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IMS

Information
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Master Degree Program in
Data Science and Advanced Analytics

Business Cases with Data Science

Case 4: AI Chatbot

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NOVA Information Management School

Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa

May, 2025

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1 EXECUTIVE SUMMARY

The sales landscape is changing fast, and AI is right at the center of it. Teams using AI are already seeing the results: **83% report revenue growth, compared to just 66% of teams that do not use AI** (Armstrong & Gilberd, 2019). They are seeing improvements in sales data quality, better understanding of customer needs and more personalized approaches that actually connect. In fact, AI-driven teams are also more likely to grow, with a 1.4x higher chance of increasing headcount. But while AI brings clear advantages, many teams face real barriers, from limited budgets and headcount to **not knowing how to use AI safely or effectively**, with 49% of sales professionals being unsure of how to safely use generative AI at work (Armstrong & Gilberd, 2019).

At the same time, customer service continues to play a critical role in sales success. Since **83% of consumers say good customer service is key in deciding what to buy** (Lambert, 2023), tools like chatbots are not just about faster responses, they also help build trust and long-term loyalty with accurate and personalized information about each customer case.

This is where **our solution comes in**. Using Langflow, a low-code AI chatbot builder, we developed **FideBot**, an AI-powered financial assistant designed to address these challenges head-on. Trained on 83 internal documents, FideBot provides sales teams with real-time, vendor-driven assistance that enhances data accessibility, customer engagement, and overall productivity. By delivering accurate, consistent, and personalized responses, FideBot empowers teams to make better decisions faster, while also reinforcing customer trust.

In short, modern sales teams must be smarter, faster, and more customer-focused than ever before. That requires not only new tools and better data, but also intelligent systems like FideBot that turn complexity into clarity.

From an investment perspective, the development of FideBot was both cost-effective and strategically sound. With an average monthly salary of €2,824 for a data consultant, the two-week development period represents an estimated cost of €1,412 per team member. With a four-person team, the total development investment amounts to approximately **€5,648**. On the operational side, the cost of running FideBot remains minimal: based on the usage of GPT-4o-mini and text-embedding-3-small models, and assuming a cap of 1,000 tokens per question, the estimated cost per interaction is just **€0.00077**.

Assuming FideBot is rolled out to Fidelidade's 4,000 sales employees, and each employee uses it for an average of four customer queries per client, the projected **Return on Investment (ROI)** reaches approximately **13 536%**. This reflects the potential for rapid value recovery and long-term savings, all while improving decision quality, efficiency, and customer satisfaction.

2 BUSINESS NEEDS AND REQUIRED OUTCOME

A clear understanding of the business needs and requirements is essential for data-driven solutions to align with real-world demands. As such, this chapter lays the foundation for suitable results by assessing the business's current situation, defining primary objectives, and outlining how data mining can address key business challenges throughout the completion of the project.

2.1 BUSINESS CONTEXT

2.1.1 Why Now? The Urgent Case for Financial Engagement in Portugal

Economic Pressures Underscore the Need for Financial Planning:

Portugal's economic environment is currently characterized by **ongoing inflation and concerns regarding the sustainability of its pension system**. As of December 2024, the annual inflation rate was recorded at 3.0%, with an average rate of 2.4% for the year. This inflationary context diminishes purchasing power, pushing individuals to **explore financial instruments that can help preserve and grow their wealth** (Lusa, 2025).

At the same time, research indicates that the Portuguese pension system is facing long-term sustainability challenges influenced by demographic shifts, such as an **aging population** and a **shrinking workforce**. These factors underscore the necessity for individuals to **build up their futures with personal savings and investment strategies**, rather than relying solely on state pensions (Moreira et al., 2019).

According to the *OECD Reviews of Pension Systems from 2019*, Portugal is experiencing rapid population aging. By 2050, the working-age population is expected to have one of the strongest declines within the OECD. The old-age dependency ratio in Portugal is projected to more than double by this time, which is amplified by historically low fertility rates (1.24 children per woman), standing much lower than the OECD average (1.70). Also, a substantial segment of the Portuguese population, **approximately 20%, resides abroad**, and the tendency of many to remain in their host countries long-term contributes to a reduction in the active contributors to the pension system, adding stress on retirement funding (Carrilho & Perista, 2016).

These converging factors are expected to have significant implications for future pension outcomes, impacting the financial stability of retirees in Portugal (OECD Reviews of Pension Systems, 2025).

Financial Literacy Remains a Significant Barrier in Portugal:

In Portugal, the pressing necessity for proactive financial planning is overshadowed by persistently low levels of financial literacy. A study conducted by the European Central Bank indicates that a mere **26% of Portuguese participants could accurately answer at least three out of five fundamental financial questions**, starkly contrasting with the 66% success rate observed in countries such as Germany and the Netherlands. Such differences in financial literacy greatly reduce one's capability to make informed decisions concerning basic financial operations, savings, investment, and even retirement (Nova SBE Executive Education, 2023).

Additionally, Portugal ranks the lowest in the European Union in financial literacy. The 2023 Eurobarometer report further asserts that only 16% of respondents from Portugal are classified as high-level financial knowledge holders, which positions them just above Romania. Several interrelated reasons can explain this phenomenon (Franco, 2024):

- **Educational Gaps:** The Portuguese education system, traditionally, under-taught the subject of financial education, resulting in illiteracy in basic financial concepts for many citizens.
- **Economic Challenges:** The Portuguese economy was severely damaged by the 2008 global financial crisis and the damage control measures that followed. As a result, attention shifted towards short-term gains, rather than focusing on education or long-term economic strategies.
- **Socio-Cultural Aspects:** In Portugal, there seems to be a general avoidance of conversations related to money. This tendency is detrimental to seeking proactive ways of planning one's finances, along with acquiring the necessary knowledge.
- **Complex Financial Products:** People are intimidated by the use of intricate languages and products offered within the financial sector, such as banking and stock markets, which makes them shun seeking guidance when it comes to managing finances or investments.

Recent assessments indicate that while younger generations in Portugal, particularly 15-year-olds, are demonstrating a rise in financial literacy, scoring with the OECD average, **engagement with financial products and digital financial activities still tends to be low.**

2.1.2 The Role of Fidelidade: From Local Access to Informed Action

Fidelidade, leveraging its vast network of sales locations throughout Portugal with near **4 000 agents from the north to the south**, can have the means to face these challenges. By providing its agents with essential tools and knowledge, such as an AI-enhanced chatbot that delivers accurate, real-time product information, Fidelidade can further develop the customer experience at all points of interaction. These resources allow agents to spend less time on repetitive administrative duties and focus more on providing quality and personalized assistance.

This is particularly crucial when considering the **wide range of investment and savings products** that are offered, whether they be short- or medium-term savings goals or retirement planning. The **Fidelidade MySavings** internet platform and the Retirement Savings Plan, RSP, (or **PPR, in Portuguese**) **Evoluir** are two notable options:

Table 1. Investing and Saving Options (Fidelidade Savings and PPR Evoluir)

Product	Summary	Risk Profile	Client Profile ¹
Seguro Option	A secure, capital-protected savings option, perfect for those who are risk-averse and seek long-term financial stability without exposure to market fluctuations. It has a rate review every six months and is only available in 'Objetivos de Poupança'.	With a risk profile that matches Risk Level 1, this option has low exposure to market volatility. With a semi-annual interest rate review, it offers a consistent and predictable return while prioritising total capital preservation with no investment risk. Because of this, it is among the safest choices, with security assured irrespective of market conditions.	For clients seeking a maximum security, a 100% capital guarantee is ideal. These individuals are considered prudent, conscious, and risk-averse . This choice prioritizes capital protection over potential returns. Risk 1
Proteção Ações Option	A hybrid solution with regulated equity exposure, attractive to customers who are open to moderate growth potential while still wanting some level of capital protection. It has a 90% capital guarantee at the maturity of the investment goal. The maturity date for such option is fixed to five years and one day and is available in both 'Objetivos de Poupança' and 'Objetivos de Investimento'. This	The Proteção Ações Option is perfect for anyone looking for a careful balance between opportunity and security because it offers moderate development potential while keeping the majority of the invested capital. It is classified as having low to	For those with a balanced profile , looking for a 90% level of guarantee at the maturity of their goal, this option offers a suitable solution by combining equity market exposure with capital protection

¹ The client's financial objectives and risk tolerance play a major role in selecting the best investment option, which is why Fidelidade provides a variety of options. An outline of the suggested choices is provided below, considering each client's risk tolerance and desired level of assurance (1 to 7).

	option is influenced by the performance of the 'Fidelidade MultiAssets Index'.	moderate risk and little market exposure under Risk Level 2.	mechanisms, aiming to provide potential growth while managing downside risk. Risk 2
ESG Ações Option	This product directs funds into companies that adhere to environmental, social, and governance (ESG) criteria, ideal for younger generations and those who prioritize sustainability, and is also available in both 'Objetivos de Poupança' and 'Objetivos de Investimento'. The asset allocation is diversified across the main stock and bond markets located in Europe and the US, and other money market instruments. The 'Fidelidade Multi-Assets ESG Index' influences this option, allocating 52% allocated to America and European stocks and the remaining 48% to the public debt of France and Germany.	These two products are considered risk based. They are Unit-Linked (UL), meaning they are linked to unit accounts. The maturity date for such products is fixed to eight years and one day. These life insurance policies have a value that depends directly on the performance of investment funds, such as stocks and bonds. For fiscal efficiency, it is recommended that the holding period of these four products is at least eight years and one day, since these investments are considered medium to long term and the capital gains tax drops abruptly after such period. The management fee for risk-exposed options is 1.2% per year.	On the other hand, clients with a dynamic profile , those willing to accept moderate risk, aiming for growth, or an adventurous profile, who are open to higher risk for potentially higher returns. Risk 3
Dinâmico Ações Option	A high-risk, high-reward investment aimed at seasoned investors pursuing long-term capital growth through engagement with more volatile equity markets. The return on the investment is correlated with the 'Fidelidade MultiAssets Index' performance and is only available in 'Objetivos de Investimento'. This index includes the S&P 500, NASDAQ 100, gold, and other assets, primarily composed of American, European, and some Asian stocks (65%). It also includes U.S. and German government debt (25%), with the remaining 10% allocated to U.S. gold.		
PPR Evoluir – Proteção + Ativo	An adaptable retirement savings scheme that merges investment growth opportunities with tax benefits, presenting a smart choice for customers preparing for a future where state pensions might not suffice. Offered by Fidelidade, is a hybrid retirement savings product that follows a life-cycle investment model. It is designed to automatically adapt the investment profile of the subscriber based on their age, which indicates that the product gradually lowers exposure to risky assets and raises capital protection over time. A protective component and a dynamic component make up the two primary parts of the RSP Evoluir's structure.	The protection component provides a guaranteed return and ensures that part of the capital is safe. For example, in the first semester of 2025, this component offered a return of 2.20%. The allocation to this component increases with the policyholder's age — if the client is X years old, X% of their investment will be allocated here. This proportion increases until it reaches a maximum of 60% at age 60. This mechanism ensures that the older the policyholder is (usually the less risk taker he/she is), the more capital is protected.	(Proteção) Ideal for conservative investors who prioritize security and stability. Risk 1 (Ativo) For clients with a more moderate risk appetite . Risk 3 (Proteção + Ativo) Individuals seeking a flexible and tax-advantaged retirement savings solution that offers a balanced combination of growth and protection , while providing a private, structured path toward retirement with a built-in mechanism to reduce risk over time.

In a market landscape where individuals frequently distrust complicated financial products and gravitate towards safer, more familiar alternatives, such as placing money in low-interest savings accounts or even 'under the mattress', Fidelidade can possess the reach, trustworthiness, and infrastructure to effect significant change, promoting financial awareness and providing accessible resources, assisting individuals in taking charge of their financial futures in the face of economic uncertainties.

2.1.3 The Impact of Knowledgeable Sales Reps

In this context, the significance of well-informed sales personnel becomes paramount. The following aspects illustrate their impact:

- **Sales reps' productivity:** Reps spend 70% of their time on non-selling tasks. The tasks that take the most time to complete are meeting customer budget needs, personalizing communication, and building a strong personal relationship.
- **Building Trust:** A study from the Lappeenranta-Lahti University of Technology emphasized that salesperson behaviour, including ethical conduct and listening ability, significantly impacts customer purchase decisions (Thi et al., 2021). Customers are more likely to engage with financial products when they trust the advisor, so a salesperson's ability to explain products clearly and answer questions confidently can significantly promote this trust.
- **Personalized Guidance:** Knowledgeable reps can give advice that fits each customer's objectives, helping them see the pros and cons of financial products (Armstrong & Gilberd, 2019). According to Salesforce, **86% of buyers are more likely to purchase if the reps show an understanding of their objectives**, and 59% of them contend that most fail to invest time in understanding their goals. Also, companies making \$1 billion a year can earn about \$700 million more within three years by investing in customer experience, showing the value of personal service (Stattin, 2025).

2.2 BUSINESS OBJECTIVES

2.2.1 Why an AI-Powered Chatbot? A Partner in Financial Guidance

Given Portugal's growing need for proactive financial planning and the ongoing problem of low financial literacy, there is a clear and urgent need for accessible and reliable financial support. As mentioned, many customers feel lost when faced with complex products, while sales agents are often too busy to give the personal help each client may need. **To respond to these challenges, our goal is to introduce AI-powered chatbots designed to assist sales teams**, helping them respond faster, explain products more clearly, and feel more confident in their day-to-day work. These tools can:

- **Provide Reliable Information Instantly:** Sales reps can quickly access up-to-date product details and answers to common questions, particularly in navigating **PPR Evoluir** and **Fidelidade Savings**.
- **Support Sales Staff:** Chatbots handle simple or repetitive tasks, allowing agents to focus on customer relationships.
- **Promote Financial Literacy:** By giving clear and simple explanations, chatbots help agents better understand financial products and explain them more easily to clients, giving more confidence to both customers and sales teams.

2.3 BUSINESS SUCCESS CRITERIA

To understand how well the chatbot is performing, we need to look at how it helps and interacts with users. These success criteria were defined together with our client during our meeting. First, the chatbot should give correct and clear information about the products 'My Savings' and 'PPR Evoluir'. It should speak in a way that is polite, easy to understand, and helpful both in Portuguese and English. It also needs to explain product features and make comparisons when needed. It must be honest about what it knows, and if it does not have an answer, it should say so/ask for more information instead of making something up. It should follow the flow of the conversation and understand when users ask follow-up questions (memory). Based on that, it should give suggestions or point users in the right direction according to their profile. It is also expected to answer common questions, including practical ones like how withdrawals work, or help with quick simulations.

Even though it might be hard to measure the chatbot's exact impact, over time, we should see clear feedback from users about how helpful it is. Ideally, it should help bring in new clients and keep current ones happy. On a daily level, it should also support the sales team, especially with explaining financial topics to clients. Finally, we needed a solution that is easy to manage, and at this stage, we are focused on getting the chatbot working inside an internal interface so we can begin testing.

2.4 SITUATION ASSESSMENT

To build and test the chatbot, our team of four business analysts used several internal resources, such as product documents and FAQs supplied by *Fidelidade*. These materials can be repetitive, inconsistent, and spread out, which makes it difficult to provide the model with accurate and up-to-date information. However, the assumption was made that the provided information is reliable, and adjustments were only made in cases where the information was outdated.

In terms of tools, we used **Langflow**, a low-code AI chatbot builder, to create a flow that can set everything up. For storing and processing the data, we relied on **Datastax Astra**, a database that supports vector search, along with **Azure OpenAI's text-embedding-3-small** model. The chatbot itself was powered by **GPT-4o-mini through Azure OpenAI's API**. We also added **Langwatch**, an **LLMOPs** platform integrated with **Langflow** to monitor performance, and used a **Docker container** to run the flow locally, while Astra DS stayed online and connected through our own API key.

Additionally, **Streamlit** was used to create a **minimum viable product (MVP)**, allowing us to test the internal platform with the sales team. **GitHub** was employed to manage the Python-based codebase that integrates both **Streamlit** and **Langflow**, while **Supabase** managed email-based access control to ensure internal use only, given that the model was trained on proprietary internal information and our team's benchmark research papers. This last tool is also used as storage for the Streamlit app.

All infrastructure components, **except for the Azure model APIs**, are open-source. This choice enabled us to create **proof of concept** while maintaining low costs, effectively balancing **token consumption during testing with minimal infrastructure cost**.

2.5 DETERMINE DATA MINING GOALS

Since this is a real-time response tool, we aim for the chatbot to respond within **10 seconds**, which is about the limit for keeping the user's attention focused on the dialogue and an acceptable response time during client-facing conversations. Of course, this target may vary depending on how complex the user's question is, but we should aim to keep most answers within this timeframe. ([Nielsen, 1993](#)) Another key goal is ensuring the chatbot gives **accurate and reliable information** at all times. This is especially important given the financial nature of the content. Mistakes in this context could lead to serious misunderstandings with clients. We will use a large language model (LLM) via LangWatch to compare the chatbot's output with the expected answer and assess alignment.

We also want to tune the **temperature setting** of the model. This controls how specific or creative the answers are. A lower temperature helps the chatbot stay focused and give more direct, accurate responses, while a slightly higher one might allow for more flexibility. We need to find a balance that works for our use case, **precise but still conversational**.

Lastly, we are keeping an eye on the **number of tokens** used per answer. This helps us control the **costs of API calls** while making sure responses are not cut off or left incomplete. The goal is to find the right settings that provide full, helpful answers without unnecessary details or excessive length.

3 METHODOLOGY

3.1 DATA UNDERSTANDING

The data understanding of the present project consisted of reviewing the documentation provided by Fidelidade, analysing its contents, and gathering complementary external data for all topics on which we lacked information.

Table 2. Data made available by Fidelidade

File Name	Content Type	Content Summary	Observations
<i>Observatório de Mercado (Produtos - Rede) - Outubro 2024</i>	⚠ Set of slides mainly composed of comparison grids, containing various logo images (hard to extract information).	Comparison of 'Produtos com Capital Garantido' offered by Fidelidade versus their competition.	Additional to the data about the 'Produtos com Capital Garantido', the first file also contains information about 'Produtos com Risco (UL)' which overlaps with the second file - the 4 last slides of this deck seem to be outdated information about the products, specifically about the column 'Rentabilidade de 2024', there is a mention of the dates of 2024 that were considered when computing the values. As such, we will discard the last 4 slides and use the information considered updated from <i>Observatório de Mercado (UL - Rede) - Dezembro 2024.pdf</i> .
<i>Observatório de Mercado (UL - Rede) - Dezembro 2024</i>	⚠ Set of slides composed by product description grids and infographics.	Comparison of 'Produtos Unit-Linked', also known as 'Produtos com Risco' offered by Fidelidade versus their competition.	-
<i>2025_Pitch Fidelidade Savings</i>	⚠ Set of slides composed by product description grids and infographics.	Characteristics of the app 'MySavings' and the 4 products in the portfolio Fidelidade Savings; It also contains example investment diversification, and the respective earnings from the investment choice.	-
<i>22984_P3_Fidelidade_Savings_Faqs_set24</i>	Text, in question-answer format (good format to extract information).	Frequently asked questions and the respective answer for the topics of – About Fidelidade Savings; Before subscribing; How to use the MySavings App; About the options; About movement of funds; About fees and commissions.	The first page of the document is a table of contents with the sections' titles.
<i>22984_P18_Fidelidade_Savings_Manual do produto_para corrigir</i>	Text, graphs, informative tables, infographics (medium difficulty in extracting information).	This document is a product manual, containing extensive information about Fidelidade Savings. It contains 12 chapters ranging from What is Fidelidade Savings? to Definitions and Subscription details	The first page of the document is a table of contents with the sections' titles. Part of the title of the file '_para corrigir' suggests that some information might not be accurate, such as 'As entregas são debitadas na conta informada pelo cliente na app MySavings.', on page 6.
<i>CG-Fidelidade Savings_ESG-1</i>	Mostly text, with few information tables.	Contains information about general and special conditions of Fidelidade Savings.	The second page of the document is a table of contents with the sections' titles.
<i>IPC+DIF Seguro-Fidelidade Savings_jan2025</i>	Mostly text, with few information tables and images.	Contains pre-contractual information directed to the client (IPC) and the Key Information Document (DIF) about the Seguro option.	The first 12 pages of all files type 'IPC+DIF...' are identical, suggesting the IPC section of the documents does not change depending on the product chosen by the client.
<i>IPC+DIF_Fid_Savings_Dinâmico (ICAE Ações)-Fidelidade Savings_jan2025</i>		Contains pre-contractual information directed to the client (IPC) and the Key Information Document (DIF) about the Dinâmico Ações option.	

<i>IPC+DIF_Fid_Savings_ESG (ICAE Ações)-Fidelidade Savings_jan2025</i>		Contains pre-contractual information directed to the client (IPC) and the Key Information Document (DIF) about the ESG Ações option.	
<i>IPC+DIF_Fid_Savings_Proteção-Fidelidade Savings_jan2025</i>		Contains pre-contractual information directed to the client (IPC) and the Key Information Document (DIF) about the Proteção Ações option.	
<i>Observatório de Mercado (PPR - Rede) - Dezembro 2024</i>	⚠ Set of slides mainly composed of comparison grids, containing various logo images and info graphics.	Description of the market of PPR Ativo, offered by Fidelidade, including comparison with competitors and the strongest performers.	-
<i>2025_Pitch_PPR_Evoluir_REDE</i>	⚠ Set of slides mainly composed of infographics, charts, tables and images.	Description of the PPR with the Ativo option, including its conditions, main goals, target segment and the benefits for the investor.	-
<i>22984_P4_Fidelidade_MySavings_PPR_Evoluir_Faqs_PX_out24</i>	Mostly text, with few information tables.	Contains frequently asked questions and the respective answer for various topics, including: PPR's and PPR Evoluir: What is it? How? Why? For who?; Investment Components; Advantages / Disadvantages; between others. This document only mentions the Ativo option.	The first page of the document is a table of contents with the sections' titles.
<i>PPR Evoluir - Argumentário_jan 2025</i>	Mostly text in table format, meaning, not continuous text with unusual structure.	Includes a description of the product (PPR Evoluir with the Ativo Option), its competitive advantages, and answers to the main client objections.	-
<i>PPR Evoluir - Ficha de Produto_dez2024</i>	Mostly text, with few information tables.	Detailed product information (PPR Evoluir with the Ativo Option)	-
<i>PPR Evoluir - Manual Operativo</i>	⚠ Mostly images with general descriptions.	Steps to adhere to the PPR Evoluir on the commercial platform.	-
<i>CG-PPR Evoluir (Rede)JAN2025</i>	Mostly text, with few information tables.	Contains information about general and special conditions of PPR Evoluir.	-
<i>IPC_PPR Evoluir ParticularesJAN2025</i>	Mostly text, with few information tables.	Contains pre-contractual information directed to the client (IPC) about the PPR Evoluir product.	-
<i>Questions_Answers_Censored</i>	Text, in question-answer format.	Contains frequently asked questions and the respective answers about Fidelidade Savings and PPR Evoluir products.	Some questions are censored, while the title of the subsection is not – this may cause confusion during information extraction.

Table 3. Complementary data gathered from External sources

File Name	Content Type	Content Summary
<i>External Data – Financial Literacy</i>	Mostly continuous text.	This file is a compilation of financial information, that gathers various basic concepts: Questions and answers about basic investment principles; Questions and answers about digital investment methods aimed at investors; Tips for investing; Investment methods; Saving and investing; Investor profile; Product risks; Term deposits; Savings plans; Stocks; Investment funds; Complex financial products; Glossary.

After analysing our internal data, as presented in **Table 3**, we decided to incorporate external information regarding Fidelidade's competitors, specifically, products that directly compete with PPR Evoluir and MySavings.

Table 4 outlines the main features that differentiate PPR Evoluir from its closest competitors in the Portuguese PPR market, focusing on risk profile and investment approach.

Table 4. Analysis of the products that directly compete with PPR Evoluir

Direct competitors of PPR Evoluir	Risk Profile	Investment Strategy	Key Differentiators
PPR BIG Ações Alpha	High	Actively managed; strong focus on equities and alternatives	Seeks higher long-term returns through diversified, active strategy.
PPR BIG Ações Equilibrado	Moderate	Balanced exposure to equities and bonds	Aims for balanced growth with moderate risk tolerance.
PPR BIG Conservador	Low	Heavier allocation to bonds and low-risk instruments	Capital preservation focus; lower volatility.
Futuro PPR Premium Moderado	Moderate	Professionally managed, diversified between equities and bonds	Designed for medium-risk investors looking for stability and some growth.
PPR SGF Poupança Equilibrada	Moderate	Balanced allocation across asset classes	Focuses on stability with moderate long-term growth.
BBVA Estratégia Acumulação PPR	Moderate	Capital accumulation through diversified portfolio	Aims to build capital over time with a controlled risk approach.
Santander Seguro PPR+ Equilibrado	Moderate	Up to 35% in equities, remainder in bonds and others	Balanced approach offering growth potential and controlled risk.
BPI Destino PPR 2050	Moderate	Life-cycle strategy that gradually reduces risk until 2050	Target-date model: automatically becomes more conservative toward retirement year.
Tranquilidade PPR	Low	Conservative investment focus, mainly bonds	Suited for risk-averse investors (risk classification: 3 out of 7).
Zurich Unit-Linked PPR	Moderate	Unit-linked structure with actively managed funds	Offers flexibility and market exposure tailored to risk appetite.

Table 5 highlights the key features and risk profiles of products that directly compete with My Savings in the Portuguese market.

Table 5. Analysis of the products that directly compete with My Savings

Direct competitors of My Savings	Risk Profile	Investment Strategy	Key Differentiators
Banco Best Aforro 4	Low	Guaranteed returns with low risk	Fixed interest rate savings with capital protection.
Novo Banco Poupança Garantida	Low	Capital guaranteed, conservative approach	Emphasizes security and capital guarantee with fixed income investments.
Novo Banco Opção Prudente II	Low	Balanced conservative portfolio	Lower risk strategy focusing on capital preservation and modest growth.
Novo Banco Opção Moderado II	Moderate	Balanced portfolio with some equity exposure	Moderate risk targeting a balance between growth and safety.
Novo Banco Opção Dinâmico II	High	Higher equity exposure for growth	Suitable for investors willing to accept more volatility for higher returns.
Millennium Opção Mais Moderada	Low	Conservative to balanced allocation	Emphasis on capital preservation with limited equity exposure.
Millennium Opção Moderada	Moderate	Balanced equity and fixed income portfolio	Mix designed to balance risk and return.
Millennium Opção Equilibrada Ações	Moderate	Balanced with increased equity focus	Greater equity allocation aiming for growth with manageable risk.
Millennium Opção Dinâmica Ações	High	Aggressive equity-focused portfolio	Higher risk profile targeting long-term capital appreciation.
Santander Opção Equilibrado	Moderate	Balanced between equities and fixed income	Designed for medium risk investors seeking growth with some security.
Santander Opção Ações Crescimento	High	Growth-oriented equity portfolio	Focused on capital growth with higher volatility.
Santander Opção Future Wealth	High	Diversified portfolio with active management	Targets long-term wealth accumulation with moderate to high risk.
Real Vida Capital Protegido	Low	Capital protected with fixed income focus	Guarantees capital while seeking steady returns.
Lusitania Vida Taxa Garantida 1.ª Série	Low	Guaranteed interest rate, capital protection	Fixed return product with no market risk exposure.

The percentage ranges for risk profiles: **Low** (up to 5% loss), **Moderate** (5 to 15%), and **High** (above 15%), are based on historical volatility and potential drawdowns over a 1- to 3-year period. These numbers show how much an investment could lose value in a down market. Metrics like standard deviation and maximum drawdown, which quantify how much a portfolio's value can change or decline, are used to calculate them. Products with lower risk, such as capital-protected funds or bond-focused funds, typically show low losses, while actively managed or equity-heavy strategies show more volatility, which supports a higher risk classification.

3.2 DATA PREPARATION

According to the observations made in the data understanding, we used an online pdf editor to fix the files with issues.

3.2.1 Langflow Flow

[Langflow](#) is an open-source, low-code platform built in Python that allows the creation of AI applications, particularly those based on [Retrieval-Augmented Generation \(RAG\)](#) and multi-agent systems. One of its key advantages is that it is **agnostic to any specific model API or database**, offering flexibility to integrate different tools within the same workflow.

3.2.2 DataStax Astra Vector Database

To manage the ingestion of approximately **80 documents**, a vector database was used instead of implementing a custom ingestion flow within *Langflow*. This choice aimed to simplify the handling of text data and enable semantic search, where information is retrieved based on meaning rather than exact words. A vector-enabled database was created in **DataStax Astra**, named **db_fidelidade**, with a collection called **fidebot_data_collection**. This setup allows for storing and retrieving high-dimensional embeddings, that is, numerical representations of text that preserve its semantic properties. These embeddings are used as the foundation for an [RAG architecture](#), where the system retrieves relevant chunks of text based on a user query and then feeds them into a language model to generate a context-aware answer.

- **Embedding Model and Dimensions:** The collection is connected to Azure OpenAI's **text-embedding-3-small** model, which generated a 1536-dimensional vector for each text input, where each value reflects a semantic feature of the text. These embeddings make it possible to compare pieces of text based on meaning, not just surface-level similarity (beyond exact keyword matches).
- **Chunking Strategy:** Before converting the documents into vectors, each document was split into smaller parts (chunks) with a size of 1000 characters and an overlap of 200 characters. This overlapping strategy helps **retain context between chunks**, which improves the accuracy of search results. Without overlap, important connections between sentences at chunk boundaries could be lost, reducing the system's performance in retrieving relevant information. This approach is commonly used in natural language processing to maintain coherence across text segments.
- **Similarity Metric ([Cosine vs. Dot Product](#)):** **Cosine similarity** was chosen as the method for comparing vectors, instead of the *dot product*. Cosine similarity focuses on the angle between vectors, which means it compares their direction without being influenced by their length. This is more suitable for comparing text embeddings, where the goal is to match the meaning of content. The dot product, on the other hand, is affected by vector magnitude, which can lead to biased results. For example, longer or more repetitive text might appear more relevant even when it is not. Cosine similarity avoids this issue by normalizing the vectors.

After processing, the system generated an estimated total of **approximately 3,576 vectorized records**², with each one representing a chunk of text from the original documents. Each vector is made up of 1536 floating-point values, such as [0.0178, 0.0427, 0.0085, ...], which capture the semantic properties of the text. These vectors are stored in the **fidebot_data_collection** and are used for **semantic retrieval** as part of the RAG process during question answering and search tasks.

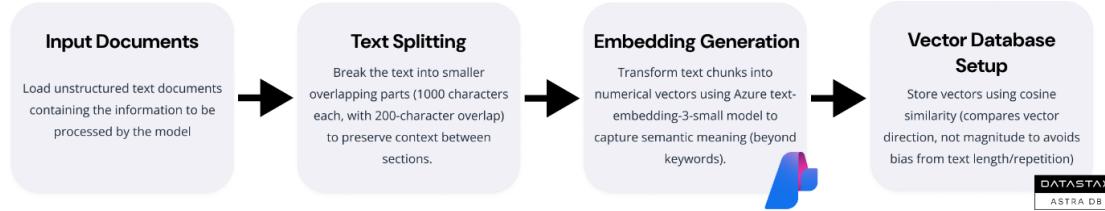


Figure 1. Text-to-Vector RAG Preparation Flow

3.3 MODELLING

The core of our solution relies on a **Large Language Model (LLM)** configured to behave as a smart assistant called **FideBot**, designed to support Fidelidade sellers in recommending the best savings or investment products to their clients, help with general questions about the products or financial literacy, rentability simulations or even competitors information to stay ahead of the competition and help to attract customers with selling points.

Our Flow starts when a **user sends an input** (a question), the then system follows a conditional logic structure that routes the message based on its content. If the input matches a keyword or command such as '*Quero Similar*', the message follows the **true path of an if/else block**. In this branch, the model does not perform internal reasoning but instead directly returns a pre-formatted output:



Figure 2. Output for ‘Quero Similar’ shortcut.

This shortcut provides users with quick access to Fidelidade's official simulation tool (Taking advantage of the current infrastructure). While our LLM is equipped to perform mathematical simulations of Future Earnings (as described in the prompt instructions), we chose to include this quick-access option because LLMs often show limitations in performing precise financial calculations. For improved accuracy and performance, we also experimented with a second LLM pipeline that integrates a calculator module. However, due to its higher computational demands and the need for further testing, this second model will be discussed in more detail during the deployment phase.

3.3.1 RAG and Prompt Engineering

If the user's message does **not** match the simulation command, it proceeds to the **false route**. In this branch, the user's input is first processed using a vector database that supports [RAG](#). The user query is embedded and compared against a collection of embedded documents using **cosine similarity**. The **top 10** results are retrieved and passed through a custom parser to extract only the relevant content, which is then injected into the model's **Prompt** via the `{info}` parameter.

² Although the DataStax Astra interface only counts the exact number of created documents until they reach the 1000 mark, the internal upload statistics estimate that over 3000 entries were successfully created.

The **Prompt** is structured to simulate a consultation flow between a knowledgeable assistant (**FideBot**) and a Fidelidade seller, guiding it through the process of product recommendation. The model also receives an additional parameter called **{memory}**, which represents the conversation history. This memory is managed through a **Message History** component that stores previous interactions, allowing the model to maintain coherence and continuity across multiple users turns.

Prompt engineering plays a central role in the design of this solution. In our case, the prompt does much more than just ask a question or make a request, it **assigns a role to the model** (acting as **FideBot**), **defines the context** (explaining Fidelidade products and user goals), and includes **commands and rules** to guide the behaviour, ensuring that **FideBot** can reason step by step, detect missing data, and respond in an empathetic, clear, and domain-specific tone.

To encourage structured reasoning, we adopted **Chain-of-Thought (CoT) prompting** principles. These instruct the model to walk through intermediate steps when reasoning about product suitability or financial simulations. For instance, before recommending a product, the model checks whether all required client details are available, such as risk level, investment horizon, and goal, and requests clarification if any are missing.

Lastly, the prompt was refined through **few-shot prompting**, in which example inputs and corresponding ideal outputs were embedded to help interpret user intent, respond appropriately to edge cases, and apply the right financial reasoning logic. Also, for a **consistent** and **trustworthy** performance, we embedded **behavioural guidelines**—*never fabricate information under any circumstance, never assume missing client data, always ask for clarification, and speak as a calm, empathetic advisor working at Fidelidade*. The model is also explicitly instructed to avoid super technical terms, opting instead for **metaphors and simple analogies**, under the assumption that clients **may lack financial literacy but are intelligent and rightfully sceptical**, and must always respond in the same language as the user’s input—either **Portuguese or English**.

3.3.2 Model Temperature

To reduce the likelihood of **hallucinations**, we explicitly instruct the model to always ground its responses in the **{info}**, but we also configured the LLM to operate at a **low temperature setting (0.08)** to increase the determinism and reliability of responses, both critical in domains such as finance.

3.3.3 Final Flow

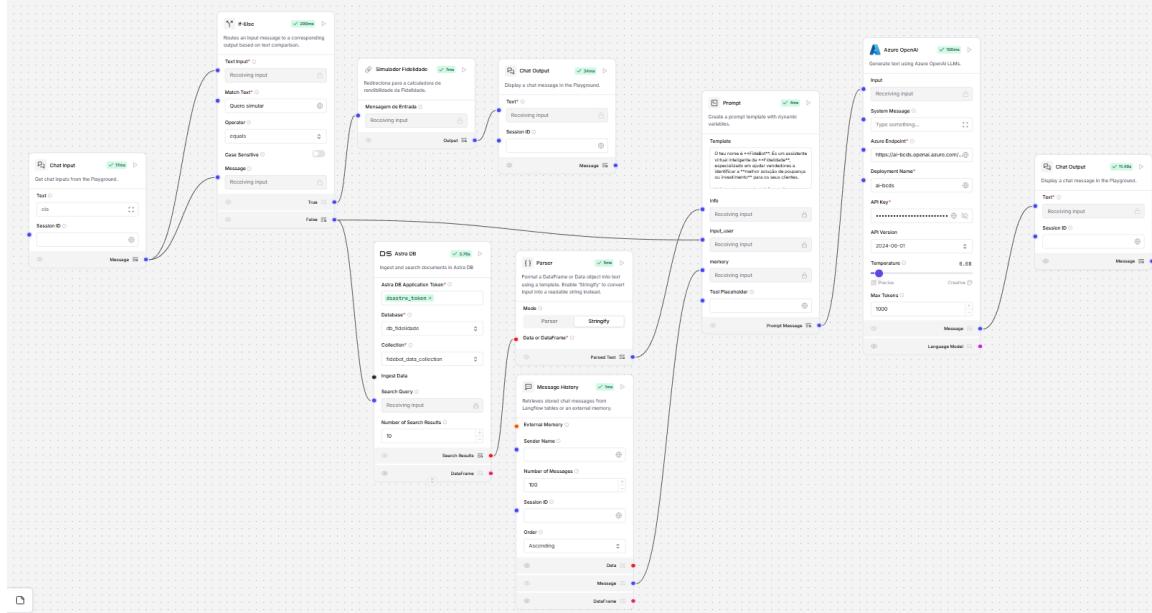


Figure 3. FideBot Flow (Langflow interface)

3.4 EVALUATION

For evaluation purposes, we used **LangWatch**, a platform designed to monitor, test, and analyze the performance of language model outputs. LangWatch allowed us to systematically validate FideBot's responses, identify areas for improvement, and ensure the chatbot meets the expected standards for reliability and relevance.

FideBot achieved a **BLEU score** of 0.13 and a **ROUGE score** of 0.54, indicating moderate alignment with reference answers. It passed the **LLM Answer Match** test with a 100% success rate (0.0 average deviation), along with 100% pass rates in **Moderation**, **PII Detection** and **Valid Format** checks, all with perfect 0.0 average scores. In human-centered evaluation, it scored 4.33 in **Rubrics-Based Scoring**, reflecting high-quality outputs across criteria. Additionally, the system proved cost-efficient, with a **mean cost** of \$0.003 per response.

To support FideBot's backend and ensure fast, secure, and scalable access to knowledge, we integrated **Astra DB**, which registered **575.7k reads**, **115.9k writes** and **97.44 MB** of storage usage, with **330.17 MB** of data transfer. These figures confirm the database's efficiency in handling high interaction volumes while maintaining performance integrity.

4 RESULTS EVALUATION

To better assess the performance of the FideBot, four common use cases were tested and reported. For the given scenarios, the conversation with FideBot is summarized below, including the initial and follow-up questions the salesperson might have:

1st Use case - First-time saver (Low risk scenario)

Question: Maria is an 18-year-old student, first time saver and risk averse. Which Fidelidade products can I suggest to Maria?

Short answer: Suggested the **Opção Seguro** from Fidelidade Savings, justifying its reasoning through product characteristics and relating them to Maria's preferences. Additionally, the chatbot explained why Maria should not choose other options, which further solidified its first suggestion, and

recommended next steps (“*Explain the benefits to Maria*” and “*Set up a savings plan*”) and a tool to simulate returns (“*Use the Fidelidade Savings calculator to show Maria how her savings could grow over time*”).

Follow-up question: *Maria enjoyed the Opção Seguro, however I am not sure how this option guarantees 100% Capital. Could you enlighten me?*

Short answer: First explained how the guarantee works by topics (“*Capital Protection Mechanism*”, “*Revaluation with Fixed Interest Rates*”, “*No Exposure to Market Volatility*”, “*Regulatory and Mathematical Safeguards*”), always adapting the explanation to the context – answering Maria’s doubts. Also keeping the context in mind, the chatbot added a clarification of why these matters to Maria and a metaphor to transmit the idea to less financially informed clients.

2nd Use case - **Aggressive growth (High risk)**

Question: *Pedro is 26, wants high returns, and does not mind risk. What does Fidelidade offer that might fit Pedro’s profile?*

Short answer: Suggested two options – **Opção Dinâmico Ações** and **Opção ESG Ações**. For each, the chatbot explained what they are, their risk level, key features and a metaphor to sum up the investor’s experience with the products. Moreover, he explained why these options align with Pedro’s profile and recommended next steps (“*Confirm Horizon*” and “*Simulate Returns*”).

3rd Use case - **Responsible planner (Medium risk)**

Question: *Carolina is 38, worrying about retirement, and kids’ education without having to micromanage. What are the best products in Fidelidade’s portfolio to recommend to Carolina?*

Short answer: Started by summing up key client details, followed by two suggestions – **PPR Evoluir** and **Opção Proteção Ações**. For each, the chatbot adapted Carolina’s information and explained why she should invest in the product, its advantages and risk level. He further summarized why the client should chose the products suggested, followed by next steps (“*Confirm Carolina’s Risk Tolerance*”, “*Define Horizons*” and “*Simulate*”).

Follow-up question: *Carolina saw the Opção Dinâmico Ações before. How should I explain this is not a good option for her profile?*

Short answer: The chatbot suggested key points to focus while explaining to the client why this option is not the best for her profile (“*focus on her goals and risk tolerance*”). He added more detailed reasons for that (“*No Capital Guarantee*”, “*Higher Risk (Level 3)*” and “*Micromanagement-free Goals*”), making a well-structured bridge between Carolina’s and the product’s information, and reinforced the best choices for the given client’s profile. Lastly, he recommended two approaches for framing the conversation – *Empathy* and *Reassurance* – with examples on how to conduct the conversation.

4th Use case - **Conflicted investor (Mixed risk)**

Question: *António is 55, wants strong returns but is uncomfortable with the idea of losing money. I was thinking of mixing some of Fidelidade’s products, creating the client is own custom portfolio, what do you think?*

Short answer: According to the António’s description, the chatbot predicted his risk tolerance, and suggested a tailored portfolio, constituted by - **Opção Proteção Ações** (~60%), **Opção Seguro** (~30%) and **Opção ESG Ações** (~10%). The chatbot also explains why the individual products align with the

client's goals and why the overall mix works ("Balanced Risk", "Growth Potential" and "Customization"). In conclusion, he advised next steps ("Confirm António's Investment Horizon", "Discuss Liquidity Needs" and "Simulate Returns").

All in all, FideBot is displaying well-structured answers, using easy to understand concepts. Some highlights taken from the interactions are that the chatbot often uses metaphors to explain products and guides the sales force through next steps. For the mentioned use cases, all interactions happened in English, as FideBot has the capacity to adapt to the language that the question was posed in.

5 DEPLOYMENT AND MAINTENANCE PLANS

'If You Fail to Plan, You Are Planning to Fail' - Benjamin Franklin.

This is especially true in IT and data-driven projects, where poor planning and communication breakdowns can significantly hinder success. The Bull Survey (Spikes Cavell, 1998) found that 57% of IT project failures stem from communication failures, followed by **39% due to inadequate planning** and **35% due to poor quality control**. Recognizing these challenges, we have established a structured deployment plan to ensure clarity, alignment, and continuous improvement. By integrating a phased approach—covering research, validation, and long-term model updates—we aim to mitigate risks, enhance segmentation accuracy, and drive meaningful business impact.

5.1 IMPLEMENTATION/ INTEGRATION IN THE COMPANY SYSTEM

Although we already have a Minimum Viable Product (MVP) in place, it serves only as a glimpse of what FideBot can ultimately achieve. Our next milestone will unfold in two main phases, each designed to expand functionality, improve user experience, and prepare for internal deployment at Fidelidade: The first phase focuses on finalizing the chatbot's ability to segment user interactions correctly by section and user. While the demo version has only been tested with a single user at the time, the database already associates each chat with a unique email, enabling multi-user support. Once this segmentation is confirmed, we will begin A/B testing:

- This testing will involve splitting users into separate groups, each interacting with a different version of the chatbot. The **Mathematical Multiagent FideBot** with an integrated calculator, and the **current version** that features the shortcut 'Quero Simular'. Our goal is to evaluate which version provides a better experience for our sales teams. To assess this, we'll use the built-in **thumbs-up/down** feature to gather direct feedback on user sentiment from the replies.
- Additionally, with **Langwatch**, we will track key performance indicators such as message volume around simulations (to assess **demand**) and **average response time per model version**. This will help us determine whether the additional computational load of the calculator is justified.

The second phase will focus on refining the chatbot's interface and user experience based on the suggestions we receive through the **suggestions** tab in the MVP. This stage is critical for tuning both design and functionality before the bot is fully integrated into Fidelidade's internal servers. **Security compliance** and **custom integration** will be key priorities during this stage. For access control, we will use **Supabase** to manage authentication and permissions. However, for the final implementation, all app data should be stored on a scalable big data platform like **MongoDB**, which is better suited to handle high-volume streaming data. A **row-level security (RLS)** key system will be implemented to ensure that only users from Fidelidade have access to the app.

5.2 COST BREAKDOWN AND ROI

An IBM study claims that chatbots can answer up to 80% of standard questions, significantly improving operational efficiency and reducing the burden on internal support teams. Juniper Research estimates that each chatbot query saves approximately 4 minutes of employee time, helping streamline routine tasks and increase productivity (Vohra, D. K., 2025).

Along with these efficiency gains, businesses benefit from the ability to **operate with leaner support structures** as internal demand for assistance grows. When generative AI and real-time data retrieval are combined, Retrieval-Augmented Generation (RAG) chatbots produce accurate, up-to-date, and context-aware responses. By integrating AI-powered RAG chatbots into internal workflows, organizations can reduce time spent on repetitive queries and enhance overall employee effectiveness.

A comparison of these costs is presented in **Table 6**, highlighting the **financial advantage of using Langflow**. While **basic chatbot** solutions for small businesses may range from free to \$150 per month, **mid-market options** typically cost between \$800 and \$1,200 monthly. **Enterprise-grade chatbots** designed for complex use cases can exceed \$3,000 and even reach over \$10,000 per month (Lindy.ai, 2024).

Table 6. Price comparison of the different chatbots

Chatbot Type	Estimated Monthly Cost	LangWatch Cloud Plan	LangWatch Monthly Cost
Basic Chatbots	Free – \$150	Developer	Free
Mid-Market Chatbots	\$800 – \$1,200	Launch	€59
Enterprise Chatbots	\$3,000 – \$10,000+	Accelerate	€199

Calculating the **ROI** required making several assumptions. We adopted a Low Assumption Approach, meaning we were **conservative** by choosing the lower bound of realistic savings, which means that actual savings may be higher.

Our solution is based on a low-code, cloud-hosted chatbot platform. As a result, Fidelidade incurs minimal to no upfront development or infrastructure costs. All expenses are operational, subscription fees, minor integration time, and updates, which significantly reduces the investment baseline.

To calculate our Gross Savings Estimation, we assumed an average working wage of 12€/hour (ERI Economic Research Institute, 2025) and 220 working days per year. For time-saving benchmarks, we referred to industry leaders such as Allianz, AXA, and Zurich, which have published annual reports stating time saving increases, in a percentual figure (Building confidence in tomorrow).

We conducted a sensitivity analysis using pre-implementation time metrics, drawing from AXA and Allianz reports as proxies. These benchmarks were applied at the individual employee level. Ultimately, we used the standard figures reported in these studies as the basis for our estimation model.

To estimate operational costs, we developed four different scenarios by varying the number of questions asked to the chatbot per client, holding all other factors constant. For our net savings estimation, we used a benchmark assumption that, on average, each sales assistant would ask the chatbot four questions per client. This figure may decrease in the short to medium term as employees become more familiar with Fidelidade's products and require less support.

Table 7. Net Savings and ROI

Number of Employees on Sales	Minimum Net Savings (in €)	Maximum Net Savings (in €)	ROI - Return on Investment (in percentage)	Payback Period (in days)
50	245 045	245 722	18 082%	2.02
100	490 090	491 445	18 082%	2.02
200	980 179	982 890	18 082%	2.02
300	1 470 269	1 474 334	18 082%	2.02
400	1 960 358	1 965 779	18 082%	2.02
500	2 450 448	2 457 224	18 082%	2.02
1 000	4 900 896	4 914 448	18 082%	2.02
2 000	9 801 792	9 828 896	18 082%	2.02
3 000	12 238 688	12 279 344	15 052%	2.43
4 000	14 675 584	14 729 792	13 536%	2.70
5 000	19 576 480	19 644 240	14 445%	2.53

Maintaining the assumption of **4 000 sales assistants** in Portugal, we calculated the ROI using the Estimated Gross Annual Cost Saved and the Maximum Yearly Operational Cost associated with handling four chatbot queries per client. As shown in **Table 7**, the **ROI reaches an impressive 13 536%**, that can be checked on our excel file **roi_estimation**. This is unusually high due to the low absolute investment relative to the large recurring time and cost savings. It highlights the exceptional cost-efficiency of chatbot technologies, particularly when deployed with minimal customization or infrastructure requirements.

Furthermore, these savings are the result of higher productivity rather than personnel reductions, enabling current workers to take on more work or clients without requiring a corresponding increase in numbers. As a result, the business can expand more effectively, reallocating human resources to higher-value activities while avoiding additional hiring costs.

The key insight is not just the numeric ROI, but the fact that substantial productivity gains can be achieved with a very small financial outlay, making this a high-impact, low-risk initiative, perfect for Fidelidade to pursue.

5.3 WHY OUR SOLUTION

Fidelidade made a calculated decision to use a chatbot to help its internal sales assistants to increase operational effectiveness, boost sales efficiency, and provide a reliable service. Sales teams deal with a variety of financial and insurance products in a fast-paced setting, so having instant access to reliable and consistent information is essential. Sales assistants may obtain information about items, prices, policies, and procedures more quickly thanks to our chatbot, which also minimises errors and speeds up response times. This tool is particularly helpful for onboarding and supporting less experienced employees, who may utilise the chatbot as a real-time guide to reduce their dependence on more experienced coworkers and speed up their learning curve. The chatbot also reduces the burden on internal support teams by automating the processing of repetitive and common requests, which saves money and allows human resources to focus on more complex tasks. Moreover, the chatbot might have a direct impact on sales results. Given the solution's scalability and straightforward updating, all sales assistants, wherever they may be, will always have access to the most recent data and policies, which is essential in the industry.

A key advantage of this solution is that it is built using a **low-code and open-source basis**, allowing for a fast and **cost-effective testing phase and easier maintenance**. Additionally, it enables significant time savings for sales staff, freeing them from routine tasks and enabling them to do their primary task, to focus on delivering value to clients. To ensure data quality, we conducted a thorough review of the materials shared by Fidelidade and applied best practices in data consistency. Additionally, FideBot remains continuously up to date using an integrated vector database, allowing new

information to be indexed and made available in real time without retraining the model. Also, **all queries and responses of the model are monitored for cost and correctness, so we can ensure accuracy even after launch** (using the Langwatch evaluator).

The application we developed offers advantages beyond its core functionality. It is fully prepared for testing, allowing to evaluate of different versions and optimization of performance based on real user feedback. Our FideBot was trained not only on internal data provided by Fidelidade but also with external sources from our benchmark research, including competitor information and financial literacy content, empowering its ability to deliver accurate, relevant, and context-aware responses.

Overall, the chatbot allows Fidelidade to streamline its sales operations, boost productivity, reduce operational friction, and maintain a competitive edge in a sector that is becoming increasingly shaped by digital transformation. As a recommended next step, **we propose a meeting with Fidelidade to review the training data in detail, since some inconsistencies were found while reviewing the files.**

6 CONCLUSIONS

With this solution, our goal is to empower employees with faster access to information, reduce repetitious tasks, and foster a more agile, informed, and productive work environment. Beyond improving internal efficiency, FideBot also aims to enhance operational effectiveness, boost sales performance, and provide a consistent and dependable service experience to customers.

By integrating generative AI into day-to-day sales operations through our secure and personalized platform, Fidelidade takes a concrete step toward digital transformation. This initiative not only demonstrates how AI can be aligned with real business needs, but also delivers measurable value through increased responsiveness, data reliability, and user empowerment.

In conclusion, FideBot proves that with the right tools, strategic implementation, and human-centric design, AI can become more than a buzzword, it becomes a competitive advantage.

7 REFERENCES

- Armstrong, A., & Gilberd, A. (2019, January 26). *Sales Statistics Essential for Smart Selling*. The 360 Blog from Salesforce. <https://www.salesforce.com/blog/15-sales-statistics/>
- Carrilho, P., & Perista, H. (2016, February 15). *Portugal: High and rising emigration in a context of high, but decreasing, unemployment | European Foundation for the Improvement of Living and Working Conditions*. [Www.eurofound.europa.eu](http://www.eurofound.europa.eu). <https://www.eurofound.europa.eu/en/resources/article/2016/portugal-high-and-rising-emigration-context-high-decreasing-unemployment>
- Franco, R. (2024, January 17). *Financial literacy is a social cause, and we need companies to embrace it*. CATÓLICA-LISBON. <https://clsbe.lisboa.ucp.pt/news/financial-literacy-social-cause-and-we-need-companies-embrace-it>
- Lambert, J. (2023, February 20). How Chatbots Can Increase Sales. <https://informi.co.uk/blog/how-chatbots-can-increase-sales>
- Lusa. (2024). *AMAN - Lusa - Business News - Portugal: Financial literacy of young people in line with OECD average - study*. <Http://Www.aman-Alliance.org/Home/ContentDetail/77582>. <https://www.aman-alliance.org/Home/ContentDetail/77582>
- Lusa. (2025). *AMAN - Lusa - Business News - Portugal: Inflation was 3.0% in December - official figures*. <Http://Www.aman-Alliance.org/Home/ContentDetail/84710>. <https://www.aman-alliance.org/Home/ContentDetail/84710>
- Moreira, A., Botelho Azevedo, A., P. Manso, L., & Nicola, R. (2019, April 12). *Sustainability of the Portuguese Pension System*. Fundação Francisco Manuel Dos Santos. <https://ffms.pt/en/research/studies/sustainability-portuguese-pension-system>
- Nova SBE Executive Education. (2023, December 27). *Why you should improve your financial literacy in 2024 | Business Room*. En.blog.exed.novasbe.pt. <https://en.blog.exed.novasbe.pt/articles/financial-literacy-in-2024>
- OECD Reviews of Pension Systems. (2025). *OECD Reviews of Pension Systems: Portugal*. OECD. https://www.oecd.org/en/publications/oecd-reviews-of-pension-systems-portugal_9789264313736-en.html
- Statton, N. (2025, April 25). *32 Customer experience statistics you need to know for 2025*. CRM Blog: Articles, Tips and Strategies by SuperOffice. <https://www.superoffice.com/blog/customer-experience-statistics/>
- Thi, N., Anh, V., Kuivalainen, O., & Sipilä, J. (2021). *IMPACT OF SALESPERSON 'S BEHAVIOR ON CONSUMER 'S PURCHASE DECISION IN FINLAND*. <https://lutpub.lut.fi/bitstream/handle/10024/162776/Master%20Thesis-MIMM%20Program2016-Ngo%20Thi%20Van%20Anh-%20n9271.pdf>
- Vohra, D. K. (2025, March 28). How AI and RAG Chatbots Cut Customer Service Costs by Millions. Nexgencloud.com; Nexgen Cloud Ltd. <https://www.nexgencloud.com/blog/case-studies/how-ai-and-rag-chatbots-cut-customer-service-costs-by-millions>
- Blackader, B., Buesing, E., Amar, J., & Raabe, J. (2025, March 19). The contact center crossroads: Finding the right mix of humans and AI. McKinsey & Company. <https://www.mckinsey.com/capabilities/operations/our-insights/the-contact-center-crossroads-finding-the-right-mix-of-humans-and-ai>
- Lindy.ai. (2024, May 15). How Much Does a Chatbot Cost in 2024? (Chatbot Pricing). Lindy.ai. <https://www.lindy.ai/blog/chatbot-pricing>
- 'LangWatch Pricing – Flexible Plans for Teams Building with LLMs. (2025). Langwatch.ai. <https://langwatch.ai/pricing>
- OpenAI Platform. (2025). Openai.com. <https://platform.openai.com/docs/models/text-embedding-3-small>
- Azure OpenAI Service - Pricing | Microsoft Azure. (n.d.). Azure.microsoft.com. <https://azure.microsoft.com/en-us/pricing/details/cognitive-services/openai-service/>
- AXA Case Study: AI In Insurance | Born Digital. (2023, October 26). <https://borndigital.ai/axa-insurance-company-case-study/>
- Balasubramanian, R., Libarikian, A., & McElhaney, D. (2021, March 12). Insurance 2030--The impact of AI on the future of insurance. McKinsey & Company. <https://www.mckinsey.com/industries/financial-services/our-insights/insurance-2030-the-impact-of-ai-on-the-future-of-insurance>
- ERI Economic Research Institute. (2025). Sales Assistant. Erieri.com. <https://www.erieri.com/salary/job/sales-assistant/portugal/lisbon>
- Building confidence in tomorrow. (n.d.). https://www.allianz.com/content/dam/onemarketing/azcom/Allianz_com/investor-relations/en/results-reports/annual-report/ar-2022/en-Allianz-Group-Annual-Report-2022.pdf

8 APPENDIX

8.1 GLOSSARY

- **Retrieval-augmented Generation (RAG):** RAG is a technique that combines the generative capabilities of LLMs with the retrieval of external information to produce richer and more accurate responses. It enhances LLMs' context-awareness by dynamically integrating relevant data during the generation process. (*Business Cases with Data Science, Calss 7 – Large Language Models*)
- **Prompt:** A prompt, in the context of LLMs, is a piece of natural language text that instructs the model on the task it should perform.
- **Mathematical Simulations of Future Earnings:**

$$VF = VI * (1 + i)^n + VM * ((1 + i)^n - 1) / i$$

VF: Future Value (total value at the end of the investment); **VI:** Initial Value (value initially deposited); **i:** Monthly interest rate (annual rate divided by 12); **n:** Number of months (total investment time in months = years x 12); **VM:** Monthly Value (value deposited monthly);

- **Supabase:** Open-source Firebase alternative. Serves as a Postgres database, allows Authentication management, instant APIs, real-time subscriptions, Storage, and Vector embeddings.
- **Large Language Model (LLM):** An AI model trained on large volumes of text to understand and generate human language, enabling tasks like answering questions, summarizing, and creating content.
- **Return on Investment (ROI):** a calculation of the monetary value of an investment versus its cost, used to evaluate how well an investment has performed.

$$ROI = \frac{Benefits - Costs}{Costs} \cdot 100\%$$

- **Payback Period:** a computation of the amount of time (in a given unit – days, in our case) that it takes to recover the cost of an investment.

$$Payback\ Period = \frac{Cost\ of\ Investment}{Average\ Annual\ Cash\ Flow}$$

- **BLEU score (Bilingual Evaluation Understudy):** is a metric that evaluates how closely a machine-generated text matches a human-written reference, based on overlapping words and phrases. Scores range from 0 to 1, with higher values indicating better quality.
- **ROUGE score (Recall-Oriented Understudy for Gisting Evaluation):** measures how much of the important content from a reference text is captured in a machine-generated response, focusing on recall. Higher scores mean better coverage.
- **LLM Answer Match:** evaluates how closely a language model's response matches a predefined correct answer. A 100% match indicates perfect alignment with the expected output.
- **Moderation:** checks whether a language model's response follows safety and content guidelines, ensuring it is appropriate, non-toxic, and free from harmful or sensitive material.
- **PII Detection:** identifies whether a language model's response contains Personally Identifiable Information (PII), such as names, addresses, or ID numbers, to ensure privacy and data protection.
- **Valid Format:** checks whether a language model's response follows the expected structure or format, such as correct JSON, bullet points, or specific response templates.
- **Rubrics-Based Scoring:** evaluates a language model's response using predefined criteria, such as accuracy, clarity, and relevance, typically rated on a scale, to assess overall quality and effectiveness.