



# BETA Brazil: Strategic integration of digital technologies for process excellence in R&D

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## **Abstract**

In the evolving digital landscape, organizations must continuously adapt and innovate to maintain competitiveness. The Case Study delves into the firsthand experiences of the Research and Development department at BETA Brazil, as they navigate the challenges of implementing a digitalization strategy in order to elevate their processes to an excellence level. The narrative also explores the importance of such change in aligning with the company's strategic objectives and enhancing its market positioning. By drawing on the insights presented, this Case Study aims to provide lessons for organizations embarking on similar paths. The Literature Review explores the established knowledge surrounding the digital technologies integration within companies. It offers an overview of the factors driving adoption and the consequential impact of digitalization on operational and organizational context, as well as in the role it plays in shaping strategic positioning and cultivating competitive advantage. It also underscores the importance of organizational culture and desired capabilities for the successful implementation of digital initiatives. The Teaching Note thoroughly analyzes the details of the department's digitalization journey, dissecting the organization's approach, challenges faced, and strategies employed to address these challenges. The main purpose is to provide understanding of the impact that digitalization can have on both operational dynamics and strategic positioning within a company, emphasizing the role of cultivating an adaptative organizational culture to navigate this process.

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## **Resumo**

Organizações devem adaptar-se e inovar para manter a competitividade na era digital. O Estudo de Caso apresenta as experiências do departamento de Pesquisa e Desenvolvimento da BETA Brasil, abordando os desafios da implementação da estratégia de digitalização para aprimorar seus processos. A narrativa também explora a importância dessa mudança no alinhamento aos objetivos estratégicos da empresa e no aprimoramento da sua posição de mercado. Com base nas percepções apresentadas, este Estudo de Caso pretende fornecer lições para organizações que embarcam em caminhos semelhantes. A Revisão da Literatura explora o conhecimento estabelecido sobre a integração de tecnologias digitais nas empresas, oferecendo uma visão geral dos fatores que impulsionam a adoção destas tecnologias e o seu impacto nos contextos operacionais e organizacionais, bem como no papel desempenhado no posicionamento estratégico e cultivo da vantagem competitiva. A Revisão da Literatura ainda enfatiza a importância da cultura organizacional e das capacidades desejadas para a implementação bem-sucedida de iniciativas digitais. A Nota de Ensino analisa minuciosamente os detalhes da jornada de digitalização do departamento, assim como a abordagem da organização, seus desafios e estratégias utilizadas para enfrentá-los. O objetivo principal é fornecer uma compreensão do impacto que a digitalização pode exercer tanto na dinâmica operacional quanto no posicionamento estratégico dentro da organização, enfatizando o papel da promoção de uma cultura organizacional adaptativa para enfrentar esse processo de mudanças.

**Título: BETA Brasil: Integração estratégica de tecnologias digitais para excelência de processos em P&D.**

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**Palavras-chave: digitalização; eficiência operacional; vantagem competitiva; cultura organizacional.**

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# Contents

- Abstract..... i
- Resumo .....ii
- Acknowledgments.....iii
- List of Acronyms and Abbreviations .....v
- 1. Case Study..... 1
  - 1.1 The company..... 1
  - 1.2 The external scenario and the R&D role..... 2
  - 1.3 The R&D context and culture ..... 3
  - 1.4 The global digital strategy ..... 5
  - 1.5 Evolution of the digital area in R&D ..... 6
  - 1.6 A trivial request? ..... 7
  - 1.7 The roots of the problem..... 8
- 2. Literature Review..... 11
  - 2.1 Digitalization, Digital Transformation and Strategy ..... 11
  - 2.2 Drivers ..... 12
  - 2.3 Competitive advantage..... 13
  - 2.4 Operational and organizational activities ..... 14
  - 2.5 Organizational fit ..... 16
  - 2.6 Organizational culture ..... 17
- 3. Teaching Note ..... 20
  - 3.1 Learning objectives ..... 20
  - 3.2 Class plan ..... 20
  - 3.3 Analysis ..... 21
- 4. Conclusion..... 39
- Appendices ..... 40
  - Case Study Exhibits ..... 40
  - Teaching Note Exhibits ..... 41
- References ..... 42

## **List of Acronyms and Abbreviations**

AI – Artificial Intelligence

EHS – Environmental, Health and Safety

IoT – Internet of Things

IP – Intellectual Property

KPI – Key Performance Indicators

R&D – Research and Development

## 1. Case Study

On a bright day in March of 2022, in São Paulo, Manoela Alves<sup>1</sup>, agronomist and the manager overseeing BETA Brazil new digitalization strategy for Research and Development (R&D) in agricultural solutions, realized that she needed to postpone the delivery of yet another project.

In the Brazilian agricultural sector, BETA, a multinational corporation with annual revenues of around €80 billion, was specialized in the development of seeds and chemical products to enhance the performance of several crops such as soybean, rice, corn and more.

The project focused on creating a simple automatic dashboard for one of the main R&D areas, and its delay could jeopardize the area's reputation with internal clients and leadership. This was a matter of concern as Manoela had been facing similar issues since the beginning of the previous year, when she was tasked with implementing the global digitalization strategy for R&D, aiming to boost the effectiveness of those activities.

Other projects had also started as simple but evolved into complexity during the development, encountering difficulties to deliver on time.

It was time for Manoela to evaluate the key issues of the situation. Given the seasonal nature of the business, certain solutions could only be tested during a specific period, coinciding with the planting cycle. Any delays would imply in the loss of test opportunity and trust of various departments in the digital strategy. Trust was a vital factor in transitioning from manual processes to more efficient outcomes.

### 1.1 The company

BETA, a global chemical conglomerate, was established in 1880 with headquarters in Germany. In 2021, the company maintained a diverse product portfolio, operating across several industries, including chemicals, plastics, agriculture solutions, nutrition, and beyond. Its central focus revolved around research, manufacturing, and distribution of its products with operations in more than 80 countries. (Exhibit 1)

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<sup>1</sup> Name of managers and company are disguised.

The company adopted a segmented structure that allowed operational responsibility and market-specific adaptability. For financial reporting purposes, it was organized in four primary regions: Asia Pacific, North America, Europe and South America, Africa, and Middle East. The company demonstrated commitment to innovation, sustainability, and corporate responsibility.

BETA had been present in Brazil for more than a century, its revenues of €3.3 billion in 2021 representing over 70% of the business in the region. The company had facilities in several locations, such as São Paulo, Bahia, Goiás, among others, and operated in a wide range of sectors, including coatings, chemicals, and performance materials.

Due to the relevance of the agricultural sector in the country, the agricultural solutions segment held significant importance, in which BETA provided an array of products, including seeds and seeds treatment, insecticides, herbicides, fungicides and biological solutions, aiming to assist farmers to optimize their crop yield.

To remain competitive over the years, the company prioritized innovation. It invested internally in R&D as well as in partnerships with customers, universities, research centers, and more. This effort was exemplified by the annual investment of approximately €2 billion worldwide in R&D. Within this investment, €900 million was dedicated to the agricultural solutions segment. The company established research centers across the globe, strategically employing a flexible approach to tailor and adapt its innovation to meet regional and local requirements.

## **1.2 The external scenario and the R&D role**

In the agriculture sector, manufacturing crop management products, like pesticides, growth stimulants, and fertilizers had a key contribution to enhance field productivity, supporting farmers in their food production mission. BETA was one of the top five agrochemical companies in Brazil and, due to its commitment to innovation, relied on the R&D department to engineer solutions to attend the farmers' needs and stay competitive.

The development process, spanning from initial molecule screening to final product launch, typically extended from 15 to 20 years, with a multi-million-euro investment. The company would then capitalize on a product throughout its patent-protected period. It was necessary to ensure that the returns would cover its costs during the product lifecycle, which was often shorter than the time of its development.

As the essence of the business was linked to the R&D department, improving process efficiency could translate into cost reduction, potentially enhancing the company's competitive edge against large competitors in the market. Furthermore, considering the lengthy development cycle, an efficiency boost could significantly reduce the time-to-market, a crucial factor in the race to register and sell products.

Besides competition in original agricultural product development, BETA also faced the challenge of dealing with companies manufacturing "generic products". These were essentially off-patent versions available at lower prices, as the generic manufacturers did not invest in the ground research. Consequently, the imperative for innovation among major corporations remained a key factor in sustaining competitiveness within the market.

In the agricultural sector, another important factor was the company's compliance with government regulations concerning effectiveness, toxicity, and safety. As regulations became increasingly strict and concerns regarding health and the environment continued to rise, the company relied on its R&D to deliver solutions aligned with new industry standards. The demands for safety and environmental friendliness were also pivotal, as they were directly aligned with the expectations of both farmers and final consumers. This factor could be decisive when competing with rivals.

Moreover, BETA monitored the evolving agricultural trends driven by technological advancements and the increasing use of information. Concepts like precision farming and data-driven decision-making, for instance, would enable a more fine-tuned and accurate application of the products. As a result, the products under development would need to be tailored to be integrated with these new approaches, a responsibility carried by the R&D department.

Major industry players were also investing in technologies to modernize and expand their portfolio, which could strengthen their connection with farmers. These external factors exemplified the pivotal role that the R&D department's responsiveness would play in shaping the company's competitive position in the market.

### **1.3 The R&D context and culture**

The R&D department of BETA Brazil relied on a dedicated team of 90 employees engaged in creating and testing new products, supported by an investment of around €20 million per year. The data generated through this research supported the registration of new products with

government authorities. Below the director, Marcelo Souza, the department was further divided in 6 main areas (see exhibit 2):

- Project Management: team responsible for overseeing the entire product pipeline cycle, from initial testing to delivering the necessary data to the regulatory team for the government registration.
- Research and Product Development: team with field experts responsible for conducting the tests and preparing the reports with technical results.
- Global Expert: a professional with extensive field experience, who provided guidance to the technical teams.
- Sites Management: team responsible for the management of the research center facilities, including the distribution of the products samples.
- Laboratory Management: this team oversaw all laboratory tests and operations.
- Governance and Performance: area that provided support to all other areas, focusing on external contracts, controlling, data management, innovation, and digitalization initiatives.

The department included highly specialized technical agronomists who were responsible for running tests and generating and analyzing the tests data. It was also not uncommon to find agronomists engaged in less technical roles, due to the belief that their understanding of the business made them well-suited for various functions. However, with the department's expansion throughout the years, there was a growing trend toward recruiting non-agronomists for new functions, such as roles in controlling, contracting, EHS (environmental, health and safety), and site management.

Usually, the product development team dedicated a significant portion of time in the field, where they applied the products and assessed its effectiveness. The data collection was a manual task, involving the process of transcribing it into paper and then into the suitable software, for subsequent statistical analysis.

Analyzing the data was a core activity, and traditionally the staff relied a lot on their intuition and experience. Manoela noted that it was common to hear technician remark: "Statistically, there is a difference, but in the field, we see no distinction!". This was part of a prevalent culture in the agricultural research area of respecting the knowledge of professionals with years of experience or relying in scientific knowledge dating back to the 90s.

Another time-consuming aspect was the extensive execution of manual tasks, ranging from field data collection to the completion of requests forms for product samples at the sample center. The agricultural research activities were marked by a high degree of repetitiveness and experienced minimal changes over the years. As Manoela pointed out: “We might witness new machinery or updated irrigation systems, but the fundamental approach to conducting research remains almost unchanged from how it was done 15 years ago”.

Even upon a new person taking on a role, the same practices tended to continue, sustaining the reliance on traditional approaches.

#### **1.4 The global digital strategy**

The emerging scenario marked by technological advancements, high-performance computing, and data science, coupled with evolving sustainability regulations and the accelerated pace of market changes, created a higher demand for quick adaptability.

BETA, recognizing the need to stay ahead in this dynamic environment, acknowledged the need of digital technologies to enhance its R&D operations, expecting to boost productivity and to raise the quality of its research.

To achieve its purposes, the company adopted a multifaceted approach. This encompassed improvements in laboratories through the integration of smart devices and advanced software to refine measurements, employing scientific modelling and simulation to streamline product development, and assessing data science methods to optimize the use of generated data. The goal was to digitalize processes across its extensive network of over 400 plants worldwide by the end of 2022.

Initiating the strategy at its European headquarters, the company then extended its implementation as top-down mandatory to other regions, including Brazil.

In what the Brazilian R&D operations were concerned, the strategy placed an emphasis on the data science approach. The aim was to refine the quality of the data collection and ensure seamless integration with other data sources. This would enable to leverage the intrinsic value of data, a pivotal component of the department’s core deliverables. The tests performed served not only to validate hypotheses, but also to provide essential support for the registration of new products within government organizations.

To initiate the dissemination of the strategy, the global team required the involvement of some Brazilian R&D employees to trial and evaluate different solutions, such as a software designed to identify and quantify plant infections and gauge the product's effectiveness in application. These solutions were initially developed with a broad perspective, and the regional collaboration was required to assess the demand for a more customized approach.

The Brazilian R&D department recognized the need for a dedicated employee to act as a liaison, making a connection between the global team and the field employees responsible for testing the solutions. This role would entail a commitment of time from the employees, in addition to their daily activities. Nevertheless, Marcelo perceived this challenge as relatively straightforward. He expressed confidence in his team's ability to readily embrace and implement the new solutions.

Furthermore, it became clear that digitalization would be a focus for the foreseeable future. Simply digitalizing the data collection would not be enough, especially when other areas of the department still relied on manual processes. Given the interconnectivity of these areas, to enhance the efficiency of the department it was necessary to explore more tailored solutions beyond the ones provided by the global team.

### **1.5 Evolution of the digital area in R&D**

The digitalization initiative took its initial steps in 2021, with Manoela and another agronomist, Tiago Barros, taking charge. Tiago was responsible for the data summarization, a key activity in R&D. His expertise in data management made him the natural choice to coordinate the initiative.

With the new digitalization approach, Manoela began receiving and assessing requests to improve other activities in the department. It soon became clear that only Tiago would not be enough to handle all the projects. Consequently, Manoela recruited a new IT specialist, a skillset that had been lacking in the department. This team was assigned the mission to delve into the challenges in R&D and develop strategies, considering the newly adopted digital approach.

In a matter of months, the digital area mapped out more than 20 projects. These projects encompassed two essential phases: the first one involved the exploration and implementation of solutions, which could be internally developed or outsourced; the second one consisted of closely monitoring the testing period post-implementation, with a primary goal of identifying

and fixing possible issues, assuring the internal client confidence regarding reliability of the solution.

According to Manoela: “After the implementation of a solution, we had the automation running alongside our technicians, with the purpose of comparing the results. Each time a new solution was put into action, it could lead to the end of a particular activity in the area, consequently assigning a new task to my team, giving support and/or assurance”.

At the beginning, the mapped projects appeared to be straightforward, with well-defined time allocation and testing coinciding with the plant cycle season. However, the projects that started as simple, evolved into higher complexity during later phases. Despite putting in extra hours, Manoela saw her team encountering difficulties to deliver on time.

Manoela also found the area under a spotlight, with Marcelo anticipating positive outcomes to elevate the R&D department to a position of excellence. However, while the frontline employees were enthusiastic about becoming more productive, making long-standing changes still caused some apprehension. This added another crucial task for the team: establishing a trustful relationship with their internal clients to achieve better results.

### **1.6 A trivial request?**

The area in charge of producing the final technical reports approached Manoela and her team with a request for a dashboard that would assist them in managing and presenting the progress of their processes. Initially, this task appeared quite straightforward.

The final technical report entailed the union of several studies conducted by the product development team and studies outsourced to external researchers. Once completed, this report required the signature of different technicians before being forwarded to the regulatory team for review. This comprehensive report included studies from different plant seasons. This was a government requirement about the consolidation of work extended over multiple years. The monitoring of this entire process was of high importance, given that the loss of a single study could lead to a potential delay, with the required test being postponed to the subsequent plant cycle, consequently affecting the registration process.

The digital team started their journey by exploring the excel file, known as “Master Spreadsheet”, that contained the essential process information. That file was a compilation of data from several sources, including internal and external tests, signatures, raw data, graphs and

more, with entries recorded by hand. It became evident that simplifying the process, as the area in charge of reports initially requested, would not be as straightforward as they hoped.

The team contemplated offering the creation of a dashboard solution that would change the way the reports area presented its results. However, during discussions regarding the project, Manoela recognized that this approach would merely serve as a temporary fix, concealing the underlying issues rather than addressing them.

For a substantial transformation of this process and to raise it to a new level of excellence, the digital team considered the possibility of integrating the raw data from other systems used across the R&D department. This approach entailed a shift in how the product development team used the available software tools. Additionally, external researchers would need to adapt their methods for presenting raw data. This process would affect multiple areas within the R&D department, with the outcomes for the reports team perceptible only in the subsequent years, if everything occurred as planned.

This would pose a significant source of frustration for the reports area, as they had anticipated a smoother workflow after the current plant season, assuming the seamless integration of the new solutions. Nonetheless, the digital team recognized the need to use this plant season to implement changes and gather results from other areas, laying the groundwork for a more substantial transformation.

When Manoela and her team introduced this alternative scenario to the reports area, the team members appeared somewhat apprehensive. They raised several questions in order to understand how this goal could be attained. After the discussion, it was concluded that a detailed analysis of the proposed changes was necessary. In addition to that, it was decided to share this with Marcelo for further consideration. At this point, everybody recognized the crucial importance of reaching a decision promptly. Delaying the decision would jeopardize the opportunity to ensure that other areas within R&D were prepared to test and adapt during the upcoming plant season.

### **1.7 The roots of the problem**

As Manoela delved into the situation, she began to discern the magnitude of the issues that were adversely affecting project delivery, and consequently impacting the progress of digitalization in the R&D department, as foreseen by the global strategy.

To begin with, a relevant challenge was the insufficiency of resources. Manoela's understaffed team struggled with the extensive project workload. Moreover, the combination of an agronomist and an IT specialist, while important, was not enough to address the fundamental issues in the existing processes. The analyses conducted for the projects remained somewhat superficial, mostly driven by the immediate requests of the internal clients. However, to achieve a substantive improvement, it became evident that a broader perspective was necessary. This required a holistic examination of the interconnections within the entire R&D process. The department currently lacked staff with expertise for the task.

She also recognized that merely meeting immediate expectations or requests would not be enough to raise the R&D department to an excellence level. For instance, crafting a sophisticated dashboard as initially requested might serve for occasional presentations, but it would not alleviate the need for manual work. To truly enhance the processes, it was necessary to initiate changes in areas and activities that might have not been directly involved from the outset. This was a result of the complexity of the department and its interdependence between the activities.

However, as Manoela delved deeper into the analysis, she encountered a biggest challenge: the prevailing cultural environment was not favorable for a change. Despite affirmations of openness to improvements, modifications to the established process were seen as dubious. With years of experience in the agricultural sector, Manoela knew that achieving enhanced R&D performance would require a collective effort. This was particularly important given the department's historical reliance on long-standing methods. Bringing substantial improvements required a profound cultural shift to ensure that the R&D could remain competitive in the market, and Manoela was not sure she would be able to deliver that. In her view, "this process would entail addressing a latent pain that remained unnoticed until now".

Manoela recognized the need for change when sharing her insights with her director. At this point, Marcelo lacked a comprehensive understanding of the situation's depth and the level of interconnectivity between the different areas. Upon receiving the digital strategy, Marcelo acknowledged the existence of numerous manual processes within the R&D department. However, he envisioned that enhancing efficiency would naturally result from the implementation of digital systems and platforms. Marcelo did not think that adapting to these new solutions would require a fundamental shift in processes. He assumed that the existing procedures could remain unchanged.

Should Manoela proceed with the current approach, delivering only what was explicitly requested to fulfill her annual goals and align with the “digital strategy”? Or should she and her team take a step back and embark on a more extensive process aimed at elevating the department to a genuine level of process excellence? This strategic shift represented a significant challenge for her, as it entailed a far-reaching impact on multiple areas that could affect internal trust. This might already be strained by the delays on delivering what was initially asked for. How could she foster a new culture and convince her boss that changing might ultimately yield superior results?

## **2. Literature Review**

Digitalization has emerged as a recurrent topic in corporate agenda over the years. Given the transformative influence of digital technologies on society and industry (Åström et al., 2022), companies have increasingly embraced them to improve existing processes and create new ones. This strategic adoption is motivated by the need to achieve and sustain competitiveness in the market (Bouncken et al., 2021; Menz et al., 2021).

To effectively respond to the wave of digitalization and secure a competitive edge, companies have been adopting new technologies, processes, and strategies (Cozzolino et al., 2018). This proactive approach often involves implementing changes at the business model level (Annosi et al., 2020). Recognizing and understanding the impact of digital technologies can offer distinct advantages, boosting productivity, supporting of decision-making processes, and shaping competitive advantage in business strategies.

The following Literature Review will delve into the influence of digital technologies on business strategy and productivity, aiming for a comprehensive understanding of the challenges outlined in the case study. Initially, the review outlines the distinctions between digitalization and digital transformation. Subsequently, it explores the driving forces behind these changes within a company. Following this, it analyses the impacts of digitalization on competitive advantage, as well as on the overall operation and activities of a company. Lastly, the discussion navigates throughout the importance of organizational culture and explores the desirable characteristics for a company effectively embrace the digitalization process.

### **2.1 Digitalization, Digital Transformation and Strategy**

The digital transformation concept encompasses the integration of digital technologies across all business areas, fundamentally shifting how operations are conducted and value is delivered to customers (Hanelt et al., 2021). As articulated by Warner & Wäger (2019), based on insights from industry leaders and theoretical perspectives, digital transformation is characterized as an ongoing process that employs new digital technologies in daily organizational activities, with recognition of agility as a core mechanism for strategic renewal.

Nevertheless, it is important to contextualize digital transformation within a three-step progression. The first step consists in digitization and the second is digitalization (Bleicher & Stanley, 2016). Digitization refers to the technical process of converting analog information

into a digital format, rendering the content programmable and traceable. On the other hand, digitalization consists in a broader process that uses digital technologies to transform information, thereby influencing how processes operate (Calderon-Monge & Ribeiro-Soriano, 2023; Kant, 2023; Sambrani & Jayadatta, 2020). Digital transformation is the third and final phase.

According to Porter's definition, strategy involves the establishment of a distinctive and valuable position through a unique set of activities (Porter, 1996). The advent of digitalization has not only prompted alterations in existing business strategies but has also given rise to novel ones (Agarwal et al., 2010). For instance, the rise of "platforms" as intermediates, such as Uber and Airbnb, has facilitated the sharing of underutilized assets among customers.

In the retail sector, for example, the transition from physical to online sales for consumer goods has occurred, accompanied by the creation of "digital products", including e-books and music. This shift has not only transformed distribution channels but has also introduced new business models (Benner & Waldfogel, 2023). In the agricultural sector, the deployment of smart technologies influences business operations and holds a social and environmental significance. It enhances the operational efficiency while reducing the overuse of resources, such as water, fertilizers, pesticides, and seeds (Annosi & Brunetta, 2020).

The evolution of this new business landscape has been primarily facilitated by advancements in computer hardware, software technology, the internet and mobile communications, and artificial intelligence (AI). These technologies reduced the cost of searching for, analyzing and sharing information (Menz et al., 2021).

## **2.2 Drivers**

New technologies triggered companies to formulate and share their digital transformation processes, exploring the potential opportunities offered (Pemer & Werr, 2023). As outlined by Cozzolino et al. (2018), the experimental integration of technologies often prompts a reevaluation of the concept of value creation and capture. Once established, these redefined dynamics can threaten the strategies of existing players if they fail to adapt their business model. Additionally, the authors argue that the early adoption and investment in new technologies within manufacturing and distribution not only enable companies to enhance their core knowledge but also afford them to gain new economies of scope (Cozzolino et al., 2018).

Despite that, Hanelt et al. (2021) highlight organizational and environmental factors as triggers for digitalization, encompassing legal and infrastructural conditions of a country and technology-driven industry dynamics. The competitive environment and advancements made by other industry players significantly impacted the digital strategy adopted by companies. This influence directly affects a company's responsiveness, potentially rendering certain products or services obsolete while generating new ones (Trategy et al., 2013).

Stock market reactions and shareholder pressure also drive the adoption of digital technology. The transformations caused by the emergency of new technologies in the market have captured attention of shareholders, and a negative response in a company's stock market may occur if the pace of technological change is perceived as insufficient (Benner, 2007).

Another driver compelling companies to embrace digitalization is customer demand. This is fueled by the need for innovative solutions to offer to clients and the essential requirement to stay alongside to the digital technologies clients are using, thereby providing a competitive edge (Pemer & Werr, 2023).

### **2.3 Competitive advantage**

An important aspect is the impact of digitalization on gaining competitive advantage. Digital technologies have a pivotal role in fostering innovation within a company, a key determinant of competitive advantage. By enhancing company performance, digitalization opens up broader opportunities for exploration and facilitates quicker access to results (Annosi et al., 2020).

Moreover, the influence of digitalization on competitive advantage extends to the diversification of business models and a shift from value capture to value creation. The exploration and innovation allowed by digitalization enable various approaches to delivering the same service, empowering companies to choose diverse strategies for competition. In terms of the transition from value capture to value creation, companies are increasingly inclined to seek potential value creation in products or services instead of building barriers against competition to capture value. This shift has implications for how they capitalize on innovations, potentially resulting in the establishment of durable competitive advantage (Menz et al., 2021).

According to Porter & Heppelmann (2014), the path to achieve a competitive advantage hinges on strategic decisions and trade-offs that a company must make, aligning with its unique circumstances when adopting digital technologies. These choices encompass considerations such as which product features and capabilities the company intends to modify, whether to

outsource or handle changes in-house, among other factors. It requires a set of choices that mutually reinforce one another, defining a coherent and distinct strategic positioning for the company.

An alternative perspective explores the synergy of AI and human capabilities to cultivate a competitive advantage. The research performed by Krakowski et al. (2022) suggests that a simple substitution of human activities with technology may yield a short-term competitive advantage but lacks sustainability. In scenarios characterized by predictability and potential for competitors to replicate such strategies, this advantage could fade swiftly. In contrast, a collaborative approach combining both human and machine capabilities have the potential to create a sustainable competitive advantage. This integration leverages the unique human characteristics of creative ideation, large-scale contextualization and social interaction (Krakowski et al., 2022).

This position correlates with the finding of Jenkins (2010), who suggests that companies, in response to dynamic environments, should exhibit ambidexterity. This involves exploiting existing resources while simultaneously exploring future sources of advantage to navigate in this scenario. As suggested by Warner & Wäger (2019), digitalization is an ongoing process that instigates changes in corporate strategy, business models, and starts by transforming internal processes through the integration of new technologies into daily activities.

#### **2.4 Operational and organizational activities**

Digitalization has not only modified the operational and commercial activities but has also altered the strategies and business models of companies (Annosi et al., 2020). The influence of digital technologies has profoundly impacted company operations. The initial advantages of the utilization of digital technologies associated with human capabilities is the increase in productivity, quality, faster processes, the promotion of innovation and cost efficiencies (Raisch & Krakowski, 2021).

For instance, the utilization of AI enhanced internal efficiency through process automation, extracting insights from data, and fostering engagement with customers and employees. As a result, leaders expect that employees can elevate the productivity, allocate more time to refining products, and delve into more creative tasks (Davenport & Ronanki, 2018). The automation of repetitive tasks has not only led to improvements in quality but has also empowered employees to engage deeper in analytical work (Pemer & Werr, 2023).

This perspective aligns with the viewpoint of Schneider & Kokshagina (2021), who proposed that as digital technologies offer opportunities for task automation. The value associated with certain positions may undergo a transformation, requiring a diverse array of new skills and priorities, such as entrepreneurial attitudes and ethical intelligence. Aligned with this point of view, Van Doorn et al. (2023) presented insights on the automation of tasks within middle-management roles, which may potentially encompass senior executives in the future. The automation of tasks in this context can reshape their engagement and influence on the company's strategy. Depending on the nature of the tasks automated and the individual characteristics of the manager, the automation has the potential to empower them to assume more central role in strategy formation.

Moreover, Menz et al. (2021) argue that advancements in automation impact the scale and scope of companies, giving a broader spectrum of strategies choices. Simultaneously, the array of technologies is extensive, amplifying their potential (Schneider & Kokshagina, 2021). For example, extended reality and reality blending solutions enable firms to speed processes by contextualizing them (Lacity & Willcocks, 2016). The surge in data and information availability, plus the integration to the Internet of Things (IoT), facilitated new forms of connection among processes, products and devices, thereby enhancing coordination possibilities for cross-functional collaboration (Porter & Heppelmann, 2015).

The authors further argue that digital technologies, particularly the availability of data, are reshaping the value chain, spinning research and development, IT, marketing, sales, and operations. For instance, in the product development process, these technologies allow cost-effective customization to meet regulatory and geographic requirements, as well as the creation of superior product versions that align with customer needs. The continuous monitoring, enabled by these digital technologies, contributes to the enhanced performance and quality control (Porter & Heppelmann, 2015).

At the organizational level, digitalization has a deep impact on how companies engage with external stakeholders and internal processes, fostering increased agility, adaptability and boundaryless (Hanelt et al., 2021). These trend involves a growing reliance on software and digital technologies for execute activities, resulting in an automated, data-driven and virtual business process (Dery et al., 2017). This shift is driven by the need to gather new knowledge and capabilities and integrate them with the existing ones, facilitating a transition towards

transformation and enabling continuous adaptation to the dynamic business environment (Hanelt et al., 2021).

The impact of digitalization on external collaboration extends to workforce sourcing and partnerships aimed at enhancing technologies through experimentation. This trend requires a delicate equilibrium between fostering collaboration and flexibility while maintaining level of control, driven by competitive considerations (Schneider & Kokshagina, 2021).

## **2.5 Organizational fit**

Despite the benefits of digitalization, some companies may struggle to adapt to new technological landscapes, thereby creating opportunities to new entrants. Because of that, companies need sustainable dynamic capabilities, which may vary depending on the industry, as certain industries afford more time to adaptation (Jenkins, 2010).

The challenge of adapting to new technologies arises from difficulty of altering organizational routines and structures. For instance, the exploration of innovation requires the development of knowledge, a task that can be impeded by organizational inclinations to reinforce skills and knowledge associated with old technologies (Benner, 2007). Furthermore, certain positions may require greater effort to transition to new tasks in a post-automation scenario, depending on how digital technology impacts the level of expertise an individual has applied and requiring additional effort to detach from past practices (Van Doorn et al., 2023)

However, dynamic capabilities alone might not be enough. Some firms may possess core capabilities that turn into rigid structures, inhibiting change due to corporate resource limitations. In such scenario, a company may become less appealing to diverse backgrounds, its management system may become inflexible, and its systems may become outdated, as exemplified by the failure of Kodak (Lucas & Goh, 2009). Porter & Heppelmann (2014) reinforce these views, emphasizing that substantial investments and skills, including software development, system management, and data analytics, are essential to support a technology stack – an aspect that manufacturing companies often lack.

To effectively navigate in market and technological shifts, leadership requires three important skills: awareness, acceleration, and harmonization. Awareness involves understanding strategy and processes, not merely observing, and reacting to changes, but also staying aware of a diverse range of data and emerging technologies. Acceleration skills are important for executing strategies, involving the ability to conceive digital processes and products using both internal

and external resources, coupled with a willingness to invest financial resources. Harmonization skills are essential for inspiring organizational changes, requiring the commitment of capabilities to facilitate integration between digital products and internal processes, fostering synergies, identifying frictions and reconciling differences (Hanelt et al., 2021).

According to Hess et al. (2016), for a company to capture value through digitalization, it is crucial to formulate a coordinated digital transformation strategy aligned with operational and functional activities. This strategy should integrate with IT but not solely depend on it, offering flexibility for integration into existing structures or independent entities separated from the company's core business.

In accordance with these perspectives, Warner & Wäger (2019) propose that a company needs to cultivate digital sensing, seizing and transforming capabilities. These dynamic capabilities encompass the ability to engage in digital scouting and scenario planning, fortify strategic ability for rapid environmental responses, balance internal and external collaborations, redesign internal governance structures and digital maturity.

## **2.6 Organizational culture**

Successfully progressing from digitalization to a broader digital transformation, while incorporating new technologies, is not a simple task. The process is influenced by technology and context and involves shifts in organizational culture and structures (Schneider & Kokshagina, 2021). The impact is more pronounced for companies not "born digital" and facing threats to their value proposition from new technologies (Sebastian et al., 2017). Changing the culture can be more challenging than adjusting strategy because it operates at unconscious level. Therefore, it is crucial for leaders to understand the existing culture thoroughly before attempting to modernize it (Westerman et al., 2019).

This cultural shift entails a transition from a low appetite for risk environment, isolated work structures, and decisions driven primarily by instinct. This evolution leads towards a scenario promoting collaboration, embracing risk, and making data-based decisions. A pivotal factor in this transformation was the presence of employees with change mindset, being flexible and adaptable (Kane et al., 2016).

In the process of culture change, having a well-defined strategy for implementing digitalization is an important foundation. As highlighted by Sebastian et al. (2017), a clear digital strategy serves as a catalyst, inspiring leaders to create new value propositions by combining existing

capabilities with emerging technologies. The authors also stress the significance of an operational backbone grounded in efficiency and operational excellence, plus the agility necessary for rapid innovation. This perspective resonates with the insights of Iansiti & Lakhani (2020), who says that a comprehensive transformation demands a holist effort. This involves crafting an integrated foundation of data, analytics, and software, while confronting silos and incorporating new capabilities.

Leadership plays an important role in facilitating cultural change for an organization to effectively embrace digital initiatives. Leaders shoulder the responsibility of advocating for digital transformation and explaining its benefits. They must cultivate an adaptative environment that enables employees to seamlessly adjust to these changes. So, leaders need to possess a comprehensive understanding of the individuals adopting new technologies and of the dynamics within the employee group (Leonardi, 2020).

According to Westerman et al. (2019), leaders must actively promote the values and practices expected during the process of cultivating a culture to embrace digital technologies. This involves sharing success stories as examples, engaging in open conversation with employees, highlighting arguments grounded in data rather than experience, and providing tools that facilitate smooth collaboration among employees.

Equipping leaders and employees with a diverse set of skills and knowledge is crucial in navigating this evolving landscape. The shifting scenario demands increased agility and commitment to lifelong learning, recognizing that jobs cannot be executed solely with last decade knowledge (Schwarz Müller et al., 2018). Learning and development programs initiatives serve as a starting point for cultivating competencies essential to successfully embrace digitalization, and foster innovation within a company (Vey et al., 2017).

Transparency regarding performance, productivity enhancement, and a comprehensive processes understanding is another pivotal factor in the cultural shift during digitalization. Achieving this requires the establishment of key performance indicators (KPIs) by the company (Westerman et al., 2019). However, according to (Schneider & Kokshagina, 2021), measuring the success and performance of such digital initiatives have been a challenge due to the uncertain and fast evolving environment.

Cultivating a cultural shift demands an intense and sustained effort, requiring continuous adjustments to ensure that values and practices align with the broader corporate goals,

underscoring the need for everyone's involvement in this ongoing endeavor (Westerman et al., 2019).

In summary, the integration of new digital technologies had been stimulated by the need to respond to competitive pressure and external factors, like market and customer demand. This integration has the potential to shape a company's strategic decisions and goals, while impacting operational and organizational activities by automating processes, enhancing efficiency, and transforming information and data management practices. These effects can influence the competitive advantage and positioning, enabling differentiation and delivering a unique value proposition. However, not all companies can seamlessly adapt to these evolving scenarios due to traditional practices. Companies must cultivate dynamic capabilities that facilitate adaptation and embrace a cultural change to successfully navigate such changes.

### **3. Teaching Note**

#### **3.1 Learning objectives**

##### **General objectives**

The main goal of this Case Study is to equip students with a comprehensive understanding of the impact that digitalization can have on a company's operation and strategic positioning. Additionally, it emphasizes the pivotal role of cultivating an adaptative organizational culture to effectively implement digital strategies.

##### **Specific objectives**

- To examine strategic impacts, analyzing how strategic decision regarding digitalization contribute to or influence the company's competitive advantage, strategic positioning, and broader alignment with strategic goals.
- To assess organizational readiness, evaluating and reflecting on the conceptual formulation of a digitalization strategy, identifying factors that could either support or hinder its successful implementation.
- To understand cultural challenges, developing an understanding of the challenges associated with organizational culture in the context of digital transformation, recognizing its importance in achieving successful outcomes.
- To explore mitigation strategies, delving into strategies to address challenges within the organization both before and during the implementation of the digital strategy, including proactive measures to navigate potential hurdles and ensuring a smoother integration.

#### **3.2 Class plan**

1. Evaluate both strengths and weaknesses in the R&D department and processes before the digitalization.
2. What were the main challenges encountered by the R&D department?
3. What were the different alternatives that the company could have used to address those problems?
4. Identify and prioritize the key challenges faced by the R&D in the digitalization process.
5. How did the strategic decisions regarding the digitalization contribute to or impact the company's competitive advantage and market positioning?

6. Would you have done anything differently either in terms of conceptual formulation or implementation?
7. What are your recommendations for the manager in charge of the digitalization process?

### 3.3 Analysis

**Question 1:** Evaluate both strengths and weaknesses in the R&D department and processes before the digitalization.

The strengths that could be highlighted were:

- **Innovation culture:** the R&D department was fueled by a culture that actively promotes creativity and innovation. This was not only exemplified but also strongly endorsed by the substantial investments the company has made in the department. Such commitment suggests that employees would be open-minded and flexible to embrace and invest in new solutions and technologies. This indicates a proactive approach towards delivering enhanced products to meet the evolving needs of its customers.
- **Skilled employees:** the department had a highly skilled workforce, with experts well-versed in the complexities of agriculture, understanding deeply technical aspects and market dynamics. Moreover, these professionals demonstrated proficiency in handling laboratory equipment and employing traditional research methodologies. This expertise was something valuable in the business. Besides that, the openness to seeking knowledge from external sources, including university professors and researchers, underscored a commitment to continuous learning. Additionally, the team exhibited a level of adaptability, evidenced by their proactive approach to identifying and incorporating expertise that was lacking in the department.
- **Robust processes:** the department had well-defined processes that contributed to its productivity and ensured the delivery on time of projects, such as the registration of products, despite the inherently time-consuming activities performed. This showcased a strength in project management and the commitment of the department to meet deadlines. Furthermore, establishing robust processes represents an advantage, as it often aligns with industry regulations, a crucial aspect for success in agricultural business. The adherence of those standards enhances the overall reliability and integrity of the R&D operations.
- **Intellectual property (IP):** the creation of intellectual property, such as patents, served as a source of competitive advantage for the company. The department strategically

leverages this advantage by continually enhancing processes integrated in existing patents, thereby gaining further competitive edge. This proactive approach extended to strategic portfolio management, allowing the department to optimize its intellectual assets effectively. This initiative aligns seamlessly with the innovation culture fostered by the department and the company, highlighting its commitment to pioneering advancements. Additionally, this strategic focus reflects the department's expertise and reinforces its position as a key contributor to the company long-term success.

The weaknesses that could be highlighted were:

- **Manual processes:** despite the considerable high expertise of the employees, the reliance on manual processes persisted, presenting challenges of both time consumption and susceptibility to human error. The substantial manual data collection, for instance, was not only labor-intensive but also introduced a heightened risk of inaccuracies. Additionally, the dependence on specific individuals made the workflow vulnerable to disruptions in case of their absence or turnover. This lack of process automation hindered efficiency, highlighting the need for a more resilient and streamlined approach to safeguard against potential problems.
- **Outdated “technology” and information management:** the predominant reliance on manual data collection and entry into basic software, such as Excel, persisted. The hesitance to embrace and trust “new” technologies for data management and research could be a challenge to their analytical processes. This resistance made the analysis more arduous and hindered the extraction of real-time insights, causing delays in identifying trends and issues that could be strategically leveraged for the company's advantage. Furthermore, the case underscores a notable inclination among employees to rely on their individual knowledge rather than harnessing the power of statistical and other data technologies, potentially limiting the robustness of their analytical capabilities.
- **Resistance to change and risk aversion:** despite the built-in R&D innovation culture, traces of resistance to change remained, being necessary global top-down initiatives for transformation. Employees strongly rely on established practices and experienced individuals, adhering to the belief that if a process yields positive results, there is no need for alteration. The department tended to gravitate towards the familiar terrain of known processes, expressing hesitancy when confronted with solutions that could potentially push them beyond their comfort zones. This preference for the tried-and-

true, while rooted in a desire for stability, also reflected a certain apprehension towards embracing new and potentially transformative approaches.

- **Organizational understanding:** while the R&D department demonstrated a significant level of connectivity among its areas, this cohesion might not be uniformly apparent to all team members. This lack of organizational awareness could inhibit seamless collaboration across different areas, with each focusing predominantly on its individual activities. Furthermore, it could lead to a gap in involving key stakeholders in the planning of changes or improvements in processes, potentially hindering the development and successful implementation of strategic initiatives.

**Question 2:** What were the main challenges encountered by the R&D department?

It is crucial to understand not just the distinction but also the interconnection between the two levels of challenges faced by the R&D department. The first level involves primary challenges: market competition and regulatory compliance. Overcoming these challenges requires the department to reach its full potential. However, to accomplish this, it must address the second level of challenges: evolving technologies, the information management, manual processes and cross-functional communication and integration issues.

Prior to the digitalization, the R&D department faced primary challenges, among them the **market competition** and the **compliance with regulatory standards**. To meet customer expectations and stay ahead in innovation, the R&D department must enhance productivity, ensuring the swift development and introduction of new products. The long product development cycle, intensified competition, and evolving regulatory requirements contributed to a shortened product life cycle. Furthermore, the adaptability to new standards became important, needing a timely and accurate response to meet regulatory and market requirements.

Moreover, in the evolving scenario of the agricultural business, the emerging customer, government and societal expectations regarding new technologies, environmental safety, and human health were challenging. For the R&D department, addressing these concerns was vital for compliance and essential for maintaining market competitiveness. Meeting sustainability and health demands were important to ensure success in the agricultural sector.

To effectively address these challenges, the R&D department must **reach its full potential**. However, achieving this potential demands addressing the challenges associated with the

weaknesses identified earlier on. These challenges are aggravated by the weaknesses and are somewhat connected to each other.

The swift and constant technological advancements created a difficulty, particularly in dealing with higher “technological obsolescence”. Keeping pace with these **new evolving technologies** proved a challenge for the R&D department, exacerbated by internal resistance to change, a reliance on historical knowledge, and a risk-averse culture. This obstacle was further compounded by the inherent value placed on the expertise of experienced professionals in the agricultural business. As a result, many research methodologies and knowledge could be considered outdated practices when compared to the technological advancements.

The challenge of keeping up with rapidly evolving technology, coupled with resistance to change posed another obstacle: the need for **improvement in information management**. The importance of the data generated for the department and the company’s goals, such as registering new products for sale, was evident. However, the reliance on outdated technology, extensive manual tasks, and a preference for traditional practices hindered the adoption of technological tools. This created a barrier to establishing an efficient data management system for innovative analytics, real-time insights, and market trends identification. Beyond enhancing data management, incorporating modern tools could streamline processes, making them faster and less error prone. The department’s cultural tendencies likely made this challenge initially unknown.

The reliance on **manual processes** was a well-recognized challenge, significantly consuming the team’s time. This issue manifested itself in various department tasks, particularly in data collection. The product development team, for instance, spent a substantial amount of time in the field applying products, assessing their effectiveness, and engaging in manual data collection, which later had to be transcribed. This manual approach extended to other areas, such as the reports team and the sample center, where tasks and report generation were reliant on manual filled Word and Excel documents. These processes were time-consuming, repetitive and error prone. Additionally, this manual focus on individual tasks hindered the potential for process improvement across the different areas.

Challenges stemming from a lack of organizational capacity to see the full picture impacted two key areas: a deficiency in **cross-functional communication** and **integration issues**. Despite the inherent connectivity among the areas, the absence of comprehensive knowledge about each other’s activities created barriers to seamless integration between processes. The

interconnected activities and areas within the department caused a high level of complexity and dependency. To reach the full potential of any desired change, a holistic approach was imperative.

The diagram presented TN Exhibit 1 may be useful for understanding the complexity and interconnections of the above-mentioned challenges.

**Question 3:** What were the different alternatives that the company could have used to address those problems?

Once the challenges are identified, the company could explore some alternatives to address them. The first option was to establish **strategic partnerships**. By making alliances with organizations, institutions, or industry experts, the R&D department could enhance its innovation processes and deliver superior products.

These strategic partnerships offer several advantages. First, external collaborators may provide access to cutting-edge technologies and methodologies, enabling the department to stay at the forefront of advancements without significant internal investments. This approach also minimizes the risk associated with untested or unknown technologies, as the department shares these risks with its partners.

Moreover, the strategic partnerships introduce a diversity of perspectives and facilitate the knowledge exchange. This diversity helps to stay updated on industry practices and enhances problem-solving capabilities within the department. In addition, the collaboration with external innovation labs further allows the team to bring disruptive solutions, fresh ideas, and diverse thinking skills. The cumulative effect of these partnerships contributes to gaining a competitive advantage, differentiating the department and the company from competitors while offering innovative solutions.

However, it is crucial to acknowledge some potential drawbacks from relying on external partnerships. Dependency risk could be a concern, as the R&D department may become vulnerable if a partner fails to meet expectations or faces challenges. Confidentiality was another critical factor, emphasizing the importance to careful handling sensitive information during the collaboration. Additionally, potential misalignment in goals, values, or strategic direction may happen, as differences in priorities could lead to conflicts.

**Outsourcing** was a second and more radical approach where the department addresses its challenges and weaknesses by mitigating risks and gaining access to advanced technology and results without investing in internal upgrades. For instance, the department could opt to outsource the product application tests and data collection, allowing the product development team to concentrate on the analysis. Alternatively, the department could focus on testing and outsource data analysis, accessing superior methodologies and data processing capabilities. This approach could enable the R&D department to concentrate on core competencies, boosting productivity and, consequently, enhancing its competitive advantage.

Outsourcing specific tasks or projects offers additional benefits, such as leveraging the expertise of specialists or having access to a broader pool of talents. This approach could yield unique solutions and provide a more cost-efficient strategy. Furthermore, the outsourcing approach had the potential to accelerate the product development process, leveraging the company's competitive edge and positioning it ahead of competitors.

Despite its benefits, outsourcing brings some challenges, like confidentiality of information, since sharing sensitive information might lead to severe consequences in case of potential data breach. Quality control of results delivered was another concern and aligning the external provider with the R&D department standards may require some time. Also, overreliance on external providers could create dependency issues, particularly in situations where the provider experiences operational and financial instability. Moreover, in the long term, outsourcing may be perceived as a loss of innovation capability within the department, potentially damaging the company's image and hindering the internal development of new ideas and solutions.

A third option was the **process optimization and technological upgrade**. The evaluation and streamlining of existing processes, coupled with investments in new technologies, constitutes a pivotal strategy to enhance overall efficiency of the department. This approach reduces manual efforts and enables employees to redirect their focus towards more value-added tasks, like improved data analysis and strategic activities. Moreover, adopting this approach ensures that the department remains in the forefront of technological advancements, upholding industry standards and delivering solutions that align with customer expectations. Importantly, it also safeguards the company's knowledge base and enhances data security, protecting sensitive information.

This option could involve collaboration with other departments within the company, leveraging its multinational nature, seeking advice, or exploring in-house solutions already adopted successfully in the agricultural solutions business unit in different countries.

Once implemented, this strategy amplifies the company's competitive advantage by concentrating on generation of innovative solutions, meeting client needs, and delivering solutions in a fast and efficient manner. However, some challenges may arise, such as the need to allocate resources effectively, including a dedicated workforce for initiating and sustaining these improvements. Resistance to change among employees, especially when it comes to changing familiar processes, may lead to implementation delays. Integration issues between different areas could exacerbate these challenges. On top of that, providing additional training for the team is crucial, and the anticipated benefits of optimization and technology adoption might not show results immediately or as projected.

A fourth alternative was to **enhance cross-functional understanding**. This approach could reshape how employees perceive their processes. By fostering a deeper understanding of the interconnected nature of different areas, employees could improve their workflow, embrace adaptability, and remain open to innovative approaches, thus diminishing barriers to future integration. Implementing this strategy would involve promoting effective communication and initiatives such as a cross-departmental rotation program, enabling employees to gain firsthand experience in different areas and understand their activities.

To facilitate this transformation, a cultural shift was necessary. Overcoming a reliance on historical knowledge, fostering adaptability, and cultivating a culture that encourages risk-taking were key elements. However, implementing such changes may find resistance from employees, and achieving consistent cultural alignment could be challenging. Adequate resources, including training programs and a robust support system, were essential for a successful transition. Furthermore, the outcomes of this approach could be difficult to measure precisely. Clear metrics may be elusive, and results may not manifest immediately.

Focusing on long-term results, an effective strategy to tackle the R&D challenges involves prioritizing process optimization and technology upgrade. However, given the existing weaknesses, it is equally vital to precede this investment with efforts to enhance cross-functional understanding, preparing the ground to receive such changes. This entails fully understanding the processes and their interconnections, while fostering a culture that readily embraces change and new technologies.

To further support these initiatives, some strategic partnerships could be beneficial. Collaborating with external entities could bring in fresh perspectives, providing the workforce access to updated techniques, ideas, and a diverse mindset. This external input supports the above-mentioned initiatives and catalyzes innovation within the department.

In summary, a combination of the third and fourth options, plus some use of the first alternative for specific purposes, seems to me the approach that BETA Brazil should have adopted.

**Question 4:** Identify and prioritize the key challenges faced by the R&D in the digitalization process.

During the digitalization process described in the case, the R&D department faced several challenges. The first outlined is the **limited resources**. The digitalization team found itself with an inadequate workforce to effectively manage the identified processes, particularly given the initiatives outlined in the global digital strategy that could not be neglected considering its top-down and mandatory nature. Furthermore, the existing employees lacked the skills necessary for the successful execution of the digital solutions.

The agronomist within the team possessed some knowledge about the R&D processes and data management, but there were evident gaps in expertise regarding areas such as project management and digital technologies. On the other hand, the newly hired IT specialist, while bringing good knowledge of digital technologies, had limited understanding of the R&D department's processes due to being a recent addition to the team.

While the availability of adequate resources is critical for supporting the implementation of the digitalization strategy, this challenge could be classified as medium priority. Other challenges required more immediate attention, creating a foundation that would enable the efficient utilization of resources and workforce capabilities in the following stages of the digitalization journey.

Another challenge during the digitalization process is the notable **deficit in digital skills and adaptability mindset**. Composed predominantly by agronomists used to relying on historical knowledge and conventional methodologies, the department exhibited a deficiency in expertise from diverse fields. This insufficiency extended beyond the data analytics or statistics, encompassing a lack of proficiency in digital-related domains.

Consequently, this insufficiency translated into a lack of readiness to fully embrace the digital strategy, which could result in resistance to change and misalignment between the goals and the cultural environment. Moreover, because employees did not fully understand how improvements could happen with new technologies, it made them uncertain. This uncertainty could make it hard for the areas to smoothly use and accept new software and technologies.

This challenge, however, can also be considered as medium priority because it could be manageable within the ongoing digitalization process. This could be tackled through training sessions, the recruitment of individuals with diverse expertise, and other supportive initiatives.

The **resistance to change** is another challenge pointed out in the case. Employees had expressed some hesitancy towards the changes proposed by the digital strategy. This challenge was rooted in the cultural dynamics of the department, characterized by the fear of the unknown, a tendency to avoid risks, a preference for established methodologies, and a reliance on historical knowledge. This reluctance becomes evident, for instance, when the reports team is presented with a comprehensive solution, and they exhibited discomfort with it. The resistance poses a potential barrier to achieving and realizing the full benefits of the digitalization of processes.

This challenge had a high priority as overcoming the resistance is fundamental to the success of the digital strategy. Otherwise, even a well-designed improvement may not be effectively implemented or embraced by employees if this is not addressed.

The **complexity of processes** was also a concern highlighted in the case. Understanding the intricacies of the R&D processes posed a significant digitalization. As illustrated in the case, the initially simple mapped-out projects evolved into complexity. This complexity arouses because the employees responsible for the digital area lacked the capacity to see the big picture, a limitation also observed in their leadership. Consequently, the high interconnectedness made any change or improvement more challenging without a holistic approach or fully understanding how the connections really happen.

Given the high degree of intricacy between the existing processes, addressing this challenge had a high priority. The complexity within the R&D department could be a barrier to implementing substantial solutions. Without a comprehensive understanding of the big picture, the initiatives implemented might be superficial, yielding a limited real impact.

The most significant challenge encountered during the digitalization process revolved around the **requirement for cultural change**. Successfully implementing the strategy and attaining operational excellence depended on overcoming mentioned weaknesses, like risk aversion, resistance to change and lack of adaptability. Without addressing these, the digital team faced obstacles in implementing solutions with meaningful impact. A shift in mindset was crucial, needing not only the acceptance but also the active embrace of new technologies, processes improvements, and enhanced integration between different areas. The initiation of this change was particularly vital at the leadership level, as evidenced in the case, emphasizing that embracing digitalization is not merely about adopting new tools, but entails a comprehensive integration into processes and the organization culture.

This challenge holds a high priority, given that the change needs to emanate from leadership. It becomes clear that cultivating a culture of adaptability and digital integration is a foundation for the implementation of any other change, be it in technology, methodology or process, ultimately leading to sustained long-term benefits.

Addressing these challenges is crucial for the R&D department to effectively adopt new technologies, enhance its processes and achieve a level of excellence. This is essential for staying competitive in the market, surpassing competitors, and seamlessly adapting to any new industry standards that may emerge.

**Question 5:** How did the strategic decisions regarding the digitalization contribute to or impact the company's competitive advantage and market positioning?

The decision to embrace new technologies and enhance its processes reflects the company's commitment to staying updated in the market. If the R&D department successfully executes its digitalization strategy, optimizing processes and integrating new technologies, it has the potential to elevate itself to a new level of process excellence and unlock its full potential. This achievement could be viewed as fundamental cornerstone for the company's overall performance and positioning in the market.

To begin, elevating the R&D department to an advanced level of process excellence stems from the enhancement of its operational efficiency. The team's success in streamlining processes, automating tasks, improving communication brings several advantages, such as improved quality of results due to reduced errors in automated processes, increased flexibility and adaptability, and quicker response time to market and regulatory changes.

Enhancing operational efficiency allows employees to shift their focus to more complex and strategic activities, as their time was previously occupied by manual tasks. By embracing advanced technologies, they can gain access to improved statistical methods and concentrate on efficient data management, key activity for the department. This, in turn, enables the generation of real-time insights, trends identification, and recognition of emerging opportunities. Such capabilities could contribute to the company's ability to make well-informed strategic decisions. For instance, it allows the identification of specific needs for crops with emerging plagues in a certain region of Brazil, facilitating the creation of effective solutions that farmers could readily apply.

Moreover, the integration of technologies and enhanced processes plays a pivotal role in diminishing the time-to-market for products, offering a substantial advantage to the company. This was particularly significant considering the long development cycles typical in the case of agrochemical products, as outlined in the case study. The investment made during the development phase could also be optimized using these technologies. This would stem directly from the innovation in product development facilitated by digitalization, empowering employees to bring innovative solutions to the market through a smoother process.

The improved innovation environment fostered by the utilization of cutting-edge technology and methodologies would serve as a distinctive factor for the company. This could be employed to formulate a unique value proposition, incorporating elements such as environmentally safe products or practices, diverse digital services serving as platforms to enhance farmers customized experience, and more. These aspects contribute to setting the company apart, and function as a competitive advantage.

At this point of the discussion, it is pertinent to introduce the concept articulated by Porter & Heppelmann (2015), which proposed that despite the transformative impact of smart connected products and digital technologies, the fundamental principles of competition and gaining competitive advantage persist. To secure a competitive advantage, a company must be capable of differentiating itself, thereby commanding a premium price, operating at lower cost or both. The foundation for building such competitive advantage lies in operational effectiveness, attained through the adoption of best practices across the value chain. This includes the incorporation of state-of-the-art technologies, utilization of latest product equipment, integration of IT solution, and others.

The enhancements facilitated by the advanced technology and techniques provided a diverse array of options to shape the strategic positioning. For instance, the company could opt to concentrate on developing differentiated products enriched with digital features. Alternatively, it could adopt a customer-centric approach, delivering personalized product packages with enhanced efficiency. Exploring different regions within the country through a market expansion could be another viable route. Moreover, the company could consider entering new markets within the agricultural sector, exploring new crops or biological targets to control. Decisions in this regard must align with the company's strategic goals, involving careful consideration of trade-offs to determine the most advantageous course of action given the prevailing circumstances.

Another important contribution of digitalizing the R&D department lies in its ability to confer the first mover advantage. Being the first to adopt new technologies can position the company as an innovation leader, strategically establishing itself as an industry pioneer. This perception could hold the potential to not only attract customers, but also foster strategic partnerships with technology providers, for instance, creating synergies that could enhance the overall competitiveness. Additionally, being the first mover offers a learning curve advantage, where early adopters can capture insights from challenges and successes for continuous improvement.

Furthermore, the brand image and reputation of the company could also be significantly influenced. A commitment to digitalization, innovation, and technology could yield a positive impact, portraying the company as forward-thinking in the digital realm and technologically advanced. This perception had the potential to elevate its reputation, drawing in more collaborations and customers.

On the other hand, if the employees in the R&D department struggle to adapt to the new scenario, the company will inevitably face adverse consequences. Among them, is the inefficiency in its processes, resulting in escalated operational costs. This inefficiency, in turn, could cause the company to miss valuable innovation opportunities and fall behind its competitors, lacking a distinctive competitive advantage. Furthermore, there was a risk of the company failing to comply with evolving regulatory requirements. In the long term, the R&D department may find itself not aligned with the dynamic business landscape. The challenge in meeting customer expectations, plus advancements made by competitors, may lead to a decline in market share, and adversely impact company's overall image.

**Question 6:** Would you have done anything differently either in terms of conceptual formulation or implementation?

I would propose a two-phase plan to effectively implement the digital strategy and elevate the process excellence. Breaking it into manageable phases could help building trust, minimizing disruptions, and facilitating a smooth, progressive adaptation. Phase 1 involves:

- **Global strategy rollout:**

In unwinding the digital strategy proposed by the global team, it is essential to acknowledge its top-down and mandatory nature. The primary objective is to lay the foundation for digital transformation within the department. The global digital strategy, as outlined in the case, revolves around enhancing the quality of the data generated by the Brazilian R&D. Therefore, the focus should be on adopting the global headquarters' solutions while customizing them for the Brazilian context. This alignment is critical for a seamless transition in the digitalization process.

A key aspect of this approach involves establishing a unified data organization by consolidating data collection practices and ensuring easy accessibility of information across functions within the department. Such cohesion is crucial to promote collaboration, efficiency, and successful implementation of the digital strategy.

- **Comprehensive department assessment:**

Simultaneously with the top-down strategy implementation, the digital team would initiate a comprehensive needs assessment. This would involve gathering information to gain a thorough understanding of the department's tasks, procedures, and the interconnections among areas. The goal is to identify pain points, challenges, and inefficiencies, while exploring opportunities for process automation, streamlining, and integrating new technologies.

- **Cultural assessment:**

This phase of the project would function as a trial test, aiming to assess how other employees embrace and integrate these new changes into their processes. It would serve the dual purpose of collecting valuable feedback from employees, capturing their expectations and concerns regarding forthcoming changes. These cultural assessment insights would be used to inform the subsequent stage of the digital strategy implementation.

- **Goals alignment:**

A crucial step involves aligning the goals of the R&D department with those of the company. This ensures that the R&D objectives seamlessly contribute to the overarching strategic vision of the organization. This alignment is important to establish a cohesive relationship between the department's goals and the broader company objectives.

- **Strategic foundation building:**

Building on the information gathered in this phase, the team could formulate a comprehensive roadmap outlining potential improvements within the department. This roadmap would introduce the concept to leadership and employees, emphasizing the need for a holistic approach and importance of cultural change. To facilitate this shift, the team could plan and implement targeted training programs, addressing potential resistance, promoting an adaptability mindset, and contributing to a smoother transition towards a more digitally integrated and culturally aligned future.

To effectively tackle these projects, it would be prudent to recruit an individual with deep knowledge about the R&D process, an IT expert with specialization in digitalization and a proficient project manager. Given the constraints of the digital team's limited workforce, the initial phase activities could be strategically managed with the specific goal of assessing both strengths and weaknesses of the department.

Defining and implementing KPIs aligned with the global digital strategy is essential for assessing the digital tools' impact on productivity and efficiency. In this stage, metrics like data accuracy, completeness of data sets, and quality of digital software output assess the quality of the collected data. Efficiency could be gauged by the time saved in transitioning from manual to digital data collection and the reduction of errors in the process. Besides that, monitoring the adoption rates among employees could provide insights about the successful integration of the digital tools.

In phase 2, it is expected that the leadership is already on board and has a clear understanding of the interdependencies among areas, recognizing the need for cultural change. Now, the primary emphasis would be on addressing additional projects, such as streamlining processes, implementing automation, and more. This phase would involve:

- **Analysis of phase one outcomes:**

Continuing with the momentum established in phase one, the analysis of outcomes would entail a thorough evaluation of the results and feedback derived from the initial implementation. The ongoing follow-up ensures the sustained effectiveness of digital strategy initiatives. It serves the dual purpose of affirming the functionality of the solutions and assessing the alignment of tailored approaches with the R&D department needs. This continuous monitoring instills a sense of security among R&D employees who may initially be apprehensive and facilitates the prompt implementation of any necessary solutions in response to issues encountered during the use of the new improvements.

- **Implementation of process optimization projects:**

Building upon the foundation laid by the global digital strategy, this implementation phase would shift focus to the additional projects identified in phase one. The objective is to enhance the operational efficiency by streamlining processes, integrating activities, and automating workflows, thereby minimizing manual effort from the R&D employees. Adopting an iterative approach, the implementation would entail continuous processes adaptation and refining based on ongoing feedback, performance metrics, and evolving organizational requirements. Processes prioritization would be fundamental, considering the urgency and challenges presented by each project.

- **Cultural adaptation journey:**

Building on the phase one groundwork, employees are expected to increasingly recognize the digitalization advantages, embracing new methodologies and data management improvements, even at an initial level. However, achieving a complete cultural transformation is a time-intensive process that demands constant efforts. Hence, it is crucial to sustain initiatives like localized training programs tailored to the specific needs and skills set of the R&D employees. These programs should address digital literacy gaps and other pertinent subjects, ensuring that employees are well-prepared for upcoming changes. Additionally, maintaining constant feedback and communication initiatives is essential. Transparency about changes, emphasis on long-term benefits, and constructing a narrative that encourages a positive attitude toward ongoing transformation are key in this phase.

In this phase, expanding the digital area becomes necessary. Incorporating new skills to strengthen the project implementation is crucial, and close collaboration with the IT department, despite historical separation of both departments, would be now fundamental.

Establishing and monitoring KPIs is also important to assess the impact of implemented changes. For assessing process efficiency, the percentage of process automated, and projects successfully implemented could be measured, as well as the reduction in time to complete key processes, quantifying the decrease in manual effort and errors reduced. While measuring cultural change is challenging, indicators like participation in training programs and satisfaction surveys could provide valuable insights. In the long term, it would also be important to assess the alignment and contribution of digital initiatives with the company strategic goals and evaluate the department's ability to innovate and develop new solutions.

With this two-phase approach, the R&D department could effectively tackle the challenges arising from its weaknesses and minimize potential hurdles during implementation. This strategy could prevent an overload of the digital team and allow for the seamless delivery of both the global digital strategy and additional improvements, thereby elevating the R&D department to a higher level of excellence while dealing with the cultural shift.

**Question 7:** What are your recommendations for the manager in charge of the digitalization process?

For Manoela to effectively support the R&D department in reaching a new level of excellence, she must not only follow the digitalization strategy but also instigate cultural change, starting with the highest level of leadership. Fostering cultural transformation is complex, and the outcomes may not be immediate. However, without the leadership support, transformative results might not materialize at all.

I would recommend that Manoela starts emphasizing **communication and transparency**, clearly articulating the reasons behind the cultural change and being transparent about the digitalization benefits. Most importantly, it should be conveyed that merely adopting tools or software without substantive changes in the processes and the approach to activities would result in only a “cosmetic” form of digitalization, likely leaving the overall performance of the R&D department unchanged.

At this stage, Manoela should also demonstrate that the digital strategy and the required cultural change are in **sync with the company strategic goals**. It is crucial to ensure that these changes contribute to the long-term success and competitiveness, underscoring their impact on the R&D department's ability to adapt to market and regulatory changes, to seize opportunities, and to tackle future challenges.

Furthermore, Manoela needs to **illustrate to the leadership the intricacies of how the R&D department operates** and how interconnected its areas are. While it is not expected that the high leadership knows every detail of the activities, it becomes imperative for Manoela to provide a visual process map. This map should depict the workflow of the activities to show the sequence of tasks, connections, and emphasizing touchpoints. In this stage, gathering feedback from employees could also provide valuable insights.

Manoela could actively **seek collaboration** to support the transformation, presenting examples from other departments within the company or citing external companies that have undergone similar changes. Additionally, she could **engage in benchmarking**, looking at how companies improved their work using digital technologies and achieved good results.

Following the cultural change with the leadership, it is important to extend this shift to other levels of employees. Here, the leadership assumes a pivotal role in **setting an example** by embodying the values and behavior expected in the cultural shift, while demonstrating commitment through their actions and decisions.

For employees, implementing training programs is fundamental to equip them with the skills and knowledge for the new culture and to adopt the new technologies. Fostering communication and collaboration between departments supports the understanding of the connections and facilitates smoother changes. Moreover, involving the employees in the process is very important, listening to their feedback, using it for continuous improvement, and engaging with stakeholders at several levels to gather insights and align project goals with organizational objectives.

In addition to the cultural transformation, I would advise Manoela to **prioritize projects**, considering the digital team limitations and the fact that the R&D department might not be ready for such changes. She should focus, for instance, on the global digital strategy, a “pre-defined” solution that could create a foundation for more significant changes in the department. **Engaging the leadership in the decision-making** process for improvement projects, based on the department challenges and priorities, is crucial. Making these strategic decisions is essential to showcase successful results, align expectations, and build employee trust.

Establishing and monitoring KPIs, as discussed in question 6, is also important. This allows Manoela to gauge the success of the digital strategy and the cultural change impact, even if the results may not be immediate. By employing this combination of strategies, Manoela can

increase the chances of success for both the global digital strategy and other desired improvements. This approach can truly push the department to a new level of excellence, yielding positive impacts for the company, enabling it to remain competitive, maintaining a competitive advantage, and upholding its status of innovative leader in the industry.

## 4. Conclusion

The Case Study presented the complex challenges encountered by the R&D department in navigating the realm of digitalization within a multinational agricultural company. Initiated as a top-down global strategy, the digitalization journey aimed not only to meet immediate needs but also to enhance several processes within the department. However, the manager responsible ran into challenges associated with the complexity of the processes and the organizational culture, underscoring the importance of assessing the organization's readiness when implementing digital strategies.

Furthermore, it was possible to analyze and understand the importance of implementing digital strategies, incorporating new technologies and updated methodologies for a company's strategic positioning. This could result in several positive outcomes, such as enhanced operational efficiency and gaining competitive advantage. The Literature Review delved into these concepts, providing a deep understanding of how the adoption of new digital technologies can influence a company's strategic operations and objectives. Additionally, it emphasizes the importance of cultivating the right aspects within a company to adapt to evolving scenarios.

The Teaching Note facilitated a comprehensive exploration of the case, prompting an in-depth analysis of the strategic implication of digitalization. It encouraged the reflection on the conceptual formulation of such strategy and highlighted the challenges faced by the R&D department both before and during the implementation. Moreover, it provided the opportunity to explore potential solutions and approaches to navigate any obstacles that may arise.

In my opinion, the Case Study provided insights into the complexities of adopting digitalization, the impact on strategy and the influence of organizational culture. For the future, I would suggest a close monitoring of the sustained effectiveness of the digitalization initiatives, tracking ongoing improvements in the operational efficiency and assessing the long-term impacts on innovation, product development and adaptability to market shifts. With additional time, I would have liked to delve deeper into change management strategies that could provide different perspectives to ensure a smoother transition for the company as it integrates new technologies.

# Appendices

## Case Study Exhibits

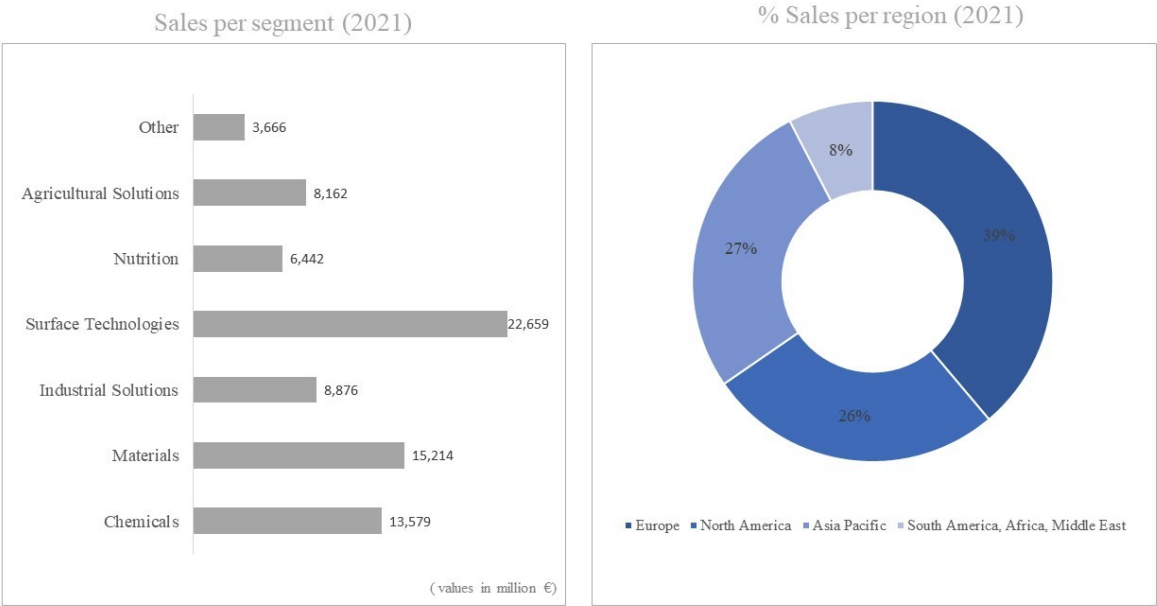


Exhibit 1- Sales per segment and region in 2021.

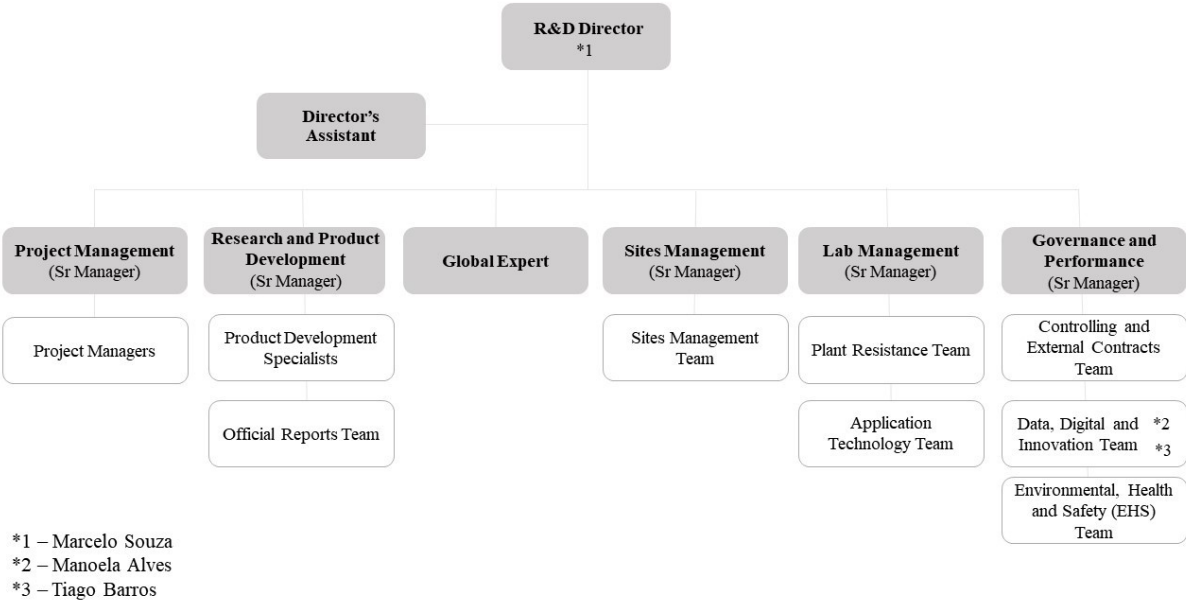
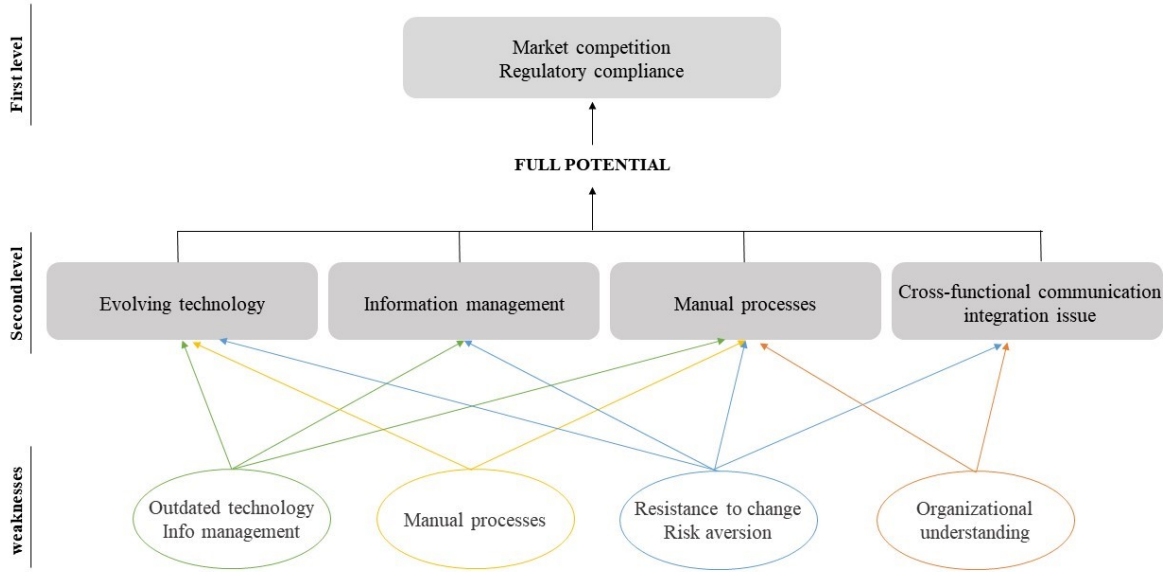


Exhibit 2 - R&D organizational chart.

Teaching Note Exhibits



TN Exhibit 1 - R&D department challenges diagram.

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