bleached eucalyptus pulp. It has plants in several states of Brazil and a large unit in the city of Três Lagoas (state of Mato Grosso do Sul), which today is known as the “pulp capital of the world.” A project to expand that unit, which added 2 million tons to the previous production of 1.3 million tons, required an investment of R\$ 7.4 billion. It involved three hundred suppliers and 40,000 workers. In addition to their figures, the innovations promoted by Suzano to carry the project forward are also very impressive. It set up a eucalyptus seedling plant (nursery) in which a computer-vision robot selects the seedlings at high speed based on strict quality standards. This plant also relies on an innovative logistics solution based on automated tray and table handling and RFID (Radio Frequency Identification) tracking of seedlings, apart from being provided with automated irrigation and fertirrigation systems with temperature, humidity, and insolation control in the greenhouses. The processes adopted for transporting cut-down trees on five-trailer trucks are equally innovative, as they make it possible to reduce costs by 20%. Finally, the burning of eucalyptus bark and the black liquor resulting from the process of separating cellulose and lignin in biomass boilers produce the heat and steam required to activate the turbines that generate the necessary energy for the remaining processes. As if this were not enough, using the energy resulting from the processes carried out in the first unit ensured the necessary conditions for it to enter operation ahead of schedule.

The case of Avon provides a very interesting example of high-impact innovation resulting from combining multiple expertise. The São Paulo-based company operates globally





and relies on collaboration arrangements with other R&D centers abroad to complement the research done by its Brazilian team. Its latest success was the launch of the ultramatte lipstick, which resulted from interactions between half a hundred professionals in the fields of chemistry, toxicology, materials, engineering and processes and its market intelligence and packaging teams. The challenge was to meet a consumer demand for a lipstick combining soft touch, non-glossy color and durability, but without the drying out of the lips caused by other products already available on the market. The solution was so successful that sales reached eight million units a year, against an initial target of three million units. This is the result of being keenly aware of the specific characteristics of the Brazilian market, whose needs cannot be met by imported solutions. It teaches us that the easiest and least risky solution may not always yield the best results.

INNOVATION MANAGEMENT

Innovation management processes have been drawing a lot of attention from business administrators. The agenda of the Entrepreneurial Mobilization for Innovation or of SEBRAE's Local Innovation Agents (ALIs) show that this is true for large, medium, or small enterprises. Since innovation is not always a simple and linear process, as it involves different teams of the company and external collaborators of various types, its management can be a crucial aspect for success. How can a company stimulate a culture of innovation, encourage its staff to develop new ideas, select the best projects, choose partners and manage them and, in particular, put aside projects and ideas that, however interesting and advocated for, may consume precious time and resources? Management is the technique and art of deciding, in an environment of uncertainty, between such choices. The examples of Medicatriz Dermocosméticos, BMD Têxteis, Actea Informática, or Mix Nutri show that paying attention to management can be decisive for the success of a company.

Medicatriz Dermocosméticos is a small company from São Paulo (state of São Paulo) operating in the cosmetics industry. It started as a compounding pharmacy and grew into a small factory, but today it also includes a training and marketing center, an online store, and a telesales center. It relies on different types of professionals to boost innovation and reinforce its results. Supported by SEBRAE's ALI Program, it managed to overcome organizational shortcomings and to create an open innovation model that brings together cosmetology academics and researchers working in universities and in a public research company. Annual launches of about two dozen new products consistently expand the range of items offered, which already exceed one hundred. The ability to take advantage of opportunities is reflected in its five sales channels: a physical store, a passive virtual store and an online store with live chat, a telesales center with an active and consultative process, a significant group of distributors and representatives, and a network of over 1,000 retailers.

BMD Têxteis is a company from Camaçari (state of Bahia) that produces intermediate technical fabrics and had to reinvent itself when its main client began to face financial difficulties arising from competition with imported products. BMD's economic and financial reinvigoration required opening new markets and developing a detailed understanding of new customers and their needs. Supported by SENAI-CIMATEC, IEL, and CNPq through the *Inova Talentos* program, the company managed to implement a diversification strategy focused on R&D and on multiplying market areas. In 2008, BMD set up a New Product Development Center. In 2009, it launched petrochemical screens. In 2011, it introduced effluent filtration pipes, mortar reinforcing screens, plastic alloy

blankets, and fabrics for the automotive industry. In 2012, it took a new step toward high value-added products by launching a red wire mesh for poultry farms. In 2015, it brought its swimming pool cover solution to market. Its new product portfolio includes: a wire mesh for poultry farms; a polyester screen for façade coating; fish breeding pools; a tridimensional and flexible polypropylene geoblanquet for vegetation; and a waterproof geocomposite for tunnel and slope drainage. All of this represented a radical change in relation to its old business model. Today, BMD's operations are guided by a comprehensive innovation management model focused on creating and capturing value.

Actea Informática is an innovation center linked to the corporate structure of DB1, a software company from Maringá (state of Paraná) that developed, supported by SEBRAETEC, an integrated internet sales management platform called Anymarket. It is an innovative solution validated by customers and with high growth potential, as it is a complete sales platform with a cost structure closely similar to that of an off-the-shelf software, even though it is also a customized service. It overcame a dilemma faced by DB1 in its early years of over-customizing its project portfolio, which had an impact on costs due to the lack of scale. The creation of Actea with the necessary autonomy to develop new projects made it possible for DB1 to speed up its decision-making processes and project execution. This is a clear example of how an organizational innovation or new innovation management approaches can greatly benefit a company.

Mix Nutri, a functional food company based in Campo Grande (state of Mato Grosso do Sul), provides a good example of what is currently referred to as a high-growth company, i.e. a company that stands out in its industry for its enviable economic performance. Its success is based on a winning business model: developing very high-quality food formulations and then licensing and manufacturing them under an outsourcing contract. Mix Nutri's product line reflects this approach, as in the case of Shake Fiber lax, its first product, which was developed at Mix Nutri and then licensed to a large company. The company has shown that providing manufacturing services to other brands can be a sustainable business. Today, about 80% of the products manufactured by the company are made for third parties and only 20% of them are sold under its brand name. Focus on quality is another determinant of Mix Nutri's successful performance, a fact that was reinforced by the registration of its functional foods with the National Health Surveillance Agency (ANVISA), for which purpose the company had to hire engineers, food technologists, and nutritionists. The rapid expansion of companies that manufacture innovative products and adopt innovative models requires support from partners in the early stages. Mix Nutri realized this need and commissioned the development of packaging from a supplier, while for exports it was supported by the Federation of Industries of the State of Mato Grosso do Sul.

INNOVATING REGULATIONS

Complying with the rules that regulate a given market is an obligation of companies operating in it, as confirmed by the case of Mix Nutri described above. Knowing how to use such regulation to improve the performance of a company or to open up new possibilities for it is an innovation that can be very relevant to its business. Several of the companies selected to be included in this book operate in regulated markets or rely on compulsory R&D resources subject to public oversight. As an electric utility, Enel Distribuidora has innovated to comply with service quality standards. As a beneficiary of the IT Law, Samsung manages compulsory R&D resources and innovates in how it uses them by partnering with universities and encouraging the creation of digital startups. Gnatus, formerly Q2Tec, took advantage of a decision made by the Administrative Council for Economic Defense (CADE) to acquire a new brand and take a giant leap forward. Montrel Tecnologia develops in turn products with resources provided for in compulsory R&D clauses applied to electric utilities. Their secret, and that of many others, is to use the standards applied to them intelligently.



The former AES Eletropaulo is now called Enel Distribuição São Paulo. It is responsible for the operations of the Enel Group in the state of São Paulo, which is a challenging market due to its size and complexity. This was how the company overcame one of these challenges that led it to be awarded to the 2015 Fierce Innovation Awards and to attend several technical events. It innovated in how it planned and implemented a tree pruning project in the metropolitan region of São Paulo city with the aim of reducing power supply interruptions and improving the quality of the services provided. In partnership with Genera Inovação e P&D, Enel developed a system using satellite imagery to map out the location of existing trees and then suggest the best pruning strategy for each location. Trees account for 50% to 70% of all power supply disruptions recorded by distributors. In 2018, there were more than 26,000 power outages in Greater São Paulo caused by trees falling and/or growing. Enel has 30 teams for pruning services and 17 teams for collecting pruning residues. Its teams and outsourced companies have pruned over 380,000 trees. Enel's initiative was to overlay satellite images on maps of its distribution network and use its knowledge of botany and artificial neural networks to build a mathematical model for prioritizing pruning services. It is a sophisticated solution to something that might seem simple but was affecting the quality of its services and the commitments of the company toward consumers.

Samsung is a large Korean company that produces a wide range of electronics. In Brazil, Samsung has two development and production clusters, one in Manaus (state of Amazonas) and another one in Campinas (state of São Paulo). As a beneficiary of the IT Law, the company strives to use its compulsory R&D resources to support the creation of new companies, allocating those resources to products originating from incubation efforts. For this purpose, Samsung set up two multi-purpose technological training centers known as Ocean in Manaus and São Paulo, following a model implemented in Korea. In those centers, different groups are trained in programming and developing solutions for electronic equipment, especially smartphones. Ocean has become a training cluster for professional solution developers, attracting designers, entrepreneurs, and college students from diverse fields of knowledge. These centers make available various technology platforms and tools from Samsung itself and from the market. These are incentives and lessons that foster the creation of digital startups focused on applications for different segments, both on the production and on the consumption side. The figures show the magnitude of the efforts made by the company and the comprehensiveness of the outcomes of its programs. In both laboratories, more than 2,000 sessions have been held already, including training sessions, technical meetings, and other events, which provided training to more than 50,000 students and professionals, ranging from

strictly technical training to entrepreneurship training. In Manaus, the Ocean center was set up in 2014 in partnership with the State University of Amazonas (UEA). In São Paulo, the Ocean center has been in operation since 2016 in partnership with the Polytechnic School of the University of São Paulo (USP).

Q2Tec, which today operates under the Gnatus brand name, is a company from Barretos (state of São Paulo) operating in the medical and dental product market. Based on their solid background in engineering, its founders created the company in 2008 in the Technology Incubator of Barretos. They started by developing innovative products such as a radiological sensor, a portable wireless ultrasound scanner, and a portable vacuum pump. Its history would not be different from those of other technology-based startups were it not for a unique opportunity afforded by a merger of two major dental equipment companies, which led Cade to require the sale of one of the brands accompanied by a contract for the provision of manufacturing and line assembly services for the acquired product line. It was up to the partners to raise the required funds for this operation. This made it possible for the company to hold a very robust industrial and market position. Following the acquisition of the Gnatus brand, Q2Tec became a company that develops, manufactures, and markets a wide and diverse line of products and equipment for surgery, endodontics, dentistry, diagnosis, lubrication and cleaning, as well as academic kits and kits for mobile doctor's offices (portable devices), in addition to products already developed by Q2Tec, which are now being marketed under the better known brand name Gnatus. The successful performance of the company was recognized by being awarded the 2016/2017 National Innovation Award for Organizational Innovation and by being a finalist in the Product Innovation Award contest.

Montrel Tecnologia is a company from Mogi Guaçu (state of São Paulo) that develops and manufactures audiovisual beacons and equipment to assist electric utilities in their efforts to reduce revenue losses. Its solutions are the result of its in-house professional skills and of its entrepreneurial spirit. Montrel's first product was an industrial beacon with distinctive features: prismatic polycarbonate lenses, high luminous LEDs, and a high-intensity piezoelectric siren sound module. The next step was that of developing a portable equipment designed to check, in the field, deviations in consumption records, helping to control and reduce commercial losses. With the ADR Multi4000, Montrel increased its revenue by 35% between 2015 and 2017 and kept it increasing at the same pace in 2018. In late 2018, the company launched the ADR 5000, an electronic equipment with an embedded operator interface.

TECHNICAL OPPORTUNITIES

More than complying with the rules that regulate a given market, observing technical standards is imperative for any company. Food, household appliances, toys, human and animal health are some of many sectors for which specific standards have been set. Preparing for this is not always simple and often requires developing new skills. The examples provided by Fornari Indústria and Play Park show that while this requires effort and innovation, sometimes it opens up new opportunities for companies.

Fornari Indústria is a small company from Concórdia (state of Santa Catarina) dedicated to producing equipment for agribusiness, providing sanitary safety solutions for the poultry and pork chains. Based on the technical knowledge and creativity of its founders, the company manufactured its first nebulizer nozzles and then developed systems for using them for sanitizing trucks. In its first year in operation, Fornari manufactured and installed a dozen sanitation systems, and in the following year this number tripled. After the Ministry of Agriculture, Livestock and Supply (MAP) issued a Normative Instruction for hygiene/sanitary procedures, Fornari's sales soared. Its success led the company Sadia to consult Fornari about the possibility of developing a solution for sanitizing fertilized eggs. In response, the company developed a process for sanitizing eggs immediately after laying that proved to be much better than existing alternatives, as it is less aggressive and has no restrictions for use. This was possible thanks to the support provided by IEL/SC - FINEP (NAGI, Innovation Management Support Center) to the company for restructuring its R&D Department, which has a staff of five currently, and to interactions with two startups incubated in the company Celta focused on developing embedded electronic components and product design. SENAI's Technology and Innovation Institute in Joinville has been assisting the company in creating a new version of the equipment, which will make it possible for the disinfection process to be monitored in real time. Fornari provides an example of how detailed insight into customers and their needs and compliance with technical standards can provide opportunities for innovation.

Play Park is a toy manufacturer located in Leme (state of São Paulo) that has innovated in the production of more complex and safer inflatable toys. Its success stems from the quality of its products and from its intense focus on technical assistance. By mapping out the weaknesses of products then available on the market, Play Park came up with innovative and more consistent solutions and was even actively involved in a process for approving a standard set by the Brazilian Association of Technical Standards (ABNT) for large inflatable toys. Its industrial and commercial reputation was boosted for the first time in 2006, when a leading magazine specializing in small enterprises published a story about the company that reached the general public and specialized customers. It took advantage of these opportunities to develop new toys and new attractions for the

public. Supported by SEBRAE, it innovated its production process with 3D models, a digital cutting table, use of drones in the process of inspecting cutting and sewing accuracy, and digital printing equipment. It is no wonder that it was awarded CNI/SEBRAE's National Innovation Trophy in 2017.

INNOVATIVE BUSINESS MODELS

Innovating in business models is another possibility that many companies have been exploring. Combining existing possibilities, rethinking what companies or even their competitors are doing, can lead to a big change in the game. Biotechnos is an example of how reinventing a company can be the key to success. Enel and Prisco Ambiental provide examples of how companies can explore new business models that can create value for them and enable them to come up with much more than trivial solutions.

Set up in 2007, Biotechnos is a small company based in Santa Rosa (state of Rio Grande do Sul) focused on producing technology, machinery, and equipment for producing biofuel from used cooking oils. Initially, it was dedicated to producing renewable fuels from canola, sunflower, or soy oil. But competition with the food market led it to rethink its model. The environmental appeal of the solution of using waste oils also boosted the business, which has gained national renown and has 30 plants in operation currently, 29 of which are based on waste oils. The secret was that of developing, with the help from a German professor, a small plant to turn waste oil into biofuel that did not require water to be used for "washing" the biodiesel, doing away with the need to invest in a treatment plant. The plant set up by Biotechnos innovates by contributing to recycling in situations that would not normally be economically feasible and it also innovates by involving local communities and for its environmental footprint.

Enel is a global company belonging to the Enel Group operating in the electricity generation and distribution





market in Brazil, and it is a leading company in the area of renewable energy sources. Enel has been innovating in its operations in Brazil, taking advantage of the alternatives afforded by the new legal framework of the National Electric Energy Agency (ANEEL) for distributed generation and for the electricity compensation system (net metering), which allows private generators to exchange the energy produced with the power grid. The Tabuleiro do Norte Solar condominium for sharing solar energy that Enel built on the border between the states of Ceará and Rio Grande do Norte to supply electricity to a drugstore chain provides an example of a system of this kind. The plant occupies an area of 3.5 hectares with 3,420 solar panels that generate 1,750 MWh of energy annually, allowing for a cost reduction of 7% in the monthly bills paid by customers, in addition to meeting sustainability concerns. It is also an example of how understanding standards in regulated markets can lead to innovative solutions and business models.

Prisco Ambiental is a small engineering company located in Maceió (state of Alagoas). It began to operate at the Business Incubator of the Federal University of Alagoas, where its founder, an experienced professional in the sector, did his master's in wastewater treatment and was supported by FINEP and CNPq to develop his projects. The company provides innovative sanitation services through experimental stations designed to capture untreated sewage discharged into the sea or through compact, low-maintenance mini sewage treatment plants. These are innovative solutions that are also taking advantage of the adoption of a new business model based on the exchange of services with the public sector. Prisco treats wastewater from the Prison Complex of Maceió and hires prison labor in exchange for land assignment, for the payment of electricity costs, for the treatment process, and for permission to cater to the needs of other private clients as well. Maintenance and technical advisory services account for Prisco's recurring revenue, which requires both robust and cost-effective solutions, a combination established providers are far from providing.

INSPIRING CASES

The 30 cases selected for this publication can inspire countless Brazilian companies to innovate. Even in such difficult scenarios as the ones experienced in recent years, it is possible for companies to stand out in the market and open up new possibilities. Many alternatives are available for this purpose: creating new skills, developing partnerships, knowing how to identify customer needs, using creativity, or coming up with new business models. Even regulations or technical standards can be drivers of change in a company.

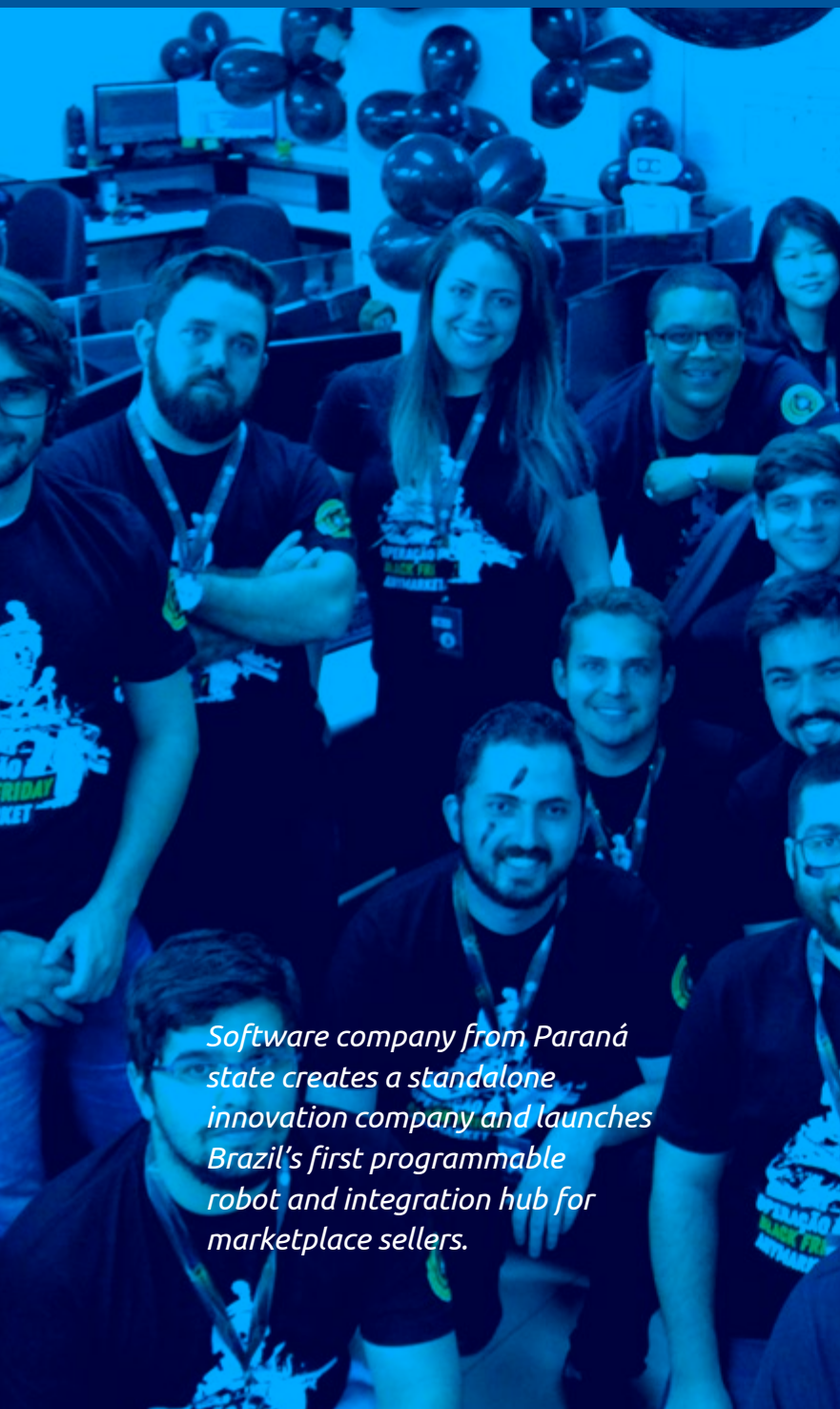
In several of the cases covered here, a combination of these characteristics of innovation can be observed: new models with new in-house competencies; external partnerships combined with market knowledge; compliance with standards and regulations combined with knowledge of the market; or creativity as a new way of managing innovation. The starting point and the path for changing may vary and may require combinations between different approaches, but the point of arrival is always the market.

Innovating for the local market or innovating for the world is always the right direction. The cases of the companies covered in this publication will surely encourage others to follow suit, in periods of crisis or not, in the hope of a change for the better that can make life even more interesting.



Process Innovation

- Maringá (state of Paraná)
- Small enterprise
- 30 employees



Software company from Paraná state creates a standalone innovation company and launches Brazil's first programmable robot and integration hub for marketplace sellers.



actea

informática



AUTONOMY TO INNOVATE

DB1 Global Software is a technology company founded in 2000 in the city of Maringá, state of Paraná, with a focus on on-demand software development with the aim of adding value in meeting specific needs of large companies.

Developing skills at the speed at which challenges arise is not an easy task in a highly dynamic software market. This is what DB1 realized in 2007, when it plunged into a crisis typically faced by companies with high growth potential but which fail to plan and consolidate their competencies, including those related to management, processes, and operational routines.

To survive its crisis, DB1 sought the support from the Brazilian Micro and Small Business Support Service (SEBRAE) to develop an innovation strategy. The lessons learned during the crisis made it possible for the company to take a qualitative leap and move to a new positioning in the market.

The software industry is made up of two main segments. One of them is that of the creation of Full Packaged Product (FPP) programs, also popularly known as “shrink wrap software,” due to the typical packaging of these products. Microsoft products are well known examples of this kind of software. The other segment is that of on-demand software development, that is, customized software specifically designed from scratch to meet customer needs. In this type of development, it is also possible to create new functionality for a functional base product, which is commonly referred to as customization.



In addition to the challenges involved in meeting deadlines and aligning expectations with those of customers, an on-demand software factory also faces the constant need to increase its development teams. To overcome these challenges, such factories must optimize their processes and invest in professionals who have both the technical knowledge and the ability to empathize with the difficulties faced by customers and end users.

But in a world heading to digital transformation, it is not enough to come up with solutions as problems arise, as it is necessary to anticipate needs and provide value solutions for even the most traditional issues. This was the dilemma experienced by DB1 in its early years in the market.

FRUSTRATION AND INNOVATION

DB1's first and main customer was a regional network for tire sales and associated services with several stores in Paraná state. The software developed for this chain provided DB1 with a very promising business base and made it possible for the company to set up a qualified and competent developer team.

With the stability ensured by a highly prestigious client, DB1 felt safe to develop new software for other markets with the aim of attracting other customers and users. Because the company's first software was successful, it seemed certain that it would also be successful in similar market segments.

However, it failed to consider that there were major differences in this new venture. While the first customer was known and had clear demands, entering open markets entailed the threat of not being able to meet the demands of the segment as a whole appropriately.

Based on this lesson, DB1 realized that it needed to reinvent itself and invest in methodologies, mentoring,



and networking. This is why the company set up an innovation department to encourage employee entrepreneurship and carry out the entire process of validating new products.

DB1's innovation department is actually a new company, Actea, which in a short period of time developed major products, such as Anymarket, one of the company's best sellers today, and Tinbot, the world's first programmable robot.

MARKETPLACE INTEGRATOR

Anymarket is an integrated process management platform for companies marketing products over the Internet. DB1 managed to centralize all stages of the sale operation into marketplaces, "virtual malls," in a single system developed with the support from SEBRAETEC.

Initially designed to serve a customer operating in the electronics marketing business who commissioned a similar system in December 2014, Anymarket's concept has proven applicable in practice and with market potential for many customers in different segments.



The platform has the unique advantage of operating a variety of trading channels in a unified system integrated into an enterprise resource planning (ERP) software. This centralization includes functionality designed to automate the most repetitive e-commerce processes, making it possible for all orders to be viewed in a single channel, thus saving time for sales staff to focus on the strategy without worrying about managing the marketing process.

An interesting and unique feature of the system is one called Smart Sync, which consists in the intelligent updating of data in marketplaces by priority. Through a proprietary algorithm that considers multiple factors, such as the probability of failure and update performance standards for each marketplace, Anymarket prioritizes product information updates (especially on inventories) in sales channels, similarly to what an emergency room service does for patient care, according to the severity and urgency of each case.

Anymarket quickly became a big hit. Since it was launched, in 2015, it has been acquired by more than 1,000 clients and the list is increasing. It is a complete and automated sales platform ranking as one of the leading players in the market. Based on its very encouraging results, Anymarket has already won over 20 marketplaces and is being used by customers operating in various segments, such as bookstores, drugstores, supermarkets, clothing, footwear and household appliances stores, and manufacturers of different products, which perform almost 1 billion transactions a month. Even during critical moments, such as during Black Fridays, the system has invariably shown a robust performance.

Anymarket also has a valuable property for companies operating in the software market, which is characterized by the well-known segmentation between “package” and “service.” Its platform makes it possible to provide a customized service, but with a cost structure closely similar to that of a software package, as it does not require adaptations and major modifications for each new customer. This obviously affords business and economic advantages for DB1, making it possible for the company to expand and strengthen its customer base with economic returns increasing at rates above those of related costs.

The lessons learned in relation to business prospecting – as illustrated by the failure of solutions that seemed to be appropriate for an entire segment but which actually only met the needs of the first customer – led the company to separate the process of developing new products from the regular development of already defined products. This culminated in the creation of an entirely separate company for designing innovative products.

Anymarket has quickly gained prominence, From its launch in 2015, the product already has a portfolio of over 1,000 clients. It is a complete and automated sales platform that is now placed as one of the main players in the market.



PROGRAMMABLE ROBOT

DB1's innovation department is also proud to have developed the Tinbot, the first Brazilian humanoid robot and the world's first programmable one. Tinbot was designed and created by computer scientist Marco Diniz Garcia Comes, a lover of robotics who worked as a developer at DB1 Global Software. The robot project began as a homemade prototype made with ice cream sticks, glue, and a cellphone screen. It took six months to create it.



DB1 saw the robot's potential and Actea began to work on its project in June 2016. Its participation in a Call for Innovative Projects (*Editais de Inovação*) of the National Industrial Apprenticeship Service (SENAI) made it possible for the company to work with 3D modeling and carry out research into appropriate materials for improving the robot project.

In its early stages, Tinbot played the role of Scrum Master, using artificial intelligence and the IoT for the purpose of improving the efficiency and performance of the software development teams. Marco Diniz assumed that when giving orders or pointing out errors, the machine had a less negative emotional impact on a team than a human being doing the same. In other words, Tinbot could firmly point out mistakes being made by a professional team without creating grudges.

The robot has a charisma derived from its artificial intelligence cognition system (software), integrated into its mechanical system (hardware). This enables features such as speech-to-text conversion, facial and image recognition, understanding Portuguese speech, capture of photographs, arm and torso movements, and control of facial expressions.

Because of this performance, the nature of the robot exceeded the original idea, making it easily adaptable to functions according to the needs of companies. From English teacher to senior caregiver, the robot can be programmed to play different roles. One of the ways to program it is using the emoji-based "tico-tico" (*Zonotrichia capensis*, a Brazilian bird) language, created by Marco Diniz.

Tinbot is DB1's first artificial intelligence product and it paved the way for an unprecedented line of research and innovation in robotics. *"We have prototype units sold to a bank, a university, and an accounting office already. Now they will leave the lab and will be continually updated. It is a product that requires constant innovation,"* says Rogério de Souza, innovation director at DB1.

Realizing the possibility of entering the international market, DB1 has patented the robot in Brazil and in the United States. *“Tinbot provides a unique and fun experience in innovation in companies. Having this robot in the workplace conveys the idea of modernity while providing unique interactions between clients and the machine in a segment that has been little explored,”* explains Rogério.

INNOVATION CENTER

Actea is seen by DB1 as its innovation center. The company was set up in 2004 for a different purpose, but its legal structure was reviewed after consultancy from SEBRAE’s Local Innovation Agents (ALI) program in 2007, when DB1 made the right decision to invest in an innovation center of its own. Endowed with autonomy and an independent corporate structure, the company ensures innovation projects the possibility of being developed with a certain degree of independence in the early stages, precisely when the relations between a factory and an embryonic idea can give rise to more intense misunderstandings and some tensions. This format reduces the risks of the feasibility of a more innovative project being undermined due to the logic of the defined and functional operating model of the factory.

“Tinbot provides a unique and fun experience in innovation in companies. Having this robot in the workplace conveys the idea of modernity while providing unique interactions between clients and the machine in a segment that has been little explored.”

Rogério de Souza

CEO and Innovation Director,
Actea Informática

This innovation framework can yield great benefits if it can ensure a high degree of autonomy in the early stages of development of innovation processes, at least until a minimally feasible product is formally approved. The initial ideas for an innovative product may turn out to be strange, outright unrealistic and unworkable or even useless in the eyes of established businesses and models.

Initially, a project might seem strange at first sight, but after being polished in successive rounds of reviews it may



become attractive. But for this to happen it must go through early stages that would not be possible if the innovation team is not endowed with a high degree of autonomy.

The same misunderstandings referred to above can occur, even more strongly, when it comes to the competition for both financial and human resources. While innovation teams promises future gains, other established departments, in this case the software factory, deliver results in the present. Competition between results in the present and promises for the future is almost always unfair. Demands for immediate results tend to absorb all available resources, including creative energy.

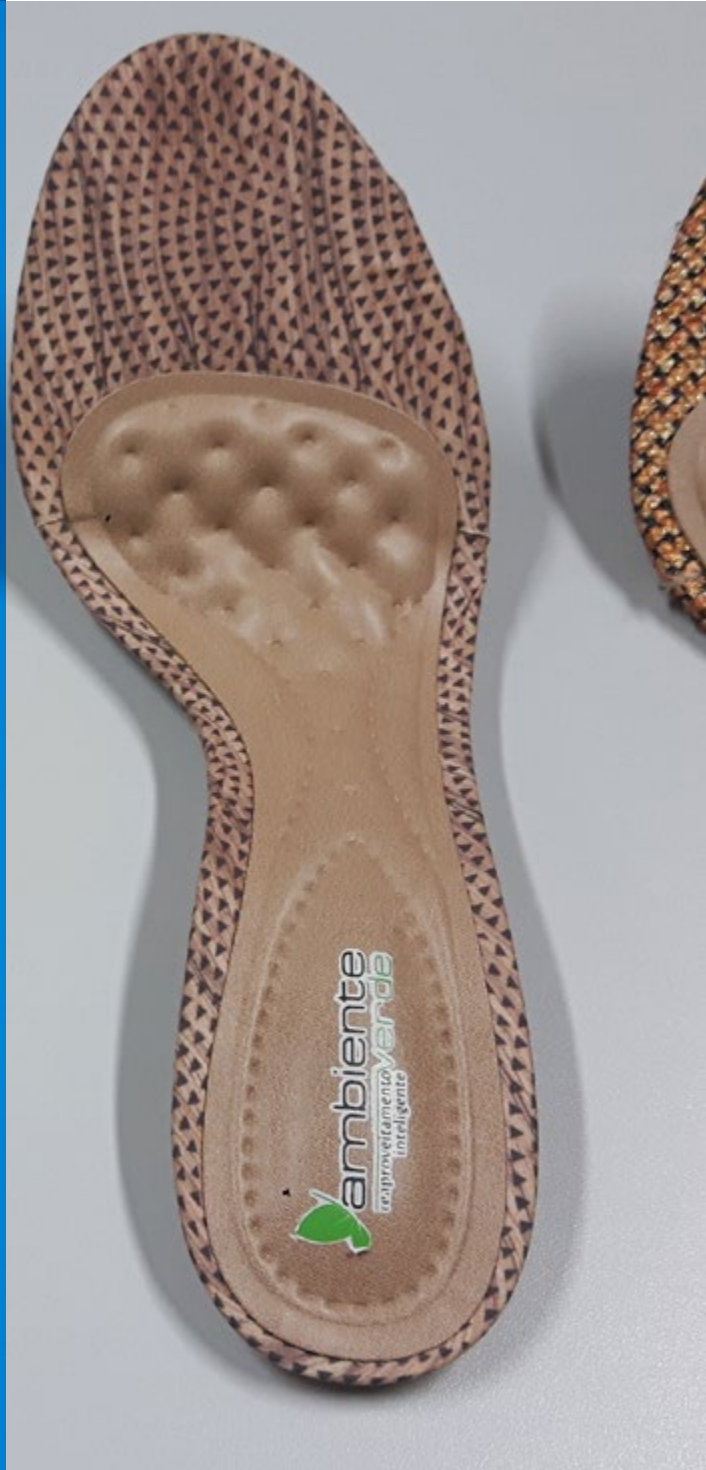
In this context, DB1's and Astea's organizational innovation offers opportunities for developing innovative products and services that will make it possible, over time, for the company to consolidate itself as a generator of new and innovative solutions.

The autonomy granted to the innovation team, coupled with the company's business prospecting and validation strategy, were two steps derived from a long learning process that allowed Anymarket and Tinbot to become actual products. The story of how the company created the necessary conditions to continue to develop software while also innovating and being recognized as a creator of highly scalable products (high revenue gains from proportionately small cost increases) is the real lesson to be learned from this case – a lesson that can help other companies that, like DB1, have already found themselves (or still are) caught in the growth and gain in scale trap.

Process Innovation

- Taquara (state of Rio Grande do Sul)
- Medium enterprise
- 78 employees

The company Ambiente Verde stands out in the footwear cluster of Rio Grande do Sul state for manufacturing footwear insoles and laminates from waste from the footwear industry.





TURNING WASTE INTO NEW PRODUCTS

The footwear industry has a longstanding presence in the state of Rio Grande do Sul, where a large number of companies have been established in all the cities that make up the Rio dos Sinos Valley area¹. The state has 2,461 companies operating in this segment, which account for 34.6% of all companies active in the footwear industry in Brazil. The footwear industry in the state produced no less than 186.9 million pairs of shoes in 2017, constituting a share of 20.6% of the domestic production, according to the 2018 Sectoral Report of the Brazilian Association of Footwear Industries (ABICALÇADOS).

With a diverse and complex system of companies supplying materials, inputs, components, utensils, tools, machinery, and equipment and a large number of service providers of different types, the Rio dos Sinos Valley region literally breathes the culture of the footwear industry.



It was in this scenario that the company Ambiente Verde, based in Taquara (state of Rio Grande do Sul), was set up and developed itself around two main activities: recycling of waste from the footwear industry and manufacturing of components used in shoe assembly.



¹ The municipalities located in the Rio dos Sinos Valley area with the highest number of footwear manufacturers are Canoas, Novo Hamburgo and São Leopoldo, but the municipalities of Campo Bom, Esteio, Sapiranga and Sapucaia do Sul also host many footwear companies. Footwear is also manufactured in the municipalities of Dois Irmãos, Estância Velha, Ivoti, Nova Hartz, Nova Santa Rita and Portão. Igrejinha, Parobé and Três Coroas, located in the Paranhana-Encosta da Serra region, are the municipalities with the largest number of shoe manufacturers that do not belong to the Rio dos Sinos region. Source: CALANDRO, Maria Lucrécia; CAMPOS, Sílvia Horst. **Arranjo Produtivo Local Calçadista Sinos-Paranhana**. Porto Alegre: Economics and Statistics Foundation, Nov. 2013.



A CHALLENGE THAT BECAME A BUSINESS

The company was born from a challenge proposed by a large footwear manufacturer in the region: solving the serious problem posed by the huge volume of waste generated in the process of manufacturing shoes. In addition to developing a solution to this problem, Ambiente Verde also created an industrial niche in which it is a pioneer.

The solution devised and implemented by Ambiente Verde turned the waste problem into a business opportunity: producing footwear insoles and laminates from recyclable materials. Ambiente Verde purchases 355.1 tons of waste every month at symbolic prices, providing a service that eliminates the costs for companies to transport waste and dispose of it in industrial landfills. With this waste, the company has been producing 288,000 m² of laminates for footwear lining a month using a process that generates virtually no new waste. All of it is reused.

With this innovation, Ambiente has gained a share of about 6% of the domestic production of insoles and has a potentially huge market to be explored in the near future. The company has a factory in Taquara and 78 employees working in its industrial units currently, apart from generating an additional 172 indirect jobs.

SENSE OF OPPORTUNITY

The bonds between the founders of Ambiente Verde and the footwear industry date back to their childhood. Born in Santo Antônio da Patrulha in 1972, Alberto Luis Wanner already made bicycle deliveries for footwear companies operating in his city at the age of 9. He grew professionally in the industry rapidly. Employed as buyer in a company from Igrejinha, a municipality located in the footwear-producing region, he later became head of warehouse operations and



was soon promoted to supply manager at Calçados Beira Rio, one of the most important footwear companies in the region and in Brazil.

Working for that footwear company, Alberto began to travel to China, a major footwear producer, where he got to know cities specializing in manufacturing products or groups of products with industrial affinities: shoes in Guangzhou and machines in Tianjin, just to give two examples. This momentous experience would later become a source of inspiration for him to set up a business of his own.

In the mid-2000s, Wanner was hired by the metal factory Plínio Fleck, which produces components for manufacturing safety shoes in Campo Bom (state of Rio Grande do Sul). There he met Luciano Woll da Silva, his future partner in the company they would set up years later, in 2011.

The challenge proposed by his former employer, Calçados Beira Rio, of coming up with a solution to the worrisome and costly problem of waste disposal was the spark that brought together Alberto's knowledge of materials and their uses and Luciano's chemical mastery of several processes involved in manufacturing shoe components. Luciano's experience in laboratory quality control routines, in physical and chemical testing of laminated and

impregnated materials, in the development of plastic laminates (toecap and heel counter) and impregnated laminates (insole and heel counter) complemented the knowledge and set of skills that gave rise to the new undertaking.

Ambiente Verde was established in December 2011, after a period during which several tests and developments were carried out with equipment borrowed from two companies in São Paulo and Santa Catarina. The experience acquired during those tests led to a partnership with a footwear machine manufacturer – whose name will not be mentioned here due to contractual confidentiality clauses agreed upon between the companies – for developing the equipment itself. Ambiente Verde actively participated in the development of the machine, which it would later acquire, but the technology and the resulting intellectual property rights belong to the supplier.

The company's first invoice was issued to Beira Rio, the company that had launched the initial challenge and was waiting for Ambiente Verde to come up with an appropriate solution. With ten production units located in nine cities in Rio Grande do Sul state (Igrejinha, Osório, Mato Leitão, Teutônia, Candelária, Roca Sales, Novo Hamburgo, Santa Clara do Sul, and Sapiranga), Beira Rio employs no less than 11,000 people and manufactures 85 million pairs of shoes a year.



PRODUCTIVE ARRANGEMENT

The great success achieved by Ambiente Verde led the company to acquire a second machine, relying on the support from Beira Rio. Under the completely informal and trust-based (risk sharing) arrangement agreed upon between the parties, Ambiente Verde began to buy, at the symbolic cost of R\$ 1 per ton, all the waste materials generated by Beira Rio, which in turn took on the commitment to purchase the materials processed into insoles by gradually reducing the debt associated with the purchase of the machine. Currently, Ambiente Verde processes all of its own waste and 50% of the waste generated by its main partner.

The relationship between Ambiente Verde and Beira Rio deserves a separate chapter. As a matter of fact, it can be said that Ambiente Verde was “born” within the footwear giant, as its initial operations consisted exclusively in processing waste from synthetic polyurethane (PU) laminates generated in the process of producing footwear – which was only possible thanks to the discovery by the partners of Ambiente Verde of a technique for separating polyurethane from fabrics, making it possible for it to be reused.

Today, Beira Rio separates its own waste and reserves it for Ambiente Verde to process. In relation to other suppliers, Ambiente Verde is responsible for collecting their waste. As the solution made it possible for footwear manufactures to reduce their costs in real terms, they give away their waste to Ambiente Verde or charge a symbolic price for it, enabling the company to produce laminates and insoles at a competitive cost.

REVERSE LOGISTICS

The production process adopted by Ambiente Verde consists of two main stages: recycling waste materials into raw materials for producing plastic laminates and cutting and turning the laminates into shoe components, which are

Ambiente Verde purchased a second machine with support from Beira Rio. Today it fully processes its own waste and 50% of the waste generated by its main partner.



assembled in other, usually small companies that perform various industrial operations for shoe manufacturers. *“The footwear industry supply chain is mainly made up of small, family-owned companies that are often informal enterprises that don’t innovate much. This is where we stand out among our competitors, because we strive to innovate in a technologically mature industry, that of insole manufacturing, a segment that*



is not usually the object of much research and development,” says Alberto Luiz Wanner.

It should be noted that footwear companies spend a lot on transporting and disposing of waste generated in their manufacturing process. After Ambiente Verde entered this market, a new process was introduced through which waste is collected and transported to processing sites as part of a partnership agreement between the two companies, making it possible for them to achieve significant gains for both through reverse logistics.

It is worth recalling that this new process also ensures gains to the environment and to the communities impacted by the reduction in the carbon footprint achieved by shortening the distances to transport the waste and future environmental liabilities caused by the required landfills to dispose of it.

PROMISING MARKET

In addition to Beira Rio, 75 other active clients make up the client portfolio of Ambiente Verde, and there is huge potential for increasing it. There are several footwear clusters in Brazil, all of which face considerable problems to dispose of their industrial waste, whether due to its effects on the environment or to the costs associated with disposing of it appropriately. In the Franca and Birigui clusters in São Paulo state and in the Nova Serrana mining cluster in Minas Gerais state, the volume of the waste generated by footwear manufacturing processes is comparable to that recorded in the cluster of Rio Grande do Sul, a fact that affords very promising opportunities for Ambiente Verde to grow. The company's turnover in 2018 amounted to R\$ 34 million and it is likely to grow by 9% in 2019.

Ambiente Verde has not been focusing on the footwear industry only, as it has already identified several other



Ambiente Verde has already identified other uses for laminates made from recycled materials. A spectacle case has already been produced and a flooring system for the construction industry is currently under development.

possible uses for laminates made from recycled materials. They have been used in a spectacle case already and a flooring system for the construction industry is under development currently.

The importance of the innovation developed by Ambiente Verde is in line with similar initiatives in other countries. Nike, one of the largest footwear manufacturers in the world, announced in 2016 that 71% of its products would contain materials made from the waste generated by its own manufacturing processes. Adidas, another major global footwear company, manufactures sneakers and other products using plastic collected from the oceans.

In a scenario of environmental challenges for the footwear industry worldwide, Ambiente Verde created an innovative alternative in the Rio Grande do Sul footwear cluster that is likely to be disseminated to all other Brazilian clusters. This is excellent for the competitiveness of the domestic industry. And for the environment as well.

Product Innovation

- São Paulo (State of São Paulo)
- Large enterprise
- 5,000 employees

Avon developed a lipstick that combines soft touch, non-glossy color, and durability without the drying out of the lips caused by other products, rapidly increasing its market share.



AVON

THE EVOLUTION OF THE MATTE CONCEPT IN LIPSTICKS

The Brazilian cosmetics industry is known for its commercial and industrial dynamism. Its characteristics include the recognized ability to grow for extended periods at rates other industries are unable to sustain. In addition to a number of favorable systemic factors, such as increased employment and women's insertion in urban labor markets, the cosmetics industry has managed to implement drivers of dynamism derived from its strategies for developing new products and innovations.

In this major sector of domestic industry, Brazilian and foreign companies share common elements in their strategies, such as recognizing the profile of local consumers. As a result, they make systematic efforts to meet the specific demands of different segments. Skin, hair, habits, sun exposure, humidity are some of the characteristics that prevent the Brazilian market from being catered to by packaged, off-the-shelf products developed in other industrial clusters. Companies are aware of this fact and have been constantly launching new products to further boost consumer demand for items better suited to local conditions.

Avon's new ultramatte lipstick was designed to cater to a demanding consumer market by satisfying its desire for a non-glossy color and a soft touch from the moment it is applied to the lips. Demand for a product with this combination of properties led the company to conduct multidisciplinary research and experimentation with new inputs. Chemistry, toxicology, materials, engineering, and



Breathless Nude



Cashmere Taupe



Pink Hush



Mauve Whisper



Misty Mocha



Plum Illusion



Cherry Delight



Bitten Apple



process professionals were brought together to pool their knowledge and skills to develop a product of outstanding qualities.

Market responsiveness to the new product exceeded the company's most optimistic expectations, so the next challenge was that of ensuring production levels that exceeded its immediately available capacity.



NEEDS AND VALUES

Creating new products and attracting new consumers while ensuring consistent sales growth are common challenges faced in the consumer goods market. Challenges are even higher for companies operating in the personal care and hygiene products market, as these products are about more than taking care of oneself to feel good and look good. They are also about how people relate to the outside world, how they relate socially, how they enhance and value their attributes. In Brazilian culture, this element is extremely valued. It is not just a matter of appearance, it is a deeply-rooted cultural element that includes daily baths and regular tooth brushing and deodorant use, to mention only the most outstanding examples.

The habits of consumers of hygiene and personal care products and services are also dynamic and tend to evolve over time. Companies operating in this market are aware that knowing consumers and identifying emerging trends are critical



elements for their success. Avon has been very successful in this field and has put together a well-structured process for new product development and innovation, linking consumer knowledge and its evolving dynamics to technological, industrial, and commercial competencies.

With five research centers spread across the more than 70 countries in which it operates, Avon prospects for information on consumer profiles, preferences, and trends and uses that information as input for developing its products. In addition to conducting market analysis and striving to understand subtleties in the needs and desires of its consumers, the company is provided with efficient means to carry out technical tests for different quality parameters.

Whenever its market intelligence and product development teams identify new elements with the potential to create promising new demands that could be met by new products, its research and development (R&D) team immediately begins to work on devising the right solution. This is how it came up with the ultramatte lipstick – a combination of the protection and color of traditional lipsticks, but without their glossy shine.



EMOTIONAL BENEFIT

Since matte, non-glossy lipsticks were already commonly available on the market, it was necessary to come up with a solution with quality differentials that the public could recognize and value, contemplating both consumers of other brands and those who did not yet know the product. It would not be enough to produce something similar to what was already available: the new product had to stand out in its category.

The ultramatte lipstick was the result of a long-term technology development project. Its main focus was on eliminating the main point of dissatisfaction among consumers with the matte lipsticks hitherto available on the market, which was a sensation of discomfort on the lips caused by dryness. The company's R&D teams were challenged to create a superior product that would address this shortcoming.

Made up of half a hundred professionals in Brazil connected to a much larger global network, Avon's R&D team has a markedly cross-disciplinary character. The team's combination of expertise in areas such as chemistry, chemical engineering, materials science, toxicology, among others, often results in solutions capable of overcoming the multiple challenges involved in ensuring the success of innovative products on the market. The first of these challenges is certainly having a clear idea of the intended product and relying on the necessary set of ideas or insights and technological and industrial concepts to materialize it.

According to Juliana Barros, Avon's Marketing Director, *"Brazilian consumers value an emotional benefit combined with the effect of our product, which provides us with a major advantage. Based on the perception of how consumers were displeased with the drying out of the lips caused by conventional matte lipsticks, we developed an innovative formula to eliminate that discomfort."*

She says that several sensory tests were conducted with consumers to compare the new formula with that of other matte lipsticks available on the market with the same appeal. *"We found that our product was highly rated for providing a greater sense of comfort,"* says Juliana.

SUPERIOR QUALITY

The first temptation could have been that of materializing the solution by reverse engineering existing products, which is a common and quite widespread practice in all markets and also in the personal care and hygiene industry. The second easy option would be to add or exclude elements from an existing base – or chassis, as it is referred to in the industry. These two tempting solutions in economic and time-to-market terms were quickly discarded in favor of a more innovative and bolder one, because, among other reasons, other experiences of adding or removing elements from an existing base had failed to meet the expectations of consumers and had fallen short of the expected commercial success. For the company to gain a strong position in the market, it was necessary to offer a superior product with the potential to attract new consumers to the segment. That was the challenge.

Avon's new product development protocols contemplate cycles of approximately two years and a series of stages that must be completed and milestones that must be met before products can be manufactured and launched commercially. The process is not entirely inflexible, but it requires that all the established procedures are complied with. Therefore, any attempt to speed up the development process cannot, under any circumstances, skip any stage or fail to meet a milestone – and this standard was observed in the process of developing the ultramatte lipstick.

Despite the company's disadvantage in relation to its main competing product, which had been on the market for

"Based on the perception of how consumers were displeased with the drying out of the lips caused by conventional matte lipsticks, we developed an innovative formula to eliminate that discomfort."

Juliana de Barros

Marketing Director, Avon



about five years, it was necessary to avoid any risks associated with undesirable shortcuts. The delay in relation to the reference product could not be overcome with quick alternatives, but rather with superior solutions. Therefore, it was necessary to create a new product that could actually meet the expectations of consumers.

NEW INGREDIENTS

Conventional lipsticks use more oily emollient raw materials, which are glossier, in response to the idea prevailing until then that lipsticks are supposed to provide good coverage and durability on the lips and be very shiny to be considered good.

When the matte concept emerged, with its opaque color, manufacturers used the same base of conventional lipsticks, adding ingredients to it to make it less oily. This “oil removal” process ended up replacing emollience with dryness and discomfort, apart from causing cracking of the lips due to the

“crumbling” of the product after a few hours of use due to excessive dryness caused by commonly used powder matting agents.

In the process of developing the ultramatte lipstick, Avon focused on balancing its formula and minimizing dryness and discomfort using ingredients that were not as shiny and therefore did not require large amounts of mattifying agents, hence the name matte. The success of this launch lies precisely in delivering the matte effect with comfort, coverage, and durability on the lips, something that was previously unheard of in the market.

To avoid cracking, it was necessary to rethink the entire base of the lipstick, adding waxes, emollients, and polymers to it to produce lubricity with little gloss. In addition to providing the desired velvety matte effect, other important additional effects also pleased consumers, such as comfort in application, hydration, SPF 15 sunscreen, smoothness, evenness, and intense, long-lasting colors.

AMAZING SALES

To complete the innovation cycle, many challenges had to be addressed. It was necessary to develop a network of suppliers, take care of the logistics of inputs and materials, ensure appropriate production capacities, and organize the distribution logistics – none of which was a trivial task. As a matter of fact, not even sizing the market for a new product is a simple exercise.

The results of the product on the market far exceeded all the expectations of the company. Commercial planning had set a target of three million units annually. Sales reached eight million units. A success of this magnitude is to be celebrated, but before that other challenges had to be addressed, such as those of meeting a much higher-than-planned demand, finding inputs and other components, and reorganizing the company’s manufacturing and distribution capacity.





*The success of the strategy
lied in showing the main
benefit of using the product in
actual situations consumers
experienced in their daily lives.*

These are major, but positive challenges after all. For the company, it is undoubtedly better to tap all local and foreign reserves to meet a demand that far exceeded expectations than to keep track of disappointing sales reports, over-reasonable inventories, lack of interest from consumers, and demotivation on the part of the teams that put their energy and enthusiasm into developing the new product.

The marketing campaign for the new product explored the ease of wearing the lipstick in uncomfortable situations as compared to conventional products, such as when eating a sandwich. The success of the strategy lied in showing the main benefit of using the product in actual situations consumers experienced in their daily lives.

Avon also took measures to strongly support its sales force by making available to it kits with the different colors of the product, an action that ended up accounting for the majority of sales.

PACKAGING BOTTLENECK

One of the most worrying bottlenecks was that of packaging availability. Packaging design and development for cosmetics can be extremely complex and account for half of the final cost. Packaging gives identity to a product and has a direct bearing on the user experience. Apart from beautiful, packaging needs to be functional and increasingly in line with sustainability standards.

Avon opted for an existing packaging solution developed by the company's technical team in the United States, but its availability from regular suppliers proved to be insufficient. That was when Avon's global dimension made its direct contribution



to solving this problem by providing the Brazilian unit with access to the industrial capacity and inventories available in other units of the company around the world.

Manufactured in Brazil, Mexico and China, the packaging in question meets the standards of other line lipsticks and is used in all units of Avon Global. This enables the company to ensure better commercial conditions in line with its global operations and to address demand fluctuations swiftly.

The lessons learned with this new Avon product and its innovation strategy are important to other companies operating in this and other segments of the cosmetics industry, as well as to the Brazilian innovation system as a whole. First, it is clear that innovation is not just about pioneering the launch of a product that defines a new market category. It is possible to innovate within an existing category with differentiated products. Second, the easiest solution may appear to be the least risky, but it is unlikely to yield the best results.

Avon did not create the matte lipstick category, but it came up with a unique solution within its category by positioning its product and brand with sufficiently clear features to be recognized by consumers. Its commercial success in capturing a slice of the existing market and pushing its boundaries clearly shows the robustness of the company's strategy and innovation processes. Checkmate!

Process Innovation

- Santa Rosa (state of Rio Grande do Sul)
- Small enterprise
- 6 employees

Small company from Rio Grande do Sul creates a technology to produce biofuel from used cooking oils that holds the promise of ensuring major gains for itself, the environment, and low-income families.





ENVIRONMENTAL SUSTAINABILITY AND LOCAL DEVELOPMENT

Biotechnos was set up in September 2007 based on the idea of producing renewable fuels to replace fossil fuel consumption in agricultural mechanized operations. Initially, the project was developed for using any oilseed raw material, such as canola, sunflower, or soybeans, which are widely available in farms in Rio Grande do Sul state.

The business model devised by its founder, Marcia Werle, who since 1991 has been living in the cradle of soy production in Brazil, contemplated the production of biofuels to meet the needs of farms and agricultural cooperatives in the region. In addition to generating savings for farmers along with environmental gains, the process developed by Biotechnos provided other competitive advantages, such as reduced carbon footprint, promotion of reverse logistics, low water consumption in production, and lower costs for processing biofuel. It also ensured improved income possibilities for communities and cooperatives that collect and process the raw material before sending it to final processing plants.





TECHNOLOGICAL DIVERSIFICATION

In its initial design, however, the project had a major bottleneck: it was meant to use virgin oils, which are mainly destined for food production. Using this type of raw material posed a double difficulty to the project: first, this would put the company into competition with the food industry, potentially increasing the cost of the final product and causing its price to fluctuate in response to demand changes in that industry. In addition, its environmental appeal would be compromised in relation to biofuels made from less noble raw materials. These bottlenecks led Biotechnos to rethink its initial model.

The company then saw an opportunity to develop a process for producing biodiesel from used cooking oils, but first it had to define the necessary logistics for capturing this



material. The solution came from an environmental education program developed by the company in 2008 for students in municipal schools of Santa Rosa (state of Rio Grande do Sul) to learn how to dispose of used cooking oil correctly. The initiative indicated a solution to the great challenge of ensuring the feasibility of collecting and disposing of used domestic oils appropriately.

The program developed for schools and their children, teachers, and staff showed that it was possible to encourage them to collect used cooking oil in sufficient quantities for biofuel production while contributing to the correct disposal of a kind of waste generated by almost every home. This had the additional appeal of generating income for low-income families by selling the material.



Realizing the potential of this socially and environmentally ingenious solution was a turning point in Biotechnos' trajectory. The company then developed a small plant to turn waste oil into biofuel with the aim of testing and refining the technology. The plant drew a lot of attention, and within a short period of time the company became known nationwide. Today, it has 30 plants in operation: 29 of them are based on used cooking oil and only one is based on virgin oils.



IMPACTS ON THE ENVIRONMENT

Proper disposal of used cooking oil poses a major environmental problem. The sheer volume and logistical difficulties involved in collecting used oil in tens of millions of homes means that most of it ends up polluting watercourses for lack of a proper way to dispose of it. According to the National Council for the Environment (CONAMA), one liter of used cooking oil can contaminate 12,000 liters of water. Considering that 50 million homes and commercial establishments in Brazil discard about 1.5 billion liters of oil annually, it is fair to say that it causes huge environmental impacts¹.

Biotechnos focuses its efforts on coming up with a sustainable solution to this major problem, which is not unique to Brazil. In the Vale do Rio Pardo area (state of Rio Grande do Sul), the company set up a plant with the capacity to produce 22,000 liters of biofuel per month from used frying oil that is currently operated by the NGO Tobacco Growers' Association of Brazil (AFUBRA). Until the end of 2018, the volume of used oil and fat that had been collected amounted to 1,018,894 liters already.

Recently, through a project funded by the Social Fund of the Guarulhos International Airport, the new technology based on using waste oils gained prominence after a plant was set up in the city of Guarulhos in São Paulo city with the capacity to process 1,000 liters of used oil from local businesses that are taken to the Coop-Reciclável, a waste picker cooperative of the city.

¹ According to the Brazilian Association of Vegetable Oil Industries (ABIOVE), only 25,949 m³ (25,949,000 liters) or 1% of all the biodiesel produced in 2014 (3,419,838 m³ or 3,419,838,000 liters) was from used frying oil. Most of it was produced from soybean oil (75%).



THE IDEA OF THE BUSINESS

The idea that small producers could make biofuel was the main driver of Márcia Werle at the helm of Biotechnos. Biodiesel production plants in Brazil – and, as a matter of fact, all over the world – are usually large plants operated by large business groups. In 2018, almost 50 million liters of biodiesel were produced from used frying oils, 25 million in only two plants owned by largest meat processor in Brazil².

This is basically due to a characteristic of the transesterification process used for converting purified oil into biodiesel. For every 1,000 liters of fuel produced, the process generates about 600 liters of wastewater, requiring the implementation of a treatment plant whose cost makes small-scale production unfeasible.

The great merit of Biotechnos' innovation is precisely that of overcoming this obstacle, since the process developed by the company does not require water to “wash” biodiesel, thus doing away with the need to invest in building such treatment plant.

TRAJECTORY

Businesswoman Marcia Werle is no rookie. She has worked in the metallurgical industry for over 15 years in the Santa Rosa region (state of Rio Grande do Sul), where she promoted the development of an industrial complex of factories of agricultural machinery and equipment. In 2005, she began to realize that more could be done, taking advantage of the region's manufacturing potential.

This realization led the businesswoman to become interested in producing biofuels through a process offering

² Source: SAMORA, Roberto. JBS *Biodiesel agrega novas matérias-primas e projeta aumento na produção*. **Reuters**, February 16, 2018. Available at: <<https://br.reuters.com/article/topNews/idBRKCN1G020M-OBRT?rpc=401&feedType=RSS&feedName=topNews&rpc=401>>. Accessed on November 28, 2018.



the advantage of saving water. During a business mission to Germany organized by the Federation of Industries of Rio Grande do Sul State (FIERGS) in 2007, she met and interacted with a German professor and researcher who had devoted much of his career to studying chemical processes for producing biofuel.

Interestingly, an agenda error that prevented a translator from being present forced the Brazilian descendant of Germans to express herself in the language of her childhood. The German researcher described it as being *"as old as the German spoken by my mother and grandmother,"* and he was very surprised over how he had been unexpectedly taken back to his distant roots as he heard that Brazilian young lady speak old German during their meeting.

That picturesque meeting created an empathy between them that led the scientist to draw a process and provide, in a seemingly improvised way (on scratch sheets, right there, in the exhibition stand of German universities), details about the stages and inputs involved in a biofuel production process that provided Márcia with the starting point for her new venture. *"When I went to Germany, we were already nurturing the idea of*

“My contact with the German researcher was fundamental in bringing us answers for our plans. With a sheet of paper and a pen, he provided us with the drawing of part of the process and all its technical parameters, charging nothing in return. He only said: ‘Make it work’”

Márcia Werle

President, Biotechnos

developing a small-scale plant for commercial production of biodiesel from waste oils. My trip was intended to try and find answers that would allow us to overcome the main bottleneck of our project, which was the large amount of water consumed by conventional technologies. My contact with the German researcher was fundamental in bringing us answers for our plans. With a sheet of paper and a pen, he provided us with the drawing of part of the process and all its technical parameters, charging nothing in return. He only said: ‘Make it work’”, recalls the businesswoman.

And that is exactly what Márcia did. Between April 2007, when the Hannover Fair was held, and June of that same year, the businesswoman made several attempts to reproduce the process drawn by the German researcher.

The first liter of renewable fuel produced failed to meet the specifications provided for in the regulations, but an analysis made in a report issued by TECPAR, the Technology Institute of Paraná State³, made it possible for a fuel in line with Brazilian official standards to be developed, adjusted, and produced before September was over.



³ TECPAR is a public institute linked to the Secretariat for Science, Technology and Higher Education of Paraná State created in 1940 to carry out research, technological development, and innovation-related activities.

COMPETITIVE ADVANTAGES

The great merit of Biotechnos' innovation lies in the realization that small-scale biofuel production from used cooking oil from factories, industrial kitchens, or homes gives an economic value to the material – by turning waste with great environmental impact into a productive input, avoiding its improper disposal.

The industrial solution designed by Biotechnos also provides an economic incentive to the reverse logistics chain. As a result, a market for waste oil has emerged and is very active. More and more units that produce it – whether homes, commercial establishments, or industrial enterprises – now have a solution for disposing of it appropriately. This is a solution that caters to the needs of not only large producers, such as restaurants and industrial kitchens, but also of homes.

The possibility of selling waste oil provides an incentive that can lead to a higher recovery rate of used cooking oil by low-income families. This is a new development compared to other waste recovery solutions, where the usual prevailing principle is that average recycling rates are higher among populations that consume more. The plant set up by Biotechnos can effectively contribute to disseminate recycling standards in areas where the means for structuring plants of the same kind in an economically sustainable manner are not usually available.

While environmental awareness is rapidly evolving throughout the world, economic incentives are key for disseminating new consumption and production patterns and thus new technologies. Edible oil, whose consumption is widely scattered, is unlikely to be appropriately disposed of after use if no combined incentive mechanisms are in place that take into account aspects related to both environmental sustainability and to the economic feasibility of using it.

The Bioplanet Energy for the World Institute aims at promoting the sustainable development of communities, cities, and organizations through projects designed to disseminate sustainable social technologies and practices.

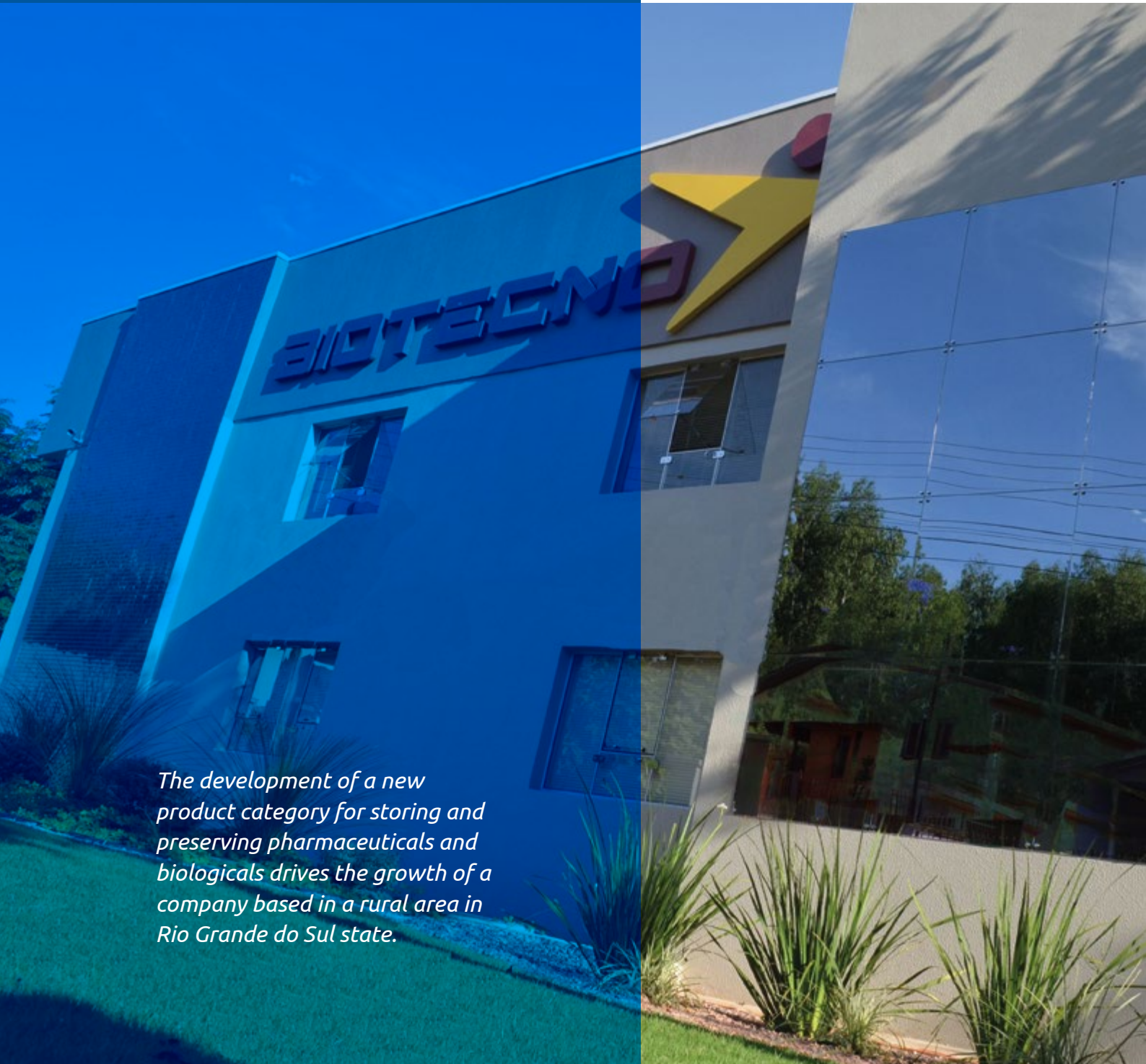
In 2019, the businesswoman teamed up with like-minded people to turn the Bioplanet Project into the Bioplanet Energy for the World Institute – a dream that was being nurtured through many high-impact actions taken over the previous ten years. The slogan of the institute is “A dream of many, working for all” and its purpose is to promote awareness about the need to care for planet Earth, about the notion that nothing is thrown away, as there is no “throwing away,” with the aim of promoting the sustainable development of communities, cities, and organizations through projects designed to disseminate sustainable social technologies and practices.

Biotechnos has ensured its economic feasibility with its innovation. In 2019, the company expects to have a turnover of R\$ 2.5 million. Not bad for a small company with only six employees that is pioneering a new market segment based on technological innovation.

Product Innovation

- Santa Rosa (state of Rio Grande do Sul)
- Medium enterprise
- 30 employees

The development of a new product category for storing and preserving pharmaceuticals and biologicals drives the growth of a company based in a rural area in Rio Grande do Sul state.





SAFE COOLING

Brazil has a network of hundreds of thousands of health care facilities in its 27 states. In a large percentage of these locations, a cold room of some kind is available for storing and preserving pharmaceutical products – vaccines, chemical and biological products for human and animal use – as well as blood products. This type of equipment is often affected by electrical problems related to the quality of the power supplied and by problems in the distribution and generation grid. Technical failures of this nature, coupled with our tropical climate, are the root cause of major financial losses and of problems related to the health and well-being of people who depend on products requiring temperature-controlled storage.

Realizing this problem (and need), Biotecno, a family business based in Santa Rosa, in a rural municipality of Rio Grande do Sul state located at 500 km from its capital, was led to develop a series of innovations that culminated in the creation of a new category of products for storing and preserving pharmaceuticals and biologicals.



Prior to creating Biotecno, the company's founder, Nerci Linck, had worked in the infrastructure unit of a hospital, where he identified difficulties for preserving certain medical products, such as blood bags, due to equipment breakdowns and maintenance difficulties. This experience provided the spark for the company created at the beginning of the last decade.



As many small businesses are forced to do in their early stages, Biotecno worked on several different fronts: technical assistance for medical equipment, development of refrigeration equipment for blood storage, distribution of medical products and manufacture of hospital furniture, wheelchairs, surgical lights, incubators, and heated cradles, taking advantage, above all, of the demand from the region's hospitals, which was being poorly met by their traditional suppliers.

The opportunity for innovation arose from the perception of a known problem: the need to preserve health care products in temperature-controlled environments appropriately.

Biotecno had to go through an adaptation period to achieve the technical qualification in medical equipment required by the standards of the National Health Surveillance Agency (ANVISA). But the result of that adaptation period was that the company rose to a new technical and training level in a very demanding market.

While on the one hand the diversity of the products and areas of operation of the company ensured its survival, on the other it restricted its prospects for specialized operations. Realizing this fact and reflecting on future paths for the company, its founder saw a promising opportunity in coming up with a solution for a known problem: that of preserving health care products in temperature-controlled environments appropriately.

The cold chain problem is particularly serious in the case of medical products. While power outages affect all segments that depend on maintaining controlled temperatures to preserve the quality of their products (food and beverages, for example), they have extremely serious consequences for vaccines, medicines, and other health care items.

In its assessments, Biotecno saw that medical refrigeration products have a potential market comprising almost 300,000 healthcare facilities in Brazil¹. That was a major business

¹ See, for example, the following story about the possible loss of 34,000 doses of vaccines in the city of Maringá due to lack of refrigeration: available at: <<https://g1.globo.com/pr/norte-noroeste/noticia/2018/11/20/saude-de-maringa-pode-perder-34-mil-doses-de-vacinas-apos-falha-em-geladeiras.ghtml>>. Accessed on December 7, 2018.



opportunity, given the continental dimensions of Brazil, whose 5,570 municipalities are, in one way or another, subject to the pitfalls of power outages.

POTENTIAL MARKET

The market depending on continued refrigeration is vast and includes manufacturers and distributors of vaccines (for human and animal use), poultry farms, semen banks, human reproduction laboratories, outpatient clinics, human milk banks, dentist's and allergy doctor's offices, parenteral nutrition services, organ transportation services, blood centers, genetic diffusion centers, drugstores, heart valve companies, and aesthetic clinics.



The common element of such large variety of potential clients is the need to ensure the quality of healthcare products and services by ensuring refrigeration in line with the required parameters for each case.

Developing emergency equipment to ensure that cooling processes will not be interrupted regardless of any power outage was identified as a great, but not risk-free market opportunity. One of the biggest difficulties to be faced would be that of low-price competition, which is not always associated with healthy market practices.

Procurement, especially public procurement, is often based on the lowest price criterion and any attempts to ensure parameters associated with quality and performance can be interpreted as means to circumvent competition. Despite offering higher quality and safer products, claims of competitors based on the argument of “lack of similarity” in tenders was at first a factor that tended to limit Biotecno’s drive to increase sales.

PROFILE OF THE COMPANY’S OPERATIONS

The quest for a market for its products with growth and development potential led the company to adopt a very well-defined focus: offering refrigeration equipment with a

self-contained safety device against power outages in the grid. For this purpose, the company came up with its first no-break in 2003, followed by its refrigeration equipment two years later, until it designed, in 2009, an innovative and much more appropriate model that defined a profile for Biotecno's operations, with appropriate focus and a coherent product.

The product innovation described in this chapter is actually a package of synergistically interacting technologies. It is a cold chamber specially developed by the company to which voltage inverters and 100a-200a stationary batteries were coupled. Sensors installed in the device identify power outages and trigger batteries to ensure power supply autonomously for up to 72 hours, depending on the size of the equipment.

As the path of innovators and innovation is almost never evident, Biotecno's path was rife with mishaps. How could a new company in the market operating from a far distance from large cities penetrate and consolidate its presence in a market that was unaware of its product and had longstanding bonds with well-known manufacturers and brands?

Having an innovative product does not always constitute an indisputable advantage. Biotecno had no associated patents to ensure exclusive intellectual property to the new invention and faced difficulties to take part in tenders because there was no established tradition of buying its product, precisely because it was innovative and there were no similar products available on the market.

Developing appropriate notices of tender for the new product could be seen by public officials, who are always concerned with what control agencies will think, as an attempt to manipulate the bidding process. Difficulties abound in the path of innovation.



PORTABLE COLD CHAMBER

Biotecno's progressive consolidation of a customer base and understanding of specific demands of its clientele fueled its innovation and diversification process. In 2012, as new facilities were being built, the company began to design a portable chamber for use in the important segment of vaccination campaigns and organ transportation. Later, to make a new version launched in 2016 feasible, it was necessary to internalize hitherto outsourced activities, such as those of cutting sheet metal and machining some of its parts.

In addition to offering specific models for vaccines, blood, and veterinary products, Biotecno also produces freezers. For each of these product lines, the company developed models tailored to specific demands either in terms of volume (up to 1,500 liters) or autonomy (12-72 hours).

One of the most important features of the equipment produced by Biotecno lies in its ability to communicate with the professional in charge, who can monitor refrigerated products in real time. The equipment is provided with tracking software that allows for remote monitoring. It is even possible to predict the need for replacement parts, enabling preventive maintenance actions.

Biotecno's cold chamber is provided with voltage inverters and 100a-200a stationary batteries and sensors that identify power outages and trigger batteries to ensure power supply autonomously for up to 72 hours.

The connectivity and intelligence of the equipment, which are in line with the concepts of the Internet of Things (IoT), make it possible for the professionals in charge to reconcile external professional routines with their personal and family life without compromising the quality of the services provided by their companies or institutions. This is an example of how intelligence can improve the quality of life both for those who use the equipment and for those who depend on the pharmaceuticals and biologicals stored in the chamber.



To avoid multiplication of models, which entails production and inventory management difficulties, the company redefined its product line to ensure variety and quality within manageable limits. It has substantially reduced the number of sizes but has continued to offer a wide range of configuration and functionality possibilities. It produces 20 models in seven cabinets for vaccines and 48 models derived from this platform.

Biotecno's commercial strategy also includes a technical assistance network available throughout Brazil with half a hundred units capable of solving any faults or malfunctions identified by users and customers.



SURPRISING TURNOVER

As a result of its innovation policy, Biotecno's turnover has been increasing at an astonishing rate of 100% a year since 2012, hitting the mark of R\$ 14 million in 2018. In the segment of small-capacity cold storage chambers with a security system for the healthcare sector, it is the leader in Brazil in the public market, with a market share of 40%.

One of the most important features of the equipment produced by Biotecno lies in its ability to communicate with the professional in charge, who can monitor refrigerated products in real time.

The company is now focusing its efforts on developing a much smaller, portable chamber for transporting organs, vaccines, and blood, for example. Because of its low price, it can be purchased without the need for bidding, facilitating its penetration in the public market. For this purpose, the company is in the process of registering its technology with the Ministry of Defense, since the Brazilian Air Force (FAB) is legally required to keep aircraft in appropriate conditions for transporting organs for transplants.

NEW ASPIRATIONS

Institutions collaborating with Biotecno in different projects include Brazilian public development and funding agencies (APEX-Brasil, BADESUL, PGQP)², the S system³ (SEBRAE, SENAI), the Brazilian public and private education and research system (UNIJUÍ, IFFAR, UFRGS, UFSM, TECNOPUC, FEMA)⁴ and the Westphalian University of Applied Sciences of Germany, as well as partner companies (AGROCERES, MINITUBE) and dedicated developers (Novellu Solution).

Biotecno's increasing demand for skills reflects the company's development and aspirations. The broadening of its technical, technological, and industrial horizons shows that the company continues to expand its aspirations both in relation to its existing portfolio and to new products.

At the same time, its participation in sectoral or regional organizations - such as in the Brazilian Association of Medical, Dental, Hospital and Laboratory Supplies and Equipment Industry (ABIMO), in the Health Technology Cluster of Rio Grande do Sul and also in official policy-making forums for healthcare equipment manufacturers (ANVISA, SIGEM, PROCOT)⁵ – contributes to identifying trends, mapping out opportunities, and promoting its business interests.

Biotecno has also broadened its business horizons by hiring a commercial director to work in its São Paulo unit and has also been attending international events related to the healthcare industry, such as the Arab Health in Dubai and the Dusseldorf Medical Fair in Germany.

By ensuring a consistent presence in the Brazilian market, traditionally dominated by much larger, older companies offering a much wider range of products and with promising forays into overseas markets, Biotecno confirms the success of its initial strategy of focusing on one innovative product.

2 Brazilian Export and Investment Promotion Agency (APEX-Brasil); Quality and Productivity Program of Rio Grande do Sul State (PGQP). "Badesul is a funding agency linked to the Secretariat for Economic Development and Tourism created to promote economic and social development in the state of Rio Grande do Sul by providing consultancy services and a set of long-term financial solutions for public sector, private companies, and farmers." Available at: <<https://www.badesul.com.br/badesul>>. Accessed on December 10, 2018.

3 The S System is made up of the following institutions: National Industrial Apprenticeship Service (SENAI); Social Service of Commerce (SESC); Social Service of Industry (SESI); and National Commercial Apprenticeship Service (SENAC). It also composed of the following institutions: National Rural Apprenticeship Service (SENAR); National Cooperative Learning Service (SESCOOP); and Social Transportation Service (SEST). Available at: <<https://www12.senado.leg.br/noticias/glossario-legislativo/sistema-s>>. Accessed on December 10, 2018.

4 Regional University of the Northwest Region of Rio Grande do Sul State (UNIJUÍ); Farroupilha Federal Institute (IFFAR); Federal University of Rio Grande do Sul (UFRGS); Federal University of Santa Maria (UFSM); Scientific and Technological Park of the Catholic University of Rio Grande do Sul - PUCRS (TECNOPUC); Federal Emergency Management Agency (FEMA).

5 National Health Surveillance Agency (ANVISA); Information and Management System for Permanent Fundable Equipment and Materials for the Unified Healthcare System - SUS (SIGEM); Technical Cooperation Program (PROTOC), linked to the Ministry of Health (MS).



Far from intending to compete with powerful giants in their resource- and asset-intensive big business logic and avoiding harmful competition with low-cost products or the (momentary) advantages it could enjoy by operating locally, Biotecno has defined a strategy focused on a niche for which it developed a product with appropriate functionalities.

IDEA BANK

Biotecno created an in-house collaboration program with its employees consisting in an Idea Bank linked to its Innovation Mural project, which gives visibility to ideas and innovation projects. To move forward, each proposal is screened for its feasibility based on the following questions:

- Is it actually applicable?*
- If so, when?*
- Date.*
- Has it been implemented?*
- Degree of relevance (on a 1-5 scale, 5 being very relevant).*

Innovation Management

- Camaçari (state of Bahia)
- Medium enterprise
- 111 employees



Company from Bahia implements a broad vision of innovation and diversifies its product line to reach new markets and overcome difficulties.



VALUE CREATION AND CAPTURE

Petrochemical chains are often composed of a small number of vertically integrated plants. There are advantages and disadvantages to this configuration. BMD had enjoyed the advantages for many years, until its main customer, which accounts for a large share of its sales (and production), started to face financial difficulties arising from the entry of large volumes of products imported from low-cost large-scale producing countries located mainly in Asia.

The company, set up in Camaçari, state of Bahia, in the immediate vicinity of its petrochemical complex, renewed itself based on a strategy of diversifying its product line, with an emphasis on research and development (R&D) and multiplication of market areas. This company embodied the popular saying, “Necessity is the mother of invention.” While the crisis had shown that competition from Asian products could be deadly, it also revealed that such competition takes place mainly, but not exclusively, in large markets for standardized high-volume products.

Dependence (by more than 65%) on a single customer could be fatal, as it had almost been. It was necessary to devise a strategy to avoid this frontal clash with large volumes and small prices. They had to consider new products and applications, listen to customers, prospect markets, and anticipate emerging opportunities.



THE BEGINNING

BMD manufactures intermediate technical fabrics for various purposes, ranging from raw material for synthetic tarpaulins to be used in awnings – the company's flagship product for a long time – to covers, blinds, safety clothing, industrial filters, shoes, bags, and gifts.

Originally linked to an Austrian industrial group with over a century of existence, the company started its activities in Bahia state in 2000 and since then has experienced more and less favorable business cycles. The establishment of the Camaçari plant was intended to meet the growing demand from manufacturers of reinforced PVC laminates – the so-called "PVC tarpaulins." The first expansion of industrial capacity occurred at the same time as the modernization of its process with a state-of-the-art loom. In addition to this organic growth, the company also expanded by acquiring another company located in São Paulo that operated in the same market segments.

A second wave of industrial expansion took place in mid-2002 and provided the company with the conditions to offer customers new fabrics and new products (Vinylsoft and Colorgrid, a screen that attenuates the effects of sunlight and can act as vertical blind and roller blind).

In the midst of a crisis triggered by difficulties experienced by its main customer, BMD's shareholding control was acquired in 2006 by the Italian industrial group Maccaferri, which has a 140-year industrial history and a prominent record of devising solutions for civil infrastructure engineering. The controlling group is world leader in gabions, reinforced-frame baskets made of corrosion-protected double-stranded hexagonal wire mesh that are sturdy, durable and widely used in gravity retaining walls, channel lining and containment, river systematization, and erosion protection and control in construction projects. Gabions generally use a double-twist steel wire mesh filled with crushed stones.

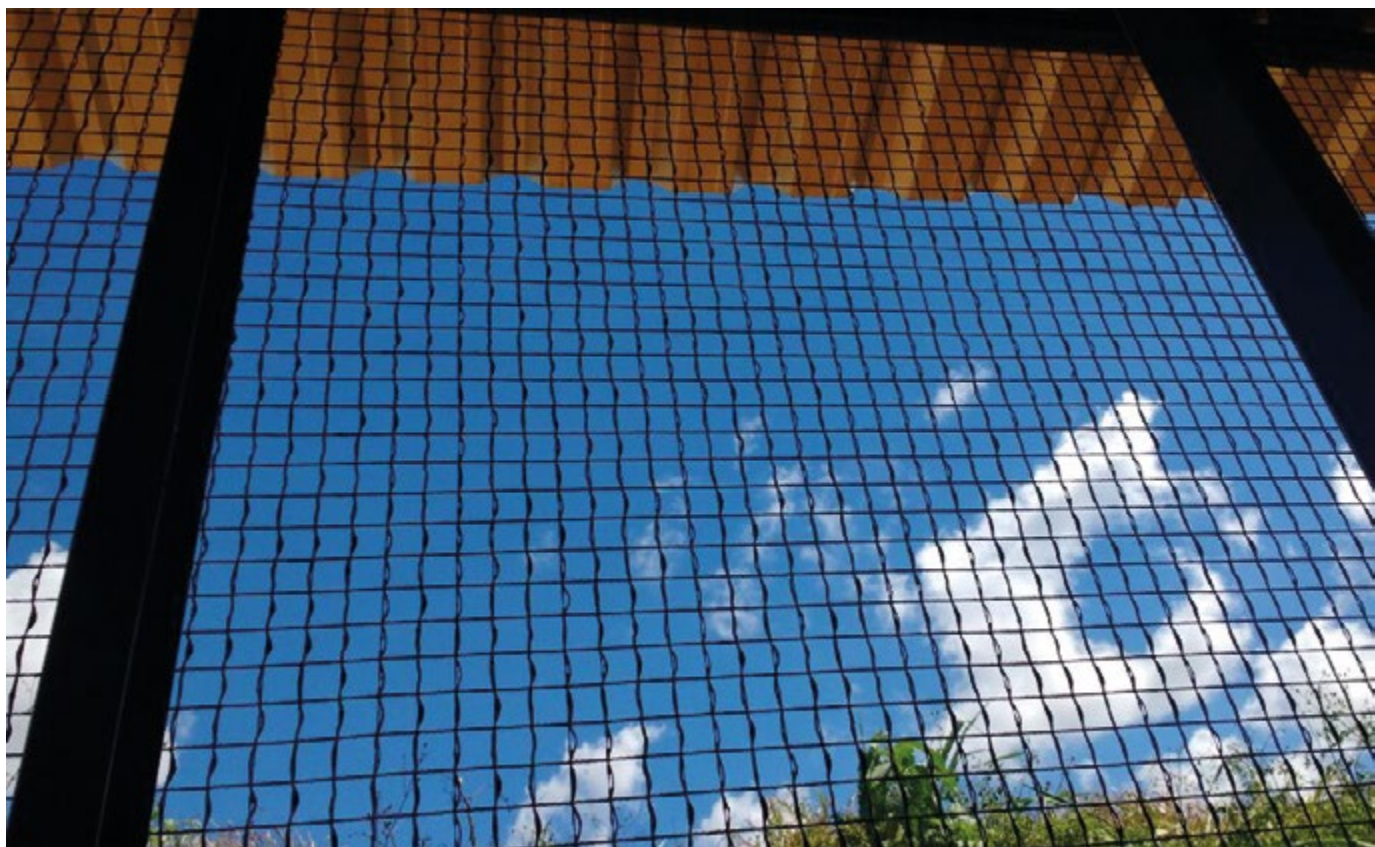
NEW PRODUCTS

The new shareholding control did not restrict BMD's innovative actions, but rather stimulated the creation and development of products and a search for new customers and markets.

In 2007, it began to produce geogrids, a soil reinforcement product. As a result, BMD has strengthened one of its main foundations, which is the ability to develop items designed to meet the unique needs of each customer and specific demands for different markets, applications, and niches.

In 2008, BMD created the New Product Development Center, a structure dedicated to prospecting and identifying opportunities to be developed in technological terms and made feasible in terms of industrial manufacturing and commercial development.

The following year, the company developed screens of petrochemical material that could replace wire mesh in poultry farms, with significant gains for poultry breeders, who were at the time facing a sanitation crisis. By extension, the new screens also conquered fish



farming tank markets. The same happened in agriculture, where the use of greenhouses and controlled environments is a very vigorous trend.

BMD continued to release new products at an increasing pace, particularly in 2011, when several products were created, such as the MacTube® (a pipe that allows effluent filtration), the B-TUK (screen for mortar reinforcement), and a geomembrane (a HDPE – high density polyethylene – mat), as well as a lightweight construction product line (BMDTEX, Trincatex), together with the strengthening of fabric production for the automotive industry. The portfolio's evolutionary process continued in 2012, when the company implemented an approach referred to as High Added Value Manufacture and had its poultry screen approved by the main Brazilian meat packing plants.

Stimulated by the results achieved in previous years, the company invested in machinery modernization in 2013, when it reached its historical peak of customers served. In the following year, results were also recorded



in the form of new clients and segments, such as in the supply of materials for building stadiums for the World Cup in Brazil and in the first sales to the agribusiness sector. Still in the area of new business segments, the company launched a decorative pool protection system, Decornet, in 2015.

Obviously, so many successive releases and new applications were only possible because BMD enjoys appropriate in-house conditions and access to external expertise. BMD's laboratory has state-of-the-art facilities and equipment and qualified human resources, which make it "capable of researching, developing, and testing products with very high technical capacity to meet the quality standards required by the market and regulatory bodies," as described by the company itself.



VALUE CREATION

To enter the world of innovation in its new development phase, BMD relied on external assistance and support. At the Regional Center of the Euvaldo Lodi Institute (IEL) in Bahia state, the company identified methodologies that helped it to build its own innovation management system. Another important source of support to solve technical problems was the National Industrial Apprenticeship Service (SENAI)/CIMATEC¹. Not least importantly, BMD also relied on the assistance of fellows from *Inova Talentos*, a program sponsored by IEL and the National Council for Scientific and Technological Development (CNPq) to support RD&I activities in industrial enterprises.

The ability to place the whole process into an expanded frame is what actually stands out in BMD's innovation model. Transcending the vision of innovation based only on new products and services, BMD has structured a comprehensive

¹ A reference unit of SENAI located in Salvador (state of Bahia) for conducting research, development and innovation (PD&I) activities.



model that puts “value creation and capture” at its core, whether through revenue increases, cost and risk reductions, or sped-up returns. To make this new approach possible, the company expanded its means and instruments to innovate in products, services, technologies, manufacturing processes, working methods, suppliers, partners, customers, and markets. The company also promoted the integration of professionals from different areas and internal levels so that each could contribute, in different and complementary ways, to the success of its projects.

A culture of innovation has strong roots throughout the company. In its strategic planning, mission, vision, values, and strategic objectives, innovation stands out as the company’s motto and guiding principle.

FIVE INNOVATIONS

The company’s working method for fostering innovation has produced substantial results in many different segments precisely because of its ability to search for and identify opportunities outside its immediate radar range, valuing information and knowledge brought into the company. Five major innovations confirm the effectiveness of this approach.

The first one is its wire mesh for poultry farms, which competes with traditional metal screens and replaces them with great sanitary advantages. Originally conceived and

executed as one of the company's first offerings after the traditional product crisis, the screen has been redesigned recently and may receive incremental improvements and innovations, such as a pest and dirt non-stick feature.

The second relevant project is a high-strength PVC-coated polyester mesh designed to reinforce the facade cladding of buildings under construction, replacing the metallic, plastic, or conventional polyester screens being used currently.

The third project that added significant results is one of fishponds. Although it may seem like a simple evolution of the poultry screen design, it does represent an opportunity for successive value-adding developments for users and for fish and shrimp producers. The screen, the architecture of the tanks, the accessories to facilitate its handling, and the aggregation of control systems in successive layers afford opportunities to transform the simple supply of a screen into an activity that ensures farmers much better development conditions.

The fourth one is a flexible three-dimensional geomat designed to facilitate the growth of vegetation, protecting the soil from the action of rain and wind and thus preventing erosion.


Finally, the fifth project that resulted from the innovation methodology implemented at BMD is a waterproof geocomposite designed to ensure greater efficiency in tunnel and slope drainage projects.

These five projects, which are part of a much more diversified pipeline, reveal the existence of a very fruitful methodology. Such variety, as well as the company's capacity to evolve in line with known and prospective needs of its customers, confirm the appropriateness of the instruments it used to achieve the greater purpose of innovation in the company: creating and capturing value, wherever it can be found.

Variety and capacity to evolve in line with known and prospective needs of its customers confirm the appropriateness of the instruments used to achieve the greater purpose of innovation in the company: creating and capturing value, wherever it can be found.

Process Innovation

- Tijucas (state of Santa Catarina)
- Large enterprise
- 2,000 employees



Traditional ceramics manufacturer from Santa Catarina incorporates artistic and historical elements into its product lines through an innovative and well-structured process, consolidating its position in a superior level in the segment.

Portobello Grupo



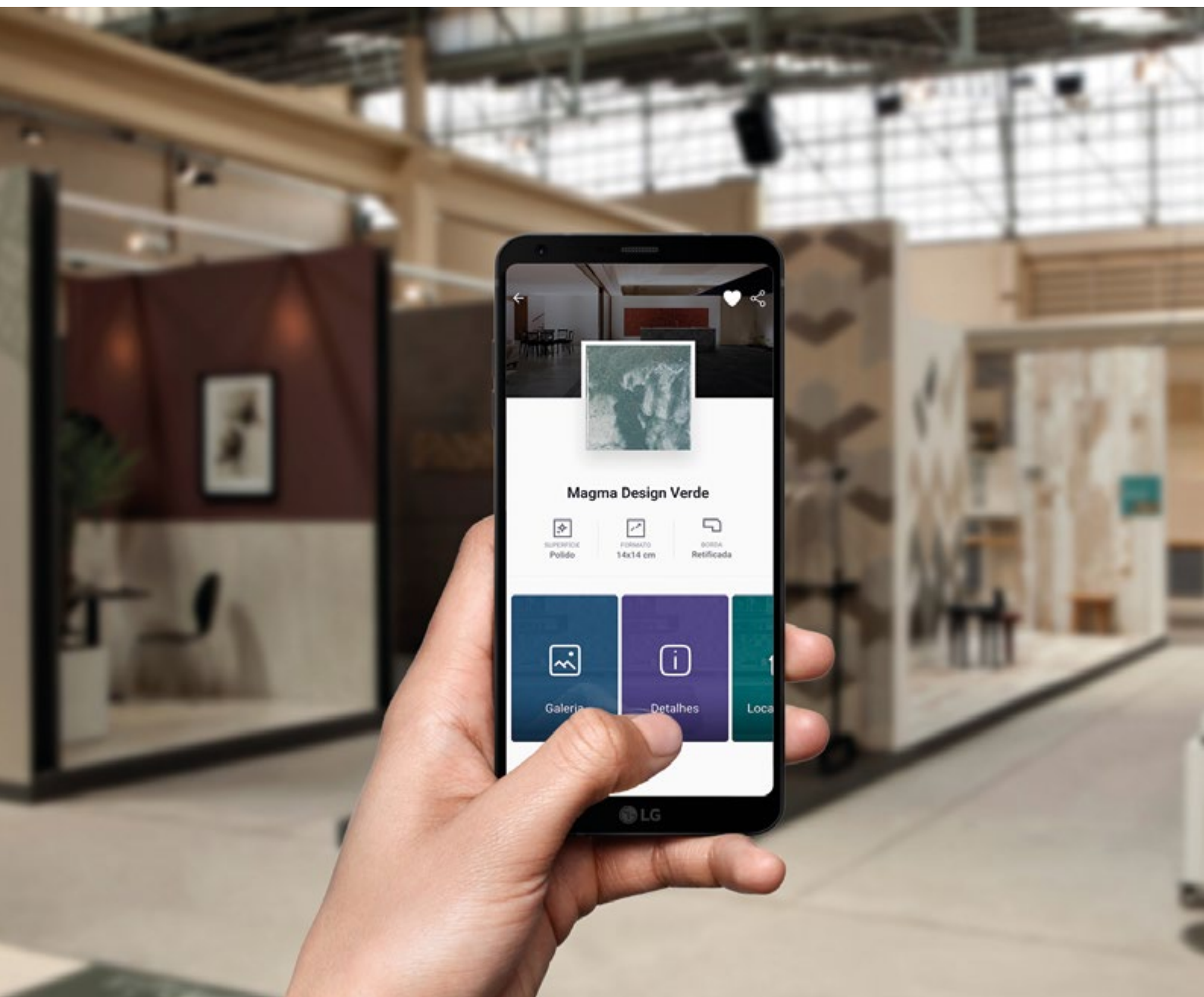
TILES WITH ART AND HISTORY

Portobello, a well-known ceramic floor tile manufacturer, has designed, structured, and implemented a robust new product development system. Positioned in the upper bracket of its segment, the ceramics manufacturer from Santa Catarina state adopts a very well-structured development cycle to create new products. Its starting point is to encourage people to come up with new ideas produced in-house or by partners, discuss identities for each new line, and define a marketing strategy that includes qualifying sales channels in its accredited store chains.

Through a well-structured product development and innovation process, the company has established strong links with its target audience by connecting with professionals in the areas of architecture, design, and construction. These professionals translate new trends and emerging elements into new collections, helping to constantly renew Portobello's product lines and to preserve the dynamism of its brand and its appeal to consumers.

The company's new product development cycle, which is carried out annually, culminates in the launch of new product families at the most traditional fair of the sector – the Revestir fair. The event brings together resellers and construction professionals eager to find out what the Santa Catarina brand has in store for them, renewing its appeal and reinforcing its positioning in the market.





Headquartered in the state of Santa Catarina, Portobello was founded in 1979 to manufacture and market ceramic tiles (for use in floors and walls). It employs 2,000 people and its annual turnover has exceeded R\$ 1 billion already. Its main factory is located in Tijucas, a small town with a population of 36,000 located 50 km north of the state capital, Florianópolis. A second, substantially smaller plant was set up by the group in the state of Alagoas in 2015.



Portobello exports to Latin America, the United States, and Australia and to European clusters, even though the domestic market is by far its main target.

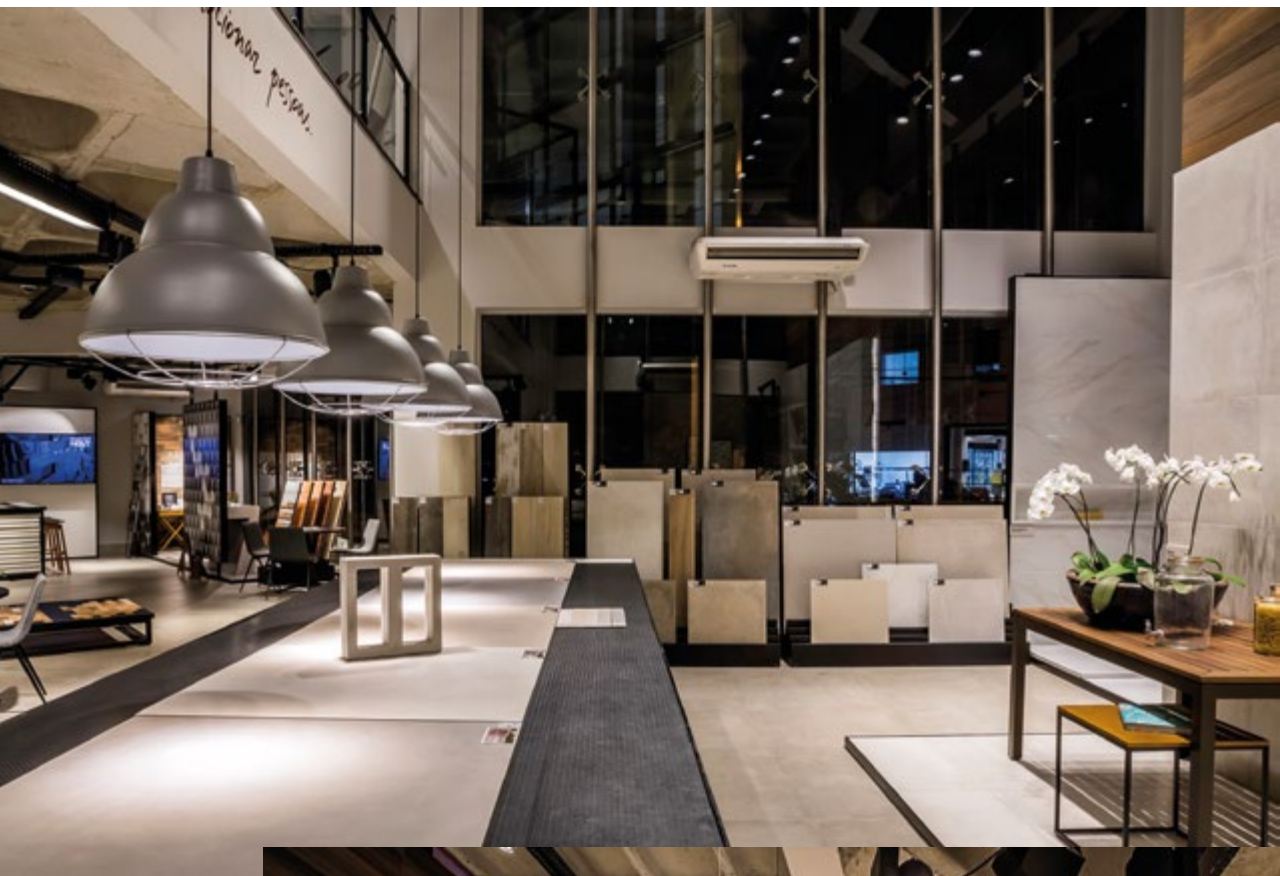
The company has 150 stores in Brazil, 15 under its direct control, identified by the Portobello Shop brand, with a unique portfolio and sales teams made up of architects or designers.

Portobello's products stand out for their distinctiveness. The brand is definitely not positioned among manufacturers who use the low-price appeal to stand up to the competition. Quite to the contrary, the company has defined a strategy for stressing the quality of its products, its technical reputation, and the appeal of their design, style, culture and fashion, as well as associated services, whether commercial or technical.

The process by which Portobello has ensured the consistency of this unique marketing strategy includes a set of actions shared between various departments of the company – notably, the innovation and new business departments, a department in charge of devising constructive solutions, and a robust research and development (R&D) team.

INNOVATION FOUNDATIONS

Portobello has three major foundations for innovation. The first one consists in what might be considered a classic R&D process, linked to new or improved materials and manufacturing techniques for ceramic tiles. It involves a team of 18 professionals, mostly material and chemical engineers, who are responsible for the products, along with engineering professionals specializing in other areas who are in charge of manufacturing processes. The incorporation of new technologies – such as the use of large presses, lamination, printing of design on tiles, and process digitization – requires concerted efforts between the R&D team and the manufacturing and product development teams. Their workload is intense, as the company renews 25% of its portfolio annually.



The second foundation involves tiling processes, known to be an activity that depends on construction professionals who do not always have the necessary technical skills, which is a major constraint to the development of good construction solutions and to the use of Portobello's products.

Larger tiles provide an example of this fact, as on the one hand they allow for productivity gains, but on the other they rely on more qualified installation processes, which may require new resources and methods. These formats were received with some resistance and were slow to gain acceptance in the market. Today, the most common dimensions for tiles are 60x60, 90x90 and up to 120x120 cm.

It would be useless to increase the size of tiles to gain productivity if at the same time no installation solutions were devised to ensure efficiency in the construction processes and meet the needs of architectural and engineering offices and construction companies. After all, floor and wall tiles face competition not only between different manufacturers, but also with other construction techniques based on different materials.

The third foundation of the innovation process is the creation of new collections. Portobello has innovated substantially in this regard, incorporating elements of history, art, and culture through systematically organized processes designed to capture new knowledge and anticipate trends.

Innovation at Portobello, therefore, is an activity that integrates several areas under a unified strategy.

The key initiatives for defining new products and permanently renewing the commercial appeal of each collection are under the responsibility of the Innovation Department. It is in that department, managed by Cristiane Ferreira, that the annual cycle of new products is carried out. For new products to be launched on a regular basis, a detailed structured process was implemented, involving all or part of the three innovation-related departments: New Business, R&D, and Innovation and Branding.

Portobello has innovated substantially by incorporating elements of history, art, and culture through systematically organized processes designed to capture new knowledge and anticipate trends.

INTEGRATED VISION

One of the distinguishing features of Portobello's activity is the highly technical nature of its products, both in manufacturing and installation – a service that the company has turned into a new business. For this purpose, Portobello has developed new technologies and projects, often absorbing professionals or projects directly from the market and involving them in a fast-track incubation process until promising and sustainable businesses can be secured.

The first stage of the development cycle involves the collaboration of professionals from the areas of art, culture, history, and design, who travel internationally to find inspiration for their work. The second stage is that of assimilating and formalizing trends, which are discussed at internal working meetings. Initially, these professionals study separately, on the one hand, applications for bathrooms and indoor areas and, on the other, applications for kitchens and outdoor areas. Then the design teams join them and begin to carry out the actual work of turning the creative process into products.

A brief description of the objective elements that characterize each phase of the annual new product creation and development process – which culminates in the launch of new product lines at the Revestir fair and in the ***Caderno de Tendências Portobello + Arquitetura*** – would not provide a fair picture of its complexity. In the words of Cristiane Ferreira, who leads the process, it is essential *“to be able to make our customers' dreams come true”* in order to create lasting affective bonds with their homes and, consequently, with products of the Portobello brand.

Building or renovating a home is a long-term investment that takes some time to materialize and last. This is what ensures customer satisfaction and brand longevity with consumers.



SOURCES OF INSPIRATION

A brief description of some lines from the 2018 collection sheds light on the different sources of inspiration and on the creative process involved in developing them. With thought-provoking and suggestive names such as Belgique, Chelsea, Ecodiversa, Ecollection, Forma, Harpa, Jackie, Le Cementine, Malibu, Marmi Classico, Ms. Barcelona, Paris, and Paysage, each line reveals its inspirations. Portobello describes the Belgique line as follows:

Pierre Blue or Blue Stone is a stone falling under the category of limestones that are typically found in Belgium. This beautiful stone has small fossils that stand out on its dark and bluish surface. Belgique is a bold design based on merging Blue Stone and concrete – a material that does not exist in nature and was created through design. This new material expresses modern plurality and was created in three shades: a darker bluish gray; Avalon, a lighter gray that also occurs in nature; and Clair, a very elegant off-white.

A more abstract example that gained content and shape through Portobello's creative process is that of the Jackie line, described by the company as follows:

Jackie, an eternal icon of good taste that gave new perspective to fashion, art, and culture in the vibrant 1960s, is the inspiration for a timeless and elegant wall décor. Its subtle texture, which reproduces a concrete surface with a fine sand finish, is presented in a pale and always contemporary color palette integrated into the chromatic proposal of the entire Collection.

SALES CHANNELS

Sales of tiles and other products in the segment are based on technical elements, but Portobello's creativity has taken this process to a higher level. Products originating from its new design process have an inspiration, a story, and a wealth of associated knowledge that require the provision of special training to the sales force.

Portobello has four clearly defined marketing channels: stores, resellers, engineering, and export. The chain of stores carrying Portobello's products required the company's attention to convey the knowledge associated with its new product lines, in accordance with its innovation strategy.

Products originating from the new design process have an inspiration, a story, and a wealth of associated knowledge that require the provision of special training to the sales force.

Unlike the technical parameters of a cladding item, such as size, thickness, and mechanical strength, the design elements developed for each new launch of a Portobello product require the involvement of people with skills, profiles, and knowledge that are very different from those commonly found in the commercial segment of construction materials. Providing this knowledge to a network of 150 stores is a huge challenge.



In the company's few flagship stores there are, to varying degrees, skilled salespeople with the required professional background and appropriate knowledge of architecture and design. To meet this need in retail stores, Portobello invested in developing an attractive professional training program accompanied by product dissemination tools designed to facilitate the understanding of what its creation process is all about from its very beginning, in very different places or periods. Still, there were more questions than answers.

How can the lifestyle of a city, such as Copenhagen, or of a country like Iceland be translated into a set of flooring products culturally adapted to the Brazilian reality of typical Portobello consumers? Or how can value be created for customers and the Portobello brand by showing the richness of the meaning and use of porcelain inspired by Lombard stone (*pietra lombarda*)? Moreover, how can a message be produced to capture the interest of consumers belonging to any income bracket and falling under any consumption category who are routinely exposed to multiple ads?

To avoid losing relevant, interesting, value-carrying stories and concepts consumers could identify themselves with, Portobello turned the storytelling associated with new collections into a sales promotion element.

For direct sales to homebuilders, Portobello set up a team of nearly 100 professionals with a strong technical background in architecture and engineering to establish an effective relationship and avoid knowledge asymmetries between buyers and sellers. These professionals are prepared to suggest suitable tiling solutions for different types of buildings.



UNIQUE IDENTITY

Cladding ceramics is not exactly a product with great innovative opportunities and its applications and production processes cannot be considered a great source of technological opportunities either. Competitive standards in the industry and market practices focused on price and cost – which often relegate quality and uniqueness to secondary importance – provide evidence of this fact.

Against this conventional view, Portobello came up with a robust innovation process involving technological development in products, manufacturing, construction techniques and creation of new collections, always with a unique identity.

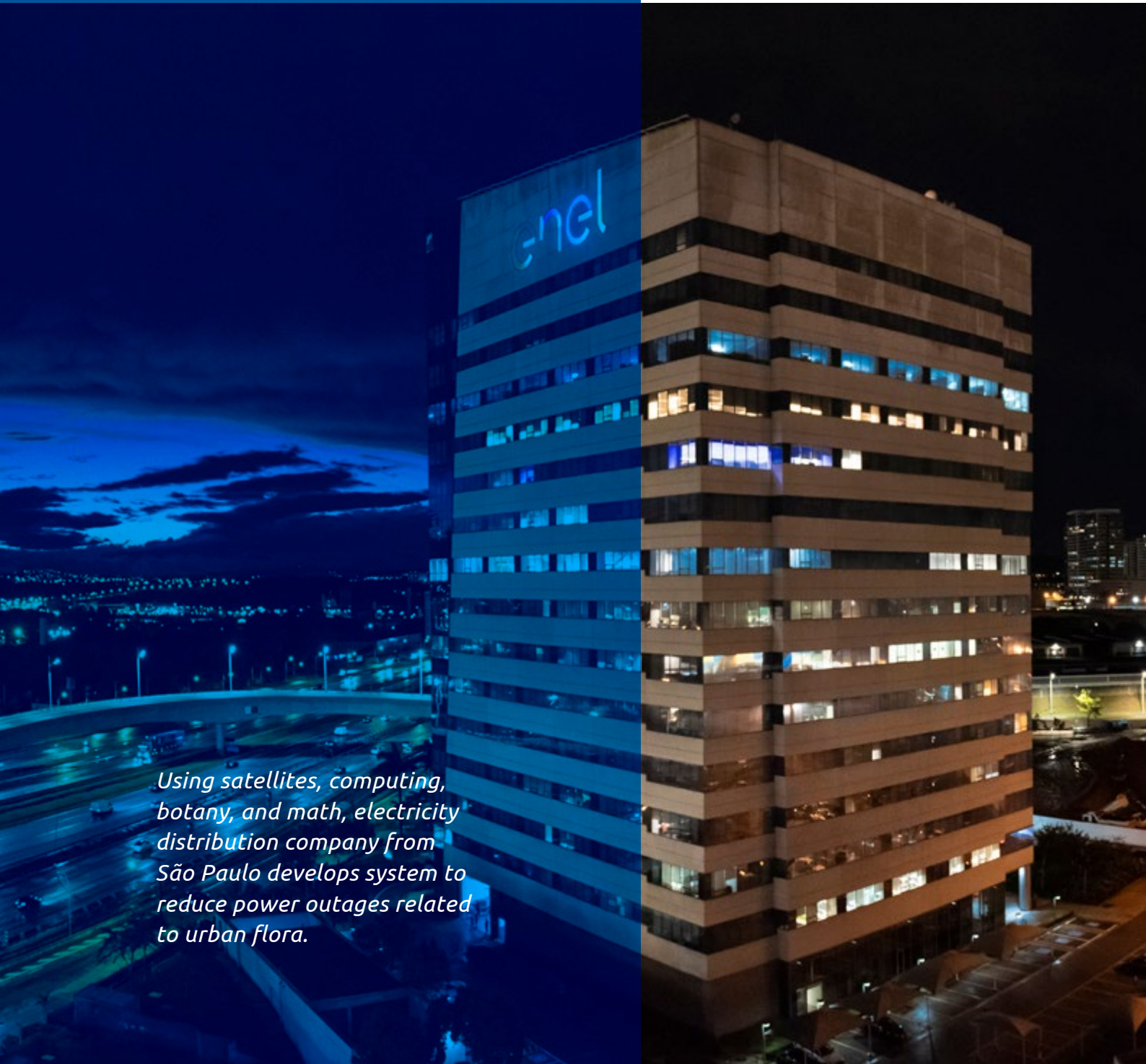
More than simply developing new products or new collections, Portobello established a consistent and well-structured process for developing new product lines and linking them to symbolic features. This process enabled the company to create and capture market segments that are off the beaten track. Innovation can be anywhere. This is the main lesson.



Process Innovation

- São Paulo (state of São Paulo)
- Large enterprise
- 7,300 employees

Using satellites, computing, botany, and math, electricity distribution company from São Paulo develops system to reduce power outages related to urban flora.





CONTROLLED GROWTH¹

The challenges involved in setting up and maintaining an urban power grid are huge, especially in large cities. Problems are not few and include weather-related issues, such as energy theft, which occurs frequently, and coexistence with trees. The latter account for 50% to 70% of supply disruptions experienced by distributors, as they compete for space with overhead distribution systems and require ongoing pruning efforts.

The solution developed by Enel Distribuição São Paulo to manage tree pruning can be considered a milestone in the company's innovative trajectory. Their research and development (R&D) program, which began in 2012, used satellite images of trees overlaid on their distribution grid maps to prioritize pruning services based on a mathematical model that also incorporates knowledge of botany and artificial intelligence.

The new system produced substantial savings for the company and reduced the number of interruptions caused by wire breakage and short circuits. It also showed that even the simplest and most secularly known activities can benefit from using technology intelligently.



¹ The selected case was that of Eletropaulo, a finalist in the 2016-2017 National Innovation Award contest. Since May 2018, Eletropaulo has been part of the Enel Group and was renamed Enel Distribuição São Paulo.





It was with a lot of technology and investments in R&D that the former Eletropaulo, responsible for power distribution in the São Paulo Metropolitan Region, managed to minimize one of the most acute problems in terms of service quality: shortages caused by the interference of urban vegetation in the electricity distribution grid.



Even though it is a common problem faced by all electric utilities in urban areas, it is enhanced by the size of greater São Paulo. With 1,521 km², the state capital has almost 50,000 streets, avenues and squares, which add up to 17,000 kilometers in length. According to information from the city hall, there are about 650,000 trees on the city's streets posing a constant threat of interference with the electricity grid.

The numbers speak for themselves: in 2017, the company recorded more than 24,000 power outages caused by trees falling and/or reaching the height of power lines – a figure that soared to 26,500 in 2018.

All electric utilities have periodic pruning programs to address the problem of unwanted interference from trees in the distribution grid. These programs are obviously labor-intensive and require dedicated teams to carry out all scheduled prunings.

There are, however, several problems involved in this task, such as traffic and parking difficulties and, especially, the planning of the operations. Where are the trees located along the distribution grid? How to ensure that pruning is carried out where it is actually necessary? How to prevent pruning teams from being sent to locations in which pruning is not urgent rather than to areas where it is actually needed?

Sending a team to perform pruning in an area where it will not be necessary for some time represents an unnecessary cost and may imply cable breakage risks elsewhere. After all, trees do not all grow at the same rate and each species has its particularities, which makes the problem more complex. It was in response to this operational efficiency and cost-effectiveness challenge that the R&D team devised the project Environmentally Friendly Tree Pruning Prioritization and Management System for Minimizing Power Outages.



CHALLENGES

Enel Distribuição São Paulo's concession area covers 24 municipalities in the Metropolitan Region of São Paulo (Barueri, Cajamar, Carapicuíba, Cotia, Diadema, Embu, Embu-Guaçu, Itapeverica da Serra, Itapevi, Jandira, Juquitiba, Mauá, Osasco, Pirapora Bom Jesus, Ribeirão Pires, Rio Grande da Serra, Santana do Parnaíba, Santo André, São Bernardo do Campo, São Caetano do Sul, São Lourenço da Serra, São Paulo, Taboão da Serra, and Vargem Grande Paulista). The total area covered by the concession comprises 4,526 km².

Since 2018, the company has over 30 teams dedicated exclusively to pruning services and 17 teams in charge of collecting plant material. Last year, more than 380,000 tree prunings were performed by internal teams and outsourced companies. Among the different plant species that grow in the city of São Paulo, six common types represent

more than 80% of the total number of trees planted on public roads (tipuana, sibipiruna, spathodea, rosewood, alfeneiro, and Indian almond).

The project to meet the challenge of efficient and effective tree pruning planning was based on the understanding that satellite imagery could provide an idea of the priorities. However, the variety of species and their different growth rates made it clear that satellite imagery could be an ingredient, but not the complete solution. This is where botanical knowledge came in handy. It guided the field teams in the process of measuring trees to assess the growth rates of each species correctly.

The model developed by Enel used satellite imagery, botanical techniques, and artificial neural networks to build a map with the location of existing trees along the wiring of the distribution grid. Based on this map, overlaps and the potential interference of trees on the power grid are identified.

A PIONEERING PROJECT

The idea of the project emerged in 2011 in the R&D program with the objective of improving and prioritizing the pruning plan, improving the company's performance indicators, and reducing interruptions and impacts on the grid caused by plants. Its aim was to send teams to the right spots, reducing operating costs and achieving greater assertiveness in operation.

The Environmentally Friendly Tree Pruning Prioritization and Management System for Minimizing Power Outages was developed in partnership with Genera Inovação, Pesquisa e Desenvolvimento, under the management of Enel engineer Carlos Donizete Franco de Camargo, who led the R&D program. Enel invested R\$ 1.5 million in the project's research and development, whose pilot phase was carried out in a 100-km² area (6% of the municipality).



In 2018, the company carried out more than 380,000 tree pruning operations using its own teams and outsourced companies.



The methodology employed can be summarized in five steps. The first one consisted in developing a method for classifying trees contained in four-band satellite images by means of the nearest infrared layer, capturing the geographical position of each tree and the length and area of its crown within a 2.5-m buffer around the primary distribution circuit.

The second step consisted in developing a method that considers the grid's hierarchy and reads the digitization direction of circuits in the Geographic Information System (GIS) to associate each tree to network elements (circuit runs and switches) automatically. The third stage was a field survey to characterize the flora in the company's concession area. Having done this, the fourth step was to measure the growth rate of species, a fundamental element for defining a pruning plan in different periods. Finally, the fifth step of the project was that of developing the methodology, which used binary and integer programming

to improve the pruning plan, minimizing the main cost variables involved in a power outage incident. *"We check satellite images against the layout of our power grid and information about the species and the growth rate of each tree. If we carry out a pruning operation today, we can estimate how long it will take for a tree to grow to the height of the power grid and determine how soon we will need to prune it again,"* explains Enel engineer Carlos Donizete.

TREES AS ASSETS

Consistent results showed the feasibility of expanding the system to the entire concession area, which was done in 2017. The algorithm that was developed reduced interruptions by highlighting the existence of a large number of conflicts between trees and the grid and indicating the need for more pruning, now defined with a high degree of selectivity.

Remote sensing made it possible to separate trees that somehow impacted the distribution grid. With this record stored in the georeferencing solution, trees became an asset as if they were a piece of equipment requiring maintenance. The recorded information and maintenance history led to a better use of resources, which were directed to pruning critical points, thus reducing interruptions. The company has filed a specific patent application for the technology developed.

The innovation developed by Enel has gained recognition in Brazil and worldwide. In 2015, the Pruning Management System won the Fierce Innovation Awards and was showcased in several technical events, such as in those held by the World Academy of Science, Engineering and Technology and by the International Scientific Committee and in the AES Innovation Congress Guidelines in the United States; in the International Conference on Remote Sensing and Geoinformation in Istanbul; and in the 30th Congress on Asset Maintenance and Management in Campinas.

The algorithm that was developed reduced interruptions by highlighting the existence of a large number of conflicts between trees and the grid and indicating the need for more pruning, now defined with a high degree of selectivity.

In the following year, the software developed by the company was presented at the 22nd National Energy Distribution Seminar (SENDI) and, in August 2017, at the Congress on Technological Innovation in Electricity (CINETEL), and at the Seminar on Energy Efficiency in the Electricity Industry (SEENEL).

BENEFITS

The main benefits of the project implemented by Enel Distribuição São Paulo are increased efficiency in the planning and delivery of pruning services and the ensuing reduction in the number of unwanted interruptions in power supply. In the traditional process, despite the availability of experience-based empirical knowledge, it is hard to know precisely the size of tree canopies and their degree of interference with the power grid, which prevents an effective control of more urgent interventions. The model solves these problems. Consumers win, the city wins, the energy distribution company wins. This is the ultimate aim of innovation: securing gains to be shared between all stakeholders.

ELECTRICITY SUPPLY QUALITY INDICATORS


Electricity supply quality indicators are calculated by electricity distribution companies and periodically submitted to the National Electric Energy Agency (ANEEL). The time and number of times a consumer unit runs out of electricity for any given period (month, quarter or year) allow the Agency to assess the continued supply of electricity to the population.

DEC (Equivalent Interruption Duration per Consumer Unit) and FEC (Equivalent Interruption Frequency per Consumer Unit) are the two main measures used to assess the quality of the power supply.

*With this data, ANEEL publishes the **Global Continuity Performance Indicator** annually, which evaluates the performance of all electricity distribution companies in Brazil based on the duration and frequency of interruptions against the limits set for concession areas.*

Organizational Innovation

- Niterói (state of Rio de Janeiro)
- Large enterprise
- 70,000 employees (worldwide)



In partnership with a drugstore chain, the energy distribution multinational Enel implemented, in rural areas in the state of Ceará, the first jointly owned distributed solar energy generation system in Brazil.



INDEPENDENT POWER GENERATION

This chapter describes an innovative renewable solar energy generation project implemented by Enel. A partnership established with a non-traditional investor and consumer in the electricity market used a new institutional framework defined by the National Electric Energy Agency (ANEEL) to organize a new arrangement for distributed production and consumption of electricity designed to promote the use of new energy sources, especially renewable sources.

The Brazilian energy mix has been undergoing major transformations. At the same time that Brazil has, throughout its history, developed a matrix for renewable energy generation by taking advantage of its water potential for using electricity generating turbines, it has also developed original global solutions for producing liquid fuels from renewable sources through Proálcool¹, a program implemented in the second half of the 1970s in response to the international oil crisis that broke out then.

Based on these two main foundations, the Brazilian energy mix is marked by a very high rate of renewable sources and by its important contribution to the environmental sustainability of Brazil and of our planet.



¹ The National Ethanol Program (Proálcool) was an initiative of the Brazilian government to increase the production and consumption of ethanol as fuel to replace fossil fuels. The program established a series of incentives for the electricity industry in response to the international oil crises of 1973 and 1979.





Brazil has a strong innovative tradition regarding the creation of alternative sources of energy production. The scarcity of coal and oil until the discovery of oilfields in the 1990s, as well as the scale and diversity of the domestic electricity industry, posed major technological challenges for the country that resulted in the creation of a complex and advanced innovation system in the energy sector. In addition to many new projects and investments in traditional and consolidated sources (hydroelectricity, deep-water oil and, recently, the pre-salt layer), Brazil has also begun to look for other sources to meet its increasing demand for electricity. Besides alternatives such as electricity generation from natural gas, implemented shortly after the so-called 'blackout' in the early 2000s, new, cleaner renewable sources are being developed with increasing success. Efforts for this purpose are being made by new companies specializing in these segments and using their own technologies and by traditional companies with consolidated operations in the electricity generation, transmission, and distribution markets. This is the case of Enel, which developed a solar energy generation project implemented in Ceará state.

COMPENSATION SYSTEM

Brazil's northeast region is not very well endowed in terms of water potential and Brazil's most important oil reserves are located in the southeast region, especially on the coast of the states of Rio de Janeiro and São Paulo. On the other hand, the region has extraordinary potential for power generation from two renewable sources – wind and solar. Their utilization depends not only on the availability of natural factors or technologies, equipment, and facilities, but also on regulations and standards to ensure their sustainable economic exploitation by companies.

Such legal framework was created in April 2012 through ANEEL's Normative Resolution (RN) No. 482, which set out



“general conditions for access of distributed electricity microgeneration and minigeneration to electricity distribution systems under the energy compensation system,” thus allowing private generators to exchange energy produced by them with the grid.

The process of building an appropriate framework for new energy production and consumption alternatives involved government agencies and the society at large, including, of course, interested companies. Its clear purpose of expanding and diversifying generation sources and supply arrangements helped to attract new investors and consumers.

The Enel Solar Condominium project is one of the most consistent examples of distributed solar power generation in remote areas taking advantage of the opportunities afforded by the new regulatory framework.

INCENTIVES TO INDEPENDENT POWER GENERATION

The key element of ANEEL’s Normative Resolution No. 482/2012 – as amended by Normative Resolution No. 687/2015, which provides that consumers may generate, within certain limits, energy for their own use and inject any surpluses into third-party distribution grids, being

physically compensated for this (i.e. in units of energy – kWh²) – was to make distributed generation by independent producers possible. This compensation system is crucial for harnessing the potential of unconventional sources, particularly wind and solar sources.

These sources are, by their own nature, irregular in terms of supply: winds blow strongly in Brazil's northeast region, but not continuously or regularly; and the sun, which has greater regularity and predictability, can produce energy for just over half a day. Although both are important sources for expanding power generation in Brazil and throughout the world, no system can rely solely on them to ensure continuous generation. The same is true of any consumer. ANEEL's regulation removed this restriction by creating the required conditions for compensation to be possible within the system.

Since solar energy is produced during daytime and consumed mainly – but not exclusively – at night, producers cannot make full use of their own energy unless they have efficient storage systems, which are costly and therefore of limited use.

In this scenario, the only available alternative is injecting surplus energy into a larger distribution system for compensation in subsequent uses. Access to the distribution grid is, in any case, essential for the development of distributed production. After all, wind and solar energy can only be harnessed where this is technically and economically feasible – namely, in locations where it is possible to capture the wind to activate huge turbines and where there are suitable large and cheap areas for installing solar panels.

SOLAR CONDOMINIUM

Enel is a multinational company of Italian origin operating in the electricity industry in 34 countries on five continents and serving 72 million customers worldwide. In Brazil, it operates in the electricity generation, sale, and distribution markets, mainly in the states of São Paulo, Rio de Janeiro, Goiás, and Ceará, serving about 17 million customers. In the solar power generation market, Enel is the country's leader in installed capacity and project portfolio. It operates the largest solar plant in Brazil, located in Nova Olinda, state of Piauí, and is one of the largest wind energy players in the Brazilian market. The shared solar power condominium is a successful innovation introduced by the company.

Formally, the Solar Condominium is a system that potentially produces energy for different consumers in remote areas. The project, which is being developed in an area of 3.5 hectares (35,000 m² – or 3.5 soccer fields) in the municipality of Tabuleiro do Norte,

2 "kWh is a measure of the electricity consumed by a device during a certain operating period and means kilowatts-hour." Available at: <<https://www.significados.com.br/kwh/>>. Accessed on November 7, 2018.

includes 3,420 solar panels of 1.1 megawatts peak (MWp) and an annual generation capacity of 1,750 megawatts/hour (MWh), equivalent to the annual consumption of just under 1,000 homes. Tabuleiro do Norte has a population of 30,000 and is located 300 km from the capital of Ceará state and 115 km from Mossoró/state of Rio Grande do Norte, in Brazil's semiarid region, and has a Human Development Index (HDI) of 0.698, which is considered fairly satisfactory. An investment of this kind has a positive impact on local as well as regional development.

Although officially and technically it is a condominium bringing together several individual producers into a shared collective farm, the company's partner is a single company – a drugstore chain with multiple retail stores.

The business configuration of the drugstore chain makes it possible for the innovative model implemented by Enel to be taken advantage of under the official resolution. The chain has multiple units consuming electricity, each of a modest size, but which together consume a sufficient volume to justify a R\$ 7 million investment. The condominium has several solar power microgeneration units that will supply electricity to 38 drugstores of the partner company throughout the state of Ceará. With this innovation, the drugstore chain can produce its own energy at a long distance from where it will be consumed. It will be entitled to a supply of 1,750 MWh per year, which will enable it to save about 7% on its monthly electricity bill.

Rafael Coelho, head of Enel's distributed generation department, explains that the project works like a solar energy system in a home, but with the advantage of not requiring the installation of roof panels: *"With this innovation, customers guarantee the price of their electricity in advance and get discounts on their electricity bill, since all the energy generated by the solar panels is injected into the power grid."*

The Solar Condominium brought extra benefits for the residents of Tabuleiro do Norte. In addition to improving



"With this innovation, customer guarantee the price of their electricity in advance and get discounts on their electricity bill, since all the energy generated by the solar panels is injected into the power grid."
Rafael Coelho



conditions for local businesses and to creating jobs, Enel replaced more than 600 common light bulbs with LED light bulbs through the *Troca Eficiente* (Efficient Replacement) program. In addition, 109 old refrigerators were replaced by new and more efficient models. Such replacements will save up to 80% on household electricity bills.

Other figures more than justify the undertaking: less 230 tons of CO² released into the environment, equivalent to planting 1,368 trees or removing 228 cars from the streets per year, in addition to saving two billion liters of water per year.

CREATIVITY AND INGENUITY

One of the most important lessons of this innovative project developed by Enel and its partner company is how creativity and ingenuity can be harnessed to build an architecture and business model tailored to existing opportunities and constraints. Many entrepreneurs have good ideas, many persevere, but they don't always manage to put together the puzzle of a reality-adjusted business model. This is what Enel has managed to do.

Although modest in its individual dimensions in comparison to the huge Brazilian energy production and consumption figures, such a project plays a very valuable role: showing that entrepreneurial and institutional ingenuity can be a lever for innovative projects and new business models that unlock countless opportunities for wealth creation and increased production, while contributing to preserving the environment and to sustainability, with positive effects in the region of deployment.

Once the solution is tested on a functional pilot scale, it will be possible to replicate it in many municipalities in different regions, possibly allowing for a process of gradual adherence to the contemporary model of distributed generation,

making it possible for a large number of small, but valuable opportunities for energy production, especially from renewable sources, to be seized. In a world facing an urgent and desperate need to address warming and extreme weather phenomena, all contributions are indispensable and welcome – even more so when they can be scaled and multiplied to meet the needs of a continental country such as Brazil.

THE PATH OF SHARED GENERATION

ANEEL's new standards, which have been in force since March 1, 2016, allow for any renewable energy source other than regular cogeneration sources to be used to generate power and to be connected to the distribution grid. Distributed generation with installed power of up to 75 kilowatts (kW) is called microgeneration, while distributed minigeneration is that with power above 75 kW and less than or equal to 5 megawatts (MW).

When the amount of energy generated in a given month is greater than the energy consumed in that period, consumers get credits that can be used to reduce their bill in following months for up to 60 months. Credits may also be used to deduct the consumption of units belonging to the same owner located elsewhere, provided that they are located in an area served by the same distributor. This type of credit use is referred to as remote self-consumption.

Another innovation in the standard is the possibility of installing distributed generation systems in condominiums – ventures involving multiple consumer units. In this case, the energy generated can be shared among the participants at percentages defined by the consumers themselves.

ANEEL also created the “shared generation” concept, making it possible for several stakeholders to get together in a consortium or cooperative to install a distributed micro or minigeneration system and use the energy generated to reduce the bills of the members of the consortium or cooperative in question.



Organizational Innovation

- Salvador (state of Bahia)
- Small enterprise
- 22 employees

Company from Bahia state takes advantage of institutional opportunities to establish new connections and incorporate innovation into its regular product release activities.





PAVING THE WAY FOR INNOVATION

Founded in 1995 by civil engineer Raymundo Dórea, Engpiso presents itself as the first flooring company in Bahia. To focus on innovation, it created a new organizational unit—a research and development (R&D) center. Initially, it was set up at the Áity Business Incubator in the Bahia Technology Park in Salvador in partnership with the National Industrial Apprenticeship Service (SENAI)/CIMATEC, the Federal University of Bahia (UFBA), and the Catholic University of Salvador (UCSAL). Today the Center is located in the SENAI-CIMATEC Accelerator.

Engpiso's trajectory is inextricably linked to its founder, who accumulated professional experience in the civil construction industry as a salaried professional before embarking on a venture of his own. Identifying an opportunity to develop new approaches to the production of flooring in construction projects, the company began to prospect for various projects with the aim of ensuring this essential element in all buildings a functional condition in line with its importance.

One of the main attributes of the founder of Engpiso, who is currently its business director, is the ability to take advantage of institutional support opportunities available in the national and state-level entrepreneurship and technological development fostering system. It was through these opportunities that the company was able to establish domestic and international connections, broadening its horizons and its ability to face new challenges.





SPECIALIZATION

Throughout almost 25 years of operation, Engpiso has specialized in an important activity, albeit apparently not very valued in the construction industry: floor production for large buildings. Such specialization, which is essential in any construction project, was not yet widespread in the northeast



and north regions of Brazil when engineer Raymundo Dórea embarked on this venture, leaving behind the security of a position in a large company and taking on the risks of a solitary enterprise. After struggling with all the typical adversities of an entrepreneurial venture without the backing of corporate resources, Engpiso reached a new level when it managed to bring together two very important assets: securing contracts for some prominent construction projects and gaining access to public support systems for entrepreneurship and innovation.

With a portfolio of more than nine million m² of flooring installed in Brazil and abroad (Angola), Engpiso has secured its prominent position through major construction projects, such as those of Ford's Camaçari plant, the most important private investment made in Bahia after that of the Camaçari Petrochemical Complex, and of stadiums built for the 2014 World Cup in Recife (Pernambuco Arena) and Salvador (Fonte Nova Arena), as well as of the Sauípe Arena, also in Bahia.

Alongside these large and high-profile construction projects, Engpiso has participated in large-scale public infrastructure projects (Salvador airport expansion, Pituaçu Bus Terminal, Itapuã Waterfront, Transoceanic Consortium, and Eurovia Paralela), as well as in industrial (Petrobahia, Galpão Frigelar, and Vedacit), commercial (Salvador Shopping, Rio Mar Shopping in Fortaleza, Monsanto, Insinuante Distribution Center, and Frigelar Store in Salvador), and residential projects (Hemisphere 360°).

Entrepreneurship and the search for new markets and solutions have always been characteristics of Engpiso's founder and his company. During its first 15 years of operation, the company mainly relied on technical solutions absorbed from companies and projects implemented in other regions to pave the way for its pioneering spirit in its regional market. Early on in 1997, the company started using water-based building systems with very significant business results. The new technology was used for renovating and building



a wing in a large hospital in Salvador without any interruption in operations that attracted the attention of the market. Providing original solutions to problems faced by customers is an important element in building reputation, a slow and gradual process that Engpiso engaged in with determination and a focus on innovation.

Based on the strategic planning carried out with the support from a junior company of the Federal University of Bahia (UFBA) in 2009, Engpiso incorporated the guidelines for innovation and innovative technological solutions through developments of its own. A new contact with the Brazilian Micro and Small Business Support Service (SEBRAE), which the company had consulted early on, but without continuity because it had to attend to other priorities and urgencies, paved the way for its participation in various programs and events. The company also sought support from the Euvaldo Lodi Institute (IEL) of Bahia for developing innovation management practices.

In this new phase, the company also got acquainted with the programs of the Bahia State Research Support Foundation (FABESP) and decided to submit projects in response to public calls for support and grants relying on SEBRAE's support for training staff and also from scholarship holders from the National Council for Scientific and Technological Development (CNPq) acting as SEBRAE's Local Innovation Agents (ALIs) to promote ongoing innovation actions in small companies.

NEW PROJECTS

Becoming acquainted with the universe of state-level and federal innovation support institutions and programs opened new horizons for Engpiso and created opportunities for it to acquire and develop skills, resources to finance them, and guidance for structuring projects, including those with SENAI-CIMATEC. Setting up the Innovation Center at the Salvador Technology Park, where it operated until August 2018, led to concrete results quickly. It was in this new phase that Engpiso raised subsidized resources to develop three new projects, each with funding from a different support institution.

The results were: 1) a project for developing a cement self-leveling cover with acoustic insulation between slabs to comply with Technical Standard (NBR) 15,575/2013 of the Brazilian Association of Technical Standards (ABNT) (through the Bahia Inovação Fapesb-Pappe Public Call for Grants – 2nd Round); 2) a project for developing an optimized system for concrete pavement with chemical treatment of the soil, reducing the use of graded gravel, and for developing a new structural synthetic fiber (through Call 009/2013 for an Economic and Research Grant); and 3) a project for developing mortars with thermal and acoustic properties for use in subfloor and plaster by SEBRAETEC, a SEBRAE program that subsidizes innovation services.

The company's most innovative project is that of a cement-based mortar with acoustic and self-leveling properties that does not require the use of blankets. This product became the flagship of the company and played a key role in securing new contracts. It is noteworthy that apart from making it possible for Engpiso to substantially improve its technical efficiency and productivity in its activities, the new product reduced by 70% the number of people required to carry out its projects, as the mortar has high fluidity and can be pumped, being leveled by simple agitation and eliminating the need for mechanical leveling.

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Since July 2018, Engpiso's R&D Center has been operating at the SENAI-CIMATEC Accelerator, in the capital of Bahia. Salvador is one of the three Brazilian municipalities included in the 100 resilient cities, an action supported by the Rockefeller Foundation designed to map out challenges faced by cities and create strategies to address them. This vision of resilience involves more than adapting to respond to external factors, as it is mainly focused on creating innovative initiatives in the governance of urban services, strengthening the urban fabric and stimulating sustainable development. Engpiso was one of the companies selected in the Resilient City Call for Proposals launched by the Salvador City Hall and Resource IT Solutions as part of



SENAI-CIMATEC's Call for Innovative Projects for Industry, for developing a project for using the Internet of Things (IoT) and for a monolithic concrete pavement with draining properties. Once the solution is fully developed and approved by the city hall, the company expects to be able to market it worldwide.

AWARDS

The portfolio of works carried out by the company and its operating results boosted its reputation and earned it major recognition from institutions and agencies that grant awards to the most innovative projects and companies. Engpiso was granted the State Winner/ Outstanding Company in Innovation in Bahia award at the 2014 MPE Brasil Award contest for coming up with an innovation management methodology using the JOIN Technology developed by IEL Bahia, focused on sustainability and on developing new solutions and processes for the construction industry.

In the 2017 edition of the National Innovation Award contest, Engpiso received triple recognition, winning in the Organizational Innovation category and qualifying as finalist in the Process Innovation and Innovation Management categories. While receiving the awards during the 7th Brazilian Congress on Innovation in Industry, Raymundo Dórea stated with joy that *"SEBRAE has played a key role in getting us where we are now,"*

a recognition that he extended to other regional institutions making up the innovation ecosystem of Salvador and of the state of Bahia.

In its trajectory of continuous development, Engpiso has been devising action plans to enter foreign markets in compliance with the third element of its strategic planning developed with the support from UFBA, alongside the execution of major works and the creation of a base for the development of innovative projects.

Even when it has an indicative character and avoids precise and quantitative goals, planning has the great virtue of helping leaders avoid the prevalence of immediacy over relevance. There are always urgent matters in business, and there are urgent matters that are also important. However, whenever companies are plunged into their immediate routines, important but non-urgent activities and goals are often postponed and miss the right time for execution. Strategic planning, with its periodic reviews, also serves to avoid this risk.

There are many inspiring lessons to be learned from Engpiso's story as a company that has managed to overcome difficulties with tenacity and with the knowledge it has acquired and assimilated. The key moment in this path was certainly when it incorporated the value of innovation, relying on the assistance of several public institutions set up to support entrepreneurship, which defined the vectors of its development. This definition made it possible for an entrepreneur to take the right steps to turn Engpiso into a regional benchmark. There is still a lot to be done and many new skills to be developed and absorbed, but Engpiso now knows that appropriate partners and support play a key role along this path.

In the 2017 edition of the National Innovation Award contest, Engpiso received triple recognition, winning in the Organizational Innovation category and qualifying as finalist in the Process Innovation and Innovation Management categories.

Product Innovation

- Concórdia (state of Santa Catarina)
- Small enterprise
- 10 employees





TAKING OFF IN POULTRY PRODUCTION

Fornari, a company from Santa Catarina specializing in poultry farm health that produces equipment for poultry agribusiness, had an unlikely start: it used to be a truck workshop. The surprising trajectory of the company, which went from the repair of cargo vehicles and refurbishment of parts to developing a system for sanitizing trucks operating in poultry farms and solutions for water treatment and egg disinfection, provides an example of entrepreneurship.

The technical knowledge of mechanic (and lathe operator) Gilmar Fornari was essential for the manufacture of the first nebulizer nozzles, occasionally commissioned by poultry farm owners, but it was Luciane, his wife, who first asked the question: what if we could manufacture the truck sanitation system and not just its components? A contact at Sadia, currently integrated with BRF, confirmed interest in the product and revealed a promising commercial potential. They still lacked knowledge of hydraulics, which was added to the team by a practical expert in the world of pipes and flows, Teno Malakowski.

Since then, Fornari has evolved to developing, manufacturing, and installing solutions designed to promote health at various stages of poultry and pork farming, adding quality to agribusiness products and improving the competitiveness of many companies. The main innovation of the Concordia company – not surprisingly, the birthplace of Sadia over 70 years ago – solves a major problem for companies operating in this industry: that of sanitizing fertilized eggs. This is the subject of this chapter.



Fornari was assisted by the Euvaldo Lodi Institute (IEL) of Santa Catarina state in structuring its innovation management department under the Nagi Project of the Innovation Management Support Center, financed by the Fund for Studies and Projects (FINEP).

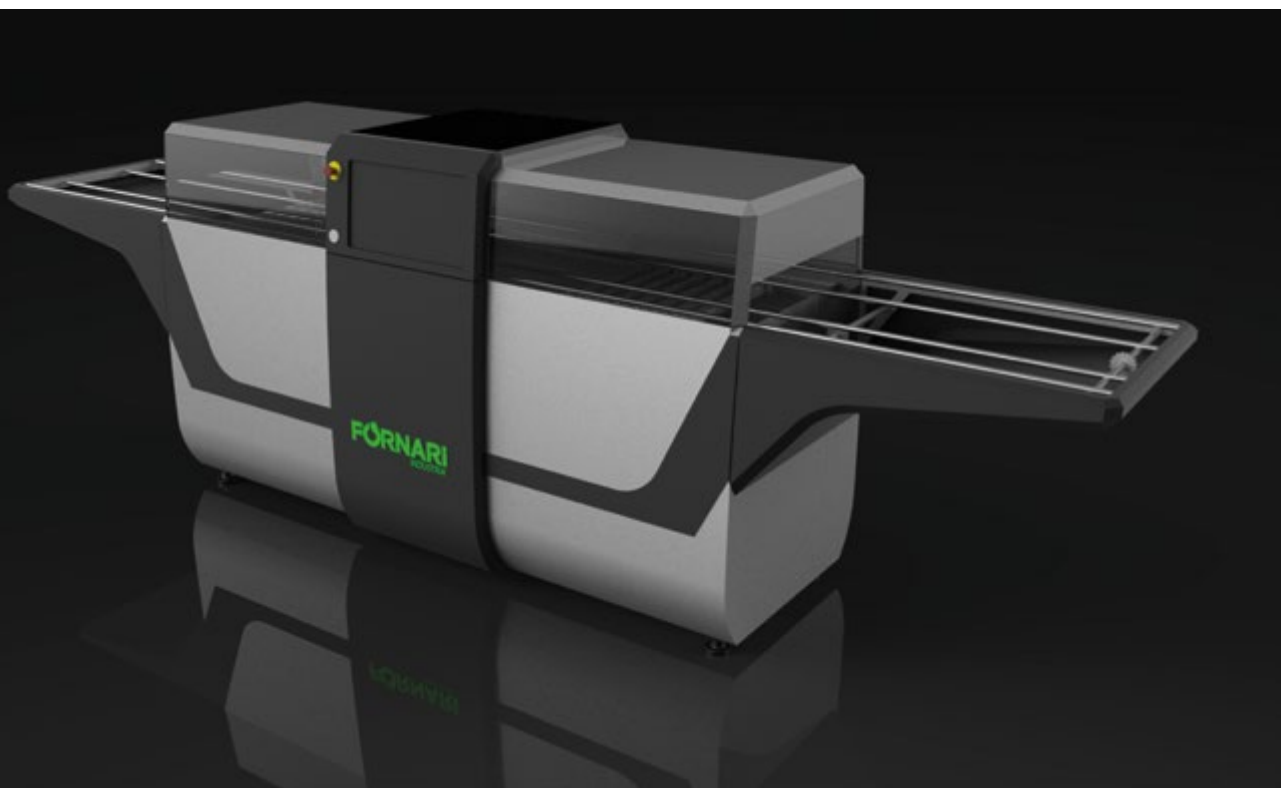


SANITIZING SYSTEM

The Fornari family has a long professional and business experience in truck mechanics. Its patriarch and his three sons dedicated themselves to maintaining and repairing cargo vehicles for many years, and it was in this environment of knowledge and technical skills that the first component to the new Fornari business was born: a nebulizer nozzle for sanitizing systems used in trucks operating in poultry farm transportation services.

Commissioned by a number of local customers and manufactured thanks to Fornaris' technical expertise in part machining, it was the nozzle that gave rise to the idea – which would seem unrealistic at first glance – of manufacturing, in a second moment, their own sanitizing system designed to meet the needs of poultry farmers and agri-industrial enterprises in the region.

With the idea still incipient, in came Luciane Piovezan, Gilmar's wife, who had worked for almost ten years at Sadia. After spending some time working as a teacher, she accepted the family's requests to devote herself – "at least part-time" – to the Fornaris' mechanical business. It was from this apparently erratic trajectory that Luciane sought, in her network of old relationships, the contact that allowed the company with so many businesses in the region to gauge the answer to the crucial question: would there be a market for a manufacturer of a sanitizing system for trucks operating in poultry farms?



The answer was given by Jorge Bifi, Luciane's colleague back in her days at Sadia, who at the time of contact was performing technical roles related to quality promotion in the company's poultry farms. The modesty of the initial ambitions soon became apparent when Sadia's sanitization team indicated that all farms – not just egg farms – should adopt effective sanitizing systems in line with good practice.

The projections thrilled Luciane and Gilmar. It was the encouragement they needed to get started, despite the obvious disconnect with the family's original business. This is how Fornari Indústria was born in 2006 inside a machine shop shed and with an overlapping address.

EFFECTIVE SOLUTION

The sanitizing system designed by the Fornaris was simple, but it far outperformed the rather precarious alternatives used back then, which were *"more intended to comply with the regulations than to actually perform the health function prescribed by good practice,"* as Luciane put it. In a market full of rustic and unreliable options, the effectiveness of Fornari's sanitizing solution was quickly recognized.



Such quality was only achieved because the entrepreneurs combined the technical expertise of component manufacturing with the practical knowledge and long hydraulics experience of plumber Teno Malakowski. His experience in manufacturing precise components and assembling hydraulic systems resulted in a robust solution that was quickly embraced by Sadia. After all, being the point of contact with consumers in Brazil and around the world, the company needs to offer safe products and, therefore, has to run a secure supply chain.

In the first year in operation of the new business, the Fornaris manufactured and installed a dozen sanitizing systems in Concórdia. In the following year, that number tripled, and the system was also installed in poultry farms in the municipality of Dois Vizinhos. Sadia's support to using the equipment was important, but Fornari also received

indirect encouragement from Normative Instruction (IN) No. 56 of December 4, 2007 issued by the Ministry of Agriculture, Livestock and Supply (MAPA), which set out stricter hygienic-sanitary procedures for poultry production following the Asian poultry crisis. It was in this scenario that Fornari, now fully organized, took off.

WATER CHLORINATOR

The company's relationship with Sadia grew closer and stronger, giving rise to a new opportunity. Jorge Bifi, Luciane's former colleague, consulted with Fornari about the possibility of developing a solution for the quality of the water used by poultry farmers, which varied excessively and was far from assured both due to widely varying sources and to the precariousness of treatment methods. This afforded an additional opportunity for the ingenuity and technical skills of the Fornari team that was not missed.

The adoption of the chlorinator for poultry farm water supply systems developed by Fornari was stimulated by Sadia and, as a result, its production and sales figures soared rapidly. Poultry import regulations adopted in foreign markets also imposed similar standards on poultry farms integrated to other companies operating in the sector, reinforcing the company's turnover and unfolding opportunities in many other markets in Brazil and abroad.

NEW OPPORTUNITIES

Immersion in the production and sales environment provides a major source of information, knowledge and, with due processing, opportunities. This immersion gave rise to the idea of developing the best technological opportunity Fornari had devised until then: that of an egg sanitization system for poultry farms.

The adoption of the chlorinator for poultry farm water supply systems developed by Fornari was stimulated by Sadia and, as a result, its production and sales figures soared rapidly.



The story is simple but rife with picturesque aspects. While visiting a customer of its disinfection products, Luciane witnessed a rather unusual scene: the farm owner's annoyance over two labor lawsuits brought by former employees due to unhealthy conditions they were allegedly routinely exposed to in the process of producing fertile eggs. The farmer's indignation stemmed from a clear fact: such labor lawsuits resulted from procedures widely adopted in poultry farms that were even recommended by the integrating companies themselves. *"How can I be sued and sentenced for practices that partner companies define as the most appropriate ones?"*, he asked.

Poultry farms face many technical issues and Luciane's keen eye identified opportunities for innovation and business in such issues. She became interested in developing a deeper understanding of the problems involved and in perhaps exploring possible technological and industrial

opportunities afforded by them. Although its use has been banned, formaldehyde is still widely used to disinfect fertile eggs – and the above-mentioned labor lawsuits are not totally unfounded, as it is a highly toxic product.

The Fornari team decided to take its chances with this new venture. After conducting research and studies to investigate different principles and application possibilities, the company realized that traditional systems, besides their toxicity, led to a considerable loss of eggs caused by using inadequate disinfectants. The solution it developed replaced the inputs used until then and promised a cleaner and more effective disinfection with high yield.

The most curious aspect is that the inspiration for the solution came from the entrepreneur's family circle. While dressing her daughter's hair for a 15th birthday party with a blow dryer in one hand and a brush in the other, Luciane came up with the idea of using hot air to remove moisture from eggs after a sanitizing bath. She ran to the garage, dipped an egg in water, turned on the dryer, and counted the seconds until it was dry. It worked!

PERSEVERANCE

The first prototype was built with used parts, pieces and equipment. It was a matter of studying the principles and ensuring that they could be applied on a large scale at high speed. The first prototype soon proved inadequate and the Fornari moved on to the second, using the company's own resources. All difficulties were overcome by the perseverance of Luciane and Gilmar.

The equipment was created in the Fornari Research and Development Department, which is currently made up of five people skilled in mechanical engineering, mechatronics, and electrical engineering. Two startups incubated at the Business Center for Advanced Technology Development (Celta)¹, Dynamox and Wavetech, participated in developing the product's design and embedded electronics.

Taking advantage of the biological window of open pores during the first two hours after eggs are laid, the equipment follows the initial concept of sanitizing eggs immediately after laying. In addition to being far more effective than other alternatives, the new equipment uses chlorine and peracetic acid for disinfection, which are much less aggressive and have no restrictions on use.

¹ The Business Center for Advanced Technology Development (CELTA) is a Certi Foundation incubator located in Florianópolis (state of Santa Catarina). It was set up in 1986 to promote the development of the Santa Catarina capital and ensure the feasibility of a promising economic sector, taking advantage of the talents and knowledge generated by the Federal University of Santa Catarina (UFSC).

After launching the new product, Fornari wasted no time and decided to develop a new version that will feature state-of-the-art embedded electronics for real-time monitoring and control, at the production and disinfection site, of a series of parameters with an impact on embryo development, such as temperature and alkalinity.

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For this second version, which is scheduled to be launched in 2020, Fornari is being assisted by the Institute for Technology and Innovation of the National Industrial Apprenticeship Service (SENAI) of Joinville, in the state of Santa Catarina, in developing the software and hardware to be used in the equipment.

DEDICATED ENTREPRENEURSHIP

The new method also provides considerable advantages for poultry farms, as it leads to a very significant reduction in non-birth rates and decreases chick mortality rates in the first week of life. Both result in considerable economic gains for poultry farms.

The equipment was originally devised for large farms, but a small-scale version has already been developed for smaller farms. This segment, which is usually ignored by traditional manufacturers, found in the Fornari equipment a suitable solution that allows them to offer cleaner and safer products to consumers.

With an eye on the international market, Fornari sought partnerships with specialized companies to develop a more modern and bold design, adding an attractive and elegant image to the good performance of the equipment, a feature that draws attention during presentations to potential clients in Brazil and abroad. Restless, Fornari has also been making an effort to diversify its sanitizing products to cater to companies operating in seedling and vegetable production.



Fornari's trajectory provides an example of entrepreneurship and dedication. For every difficulty identified in its surrounding environment, it prospected for opportunities and built new businesses. It is no wonder that the company's turnover stands at around R\$ 3 million a year currently and has been steadily increasing at a rate of 30% per year, as anticipated for 2019. In a short period of time, Fornari has become a company actively engaged in solving poultry health issues with the same determination it showed in the truck repair business years ago.

Organizational Innovation

- Barretos (state of São Paulo)
- Medium enterprise
- 65 employees

www.gnatus.com.br

Small dental and medical equipment manufacturer from Barretos, located in a rural area in the state of São Paulo, acquires a traditional company operating in the segment and has plans to expand substantially into domestic and international markets.

GNATUS 
Evoluir com confiança





ENTREPRENEURIAL BOLDNESS¹

Being “real engineers” was the dream of cousins and friends Alexandre Vicentini de Queiroz and Cristiano Camposana de Queiroz when they attended, respectively, the School of Industrial Engineering (FEI), in São Bernardo do Campo, and the State University of Campinas (UNICAMP) to conduct their courses in Mechanics and Mechatronics. Incidentally, these two engineering areas are an excellent match in many areas of manufacture and creation of new products, artifacts, and equipment. What the two future engineers born and raised in Barretos, in the western region of the state of São Paulo, did not know was that facing engineering challenges was just the first step in a virtuous trajectory of coming up with new products and big business far beyond their initial dreams.

From the establishment of the company Q2Tec at the Barretos Technological Incubator in 2008 to revenues of tens of millions through the acquisition in 2017 of Gnatus – a well-known company and brand in the industry and in the dental office equipment market – less than ten years went by. During this period, the young entrepreneurs accumulated great experience and dared to seize a unique business opportunity to project themselves in the market at a fast rate, a feat that was made possible by the support they had from their families.

¹ Q2Tec was the winner in the 2016/2017 National Innovation Award in Organizational Innovation contest and finalist in Product Innovation, both as MPE ALI. In January 2017, Q2TEC received approval from the Administrative Council for Economic Defense (Cade) for acquiring the Gnatus brand and its entire product portfolio and began to operate as Gnatus from February 11 of that year.





While they faced the difficulties of commercially developing three innovative products they had created (a radiological sensor, a wireless handheld ultrasound device, and a portable vacuum pump), the dental equipment industry and market were going through a period of crisis and consolidation resulting from the merger of the two main companies operating in this market with their traditional brands. The possibly damaging effects of this merger on the market led antitrust and competition authorities to impose certain conditions on the emerging giant, which would have a market share seen as too large. The main condition was that of selling one of the brands – an opportunity that the young enterprising engineers managed to take advantage of.

The city of Ribeirão Preto, located in the state of São Paulo, is known throughout Brazil for several characteristics. In the field of science and technology, the city has gained dynamism through the positive effects resulting from the strong presence of a campus of the highly traditional University of São Paulo (USP), which conducts cutting-edge research focused mainly on health and, not by chance, from the availability of a relevant cluster for medical and dental equipment.

It was in this technological environment that the company Q2Tec, founded in 2008 by engineers Alexandre Vicentini de Queiroz and Cristiano Camposana de Queiroz, emerged. The company had a good start by developing and patenting three new products while continuing to invest in development and innovation, securing major support in the form of grants from the Human Resources in Strategic Areas (RHAE) program of the National Council for Scientific and Technological Development (CNPq), resources from SENAI-SESI's Call for Innovative Projects, from the *Inova Talentos* program of the Euvaldo Lodi Institute (IEL), and from the Design Export program of the Brazilian Export and Investment Promotion Agency (Apex). The company was also granted, in 2017, the Corporate Management award



(MPE Brasil) and the National Innovation Award of the National Confederation of Industry (CNI) in the Organizational Innovation and Product Innovation categories.

In spite of these achievements, Q2Tec was growing at an inevitably slow pace for having to face an established pattern of competition with a limited set of producers with well-known and consolidated brands. Furthermore, it had to operate in an environment marked by stringent regulatory processes and certifications and lacked a technical assistance network to ensure customer service and continued equipment operation.

In this segment, two large companies stood out for many years: Dabi Atlante, founded in 1946, and Gnatus, established in 1976. Both developed innovative products and solutions of different kinds and had also consolidated their presence in overseas markets, especially in several countries of Latin America, Africa, Asia and Europe. Official sources from both companies report that Dabi Atlante exports its products regularly to 30 countries, while Gnatus has customers in 146 markets abroad.



Following a period of strong expansion in the early 2000s, a crisis broke out that forced those two companies to seek equity consolidation to avoid overcapacity and destructive competition and to promote greater complementarity between their product lines and operating markets.

The new company, created in 2015 as a result of the consolidation of assets of Dabi Atlante and Gnatus, has become the second largest manufacturer of dental



CADE considered that the merger of two major competing manufacturers, both with leading positions in various markets, could have a negative effect on competition and consumers, whether individuals or healthcare professionals.

offices in the world, with the capacity to produce 19,000 units per year. The name of the new company, Alliage, is suggestive of an alliance and it was indeed set up to combine what both original companies knew how to do best.

However, the merger of the two companies met with initial opposition – and several restrictions – from the Administrative Council for Economic Defense (CADE), the agency of the Ministry of Justice responsible for evaluating practices that may be detrimental to competition and to the functioning of markets. CADE considered that the merger of two major competing manufacturers, both with leading positions in various markets, could have a negative effect on competition and consumers, whether individuals or healthcare professionals.

The main purpose of the merger, which was to strengthen their consolidated position in foreign markets, promised several gains for Brazil and for the competitiveness of the new company, but CADE considered that it generated burdens for the functioning of the domestic market and decided to impose certain restrictions on the merger, including the obligation to sell one of the brands and its respective product lines. In response, Alliage decided to sell the Gnatus brand.

SENSE OF OPPORTUNITY

This was a unique opportunity for Q2Tec, after nearly ten years of organic growth facing all the difficulties typically faced by small businesses operating in a market dominated by large players. The prospect of taking a big step toward better business opportunities by acquiring the assets of Gnatus was highly attractive, especially because CADE had determined that the buying company should be capable of operating functionally in a competitive environment – that is, in sound conditions in terms of production and marketing, both made possible by the sale of the assets.



Q2Tec had technical, industrial, and commercial expertise in the industry, but adding it to Gnatus' new product line meant much greater breadth and diversification. It devised a creative solution to such an industrial challenge involving a contract whereby Alliage would continue to manufacture and assemble, at Gnatus' own manufacturing facilities, the product line acquired by Q2Tec, which started to use the Gnatus brand and its technical assistance network throughout the national territory.

In the international market, where the former Gnatus had a significant presence and a large outsourced technical assistance network, the opposite happened: Q2Tec licensed

Alliage to work with the Gnatus brand for a period of ten years. After this period, the Gnatus brand will no longer be marketed by Alliage and will be exclusively owned by Q2Tec.

The funds raised for the acquisition operation were partly provided by the families of Q2Tec's founders, who have long been involved in the meat production and marketing segment and own a traditional meat packing plant. The seriousness of purpose and the determination of the young entrepreneurs in the pursuit of their goals shown during almost ten years of business activity justified the parents' decision to bet on the new opportunity, which was also good business for the family and for the city of Barretos. This was a rare win-win relationship for all parties involved.

EXTENDED LINE

With the acquisition of the Gnatus brand, completed in early 2017, Q2 Produtos Médicos Odontológicos became a company that develops, manufactures, and markets a wide and diverse line of products and equipment for surgery, endodontics, dentistry, diagnosis, lubrication, and cleaning, as well as portable dental office equipment and academic kits.

Gnatus' product line, which was already very broad and diverse, was added to the products that the two entrepreneurs had been developing since 2008. Q2Tec's various devices and products in the area of implants (motor, counter-angle, portable suction unit, digital radiology sensor, intraoral camera) began to be marketed under the brand name Gnatus.

Gnatus' assets afforded an opportunity for immediate growth and fast expansion in the near future. This was a move that strengthened the development project of the two entrepreneurs, who dared to assume control of a much larger company than Q2Tec with a well-known brand in the market.

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Commercially, in addition to the products developed so far by Q2Tec, the Gnatus brand will also boost new products to be developed by a company that has, from now on, a much wider marketing network connected with a much larger and diversified consumer base.

From an industrial point of view, the manufacturing and assembly contract with the former company also provides for appropriate conditions for Q2Tec to develop its own industrial capacities and competencies gradually, without the need to invest costly financial resources and business energy in a moment marked by high risks arising from intense and unpredictable fluctuations in the domestic economy.

NEW PATH

Q2Tec's trajectory provides at least one important lesson for the world of innovation and public policies designed to promote it. It is possible to mobilize financial resources to create dynamic business growth trajectories through the commercial development of new products in new ways that escape the laws of gradual clientele accumulation.

The undeniable entrepreneurial spirit and determination of its founders were, so to speak, hampered by this market functioning mechanism. Acquiring the commercial assets of Gnatus and being able to access the industrial capacity of consolidated companies made it possible to leverage the innovative capacity of Q2Tec and of its two partners. It showed that enterprise engineering can also be used to speed up the development of innovative industrial solutions.

Process Innovation

- Pindamonhangaba (state of São Paulo)
- Small enterprise
- 10 employees



Small company from a rural area in the state of São Paulo develops a construction system for social housing based on concepts of the automobile industry, reducing construction costs and time and improving the quality of construction projects.





INDUSTRIALIZATION IN THE CONSTRUCTION INDUSTRY

For Brazilians, the idea of social housing is closely associated with concepts such as productive inefficiency, squandering of materials, and rework. In a country where the housing deficit peaked to 7.8 million units in 2017¹, this segment represents a true golden vein for the civil construction industry, which over the last few years has been investing in and betting on construction systems that combine cost savings, delivery time, and rational use of materials, but still without a definitive solution.

Rubbish dumpsters “parked” in the streets in front of construction sites show the high amount of waste produced by the domestic construction industry. Waste, which is certainly associated with unskilled workers employed in this activity, i.e. is inherent in the traditional construction systems currently in use, is an alarming reality, and according to some estimates amounts to about 30% of total construction materials. The severity of this waste is even more important when factoring in the amount of greenhouse gases (GHGs) generated to produce materials that will be subsequently disposed of and landfilled.

The partners at Habitar Construções Inteligentes saw an opportunity in this segment and invested in creating an innovative system that enables building social housing with meaningful cost and waste decreases, in addition to significantly reducing the need for both physical labor at construction sites and construction time.



¹ Available at: <<https://www.abrainc.org.br/wp-content/uploads/2018/10/ANEHAB-Estudo-completo.pdf>> (Accessed on June 3, 2019).



Cost savings, in part, increase the company's profitability, but also enable incorporating some special architectural elements into construction projects, as well as delivering a higher-quality finishing standard as compared to what is traditionally seen in the segment.

The small Habitar company, founded in 2014 in Pindamonhangaba, in a rural area in the state of São Paulo, has a panel production line and a housing project portfolio ranging from two to 32 units. The company has already built 32 units using this system,



all of which were sold through the federal government's *Minha Casa Minha Vida* (my home, my life) program.

It is a win-win situation. The reported profitability of delivered projects grew by 25% over a 12-month period - an exceptional rate for a time when few companies made any profit at all. The units were sold at lower prices than the competition, despite their high-quality workmanship and aesthetic standard, which are unusual in construction projects of this kind.



The development of a new construction system – with significant gains in terms of time reduction, construction quality, savings of materials and, above all, the possibility of replicating the model in different places – made all the difference to the success of a small construction company in a country whose area is over 50 degrees latitude from the Equator, at the mouth of the Oiapoque River, to its southernmost point at the mouth of the Chuí River, on the border with Uruguay.

This is not a simple engineering task when considering the climate range, with its rainfall regimes and temperature variations, as well as the different degrees of insolation to which Brazilian states are exposed. If that were not enough, the country is plagued by the high rate of civil construction waste and a projected housing shortage of 20 million units in 2024², which contributes to unplanned urbanization, urban sprawls and the spread of slums, with all their ensuing urban, social, and health problems.

Aware of this market and its problems, the partners of Habitar Construções Inteligentes began to study, think about, and devise a solution. The combination of their different professional experiences in the domestic and European automobile industries and in the construction industry on three different continents, coupled with their

2 CASTELO, Ana Maria. **Políticas Permanentes de Habitação**. [S.L.]: FGV, 2014.



academic backgrounds in Electrical and Civil Engineering, Architecture, and Product and Process Development resulted in the creation of the Habitar Construction System, a solution that addressed most of these challenges.

From the outset, the partners were concerned about protecting intellectual property, secrecy and confidentiality, since the construction and manufacturing process created by them is one of the company's foundations. This decision drew on the experience of one of the partners, who had already filed two patent applications and was aware of the advantages and disadvantages of investing in existing protection mechanisms. Prior experience as small entrepreneurs in various fields also helped the partners not to incur customary mistakes that lead to the "premature death" of small businesses, such as having immediate or enough revenue to repay initial investments within a short timeframe. Knowledge accumulated in several professional experiences is a valuable asset, even when it cannot be formally coded or transmitted.

STRATEGIC LOCATION

The city of Pindamonhangaba was chosen as the corporate headquarters based on the combination of several strategic reasons: it is located between the cities of São Paulo and Rio de Janeiro, provides easy access to important highways, has a relief

of its own, and has a high housing deficit and land suitable for urban expansion at significantly lower costs as compared to those in regions with the highest densification and economic growth rates. Subsequently, having consolidated its methodology and experience in the Paraíba Valley region, the company set up a branch in Monte Mor, in the Campinas region, and already has 22 units contracted to be built by mid-2020.

In its first two years of existence, Habitar invested in improving its product using processes and methods that have been proven in both academia and practical experience. Firstly, a manufacturing model was designed for in-line production of panels to form the walls, which went through the prototyping phase with experimental tools, which in turn were adjusted and improved until the final model was achieved.

The entrepreneurs recognize and underline the importance of using proven models and processes that lead to the rapid elimination of bad ideas and products with no “emotional” attachments. The company has also adopted an internal program to reward employee-suggested innovations that have a particularly detailed view of the practical and crucial aspects of the panel manufacturing process and its use in house assembling works.

An interesting example of an employee suggestion that was incorporated by the company is a quick-connect panel lifting hook that does not require the use of a ladder to connect the panels. This innovation reduced the risk of accidents and helped improve productivity.

Habitar panels come with built-in preparations for electrical and hydraulic installations and have thermal insulation, which works effectively to retain heat in cold regions as well as to avoid warming up the environment in warmer regions, considering the Brazilian climate diversity.

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COST REDUCTION

The use of automotive industry concepts resulted in less material waste and in the optimization and rationalization of the panel manufacturing and assembly process. All in all, these factors allow the company to put up two houses in a single day, using inventory panels and with the foundations already laid on the ground.

Cost reduction – between 25% and 35% – is due to the good use of materials, to a significant reduction in physical labor on construction sites, and to the high productivity of the panel production line. These savings made it possible to invest in distinctive finish, with architectural details such as higher than usual ceilings for the category, and the inclusion of special elements in the design, such as bathroom niches with details in the cladding treatment. The use of nobler materials, such as porcelain tiles, wood in openings and sturdier hardware completes the standard of the Habitar Construction System.

The company has already adjusted itself to the requirements and procedures defined by the Brazilian Association of Technical Standards (ABNT) through Brazilian Standard (NBR) No. 16,475 for precast concrete wall panels. This certification allows panels to be used as sealing elements and helps the company obtain bank financing.

POSSIBILITIES FOR EXPANSION

If the advantages are many, there are also some limitations. Chief among these is the logistics and transportation of panels over long distances, which represents a cost factor that can compromise or even neutralize the cost gains afforded by the integrated manufacturing and construction system.

In order to enter the market in other regions, the entrepreneurs intend to create regional production units,

The use of automotive industry concepts resulted in less material waste and in the optimization and rationalization of the panel manufacturing and assembly process.



so that over a horizon of two to five years they will have the lowest construction price per square meter in Brazil. In the state of São Paulo, in 2018, the basic unit cost (BUC) was approximately R\$1,200/m².

The company's intellectual property strategy is based on the development and reputation of its brand. Currently, a patent is being drafted with support from the University of São Paulo (USP) and the Institute for Technological Research (IPT), through the programs of the Brazilian Agency for Industrial Research and Innovation (EMBRAPPII). However, Habitar maintains that certain construction and process advantages are best protected as a business secret. This attests to the experience of partners who had the opportunity to find out the importance of an appropriate intellectual property strategy.

PROSPECTS

Since its first commercial construction projects, the company has adopted a financing mechanism that raised funds from small investors, with R\$ 50,000 quotas but an unparalleled rate of return in the financial market, considering the small amount invested. This strategy allowed the company to have access to “cheaper” money, with less strict requirements compared to products available in the financial market.

Except for the aid received through the EMBRAPII program, the company was fully funded by the partners, who used their own funds, including from the sale of personal property, to invest in the initial phase of Habitar’s operations. This is another important lesson from this case, as the partners resisted the temptation to engage in parallel construction projects – that would stray the company from its main purpose – to try and finance the business.

The proposed expansion into other regions considers location from the logistical standpoint, housing shortage, and material and labor opportunities. The partners intend to make their brand – and their system – synonymous with construction quality and durability, so that buyers can base their decisions not only on price and opportunity, but mainly on the product.

Habitar has been able to develop an innovative construction system with relevant competitive advantages, such as shorter construction time, improved construction quality, and differentials that appeal to customers. Innovations like these are essential for Brazil to move forward in overcoming its housing shortage.



Marketing Innovation

- São Paulo (state of São Paulo)
- Small enterprise
- 30 employees



Dermocosmetics company from São Paulo invests in an open innovation model to leverage launches of innovative products and reduce costs.



Medicatriz

DERMOCOSMÉTICOS

ACTIVE PRINCIPLE OF GROWTH

Brazilian couple Sheila and Marcos founded Medicatriz with two other partners 30 years ago, confident in their previous experience in the chemical and pharmaceutical industries. With great knowledge of the healing power of any substance, Sheila and Marcos risked their savings to open a small compounding pharmacy, which would later become a larger enterprise with a small industrial facility, a training and marketing center, an online store, and a telesales center.

Medicatriz's founding principle of incorporating scientific knowledge to meet market demands was maintained in the new phase of the São Paulo company located in the Saúde neighborhood, whose products have already attracted customers from various Brazilian regions.

One of the company's strengths is its well-established business strategy that integrates professionals from the world of dermatology, aesthetics, and beauty into the flow of technical information about Medicatriz's products, which in turn receives feedback from those professionals and other customers on product performance and emerging market demands.

The launch of about two dozen new products each year consistently expands the range of offerings to over 100. The ability to formulate new products based on the perception of what the market wants has been enriched by a business sense and commercial, economic and financial parameters, incorporated by the company with the support of the Brazilian Micro and Small Business Support Service (SEBRAE).





Medicatriz's facilities house a surprising number of activities. It is a small cosmetics company that owns a store, a training center, offices, and a telesales center located in a building adapted to the company's needs, and which has been expanding its presence in an important niche of the dermocosmetics market¹.

The original project of the four partners in the 1980s included a pharmacy specializing in dermatology. Two of them got out and sought other paths, one in the interior of São Paulo and the other in Japan, as a result of the Collor Plan (1990). The remaining partners, Sheila and Marcos, with solid chemical and pharmacological knowledge, took full responsibility for the business.

The company name – Medicatriz – refers to the original meaning of the word, which is "that which has the power to heal." The location, which is close to São Paulo Hospital, in the state capital, and was chosen based on a geolocation study, witnessed the constant diversification and expansion movements of the initial activities of a typical compounding pharmacy specializing in dermatology.

Initially, the Training Center was created so that professionals in the areas of beauty care and cosmetic treatments could develop and assimilate new techniques and skills in the use of their products. Then, in 2005, the structure of the pharmacy was transformed into an industry, valuing the knowledge and technological skills of the remaining founder.

Over time, the consolidation of the entrepreneurial and business model opened new possibilities and challenges for Medicatriz, but the company lacked business organization and the ability to seize opportunities. The company then sought the aid of the public support system for business development and innovation and was assisted by SEBRAES's Local Innovation Agents (ALIs) program.

¹ Dermocosmetics are products for dermatological use with pharmacological principles that have therapeutic impacts on the skin.



In fact, the importance of public support instruments is one of the lessons learned by Medicatriz, which quickly profited from an active, dynamic, and confidence-based relationship with SEBRAE.

URGENCY AND IMPORTANCE

In many companies of all sizes it is well known that urgent and important tasks take the place of important but not so urgent activities. Thus, people are never available – whether in terms of time or intellectually – to devote themselves to what can, indeed, make a difference in the long run. Entangled in their immediate and demanding daily tasks, companies fail to carry out activities that could help them achieve better positions based on new strategies.



An important part of explaining this business dynamic is linked to the shortage of resources and to some people's need – real or otherwise – to multitask or oversee even the most routine activities that should have been assimilated and be carried out with proficiency according to well-defined work plans. This practice, which is so common in companies and institutions, ultimately reduces the time that the most skilled and experienced people should devote to activities such as analyzing their businesses and planning their future development, which require designing appropriate strategies and providing the corresponding means.

SEBRAE's ALI program showed the logic of faster results and helped the company understand that it would need to devote more time to developing the proposed training activities if it were to move up the corporate ladder.

Small companies often lack the financial wherewithal to invest in expansion, but a recurring problem is the lack of employees' availability for training and capacity building activities, as they are consumed by daily priorities. The ALI program contributed to breaking this routine and gave Medicatriz renewed strength, which is essential to start a growth phase.

OPEN INNOVATION

From this perception, the company was able to implement innovative initiatives that gained strength and enriched its business model. Gradually, concepts related to the open innovation model were assimilated and integrated. Capturing ideas has become a systematic process through both pre-existing external relationships and other relationships deliberately forged for this purpose.

A VIP Coffee was created to promote regular meetings between beauticians and users of the company's products. This same event unfolded into another, similar in nature, but also bringing together academics and researchers in the fields of cosmetology who worked in universities and public research companies and were devoted to studying the natural products of Brazilian biodiversity. This pursuit of external knowledge, known as open innovation, was essential for Medicatriz.

The concept of open innovation emerges as an alternative for companies to address two current issues inherent in research and development (R&D) activities: the rising cost of this investment and the resulting drop in product

A VIP Coffee was created to promote regular meetings between beauticians and users of the company's products. This same event unfolded into another, similar in nature, but also bringing together academics and researchers in the fields of cosmetology who worked in universities and public research companies.



profitability due to the shorter life cycle of the innovations created. With open innovation practices, development costs are reduced through the absorption and use of external technology and knowledge in the company's R&D process. As a result, the company expands its share of the markets in which it operates and opens possibilities for accessing other segments.

These different sources of income increase the value of the innovation, as the efforts needed to generate it are better paid off. To get the most out of the benefits of open innovation, companies need to develop skills to change their business models and make them more permeable, something that is all but trivial.

The development of new opportunities envisioned by Medicatriz required establishing technical and commercial relationships with specialized companies, such as suppliers of inputs and developers of new technologies. In this partnership model, universities play their role by offering scientific knowledge and expertise, such as the University of São Paulo (USP) in Ribeirão Preto, which is conducting research for Medicatriz into the characteristics and effectiveness of a type of pure and natural essential oil.

The need imposed by the development of products on a commercially competitive basis has also led Medicatriz to import inputs, an experience with positive results, although not to the point of becoming usual.

Creating multiple spaces and channels for identifying business opportunities has resulted in the launch of 20-25 new or redesigned products per year, which represents an annual innovation rate of at least 20%.

SALES CHANNELS

The sense of profitability, which is not always found in small enterprises, was another gain from SEBRAE'S support. The metrics associated with the pursuit of profitability were created and embedded into the company's management practices; from that point on the sales area was developed, which now includes five channels. In addition to the brick and mortar store, Medicatriz has an online store with and without a chat feature; the telesales service, with an active and consultative process; an expressive group of distributors and representatives; and a network of over 1,000 retailers. Each of these sales channels has contributed for Medicatriz's products – sold under the brand names Medicatriz Dermocosmeticos and Velox – to be present in the lives of many professionals and consumers of beauty products and successfully compete for the space traditionally occupied by older and much larger companies.

Companies are differentiated by the assets they own, their development path and the markets they serve. However, they tend to see opportunities very differently, often judging as positive the ideas that fit their operating pattern and rejecting ideas of developments that require the configuration of resources, assets, and markets that are not familiar to them. With the concept of open innovation, which is the centerpiece of this chapter on Medicatriz, ideas that flow into places where the company would not initially focus its attention and resources can have the potential to become innovative solutions – and Medicatriz has been able to take advantage of this scenario in order to grow.

Creating multiple spaces and channels for identifying business opportunities has resulted in the launch of 20-25 new or redesigned products per year, which represents an annual innovation rate of at least 20%.

Product Innovation

- Campo Grande (state of Mato Grosso do Sul)
- Medium enterprise
- 92 employees

Campo Grande-based company reinforces growth supported by innovation in food supplements and a product line with over 100 items.



MIX NUTRI

INOVAÇÃO NUTRICIONAL

INGREDIENTS OF SUCCESS

Mix Nutri from Campo Grande (state of Mato Grosso do Sul) started its activities in 2009, still inside a family wholesale store. The ingredients of the so-called “human ration”, which were very popular at the time, were weighed in varying proportions, according to the demands of each client. The repetitive – and non-standardizable – character of the tasks of that marketing model prompted Danilson Charro, the company’s founder, to check out the possibility of industrializing the product. Charro had already ventured into several fields, with no obvious success. Mix Nutri rewarded his and his lawyer wife and partner Evelyn Pierezan Charro’s determination. She is the managing director of Mix Nutri and the linchpin of a growing business that needs to build processes that enable a controlled environment.

Mix Nutri products – functional foods – are intended for people with dietary concerns, particularly sportspersons and athletes. Its flagship is the Chokler’s line of sugar-free protein bars, fruit bars with functional additives, and Whey Protein. Other product lines include over 100 items, including energy and thermogenic drinks, teas, vitamin capsules, collagen, protein, and nutraceuticals.

The business model also considers product outsourcing to various companies, including domestic and international brands. Offering products with high quality ingredients has given Mix Nutri the opportunity for intense growth, which has doubled its turnover in recent years.



While working for other companies, Mix Nutri's own products gain space in the company's sales. The idea is to increase this share in the near future.



DETERMINATION

Danilson Charro is the typical diehard entrepreneur. His initial failures were felt as defeats, but no more than temporary ones. After several attempts in different fields of activity, it was inside the family store that he started the successful stage of his entrepreneurial trajectory.

At the family's grocery store, Charro began by selling ingredients from the so-called *human ration*, a formulation containing a dozen ingredients that was very successful before the name was banned for marketing by the National Health Surveillance Agency (ANVISA)¹. Repeatedly weighing small portions of the many ingredients that made up the formulation, the founder of Mix Nutri began to consider the possibility of increasing the profitability of this artisanal – and therefore not very profitable – operation. Would it be feasible? How would he do it?

A first step was the sale of pre-made portions to resellers. It was a step in the right direction, but not enough. Sales evolved satisfactorily over a period, but then plummeted. That's when Mix Nutri's first branded product came out: Shake Fiberlax. It was developed together with a food engineer, who has since become a regular employee of the company, mainly because of the interface of functional foods with ANVISA regulations.

¹ Brown sugar, almond, oats, nuts, Brazil nuts, collagen, wheat fiber, sesame seeds, wheat germ, soymilk, and flaxseed were all part of the so-called human ration which, true to its name, suggested the possibility of fully meeting people's nutritional needs. It was because of this name, deemed misleading by ANVISA, that the product began to be sold under the name of food supplement.



Although unregulated, functional foods must meet certain standards and be registered with the Agency. That's why technical skills became important to Mix Nutri, and since then the company has brought engineers and food scientists and nutritionists into its technical staff.

FORMULATION LICENSING

The success of Shake Fiberlax sparked the interest of large companies, leading Mix Nutri to license the formulation to a company in the cosmetics and healthcare segment and start manufacturing its products under an outsourcing contract, which ensured Mix Nutri significant revenue and the possibility of enhancing its industrial capacity.

That was the starting point for the development of the main axis of Mix Nutri's business model: the preparation of high-quality formulations, capable of gaining recognition from consumers and key market players, and their subsequent licensing and manufacturing under an outsourcing contract.



In some cases, the idea originates internally, from Mix Nutri itself, but there are situations in which customers – or potential customers in the product prospecting process – come to the company with a rudimentary design and leave with a fully developed item, both technically and commercially. Under normal circumstances, the technical and industrial development of a new product takes approximately two months.

Unable to rely internally on all the skills required to support its growth, Mix Nutri regularly resorted to external support and consulting. The Federation of Industries of the State of Mato Grosso do Sul (FIEMS) was decisive in supporting the company in its exports,

which account for 10% of revenues. Experienced consultants assisted it in developing new formulations. However, the pursuit and assimilation of information and knowledge by the company are only effective because the in-house team is permanently “up to speed” on external trends, as Evelyn Charro says.

PRODUCT FAMILIES

A central element of the model developed by Mix Nutri is the use of high-quality ingredients. Functional foods need to guarantee users the results they want in terms of nutritional performance, and the inability to meet the needs of consumers evidently generates dissatisfaction and the search for other alternatives. The company invested in building a reputation for quality products, always discarding price-reduction alternatives that involve using either low-quality inputs or high-quality ingredients to a lesser extent than necessary.

By adopting the concept of nutritional innovation, the company organized the products created, manufactured and marketed into four large families, with their own or common market names: Chokler’s, Wellness, Life and Supera. Each has its own qualities and functionalities, all invariably supported by scientific studies conducted by employees and partners.

Avoiding miraculous promises for its products is one of the business practices adopted by the company to eliminate the commercially perverse effect of consumer frustration. In commercial and marketing practices, as Danilson Charro says, “*Mix Nutri does not invent new habits for consumers, it merely seeks to understand market demands and provides solutions with practical, healthy and tasty products.*”



“Mix Nutri does not invent new habits for consumers, it merely seeks to understand market demands and provides solutions with practical, healthy and tasty products.”

Danilson Charro
Executive Director,
Mix Nutri



This recognition seems to be a good antidote to the tendency to create products without prior knowledge of both the market and potential consumption. In other words, the company identifies emerging consumer trends, working to pioneer the development of new products.

INDUSTRIAL CLUSTER

Mix Nutri's growth prospects, which foster the company's expectations and plans, are extremely promising. An illustration of that is the still relatively low use of functional



foods by Brazilian consumers, which is around 2% compared to much higher numbers in more developed countries – for example, more than half of the US population uses functional foods regularly.

Because it is certain of its growth potential, the company designed a new 40,000 m² industrial cluster to be opened in December 2019. The investment, which rose the company's industrial capacities to a new level and was primarily funded with own resources as well as with money from the Midwest Financing Fund (FCO), will earn it a place among the largest companies in its segment in South America.



Mix Nutri designed a new 40,000 m² industrial cluster which will earn it a place among the largest companies in its segment in South America.

Mix Nutri is increasingly investing in its own product lines, envisaging the gradual adoption by Brazilians of consumption patterns seen in more developed countries. Nowadays, as regards the amounts of items manufactured, outsourcing accounts for approximately 80% of the total and only 20% correspond to products sold under the company's brand name. This is the number that Mix Nutri intends to increase in relative terms, without reducing the growth pace of sales under outsourcing contracts.

Thanks to this combination of supplying to third parties and selling under its brand name, Mix Nutri has been able to see remarkable growth even in recent crisis years, having doubled its turnover in 2016 and 2017 over the immediately preceding years.

Coming from a modest origin, nothing seemed to indicate that the manufacturing and sale of small portions of dietary supplements would give rise to a company that has made dozens of millions of reais and employs nearly 100 people, supplying products for several prestigious brands and customers loyal to its brand. The use of high-quality inputs coupled with innovation and constant diversification have certainly contributed to the company's growth. However, Mix Nutri's success story owes much to the entrepreneurial vision of the partners, who realized the growth potential of a market niche and transformed a craft activity into a consolidated industrial process.

Product Innovation

- São Carlos (state of São Paulo)
- Medium enterprise
- 65 employees

*Optical technology company
born in the scientific
environment of a university
city in the interior of São Paulo
shares knowledge and innovates
in health products.*





LIGHT BEAMS FOR HEALTH

Created just over 20 years ago to enable a cooperation agreement between Germany and Brazil on the manufacture of microscopes for educational purposes, MMO redefined its path after manufacturing more than 3,000 devices and redirected its technological vocation to health equipment.

Without ever straying from technology and innovation, namely optical physics, MMO has developed a broad and diverse line of new, market-recognized products and solutions for a variety of medical and dental applications, such as photopolymerizers and a photo-accelerated tooth whitening device.

The company was established and developed in continuous connection with scientific institutions in the city of São Carlos, 250 kilometers from the state capital. São Carlos is a university center that houses two large public universities (one state, one federal) and two physics departments with vast scientific and technological production. In this environment of intense training of skilled human resources, many technology-based companies such as MMO have arisen over the last 30 years.

MMO has not trodden a linear path, as it had to struggle with many doubts, mishaps and difficulties along the way. Partners joined and left the company, roles and directions were redefined; some partnerships went sour. To add to that the company also faced financial constraints, which are so common in the Brazilian industrial world, especially among innovative small companies with an accelerated growth potential that far



exceeds their internal financing capacity. Nonetheless, MMO has always been guided by innovation.

The most innovative product created by the company is a teeth whitener using a 405-nanometer wavelength laser, that far outperforms other commonly used spectra. Noticeable benefits are recognized by users because, in addition to a substantial reduction in treatment time, the patient is not affected by discomfort or pain.



MMO was born to join a German-Brazilian partnership involving technology transfer for the manufacture of microscopes. With the disinterest of the national company that would absorb the technology and scale up production of the German equipment, the responsibilities fell to the seven university partners that founded MMO. Perhaps with less optimistic expectations and willing to overcome technological difficulties, the university-based

company went ahead with the project, tackling all shortcomings identified as they arose.

Among the original partners were prominent researchers in the field of optics, but who lacked the industrial and commercial skills essential to the new business – perhaps because they were foreign to the environment of educational and research institutions. This unmet need made it difficult to set up a company with a defined vocation and ended up leading to different paths.

It was in this scenario that the idea of using optical technology to manufacture low intensity lasers for dental use emerged. By then, the number of partners had fallen to four, but the company was enriched by two new professionals – an engineer with a master's and a doctorate degree in physics and a physicist with a doctorate degree in the field, who were hired thanks to the generous offer of researchers with advanced training in the city which, in turn, does not offer many well-paid job opportunities.

Taking advantage of this feature of a state-of-the-art university center, MMO endeavored to strengthen its in-house team and the skills needed to develop new products, as a way of avoiding both over-dependence on partners and the weakening of its own capabilities and skills.

SCIENTIFIC LINKS

With a stronger team, MMO began to expand its own product range by developing equipment for various medical and dental purposes, using LED light sources such as high-power light curing systems, photo-accelerated teeth whitening systems, laser therapy and photodynamic therapy, in addition to dental and surgical instruments and equipment for acupuncture, physical therapy and veterinary uses. There are more than two dozen devices that share a common science and technology base but lend themselves to many different uses in health and well-being.





Alongside the very effective links to the scientific base of optics that underlie MMO's products, the company maintains close relationships and collaboration with medical and hospital institutions. One of them is the University of São Paulo (USP), which has a university campus and a hospital in Ribeirão Preto, a hundred kilometers from São Carlos, and the other is an important dentistry teaching and research unit in Bauru. These institutions are sources of information, knowledge, and research and development (R&D) topics for MMO. The same goes for the School of Dentistry of the State University of São Paulo (UNESP) in Araraquara, near São Carlos.

In all cases, collaboration relationships are established through the exchange and sharing of information to enable researchers and equipment users to devise new approaches and identify opportunities for solving problem from new perspectives. These attributes of MMO and

its new product development process have enabled the company to develop a related business segment – developing projects for other health and wellness equipment manufacturing or marketing companies.

Among the various equipment developed in collaboration or for other companies are cancer treatment equipment (for cervical cancer), equipment for the treatment of a very common citrus pest (citrus growing is a very important agricultural activity in the São Carlos region) and equipment for soil analysis (in collaboration with researchers from the local unit of the Brazilian Agricultural Research Corporation, EMBRAPA).

For the design and development of own and third-party products, MMO has engineers from various areas of expertise – electronics, mechanics, production, and the environment, as well as a physics professional and a process manager with a background in business administration. For a small company, this is an unusual list of professionals with higher education and advanced specialization.

SPECIALIZED SUPPLIERS

In its trajectory, MMO has always had the industrial support of several manufacturers specializing in parts, components and systems that the company uses in its products, as it would not be feasible or desirable to internalize all production activities. Its manufacturing processes involve activities as diverse as electronic components and injected plastic parts which, to be produced at adequate levels of efficiency and on a competitive basis, require production volumes much higher than those typical of healthcare equipment companies. Having specialized suppliers in the region is an important advantage that MMO uses very consistently without weakening its competitive capabilities.

Despite all that, the São Carlos-based company has in-house capacity to produce various components and

MMO also develops projects for other health and wellness equipment manufacturing or marketing companies



The Bright Max Whitening LED teeth whitener features simple and versatile control functions and innovated in the use of 405-nanometer light, which replaces the commonly used 470-nanometer light.

parts, especially mechanical ones, thanks to the indirect financial support of the National Bank for Economic and Social Development (BNDES) for the purchase of a lathe. The MMO model also has the support of a product design company and a marketing strategy company.

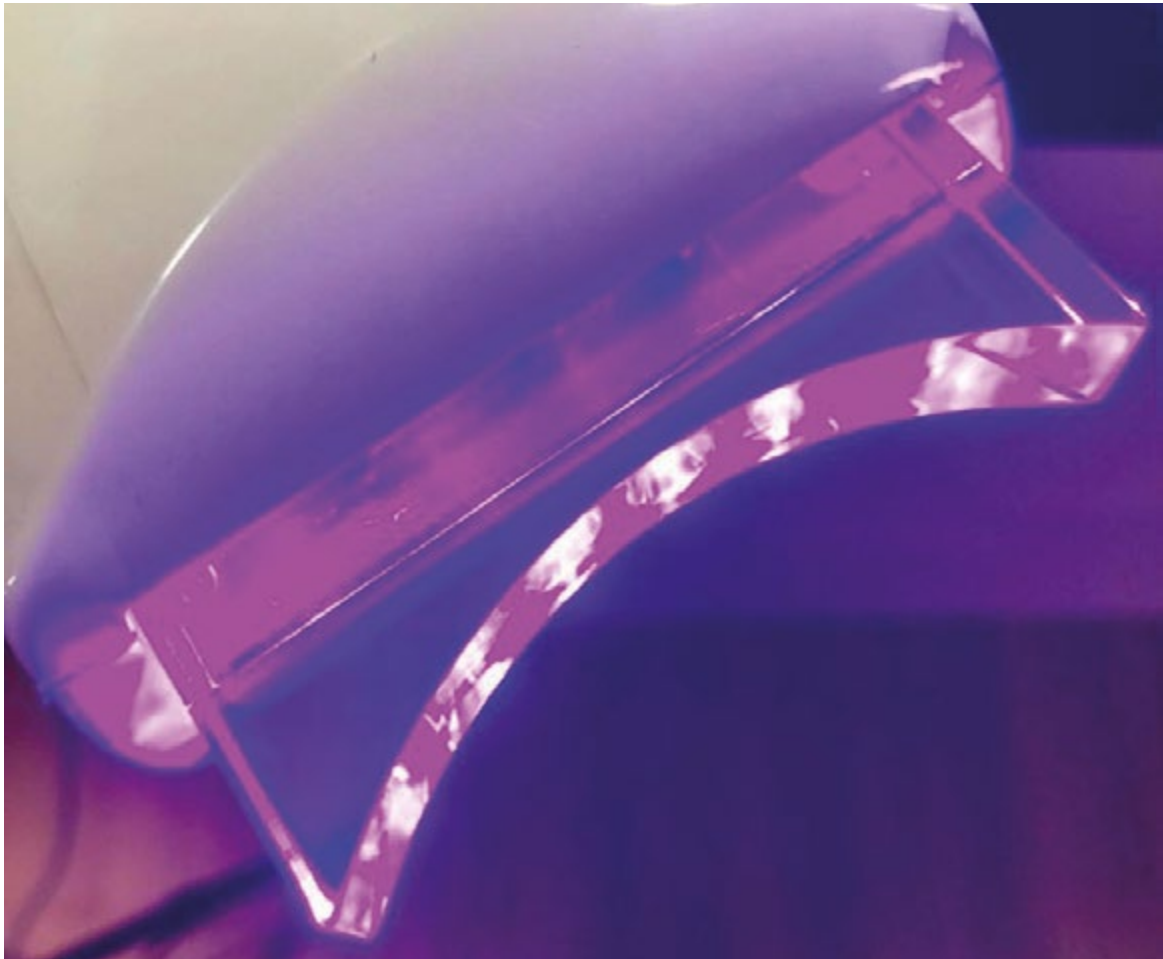
TEETH WHITENING

The main innovation introduced by MMO that captured a significant share of the teeth whitening market and made a significant contribution to its business performance is Bright Max Whitening, which spearheaded the new generation of LED teeth whiteners, featuring simple and versatile control functions.

The device innovated in the use of 405-nanometer light, which replaces the commonly used 470-nanometer light. With higher frequency light beams and shorter wavelengths in the violet light spectrum, the equipment, which is unique in the market, achieves a more appropriate resonance and more effective whitening results. The superior effectiveness of this light beam significantly reduces treatment time and eliminates the use of chemicals such as hydrogen peroxide or carbamide that can cause tooth sensitivity.

This advantage of comfort and well-being for patients is also a plus for the dental professional, who can devote more time to other procedures, reduce treatment time or increase the number of patients.

This double advantage of MMO equipment contributes to the recognition of the company's brand and embedded technologies, thanks to the links with the scientific and technological system of São Carlos and the region. The company's technical team from different areas of specialization has also succeeded in transforming the information received through relationships with the local health system into consistent products.



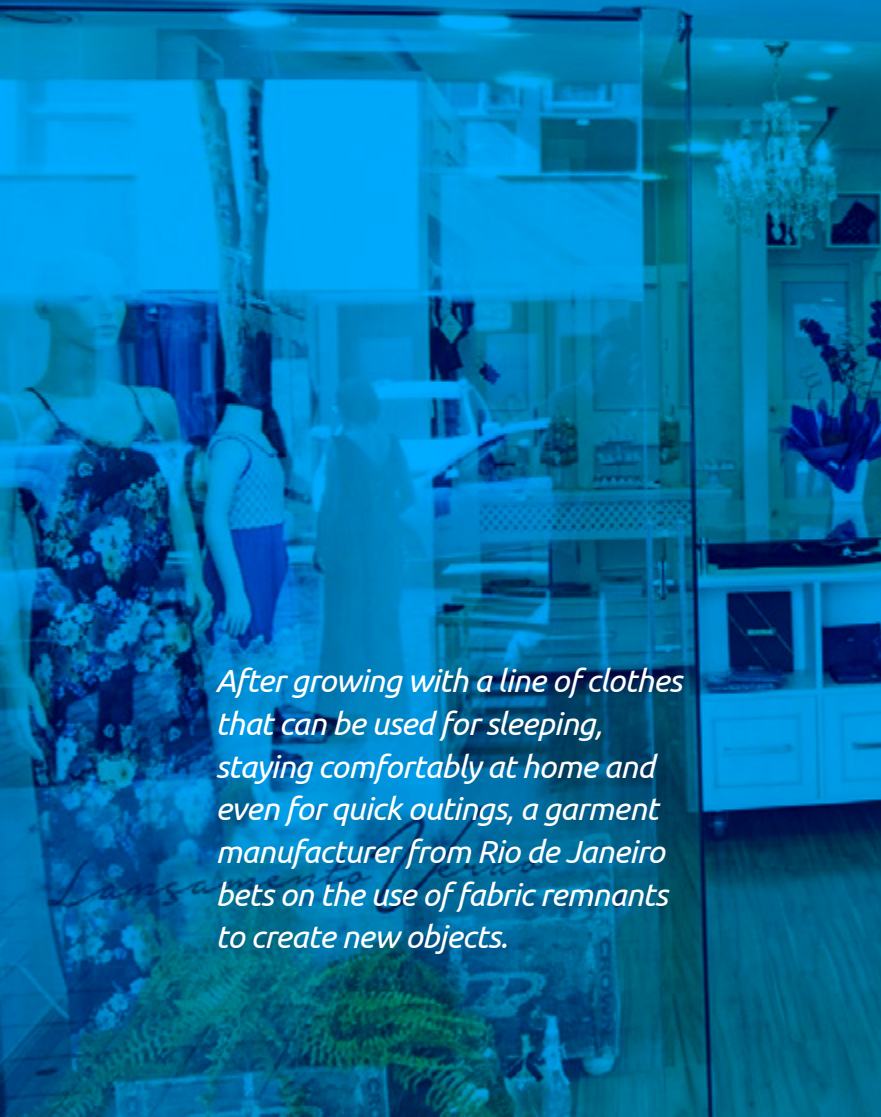
MMO's business success is largely due to the scientific and technological knowledge base of the city in which it is located. The development of specialized suppliers, which completed MMO's industrial and commercial base, has also contributed to the company's sustainability. However, without the in-house ability to properly capture and use the scientific knowledge of the optical universe, MMO would not have been able to develop such a wide range of technical products, particularly its flagship innovative product. If a rich external environment is a major factor in the success of a technology company, its internal ability to make good use of that environment is crucial.

Product Innovation

- Bom Jardim (state of Rio de Janeiro)
- Small enterprise
- 40 employees

After growing with a line of clothes that can be used for sleeping, staying comfortably at home and even for quick outings, a garment manufacturer from Rio de Janeiro bets on the use of fabric remnants to create new objects.

MONTE





FASHION FROM HOME TO THE STREET

In modern life, the boundaries between personal and professional activities are vanishing. There was the time to be home and the time to go to work. What about now, with the home office? There was also the time of staying home and the time of going out – but what to do with quick outings, for example, to take the children to school and immediately return home or to the home office?

Contemporary life, home offices, conference calls, the workday that goes hand in hand with family life, these new ways of managing time and daily life have created new situations for people, for social life and for habits. Dressing oneself is one of them.

It was the recognition of this set of new situations that led entrepreneur Eleonora Erthal to create Monthal, a company in the garment industry dedicated to the design, manufacture and sale of clothing for wearing primarily – but not exclusively – at home.

These are not nightgowns or pajamas, although you can wear them for sleeping or staying comfortably at home, as well as for entertaining or for a quick outing. It is certainly not the appropriate clothing to attend a formal meeting at the company, but you can wear it at home when you have company or to get the kids to or from school. It is a comfortable outfit and almost always basic but not uncouth. Comfort and simplicity do not mean relinquishing the possibility of enjoying social life according to socially accepted standards.



INFORMAL BEGINNING

Entrepreneur Eleonora Erthal founded Monthal in 1992 in Bom Jardim, a small town of 27,000 people in the state of Rio de Janeiro, three hours from the state capital. The name of the company alludes to the names of the two families united by old bonds and now also by marriage – Monnerat and Erthal, from Eleonora Maria Monnerat Erthal and José Eugênio Erthal.

The family's farm in the rural area of the municipality, where Eleonora worked as a primary school teacher, was the setting of the initial cutting and sewing activities that were the embryo of the company that was later formalized and thrived. The first pieces, mainly in the nightwear line, were designed (and modelled) by a friend and sewn in only two machines purchased with family support, along with a small amount of fabrics. Sales were made on a very experimental basis, in friends' stores and in the family circle.

The manufacturing activities, which began as a complement to Eleonora's professional life in the municipal school, gained momentum with the founder's creative enthusiasm and family support; but the teacher and designer had to choose between teaching and entrepreneurship.

With the success achieved by the first pieces, Eleonora felt encouraged to increase production, which required the collaboration of other professionals. Step by step Monthal developed a clothing line consisting mainly of nightgowns and pajamas and hired additional employees. Later it opened the first corporate-owned store in the city of Bom Jardim. The business grew and scaled up and the company was able to negotiate with its suppliers the purchase of exclusive prints, thus adding value and differentiation to its products.

More than 25 years later, Eleonora has no regrets about having chosen to produce and sell the items she has designed since then. Now headquartered in a central





building in the mountain town of Bom Jardim, with a street-facing store and industrial facilities on the upper floors, Monthal has six corporate-owned stores, and does not intend to stop there. The brand is present in all regions of the state through sales representatives, who are responsible for the sale of 72,000 pieces annually. More recently, the company has started to conduct surveys and training to operate in foreign markets.



NEW TRENDS

The trends of society, customs, habits, lifestyles, consumption and social life naturally interfere with the way people dress. Sleep-only clothes began to be used to stay comfortably at home. Changing clothes to entertain company or make a quick run to the store has become an inconvenience and led to the emergence of the so-called home wear – a segment that is an offshoot of nightwear, which has become a comfortable and elegant outfit and acceptable in more informal social occasions.

This trend in home wear (or underwear), therefore, is far from being an invention “concocted” by designers or people from the garment industry. It corresponds to an increasingly frequent lifestyle, in which the distinction between the time to stay home and the time to be at work has been replaced by various types of intermediate situations.

The house has also become a home office. When at home, whether working or not, people are frequently meeting with their children’s friends and often with these children’s parents. The strict distinction between home wear and other clothing items has become increasingly inadequate and impractical.

There was a promising field between these two extremes of the clothing spectrum, which Monthal and its founder, a determined entrepreneur, set out to explore.

A curious fact that happened during the 2012 floods confirms this trait of Eleonora’s character. Monthal was going to participate in FENIN, a major fashion fair held in Gramado, in the state of Rio Grande do Sul, when the tragic flood hit Bom Jardim and six other cities in the mountain region of Rio de Janeiro, causing 918 deaths and leaving more than 30,000 people homeless.

To get from home to the company, Eleonora had to cross a river in a Fire Department boat and then climb a hill just to



find the factory completely flooded. Even so, she managed to salvage the items she needed to showcase at the fair – and it was thanks to the orders received during that event that the company was restructured.

COMFORT AND STYLE

Monthal was one of the first companies to foresee the consolidation of the home wear trend in Brazil. There are many manufacturers of sleepwear, but Monthal had, from the beginning, developed items for a customer segment that demands high-quality materials, comfort and style.

What could be called sophistication, but perhaps could more properly be described as excellence in quality, was the intermediate step that helped Monthal prepare for

Monthal was one of the first companies to foresee the consolidation of the home wear trend in Brazil, developing items for a customer segment that demands high-quality materials, comfort and style.



venturing into home wear, a clothing style that caters to different situations – at home and out and about, resting or working, alone or with company. The ideal clothing that suits the practicality of contemporary life has become the centerpiece of Monthal's design, product development and business model.

Commitments to environmental and sustainability values have inspired the launch of products aimed at children and at those increasingly popular family friends: dogs and cats. This is a product line that uses the same fabrics and prints in child and pet outfits.

This solution entails two important gains. The first gain is the creation of a new product line with a strong appeal



from a segment of society that, as it is well known, is extremely devoted to their pets, which are often treated almost as family members. By matching prints in family and child outfits to those of animals, Monthal creates a differentiating element for its brand, while stimulating new purchases by customers and attracting new consumers. And what is even better – the new line increases sales, but costs are reduced as the raw material is fabric remnants. This of course improves the company's profitability while retaining customer loyalty and promoting the brand.

The second gain, no less important than the first, is the transformation of an industrial process waste into raw material at zero cost (or negative cost, considering transportation costs and proper disposal). There is an economic gain for the company, of course, but there is also an environmental gain. As fabric remnants are in many cases made of artificial or synthetic materials (of fossil origin such as polyester and polyamide) of very slow decomposition, their disposal in landfills poses a major environmental problem, making its use in the process itself highly recommended in terms of sustainability.



INNOVATIVE REUSE

The topic of sustainability goes beyond the use of fabric remnants to produce small clothing items for children and small pets. Manufacturing small pieces from fabric remnants still produces more fabric remnants, which are too small to produce other garments. What to do? Monthal's answer was the ReBOARD project¹, based on a graduate thesis in production engineering that aims to reuse these wastes to manufacture other products. Fabric remnants combined with resin gain new life and use by being transformed into design objects such as costume jewelry and furniture, for example.

With the ReBOARD project, fabric remnants combined with resin gain new life and use by being transformed into design objects such as costume jewelry and furniture.

Monthal also invests in educational activities in the municipality to raise awareness among children and young people about the principles that guide the company's actions. These actions, which are so important in any community, are even more effective in municipalities like Bom Jardim,

¹ Available at: <<https://www.monthal.com.br/projetoreboard/>> (Accessed on December 10, 2018).



a small community where distances between people and social groups are shorter, where the people who work at the company are the mothers and fathers of those attending the nearest school.

With Nova Friburgo, an important underwear production cluster that predominantly uses artificial and synthetic fibers, as the region's nucleus, disseminating the concepts of reuse and recycling is crucial to ensure sustainable paths for the region's economy.

The path trodden by Monthal's bears the marks of its founder's entrepreneurial determination and of the innovation built by the perception of untapped opportunities. Both are present and explain the success of the company and its products. From more elaborate articles of excellence in quality, the company was able to create a product line in which this quality explores an emerging niche of new lifestyles and new consumer items. Aware of her corporate responsibility, Eleonora Erthal has succeeded in combining contemporary and environmental values by advocating sustainability in her business and in the lives of her fellow citizens.

Product Innovation

- Mogi Guaçu (state of São Paulo)
- Small enterprise
- 25 employees

From reverse engineering to products for electricity distribution utilities, a small company from São Paulo develops innovations that help fight losses.

MONTREL
TECNOLOGIA





ENERGY TO SAVE ENERGY

Montrel is a small company founded and headquartered in Mogi Guaçu (state of São Paulo) that develops and manufactures audiovisual beacons and equipment to assist electricity utilities in their effort to reduce revenue losses.

Mogi Guaçu is a traditional industrial cluster located 200 km from the state capital, towards the north. The region, once a traditional coffee-producing center, has a considerable number of old industries and a younger network of companies that migrated from the São Paulo metropolis, as well as others that resulted from the rearrangement of the industrial and technical competencies of this entanglement. The cluster was stimulated and energized by vocational and technical education institutions, which make up a vital foundation for the economic system of the region's network of medium-sized cities.

The two founding partners of Montreal spent most of their professional lives in a large, traditional international pulp and paper manufacturing company. As the persons responsible for various activities related to the maintenance of industrial electronic equipment, José Carlos Valério and his former partner faced the difficulties related to electronic devices and equipment in a period of shortage of components and poor access to imported items. This situation unveiled at least two qualities that characterize Montrel entrepreneurs: the skillfulness to promote reverse engineering to recreate different types of equipment with some sort of attached electronic device; and the ability to identify opportunities for innovation in products and equipment at the industrial level. For these industrial maintenance enthusiasts, possible paths stem from necessity: the factory cannot stop.





Reverse engineering is a term with many different meanings. In a shallow version, it is simply and purely a copy. However, to copy one must learn, decipher, understand, and know the requirements and functionalities of each component and of the system in which they operate, jointly and in a coordinated manner. Just like a skilled artist, a musician or a painter develop and build their skills by repetition, reverse engineering allows a technician or a company to develop technical skills, possibly to replicate something, with adaptations imposed by (un)available resources, to only then develop original solutions.



Such set of skills, so underrated in the case of reverse engineering, formed the technical foundation of the two mates who would later make their way out of the company where they met to pursue their entrepreneurial careers.

The partners looked for new opportunities based on overcoming obstacles. It was in the search for this other dimension of entrepreneurship and construction of their own path that the two decided to create an enterprise: Montrel.



Dedicated initially and exclusively to the maintenance of industrial electronic equipment, the new company had as its first client its own company of origin, the large pulp and paper manufacturer, which for many years was the anchor company of an entire region, next to other manufacturers of ceramic tiles. The variety of industrial segments of the region's companies began to offer new business opportunities and new technical challenges that Montrel overcame, thereby building its technical reputation and expanding its business horizons. This was the trigger for putting manufacturing opportunities alongside maintenance services.

A new partner, José Brito de Andrade, also from the same pulp and paper company, joined his mates a few years later. The arrival of Eliana Zancopé, a professional with administrative and commercial background in multinationals, helped the partners think and discuss the direction of the company. The debate between different opportunities – both in services and in manufacturing – was shaping paths that differentiated and followed different directions. While the old partner chose the exclusive path of maintenance services, a fertile field in the region, the other two went deeper and deeper into industrial production. This is precisely where a trajectory of entrepreneurship and innovation opportunities begins.



THE FIRST PRODUCT

Montrel's first product was an industrial beacon. Although it is available on the market and manufactured (and imported) on a large scale, it is not always well adapted to Brazilian conditions and local industrial environments. Accumulated experience was very useful for manufacturing of this item, but it was even more useful for becoming acquainted with Brazilian manufacturing and production environments – a quality that Montrel had developed based on the original experience of its partners.

If it were impossible to compete in terms of production costs and sales price with products imported from Asia, it would be necessary to offer customers high quality products with functionalities that made sense for local environments and situations.



A new line of Montrel audiovisual beacons was then designed with distinctive features to suit a variety of applications, regardless of the type of environment and noise level. One of Montrel's products were prismatic lenses made of polycarbonate to ensure durability and impact resistance. High light intensity LEDs were another product designed to give maximum visibility in any environmental condition.

The sound module was designed "to meet customer needs including in places with high noise levels." Featuring a high-intensity piezoelectric siren that produces sounds of up to 110 dB, the equipment features volume control and different selectable tones, allowing for easy identification of each machine.

NEW CHALLENGE

Access to the industrial environment led to other problems as well as to new demands and opportunities. Chief among them was the demand from an electricity distribution utility that needed to identify technical problems – whether accidental or deliberate – that caused loss of electricity revenue.

The customer wanted a portable equipment to practically and quickly check electricity meters on site. The project had already been started by the utility's in-house team, which was looking for a company able to complete the development and with large-scale supply capacity. Montrel's well-established know-how contributed to forging the partnership.

The development of the equipment drove the search for employees with new talents and appropriate technological skills, among them Paulo Canavezi, an engineer who had once belonged to Montrel's staff and rejoined the company after a period as an independent entrepreneur.

The project seemed technically feasible, but there was still the commercial risk. The utility needed equipment that solved its problem of gauging electric meters. However, it could not place any pre-orders or guarantee future purchases. They would have to be made on a competitive basis and any other supplier, including from abroad, could submit a proposal and win the tender.

In assessing the technical, industrial and commercial risks, the entrepreneurial spirit prevailed and Montrel decided to move on with the project and take the risks. They were not irrelevant, of course, but the opportunity was worthwhile.

The first product developed in this line was the ADR M2000, which met what had been requested by the utility: a portable equipment capable of identifying inaccuracies in electromechanical or electronic electric meters. Success came immediately.

As an evolution of this concept, Montrel subsequently launched the ADR Multi4000, which is also a portable equipment that checks, in the field, deviations (errors) in consumption records without the need to turn off the consumer's electricity network. Furthermore, because it can be operated remotely through a tablet or smartphone and be installed in the dripper, the operator does not get in direct contact with the energized system during tests, thus ensuring occupational safety.

The ADR Multi4000 helps control and reduce commercial losses. The equipment features all interfaces, such as email, print support and various file formats, which can be integrated into the systems already being used by the customer.

An important differential of this equipment in relation to other imported ones available on the market, which still do not outperform it in terms of its many possibilities, is the price, which is substantially lower than that of competitors. In addition, Montrel offers after sales technical assistance, which is more complicated for companies that in many cases are not located in Brazil.

REAPING RESULTS

As a result of the launch of the ADR Multi4000, Montrel increased its revenue by 35% between 2015 and 2017, having maintained that pace also in 2018.

In late 2018, the company launched the ADR 5000, an electronic equipment with built-in operator interface and several upgrades to the ADR Multi4000, such as the embedded system with TFT liquid crystal display, which allows users to visualize magnitudes in real-time, the physical keyboard, and voltage connections and sensors for picking up marks and meter pulses. This eliminates the use of tablets or smartphones. The ADR 5000 enables generating field test reports and exporting them via USB to a flash drive.

The development of these projects took company time and resources and generated corporate tensions that were all but negligible. The equipment, however, produced technically consistent results, leading the utility, which was pleased with the rapid assessment of the technical

The ADR Multi4000 checks, in the field, deviations in consumption records without the need to turn off the consumer's electricity network.

As a result of the launch of the ADR Multi4000, Montrel increased its revenue by 35% between 2015 and 2017, having maintained that pace also in 2018.



problems provided by the equipment, to immediately purchase a sizable lot, followed by new orders. These sales have already enabled recovering the investment made to develop the equipment.

The news quickly spread in the industry and new orders from other electricity utilities increased Montrel's customer base. With additional features, new versions of the equipment have been designed and manufactured that improve operating conditions and results for companies.

Starting from a modest beginning, Montrel used innovation to reach a higher level by combining knowledge and determination, enhancing as well the product design and development capabilities acquired along the way.



Product Innovation

- Belo Horizonte (state of Minas Gerais)
- Large enterprise
- 22,000 employees

Construction company from Minas Gerais installs solar panels in the residential units it builds for the Minha Casa Minha program, based on a strategy aimed to improve access to homeownership by saving on electricity costs.





SUSTAINABLE ROOFS

MRV construction company, based in Belo Horizonte (state of Minas Gerais), specializes in the low-income segments of residential buildings, especially those linked to government programs (*Minha Casa Minha Vida*). The company's rapid growth until the outbreak of the economic crisis was accompanied by a process of standardizing solutions to optimize structural and architectural designs for greater operational efficiency.

Based on the strategy of reducing costs through operational efficiency and large-scale purchasing, the Minas Gerais-based construction company, which operates in much of the national territory, has also implemented innovations in its designs and buildings. Some of them are derived from other areas but are very useful to MRV's business segments and fulfill important functions in its business model.

Among the many innovations conceived and implemented by MRV during its growth and consolidation process as a segment leader is the production of renewable energy using equipment installed on the roofs of buildings. In this project, which is in its initial implementation stage, MRV installs on the roofs of the residential units it builds, equipment that captures sunlight and generates energy to initially meet the needs of common areas of a condominium, and may also supply energy to individual apartments in the following stages.

The equipment is not exactly an innovation, although the generation of photovoltaic energy has been advancing through technologies that increase revenues and reduce



costs. But its installation in MRV buildings fulfills an important function in its business model: cost savings by condominiums, which increases household income and thereby improves access to home ownership.

Thus, MRV is at the forefront of promoting the generation and distribution of electricity in condominiums, anticipating a future in which selling energy surpluses to the distribution utility and charging electric car batteries will become a reality.



ENTREPRENEURIAL PRINCIPLES

Some factors can be identified as responsible for MRV's extraordinary success: significant inventories of corporate-owned real estate in areas compatible with this type of enterprise; identification of the real needs of its customers; operational efficiency; standardization and optimization of structural and architectural designs; large scale purchases and supplies; and investments in staff training.

These are the guiding principles of the company, which today is led by two co-CEOs, both from the founder's second generation, who run a construction company that produces up to 40,000 residential units annually, typically in the segment of up to R\$200,000 per unit and just over 40 m²-large (2 bedrooms, 1 bathroom), financed essentially by Caixa Econômica Federal, with payback periods of up to 30 years and monthly payments between R\$500 and R\$600.

The remarkable growth of MRV, which is just shy of its 40th anniversary, started in 2007 when it went public, like many other companies in the sector have done¹. MRV bet mainly on the income bracket of categories 2 and 3 of *Minha Casa Minha Vida* beneficiaries. Thanks to this option, which was based on its analysis and ensuing strategy, the company

¹ MRV is part of BM & FBovespa's New Market and is traded under code MRVE3.



was less affected by the recent crisis. With very sound financial results, MRV purchased large amounts of land in very advantageous conditions when the market was shrinking – a comfortable situation that allows it to keep growing. Its “land inventory” is enough for the construction of over 300,000 housing units. Today, the units built by the company cover more than 150 cities in 22 states.

MRV’s area of innovation was formally established in 2012, but the company inherited a tradition of previously existing continuous improvement processes. The company’s Innovation Department, set up in 2017, reports directly to the vice president for production in Belo Horizonte, and currently has six employees, including engineers and business administrators. Its core competencies are in the fields of energy management, real estate development and market prospecting.



MARATHON OF IDEAS

MRV's Marathon of Ideas (Ideathon) is one of the important sources of its innovation process, capturing new ideas at each edition – around 300 or 400 ideas. In 2016, 22 of these ideas were implemented, including a prefabricated restroom, and a statistical study to define an optimal price for selling and generating photovoltaic energy per equipment installed on the roof of the residential units built by the company.

The Marathon of Ideas is preceded by MRV's ongoing concern about creating new business opportunities by stimulating the creativity of all its employees – from those who perform executive functions to those engaged in construction projects. The Marathon rewards good ideas based on open innovation assumptions, a concept that emerged at the University of Berkeley and stimulates the generation and mobility of knowledge in organizations. Knowledge generation, therefore, becomes everyone's job, rather than just of a specific department.

At MRV, all employees can submit ideas, but only those generated by people in positions below the coordination level are eligible for awards. The aim, therefore, is to encourage a constant flow of ideas from which, three times a year, the best ones are chosen to participate in the final phase, which will reward those ideas with the greatest potential for generating new business or improving existing ones.

The solar energy project is intended to offset about 80% of the energy used by the condominiums built by the company, by installing solar panels on the roofs of buildings, which in turn are connected to inverters that convert solar energy into electricity. This energy is then used in the common areas of the condominium. In a second phase, the project also plans to install panels in individual units, thus enabling reducing the energy bill for all.

All surplus energy that is generated throughout the day is transmitted to the local utility's distribution network. At the end of each month, the additional energy generated by the system is accounted for as surplus and deducted from the monthly electricity bill, which currently may cover the entire condominium and, in the future, individual units as well. Besides contributing to the environment, the system is an excellent source of savings for residents.

The generated energy is used in the common areas of the condominium. In a second phase, the project also foresees the installation of panels in individual units, thus reducing everyone's electricity bill.

CREATING A NEW STANDARD

The equipment itself is extremely conventional, imported from abroad (China) and installed by a specialized company. Although it brings no technological news, it plays an important role in MRV's condominiums, business model and philosophy. In a typical MRV-standard building built for *Minha Casa Minha Vida* (each building has 16 units), the photovoltaic energy production equipment costs approximately R\$8,000 and is manufactured with technical support from the Electric Energy Company of Minas Gerais (CEMIG), in compliance with the rules established by the National Electric Energy Agency (ANEEL).

Currently, all equipment suppliers are from China, which offers the most competitive options, according to MRV itself. It is not easy to measure the impact of the innovation represented by the installation of photovoltaic equipment in monetary or sales growth terms. However, by installing them MRV aims to "push the market", that is, to pioneer the deployment of innovations that will later become a market standard.

MRV is the first construction company in Latin America to introduce large-scale photovoltaic solar energy in the low-income housing industry. By 2022, the company expects 100% of new deliveries to be equipped with photovoltaic generators and, to that end, intends to invest R\$ 800 million.

Importantly, the process of installing photovoltaic energy in condominium buildings is no simple task. MRV had, for example, to forge a close relationship with the electricity distribution utilities that would install the equipment. The surplus energy generated by the condominiums is supplied to the grid, thus reducing the energy bill for common areas of the condominium. The operation will become even more complex when apartments are also included, allowing for individual price reductions².

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² The electricity energy compensation system was established in April 2012 by Resolution No. 482 of the National Electric Energy Agency (ANEEL), which began to regulate this type of energy generation for national energy utilities.

MRV'S SOLAR ENERGY AND PHOTOVOLTAIC PANELS

1. Photovoltaic panels capture sunlight and produce photovoltaic electricity.
2. The Solar Inverter connected to the panels is responsible for converting solar energy into direct current (DC) electricity, which is the standard used in the public grid.
3. After passing through the Inverter, the energy generated goes to the switchboard, reducing the amount of energy used from the distribution utility.
4. The energy generated can be normally used by electronic equipment, lighting and general appliances.
5. Unused energy is made available to the public grid.

Source: MRV.

Although small, the financial advantage contributes to the financial sustainability of the condominium and unit owners. Therefore, considering its customers as partners of the company is in tune with the philosophy that governs its projects, thus contributing to the soundness of its business model.

THINKING IN THE LONG TERM

The Minas Gerais-based construction company is well acquainted with Brazilian business cycles and does not want to be pushed into crises like those that affected so many other construction companies which, before MRV, experienced periods of accelerated expansion but failed to make the cut and plunged into hopeless crises. To avoid this fate, MRV seeks to develop a model aimed at promoting systematic improvements in its processes and in the quality of its buildings and units delivered to its customers. A building can be built quickly, but it will be a family's main investment and will have to last for many years, far longer than the 30-year financing period.

Although Caixa Econômica Federal pays for the construction company's investment immediately and financial debts rest entirely on the borrowers who purchase the housing units, MRV understands that the sustainability of the model depends on the delivery of housing units that last and have reasonable costs, including maintenance costs. Therefore, the company invests in initiatives that ensure these conditions.

One of the investments made by the construction company to ensure the long-term sustainability of its buildings and borrowing families is the training and qualification of condominium management professionals. There are obvious difficulties in managing condominiums of any standard, but they are more obvious and possibly more serious



in buildings and condominiums aimed at low-income populations. After all, with tighter budgets families will tend to avoid any expenses that burden family income.

Because some condominium expenditures involve conservation and maintenance – with direct and possibly increasing impacts over the medium to long term –, not spending correctly on proper maintenance items today could mean spending much more in the future.

This situation, of course, threatens the financial sustainability of condominiums and borrowers, as it can dramatically accelerate the deterioration of buildings and family assets.

Preserving the MRV brand and its business model therefore involves a long-term strategic element, even if all its businesses are liquidated as soon as the buildings are delivered, and the families receive their units and corresponding debts.

IN TUNE WITH THE FUTURE

It is quite clear that the model designed and implemented by MRV is in tune with the future. The amount of energy produced is still small and its reinsertion in the distribution utility's electricity grid is a limited process. However, the distributed generation model is an emerging reality and should profoundly affect many of the known standards. On the one hand, residential units will become energy production units for self-consumption and sale, but also, for instance, for charging the batteries of hybrid or electric cars.

Another factor that can be observed in this project is that there are important tax gains, because when the energy is generated and consumed at the same location, the legislation exempts consumption from state taxes related to the Tax on Circulation of Goods and Services (ICMS). Although the amounts seem small at first glance, this initiative enables low-income consumers to use tax benefits that are typically only used by large companies.

For this reason, it can be said that the innovation introduced by MRV for solar energy production in its buildings is perfectly aligned with its business model and its vision of the future and committed to the sustainability of the company, its customers and the financial agent. Furthermore, it is an idea that energizes one of the most successful construction companies in the country.

Process Innovation

- São Paulo (state of São Paulo)
- Large enterprise
- 6,300 employees

Cosmetics company develops innovative process to identify new uses and properties of Amazonian biodiversity assets.





SCIENCE AND BIODIVERSITY AT THE SERVICE OF INNOVATION

Natura is the leading Brazilian company in the cosmetics industry¹. It was established in São Paulo in 1969, from a laboratory and a small store. Today it has 1.7 million consultants in Latin America, 6,300 employees, 45 corporate-owned stores, and a growing online sales operation through the Natura Network. It operates in nine countries – Argentina, Bolivia, Brazil, Chile, Colombia, United States, France, Mexico, and Peru. More than 80% of its formulations are plant-based, and its relationship with about 5,300 families to obtain biodiversity assets encourages production techniques that contribute to the conservation of 257,000 hectares of standing forest. In 2014, Natura became the first publicly traded company in Brazil to be certified as Company B, owing to its business model capable of generating a positive impact on society.

Innovation is integral to Natura's business strategy and results from a structured process: the company has two innovation boards that together employ 350 highly skilled employees – many of whom hold a doctoral degree.

The company used elements of Brazilian biodiversity as a platform for the development of new technologies and products, which put it at the forefront of industrial leaders in the country when it comes to "innovation."



¹ Source: **Valor Econômico**. Natura supera Unilever e volta a liderar mercado. 2018. Available at: <<https://www.valor.com.br/empresas/5458199/natura-supera-unilever-e-volta-liderar-mercado>> (Accessed on November 26, 2018).



GENETIC HERITAGE

Brazilian biodiversity is admittedly very rich, with enormous potential to inspire the creation of new technologies and new sustainable products. Brazil is a country of continental dimensions, with 8.5 million km² covering almost half of South America and various climate zones – from the humid tropics in the North to the semiarid regions in the Northeast and temperate areas in the South. Obviously, these climate differences entail great ecological diversity, forming very distinct biogeographic zones or biomes: the Amazon Rainforest, which is the world's largest rainforest; the Pantanal region, which is the largest floodplain; the Cerrado, with woodlands savannahs; the Caatinga, with semiarid forests; the Pampas prairies, and the Atlantic Forest. In addition, Brazil boasts a 3.5 million km² coastline, also formed by a great diversity of ecosystems, such as coral reefs, dunes, mangroves, lagoons, estuaries and marshes².

The variety of biomes reflects the enormous richness of Brazilian flora and fauna: over 20% of the Earth's total number of species are endemic to Brazil, earning the country the leading position in terms of biodiversity. Like no other company, Natura knew how to tap into this potential when compared to its competitors or even to other large Brazilian industrial groups. It is the private company with the largest number of authorizations for accessing Brazil's genetic heritage and associated traditional knowledge, issued by the Genetic Heritage Management Council (CGEN). In addition, Natura is the leading company as regards sharing benefits with traditional communities in Brazil.

The great wealth of Amazonian biodiversity has encouraged the company to develop a Research and Development (R&D) strategy based on the exploitation of the region's wealth. Recognizing the importance of this ecosystem for



² Source: MMA. **Biodiversidade brasileira**. Available at: <<http://www.mma.gov.br/biodiversidade/biodiversidade-brasileira>> (Accessed on November 26, 2018).



the country and the world, as well as for the development of a new business platform in the Personal Hygiene, Perfume and Cosmetics (HPPC) industry, Natura chose the region with the richest biodiversity in the world as one of the priority areas for its expansion.

The launch of the Ekos line in 2000 symbolized the company's pioneering spirit in tapping into Brazilian and especially Amazonian biodiversity assets, bringing together the best of nature and science in innovative cosmetic products.



AMAZON PROGRAM

A decade later, this commitment was strengthened through the Amazon Program, which has already brought more than R\$1 billion in business to the region, ensuring the viability of a business model in which the forest is worth more standing than felled. The Amazon Program is based on three main lines of action: i) Science, Technology and Innovation (ST&I); ii) Sustainable Production Chains; and iii) Institutional Strengthening. Its main objective is to generate new business from new technologies, arising from the production and combination of knowledge, ideas and initiatives. The program also aims to create opportunities for organizing the communities the company works with to create proposals for regional development in tandem with governments, communities, non-governmental entities and universities, among other social actors.

Since 2001, Natura has adopted the open innovation model, expanding its limits for networking with different partners such as research institutions, large companies, startups, specialists, government agencies, communities, and professional associations. Since 2012, it has been keeping an innovation hub in the Amazon region, currently located in Pará, inside the Ecopark, in the region of the state capital Belém.

With the development of new research and innovative activities, Natura intends to contribute to stimulate the establishment of local researchers and scientists in their region of origin.

In 2018, Natura received a new international certification by the Union for Ethical Biotrade (UEBT)³ in Paris, for its natural ingredients supply system in the Ekos line products. In addition to this seal, in 2018 Natura received the recertification, also by UEBT, for the verification system of its direct relationship chains, in a process that involves 70 ingredients, such as ucuuba (*Virola surinamensis*), murumuru (*Astrocaryum murumuru*) and andiroba (*Carapa guianensis*) and 34 agroextractive supplier communities.

INNOVATION PLATFORM

Recently, Natura's innovation platform based on the use of Brazilian biodiversity assets has risen to a higher level by incorporating new innovative capabilities based on scientific knowledge.

Prior to this change, the company's innovative process regarding the use of ingredients from Brazilian biodiversity had a unidirectional format, which always began with studies on the ethnobotany of each species – that is, with the understanding of traditional use and knowledge associated with each plant, produced and accumulated over generations in communities that have a synergistic relationship with biodiversity assets.

As one of the interviewed researchers stated, this new approach represents a paradigm shift in the company regarding the creation of new cosmetic and hygiene



*Natura's direct relationship chains involve 70 ingredients, such as ucuuba (*Virola surinamensis*), murumuru (*Astrocaryum murumuru*) and andiroba (*Carapa guianensis*), and 34 agroextractive supplier communities.*

³ UEBT is a non-profit organization that promotes supply with respect. The organization was created following an initiative by UNCTAD (United Nations Conference on Trade and Development) based in Geneva, Switzerland, to promote the use of natural ingredients, respecting people and biodiversity during the extraction process. UEBT, of which Natura is a founding member, supports and verifies companies' commitments to innovation and ingredient handling, so as to contribute to a world in which people and biodiversity can thrive. Certification audits are performed in all supplier communities, cooperatives, associations, and family farms from which Natura acquires its ingredients from Brazilian biodiversity. The certification is based on an innovative approach developed in 2016 between UEBT and Natura, combining UEBT's Ethical BioTrade standard with Natura's stringent supply requirements. Source: UNION FOR ETHICAL BIOTRADE. Available at: <<http://www.ebc.com.br/uniao-para-o-biocomercio-etico-uebt>> (Accessed on November 26, 2018).



products, thereby expanding the potential reach of the funds that the company invests in research, development and innovation (RD&I).

The evolution of the company's innovative platform based on biodiversity occurred from the systematization of the development and use of new advanced scientific knowledge from fields such as:

- Phytochemistry: identification and study of plant chemical components.



- Molecular biology: study of biology at the molecular level, with a special focus on gene and protein expression and evaluation of biological functions in bioactive modulated mechanisms.
- Metabolomics: field of science that aims to identify and quantify the set of metabolites – the metabolome – produced and/or modified by an organism. The metabolome represents the set of all metabolites in a cell, biological fluid, tissue or organism, substances that are considered the end products of cellular processes.

Thus, by resorting to fields of knowledge such as in vitro biological systems and biotechnology, the company developed a new platform for innovative products based on ingredients from Brazilian biodiversity.

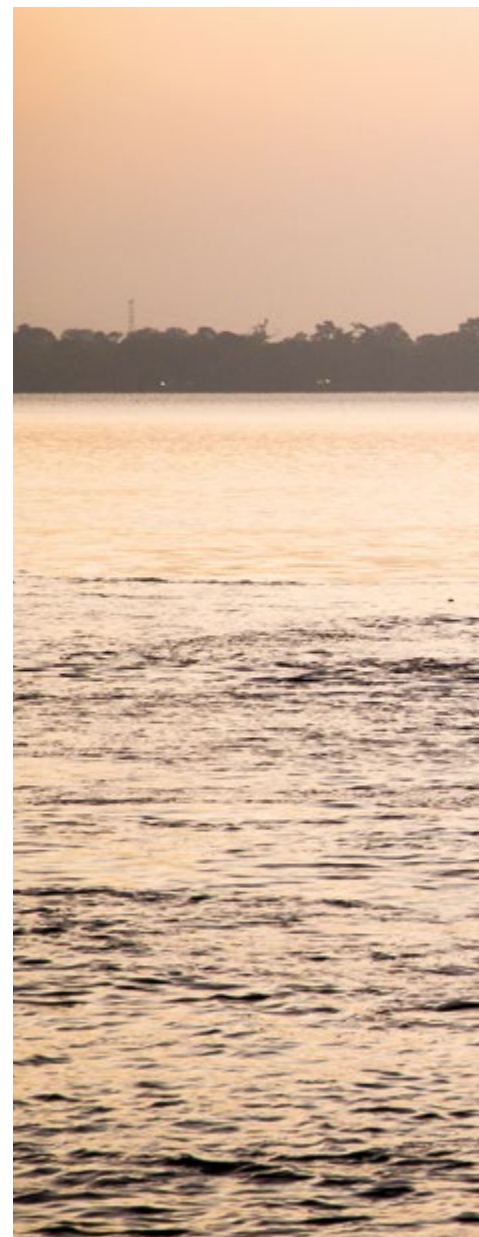
MULTIDIRECTIONAL PROCESS

The company has gone through a profound change of perspective with impacts on its innovation process, which acquired a multidirectional profile. Rather than developing products primarily from traditional knowledge and use associated with each ingredient of biodiversity, the company also began to look for new, unknown applications, other than those associated with the traditional use of each ingredient. This initiative resulted in the expansion of associated uses of ingredients of Brazilian biodiversity beyond the underlying traditional knowledge, based on increased molecular knowledge about the ingredients and their effect in living systems.

Clearly, this is not about neglecting the value of traditional knowledge generated by the communities with which the company works. However, notwithstanding the enormous wealth of Amazonian biodiversity, the number of ingredients is obviously finite, as also are their associated traditional uses. There is, therefore, an inherent tendency that the unidirectional research model will yield decreasing returns as possibilities for exploiting associated traditional uses are exhausted. Thus, the adoption of the new approach – multidirectional and multidisciplinary – allows the company to increase the returns of its research and development activities, thus contributing to generating wealth in the country and valuing Brazil's natural wealth and biodiversity.

An illustrative case of this change in perspective is patauá⁴. This ingredient, the fruit of a palm tree, is found throughout

⁴ The patauá palm, which goes by the scientific name of *Oenocarpus bataua*, is one of the Amazon's plant species. A high-quality oil, rich in fatty acids and similar to olive oil, is extracted from the pulp of its oval fruits, which measure up to 3.5 cm.





the Amazon region. Traditionally, it is used in different communities for washing and moisturizing hair. From studies dedicated to surveying other properties of the oil using techniques based on frontier science, Natura has developed a hair tonic to accelerate hair growth. Patauá crude oil prolongs the anagen phase, thus promoting faster and stronger hair growth.



TRUSTING RELATIONSHIP

This change in perspective of the innovative process brings new challenges (and new opportunities) to the company's operation. Exploiting the new properties of each ingredient precludes the use of conventional sources (the processed vegetable oils supply market) for obtaining inputs, for example. The process of refining the oil for its homogenization inherently involves the loss of natural substances with unique and important cosmetic properties. It is therefore necessary to build new channels for obtaining the raw ingredient (or unrefined oil), which may seem a simple task but is a complex one.

The evolution of Natura's innovative platform based on biodiversity has only been possible because over the last decades the company has built a close and trusting relationship with the communities in which it operates. This type of relationship, which guarantees safe channels for obtaining quality inputs, can only be built in the long term, based on mutual respect and synergistic cooperation.

It is therefore a process that involves training and developing suppliers, which is inseparable from the innovation addressed in this chapter. Natura's new product platform takes the use of Brazilian biodiversity knowledge to a new level that, no matter how new and higher it is, does not dispense with the knowledge acquired and developed in the company's previous stage. It is the vast knowledge of the natural development conditions of each plant species of interest and of the mechanisms of its biological action, that allows Natura to define its strategy for valuing the natural resources of Brazilian biomes.

The evolution of Natura's innovative platform based on biodiversity has only been possible because over the last decades the company has built a close and trusting relationship with the communities in which it operates.

Product Innovation

- Maceió (state of Alagoas)
- Medium enterprise
- 40 employees

Company from Alagoas develops ecothermal box, which replaces with great advantages Styrofoam, a known pollutant.

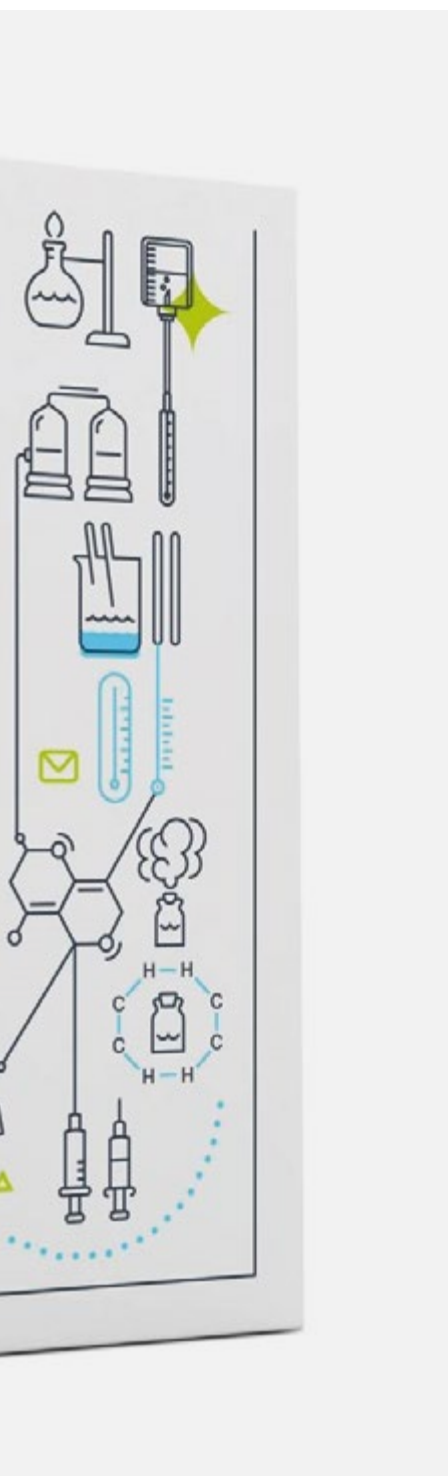




SUSTAINABLE PACKAGING

Norvinco has developed an innovative solution for the safe packaging and transportation of thermosensitive products: the ecothermal box. It is an alternative to expanded polystyrene (Styrofoam) packaging, which is known to cause environmental impacts due to improper disposal and the long time it takes to break down in the environment. In the plastics category, expanded polystyrene has an even more undesirable effect – it fragments easily, making collection even harder. Furthermore, these fragments are ingested by fish and marine life, causing their premature death.

The ecothermal box resulted from the combination of Norvinco's expertise in corrugated packaging and the demands of customers eager to overcome the impacts of the conventional fossil solution. The packaging created is a hybrid solution that combines plant fibers with reusable and recyclable polystyrene boards. The innovation promises to be a step forward in sustainability for a broad category of customers who want to reduce their carbon footprint and add environmental value to their products and brands.





AN ENTERPRISING COUPLE

Norvinco's trajectory combines the solid technical background in structures and constructions of its founder, the Swiss-born Jurg Hassenstein, with the management skills of his wife Cristina, who runs the company founded in Maceió 25 years ago. The couple succeeded in combining, with economy of resources and moderation, the technical rigor and quality values and ideals assimilated in Europe. Hassenstein and Cristina met in Rio de Janeiro in 1978, where they lived until 1981 and he worked in his area of expertise. The two moved to Switzerland in early 1982 to deepen their studies and gain more knowledge and work experience. As the son of a family dedicated to the hotel industry, Jurg followed Cristina when she chose to return to her homeland in 1989.

When the opportunity arose, the couple returned to Cristina's hometown to create the company, with the dual purpose of creating a productive activity and a high-quality business experience and contributing to regional development by becoming part of the economic and social environment and valuing local culture. The company's physical and human environment attests to this way of being – a modern manufacturing complex, with offices that show the company's ties to the land by exhibiting works by local artists and the region's well-known handicrafts.

Norvinco – the name is combination of the prefix of Northeast with the word Vinco that defines the core technique for the construction of carton packs – was founded in 1993, following a work project that allowed Hassenstein to become acquainted with the printing industry and visit an international sector fair.

SOCIAL AND ENVIRONMENTAL RESPONSIBILITY

The company's mission, as established in its strategic planning, is to "develop and produce solutions in corrugated cardboard packaging and artifacts with design, innovation and social and environmental responsibility, thus contributing to the competitiveness of customers." To fulfill this mission, the company is anchored in knowledge-gaining processes with customer inventory management and tracking, which enable it both to plan production in a more streamlined and economical manner and constantly prospect and monitor its core markets of operation.

Norvinco, in a way, "horns in" fields that could appear to belong exclusively to its customers. But it is the understanding of the needs of these customers, and often of their customers' customers, that provides the information, the knowledge and the relationship base to anticipate demands and gain recognition and a high

The company is anchored in knowledge-gaining processes with customer inventory management and tracking, which enable it both to plan production in a more streamlined and economical manner and to constantly prospect and monitor its core markets of operation.



level of business loyalty. The robust client portfolio, made up of large companies, including national and multinational companies operating in Brazil, is the most visible result of this strategy.

Norvinco's work methodology includes a phase of analysis of its customers' packaging and its qualities, costs and shortcomings. This careful and critical analysis serves as input for the development of solutions that overcome possible flaws and meet customers' needs – which are not always clearly stated.

This process, however, is not without hurdles. It is not always easy to overcome the barrier of the buyer who is focused exclusively on the price criterion and sensitize

those professionals with technical training and business understanding who are able to understand and value better solutions. Thanks to the company's reputation, technical sales are advancing, and the customer base is growing steadily, supported by the success of the solutions recognized by customers.

COMMUNITY CULTURE

The values of community culture and the associative spirit of Hassenstein and Cristina have enabled their rapid integration into the business community of Maceió, both in the Federation of Industries and in the Association of Governador Luiz Cavalcante Multisectoral Cluster (ADEDI), where the company is located. Norvinco today has 40 employees, including a design team and a researcher who is responsible for the development of the ecothermal box, which is the topic of this chapter.

Because it was well acquainted with its customers profile and their unmet or poorly met demands, the company saw the opportunity to improve packaging for refrigerated items, traditionally made of expanded polystyrene, known as Styrofoam, which has harmful effects on the environment.

This type of packaging is often reused and then disposed of improperly, causing serious environmental impacts on wildlife, rivers, beaches and nature's cycles¹. In Brazil, according to a study by the Federal University of Rio Grande do Sul (UFRGS), the use of Styrofoam currently reaches 36,600 tons/year²; in 1992, it totaled 9,000 tons/year. The estimated time required for it to fully break down in the environment is around 150 years³.

A TIMELY INNOVATION

It was the environmental values shared by Norvinco's executives that sparked interest in the development of environmentally friendly packaging that could overcome the drawbacks of the more traditional solution.

1 The seven billion human beings that currently make up the planet's population produce 1.4 billion tons of solid waste per year — an average of 1.2 kg per capita per day (FEDERAL SENATE, 2017). About 800 million tons per year are landfilled worldwide. The United Nations (UN) estimates that four billion tons of urban waste will be produced by 2050. (FEDERAL SENATE. Available at: <<https://www12.senado.leg.br/emdiscussao/edicoes/residuos-solidos/mundo-rumo-a-4-bilhoes-de-toneladas-por-ano>> (Accessed on August 10, 2017).

2 Source: Available at: <<https://www.ecycle.com.br/209-eps-isopor.html>>. Accessed on August 10, 2017.

3 A Senate Bill (719/2015) by Senator David Alcolumbre (DEM/AP) proposes a ban on the marketing and use of polystyrene packaging and containers intended for packaging food and beverages, due to the deleterious damage associated with this type of material.



The ecothermal box uses a thermal insulator derived from PET wool developed from recycled plastics, as well as corrugated board and air. The product can be disassembled and allows customization in terms of size and visual identity. And its cubage – the ratio between its weight and the space it occupies – is lower than that of Styrofoam packaging.

Norvinco's innovation uses a thermal insulator derived from polyethylene terephthalate or polyester (PET) wool, meaning that it is a product developed from recycled plastics, which is in line with the concept of circular economy⁴.

In addition to PET wool, which is the main insulator, the hybrid thermal insulation system of the ecothermal box also includes corrugated board and air. The solution developed by the company allows customizations according to different needs, in terms of either size or visual identity. Customers can also reduce transportation costs because the cubage – the relationship between the weight of a product and the space it occupies inside the vehicle – is lower than that of Styrofoam packaging.

Because it can be disassembled, the ecothermal box also enables reducing the storage volume, thus facilitating

⁴ Circular economy is a concept that involves maintaining the use of resources for as long as possible by minimizing their disposal, using them in the most efficient way and reclaiming and regenerating products and materials throughout their life cycle.

non-disposal until the next use. These elements represent hidden costs of the conventional solution, which are not always properly measured and evaluated by companies. The availability of packaging storage area, for example, is hardly considered in the cost comparison between two packages. For these reasons, Norvinco's innovative solution requires a relationship with the customers' technical areas rather than just with the purchasing sector.

Finally, Norvinco's ecothermal box for the transportation of thermosensitive products can be customized in terms of size and print, disassembled, reused, and recycled, with proven efficiency to meet the needs of different temperature and technical conservation profiles. It ensures an inside temperature between 2°C and 8°C for 48 hours.

The pharmaceutical industry, pathology diagnostic laboratories and the food industry are among the main customer segments of Norvinco's innovative solution. These are companies whose products require proper transportation and packaging, and which are willing to add the intrinsic qualities of the new product, in addition to its environmental appeal.

SUPPORT FOR INNOVATION

To develop this solution, Norvinco faced and overcame several hurdles with the resources and skills of both the company itself and outside supporters. The *Inova Talentos* program, linked to the Enterprise Mobilization for Innovation of the Industry System's Euvaldo Lodi Institute (IEL), was important to enable hiring a professional fully dedicated to researching and developing solutions to the technological challenges of the new product. The fellow was awarded the Prêmio Artigo Destaque (Best Paper Award) of the *Inova Talentos* program, for the project "Technology for Packaging and Transporting Thermosensitive Products."

It is important to note that IEL Alagoas participated from the project's design stage, including the selection of fellow Aline da Silva Sampaio – who holds a Master's Degree in Chemical Engineering from the Federal University of Alagoas (UFAL) and is a graduate student in the MBA Leadership in Innovation program at the Faculty of Industry (IEL) – for the project's final stage⁵. Norvinco also benefited from the support of other institutions, in particular the Alagoas Development Agency (DESENVOLVE).

While external support is not always adequate in terms of size and timeframe, it has been important in stimulating the allocation of funds for innovation. It shows that there are still many opportunities for improvement in the Brazilian innovation scenario, a proposition that is valid for all regions, especially those where research and development (R&D) and support from funding agencies are less consolidated.

⁵ The Inova Talentos Award is an initiative of the Enterprise Mobilization for Innovation (MEI), implemented by the Euvaldo Lodi Institute (IEL), with the support of the National Confederation of Industry (CNI). It also has a partnership with the National Council for Scientific and Technological Development (CNPq) and the Ministry of Science, Technology, Innovations and Communications.

LAUNCH

Launched in the market in May 2017, at an international technology fair for the pharmaceutical industry, the ecothermal box already shows extremely promising results. Norvinco expects to pull in R\$4 million in revenues with the new product as early as 2019, which accounts to 30% of its total revenue. Not bad for a company that is just beginning to arrow down into the world of innovation.

Recently, Norvinco's ecothermal box was also awarded the official Green Seal and certificate from the Chico Mendes Institute, a non-governmental organization founded in 2004 to promote sustainable development.

Norvinco's ambitions don't stop there. The knowledge accumulated with the new product already suggests that its refrigeration time can be extended – and efforts in this regard have begun through the encouragement and promises of purchases by customers who endorsed the current version but would still like to see an even better performance. The constant pursuit of improvement is the basic principle of innovations that really make a difference.

Norvinco is now dedicated to doing that, hoping to count on the most appropriate involvement of instruments of national and regional innovation support systems. Strengthening these ties will enable giving more appropriate contours to those who need support to invest in innovation, especially smaller enterprises and those that are not located in the most visible and favored environments. A true national innovation system will then be able to thrive alongside regional systems.

Product Innovation

- Manaus (state of Amazonas)
- Small enterprise
- 40 employees

Small company from Amazonas promotes alliance between local biodiversity and scientific knowledge to diversify a wellness product line based on forest assets.





AMAZON BIOACTIVES

Amazonian biodiversity is one of the great hopes of Brazilian development. Many individuals, institutions, and companies are dedicated to enhancing this idea, which is increasingly recognized in Brazil and the world, sometimes for complementary reasons.

Among those well acquainted with this wealth of Amazonian biodiversity is pharmacist Schubert Pinto, professor at the Federal University of Amazonas (UFAM), who added to his university scientific and technological trajectory the enthusiasm for valuing regional wealth.

One of the motivations is, of course, the grandeur of the forest and its collection of secrets, mysteries and wealth. It was this enthusiasm, the result of a life in the Amazon region and an academic career, that converted him, in 2001, into the entrepreneur who founded Pharmakos D'Amazônia to explore his knowledge and apply it to the cosmetics and personal care industry.



Pharmakos D'Amazônia's small regional unit dedicated to handling regional extracts and substances, with rustic and unprofessional equipment for testing and producing small batches, has in a few years become a unit at the Business Incubation and Development Center, where public support was added to the entrepreneurial spirit and scientific and traditional knowledge to strengthen the enterprise.

From the first massage and body-care creams, Pharmakos has evolved into a diversified product line, with forest





biodiversity at its core. Throughout the trajectory of this small company, the knowledge about the design and manufacture of new products has been enhanced and enriched by commercial, financial and regulatory competencies. The support of public institutions, including the Brazilian Micro and Small Business Support Service (SEBRAE) and the Euvaldo Lodi Institute (IEL), is recognized as an essential foundation for the company's consolidation.

The example set by Pharmakos helps to shed light on one of the ways to enhance the value of Amazon forest resources. The recognition achieved from winning a good number of awards shows, ultimately, that forest and knowledge can come together to create wealth and sustainability. Pharmakos D'Amazonia, a genuinely Amazonian technology-based company focused on innovation, won 1st prize in the Abiphec Award – Entrepreneurship Category. It also won the FINEP Award (Funds for Studies and Projects) for the North region in 2004, 2005, 2006, 2008, 2010 and 2012. In 2017, it won in the Innovation and Marketing category and was a finalist in the Product Innovation category of the National Prize for Innovation (PNI).



The product line was diversified through a research and innovation project funded by FINEP that led to the production of four colognes with an Amazon look. Developed with native aromatic bioactives (cumaru, preciosa, priprioca, and patchouli), the colognes smell of forest. The products add other values to their handcrafted packaging, which is lined with buriti straw and includes an indigenous ornament and a lid made of wood waste. The names of the products are also of indigenous origin: Kaioé, Kuite, Kumatê, Kumarú, in recognition of the value of the roots and culture associated with them.

ACADEMIC BASIS

Pharmakos' pioneering entrepreneur is a descendant of an Amazonian family of many generations. Born in Careiro, a town located a hundred kilometers from Manaus, the choice of his son's very original name was influenced by a German pastor who travelled around



the region. It was at the insistence of his family, especially his teacher mother, that young Schubert devoted himself to his studies and pursued a teaching and research career at the university. It was amid very active academic work on knowledge of biodiversity products and their aesthetic and medicinal effects, that Schubert decided to create the company entirely focused on the rational and intelligent use of local resources.

Pharmakos D'Amazônia's first product was a copaiba oil-based refreshing gel that can be used mainly for massage. Copaiba oil is a resin oil extracted from the trunk of the *Copaifera multijuga*. Technically, the term oil-resin would be more appropriate, since the extracted product contains resinous acids and volatile compounds¹. The product was manufactured in small quantities in makeshift facilities adjacent to the house and informally sold by a single freelance salesman in downtown Manaus. This experience, although unique, was key for developing new skills.

The learning of artisanal production occurred in the comings and goings between the university laboratory and the company's makeshift facilities. However, it was the knowledge of the market acquired through direct contact with consumers that enabled identifying other possibilities when the company heard of *Mercadão da Beleza* (Beauty Market),

¹ There are several types of copaiba oil, with different concentrations of active ingredients determined by edaphoclimatic factors. The oil contains diterpenes, substances with anti-inflammatory and antiseptic effect. Several studies have sought to determine the benefits of copaiba oil, including anti-inflammatory action, central nervous system protection, and the presence of inhibitors of various cancers.

officially called Adolpho Lisboa Market, with its art nouveau architecture and a large and diverse customer base. There, Pharmakos was able to assimilate preferences and trends and perceive opportunities.

With more information and skilled staff, the company gained new momentum and began to expand its product line as new challenges emerged. Growing required a different degree of organization and systematization of procedures than that of the early stages of a micro-enterprise run by a professional determined to bring his teaching and research experience into the world of production and sales, which he did by impulse and improvisation.

Consolidating the company also required progressive entry into the world of formality and official regulations for nature's products – challenges that led to the expansion of the management team and training for new roles and activities. Since its inception, Pharmakos' growth and consolidation trajectory has been largely supported by institutions promoting industrial development and micro and small enterprises (MSEs).

GROWTH

The transforming element in Pharmakos' trajectory was its establishment, in 2001, at the Business Incubation and Development Center (CIDE), which had been opened two years earlier with the aim of stimulating the creation of local companies, mainly technology-based ones dedicated to innovation that could contribute to the development of the Amazon region. CIDE brings together more than a dozen institutions that support the development of a production and innovation ecosystem, revealing a vocation for areas related to Pharmakos' activities: biotechnology and fine chemistry (alongside agribusiness and information technology).



The transforming element in Pharmakos' trajectory was its establishment in 2001 at the Business Incubation and Development Center (CIDE), which had been opened two years earlier with the aim of stimulating the creation of local companies, mainly technology-based ones dedicated to innovation that could contribute to the development of the Amazon region.



The identity between Pharmakos and the Center facilitated the company's subsequent development, marked by business evolution and market recognition. Later, in 2008, Pharmakos moved to the Micro and Small Business Industrial District (DIMPE), an initiative of the state government of Amazonas to house and stimulate the development of micro and small enterprises. Pharmakos' manufacturing, commercial and administrative facilities are still there.

The company started its production and sales growth phase accompanied by diversification and the launch of new products. It also enhanced its internal structuring by hiring new experienced professionals. The son, Schubert Pinto Junior, an economist with a graduate degree in entrepreneurship, and the daughter Samara Pinto, a pharmacist, cosmetologist and manager of Schubert's company, also joined the team, with responsibilities in the commercial and management areas. As a result, the founder of Pharmakos was able to devote himself more vigorously to developing new technological skills and new products. Reumatgel and Intimusderm are two examples of this generation of products.

However, the overlapping of properties of some Pharmakos products with the health area made it difficult to comply with regulatory requirements imposed by the National Health Surveillance Agency (ANVISA). Pharmakos then decided to stay true to the original area of activity that had catapulted the company to winning industry recognition, thanks to accumulated knowledge and skills.

After all, one of the main difficulties facing small companies is the dispersion of efforts between different areas, activities and initiatives. This lack of focus requires tremendous efforts to achieve results, reducing opportunities to accumulate experience, increase productivity and improve economic returns in their priority activities.

Pharmakos currently operates in three main market segments that have important overlaps in terms of scientific and technological inputs and marketing strategy. In the perfume segment, the company produces colognes with products and smells of the Amazon region. In food, it offers spices, herbs, fruits, oils, and aromas of the forest. Finally, in the phytocosmetics segment, the company produces cosmetics with natural active ingredients and formulated with plant oils and extracts, without causing degradation or pollution to the environment.

CROSSING BORDERS

The attractiveness of the portfolio of products and the differentials related to its Amazonian origin created the conditions for Pharmakos to pursue new horizons. The company, already present in the North and Northeast, is expanding its operations to other Brazilian states as well as to the international market, which tends to value the guidelines of sustainable development, prestige to local resources (including human resources) and preservation of the environment.



Pharmakos operates in the perfume segment with colognes containing ingredients and scents of the Amazon region; in the food segment with spices, herbs, fruits, oils, and aromas of the forest; and in the phytocosmetics segment by producing cosmetics with natural ingredients formulated from plant oils and extracts.



The company already has five distributors in the United States (USA) and launched its first pilot export in 2017. Its participation in the Beauty World Middle East, a beauty industry fair held in Dubai, in the United Arab Emirates, showed that there are opportunities outside Brazil to be explored systematically, by taking advantage of the Amazonian appeal and also of the innovative vein of the company, which owes 25% of its revenues to new products.

But the importance of innovation goes beyond financial gains. It was through innovative projects that the company was able to insert itself into the regional and national innovation ecosystem and develop a product line aligned with forest biodiversity. These structuring results form the basis of Pharmakos' business and guarantee its development trajectory.

To control the quality of its products, the company also opted for producing raw materials. If grown on an agronomically consistent basis, copaiba can ensure one of its most important products the quality and quantity guarantees required to make any external contracts possible.

In its trajectory, Pharmakos eventually developed its own successful recipe by bringing together academic experience and entrepreneurial efforts to innovate in the development of products derived from Amazonian biodiversity by using regional inputs and knowledge of their properties. This is a formula that could be replicated in other Brazilian innovative ventures to multiply positive impacts on both the economy and sustainability.

Process Innovation

- Leme (state of São Paulo)
- Small enterprise
- 50 employees

Company from a rural area in São Paulo state incorporates new technologies to produce safer and more complex inflatable toys.





SAFE ENTERTAINMENT

Play Park is a manufacturer of inflatable toys for amusement parks and parties located in Leme (state of São Paulo). Although it is a reference in its industry, the company faced many setbacks and difficulties before reaching its current status. The determination, past experience, and family roots of Play Parks' founder helped shape the successful model implemented in the company.

A diversity of experiences marked the path of Luis Fernando Pereira, the founder of Play Park, located in the Industrial District of Leme, 200 kilometers from São Paulo, before reaching its current position in the inflatable toy market. The son of a carpenter and a seamstress, Luís Fernando initially worked as a general service assistant and later as a sales representative for a major wood board manufacturer, before venturing into a business compatible with his limited financial resources: developing websites for companies interested in entering the digital world.

The frustration of this venture forced Pereira to another period of professional activity without the desired autonomy and, above all, without the conditions necessary for the development of his entrepreneurial spirit. But this interruption did not bury that dream.

The opportunity finally came when he went to work alongside a friend as a sales representative of a well-known inflatable toy brand. Making a long story short and with a few comings and goings, Pereira embraced the new activity head-on, learned the “seamy side of the job,” developed the market and became acquainted with its nuances, to finally





be frustrated by the poor quality and service limitations of the brand he represented.

Then came the motivation to try a new solo flight and start a company in the industry. His experience in sales, however, did not meet the qualifications needed to make toys capable of overcoming the identified constructive deficiencies. Pereira knew that the effort to launch higher quality products without excessive costs to avoid raising prices would not be easy. However, he was familiar with the market and determined to create the new venture on the healthy foundations that every company needs to build.

MULTIPLYING RESOURCES

The facilities of the new company, which opened in 2000, were located on the grounds of his home – a suitable solution for someone with scarce financial resources who needed family collaboration. The manufacturing process was made possible thanks to the great practical knowledge of his seamstress mother, who applied the techniques and arts of this millenary craft to the new materials, with the same excellence that characterized the clothes she made.

At the same time, Pereira brought to the commercial area all his previous experience in website development,



which allowed for widespread dissemination without requiring high investments. Play Park's early steps is a typical case of an entrepreneur who finds ways to overcome the scarcity of financial assets by saving and multiplying resources.

Following a lesson from previous experience, Pereira bet on the quality of products and manufacturing, using first-rate raw materials. He likes to remember that he always preferred to buy full rolls of materials, thus avoiding the common practice among competitors of using material remnants to reduce costs. He also paid full attention to technical assistance, aware that the toy industry is a typical word-of-mouth market, where the success of the next sale often depends on the satisfaction of the person who made the previous purchase. Results began to appear and led to the first move, this time to an industrial condominium.

The first boost to Play Park's industrial and commercial reputation came in 2006, when a leading magazine specializing in small enterprises published a story on the company that gained considerable prominence among the general public and specialized customers. This publicity substantially increased demand and offered Play Park its golden opportunity. In order not to waste it, it was necessary to ensure production growth without compromising product quality and the satisfaction of both customers and toy users.

Play Park bet on the quality of products and manufacture, using first-rate raw materials, and paid full attention to technical assistance.

The growth prospect now required a new technical effort. New cutting, printing and sewing methods had to be developed. In addition to traditional mass-produced toys such as ball pools and trampolines, the company decided to design new products to boost commercial development and help create a brand with innovative qualities.

INNOVATIVE PROCESSES

Play Park invested in innovating its production process by incorporating new skills. Chief among these was the development of 3D toys, which eliminated the manual development phase. The company acquired new software that added speed and precision to new projects. *"Until then, we would stretch the canvas out on the floor and, with some knowledge of geometry and a lot of intuition, draw the toy 'by eye,'"* recalls Pereira.

Another important innovation was the incorporation of a digital cutting table, which enabled eliminating the scissors phase that caused losses due to cutting failures and slowed the process down. With the new process, the 3D drawing is placed on the digital table, which cuts it in a fully automated way, bringing agility and precision to the process.

Play Park has also innovated with the use of drones in to inspect cutting and sewing accuracy, in order to meet increasingly complex and demanding toy production requirements. *"Today, if we want, we can, for example, make an inflatable elephant with great precision. There are few companies in Brazil that do something like that,"* explains Pereira.

Due to increasing technical requirements, making new product designs viable also required investing in digital printing equipment to replace the traditional painting techniques used in the industry. Other techniques used with increasing proficiency, such as the use of seam instead of welding, have enabled designing increasingly

"Today, if we want, we can, for example, make an inflatable elephant with great precision. There are few companies in Brazil that do something like that."

Luís Fernando Pereira

Director
Play Park



elaborate and complex products in terms of both structural dimensions and finishing details.

With a long list of products, Play Park caters properly to a market whose nature is to seek more and more novelties. In addition to inflatable toys (bouncing castles, playground slides, sporting toys, indoor soccer), the company manufactures and markets various ball pools, trampolines, mechanical bulls, and party tents, in addition to offering some third-party electronic toys.

Diversification and the ever-renewed supply of entertainment accompany market developments according to users' ages and types of parties. The demand for traditional products does not disappear but is boosted also by the desire for novelties.

TECHNICAL PERFORMANCE

The support of the Brazilian Micro and Small Business Support Service (SEBRAE) throughout Play Park's structuring and growth trajectory is recognized and praised by the entrepreneur, who was awarded the CNI/SEBRAE National Innovation Trophy in 2017. However, the expansion of the company had to rely mainly on corporate resources. Investments were concentrated in specialized equipment for other industrial processes adapted mainly from the garment industry, which is directly related to the inflatable toy manufacturing process.

Determined to develop processes capable of delivering more reliable products, Pereira actively participated in raising the safety level of inflatable toys in Brazil, which came into force with the approval of the standard set by the Brazilian Association of Technical Standards (ABNT) for large inflatable toys (ABNT NBR 15859: 2010), in 2010. The owner of Play Park chaired the expert committee responsible for providing the Association with information and knowledge that guided the development of the standard.

The evolution of safety has made it possible to manufacture increasingly bigger inflatable toys and with more stringent technical performance requirements. Developing new techniques and creating an in-house design process with design professionals is a way of supporting the most challenging project the company is carrying out. It is a large inflatable toy, with a runway that is no less than 140 m long mounted on a 50 m by 14 m structure, intended to cater mainly to large shopping malls, which are always interested in novelties that appeal to the public, as long as they guarantee a safe playing experience.

By pursuing a more challenging segment with products that can "spark" the imagination of children and young people, Play Park sets itself apart from other competitors and is able to consolidate its presence in a market that tends, at its base, to disseminate products and practices that hardly reward quality and innovative efforts. Escaping this trap seems to be one of the company's success factors.

An entrepreneur rarely gets it right on their first try. This was the case of Pereira, who founded and leads Play Park. It is true that the failure of a venture does not always produce lessons that can be assimilated or provide the conditions for new experiences. Nonetheless, Pereira has succeeded in taking advantage of each lesson to build Play Park's rich history.

His inflatable toys make kids happy and vitalize the play spaces of parties and shopping malls. Above all, they attest to the entrepreneurial journey of someone who had the ability to combine his accumulated experience with innovative processes and build a solid and promising company – which is no easy task.

Organizational Innovation

- Maceió (state of Alagoas)
- Small enterprise
- 30 employees

Company specializing in the construction of sewage treatment plants innovates its business model by exchanging with the government the treatment of wastewater from the Prison Complex for permission to build a plant in the prison area and provide services to private clients.

priscoambiental.com.br

Tratamento de água e esgoto
Filtração,
Desmineralização,
Tanques,
Equipamentos especiais



SANITARY INNOVATIONS

One of the major problems of Brazilian cities is sewage collection and treatment. Poor service delivery rates have devastating consequences for public health and the environment. In the case of the capital of Alagoas, Maceió, only 40% of the sewage is collected for treatment. Public spending on health directly suffers the effects of this deficiency, which also affects labor productivity, education, and the quality of life of children and their families.

Prisco's competence is the production of solutions for sewage treatment plants (ETEs). Its founder, Mateus Erdmann Kuhn, has accumulated rich professional experience in different treatment plants of private companies in the industrial sector. He also invested in academic education before finally embarking on the task of developing innovative solutions involving equipment, facilities and related services for this problem that affects virtually all Brazilian cities.

The Maceió-based company boldly accepted the numerous challenges created by lacking or deficient sanitation. For ten years, since its foundation Prisco and its founder experienced "the pains and pleasures" of entrepreneurship, with ups and downs, moments of euphoria and discouragement, until they reached a position that seems, at this point in time, to represent an important contribution to the development, implementation and operation of wastewater treatment systems.



Mateus Erdmann Kuhn can be considered a very special type of serial innovator. Armed with his training and experience in water and wastewater treatment, he is always determined to create solutions to the most different sorts of problems in the area, aware that he is promoting the quality of life and the environment of Alagoas residents and tourists who visit the city and enjoy its beautiful beaches.

Be it the sewage slicks that contaminate the beaches and residential condominiums, which in turn multiply without the corresponding upgrading of the sewage collection system, or the prison system of the capital of Alagoas, which lacks an appropriate solution, for each of these areas Mateus' company has developed very innovative solutions in terms of both technology and business model.

The starting point of this entrepreneurial career was a technical training course at the State University of Rio Grande do Sul (UERGS), in his home state, where he got his diploma in Environmental Technology in 2007 and two years later a specialization degree in Environmental Chemistry from the Regional Integrated University of Upper Uruguay and Missions. Interested in furthering his studies, he passed the entrance exams for a master's degree in Water Resources and Sanitation, focusing on wastewater treatment at the Federal University of Alagoas (UFAL).

Between his graduation, still in his native state, and the move to the capital of Alagoas, Kuhn maintained a professional relationship with GCTbio, a company that offers a network of integrated engineering, biotechnology and business solutions in water, renewable energy and bioprocess. Kuhn's academic and professional experiences coupled with his restlessness and entrepreneurial spirit led him to create Prisco Ambiental.



SEWAGE SLICKS

Prisco's first project was the establishment of an experimental plant on the coast of Maceió to capture untreated wastewater discharged into the sea. As absurd as this practice may seem in any situation – and even more so in a city that has tourism as one of its economic mainstays – it is usual and well known to the authorities and the general population.

The experimental plant established by Prisco is far from solving the problem of so many "slicks" (as these discharges that cross the beach towards the ocean are called) that exist in the capital city, but it serves to show the technical feasibility and cost-effectiveness of the solution. The installed equipment is relatively simple and is such an affordable treatment solution that even a small business like Prisco was able to bear the investment costs.



While the solution offered shows that it could be deployed in larger numbers and on a wider scale, thus solving the problems of beach pollution and degradation of the environmental conditions offered to users in general and tourists in particular, it seems far from the horizon of local public policies both in Maceió and Alagoas and in other cities and states.

CREATIVE EXCHANGE

Kuhn then went on to a second innovative project, mainly because of the business model on which it is based. Aware of the lack of sewage treatment infrastructure in Maceió, Prisco intended to establish itself in this market by setting up a new plant in the city.

Since the existing plant is far from downtown Maceió and does nothing more than send waste to the sea through an underwater outfall, Kuhn managed to sensitize the authorities to accept his ingenious exchange proposal. Through it, Prisco would be responsible for

treating sewage generated at the Prison Complex of Maceió in exchange for permission to set up a treatment plant in the prison area, to cater to private clients as well.

The exhaustion of the service capacity of the existing plant was another factor that contributed to enable the exchange. The donation of “services for the recovery, installation and operation of the plant for the treatment and reuse of sewage and septic waste generated by the Prison Complex” was published in the **Official Gazette of the State of Alagoas** on October 14, 2016.

The document also formalized Prisco’s obligations: to develop a project for a treatment plant that meets the standards for the release of a consortium of treated wastewater, as well as to recover, activate, operate and maintain the existing wastewater treatment system in the prison complex and hire at least 80% of prison labor for the operation of the plant.

In addition, the prison system provided a minimum area of 12,000 m² for installation of the treatment plant, allowed the receipt and treatment of any and all wastewater authorized by Prisco Ambiental and met the costs of electricity consumption.

The agreement signed formalized a very innovative partnership model. On the one hand, the prison system would have an effective system for treating waste produced by inmates and administrative staff, at no investment or operating costs for the Government. On the other hand, Prisco ensured treatment capacity on a commercial basis and at lower costs in exchange for the treatment of wastewater from the prison complex.

Despite numerous difficulties associated with the unprecedented nature of both the instrument and the underlying model, the waste treatment system of the prison system of Maceió underscores the entrepreneurial

The agreement signed formalized a very innovative partnership model. On the one hand, the prison system would have an effective system for treating waste produced by inmates and administrative staff. On the other hand, Prisco ensured treatment capacity on a commercial basis and at lower costs.

spirit and skills of Prisco's founder. Having been duly licensed, ETE receives, treats and disposes of household, commercial and industrial wastewater. The prime location attracted enough clients to pay off the investment and cover the costs of both treating prison wastewater and catering for private clients.

MINI TREATMENT PLANTS FOR CONDOMINIUMS

Prisco's third innovative project was the development of a mini plant for treating wastewater, focused mainly on the housing developments of the *Minha Casa Minha Vida* program, especially those built in new areas, which are not always connected to sewage collection and treatment networks.

For the company, entering this segment was a great opportunity, given the large number of housing developments built under the aforementioned program and the types of sewage treatment plants available on the market, which are often a source of problems for users.

Prisco's competing wastewater treatment plants require regular care and maintenance that are not always prioritized by condominiums, in view of other more visible needs such as lighting, landscaping or conservation of social areas. Always focusing on innovation, Prisco operates in this segment by providing compact plants along with maintenance services that seek to combine technical efficiency with cost-effectiveness.

These services, which account for Prisco's recurring revenue, require both robust and cost-effective equipment and solutions, a combination that established manufacturers are far from providing – hence the emerging opportunities for innovations developed by Mateus Kuhn's company.

Prisco's third innovative project was the development of a mini plant for treating wastewater, focused mainly on the housing developments of the Minha Casa Minha Vida program.



Unfortunately, given the characteristics of much of the target population, immediate cost considerations override efficiency and long-term gains. This leads to many condominiums opting for cheaper and less effective solutions, causing Prisco to concentrate on business with private companies as it waits for this deeply ingrained culture overly focused on short-term results to change.

Public support for more effective treatment standards could accelerate the change process, but this is not what happens, since sanitation has not yet become a real priority for public policy at the federal, state, and municipal levels. Despite the difficulties facing this market segment, Prisco's solutions and associated services have been attracting new customers.



It should be pointed out that sanitation does not need to be expensive, as shown by the solutions designed and implemented by Prisco. Knowledge, technological capability, innovation and entrepreneurial spirit can come together to produce technically superior and economically affordable solutions.

Organizational Innovation

- Manaus (state of Amazonas) and São Paulo (state of São Paulo)
- Large enterprise
- 10,000 employees

Korean multinational creates two technological training laboratories in Brazil, following a model successfully implemented in its country and using the IT Law in a pioneering way.



OCEA



AN OCEAN OF OPPORTUNITIES

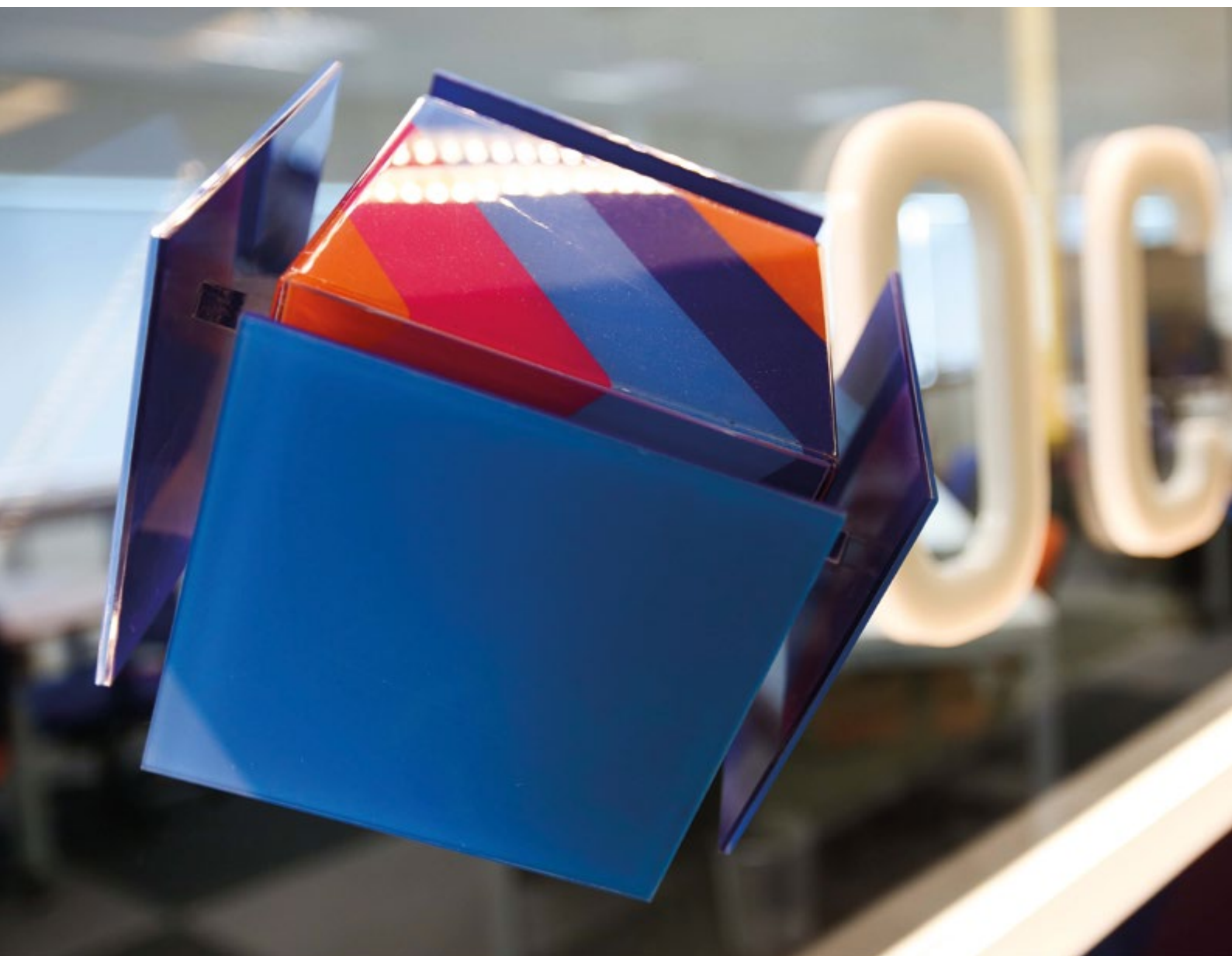
Samsung ranks high among the world leaders in the electronics industry. Its products enjoy large shares of all markets in which the Korean company operates, and are boosted by considerable research, development and innovation (RD&I) efforts.

The company consistently invests in research and development, and in 2017 it invested more than \$14 billion worldwide. It is these truly massive capabilities that afford the company solid positions in very competitive industries such as semiconductors, monitors, TVs, smartphones, wearables, and mobile communications.

Its competitive position in such technologically dynamic markets is also protected by a very active intellectual property policy: the US Patent Office (USPTO) granted Samsung 7,800 patents in 2018 alone, a figure that allows the company to rank second in terms of patents issued in the United States, easily outshining the country's largest and most traditional digital companies.

The company has more than 200 operating units around the world, including manufacturing or sales units, product design and research and development (R&D) centers, as well as 15 regional offices located in South Korea, North America, Europe, Southeast Asia, and Africa. All these activities, which are carried out by over 300,000 employees in more than 70 countries, are coordinated from the company's headquarters located in Suwon, in its country of origin.





In Brazil, Samsung has set up two multipurpose technology training centers known as Samsung Ocean, in the cities of Manaus and São Paulo, following the model implemented in Korea. In those centers, different groups are trained in programming and developing solutions for electronic equipment, especially smartphones.

Ocean has become a training cluster for professional solution developers, attracting designers, entrepreneurs and college students from diverse fields of knowledge.



The space created by the Korean company encourages young professionals to innovate and generate new technological solutions. Support from a stimulating environment, appropriate equipment and consistent methodologies, helps professionals attending training programs to learn more quickly and effectively.



Samsung is the best-known Korean company and enjoys a global presence. By investing heavily in R&D to foster the regular flow of new product launches, its market position is strongly supported by structured programs and actions. This is the case of Ocean, a worldwide Samsung initiative also adopted in Brazil.

With the main purpose of encouraging the development of mobile digital solutions, Ocean offers various technology platforms and tools from Samsung itself and from the market. These are incentives and lessons that foster the creation of new digital startups focused on applications in different segments, on both the production and consumption sides.

One of the important elements of this initiative stems from the ingenious use of the obligations imposed by the Brazilian IT Law¹, according to which manufactures of products specified in the law can be exempted from tax payments, provided they carry out certain R&D activities in the country. The regulation is quite complex as it covers numerous legal and technical aspects, therefore requiring very careful management by the company, in line with the Ministry of Science, Technology, Innovation and Communications.

The law states that, in order to qualify for exemption or abatement of the Tax on Industrialized Goods (IPI), companies developing or producing computer and

¹ The original law, which replaced the previous market reserve (No. 8,248 of October 23, 1991) was successively updated by Law No. 10,176 of January 2001 and Law No. 11,077 of December 30, 2004. It was regulated by Decree No. 5,906 of September 26, 2006.



automation goods and services must annually invest at least 5% of their gross revenues in the domestic market, in R&D activities in information technologies, as well as in professional development or training at secondary and university levels. This provision supported Samsung in launching Ocean in Brazil.

PARTNERSHIP WITH THE UNIVERSITY OF SÃO PAULO

Ocean numbers and facts reveal the extent of the effort and the scope of the program's results. In both laboratories, around 3,000 sessions have been held since 2014, such as capacity-building, technical meetings and other events, which offered training courses to more than 62,000 students and professionals, ranging from strictly technical to entrepreneurship.

In São Paulo, Ocean has been operating since 2016 at the Polytechnic School of the University of São Paulo (Poli-USP). It occupies a 300 m² space provided by the university under the Poli Partners institutional program, in an area of the Production Engineering Department. Ocean carries out teaching, research and development and extension activities, the latter through technology diffusion courses, along with training related to business practices (strategic planning, project management, marketing, entrepreneurship).

A prominent area in the Ocean lab at USP is the Internet of Things (IoT), the new frontier of technological applications that should connect an extensive range of everyday objects – from consumption and production – and allow increasingly integrated and intelligent use, with positive impacts on people's lives as well as on homes, mobility, health, and safety.

Eduardo Zancul, a professor in the Production Engineering Department at Poli-USP and one of the coordinators of USP's Ocean lab, sees as extremely positive the operational model of Samsung's program with the university, which *"allowed to add innovative technologies to Production Engineering methods, thus driving research and practical action in advanced manufacturing."*

The head of the department, Fernando José Barbin Laurindo, highlights the training of excellent professionals and the production of knowledge, while for José Roberto Castilho Piqueira, director of the Polytechnic School, training "people capable of transforming the production system" is of fundamental importance.

The relevance of the program is also recognized by the Dean of Graduate Studies, Gilberto Carlotti Júnior, who draws attention to the role of innovation in the university's mandate, and by the Dean of Research, José Eduardo Krieger, who sees the conversion of knowledge into economic wealth as one of the most difficult missions of the university.

In the two laboratories, around 3,000 sessions have been held since 2014, such as training courses, technical meetings and other events, providing capacity building to more than 62,000 students and professionals.

Samsung is also pleased with the results achieved. *"We believe it is very important to be close to the growing ecosystem of entrepreneurs and content developers, who make up a regular group at leading universities such as USP. These young people are very committed to finding innovative resources to address issues in their communities,"* says Eduardo Conejo, the company's Senior Innovation Manager for Latin America.

MANAUS CLUSTER

Samsung's second unit of the Ocean program was implemented in Manaus in 2014 as the result of a partnership with the State University of Amazonas (UEA). Samsung's choice to establish Ocean at the leading Brazilian cluster for the assembly of consumer electronic products and equipment took into account the contribution it would make to consolidating a technology-based innovation and entrepreneurship ecosystem, with opportunities for the entire electronics industry located in the region.

The Manaus Cluster, which is perfectly integrated into the regional environment, with elements of the culture and activities typical of the region in its facilities, proposes to nationally disseminate incubated emerging activities, such as the development of digital games, which integrate both virtual reality and design and art competencies.

Ocean is important not only for the corporate world, but also for scientific research. The program enables the university to delve into research that will become the foundation for the development of Industry 4.0 technologies.

Based on the complex and synergistic operation of cutting-edge technologies, the Industry 4.0 concept, also known as the Fourth Industrial Revolution, integrates manufacturing and a wide range of information and communication technologies.

This integration will make it possible to intelligently connect people, machines and processes, with substantial



advances in productivity and the ability to meet different demands. Ultimately, Industry 4.0 will be able to meet each individual consumer demand, with high productivity and no additional hindering costs.

FACTORY OF INNOVATORS

The fact is that Ocean is more than a necessary training center in a country so lacking in technical professionals. Samsung's initiative is also a factory of innovators and a laboratory of innovations, a *"tool to search for new ideas that can generate new products for the market,"* in the words of Eduardo Conejo, from Samsung.

By providing a large contingent of trained and educated professionals with the means to participate in technology diffusion movements and learn about emerging trends in the electro-electronic industry, especially mobile digital equipment, Ocean gives a big boost to innovation.

By providing a large contingent of trained and educated professionals with the means to participate in technology diffusion movements and learn about emerging trends in the electro-electronic industry, especially mobile digital equipment, Ocean gives a big boost to innovation. It also “opens doors” for many entrepreneurs to develop new consumer and production solutions, helping to disseminate IoT and Industry 4.0.

It is undoubtedly a promising prospect, especially when this movement takes place in an industry teeming with technological opportunities, through the hands of a company that is a global leader in taking advantage of these opportunities, with different partners endowed with great scientific expertise and highly skilled human resources.

The great hope is that this and other initiatives supported by R&D resources provided for in the IT Law will contribute to earn Brazil a prominent position in the electronics industry and the mobile digital applications market. The incentive of the law and the successful experience of Ocean already exist. Let others come.



Product Innovation

- Cachoeirinha (state of Rio Grande do Sul)
- Small enterprise
- 12 employees



Biotechnology company from Rio Grande do Sul consolidates a solid growth path with solutions suited to market demands.



DOWN-TO-EARTH BIOTECHNOLOGY

Simbios is an example of a company born in the scientific milieu, along the lines of the university, with the mandate to solve technological and economic challenges of both economy and society. Set up by three very young researchers, the biotechnology company was able to establish itself with a platform of new services and products with high potential and very consistent results.

Founded when technology-based entrepreneurship – which characterizes most of the so-called startups – had not yet reached the profusion of recent years, the company from Rio Grande do Sul took its first steps in the late 1980s, at the beginning of the incubation of technological business in university environments.

André Fonseca, Nilo Ikuta and Vagner Lunge were encouraged by the heads of the Biotechnology Center at the Federal University of Rio Grande do Sul (UFRGS) to seek solutions for technological problems in the business world. One of the keys to the company's success in its nearly 30 years of existence is this method – which reverses the most frequent direction of knowledge: from the university to the outside world. Instead of solutions in search of applications in the market and in society, the trio of entrepreneurs started from real problems to which they looked for appropriate solutions in their knowledge base in modern biotechnology.

Appropriate solutions for Simbios necessarily have three attributes: accuracy, agility and cost-effectiveness. Accuracy (or precision) is obviously a highly valued attribute in





diagnostics. Biotechnology, with its rigorous scientific methods and high-performance equipment enables meeting this requirement. The company team can also develop and apply methodologies that deliver solutions as quickly as necessary, allowing the users of their methods to get answers within the shortest time possible. The company is also concerned about the cost-effectiveness of its solutions, or about the delivery of results that favorably balance the terms of the benefit and cost binomial.



SECRET OF LIFE

There are few industrial activities in which the distance between the laboratory in which scientific knowledge is produced and the technological products and services that solve economic and societal challenges is as short as in modern biotechnology. Simbios is an eloquent example of this proximity and also highlights the wide range of opportunities that a technology-based venture focused on knowledge of modern biotechnology can exploit and harness.

The origin of the company helps explain important elements of its trajectory, including its sensible strategy and link to very concrete demands. These two characteristics are uncommon in the world of biotechnology, where so often very ambitious promises are but a first step in an excessively long cycle of development and the harbinger of a fall.

When on February 28, 1953 Francis Crick, one of the scientists whose name is associated with the original knowledge that produced modern biotechnology, declared that he and his research and laboratory colleague, James Watson,

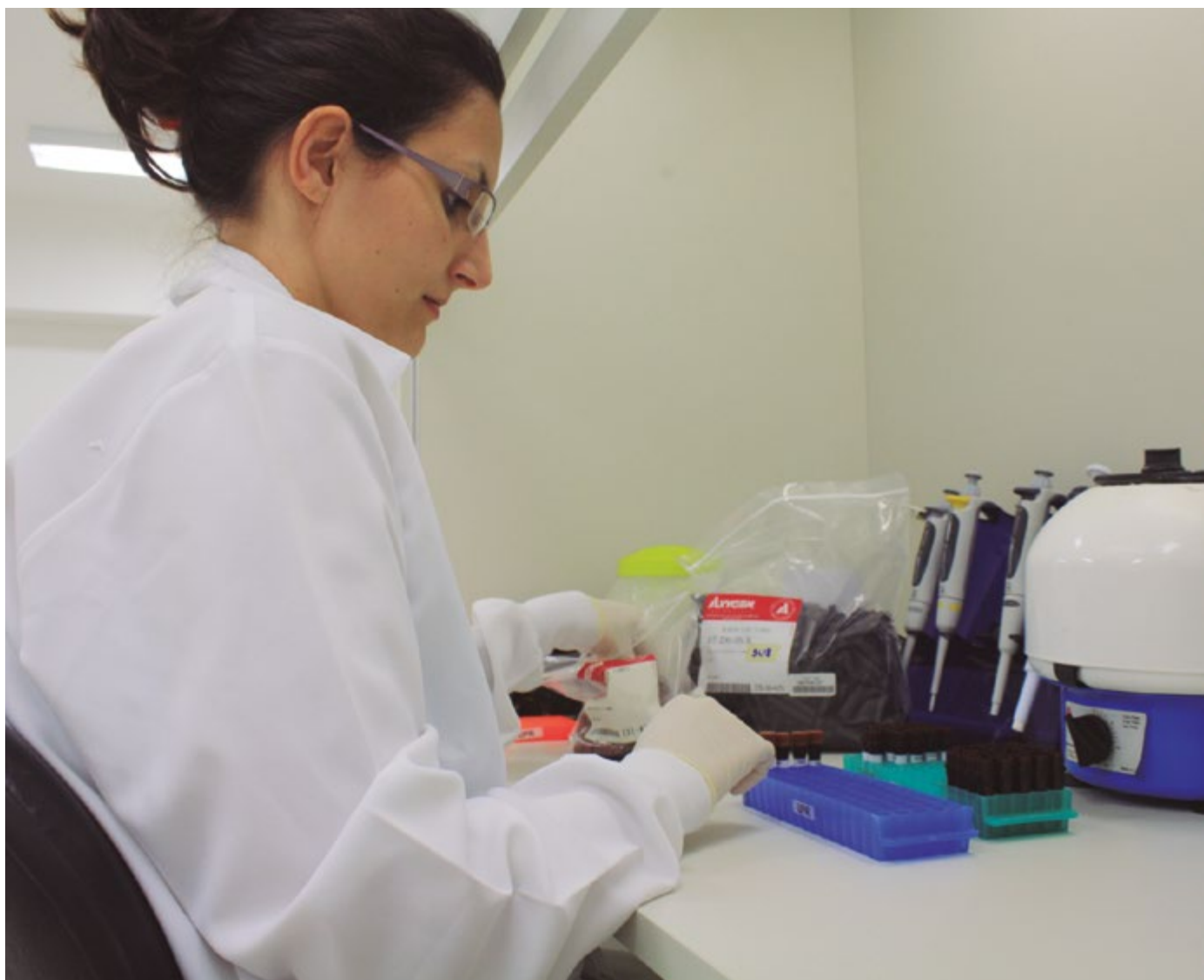


had “found the secret of life,”¹ it would be very unlikely that anyone, including the most prepared scientists, would be able to adequately estimate the breadth of the opportunities that opened up for science and knowledge about the “mysteries of life” for developing new technologies and harnessing economic opportunities.

In fact, the failure to properly appreciate these opportunities would be corroborated by the following 20 years, when science advanced but without any translation of knowledge into economic (or social) opportunities.

It was in the wake of scientific discoveries and technological developments associated with the 1953 work of Crick and Watson that tens of thousands of biotechnology companies, each devoted to developing solutions to more or less precise problems with varying degrees of success, including many commercial and corporate failures, emerged around the world from the 1980s onwards, and especially over the following decade.

¹ James Watson and Francis Crick were the scientists who jointly discovered the double helix structure of the deoxyribonucleic acid (DNA) molecule. Research provided the means to understand how hereditary information reproduces in all living organisms. Evidence in the history of science indicate that shortly after his discovery, Crick walked into a Cambridge pub claiming to have found “the secret of life.” The discovery was only known to the world two months later, on April 25 of that year, when it made the cover of Nature magazine. From then on, the two scientists and their discovery went down in the history of humanity and won the Nobel Prize in Medicine in 1962. Source: BBC Brazil. Available at: <https://www.bbc.com/portuguese/ciencia/030227_dnamtc.shtml> and <https://pt.wikipedia.org/wiki/James_Watson> (Accessed on November 26, 2018).



While these failures are not a prerogative of biotechnology as they also occur in other industries – such as microelectronics, IT or nanotechnology – it is a fact that the promises made by entrepreneurs in the biotechnology universe are often associated with big investments as well as with great frustrations.

The typical cycle of these businesses starts from cutting-edge scientific knowledge that makes very bold promises, leads to the need to raise large investment amounts, generates high expectations and new funding, etc., and when the first difficulties and result postponements arise, investors move away if they can. It is at this point that enterprising scientists experience a reality check and begin to focus on less ambitious themes, often more closely linked to close problems, with more concrete and well-identified demands.

“DOWN-TO-EARTH”

Simbios was born with a more realistic – “down to earth” – ambition than most biotechnology companies, even though it emerged in the wake of Brazilian companies linked to new knowledge and scientific and technological skills derived from the “secret of life.” Scientists André Fonseca, Nilo Ikuta and Vagner Lunge founded this biotechnology startup in Rio Grande do Sul, based on a solid scientific background and on the implementation of several academic projects in collaboration with the entrepreneurial world.

As witnesses of the proximity between applied science and technology, which are characteristics of modern biotechnology, the three partners were encouraged, while still at university, during their graduate research programs at UFRGS dedicated to genetics and molecular biology, to seek solutions to problems of the outside world, companies and institutions. Ikuta and Lunge, both with a degree in agronomics, approached the third element of this tripod, André Fonseca, a biologist, and became partners in scientific and technological endeavors at the university and, later, in a rich entrepreneurial journey.

While most advanced biotechnology companies glimpse opportunities from science, the three entrepreneurial scientists’ model has, from the outset, turned the other way: understanding real problems, translating them into effective demands – preferably with well-defined clients – and seeking, henceforth, solutions that could address the challenges of reality with actual chances of being solved, based on existing knowledge or on knowledge that could be rapidly mobilized.

The Federal University of Rio Grande do Sul, undoubtedly one of the most important research and teaching institutions in Brazil, had well-established laboratories and research programs in the field of genetics and molecular biology, and despite the economic crisis, in the



André, Nilo and Vagner developed their first project, which was dedicated to addressing the quality problem of inoculants commonly applied to seeds used in agriculture.

late 1980 and the early 1990s Brazil had sufficient human and material resources to carry out research projects, including those of interest to enterprises.

QUALITY OF INOCULANTS

At the Biotechnology Center, the heads of the institution were professors and researchers (like Homero Dewes), who adequately estimated the great potential offered by modern biotechnology for solving economic and social problems. Coherently, these highly regarded and influential researchers in the academic world took the next step and encouraged young researchers to choose research problems that matched economic and social demands. This is how Fonseca, Ikuta and Lunge developed the first project, which was dedicated to addressing the quality problem of inoculants commonly applied to seeds used in agriculture.

For their economic importance and rich history, inoculants in Brazilian agriculture would merit a chapter of their own. As a brief parenthesis to this chapter, it must be said that inoculants are microorganisms (bacteria) that promote the development of nitrogen fixation in the roots of plants, thereby substantially reducing the use of fossil-based nitrogen (gas), which is replaced by that existing in the natural environment. In the research that culminated in the introduction and widespread use of inoculants in Brazilian agriculture, special mention should be made of Johanna Doberheiner, a Brazilian researcher of Czech origin, who devoted her professional life in Brazil to research in this area.

It was to solve a fundamental problem of determining the quality of these inoculants that the academic research developed at the University of Rio Grande do Sul's Biotechnology Center has strongly focused, from its beginning, on agronomic and entrepreneurial reality.

After all, if inoculants are so important, it should be possible to know their quality and, by extension, their effectiveness. The problem, however, is that inoculants interact in a complex and very dynamic way with their environment, the soil. This posed a research method problem.

From its inception, Simbios has learned to develop robust methodologies. Each problem, with a well-defined customer, provides the research and technology team with a set of elements for developing a solution that brings together the predicates that ensure business success: an effective, agile, economical method. Without these predicates, knowledge may advance, but the company needs much more business capable of supporting and ensuring its sustainability.





NEWGENE

Services and products are among the many businesses the company has already created using this method and corresponding business model. Simbios's portfolio includes solutions for the human health and animal health areas, as well as for agricultural markets. In the area of human health, we have HIV, hepatitis C, molecular diagnostics. In the animal health area, Simbios has solutions that enable identifying several dozen pathogens in poultry and swine.

The company's main technological innovation is a product line called NewGene, designed for on-site molecular diagnostics, i.e. in its clients' own industrial laboratories, with a host of advantages over the alternative of performing tests in contracted laboratories. This is a complete product line, ranging from extraction to nucleic acid (DNA or RNA) analysis through amplification.

The central idea behind the development of this technology was the convergence of protocols between Simbios and its customers. Prior to the development of this product line, there was a wide divergence of protocols in animal pathology testing. The company's innovation, unique in this segment in the domestic market, has allowed it to disseminate best practices among its technology users and to gauge flexibility, agility and reliability of results.

The NewGene line was developed with the committed collaboration of Simbios' main clients, the companies Sadia and Perdigão (currently BRF). According to partner André Fonseca, *"Sadia and Perdigão are historical partners in the development of these kits and have been purchasing reagents and products from this line since the inception of the NewGene project. In other words, they helped define the format and have been making purchases since the launch of pilot products."*

The NewGene line is based on state-of-the-art nucleic acid amplification techniques, a technology initially developed by researcher Kary Mullis in 1983, which earned him the 1993 Nobel Prize in Chemistry together with Michael Smith. More specifically, this product line utilizes the technique known as Polymerase Chain Reaction (PCR), which is used in molecular biology to amplify a single copy or a few copies of a piece of DNA or RNA across several orders of magnitude, generating from thousands to millions of copies of a particular sequence.

This set of products allow customers to perform on-site testing, thereby more precisely control the flow of their laboratory demands, as there is no need to send material samples to third parties. This ensures the savings of resources, speed in obtaining results, and the implementation of intervention actions (in the case of presence of a pathology in meat production, for example) and, most importantly, the management and control of critical information.

PROMISING ALTERNATIVES

Simbios' business area enjoys extraordinary development and growth opportunities. The human health problems of the Brazilian population and local realities lack appropriate solutions to Brazilian demographic and social situations. Growing healthcare spending demands new innovative methods and solutions, and biotechnology offers promising alternatives.

"Sadia and Perdigão are historical partners in the development of these kits and have been purchasing reagents and products from this line since the inception of the NewGene project. In other words, they helped define the format and have been making purchases since the launch of pilot products."

André Fonseca

Partner

Simbios Biotecnologia

Animal health problems, in turn, represent opportunities for increasing productivity and adding value to a field in which the Brazilian economy has increasing international relevance.

The NewGene business, excluding BRF purchases², has grown in recent years at the following rates: from 65.4% in 2016 to 76.60% the following year and estimates in October 2018 indicated an 80.3% growth in the year.

Interestingly, Simbios is a unique biotechnology company in Brazil and until 2014 BRF was its only major customer in the NewGene business. Today it has 22 customers. *"It's a small number, but one should consider the size of these companies, which in many cases represent, in a single purchase center, several related companies,"* says André Fonseca.

NewGene's turnover (including products and reagents) today already accounts for 40% of Simbios Biotecnologia's total annual revenues, with chances of significant increases in the coming years.

Simbios is focused on authentic and original insight into the rapid commercial application of its research and development (R&D) efforts. This translates also into the division of labor between partners. *"Lunge is responsible for scientific prospecting; Ikuta is focused on developing technology applications for the scientific knowledge we produce, and I take care of business management. We are the only domestic company that develops technologies for on-site industrial laboratory testing; all our competitors are international companies, but it is important to note that we were pioneers also at global level. This gives us a huge growth prospect for the coming years,"* says André Fonseca.

MARKET SIZES

Simbios and other biotechnology companies and the chains in which they operate (human and animal health) could take greater advantage of the opportunities afforded by the molecular diagnostics market if the Brazilian innovation ecosystem were adequately prepared to cope with its various sizes.

Organizations such as the Ministry of Agriculture, Livestock and Supply (MAPA) and the National Health Surveillance Agency (ANVISA) have views and actions that do not always coincide, and the uncertainties associated with the lack of harmonization in their approaches undermine some important opportunities for sector development, precluding or hampering the development of better solutions. There are therefore great opportunities for improving the institutional environment, for the benefit of biotechnology and the development of new solutions for human and animal health.

² The company removes BRF from the calculation because it is considered a partner in product development and not just a customer.



Notwithstanding these difficulties, Simbios was born and grew in an environment comprised of public initiatives, whether of a federal or state nature. The conditions for the emergence of the knowledge that underlies the creation of Simbios, as well as of other biotechnology companies in several Brazilian states such as Minas Gerais, Rio de Janeiro and São Paulo, in addition to Rio Grande do Sul, were set by public initiatives within the scope of Science and Technology.

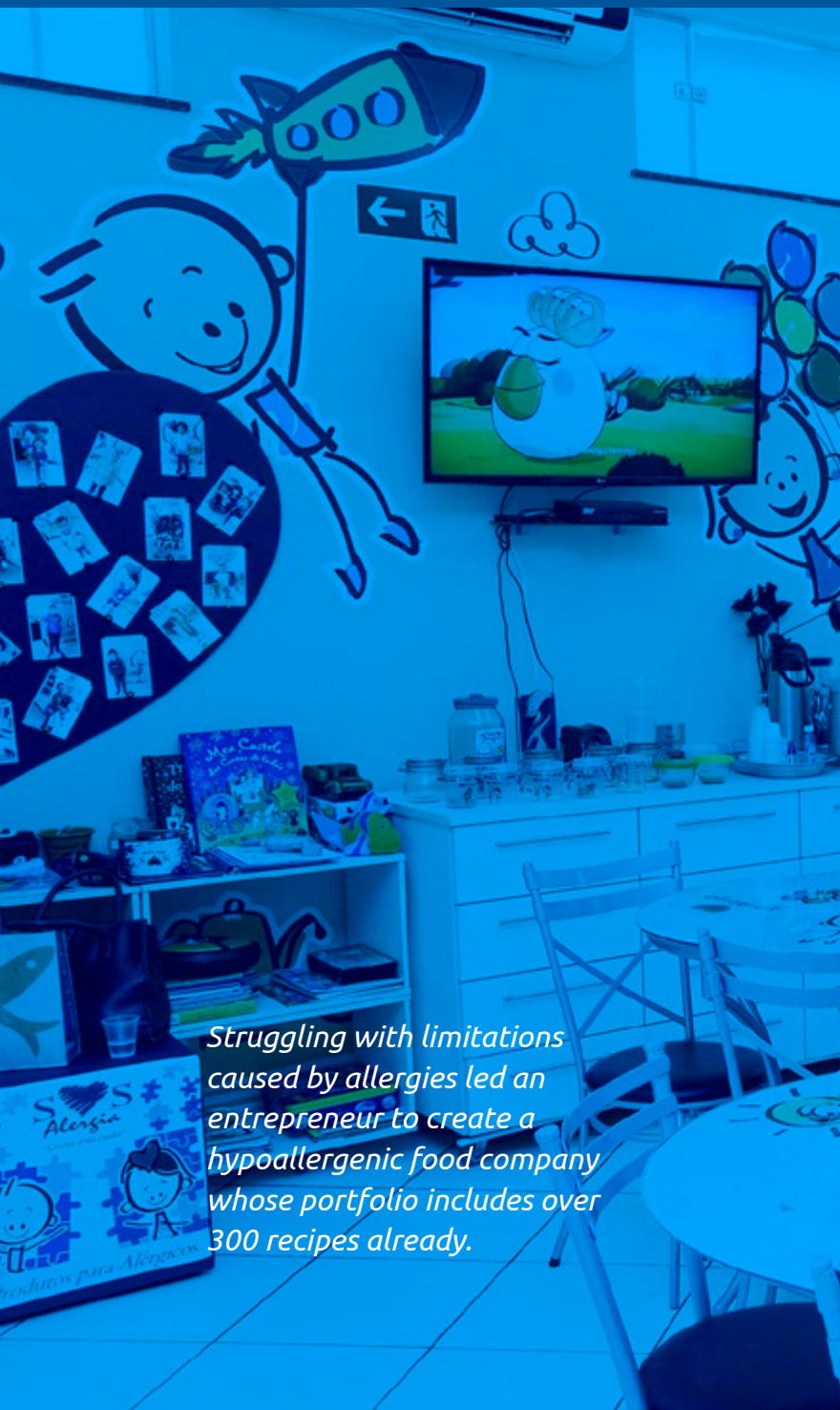
Simbios also benefited from an existing view in the world of biotechnology and at UFRGS that the distance between basic knowledge and applied technologies was relatively small and, therefore, there would be room for young researchers, with the support of their institutions, to fill it and create businesses that are useful for the economy and society, and sustainable in economic and financial terms.

Finally, Simbios also had the financial support of some of the most important entities in the technological development and innovation support system – the Fund for Studies and Projects (FINEP) at federal level, and the Rio Grande Sul State Research Support Foundation (FAPERGS) at state level.

Simbios' strength as a Brazilian pioneer company in molecular biology is based on three fundamental pillars: firstly, the complementarity between the partners' competencies, which translates into the company's organizational structure; secondly, the matrix organization of their business, which allows each of them to collaborate, regardless of their role, to generate new ideas and develop new products; and finally, the company's close and synergistic relationship with its technology users. These differentials make Simbios a very promising biotechnology company not only in Rio Grande do Sul but across Brazil.

Product Innovation

- Marília (state of São Paulo)
- Small enterprise
- 6 employees



Struggling with limitations caused by allergies led an entrepreneur to create a hypoallergenic food company whose portfolio includes over 300 recipes already.





FOODS THAT PROMOTE HEALTHY LIVES AND SOCIAL INCLUSION

Food allergies are socially invisible or denied illnesses, despite their serious effects on people's lives and their daily social life¹. In many situations, the allergies and dietary restrictions they entail are seen as simple "fussiness." It is also very common for allergic persons, even when reactions are very severe, to take some time to find out that their suffering is due to this disorder. There are people who never get to identify the source of the discomfort that afflicts them.

According to the Brazilian Allergy and Immunology Association, 2% of adults and 5% of children in Brazil have some type of food allergy. The most common types are related to a small group of foods: milk, eggs, soy, nuts, peanuts, seafood, and wheat. Reactions to these foods vary but may ultimately cause death. In the most frequent cases, this extreme outcome does not occur, which does not mean that allergic persons do not endure major physical and social sufferings.

The invisible suffering of so many people was also for many years that of Sandra Matunoshita, the founding partner of SOS Alergia, a company that combines the manufacture and sale of products for people with some type of allergy. With a degree in Social Work and endowed with a strong spiritual foundation, Sandra has devoted herself to promoting the health, well-being and social inclusion of

¹ BBC Brazil. **O drama de manter filhos vivos em "sociedade que vê alergia alimentar como frescura"** - 2017. Available at: <http://www.bbc.com/english/geral-41904680> (Accessed on December 13, 2018).

people who silently suffer the effects of their allergies, as she did in the past.

Her company, established in partnership with engineer and husband Frank Matunoshita, has been working for 15 years to produce and sell products for individuals, especially children, with some type of food allergy. In addition to entrepreneurial results, the couple regularly reaps the recognition of many people whose lives have improved thanks to the products that SOS develops, manufactures, and sells. This is the innovative experience reported in this chapter.



PERSONAL EXPERIENCE

Although they affect many people at all ages, food allergies are not easily recognized. Even less recognized are its nonclinical effects: people who suffer physically from allergies are often subject to social exclusion. This exclusion may be motivated not only by prejudices – unfortunately still very widespread – but also by the difficulty and fears that the person suffering from allergies develops in the course of social life experiences.

This was the case with the founder of SOS Alergia, Sandra Matunoshita, who is devoted to constructing an industry and trade model aimed at this vast and underserved group. Matunoshita tackled, as a job and business opportunity, a segment that she knew from personal experience as someone who suffered from multiple allergies from birth.

During her childhood and teen years, she drank cows' milk from her father's farm but did not associate it to frequent hospital visits. After all, milk is considered a healthy food, with no widely known exceptions. But for Matunoshita, the symptoms of something wrong were frequent and any



physical effort was too much to bear. Contact dermatitis made social life difficult and its effects even prevented her from being fingerprinted to get her ID card. Psychosocial pressures could rise to extremely unpleasant levels (“you have leprosy”), something unimaginable for someone who lived a healthy life.

From doctor to doctor, she finally saw the opportunity to take a skin puncture test – the so-called prick test – that confirmed an allergic reaction to milk. A considerable number of other allergies were subsequently identified, increasing her dietary restrictions. Alongside food allergies, she was also afflicted by skin allergies.

Not even on her wedding day in 2002 she was spared by her allergies. *“The dermatologist who treated me at the time prohibited me from using makeup, at the risk of swelling up during my wedding ceremony. That shook me a lot. I wanted to be a social worker then, to work with needy people. I had never imagined becoming an entrepreneur. The situation I faced on my wedding day made me rethink it,”* says Mrs. Matunoshita.



WORK AND PERSONAL VALUES

It was with her husband, Frank Matunoshita, that the company dedicated to the allergy products market was born. With a degree in electric engineering, the São Paulo-born son and grandson of small businessmen moved to Marília, where Sandra, whom he had met years before in the Japanese community, used to live. His previous professional experiences were all related to his academic background: electro-electronic equipment and automation of large events.

Already in Marília, the couple founded and maintained an internet café, which was a good business to get into but far from the values professed by the two partners and on which they wanted to build their family life. They needed to take a different turn, find

other activities, think about other businesses, in order to reconcile work and personal and family values.

This life project gave rise to SOS Alergia, initially established – with caution and financial restraint – in a segregated space in the premises adjacent to the Cyber Café, to sell cosmetic products intended for people with allergies. If planning was admittedly precarious, there was at least one important success factor for the new venture: they were personally acquainted with many allergic people, and consumer options were limited. After all, there was a lifetime in which personal suffering had made it possible to identify and talk with people in similar conditions. It was a start.

In addition to accumulated experience and knowledge, there was also a favorable environment. The municipality of Marília is an important food manufacturing cluster. Some large companies in the food industry – especially but not limited to cookie and cracker producers – employ a large contingent of workers on the “factory floor” and in technical positions.

To put together this technical staff, the network of Technology Schools of the State of São Paulo (Paula Souza Network) offers in Marília a course dedicated to the food industry. It is a three-year undergraduate (technologist degree)² program. The curriculum includes basic scientific disciplines as well as other more applied, business-oriented ones. With disciplines in chemistry, physicochemical, microbiology, and epidemiology³, Sandra Matunoshita was able to understand the problems and solutions for manufacturing products suitable for people suffering from illnesses that were so familiar to her.



In the course, Sandra Matunoshita was able to understand the problems and solutions for manufacturing products suitable for people suffering from illnesses that were so familiar to her.

² A Food Technologist is a professional who plans, implements, coordinates, controls, and oversees food and beverage production processes; participates in research to improve, adapt, and develop new products and processes; plans, conducts, and coordinates health inspections in the food industry and related industries; deploys food quality assurance systems, in compliance with national rules and standards and international market requirements; guides all activities related to the maintenance of equipment used in food industry processes; controls the quality of food services, with a view to protecting the health of consumers; and manages customer services in food industries.” Source: Available at: <<http://novosite.fatecmarilia.edu.br/cursos/graduacao/alimentos.html>> (Accessed on December 7, 2018).

³ Source: Available at: <http://novosite.fatecmarilia.edu.br/arquivos/grade_curricular/Grade_A31.pdf>. (Accessed on December 7, 2018).

SOS Alergia's administrative and commercial skills in the food industry were developed when the couple sought help from the Brazilian Micro and Small Business Support Service (SEBRAE) – by January 2019, 242 requests for assistance had been met by the regional office, in addition to other services not accounted for. Special mentions should be made to the participation in EMPRETEC, for the development of entrepreneurial behaviors, in the Alimento Seguro – PAS (Food and Feed Safety) Program, for the organization of the productive sector, and in SEBRAETEC, to define the brand logo. Consulting provided by SEBRAE also encouraged participation in several contests, guiding the areas of the company that needed to be developed. With no financial resources to hire specialists, the couple went on to study and develop the business identity as well as manuals, processes and procedures.

A DIVERSIFIED PORTFOLIO

From a commercial company that manufactured products for people with allergies, SOS Alergia has become more and more an industrial company dedicated to manufacturing food products for this specific group. Breads, cakes, cookies, crackers, butters, and chocolates in different flavors and presentations enrich the product portfolio offered by SOS Alergia. Because traditional recipes invariably use raw materials that are allergenic, many studies, research and experimental tests were needed to obtain versions suitable for the target market.

Currently, the company produces no less than 300 different⁴ recipes for a group of consumers in Marília, other cities in São Paulo and other states (especially in the Northeast region of Brazil).

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⁴ The company has a catalogue of about 2,000 products, including earrings, which are produced by an outsourced company.



One of the major challenges of industrial production and marketing of SOS Alergia products is the impossibility of using certain types of raw materials and ingredients. In addition to excluding milk, eggs, soy and other major allergenic agents, the formulations cannot use certain types of food additives such as preservatives, flavorings and colorings. Thus, the development of new products is subject to many relevant restrictions, among them the shelf life of manufactured articles, which imposes the need to work with small batches to avoid their disposal and waste.

The development of new products at SOS Alergia always begins with identifying a need raised by the parents of allergic children (who are the main focus of the company's business) or by mapping out the market. The different opportunities are then internally screened, and the main ideas are selected based on their feasibility to be developed (considering access to alternative conventional inputs, for example), market potential and impact on the target group. A pilot recipe is then prepared and sent for a sensory analysis of flavor, texture, aroma, etc., first with the employees and then, in an improved version, with potential customers. The product undergoes improvements according to the experiences gained during the process. The approved recipes follow to the packaging development and commercial distribution stage.

FRANCHISES

A solution for overcoming the problem of the limited lifecycle of SOS Alergia's products, which is inherent in non-preservative products, was to develop a marketing system through franchises in other Brazilian regions. This solution allowed SOS Alergia to find outlets for its larger batch products while diluting development costs and amortizing other fixed costs.

The development of the franchise chain began when a customer from Piracicaba (state of São Paulo), impressed by the company and the values it held, urged its owners to authorize the opening of a store in their city – which they agreed to, with the aim to disseminate their ideas and drive the development of the company, giving rise to the first SOS Alergia franchise.

The option for franchising gave the company access to regions with different dietary patterns and habits. This is precisely why SOS Alergia allows franchisees to develop their own recipes, or even to change recipes developed by the parent company. A curious case mentioned by Mrs. Matiunoshita was that of a Ceará franchisee who created a cake for allergic people that replaced the famous “soft cake”, which is very common in that state but hard to find in South and Southeast Brazil. There are four product lines: food; products for respiratory allergy; products for insect bite allergies; and products for contact allergies⁵.

CHOCOLATE-MAKING MACHINE

One of the important products developed by SOS Alergia is chocolate free of the allergenic ingredients that prevent its regular consumption by so many people and entails a personal cost for people of all ages and especially for children. Until very recently, large chocolate producers could use the same equipment to produce milk and milk-free chocolate without the need to mention on the label that the product could contain traces of the ingredient.

Although the practice of cleaning between batches avoided reactions in most allergic people, those who were very sensitive endured the consequences of misinformation, as traces of milk and other allergenic products were found in supposedly milk-free chocolates. It was only in 2015, with the regulation of Resolution No. 26/2015 issued by the Collegiate

⁵ Currently, in addition to its headquarters in Marília (state of São Paulo), the company has franchises in Piracicaba (state of São Paulo), Águas Claras (Federal District), Goiânia (state of Goiás), Fortaleza (state of Ceará), João Pessoa (state of Paraíba), Boa Vista (state of Roraima), Petrolina (state of Pernambuco), and Sobral (state of Ceará), in addition to a unit in Belo Horizonte (state of Minas Gerais), currently under construction, totalling nine franchisees.



Board of ANVISA, that companies were required to correctly inform consumers about the risk of cross contamination⁶.

SOS Alergia began producing chocolates without any trace of milk and other allergenic products, using a small conventional machine purchased on the market. However, the plastic parts of the equipment broke very easily due to the thickness of the ingredients used in the recipe, which far exceeds that of traditional recipes, precisely because they do not contain milk or other products with the same emulsifying properties. The solution to his problem required Frank Matiunoshita's creativity and knowledge of engineering.

⁶ The "Põe no Rótulo" (Put it on the Label) movement, a group of families fighting for the rights of allergic people, played a decisive role in changing the legislation. For more information visit <<http://www.poenorotulo.com.br>>

Based on the lessons learned from replacing the breaking parts, Mr. Matiunoshita designed and built his own machine, with parameters adapted to the production of chocolate for allergy sufferers. The simple yet very effective equipment allowed SOS Alergia to substantially reduce the production costs of its chocolate products, with significant sale increases. But the engineer wanted to go farther and is now developing a second version, with greater production capacity and even sturdier.

PUBLIC SUPPORT

SOS Alergia has received – and acknowledges – important support from public systems. The initial technical training, which was provided by the State School of Technology (FATEC) of Marília, was complemented over time by different courses, training programs and consulting provided by SEBRAE, including other support arrangements with the National Industrial Apprenticeship Service (SENAI) and machinery financing by FINAME (Caixa Econômica Federal operation) and Brazil's Development Bank (BNDES) card. Although these are not formal partnerships, they are support arrangements that have contributed decisively for the company to structure and develop its business and reach its current level, according to Mrs. Matiunoshita: a small enterprise, no doubt, but with identity and vocation, founded on values and with development and growth opportunities that contribute to improving the lives of so many people. The company expects a 50% increase in revenue for 2019.

According to its founders and owners, the most important contribution of SOS Alergia is the possibility of social integration that the company has offered so many people. Eating, which for some of us is a commonplace and relatively easy experience, can be a source of sadness, suffering and pain for others. *"At the end of a child's birthday party, seeing a smile where once there were tears is our best reward,"* says Sandra Matiunoshita. The enthusiasm of this statement and the smile on the face of the person who made it are a dream come through.



Process Innovation

- Três Lagoas (state of Mato Grosso)
- Large enterprise
- 19,000 employees

A pulp and paper company develops and implements a series of innovations to enable one of the main industrial investments in its history.





AN INNOVATIVE HORIZON¹

An industrial investment project provides a unique occasion for identifying new solutions to many challenges. This is the time to combine previous corporate and third-party experiences to expand the technical and economic boundaries of the new unit and its complementary activities. In the case of Brazilian pulp (and paper) companies, which have been vertically integrated from forestry production, the breadth of innovations that enable implementing a new project and promote the company's competitiveness is even greater.

Best practices from the past may, for different reasons, be insufficient for achieving the proposed level of viability of the investment project, which requires from the company, its executives and its technical teams – often in close collaboration with partners on the supply and service provision sides – new creative efforts and new approaches to solving problems and overcoming challenges.

This was the roadmap for the construction of Fibria's new pulp mill in Três Lagoas, state of Mato Grosso do Sul, an impressive project that added nearly two million tons of pulp to the company's annual production and required several innovative initiatives to become viable. It is a milestone in the company's growth trajectory, which leverages the natural conditions existing in Brazil through investments in new technologies and innovations.



¹ The selected case was that of Fibria, a finalist in the National Innovation Award 2016-2017. Since January 2019, Fibria has been part of the Suzano company under the new name of Suzano S.A.



The pulp industry is one of the areas in which Brazil has been building, for more than half a century, an important level of competitiveness. The determinants of this position derive in part from natural conditions found in many Brazilian regions, which sometimes are considered the main determining factor. Private investments and public support also have an equal weight, which ensured a trajectory of great technological dynamism, with developments that range from the forestry stage to product flow logistics, including the industrial processes that promoted an accumulation of increasing competitive advantages. This dynamism explains the success of large projects implemented by the main companies in this industry, even in a structural and circumstantial scenario that has been constraining investments.

On the structural side, we have the well-known competitive difficulties faced by so many companies and entire industries that are being increasingly threatened by imports mainly from Asia, in particular from China. Reasons both internal and external to companies and sectors – such as the unfavorable macroeconomic environment, deficiencies in infrastructure and difficulties in the institutional and regulatory fields – contribute to undermining the competitiveness that Brazilian industry has built over time. In some cases, these problems are insurmountable. However, this is not always the case, thanks to the actions of companies that can remove some of these barriers or offset their effects.

On the circumstantial side, there are at least two scenarios that could be critical to Fibria's project: the situation of the domestic market, whose performance may sway at an amazing speed between great optimism and sheer pessimism, and cyclical fluctuations in pulp prices in the international market. However, competition in the pulp industry and the need to increase size to stand up to internal and external competitors were decisive factors for the company to decide to substantially increase its production capacity.

The investment project for the establishment of Fibria's second industrial unit in Três Lagoas mobilized the company's best competencies, in an effort to overcome its limitations that was commensurate with its size. The numbers are impressive. The new plant, which was announced in May 2015, added nearly two million tons to the annual production of the previous unit, which has a production capacity of 1.3 million tons. Over the course of 27 months, 300 suppliers were mobilized and sold products or services to enable carrying out the project, which directly and indirectly involved approximately 40,000 people.

The feasibility of Horizonte 2 – an investment project of no less than R\$7.4 billion implemented in a scenario of high uncertainty and strong instability – required high



performance from executives and technical teams to ensure that costs remained consistent with those initially planned, with production on schedule and, most of all, without surprises. It is the surprises that often sabotage so many projects and make them deficient even before they are completed or become operational.

In an economy that has long been plunged into a scenario of low investment and few large projects, the ability to ensure well-designed budgets and meet deadlines is also low. After all, investing in new projects is the biggest business challenge as it requires mobilizing a wider range of resources, including developing new skills and original solutions. This is possibly the biggest contribution of the new Três Lagoas project to the Brazilian innovation universe: the active participation of multiple innovations throughout the chain to make the expansion project viable.

SERIES OF INNOVATIONS

The first important technological innovation brought by the Três Lagoas project was in the eucalyptus seedling plant (nursery), which precedes its planting in the field. A computer-vision robot allows the process of selecting and planting seedlings in biodegradable tubes for greenhouse growth to be carried out at high speed and with extremely stringent quality standards.

The nursery, which occupies an area of 90,000 m² (the equivalent of nine soccer fields), needs to produce 43 million seedlings annually. Each seedling will become a tree whose quality will add production volume to the industrial pulp and energy process, or otherwise compromise the result if the process is not carefully designed and implemented.

In addition to computer vision and artificial intelligence tools used in seedling planting and selection (at two different growth stages), the mill of future wood- and pulp-producing eucalyptus also uses resources typical of manufacturing, logistics and cargo movement processes for the automated handling of trays and tables and for tracking seedlings using RFID (Radio Frequency Identification).

All that goes alongside technologies typical of agricultural processes such as irrigation and fertigation (technique in which fertilizers are applied with the irrigation water) using automated systems, which are also used to control greenhouse temperature, humidity and insolation. In many cases, automation concepts are fully developed and implemented in these nurseries, in a way not unlike that of industrial sectors, which handle parts, pieces and equipment rather than plants.

Another important innovation occurred in the logistic processes used for transporting trees harvested in forests planted by the company and its partners. Altogether, they account for an area of 307,000 hectares that could be as

A computer-vision robot allows the process of selecting and planting seedlings in biodegradable tubes for greenhouse growth to be carried out at high speed and with extremely stringent quality standards.

far as 100 km from the industrial unit. Obviously, managing this process poses significant challenges both in operational terms – to ensure a continuous flow of raw materials for industrial processing – and in terms of the cost to transport logs by truck.

Fibria implemented the transportation of harvested eucalyptus from the forests to the industrial processing unit by five-trailer trucks. These trucks represent savings of approximately 20% in fuel and transportation costs when compared to previous methods. This means of transportation, not yet authorized in public road systems, operates in planting areas adjacent – or at least contiguous to – the industrial plant, even when distant.

ENERGY USE

One of the foundations of the sustainability of industrial processes used is based on the wide use of its raw materials. The burning of eucalyptus bark in biomass boilers produces the heat and steam to activate the turbines that generate the energy feeding other industrial processes. The company also burns, in the recovery boiler, the black liquor resulting from the process of separating cellulose and lignin once the wood has been chopped into small pieces and cooked in the digester, thus generating more steam and energy.

Another innovation that contributed to starting the second unit was precisely the use of energy from processes of the first unit. A pipeline was installed interconnecting the high-pressure manifolds of the two factories and providing the conditions for starting operation ahead of schedule. It is obvious that in large investment projects, any postponement of operation – and thus of revenue generation – can be critical to their sustainability and financial balance. Conversely, starting operation ahead of schedule provides the conditions for increased profitability and contributes to making the project feasible.

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By providing the conditions for a large project to deliver operating results as expected, the set of innovations and operational decisions made contributes to overcoming the difficulties that companies face regarding investment decisions, in addition to those that concern their feasibility: meeting deadlines without budget overruns.

The construction model, which incorporates a leading company in the manufacture of equipment and the design of projects for the pulp and paper industry, was decisive for Fibria's project to achieve the desired results in terms of costs, timelines and returns. Under the Engineering, Procurement and Construction (EPC) model adopted, the contracting company delegates the responsibility for the project to a specialized company, which benefits from the fact that it is an equipment manufacturer and has been responsible for other investment projects of a similar nature. Thus, the chances of delay are minimized, and (non-)decision-making times to which a non-specialized company would inevitably be exposed are avoided. Also for this reason, a multifunctional Fibria team was allocated to the project to ensure agility to the decision-making process.

LESSONS

Fibria's expansion project in Três Lagoas offers important lessons to the pulp industry as well as to Brazilian industry. The first lesson was to ensure its viability through a set of technological and organizational innovations that contributed decisively to the economic profitability of the project.

The list of innovative solutions is long and has been exemplified by three steps, starting with forest preparation, going through internal logistics and reaching the mill. The eucalyptus seedlings that are planted in the vast plain of the region were produced in a nursery where a robot does typically human work at accelerated speed, highlighting the opportunities for the robotization of repetitive activities.

The seedlings that are finally planted will grow to an expected standard and optimize forest mass production to feed the mill. This forest mass is transported by five-trailer trucks that reduce the cost of transportation between the forests and the mill. At the mill, the integrated vision between industrial processes and steam and energy production enables maximizing resource efficiency.

A company with an innovative vision can optimize an investment by reconstructing processes and intervening in everything that can improve efficiency and economic and financial results, using new knowledge and new approaches. The project to implement Fibria's new unit shows that innovation can be an important lever for relaunching investments in industry and reaching a new level of competitiveness.







Process Innovation

- Goiânia (state of Goiás)
- Medium enterprise
- 600 employees

Construction company from Goiás state bets on partnerships to ensure that high performance standards are met and develops a wastewater treatment and reuse system to be used on its construction sites.



TOCTAO

ENGENHARIA

WATERING CONSTRUCTION SITES

Toctao Engenharia belongs to the Toctao group and operates in different segments of the construction industry: in addition to residential and commercial buildings, the company from Goiânia, the capital of the state of Goiás, designs and implements major construction projects, such as shopping malls and hydroelectric power plants.

The main projects carried out by the Toctao group include the Cerrado (Goiânia) and Aparecida (Aparecida de Goiânia) shopping malls, expansions in the Flamboyant (Goiânia) and BH (Belo Horizonte) shopping malls, and the Riacho Preto and Lagoa Grande hydroelectric power plants, both in Dianópolis (state of Tocantins). The Toctao group also operates in the real estate development and construction and urban development markets.

Founded by the engineers Alan de Alvarenga Menezes and Geraldo Magela da Silva, Toctao has been granted many awards for its innovative and sustainability-oriented projects, one of the company's pillars, among which the development of a wastewater treatment and reuse system for construction sites stands out¹.

¹ The company has certifications such as: ISO 9001 and PBQP-H Level A Quality Management System, ISO 14001 Environmental Management System, and OHSAS 18001 Occupational Health and Safety Management certificates. It was granted the Brazilian Chamber of Construction Industry (CBIC) Award for Innovation and Sustainability in 2016 and its Social Responsibility Award in 2015 and 2013. Its *Conta-Gotas* (dropper) program for reusing wastewater on construction sites was selected to be presented as an innovation case at the 15th Conference of the National Association for Research and Development of Innovative Companies (ANPEI) on Technological Innovation. In the 2016-2017 edition of the National Innovation Award, it was the winner as medium enterprise in the Process Innovation category.



In recent years, the company has managed to deal with economic ups and downs that hit the construction industry hard by taking a clear position of focusing exclusively on private construction projects to avoid the typical problems faced in large public works. In addition to this strategic element, Toctao developed a management, planning, and control system that has become a key differential for the company and allows it to implement highly complex projects and works without compromising deadlines and costs and observing strict quality parameters while respecting the environment and protecting the health and safety of its employees.



Construction is one of the global villains in generating adverse effects on the environment. While economic and social gains are fundamental to the progress of our civilization, they can have negative effects on the environment throughout the entire production chain, which involves the manufacture and transportation of materials, intensive use of inputs, and gigantic waste generation.

Common sense usually associates the waste generated on construction sites with debris and leftovers. Few people are aware of the intense water consumption required for preparing mortar and concrete, diluting paint, and cleaning up equipment and work areas. In addition to discharging an effluent laden with harmful solutes and suspended particles into the public sewage collection system, or into soil, construction projects require a noble resource, namely, water, usually drinking water, from the water supply system for a purpose that does not require such degree of purity, wasting an essential input for human consumption.



Inspired by the five characteristics of sustainability described by physicist Fritjof Capra (interdependence, recycling, partnership, flexibility, and diversity)², Toctao assumed the commitment to reduce and make up for the impacts of its construction projects on the environment. The company then defined five sets of actions to review processes and eliminate environmentally aggressive actions. The first set involves the life cycle of construction site structures, the second one rethinks and modifies production means, i.e. its productive techniques themselves, the third one involves adjustments in procurement processes, the fourth one is related to the training provided to workers and operational teams and, finally, the fifth one refers to investment in innovation.

The initiative highlighted here refers to the development of an innovative solution designed to reduce water consumption on construction sites by treating and reusing wastewater. Water from different sources used in a large construction project amounts to

² According to physicist Fritjof Capra, sustainability is the consequence of a complex pattern of organization characterized by five basic elements: interdependence, recycling, partnership, flexibility, and diversity. If society applies these characteristics to ecosystems, it can also achieve sustainability. In his book **Ecological Literacy**, he argues that sustainable action is not only intended to preserve or conserve the environment so as not to compromise natural resources for future generations, or to maintain economic, social, cultural, political, institutional or physical-territorial entities or processes in the long term, but that it is rather a complex function that combines, in particular, the five above-mentioned characteristics.

thousands of liters a day, with economic and environmental consequences. Therefore, the possibility of reusing it, if such reuse is technically and economically feasible, can be very advantageous and provide substantial gains for both the environment and the business economy. The reasoning was correct, the decision had been made, but the issue of the cost of the required investment had yet to be addressed.

PARTNERSHIPS

Before the decision could become economically feasible, it was necessary to devise an appropriate technical solution, which was made possible through a partnership with the National Industrial Apprenticeship Service (SENAI) in Goiânia (Vila Canaã unit), funded by SESI-SENAI's Call for Innovative Projects.

After an 18-month research and development (R&D) cycle, the collaboration between SENAI and Toctao made it possible to develop and implement the Ecoágua (ecowater) project, which consisted in a small physicochemical treatment plant designed to be set up on construction sites called mini sewage treatment plant. Wastewater from washing concrete mixers and other equipment items, from preparing mortar, and even from the showers used by workers is stored and channeled to the mini station, which can treat up to 600 liters per hour, reaching a degree of purity that allows bathing, that is, primary contact, without causing any harm.

With the Ecoágua Project, wastewater from washing concrete mixers and other equipment items, from preparing mortar, and even from the showers used by workers is stored and channeled to the mini station, which can treat up to 600 liters per hour.

In addition to treating effluents with different characteristics, the mini sewage treatment plant also has the great differential of being portable and easily transportable to any place where wastewater is generated, which cannot be done with similar equipment available on the market. In addition, after a construction project is completed, it can be transferred to another site.

With the Ecoágua project, implementing a wastewater collection and treatment system is no longer a challenge but rather a decision exclusively dependent on economic and financial considerations, whose figures are also positive.

In the case of the construction site of the Aparecida shopping mall, which served as a pilot for the plant project, implementing the mini sewage treatment plant made it possible to save approximately 5,000 liters of water a day, reducing expenditures with this input by about 70%. Obviously, this figure does not take into account, on the one side, the gains in terms of social responsibility and the company's image, and on the other the cost of developing the innovative solution.

It is also very costly for any company to maintain a team of qualified professionals dedicated to the R&D project of a new solution. But prospects are promising. In the process of building the Aparecida shopping mall, Toctao paid R\$ 15 per cubic meter of drinking water provided by the state water utility Saneamento de Goiás (SANEAGO). The cost of the water treated by the mini sewage treatment plant was in turn R\$ 3.35 for the same volume – with the very interesting possibility of reusing it repeatedly.

There are, of course, several ways to analyze the required investment and its cost, and one of them seems to have prevailed in Toctao's analysis: the company's commitment to environmental sustainability.

In addition, value is created for the team engaged in the project and also for the company, which has managed to mobilize in-house and external creative energy and competencies to address knowledge needs and solve the technological puzzle posed by the challenge. A project of this nature tests the contributing capacity of the members of the team in charge of it and forces them to overcome challenges while producing permanent gains for the people and organizations in question, both as a result of the technical learning process involved and of the development of collaboration methodologies.



INTEGRATIVE MODEL

In Toctao's case, bonding with research and technological development institutions, a well-known weakness of Brazilian innovation ecosystems, went from nonexistent and unknown to a success story that lends itself to replication, since the bonds and the collaboration method became familiar to members of the two organizations involved in the process. This partnership was successful due to a mutual understanding of the challenge and to a willingness to combine knowledge and technical skills. In such cases, the results may take longer than initially expected, but they often far exceed initial expectations.

The ability to build partnerships seems to be one of Toctao's distinguishing qualities. The major projects developed by the company from Goiânia involved, among their differential elements, efforts to secure cooperation from other institutions in the main stages of each venture.

There are different ways and means to meet the stringent quality standards demanded by clients and project deadlines and budgets. Toctao chose to adopt an integrative model based on shared responsibilities between the various stakeholders and partners as a means to ensure a high degree of involvement and responsibility from the initial drafting of the project to its final stages and in defining its financing model and actual implementation.

By bringing together experts with different skills, Toctao can see the large picture and thus identify opportunities for improvement, which is always possible in each construction project. This is what led it to adopt the Building Information Modelling (BIM) tool, a resource integrated into the Enterprise Resource Planning (ERP) software that allows for construction projects to be viewed in 3D and for different elements to be appropriately harmonized - including the hydraulic, electrical, civil, and lighting projects, a feature that always amazes customers.





The construction industry provides a vast territory of opportunities for innovation both in products and processes. Each construction project always affords opportunities for new ideas, for different concepts, for doing things in different, better ways. Toctao fosters these opportunities by adding harmonious partnerships to its projects and processes with the aim of enriching the arsenal of possibilities available and improving the effectiveness of its operations.

Toctao chose an integrative model based on shared responsibilities as a means to ensure a high degree of involvement and responsibility in all stages of an enterprise.





Product Innovation

- Rio Claro (state of São Paulo)
- Large enterprise
- 11,000 employees

Home appliance giant launches washer that allows for clothes of different characteristics to be washed separately in the same cycle.





CLOTHES OF ALL COLORS

Whirlpool's Double Wash washer was developed in Brazil but is being marketed globally. The new washing machine allows for two loads of clothes with different characteristics and requirements to be washed at the same time in two independent baskets. This innovation reduces the number of washes and washing time while saving water, energy, and cleaning products.

Based on a robust new product development process created by the global company headquartered in the United States, the new machine was designed to meet demands identified among upper-market consumers. The result was a product that caters to the most demanding consumers in terms of performance while ensuring higher levels of sustainability and respect for the environment.

Whirlpool Corporation in Brazil is the home appliance business of Whirlpool S.A., a subsidiary of Whirlpool Corporation, a centenary company and the largest household appliance manufacturer in the world. With a strong base in Brazil, where it has a long history of corporate ownership, product development, and manufacturing, it has three factories, two administrative offices, four technology centers, 23 laboratories, and three distribution centers. For many years, it was a shareholder and technology provider to Brastemp, of which it became the controlling shareholder in the 1990s. Its affiliate Embraco (former Empresa Brasileira de Compressores), a 1970s venture that brought together three local manufacturers of cooling





equipment (Consul, Prosdocimo and Springer), is one of the world's leading manufacturers of airtight compressors, the functional heart of refrigerators.

Whirlpool has teams dedicated to developing new products in its two plants in Brazil, one of which is located in Joinville (state of Santa Catarina), where refrigeration products are manufactured, and the other in Rio Claro (state of São Paulo), which specializes in manufacturing washing machines. In the Rio Claro unit alone, from 80 to 100 new products are launched annually to be marketed in all Latin American countries.

This high number of launches may lead to the illusion that they are merely minor improvements to existing products. However, the process of designing, developing, and launching a new product such as the Double Wash washer involves a highly selective cycle lasting 18 months on average, as shown in the figure below.

INNOVATION MACRO PROCESS



Whirlpool has teams dedicated to developing new products in its two plants in Brazil, one in Joinville (state of Santa Catarina), where refrigeration products are manufactured, and the other in Rio Claro (state of São Paulo), which specializes in washing machines. In the Rio Claro unit alone, from 80 to 100 new products are launched annually to be marketed in all Latin American countries.

A product is only launched if it meets an actual need as measured with consumers through qualitative surveys mainly: *"No product is launched if consistent demand for it has not been identified through market research,"* says Caio Doranti, an electrical engineer graduated from the Paulista State University (UNESP) who has been working at Whirlpool for the past eight years and currently holds the position of project manager at the Rio Claro unit.

Incidentally, the research and development (R&D) team of that unit is made up of 250 professionals developing projects ranging from simple redesign (referred to as "face lift") of traditional products to entirely new designs,



such as that of the Double Wash washing machine. The initial idea of this project dates back to 2012, when the company's market research team found that the features of such a washer were highly desired, albeit still vaguely, by consumers.

Potential consumers of a new washing machine perceive certain limitations in existing models. Through qualitative surveys, it was seen that, among other things, users found it painstaking to have the technical knowledge to know which clothes of different colors and types may or may not be mixed to avoid cross staining or wear.

This complaint was made several times in the surveys conducted by Whirlpool. As one respondent put it, "washers are indeed a blessing, but users still have a lot of work to do, as they are the only ones who can, provided that they have the necessary knowledge and experience, make sure that clothes being washed will not be damaged."

To avoid damaging clothes, consumers adopt a variety of procedures, some of which are intuitive while others are based on some accumulated experience. But all of them would like to have a washing machine delivering better results in terms of washing quality and care, reliability, and safety.

FREE TIME

Apart from the efficiency of the washing operation itself, knowledge of Brazilian culture and social values also contributed to building the new product. A washing machine is synonymous with more free time and more quality of life. The more free time users, who in most cases are still women, have the more they can devote themselves to other professional, family, or personal activities. Whirlpool estimates that reducing washes and eliminating the need to separate clothes by their color reduce the time usually spent doing laundry by 29%.

Therefore, the Double Wash washer means more free time, a symbolic value widely accepted by Brazilians. No wonder the model has become the anchor product of the Brastemp brand in all its corporate communications.

The Double Wash washer is also economical and aligned with highly appreciated values in Brazilian society. Compared to “conventional” washers with the same capacity, Whirlpool’s innovation saves water, electricity and soap by 20%, 43% and up to 30%, respectively.

NEW CONCEPTS

Consumer wishes are the starting point for Whirlpool to invest in improving its products. However, developing a new washing machine and its washing process to meet needs and desires identified through qualitative surveys is not a trivial procedure.

The process of developing new products begins with a research team, which is always cross-functional, dedicated to finding innovative ways to meet detected demands. In this case, the project team had ten managers specializing in different areas who devised 11 possible solutions for problems brought up by respondents in qualitative surveys.

The following phase of the development process consists in presenting new concepts to consumers to gauge their acceptance. At this stage, tentative options are presented to potential users to check their reaction and collect their comments for validation or disapproval. Each of 11 possible solutions were assessed through surveys against five criteria adopted by Whirlpool to validate its new concepts before embarking on the actual development of a product. These criteria are the following ones: innovation, which has become a value appreciated by consumers; willingness to pay more for a new product for the advantages it offers; credibility of the claim; affirmation of a superior criterion that must be met; and, finally, care and desire to own the product.

Of all 11 concepts presented to consumers, only the one proposing the creation of two fully independent washing environments was approved in each of the five criteria.

Once consumers validated the new product, Whirlpool set out to develop it. In this “hands-on” phase, engineers began to work on the technical and industrial requirements to combine two baskets, one with a capacity of 7.5 kg (lower basket) and another one with a capacity of 2.5 kg (upper basket) to make it possible for white clothes to be washed at the same time as others but without mixing them, eliminating the need for two or more washes. When consumers opt for using one basket only, the washer’s capacity is 15 kg.

SIMULTANEOUS AND INDEPENDENT WASHING

The seemingly simple concept of the washer involved major technical and engineering challenges. Among other challenges, it was necessary to devise a solution to keep the two environments effectively separated and to ensure mechanical coupling between the two baskets and full extraction of water from each of them.

The complexity of the innovation can be gauged by the number of patents filed: 18 altogether, covering from the concept of two baskets itself to its revolutionary water supply and drainage processes and the algorithm underlying the washer’s embedded intelligence.

Each of these patents represents a technological challenge that was addressed and overcome through an original solution – in some cases, by the R&D and engineering teams of Whirlpool do Brasil; in others, by those teams working together with other units of the company, as in the case of the water extraction speed control software designed for each of the two baskets, which was jointly developed with the company’s United States unit.



The combination of two baskets, one with a capacity of 7.5 kg and another with a capacity of 2.5 kg, made it possible for white clothes to be washed at the same time as other items, but without mixing with them.

After all technical issues had been resolved, the new product also required a careful design and other attractive features, such as the possibility of choosing between two colors: traditional white or metallic graphite.

WAR ROOM

Managing a project of this kind required well-coordinated and concerted efforts between the different departments of the company. In addition to its Core Team, as it is referred to at Whirlpool, made up of functional leaders, the project involved an extended team of approximately 150 people. Managing a process involving so many departments and people is not simple and requires a project manager with extensive knowledge of the product to be developed, in addition to project management and leadership skills.

For this reason, a dedicated environment consisting of a central room was set apart to manage the project, which is quite appropriately referred to as the War Room. In this meeting and decision-making space, all relevant information and indicators are available for viewing, including those relating to the relationships between different areas.

The new washer was launched in September 2017, five years after its initial idea emerged. Its business result exceeded the company's expectations for a product designed for consumers in the upper segment of the market and, therefore, with limited demand in a middle-income country with known income distribution challenges.

The results achieved with the Double Wash washer confirmed the effectiveness of Whirlpool's new product development methodology, which avoids launching white elephants, as companies claiming to be very innovative often do. The company also does not accept projects that exceed their deadlines and anticipated costs mainly as a

result of cross-functional teams not sufficiently committed to their outcomes and without well-defined, shared responsibilities.

Whirlpool believes that the Double Wash washer will have a long life in the company because it is a product that very well represents the pillars of its brand. It has plans to replicate its technology in other products and studies are already under way to make it available in at least four countries. The innovation generated in Brazil has contributed to increased appreciation for the company's brand, consolidating its positioning in the high-end market segment, and to the dissemination of values and concepts related to preserving the environment and fostering sustainability. Making an analogy with another value that is very dear to Brazilians, soccer, the Double Wash washer has made a clean sweep.



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