

POLITECNICO DI TORINO

**Collegio di Ingegneria Gestionale e della Produzione
Corso di Laurea Magistrale in Management Engineering**



**Implementation of the NetSuite ERP system for
cost monitoring in prototype production: the case
of M.R.M. S.R.L.**

Supervisor:

Prof. Giulia Bruno

Candidate:

Andrea Pieraccioli

A.Y. 2023/2024

Abstract

The implementation of the NetSuite ERP system in the company M.R.M. S.R.L., specialized in prototyping and production of small volumes for the automotive and aerospace sectors, represents a response to the need to optimize cost management and resource planning. NetSuite, by integrating company data into a single centralized platform, allows you to monitor production activities, overcoming the limits of traditional Excel spreadsheets and allowing more precise and efficient control of processes.

The pilot project, focused on the *Ferrari F2XX Scocca* order, demonstrated how NetSuite can significantly improve operational management. Key benefits include continuously updating financial data, automating cost allocation, enabling faster, more informed business decisions. The centralization of information has also facilitated collaboration between departments, reducing errors related to data duplication.

With advanced reporting and analytics tools, NetSuite has enhanced M.R.M. S.R.L.'s ability to compare real and estimated costs, improving visibility into operating margins. The positive results of the pilot project highlight the potential of NetSuite as a strategic tool to increase business competitiveness, suggesting an expansion of use to other projects and an expansion of its functionality to further increase efficiency and management control.

Index

1. Introduction	6
1.1. Objective of the study	6
1.2. Thesis structure	7
2. ERP Systems	9
2.1. Importance of ERP Systems for Automotive Manufacturing Companies.....	10
2.2. Introduction to NetSuite.....	12
2.2.1. Features.....	12
2.2.1.1 NetSuite Basic Architecture	12
2.2.1.2 Communication and Collaboration	13
2.2.1.3 Active Cycle.....	13
2.2.1.4 Passive Cycle.....	14
2.2.1.5 Administration and Control.....	14
2.2.1.6 Production and Logistics	14
2.2.2. Benefits of Implementing NetSuite	14
2.2.3. Screenshot and visual explanation.....	15
3. Literature Review	18
3.1. Search methodology and selection criteria	19
3.1.1 Research query definition.....	19
3.1.2 Exclusion Criteria.....	20
3.1.3 Eligibility	20
3.2. Search results	22
3.3. Challenges in ERP System Implementation	26
3.3.1. Main Challenges identification.....	26
3.3.2. Sources Analysis	33
3.4. Critical ERP Implementation Success Factors	34
3.4.1. Critical Success Factors Identificaiton	35
3.4.2. Sources Analysis	40
3.5. Benefits of implementing ERP systems.....	41
3.5.1. Main Benefits Identification.....	42
3.5.2. Sources Analysis	46
3.6. Conclusion and Future Developments	46
4. Company Description and Current Use of NetSuite at M.R.M. S.R.L.	48
4.1 Overview of M.R.M. S.R.L.	49
4.1.1 Company Profile.....	50
4.1.2 Company Organizational Structure	51

4.1.3	Mission	52
4.1.4	Production Processes	52
4.1.5	Automotive Plant Layout	54
4.1.6	Customers	57
4.1.7	SWOT Analysis.....	59
4.1.7.1	Strengths.....	59
4.1.7.2	Weaknesses	60
4.1.7.3	Opportunities.....	60
4.1.7.4	Threats.....	61
4.2	Challenges in Job Costing and Production Management	62
4.2.1	Job Costing Challenges	62
4.2.2	Production Management Challenges.....	64
4.3	NetSuite Utilization at M.R.M. S.R.L.	65
4.3.1	Sales Department.....	68
4.3.2	Purchasing Department.....	69
4.3.3	Logistics and Shipping Management Department.....	71
4.3.4	Administration and Accounting Department.....	72
4.3.5	Considerations on the current use of NetSuite in M.R.M. S.R.L.	73
5.	Definition and Categorization of Productive Costs for Prototyping Projects at M.R.M. S.R.L.....	75
5.1	Productive Costs Classification	75
5.1.1	Fixed Costs	76
5.1.2	Variable Costs	77
5.2	Hourly Cost Calculation	81
5.2.1	Hourly Labour Cost Calculation	81
5.2.2	Hourly Machinery Cost Calculation.....	82
6.	NetSuite ERP Implementation Strategy at M.R.M. S.R.L.....	87
6.1	Overview of the implementation approach.....	87
6.1.1	Ferrari F2XX Project Planning.....	88
6.2	Development of the Ferrari F2XX project.....	89
6.2.1	Project creation, Budgets definition and Customer Order entry	91
6.2.2	Creation of product master data.....	96
6.2.3	Assembly creation and input of the work cycle	97
6.2.4	Creating Work Order and Production Status Updates.....	101
6.2.5	Economic and productive control of the project	102
6.2.6	Current Excel-based cost tracking method.....	103
6.2.7	Accuracy Check of Worked and Reported Hours	107

6.2.8	Benefits of implementing cost tracking in NetSuite.....	109
7.	Conclusions	116
7.1	Recommendations for future NetSuite deployments and expansions	117
	Bibliography	119

1. Introduction

In recent decades, ERP (Enterprise Resource Planning) systems have established themselves as indispensable tools for business management, particularly in the manufacturing sector, where operational efficiency and asset tracking are key elements for achieving success.

ERPs centralize and integrate information from different business areas, such as manufacturing, logistics, finance, and human resources, creating a single database. This allows you to get a complete and up-to-date view of your business operations. With this level of integration, you can reduce errors, improve communication, and facilitate decision-making.

Adopting an ERP system offers numerous benefits, including increased productivity, improved monitoring of operations, and more transparent and effective cost management. However, implementing an ERP can prove to be a remarkably complex and expensive process, with several technical and organizational challenges to be addressed. For this reason, an understanding of the specific business needs, careful planning of the implementation phases of the system, with particular emphasis on the involvement of all stakeholders to ensure the success of the project is required.

This thesis focuses on the case of the company M.R.M. S.R.L., specialized in the production of prototypes and small series production for the automotive and aerospace sectors. M.R.M. S.R.L. has decided to implement the NetSuite ERP system to meet the growing need for reliable and transparent management control. This thesis discusses the difficulties the company has encountered in managing its operations and discusses how the implementation of NetSuite can represent a solution to current challenges, contributing to an effective digital and operational transformation.

1.1. Objective of the study

This research work has several objectives to examine the level of use of NetSuite in M.R.M. S.R.L. and to study the impact on business processes following its implementation. Specific objectives include:

- Analyze the operational and financial challenges that M.R.M. S.R.L. faces on a daily basis in the management of production costs and in the planning of activities. This

analysis will help identify critical areas where the ERP system can offer effective solutions.

- Evaluate the suitability of NetSuite as an ERP solution to address the identified challenges and issues that emerged. NetSuite is an integrated ERP platform with specific modules for accounting, logistics, order management and production control, which adapts to the business needs of M.R.M. S.R.L. and can facilitate centralized information management.
- Develop a NetSuite implementation strategy, on a pilot project, focused on cost monitoring. This strategy will consider the specific characteristics of M.R.M. S.R.L., such as its engineer-to-order (ETO) model and the need for flexibility and adaptability in the management of prototyping projects.
- Evaluate the effect of NetSuite implementation on M.R.M. S.R.L.'s business processes and performance in terms of operational efficiency, data transparency, and cost control. This analysis will allow you to understand how the adoption of an ERP can optimize processes and improve business performance.

1.2. Thesis structure

The thesis is divided into 7 chapters that analyze different aspects of the ERP NetSuite implementation and its impact on M.R.M. S.R.L.:

- **Chapter 1:** Offers an introduction to ERP systems and the challenges related to their implementation, also outlining the objectives and structure of the thesis.
- **Chapter 2:** Explores the topic of ERP systems as a whole, explaining their benefits and providing an overview of their importance for manufacturing companies. Particular attention is placed to the NetSuite ERP software present in M.R.M. S.R.L., describing its characteristics, architecture and main functionalities, such as centralized data management and integration between modules.
- **Chapter 3:** Presents a systematic review of the existing literature on ERP systems in manufacturing, with particular emphasis on the challenges, critical success factors, and benefits that such systems bring to the companies that adopt them.
- **Chapter 4:** Provides an overview of the M.R.M. S.R.L. company, illustrating its organizational structure, the production processes it offers and the customers to whom it is proposed. Finally, the chapter explores the current use of NetSuite within the company, describing the routines of the various company employees operating

on the system, and the considerations that emerged from an in-depth analysis of their practices.

- **Chapter 5:** Analyzes the definition and categorization of productive costs in M.R.M. S.R.L.'s automotive prototyping projects, explaining how these costs affect the overall management of production. In addition, it presents the methodology used to calculate the hourly costs of the processes that the company offers on the market, thus creating a solid foundation for monitoring the profitability of orders.
- **Chapter 6:** Illustrates the NetSuite implementation process in M.R.M. S.R.L., with particular reference to the *Ferrari F2XX Scocca* pilot project. The section describes the various implementation phases, the difficulties encountered, and the solutions adopted in order to achieve the established goal: the tracking of production costs on the system. It also compares the use of the ERP system to the previous Excel spreadsheet-based method, evaluating the benefits gained in terms of data accuracy and transparency and ease of access to financial information.
- **Chapter 7:** Concludes the thesis by presenting a summary of the main results obtained from the implementation of NetSuite in M.R.M. S.R.L. and provides recommendations for potential future projects for the implementation and expansion of the ERP system within the company.

This structure allows a clear and detailed view of the process of implementing ERP systems in manufacturing companies, providing a concrete example of the impact of NetSuite on business management in a complex and tailor-made production context such as that of M.R.M. S.R.L.

2. ERP Systems

ERP (Enterprise Resource Planning) systems are integrated software solutions that support the management and coordination of all business resources and processes. Thanks to these systems, departments such as: production, logistics, finance and human resources can access a unified and centralized database, facilitating the sharing of real time information and reducing data duplication. In an increasingly globalized economy, this integration becomes essential to obtain and maintain the competitiveness of companies over time.

Originally developed by MRP (Material Requirements Planning) systems in the 1960s [1], ERP systems have evolved to include functions such as financial management, accounting, and sales, expanding their use to small and medium-sized businesses (SMEs) as well. This has happened mainly thanks to the significant advantages in terms of efficiency and control they offer.

The main goal of an ERP system is to centralize information [2], allowing for a more comprehensive analysis and informed and timely decision-making. Key features include specific modules for financial, operational, and human resources management, each designed to streamline workflows and improve communication between different departments.

There are many benefits to implementing an ERP system, including increased operational efficiency through process automation, which directly leads to an increase in overall productivity. By centralizing data, ERP systems reduce the risk of errors and ensure the validity and reliability of information, facilitating rapid communication between departments. Inventory management also benefits significantly: ERP systems monitor stock levels, preventing resource depletion and excessive accumulation of materials, allowing you to have a clear and timely overview of the materials in the company.

However, implementing an ERP system can come with some challenges, including upfront investment costs, which can be high, and the need for meticulous planning and the involvement of an experienced internal team. Employee resistance to change can hinder adoption, making active user engagement and proper training critical.

In summary, ERP systems are essential tools for businesses looking to optimize operations management. They provide opportunities to improve efficiency, visibility, and control. It is essential to carefully evaluate the benefits and challenges of implementing them, ensuring a significant commitment in terms of resources and change management should you decide to start an ERP transformation project.

2.1. Importance of ERP Systems for Automotive Manufacturing Companies

The importance of ERP systems in the manufacturing sector, and particularly in the automotive industry, is evident in their critical role in integrating essential business processes. These systems, integrating all business processes, offer a complete platform that brings significant advantages in an increasingly global competitive market.

Manufacturing companies, particularly those in the automotive sector, can benefit enormously from using ERP systems, especially as they manage complex supply chains and a high volume of data. The evolution of ERPs has its roots in MRP systems, which are designed to plan and organize production. Over time, ERP providers have expanded the software's capabilities to include supply chain management, supplier relationships, via Supplier Relationship Management (SRM), and customer relationships using Customer Relationship Management (CRM), making these systems increasingly comprehensive and integrated.

One of the main benefits of ERP systems is increased operational efficiency. By automating business processes, these systems reduce the need for manual intervention, allowing employees to focus primarily on high-value-added tasks and strategic tasks, avoiding wasting time on reporting tasks, which could also be repetitive and involve the risk of errors. In addition, access to up-to-date, centralized data promotes more precise production planning, optimizing the use of resources and minimizing waste. In the automotive industry, supply chain management requires high monitoring of quality requirements and effective management of information on the raw materials used, making the implementation of an ERP system crucial to maintaining high standards.

Integration with Internet of Things (IoT) devices provides real-time and reliable visibility of the supply chain, allowing companies to promptly identify inefficiencies that can result in

processes and optimize the use of resources. By centralizing data, ERP systems eliminate problems related to duplication of information and miscommunication between departments.

ERP systems also improve collaboration between departments, streamlining business processes, promoting more effective communication, and increasing overall efficiency. The adoption of an ERP also leads to the standardization of processes, reducing the risk of variability in product quality and facilitating compliance with industry regulations.

In addition, optimized inventory management allows for real-time monitoring, ensuring that materials are always available for production, avoiding excessive costs related to overstock. For example, the production department can check the updated data from the warehouse before the start of a production cycle, having the guarantee that raw materials are available.

An additional benefit is the support for data-driven decision-making. Integrating IoT data with the analytical capabilities of cloud-based ERPs provides valuable insights that support strategic decisions, helping to reduce non-value-added activities in favor of those with higher profitability, helping to achieve a competitive advantage.

Scalability is another key feature of ERP systems, allowing the platform to be adapted as businesses grow. The modular architecture, with which the ERP systems are supplied, allows the implementation of specific modules according to needs and allows the addition of additional features in line with any business expansion.

However, implementing an ERP system presents significant challenges, such as high costs and the need for customization. It is crucial to carefully consider whether to adopt agile or planned methodologies on which to base the internal transformation process. In addition, implementation often requires necessary changes in business processes and organizational culture, which can meet resistance if the benefits are not understood. Therefore, staff training and involvement are essential for the success of the project.

In conclusion, ERP systems are critical for automotive manufacturing companies that want to stay or become competitive in an ever-changing landscape. They offer benefits such as improved operational efficiency, supply chain visibility, and informed decision-making. However, it is essential to proactively address the challenges associated with implementation

by planning appropriately, providing training, and ensuring the necessary support to maximize the success of the project.

2.2. Introduction to NetSuite

NetSuite is a comprehensive, integrated ERP solution designed to meet the operational and strategic needs of manufacturing companies. In a competitive and rapidly changing environment, businesses need systems that centralize data and simplify process management, allowing them to improve efficiency, reduce costs and optimize the use of resources.



Figure 1: NetSuite logo

NetSuite proposes itself as an answer to these needs, providing a unified and scalable platform, usable on any device and on any operating system, which manages all the main business functions, from accounting to logistics, from warehouse management to communications.

2.2.1. Features

This paragraph discusses the key features of NetSuite and the benefits that businesses can gain by choosing to implement this ERP platform.

NetSuite stands out for its wide range of features designed to address a variety of business needs and support day-to-day operations. These capabilities cover six major operational areas, each of which offers specific benefits for business process improvement.

2.2.1.1 NetSuite Basic Architecture

One of the key aspects of NetSuite is its basic architecture, which is designed to ensure secure and well-structured data storage, capable of supporting companies in managing and synchronizing information. The system allows you to store and manage important data for business management, such as customer and supplier information, items, price lists and warehouses, structuring them into setting and configuration tables for customizing the system.

In addition, NetSuite allows automatic updating of data between different companies within a group, ensuring consistency and accuracy, regardless of the geographical location of the different operating locations.

This architecture also facilitates the import of data from external sources, such as Excel spreadsheets, by easily and directly integrating pre-existing information and reducing the need for manual transfers. This functionality takes on a certain relevance especially in technological transition projects.

2.2.1.2 Communication and Collaboration

NetSuite allows the efficient and personalized management of all interactions with customers, both current and potential, and with suppliers. With this feature, companies can maintain stronger, more focused relationships by responding quickly and accurately to their partners' needs.

In addition, the platform offers the possibility of visualizing company data immediately through graphic representations on geographical maps. This allows you to have a clear overview of your business operations and identify areas of interest.

Advanced tools are also available for archiving and searching any scanned document, regardless of its nature and when it is requested. This ensures that information is always easily accessible and organized.

Finally, it supports communication via SMS, triggered by specific events in the management system. This feature allows you to send timely notifications, further improving responsiveness and relationship management with customers and suppliers.

2.2.1.3 Active Cycle

NetSuite simplifies the management of the accounts receivable, which includes all sales-related operations, such as the management of: quotes, quotes, related commercial documentation and customer relationship management. The platform provides an integrated view of business activities, allowing you to monitor sales trends, calculate commissions, and generate detailed reports. This functionality is critical to supporting business planning and providing an accurate picture of sales performance and customer relationships, thereby optimizing interactions and business opportunities.

2.2.1.4 Passive Cycle

The passive cycle deals with the management of purchasing operations and relationships with suppliers. NetSuite provides advanced tools that allow easy control of invoices, management of contracts with suppliers and organization of distribution and contract manufacturing.

These features allow the company to optimize procurement processes and improve the management of services and materials acquired, thus ensuring a solid and transparent relationship with suppliers.

2.2.1.5 Administration and Control

One of the main features of NetSuite is administrative management and effective business control, which allow the company's management to create performance forecasting charts and in tax and financial management.

NetSuite allows you to effectively monitor payables and receivables, reconcile bank transactions with ordinary transactions and control operating costs. The platform is designed to ensure tax compliance and to simplify administrative practices, making available a series of modules that include the management of tax activities, debt collection and cost accounting, thus offering strategic support to corporate governance.

2.2.1.6 Production and Logistics

NetSuite optimizes the company's production and logistics cycle, providing tools to efficiently manage warehouse organization, inventory accounting and monitoring of orders in production. The platform allows you to automatically assess supplier needs, improving supply chain management and ensuring constant availability of materials and resources. In addition, NetSuite supports the quality control of products and services sold and facilitates the monitoring of after-sales information. This translates into a strategic advantage in terms of operational efficiency and information flow between the various departments.

2.2.2. Benefits of Implementing NetSuite

In the following paragraph, the main advantages that a company can benefit from thanks to an adequate application and use of the NetSuite ERP system are summarized.

A correct adoption of NetSuite as an ERP system allows companies to take advantage of numerous strategic advantages, improving the management of daily operations and optimizing processes.

The main benefits include:

- **Full Integration:** NetSuite allows you to automate and connect different business processes, eliminating data duplication and reducing the margin of human error. Thanks to its modular architecture, the system facilitates efficient management of company resources, improving information consistency and promoting unified operating practices.
- **Data Security and Accessibility:** Data security is a priority for NetSuite. The platform ensures secure storage of all company information and allows a high level of data accessibility from any device or operating system, thus supporting remote work and collaboration between possible different locations.
- **Business Planning and Cost Control:** With advanced reporting tools and forecasting charts, NetSuite enables managers to continuously monitor business performance and make informed decisions in real time. Automated management of cash flows, including payables and receivables, along with bank reconciliation, promotes tight cost control and reduces operational risks.
- **Logistics and Production Optimization:** NetSuite improves operational efficiency through effective warehouse and inventory management, ensuring optimal material availability and continuous production monitoring. The platform allows you to reduce waste and improve customer service through an accurate evaluation of supplier performance and careful quality control.

2.2.3. Screenshot and visual explanation

To provide a clearer understanding of NetSuite's features and user interface, this section will include screenshots and visual explanations highlighting some of the key functionalities.

- **Main dashboard:** shows the central hub for accessing the various features.

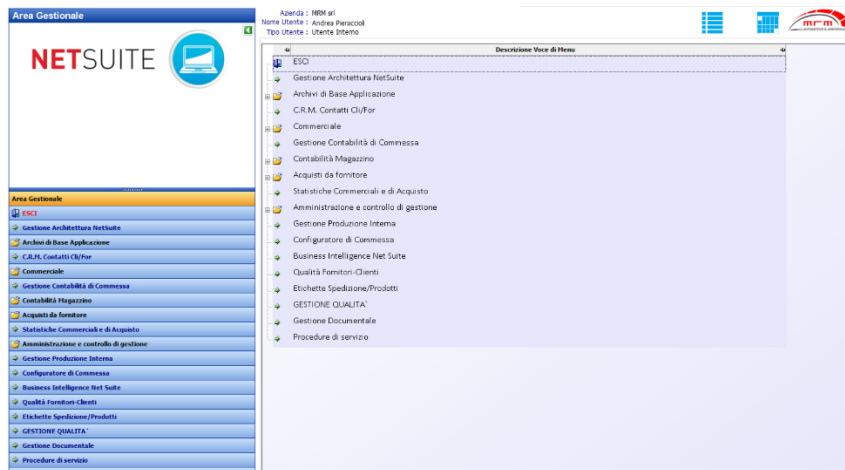


Figure 2: Main Dashboard

- **Tables Management:** The core of NetSuite, fully adaptable to the business needs.

Esci + Aggiungi Elemento Refresh Griglia Stampa

Trascina Qui Per Raggruppare

Descrizione	Tipologia Tabella	A=Annull	Codice Elemento
▶ Tabelle di installazione			01
Tabelle comuni			02
Tabelle di magazzino			03
Tabelle di marketing			04
Tabelle fiscali			05
Tabelle delle commesse			06
Tabelle della produzione logistic			09
Tabelle Contabilità			10
MATERIALE RICEVUTO IN CONT			CL
MATERIALE ACQUISTATO CON			CV

Figure 3: Tables Management

- **Document management:** document storage and retrieval interface, shows the screen through which users interact with the created documents.

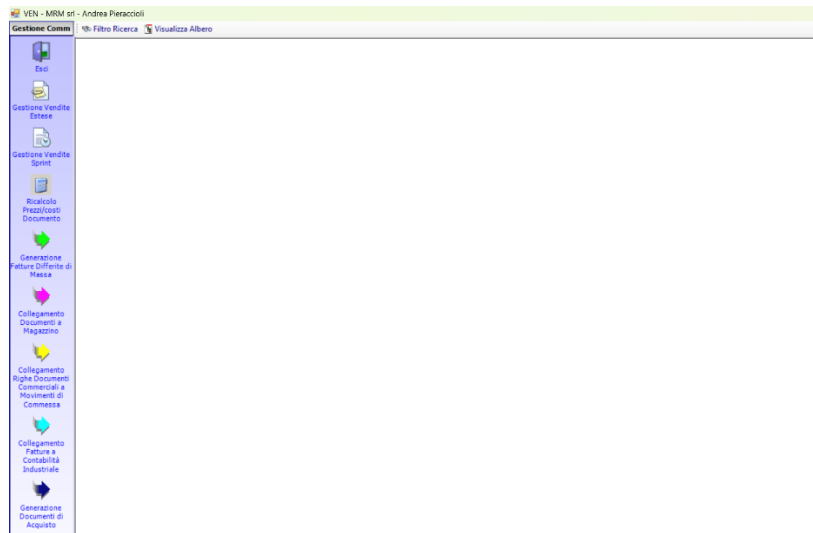


Figure 4: Commercial Documents Management

3. Literature Review

The implementation of ERP systems is an important step for organizations, as it allows you to centralize and optimize business processes. While there are numerous possible benefits of implementing these systems in companies, it is also crucial to consider some significant challenges that may arise during the various stages of project development and compromise its implementation.

For this reason, it is necessary to have an in-depth understanding of the main difficulties encountered by companies during the implementation phases of these transformation projects, the critical success factors that characterize their success and the benefits that can be obtained from the use of these new practices.

In this chapter we will present a systematic analysis of the literature concerning the implementation of ERP systems in manufacturing companies with the aim of answering the following research questions:

- **RQ1:** What are the most significant challenges that emerge during the implementation of ERP systems, in particular, in contexts of transition to Industry 4.0?
- **RQ2:** What are the critical success factors and best practices for effective ERP project management in manufacturing?
- **RQ3:** How does the adoption of ERP systems affect business process integration and performance improvement in manufacturing companies?

To address these questions, the chapter is organized as follows.

The first part presents the research methodology used to conduct a detailed analysis of the literature, with an in-depth description of the tools used and the sources considered for data collection.

Subsequently, the preliminary results that emerged from the documents resulting from the research are illustrated, highlighting the main issues covered, in order to provide a clear overview.

For each article reviewed, the following elements are described: the main topic of the article and the objectives of the research, the key findings that emerged from the study, with an analysis of the most significant conclusions and gaps identified in the current research and potential directions for future studies.

In the following paragraphs, the following topics will be covered:

- The challenges and critical issues, both already emerged and potential, related to ERP software implementation projects in manufacturing companies.
- The analysis of the strategies adopted to address the most common difficulties and improve the effectiveness of ERP systems, with the aim of offering practical recommendations for companies undertaking this complex digital transformation process.
- An in-depth look at the main benefits that derive from the implementation of such systems.
- Finally, a final overview of the results obtained will be presented.

The aim of this research is to contribute to the existing literature, offering an in-depth analysis of the critical issues related to the implementation of ERP systems and identifying effective solutions to ensure the success of these projects in complex business contexts.

3.1. Search methodology and selection criteria

This section describes the methodology with which the bibliographic research was conducted. The literature search was conducted mainly by reference to the Scopus database, which was selected for its comprehensive coverage of scholarly articles across relevant fields such as engineering, business, and management.

3.1.1 Research query definition

The following keywords considered relevant to the topic addressed were used:

- "ERP", "enterprise resource planning"
- "manufactur*", "automotive"
- "cost*", "financial*", "budget*", "expense*"
- "monitor*", "analyze*", "control*", "manage*", "trace*"
- "success factors", "challenges"

combining them with the Boolean OR operators within the collection to which they belong.

Keywords were used to search for titles, abstracts and text articles.

Following this first phase of article identification 49,899 articles were found to have been used in the first group of keywords and the second group 1,772,301 articles.

From the third set 4,988,653 articles, from the fourth 43,780,228 articles and finally 3,039,046 articles from the fifth group of keywords.

By combining the 5 groups of keywords with the AND operator, 172 articles were identified.

3.1.2 Exclusion Criteria

In order to conduct a more targeted search, focusing on the topic of interest, the articles were further filtered, according to the following exclusion criteria:

EX 1: Publication year range: Only articles published between 2014 and 2024 were considered. All publications prior to 2014 have been excluded in order to focus on recent and relevant developments.

Therefore, all papers published before 2014 were excluded from the research.

EX 2: Subject areas: Contributions have been limited to specific subject areas relevant to engineering, computer science, economics, management and accounting, decision sciences and economics, econometrics and finance. These areas were the most relevant for the focus of this thesis. For this research, papers that are not in these areas have been excluded.

EX 3: Document Type: The selection focused on three specific document types: Conference Papers (CP), Articles (AR), and Reviews (RE).

Other types of publications such as book chapters, editorials, and notes have been excluded to keep the focus on peer-reviewed research.

EX 4: Language: Only articles published in English were considered, ensuring accessibility and consistency of the review.

After the application of these exclusion criteria, 63 articles were obtained.

3.1.3 Eligibility

Subsequently, the eligibility phase was conducted on the 63 resulting articles to define the final definitive articles to be considered for the thesis document, the steps of the eligibility phase carried out were the following:

1. Reading of the title and abstracts of the articles found through the keyword search, the title and abstract must be relevant to the purpose of this search, if the answer is yes, the article is subjected to a further eligibility step.
2. Reading of introduction and conclusion or results of articles that have been approved in eligibility phase 1, in the case of introduction and conclusion relevant to the topic, the article is considered for research.

The first phase of eligibility was successfully passed by 46 documents.

Finally, 22 articles were considered and analyzed for the study, as they successfully passed both eligibility phases and were accepted and considered for the research as each of them contained the answer to at least one of the three research questions.

This procedure is reported below in the following flow chart:

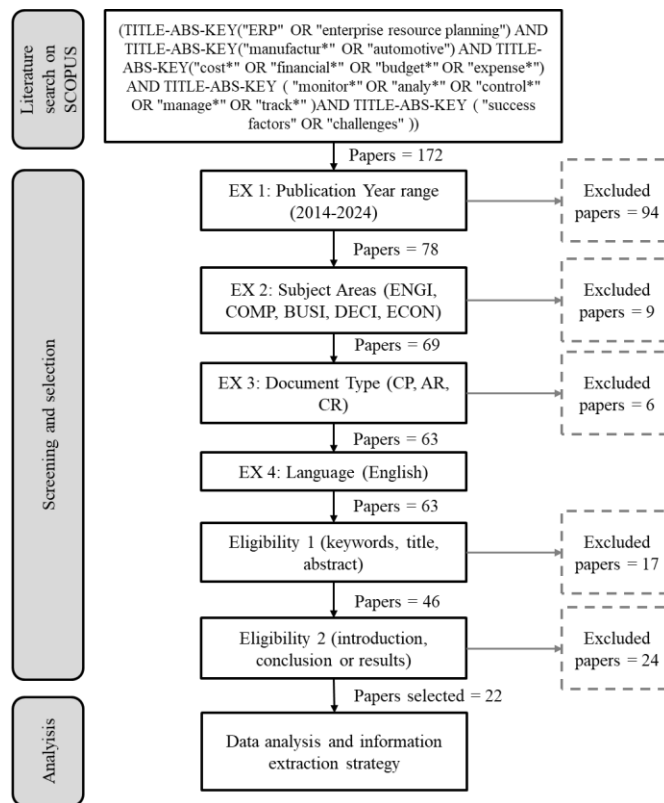


Figure 5: Literature review methodology

Through the use of the VOSviewer software it was possible to see which keywords were mentioned in 2 or more documents of the 63 analyzed, the information was used to initially identify some main clusters.

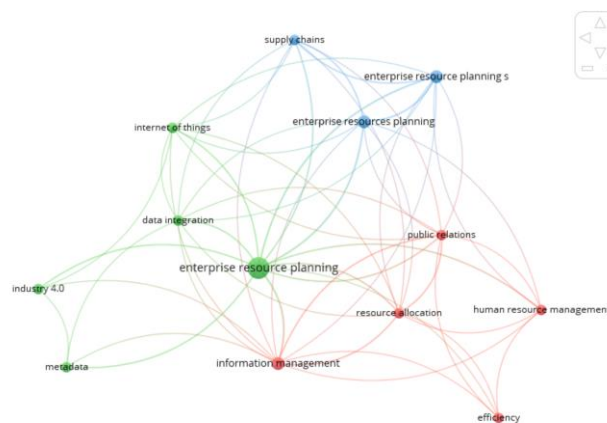


Figure 6: Keywords in at least 2 documents via the VOSviewer software

3.2. Search results

This paragraph lists the articles considered for the literature review conducted in this document. The articles are sorted by the thesis citation order.

They are presented through a table that summarizes them, for each document it is indicated: the reference number, the main topic covered, the key result obtained, and the gaps identified, to guide future research in the field.

Rif. N°	Focus	Key Findings	Gap Addressed
1	Study the critical success factors (CSFs) that influence ERP adoption in the Jordanian manufacturing sector using the Technology-Organization-Environment (TOE) framework.	Identification of key CSFs that significantly influence the success of ERP implementation projects such as: competitive pressure, vendor support, compatibility and solution complexity.	Need for broader studies encompassing various sectors beyond the manufacturing context to examine other impact factors.
2	Identify challenges that emerged in ERP implementation at an LED manufacturing company in Malaysia, with a focus on supply chain management.	Identify issues that can lead to the failure of ERP implementation projects, such as: server downtime and lack of training. It also highlights the need for managerial commitment.	It considers it appropriate to study the processes of user adaptation and the broader impacts of ERP systems in the various production contexts.
3	Examines the implementation of BaSyx middleware in SMEs for the use of Industry 4.0 principles through two case studies.	Identification of the benefits of introducing BaSyx, which primarily enables efficient data integration and process automation, improving responsiveness and productivity.	The need for standardized approaches is highlighted, especially in the various contexts of SMEs.
4	Explore the critical success factors (CSFs) that influence ERP implementation in SMBs in Thailand using qualitative and fuzzy weighting methodologies.	Identification of key activities during the ERP implementation phases, with particular emphasis on managerial support and training.	Need for further studies exploring CSFs in different contexts and the long-term impacts of ERP implementation on business performance.
5	Analysis of the integration of IoT into ERP systems, investigating benefits,	IoT integration improves ERP with real-time data and efficiency, but addresses challenges such as data management and security.	Need for studies on data management solutions and communication challenges in IoT-enabled ERP systems.

	challenges and impacts in various sectors.		
6	Analyze the decision criteria for selecting between agile and traditional approaches in ERP implementations across companies.	The study shows that decision-makers face difficulties in distinguishing between implementation strategies. First, cost prioritization is significant in agile projects over traditional ones.	Further studies are needed on the factors influencing ERP implementation decisions in various industries in addition to the study sample.
7	Analyze production planning and software control in Engineering-to-Order manufacturing (ETO), highlighting tools, implementation methods, challenges, and benefits.	Use production planning and control (PPC) tools to improve production efficiency, planning, and decision-making. Overview of challenges in flexibility, in-house expertise, and data management.	Need frameworks that integrate customized PPC system solutions against the unique requirements of ETO environments.
8	Analyze how Germanic accounting logic is incorporated into SAP ERP systems and what is its impact on organizations during project implementation.	The SAP system spreads a specific accounting logic throughout the organization, creating challenges to manage due to the alignment of managerial accounting practices in the company's subsidiaries.	Need for further research on the effects of different accounting logics on ERP implementation in various cultural and organizational contexts.
9	Examine how ERP adoption impacts companies' performance in the automotive ancillary industry.	The article shows a significant improvement in performance indicators such as cost and time efficiency.	Further studies on the long-term impacts of ERP systems in various industries beyond automotive/manufacturing are considered necessary.
10	Explore the challenges of integrating agile project management with traditional budgeting models, proposing a combined "Continuous Forecasting Framework" for companies.	A "Continuous Forecasting Framework" can improve the alignment between agile and financial planning methods.	Need for empirical and practical validation of the proposed framework in ERP implementation projects.
11	Identify and analyze the main challenges faced while implementing ERP in large organizations in Iran.	Organizational barriers are the main challenge, followed by technological and individual factors.	More research is needed on specific solutions to overcome the identified challenges and

			improve ERP success in Iranian organizations.
12	Review CSFs for ERP introduction in Taiwan's manufacturing sector primarily for financial cost reduction and timelines.	Identification of five main dimensions: management/organization, introduction process, technical support, documentation, and personnel, with detailed sub-dimensions.	It suggests a broad exploration of the impact of ERP implementation projects on business continuity and effectiveness across various industries.
13	Examines the process of implementing SAP in the plant of a large biopharmaceutical company, emphasizing the impact of human factors and the operational challenges faced.	It analyzes the main CSFs, such as: strong managerial support, user training, and effective communication. The most significant problem concerns the lack of compatibility with pre-existing data.	Need for further studies on the long-term effects of SAP integration on overall organizational performance.
14	Evaluate CSFs for the implementation of lean manufacturing in Indian manufacturing industry using the Structural Equations (SEM) model.	Identification of 11 CSFs that influence the implementation of Lean in Indian manufacturing industries. Financial skills, strong management, and effective communication are emphasized.	Further studies are needed on the long-term impacts of Lean practices in various industries and regions, focusing on scalability and adaptability.
15	Identifies critical success factors (CSFs) for the implementation of hybrid Lean ERP systems, focusing on the interaction between the stakeholders and their influence.	Effective stakeholder engagement and CSF management improve performance and induce cost reductions while increasing quality.	Further exploration is needed on the long-term impacts of CSFs and stakeholder dynamics in different industries implementing Lean ERP systems.
16	It discusses the benefits and challenges of implementing ERP systems in organizations, highlighting process integration and optimization.	ERP systems improve efficiency, decision-making, and communication, but they face challenges such as high costs, inadequate training provided to staff, and resistance to change from operations that are already assimilated.	Need for further empirical studies on the long-term impacts of ERP systems in various industries and the effectiveness of enterprise change management strategies during these implementation projects.

17	Effort estimation challenges in large-scale ERP transformation programs with agile methodology.	Identification of 14 challenges in estimating effort. Mitigation proposals include improved communication and clarification of requirements.	Need for empirical studies on effort estimation in large-scale agile ERP implementations.
18	Identifying factors for successful ERP implementation in Indian SMEs.	The study highlights the critical success factors that enable effective ERP adoption in Indian small and medium-sized businesses.	It is suggested to focus the following studies on the impact of specific low-cost ERP solutions and how their effectiveness can increase the competitiveness of companies.
19	Identify ERP module requirements for micro, small and medium-sized enterprises (MSMEs) in the fashion industry in Bandung, Indonesia.	Results show that ERP for MSMEs must be cost-effective, scalable, and intuitive, with data management capabilities and modules tailored to size.	Need for studies on the long-term impacts of ERP systems on the growth and competitiveness of MSMEs in the fashion industry.
20	Creation of a decision-making framework for the selection of technologies in manufacturing companies, integrating Industry 4.0 technologies.	A systematic framework incorporates technological, social, and business factors, facilitating the selection of appropriate technologies for Industry 4.0.	Need for practical implementation and validation of the proposed solution in real scenarios to evaluate its effectiveness.
21	It examines the critical success factors (CSFs) that influence the adoption of lean manufacturing systems in small and medium-sized enterprises (SMEs).	The main barriers to adopting Lean include lack of commitment from top management, cultural change, and inadequate training and education.	Further studies are needed to explore the specific strategies that SMEs can implement to overcome these obstacles and effectively adopt Lean principles.
22	It proposes a hybrid model for estimating the costs of machined parts using product lifecycle management (PLM) tools and using knowledge to improve accuracy.	The model improves the reliability of cost estimates by leveraging geometric and historical data, significantly reducing estimation errors and improving efficiency.	Need for further exploration on the standardization of cost estimation models in different production and test contexts in real-world scenarios.

Table 1: Summary of the Search Results

3.3. Challenges in ERP System Implementation

The implementation of ERP systems represents a major challenge for companies, as these solutions aim to integrate and optimize company resources, increasing operational efficiency and improving the quality of information.

However, despite the potential benefits they bring, the process of implementing an ERP is complex and has significant hurdles that can emerge from technological, organizational, and human factors.

Implementation challenges are not limited to technical aspects only, but can very frequently involve company culture, employee training, and change management. Understanding these challenges is key to defining implementation strategies that make a transition to an effective and integrated ERP system smoother.

The introduction of an ERP system in an organization is not just a technological change, but it is a transformation that touches every aspect of the company's operation.

Among the most common problems is resistance to change: many employees may perceive the advent of new technologies and processes as a possible threat that will alter their consolidated work habits. Additionally, a lack of clear support and commitment from management can lead to discontinuities in communication and motivation, further hindering adoption of the system.

Another critical aspect is the insufficient training of users, which is often overlooked. Many organizations underestimate the importance of proper staff training, leaving employees without the skills needed to fully utilize the capabilities of the new system, which leads to inefficiencies and frustration. The complexity of ERP systems and their ability to integrate different business processes require careful management and meticulous planning. Finally, adapting existing processes with new ERP capabilities presents a significant challenge, as companies often need to review and adapt their established operations to comply with the system's new required procedures.

3.3.1. Main Challenges identification

From the analysis of the existing literature, several key challenges emerge that can compromise the success of an ERP project.

Main Challenges	Sources																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	
Time estimation	*							*	*	*		*									
Tool support	*																				
Monitoring	*								*												
Team commitment	*											*									
Project Scheduling	*							*				*							*		
Understanding the requirements	*		*									*	*	*	*			*			
Coordination and integration	*		*					*		*		*						*			
Availability of Suppliers	*	*		*	*	*					*	*			*						
IT Skills	*		*				*			*	*						*	*	*	*	*
Incorrect estimates	*		*																		
Data volume		*																			
Data security		*																			
Data standardization		*				*		*													
Data processing		*																			
Interoperability		*	*	*		*				*											
Scalability		*																			
Cost management		*	*		*	*			*	*					*			*		*	*
Regulatory compliance		*																			
Knowledge transfer			*										*								
Stakeholder involvement					*					*											
Top management commitment					*		*						*				*				
Hardware and software support					*																
Formation					*			*					*				*		*		
Resistance to change					*					*			*		*	*	*				*
Complex procedures				*			*														*

Table 2: Main Challenges identified

- **IT skills** (9 sources) frequently emerge in the documents that make up the reference sample. They are identified as a challenge to be faced during the implementation of ERP systems, with a greater impact in particular for MSMEs, who often find themselves with very limited or even non-existent IT teams, as well as limited skills in managing complex projects. A lack of specialized skills and dedicated resources can make it difficult to balance routine operational tasks with ERP adoption, leading to delays and unexpected costs[3].

To mitigate these risks, it is essential to choose competent suppliers and formalize the knowledge gained through documentation and continuous training. In addition, opting for a scalable ERP and a modular approach, along with suitable financing solutions, can help MSMEs overcome these costly challenges.

- **Cost management** (9 sources) is a key challenge when implementing ERP systems, as it involves significant expenses related to the purchase of the software, hardware, consulting, and necessary customization of the solution. The transition to a new

system also requires investment in staff training and organizational change management. High-end solutions such as SAP or Oracle, while guaranteeing high levels of customization, tend to increase costs even further [4]. The pressure to keep costs down can lead to trade-offs that could directly affect the quality and success of the project. For SMBs with limited resources, options such as open-source systems or cloud-based ERP can be more sustainable alternatives [5].

- The **availability of experts/suppliers** (8 sources) [6] is a significant challenge in implementing an ERP system, as in-house expertise is often not sufficient to manage project complexity. Failure to work with an ERP provider that offers comprehensive support, such as technical assistance, training, customization, and ongoing maintenance, is a risk that should be avoided. Many companies find themselves having to use external consultants to fill skills gaps, but it is essential to choose experienced and reliable consultants.

An additional challenge here is due to the possible lack of in-depth understanding of the customer's business by suppliers, which can hinder the implementation of customized solutions. Continuous maintenance is necessary to ensure the sustainability of the system, and the formalization of the knowledge acquired through documentation and training are essential.

- **Understanding Requirements** (7 sources): Understanding requirements is one of the main challenges in implementing ERP systems. If the requirements are not clear from the start, the entire project can be compromised [7]. Often, requirements collection is rushed or incomplete, resulting in inaccurate initial estimates and unclear specifications, necessitating subsequent rework and causing possible conflicts. Choosing system features can be problematic if you don't take a systematic approach, risking choosing a system that isn't adequate for your real needs. In addition, a well-defined implementation strategy is crucial: an overly rigid approach and lack of flexibility in managing unexpected changes can increase the complexity of the project and compromise its success.
- **Coordination and integration** (6 sources): Coordination and integration in the implementation of ERP systems presents a major challenge, as it involves managing dependencies between modules, processes, and departments. Neglecting these interconnections can lead to conflicts and delays, as ERP modules must be synchronized effectively to ensure smooth data sharing. A lack of integration between business processes across departments, such as logistics, finance, and

human resources, can compromise the overall effectiveness of the ERP system. In addition, cultural resistance and a limited understanding of the benefits of integration can further slow down the project [2]. Finally, using a fragmented approach in system selection and training planning can hinder effective adoption and collaboration across departments.

- **Resistance to change** (6 sources): Resistance to change is a significant challenge in the implementation of ERP systems. This problem often emerges due to fear of the unknown, lack of trust in management and inadequate communication. In addition, poor training and role changes can further fuel resistance. Company culture has a significant impact on acceptance of the new system, directly influencing potential delays, additional costs, and poor adoption, all of which can compromise the success of the ERP project [8].
- **Interoperability** (5 sources): Interoperability is a key challenge in Industry 4.0, especially for companies that integrate ERP systems with legacy solutions and Digital Twins. The lack of interoperability between ERP systems and manufacturing systems, such as MES, can compromise the efficiency of business processes, making it difficult to communicate smoothly and achieve optimal workflow [9]. In addition, compatibility with systems already in use in companies is essential to avoid data loss and operational inefficiencies. Data management is critical, complicated by the high volume of information and the need for real-time processing. Solutions such as middleware, SOA architecture, cloud computing, and edge computing can facilitate advanced data integration and analytics, enabling companies to optimize operations and increase competitiveness in Industry 4.0.
- **Time and scheduling** (5 sources): The time and planning challenges in the implementation of ERP systems are numerous. One of the main challenges is the pressure of tight estimates, which leads to frequent inaccurate forecasting, especially in projects with limited budgets and tight deadlines. In addition, the underestimation of the time required for data migration and correction, a complex phase that, if neglected, can cause delays and unexpected costs. Not considering the long-term lifecycle of the ERP system can lead to future challenges, such as compatibility issues with legacy systems. Long implementation times, often longer than 1-3 years, can increase costs, but more importantly, demotivate staff. Finally, inadequate planning of the final phase of the project, including success criteria and user training,

the importance of which is not always understood, can jeopardise the effectiveness of the system and the realisation of the expected benefits [10].

- **Project Scheduling** (4 sources): ERP implementation project scheduling presents several critical challenges. Inadequate planning can lead to delays, overlapping tasks, and lack of coordination between teams. Scheduling is required to be flexible and able to adapt to changes, based on a clear definition of requirements to avoid misestimates of time and resources. Additionally, overwork for implementation teams is a common obstacle, often due to resource shortages and poor time management, compromising the quality of work and team morale. An unbalanced composition of project teams, with a lack of technical or business skills, and poor internal collaboration, can lead to significant inefficiencies [11]. Therefore, careful planning, the involvement of top management, and the adoption of agile methodologies are crucial to ensure the success of the project.
- **Top Management Commitment** (4 sources): Top management commitment is necessary for the success of an ERP project. Lack of management support can increase resistance among employees and impair coordination within the project team or across departments [12].
- **Hardware and software support** (4 sources): Hardware and software support is a significant challenge, especially for SMBs. The costs of acquiring and customizing the software, along with those required for the possible renewal or upgrade of the hardware, can take on considerable weight. SMBs often lack skilled IT staff and have to deal with integration with legacy systems, requiring careful planning [12].
- **Training** (4 sources): Training is crucial to ensure the successful implementation of an ERP system. Without proper preparation, users can find themselves unprepared, which can lead to frustration and resistance to change. You need to invest and spend time and energy on hands-on training to ensure that your staff are ready to use the system effectively [13].
- **Complex procedures** (3 sources): The complexity of procedures can negatively affect the implementation of ERP systems. The need to adapt existing processes and legacy systems requires significant resources and specialized expertise, increasing the risk of delays and unexpected costs [14].
- **Data standardization** (3 sources): Data standardization is critical to the success of ERP projects, as it allows for the integration of information from different sources in

an easy way, reducing the degree of incompatibility and complexity. Causes that can hinder standardization include the use of legacy systems and the absence of a clear strategy for data management. This situation can lead to interoperability issues and an increased risk of errors. Implementing solutions such as setting business standards and adopting integration technologies can improve standardization, which is particularly beneficial for MSMEs who can benefit from cloud-based ERP systems [5].

- **Knowledge transfer** (2 sources): Knowledge transfer in Engineer-to-Order (ETO) contexts is complex, as it requires the formalization of know-how and the adaptation of unstructured processes. Adapting a standard ERP system to an ETO context requires a review of processes, balancing standardization and adaptability [7].
- **Stakeholder engagement** (2 sources): Stakeholder engagement is crucial but complex, as it requires managing resistance to change. Poor understanding and insufficient communication can accentuate this resistance, while conflicts between stakeholders with different priorities can slow down the process and create additional obstacles [15]. Ensuring effective training and obtaining support from management are key steps in facilitating ERP adoption.
- **Monitoring** (2 sources): ERP projects face significant challenges in monitoring due to their complexity, which involves different departments and business processes. The lack of transparency and the use of inadequate software tools make it difficult for project managers to monitor progress and identify any problems early. In addition, many companies rely on superficial metrics to evaluate performance, such as simply counting tasks completed, thus neglecting the real impact on business processes [10]. Evaluating success solely on time and on cost is a limited approach, as it does not consider user adoption of the system and the achievement of business goals. Pressure on time and budget can lead to trade-offs on the quality of implementation, while indirect costs, such as those related to training and operational disruptions, often tend to be underestimated.
- **Team Commitment** (2 sources): The commitment of the implementation team is critical. If there is a lack of involvement, especially from management and end users, the entire project can be compromised [16]. It is crucial that top management offers support through clear communication about objectives and the allocation of adequate resources. In addition, end-user engagement is crucial to avoid resistance to change

and ensure proper adoption of the system. To address resistance, you need to provide proper training and explain the strategic benefits of the ERP system. In summary, an active and shared commitment from everyone, combined with a clear vision and the use of agile methodologies, is essential for the success of the implementation.

- **Incorrect estimates** (2 sources): Incorrect estimates are a frequent problem in ERP projects and can result from failure to consider key factors, such as lack of experience, incomplete information, and time pressures. These mistakes often lead to delays and budget overruns. In addition, the high variability and uncertainty, common characteristics of ERP projects, require a flexible and iterative approach. The adoption of Agile methodologies, constant monitoring and effective communication between stakeholders are essential to manage uncertainty, allowing the team to adapt to changes and maintain control over the project [17].
- **Tool support** (1 source): One source highlights the difficulties associated with tool support when implementing complex systems, especially in Agile contexts. The lack of accurate estimates in agile environments can be influenced by biases and ever-changing requirements. This becomes especially critical in large-scale projects, where coordination between distributed teams and the interdependencies between them increase complexity. The absence of clear specifications for requirements makes it difficult to make accurate estimates, highlighting the importance of proper instrumental support and automation to streamline processes. In high-variability manufacturing scenarios, having effective instrumental support is critical to successful implementation of a production planning and control (PPC) system [17].
- **Data volume** (1 source): Data volume is a key challenge in implementing ERP systems, especially for small and medium-sized enterprises (MSMEs). Effective data management is essential for project success, as ERP systems must integrate and transform large amounts of information from different sources. Among the main challenges are the integration and migration of data from legacy systems, as well as the need to clean data and ensure its quality. Technologies such as database management systems (DBMS), data warehouses, and cloud solutions offer scalable and flexible options to address these challenges [5].
- **Data Security** (1 source): Data security is a critical concern for businesses when implementing ERP systems, especially when integrating IoT. ERP systems collect sensitive information from different sources, which increases the risks of

unauthorized access and data theft. To mitigate such risks, businesses must implement access controls, conduct security audits, use encryption, and provide appropriate training to staff. IoT integration further complicates security management, as many IoT devices can have vulnerabilities. Small and medium-sized businesses (MSMEs) can benefit from adopting cloud-based ERP systems and outsourcing security as strategies to protect their data [5].

- **Data processing** (1 source): Real-time data processing is a significant challenge for businesses, particularly in the manufacturing sector, where it is crucial to have a current view of processes to ensure efficiency. This need implies the need for a robust IT infrastructure, capable of handling large volumes of information in a timely manner. In addition, it is essential to implement adequate security measures to protect sensitive data, especially in a context where IoT is integrated. The complexity of ensuring that all systems work synergistically while maintaining data security is a challenge that businesses must carefully address [5].
- **Scalability** (1 source): The scalability of IoT deployments is crucial for companies that intend to successfully integrate these devices into their ERP systems. The main challenges are managing the growing volume of data in real time and the need to have a robust IT infrastructure that can support this increase. Ensuring that technology can adapt and respond effectively to the ever-expanding data needs is a significant challenge for many organizations [5].
- **Regulatory compliance** (1 source): Regulatory compliance is critical for ERP systems, especially when integrating IoT devices. Systems must comply with regulations such as GDPR, and companies have to deal with regulations that are constantly changing. Ensuring compliance requires regular updates to the ERP system and, in some cases, the support of external experts to better manage these requirements [5].

3.3.2. Sources Analysis

Analysis of sources indicates that the challenges of implementing ERP systems manifest themselves in similar ways in various contexts and regions, demonstrating how these issues transcend business and cultural boundaries.

Almost all surveys emphasize the importance of proper training and effective change management, suggesting that the approach to implementing ERP systems must be strategic

and well-organized to address these issues. The available literature also highlights how a lack of communication during the implementation process can exacerbate resistance and uncertainty among employees.

Studies conducted in different industries and company sizes reveal that resistance to change and lack of support from leadership are the main challenges that often emerge. These issues can seriously hinder the implementation of new systems and processes, impacting project outcomes and employee engagement. Addressing these challenges is key to facilitating a smoother transition and cultivating a workplace culture that is open to change. In addition, staff readiness and infrastructure limitations are often cited as the main obstacles affecting successful implementation.

In summary, to face the challenges related to the implementation of ERP systems, a global approach is needed that considers not only the technological aspects, but also the human and organizational ones.

3.4. Critical ERP Implementation Success Factors

As part of the implementation of enterprise resource planning (ERP) systems, critical success factors (CSFs) play a key role in determining the success of the project.

Unlike challenges, which highlight obstacles, CSFs focus on the key areas that organizations need to focus on in order for the ERP system to meet business needs and integrate seamlessly into existing operations. These factors are not limited to technical requirements, but also embrace strategic, organizational, and human aspects that are essential for aligning ERP systems with business goals.

The primary goal of ERP systems is to centralize different business functions, such as finance, operations, human resources, and supply chain management, within a single, integrated platform. This centralization brings significant benefits, such as increased data accuracy, streamlined processes, and real-time visibility across the organization. To achieve these benefits, it is critical to effectively manage critical success factors throughout the ERP lifecycle, from system planning and selection to deployment and ongoing support. In this context, CSFs serve as strategic guidelines, helping to keep projects aligned with business objectives and minimize the risks associated with ERP implementation.

This section analyzes the main critical success factors for ERP implementation, emphasizing the importance of management support, a clear vision, and effective project management. By focusing on these aspects, organizations can address the challenges inherent in ERP projects and maximize the potential of these systems to generate strategic and operational improvements. The ERP literature emphasizes that effective CSF management is essential to ensure that ERP systems achieve business goals and integrate smoothly into existing structures.

3.4.1. Critical Success Factors Identificaiton

The following CSFs have been identified as central to the success of ERP projects:

Critical success factors	Sources																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18	19	20	21	22		
Definition of Requirements	*		*											*		*				*		
Communication	*		*				*		*	*	*		*							*		
Management Support	*		*				*	*	*	*	*	*		*		*	*		*	*	*	
Adequate IT infrastructure	*		*		*	*	*				*		*					*				
Effective data management		*	*				*			*												
Integration		*	*				*			*	*	*										
Security		*																				
Scalability		*		*																		
BPR		*	*			*	*	*	*	*	*	*		*		*					*	
Project Team			*					*			*	*	*	*	*	*	*	*	*	*	*	
Staff Training			*		*	*	*	*		*	*	*			*		*	*	*	*	*	
User Engagement			*		*		*	*	*	*	*	*										
Project Management			*				*			*	*	*	*	*						*		
Monitoring and Evaluation			*			*			*	*	*	*	*	*						*	*	
Supplier Support				*	*		*			*	*	*	*	*	*							
Competitiveness				*										*								
Finance									*											*	*	

Table 3: Critical Success Factors Identified

- Management support** (13 sources): The active involvement of top management is crucial for the successful implementation of ERP systems. This leadership not only ensures the necessary financial resources, but also offers strategic direction and facilitates change management. The clear vision of management helps to promote user acceptance of the system and support the project team with the required authority and support. Visible support from management not only improves ERP adoption, but also creates trust, reducing resistance to change [18].

- **Staff training** (13 sources): Training is a critical aspect of the success of an ERP implementation. Properly training staff is essential for employees to be able to adapt effectively to the new system. Continuous and targeted training programs help reduce anxiety and improve safety in the use of ERP. Both IT and business skills are crucial to facilitate the adoption of the system, while the formalization of know-how makes it possible to make tacit knowledge explicit, thus optimizing the use of ERP [19]. Un investimento nella formazione è cruciale anche per affrontare l'evoluzione tecnologica e mantenere alti livelli di performance nel lungo periodo, inclusa una preparazione specifica nel project management per garantire una gestione efficace del progetto.
- **Business Process Reengineering (BPR)** (11 sources): Process reengineering is a central element to successful ERP implementation. This approach implies a radical overhaul of operational flows, so that they can align with the new system model. While BPR can generate resistance, it offers significant opportunities for improvement in efficiency, quality, and speed [11]. It is critical that change management and management involvement are supported by appropriate user training to facilitate the transition to the new system and ensure the overall success of the implementation.
- **Project team** (11 sources): The composition and expertise of the project team are crucial for the success of an ERP implementation. It is essential for the team to include functional experts, IT specialists, and end-user representatives, thus ensuring a comprehensive view and operational engagement. The choice of a Project Manager with strong leadership, communication and problem-solving skills is crucial to face the challenges that arise and effectively coordinate the group. In addition, the allocation of financial and technological resources, together with clear and transparent communication, fosters the building of trust among team members and reduces resistance to change, thus facilitating a smooth transition [20].
- **Monitoring and evaluation** (10 sources): Continuous measurement of project phases is critical to the success of an ERP system. This approach involves engaging all stakeholders, from project team members to end users, to identify any critical issues and opportunities for improvement. The use of knowledge management tools allows you to capture and disseminate skills within the organization, thus facilitating the adoption and conscious use of the system. Measuring performance through well-

defined KPIs aligned with business objectives allows you to monitor the impact of the ERP in terms of efficiency and user satisfaction, helping to maintain high standards of competitiveness [21].

- **Supplier Support** (9 sources): Choosing the right vendor is crucial to the successful implementation of an ERP system. It is essential to select a partner who understands the specific needs of the company and who offers technical and training support at all stages of the project. Establishing a strategic partnership based on trust and collaboration is essential to addressing challenges and maximizing benefits. This requires careful planning and constant commitment from management, along with a detailed analysis of business requirements and available ERP solutions. Finally, open communication and alignment of goals between the company and the supplier are key to ensuring ongoing updates and support [1].
- **Effective communication** (8 sources): Clear and transparent communication is vital to the successful implementation of an ERP system. It facilitates collaboration between all stakeholders and ensures that expectations are well aligned. Open communication helps managers set clear goals, allows the project team to coordinate and solve problems, and allows end users to fully understand the new system. Among the benefits of good communication are better change management, timely resolution of problems, and increased user engagement. Strategies such as regular meetings, detailed documentation, and the use of different communication channels help promote ERP project adoption and effectiveness [17].
- **Adequate IT infrastructure** (8 sources): A robust technology infrastructure is essential for the success of any ERP system and the adoption of Industry 4.0 principles. It is important to make a careful selection of ERP software, use automation tools, and ensure a reliable and secure IT architecture. Advanced technologies, such as IoT, AI, and cloud computing, can improve real-time data management and analysis. The implementation of middleware, such as Eclipse BaSyx, facilitates system integration, allowing for a continuous flow of information and a complete view of business processes [3].
- **Active user involvement** (8 sources): Critical to the success of any ERP project. End users, thanks to their operational experience, can provide valuable input for system configuration, ensuring that the ERP meets specific needs. An open and flexible corporate culture makes it easier to accept the new system and promotes a positive

attitude towards change. It is essential to manage user expectations from the earliest stages, involving all stakeholders and addressing their concerns to overcome the difficulties associated with ERP implementation [12].

- **Project management** (8 sources): The robustness and effectiveness of project management are two key elements for the successful implementation of an ERP system. A dedicated team of knowledgeable and experienced leaders from different areas of the business must be formed to address complexities and coordinate resources and activities. Detailed planning, which sets clear goals, timelines and responsibilities, must be supported by effective risk management and transparent communication. This flexible management allows you to track progress and foster a positive company culture, making it easier to adopt the new system. An organized and adaptable approach ensures that ERP implementation is a strategic investment, critical to long-term business competitiveness and efficiency [4].
- **Integration** (6 sources): A key factor in the success of ERP systems, as it combines data, processes and business systems in a centralized environment. A unified database allows for real-time information sharing, thereby improving data accuracy and transparency. Integration not only supports process automation but also promotes collaboration across departments. Addressing challenges such as compatibility with legacy systems and data quality requires innovative solutions, including middleware and standardization. Active stakeholder involvement and cooperation between departments, accompanied by effective communication and management support, are essential to overcome complexities and maximize the benefits of ERP [16].
- **Clear and well-defined requirements** (5 sources): They are a critical factor in the success of an ERP system, as they ensure compatibility and a user-friendly design. A detailed definition of requirements is crucial to selecting an ERP system that responds to specific processes, reducing the risk of errors and unexpected costs. The system's compatibility with existing infrastructure and ease of use are crucial for user adoption. Therefore, an intuitive and customizable design, supported by targeted training and active end-user engagement, is essential to overcome resistance to change [11].
- **Effective data management** (4 sources): Data management is vital to the success of ERP systems and the realization of Industry 4.0. Ensuring data quality and accuracy

is critical to making informed decisions and conducting effective business analysis. Addressing challenges such as manual entry errors and complexity in migrating from legacy systems requires solutions such as automation, validation, and data cleansing. Accurate migration, supported by precise mappings and post-migration monitoring, is essential to maintaining information integrity. In the reality of Industry 4.0, the management of Big Data, in terms of volume, speed and variety, becomes crucial for real-time processing and effective integration of information [9].

- **Financial capacities** (3 sources): Financial resources play an important role, as high costs can be an obstacle, especially for SMEs, which often face resource constraints and cost overrun problems. It's critical to carefully evaluate all costs associated with ERP adoption, including hardware and software. Budgetary flexibility is equally important, as implementation can involve unforeseen events that require adjustments. Moving beyond traditional budgeting models and adopting more agile approaches, such as "beyond budgeting," can improve adaptability during the implementation process [10].
- **Scalability** (2 sources): Essential in the implementation of ERP systems, as it allows the system to evolve with the business and handle an increasing volume of data, particularly with IoT integration. Scalable ERPs offer modularity, allowing functionality to be added as needed. However, scalability also comes with challenges, such as complexity and management costs. Ensuring compatibility with legacy systems and interoperability between different systems is crucial. These aspects require innovative solutions, such as middleware and SOA architectures, to optimize operational efficiency and improve coordination between departments [5].
- **Competitive pressure** (2 sources): Competitive pressure emerges as a critical factor in the adoption of ERP systems, as companies must quickly adapt to the dynamics of an ever-changing market to maintain their competitiveness. In highly innovative industries, ERP is seen as a strategic lever to optimize processes, reduce costs, and improve efficiency. This need to innovate is heightened when competitors adopt advanced technologies, prompting companies to do the same. However, the impact of competitive pressure on ERP adoption can vary; large companies, with more resources, tend to see it as a determining factor, while SMEs may not initially perceive it as such, but will recognize it as they understand the potential of ERP to improve their market positioning [1].

- **Security** (1 source): Security is a fundamental element in the implementation of ERP systems, particularly in the era of Industry 4.0. Attention must be paid to data protection and privacy, using security audits and reference standards to ensure the integrity of the information. With the introduction of new technologies, the risks of cyberattacks and privacy violations increase, requiring strict management and the implementation of role-based controls. SMBs can benefit from advanced security measures, such as firewalls, regular backups, encryption, and centralized administrative access, to protect their data and ensure information privacy [5].

3.4.2. Sources Analysis

Critical success factors (CSFs) are of fundamental importance in the implementation of ERP systems, as numerous studies and practical cases show. These elements can significantly influence the final outcome of the project. Strong and ongoing support from management is essential, as it ensures proper resource allocation and gives the necessary authority to move the project forward. This involvement creates a positive environment for ERP system adoption and ensures that decisions align with the organization's strategic goals.

Another crucial factor is effective project management. Meticulous planning and proper execution help keep the project on schedule and on budget, thereby maximizing the benefits of ERP. It is also crucial to invest in user training to ensure that staff are ready to use the new system. Proper training not only facilitates adoption, but also increases user satisfaction, making the ERP system more effective at supporting business processes.

Business process engineering (BPR) is another important aspect to consider. Organizations that address this issue are able to make the most of the capabilities of ERP, optimizing workflows and achieving more efficient results. Data quality is also crucial: having accurate and well-managed information is essential for making informed decisions and ensuring reliable results.

In addition, a robust technology infrastructure is imperative for successful ERP deployments. Investing in scalable and appropriate technologies allows companies to face future challenges and ensure the stability of the system. Additionally, working with experienced vendors and consultants can further strengthen implementation, as these partners bring valuable expertise and assist organizations in critical phases of system setup.

In conclusion, paying attention to the critical success factors in ERP implementations is essential. Focusing on these elements not only increases the chances of delivering a successful project, but also maximizes the potential of the ERP system to improve the performance and flexibility of the entire organization.

3.5. Benefits of implementing ERP systems

The adoption of ERP systems is a key strategic lever for integrating business processes and improving an organization's overall performance. Through the implementation of an ERP, companies can consolidate operational and financial data, simplifying the flow of information between different departments and improving the quality of management decisions. An ERP system is designed to provide an integrated view of business operations, optimizing processes and reducing the time required to produce reports and performance analysis.

This integration facilitates greater visibility into operations, enables finer cost control, and helps reduce operational inefficiencies. The digital transformation initiated by ERP systems, further supported by the integration of technologies such as IoT (Internet of Things) and cloud computing platforms, amplifies the benefits of ERP. Businesses can then obtain real-time data, improving the accuracy of analytics and forecasts. In this context, the adoption of ERP translates into an increase in business competitiveness, as it helps to respond quickly to market changes and manage available resources more efficiently.

ERP systems improve operational efficiency by integrating different business functions into a single, centralized platform, which provides real-time visibility. This approach not only allows for standardization of processes and access to reliable data, but also promotes more effective collaboration between teams. A unified view of operational data is crucial to align business activities with strategic objectives, thus contributing to higher quality of services and reduced costs.

From a performance perspective, a well-implemented ERP has the power to reduce cycle times in production and logistics, optimize inventory management, and minimize costs associated with technical and operational support. The integration of financial and operational modules also improves the transparency of operations, ensuring consistency in

information—essential elements for ensuring regulatory compliance and effective process control.

Subsequently, the benefits found in the literature following the implementation of the ERP system in companies will be presented, providing a clearer picture of the advantages that these solutions can bring.

3.5.1. Main Benefits Identification

The adoption of an ERP system brings several concrete advantages for organizations. The main benefits that the implementation of an ERP can generate are outlined below:

Benefits	Sources																					
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Automation	*	*			*	*										*						
Cost reduction	*	*	*	*	*	*	*		*	*	*	*		*		*		*		*		
Data Analysis	*				*	*				*	*	*	*			*	*	*	*			
Customer service	*	*				*					*			*		*		*		*	*	
Management	*	*	*	*		*	*	*	*	*	*		*		*		*	*	*	*	*	
Productivity	*	*	*	*	*		*		*	*	*	*	*		*		*		*	*	*	
Flexibility		*	*		*	*		*				*		*								
Time reduction	*	*					*		*												*	
Competitiveness		*		*		*	*		*	*												
Process simplification			*																			
Product Quality				*	*	*			*	*	*					*		*			*	
Quotation					*										*							
Business Growth									*				*					*	*			
Cooperation									*													

Table 4: Main Benefits Identified

- Business Management** (17 sources): Implementing ERP systems and production planning and control (PPC) software offers significant benefits for businesses. These systems integrate information from different departments, improving communication and increasing operational efficiency. With detailed and timely reporting, managers can make more informed decisions, while optimizing supply chain planning provides better visibility into costs. Sharing information with supply chain partners allows for faster response to customer needs and enables more effective project management. However, to maximize the benefits, it is crucial that the implementation of these systems is well planned and that staff receive proper training [22].

- **Cost reduction** (15 sources): An important impact of implementing ERP systems is the reduction of operating costs. Automations and data centralization not only simplify operations, but also reduce transaction and processing costs. This optimization allows you to maintain adequate inventory levels, decreasing expenses related to overstocking and obsolescence. Efficiency in cost management results in better profit margins and more effective financial management, allowing companies to make more informed strategic decisions and maximize growth opportunities [18].
- **Increased productivity** (15 sources): ERP and PPC systems can generate significant operational improvements, increasing productivity and optimizing business processes. The standardization of processes, promoted by ERP, not only reduces inefficiency but also improves product quality. Thanks to data integration and digitization, companies can plan more precisely and automate various tasks, contributing to an overall increase in productivity. Additionally, efficient inventory management reduces errors and optimizes inventory levels, facilitating visibility across the supply chain [14].
- **Real-time data analysis** (11 sources): ERP systems offer numerous advantages related to real-time data analysis. This feature improves not only operational efficiency, but also the ability to make informed decisions and manage data optimally. With instant access to data, businesses can perform accurate analysis and respond quickly to market changes. A centralized database reduces duplication of information and improves data quality and reliability. This leads to higher customer satisfaction through faster and more efficient services [8].
- **Improvement of product, service and data quality** (9 sources): The implementation of ERP systems can lead to a significant improvement in the quality of the product and the services offered. By effectively managing information and standardizing processes, companies can reduce elements that negatively affect quality. Integration with IoT allows real-time monitoring of product quality and deliveries. Additionally, data centralization improves regulatory compliance and facilitates audits, ensuring that information is accurate and reliable [21].
- **Customer service** (8 sources): Adopting an ERP system can transform customer service, increasing business satisfaction and responsiveness. With access to up-to-date customer, order, and shipment information, customer service representatives can respond more efficiently to inquiries. Automating processes such as order

management frees staff from repetitive tasks, allowing for more personalized service. Additionally, built-in CRM modules help manage customer relationships, improving internal communication and expectation management [6].

- **Flexibility** (7 sources): I sistemi ERP e PPC potenziano la flessibilità e l'agilità delle operazioni aziendali. Grazie a una visione unificata dei dati, le aziende possono adattarsi rapidamente alle dinamiche del mercato e rispondere efficacemente alle fluttuazioni della domanda. L'implementazione di sistemi avanzati supporta metodologie agili e migliora la qualità del prodotto, permettendo alle organizzazioni di mantenere la competitività in un contesto in continuo cambiamento [10].
- **Competitiveness** (6 sources): A well-implemented ERP system can greatly increase the competitiveness of companies, making them more responsive to market needs. Access to real-time data and an integrated view of operations allow you to adapt quickly to changes, improving product quality and reducing production costs. In particular, SMEs can leverage ERP to effectively respond to market needs and maintain a competitive edge [12].
- **Automation** (5 sources): Automation within ERP systems brings numerous benefits, including increased operational efficiency and reduced costs. By optimizing business processes, businesses can improve productivity and manage resources more effectively. With the integration of technologies such as IoT, automation becomes even more effective, simplifying the management of complex processes and reducing errors [5].
- **Reduced lead times** (5 sources): Implementing ERP and PPC systems helps businesses dramatically improve operational efficiency, contributing to reduced lead times. By optimizing workflows and improving resource planning, these systems enable more effective order management and rapid response to market needs. Standardization and centralization of data reduces errors and allows for more accurate planning, thus ensuring timely delivery [13].
- **Business growth** (4 sources): ERP systems can support business growth and scalability through a number of key benefits. By automating processes and providing access to accurate data, businesses can make informed decisions and respond quickly to changes in the market. In addition, the modular architecture of ERP systems allows you to add functionality according to growing needs, thereby improving asset

management and increasing customer satisfaction. However, to achieve these benefits, proper implementation and customization of the system is crucial [4].

- **Digitization and automation of the quoting process** (2 sources): The implementation of ERP systems offers small and medium-sized companies a significant opportunity to optimize production planning and accelerate the quotation process. Through automated checks and the integration of data such as downtime and tool costs, companies can provide more accurate quotations and respond promptly to customer needs. A concrete example of this approach is the case study on the use of BaSyx middleware, which demonstrated how better integration leads to more reliable estimates and greater responsiveness to market demands [3].

In addition, formalizing technical expertise and leveraging web portals to interact with customers further simplifies the listing process, ensuring immediate feedback. Finally, ERP systems reduce financial reporting times, increasing the reliability of information and improving cost management. Essentially, adopting an ERP system not only increases operational efficiency, but also strengthens the competitiveness of SMEs, contributing to greater profitability in the long term.

- **Process simplification** (1 source): Implementing ERP systems greatly simplifies business processes. By standardizing operations according to best practices, ERP systems eliminate inefficiencies and improve product quality. Centralizing data allows for consistent reporting and real-time information, reducing errors and facilitating communication. Automating repetitive tasks frees up staff to focus on more strategic tasks, improving productivity and the quality of decisions. However, the simplification of processes is linked to proper implementation and customization, which must be supported by an in-depth analysis of business needs [1].
- **Cooperation** (1 source): ERP systems and other strategies significantly improve collaboration with partners and suppliers, which is crucial to business success. By creating a centralized database that is accessible to all, ERP systems enable real-time information sharing, improving visibility into the supply chain and increasing efficiency. Companies that engage suppliers early in the design phase and establish clear roles can avoid conflicts and foster synergies. Building relationships based on trust and transparency is key to maximizing the benefits of collaboration, translating into greater innovation and competitiveness [9].

3.5.2. Sources Analysis

Numerous industry studies show that the implementation of ERP systems leads to tangible positive impacts on business performance. The literature demonstrates how ERP improves process efficiency, information quality, and resource control. For example, an analysis conducted in the automotive industry revealed that the integration of an ERP system led to a significant reduction in lead times and production costs, thanks to the centralization of operations and the automation of data collection. Other studies indicate that ERP adoption increases customer satisfaction and reduces logistical inefficiencies, which also has positive effects on companies' financial KPIs.

In addition, research focused on small and medium-sized enterprises (SMBs) shows that the implementation of ERP, in combination with the integration of emerging technologies such as IoT and the cloud, allows these organizations to gain a competitive advantage. This approach provides a level of scalability and flexibility that is essential to respond quickly to changing market needs. However, the literature also emphasizes the importance of properly managing change and ensuring strong management support, to overcome organizational and cultural barriers that may arise during ERP implementation.

In conclusion, adopting an ERP system represents a strategic investment capable of bringing significant advantages in terms of process integration and improvement of business performance. While implementing an ERP requires careful planning and constant effort, the benefits in terms of operational efficiency, cost reduction, and decision support make ERP a must-have tool for organizations looking for growth and innovation.

3.6. Conclusion and Future Developments

The implementation of ERP systems has been shown to bring significant changes in process integration and improved business performance. However, the path to successful adoption of these systems can be complex and requires careful management of various critical factors. It is clear from the literature review that active support from top management, together with robust data quality management and adequate user training, is key to ensuring that ERPs can truly contribute to optimizing operational and strategic performance.

The benefits associated with the use of ERPs, such as the integration of different business functions and increased operational efficiency, are widely recognized. At the same time, it

is important to be aware of the challenges that may arise, such as the complexity of systems and the resistance to change by users. These factors require ongoing efforts from the organization to ensure that the system remains aligned with evolving business needs. Ongoing training and technical support are essential to keep ERP systems running effectively over the long term.

An interesting aspect for future research concerns the long-term impact of ERPs on business continuity and on the adaptation of organizations to new business models. In this context, further studies could explore how ERP systems can support sustainable growth strategies and increase competitiveness globally, exploring implementation models that balance the necessary flexibility with adequate control.

Looking to the future, the integration of emerging technologies such as the Internet of Things (IoT), Digital Twins and artificial intelligence represents a promising direction for the development of ERPs. The adoption of these innovations could further enhance the capabilities of ERPs, making them more flexible and responsive to the challenges of a competitive and rapidly changing environment. In addition, the use of middleware systems, such as BaSyx, could facilitate communication between various layers of automated systems, thereby improving ERP integration and flexibility in small and medium-sized businesses and manufacturing sectors.

4. Company Description and Current Use of NetSuite at M.R.M. S.R.L.

In the fourth chapter of this paper, the structure and operations of M.R.M. S.R.L. are analyzed in detail, starting with a detailed description of the company. The organizational transformation that led to its current configuration is illustrated with particular attention to its two divisions: automotive and aerospace.

The chapter provides an overview of the main production activities, highlighting the use of advanced technologies in processes, such as laser cutting, certified welding and prototype assembly.

This is followed by a presentation of the automotive operational headquarters and an in-depth analysis of the most important customers of both business units.

Next, the chapter highlights the main challenges that management and project managers face daily, especially in the area of cost management and production planning.

These issues are particularly relevant for a company that operates on highly customized projects, such as prototypes for the automotive and aerospace industries.

Accurate management of labour and machinery costs, as well as production monitoring, are essential to ensure profitability and operational efficiency.

Finally, the chapter explores in detail the current use of the NetSuite ERP system within M.R.M. S.R.L., highlighting how the company has started to implement this technological solution to improve the management of operational processes and address production challenges.

NetSuite is currently a key element in the company's digital transformation strategy, allowing the automation of various processes and the monitoring of business activities more precisely and efficiently.

However, despite initial progress, several operational issues have emerged, such as the lack of integration between departments, the incompleteness of the data entered the system, and the partial use of the available functionalities offered by the solution.

Interviews conducted with the main players, operating on the management system, belonging to the sales department, the purchasing office, logistics and administration, highlighted both the benefits and the difficulties related to the adoption of NetSuite for the performance of their activities.

Each employee surveyed uses NetSuite to manage specific aspects of their work, but the lack of coordination between the various departments has often created inefficiencies and slowed down the full exploitation of the system.

For example, sales orders and purchase orders, were not always linked correctly to their specific project, which made it difficult to track costs and revenue.

Despite these difficulties, the company has embarked on a path of continuous improvement, supported by an external consultant who has helped to optimize workflows and implement solutions created specifically according to business requests, streamlining some critical processes thanks to automatic links of transport documents and invoices to the respective orders.

This process has significantly improved accounting and logistics management, reducing the risk of errors and increasing operational efficiency.

However, there is still a lot of work to be done to fully exploit the software in the direction of accurate monitoring of order costs and to implement future automated production management, fundamental objectives to ensure full integration and optimization of business processes.

4.1 Overview of M.R.M. S.R.L.

M.R.M. S.R.L. is an Italian company characterized by a long presence in the manufacturing sector, it has a rich history that has its roots in the sheet metal working industry. It is specialized in the production of components, subassemblies, and assemblies for the automotive and aerospace industries, focusing on prototype development and small-scale production.



Figure 7: M.R.M. S.R.L. Company Logo

The current form of the company is the result of a significant organizational transformation, which began in January 2023 after the restructuring of the previous entity, M and M S.R.L., which had encountered financial difficulties.

The goal of this restructuring was to create a more agile, efficient and profitable company, able to compete in highly specialized markets.

Since its operational inception in January 2023, the company has been committed to the optimization of its production processes, improving profitability, and integrating advanced management practices.

The company operates two distinct business units: MRM Automotive and MRM Aerospace, each operated as independent cost and profit centers, reflecting their specialization in the automotive and aerospace markets.

The company has two operational offices: Via della Cortassa 21 in Pianezza, Turin, which houses both the automotive sector and also a small part of the aerospace sector, while the aerospace division also has a separate headquarters in Via Asti 8 in Pianezza, Turin.

Each facility is designed to meet the specific needs of the manufacturing industries it serves: the automotive site specializes in high-quality production for the prototype and small series production segments, while the aerospace site focuses on precision aviation components and assemblies.

The organizational restructuring of M.R.M. S.R.L. has been crucial for adapting to a rapidly changing market. The company's goal is to create a lean and efficient structure that can deliver value in both the automotive and aerospace industries, with a strong focus on innovation, quality, and customer satisfaction.

4.1.1 Company Profile

M.R.M. S.R.L. has consolidated itself as a relevant player in the automotive manufacturing sector, operating mainly in the areas of central and northern Italy, where the sector has a strong presence, and collaborating with companies in France and Germany, key markets for the European automotive industry.

In 2022, M.R.M. S.R.L. was officially established, after a significant restructuring of the previous M and M S.R.L. (operating in the same sector) with the start of operational activities on 1 January 2023.



Figure 8: M. and M. S.R.L. old logo and M.R.M. S.R.L. new logo

4.1.2 Company Organizational Structure

The new ownership of M.R.M. S.R.L. is led by a team of four key partners, each of whom has specific skills which are crucial to the success and growth of the company.

These four partners make up the Board of Directors of M.R.M. S.R.L., and hold the following roles:

- Roberto Maiorano: Marketing and Sales Manager, he leads marketing strategies and the development of commercial relationships.
- Giuseppe Migliora: Chief Executive Officer (CEO), responsible for general operational supervision and definition of the company's growth strategy.
- Massimiliano Madio: Legal Consultant and Legal Affairs Coordinator, he manages the company's legal matters.
- Paolo Milone: Chief Financial Officer (CFO), in charge of financial planning and management, ensuring the economic solidity of the company.

The corporate organization chart of M.R.M. S.R.L. reflects a well-defined functional structure, which is structured in such a way as to effectively support the various activities of the two main plants.

The general management is led by the Chief Executive Officer (CEO), Eng. Giuseppe Migliora, who directly coordinates the heads of the various company departments.

The project management system is entrusted to a team of project managers, with supervision that extends both to the automotive plant and to the aerospace plant.

Each plant operates with its own internal organization that guarantees efficiency in their respective operational areas, such as quality, logistics and production control.

This organizational structure allows for streamlined and coordinated management, facilitating collaboration between the various departments and allowing the company to maintain high quality and production standards in both the automotive and aerospace sectors.



ORGANIGRAMMA FUNZIONALE GENERALE

Organigramma Nominativo
Rev. 2 Del 19/03/2024

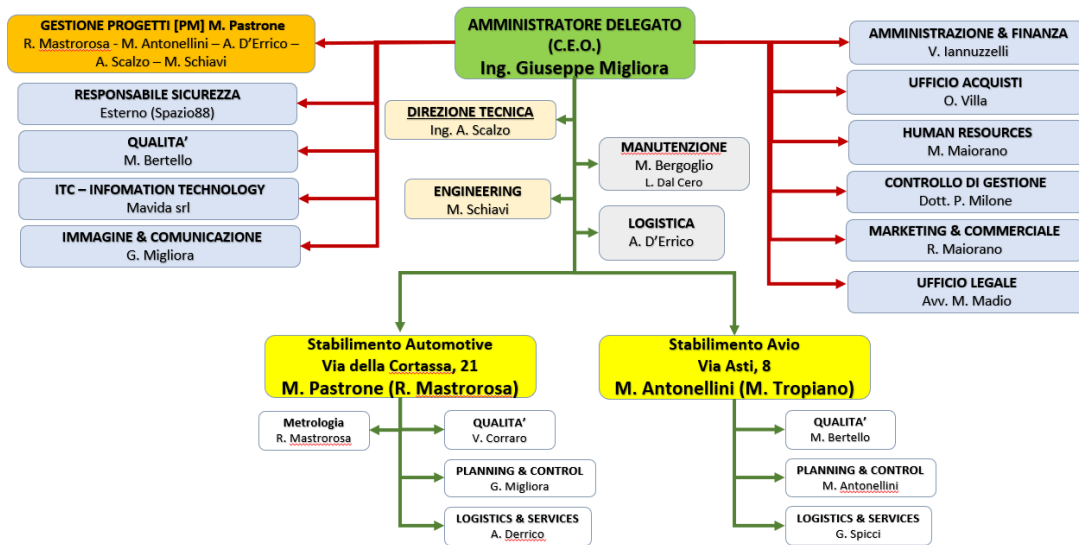


Figure 9: Company Organizational Chart

4.1.3 Mission

M.R.M. S.R.L.'s mission is to provide high-quality components, subassemblies and assemblies for both the automotive and aerospace industries, with a focus on prototyping.

In the automotive sector, M.R.M. S.R.L.'s goal is to become a point of reference for the assembly of systems and subsystems, up to the complete production of bodies for prototypes, guaranteeing IATF certified quality and geometric resolution. In addition, the company proposes itself in the design and construction of sheet metal molds, both for prototypes and for small series production.

In the aerospace sector, M.R.M. S.R.L. aims to become a reference for the heat treatment of sheet metal, supported by material analysis carried out in a certified laboratory. In addition, thanks to close collaborations with leading companies in the sector, such as LMA (aerospace mechanical machining) for mechanical machining and Playform for carbon fiber components for aerospace, the company aims to become one of the main players in the nascent aerospace hub of Turin.

The company aims to differentiate itself for technical expertise, high quality standards and the ability to manage complex projects from design to production.

4.1.4 Production Processes

M.R.M. S.R.L. operates in two productive plants. The total production space covers approximately 3,500 square meters of covered facilities, with an additional 2,000 square meters dedicated to storage and logistics.

M.R.M. S.R.L. stands out for its ability to manage the entire production cycle, thanks to advanced technical skills.

The company takes an Engineering to Order (ETO) approach, designing and developing customized prototypes based on specific customer requirements. This method requires that design and engineering begin only after the order has been received, ensuring tailor-made solutions for each project.

Subsequently, the company applies an End-to-End (E2E) approach, managing all subsequent production phases in an integrated manner, from initial engineering to production and assembly of components, up to the final delivery of the product. This approach allows total control over every aspect of the process, optimizing time, quality and costs, to ensure a result that perfectly reflects the customer's expectations.

M.R.M. S.R.L. is organized around distinct processes, for the automotive and aerospace divisions, and offers a wide range of specialized services, described as follows:

- **Design of sheet metal equipment and molds:** The company deals with the design of equipment and molds used in sheet metal processing, both for the prototype phase and for small component productions. This service allows you to develop customized solutions for specific production needs.
- **Simulations to calculate the stamping phases:** M.R.M. S.R.L. uses advanced software to perform simulations of the molding phases, ensuring accurate design and optimization of production processes, reducing errors and improving efficiency.
- **In-house construction of welding molds and assembly masks:** The company has 5-axis milling machines, laser and waterjet cutting machines, which allow the in-house construction of complex molds and welding and assembly jigs, with direct control over quality and production times.
- **Assembly of sheet metal components:** M.R.M. S.R.L. deals with the assembly of sheet metal components, using wire and hot-spot welding techniques, performed by certified operators. This ensures high quality standards in the assembly processes and in the manufacture of the products.
- **Production of complete bodies:** The company offers the ability to create complete bodies, taking care of the construction of the individual body parts. This process is

particularly useful to produce prototypes and small series, ensuring geometric accuracy and quality.

- **Dimensional controls in the metrology department:** M.R.M. S.R.L. has a metrology department equipped with a fixed DEA gantry, three-dimensional arms and scanning systems. These tools allow accurate dimensional checks to be carried out, ensuring that products meet the required tolerances and specifications.
- **Materials testing laboratory:** The company has a laboratory for material testing, where hardness, roughness and tensile tests of the material are carried out. These tests ensure that the materials comply with the required technical specifications and verify their performance.
- **Department specialized in sheet metal processing for the aerospace sector:** M.R.M. S.R.L. has a department dedicated to sheet metal processing for the aerospace sector, which requires high standards of precision and quality. This specialization allows it to meet the stringent demands of the industry.
- **Heat treatments and material analysis in the aerospace sector:** M.R.M. S.R.L. specializes in sheet metal heat treatment and material analysis, ensuring that the components produced for the aerospace industry meet the required quality and reliability requirements.

These services allow M.R.M. S.R.L. to offer complete solutions for its customers in the automotive and aerospace sectors, with a strong focus on quality, innovation and precision.

4.1.5 Automotive Plant Layout

M.R.M. S.R.L.'s production layout is strategically designed to try to maximize efficiency in its two main divisions: automotive and aerospace.

The plants are organized into distinct sections based on the type of work carried out and the machinery necessary for each process.



Figure 10: M.R.M. S.R.L. Automotive Plant

The production layout of the plant in Via della Cortassa 21 has been designed with the aim of maximizing operational efficiency and ensuring an optimal workflow. Mainly dedicated to automotive production, the plant is organized into different sections, each intended for specific stages of production, from the creation of the molds to the final assembly. Thanks to the use of advanced machinery and cutting-edge technologies, each department is specialized to better manage the required activities, ensuring high quality standards and fluid production management.

The main areas and machinery present in the plant are described below.

- **Milling Department:** Intended for the creation of molds, it is equipped with precision machines such as:
 - RONIN Comm.GM154
 - CME HZ40
 - DMG MORI
- **Welding and Assembly Department:** Dedicated to the assembly of metal components, wire and hot spot-welding processes are used here, performed by certified operators, ensuring high-quality welding for structural components. Equipped with hanging and fixed spot welders for the assembly of body subsystems, it guarantees efficiency in the union of the different mechanical components.
- **Overhaul Zone:** Area intended for checking and finishing products, to ensure that each piece complies with specifications before moving on to the final stages of production.

- Furnace Sector: Used for heat treatments, it houses the machinery:
 - OVEN TM003
- Laser Cutting Area: Equipped with precision sheet metal cutting machinery, including:
 - LASER OPTIMO PRIME INDUSTRIE
 - LASER RAPID PRIME INDUSTRIE

The WATERJET BP-C 4020 - 1 60HP machine for waterjet cutting is not present in this plant but is in the aerospace plant in Via Asti 8.

- Press Area: Dedicated to stamping operations, it is essential for the production of automotive and aerospace components, it uses high-capacity presses, which allow the production of large parts for small batches.

It is equipped with the main presses:

- HYDRAULIC PRESS HURSAN 1200 TN
- HYDRAULIC PRESS EMANUEL 400 T
- Metrology Department (DEA): Dimensional and metrological checks are carried out here using tools such as the Faro 3D arms and the DEA bench, to ensure the compliance of the products with the required technical specifications throughout the production cycle.
- Warehouse: Used for the storage of materials and the management of supplies, this area is crucial to ensure a continuous production flow, optimizing logistics management and reducing downtime.
- Cooling and Refrigeration Systems: The layout includes areas dedicated to cooling and refrigeration systems, which are essential for keeping machines and components at the ideal temperature during machining. A chiller ensures the cooling of the machines, while a cooling tower maintains the optimal temperature in the main production areas.

Below is the image of the layout of the plant in Via della Cortassa 21, which illustrates the layout of the different production areas.

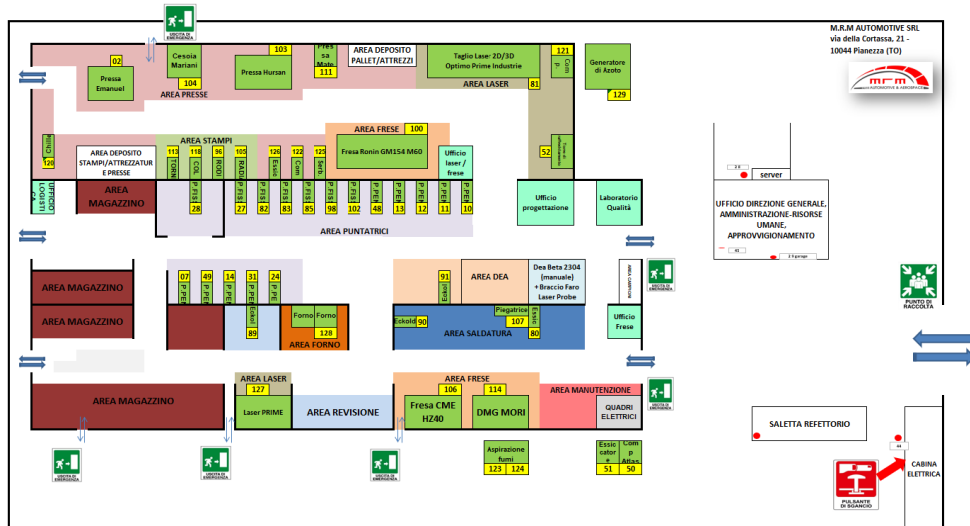


Figure 11: M.R.M. S.R.L. Automotive Plant

This carefully planned factory layout, with dedicated spaces for each stage of production, ensures M.R.M. S.R.L. can meet customers' complex demands, while maintaining the flexibility to manage their custom orders.

The future development plan provides for a consolidation of the aerospace and automotive activities in a single plant at Via della Cortassa 21, with the aim of improving operational efficiency and reducing structural costs.

The new management is considering the closure of the aerospace headquarters in Via Asti, centralizing all operations in a single plant. Specifically, it is planned to dedicate about 1,000 square meters to the aerospace sector and about 2,000 square meters to the automotive sector. This centralization would allow for more efficient management of resources and skills, as well as producing significant economic benefits for the company.

4.1.6 Customers

M.R.M. S.R.L. has a diversified customer base, which includes major players in the automotive and aerospace industries.

The main geographical areas in which the company operates commercially are Italy and Germany for the automotive sector, and Italy and France for the aerospace sector.

M.R.M.'s most important automotive customers include companies such as Fontana, Tiberina, Ferrari, Maserati, O.M.A., and BMW, with some of which it has established long-term partnerships.



Figure 12: Fontana Gruppo logo



Figure 13: Tiberina logo



Figure 14: Maserati logo



Figure 15: BMW logo



Figure 16: Ferrari logo



Figure 17: O.M.A. logo

In the aerospace sector, the company has collaborated with important companies such as Leonardo, Piaggio Aerospace and Airbus, focusing on the production of high-tech aeronautical components, which require high standards of precision and quality to be used in critical applications.



Figure 18: Leonardo logo



Figure 19: Piaggio Aerospace logo



Figure 20: Airbus logo

M.R.M. S.R.L.'s ability to provide turnkey solutions for complex projects, especially in prototyping, has allowed it to establish itself as a reliable partner. His ability to ensure on-time delivery, high-quality products at competitive costs is a key factor in the company's success and growth in the highly competitive markets in which it operates.

4.1.7 SWOT Analysis

In order to provide a complete and strategic picture of the current state of M.R.M. S.R.L., the realization of a SWOT analysis was considered of particular importance, a fundamental tool for identifying the strengths, weaknesses, opportunities and threats that the company must face in the competitive context in which it operates.

The objective of the SWOT analysis is to provide a solid basis to guide the future strategic decisions of M.R.M. S.R.L., directing efforts towards strengthening its capabilities and mitigating risks, in an increasingly competitive and constantly evolving market.

4.1.7.1 Strengths

- **Technical expertise:** M.R.M. S.R.L. has extensive know-how in sheet metal processing, which includes laser cutting, waterjet cutting and certified TIG/MIG welding. In addition, it is highly specialized in tooling design and prototyping of complete vehicles, offering turnkey solutions to customers.
- **Diversified capabilities:** The company operates in both the automotive and aerospace industries, using advanced technologies and skilled personnel. M.R.M. is IATF and ISO 9100 certified, ensuring compliance with high quality standards in both industries.
- **Mold design and construction:** The company has high skills in the design and construction of molds, allowing the management of complex processes.
- **Management of assembly projects:** M.R.M. can manage complete assembly projects, thanks to a highly structured internal organization.
- **Specific division for the aerospace sector:** It has a department dedicated exclusively to specific activities in the aerospace sector, ensuring tailor-made solutions and the management of highly critical components.
- **Advanced managerial organization:** The company has a well-organized managerial structure, capable of optimizing production and administrative processes.
- **Integrated management software:** Use complete management software for accounting, administrative (purchasing, accounting, administration), commercial and industrial management, ensuring control over bills of materials.
- **Resilience to the crisis:** M.R.M. is one of the few companies in the Turin area that has been able to withstand the crisis in the sector, distinguishing itself for its solidity and ability to adapt, with very few competitors in Italy.

4.1.7.2 Weaknesses

- **Fragmented operations:** The management of two separate operating locations, generates logistical challenges and inefficiencies in production and cost monitoring. While plans are underway to consolidate these locations, the current situation adds complexity to the workflow. Splitting activities between two plants increases operational complexity and management costs.
- **High fixed costs:** Despite a reduction in headcount, M.R.M. continues to incur high fixed costs, mainly related to production facilities and machine rentals. The company's infrastructure is not fully optimized from an energy point of view, which leads to higher operating costs.
- **Limited knowledge of the English language:** Limited command of the English language can be an obstacle in managing international business relationships and collaborations with foreign partners.
- **Excessive incidence of indirect resources:** The company has a high incidence of indirect resources, which can reduce overall operational efficiency.
- **Aging workforce:** With a relatively high average age (around 48 years), the workforce may be less flexible in adopting new technologies and innovative processes, although they maintain a high level of expertise.

4.1.7.3 Opportunities

- **Growth in the aerospace sector:** M.R.M. is well positioned to take advantage of the growth of the aerospace sector, particularly with the planned development of a new aerospace hub in Turin. The company's expertise in manufacturing precision aircraft components meets the needs of this expanding market. The sector is going through a phase of aggregation, with large groups such as Leonardo and Thales looking for integrated suppliers capable of offering turnkey products. The birth of the aerospace industrial hub in Turin, announced in April 2023, represents a significant growth opportunity for companies that will be able to seize this opportunity.
- **Expansion of the customer base:** M.R.M. can expand its customer base, both in the automotive and aerospace sectors, thanks to existing relationships with Tier 1 suppliers such as Fontana, Tiberina and Leonardo. Strategic collaborations are being evaluated, especially in the aerospace sector, through network integration projects with other companies, to offer complete products to large groups.

- **Technological advancements:** Continuous investments in automation, metrology and material testing allow M.R.M. to maintain its competitiveness, improving the efficiency and quality of its products. The adoption of advanced technologies allows us to respond effectively to market demands and add value for customers.
- **NetSuite ERP Implementation:** Implementing the NetSuite ERP system provides an opportunity to streamline various business operations, including cost tracking, inventory management, and real-time project control. This system helps to improve operational efficiency, financial transparency and the reliability of business operations.

4.1.7.4 Threats

- **Competitive pressure:** The automotive and aerospace industries are highly competitive, with numerous global players offering similar services. For M.R.M., maintaining a competitive edge will require continuous improvement in cost efficiency and product quality. The main competitors in Italy, especially in the Turin area, include companies of similar size such as RGTech, Eurodies and Lasergate. To differentiate itself in the automotive sector, M.R.M. will have to strengthen its skills and expand its resources and equipment. In the aerospace sector, competition is limited, mainly concentrated in southern Italy, offering M.R.M. the opportunity to collaborate with other suppliers of the nascent aerospace hub in Turin to consolidate a leadership position.
- **Supply Chain Disruptions:** Current global challenges, such as material shortages and frequent supply chain disruptions, pose a significant threat to M.R.M.'s ability to meet production deadlines and maintain cost control, particularly in a post-pandemic context.

The SWOT analysis shows how M.R.M. S.R.L. has a solid foundation on which to build its future development, thanks to considerable technical expertise and a diversified range of services. These elements allow it to maintain high quality standards and to respond effectively to the needs of a demanding market such as the automotive and aerospace sectors.

However, internal challenges related to high fixed costs and fragmentation of operating locations require strategic intervention, particularly through plant consolidation and operations optimization to reduce inefficiency and simplify cost monitoring. In addition, the

ageing workforce poses a challenge to operational flexibility, which could be addressed through training programs to encourage the adoption of new technologies.

Opportunities in the aerospace industry and the expansion of the customer base, if properly exploited, could provide new revenue streams and further enhance the company's competitive position. However, it is critical that M.R.M. S.R.L. maintains a constant focus on external threats, such as competitive pressure and global economic uncertainties, working to mitigate supply chain risks and diversifying its long-term contracts.

In summary, M.R.M. S.R.L. has all the resources it needs to grow and consolidate itself as a leading player in the automotive and aerospace industry, but long-term success will depend on the company's ability to address its internal weaknesses and react promptly to external market dynamics.

4.2 Challenges in Job Costing and Production Management

The management of M.R.M. S.R.L. primarily focuses on accurately identifying and allocating labour costs, as well as maintaining a production schedule that ensures timely deliveries. These two pillars occupy an obvious prominent position because the company deals with the production of highly customized prototype products based on customer needs. Additionally, these challenges, after an initial analysis, lack of an historical data foundation, are not monitored in real time and are managed using spreadsheets such as Microsoft Office Excel.

4.2.1 Job Costing Challenges

Calculating job costs represents a critical challenge and is fundamentally important for the company's health. A correct definition of these costs is necessary to evaluate the profitability of the company, each project, and, in more detail, each service offered. In the presence of an important history of data, it would be possible to understand where to direct the business activity in the years to come, towards assembly only, with higher margins, or on the construction of production equipment (mainly iron molds), with much lower margins but substantial volumes.

During the interviews and the continuous and stimulating discussions with the CEO of the company, it was possible to understand the methodology with which the company defines the prices of the services it sells, going to understand their composition. The CEO pointed out that, in the last two years, with the new company management, a solid basis has been

created for the adoption of reliable tools for the timely monitoring of the costs of each project, which is currently not fully implemented, but is a fundamental goal to be achieved in a short time.

He uses a management approach, moving away from non-objective and therefore not directly measurable data. He clearly stated that an analytical approach allows for promptly identifying inefficiencies as they arise; in periods where the market is stagnant, other approaches risk being failures.

Today, the CEO is satisfied with the work done to correctly identify the costs on which the quotes for the offers sent to customers are based. What is missing in the company is the final balance of production after the estimates made, specifically how many hours employees work on the assigned projects. One of the most critical challenges identified during discussions with the management is the lack of reliable cost monitoring. Currently, the company operates with a retrospective approach, in which costs are mainly analyzed only after the completion of a project, or during the project but not at regular intervals, obviously not in real time. This makes it difficult to make changes during the project lifecycle to avoid overspending or delays in the project.

Currently, the company is low in profitability, lower than the sector target, the reasons can be many and not easy to resolve, however, by preparing a reliable accounting system that is easily usable by employees, it would be of fundamental use in identifying inefficiencies.

Relying on theoretical estimates for labour hours and material usage often leads to a misalignment between actual costs and what is billed to the customer.

The CEO points out that inefficiencies in production are often due to inadequate initial estimates. If the initial labour hours or material requirements are underestimated, the company ends up losing money on the project as the additional time or materials needed are not billed to the customer. This can also affect the company's profitability, as it may take on projects with insufficient margins, not realizing the extent of the resource drain until the project is complete.

A significant problem is the allocation of labour costs. He points out that while the company calculates an hourly labour cost of about 28 euros, this amount does not cover fixed expenses and indirect costs. To maintain profitability, the company must charge around 48 euros per hour.

In addition, inefficiencies arise when work hours are not recorded accurately with respect to individual jobs. Employees may log fewer hours on a specific project than they actually worked, while the rest are not tracked or recorded under the general overload. This

discrepancy leads to a situation where production costs increase without having been adequately predicted in the budgeting phase.

4.2.2 Production Management Challenges

The current production planning procedure at M.R.M. S.R.L. is a highly manual process, resulting in a lack of flexibility, which is strongly required for automotive prototype projects, and does not allow a real-time utilization of data to promptly identify the possible presence of inefficiencies.

As identified during the interviews with the Automotive Unit Project Manager, production is currently scheduled using Excel spreadsheets. One of the main challenges is that Excel-based scheduling is disconnected from real-time data inputs, workloads are manually assigned to the Machining Centers and a deadline is set for their completion. This manual scheduling method requires constant review and rescheduling, because unexpected delays may occur at some stage of the work cycle to produce prototype components. Also, machine downtime may occur which may not be promptly resolved. This method often results in schedules that are highly inaccurate, even in the short term.

He points out during the interview that he spends approximately two hours every day to adjust the workload schedule, focusing mainly on the weekly one, to cope with the problems of various types that may arise in particularly specialized productions.

The main problem with using this system for workload scheduling is due to the high inaccuracy that results from the initial planning phase. It may also happen that delays in the production of components are related to the fact that the raw material, standard products or semi-finished products necessary for processing (usually supplied directly by the customer) are delayed in arriving at the plant. In addition, the timing required by the customer is often too optimistic for activities such as design/engineering, simulation and production itself. This can result in frequent mismatches between the planned timelines and those currently used for the significant execution of each task.

Since some activities vary their scheduled planning, this implies a cascading impact that results in a rescheduling of the other projects in the queue, increasing production inefficiencies. Each task must be reclassified according to the new expected delivery dates. This manual rescheduling process is time-consuming and error-prone, especially when you consider the complex dependencies between tasks.

In addition, the lack of integration between the departments is evident. Ideally, production scheduling should be managed primarily by the foremen, as they know their specific

operational needs, they should be more familiar with the specific requirements and constraints of their machines. The Project Manager, on the other hand, is responsible for coordinating the activities and needs of each department. He also highlighted the challenge of allocating resources between different shifts. For example, some machines, such as laser cutters, run three shifts a day, while others, such as presses, operate in two shifts. These operational differences require careful coordination, which is currently handled manually in the Excel sheet.

During interviews, the Project Manager suggested that foremen should take more responsibility for planning activities based on management's deadlines, but this has not yet been implemented, although there is a good basis for doing so.

For the long-term success of M.R.M. S.R.L. the CEO aims to implement a more dynamic system where costs and hours worked are monitored in real time, without it, it will be impossible to accurately measure operational efficiency, and it will be difficult to identify cost overruns in a timely manner. It will be essential to improve the system of control of the profitability of productions with respect to the budgets defined in the estimate phase.

The utilization of the NetSuite system could potentially solve these issues, as it would allow reliable and timely monitoring of working hours, material usage, and machine efficiency. By adopting the ERP solution more, they would also be able to simplify production management. The Project Manager also expressed interest in switching to NetSuite for programming, in particular for the small-scale serial production. He suggested that prototype production could still be tracked in Excel at the beginning, but with a more integrated approach for standard production lines, NetSuite could significantly reduce the time spent on manual adjustments. However, the current state of NetSuite implementation at M.R.M. S.R.L. does not yet fully support these advanced productive scheduling capabilities.

4.3 NetSuite Utilization at M.R.M. S.R.L.

In the following section, the use of the NetSuite system within M.R.M. S.R.L. is explored, with a focus on the Automotive business unit, conducting a detailed analysis of how the main players interact with the software in the various departments.

NetSuite's integration within the company focused on automating operational processes, with the goal of improving efficiency and reducing manual errors. For example, the management of commercial offers, warehouses and transport documents (D.D.T.) has been optimized, leading to time savings and a significant reduction in errors.

In addition, the active and passive cycle, as well as administrative management, are currently mainly performed through automatic file import, eliminating the need for manual entries.

The active cycle refers to all activities related to sales and credit management. It starts with the generation of a commercial offer and ends with the collection of the payment by the customer. It includes phases such as the management of customer orders, the production or supply of the good or service, delivery, issuance of the invoice and subsequent collection. In other words, it's the revenue stream for the business, enhanced by NetSuite automation.

The passive cycle, on the other hand, concerns all activities related to purchases and debt management. It starts with the issuance of a purchase requisition and ends with payment to the supplier. It includes the management of purchase requests, the receipt of goods or services, the issuance of the invoice by the supplier and the payment by the company.

Thanks to automation, these phases are managed more efficiently, reducing the risk of errors and improving control over financial flows.

During 2023, M.R.M. started the management of complete orders, including the creation of bills of materials for materials, with the aim of further automating warehouse management and cost control. The continuous automation process envisages, by the end of 2024, the implementation of the final control of the operators' processes, to ensure more precise management of production resources and improve integration between the different business areas.

To fully understand the current use of NetSuite within the company, in the automotive business unit, an evaluation methodology based on interviews with key employees from the various departments was adopted.

This process included shadowing employees during their day-to-day activities to observe how they interact with the software in their routine operations.

The following table shows the main actors involved in the evaluation process. Each participant has a specific role and interacts with NetSuite to manage key activities such as logistics, accounting, sales, and purchasing. Experience with the ERP system varies between different users, providing a comprehensive view of the current implementation.

The interviews allowed us to obtain a direct view of how the system is used and to identify operational challenges, as well as opportunities to improve integration between the various company departments.

Interview N°	Alias	Department	Role	Years of experience with NetSuite
1	E1	Sales	Offer Manager	8-10
2	E2	Purchasing	Procurement Management	1-2
3	E3	Logistics	Logistics and Shipment Coordination	8-10
4	E4	Accounting and Administration	Financial and Accounting Management	10
5	C1	NetSuite Consultant	Support and education	10+

Table 5: Key Roles Interviewed

Despite the benefits of utilizing the system, operational inefficiencies and disconnections between departments have emerged, caused by a lack of coordination and integration between the various business areas. The fragmentation of operations has led each user to focus mainly on their activities, neglecting the necessary synergy with other business processes, thus limiting the full exploitation of the potential of the NetSuite system.

Below there is a legend providing explanations for the abbreviations that will be used in the upcoming chapters:

N°	Abbreviation	Description
1	OC	Customer Order
2	CO	Job/project
3	BO	Delivery Note to return goods processed on a subcontracted basis
4	BV	Delivery Note to ship raw materials purchased on consignment
5	BL	Delivery Note for sending materials to external suppliers for specific processing
6	RE	Customer Return Delivery Note
7	OA	Purchase Order

	BA	Delivery Purchasing Note
8	RDA	Purchase Request
9	RDO	Request for quotation
10	FA	Deferred Invoices
11	OP	Production Order
12	DDT	Transport Document

Table 6: Legend of Documents created in NetSuite and mentioned in the thesis

The following paragraphs detail the interviews conducted and the experiences of each participant, offering an in-depth overview of the use of NetSuite in their respective operational areas. Finally, general considerations on the effectiveness of the current implementation of the system within M.R.M. S.R.L. are presented, with suggestions to improve integration and reduce operational inefficiencies.

4.3.1 Sales Department

In the sales order management process at M.R.M. S.R.L., one of the most critical tasks is the creation and entry of orders into the NetSuite system. This task, managed by a key figure in the sales department, represents a fundamental step in ensuring the integrity and consistency of information throughout the entire operational flow. When a new customer order arrives, E1 must create the job (CO) that the customer's order refers to, unless it has already been generated. Only after this step does E1 proceed with the creation of codes for the finished products requested by the customer, if these items are not already present in the system, and with the generation of the sales order (OC) involving the codes for the finished products requested.

The correct connection between the OC and the CO is essential, since all subsequent documents generated by the system, including packing slips and invoices, depend on it. If this link is not managed accurately, there is a risk of compromising the traceability of costs and revenues, as well as hindering efficiency in accounting and administrative management. This step, initially underestimated, proved to be crucial for the proper functioning of business processes, ensuring that all commercial and operational information is correctly synchronized and monitored through the ERP system.

Before the process review, E1 used to manually enter the billable amount of the order, an operation that was carried out both during the creation of the sales order on NetSuite and

during the recording phase in the order accounting. This double entry often resulted in errors and discrepancies in the data, which resulted in operational inefficiencies and difficulties in tracking costs and revenues. Thanks to a discussion with NetSuite's consultant, it was possible to optimize this procedure, automating the update of billable amounts directly from the customer order, thus eliminating the need for a second manual entry. It emerged how essential it was to connect the OC to the CO, to ensure proper administrative and accounting management.

In conclusion, the review of processes has improved the synchronization of documents linked to the order and reduced the risk of errors in the management of costs and revenues. These improvements represent an important step towards smoother and more integrated management of business workflows.

4.3.2 Purchasing Department

In the context of purchasing management at M.R.M. S.R.L., one of the crucial aspects is the accurate creation and management of purchase orders (OA), which includes the creation of products and suppliers master data, as well as the updating of price lists. This activity, carried out by the Purchasing Department, is essential to ensure the fluidity of business operations and keep project costs under control. At the head of this department is E2, who uses the NetSuite system to manage these processes.

From the interviews conducted, a significant problem emerged related to purchase requests (RDAs), which are made in paper format by employees. Often these requests did not report to the reference project CO, preventing the correct connection between the purchase orders and the COs themselves.

This detail has made it difficult to monitor the real costs of the projects, directly affecting the accounting data of the projects complicating traceability and cost control.

The process followed by E2 is that, once an RDA is received, a request for quotation (RDO) is generated to send it to potential suppliers. This is not currently handled through NetSuite. After collecting the answers from the suppliers, E2 selects the best offer based on criteria such as the most favorable payment conditions and consolidated relationships with suppliers, and then proceeds to create the purchase order.

Another critical issue that emerged concerns the management and updating of product master data. When creating purchasing orders, E2 manually modified the existing product codes, instead of creating new entries in the master data for the variants of ordered material. For example, when creating an OA for a block of material intended for milling a mold, instead of creating new code for the instance, it modified an existing code (such as MAT. C45 followed by the block size).

This caused confusion within the system, as the different material variants were not tracked. This shortage prevented proper management of bills of materials (BOMs) and made it difficult to monitor inventory stocks, which were tracked only by the total amount of material in kg, with no details on individual variants.

This problem did not emerge in a timely manner because the purchasing processes mainly concern the materials used for the construction of the molds, and their management for production was not yet fully integrated into NetSuite. The inefficiency related to the failure to create new items could have complicated production operations, especially from the point of view of traceability and control within the management system.

As far as prototype production is concerned, on the other hand, many of the necessary raw materials, such as sheet metal, normal/standard products and semi-finished products, are supplied directly by customers. As a result, these materials did not go through the purchasing department and were managed and entered in the registry by E3, reducing the extent of the problem in that specific context.

Thanks to targeted support and process review, E2 has adopted new practices to ensure accurate management of materials in the system, significantly improving operational efficiency.

In addition, a new standard nomenclature language has been implemented to code purchased items, developed in collaboration with management and the purchasing department, in order to standardize codes and improve the traceability of purchased items.

Finally, E2 is also responsible for the management of transport documents relating to incoming goods. Once the ordered goods arrive at the factory, it uploads the packing slip (purchase note, BA) and registers the goods in the "Goods Receipt from supplier" module in NetSuite, allowing accurate tracking of goods awaiting delivery.

After the review process, the purchase orders created by E2 correctly report the link to the OC and the created items, laying the foundations for a precise data flow and for an efficient future management of production processes on NetSuite.

4.3.3 Logistics and Shipping Management Department

In the context of M.R.M. S.R.L.'s logistics, the management of transport documents (DDT) and integration with the NetSuite management system represent a crucial aspect for operational efficiency. E3, logistics manager, oversees using NetSuite for the creation and management of transport documents, including BO Bills, Sales Bills (BV), and Work Bills (BL). Each transport document has a specific purpose: the BO is used for the shipment of returns of goods processed on a subcontracted basis, the BV is dedicated to shipments of raw materials purchased on consignment, while the BL is used for sending materials to external suppliers for specific processing. The latter document contains all the necessary information about the materials supplied to the supplier, with reference to the purchase order issued by the sales department.

A recurring problem that E3 has encountered is the lack of automatic connection between logistics documents and CO. Specifically, the costs and turnovers related to logistics documents were not displayed correctly in the job accounting, thus lacking effective traceability between the generated documents and the related order. To temporarily solve this criticality, a manual intervention was implemented that involved entering the order in the commercial data of the invoices (FA). Subsequently, a NetSuite consultant was contacted to automate this connection, thus ensuring that all documents generated from the customer order automatically maintain the connection with the reference order. This change has significantly improved operational efficiency, reducing the risk of errors in both logistical and accounting management.

In addition to the management of transport documents, E3 is responsible for the creation of product records, including raw materials and semi-finished products, which the company usually receives on a subcontracting basis from customers. This is complemented by the creation of bills of materials (BOMs) for the components required by customers. However, the BOMs that E3 creates are structured at only one level, which allows for proper management of the flow of goods in and out of the warehouse and accurate monitoring of the average inventory. However, because there are no intermediate assemblies, this approach

limits the ability to create specific work orders directly in NetSuite for each individual component of the final assembly.

Another error detected in the management was the loading of the material BOMs into an incorrect section of the management system. This error prevented the creation of complete assemblies that could be used to generate production orders, limiting the effectiveness of the system in managing production optimally. E3, in reality, worked in order accounting, which however should be used mainly to provide an economic-financial overview rather than to manage the production cycle. Following a shadowing, E3 changed his operating routines, ensuring the correct creation of BOMs for assemblies.

Despite E3's commitment, the management of some activities on the management system should not be his responsibility. It would be preferable for the company to include a figure dedicated to the in-depth management of the NetSuite system. This figure should take care of the item master data precisely, create the bills of materials and define the work cycles, as well as manage the work order and the final balance of the hours worked on each order. Currently, manufacturing management on NetSuite is limited to creating single-level BOMs for finished components, without progressing towards more complex integration of machining steps.

Finally, it will be essential to further develop the process on NetSuite, integrating the creation and launch of work orders (OP) and their final balance. This will allow a timely view of the profitability trend of orders, further improving business management.

4.3.4 Administration and Accounting Department

In the administrative management of M.R.M. S.R.L., a crucial role is played by E4, head of accounting control, who uses NetSuite for the management of invoices and accounting records. Mass deferred invoices are created through the commercial module, selecting the reasons for sale (BO or BV) and recalling customers with the code "TO INVOICE" to generate provisional or final invoices. However, a problem encountered concerns the connection of invoices to orders: currently, documents are linked via the "Ref. Doc. Cli.", which, while referring to the customer, does not always ensure a clear connection with the corresponding order. This has generated doubts about the actual interconnection between accounting documents and orders, with the risk of errors in reporting. The support conducted

together with E4 has allowed the identification of this problem concerned the lack of automatic synchronization between the documents generated by the system and the CO to which they were associated. In particular, invoices (FA) did not maintain the link with the reference order, causing difficulties in tracking costs and revenues. This flaw prevented a clear and consistent view of project accounting, increasing the risk of errors in monitoring economic performance. However, thanks to the intervention of the consultant, this critical issue was resolved.

4.3.5 Considerations on the current use of NetSuite in M.R.M. S.R.L.

The interviews conducted at M.R.M. S.R.L. have highlighted some operational criticalities related to the use of the NetSuite ERP system, in particular with regard to the integration between the various departments and the limited use of some key features. While some processes have been successfully streamlined via the platform, such as the management of commercial quotations and transport documents (transport documents), there remain several areas that require significant improvements.

Conversations with the main players operating on NetSuite brought to light various problems in the daily use of the system, related to the lack of synchronization between the data entered and the company job orders. Although the ERP system provided the ability to automatically link sales orders (OCs), purchase orders (OAs), and other documents such as bills and invoices, in many cases the connections were overlooked or managed manually, reducing the effectiveness of job cost tracking. The interviews revealed that each employee focused solely on their duties without considering the overall flow of company data, creating silos that hindered efficiency. For example, E1 managed sales orders correctly, but the failure to link orders made it difficult to track subsequent documents. E2, in the Purchasing department, faced problems related to the entry of material master data, which complicated the management of bills of materials (BOMs) and warehouse stocks.

E3 oversaw logistics and product BOMs but lacked a clear view of the overall production flow, which compromised the accuracy of production management.

Finally, E4, in the Administration department, encountered difficulties in automatically linking invoices to orders, putting the consistency of accounting data at risk.

These operational issues have underlined the need for greater integration between departments and a more synergistic use of the NetSuite system. After discussing these issues with NetSuite consultant, C1, during two key meetings in May 2023, solutions were

implemented to improve system integration. One of the main interventions concerned the automation of the connection of orders to the documents generated by the system, thus reducing the number of manual interventions and ensuring better traceability of costs and revenues. In addition, standardization of product codes has been suggested to improve inventory and BOM management. A crucial aspect for the future will be NetSuite's ability to monitor contract costs in real time, providing accurate and up-to-date data on the profitability of projects. At the moment, the ERP system allows you to have an overview of the costs related to purchases and revenues, but the long-term goal of M.R.M. is to adopt a more detailed and integrated management of production processes by also monitoring the costs related to the resources used for individual projects, moving from an accounting view to a complete view that also includes the planning and execution of production.

The improvement journey undertaken with NetSuite will require continuous refinement of internal procedures, especially to ensure that all business departments share a common vision and that data flows seamlessly between the various business functions.

In the next chapter, the €/h hourly costs for human resources and machinery will be analyzed and defined, an essential parameter for the accurate monitoring of order costs. This analysis will constitute a fundamental basis for understanding the impact of the different factors of production on the profitability of the projects.

In Chapter 6, on the other hand, a practical case will be presented that will illustrate how NetSuite can be used to effectively monitor the profitability of orders, providing a detailed view of costs and revenues in real time.

This digital transformation process will allow M.R.M. S.R.L. to further optimize its operations, improving efficiency in project management and facing market challenges in a more structured and competitive way.

5. Definition and Categorization of Productive Costs for Prototyping Projects at M.R.M. S.R.L.

The success of a prototype project in the automotive industry is strongly influenced by the efficient management of production costs. This chapter examines the different categories of costs associated with machining automotive prototyping projects, analyzing their impact on business profitability, with the goal of quantifying and ranking them. In this section, we will discuss the key elements that contribute to the overall cost structure, including a description of the main fixed and variable cost elements, the cost of labour and materials, the cost of machinery and equipment to determine the total costs incurred by the company. A clear determination of them allows for business management and allows targeted decisions to be made to solve inefficiencies that may occur.

In the production of automotive prototypes, proper cost management is one of the determining factors for the success of a project. It is essential to classify and understand the different types of costs, as this allows for accurate monitoring and effective control during all production phases. This chapter provides a detailed classification of production costs, with a specific focus on fixed and variable costs, highlighting their relevance in the business context of M.R.M. S.R.L.

The definition and classification of production costs is essential to ensure the economic sustainability of automotive prototyping projects. At M.R.M. S.R.L., the accurate management of fixed and variable costs, combined with a real-time monitoring system, allows you to optimize the allocation of resources and maintain control over profit margins. The next chapter will take a closer look at the NetSuite ERP system implementation strategies and the impact it has had on cost management and business production.

5.1 Productive Costs Classification

Production costs can be divided into two main categories: Fixed Costs and Variable Costs. Distinguishing between fixed and variable costs is critical to understanding the business cost structure and planning resources efficiently. In automotive prototyping projects, such as those managed by M.R.M. S.R.L., it is important to have a clear view of the expenses that will remain constant and those that will increase or decrease based on the volume of production.

5.1.1 Fixed Costs

Fixed costs are those that remain the same, regardless of the level of production or the number of projects undertaken. These costs are related to the company's overhead and must be incurred even when production is temporarily stopped. In the case of M.R.M. S.R.L., the predominant fixed costs are divided into the following main categories:

- **Administrative and General Costs:** With an incidence of approximately 7.3% on the 2024 earnings, this category includes:
 - Cost for utilities (gas, water, electricity)
 - Rentals (e.g. cars)
 - Entertainment expenses
 - Administrative consultancy
 - Purchase of user licenses
 - Lubricants
 - Travel and fuel
 - Advertising, trade fairs and sponsorships
 - Administrative practices
 - Alarm service
 - Stationery and printed matter

Over the years, the administrative costs of M.R.M. S.R.L. have shown a significant evolution with respect to revenues. In 2022, they accounted for 12.5% of revenues, a figure that indicated a company structure that was oversized compared to revenues.

However, in 2023, thanks to the new management, these costs were reduced to 7.6% of revenues. This reduction reflected a commitment to rationalizing expenditure. For 2024, a slight increase in administrative costs is expected, although the percentage of revenues has fallen to 7.3%. This increase could reflect growth in the company and its operations. Looking ahead, projections for the period 2025-2027 indicate that administrative costs will remain stable at around 7.3% of revenues, highlighting financial planning based on a constant percentage of expected turnover.

- **Overhead Costs:** These costs represent approximately 3% of the earnings for the end of 2024 and include:
 - Directors' compensation

- Rental of the shed
- INPS contributions for directors
- Subscriptions and fees
- Insurance
- Telephone expenses
- Maintenance and assistance of plants and equipment
- Maintenance of machinery, offices and software
- Maintenance of vehicles and buildings

In 2022, M.R.M. S.R.L. faced industrial costs corresponding to 14.7% of revenues, highlighting an inefficient structure in the management of production processes. However, in 2023, thanks to new management, these costs dropped, representing only 3% of revenues. This significant reduction reflects effective operational optimization. For the 2024 budget, industrial costs are expected to increase to 6.6% of revenues, due to targeted investments in production. Projections for the period 2025-2027 show a stabilization of industrial costs at around 6% of revenues, a sign of a continuous improvement in the optimization of production investments and in the management of company resources.

5.1.2 Variable Costs

Variable costs, as opposed to fixed costs, are directly proportional to the volume of production. They are tied to the actual consumption of resources during specific projects and occur only when production is active. At M.R.M. S.R.L., the main variable costs include:

- **Industrial Labour Costs:** This represents a significant part which weighs on total revenues (around 40.1% projected for 2024) and includes:
 - Employee wages and salaries
 - Social contributions (INAIL and INPS)
 - Severance Indemnity Portion (TFR)
 - Collaboration and temporary staff
 - PPE (Personal Protective Equipment) and work uniforms
 - Staff training
 - Corporate Welfare

Labour costs are one of the most significant items for M.R.M. S.R.L., expressed as a percentage of revenues (approximately 40.1% of the total), are in line with the company's growth objectives. The introduction of a new labour consultant has allowed the adoption of specific procedures for the exit of some resources close to retirement, involving significant costs. In addition, the analysis of working hours made it possible to identify unproductive orders, making it possible to convert resources from low-performance activities to more productive activities with a higher skill content, incentivizing and stimulating workers with more rewarding tasks.

Managing labour costs is particularly complex, as it includes both direct work, associated to the hours worked by employees who are directly involved in the production of prototypes, and indirect work, related to employees who are not directly involved in production, such as quality control staff, management, and administrative personnel. Their hours are not directly billable to a specific project, they contribute to the overall operational efficiency of the company. The costs associated with these employees must be distributed across all projects to ensure full cost recovery.

Proper attribution of direct labour costs is critical to ensuring that the hours actually worked on projects are charged to clients, avoiding losses. Inefficiencies, such as failure to record working hours on order, can cause discrepancies between the time actually spent and the time invoiced, resulting in economic losses for the company.

In 2022, M.R.M. S.R.L.'s labour costs amounted to 83.7% of revenues, an indication of inefficient human resource management. However, in 2023, thanks to a change of management, the cost of labour was drastically reduced in percentage, falling to 56.2%. Although the absolute amount has increased slightly, its impact on revenues has decreased, suggesting greater efficiency. For the 2024 budget, a further reduction in incidence is expected, dropping to 40.1%. Projections for the period 2025-2027 indicate a continuous improvement, with the incidence of labour costs expected to fall to 39.5% in 2027, highlighting an effective human resources optimization strategy.

- **Direct Costs:** Direct costs, which represent approximately 32.3% of the total earnings of the year taken in analysis, include:
 - Purchases of raw materials
 - Purchases of semi-finished products

- Consumables
- Third-party processing
- Packaging
- Production scrap
- Purchase of equipment and molds
- Spare parts and accessories
- Technical advice and quality control
- Specific maintenance
- Waste disposal and specific treatments
- Purchase of services
- Freight and shipping costs

Material costs are highly volatile and vary based on the type of project. For each project, a detailed bill of materials (BOM) is prepared, which includes all the raw materials, components, and consumables required for production.

The efficient management of these resources is essential to avoid waste and overproduction. In automotive prototyping, the most widely used materials include metals such as steel and aluminum.

The purchase of raw materials and semi-finished products, which accounts for 32.3% of the earnings, must be precisely planned to ensure that materials are available at the right time and in adequate quantities.

Direct purchases remained stable compared to 2022, with a slight reduction, attributable to the introduction of the central purchasing office. This change has made it possible to achieve efficiencies in both purchase prices and supplier payment terms. In addition, a comparative analysis was conducted between the payment terms of suppliers and those applied to customers. In the first half of 2023, the goal of the following was achieved:

- Payment to suppliers: 90 days.
- Cash out from customers: 60 days.

This balance made it possible to generate a positive cash flow, although this result was only visible from the months of June/July 2023. This delay was due to a significant increase in turnover that was recorded only from April, following the introduction of the new organizational structure and management.

Particular attention is also paid to the management of waste and scrap, which must be minimized to reduce overall costs.

Variable costs require real-time control to avoid waste and inefficiencies. For example, the purchase of raw materials and semi-finished products must be carefully managed to avoid overstocking or the risk of resource depletion during production.

In 2022, M.R.M. S.R.L.'s direct costs correspond to 33.7% of revenues, highlighting inefficient management under the previous administration. However, in 2023, with the introduction of new management, the incidence of direct costs on revenues decreased slightly to 32.3%. For the 2024 budget, direct costs are expected to reach a stable incidence of 32.3% on revenues. This suggests an improvement in expense management. Projections for the period 2025-2027 indicate that direct costs will continue to remain stable as a percentage of revenues, around 32.3%, a sign of good control of operating expenses and an effective financial management strategy.

- The remaining part of the costs is allocated to **Non-industrial management**, which includes depreciation and leasing, as well as the **Financial management** of the company.

Over the years, M.R.M. S.R.L. has embarked on a path of rationalization and optimization of resources, evidenced by significant variations in costs. In 2022, depreciation and leasing amounted to 10.8% of revenues, but in 2023, thanks to new management, they were reduced to an incidence of 14.2%. For the 2024 budget, a further reduction is expected to only 1.7% of revenues. Non-industrial costs, initially set at 1.1% of revenues in 2022, showed an improvement, reducing further in 2023, with growth expected to double in 2024, but stabilizing in the following years. Overall, these strategies have led to increased operational efficiency and tighter control of business expenses.

With a clear distinction between fixed and variable costs, the next step is to examine how these costs are quantified and managed on an hourly basis. This involves calculating the hourly cost of labour and machines, which are critical for pricing, budget planning, and overall financial management.

5.2 Hourly Cost Calculation

To effectively manage production costs, it is essential to calculate the hourly cost for both labour and machines. This calculation allows for accurate pricing of services, financial planning, and cost control. By applying the cost classifications defined above, we can determine how each cost type contributes to the overall hourly cost. This section will explore the methodologies used to calculate the hourly cost of labour and the hourly cost of machines, providing a comprehensive approach to cost management in automotive prototyping projects.

5.2.1 Hourly Labour Cost Calculation

In recent months, the company's goal has been to define the appropriate hourly rate for the Cost of Labour, a fundamental unit of measurement to quantify the working time of a single person dedicated to specific activities.

It is crucial to establish the number of direct working hours that can be sold to customers, identifying the target and setting the necessary goal to avoid negative balances.

To calculate the Labour Cost, it is necessary to start from the analysis of the company's Human Resources, determining the actual Labour Cost. This is achieved by adding up the costs of Direct Resources (40 people), Indirect Resources (11 people), and the CEO.

Subsequently, a standard 8-hour shift for 220 working days per year is considered, resulting in a total of 1,760 working hours per year for each Direct Employee. In the phase of determining the hourly cost, only one shift of use of the machinery present in the company is considered, calculating the hours worked for each machine.

The Hourly Cost of Direct Resources is calculated by dividing their total cost, equal to €1,899,198.80, by the total number of saleable hours, i.e. 72,800 hours per year. This provides an hourly cost of €26.09. However, this price does not cover Fixed Costs and the share of Indirect Workers. Direct Costs, being closely linked to the business, are covered by the revenues deriving from the services offered, provided that the quotes sent to customers correctly reflect the value of the company's services.

To determine the Hourly Cost of Labour, which represents the break-even point below which the profitability of the order and, more generally, the company's profitability is negatively affected, it is necessary to consider the hourly incidence of Fixed Costs and Indirect Workers.

A part of these costs is covered by the sale of Machine Hours, while the remaining is distributed over the hours worked by Direct Workers with an increase of the 20% of their cost.

The Hourly Labour Cost, calculated in this way, is equal to € 47.02. A trade margin of 20% is generally applied to this value, thus bringing the hourly sale price to €56.42.

Accurate estimation of Hourly Labour Costs is crucial, as it allows you to assess the leeway available in the event of requests for discounts from customers. A precise determination of this cost allows you to understand the extent to which a discount can be applied without compromising the profitability of the company. In other words, it provides a solid basis for making informed decisions regarding business negotiations, ensuring that any price concessions do not negatively affect the profit margins and economic sustainability of the company.

Human resources	N°. Employees	h. Ordinary [h]	h. Extraordinary [h]	h. Total [h]	h/Year	Total Resource Costs [€]
Direct Resources	40	1,720	100	1820	72,800	1,899,199
Indirect Resources	11	1,720	40	1760	19,360	692,689

Table 7: Resources Cost Calculation

Direct Labour Hourly Cost [€/h]	N°. Hours That Can Be Sold to the Customer [h]	Other Costs [€]	Of which Covered by Machinery [€]	Total Cost [€]	Hourly Labour Cost [€/h]	Trading Margin [%]	Hourly Labour Price [€/h]
26.09	72,800	1,790,633	266,800	3,423,032	47.02	20	56.42

Table 8: Hourly Labour Cost and Price Definition

5.2.2 Hourly Machinery Cost Calculation

M.R.M. S.R.L., in addition to the sale of labour hours, also markets the hours of use of the machinery. The correct determination of the cost associated with the use of individual machines is fundamental and depends largely on the forecast of the planned production shifts for each machine.

For a company like M.R.M. S.R.L., the configuration of the shifts for the use of the machinery can vary between 1, 2 or 3 daily shifts of a single duration of 8 hours. Typically, a prudent decision-making approach is taken to avoid unexpected excessive costs. However, it is important to consider that an extremely cautious approach would result in an

underestimation of the hours of use of the machinery which could lead to a significant increase in the hourly cost. A high hourly cost, in turn, could cause the service offered to be uncompetitive, negatively affecting company revenues.

The company's goal is to achieve complete saturation of the equipment on 3 shifts days to maximize its profitability.

The process for establishing the Hourly Cost of using the machinery is applied uniformly to the entire machine sector of the company. Although some minor machine-specific adjustments may be necessary, the basic procedure for estimating the hourly cost remains unchanged.

In the following, the method adopted to calculate the Hourly Cost of using machinery will be illustrated in detail, highlighting the importance of accurate planning and precise analysis to ensure the competitiveness and economic sustainability of the services offered.

For the determination of the hourly cost of using machinery, it is considered that, despite the presence of several machines of the same type, there are no significant differences in the calculation of the hourly cost for each type of machinery. The types of machinery considered include Press, Mill, Waterjet and Laser Cutters. The following data are recorded for each of them:

- Number of machines by type
- Year of start of activity
- Investment cost for the purchase
- Estimated depreciation duration (generally, for this type of asset, the duration of the depreciation considered is 10 years)
- Annual depreciation rate

The duration of the daily ignition of the machinery is assumed on the basis of the work shifts: 8 hours for one shift, 16 hours for two shifts and 24 hours for three shifts. This prediction is crucial, as an inaccurate estimate could have negative effects on the hourly cost calculation. Electricity consumption and its cost per kilowatt-hour (kW) are also identified. The theoretical hours that can be worked on an annual shift are estimated at 1,760 hours. With this data, it is possible to calculate the Hourly Cost of Electricity and determine the impact of the depreciation of the machinery on the hourly cost. An incidence for maintenance from 3% to 10% of the sum of energy costs and depreciation is considered (the Waterjet machine has a fund of € 15,000 for maintenance costs, considering that these interventions can be very frequent), with an additional 1% tolerance for any unforeseen events.

To calculate the Hourly Cost of the Unmanned Machine, the hourly cost of the operator is added if the work shift is manned. The hourly cost of the operator, previously calculated at about €47, includes not only the direct cost of labour, but also a share of indirect costs and the company structure (approximately 20%). When the machine is operated with an operator, the cost associated with operating the machine is lower than if it were considered unmanned. This is lower than the actual cost of the unmanned machine, as the cost of operators already covers part of the indirect costs and structural expenses. Therefore, the cost of the machine is reduced to reflect the fact that the costs associated with operators are already included in the price of the operator's hourly labour.

Machinery reference data	Hursan Press	Small Milling machinery	Waterjet Cutter	Laser Cutter	Large Milling machinery	Oven
Start of Activity	01/03/2019	01/01/2023	01/03/2019	06/11/2018	01/01/2023	01/07/2024
Duration Depreciation [y]	10	10	10	10	10	10
Seniority [y]	5.67	1.83	5.67	5.99	1.83	0.33
Cost [k€]	132	300	400	630	500	100
Depr. Amount per Year [k€/y]	13.2	30	40	63	50	10
Electricity consumption [kW/h]	65	18	65	18	18	40
Cost per kW [€/kW]	0.12	0.12	0.12	0.12	0.12	0.12
Theoretical hours that can be worked on 1 shifts [h/y]	1,760	1,760	1,760	1,760	1,760	1,760
Operator Hourly Cost [€/h]	47	47	47	47	47	47
Rivoira Gas Cost per Year [(€/ton)/y]	\	\	\	4.04	\	\
Sand Cost per Year [(€/ton)/y]	\	\	14.66	\	\	\
Sand Withdrawal Cost per Year [(€/ton)/y]	\	\	1.19	\	\	\

Table 9: Machinery Data

Hourly Cost Calculation	Hursan Press	Small Milling machinery	Waterjet Cutter	Laser Cutter	Large Milling machinery	Oven
Hourly cost of electricity [€/h]	7.8	2.16	7.8	2.16	2.16	4.8
Hourly Cost Depreciation [€/h]	7.5	17.05	22.73	35.80	28.41	5.68
Hourly Maintenance Cost [€/h]	1.53	0.58	8.52	1.14	0.92	0.31
Direct Costs [€/h]	\	\	15.85	4.04	\	\
Miscellaneous [€/h] (1%)	0.17	0.2	0.55	0.43	0.31	0.11
Hourly Cost Without Operator [€/h]	17	20	55.5	43.6	31.8	10.9
Hourly cost with operator [€/h]	64	67	102.5	90.6	78.8	57.9

Table 10: Machinery hourly Price Calculation

The tables above show the procedure used by the company to calculate the number of manned and unmanned hours of use of the machinery. Generally, during the negotiation phase with the customer, a commercial margin is added to the previous costs, increasing the cost incurred by M.R.M. S.R.L. by about 20% to obtain the selling price.

The calculation of the selling price, based on the analysis of the hourly costs of labour and machines, has allowed M.R.M. S.R.L. to precisely define the break-even point of the activities offered, preventing requests for discounts from compromising the profitability of the orders. This calculation methodology has led to the optimization of decision-making processes in the budgeting and negotiation phases, allowing the company to have a clear and complete view of the real costs of its operations.

Thanks to the organization by cost centers, the sales department has a transparent view of the costs related to production processes and products, establishing the limits within which price reductions can be applied without compromising overall profitability. This integrated approach ensures that any pricing concessions are based on hard data, maintaining the company's economic viability.

In addition, the adoption of a unified model for the compilation of offers allows an accurate entry of hours by the technical office. The €/h multipliers for man and machine are determined annually by the company management through a detailed analysis of personnel costs, fixed costs and depreciation of the equipment. This process allows the company to maintain a rigorous and structured management of costs, promoting greater competitiveness

in the market and the possibility of dealing more effectively with customer requests without compromising profitability.

6. NetSuite ERP Implementation Strategy at M.R.M. S.R.L.

6.1 Overview of the implementation approach

The current implementation and use of NetSuite within M.R.M. S.R.L. has a high degree of fragmentation. This is manifested through uneven use of the system across departments, lack of standardized processes, and insufficient integration between available modules. These issues hinder the overall operational efficiency of the organization and indicate a significant underutilization of NetSuite's potential as a complete ERP platform.

Inefficient use of NetSuite's advanced features has a number of negative consequences. On the other hand, most of the operations that can be managed with the NetSuite system are dealt with daily through Excel spreadsheets, which leads to frequent duplication of data and processes, increasing the risk of errors and inconsistencies. In addition, the lack of a unified view of business operations limits optimal resource management, making it difficult for the company to react quickly to market demands. This fragmented approach also prevents you from taking full advantage of NetSuite's analytical and reporting tools, which are critical to supporting informed strategic decisions.

NetSuite's underutilization is particularly alarming in a competitive environment such as automotive manufacturing, especially in the prototyping sector, where agility and operational efficiency are crucial for business success. Best practices in ERP system implementation suggest that full adoption and integration of available features can lead to significant improvements in productivity, cost reduction, and customer satisfaction. Therefore, it is essential that the company adopts a more integrated and process-optimized approach through NetSuite.

In consultation with company management, involved employees, and NetSuite's business consultant, a pilot project was identified to address these challenges and provide a solid baseline for a broader implementation.

The *Ferrari F2XX Scocca* project, in which the company M.R.M. S.R.L. was entrusted with the production of finished prototype components of front and rear doors, as well as the rear spoiler.

It was chosen as the initial case study for the implementation of NetSuite for cost tracking during component manufacturing. This pilot case will show how the profitability monitoring of each job will be managed within the NetSuite system.

Given the complexity of the operations and how they will integrate with the employees' current work routines, a customized solution was proposed. The goal is to re-propose the current cost monitoring, which is currently managed by the project manager through Excel spreadsheets, directly in the NetSuite ERP system, without altering the fields and processes already used by employees. The intention is to ensure a smooth transition and maintain consistency in workflows for those employees who already use the system, minimizing resistance to change and avoiding operational inefficiencies.

It was decided not to introduce a radical transformation in employee routines, as this could generate discontent and inefficiencies related to too rapid a change. Instead, this project aims to create a solid foundation for employees to gradually familiarize themselves with new workflows, facilitating a progressive adoption of NetSuite features. The next steps include the extension of the integration to other areas of production management, such as programming, which will be implemented later. However, management identified cost monitoring as an initial priority, which was considered crucial to ensure precise control of expenses and improve the overall efficiency of the work performed.

In summary, the initial implementation of NetSuite for the *F2XX* project serves as a pilot for monitoring the profitability of the order. This represents a crucial step towards leveraging the broader capabilities of the NetSuite ERP system in the future, with the goal of gradually improving operational efficiency while maintaining employee satisfaction.

6.1.1 Ferrari F2XX Project Planning

The pilot project for the implementation of cost monitoring via NetSuite, relating to the *Ferrari F2XX Scocca*, was launched between April and May 2024.

After an initial phase of planning, understanding and configuration of the system, the production of the prototype components (front doors, rear doors and the rear spoiler) offered the opportunity to calculate the costs of the production processes in real time, analyzing each phase of the production process within the NetSuite system.

The final balance of the project was started during the production phase, between August, September and October 2024. During this time, it was possible to monitor costs continuously and in detail. This made it possible to collect fundamental data for the analysis of the profitability of the order and to identify any inefficiencies, as well as opportunities for process improvement.

The long-term goal of the project is to extend this type of final accounting and cost monitoring to all orders by the end of 2024.

The plan provides for progressive implementation, which will involve all employees and company departments, allowing for more accurate and integrated monitoring of costs and revenues related to individual orders. This implementation and monitoring project represents an important turning point in the digitization and improvement of business cost management.

Starting from 2025, the development plan provides for a further level of detail. In particular, production monitoring will be introduced at the level of subassemblies, a crucial area to ensure an even more precise balance sheet of production activities. This will allow you to trace in detail not only the main phases of the process, but also the individual subgroups, thus ensuring granular control over each component made.

This step will be essential to improve transparency and operational efficiency, as well as to maximize the overall profitability of the company.

In summary, the initial implementation of NetSuite for the F2XX project represents a first step towards a complete adoption of the ERP system for monitoring the profitability of the order and creates the necessary premises for the implementation of future automated production planning and control.

6.2 Development of the Ferrari F2XX project

The *Ferrari F2XX Scocca* project, entrusted to M.R.M. S.R.L. by the company Fontana Pietro S.p.A., a direct supplier of Ferrari S.p.A., represents a significant opportunity for the company in the field of automotive prototyping. The project involves the production of 10 complete Kits of 5 finished prototype components: the front doors (right and left), the rear doors (right and left) and the rear spoiler.

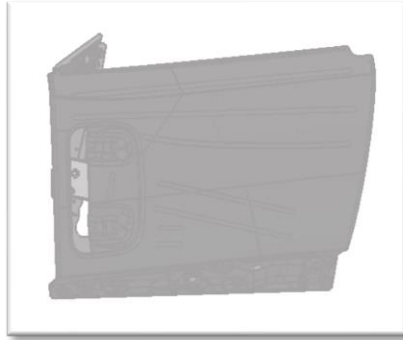


Figure 21: F2XX Right Front Door

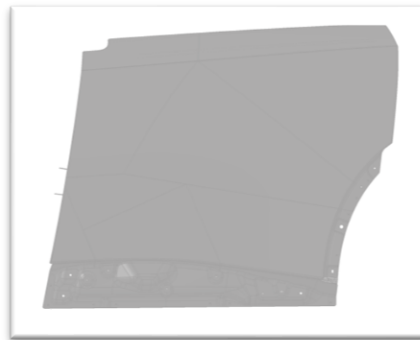


Figure 22: F2XX Left Rear Door

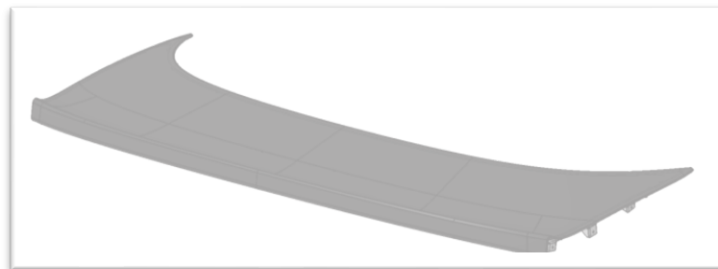


Figure 23: F2XX Rear Spoiler

In addition to the production of these components, M.R.M. S.R.L. must take care of the supply of the tools necessary for production, such as molds, assembly jigs and test gauges.

To ensure efficient monitoring of profitability and precise management of project costs, the company decided to adopt its own NetSuite management system.

This software will reduce analysis time and improve cost control compared to the current Excel-based method. In the following paragraphs, the necessary steps that employees will have to follow on NetSuite will be illustrated to allow management to promptly and reliably monitor the profitability of the order, with particular attention to the costs related to the purchase of materials, external processing (when internal working hours are engaged on other projects) and the production of assemblies.

Below there is a flowchart that outlines the sequence of steps taken to implement the management software at M.R.M. S.R.L., which will be explained in detail in the following paragraphs.

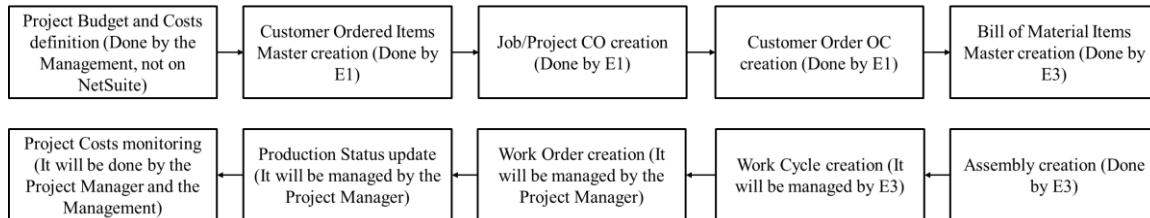


Figure 24: Flowchart highlighting the implementation process of NetSuite used

6.2.1 Project creation, Budgets definition and Customer Order entry

The first fundamental step to start the project is the creation of the CO job (initially it is not created on NetSuite), which must be identified with a specific name before sending the quote to the customer. In this case, the project was named *IFON23N_F2XX_SCOCCA*. This nomenclature follows a very precise logic shared by all management: the number 1 refers to the cost center of the plant dedicated to the automotive sector (while the number 2 would have been used for the aviation plant); FON refers to the customer Fontana Pietro S.p.A.; 23 indicates the year in which the first offer was submitted to the customer; N represents the month in which the offer was made, and finally *F2XX SCOCCA* is the name assigned by the management to uniquely identify the project relating to the Fontana Pietro S.p.A. order.

Once the official order has been received from the customer, after several changes and negotiations (which in the prototype production sector can be particularly accentuated and must be carefully considered for the profitability of the order).

E1, from the sales department, takes care of the creation of the purchased items on the management software, using the item codes created by the customer. This process is carried out in the "Item Master Data" section of the NetSuite system, as shown in the following image.

In the Item Master Data screen, the details relating to the components requested by the customer are entered. For example, below you can see the article code, the product description; in the Item Details the product class, the product line, the type of product and

the reference customer are indicated. Every detail related to the product "F2XXPR CS SPOILER POST":

The screenshot shows the 'Anagrafica Articoli / Parti' window. The main data fields are as follows:

- Codice:** ZAS055027950
- Data Ultima Manut.:** 13/06/2024
- Stato Anagrafica:** (empty)
- Descrizione:** F PR CS SPOILER POST
- UM Stoc.:** N
- Numero:** (empty)
- COMM.:** 237420
- Ultimo Aggiorn.:** 10/10/2024 11:10:04 - Andrea
- Note:** (empty)

The 'Dettaglio Articolo' section includes the following details:

- Tipo IVA:** 22 (IVA 22%)
- Data esaur. fornitura:** (empty)
- Art. ad esaurimento:**
- Gestione a Lotto:**
- Art. Gestito a Matricola:**
- Cd. Art. Form.:** (empty)
- Ci. Mercol.:** \$0 (Ricevuti in c/to lavoro)
- Lin. Prodotto:** 244 (F2 FONTANA)
- Tip. Prodotto:** \$1 (Assieme montato)
- Categoria:** (empty)
- Rif. Disegno:** (empty)
- Cliente:** 000213 (FONTANA PIETRO S.p.A.)
- Fornitore:** 100266 (FONTANA PIETRO S.p.A.)
- Prod/Ter:** (empty)
- Conto Vend.:** (empty)
- Conto Acq.:** (empty)
- Rif. Catalogo Vendita:** (empty)
- Obligatorio per esplosione distinta base livelli inferiori:**
- Gestione Misure:**

Figure 25: Item Master - Item Details

The "planning" sheet includes further information, namely the Lead Time necessary for the Production of the component (not strictly useful in our case in question as the MRP is not currently used) and the commitment warehouse.

The screenshot shows the 'Anagrafica Articoli / Parti' window with the 'Pianificazione' tab selected. The main data fields are as follows:

- Codice:** ZAS055027950
- Data Ultima Manut.:** 13/06/2024
- Stato Anagrafica:** (empty)
- Descrizione:** F2 R CS SPOILER POST
- UM Stoc.:** N
- Numero:** (empty)
- COMM.:** 237420
- Ultimo Aggiorn.:** 10/10/2024 11:10:04 - Andrea
- Note:** (empty)

The 'Dettaglio Articolo' section includes the following planning details:

- Lead Time in giorni (Utilizzato x MRP):**
 - Produzione: 0
 - Terzista: 0
 - Fornitore: 0
- Pianif. per singola Commessa:**
- Qtà Lotto Std di Prod.:** 0,0000
- Magazzino Impegno Componenti Produzione:** CL

Figure 26: Item Master - Item Planning

In the last used screen of "Production" the unit of measure considered is specified, the Subcontractor Commitment (No Commitment), the Class Part. Structural (Finished Product in this case, as we are creating the finished Rear Spoiler item) and Primary Supply Type (Production as it is produced in-house).

The screenshot displays the 'Anagrafica Articoli / Parti' window for item 'R CS SPOILER POST'. The interface includes a menu bar with options like 'Esci', 'Nuovo Articolo', 'Salva Dati', 'Elimina Articolo', 'Duplica Articolo', and 'Articoli Equivalenti'. The main area shows the following details:

- Codice:** ZAS055027950
- Data Ultima Manut.:** 13/06/2024
- Stato Anagrafica:** (checkbox)
- Descrizione:** F2 R CS SPOILER POST
- UM Stoc.:** N Numero
- COMH. 237420**
- Ultimo Aggiorn.:** 10/10/2024 11:10:04 - Andrea
- Note:** (empty field)

Below the main details, there are several sections:

- Dettaglio Articolo:** Includes fields for 'UM Peso', 'UM Tec.' (N), 'UM Acquisto' (N), 'N° Assemi' (0), 'Coeff. C./A...' (0,00000), 'N° Operazioni' (0), 'Parte Gestione', 'Peso Unitario' (0,00000), 'Conv. UM Tec.' (0,00000), 'Conv. UM' (0,00000), 'Centro di Costo', 'Spesa/Ricavo' (310), 'Corrispondente', 'Voce di Spesa' (310), 'Cd. Gruppo', and 'Posiz. Linea'.
- Impegno Terzista:** A list of options including 'Magazzino', 'Magazzino terzista', 'Nessun Impegno', 'Asieme Fittizio', 'Prodotto Finito', 'Semilavorato', and 'Materiale di Base'.
- Parte class. Strut.:** A list of options including 'Asieme Fittizio', 'Prodotto Finito', 'Semilavorato', and 'Materiale di Base'.
- Tipo Approvv. Primario:** A list of options including 'Fornitori', 'Produzione', 'Terzista', and 'Conto Lavoro Cliente'.

Figure 27: Item Master - Item Production

After completing the insertion of the product master data, E1 creates the reference CO job within the "Job Management" section, as shown in the image below.

Figure 28: Job/Project CO – Main Data

On this screen, you enter all the details of the order, including the data relating to the customer (Fontana Pietro S.p.A.), the description of the order (in this case "PORTE ANT/POST F2XX" which also includes the Spoiler), the expected start and delivery dates, and other administrative information.

After the CO job is created, the budgeting process begins, based on the values established during the budgeting phase. As you can see in the first image, the Costs & Revenue screen gives you a detailed overview of the main cost items, including the cost of Resources, Purchase costs, Agreed Amount, and Estimated Margin. This window allows you to monitor the economic progress of the project, keeping track of the final costs compared to those budgeted and offering a real-time view of the profitability of the order.

Currently, the budget entry process on NetSuite is not carried out by any person operating on the system, once the procedures of this pilot project have been extended to all other orders, the budgets will be defined and entered by the Project Manager agreed with the management.

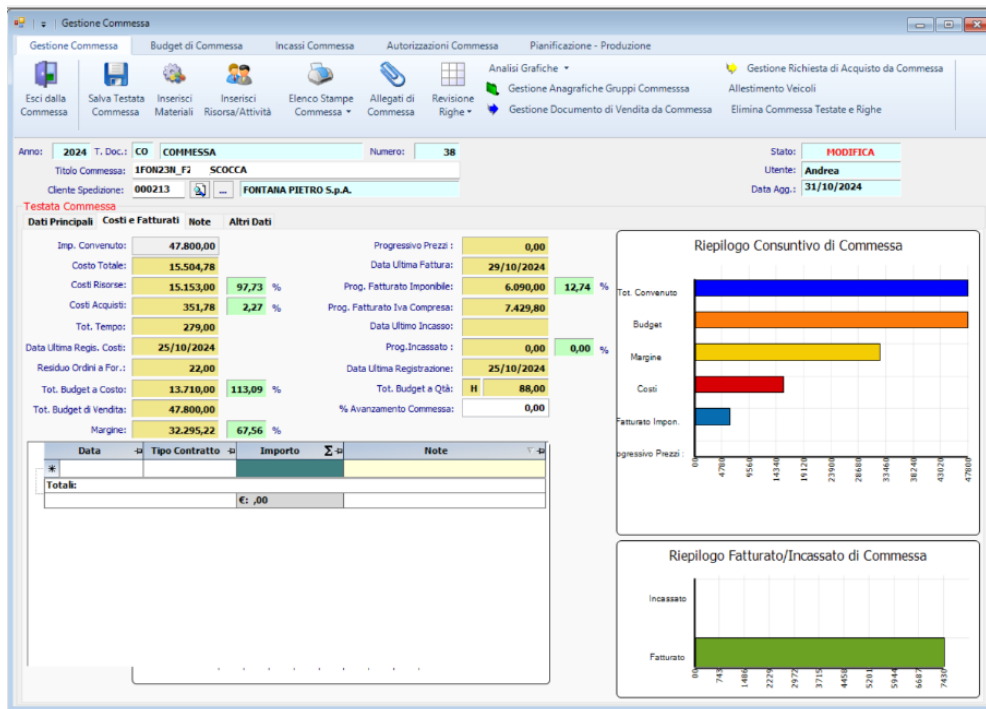


Figure 29: Job/Project CO - Costs and Revenues

Finally, the document corresponding to the sales order, named "OC" (sales order) in the NetSuite system, is created, as seen in the image below.

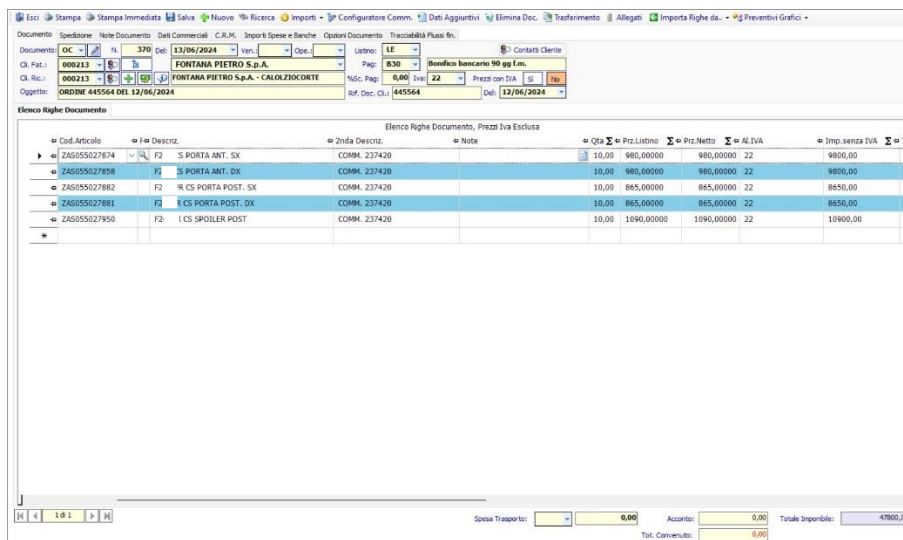


Figure 30: Sales Order OC

In this step, the article numbers of the required items are entered, together with their description, quantity and agreed price. Once the data relating to the customer's Company Name and contractual conditions have been correctly entered, the system automatically calculates the taxable amount, as highlighted at the bottom right of the screen. The

calculation is made by adding up the individual component prices and multiplying them by the required quantity.

The total amount calculated in this way will subsequently be visible in the job accounting, in the event that the OC document is correctly linked to the CO shown in the proceeding.

In conclusion, the creation of product master data, the definition of the budget and the management of customer orders on NetSuite are the primary fundamental steps for effective management of the *IFON23N_F2XX_SCOCCA* project. These steps, currently managed by E1, allow the order to be started with a clear and detailed structure, ensuring a necessary basis for real-time monitoring of profitability and production, and supporting informed and rapid business decisions.

6.2.2 Creation of product master data

The Bill of Materials (BOM) definition of the components required for manufacturing is achieved by the Design/Engineering process.

In automotive prototype production, the aforementioned phase can be particularly long and complex. This is due to the fact that the department collaborates closely with the customer, who often has needs that evolve over time. The technical specifications of the components can undergo significant changes based on new requirements, technological upgrades or simple functional adjustments requested by the customer.

As a result, the BOM of components is not always a static document, but requires continuous revisions and updates that reflect changes in the needs of the project.

Furthermore, it is important to emphasize that this engineering process is not carried out directly on the management system. Technical specification and change management takes place outside of the ERP system, using tools such as Excel sheets to gather and organize the necessary information. The final output of this process is a final bill of materials, processed on Excel.

Subsequently, E3, in charge of entering the BOMs on the management system, will take care of manually uploading the Master Data of the Items present in the BOM provided to him, within the system.

This approach, while well-established, requires care to ensure that the data entered into the system is accurate and faithfully reflects the latest changes agreed upon with the customer.

6.2.3 Assembly creation and input of the work cycle

Once the master data sheets of all the necessary items have been created. It is necessary to go and create the Bill of Materials of the component required by the customer.

The following example shows the bill of materials for the Rear Spoiler component.

The screenshot displays the 'Dati Assieme' (Assembly Data) section for assembly 'ZAS055027950'. The assembly description is 'F2 - R CS SPOILER POST' with drawing 'COFH. 237420'. The user is 'Antonio' and the date is '16/09/2024 14:05:35'. Below this is a table of components:

Seq.	Cod. Componente	Desc. Comp	Desc. 2 Comp	UH	Qta	Lung	Larg	Prof.	Approvigionamento	Ute Ult. Mod.	Data Ult. Mod.	CLM
0010	F2_650000158	ALLUMINIO ADVE170 1795X1770X1 EL TIZR		KG	5,198	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	LA
0020	055027950_1	INCOLLAGGI SPOILER POSTERIORE	F2 - COD. FONTANA 8	N	0,100	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0030	055027950_2	GIUNZIONI SPOILER POSTERIORE CPL	F2 - COD. FONTANA 8	N	0,330	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0040	F2_5001636	ALLUMINIO ADVANZ 6CM 1950X1800X0,8	OSSATURA SPOILER	KG	3,121	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	LA
0050	55029998	SUPPORTO ANTERIORE SPOILER	F2	N	2,000	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0060	F2_650000007	ALLUMINIO S170 2000X1500X2		KG	0,224	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0070	F2_650000007	ALLUMINIO S170 2000X1500X2		KG	0,224	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0080	14059214	DADO E CON FLANGIA M6	F2 - COD. FONTANA 7	N	4,000	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	11
0090	F2_650000224	ALLUMINIO ADVE170 2450X1100X1,5		KG	0,017	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	LA
0100	F2_650000224	ALLUMINIO ADVE170 2450X1100X1,5		KG	0,017	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	LA
0110	15624311	RIVETTO EF TC M 5X14	F2 - COD. FONTANA 7	N	10,000	1,00	1,00	1,00	Fornitore	Antonio	16/09/2024	11
0120	F2_650000007	ALLUMINIO S170 2000X1500X2		KG	0,056	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0130	F2_650000007	ALLUMINIO S170 2000X1500X2		KG	0,056	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0140	F2_650000007	ALLUMINIO S170 2000X1500X2		KG	0,051	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0150	82286900	PRIGIONIERO TP ESAGONALE M6X17,5	F2 - COD. FONTANA 7	N	2,000	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	11
0160	85917100	RIVKLE M6 ESAGONALE A TESTA LARGA	F2 - COD. FONTANA 7	N	2,000	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	11
0170	F2_650000007	ALLUMINIO S170 2000X1500X2		KG	0,051	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	
0180	82286900	PRIGIONIERO TP ESAGONALE M6X17,5	F2 - COD. FONTANA 7	N	2,000	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	11
0190	85917100	RIVKLE M6 ESAGONALE A TESTA LARGA	F2 - COD. FONTANA 7	N	2,000	0,00	0,00	0,00	Fornitore	Antonio	16/09/2024	11

Figure 31: Creation of Bill of Materials for Assembly: F2XXPR CS Spoiler Post

As can be seen in the bill of materials, there is only one level of detail, which includes components such as sheet metal, normalized and semi-finished products with the correct requirements for the production of a single Rear Spoiler Kit.

In this initial phase of development of the management software implementation project in the company, the bill of materials is simplified and loaded with only one level of detail, which means that no specific subassemblies are managed. This approach streamlines the data entry process, reducing management complexity in this preliminary phase of implementation.

The decision to use a simplified bill of materials was driven by the need to avoid an excessive increase in workload for employees and the lack of resources dedicated solely to production management on NetSuite.

Currently, the BOM level of detail only includes the base materials, such as sheet metal, normalized components, standards, and semi-finished products, which are required to ensure a proper warehouse loading and unloading process. This process is crucial for inventory

management and production planning, as it ensures that essential materials are always available and that warehouse stocks are constantly updated in real time. This process includes various activities, such as monitoring the inputs and outputs of raw materials, semi-finished and finished products, checking stocks, and automatically updating available quantities.

In the specific context of automotive prototype production, precise loading and unloading management takes on even greater importance, as high-value materials and components are often worked with and sometimes difficult to find. An error or delay in stock management can compromise the entire production cycle, causing delays in the delivery of the prototype to the customer. For this reason, the NetSuite system should play a fundamental role in accurately tracking every warehouse movement, associating loading and unloading operations directly with work orders and specific orders.

In the future, it will be necessary to evaluate the opportunity to add intermediate levels to the bill of materials to manage the production cycle more completely directly on NetSuite, eliminating the use of Excel sheets that currently represent a bottleneck in terms of operational efficiency.

After obtaining the Bill of Materials it is possible to load the Work Cycle on the Rear Spoiler assembly.

From now on, all the phases described are not part of the routine of the personnel operating on the management system. To expand the methodologies used in this pilot project, to all company orders, the insertion of the Work Cycle will be entrusted to E3, while the subsequent phases will be managed by the Project Manager.

The Work Cycle consists of Standard Production Operations, which include all the steps necessary to transform incoming raw materials or semi-finished components into a finished product, each with its own timelines and other key information to ensure efficient production.

Each operation is associated with precise timing, resources required (such as machinery and/or labour), and estimated costs (see Chapter 5) to ensure control and monitoring of production efficiency.

Figure 32: Input Work Cycle - Stamping Phase

The standard operations in a future implementation of the NetSuite management system will allow the company to have a clear view of the production flow and can be used to plan activities, in this thesis they are used to allocate resources in order to monitor the costs associated with each phase of production.

In this project, concerning the first phase of implementation, it was decided to use the Standard Operations present on the Estimates model (visible in the table) for the generation of the offers to be sent to the customer.

M.R.M. S.R.L. Production Processes
Milling element
2D Laser cutting
Supervised Waterjet cutting
Unsupervised Waterjet cutting
Man
3D Laser cutting
Stamping
Packaging/marketing
Bending
Calibration/assembly
Manual beating
MIG welding (continuous wire for steel)
MAG welding (continuous wire for aluminum)
TIG welding
Element revision
Manual drilling
Shear cutting of the blank
Assembly
Unsupervised milling

Table 11: M.R.M. Standard Operations

The Standard Operations currently present are not detailed for the generation of a real Work Order document that should follow the production of the component, because the insertion of a bill of materials with a single level, without the subgroups, does not allow this.

In the future, the subgroups of the finished assembly must also be loaded, to which a more specific Duty Cycle can be associated with the instructions for the production of the individual component.

In this first phase of implementation of the NetSuite system in the company, it was decided to prioritize the tracking of the profitability of the order, i.e. the simple and effective final balance of labour costs relating to the previously mentioned macro-phases. In the image below you can see the Work Cycle to produce one Rear Spoiler item.

N.Fase	Centro	Attrezzo	Cod. op. std	Desc. Operazione	UM	T. mac.	Tempo Manod. I	Nr. addetti	Qtà base	E=Opz Est.
0000	STA		STA	01_STAMPAGGIO	M	31,00	0,00	1	1	
0010	TAG		LAS	01_TAGLIO LASER	M	8,50	0,00	1	1	
0020	BATT		BAT	01_BATTITURA MANUALE	M	360,00	0,00	1	1	
0030	ASS		ASS	01_ASSEMBLAGGIO	M	120,00	0,00	1	1	
0040	PIE		PIE	01_PIEGATURA	M	1,50	0,00	1	1	
0050	MIS		CTR	01_MISURAZIONI/CONTROLLO	M	0,00	0,00	1	1	
0060	UOMO		UOM	01_UOMO/ALTRO	M	0,00	0,00	1	1	
						0,00	0,00			
Sommario						Somma = 521,00000		Somma = 0,00000		

Figure 33: F2XXPR CS SPOILER POST Work Cycle

This window allows you to define and view all the macro-operational phases necessary for the production of the component, highlighting the timing and resources required for each operation.

Each row represents a phase of the production process, the operations listed are:

- **Stamping:** This operation involves the use of stamping for the processing of the raw material. It is associated with a labour time of 30 minutes.
- **Laser Cutting:** Next, the material is subjected to laser cutting, an operation that has a processing time of 8.5 minutes.
- **Manual Hammering:** After laser cutting, manual typing is performed, which takes a significantly longer time of 360 minutes due to its manual nature and the level of precision required.
- **Bending:** A bending step follows beating, with a processing time of 1.5 minutes.
- **Assembly:** Finally, the assembly phase has a processing time of 120 minutes.

The Standard Operations are preceded by the number 01 in front to indicate the fact that they refer to the Automotive plant in Via della Cortassa 21.

At the bottom of the screen, the total labour time required to complete all phases of the work cycle is displayed, which in this case is 520 minutes.

This screen is crucial for production planning, as it provides a detailed view of each individual operation.

6.2.4 Creating Work Order and Production Status Updates

The creation of the Work Order/Production (PO) is an essential phase for the management of company production through the NetSuite software. Each work order must specify the quantity (10 Kits in this case) of components to be produced, the warehouse for picking materials, and the requirement for basic components (such as sheet metal and standard components). NetSuite, in fact, automatically checks the warehouse stocks to verify the availability of the necessary material and report any shortages.

In the following figure, you can see the OP document creation form.

Seq	Articolo	Descr. Articolo	2^ Descr. Articolo	Avanz	Dt Util	Qta A	Qta P	Uff	Cd Gru	Alt	La	Pr	Vo	Di	Su
0010	F2 _L_65000	ALLUMINIO ADVE170 1795X1770X1			16/09/2024	51,975	0,000	KG			0,00	0,00	0,00	0,00	0,00
0020	055027950_	INCOLLAGGI SPOILER POSTERIORE	F2 - COD. FONTANA 851317		16/09/2024	1,000	0,000	N			0,00	0,00	0,00	0,00	0,00
0030	055027950_	GIUNZIONI SPOILER POSTERIORE C	F2 - COD. FONTANA 851309		16/09/2024	3,300	0,000	N			0,00	0,00	0,00	0,00	0,00
0040	F2 _L_50016	ALLUMINIO ADVANZ 6CH 1950X180	OSSATURA SPOILER		16/09/2024	31,212	0,000	KG			0,00	0,00	0,00	0,00	0,00
0050	55029998	SUPPORTO ANTERIORE SPOILER	F2 - I		16/09/2024	20,000	0,000	N			0,00	0,00	0,00	0,00	0,00
0060	F2 _L_65000	ALLUMINIO S170 2000X1500X2			16/09/2024	6,612	0,000	KG			0,00	0,00	0,00	0,00	0,00
0080	14059214	DADO E CON FLANGIA H6	F2 - COD. FONTANA ?		16/09/2024	40,000	0,000	N			0,00	0,00	0,00	0,00	0,00
0090	F2 _L_65000	ALLUMINIO ADVE170 2450X1100X1			16/09/2024	0,340	0,000	KG			0,00	0,00	0,00	0,00	0,00
0110	15624311	RIVETTO EFTC H 5X14	F2 - COD. FONTANA 700000000		16/09/2024	100,00	0,000	N			0,00	0,00	0,00	1,00	0,00
0150	82286900	PRIGIONIERO TP ESAGONALE M6X1	F2 - COD. FONTANA 700000457		16/09/2024	40,000	0,000	N			0,00	0,00	0,00	0,00	0,00
0160	85917100	RIVKLE H6 ESAGONALE A TESTA LAR	F2 - COD. FONTANA 700000352		16/09/2024	40,000	0,000	N			0,00	0,00	0,00	0,00	0,00

Figure 34: Work Order OP for 10 Kits of F2XXPR CS SPOILER POST

Once the work order has been created and the production of the component has started, it is necessary to go to the final balance of the Standard Production Operations, these updates are made in a simple and immediate way as shown in the following figure.

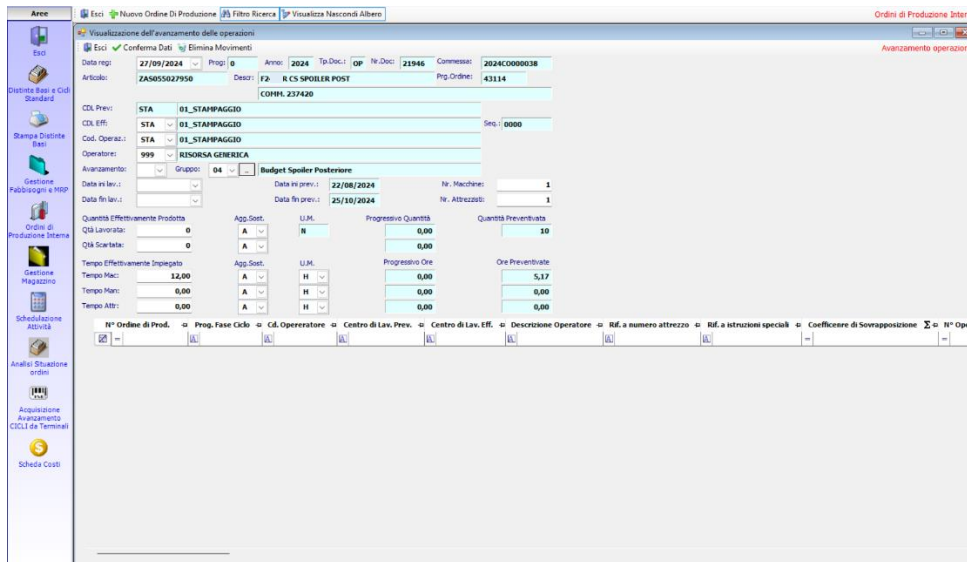


Figure 35: Progress of the Stamping Phase

To enter the Progress of the Processing, it is necessary to enter in this screen, the date of registration, the operator who carried out the operation, the quantity processed and rejected and the time actually taken.

The entry of the progress of the work results in the Job Accounting screen by increasing the Cost of Resources.

6.2.5 Economic and productive control of the project

The control of the profitability of the *Ferrari F2XX Scocca* project through the management software is the main objective of this thesis.

Currently, costs related to the purchase of materials and production are monitored through Excel spreadsheets, a system that, although widely used in many companies, has several significant limitations, and is also inflexible in providing a global and real-time view of expenses and revenues related to projects. This approach prevents the company from accurately monitoring costs as work progresses, making it difficult to intervene promptly if there are deviations from the initial budget.

A lack of a clear and up-to-date, timely view of manufacturing operations can also negatively impact the company's ability to make targeted and informed strategic decisions.

In the following chapters, we will first look at the current Excel-based method of cost tracking, highlighting its limitations and inefficiencies. Next, the impact of implementing cost tracking within the NetSuite system will be discussed, with the aim of optimizing the control of production processes, improving data transparency and reducing operational errors.

6.2.6 Current Excel-based cost tracking method

Currently, the cost of the production of assembled components is monitored with the following Excel sheet where the costs expected in the estimate phase and the actual final costs are calculated.

Assemblato	Valore Ordine	Break Even	Consuntivo	Forecast	Delta (Break Even-Forecast)	Delta (Ordine-Break Even)	Delta (Ordine-Forecast)
(Costi)	47.800,00 €	12.958,00 €	5.390,00 €	17.685,00 €	-4.727,00 €	34.842,00 €	30.115,00 €
(Ore)	NA	241	74	302	-61	NA	NA

Figure 36: Current reference table for monitoring project profitability on Excel

This method provides a clear view of key financial metrics, such as order values, break-even point, actual cost of production, and forecasts of remaining costs for machining.

Also shown:

- Delta (Break Even - Forecast): The difference between the break-even point and the expected value, which shows a negative change of €-4,727.00 (highlighted in red, indicating a cost overrun compared to break even).
- Delta (Order - Break Even): The difference between the order value and the break-even point, equal to €34,842.00, indicating a positive margin (highlighted in green).
- Delta (Order - Forecast): The difference between the order value and the forecast, equal to €30,115.00, which shows another positive margin (highlighted in green).

These data were obtained from the total balance of the components: Front Door (right and left), Rear Door (right and left) and Rear Spoiler.

Attrezzatura / Assemblato	Particolare	Valore Ordine	Margine BreakEven/Prezzo	Break Even (costo)	Consuntivo (costo)	Forecast (costo)	Delta (Break Even-Forecast)	Break Even (ore)	Consuntivo (ore)	Ore a finire	Forecast (Consuntivo + Ore a finire)	Delta (Break Even-Forecast)	
Assemblato	Porta Anteriore DX-SX	19.600,00 €	80%	Totale:	3.965,00 €	1.020,00 €	5.289,00 €	-1.320,00 €	77	14	82	96	-19
				Stampaggio:	180,00 €	480,00 €	960,00 €	-780,00 €	3	8	8	16	-13
				Taglio Laser:	270,00 €	540,00 €	810,00 €	-540,00 €	3	6	3	9	-6
				Battitura Manuale:	840,00 €	0,00 €	840,00 €	0,00 €	14	0	14	14	0
				Pingatura:	94,00 €	0,00 €	94,00 €	0,00 €	2	0	2	2	0
				Saldatura:	0,00 €	0,00 €	0,00 €	0,00 €	0	0	0	0	0
				Assemblaggio:	2.350,00 €	0,00 €	2.350,00 €	0,00 €	50	0	50	50	0
				Misurazioni/Controllo:	0,00 €	0,00 €	0,00 €	0,00 €	0	0	0	0	0
				Altro:	235,00 €	0,00 €	235,00 €	0,00 €	5	0	5	5	0
				Assemblato	Porta Posteriore DX-SX	17.300,00 €	77%	Totale:	3.922,00 €	1.350,00 €	5.272,00 €	-1.350,00 €	76
Stampaggio:	180,00 €	0,00 €	180,00 €					0,00 €	3	0	3	3	0
Taglio Laser:	270,00 €	1.350,00 €	1.620,00 €					-1.350,00 €	3	15	3	18	-15
Battitura Manuale:	840,00 €	0,00 €	840,00 €					0,00 €	14	0	14	14	0
Pingatura:	47,00 €	0,00 €	47,00 €					0,00 €	1	0	1	1	0
Saldatura:	0,00 €	0,00 €	0,00 €					0,00 €	0	0	0	0	0
Assemblaggio:	2.350,00 €	0,00 €	2.350,00 €					0,00 €	50	0	50	50	0
Misurazioni/Controllo:	0,00 €	0,00 €	0,00 €					0,00 €	0	0	0	0	0
Altro:	235,00 €	0,00 €	235,00 €					0,00 €	5	0	5	5	0
Assemblato	Spoiler	10.900,00 €	54%					Totale:	5.067,00 €	3.020,00 €	7.124,00 €	-2.057,00 €	88
				Stampaggio:	300,00 €	720,00 €	960,00 €	-660,00 €	5	12	4	16	-11
				Taglio Laser:	180,00 €	1.350,00 €	1.530,00 €	-1.350,00 €	2	15	2	17	-15
				Battitura Manuale:	3.600,00 €	480,00 €	3.600,00 €	0,00 €	60	8	52	60	0
				Pingatura:	47,00 €	94,00 €	94,00 €	-47,00 €	1	2	0	2	-1
				Saldatura:	0,00 €	0,00 €	0,00 €	0,00 €	0	0	0	0	0
				Assemblaggio:	940,00 €	376,00 €	940,00 €	0,00 €	20	8	12	20	0
				Misurazioni/Controllo:	0,00 €	0,00 €	0,00 €	0,00 €	0	0	0	0	0
				Altro:	0,00 €	0,00 €	0,00 €	0,00 €	0	0	0	0	0

Figure 37: Current cost collection system for project on Excel

As can be seen from the table, the Project Manager, for each machining process of each part, enters the hours worked, linked to another Excel sheet with the specific economic evaluations, in order to obtain the current situation.

The hourly data shown in the figure are obtained as a result of a process that is not immediate, increasing the risk of errors and delays, but above all limiting the company's ability to respond promptly to changes during production.

Employees in the various departments filled out a production form every day like the following:

DATA	DIPARTIMENTO	INIZIO	FINE	Q.TA PRODOTTA	SCARTE
3-7-24	SCOCIA, PORT. ANT-PL-MR	8.00	17.00		
4-7-24	11	11	11		
5-7-24	11 ANT-MR-DX	11	11		
6-7-24	PORTA - RIV. SX - MR - PL	8.00	17.00		
8-7-24	11	8.00	17.00		
9-7-24	PORTA - DX - PORTA	8.00	17.00		
10-7-24	11	8.00	17.00		
11-7-24	RIV-PORTA - PZ SX	8.00	17.00		
12-7-24	RIV-PORTA - DX - PL - PE	8.00	17.00		
15-7-24	11	8.00	17.00		
16-7-24	RIV-PORTA - SX	8.00	17.00		
17-7-24	11	8.00	17.00		
18-7-24	4	8.00	17.00		
19-7-24	RIV-PORTA DX	8.00	17.00		
20-7-24	11	8.00	12.30		
22-7-24	RIV-PORTA DX - MR	8.00			
23-7-24	11	8.00	17.00		
24-7-24	11	8.00	17.00		
25-7-24	RIV - SPONLER - MR	8.00	17.00		
26-7-24	AVIO - PZ	8.00	17.00		

Figure 38: Previous daily Production report

By entering: Department, Name and Surname, Date, Reference Order, Start Time, End Time, Quantity Produced and Waste.

At the time of implementation of this thesis project, the importance of this module was not fully understood by the production employees, this can also be seen from the approximation of the data reported.

In Chapter 6.2.7, the newly introduced paper form currently in use is described.

Once a week, the Head of Department or Project Manager collects the forms and updates the data on the Excel sheet.

In the event that the form is collected by the Head of Department, the data contained are transcribed on an additional Excel sheet and are then subsequently taken up and rewritten by the Project Manager in the Excel sheet for monitoring the costs of the global order.

In addition, when using Excel spreadsheets, collaboration between employees is complicated, as multiple users cannot access and edit the same file at the same time. So it is

very common for employees to move between departments to ask for the closure of a file open in several terminals for editing.

Despite the current method used by M.R.M. S.R.L. for monitoring costs in the project *IFON23N_F2XX_SCOCCA* Excel offers a clear structure for monitoring various metrics related to production costs, has both strengths and weaknesses that deserve to be analyzed.

Among the strengths, we can list:

- **Simplified data visualization:** The structure of the Excel sheet allows an immediate and clear reading of the values of Order Value, Final and Forecast, facilitating the comparison between financial metrics. The use of Excel allows a high level of accessibility.
- **Delta calculation:** This tool allows you to quickly assess profitability and areas where the project may be delayed, making proactive management possible.
- **Customization and flexibility:** Users can tailor the sheet size to the specific needs of various projects by manually entering data related to production, materials, and hours worked.
- **Adaptability to evolving projects:** The flexibility of the system is advantageous in contexts where processes are not fully standardized, allowing for quick and effective adaptation.

However, the method also has several weaknesses that can negatively affect operational efficiency:

- **Manual and redundant data entry:** Dependence on this method increases the risk of human error. Each digit must be entered manually, and even a small mistake can lead to significant discrepancies.
- **Lack of real-time updates:** Excel does not integrate data from manufacturing or financial systems; information is likely to be entered retrospectively, limiting immediate access to the most up-to-date information.
- **Limited scalability:** Excel becomes problematic as projects increase in complexity, leading to data disorganization and silos.

- **Difficult collaboration:** Multiple users can't update or access the same data at the same time, slowing down the workflow.
- **Inconsistent integration with other systems:** The absence of integration with the ERP system complicates cross-referencing with other key metrics, increasing the risk of data discrepancies and delays.

In addition, manual data entry is one of the most critical points. Every figure, whether it's costs, production time, or order values, must be entered manually, and even a small mistake can lead to decisions based on incorrect information, compromising the ability to accurately assess the progress and profitability of the project. The lack of timely updates is a problematic aspect; Excel does not integrate data from manufacturing or financial systems, and the information is likely to be inserted retrospectively. This delay in updating data means that project managers do not have immediate access to the latest information, which can lead to inefficiencies, especially when quick decisions need to be made in response to unexpected changes.

In addition, limited scalability and collaboration are other significant weaknesses. While Excel is a great tool for handling small projects, it becomes problematic as projects increase in complexity. In large prototype production setups, managing multiple projects via individual Excel sheets can lead to disorganization and data silos, further complicating performance tracking. Collaboration is also hindered, as multiple users cannot update or access the same data at the same time in real time. This can slow down your workflow, especially in environments that require quick adjustments. Finally, inconsistent integration with other systems is another critical issue. Excel is not integrated into the ERP system, making it difficult to cross-reference with other key metrics such as inventory, purchasing, or production capacity. Manually transferring data between Excel and other management systems such as NetSuite exposes the company to the risk of discrepancies, delays, and inconsistencies in the flow of information.

In summary, while the current Excel-based method offers robust capabilities for visualizing and financially tracking your *IFON23N_F2XX_SCOCCA* project, its reliance on manual processes, lack of real-time data, and poor scalability present significant challenges. Transitioning to an ERP-integrated solution, such as NetSuite, would not only streamline the data entry process, but also allow for quick updates and improve collaboration between

departments, mitigating many of the weaknesses identified in this current method and contributing to more effective and efficient project management.

6.2.7 Accuracy Check of Worked and Reported Hours

Checking the reliability of the final productive hours is essential to ensure that the data relating to work activities are recorded and managed correctly. This process involves verifying the hours declared by employees in the paper form, comparing them with those actually recorded by the clocking system. The goal is to identify any discrepancies and correct them promptly. Accurate monitoring of hours worked allows for more accurate data, facilitating the analysis of production costs and supporting more informed decisions.

In the event of differences, action is taken by reprimanding resources who do not fill in forms correctly, to improve the reliability of information and optimize the management of orders on NetSuite.

In order to monitor the hours worked by the operators in relation to the reference orders, a paper form has been introduced, distributed in the production departments.

Thanks to this tool, the operator is able to accurately record the hours dedicated to each activity, thus offering a clear picture of his performance, useful for improving efficiency and optimizing production processes.


		MODULO RILEVAZIONE ORE				PQ 006.09 rev.7
		INDICARE IL COD. COMMESSA SE SI LAVORA SULLA COMMESSA O GENERALE PER QUALSIASI ALTRA ATTIVITA' CHE NON SIA UNA COMMESSA				05/10/2023
OPERATORE:						
COMMESSA	REPARTO / LAVORAZIONE	DATA	ORARIO INIZIO	ORARIO FINE	QUANTITA' [PZ]	

Figure 39: Actual work hours tracking form

Operators must fill in the form daily, and then deliver it to the department head or Project Manager at least weekly.

In order to ensure the reliability of the data reported and, consequently, the correct accounting of the hours worked in the order accounting, a verification procedure has been adopted. In particular, to prevent the accounting of the profitability of the order from being incorrect or untrue, it was decided to cross-check the data relating to the hours worked reported in the form and those recorded by the clocking machine, which detects the entry and exit times of employees from the production plant. This approach allows you to more accurately monitor the correspondence between the hours actually worked and those declared, ensuring more transparent and accurate management of resources.

Following the control of the individual resources, a report was drawn up at the department level.

Department	Total H Form (monthly averages) [h]	Total H Badge Reader (monthly averages) [h]	X= H Form/H Badge Reader [%]	Department Score
Engineering	157	196	80.1	1.00
Quality	176	184	95.7	3.00
Metrology/Prototype Assembly	365.5	388.5	94.1	1.50
Laser	546	557	98	2.67
Stamping	439.5	865.5	50.8	1.00
Mold Construction	399	388.5	102.7	2.00
Assembly/Welding	567	595.25	95.3	2.67
Production	505.5	501	100.9	2.33
Milling	767.3	779.25	98.5	2.00
Overhaul	168	168.5	99.7	3.00

Table 12: Comparison of reported and worked hours

The table shows the company departments (automotive business units), with a column indicating the hours worked marked on the paper form, followed by a column with the hours recorded by the clocking machine report. Next, the percentage of hours declared on the form compared to those actually worked is indicated, and finally, a column with the score assigned to each department.

A score has been assigned to the individual resources of each department based on the data collected.

Value	Score
$X < 90\%$	1
$90\% < X < 95\%$	2
$95\% < X < 100\%$	3
$100\% < X < 105\%$	2
$X > 105\%$	1

Table 13: Rules for assigning the score

Subsequently, the average of the scores of the individual resources of the department is calculated to obtain the overall score of the department itself. This score reflects the overall performance of the department based on the correspondence between the hours worked declared and those actually recorded, providing an assessment of the reliability of the data and operational efficiency.

It has been decided that, if the department's score is less than 2.00, it will be necessary to intervene, reprimanding the resource who does not correctly fill in the paper form for recording the hours worked on the orders. The goal of this intervention is to improve the reliability of the data entered, ensuring greater precision in monitoring production costs on NetSuite and, consequently, a more accurate control of company performance.

6.2.8 Benefits of implementing cost tracking in NetSuite

Implementing cost tracking in NetSuite will bring significant advantages over the current Excel-based system. NetSuite centralizes all information, automating the cost allocation process and providing real-time updates. The Project Manager will be able to monitor expenses as soon as they are recorded, allowing the management for more accurate financial and timely decisions.

In addition, NetSuite automates the allocation of direct and indirect costs, automatically linking them to jobs and work orders. This greatly reduces the risk of human error and improves the accuracy of cost tracking. The built-in reporting tools also provide a comprehensive overview of the project's financial performance, comparing actual and estimated costs, and supporting detailed break-even point analysis.

NetSuite allows for greater scalability than Excel, allowing the company to handle complex projects without compromising the speed or efficiency of the system. In addition, the

transition to NetSuite will improve collaboration between employees, thanks to the ability to update data simultaneously and in real time.

NetSuite improves cost tracking at M.R.M. S.R.L. in several ways, addressing many of the weaknesses found in the previous Excel-based system:

- **Timely data integration:** NetSuite integrates all aspects of business operations, from manufacturing to finance, ensuring that cost data is always up-to-date. This allows the complete monitoring of expenses and resource usage as they occur, providing a clear and accurate financial view of ongoing projects. Unlike Excel, where data entry is done manually and retrospectively, NetSuite offers instant updates that help you make faster decisions.
- **Automated cost allocation:** With NetSuite, allocating costs to specific projects becomes automatic. The system deals with labour and materials costs and other costs like overheads. This way, all costs are automatically assigned to the right work order, reducing the need for manual entry and the risk of frequent human error in Excel.
- **Centralized data management:** NetSuite centralizes all financial and manufacturing data on a single platform. This approach improves communication between departments, ensuring that everyone is working with the same up-to-date information. By bringing together data from purchasing, inventory, production, and sales, NetSuite eliminates the information silos and discrepancies that can arise with separate Excel sheets.
- **Improved reporting:** The system offers advanced reporting and forecasting tools that provide in-depth analysis of project costs. Users can generate detailed reports on economic performance, identify variances between estimated and actual costs, and make forecasts on future expenses based on historical data. Reports can be further customized to focus on specific metrics, such as break-even analysis or machine utilization rates, providing managers with greater visibility into costs.

MRM srl

Ordini di Produzione + Impegni Materiali + Fasi di Lavorazione del Ciclo

Nr. Ordine di Produzione: **2024 OP 21946** del **18/07/2024** Data Inizio: **22/08/2024** Data Fine: **25/10/2024**

Commessa: 2024CO000038

Articolo: ZAS055027950 F2 R CS SPOILER POSTCOMM. 237420

Quantità: 10,000 UM: N

Magazzino: CL MAG. MATERIALE RICEV. IN C/LAVORO A

Cliente: 000213 FONTANA PIETRO S.p.A.

Operazione	Centro di Lavoro		Attrezzo	Date		Tempi di Lavorazione		
	Prev.	Effet.		Inizio	Fine	Attrezzaggio	Macchina	Manodopera
0000 01 STAMPAGGIO	STA	STA		22/08/2024	25/10/2024			5,17
0010 01 TAGLIO LASER	TAG	TAG		22/08/2024	25/10/2024			1,42
0020 01_BATTITURA MANUALE	BATT	BATT		22/08/2024	25/10/2024			60,00
0030 01_ASSEMBLAGGIO	ASS	ASS		22/08/2024	25/10/2024			20,00
0040 01_PIEGATURA	PIE	PIE		22/08/2024	25/10/2024			0,25
0050 01_MISURAZIONI/CONTROLLO	MIS	MIS		22/08/2024	25/10/2024			
0060 01_UOMO/ALTRO	UOMC	UOMC		22/08/2024	25/10/2024			

Articolo Impegnato	Descrizione Articolo	Seq.	Mag.	U.M.	Quantità Impegnata	Quantità Prelevata	AV	Data Ultimo Prelievo
F 650000158	ALLUMINIO ADVE170 1795X1770X1	0010	CL	KG	51,975	10,948		22/08/2024
055027950_1	INCOLLAGGI SPOILER POSTERIORE	0020	CL	N	1,000			22/08/2024
055027950_2	GIUNZIONI SPOILER POSTERIORE C	0030	CL	N	3,300			22/08/2024
F S001636	ALLUMINIO ADVANZ 6CM 1950X1800	0040	CL	KG	31,212			22/08/2024
55029998	SUPPORTO ANTERIORE SPOILER	0050	CL	N	20,000			22/08/2024
F 650000007	ALLUMINIO S170 2000X1500X2	0060	CL	KG	6,612	1,302		22/08/2024
14059214	DADO E CON FLANGIA M6	0080	CL	N	40,000			22/08/2024
F 650000224	ALLUMINIO ADVE170 2450X1100X1,5	0090	CL	KG	0,340			22/08/2024
15624311	RIVETTO EF TC M 5X14	0110	CL	N	100,000			22/08/2024
82286900	PRIGIONIERO TP ESAGONALE M6X17	0150	CL	N	40,000			22/08/2024
85917100	RIVKLE M6 ESAGONALE A TESTA LA	0160	CL	N	40,000			22/08/2024

Figure 40: F2XX Production order, material commitment, and work cycle phases

MRM srl

Stampa Ripartizione Costi di Commessa :

dal:

al:

Per Gruppo/Centro di Costo/Attività

Commessa 2024CO000038		Cliente 000213	Valori Espresso in Euro
1FON23N_F2 _SCOCCA		FONTANA PIETRO S.p.A.	
PORTE ANT/POST F2 }POILER		V.le Alcide De Gasperi n. 16	
Stato		23801 CALOLZIOCORTE LC	
		Costi	
Gruppo :	Totale €:	15.504,78	
Centro di Costo :	Totale €:	14.544,78	
	MATERIALE	351,78	
	Totale Attività €:	351,78	
ASS 01_ASSEMBLAGGIO	RISORSE	3.384,00	
	Totale Attività €:	3.384,00	
BAT 01_BATTITURA MANUALE	RISORSE	1.350,00	
	Totale Attività €:	1.350,00	
CTR 01_MISURAZIONI/CONTROLLO	RISORSE	1.410,00	
	Totale Attività €:	1.410,00	
LAS 01_TAGLIO LASER	RISORSE	3.195,00	
	Totale Attività €:	3.195,00	
PIE 01_PIEGATURA	RISORSE	376,00	
	Totale Attività €:	376,00	
SAL 01_SALDATURA	RISORSE	60,00	
	Totale Attività €:	60,00	
UOM 01_UOMO/ALTRO	RISORSE	4.418,00	
	Totale Attività €:	4.418,00	
Centro di Costo : C CORTASSA	Totale €:	960,00	
STA 01_STAMPAGGIO	RISORSE	960,00	
	Totale Attività €:	960,00	
TOTALE COSTI RISORSE COMMESSA EFFETTM €		15.153,00	
TOTALE COSTI MATERIALE COMMESSA EFFETTM €		351,78	
TOTALE COSTI COMMESSA EFFETTM €		15.504,78	

Figure 41: Cost allocation for the project

STAMPA SINTESI COMMESSA			
Commissa :	38	Anno: 2.024	1FON23N_F2 SCOCCA PORTE ANTI/POST F2 SPOILER
Cliente :	000213	FONTANA PIETRO S.p.A.	Qtà: Data Inizio: 13/06/2024 Data Fine:

Oper.	ASS	01_ASSEMBLAGGIO	72,00		
Oper.	BAT	01_BATTITURA MANUALE	22,50		
Oper.	CTR	01_MISURAZIONI/CONTROLI	30,00		
Oper.	LAS	01_TAGLIO LASER	35,50		
Oper.	PIE	01_PIEGATURA	8,00		
Oper.	SAL	01_SALDATURA	1,00		
Oper.	STA	01_STAMPAGGIO	16,00		
Oper.	UOV	01_UOMO/ALTRO	94,00		
					279,00

					15,00
					336,78
					351,78

Totale ore Lavorate	279,00	15.153,00	
Materiale		351,78	
		15.504,78	

Figure 42: Project summary

- Scalability and efficiency:** Unlike Excel, which can become heavy with large data sets or complex projects, NetSuite is designed to handle large volumes of data efficiently. This scalability capability allows M.R.M. S.R.L. to monitor the costs of multiple projects, customers, and production lines without compromising speed or accuracy. In addition, as the company grows, the system adapts to greater complexity in cost monitoring.
- Accuracy and error reduction:** By automating data entry and linking costs directly to jobs, NetSuite minimizes the errors typical of manual processes. This increased accuracy ensures reliable financial data, allowing for more accurate cost control and budget planning. Automated checks help identify any discrepancies in real time, allowing for quick interventions.
- Streamlined workflows:** NetSuite integrates cost tracking with other crucial business processes, such as procurement, inventory management, and invoicing. This smooth workflow ensures that costs are recorded naturally, from the purchase of raw materials through to the delivery of finished goods. Every step of the process is connected, ensuring that costs are tracked and reflected in budgets without the need for separate manual updates.
- Intuitive dashboards and KPIs:** NetSuite offers customizable dashboards that display key performance indicators (KPIs) related to cost tracking. Managers can access real-time data on work efficiency, machine utilization, cost variances, and other metrics directly from their dashboard. This immediate visibility allows for faster adjustments and proactive cost management.

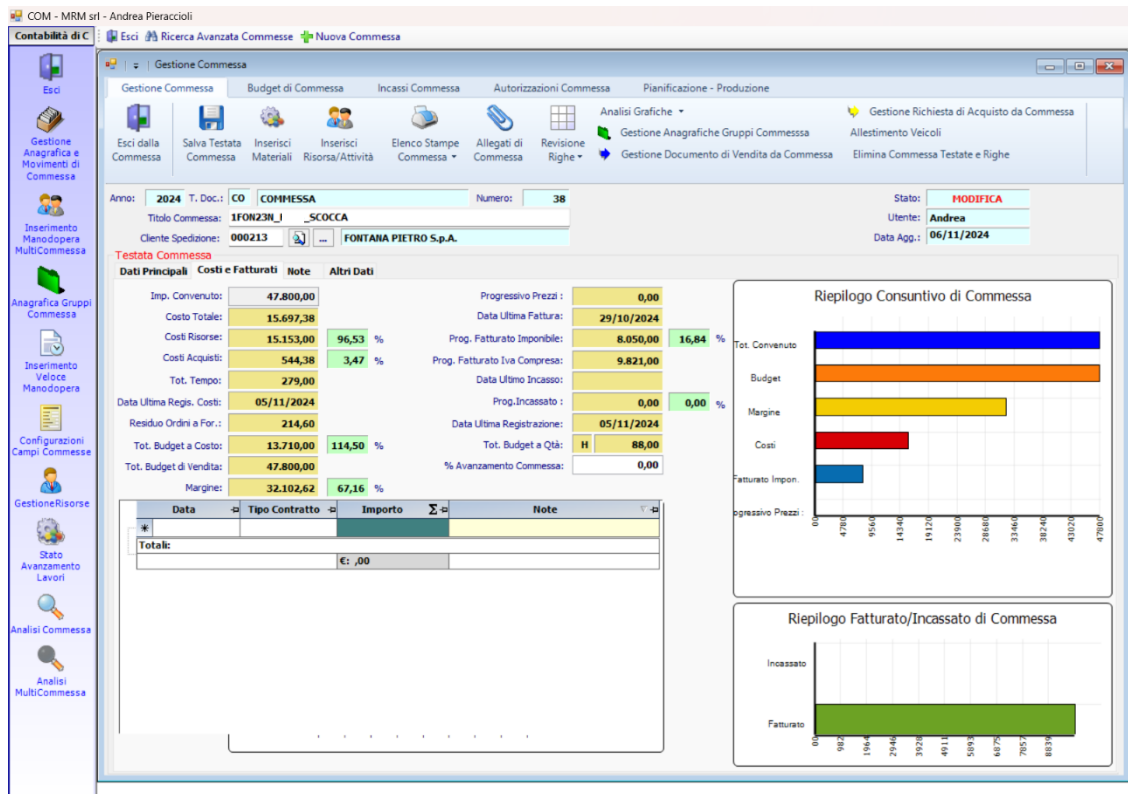


Figure 43: Up-to-date Costs and Revenues Project Management

MRM srl Comparazione Commessa Budget/Consuntivo per Attività

Commessa: 2024CO000038 Cliente: 000213 FONTANA PIETRO S.p.A.
 1FON23N_F2 _SCOCCA V.le Alcide De Gasperi n. 16
 PORTEANT/POST F2 SPOILER CALOLZIOCORTE

	Manodopera		Materiale		Totale Costi A+ (B-C)+D	Budget	Delta
	Ore	a Commessa(A)	in Ordine(B)	Cons.Fornit.(C) a Commessa(D)			
ASS-01_ASSEMBLAGGIO	72,00	3.384,00			3.384,00	5.640,00	2.256,00 40,00%
BAT-01_BATTITURA MANUALE	22,50	1.350,00			1.350,00	5.280,00	3.930,00 74,43%
CTR-01_MISURAZIONI/CONTROLLO	30,00	1.410,00			1.410,00	752,00	-658,00 -87,50%
LAS-01_TAGLIO LASER	35,50	3.195,00			3.195,00	720,00	-2.475,00 143,75%
PIE-01_PIEGATURA	8,00	376,00			376,00	188,00	-188,00 100,00%
SAL-01_SALDATURA	1,00	60,00			60,00	60,00	-60,00 0,00%
STA-01_STAMPAGGIO	16,00	960,00			960,00	660,00	-300,00 -45,45%
UOM-01_UOMO/ALTRO	94,00	4.418,00			4.418,00	470,00	-3.948,00 340,00%
TOTALI:	279,00	15.153,00			15.153,00	13.710,00	

Figure 44: Budget vs Actual Delta Comparison

MRM srl
Comparazione Commessa Budget/Consuntivo per Attività

Commessa: 2024CO000038
 1FON23N_F2 _SCOCCA
 PORTEANT/POST F2 /SPOILER

Cliente: 000213 FONTANA PIETRO S.p.A
 V.le Alcide De Gasperi n. 16
 CALOLZIOCORTE

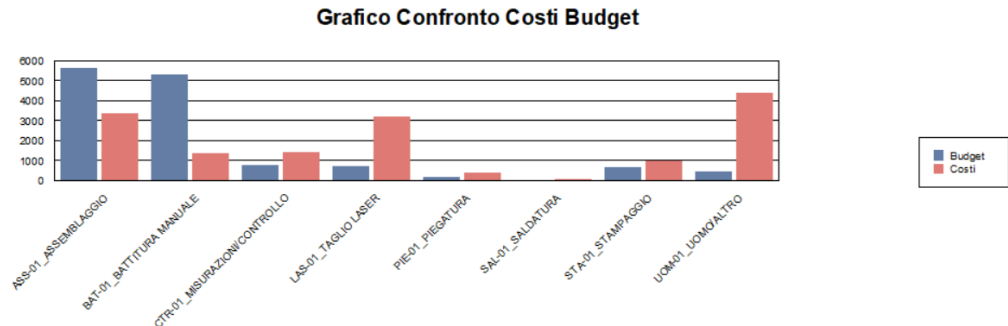


Figure 45: Actual vs Budget Cost Comparison Chart

In conclusion, NetSuite's centralized and automated approach is a significant improvement over the manual, error prone and fragmented Excel system previously in use at M.R.M. S.R.L. By integrating cost tracking with the broader ERP system, NetSuite improves accuracy, reduces errors, and provides deeper insights into financial performance, ultimately supporting better cost control and more efficient project management.

The implementation of NetSuite will have a significant impact on cost monitoring and production management at M.R.M. S.R.L. An improvement in key performance indicators (KPIs) related to profitability, labour efficiency, and resource optimization is expected. NetSuite will bring greater transparency and continuous monitoring of operations. System integration will eliminate the need to use Excel, speeding up data collection times and improving the accuracy of information available for decision-making. Among the advantages will be significant time savings in order management and greater precision in cost reporting, with more effective planning for future projects.

NetSuite offers a wide range of KPIs to keep tabs on various aspects of cost and project management. Although you can calculate these KPIs with Excel, the process is often less reliable and more complex. Manual data entry and updating increases the risk of errors and inconsistencies, reducing the accuracy and reliability of results. In addition, processing KPIs using Excel requires time-consuming and resource-intensive procedures to collect, sort, and analyze data. Instead, NetSuite automates these operations, ensuring continuous data collection and greater accuracy in real-time monitoring.

Subsequently, some of the most significant KPIs that NetSuite can offer in the Project Accountability view, to M.R.M. S.R.L. to improve the monitoring of financial and operational performance are proposed:

- **Cost variance:** Measures the difference between estimated and actual costs incurred on a project, this helps to identify any budget overruns, providing a clear view of budget adherence.
- **Work efficiency ratio:** Compares actual hours worked with estimated hours, which is useful for monitoring efficiency in the use of labour resources and identifying productivity issues.
- **Project profitability:** Tracks the profitability of projects by comparing the revenue generated to the total costs, ensuring that each project reaches its expected margin.
- **Order Fulfillment Cycle Time:** Measures the time it takes to complete the process from receiving an order to delivering the final product, helping to optimize the supply chain.
- **Break-even point analysis:** Calculates the point at which total revenue equals total costs, allowing managers to assess the profitability of a project.
- **Employee utilization rate:** Tracks the percentage of time employees spend on billable versus non-billable work, maximizing the use of labour resources.

These KPIs provide M.R.M. S.R.L. with a robust framework to monitor performance, contributing to a more informed and strategic management. In future NetSuite could also measure whether the project is on schedule, helping to keep projects on track and identify potential delays.

By exploiting these indicators, NetSuite helps the company monitor critical aspects of production and financial control more effectively than a manual system like Excel. The integration of these KPIs allows a clearer and more immediate overview of the company's financial health, facilitating the identification of areas for improvement and the optimization of resources. In a competitive environment, the ability to adapt quickly and make informed decisions is critical, and these KPIs are essential tools for achieving these goals.

7. Conclusions

The implementation of an ERP system represents a turning point in management and operational efficiency for many companies, and M.R.M. S.R.L.'s experience with NetSuite is no exception. This document examined how the introduction of NetSuite in a complex manufacturing E-T-O context, characterized by automotive and aerospace prototyping processes, can solve key challenges related to cost management and production planning. The main objective of the study was to evaluate how the integration of NetSuite could address the challenges of managing production costs, improving overall operational efficiency and competitiveness of the company.

In particular, the thesis evaluated the effectiveness of the NetSuite ERP in improving cost control, the quality of reporting and the ability to monitor orders thanks to the improved transparency in business processes.

The initial analysis started in chapter 4.3.5 “Considerations on the current use of NetSuite in M.R.M. S.R.L.” showed that the partial use of NetSuite, associated with the still widespread use of Excel spreadsheets in various operations, represented a significant limit to the efficiency of M.R.M. S.R.L. This fragmented approach did not allow for centralized cost tracking, limited visibility, and made consistent communication between departments difficult. The pilot project, focused on the *Ferrari F2XX Scocca* order, made it possible to test NetSuite in its main functions and to understand the potential impact of an integrated and automated management of business processes. This study highlighted the concrete improvements that ERP can bring in terms of timely, reliable updates, automation of cost allocations and centralized data management, solving many of the inefficiencies caused by the fragmented use of data and the use of Excel.

Chapter 6 describes not only an overall evaluation of the benefits and improvements brought by NetSuite, but also a practical guide for M.R.M. S.R.L. in pursuing a complete digital transformation process, oriented towards efficiency and competitiveness in the long term.

This project has brought to M.R.M. S.R.L. several benefits, as described in chapter 6.2.8 "Benefits of Implementing Cost Tracking in NetSuite". This system has greatly improved business operations. NetSuite provides timely data updates, making cost information

available right away thanks to its feature to integrate with various departments, speeding up and facilitating the decision-making process.

The automatic allocation of costs, both direct and indirect, has reduced human error and increased accuracy in monitoring, this has improved the transparency of business processes too.

NetSuite's advanced analytical tools have improved reporting capabilities, allowing M.R.M. S.R.L. to effectively compare estimated costs with actual costs and make more accurate forecasts for future expenses. Scalability and efficiency of the system allow M.R.M. S.R.L. to handle large volumes of data without compromising speed or accuracy, providing a solid basis for monitoring complex projects such as the *Ferrari F2XX Scocca* and for supporting any future expansions of the ERP system.

Overall, the implementation of NetSuite was a significant improvement for M.R.M. S.R.L., offering more efficient cost management, better control over production processes, and increased profitability. The results of the pilot project suggest that NetSuite can be a valuable tool for optimizing M.R.M. S.R.L.'s business processes, contributing to higher operational efficiency and supporting the company in achieving its strategic objectives.

7.1 Recommendations for future NetSuite deployments and expansions

In this paragraph are reported some recommendations to extend and maximize the benefits of NetSuite utilization at M.R.M. S.R.L.:

- **Extend implementation to all jobs:** The positive results of the pilot project indicate that it would be beneficial to use NetSuite for cost tracking across all business jobs. This approach would allow for uniform cost control and greater consistency in monitoring processes.
- **Integrate production planning:** It is recommended to take advantage of NetSuite features to manage production planning as well. In this way, M.R.M. S.R.L. could optimize work order management, monitor production progress in real time, and improve resource allocation. Integrated planning would help reduce downtime and improve production efficiency.
- **Standardize item coding:** To improve data accuracy and consistency, it is helpful to standardize item coding in NetSuite, eliminating dependency on customer

numbers. This will ensure consistency and accuracy of information, simplifying inventory and material management.

- **Utilize reporting and analytics tools:** NetSuite offers advanced tools for reporting and data analysis, which can be valuable for strategic management. It is important to encourage M.R.M. S.R.L. managers to make full use of these resources to monitor business performance, identify trends and make strategic decisions based on accurate and up-to-date data.
- **Promote continuous training for employees:** To ensure effective use of NetSuite and ensure that employees can utilize most of the system's features, it is essential to organize continuous training sessions with the ERP consultant. A thorough understanding of NetSuite and its capabilities will allow staff to use the system optimally, thus increasing the return on investment.

By adopting these recommendations, M.R.M. S.R.L. will be able to maximize the benefits of implementing NetSuite as a complete ERP solution. This will not only improve operational efficiency and profitability, but also strengthen competitiveness in the market. NetSuite can become a solid technological foundation to support future growth and allow the company to respond flexibly to the challenges of an dynamic industry.

Bibliography

- [1] M. A. K. Alsmairat, N. Al-Ma'aitah, and I. Alrafaty, "Modelling of Critical Success Factors Affecting the Adoption of Enterprise Resources Planning: A mediated Model," in *International Conference on Cyber Resilience, ICCR 2022*, Institute of Electrical and Electronics Engineers Inc., 2022.
- [2] S. Noor *et al.*, "ERP System Implementation in a Leading LED Manufacturing in Malaysia: A Supply Chain Perspective," 2020. [Online].
- [3] S. Kanno *et al.*, "Enabling SMEs to Industry 4.0 Using the BaSyx Middleware: A Case Study," in *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, Springer Science and Business Media Deutschland GmbH, 2021, pp. 277–294.
- [4] Jarernsri. Mitranont and Wudhichart. Sawangphol, *A Combined Method for Analysing Critical Success Factors on ERP Implementation*. IEEE, 2018.
- [5] S. Wijesinghe, I. Nanayakkara, R. Pathirana, R. Wickramarachchi, and I. Fernando, "Impact of IoT Integration on Enterprise Resource Planning (ERP) Systems: A Comprehensive Literature Analysis," in *Proceedings - International Research Conference on Smart Computing and Systems Engineering, SCSE 2024*, Institute of Electrical and Electronics Engineers Inc., 2024
- [6] L. Gren, A. Wong, and E. Kristoffersson, "Choosing agile or plan-driven enterprise resource planning (ERP) implementations-A study on 21 implementations from 20 companies."
- [7] P. Bründl, M. Stoidner, H. G. Nguyen, A. Baechler, and J. Franke, "Challenges and Opportunities of Software-Based Production Planning and Control for Engineer-to-Order Manufacturing," in *IFIP Advances in Information and Communication Technology*, Springer Science and Business Media Deutschland GmbH, 2023, pp. 67–79.
- [8] R. Heinzlmann, "Accounting logics as a challenge for ERP system implementation: A field study of SAP," in *Journal of Accounting and Organizational Change*, Emerald Group Publishing Ltd., 2017, pp. 162–187.
- [9] S. E. Christophe, "The impact of adopting ERP on key performance indicator by the mediation effect of critical success factors and performance indicators in automobile ancillary industries," *International Journal of Recent Technology and Engineering*, vol. 8, no. 2 Special Issue 3, pp. 116–121, Jul. 2019.

- [10] C. Ploder, T. Dilger, and R. Bernsteiner, “A Framework to combine Corporate Budgeting with Agile Project Management,” 2020.
- [11] M. Babaei, Z. Gholami, and S. Altafi, “Challenges of Enterprise Resource Planning implementation in Iran large organizations,” *Inf Syst*, vol. 54, pp. 15–27, Jun. 2015.
- [12] L.-M. Chuang, “The key success factors of introducing ERP system in Taiwan’s manufacturing industry,” 2022.
- [13] D. L. Olson and Z. Bocek, “Case Study of SAP Implementation in a Corporation Network Plant.”
- [14] S. Gunasekharan, D. Elangovan, and P. Parthiban, “A comprehensive study to evaluate the critical success factors affecting lean concept in indian manufacturing industries,” in *Applied Mechanics and Materials*, Trans Tech Publications Ltd, 2014, pp. 2569–2576.
- [15] M. Houti, L. El Abbadi, and A. Abouabdellah, “CSFs for the implementation of the hybrid lean ERP system. Stakeholders interactions,” *Advances in Science, Technology and Engineering Systems*, vol. 4, no. 6, pp. 443–447, 2019,
- [16] A. Susanto, “Benefits And Challenges Of Enterprises Resources Planning Systems,” *INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH*, vol. 7, no. 11, 2018.
- [17] F. Tobisch, K. Weigelt, P. Philipp, and F. Matthes, “Investigating Effort Estimation in a Large-Scale Agile ERP Transformation Program,” in *Lecture Notes in Business Information Processing*, Springer Science and Business Media Deutschland GmbH, 2024, pp. 70–86.
- [18] *Empirical Analysis of Factors Influencing ERP Implementation in Indian SME*. IEEE, 2014.
- [19] J. Siswanto and A. Maulida, *ERP Module Requirements for Micro, Small and Medium Enterprise Fashion Industry in Bandung*.
- [20] R. Hamzeh, R. Zhong, X. W. Xu, E. Kajáti, and I. Zolotova, “A technology selection framework for manufacturing companies in the context of Industry 4.0.”
- [21] H. T. Yamchello, R. Samin, A. Tamjidyamcholo, P. Bareji, and A. Beheshti, “A review of the critical success factors in the adoption of lean production system by small and medium sized enterprises,” in *Applied Mechanics and Materials*, Trans Tech Publications Ltd, 2014, pp. 627–631.
- [22] M. A. Michaud and R. Maranzana, “Cost estimation aided software for machined parts: An hybrid model based on PLM tools and data,” in *IFIP Advances in*

Information and Communication Technology, Springer New York LLC, 2017, pp. 199–211.