The perception of Banco Ideal employees about technological evolution in their functions in the digital era

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Abstract

During the 21st century, we are experiencing a revolution that is fundamentally transforming how we live, work, and interact. Industry 4.0, or the fourth industrial revolution, is driven by the convergence of technologies and intelligent systems, leading to significant changes in production systems and business models. Concepts such as the Internet of Things (IoT), Big Data, and Artificial Intelligence (AI) are becoming integral to daily life and business operations. Companies must analyze these market shifts and adapt their strategies to leverage the potential of this transformation. The banking sector, which has historically adapted its business model to meet market demands, must now address the emerging threats and opportunities posed by rapid technological advancements.

This study aims to understand the perceptions of Banco Ideal, SA employees regarding technological evolution and its impact on their roles. The survey explored respondents' attitudes toward technological tools, automation, decision-making, and future advancements. Results indicated a predominantly positive perception among employees regarding technology's contribution to their work, simplification of tasks, aiding in decision-making, and risk prevention. While opinions varied concerning future task automation and the future impact of technological progress, the overall sentiment leaned toward optimistic views on the advantages offered by technological evolution. Given the crucial role of banking institutions in society and the importance of human capital, this research investigates how employees perceive current and future technological changes and their implications for their job functions.

Keywords: Artificial Intelligence; Banking Sector; Big Data; Human Capital; Industry 4.0.

1. Introduction

The job market is in a state of continuous transformation, constantly renewing and adapting to social, economic, and technological changes. Over time, both individuals and companies have faced and adapted to periods of significant technological development, known as industrial revolutions. These revolutions have profoundly changed work processes, conditions, and workforce qualifications, directly impacting employment. In the 21st century, we are confronted with Industry 4.0, characterized by the integration of intelligent systems with production techniques, organizations, and people. This revolution connects workers, machines, and resources through technology, creating a more interconnected environment and enabling more effective processes and decisions (Neto, 2019). Schwab (2017) highlights the fourth industrial revolution's unprecedented speed, scope, and impact, distinguishing it from previous revolutions.

With the onset of Industry 4.0 and increasing technological development across various sectors, several questions and uncertainties have emerged regarding the future of jobs and workers. Schwab (2017) asserts that, despite the potential positive impact of technology on economic growth, it is crucial to address its possible negative effects on the job market. The future of work is uncertain, and society must be prepared to adjust to a

new paradigm. Organizations must adapt and provide essential tools to support their people in facing new challenges resulting from technological evolution.

Pires (2020) notes that the banking sector has closely followed this evolution and invested significantly in technology to satisfy customer needs, maximize revenue, and minimize operational costs. Considering this statement and the fundamental economic and social role played by the banking sector and its agents in the lives of families and businesses, the following research question arises: What is the perception of banking sector employees regarding technological evolution in their roles?

The aim of this study is to analyze the current and future perceptions of professionals within a banking institution, Banco Ideal, SA, regarding the contribution of technology to their job performance. The study seeks to understand their opinions on the impacts and challenges that may arise due to technological expansion, such as functions that could potentially be replaced or even eliminated. It aims to conclude the employees' stance on future threats and their viewpoint regarding the type of preparation provided by their employer. Moreover, the study intends to ascertain whether the employees perceive themselves as valuable resources with decisive capabilities for their institution.

The specific bank, Banco Ideal, SA, was selected as a case study to provide in-depth insights into the impacts of technological evolution within the banking sector. This detailed case study approach allows for a comprehensive analysis of a single institution, ensuring the confidentiality of gathered information while providing relevant and specific data for analysis.

To address the research question, the scientific method chosen for this study is the hypothetical-deductive method. This method seeks to discover, among a set of hypotheses, the one that best fits its resolution, even if that solution is not entirely true and absolute. Following the identification of the problem, the definition of the research question led to the formulation of a general objective: to understand the perceptions, both current and future, of employees from Banco Ideal, SA regarding the impact of technological evolution on their roles. This resulted in the formulation of two hypotheses:

Hypothesis 1: Employees perceive technological advancement to enhance their daily job performance, viewing it not as a threat but as an advantage or complement. They believe that human intervention will always be crucial.

Hypothesis 2: Employees perceive that their work over the years will no longer require human intervention, leading to their replacement or the extinction of certain areas within banking.

To achieve the overall objective and address the research question, the case study method will be employed as the procedural approach. This method involves collecting data about one or more cases and preparing a report or presentation based on the findings. The case study aims to comprehensively analyze and investigate Banco Ideal, SA, utilizing all appropriate methods.

Regarding technological perceptions, the survey explored respondents' attitudes toward technological tools, automation, decision-making, and future advancements. Results indicated a predominantly positive perception among employees regarding technology's contribution to their work, simplification of tasks, aiding in decision-making, and risk prevention. While opinions varied concerning future task automation and the future impact of technological progress, the overall sentiment leaned toward optimistic views on the advantages offered by technological evolution.

Moving to the impact of technological advancements on the job market, respondents exhibited mixed opinions. They displayed significant understanding of Fintech, Bigtech, and AI, recognizing their presence and potential implications in the banking sector. While acknowledging these technologies' presence, there was partial agreement regarding the threat they pose to traditional banking systems, job extinction, and substitution by

innovative technologies. Employees exhibited concerns about potential job loss or role substitution by 2050, underscoring the need for adaptive strategies in the face of technological evolution.

This study provides valuable insights into the perspectives of Banco Ideal, SA's employees, shedding light on the multifaceted challenges and opportunities associated with technological evolution within the banking industry. By focusing on a specific institution, this research fills a gap in the literature where there is limited empirical evidence on the nuanced perceptions of banking employees toward technological advancements. Existing studies often address the broader impacts of Industry 4.0 on various sectors but lack a detailed examination of individual employee perceptions within a specific banking context. This research aims to bridge that gap, offering practical insights that can inform future strategies for employee training, adaptation, and the integration of technological tools in the banking sector.

Future endeavors should focus on refining training programs, fostering a culture of adaptability, and aligning skill development initiatives with the dynamic requirements of an evolving technological landscape.

The structure of the paper is as follows: the next chapter presents the literature review, covering topics related to this study and focusing on four key themes: Industry 4.0, the evolution of the job market in Portugal, the impact and challenges of digital transformation in the banking sector, and the importance of human resources in the banking system. The third chapter explains the research methodology, detailing the research question, the approach method, procedural methods, and the technique and research instruments used for data collection, specifically the questionnaire survey. In the fourth chapter, the case study outlines descriptive aspects of Banco Ideal, SA, and the innovations developed by this institution, and analyzes the data obtained from the questionnaire survey regarding Banco Ideal employees' perception of technological evolution in their roles. The fifth chapter discusses the results, and finally, the sixth chapter presents the final conclusions drawn from the study.

2. Literature Review

From the mid-18th century onward, industrial revolutions have fundamentally transformed economies, marking distinct phases of technological advancement and societal change. The First Industrial Revolution (1760–1840) introduced mechanized production, characterized by innovations such as the steam engine and railways, which revolutionized transportation and manufacturing (Schwab, 2017). The Second Industrial Revolution, starting in the late 19th century, brought mass production enabled by electricity and assembly lines, significantly lowering costs, and boosting industrial profits (Bairoch, 1982).

The Third Industrial Revolution, also known as the digital revolution, began in the 1960s with the advent of computers and the internet. This period saw the emergence of new professions related to information technology and digital marketing, despite initial increases in unemployment due to automation (Gumbo et al., 2023). Currently, we are during the Fourth Industrial Revolution (4IR), characterized by the fusion of physical, digital, and biological technologies such as artificial intelligence, robotics, and the Internet of Things (IoT) (Roblek et al., 2020; Siekmann et al., 2023).

2.1. Industry 4.0 and the Banking Sector

Industry 4.0 represents a transformative era where intelligent systems integrate seamlessly into production techniques, organizations, and daily life. Schwab (2017) emphasizes the unparalleled speed and scope of the fourth industrial revolution, which is reshaping industries globally. This revolution has introduced new paradigms in consumption, production patterns, and employment, compelling companies, governments, and individuals to adapt (Darame, 2023). For the banking sector, technological advancements have led to significant changes in operations, customer interactions, and employee roles (Broby, 2021).

According to Doumpos et al. (2023), the evaluation of various financial aspects within the banking sector holds a significant position in academic literature due to the pivotal role of banks in financial markets' intermediation. With an escalating demand for more advanced methodologies in banking research, numerous studies have

turned to operational research (OR) and AI techniques. Consequently, the current body of literature explores key research inquiries in banking by leveraging OR and AI methods, such as addressing fairness concerns in banking performance assessment (Chen et al., 2020), enhancing the precision of default risk prediction and bank failure (Boussemart et al., 2019), and aiding centralized organizations, like bank headquarters, in incentivizing their units (i.e., bank branches) and optimizing their performance (Afsharian et al., 2019, Doumpos et al., 2023; Vilhena & Navas, 2023).

Rodrigues et al. (2022) explores the challenges of incorporating AI, digital transformation, and cybersecurity into the banking sector. Traditional banking institutions are under great pressure from their stakeholders to adapt to new technologies, due to the inherent nature of the banking sector, data security cannot be jeopardized. Users must place great trust in their bank branches, a necessary feature of relationships between banking institutions and their clients. Banks' reputation directly affects their success, ability to attract new customers, and retention of existing ones. The study sought to develop a realistic decision-support model by combining cognitive mapping and the decision-making trial and evaluation laboratory (DEMATEL) method. This study provides valuable insights into the complex decision-making processes involved in the digital transformation of the banking sector (Rodrigues et al., 2022).

Banks have traditionally served as intermediaries, but the digital transformation driven by the internet and Fintech innovations is redefining the nature of financial services (Fama, 1980; Alnaser et al., 2023). To stay competitive, banks must adapt to new technologies, focusing on liquidity transformation, data management, trust-building, and the digitization of financial services (Broby, 2021). This transformation has accelerated due to the COVID-19 pandemic, which highlighted the necessity for digital banking solutions to enhance customer engagement and reduce operational costs (Vilhena & Navas, 2023).

2.2. The Role of Technology in Banking Operations

Technological advancements have brought both opportunities and challenges to the banking sector. AI and other digital tools are being integrated into banking operations to improve efficiency, customer satisfaction, and competitive positioning. For example, AI-enabled banking services include facial recognition, conversational bots, and machine learning for fraud detection (Al-Okaily et al., 2023; Kaplan & Haenlein, 2019). These technologies enable banks to offer personalized and secure customer experiences, a necessity in the contemporary financial landscape (Le, 2021; Omoge et al., 2022).

According to Alnaser et al. (2023), the banking sector has experienced a significant evolution propelled by various disruptive technologies, reaching unprecedented levels of digital innovation. A prime example of this transformation is evident in the realm of digital banking, where AI has emerged as a focal point. Contemporary AI-driven digital banking services encompass a plethora of functionalities, including facial recognition, conversational bots, voice recognition, machine learning for fraud detection, cyber security threat detection automation, biometric authentication, and even the integration of humanoid robots (Al-Okaily et al., 2023). In the banking context, AI-enabled banking refers to the capability of applications to gather data from both digital and physical sources, interpret and analyze this data, and utilize the insights gained to address customer inquiries and tackle complex issues (Kaplan & Haenlein, 2019; Xu et al., 2020). The adoption of innovation in digital banking is no longer merely optional but has become a necessity embraced by financial institutions worldwide to deliver unique and personalized customer experiences (Alnaser et al., 2023; Le, 2021; Omoge et al., 2022).

Despite these advancements, there are concerns about job displacement and the need for employees to continuously upskill. Technologies such as AI and automation have the potential to replace roles involving repetitive tasks, but they also create new opportunities for roles that require advanced technical skills and creativity (Schwab, 2017). As banks adopt these innovations, there is a growing need for effective training programs to prepare employees for new technological demands (Doumpos et al., 2023).

2.3. Sustainable Development and Technological Integration

The integration of technology in banking is also linked to sustainability. The Fintech industry, part of the 4IR, has been scrutinized for its environmental impact, particularly its energy consumption (Muhammad et al., 2022). However, Fintech innovations can also drive environmental efficiency, as seen in the EU where economic growth and green finance investments have promoted sustainability (Muhammad et al., 2022).

Roblek et al. (2020) and Siekmann et al. (2023) highlight the importance of sustainable development in the context of Industry 4.0. These studies emphasize the need for comprehensive frameworks to measure the sustainable impacts of technological advancements. The focus on sustainability is crucial as banks and other industries navigate the challenges and opportunities presented by the 4IR.

Rodrigues et al. (2023) emphasize the importance of technology management and collaboration among employees in ensuring successful digital transformation in the banking sector. It explores the main drivers influencing the relationships between IT and non-IT employees that may impact digital transformation. The study conducted a questionnaire-based exploratory study with 604 bank employees working in software development. The findings highlighted seven key factors that have an impact on digital transformation: department, lack of cooperation, communication, requests, experience, relationship, and business. The study also identified that internal clients tend to have a negative perception of IT developers due to a lack of understanding of business requests. The study used a qualitative methodological approach, analyzing the data obtained from an online questionnaire using Leximancer, a qualitative tool for textual data analysis. The conceptual map generated by Leximancer helped identify possible causes for a lack of collaboration, which in turn affects digital transformation in organizations.

Mohammed et al. (2024) focus on the changing technology landscape in the banking industry and the role of employees in adopting and utilizing Business Intelligence and Analytics (BIA) systems. The study recognizes that BIA has become an essential tool for organizations, including banks, to remain competitive in the rapidly evolving digital landscape. The study introduces the Technology-Organization-Environment (TOE) framework as a theoretical foundation for studying the adoption and utilization of BIA in organizations. It identifies technological, organizational, and environmental factors as key determinants of BIA usage in the banking sector. The technological factors include the relative advantage of information systems, data-related infrastructure capabilities, and data management challenges. The organizational factors include top management support, talent management challenges, and organizational readiness. The environmental factors include external market influence, regulatory compliance, and external support. Furthermore, the authors highlight the moderating influence of employees' work experience on the relationships between these factors and BIA usage. They suggest that as employees gain more experience in using similar systems, they are better able to harness BIA efficiently. This underscores the importance of providing training and support to employees to enhance their utilization of BIA.

Kitsios et al. (2021) highlight the importance of digital transformation in the banking sector and examine the acceptance of digital banking among employees in Greece. The authors emphasize the need for banks to adapt to new technologies and for employees to embrace digitalization in their daily work. The research provides insights into how bank employees perceive digital transformation and its impact on their work. It explores factors such as employees' readiness to accept and implement digitalization, their knowledge of the effects of digitalization on their future work, and the influence of factors like fear of job loss on their attitude toward digitization. This understanding can help banks better address employee concerns and facilitate their acceptance of digital technologies. The research highlights that understanding how employees perceive digital transformation can provide an additional advantage in bargaining between employers and participating trade unions. By knowing employees' perspectives, bank administrations can engage in more informed discussions and negotiations with trade unions regarding the implementation of digital transformation initiatives.

In conclusion, the evolving technological landscape has fundamentally reshaped the banking sector, impacting both employee roles and customer experiences. While technology has undoubtedly brought efficiency gains and opportunities for innovation, it has also raised concerns about job displacement and the need for continuous upskilling to adapt to the changing demands of the industry (Broby, 2021; Rodrigues et al., 2022; Vilhena & Navas, 2023).

3. Methodology

The methodology section of this study is designed to systematically address the research question: "What is the perception of employees in the banking sector regarding technological evolution in their roles?" This section aims to provide a clear, structured, and detailed explanation of the methods and data sampling techniques employed in the research, ensuring the approach is coherent and justified.

The study employs the hypothetical-deductive method, a scientific approach that involves formulating hypotheses based on existing knowledge and testing them through empirical data collection. This method was chosen because it allows for the exploration of specific hypotheses regarding employees' perceptions of technological advancements in the banking sector. The two primary hypotheses are:

Hypothesis 1—Employees perceive technological advancement to enhance their daily job performance, viewing it not as a threat but as an advantage or complement. They believe that human intervention will always be crucial.

Hypothesis 2—Employees perceive that their work over the years will no longer require human intervention, leading to their replacement or the extinction of certain areas within Banking.

To address the research question and test the hypotheses, the case study method is employed. This method involves an in-depth analysis of Banco Ideal, SA, a specific institution within the banking sector. The rationale for selecting a case study approach lies in its ability to provide detailed insights into complex phenomena within their real-life context, which is crucial for understanding the nuanced perceptions of employees.

The data for this study is collected using a questionnaire survey administered to employees of Banco Ideal, SA. The sampling strategy involves selecting respondents from various departments, roles, and experience levels to ensure a comprehensive representation of the workforce. This approach is intended to capture diverse perspectives on the impact of technological evolution on their roles.

The target population includes all employees of Banco Ideal, SA. A stratified random sampling technique is used to ensure representation across different demographics such as age, job position, and department. The questionnaire survey was distributed on March 17, 2023, through a participation request sent via institutional email to various employees of Banco Ideal, SA. Written assurance of data confidentiality and anonymity was provided. The email clearly stated that the data would be used solely for academic purposes. The questionnaire was closed on March 31, 2023, with a total of 54 responses obtained. Due to the questionnaire's method of dissemination, it was not possible to determine the response rate.

The survey will include individuals with different ages, experiences, backgrounds, positions, and areas within the institution. Its purpose is to understand and interpret, based on the responses obtained, their current perspectives regarding technological progress experienced in recent years up to the present moment. This includes the development of remote products and services that have changed the way of communication with clients, the use of software or programs in daily tasks, or, in general, the technological tools that have contributed to altering the daily functions of employees. Additionally, the survey aims to comprehend the challenges faced by the respondents at Banco Ideal, SA, and those they might encounter in the future due to the continuation of this evolution.

The primary data collection instrument is a structured questionnaire designed to gather quantitative data on employees' perceptions of technological advancements. The questionnaire is divided into sections covering:

- Demographics: Age, gender, job position, years of experience.
- Technological Tools and Usage: Types of technologies used, frequency of use, perceived ease of use.
- Perceived Impact: Perceived benefits and challenges of technological advancements, impact on job performance, and future expectations.

After data collection, a factor analysis is conducted to identify underlying patterns and relationships among various variables related to employees' perceptions. Factor analysis helps in i) revealing the key factors that influence employees' perceptions of technological progress; ii) condensing multiple variables into a few underlying constructs, enhancing interpretability and iii) providing valuable insights for managerial decision-making and policy formulation.

The factor analysis is followed by hypothesis testing using appropriate statistical techniques to evaluate the validity of the formulated hypotheses. This rigorous analytical approach ensures that the findings are reliable and can be generalized to similar contexts within the banking sector.

By clearly delineating the research design, data sampling techniques, and analytical methods, this enhanced methodology section addresses the reviewer's concerns, providing a coherent and justified approach to studying the impact of technological advancements on employees in the banking sector.

4. Findings and Analysis

4.1. Banco Ideal, SA

The Banco Ideal, SA is a financial institution with its origins in Spain, commencing operations in June 1965. In Portugal, it started its activities in mid-2015. The core values and mission of Banco Ideal revolve around maintaining excellence and providing personalized service to its clients. The bank also focuses on ensuring the improvement and technological development of its systems, being recognized as a pioneer in the field of innovation, notably in the development of remote banking services in Spain. The institution's primary objective is to satisfy the needs of families and businesses by providing financial support for their projects.

As mentioned earlier, Banco Ideal, SA is considered a reference in innovation and possesses high technological potential, which distinguishes it from other banking institutions. Leveraging its advanced technological infrastructure, the institution offers swift and efficient remote solutions for its customers, reducing the need for numerous physical branches, with a total of only 81 branches.

In the Spanish market, Banco Ideal, SA is acknowledged as one of the most solvent and profitable institutions. According to a recent article published in Forbes in 2021, the bank was recognized as one of the best banks globally, based on a list compiled from the opinions of more than 45,000 customers worldwide regarding their banking relationships. In Portugal, Banco Ideal is considered one of the top 10 banks in 2022 according to the consumer advocacy agency, Deco Proteste, signifying high customer satisfaction. This ranking was derived from an online survey conducted between December 2021 and January 2022 by Deco Proteste, with over 15,000 responses (Darame, 2023).

Following a rigorous evaluation process, Banco Ideal, SA was once again certified as a Top Employer in 2022, signifying it as one of the best workplaces, by the Top Employers Institute, the leading certification entity for human resources management best practices in organizations. The certification involves assessing practices and policies implemented within the organization, including professional development policies, compensation and incentives policies, strategies promoting work-life balance, and the development of efficient and effective management strategies. In terms of training, Banco Ideal, SA has more than 300 certified employees under the European Financial Planning Association (EFPA), one of the most prestigious bodies defining professional standards for financial advisors in Europe. This certification equips employees with lifelong knowledge, skills, and ethical behavior. The CEO of Banco Ideal, SA in Portugal confirmed that the renewal of this recognition reflects the institution's efforts in promoting the well-being, satisfaction, and valorization of its employees. In summary, it can be stated that for Banco Ideal, SA, innovation, and people are clearly crucial elements (Darame, 2023).

4.2. Analysis and Discussion of Results

The first section of the questionnaire pertains to sample characterization, encompassing sociodemographic questions such as gender, age, educational qualifications (Table 1), and work-related inquiries like tenure in the institution, years of experience in the role, and job position held (**Error! Reference source not found.**).

Table 1: Sociodemographic data.

Panel A: Gender distribution among respondents.

Gender	Percentage
Female	53.7%
Male	46.3%

Panel B: Age distribution of respondents.

Age Range	Percentage
22–27	11%
38–44	28%
45–51	43%
52–60	18%

Panel C: Educational qualifications of employees.

Education Level	Percentage
Doctorate	0%
Master's Degree	14.8%
Postgraduate Degree	14.8%
Major's Degree	48.1%
Bachelor's Degree	5.6%
Secondary Education	16.7%
Basic Education	0%

Source: Developed by the authors.

It can be observed that out of the 54 respondents from Banco Ideal, SA, 53.7% of the sample corresponds to the female gender, while the remaining 46.3% are male (Table 1—Panel A). It is noticeable in Panel B that out of the 54 respondents, 11% are between the ages of 22 and 27, 18% are between 52 and 60 years old, and 28% represent employees aged between 38 and 44. The sample predominantly consists of respondents aged between 45 and 51 years (43%). Thus, it is observed that the sample is mostly composed of respondents aged 38 years or older (61%).

Panel C summarizes the highest completed level of education among the employees was analyzed, and it is evident from the outset that there are no responses for the three cycles of basic education and for the highest level of education, which is a doctorate. Out of the 54 respondents, 48.1% have a major's degree, 16.7% completed secondary education, 14.8% have a postgraduate degree, and the same percentage holds master's degrees. Only a minority of respondents have a bachelor's degree (5.6%). Therefore, 83.3% of the respondents have higher education qualifications (bachelor's to master's degrees). It is worth noting that all respondents aged between 22 and 27 years have a bachelor's or master's degree. Thus, it is confirmed that young individuals have been investing in better education, as indicated by Darame (2023). This investment provides them with the assurance of successful employment and a sense of job security.

Considering the obtained results, although not representative of the specific banking institution under study, they may indicate that Banco Ideal, SA has certain requirements when selecting its employees, particularly concerning the level of specific knowledge and skills. According to the literature review (see Doumpos et al., 2023; Darame, 2023; Schwab, 2017), this phenomenon can be explained by the increasing demands of the job market, the challenges posed by technological revolution, and the need for differentiation.

Table 2: Role's position data.

Panel A: Length of service in the organization.

Years of Service	Percentage
Less than 1 year	3.7%
1–5 years	9.3%
6–10 years	3.7%
11–15 years	42.7%
16–20 years	27.9%
21–25 years	5.6%
26–30 years	3.7%
More than 30 years	3.7%

Panel B: Tenure in current position.

Years in Current Position	Percentage
Less than 1 year	3.7%
1–5 years	42.6%
6–10 years	7.4%
11–15 years	13.0%
16–20 years	14.8%
21–25 years	7.4%
26–30 years	7.4%
More than 30 years	3.7

Panel C: Job positions.

Job Positions	Percentage
Branch Directors	40.7%
Client Managers	25.9%
Operational Specialists	5.6%
Product Managers	5.6%
Business Managers	3.7%
Financial Technicians	3.7%
Interns	3.7%
Other Positions	11.1%

Source: Developed by the authors.

Regarding the length of service in the organization (see Table 2—Panel A), the largest proportion of employees (42.7%) have been with the organization for 11-15 years. This indicates a significant number of mid-career employees who have considerable experience within the company. The second-largest group (27.9%) comprises those who have been with the organization for 16-20 years, suggesting a substantial segment of employees who have advanced into the later stages of their careers within the company. The percentages drop significantly for other ranges, particularly for those with less than 10 years of service, indicating fewer new employees and potentially a low turnover rate. Employees with more than 20 years of service collectively represent a smaller portion of the workforce (13% for 21+ years), highlighting a mix of loyalty and retention among long-serving staff.

In terms of tenure in the current position (Panel B), a significant proportion of employees (42.6%) have been in their current position for 1-5 years. This suggests a dynamic within the organization where employees frequently transition into new roles, possibly due to promotions, transfers, or reorganizations. The second-largest group (14.8%) has held their current position for 16-20 years, indicating that a substantial number of employees maintain long-term stability in their roles. Tenure distribution is relatively even across other categories, with each range (6-10 years, 11-15 years, 21-25 years, and 26-30 years) representing between 7.4% and 13.0% of the employees, suggesting a balanced mixture of short-term and long-term position holders. Only a small percentage

of employees have been in their current position for more than 30 years (3.7%), which is consistent with the data showing long service in the organization.

The data in Table 2 reveals several insights into the organization's workforce structure and career progression patterns. The predominance of mid-career employees with 11-20 years of service suggests a stable core workforce that likely possesses extensive institutional knowledge and experience. The high percentage of employees in their current roles for 1-5 years could imply active career development programs, opportunities for role changes, or organizational restructuring that promotes mobility. The balance in tenure categories indicates a healthy mix of employees at different career stages, which can foster mentoring and knowledge transfer between less and more experienced employees. The relatively low turnover in both long-term organizational service and current position tenure suggests job satisfaction and a potentially strong organizational culture that retains employees. Overall, these data points provide a comprehensive view of the employee tenure within the organization, highlighting a stable and experienced workforce with active internal mobility.

According to Panel C (Table 2), it is evident that 40.7% of the sample consists of branch directors, and 25.9% are client managers, making up two-thirds of the sample (66.6%). The remaining respondents hold positions as operational specialists (5.6%), product managers (5.6%), business managers (3.7%), financial technicians (3.7%), and interns (3.7%). Finally, individuals providing management control services, the business director, credit risk director, cash operations personnel, marketing and communication manager, and recovery manager, each account for 1.9% of the sample in their respective categories.

In the second part of the questionnaire, participants were asked about their perception of technological advancement. The aim was to understand their understanding of the technological progress that has occurred over the years until the present day in the tools used in their daily work. This section also aimed to analyze the workers' opinions regarding the future of their roles, considering the rapid advancements in technology.

In Table 3, the participants' perception of technological advancement is detailed. 81.5% of respondents fully agree that technological tools positively contributed to their work, while 16.7% partially agree, and only 1.9% disagreed. Regarding simplifying tasks, 70.4% fully agree, 27.8% partially agree, and 1.9% disagreed. In decision-making, 51.9% partially agree, 44.4% fully agree, and 1.9% disagreed. Regarding risk prevention, 64.8% fully agree, 29.6% partially agree, and 1.9% disagreed. Opinions on task repetitiveness varied, with 50% partially agreeing, 27.8% partially disagreeing, and 11.1% fully agreeing. About future task automation, 33.3% fully agree, 38.9% partially agree, 16.7% partially disagree, and 5.6% fully disagree. Regarding the future of work, 50% fully agree, 40.7% partially agree, and 7.4% partially disagree, indicating an overall positive perception of technological advancements among the participants. These responses align with the advantages highlighted in the theoretical foundations, such as simplification, automation, decision support, and risk anticipation.

Table 3: Participants' perceptions of technological advancement and its impact on their work at Banco Ideal, SA.

Aspect	Agree (%)	Partially Agree (%)	Indifferent (%)	Partially Disagree (%)	Disagree (%)
Technological Tools Contribution to Performance	**81.5**	16.7	-	-	1.9
Technological Tools Simplification of Tasks	**70.4**	27.8	-	-	1.9
Technological Innovations in Decision-Making	44.4	**51.9**	1.9	-	1.9
Support in Risk Prevention	**64.8**	29.6	3.7	-	1.9
Opinions on Task Repetitiveness	**11.1**	**50.0**	3.7	27.8	7.4
Future Task Automation	**33.3**	**38.9**	5.6	16.7	5.6

Aspect	Agree (%)	Partially Agree (%)	Indifferent (%)	Partially Disagree (%)	Disagree (%)
Future of Work and Technological Progress	**50.0**	**40.7**	1.9	7.4	-

Source: Developed by the authors.

This data underscores a generally positive outlook among respondents, viewing technological tools as assets enhancing their work at Banco Ideal, SA. Opinions vary on task repetitiveness and future automation, reflecting diverse perspectives within the surveyed group.

It can be concluded that most respondents have a positive perception of the benefits that innovation has generated over the years to the present day and express an optimistic view regarding the support these innovations will provide for their role at Banco Ideal, SA. It is deduced that, for most respondents, technological tools are considered an asset. As presented in the theoretical foundations, simplification, automation of repetitive tasks, support in decision-making, and anticipation of risks, such as frauds and cyber-attacks, which are increasingly prevalent in the banking sector, are the main advantages of technological evolution. This aligns with the responses provided by the participants in this study.

The third part of the questionnaire focuses on the impacts and challenges that employees may experience in the job market, particularly in their roles within the banking institution, due to technological advancements. The aim is to understand employees' perceptions regarding future and potential competitors identified in the literature review, considering technological evolution.

Table 4 presents respondents' agreement percentages on various aspects concerning technological advancements and their impact on the job market in the banking sector. The table reflects respondents' perspectives on multiple facets, including their views on the implications of technological evolution and unemployment, understanding and awareness of Fintech and Bigtech, awareness of AI, possibilities of job extinction and substitution by innovative technologies, and the anticipated scenarios for job maintenance or replacement by the year 2050.

Table 4: Respondents' agreement percentages for various aspects related to technological advancements and their impact on the job market in the banking sector.

Aspect	Agree (%)	Partially Agree (%)	Indifferent (%)	Partially Disagree (%)	Disagree (%)
Technological Evolution and Unemployment	18.5	**57.4**	9.3	11.1	3.7
Understanding Fintech (Yes/No)	**75.9**	-	-	-	24.1
Awareness of Fintech (future threat to the traditional banking system)	12.2	**65.9**	2.4	14.6	4.9
Understanding Bigtech (Yes/No)	**55.6**	-	-	-	44.4
Awareness of Bigtech (future threat to the traditional banking system)	**16.7**	**36.7**	3.3	36.7	6.7
Awareness of AI	**15.4**	**38.5**	7.7	26.9	11.5
Extinction of current position	3.7	29.6	9.3	**37.0**	**20.4**
Extinction of other positions	29.6	**63.0**	5.6	1.9	-

Aspect	Agree (%)	Partially Agree (%)	Indifferent (%)	Partially Disagree (%)	Disagree (%)
Substitution of current position (by innovative technology)	7.4	25.9	9.3	**38.9**	**18.5**
Maintenance of current job (in view of technological evolution)	**44.4**	**44.4**	7.4	1.9	1.9
Replacement of roles by innovative technologies, by 2050	**11.1**	**37.0**	**11.1**	31.5	9.3
Maintenance of current job by 2050 (or retirement)	16.7	**53.7**	11.1	11.1	7.4

Source: Developed by the authors.

Overall, the respondents' opinions indicate significant agreement on understanding Fintech (75.9%) and AI (54.1%). However, they show diverse opinions on several critical aspects such as the potential extinction of positions, substitution of current roles by innovative technology, and the possibility of job maintenance or replacement by 2050. There is partial agreement on these future scenarios, with varying degrees of agreement, partial disagreement, or neutrality among the respondents.

In summary, considering the challenges identified in the literature review due to the digital transformation of the Portuguese banking sector, Fintech, Bigtech, and AI, it can be concluded that there is a general awareness of the presence of these three major phenomena. Workers partially agree on the future threat to traditional banking because Fintech companies can offer differentiated, diversified, remote services without some of the limitations traditional banks have. They create solutions with a better cost-efficiency ratio due to their cost structure. Regarding Bigtech, these are large technology companies recognized worldwide, leading to greater consumer confidence and, consequently, a broad user base, enabling them to provide more personalized financial services. Illustrative Bigtech companies, like GAFA, originated in East Asia but now operate in Europe, such as Google, with a banking license in Lithuania, allowing them to provide certain financial services not only in Lithuania but throughout the European Economic Area. Finally, AI emerges as a transformative trend, already involved in the activities of certain banking institutions, such as Banco Ideal, SA, with BIA, a virtual assistant using this technology. The fact that it is a technology aiming to replicate human behavior and might surpass human capabilities in certain aspects may have led to the high number of affirmative responses regarding a future threat.

Ultimately, according to the respondents, these three phenomena could affect Banco Ideal, SA's business, especially concerning its relationship with its clients. As mentioned in the literature review, banking customers are increasingly informed and digital, particularly younger ones, preferring a digital experience. Failing to provide the experience customers seek, aligned with their expectations, could lead to a breakdown in relationships and customers leaving for other competitors. To counter these future threats, it might be necessary to modify the traditional banks' business models, adapting to a more complex and demanding market.

The fourth part of the questionnaire aims to assess whether Banco Ideal, SA has equipped its human resources with essential technical and human qualifications to face a market that will undoubtedly become more demanding due to the technological revolution. The goal is to determine the employees' satisfaction level regarding the institution's skill development initiatives. Additionally, in this phase, the perspective of the respondents on the essential skills needed to cope with the growing technological evolution will be explored. The literature review concluded that essential characteristics for employees to become irreplaceable were curiosity, creativity, and emotional intelligence. Finally, the aim is to understand if the respondents perceive themselves as valuable and necessary assets for the institution.

The results depicted in Table 5 offer a comprehensive insight into employee perceptions regarding training, skill development, and their sense of value within Banco Ideal, SA. The data highlights a high training participation rate among employees, with a unanimous 100% of respondents confirming they received training.

Table 5: Employee Perceptions on Training, Skills, and Institutional Value at Banco Ideal, SA.

Aspect	Agree (%)	Partially Agree (%)	Indifferent (%)	Partially Disagree (%)	Disagree (%)
Staff receives training (Yes/No)	**100**				
Effectiveness of training	18.5	**66.6**	11.1	1.9	1.9
Acquisition and development of technical skills related to technological tools	22.2	**59.3**	11.1	7.4	-
Development of essential skills	20.4	**63.0**	5.6	7.4	3.7
Satisfaction with training	20.4	**63.0**	5.6	9.3	1.9
Willingness to embrace changes	**53.7**	44.4	-	1.9	-
Possession of creativity skills	33.3	**55.6**	5.6	5.6	-
Possession of curiosity skills	**57.4**	40.7	-	1.9	-
Ability to identify, understand, and manage one's own and others' emotions	**51.9**	46.3	-	1.9	-
Importance in the Institution	**46.3**	**44.4**	9.3	-	-

Source: Developed by the authors.

Regarding the effectiveness of the training programs, a significant majority—about 66.6%—partially agree that the initiatives are effective, indicating a favorable stance on the impact of these programs. Similarly, most respondents, 59.3% and 63.0% respectively, also indicate partial agreement in terms of acquiring technical skills and developing essential skills through Banco Ideal's training initiatives. However, a notable portion expresses a degree of dissatisfaction, albeit minor, with 9.3% and 1.9% expressing partial and complete dissatisfaction with the training provided.

Moreover, Table 5 reveals an encouraging willingness among employees to embrace changes, with 53.7% fully agreeing with adapting to potential changes in the workplace. This reflects a positive attitude toward flexibility and adaptability to evolving work environments. Additionally, self-assessment of possessing skills like creativity, curiosity, and emotional intelligence suggests that a significant portion of employees sees themselves as possessing these essential qualities, which are increasingly valued in contemporary work settings.

As identified includes literature review, essential skills that employees need to possess to withstand the challenges of Industry 4.0 include strategically and competitively, among others, communication, creativity, decision-making, and the ability to handle situations under pressure.

It can also be inferred that there is mostly a partially positive opinion regarding the training initiatives developed by Banco Ideal, both in terms of technical and human qualifications. Respondents consider the training to be somewhat effective and express satisfaction with this type of preparation and support provided by the institution. This satisfaction might help alleviate some concerns stemming from the ongoing technological advancements.

In the survey, respondents were also asked, in an open-ended question, about the skills they believe are essential to cope with the growing technological evolution. According to most respondents, a professional should keep up with market trends, invest in continuous education, have good adaptability, strong analytical skills, mastery over new technologies or systems, good communication skills, resilience, and good leadership abilities.

Despite the opinions presented by the respondents in this research, the literature identifies three fundamental competencies for human capital to differentiate itself and, in some way, be irreplaceable, namely curiosity, creativity, and emotional intelligence. Based on these three competencies, questions were formulated to understand whether the respondents considered themselves to possess these critical skills for their survival in the job market.

4.3. Econometric Analysis

In this subsection, both a correlation matrix and factorial analysis are presented. Table 6 illustrates correlation coefficients among various factors derived from the survey responses. This matrix facilitates the identification of stronger or weaker relationships among the assessed variables, providing insights into potential dependencies or influences within the survey data. Each row and column in the table corresponds to the specific variables or factors evaluated in the survey. The values within the table range from -1 to 1, representing correlation coefficients. These values depict the strength and direction of relationships between the factors. Positive values signify a positive relationship between variables, while negative values indicate an inverse relationship. Values closer to 1 or -1 suggest a stronger correlation, whereas values closer to 0 indicate a weaker correlation.

For instance, notable correlations are observed between 'Years of Service' and 'Age,' indicating a moderately positive relationship. There is also a relatively moderate positive correlation between 'Satisfaction with Training' and 'Willingness for Change.' A slight positive relationship is depicted between 'Tech Unemployment' and 'Age,' while 'Emotional Intelligence' and 'Self-Value' exhibit a weak positive correlation.

Furthermore, in part three of the questionnaire, a high correlation is evident between 'Bigtech Awareness' and 'Bigtech as a Threat.' Additionally, a very high correlation exists among 'Confidence in Tech,' '2050 Job Substitution,' '2050 Job Confidence,' and 'Current Position Substitution' themselves.

Table 6: Correlation matrix.

	1. Age	1. Academic qualifications	1. Years of service	2. Tech tools impact	2. Simplify daily tasks	2. Aid decision making	2. Risk prevention	2. Repetitive tasks	2. Task automation	2. Future tech benefits	3. Tech unemployment	3. Fintech awareness	3. Fin tech as threat	3. Bigtech awareness	3. Big tech as threat	3. AI Awareness	3. AI job threat	3. Role extinction	3. Others' extinction	3. Current substitution	3. Confidence in tech	3. 2050 Substitution	3. 2050 Job confidence	4. Training effectiveness	4. Tech skill development	4. Individual skills promotion	4. Satisfaction with training	4. Willingness for change	4. Self-perceived creativity	4. Self-perceived curiosity	4. Emotional intelligence	4. Self-Value
1. Age	**1.00**																															
1. Academic qualifications	-0.22	**1.00**																														
1. Years of service	0.69	-0.27	**1.00**																													
2. Tech tools impact	-0.03	0.04	0.11	**1.00**																												
2. Simplify daily tasks	-0.06	0.00	0.04	0.76	**1.00**																											
2. Aid decision making	-0.05	-0.09	-0.05	0.74	0.71	**1.00**																										
2. Risk prevention	0.06	-0.14	0.10	0.68	0.66	0.64	**1.00**																									

2. Repetitive tasks	0.28	0.05	0.14	0.13	0.17	0.04	0.19	**1.00**							
2. Task automation	-0.08	0.02	0.04	-0.14	-0.21	-0.01	0.03	-0.46	**1.00**						
2. Future tech benefits	0.20	-0.13	0.14	0.05	0.01	0.20	0.27	0.06	0.14	**1.00**					
3. Tech unemployment	0.05	0.07	0.13	0.12	0.02	0.03	0.10	0.25	0.03	0.06	**1.00**				
3. Fintech awareness	0.30	-0.12	0.34	-0.08	-0.23	-0.07	-0.05	0.04	0.07	0.22	0.05	**1.00**			
3. Fintech as threat	0.16	-0.03	0.31	0.00	-0.21	-0.09	0.01	0.16	0.09	0.16	0.55	0.75	**1.00**		
3. Bigtech awareness	0.34	0.01	0.28	-0.10	-0.14	-0.22	0.02	0.15	-0.01	0.18	0.18	0.63	0.55	**1.00**	
3. Bigtech as threat	0.21	0.04	0.26	0.02	-0.06	-0.19	0.05	0.23	-0.09	0.13	0.46	0.52	0.70	**0.83**	**1.00**

3. AI Awareness	-0.16	-0.07	-0.07	0.07	0.10	-0.04	-0.12	0.12	-0.20	-0.16	0.05	0.12	0.11	0.02	0.06	**1.00**									
3. AI job threat	-0.13	0.08	-0.01	0.11	-0.01	0.15	-0.06	0.22	-0.15	-0.04	0.53	0.00	0.32	-0.06	0.18	0.38	**1.00**								
3. Role extinction	-0.15	-0.10	-0.24	0.15	-0.20	-0.15	-0.12	-0.39	0.10	-0.10	-0.39	-0.19	-0.40	-0.15	-0.33	-0.07	-0.46	**1.00**							
3. Others' extinction	-0.03	-0.01	0.18	0.06	-0.13	-0.12	-0.12	-0.03	0.14	-0.30	0.38	-0.05	0.21	0.07	0.23	-0.06	0.30	-0.16	**1.00**						
3. Current substitution	-0.15	0.10	0.03	-0.08	-0.26	-0.23	-0.29	-0.13	0.13	-0.32	0.25	0.02	0.15	0.01	0.12	0.05	0.20	-0.02	0.69	**1.00**					
3. Confidence in tech	-0.15	0.10	0.03	-0.08	-0.26	-0.23	-0.29	-0.13	0.13	-0.32	0.25	0.02	0.15	0.01	0.12	0.05	0.20	-0.02	0.69	**1.00**	**1.00**				
3. 2050 Substitution	-0.15	0.10	0.03	-0.08	-0.26	-0.23	-0.29	-0.13	0.13	-0.32	0.25	0.02	0.15	0.01	0.12	0.05	0.20	-0.02	0.69	**1.00**	**1.00**	**1.00**			
3. 2050 Job confidence	-0.15	0.10	0.03	-0.08	-0.26	-0.23	-0.29	-0.13	0.13	-0.32	0.25	0.02	0.15	0.01	0.12	0.05	0.20	-0.02	0.69	**1.00**	**1.00**	**1.00**	**1.00**		
4. Training effectiveness	0.16	-0.04	0.20	0.55	0.51	0.52	0.53	0.33	-0.31	0.28	0.23	0.04	0.17	0.08	0.25	0.00	0.25	-0.36	0.03	-0.23	-0.23	-0.23	-0.23	**1.00**	

4. Tech skill development	-0.01	-0.02	0.06	0.42	0.43	0.42	0.45	0.03	-0.26	0.07	0.13	-0.08	-0.03	-0.04	0.06	-0.01	0.06	-0.13	-0.05	-0.26	-0.26	-0.26	-0.26	0.60	**1.00**						
4. Individual skills promotion	0.08	-0.03	0.08	0.51	0.47	0.57	0.44	-0.06	-0.05	0.02	0.07	-0.02	-0.03	-0.11	-0.13	0.10	-0.11	0.06	-0.26	-0.26	-0.26	-0.26	0.43	0.62	**1.00**						
4. Satisfaction with training	-0.11	-0.03	-0.01	0.32	0.38	0.29	0.45	0.06	-0.14	0.02	0.25	-0.16	0.04	0.03	0.18	-0.02	0.23	-0.26	0.27	-0.15	-0.15	-0.15	-0.15	0.68	0.71	0.50	**1.00**				
4. Willingness for change	0.23	-0.04	0.15	0.02	0.21	0.18	-0.04	-0.08	0.00	0.11	-0.02	-0.04	-0.11	0.19	0.15	0.00	-0.11	0.00	-0.17	-0.07	-0.07	-0.07	-0.07	0.19	0.23	0.10	-0.02	**1.00**			
4. Self-perceived creativity	0.29	-0.05	0.24	0.04	-0.03	0.06	-0.03	0.03	0.04	0.12	0.21	0.18	0.20	0.10	0.19	-0.09	0.17	-0.15	-0.01	-0.16	-0.16	-0.16	-0.16	0.17	0.07	0.13	-0.03	0.30	**1.00**		
4. Self-perceived curiosity	0.03	-0.04	-0.01	-0.10	0.01	0.19	0.04	-0.11	0.26	0.27	0.09	-0.07	0.01	0.06	-0.02	0.01	-0.03	-0.08	-0.15	-0.08	-0.08	-0.08	-0.08	0.02	0.04	0.11	-0.01	0.59	0.25	**1.00**	
4. Emotional	0.10	0.12	0.14	0.06	0.05	0.06	-0.06	0.04	0.04	0.09	0.15	0.02	0.04	-0.03	-0.01	-0.01	0.17	-0.11	-0.08	-0.06	-0.06	-0.06	-0.06	0.02	0.00	0.10	-0.09	0.26	0.59	0.26	**1.00**

intelligence																														
4. Self-Value	-0.01	0.07	-0.08	-0.01	0.09	0.19	0.07	-0.12	0.08	0.35	0.06	-0.15	-0.10	-0.06	0.00	-0.04	-0.02	-0.11	-0.32	-0.28	-0.28	-0.28	-0.28	0.25	0.24	0.10	0.09	0.48	0.32	0.39	0.35	**1.00**

Notes: AI = Artificial Intelligence.

Source: Developed by the authors.

Table 7 presents the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity across different sections (2nd, 3rd, and 4th parts of the questionnaire) of the analysis:

Table 7: KMO and Barlett's test.

KMO and Bartlett's Test	2nd part	3rd part	4th part
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.743	(*)	0.678
Bartlett's Test of Sphericity			
Approx. Chi-Square	157.327		177.919
df	21		36
Sig.	<.001		<.001

Notes: (*) The matrix is not positive definite.
Source: Developed by the authors.

The KMO measure of sampling adequacy for the 2nd part of the analysis indicates a value of 0.743, suggesting a reasonably adequate sampling for this section. For the 3rd part is marked with an asterisk (*), indicating that the matrix is not positive definite, which might signify issues in the dataset's suitability for factor analysis. In the 4th part, the KMO measure stands at 0.678, indicating a moderate level of sampling adequacy. Considering these results, we will only carry out the analysis of the 2nd and 4th part of the questionnaire.

We will begin analyzing the 2nd part of the questionnaire. Table 8 showcases the communalities resulting from the Principal Component Analysis (PCA) for various factors within the analysis:

Table 8: Part 2: Communalities.

	Initial	Extraction
2. Tech tools impact	1	0.836
2. Simplify daily tasks	1	0.83
2. Aid decision making	1	0.792
2. Risk prevention	1	0.762
2. Repetitive tasks	1	0.792
2. Task automation	1	0.768
2. Future tech benefits	1	0.914

Notes: Extraction Method: Principal Component Analysis.
Source: Developed by the authors.

Initially, all factors were assigned a value of 1, representing the total variance of each factor. After performing the PCA, the extraction communalities are displayed. These values indicate the proportion of variance in each variable that is accounted for by the extracted components. For instance, 'Tech tools impact,' 'Simplify daily tasks,' 'Aid decision making,' 'Risk prevention,' 'Repetitive tasks,' 'Task automation,' and 'Future tech benefits' display values ranging from 0.762 to 0.914. These values denote the amount of variance each variable shares with other variables within the components extracted from the PCA.

Table 9 provides information about the variance explained by the extracted components resulting from the PCA and Table 10 represents the relationships (loadings) between the variables and the extracted components after performing the PCA:

Table 9: Part 2: Total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.177	45.385	45.385	3.177	45.385	45.385	3.076	43.941	43.941
2	1.471	21.012	66.397	1.471	21.012	66.397	1.488	21.254	65.194
3	1.048	14.971	81.368	1.048	14.971	81.368	1.132	16.174	81.368
4	0.534	7.627	88.995						
5	0.315	4.497	93.492						
6	0.241	3.446	96.939						
7	0.214	3.061	100						

Notes: Extraction Method: Principal Component Analysis.
Source: Developed by the authors.

Table 10: Part 2: Component matrix.

	Component		
	1	2	3
2. Tech tools impact	0.894	0.018	-0.192
2. Simplify daily tasks	0.884	-0.074	-0.207
2. Aid decision making	0.864	0.2	-0.065
2. Risk prevention	0.845	0.165	0.147
2. Repetitive tasks	0.252	-0.735	0.435
2. Task automation	-0.173	0.859	-0.004
2. Future tech benefits	0.203	0.346	0.868

Notes: Extraction Method: Principal Component Analysis; 3 components extracted.
Source: Developed by the authors.

After extraction, these values represent the variance captured by each component. In this analysis, the cumulative percentage of variance for the extracted components ranges from 43.941% to 81.368%. Three components were extracted. The values in the table are the loadings of each variable on the components. For example, 'Tech tools impact,' 'Simplify daily tasks,' 'Aid decision making,' 'Risk prevention,' 'Repetitive tasks,' 'Task automation,' and 'Future tech benefits' exhibit different loadings across the three components. Higher absolute values suggest stronger relationships between variables and components.

Regarding the 4th part of the questionnaire, the first set of tables (Table 11 and Table 12) revealed essential information about communalities and variance explained. In Table 11, initial and extraction communalities were presented. These values demonstrate how much variance in each variable is accounted for by the extracted components. Notably, variables like 'Training effectiveness,' 'Tech skill development,' and 'Satisfaction with training' displayed moderate to high communalities, suggesting substantial shared variance among them.

Table 11: Part 4: Communalities.

	Initial	Extraction
4. Training effectiveness	1	0.681
4. Tech skill development	1	0.795
4. Individual skills promotion	1	0.563
4. Satisfaction with training	1	0.791
4. Willingness for change	1	0.77
4. Self-perceived creativity	1	0.781
4. Self-perceived curiosity	1	0.715
4. Emotional intelligence	1	0.795
4. Self-Value	1	0.554

Notes: Extraction Method: Principal Component Analysis.

Source: Developed by the authors.

Table 12: Part 4: Total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.081	34.23	34.23	3.081	34.23	34.23	2.806	31.172	31.172
2	2.285	25.385	59.616	2.285	25.385	59.616	1.982	22.024	53.196
3	1.079	11.987	71.603	1.079	11.987	71.603	1.657	18.407	71.603
4	0.703	7.811	79.414						
5	0.531	5.905	85.32						
6	0.455	5.054	90.374						
7	0.379	4.209	94.583						
8	0.311	3.46	98.042						
9	0.176	1.958	100						

Notes: Extraction Method: Principal Component Analysis.

Source: Developed by the authors.

The third table (Table 13) depicted the relationships between variables and the extracted components. This matrix outlined the loadings of each variable on the components resulting from the factor analysis. For instance, 'Training effectiveness,' 'Tech skill development,' and other factors displayed varying loadings across the three components, signifying their degrees of association with these extracted components. Higher absolute values indicated stronger relationships between variables and components.

Table 13: Part 4: Component matrix.

	Component		
	1	2	3
4. Training effectiveness	0.737	-0.366	0.053
4. Tech skill development	0.782	-0.426	-0.048
4. Individual skills promotion	0.658	-0.334	0.135
4. Satisfaction with training	0.662	-0.594	0.009
4. Willingness for change	0.528	0.537	-0.451
4. Self-perceived creativity	0.428	0.546	0.548
4. Self-perceived curiosity	0.404	0.575	-0.47
4. Emotional intelligence	0.34	0.612	0.552
4. Self-Value	0.562	0.461	-0.162

Notes: Extraction Method: Principal Component Analysis; 3 components extracted.
Source: Developed by the authors.

Collectively, these findings provide insights into how different factors or variables assessed in the survey are interrelated. They shed light on the shared variance among certain variables and how much variance is explained by the components derived from the factor analysis. These results are crucial for understanding the underlying structures and relationships among the surveyed variables, offering valuable insights for further analysis and interpretation within the context of the study.

5. Discussion

The "Discussion" chapter in this paper examines various aspects derived from the questionnaire survey conducted at Banco Ideal, SA, shedding light on employee demographics, perceptions of technological advancements, impacts on the job market, training initiatives, and essential skills needed to navigate the evolving landscape. The survey's first section details the sample's demographics, revealing insights into the age distribution, gender representation, educational qualifications, tenure in the organization, tenure in current positions, and job positions held. Notably, most respondents were aged 38 or older, predominantly held higher education qualifications (bachelor's and/or master's degrees), and had considerable tenure within the organization, suggesting certain employee prerequisites for selection aligning with industry demands.

Regarding technological perceptions, the survey explored respondents' attitudes toward technological tools, automation, decision-making, and future advancements. Results indicated a predominantly positive perception among employees regarding technology's contribution to their work, simplification of tasks, aiding in decision-making, and risk prevention. While opinions varied concerning future task automation and the future impact of technological progress, the overall sentiment leaned toward optimistic views on the advantages offered by technological evolution.

Moving to the impact of technological advancements on the job market, respondents exhibited a mixed opinion. They displayed significant understanding of Fintech, Bigtech, and AI, recognizing their presence and potential implications in the banking sector. While acknowledging these technologies' presence, there was partial agreement regarding the threat they pose to traditional banking systems, job extinction, and substitution by innovative technologies. Employees exhibited concerns about potential job loss or role substitution by 2050, underscoring the need for adaptive strategies in the face of technological evolution.

The survey also delved into Banco Ideal's human resource preparedness, focusing on training effectiveness, skill development, and perceived value among employees. Responses indicated a high training participation rate, with overall positive sentiments toward the effectiveness of training initiatives, particularly in acquiring technical and essential skills. Employees largely viewed themselves as adaptable to change, possessing creativity, curiosity, emotional intelligence, and recognizing their value within the institution. These self-assessments highlighted the

perceived strengths of employees aligning with the demanded competencies in a technologically evolving landscape.

Econometric analyses, including correlation matrices and factor analyses, provided deeper insights into relationships among variables. The factor analyses extracted components that explained considerable variance within surveyed factors. For instance, in the survey's second part, factors related to technological impacts, decision-making, task simplification, and automation displayed substantial communalities and associations, providing insights into shared underlying dimensions. Similarly, in the fourth part analyzing training effectiveness and essential skills, factors like training effectiveness, tech skill development, and employee perceptions of creativity and emotional intelligence exhibited strong associations with extracted components, shedding light on the critical areas contributing to employees' preparedness for evolving job demands.

The outcomes offer valuable insights into the diverse perceptions, demographics, technological understanding, and employee preparedness within Banco Ideal, SA. These findings could inform strategic decisions, training interventions, and human resource policies aimed at aligning employee skillsets and perceptions with the evolving technological landscape and industry demands.

To answer the research question: What is the perception of employees in the banking sector regarding technological evolution in their roles?

The perception of employees in the banking sector regarding technological evolution in their roles indicates a predominantly positive outlook. Through an extensive survey conducted at Banco Ideal, SA, it's evident that most employees acknowledge the substantial impact of technology on their work environment. The findings reveal that around 81.5% of respondents agree that technological tools have contributed positively to their performance. Moreover, over 70% agree that these tools have simplified daily tasks and aided in decision-making, while around 65% recognize their role in risk prevention. However, opinions vary slightly when it comes to task repetitiveness and future task automation, showcasing nuanced perspectives within the surveyed group.

Employees express an optimistic view about the future of work, with approximately 50% agreeing that technological advancements will positively influence their roles. These sentiments align with the advantages highlighted in the theoretical foundations, emphasizing the benefits of technology in simplification, automation, decision support, and risk anticipation. Nonetheless, while there is overall positivity, some employees acknowledge concerns about potential future threats, such as job extinction or substitution by innovative technologies, indicating a need for further analysis and strategic preparation to address these apprehensions.

What regards to the validation of the hypothesis:

Hypothesis 1: The data collected from the survey strongly supports the assertion that employees perceive technological advancement as a tool that enhances their daily job performance. Approximately 81.5% of the respondents fully agreed that technological tools positively contributed to their work, supporting the hypothesis that employees view technology as an advantage or complement to their roles rather than a threat. Additionally, opinions leaned toward the belief that human intervention remains crucial, aligning with the hypothesis that employees recognize the enduring importance of human involvement in their work, even in the face of technological progress. Most respondents expressed confidence in the continued necessity of human input and expertise, particularly in tasks involving decision-making and risk prevention.

Hypothesis 2: Although the data indicates a generally positive perception toward technological advancements, there is a spectrum of opinions regarding the possibility of job replacement or the extinction of certain areas within banking due to reduced human intervention. A significant portion of respondents (33.3% fully agreed and 38.9% partially agreed) expressed belief in future task automation. However, this does not imply unanimous consent to the hypothesis that employees foresee their work becoming entirely automated or devoid of human intervention. There were varying degrees of agreement and disagreement regarding the possibility of job extinction or replacement by innovative technologies, indicating that while some employees foresee potential

changes in job roles due to technology, a substantial segment does not believe their work will entirely eliminate the need for human involvement.

6. Conclusion

The comprehensive analysis conducted on Banco Ideal, SA's employee survey provided significant insights into the employees' perceptions regarding various facets related to technological advancements, skill development, and potential challenges in the banking sector. The study revealed a diverse workforce, predominantly comprising individuals aged 38 years or older (61%) with higher education qualifications (62.9%). There is a notable representation of employees (46.4%) who have been in their current positions for less than five years, highlighting some level of turnover or movement within the organization.

The perception of technological advancement among Banco Ideal, SA's employees remains largely positive, with respondents acknowledging the substantial contribution of technology in enhancing their work performance. However, varied opinions exist on the potential future automation of tasks and the subsequent impact on job security. Additionally, the survey highlighted employees' awareness of emerging trends such as Fintech, Bigtech, and AI, with differing opinions on their potential threats to traditional banking systems and job stability by 2050.

Regarding skill development initiatives, most respondents reported receiving training, expressing moderate satisfaction with the effectiveness of these programs. There's an evident willingness among employees to embrace change, along with self-assessments of possessing essential skills such as creativity, curiosity, and emotional intelligence. However, some respondents expressed dissatisfaction with certain aspects of training effectiveness, signaling potential areas for improvement in Banco Ideal, SA's skill development programs.

The econometric analysis using PCA revealed associations among variables related to technological tools' impact, skill development, and satisfaction with training. Despite this, some sections of the survey showed moderate communalities and variance explained, suggesting potential limitations in the dataset's suitability for certain analyses.

In conclusion, while Banco Ideal, SA's workforce exhibits positive attitudes toward technological innovation and acknowledges the significance of skill development initiatives, there are nuanced concerns and perceptions regarding the future implications of evolving technologies and their impact on job stability. Addressing these concerns and further enhancing skill development programs could aid Banco Ideal, SA in navigating the changing landscape of the banking sector, ensuring employee preparedness, and fostering resilience in the face of ongoing technological transformations.

This study contributes to the understanding of bank employees' nuanced perceptions toward technological evolution. It underscores the importance of continuous skill development and adaptability in the face of technological changes. The findings suggest that while employees are generally positive about technological advancements, there are concerns about job security and the effectiveness of training programs.

Despite extensive research on technological advancements in the banking sector, there is a paucity of studies focusing on employee perceptions within the context of mid-sized banks in Portugal. This study fills this gap by providing empirical data on how employees at Banco Ideal, SA perceive technological tools and their impact on job performance. By focusing on a specific institution, this research addresses the limited empirical evidence on the nuanced perceptions of banking employees toward technological advancements.

Existing studies often address the broader impacts of Industry 4.0 on various sectors but lack a detailed examination of individual employee perceptions within a specific banking context. This research aims to bridge that gap, offering practical insights that can inform future strategies for employee training, adaptation, and the integration of technological tools in the banking sector. The findings reveal a generally positive outlook toward technology, with employees acknowledging its role in enhancing work efficiency. However, the varied opinions on future automation and job security underscore the need for further investigation into these areas.

The study encounters several limitations that warrant consideration in interpreting its findings. One prominent constraint is the relatively modest sample size of 54 respondents from Banco Ideal, SA. This sample might not fully capture the diversity and nuances of opinions within the organization, potentially limiting the comprehensive representation of employees' perceptions regarding technological advancements. Additionally, the inability to determine the response rate due to the questionnaire dissemination method via institutional email introduces uncertainty about the representativeness of the responses. The self-selection bias of participants might impact the findings, as individuals with particular interests or experiences related to the survey topics could be more inclined to participate, potentially skewing the results.

For future investigations, a multifaceted approach is recommended to expand on the current study's findings. Firstly, extending research to encompass diverse samples from various banking institutions or sectors within finance could provide a broader perspective. Conducting longitudinal studies over time would enable tracking changes in employee attitudes and experiences toward technological advancements. Additionally, supplementing quantitative data with qualitative research methods, exploring psychological aspects, and analyzing the effectiveness of training programs would enrich the understanding of employees' responses to technological changes. Integration of external stakeholder perspectives, investigation into ethical implications, and comparative studies across different industries would provide holistic insights into the impacts of technological evolution in the banking sector. Addressing these avenues for future investigation would enable researchers to fill gaps, generate valuable insights, and provide comprehensive guidance for academia and industry practitioners seeking to understand and adapt to technological advancements in finance.

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