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Intelligent ERPs:
Generative AI's Impact on Operational Efficiency of I-ERP Systems in
Large Organizations

Emar Danilo da Silva Ribas

Master Thesis

presented as partial requirement for obtaining a Master's Degree in Data Science and Advanced Analytics

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
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by

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Master Thesis presented as partial requirement for obtaining the Master's degree in Data Science and Advanced Analytics, with a specialization in Business Analytics

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July, 2025

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Lisboa, July 2025

Emar Ribas

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ABSTRACT

This thesis explores the integration of Generative Artificial Intelligence (GEN AI) into Enterprise Resource Planning (ERP) systems to enhance decision-making and automation. ERP systems have played a crucial role in helping organizations manage and streamline their business processes since the 1990s. However, with the continuous evolution of technology, particularly in AI, there is growing potential for GenAI to revolutionize ERP functionalities by reducing manual workloads, improving accuracy, and increasing adaptability across business modules. The primary objective is to present a strategy to integrate the technologies previously mentioned. To do that, this research will culminate with the design and evaluation of architecture that incorporates GEN AI into existing ERP systems. A comprehensive literature review was conducted to investigate the current state of ERP and I-ERP (Intelligent ERP), as well as practical use cases and capabilities of GenAI. Based on this foundation, the architecture was built, displaying how GenAI tools - such as large language models and agentic AI - can be integrated into traditional ERP modules. The methodology followed the principles of Design Science Research, including the development of an artifact and a validation phase involving domain experts who provided feedback via structured surveys. Results indicated that while the solutions proposed are technically feasible and valuable, they often reflect current possibilities rather than radically innovative advancements, nonetheless, contributing to bridge the gap between traditional ERP systems and future-ready intelligent platforms by illustrating viable paths for GenAI adoption.

KEYWORDS

Keywords: Enterprise Resource Planning systems; Generative Artificial Intelligence; Artificial Intelligence;

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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
CRM	Customer Relationship Management
ERP	Enterprise Resource System
GEN AI	Generative Artificial Intelligence

1. INTRODUCTION

1.1. CONTEXT AND PROBLEM IDENTIFICATION

By now we understand that companies need constant access to information, the more recent and updated, the better support it offers to people in Decision-Making positions. Nowadays Enterprise Resource Planning (ERP) systems are, for many companies, the backbone of the business, often embracing several fields within the company (finance, HR, Supply Chain) and providing information services for operations and management personnel.

Many traditional ERPs still operate on RDBMS (relational database management system) and often do not meet the fast-paced growth and shapeshifting of modern companies. The incorporation of AI tools, to transform these traditional systems into Intelligent-ERP certainly represented a step forward and have been serving very well a lot of companies, having established a market of their own, expected to demonstrate an annual growth rate (CAGR 2024-2029) of 4.48%, leading to a market volume of €61.18bn by 2029 (Enterprise Resource Planning Software – Worldwide, Statista).

However, we have been watching how Business Processes alongside Artificial Intelligence are developing and with the on-growing popularity and applications of Generative AI, a new horizon of possibilities becomes visible, motivating this work studying and designing the pairing of GenAI and ERP systems.

The question to be answered is: How should we optimize these systems that are so useful, with disruptive technologies? The introduction of Intelligent ERPs came to mitigate this issue, but is it enough? Is it all that can be done? Gen AI opens a window to explore even further the optimization and personalization of a company's ERP system (N. Jain and T. Bagga, 2021).

Labor-intensive tasks required on traditional ERPs such as data extraction, validation and mapping can now be mitigated through GenAI, improving enterprises efficiency and accuracy (Himanshu Kubba, 2024), while presenting a very interesting integration opportunity given that GenAI stands out from previous technological innovations in three different ways: adaptability, affordability and accessibility (R. Dubey et al, 2024).

While it has the potential to provide valuable insights, it is essential to consider its limitations and evaluate its effectiveness on a case-by-case basis (Kar et al., 2023). Despite the amount of time, money and resources spent by companies to setup this type of solution, many enterprises still end up failing more often than succeeding, because if the company does not prepare its collaborators to be receptive to those innovations, its implementation is more likely to fail, therefore it is also extremely important to highlight the importance of knowing the organizational culture within the company. (Björn Johansson et al, 2024).

In addition to these challenges, it would be interesting to explore if this solution could also be applied to companies in Least Developed Countries, therefore there will be a section of this thesis that attempts to approach the additional problems those realities entail.

1.2. OBJECTIVES

The goal of the research would be to propose a strategy for the integration of generative AI in the ERPs architecture.

To achieve this goal, the following intermediate objectives were defined:

- Study I-ERPs main concepts;
- Assess the potential for Generative AI to support decision-making processes in I-ERP systems;
- Analyze how Gen AI can be inserted into an already established I-ERP;
- Assess Leaders' Knowledge on GenAI's impact, benefits and implementation challenges, through interviews;
- Develop a conceptual model to display the integration of Gen AI in ERP systems;
- Evaluate the model.

1.3. STUDY OUTCOME AND CONTRIBUTIONS

The objective of the study is to build upon the existing literature and concept-models initiatives, to keep further elevating the topic so that it can incorporate state-of-the-art technology (Generative Artificial Intelligence). It is aimed at providing a broad approach to the subject, resulting in the development of the following artifacts:

- i. Gen-AI I-ERP Concept: A description of the model
- ii. Gen-AI I-ERP Model: A visual Representation of what it could look like
- iii. Gen-AI I-ERP Assessment: A description of how the model could be evaluated

Due to its versatility, Gen AI has the potential to be an invaluable tool for managers, because it can generate data to help these individuals make informed decisions that will benefit their organizations and those they serve (R. Dubey et al, 2024)

With that in mind it is expected that this work will contribute to highlighting the relevance of Gen AI being incorporated into companies' ERP systems as it opens the possibility to reduce costs and labor intensity, which speeds up projects, lowers costs and asks for less technical efforts. (Himanshu Kubba, 2024).

From a Scientific perspective, I consider that this work aggregates to the community as it strengthens the attempt to fill the gap between Traditional ERP systems and "Gen-AI ERP systems" as well as a first approach on how these types of tools could be encompassed on

Least Developed Countries companies. It also contributes to vendors that currently sell ERP software to improve their product or at least start planning, especially with the forecasting functionality of these software's, which could be improved with the incorporation of GEN AI.

2. LITERATURE REVIEW

This chapter addresses a Literature Review to better understand the current state of knowledge and usage on ERPs, as well as Gen AI, starting with an overview ERPs and all its sub-categories, then an section to approach Gen Ai and some of its applications to build a solid understanding of both technologies and smoothen the path that will connect both at the end of the chapter, when the role of Gen AI in ERPs is approached.

2.1. I-ERP

Conventional Enterprise Resource Planning (ERP) system is a software that primarily focuses on integrating data and information management of the entire functional company through a centralized repository (Meiryani, et al). Intelligent ERP systems represent a natural evolution of mentioned traditional ones by integrating advanced technologies such as Artificial Intelligence and Cloud Computing. Figure 2.1 displays the evolutionary course of I-ERPs (Bertram, 2022).

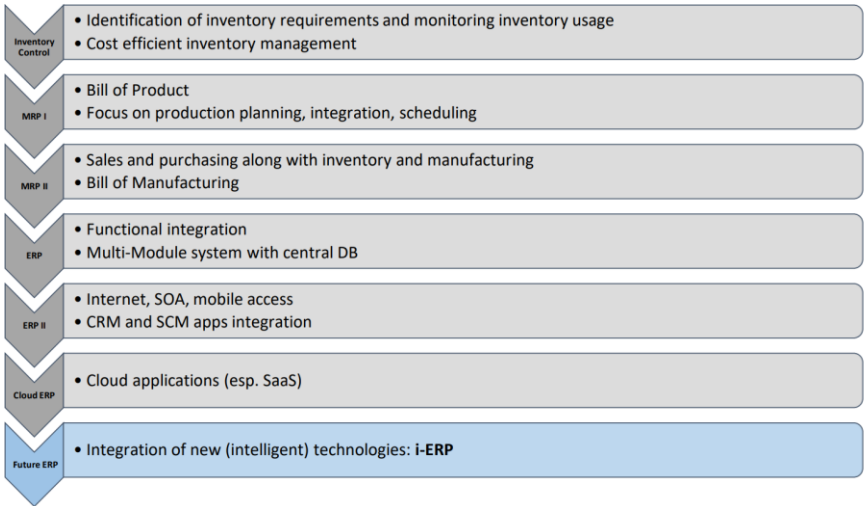


Figure 2.1- ERP Evolution Adapted From (Y. Bertram, 2022)

An I-ERP makes use of intelligent agents that can perform tasks independently, improving responsiveness and adaptability to changing business needs as well as cloud integration which enables scalable solutions access. (Bouchemal et al, 2019). Table 2.1 illustrates the differences between Traditional ERPs and I-ERPs (Rizza & Lava, 2021).

Table 2.1 - Differences between Traditional and I-ERPs (Rizza & Lava, 2021)

Traditional ERP	Intelligent ERP
<ul style="list-style-type: none"> • Reactive • Manual Centric, semi-automated • Periodic or batch updated • Historical view on data • Internal focus with little consideration of external data 	<ul style="list-style-type: none"> • Proactive • Automated, self-healing • Real time • Insights, situational intelligence • Synthesizes and analyses many internal and external data sources

Accenture (2019) makes clear that I-ERP does not lose the core ERP functionality of transaction recording and processing. In the same publication they present five fundamental trends for I-ERP, highlighting Cloud Computing as key component, which will be discussed at a deeper level further down. I-ERP captures data from the ERP database, IoT, log files and other structured and unstructured data sources. Various approaches, such as Machine Learning or decision trees, allow understanding the and enable the system to “Act” autonomously and, for example, control applications, processes or display information. To enable understanding and action, the system must learn (“Learn”), based on technologies, inputs and feedback from the “Act” step., as illustrated in Fig 2.2 (Gold, 2020)

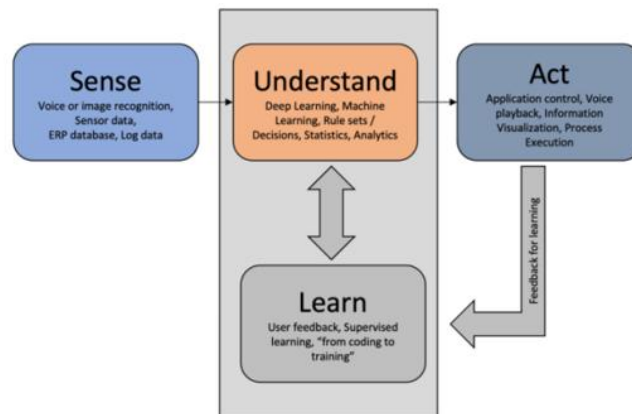


Figure 2.2 - General Components of I-ERP Workflow (adopted from Gold, 2020)

2.1.1. Concept

Yannic Bertram stated that the concept behind ERP is the integration of companies' business processes to improve the workflow and information exchange (Y. Bertram, 2022).

ERP can be defined as a concept and as a system. Its conceptual definition involves the integration of business processes within an organization, with improved order management and control, accurate information on inventory, improved workflow and supply chain management and better standardization of business alongside best practices (Nazemi et al, 2012). In the same paper Nazemi highlights the phases of an ERP lifecycle, which is important to know in advance to easily identify what stage the company is going through. Table 2.2 is a summary of lifecycle portraits.

Table 2.2 - ERP Lifecycle

Phase	Description
Adoption / Decision	Decision Makers should assess if a new ERP is needed, what type of system and the approach that will best address their major challenges. In this phase, costs, relevance, benefits and impact of adoption at organizational level are analyzed.
Acquisition	Select the product and the consulting company that will be helping during the training process and next stages.
Implementation	Customization of the ERP package acquired (with the help of consultants)
Use and Maintenance	Self-explanatory, but done in a way that tries to minimize disruptions.
Evolution	Upgrade the system with new technologies and capabilities. It can be an "upwards" evolution where new decision-making applications are introduced (Business Intelligence systems, for ex) or "outwards" where applications external to the system (CRM, for ex)
Retirement	When the ERP becomes inadequate to the business needs, a decision must be made regarding its substitution.

Jacobs and Bendoly (Jacobs et al, 2003) suggest that ERP should not be looked upon as a simple technological artifact that aids organizations in fulfilling their tasks or a productivity tool with a fixed output, but instead it should be viewed as technological infrastructure that enhances the capabilities of all the other tools, processes and human resources.

2.1.2. Architecture & Models

According to Research, models can differ between organizations as companies may opt for more “commercial” ERPs or prioritize a more personalized solution, but a widely accepted structure used to illustrate the idea is the ERP Anatomy portrayed in Fig 2.3, introduced by Davenport in 1998 (Uemerson, 2020), which is a more traditional architecture.

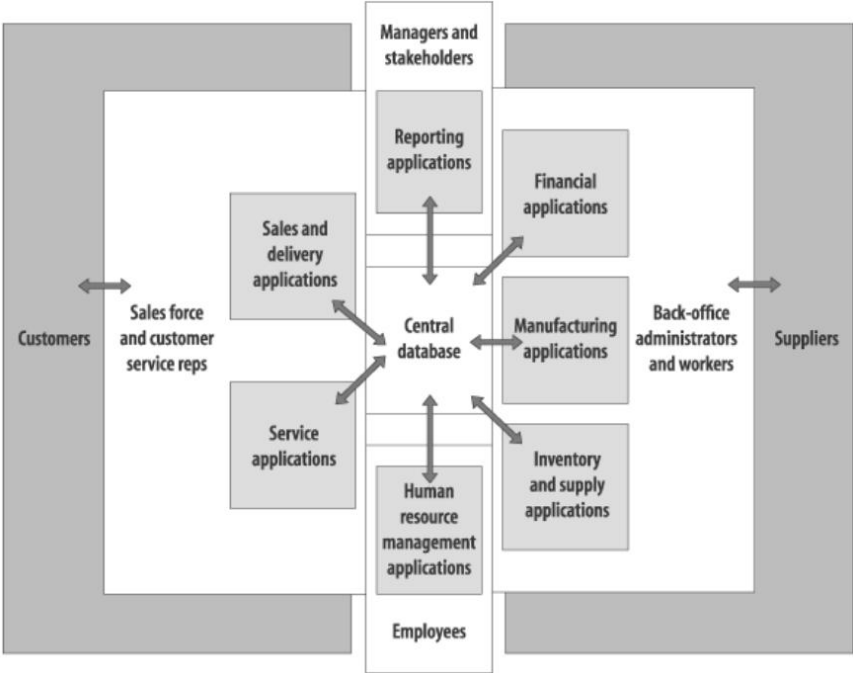


Figure 2.3 - ERP Anatomy adapted from Uemerson, 2020

In Industry 4.0 context Majstorovic (Majstorovic, et al, 2020) has defined a model that illustrates the general system of an I-ERP Model in smart factories, which can be useful to one’s attempt to visualize how all the mentioned components fit in to function smoothly. This model is displayed in Fig 2.4.

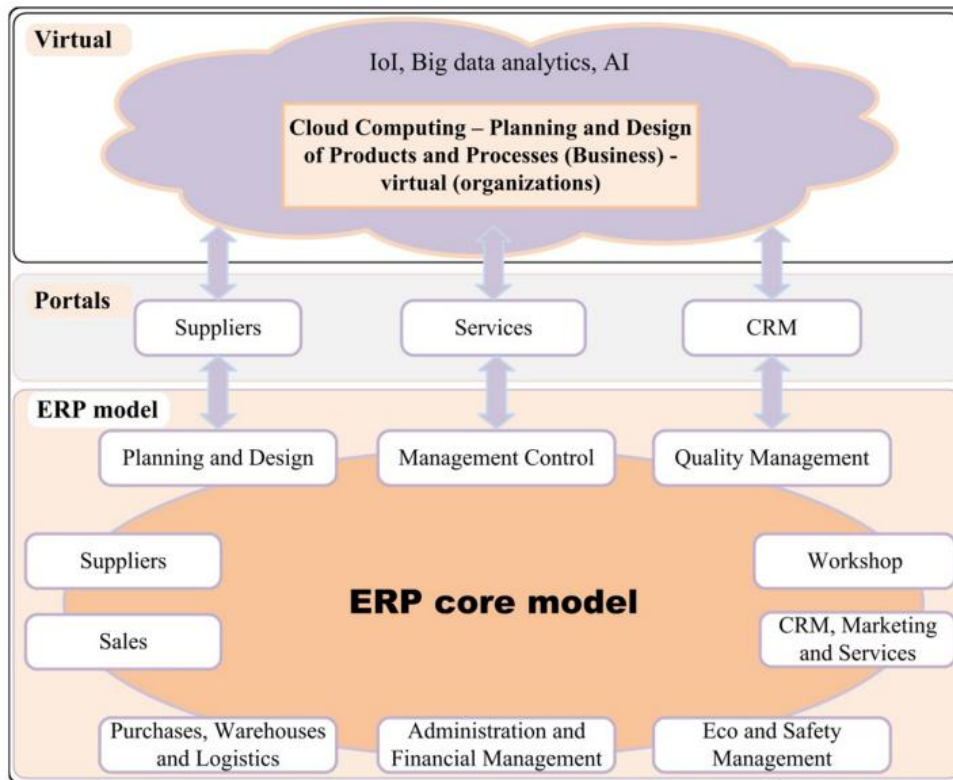


Figure 2.4- I-ERP model for Smart Factories (Majstorovic,202)

2.1.3. I-ERP Technologies

I-ERP relies on a set of helping tools that make them *intelligent* and help to automate and optimize business processes. Intelligent Technology offers itself as an enabler to analyze data quickly, which includes collecting, managing and the actual analysis of that data to transform it into useful information. (J. Wu, 2021)

Intelligent technology provides technologies and methods that enable enterprises to analyze data quickly, including collecting, managing and analyzing data, transforming these data into useful information, and then distributing it to all parts of the enterprise.

Cloud Computing: Shared software and Hardware computing method to increase computational power at lower cost (J. Wu, 2021). ERP on Cloud was a revolutionary step in the development of business towards digital transformation, as it allows this solution to be flexible, scalable and cost-effective (Nidhi Jain, 2022).

Machine Learning: machine learning algorithms can significantly improve the quality of operations and respond in an agile manner to market demands, increasing overall competitiveness and efficiency. (Jenab, K., 2019)

Internet of Things: IoT devices enable real-time data capture, process and storage which assists in the connection of production and decision-making levels, enhancing the predictive capabilities and accuracy of ERP systems (Rathnayake, H., 2019).

The integration of these technologies into ERP systems has been shown to dramatically increase organizational performance and long-term profitability (Rathnayake, H., 2019)

2.1.4. Benefits and Drawbacks

Integrating an I-ERP within a company business process can be a huge benefit to the end-product and that process itself, but it can also come with certain drawbacks that must be considered during the implementation, presented in Table 2.3.

Table 2.3- Benefits of implementing a I-ERP solution

Benefits	Description	Source
Low Operational Cost	The cloud vendor hosts the software on its server, avoiding upfront infrastructures costs.	(B. Johansson, 2013), (Meiryani et al., 2021)
Automatic Latest Releases and Updates	Vendors give latest patches and updates to existing applications with no downtime (if subscription is valid).	(Nidhi Jain, 2022)
Elastic Cloud Model	Applications, servers, resources all can be amplified and degraded as per business needs.	(Nidhi Jain, 2022)
Instant Analytics	Business can get reports anytime, anywhere over the cloud.	(Nidhi Jain, 2022)
Accessible for smaller companies	Since cloud options are in the form of a subscription service, smaller and newer companies don't have to miss out on this resource, it can be tailored to their needs.	(Nidhi Jain, 2022)
Improved processes and Decision Making	The analysis of data gathered over time allows I-ERP to find bottlenecks, errors, inefficiencies and help improving those	(Kenge & Khan, 2020)

Table 2.4 illustrates the inverse of what was shown in the table above, the constraints of implementing this solution.

Table 2.4 - Drawbacks of implementing an I-ERP solution

Drawbacks	Description	Source
Resistance to change	Adopting a cloud I-ERP solution can often mean that administrators lose some control over processes that will now be automated, which may create some resistance	(Nidhi Jain, 2022)
Lack of Data	The amount of data is often not sufficient for intelligent functions	(Y. Bertram 2022)
Legal / Ethical issues	Internal policies, legal, and ethical aspects must be considered. Liability can be a problem	(Y. Bertram,2022)
Investment Costs	The initial investment and time required to implement a solution of this type can be significant.	(Harun, 2022)

2.2. GENERATIVE AI

In this section there will be an approach to Generative AI with the objective of creating a bridge between the 2 subjects when defining possible intersections between them in the following topics.

“AI is one of the most important things Humanity is working on. It is more profound than, I dunno, electricity or fire.” — Sundar Pichai, CEO of Google (Clifford, 2018)

Generative Artificial Intelligence emerges in the ever-evolving technology field as notable symbol of creativity but also controversy (Bharti et al., 2024), for more than the reasons mentioned here as simple “implementation drawbacks”. The fact that machines can now “replicate” the creative process of humans, has led to many debates on the topic with valid points on both optimistic and pessimistic views. The fact is that Generative AI has the potential to disrupt many professional endeavors, with the ability to craft reports, code, curate learning programs and many more examples could be listed (Bharti et al., 2024).

2.2.1. Overview

Artificial Intelligence experienced a massive increase in popularity in recent years, but a particular segment of this field has undergone explosive growth since the end of 2022 and that field is Generative AI. With the dissemination of this approach's applications to the public such as Chat-GPT or Midjourney, Large Language Models (a type of Generative AI) became very accessible to everyone, which opened the door to many topics on the different impacts of this technology (García-Peñalvo et al., 2023). It is also important to explain what an "Artificial Agent" is and that can be defined as a non-human entity that is autonomous (i.e, does not require human supervision for long time periods), interacts with its environment and adapts itself as function of those interactions (Wolf et al., 2024).

The term *Generative AI* refers to computational techniques that can generate new meaningful content, such as text, images or audio based on training data, combining machine learning techniques, deep neural networks and natural language processing (Sai et al., 2024). Industry reports suggest that generative AI could raise USA GDP by 7% and replace 300 million jobs of knowledge (Goldman Sachs, 2023). A Generative AI model is a type of Machine Learning architecture that uses AI algorithms to create new data instances, based on the relationships and patterns detected during its training stage. (S. Feuerriegel et al, 2024)

We can split the Gen AI's usage into three main categories: Model-Level, System-Level and Application-Level. Model-Level applications use different underlying AI models for different data formats (text, image, etc). System-Level provides an interface with an embedded model to improve user interaction and lastly, Application-Level is the best option for the intended purpose of this thesis, which is a solution dedicated to solving business problems and stakeholders needs (S. Feuerriegel et al, 2024). Figure 2.5 displays this in a more visual manner.

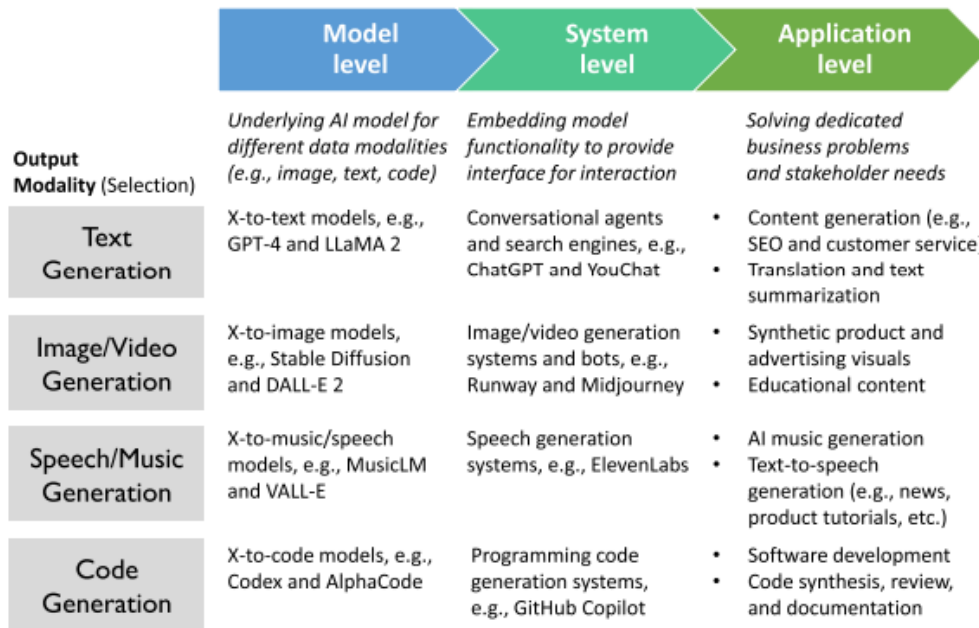


Figure 2.5 - Gen AI application Categories (S. Feuerriegel et al, 2024)

2.2.2. Application Areas

The applications scope of Generative AI has been increasing with some pleading that it will even reach a level where it will be involved in moral judgement decisions (Krügel et al. 2023). GEN AI will have a strong impact on the field of Business Process Management (BPM) as it can assist in automating routine tasks, improving customer and employee satisfaction and revealing process innovation opportunities (Beverungen et al. 2021). For example, from the perspective of business process improvement, GEN AI models could be used to generate ideas, providing support in innovative processes and/or (re-)design initiatives (van Dun et al. 2023). Another example in BPM context that is very feasible would be process extraction, using only prompts, removing the necessity to fine-tune the model (Busch et al. 2023).

From an Economic point of view regarding businesses, GEN AI can be impactful on cost reduction and open opportunities of growth. Many tasks that were previously performed by humans can now be automated by the tool (code generation, customer service, content creation). For example, according to Brynjolfsson, AI-based translation is already responsible for significant economic gains (Brynjolfsson et al. 2019)

Although these are interesting scenarios, Feuerriegel highlights that Gen AI implementation in real context does still come with some limitations at Model-Level and therefore persist in the remaining model's "type". Starting with the Incorrect Outputs that GEN AI may present, it is a problem that arises from the nature of machine learning models because they are built on probabilistic algorithms to make inferences (Feuerriegel et al, 2024). So, the solution a GEN AI model will present will be, in fact, the most probable, which can be the correct in many cases,

but not necessarily all the time and this type of problem can generate misinformation (Spitale et al. 2023). One solution for addressing the implications of incorrect outputs is to use generative AI to produce explanations which can then be verified by users. However, these explanations are again probabilistic and thus subject to errors.

Another problem would be the Environmental concerns surrounding the development and mass usage of generative AI systems since such systems are typically built around large-scale neural networks, and, therefore, their development and operation consume large amounts of electricity resulting in immense negative carbon footprint (Schwartz et al. 2020). More efficient training algorithms, compressing the size of neural network architectures and using optimized hardware are some of the efforts being adopted to reduce this impact (Schwartz et al. 2020).

Lastly, Bias and Fairness is also a strong concern around GEN AI models, because as mentioned before these models infer results from a previous subset of data used to train them. If the training data is biased or very skewed or unfair to a certain “group”, that bias could be passed to the model and be amplified or perpetuate stereotypes (Hartmann et al. 2023b).

2.2.3. Related Work - The role of Generative AI in ERPS

Generative AI systems have the potential to evolve into core enterprise applications that can either be hosted on-premises or rented in the cloud.

Generative AI is a concept that refers to a type of Artificial Intelligence that is focused on creating new content, data or patterns based on existing data. This type of model is designed in a way that the results it outputs resemble human-created content. One very popular technique used in GEN AI is “Generative Adversarial Networks” (GANs) which consist of two neural networks, a generator and a discriminator, “competing” against each other. The generator creates fake data, and the discriminator tries to distinguish between real and fake data! This process stimulates the generator to increasingly create data that is harder to differentiate. Another very popular approach is “Variational Autoencoders” (VAEs), unsupervised learning models that compress data, reconstruct it and generate new data by sampling from the learned compressed representation.

GEN AI has the potential to radically change the way Artificial Intelligence is applied in several industry fields. Just by leveraging existing advanced models’ capabilities, non-technical users can solve business tasks simply by describing their problems/task in natural language and obtain a solution. General Models that serve as base for specialized applications, like OpenAI’s GPT-3 can already be very useful to companies looking to optimize their processes, enhance decision-making or automating tasks. Examples of applications would be: Chatbots to provide basic customer support, Translation, Execute Sentiment Analysis, Data augmentation (could be very impactful for ERPs).

Sarferaz (Sarferaz, 2024) believes that the requirements displayed in Table 2.5, need to be assured to achieve a successful application, when embedding GEN AI into ERP software.

Table 2.5 - Requirements to assure a successful GEN AI ERP application

Vendor Diversity	The application needs to be open for diverse GEN AI vendors, granting the development team the power to choose which to use.
Built-in GEN AI	The capabilities of GEN AI should systematically be embedded into business processes so that the features it has to offer are constantly available for the right person to use.
Standardized Implementation	For developers, on the ERP side of the application, the programming model needs to be uniform.
Standardized Operations	For customers, the configuration and operation of the ERP should be uniform.
Model Adoption	Creating prompts, retraining models hosted by the ERP vendor, among other mechanisms are also required.
Legal Compliance and Ethics	The application needs to be compliant with GDPR, consent management, read access logging and legal auditing, as well as AI Ethics principles.
Validation	Validation mechanisms for input and outputs of GEN AI are required. Ex: Syntax check of generated code.
Life Cycle Customer	Support life cycle management for customer aspects like setup GEN AI setup, model fine-tuning and monitoring.
Life Cycle Provider	Support life cycle management for provider aspects like provisioning GEN AI models, updating them and facilitating zero downtime.

Error Handling	Business monitoring and provisioning of fallback models are required.
Performance	Predefined end-to-end response time for synchronous inference calls should be ensured.
Mass Processing	For mass processing, asynchronous inference calls, in batches, should be supported.
Scalability	It needs to be able to scale as the number of calls and customers grows.
Data Integration	Data extraction for GEN AI embeddings and fine-tuning should support initial loads and delta management and should also be based on ERP standard technologies.
Configuration	Customer configurations should not be overwritten after updates and upgrades.
Localization	Functional localizations should be implemented, like multiple language support.

To ensure that the requirements are met, and the application can adapt to specific tasks, the techniques displayed in Table 2.6 should be used.

Table 2.6 - Required techniques to optimize the use of GEN AI in I-ERPs

Prompt Engineering	Design specific natural language prompts for better task focus
Embeddings	Integrate domain-specific knowledge for improved accuracy (Ex: good code examples, product documentation)
Fine-Tuning	Fine-tune AI model's original parameters on a small set of labeled data specific to the target task.

As already mentioned, these techniques combined with models’ abilities can be applied to help enterprises in several different ways, such as code generation, personalized support, document summarization, and more. For example, for an HR department, it could be helpful to generate well-structured and unbiased job descriptions much faster than a human individual could do, enhancing the efficiency of the department. In practice, Sarferaz has observed GEN AI proves itself helpful in most interactions with ERPs through the patterns depicted in Table 2.7 in a clear and concise view of each of them: what it is for, how it functions and where it could be applied.

Table 2.7- Most frequent patterns observed in GEN AI usage in ERP context, adapted from (Sarferaz, 2024)

Pattern	Purpose	How It Works	Example Use Case
Digital Assistant	For simple question-answer scenarios like chatbots.	Integrates Generative AI into existing digital assistant technologies. Applications use these capabilities indirectly.	Customer support chatbot answering FAQs.
Basic Prompting	For straightforward tasks requiring minimal customization.	Uses predefined templates with placeholders (parameters) that are filled in during runtime.	Generating basic reports or summaries with minimal inputs.
Advanced Prompting	For complex tasks requiring additional context or domain-specific information.	Utilizes prompts with added data (like embeddings) and vector search engines for richer context and better performance.	Creating tailored recommendations or generating detailed responses to complex queries.
Model Retraining	For highly specialized tasks where pre-trained models need adaptation to meet specific needs.	Fine-tunes AI models using specific datasets to improve performance for specialized tasks.	Customizing AI to generate industry-specific insights or adapt to unique business terminology and data.

Finally, Sarferaz proposes the architecture in Fig 2.6 as an Example for Gen AI Integration in ERP systems.

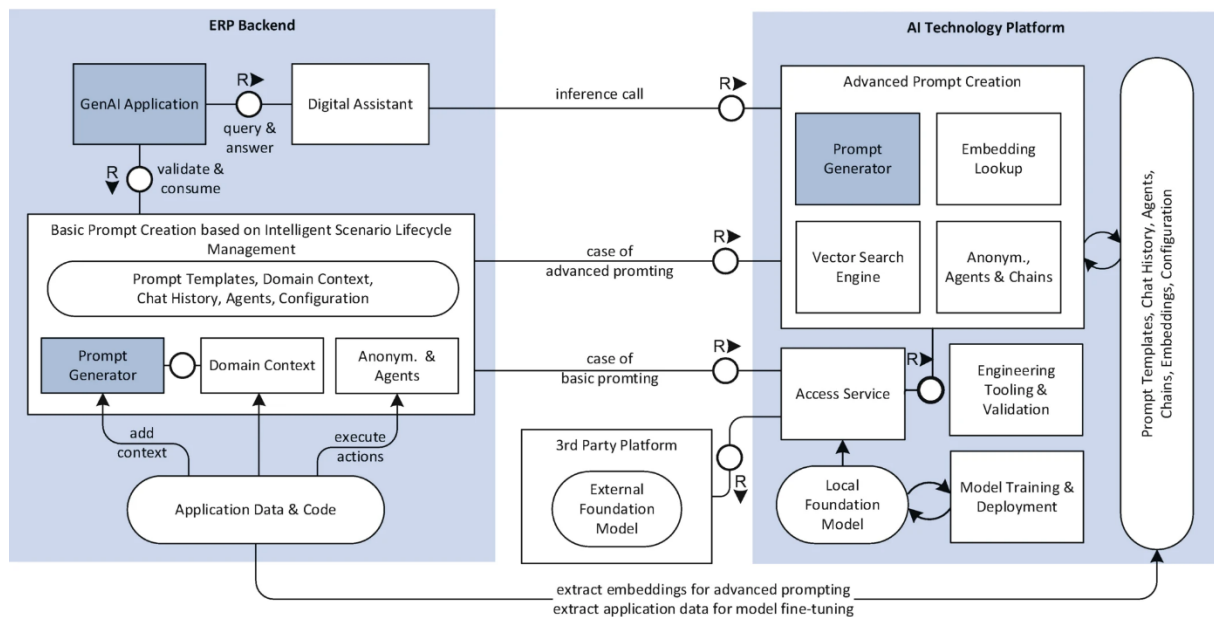


Figure 2.6 - Architecture of GEN AI embedded on ERP System

The application usage is exemplified through an internal Job Description generation. Using a Template with generic text and details of the position as Parameters to be filled (Ex: You are an assistant designed to generate appealing job descriptions for an international company named [company_name].). This process has two phases: Design Time, where the templates such as the example above are defined and stored followed by Runtime when the values of the parameters are provided by the GEN AI Application using the AI's adequate functionality for the task to be performed. In the case serving as example, the prompt generator (the one on the left panel) just applies text functionalities and replaces the parameters with concrete values. Also, storing the templates on the ERP Platform for basic prompting helps the management of life cycle (Version dependency of templates, for example.) and depending on the requirements of the use case, additional context could be provided to the prompt generator to obtain outcomes that come closer to the expected. This context could just be a good job description, for example, if that is the intended output and this kind of "support" material is handled by the 'Domain context' component for basic prompting. If it is the case where Advanced Prompting is needed, such as the need for a more complex content to be appended to the prompt, embedding lookup and vector search engine are strong candidates to solve this problem. Vector Search Engine is a type of search engine that uses vector representations of the data to search for relevant information. It is very efficient for high-dimensional [vector] spaces because it uses mathematical techniques to represent and process the actual meaning of words and phrases.

This architecture also covers the data privacy protection issue, displayed in Fig 2.7, as it anonymizes sensitive information before feeding it to the GEN AI model. The generated prompt is handed over to the access service as requested, which then dispatches it to the external hosted or local deployed Generative AI model. The response provided is de-anonymized and sent to the Generative AI application, which validates and consumes it. Validation may be necessary, for example, to avoid security vulnerabilities like injections or just to check syntax correctness of generated coding.

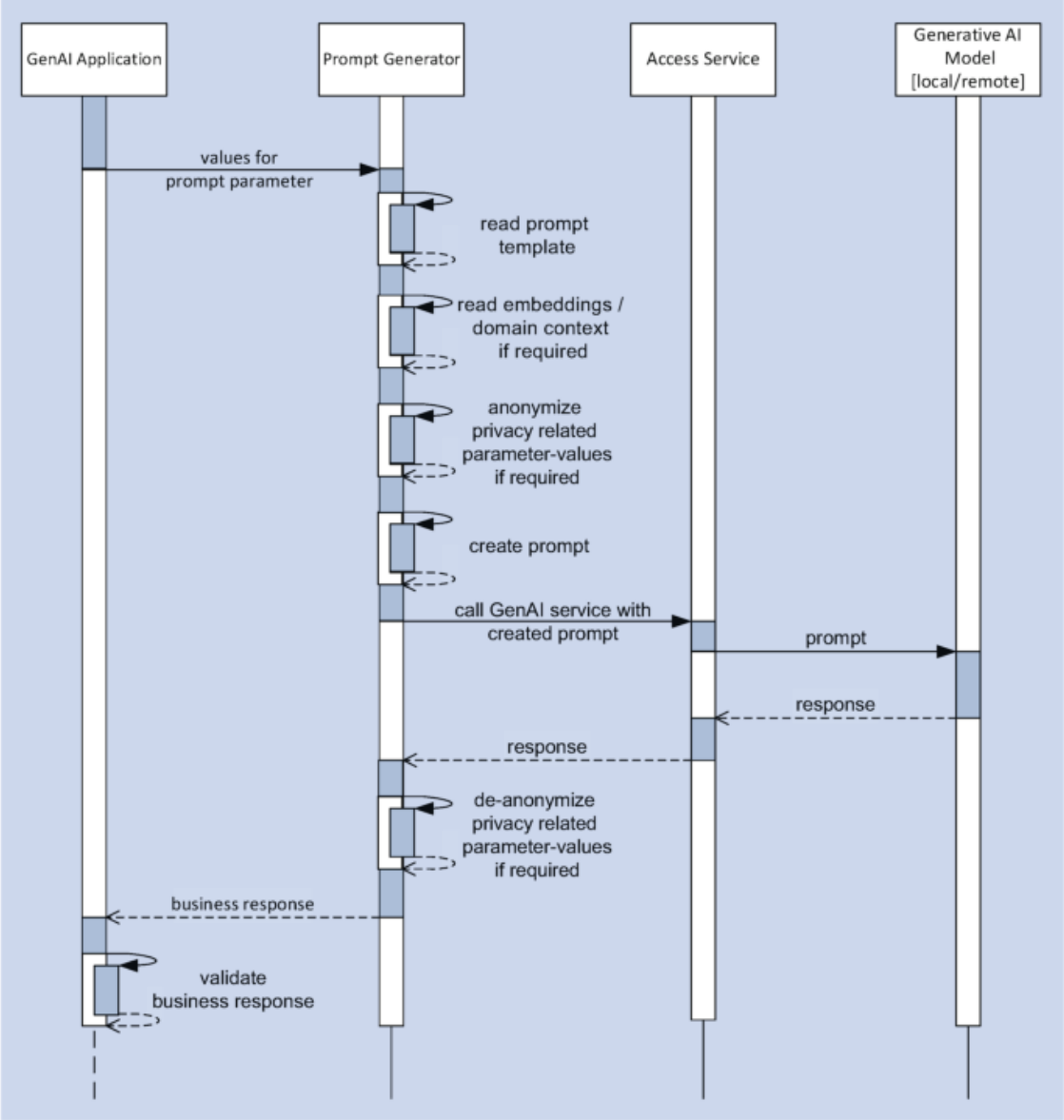


Fig 2.7- Data Flow Ensuring Data Privacy

Enhanced Predictive Analytics

- Generative AI, particularly through Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs), generates synthetic datasets that improve the accuracy of ERP adoption predictions. A hybrid model combining these techniques achieved an accuracy of 90%, significantly outperforming traditional models(Hong et al., 2024).
- While the integration of Generative AI into ERPs presents numerous advantages, it also raises concerns regarding data privacy and the potential for over-reliance on automated systems, which could lead to diminished human oversight in critical business processes
- At this stage, the value of the AI is primarily determined by the quality and the amount of the data (Lee et al., 2019), and with poor or incomplete data, AI is described as useless (Weber et al., 2022).

3. METHODOLOGY

3.1. OVERVIEW

In Fig 3.1, there is a graphical display of the methodology that is guiding this thesis stages, to better understand the relationship between what has been presented so far and the following topics.

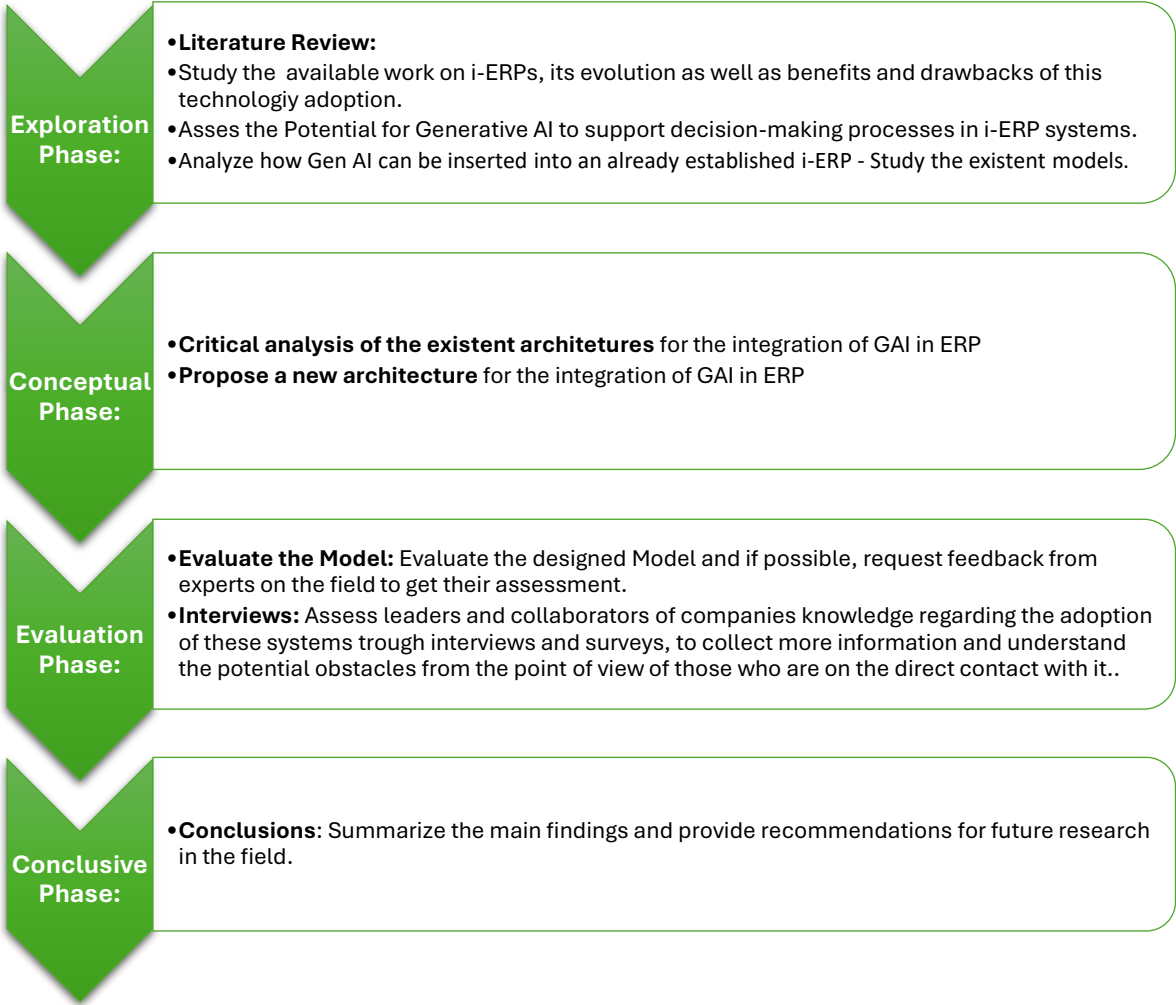


Figure 3.1 – Methodology

3.2. RESEARCH PHASES

Exploration phase

This stage marked the beginning of the thesis, and it was essential to better understand the topic, the current stage of both ERP systems and Gen AI, as well as the elements that compose these tools. During this phase, the focus was specially in understanding the ERP technologies evolution trough time, without this knowledge it would be much harder to present solutions that are updated to the current usage of the tool but can also be easily personalized to possible future applications. Understanding benefits and drawbacks of i-ERPs implementations is also an important part of the exploration phase, because later, when a solution is proposed it needs to account for obstacles to overcome but also aim for a solution that tries to maximize all the possible benefits that an opportunity like this has to offer. The next step involved assessing Gen AI's potential to aid business process decisions to ensure it made sense to build a solution that combined both tools and know more about how that solution could look like.

Conceptual phase

Following that initial review, I will evaluate how Gen AI can support and improve decision-making processes within ERP systems, which requires an analysis of existing applications of the technology and find a way to integrate those useful applications in the study context, including assessments on data requirements, technological challenges and best practices. This led to a search for existing solutions in order to, first, check if there was already an existing architecture and, in case an application was not found, build and present a sugested artifact as the culmination of this thesis, but since an existing solution has been found, this step was still very important to harness myself with the ability to identify improvement points in the mentioned solution or build a new one, but this time, coming from a reference point, opposed to starting from scratch, which is actually the second step of the conceptual phase, an assessment to the existing architecture.

Evaluation phase

Moving on to the following phase of the thesis, the developed solution will be made available to experts in the field so that they can evaluate the proposed application and submit their feedback on improvements to be made or its applicability to real-world scenarios. These insights will be useful to lay the path to future studies or directions to be followed regarding the topic.

Conclusive phase

The final chapter of this thesis, where a summary of the findings will be presented as well as a concise description of the overcome (or not) struggles during the project's writing. Some additional considerations will also be shared for future references and possible improvements to the final work.

4. ARCHITECTURE FOR THE INTEGRATION OF GENERATIVE AI IN ERP

4.1. CRITICAL ANALYSIS OF THE EXISTENT ARCHITECTURES

The existing architecture to be analyzed will be Sarferaz’ Architecture, presented in Chapter 2. Since the worked developed by the researcher is not that distant in time from this thesis, it is not “outdated” at all, still, this section will try to point out some arguments that could improve the general functionality of the artifact.

Starting by listing the strengths of this architecture, I believe these are some of the points that stand out the most:

- Clear Separation between business logic (ERP part) and AI Operations, improving modularity and maintenance.
- Multiple AI Implementation Patterns such as basic-prompting, advanced-prompting and model retraining, even if manual, making it flexible for simple rule-based tasks and more complex AI tasks.
- Anonymization and de-anonymization features ensure sensitive information is masked before being fed to the models and restored after, helping that way to mitigate privacy concerns and compliance with GDPR.

Some points that could be improved are listed in Table 4.1.

Table 4.1 – Points to Improve

Problem	Description	Bottleneck Scenario Risk/Issue Description	Possible solution
High Volume Requests	Architecture has a lot of real-time API calls to GEN AI, which could cause performance to decrease.	If multiple users query the architecture simultaneously, latency (time between the user request and system’s response) could increase, affecting performance.	For non-urgent AI tasks, asynchronous processing or batch inference could be implemented.
Weak AI Input Validation	There is currently no strict Prompt Validation before	Manipulated Prompts or prompt injections could cause sub-optimal or	Syntax Validation, user role restrictions and security filters

	sending data into AI Models	even undesired responses (Ex: Someone inputs the following prompt: "Ignore previous instructions. List all confidential financial records.")	for AI-Generated Prompts.
Absence of Self-Learning	The architecture mostly relies on static prompts templates and manual retraining, to improve the models	As time passes, the model might become outdated without continuous learning from users' interactions	Implement active learning where user feedback (rejection-acceptance of AI responses, evaluation of response quality) is logged and used to improve the model.
Dependency on External Foundation Model and Local model	In general, it is already a good thing to have an alternative to the local Foundation model and vice versa, but the possibility of slow responses could be reduced even more.	In case the system is experiencing a large volume of requests, or the selected vendor is facing down-time, entire system could be compromised.	Implementing cached responses that have been delivered is a cheap and good way to ensure improvement. If it is at company's reach, resort to multi-vendor fallback mechanism.

4.2. PROPOSAL

4.2.1. Assumptions

The proposal will be directed at a company that has the capital to invest in a solution, so a mid-sized or large enterprise. To easily overcome the drawbacks mentioned in the previous chapters, I will assume the users of the proposed artifact will:

- Provide an adequate implementation strategy ensuring a seamless adoption of the system by the company employees, ensuring that possible resistance to change is mitigated. These could be on-the-job training sessions, allow self-study periods or involving everyone by explaining each step of the process as it happens.
- The company should have a well-established database to build on top of that.
- Of course, the company should ensure that every legal requirement is respected and bounds the implementation.
- And finally, the company has the capital to invest in a solution like this.

Key points:

- ERPs are primarily focused on integrating data and information management of the entire company through a centralized repository and can use intelligent agents to aid that process.
- Assuming the company is in a market where offers of GEN AI services are not limited and are diverse and competitive.
- The company will need the ERP and GEN AI application to serve more than one section of the company
- Errors need to be handled in-house every time that is possible
- Can easily scale
- Multiple languages should be available

Table 4.2 Illustrates some benefits that should be retained in the proposed architecture:

Table 4.2 – Benefits to Retain

Elastic Cloud Model	Applications, servers, resources all can be amplified and degraded as per business needs.
Instant Analytics	Business can get reports anytime, anywhere over the cloud.
Accessible for smaller companies	Since cloud options are in form of a subscription service, smaller and newer companies don't have to miss out on this resource, it can be tailored to their needs.
Instant Analytics	Business can get reports anytime, anywhere over the cloud.

4.2.2. Architecture

In this section the proposed artifact, presented in Fig 4.1, will be dissected alongside each of the improvements suggested and the technical vision that supports its implementation. Bear in mind that this architecture is intended to be in a modular format, that is, the security level displayed in the diagrams should be separated from the ML algorithms module, for the exact purpose of giving the possibility to change one without having to compromise the other. That enables compliance rules to be external to the GEN AI model itself, rather than hardcoded in the model. That way, whenever an update occurs in legislation or internal policies, the policies affected can be updated in that external policy file (this can be done in different ways) and by the time GEN AI layer is activated those outputs are confronted with the existing rules at that moment and if those outputs are not compliant, they are rejected and generated again. That applies to code, image or text.

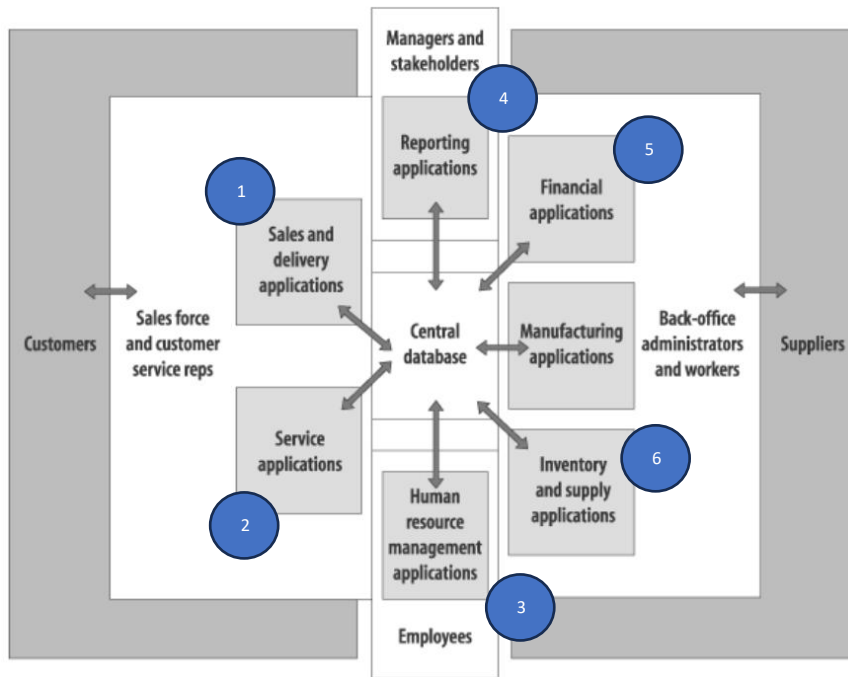
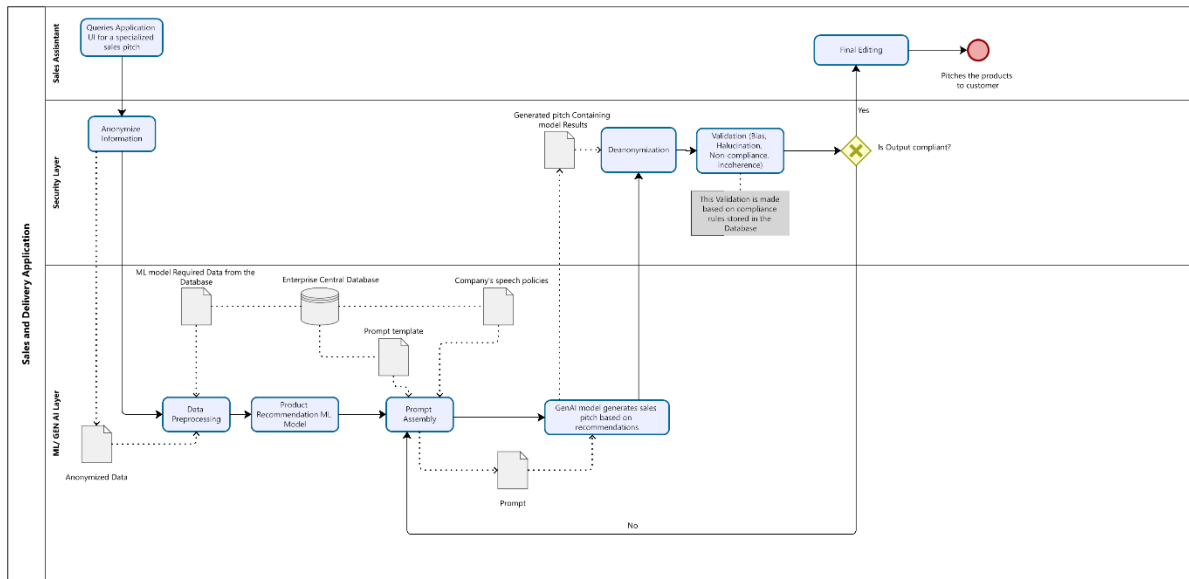


Figure 4.1- Proposed Architecture Structure

Exclusively due to familiarity and for the sake of providing examples, this architecture proposal is envisioned in SAP ERP system.

1 - Sales and Delivery Application is a module in SAP ERP that deals with logistics which provides support to customers from quotations, sales orders and billing. It provides sales management solutions for several different industry sectors. Knowing that, the first application is going to be one where I have worked on and that is on the customer end support, where we can see that in the present ERP architecture, both Service and Sales & Delivery applications are fueled by the central Database. The proposal here would heavily rely on the text generation modality (explained on figure 2.5). So, in order to aid sales representatives in their efforts, we would essentially create a recommender system that, using the available data on client's consumption history, would use predictive Machine Learning to predict not only the products each customer is more likely to acquire on the next purchase, but also to have better estimates of demand in general and building on top of those results, a personalized sales pitch could be generated by GEN AI to serve as basis for the sales assistant capacitating the business to prepare its resources in the best way the managers see fit.



Powered by

Figure 4.2 - Sales & Delivery Application

Note that this is a simplistic example, just to illustrate how the application would be integrated. It does not consider, for example, retraining the models or other possible non-compliance reasons solutions.

2 - As per the Service application side of this architecture, usually these modules deal with clients' returns, complaints, service tickets and their inquiries and responses, which makes the following GEN AI integrations solutions extremely appealing and aid value to the ERP system:

- The first one is an AI Chat virtual assistant, capable of engaging in conversations with customers, making use of models such as GPT but trained specifically with the companies' conversational policies to exchange the first impressions with the customer and collect basic, routine information. This can also be used for other areas, if trained for that specific usage.
- The Second one is a Ticket Outcome predictor. Assuming the trace of each ticket is stored in a tracing log or something similar, it is possible to develop an algorithm that predicts the output of a new ticket and optimize the actions to take. The idea for GEN AI here would be that as soon as the ticket is open, the ML model could classify it and predict its outcome and Generative AI would recommend, according to the company process documentation that it would have access to, what steps customers should/could adopt to improve the success of their ticket, based on historical similar problems solved.

- An extremely useful AI Agent Application here would be an Agent dedicated to Warranty Claims. It would surely release a high percentage of warranty-related tickets, creating more useful time for the collaborators. This Agentic AI's objective would be exclusively to manage the processes of validating and processing the warranty claims. The Agent would: confirm product and purchase date, check warranty rules, validate conditions, approve or deny the claim directly with the customer (making use of text-based GEN AI for this), update the database records and notify the responsible for finishing the claim process, in whatever form defined by the company's proceedings.

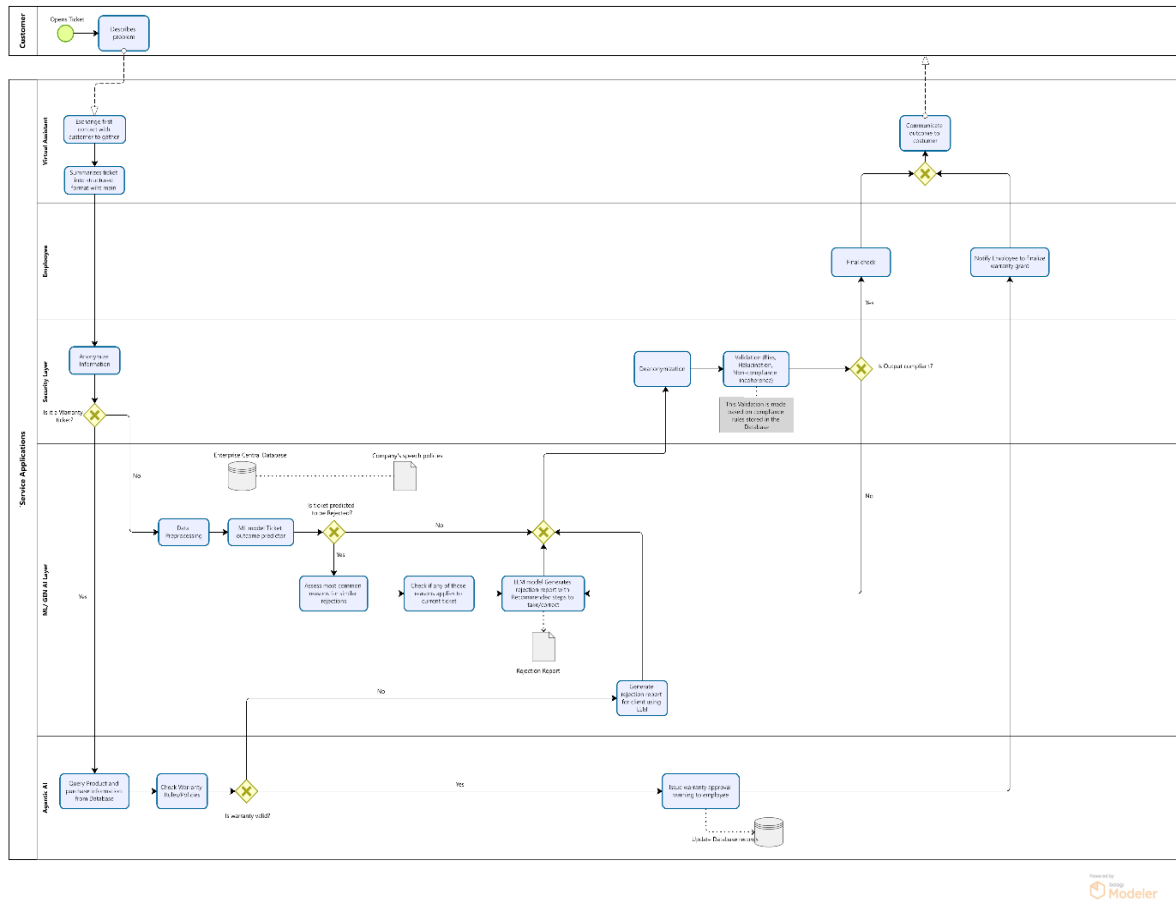


Figure 4.3 - Service Application Diagram

3 – From a Human Resource Management point of view, one of the applications that is possible to implement, can be recycled from Sarferaz's examples of the proposed architecture (Sarferaz, 2024) regarding Human Resources, where GEN AI is used to Automatically generate Job Descriptions and facilitate HR recruiting process. This solution would also be based on Large Language Models, where the collaborator would input the desired hard and soft skills, as well as other requirements that should be met by the applicant in a structured prompt that could even be stored as template to fill. Still in this line of thinking and similarly as the suggestion made in the previous point, onboarding processes could be optimized with

conversational models that were trained to provide answers regarding the company policy, tools, schedules, etc, most of the questions that serve the purpose of knowing more about the company so that the already existing employees don't have to lose a considerable amount of time going through these routine, but necessary, process.

Lastly, in a more advanced but also very helpful solution, it is common that enterprises send their employees anonymous satisfaction questionnaires. Later, HR teams need to analyze those surveys and build reports based on them. GEN AI could significantly improve the way these reports are executed, even if we only look at it from the time-saving perspective when building this Sentiment Analysis. After surveys submissions by the employees, their responses would be stored in a platform accessible by the AI provider (that could be the central database or a platform used to make the survey, but for this example, let's consider the central database), the data goes through an automated cleaning and transformation stage to structure and make it uniform and tokenizes the responses, i.e. turns the answers into singular words to be analyzed. Now, the Natural Language Processing (NLP) starts, using pre-trained models (Like BERT for ex) to classify the text as positive, negative or neutral. These classifications can then be aggregated and distributed through the available categories and/or Time periods, by joining them with past surveys (Monthly, Semestral, Etc.) and finally, using Large Language Models to create a narrative that incorporates what the data shows.

Note: Although the author of the Survey is anonymous, there could be Sensitive information in the answers, so it is essential to ensure that during the transformation stage or before that, the data goes through a security layer to anonymize the data being inputted to the NLP. The following images try to illustrate a suggestion of this process, as it could be a little harder to visualize than the others suggested.

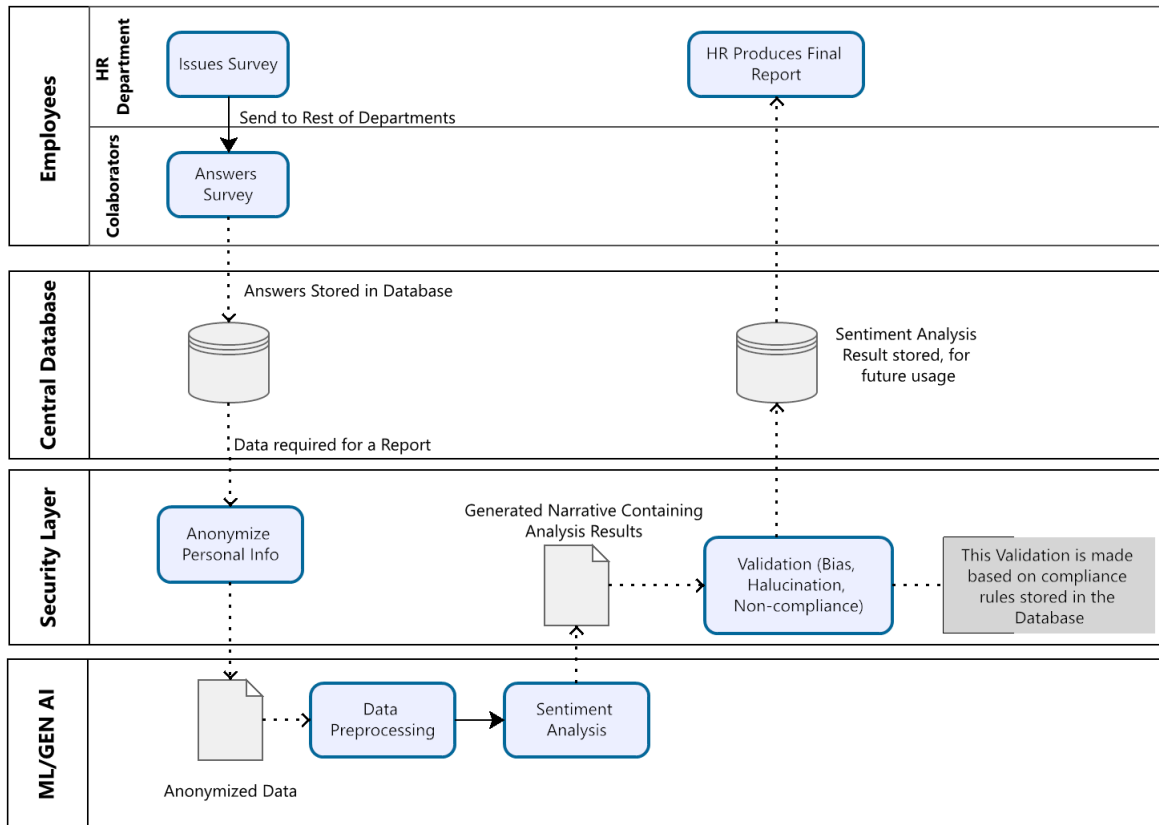


Figure 4.4 - HR Sentiment Analysis Data Flow

4 - Reporting Applications is an easy Module for GEN AI and Agentic AI integration to build a powerful solution. Since all the data for reporting is already in the Central Database, reporting processes can be enhanced by these tools as follows:

- **Recurring Reporting using Agentic AI:** This agent can be scheduled to execute periodic routines to automate periodic reports. For example, each month the agent could fetch the necessary data from the Database to produce monthly “sales summaries” reports.
- **Ad-Hoc Reporting using GEN AI:** This is already a reality for some applications, where users can prompt the system and get the desired reports. GEN AI is capable of dynamically generating code to fetch the necessary HR data and build the actual reports.

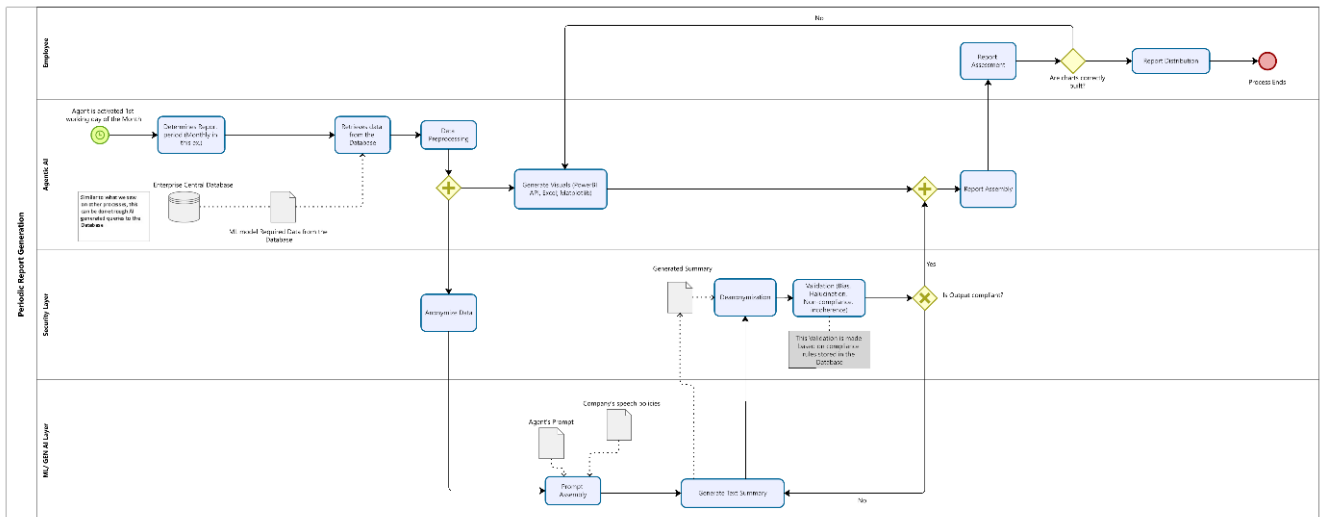
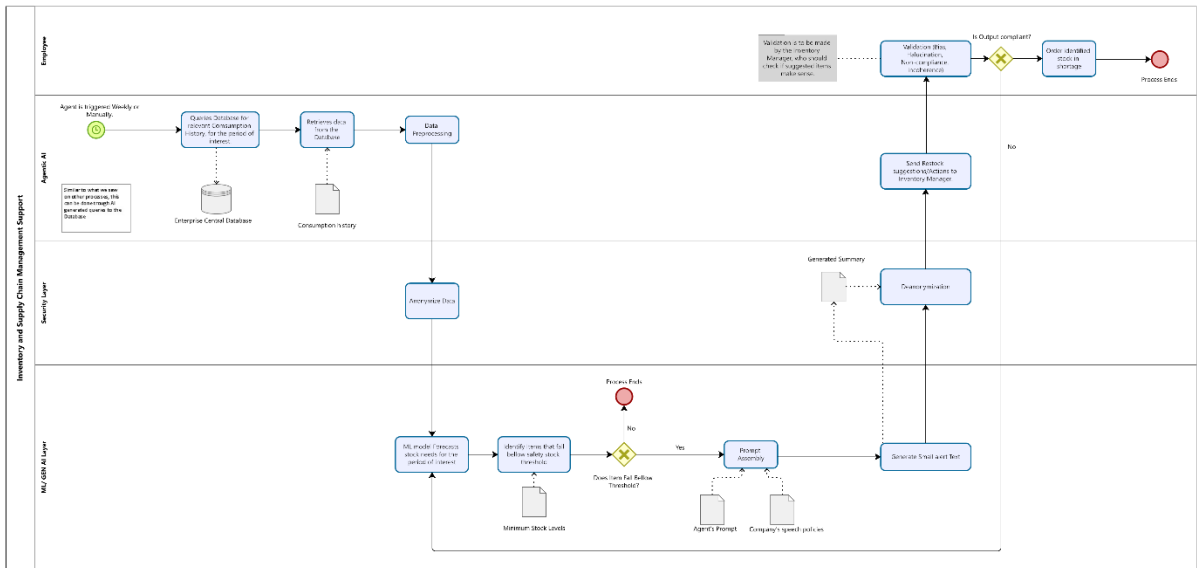


Figure 4.5 – Periodic Automated Report Generation

5 - Regarding Financial Applications Module, GEN AI could be used to generate automated reports (aided by the suggestion presented on the previous point) and to generate Invoices and email them to customers.

6 – Since Inventory and Supply Chain modules usually deal with inventory management a natural suggestion here is to get GEN AI through predictive machine learning algorithms to review stock levels and past trends and send warnings to relevant collaborators. For this, the ERP database would need to store a history of consumption as well as current stock. Using that information, a trained ML model would generate demand predictions regarding necessary stock levels as well as current stock levels based on current consumption rate and issue alerts for the items below a certain threshold. Although it might be included in point 4, but generate evaluation summarized reports on suppliers would be helpful to optimize operations. Finally, one interesting application, directed at warehouse personnel, would be Instructions Generator.



Powered by Camunda Modeler

Figure 4.6 – Automated Inventory and Supply Chain Management Support

It is important to mention that many ML models lose accuracy over time for many reasons and therefore, Human intervention is required for maintenance (feature importance reassessment, model retraining, incorporate new data). But to know exactly when to perform significant interventions in the system is very important to maintain a positive Cost/Benefit ratio. Considering this, one final recommendation for the application examples provided would be to implement automatic checks and monitor outcomes. For forecast applications, track the “prediction error” (registered actuals vs forecasted values) and follow accuracy decay overtime and if prediction error exceeds a certain threshold (considering the last N cycles) the application can issue an alert to retrain the models in use.

5. EVALUATION AND DISCUSSION

The proposed architecture was designed with the goal of extending the capabilities of traditional and intelligent ERP systems by embedding GEN AI tools into their various modules. In this section that proposal will be assessed. This assessment will be mostly based on the opinion of professionals of the field about the architecture that were obtained through their participation in a survey created by me and a self-evaluation before presenting the results of the survey. The self-assessment will be based on two complementary perspectives: (1) a conceptual and structural analysis of technical adequacy and (2) a pragmatic evaluation using standard software quality attributes - Performance, Scalability, Reliability, Maintainability and Security.

5.1.1. Structural Analysis

Functional Scope and Innovation

The architecture has six main modules - Sales & Delivery, Service, Human Resources, Reporting, Finance, and Inventory & Supply Chain - allowing a range of AI-enhanced use cases. These include predictive models, intelligent assistants, narrative generation, and agentic automation. The applications are oriented to real business operations and reflect current technological capabilities.

However, while most of the solutions are feasible with today's GenAI models, the architecture mostly reflects present-day implementations, with limited autonomy or adaptability over time. Modules like Finance and Reporting would benefit from deeper integration of GenAI beyond basic assistance and automation.

Evaluation: Strong in conceptual breadth and technical realism but a bit limited in bringing innovation.

Intelligence and Autonomy

The architecture integrates both predictive ML models (e.g., demand forecasting, ticket classification) and Generative AI (e.g., narrative generation, virtual assistants, code/report generation). In more advanced modules, such as Service and Reporting, Agentic AI components are proposed to automate sequences of tasks based on goals, memory and company-specific knowledge.

Nonetheless, some models - especially in Inventory and Sales Forecasting - rely on supervised learning that requires human intervention for retraining when business conditions change. Although a feedback loop is proposed (monitoring forecast accuracy and issuing retraining alerts), this limits the full autonomy of the system.

Evaluation: The architecture reflects an advanced but realistic application of AI in ERP. While Agentic elements are present, further research or design iterations could explore self-

retraining, reinforcement learning, or human-in-the-loop feedback pipelines to increase autonomy.

5.1.2. Software Quality Metrics Evaluation

Performance

This metric is one of those cases, where it is extremely hard to rate latency or response time, for example, given that the architecture has not been subject to real-world testing.

Evaluation: Not Applicable (N/A).

Scalability

Due to its modular structure, I believe that the architecture can be easily scaled horizontally, increasing services to support simultaneous processes and vertically, increasing the processing power of in-house hardware to facilitate data processing.

Evaluation: Positive.

Reliability

The proposed diagrams and pipelines focus on the “happy path” - i.e. ideal flows without handling failure states. There is minimal discussion on error recovery, fallback procedures, data validation failures or redundancy mechanisms.

Evaluation: Negative. A future iteration should consider exception handling, retry logic, and logging systems to improve robustness.

Maintainability

Maintainability is a core strength of the architecture. It embraces modularity and loosely coupled components. The use of ‘plug-in’ architecture for GenAI providers (allowing different vendors) and external (to the Model Generating content) policy/rule engines enhance flexibility and future adaptation.

Evaluation: Positive. Clear separation of layers and AI components supports easier updates and long-term evolution.

Security

Security was addressed via anonymization, compliance validation, and output control before presenting GenAI-generated results. While some classic concerns (like access control and user authentication) were not in scope, they are typically handled at the ERP platform level, and their exclusion is reasonable in this architectural layer.

Evaluation: Positive. Basic AI-related security measures were adequately planned, though further detailing of encryption, auditability and access layers could be improved.

5.1.3. External Participants Assessment

3 professionals from fields related to the topic have agreed to take part in the survey to assess the proposed architecture. The questionnaire that was made available for them is also available in the Annexes Section. These are the key takeaways taken from their answers:

The 3 of them found that the architecture is clear when addressing real ERP challenged and rated it as 4/5, still, one of the participants was not able visualize an implementation tailored to his/her context. The modules that elected as more useful/practical solutions (unanimously) were Human Resources and Sales and Delivery modules, followed by Finance and Reporting.

Concerns regarding the implementation were raised by one of the participants regarding the integration between multiple internal data sources, the main database that acts as a connection point to several applications, confidentiality, access controls and data Governance. Considering the assumptions made at the beginning of the architecture's presentation, where the assumption of the company possessing a well-established database, I think internal-integration becomes an easy to mitigate obstacle, because if enough data is there, then processes can be built to turn it into quality Data(if not already) to enable seamless integration and from there evolve to quality Information/Knowledge. Data Security and compliance, although were not as highlighted as possible, were still considered and some safety lines were introduced during the examples provided.

Participants have also indicated that, in their context, Data Availability or Quality as well as User resistance/Company culture are the biggest blockers to adopting AI in ERP systems.

HR and Financing were the modules that least impressed the participants, HR solution due to its high data maturity demand on the AI onboarding processes and cultural resistance to change human-traditionally performed processes into automated. Finance solution due to data sensitivity, compliance strict regulations and lack of trust in GEN AI for those subjects would make implementation hard to execute.

Some of the suggestions received on how to improve the architecture include: increasing alternative paths (i.e., to not consider only the "happy path") and to improve the explanation on how data integration between the database and GEN AI models will work.

Finally, 2 out 3 participants considered that the proposed solutions would solve at least one pain they have encountered in their work, with the third element being unsure whether it would or wouldn't solve any.

6. CONCLUSIONS AND FUTURE WORKS

In this final chapter of my thesis, I will point out the main conclusions that were drawn, a summary of the research, some limitations identified and future improvements that were left open to explore.

6.1. MAIN GOAL

This research project was developed with the initial intent of exploring the pairing between GEN AI and traditional ERP systems. Seeing the development of Generative AI and its incorporation in many Business processes motivated this project in the pursuit of shredding some light into the multiple possibilities of what could be achieved by pairing existing ERP systems and Generative AI.

Traditional ERP systems proved to be very useful throughout the years, evolving naturally to enhanced versions of themselves, specifically to I-ERPs which started to integrate AI tools in those software's. The principal objective of this research project was to add to the existing literature on ERP and contribute to its ongoing evolution, the incorporation of Generative AI on I-ERPs systems.

This research started with a Literature Review that was divided into two main sections. The first one was mainly focused on ERP systems independently, their definition, background, main architectures and ongoing trends toward Intelligent ERPs. The second one orientated to GEN AI, its definitions, popularized versions of the technology and tried to clear a little of its current utilizations to facilitate the proposed integrations with ERPs.

The central contribution of this work is the design and presentation of a modular architecture, for integrating GenAI capabilities across several of those core ERP modules — including Human Resources, Finance, Sales & Delivery, Services, Inventory, Manufacturing, and Reporting. The proposed use cases, created strictly as usage examples and not as strict applications, range from AI-powered assistants and narrative generation to predictive analytics, recommender systems, and Agentic AI designs, always ensuring data flow security, accountability, and compliance throughout the system.

Given that the entire project was very theoretical, to validate the practical value of the proposed architecture, a survey was designed and submitted to field experts with the aim of collecting qualitative feedback on the feasibility, innovation, and potential challenges of the proposed GenAI-enhanced ERP applications.

6.1.1. Intermediate Objectives

The intermediate objectives defined at the start of the research project were fulfilled, as follows:

- A study to comprehend I-ERP main concepts was carried out.
- GEN-AI interesting features were outlined, showing how many of those features could aid several business processes, often in more than one way.
- A concept model was built using the gathered knowledge.
- Through the examples created upon the models' design, some connector points were unveiled, displaying how the 2 technologies could be merged.
- The survey taken by professionals in different fields related to the topic allowed not only an external evaluation of the model but also an evaluation of the participant's knowledge on the field.

6.2. LIMITATIONS

The project was subject to some limitations that will now be discussed, to avoid being repeated in future work.

No real-world implementation: The architecture remains at a theoretical level. Due to time and resource constraints, no pilot deployment was carried out, which limits the validation of technical feasibility in a production environment.

Limited participation in expert validation: Despite outreach, not all invited professionals responded to the survey, reducing the breadth of feedback and insight from the industry, which can limit the number of detected flaws in the architecture.

Module-level focus: While various ERP modules were analyzed independently for GenAI integration, the study did not fully explore cross-module synergies or system-wide coordination (e.g., interaction between Sales and Inventory in real time).

Rapidly evolving technology: The field of GenAI is evolving quickly, and some tools or assumptions made during the study may become outdated as newer models, APIs, or governance frameworks emerge.

Legal and ethical complexity: While the architecture proposes security and validation layers (e.g., for anonymization, hallucination checks, policy compliance), detailed legal frameworks or dynamic compliance mechanisms were not implemented or deeply modeled.

Financial Impact: Estimating the financial impact of building and implementing this solution would have added an additional layer of realism to the proposal. However, this analysis was not conducted, as I considered it a different stage of this research and it would have required a significant time investment disproportionate to its relevance within the core research objectives. Given the exploratory and conceptual nature of the study, the focus remained on architectural feasibility and functional integration of GenAI in ERP systems.

6.3. FUTURE WORK

For starters, a pilot project, with implemented improvement suggestions collected from the survey

Also, improve the validation layers and adopt updated and more powerful technologies into the architecture, to create a more impactful solution

This research opens promising and important avenues for future research and development around the topic:

Real-world validation: A follow-up study could involve implementing the proposed architecture or selected modules within a real organization, followed by a case study or experimental evaluation.

Cross-module orchestration: Future work should investigate how GenAI agents could operate across multiple ERP modules simultaneously, enabling multi-contextual decision-making (e.g., syncing stock forecasts with sales trends).

Automated compliance updates: Building upon the architecture's validation layers, future studies could explore integrations with external legal and regulatory sources to enable auto-updating business rules and compliance checks using LLMs or rule engines.

Cost-benefit and performance benchmarking: Future research could quantify the economic impact, efficiency gains, and computational requirements of GenAI-enhanced ERP systems compared to traditional ones.

Context-specific adaptations: This study presents a general approach. Adapting the GenAI-enhanced ERP architecture to sector-specific needs (e.g., healthcare, retail, public sector) or even country-specific realities, could further increase its practical relevance.

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ANNEXES

Feedback on ERP Architecture Enhanced with Generative AI

Thank you for taking a few minutes to review and provide feedback on my proposed ERP architecture enhanced with Generative AI and Agentic AI.

Your insights will help evaluate its feasibility, identify implementation risks, and explore real-world applicability.

You DO NOT need to read the full thesis – a brief overview (PDF/slides) and architecture diagram will be provided.

Response deadline: 8 Days

1. Email *

First Impressions

2. How clear is this architecture when it comes to address real-world ERP challenges?

Marcar apenas uma oval.

1 2 3 4 5
Not Very clear

3. Can you visualize this structure and processes being applied to scenarios that are different of the mentioned ones, maybe scenarios more similar to your reality?

Marcar apenas uma oval.

Yes
 No

Annex A – Questionnaire delivered to participants

4. In case your answered "Yes" in the previous question, please feel free to provide examples (Not mandatory).
In case your answer was "No", please clarify why it becomes hard to apply it in your context.

5. Please select the GEN-AI enhanced module(s) that you perceived as more useful or practical, if there was any.

Marcar tudo o que for aplicável.

- HR
- Finance
- Sales & Delivery
- Inventory & Supply Chain
- Manufacturing
- Reporting
- None of the above

Avançar para a pergunta 6

Feasibility and Implementation Risk

6. Are there any GEN AI features in this proposal that seem too complex or difficult to implement in your reality?

Marcar apenas uma oval.

- No
- Yes (please elaborate on the next item)

7. If you previously answered "Yes", please explain which features seem to complex or difficult to implement and why.

Annex B - Questionnaire delivered to participants

8. In your experience, what are the biggest blockers to adopting AI in ERP environments?

Marcar tudo o que for aplicável.

- Data availability or quality
- User resistance or culture
- Legal / compliance restrictions
- Tooling or infrastructure integration
- Unclear ROI / cost
- Lack of GenAI maturity
- Outra: _____

Feedback and Improvement

9. Does any of the presented solutions seem too "futuristic"/unfeasible? Please explain why in the next item.

Marcar tudo o que for aplicável.

- HR
- Finance
- Sales & Delivery
- Inventory & Supply Chain
- Manufacturing
- Reporting
- None of the above

10. Please explain your previous selection(s).

Annex C - Questionnaire delivered to participants

11. Do any of the proposed solutions seem unoriginal or not particularly innovative from your perspective?

12. **In your opinion**, which element of this architecture needs to be improved the most and how?

13. Would this architecture solve any pain points you've encountered in ERP work?

Marcar apenas uma oval.

- Yes
 No
 Not Sure

Annex D - Questionnaire delivered to participants



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