Woodpecker's business development: where to?

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Abstract

Dissertation title: Woodpeckers's business development: where to?
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This Dissertation presents a situation where a Portuguese pulp and paper manufacturer initiates a development project to enhance its global competitiveness. The Case Study explores the decision-making process by stimulating debate on diverse key factors influencing these decisions. Additionally, it addresses several strategic concepts in real situations, allowing for evaluating hypotheses to enhance the company's competitive advantage and prompts students to engage critically with real-world business complexities.

Furthermore, the case helps to better understand the decision-making process regarding strategic, operational and tactical decisions in determining where to place a factory to increase production. These decisions involve a complex analysis of various factors and require an understanding of strategic and operational considerations. As the decisions for increasing the company's competitive advantage are pivotal to its success, the Literature Review and the Teaching Note provided in this dissertation assess several aspects related to topics such as supply chain management, integration/collaborations, innovation and product diversification. In addition, the Case Study highlights the importance of sustainable and ethical business practices.

Ultimately, a thorough evaluation of these multifaceted aspects enables the company to make informed decisions that positively impact its continuous growth, efficiency, and overall competitiveness in the market.

Keywords: supply chain management, vertical and horizontal integration, pulp and paper industry, plant location decision-making process.

Resumo

Título da dissertação: Desenvolvimento de negócios da Woodpecker: para onde?
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Esta dissertação apresenta uma situação onde um fabricante português de pasta e papel inicia um projeto de desenvolvimento para aumentar a sua competitividade global. O Caso explora o processo de decisão, estimulando o debate sobre diversos fatores-chave que influenciam o mesmo. Além disso, aborda vários conceitos estratégicos em situações reais, permite avaliar hipóteses para aumentar a vantagem competitiva da empresa e incentiva os alunos a envolverem-se criticamente com as complexidades empresariais do mundo real.

O Caso permite compreender melhor o processo de decisões estratégicas, operacionais e táticas para determinar a localização de uma fábrica para aumentar a produção. Estas decisões envolvem uma análise complexa de vários fatores e exigem uma compreensão de considerações estratégicas e operacionais. Uma vez que as decisões para aumentar a vantagem competitiva da empresa são fundamentais para o seu sucesso, a Revisão da Literatura e a Nota Pedagógica apresentadas nesta dissertação avaliam vários aspetos relacionados com a gestão da cadeia de abastecimento, integrações/colaborações, inovação e diversificação de produtos. Para além disso, o Caso salienta a importância de práticas empresariais sustentáveis e éticas.

Em última análise, uma avaliação aprofundada destes aspetos multifacetados permite à empresa tomar decisões informadas que têm um impacto positivo no seu crescimento contínuo, eficiência e competitividade global no mercado.

Palavras-chave: gestão da cadeia de abastecimento, integração vertical e horizontal, indústria da pasta e papel, processo de decisão sobre a localização de fábricas.

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1. Case Study

The Woodpecker Group[1] was an integrated forest producer whose main products were pulp, office paper and energy. Its operations were based on modern, large-scale industrial units that used state-of-the-art technology. By January 2017, it was one of Portugal's largest exporters, shipping to more than 100 countries over five continents.

Two years earlier, the company had acquired a producer of "tissue", a segment previously identified as a strategic area for expansion, broadening Woodpecker's activity and range of products into the paper market for domestic and industrial use.

This factory's sales grew by almost 30% in 2016, thanks to the expansion in production capacity after the acquisition. Therefore, Woodpecker announced a development project consisting of a new production line for tissue paper and its corresponding industrial facilities to support it.

The project required an investment of 150 million euros and was expected to be completed in the second half of the following year. However, the acquired tissue factory was already using its available industrial area. Consequently, João Pereira, the Manager in charge of the Tissue Business, alongside other departments, had to assess the opportunity to buy land near any port or current industrial complex, including variables such as the distance between existing factories, logistics and associated transportation methods in order to best advise the Board on this issue.

1.1. The Woodpecker Group

The company was founded in 1950, operating a pulp factory in Ovar (Exhibit 1), where a team of technicians achieved a significant breakthrough by becoming the first to produce paper pulp from eucalyptus using the kraft process worldwide. This mark set the company on a path for global leadership in manufacturing Bleached Eucalyptus Kraft Pulp (BEKP) and Uncoated Woodfree Paper (UWF).

In the following years, as the sector grew, other companies entered the market as paper distributors and pulp producers, and new factories were built in Portugal (Exhibit 2). The company's growth was built up over more than seven decades of innovation, investment, mergers and acquisitions in the pulp and paper industry.

[1] The names of companies and managers are disguised.

In the mid-70s, during a period of political turmoil, the Portuguese paper industry was nationalized and became highly subsidized by state funds. The company became more prominent by integrating several Portuguese pulp, paper and packaging factories. In the mid-1990s, the company acquired more firms and was partially privatized. Before the millennium transition, product advancements were accomplished using eucalyptus fiber with precipitated calcium carbonate (PCC), an additive to enhance paper quality.

At the beginning of the 21st century, an essential stage towards consolidation began, as a significant paper producer sold its production business to one of the leading competitors in the market. Then, Woodpecker acquired that player, giving rise to the corporate brand "The Woodpecker Group", a corporate group that brought together a range of companies with a history of more than 50 years in the pulp and paper sector. It had become the country's third largest exporter, shipping to more than 100 countries over five continents and thus achieving the widest international presence among Portuguese companies. It was also Europe's top manufacturer and among the top 10 worldwide in the pulp and paper industry.

In 2004, a Portuguese Management & Investment Conglomerate acquired a majority stake, which helped to consolidate its leading position in international markets. In 2006, the construction of a new paper factory in Pegões was announced and another one in 2009 at the same industrial complex (Exhibit 3). The second factory was a significant milestone for Woodpecker and the country's industrial capacity, as the investment of over 500 million euros resulted in the world's largest and most sophisticated paper factory. This decision established the Group as the leading European producer of UWF and placed Portugal at the top of the European ranking of manufacturers of this type of paper as well as one of the largest in the world.

In 2015, in order to broaden its activity and range of products into the paper market for domestic and industrial use, Woodpecker acquired a company established in Torre that only produced "tissue". This factory's sales grew by almost 30% in tons in 2016, thanks to the expansion of production capacity after Woodpecker's takeover. However, at that moment, with the continuously increasing demand, the company realized that this factory could not increase its production accordingly and announced a development project consisting of a new production line for tissue paper and its corresponding industrial facilities to support it.

At the end of the financial year of 2016, the company had reached a turnover of almost 1.8 billion euros and an EBITDA of 400 million. It had invested nearly 140 million euros in

development and 5 million in forest fire prevention and mitigation measures. Its pulp and paper factories were working at full capacity, and 95% of the production in Portugal was for export markets.

1.2. Locations

Business Subsidiaries

Woodpecker established a global presence through a network of 21 offices in key regions worldwide (Exhibit 4). In Europe, its reach extended to countries such as Spain, France, Italy, Germany, Belgium, Switzerland, Netherlands, Austria, Poland, Turkey and the United Kingdom. In Africa, Morocco and Mozambique. In America, the USA. This geographical scope allowed the company to respond and tailor its approach to different markets and maintain a consistent approach on a global scale.

Nurseries, Research and Development

The company produced its own trees, among other smaller species, in three production units in Portugal (Exhibit 1) and one in Mozambique. Around 35% was for internal consumption, and 65% sold to the market. In 2016, the regular activity resulted in the production and sale of almost 9 million plants, of which around 500 thousand were native or protected species and 80 thousand ornamental or shrub plants.

Its nurseries produced young trees of eucalyptus globulus (Exhibit 5) through cloning and seeding. In the Portuguese market, the company accounted for 20% of the total output and sales of certified plants of all species (25% of eucalyptus plants). Following significant investment in the past years, these locations were some of Europe's largest and most sophisticated nurseries for producing certified forest plants. In this way, the company positioned itself as a world reference regarding efficiency and technological innovation.

Industrial Complexes (Exhibit 1)

(i) Ovar

This city served as a logistical hub for industries engaged in international trade. The factory played a key role in pulp and paper production and the company's export activity due to its proximity to the main ports along the Portuguese coast.

The past investment of almost 60 million euros in this industrial complex led to an increase in this industrial unit's eucalyptus pulp production capacity of 20% in relation to its first years of activity. This complex was located near one of the most extensive eucalyptus forests in Portugal, in the district of Aveiro. It produced an annual volume of over 300 thousand tons of bleached eucalyptus pulp to make several paper types (Exhibit 6).

The industrial complex was internationally renowned for its "designed" pulps for special applications, which were highly appreciated by demanding European customers. With more than five decades of existence, the history of this complex had been marked from the outset by its capacity for innovation. The use of the kraft process for pulp production from eucalyptus was developed at this site and was considered ideal for making high-quality paper.

(ii) Mira

This industrial complex was strategically positioned for manufacturing facilities due to its proximity to abundant natural resources and transportation infrastructures. It was Europe's benchmark for industrial efficiency, recognized worldwide for producing high-quality eucalyptus pulp and paper. This factory was a global reference due to its technological complexity and annual production capacity of over 500 thousand tons of BEKP and 700 thousand tons of UWF (Exhibit 6).

The factory had an integrated production system since 1991, with the implementation of its first paper machine, combining pulp production with paper processing. A second paper machine was installed in the year 2000.

(iii) Pegões

The industrial complex occupied an area of almost 750 thousand square meters and had an integrated production system consisting of one pulp and two paper factories. The second paper factory created nearly 400 jobs in 2009 and was one of the most significant investments made by the company. Over 500 million euros turned it into the world's largest and most sophisticated paper factory, producing paper at a rate of 30 meters per second. The largest machine needed five ships and over 200 trucks to be transported to the site. Over the years, the constant investment in both its environmental performance and operational efficiency led the complex to be seen as a European benchmark. Its production capacity reached an annual output of over 500 thousand tons of pulp and 800 thousand tons of paper from the two factories (Exhibit 6).

All three main industrial complexes included a plant for producing renewable energy from natural gas turbines, combining efficient fuel with a low carbon content. This allowed the company to meet the complex industrial electricity and steam requirements and supply surplus energy to the national electricity system.

(iv) Torre

In 2009, before Woodpecker's acquisition, this factory, located near the border with Spain, began production through a pipeline to a nearby pulp producer. This resulted in a significant reduction in its environmental impact, gains in the economy, reduction in transportation costs and efficiency in the production process.

In 2015, in line with its business diversification strategy, Woodpecker acquired this industrial unit solely dedicated to producing tissue paper. It was considered Europe's second most efficient tissue factory and the first in the Iberian Peninsula. This greenfield plant included two modern, sophisticated tissue paper production machines and processing lines. This factory had the capacity to produce 60 thousand tons of tissue paper per year and had over 200 employees (Exhibit 6).

1.3. Manufacture and Processing

Woodpecker produced its own "raw material", from seeds to paper sheets, through 5 phases, reaching its customers worldwide.

Phase 1: Forestry Research

Starting with R&D and Nursery production units (Exhibit 7), the company developed genetic materials and forestry techniques that helped increase yields and improve wood properties. The nurseries produced around 12 million plants annually and supplied the Group's forest planting operations. The eucalyptus globulus, the main species, was chosen due to its quality in producing pulp and because it required less wood to manufacture the same amount of paper, saving up to 45% compared to other species.

After being tended and reaching a particular growth, the saplings were transported to the forest sites for plantation. This specimen grew healthier in coastal locations, lowland regions below 700 meters and humid climates in Portugal.

A large tree, an adult specimen, could reach a height of at least 40 meters or higher when grown in a forest environment, having a life cycle of 12 years. The company managed forests covering over 100 thousand hectares under international certification systems, following strict sustainable management policies.

Phase 2: Forestry

The wood was harvested ("logging"), peeled and cut into specific-sized logs to be transported to the paper factories (Exhibit 8). At these sites, the wood was stripped from the logs and processed into chips of a standard size (Exhibit 9).

Phase 3: Pulp Production

The wood chips were put into a digester (Exhibit 10). The cellulose fibers were separated from the lignin using chemicals, heat and pressure, resulting in a brown raw pulp. Lignin was an organic compound with a high calorific value and reclaimed to produce steam and power when burned in a recovery boiler. While the wood was in the digester, chemicals and energy were recovered. At this stage, the company produced electricity from these integrated biomass units. This electricity was generated by the recovery boiler.

The raw pulp was then bleached to produce printing and writing paper. This process was designed to release the pulp of its residual lignin and other components surrounding the cellulose fibers. After several stages, the pulp turned whiter with each successive stage (Exhibit 11).

Whether the pulp was destined for sale or use at the other paper factories, it underwent a drying process, resulting in sheets of cellulose pulp to make its transportation more accessible (Exhibit 12). If the pulp were to be used at the same integrated industrial complex (producing both pulp and paper), the bleached pulp would be pumped directly, as a "slurry" (Exhibit 13), through pipelines to the paper production areas.

Phase 4: Paper Production

The paper production process consisted of five sections until one "jumbo roll" of paper (Exhibit 14) could be produced. Before the slurry left the pulp factories, it underwent a refining process designed to strengthen the bonding between the fibers. At the same time, mineral fillers and other additives were added to improve the strength and optical properties of the paper.

In section one, the wet pulp was pumped along pipelines to the first sector of the paper machine, being processed into continuous sheets to be drained on a grid. By the end of this section, moisture was reduced to 80 to 85%.

Section two consisted of a longer de-watering process, done by presses and often combined with vacuum processes. At the end of this process, the mechanical means could not remove more water as moisture was reduced to almost 60%.

In section three, the paper was applied with a surface sizing agent to improve its interaction with printing inks. After this application, the paper was moist and had to be dried again, moving to section four, the "post-dryer". At this stage and to complete the de-watering process, the water was evaporated using heat when passed over-drying cylinders.

The final stage of paper production was the Jumbo Reel. The paper was winded on a reeler, taking one hour to produce one jumbo roll of paper, weighing around 80 tons.

Producing Tissue

Woodpecker's tissue paper products were made with pure virgin fiber, which granted a high standard of excellence and greater purity, a combination of short fibers to ensure greater softness and long fibers from pine to provide greater strength and absorption.

Softness was one of the most important characteristics of tissue, especially when it came to facial tissues and toilet paper, while absorbency and resistance were characteristics associated with products such as hand towels, kitchen rolls and other rolls for the professional segment. Woodpecker used state-of-the-art embossing (Exhibit 17) to manufacture tissue paper, which, combined with virgin eucalyptus fiber and excellent lamination, gave them the softness, strength and absorbency desired in tissue products.

The tissue segment converting lines (Exhibit 18) were organized by product type, each dedicated to making one product: industrial rolls, domestic rolls, napkins, and hand towels.

Phase 5: Processing and Dispatching

The rolls were re-sized into smaller ones and sent to the packaging machine to be protected against humidity and for easy transportation (Exhibit 15). In the processing phase, the paper was cut into different formats and products for segments such as home or office use or the

printing industry (Exhibit 16). Then, it was wrapped, packaged and put on pallets for road, rail or sea dispatch.

1.4. Market Performance

Pulp

The pulp market experienced a downfall at the beginning of 2014 due to a decrease in demand for traditional paper products, overcapacity, rising production costs and export challenges because of the substantial currency value abroad. This market showed signs of recovery towards the end of the year, and this growth was sustained throughout 2015. The company's position benefited from a combination of factors, such as the decrease in supply capacity from other competitors due to production stoppages and the prominent demand from the Chinese market.

However, towards the end of 2015, business had slowed down due to several market trends throughout the year. The price of raw materials increased by an average of 5%, and in Euros, due to the currency's weakness against the dollar, the price increase was even more significant. In addition, even though it represented a growth of almost 15% of the pulp sales, the demand from the Chinese market had slowed down.

At the beginning of 2016, Chinese buyers continued to decrease their pulp purchases, but subsequently, the market recovered, resulting in a worldwide demand growth of almost 6%. However, there were concerns about the impact of the global increase in production capacity planned for the following year, as the utilization rate in 2016 for global BEKP capacity reached 95%.

At the end of 2016, the company's pulp sales had increased by almost 6% (Exhibit 19) despite a significant drop in the industry benchmark price of around 16% in USD and 13% in EUR since the beginning of the year. This was made possible due to the expansion of the company's capacity in 2015.

Paper

In 2015, European market consumption decreased slightly by almost 0.5% compared to the previous year, and paper prices fell by nearly 1%. On the one hand, the euro devaluation against the dollar led European producers to seek more profitable opportunities by increasing exports, consequently reducing sales in the European market. On the other hand, the capacity utilization

rate increased to around 92%, and the industry's “order book” was almost 1.5% higher than in 2014.

Paper consumption fell by almost 0.5% in the US market due to a significant reduction in imports caused by anti-dumping measures against paper producers. The capacity utilization rate was slightly lower than in 2014, and the sector's main price index fell by almost 2% compared to the previous year, with a total drop of 12% since its high point in 2010.

Despite these market challenges, the company achieved its highest-ever volume of paper sales in 2015, with an increase of almost 4% compared to 2014. The increase in sales in foreign markets fostered this growth. Woodpecker expanded into new geographical regions, especially Latin America and Africa, as sales in Europe slowed down due to the shift in focus to US dollar-denominated markets, leading to higher profit margins.

Woodpecker maintained 100% capacity utilization and recorded comfortable order levels compared to the previous year. Woodpecker continued to lead the industry in performance, maintaining a strong presence and recognition in the sector.

In 2016, the market environment was adverse due to a drop of almost 4% in consumption in European markets (Exhibit 19). In addition, with the pressure from lower pulp prices, the paper market price stayed close to the previous year's value. In the US market, the drop in consumption was in line with Europe and, additionally, due to more anti-dumping tariffs and the strong currency, imports and exports went down by 12% and 10%, respectively.

Tissue Paper

After the acquisition of the tissue manufacturer, Woodpecker invested in this plant, adding two new converting lines with a capacity of almost 65 thousand tons per year, which doubled the factory’s production capacity. The company operated in two market segments, which differed by use and package size. The “At Home” segment (AH) accounted for almost 80% of the total market and consisted of products sold in smaller retail packaging intended for personal hygiene or use within households. The “Away From Home” segment (AFH) consisted of products designed for use in public or commercial spaces, sold in larger quantities or, for example, industrial-sized rolls for the convenience of businesses and institutions. Both markets were supplied with a wide range of products, such as kitchen rolls/towels, toilet paper, napkins and tissues.

The Group's strategy was aligned with its expansion goals, targeting high-growth segments within the industry and gradually implementing its business model, ensuring a smooth entry into a new segment and minimizing risks. The commercial strategy was focused on the Iberian market. However, the company was developing other high-potential markets in Europe and Africa. The market in Western Europe accounted for around 6.4 million tons, with the UK and Germany leading consumption per capita. The growth of the European market over the previous decade had been constant, with an annual rate of approximately 1.3%.

In 2015, the tissue business recorded sales of almost 56 million euros, 52% of which was generated by the AH segment and the remaining by AFH products. At the end of 2016, the tissue sales volume, in tons, grew by almost 30%, especially from the AFH segment in Portugal and Spain. The Portuguese market accounted for nearly 48 million euros, around 65% of the total volume, and the remaining went almost entirely to Spain, which accounted for approximately 25 million euros. Overall, with the increase in quantities sold and the decline in average sales price, the company's tissue sales were worth over 70 million euros, achieving a growth of almost 25% in relation to the previous year (Exhibit 19).

1.5. Imports, Exports & Logistics

In 2016, Portugal was recovering from an economic crisis that had affected the country in previous years. Consequently, the negative impact on the country's investment capacity affected multiple industries. The company's ability to be competitive was threatened by limited infrastructure investment in ports, railways, and roads due to national budget restrictions.

Imports

In 2016, the company had more than five thousand suppliers, providing wood from forests abroad, chemicals for production, and several service providers. The increase in pulp, paper and tissue consumption made wood importation necessary, as the wood supply within the Portuguese territory was insufficient to meet the company's requirements.

The company imported primarily from Spain because almost 90% of its wood was certified. As the owner and manager of forestry holdings, the company achieved international forestry management certifications, adopting better practices and responsible management principles and rules that merged social, environmental, technical and financial concerns. As part of its sustainability commitment, the company also stepped up its efforts to encourage suppliers to adopt forestry and chain of custody certification despite its higher costs. The company's forestry

activities contributed to 70% of the supply, importing 15% from Spain and the remaining from other countries, such as Brazil.

Regarding logistical expenses, the first half of 2016 registered less 8 million euros than the previous year. This was due to the falling oil prices, the company's mix of destination markets, the increased use of ports closer to the factories (Setúbal and Figueira da Foz) and the continued efforts of the company to improve the efficiency of its commercial operations. The wood flows that supplied the company's industrial complexes were under "Forestry Logistics Units", an organizational arm. This area consolidated the company's operations by continuously searching for integrated, competitive and environmentally friendly alternatives while offering high safety and energy efficiency standards based on over ten logistical platforms (depots and ports).

The company prioritized rail transportation (Exhibit 20), mainly between Spain and Portugal, which accounted for slightly over 20% of the volume handled. This enabled the company to reduce road traffic and CO_2 emissions, which was also part of the company's sustainability commitment.

Regarding transportation by sea to handle the cargo from outside the Iberian Peninsula, the company received 13 woodchip carriers in the ports of Setúbal and Leixões and a bulk carrier in Aveiro (Exhibit 21). The ports of Setúbal, Figueira da Foz and Aveiro received about 25 ships bringing logs from northwest Spain. In terms of road haulage, Woodpecker used specialized trucks for transporting logs or woodchips, registering over 1.5 million tons handled.

Exports

In 2016, the company mobilized outbound logistical operations, which dispatched almost 2 million tons of products, combining pulp, paper and tissue, for its 4000 destinations over five continents. Exports were worth slightly over 1 billion euros, which corresponded to nearly 3% of Portuguese goods' exports. Approximately 95% of the company's pulp and paper sales went to foreign markets, primarily by sea.

In what existing ports near the factories were concerned, the company accounted for over 95% of containerized cargo exports (Exhibit 22) at the port of Figueira da Foz and almost 40% at Setúbal. At the port of Aveiro, "pulp containers" represented nearly 30% of conventional cargo exported. The company used rail transportation mainly for flows between factories and sea ports located away from the industrial complexes. In order to optimize transport between the factories and customers, Woodpecker used logistics hubs in Europe and the US as a central

point for its operations. These hubs handled, primarily by road, around 400 thousand tons in 2016.

At the time, the company was one of the largest exporters of containerized cargo, as maritime transport accounted for over 60% of paper exports and over 80% of pulp exports. The remaining export cargo of pulp and paper, and around 99% of the tissue products, were transported by road.

1.6. In need of a recommendation

Woodpecker had successfully entered the tissue business after the tissue manufacturer acquisition in 2015 and investing in its production capacity. As sales continued to grow throughout 2016, and the market forecasts for the upcoming years were optimistic, demand would outpace supply. However, the current production capacity was unable to keep up the pace.

João Pereira, the manager in charge of the tissue business, was well aware that the 150 million euro investment announced by the company for the development of a project to build new production lines for producing tissue products had been approved. However, the space available at the current industrial complex was not sufficient, forcing the company to relocate these facilities within the Portuguese territory.

Woodpecker did not lack technological, material or human resources, but it did lack time. João Pereira, alongside other heads of departments, found themselves with a tight deadline to make a recommendation for a new location to establish the new factory. How should this recommendation on a location in Portugal for the new facilities be made to the Board?

2. Literature Review

This literature review provides a conceptual understanding of supply chain and organizational strategy, with essential concepts for analyzing the case study and understanding the teaching note. This section introduces the concepts of supply chain management, network design, integrated production systems, vertical and horizontal integrations, and collaborations.

These concepts will help to understand the thinking process and type of decisions that supply chain managers face when establishing their short or long-term strategy.

2.1. Supply Chain

Supply Chain Management

A supply chain (SC) is a multi-stakeholder process involving several business entities, each representing an essential process of the chain. Their optimal functioning is necessary for the success of the entire network. SC collaboration facilitate the cooperation of participating members to improve performance (Hult et al., 2004).

Supply Chain Management (SCM) focuses on coordinating and integrating activities across multiple companies in an SC (Kurbel, 2013). It encompasses activities traditionally associated with production, logistics, marketing, and operations management (Mentzer et al., 2008). All entities along the SC work together to accomplish objectives, such as the acquisition of raw materials, its transformation to final products and its delivery to retailers. The advantages of collaboration include increasing revenue, decreasing costs, and improving flexibility to deal with uncertainties in demand (Fisher, 1997; Lee & Lau, 1999).

Strategic SCM goes beyond delivering products to customers as it involves leveraging the SC as a tool to enhance key outcomes. When companies use their SC to increase their competitive advantage, the value of strategic SCM is evident (Simamora et al., 2015). Conversely, failing to strategically manage SCs can raise challenges and negative consequences, such as inventory write-offs worth millions or missing early market entry products, leading to loss of sales and, ultimately, competitive advantage (Hult et al., 2007).

Over the years, the SC has been studied, focusing on its individual processes. However, recently, the focus has shifted towards performance, design and analysis of the process as a whole, defining it as an integrated manufacturing process. SCs can be split into (i) Production Planning and Inventory Control Process and (ii) Distribution and Logistics Process (Beamon,

1998). The first can be said to involve suppliers and producers, and the second involves distributors and retailers, each with its different sub-processes and timelines. All entities work towards providing an optimal service, meeting the chain's requirements. On the SC network, we can define the interactions between entities as business-to-business (B2B) or business-to-consumer (B2C) relations (Slack et al., 2013).

SCM is also highly relevant for achieving organizational goals and customer satisfaction, particularly through effective supplier selection and management (Dath et al., 2010). Overall, SCM focuses on the external coordination and integration of activities in an SC, while operations management concentrates on internal operations (Curry, 2019).

Exploiting the connections between different businesses can be the primary source of value creation as these key linkages permit the sharing of resources and capabilities across various businesses, allowing diversification to increase competitive advantage (Grant, 2018).

Supply Chain Network Design (SCND)

SCM is also about creating value by recognizing factors such as customer value and SC cost. Another essential aspect of this process is choosing a suitable business partner for each key role along the chain, considering several factors, starting with its ability to work in the short or long term (Slack et al., 2013). Designing an SC involves determining the organization's structure, roles, and responsibilities by identifying partners with the appropriate skills for each stage of the SC. As it constantly evolves, the roles and responsibilities may be revised, and goals and priorities may be adjusted depending on changing business requirements. The essence of SCM is effective integration, which is also the ground for the SC design in manufacturing companies. (Ambe, 2009)

Design decisions must function well in complex and uncertain business environments for decades, making SCND a critical planning problem in SCM (Govindan et al., 2017). A practical, efficient and robust SC can provide a sustainable competitive advantage, enabling businesses to handle growing environmental disruptions and intense competition. The SCND is a crucial strategic decision in SCM, involving deciding the number, location and capacity of facilities and the amount of flow between them (Pishvaee et al., 2011). Usually, two dual objectives conflict with each other and must have a clear tradeoff: minimizing costs and maximizing reliability (Yildiz et al., 2016).

One of SCND's objectives is to provide the maximum value to the customer at the lowest cost possible. There are typical decisions in network design problems, such as where a factory should be built or its capacity, shipment directions, outsourcing, and transportation models, among others (Babazadeh et al., 2012). For SCM, there are two categories into which these decisions can fall: strategic or operational decisions. The former is concerned with design and strategy, closely connected to the corporate strategy, and taken over a more extended period, such as how to structure the SC over the next several years. The latter is taken on a short-term basis as daily or weekly decisions (Romano & Vinelli, 2001).

Furthermore, strategic decisions may involve allocation (transportation costs) and location problems, i.e., locating production facilities, distribution centers or suppliers along the SC network. Deciding upon a location and choosing the technology to be used may require a tradeoff between profiting from low labour costs and maintaining high labour productivity and quality standards. Operational planning can include decisions such as determining the size of a batch, mainly based on economic criteria (Lemmens et al., 2016).

Additionally, according to their time span, a third type can arise, on a mid-term horizon, called tactical decisions (Govindan et al., 2017). These may include deciding upon inventory level (inventory cost), production capacity planning and distribution capacity (e.g., available storage in the distribution centers or the capacity limit in transportation) (Lemmens et al., 2016).

There are four essential decision topics in SCM, which all have both strategic and operational elements to decide upon: (i) Location – the geographic placement of locations such as production facilities or warehouses is the natural first step in creating an SC, and it involves a commitment of resources to a long-term plan; (ii) Production – decisions that may include what products to manufacture at which locations; (iii) Inventory – decisions on which inventories are managed as either raw material, semi-finished or finished products; and (iv) Transportation/Distribution – usually the more strategic decisions, and they are linked to inventory management and deciding which markets to serve (Ganeshan & Harrison, 1995).

The choice for an adequate SC strategy differs according to the demand and supply uncertainty. For example, implementing a responsive SC involves using a strategy designed to be adaptable and responsive to customers' changing needs. This approach accounts for a mass customization process, ensuring order accuracy to meet customer requirements. In contrast, an agile SC can quickly respond to unexpected customer demands while minimizing risks of supply disruptions on the back end (Lee, 2002).

It is important to include uncertainty in demand and supply in SCND, as plant failures or epidemic outbreaks can have a major impact on the SC. Unreliable facilities or transportation, for example, a factory stoppage or an inefficient distribution center, can easily disrupt the SC and make customers "turn" to a more reliable source, thus making outsourcing activities ideal in some situations (Lemmens et al., 2016).

Integrated production systems (IPSs)

Integrated producers engage in several activities within their industry/sector, implying a coordinated approach to optimize the production process. This method focuses on the integrated product and production engineering approach, highlighting the complexity of selecting functional principles, processes and materials to achieve economic, environmental and social objectives (Stoffels et al., 2018).

This approach recognizes these elements' interdependence and seeks to optimize outcomes for all stakeholders. Similar functional strengths may result in consolidation into one unit as a shared activity set (Krishnan et al., 1997). The term "integrated" implies a coordinated approach to production, where different components are combined to achieve a specific goal, which usually involves optimizing the production process.

An IPS in a manufacturing context means organizing and interconnecting processes and components to optimize resource efficiency, streamlined processes, quality control, and flexible production. The concept of an IPS is also closely related to two economic principles:

(i) Economies of Scale, which involve coordinating and optimizing different production processes to take advantage of increased production levels. For example, by streamlining processes, a company can benefit from lower production costs per unit, increased efficiency in equipment utilization and enhanced negotiation power with suppliers and customers.

(ii) Economies of Scope refer to producing multiple products or services more efficiently by coordinating processes and sharing resources or expertise across related production lines. This allows to produce more cost-effectively by reducing the duplication of resources, improving the shared resources (R&D capabilities), refining risk management and enhancing cross-selling opportunities when products or services complement each other.

The two principles are economic theories aiming to reduce production costs, and an IPS is a practical approach to achieve these efficiencies by coordinating and optimizing various

processes and products within the organization to improve its competitiveness in the market (Ghoshal, 1987).

2.2. Organizational Strategy

Vertical Integration

Integration strategies link activities within or between businesses through vertical or horizontal integration of value activities (Morrison & Roth, 1992).

Deciding on a method of operation, i.e., the extent to which a company should own the entire SC network, leads to the decision to outsource activities or proceed to vertical integration (Slack et al., 2013). For example, when a company owns its supplier or distributor, it is called vertical integration (Lonsdale, 1999). When developing or managing an SC, there are several issues to consider, such as upstream or downstream integration in the SC. Companies use a competitive strategy to achieve greater coordination, collaboration, knowledge and resources among SC partners (Ambe, 2009).

Furthermore, it prevents the need for extensive negotiations and disagreements by bringing different stages of business operations under common ownership and streamlining decision-making (Wolter & Veloso, 2008). In addition, transaction costs can be reduced by eliminating the need for market-based regulation of exchanges, as it internalizes these exchange relationships (Hill & Hoskisson, 1987). Also, a company's bargaining power plays an important role in vertical integration, as it may lose the flexibility to choose the best suppliers for their final product when integrating the production process (Ursino, 2015).

Moreover, vertically integrated SC companies are seen as leaders in production and transportation. A full vertical integration can lead to increased market volumes and aggregated profits (Kholodenko, 2020). When a company decides to expand, it must assess the difference between resource requirements and its current capabilities. Similarly, when a company considers diversifying, it must evaluate two key factors: the new industry’s potential and whether it can establish a competitive advantage (Grant, 2018).

Diversification has many benefits, one of which is economies of scope, which, instead of reducing the cost of producing a single product (economies of scale), reduces the cost of producing multiple products. The specific nature of economies of scope differs depending on the resources and capabilities involved (Grant, 2018).

Ultimately, deciding the right growth path can be outlined by three approaches: (1) a comparison between the company's current resources and its needs for future developments - as this gap increases, it is more likely to seek these resources externally rather than developing them internally; (2) if the required resources come externally, usually there is a need for contractual agreements such as licensing specific technologies; (3) assessing the company and its partners level of involvement to effectively transfer and integrate the resources needed – a low depth and complexity would only require an alliance while a closer involvement requires a more extensive integration, becoming preferable to proceed to an acquisition (Capron & Mitchell, 2010).

Vertical Integration, on the one hand, can bring competitive benefits such as avoiding the foreclosure of services and gaining superior control of the company's market power. On the other hand, for example, it can bring the burden of excess capacity or the loss of information from suppliers (Harrigan, 1984).

Horizontal Integration

Vertical ties within the SC increase manufacturing productivity, while horizontal ties facilitate the sharing of resources and collaborative product innovation. These collective efficiencies serve as competitive advantages (Mesquita & Lazzarini, 2008).

Regarding business expansion, horizontal integration refers to bringing together multiple businesses and centralizing management. This strategy involves merging or acquiring similar businesses within the same industry, effectively reducing competition and enhancing competitive advantage by promoting cooperation and streamlining operations (Knapp, 1950). Horizontal acquisitions seek economies of scale from greater efficiency and economies of scope from leveraging shared resources. It also allows for internal reorganization and market expansion (Cording et al., 2008).

Regarding involvement, it helps build a collective identity by increasing horizontal cooperation and providing access to more information, mentoring and other resources (Goshal & Bartlett, 1994). Market power theories see growing market share and reducing competition as means, while traditional efficiency theories say it leads to improved efficiency due to large-scale operations. Both theories emphasize that business combinations help maintain leadership positions (Capron et al., 1998).

Furthermore, by exploring scale and scope economies, horizontal acquisitions are seen as an opportunity to save costs. Also, it can enhance innovation through the acquired superior technology (Capron, 1999). Even though it provides space for technological advances, it can also lead to a lower tolerance for high-quality deviations (Cai & Obara, 2009). When competing for the output produced, acquisitions without synergies can raise prices, thus needing a previous analysis of potential price effects (Farrel & Shapiro, 1990).

Moreover, in exploring logistics integration in horizontal acquisitions, there must be an emphasis on realising synergies in such transactions, such as cost savings, improved operational efficiency and streamlined SCM (Häkkinen et al., 2004).

The ability to share information in real-time plays an important role in a successful horizontal integration as it helps to mitigate risks (Christensen et al., 2019). Horizontal integration provides several strategic advantages, however, these benefits are not guaranteed and can be influenced by factors such as demand uncertainty (Wu et al., 2012).

In comparison, vertical integration focuses on different stages of the SC (either upstream or downstream), while horizontal integration focuses on the same stage. The former aims to improve efficiency, reduce costs, and enhance control over the SC as it involves expanding a company's business into areas that are either closer to the end consumer (e.g., a manufacturing company acquiring a distributor) or closer to raw materials (e.g., acquiring a supplier of raw materials). The latter aims to increase the scale of operations, eliminate competition, and increase market share, as it involves merging or acquiring companies that are at the same level of the SC, often direct competitors in the market.

Collaboration

Collaboration within a supply chain aims to enhance communication, responsiveness and overall efficiency. A close collaboration between SC members can help optimize the matching of supply and demand, leading to increased overall profitability (Simatupang & Sridharan, 2002). Compared to integration, it seems a more cooperative approach, as it refers to the coordination and cooperation among different entities within the SC. For example, collaborative forecasting and planning between a manufacturer and a retailer to optimize inventory levels.

Collaboration can also be divided into the same categories: (i) vertical, when collaborating with customers, internally (across functions), service providers or suppliers, and (ii) horizontal, between different SCs when cooperating with competitors and non-competitors (Barrat, 2004).

The following topics can distinguish the differences between collaboration and integration:

(i) Ownership/Control: integration involves ownership changes, increasing one's control over the integrated companies (e.g., mergers and acquisitions), becoming more advantageous for streamlining operations and aligning strategic objectives, while collaboration between two or more entities, maintaining each one's independence, without significant ownership changes, shared decision-making and joint efforts.
(ii) Risk: integration may carry higher risks as it involves changes in ownership and scope of operations, while collaboration shares the risks among multiple parties.
(iii) Flexibility/Commitment: integration strategies, on the one hand, tend to be less flexible due to ownership changes and imply a long-term commitment. However, on the other hand, it creates synergies, leading to improved coordination and overall performance. Collaborations maintain the ability to pursue independent strategies and preserve independence but offer limited control due to a decentralized decision-making process and may create potential misalignments due to the different goals.

When deciding upon integration or collaboration, it is essential to assess each entity's specific needs, goals, context and preferences. In some situations, some may benefit from the increased control and operational synergies that integration can provide, while others may find collaboration more suitable due to its flexibility and risk-sharing characteristics.

In conclusion, companies face different challenges and opportunities when deciding their organizational strategy, as strategic decision-making in modern business involves complex interdependencies. A strategic SCM leverages the SC by exploiting connections between businesses, enhancing value creation and diversification, contributing to a company's competitive advantage, while mismanagement can lead to significant challenges and loss of competitive edge. Moreover, a robust SCND can provide a sustainable competitive advantage, mitigating potential disruptions and intense competition by continuously adapting to changing business needs and market behaviour. An effective SCM is essential for global business success as strategic decision-making shapes the industry's resilience, responsiveness, and overall competitiveness. Deciding upon the company's organizational strategy should be based on

several factors according to the market's behaviour and the company’s goals, needs and capabilities.

3. Teaching Note

3.1. Learning Objectives

The Case Study offers a compelling exploration of the dynamics that shape a company's competitive advantage in the pulp and paper industry, delving into its supply chain management, global presence, logistics and operational efficiencies, and the challenges and opportunities associated with its integration strategies.

Furthermore, with the overview of the company's modus operandi and its need to accomplish its future development plans, students will be able to:

- Understand the impact of efficient supply chain management on competitive strategy;
- Explore the concept of a robust supply chain network design;
- Identify different types of integration and evaluate their impact on the supply chain;
- Recognize the impact of resource requirements and the company's capabilities;
- Highlight the factors influencing a decision-making process;
- Understand how strategic, operational and tactical decisions impact competitive advantage;
- Reflect on the importance of innovation, sustainability and ethical business practices;

These learning objectives aim to provide an understanding of strategic and operational aspects involving supply chain management, integration decisions, and overall business strategy.

3.2. Class Plan

1. How has Woodpecker's approach to managing its supply chain shaped its competitive strategy?
2. To what extent did the company oversee and control the entire span of its supply chain?
3. How can The Woodpecker Group benefit from an efficient supply chain management, particularly in light of its past use of integrated production systems?
4. How can a robust supply chain network design contribute to Woodpecker's competitive advantage?
5. What potential integrations or collaborations could the company pursue to extend its supply chain ownership/reach?
6. Considering vertical and horizontal integration aspects, how do you evaluate the tissue manufacturer's acquisition and its further investment?

7. What are the main challenges the company faces with this integration?
8. What are your recommendations for the new facilities' location?
9. What other recommendations would you make to the company's management?

3.3. Analysis

1. How has Woodpecker's approach to managing its supply chain shaped its competitive strategy?

Woodpecker's approach to managing its SC has significantly shaped its competitive strategy, mainly through continuous investment in new technology, strategic geographical positioning, innovation capacity and vertical integration. A competitive strategy is an overall plan to achieve a competitive advantage, which was accomplished through the following approaches:

(i) Vertical integration: evident from its involvement in forestry activities, pulp production, and paper manufacturing, Woodpecker's vertically integrated SC allowed for closer supervision of the production processes, increasing control over costs and product quality. The company streamlined operations, optimized processes, reduced waste, and achieved scope and scale economies by coordinating production activities from raw material sourcing to the final product. In addition, by being able to own multiple stages of the SC, it created long-term business relationships that contributed to mitigating risks (e.g., supply/demand uncertainty and vulnerability to market fluctuations). On the one hand, integrating the SC has helped to achieve a strategic position in the market by providing end-to-end control and a competitive edge. On the other hand, it can lead to excess capacity or loss of information from suppliers, which can be a burden and potentially dilute its core competencies or strategic focus due to pursuing too many segments/markets simultaneously. Additionally, as it requires careful planning, it can create a dependency on internal resources and future resource allocation challenges across the multiple stages of the SC.

(ii) Geographical dispersion/global presence: the strategic placement of industrial complexes in key locations reflects a well-designed SC strategy. These locations were chosen for their proximity to importation/exportation ports, natural resources and transportation infrastructures. Its global presence, through a worldwide network of offices, contributed to its ability to tailor its approach to different markets. Its global reach enabled the company

to stay responsive to market demands, adapt to regional variations, and optimize SC operations on a global scale.

(iii) Logistics efficiency and sustainability: the emphasis on rail transportation, utilization of ports closer to factories, and efforts to reduce road traffic are aligned with Woodpecker's commitment to efficient and sustainable logistics. This focus reduced operational costs and positioned the company as environmentally conscious.

(iv) Sustainable forestry practices: Woodpecker's ownership of nurseries and forestry holdings demonstrates a commitment to sustainable and responsible practices. Managing forests under international certification systems and adhering to strict sustainable management policies ensured a long-term and stable wood supply and an alignment with environmentally conscious practices.

(v) Research and development: the engagement in forestry R&D, including producing trees, indicates a commitment to innovation and efficiency. This "in-house" R&D approach positioned Woodpecker as a leader in technological innovation and efficiency.

(vi) Differentiation: the increased control over the entire SC enhanced the company's innovation ability and supported its differentiation strategy. Woodpecker's acquisition of a tissue manufacturer, subsequent investment in technology and expansion in production capacity reflected a proactive approach to diversifying its product portfolio, followed by entering new market segments, facing different consumer needs and responding to current industry trends.

Overall, these approaches contributed to controlling costs, ensuring product quality, fostering innovation, and responding effectively to market changes, positioning Woodpecker as a competitive player in the pulp and paper industry.

2. To what extent did the company oversee and control the entire span of its supply chain?

To successfully oversee and control every facet of its SC, Woodpecker has strategically positioned itself to master each production process. The commitment to control each stage highlights the complex organizational and strategic architecture. The company is involved in almost every stage of the SC. The first step is at its R&D units, where genetic materials and forestry techniques are developed, increasing yields and improving wood properties. Then, these seeds/plants move to the company's nurseries until the trees reach a specific size, and when they do, they are transported to the forest sites for plantation.

The eucalyptus globulus has a life cycle of around twelve years, after which they are harvested, peeled, and cut into logs to be transported to the industrial complexes. The company transforms the logs received into small woodchips and puts them into a digester, where the pulp production starts. At this stage, in between processes, it also produces energy. Then, part of the pulp produced goes to manufacturing paper and tissue products. Ultimately, the company offers several products for B2B and B2C segments: pulp, paper jumbo rolls, and several paper and tissue products for domestic and industrial use. It also has a worldwide network of offices in key regions attending to each market's needs.

Regarding outsourcing activities, the company works with over five thousand entities, providing wood from forests abroad and chemicals for the production processes. Furthermore, it hires several service providers to transport different raw materials, wood or finished products. For example, wood supply through railroad transportation within the Iberian Peninsula and sea transportation for importing wood and exporting the finished products. Additionally, the company also uses road haulage, i.e., trucks, for short-distance transportation and almost all of the tissue cargo dispatching, as well as for the distribution hubs in Europe and the US.

Overall, it ensures an efficient production flow by closely managing the entire life cycle of its primary resource and controlling the transformation processes from raw materials to finished products. Moreover, its global presence through a network of offices and collaborations with over five thousand suppliers, as well as engaging various service providers for transportation and distribution, highlights the intricacies of its strategic course in addressing the diverse needs of B2B and B2C markets. This approach positions the company as a dominant player in forestry, pulp and paper production, and in skillfully navigating complex competitive dynamics across various business activities.

3. How can The Woodpecker Group benefit from an efficient supply chain management, particularly in light of its past use of integrated production systems?

The company's history of using IPSs suggests it has embraced a vertically integrated approach, increasing control over various stages of its SC, with an efficient SCM leading to cost savings in these stages. The IPSs allow for optimizing resource utilization and reducing operational costs, achieving scale and scope economies. These systems also facilitate a seamless flow of materials and information across different SC stages, as streamlining operations can reduce

bottlenecks, minimize delays, and enhance overall process efficiency. Furthermore, it can improve data-driven decision-making as integrated systems can leverage technology for SCM by providing valuable data insights to identify areas for improvement. For example, integrating pulp and paper production at Mira's factories facilitates streamlining operations and reduces transportation costs, contributing to cost-efficiency and its sustainability commitment.

In addition to this commitment, Woodpecker's ownership of nurseries and forestry holdings, producing its own trees, exemplifies an integrated approach to resource utilization, which can be further optimized through efficient SCM (e.g., future technologies integration, resource recycling and reuse), ensuring a more sustainable and cost-effective supply for pulp and paper production. Additionally, integrating the production of renewable energy demonstrates a commitment to energy efficiency.

Regarding product quality control, the integrated systems provide greater control throughout the production process, maintaining or increasing quality standards at every stage. For example, Ovar, renowned for its designed pulps for special applications, focuses on high-quality production as it can ensure that raw materials meet certain specifications and that the final products meet specific quality standards.

Focusing on market responsiveness, merging IPSs with agile SCM enables quicker response times to market demand/changes, capitalizing on emerging trends. Furthermore, the company can adjust production volumes or change product configurations, contributing more effectively to the response to market fluctuations. For example, its network of offices worldwide allows it to respond effectively and tailor its approach to different market demands, and adapt quickly to changing market conditions. Moreover, these capabilities, the internal information/data gathered, and the IPSs can help optimize inventory management by aligning production with demand, reducing the need for excessive stockpiling of raw materials or finished products.

Additionally, the engagement in forestry R&D and its history of technological innovation exemplifies an integrated and innovative approach. An efficient SCM supports innovation by facilitating the integration of new technologies and processes into the production system, as seen in developing the kraft process for pulp production from eucalyptus. Also, acquiring a tissue manufacturer and its subsequent investment in production expansion capacity showcase a diversification strategy. An efficient SCM can be crucial in integrating new product lines, optimizing production processes, and leveraging synergies between the different business segments.

In conclusion, on the one hand, an efficient SCM, particularly when aligned with IPSs, enhances Woodpecker's global competitiveness, as the ability to efficiently produce and deliver products strengthens the company's position as a reliable and competitive player in the industry. On the other hand, there are also potential downsides and risks, such as (i) overreliance on crucial suppliers, i.e., depending heavily on a limited number of suppliers for either raw materials or service providers; (ii) being in this industry, it is guaranteed to face environmental and regulatory risks that will impact operations and require changes in SCM; (iii) its reliance and continuous investment on advanced technologies, increases the risk of technology failures or cybersecurity threats (e.g., a disruption in technology systems could stop the production process); (iv) the IPSs bring many benefits but also pose challenges in maintaining consistent product quality across various stages if not well supervised (e.g., the final product's quality can be affected by changes in the raw materials) and (v) complexity in SCM, i.e., for organizations with diversified operations, complexity may arise from integrating different production processes, multiple suppliers, and a global distribution network, requiring careful coordination and monitoring.

4. How can a robust supply chain network design contribute to Woodpecker's competitive advantage?

A robust SCND implies strategic and well-defined planning and execution, as design decisions must function well in complex and uncertain business environments in the short, medium and long term - operational, tactical and strategic decisions, respectively.

A practical, efficient and robust SC can provide a sustainable competitive advantage, enabling the company to handle growing environmental disruptions and intense competition, usually with objectives that conflict with each other and must have a clear tradeoff, e.g., minimizing costs and maximizing reliability. Taking into consideration the company's existing strategic assets, these decisions can contribute to its competitive advantage in several ways:

(i) Optimized logistics: Woodpecker's global presence and network of offices highlight the importance of an optimized logistics network. A well-designed SC network ensures efficient transportation routes, reducing lead times and costs (e.g., increasing rail transportation would reduce road traffic and CO_2 emissions, showcasing a strategic network design and contributing to the sustainability commitment).

(ii) Proximity to resources and ports: placing the industrial complexes near natural resources and main ports along the Portuguese coast reflects a well-thought SC network, as it can minimize transportation costs. Simultaneously, close access to ports facilitates international trade - further similar investments should follow the past strategies.

(iii) Market responsiveness: Woodpecker's presence in key regions worldwide results from a carefully designed SC network, allowing a prompt response to market demands in different regions. For instance, the network enables Woodpecker to tailor its approach to diverse markets, ensuring that products meet specific regional requirements and regulations. Furthermore, as it facilitates the company's global reach, it simultaneously allows for future market expansion.

(iv) Diversification strategy: an effective SCND supports diversification strategies, as the company did by strategically acquiring a tissue manufacturer and diversifying its product portfolio for B2B and B2C segments. A robust design can optimize production processes and leverage synergies between the different business segments.

(v) Risk Mitigation: an effective SCND includes risk mitigation strategies, e.g., Woodpecker's ownership of nurseries and forestry holdings, combined with international certification systems for sustainable forest management, exemplifies a risk-aware approach. By diversifying sourcing locations and ensuring sustainable practices, Woodpecker can mitigate future risks related to raw material supply disruptions and environmental concerns.

In conclusion, a robust SCND can increase competitive advantage from optimizing logistics to enhancing market responsiveness and supporting diversification strategies. However, there are potential risks and downsides, such as involving significant upfront costs (e.g., investment in technology or R&D), the complexity of managing and coordinating multiple entities or distribution channels, and an overemphasis on efficiency that might lead to a lean SC that lacks redundancy, i.e., an extreme focus on efficiency may streamline and simplify operations to the point where there is little room for alternative options. Balancing the advantages of a robust SCND with design decisions and the potential risks requires continuous monitoring, flexibility, and a strategic approach to adaptation.

5. What potential integrations or collaborations could the company pursue to extend its supply chain ownership/reach?

Woodpecker could explore possibilities of integration or collaboration to extend its SC ownership and reach. Focusing on its active participation in R&D and forestry operations, it can continue pursuing its innovation capacity by collaborating with technology companies and institutions and joint research initiatives with universities. This will be instrumental not only for acquiring new knowledge and being at the vanguard of technological developments but also for raising brand awareness, meeting potential employees, and, ultimately, making advancements in genetic materials, forestry techniques, and manufacturing processes. Regarding forestry operations, it could expand its managed forestry area globally or explore its CSV approach ("creating shared value" – similar to Nestlé's approach to the agriculture sector) by pursuing further partnerships with local companies (e.g., wood suppliers, transportation providers). This would allow for more sustainable forestry practices by helping its suppliers (raising the benchmark "level") and increasing awareness to other factors such as water usage, climate and carbon emissions (part of international certification requirements) from all stakeholders.

Furthermore, given its sustainable commitment and emphasis on renewable energy, partnerships with specialized sustainable energy companies could be explored (e.g., initiatives to improve the current energy generation process or enhance energy conservation measures). In addition, it can collaborate with environmental organizations to reinforce its commitment to sustainability and form partnerships with NGOs or certification bodies to enhance its environmental credentials. Also, to increase its global presence, Woodpecker can pursue joint ventures, strategic alliances or collaborations with local companies in regions where it aims to strengthen its market position. This could involve partnerships with established players in continents/countries where the company needs to grow to start leveraging local market insights, navigating regulatory landscapes, sharing distribution networks or co-developing new products.

Additionally, regarding SC optimization and given the appetite for innovation and technology, it can collaborate with tech companies in this field to enhance operational efficiency. For example, exploring the implementation of more advanced technologies in predictive analytics, inventory management, and demand forecasting.

In conclusion, Woodpecker can pursue integration or collaboration efforts that align with its sustainability goals, enhance innovation, optimize the SC, and facilitate global expansion, simultaneously contributing to its long-term competitiveness in the industry.

6. Considering vertical and horizontal integration aspects, how do you evaluate the tissue manufacturer's acquisition and its further investment?

Simplifying the scenario into three stages of investment, Woodpecker is a pulp and paper producer that (i) acquires a manufacturer of a "different type of paper", (ii) expands its current production capacity, and (iii) wants to build another factory for producing tissue.

The first investment is considered a horizontal integration, as the company acquired a business with a similar SC, transforming pulp into paper, although a different type of paper product (tissue products). This integration expanded its presence within the existing SC stages ("forestry-pulp-paper-distribution") as a parallel SC, entering another market segment and adding a new product line to its portfolio for B2B and B2C segments.

The second investment, increasing production at this location by establishing more production lines, is a decision to increase production capacity rather than horizontal integration, as it involves expanding production through investments in additional equipment, facilities, or technology. Horizontal integration typically involves broader strategic moves at the industry or market level, such as the previous investment. Therefore, the third investment, building a new factory, can be discussed and considered a capacity expansion decision and horizontal integration due to its similar advantages.

This integration allowed for controlling another part of the SC, i.e., manufacturing tissue products and distributing them directly to retailers or consumers. Furthermore, the company gained more control over the tissue market, potentially increasing market share and profitability. Aligned with Woodpecker's diversification strategy, it widened its product portfolio, although it had to manage risks related to increased distribution logistics, retailers, and customers. Additionally, the company may increase its tissue production efficiency by integrating the current streamlined production processes, taking advantage of innovative and technologically advanced machinery and location close to the source of pulp supply. However, there are factors to consider, such as evaluating operational supply synergies (e.g., managing pulp supply for both paper and tissue), distribution (e.g., merging both products' distribution

logistics), and consumer marketing to ensure the tissue products' successful introduction into each market.

A pulp and paper producer acquiring a tissue manufacturer represents a strategic move toward product diversification and forward integration parallel to its existing SC. This allows the company to broaden its reach into the consumer market, control the production of finished goods, and achieve operational synergies within the integrated SC, carefully evaluating market conditions, risks, and opportunities within the tissue segment. Additionally, replicating synergies between pulp and paper for pulp and tissue production can potentially achieve scale or scope economies and strengthen its overall tissue market competitiveness.

In conclusion, this acquisition is a well-executed decision aligned with the company's growth and diversification objectives. However, ongoing evaluation of the integrated operations is crucial to ensure continued success and maximized synergies between the different business segments.

7. What are the main challenges the company faces with this integration?

Integrating the tissue manufacturer into Woodpecker's operations brings several opportunities but also comes with a set of challenges. Regarding resource allocation, finding an optimal allocation across multiple stages of the SC requires careful planning, e.g., staff allocation or inventory management. In addition, ensuring a stable and cost-effective supply of raw materials is vital for consistent production because coordinating the sourcing of raw materials for tissue production with the existing pulp and paper production may present challenges.

Furthermore, ensuring timely deliveries and optimizing transportation routes are essential for efficiency, as coordinating the new logistics and distribution networks alongside the other products can be complex. Regarding capacity, as a steady growth in the tissue segment is predicted, managing production capacity and ensuring the scalability of operations without compromising quality can be challenging. Also, planning for further expansion and identifying suitable locations for the additional production facilities poses strategic challenges regarding logistics, market reach, and resource allocation.

Regarding operational integration, adding a new product to the existing operations requires careful coordination, as merging different manufacturing processes, SC management, and

quality control measures can be challenging. In addition, ensuring compatibility and integration of technology systems between the existing operations and the acquired manufacturing facilities may pose technical challenges. Concerning market challenges, integrating new products into Woodpecker's brand portfolio, maintaining or enhancing brand reputation for the tissue segment and ensuring a consistent brand messaging can be crucial for market entry, as this may have different competitors, trends and demands than the pulp and paper market, requiring a rigorous previous market analysis to properly assess the potential success of the product as well as a thorough "pre-launch client acquisition" process.

Moreover, financial considerations must be attended to. Combining reporting structures and budgeting processes between the acquired entity and Woodpecker may be very complex. In addition, achieving the expected return on investment requires effective management and optimization of resources. Also, it is essential to guarantee that the new operations conform to local and international regulations, especially if there are variations in regulatory frameworks between pulp and paper and the new type of production. Additional efforts that this production requires to align with the current sustainability commitment should also be assessed.

Additionally, the tissue manufacturer probably had its own organizational culture and work practices, and aligning them with Woodpecker's culture may consume time, resources and effort to ensure a productive work environment. These organizational changes can create uncertainty among employees, so maintaining morale, effective communication, and addressing other concerns, such as job security and roles, are crucial for a smooth transition.

A successful integration will involve adapting to change, leveraging synergies, and mitigating potential risks. Furthermore, pursuing integration into too many segments or markets can lead to overextension, i.e., several business activities might dilute the company's core competencies and strategic focus. Therefore, addressing these challenges requires a comprehensive and strategic approach to integration involving cross-functional teams, clear communication, and ongoing assessment of operational, cultural, and market dynamics.

8. What are your recommendations for the new facilities' location?

Deciding upon an optimal location for the new facilities involves several factors, and considering the information provided in the case study, some can be listed as follows:

(i) Evaluation of the regulatory frame in potential locations to ensure compliance with environmental or other relevant regulations as part of the sustainability commitment.
(ii) Assessment of the proximity to existing industrial complexes to leverage established infrastructure, transportation networks, and shared resources due to facilitating streamlining logistics, reducing transportation costs, and enhancing operational efficiency. Additionally, the company should assess the availability of a skilled workforce.
(iii) Analysis of product synergies is also crucial if the decision is to integrate tissue production into the existing factories. It should consider the extent to which the current production processes align with producing tissue regarding raw materials requirements, current operational efficiency impact, market positioning, and each location's specific expertise and capabilities. An overall logistics and SC network analysis must ensure seamless integration with existing operations to support an integrated and agile SC.
(iv) Prioritization of locations with easy access to ports to facilitate exports to international markets, as it aligns with Woodpecker's status as a significant exporter. Additionally, an evaluation of a location should also be based on the quality of other transportation infrastructure (e.g., road and rail networks), as efficient transportation is essential for the timely delivery of raw materials and finished products. Also, considering the proximity to target markets and major consumer bases helps to reduce lead times and respond quickly to market demands.
(v) Align the location decision with long-term expansion plans, ensuring that the chosen location can accommodate future growth according to the company's strategic objectives.

Considering the points above and the information in the case study, my starting point would be to place the new facilities at one of the existing industrial complexes, mainly to take advantage of its infrastructure, skilled labour, and proximity to the import and exportation ports. Therefore, looking at the current locations:

Mira

This manufacturing facilities are already strategically positioned and have been recognized worldwide for producing high-quality pulp and paper. This complex already has an established infrastructure (it has had IPSs since 1991), which includes pulp and paper production facilities that can leverage new tissue production lines by replicating the synergies between pulp and paper production for pulp and tissue.

The complex is also close to abundant natural resources and efficient transportation infrastructures and can contribute to the seamless integration of the new facilities into Woodpecker's existing SC. Additionally, it ensures proximity to the main ports, which is already an advantage for importing raw materials and, in the future, exporting tissue products to international markets, aligning with Woodpecker's status as a significant exporter. This location also aligns with maintaining an integrated and efficient SC, the existing logistics and the SC connections can be extended to support the tissue production lines.

Furthermore, Mira's complex has a history of innovation and operational efficiency. Expanding the facilities at this location can capitalize on the complex's successful track record in the pulp and paper industry. Additionally, leveraging the existing workforce and operational expertise can streamline the setup of the new production lines, benefiting from the current/present knowledge and experience and facilitating synergies with tissue production, especially if there are opportunities for shared resources, technologies, or processes.

Moreover, this complex occupies a substantial area and has been subject to constant investment in environmental performance and operational efficiency, allowing for flexibility in accommodating the new production lines and potential future expansions. Even though being essential to analyze the impact on the efficiency of the current operations, by selecting this location, the company can capitalize on the advantages offered by the existing facilities, which have a strong reputation in the industry, strategic location, established infrastructure, and proximity to resources.

Ovar

This is where the company was founded in 1950, and choosing it for the new tissue production lines could be a way to honour its history and roots. It also has a history of being an innovation hub that played a key role in pulp production with the development of the kraft process from eucalyptus. This historical significance may have sentimental value for stakeholders, contribute to the company's identity, enhance marketing campaigns and leverage its technological expertise, which could contribute to the success of the new production lines.

Its location near the main ports is also advantageous for transportation and logistics, as it already facilitates importing raw materials that would also apply to exporting tissue products to international markets, aligning with Woodpecker's global reach. Ovar is internationally renowned for producing bleached eucalyptus pulp and for its quality, if the characteristics of

the tissue products align with the expertise developed here, it could ensure a high-quality standard for the new products. As a key location for Woodpecker, it may already have the necessary infrastructure and facilities, as well as available land and capacity for expansion that can provide the opportunity to scale up production for tissue products in the future. This location can integrate its production systems by replicating Mira's systems and enhancing its operational efficiency, as, at the moment, it only produces pulp.

Choosing Ovar can be a strategic business decision, aligning with the company's historical strengths, expertise, and brand image. This decision may resonate positively with stakeholders, customers, and the market dynamics. Additionally, it has the potential to integrate production if, in the future, it produces other products that are complementary to tissue or existing paper products, contributing to overall business synergy.

Pegões

Seen as a European benchmark, it is "the world's largest and most sophisticated paper factory", which can enhance marketing campaigns and indicates that it has the advanced technology and capabilities needed. Therefore, choosing this location can be leveraged by the existing infrastructure and technological sophistication, potentially ensuring high-quality products.

These facilities already have IPSs, which can lead to achieving operational efficiencies and synergies for tissue production. Additionally, taking advantage of these production systems and being one of the largest paper factories, there is a potential for scale and/or scope economies. Also, if it already produces various paper products, there may be future opportunities for diversification and synergies within the product portfolio. This diversification can provide resilience against market fluctuations and enhance the company's competitiveness. Moreover, similar to Mira and Ovar, it already has established SC networks, and leveraging them can contribute to the efficiency of sourcing raw materials, production processes, and distribution.

Furthermore, Pegões has constantly invested in environmental performance and operational efficiency. This commitment to sustainability and efficiency can be advantageous for tissue products by aligning with the demand for environmentally friendly products and the sustainability commitment. Additionally, its production capacity is substantial, with an annual capacity to produce over one million tons of pulp and paper. This large capacity may be beneficial for meeting the potential demand for tissue products, especially if market forecasts indicate a growing need for the company's products.

Pegões has several attributes, including integrated production, technological sophistication, and large capacity. However, considering the existing operational capacity and its current output optimization, adding a production line might affect the efficiency of the entire complex. In addition, allocating resources for further expansion or modifications to "the world's most sophisticated paper factory" to accommodate a different product might be a substanti al "extra" investment and cause constraints in its current operations.

Final Call

After comparing the three locations, I recommend building the new facilities at the industrial complex in Ovar. Although it is vital to the company's production capacity, it is the only location that "just" produces pulp. Additionally, besides being close to the main ports, it's located near one of the most extensive eucalyptus forests in Portugal, which may allow for an increase in pulp input to support tissue production and, in the future, paper production, as it is internationally renowned for its "designed" pulps for special applications. This decision could also place Ovar at the level of the other two complexes regarding production capacity and product offering, allowing for a balanced "production distribution" among the three locations and minimizing the risk of disruptions/dependency in production at the others.

Moreover, it would not be unknown territory to replicate the operational synergies, technology and modus operandi of the other locations in Ovar, as it was done before, and take advantage of the existing know-how and support from the industrial engineering and commercial teams. This would guarantee high quality and consistency with a more efficient operation from a logistical and energy point of view, with the corresponding environmental advantages.

Nevertheless, there is an overall challenge in having a centralized production only in one country (Portugal). The company's competitors can respond to their respective markets through their local factories, allowing them to react quickly to all the local specifications. On the one hand, this creates complexity for the company in responding to all the different specifications. On the other hand, it has the advantage of having the possibility to respond with a variety of products that very few will have from the same factory. Therefore, placing the three complexes at the same level of production capacity and product offering, starting with Ovar, would consolidate the company's position in the Portuguese and foreign markets.

9. What other recommendations would you make to the company's management?

Complementing the answer to question 5 and briefly suggesting further recommendations to the company's management, these can include:

- Prioritizing employee well-being, satisfaction and training;
- Pushing for more ethical and responsible sourcing and practices from all stakeholders;
- Continuously searching for improving product quality and inventory management in all stages;
- Assessing possible increases in capacity and efficiency of the existing infrastructures;
- Continuing to explore opportunities for increased integration of renewable energy sources in production processes as well as embracing further circular economy principles;
- Enhancing digital marketing efforts and brand visibility, as well as establishing mechanisms for regular customer engagement and feedback;
- Investing in market intelligence capabilities to stay informed about global industry trends and explore other advanced decision-making frameworks to respond swiftly to market changes;
- Keep searching for strategic partnerships to enhance competitiveness and create synergies along the supply chain;
- Developing flexible manufacturing strategies to adapt quickly to potential disruptions.

These additional suggestions focus on sustainability, global competitiveness, employee well-being, and agility in decision-making to strengthen Woodpecker's position in the market. Furthermore, it supports continuous growth and innovation and can contribute to long-term success and resilience in evolving market conditions.

4. Conclusion

Woodpecker presents a situation where future development plans require a thorough analysis of its challenges and opportunities. When considering business development, it's important to carefully assess the tradeoff between its demands and current capabilities.

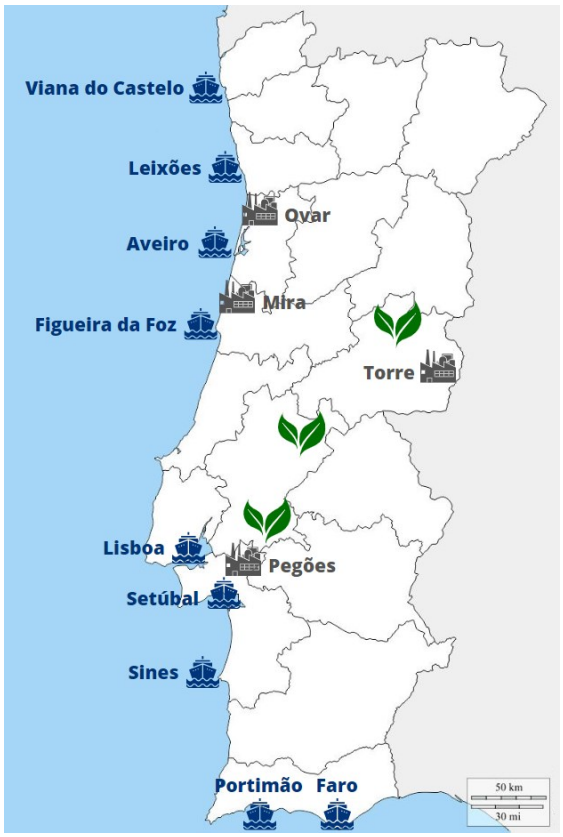
This Case Study aims to raise issues in SCM, operations and logistics efficiency, integrations/collaborations, innovation, product diversification, and, ultimately, enhancing competitive strategy. Woodpecker is an example of successful strategic decision-making, innovation and commitment. The company decided to continuously invest in advanced technology, sustainability, and infrastructure to stay at the forefront of its industry, allowing it to expand into new business segments and diversify its product portfolio. Additionally, the different analysis perspectives to the case's problem statement enable the company to replicate the success of previous similar investments from the production synergies between its first products, and further expansion plans will most likely follow the same path if efficiently and strategically well-managed.

After developing this Dissertation, I have acquired a deeper understanding of strategic decision-making processes, the corresponding elements that can affect decisions, and their impact on the company's activities. The Literature Review presents several articles and theories that help to understand the case and address the issues on the Teaching Note, simultaneously facilitating the comprehension of topics such as supply chain management.

In addition, I must highlight that the fundamental importance of investing in innovation, sustainability, and ethical business practices to enhance competitive strategy was not entirely in my knowledge until now. Moreover, if time and requirements allowed, I would have liked to explore the case further from a marketing and/or financial analysis perspective. In conclusion, the case study allowed for a better understanding of strategic decision-making processes and the corresponding elements that can impact the company's supply chain.

Case Exhibits

Exhibit 1. Locations in Portugal



Ports || Industrial Complexes || R&D Labs and Nurseries

Exhibit 2. New Factories

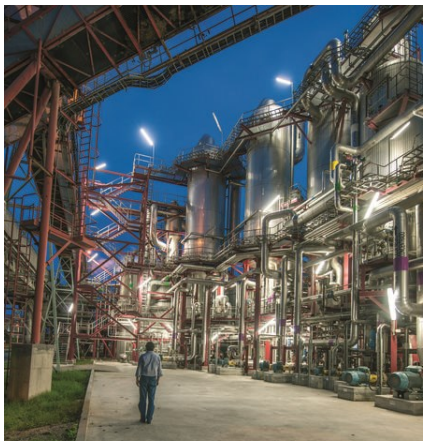


Exhibit 3. Industrial Complexes

Exhibit 4. Business Subsidiaries

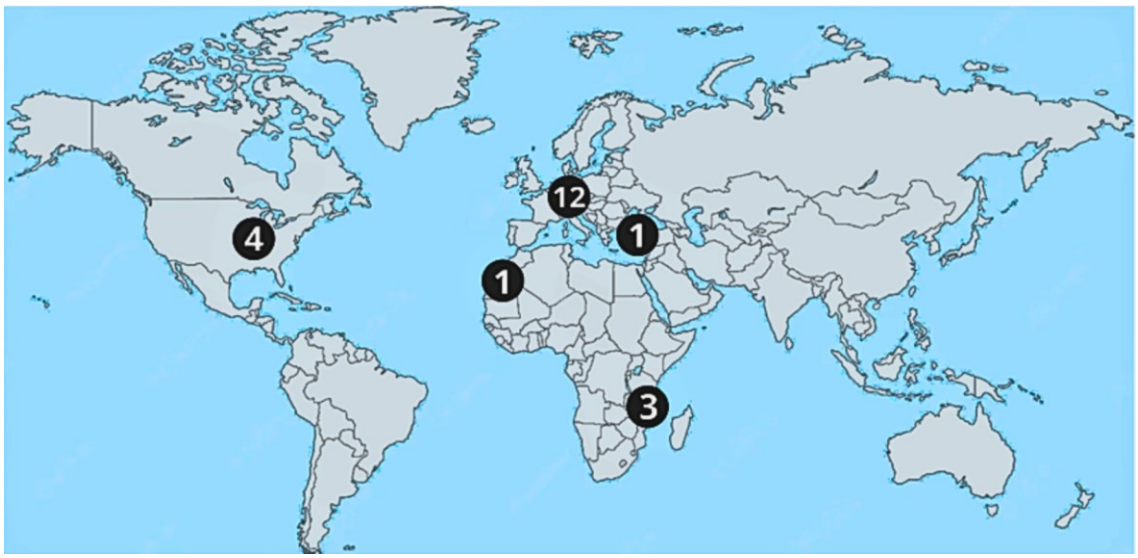


Exhibit 5. Eucalyptus Globulus

Exhibit 6. Woodpecker's Manufacturing by Location

Pulp (in 000 tons)	Year 2014	Year 2015	Year 2016
Ovar	300	295	330
Mira	560	575	580
Pegões	550	545	540
TOTAL	**1 410**	**1 415**	**1 450**

Paper (in 000 tons)	Year 2014	Year 2015	Year 2016
Ovar	-	-	-
Mira	770	770	775
Pegões	800	815	830
TOTAL	**1 570**	**1 585**	**1 605**

Tissue (in 000 tons)	Year 2014	Year 2015	Year 2016
Reels	-	35	50
Finished products	-	37	45

Exhibit 7. R&D Laboratories

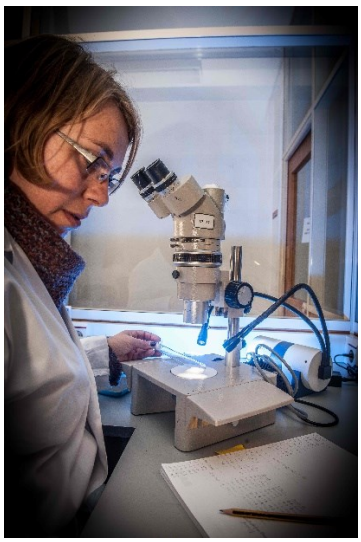




Exhibit 8. Logging and Transport

Exhibit 9. Wood Chips

Exhibit 10. Pulp Digester

Exhibit 11. White Pulp

Exhibit 12. Cellulose Paper

Exhibit 13. Pulp Slurry

Exhibit 14. Jumbo Roll

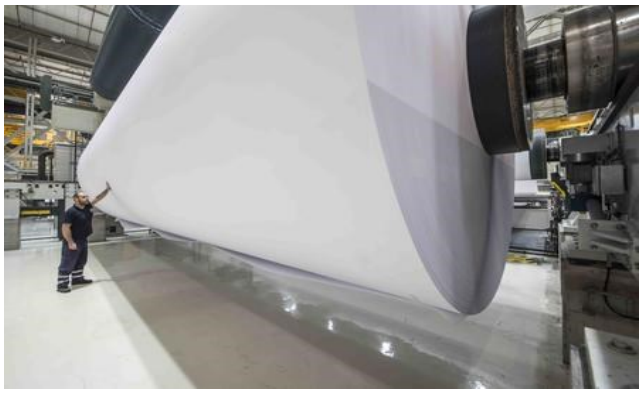


Exhibit 15. Re-sizing and Dispatching

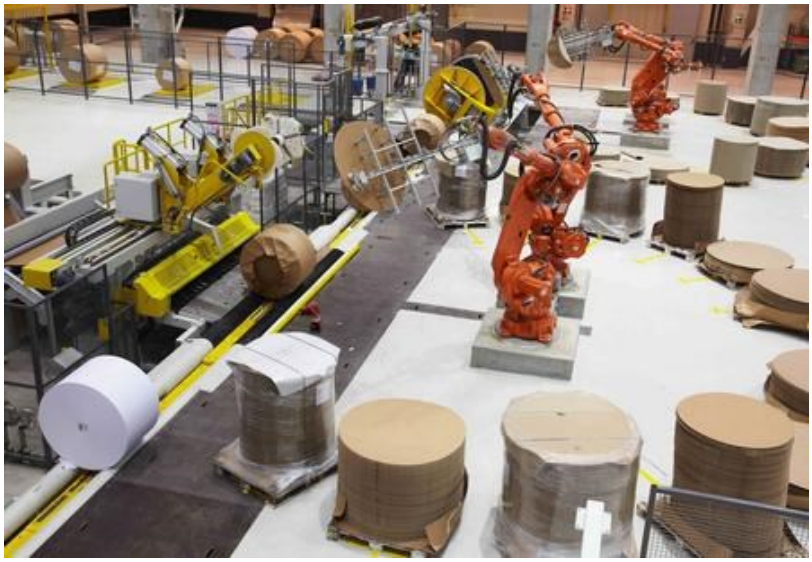


Exhibit 16. Paper Format

Exhibit 17. Embossing Tissue Textures

Exhibit 18. Tissue Converting Lines

Exhibit 19. Woodpecker's Product Sales by Market

	Year 2015	Year 2016
Pulp	**155 854 166 €**	**166 514 319 €**
Portugal	9 139 519 €	21 869 285 €
North America	534 402 €	1 252 €
Rest of Europe	138 745 270 €	132 169 148 €
Other Markets	7 434 974 €	12 474 635 €
Paper	**1 538 125 383 €**	**1 456 999 814 €**
Portugal	267 811 828 €	206 471 505 €
North America	179 508 711 €	156 760 522 €
Rest of Europe	819 174 307 €	758 550 217 €
Other Markets	271 630 538 €	335 217 571 €
Tissue	**55 843 004 €**	**74 194 051 €**
Portugal	36 550 806 €	47 629 212 €
North America	-	-
Rest of Europe	19 292 198 €	26 045 384 €
Other Markets	-	519 454 €

Exhibit 20. Railway Transportation

Exhibit 21. Bulk Carriers

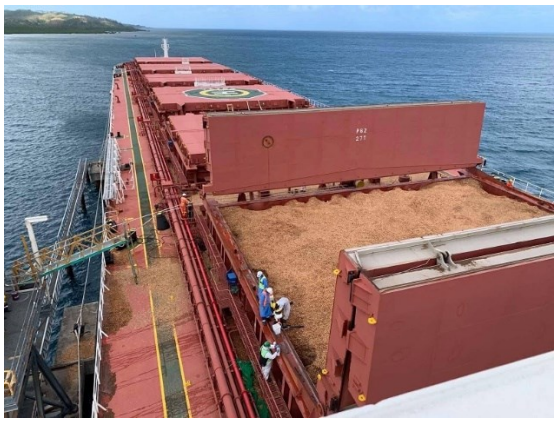
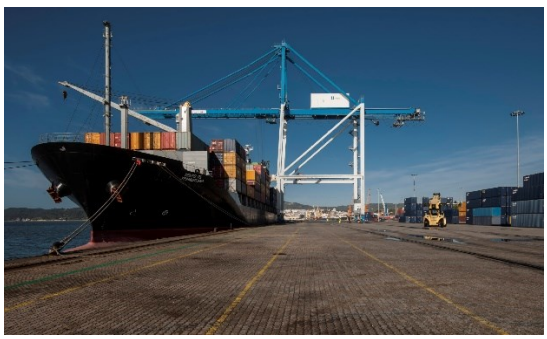
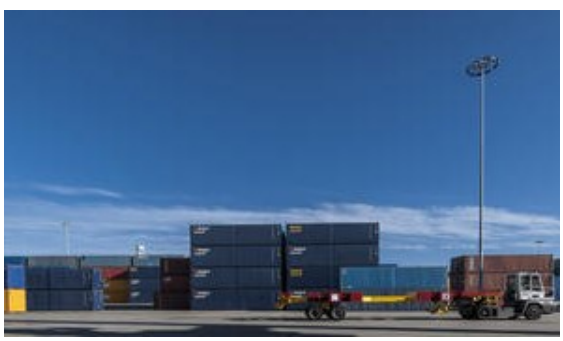



Exhibit 22. Containerized Cargo



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