POLITECNICO DI TORINO

Class LM-31: management engineering

Department of management and production engineering

Master Degree Thesis

Optimizing operational efficiency: a comprehensive study of ERP systems and Accenture's SAP utilization in work process enhancement.

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Table of contents:

Premise and purpose of the work

This thesis will explore the attributes of information systems, with a focus on enterprise resource planning (ERP) systems, considering their potential as alternatives to conventional business methodologies and structures. A summary assessment of the operational efficiency improvements that such systems offer companies will also be conducted. In particular, the process of replacing business flows within a large automotive company will be analyzed.

The first chapter will outline the current state of digital technologies, documenting the undeniable supremacy resulting from their use and delving into their ramifications on the business and socioeconomic environment. In addition, special attention will be paid to the landscape of Italian small and medium-sized enterprises (SMEs).

The second chapter will analyze new information systems, presenting a classification and delineation of their technological aspects.

The third chapter will delve into the nature of ERP systems, their integration methodologies within enterprises and the benefits of their adoption.

The fourth chapter delves into Accenture's use of a world-renowned ERP system to improve business processes and, consequently, related revenues. A detailed examination of improvements made to an existing authorization process within a major Italian automotive company will also be provided.

Finally, the technical aspects of how the ERP system leverages periodically acquired information to formulate an optimal pricing strategy will be explored.

1. Digital technology: current state

Nowadays, technology plays a very important role in everyday life. Thanks to it, we have had improvements in all areas of human life: from the most mundane things such as grocery shopping, to the most important things such as improvements in surgery that have made it possible to increase the life expectancy of every person.

Digital transformation leverages technologies to create value and new services, innovate and acquire new capabilities to rapidly adapt to an ever-changing world. Digitization refers to the process of transforming analog information and data into digital format through information technology. In other words, it is a process by which written information, images, business activities and transactions, relationships between people and institutions, and many other activities, are transformed into digital format, thereby facilitating data sharing, storage and analysis.

In recent years, the scope of digitization has increased exponentially, and its potential applications are spreading to all areas of life. Tools such as distributed computing, cloud hosting and artificial intelligence are transforming the way we live and do business. Digitalization also, can reduce carbon emissions by replacing physical travel with digital meetings, as well as support and accelerate progress toward achieving sustainable development goals. This transaction to the digital also changed the way people communicate, shop, learn and work, thereby changing the way we live our daily lives.

This change has the greatest impact on economic, social, and political systems, and its use is steadily increasing due to evolving technologies and the growing need to manage large amounts of information effectively and cost-effectively.

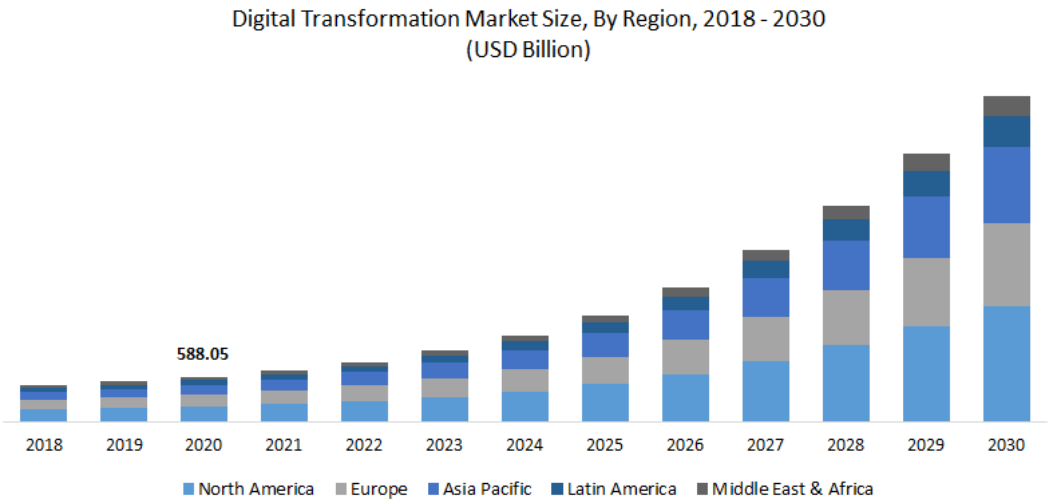

Figure 1.1: Digital Transformation Market Size Global Report, 2018 - 2030.

Digitization in the world is at an advanced stage in many countries, such as the United States, Canada, Western Europe, and Japan. In these countries, most economic activities are now digitized, with a high level of access to the Internet and use of digital devices.

In many parts of Africa, Asia and Latin America, on the other hand, digitization is still at an early stage, with limited access to the Internet and little widespread use of digital devices.

However, even in these parts of the world, digitization is advancing rapidly due to the spread of mobile technologies and increasing availability of digital services.

As shown in Figure 1.1, the global digital transformation market was worth $588.05 billion in 2021 and is expected to grow by 23.6 percent over the forecast period. The growing acceptance of digital solutions in industries such as BFSI, automotive, healthcare, manufacturing, etc. is driving the growth of the global market. In addition, the proliferation of various transformational technologies such as the Internet of Things has accelerated the productivity and skills of computing systems, and the emergence of Industry 4.0 has given rise to market demand for digital transformation.

Moreover, the growth of smart devices, increased IT investment and network infrastructure development are likely to further drive the growth of the digital transformation market in the coming years.

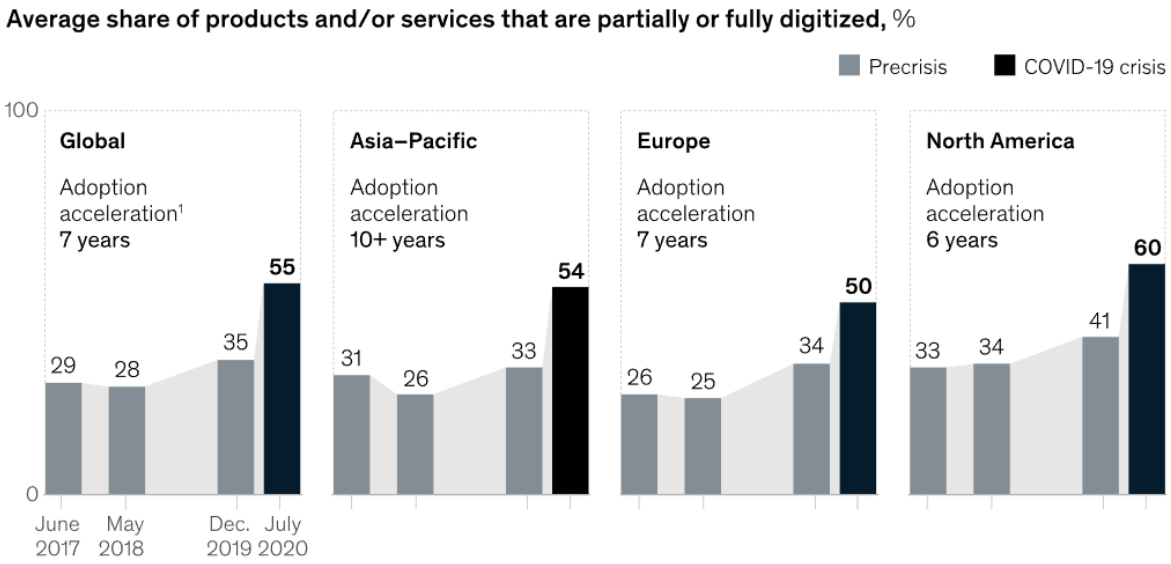

Figure 1.2: Average share of product and services that are partially or full digitized.

The deployment of COVID-19, furthermore, has had a strong impact on several industries (Fig 1.2). In fact, during the pandemic period, digital purchases increased by 15-30% due to the introduction of the Internet and other technological developments.

Digital communication has become the only form of communication for many people, thus giving people who had no previous digital experience the opportunity to learn how to communicate effectively online. In addition, thanks to advances in digital technology, people are now able to learn and work remotely without having to be physically present in a specific area.

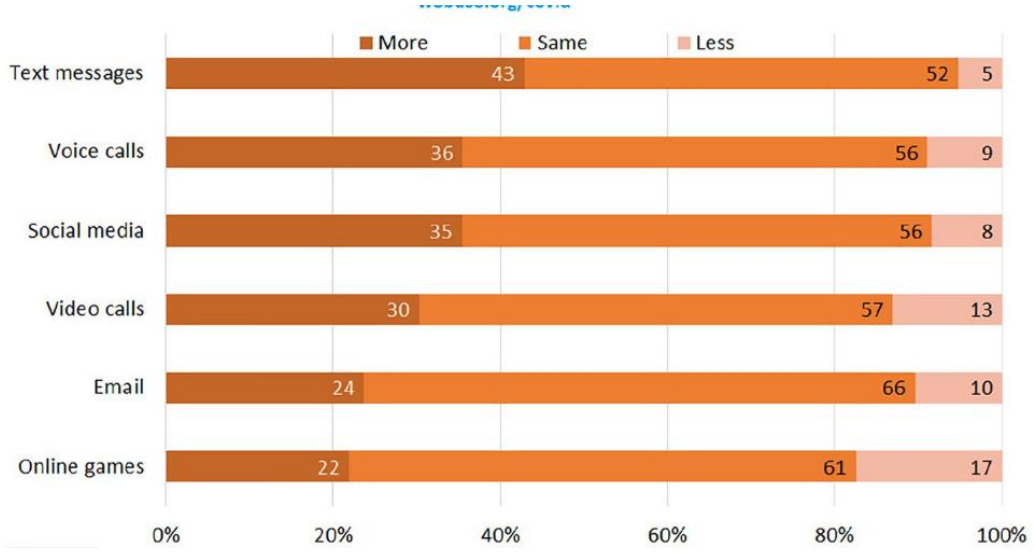

Figure 1.3: Changes in people's digital communication behaviors during the Coronavirus pandemic. Based on data from 1,374 US adults, 4–8 April 2020.

As we can see from the figure 1.3 the data show that 43% of respondents used text messaging more often. This was followed by an increase in voice calls (36%), social media (35%), and video calls (30%). Almost a quarter of people more frequently used email (24%), and just over one fifth played online games more often (22%). Taking all modes together, 46% of respondents had only increased their digital communication, without decreasing any of the methods.

In fact, the main challenge for economies, in this period, has been to ensure business continuity among closures in different regions, work-from-home policies, social distancing rules and other challenging factors. This has had a positive impact on the growth of the transformation market due to increased conversion requirements in many sectors.

In business, instead, technology is often used to improve performance, reduce costs, and make a company perform better and be more competitive. In this chapter we will look at how technology has enabled companies to modernize with the goal of reducing costs and improving performance.

1.1 Digitization of companies

As noted above, digitization plays an important role at the enterprise level. In fact, digital transformation is the process of completely replacing manual, traditional and legacy methods of doing business with the latest digital alternatives. It encompasses all aspects of a company and enables it to remain responsive to the ups and downs of the market: the transition to digital technologies affects products and services, marketing and distribution channels, business processes, supply chains, and new partners in the market. It is therefore a radical change in culture, operations, and technologies, but it is also a fundamental change.

In fact, the environment in which companies collaborate is very competitive, which forces them to change and continuously invest in research and development of new technologies. Precisely for this reason, digitization is becoming an increasingly hot topic in companies and especially crucial as incorporating these new technologies makes a difference from the traditional model: companies that do not have the new digital tools lose many points in the business market.

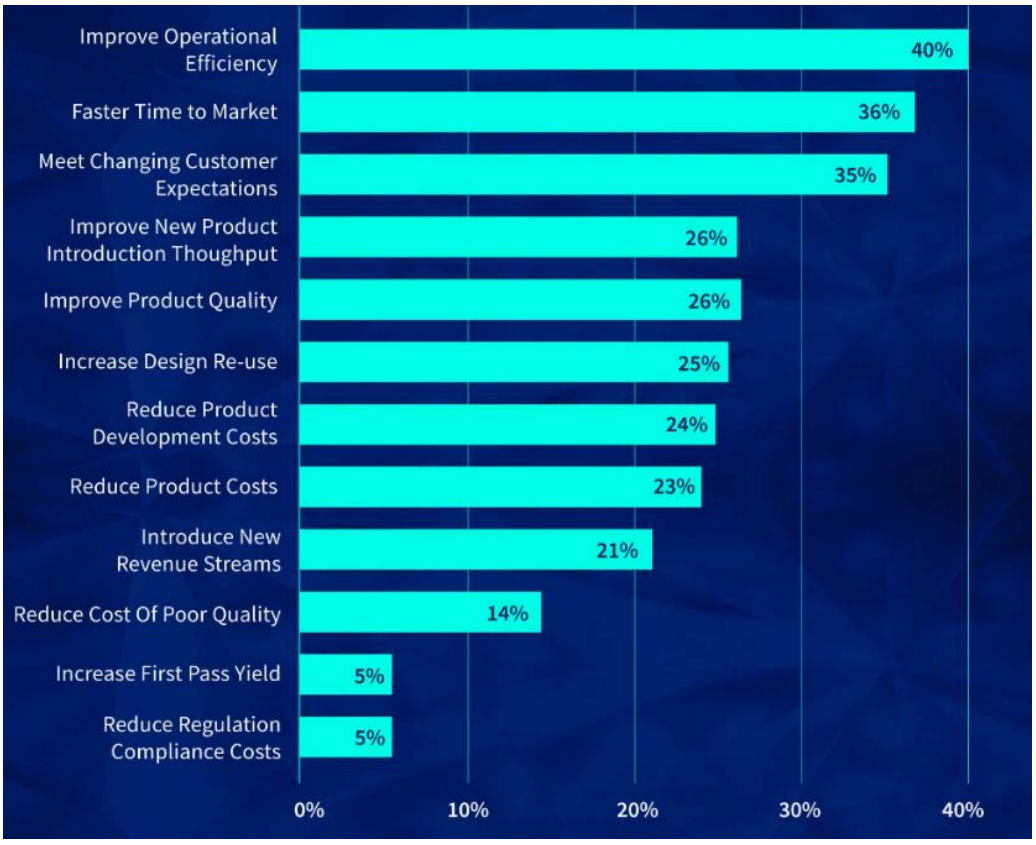

Figure 1.4: benefits of adopting a digital model by PTC.

An analysis conducted by PTC (Parameter Technology Corporation), the results of which are summarized and visible in Figure 1.1 shows that the benefits of companies adopting new digital technologies are many:

- improved productivity and competitiveness.
- cost reduction compared to the traditional model.
- better information management: business strategy relies on a large amount of information and data from customers, competitors, suppliers or banking institutions. Therefore, the better the data management, the better the vertical and horizontal integration, facilitating the exchange, control and storage of information to increase one's competitive advantage.
- Increase security: information systems also manage security systems both implemented in computers and in the company itself.
- Increases business flexibility and mobility: with a technology approach, it improves not only the use of the cloud but also, as a result, communication.
- Enhancement of the corporate brand: by using the digital marketplace, companies not only improve their image but also their staff is enhanced, whose task, after digitization, is more performant thanks to the use of digital CVs.

Digital transformation, therefore, touches all the highlights of a company's organization, altering working methods and applying change to production processes. Like any change, digitization has its downsides and upsides. The change in the way of working and producing on which the company was founded makes digital transformation, and consequently the introduction of information systems, a very sensitive issue especially in areas that have a strong impact on company policies. On the other hand, once the controversy against change is overcome, all its benefits are obvious, starting with constantly updated data and ending with increased productivity by taking full advantage of the company's characteristics.

Thus, it is true that digitization is a means by which to exploit the full potential of the company, defining a completely different way of working, but it places the human element at the center of the change and makes it fundamental to the success of the migration, with the goal of achieving perfection by eliminating all waste that does not serve the company itself.

1.2 Economic performance linked to the implementation of integrated digital processes

As pressure grows for digitization, it is unclear how much and how to invest. Recent research confirms this: the world we live in is a smart world, where everything is connected. As a result, the intrinsic value of connectivity is constantly growing and the digital economy is booming. Although the advance of digital transformation has not yet affected all industries, those that adapt to new and evolving markets are more likely to keep revenues steady even as revenue streams change. Several economists, in fact, have identified a link between economic performance and the implementation of integrated digital processes.

First, the first data point to highlight has been highlighted by the World Economic Forum, which states that by the end of 2022, nearly 60 percent of the world's GDP will be generated by digital assets, the set of goods and services related to the digital economy. This process has been accelerated by the recent pandemic and the measures introduced to contain it. Limitations on travel, the ability to contain any environment and social distance have necessitated the extraordinary use of smart working, which in turn has given a spontaneous but very important acceleration to digitization.

The second data point to highlight comes from the Mexedia report, which states that in Italy, based on an analysis of corporate balance sheets over the five-year period 2015-2020, companies that have invested in digital technologies in the past have made 30 percent more profit than the average and have 19 percent higher added value.

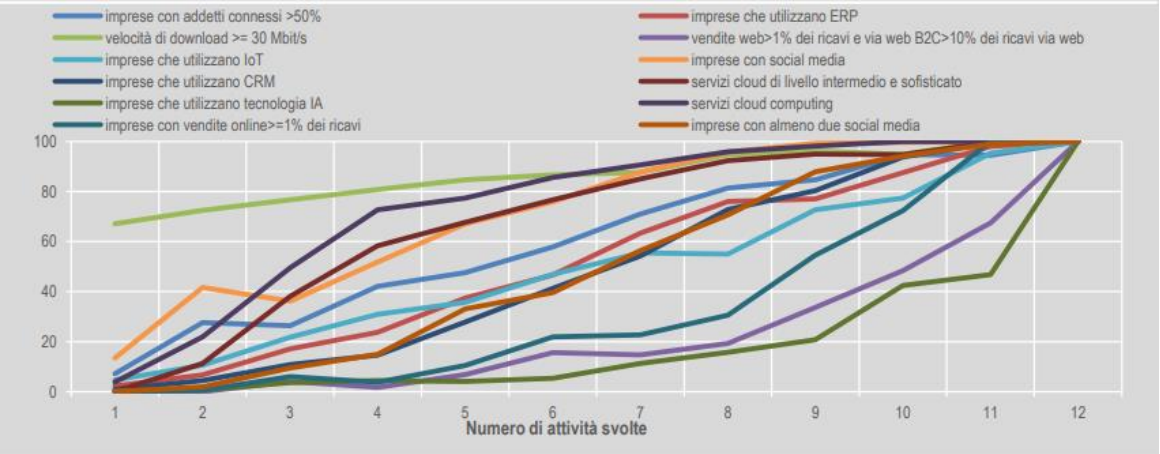

Figure 1.5 : Indicators by number of activities performed. Year 2021, percentage values. ISTAT.

Although the past trend has been very positive, a latest ISTAT analysis affirms that we are light years away from what should be called the norm in the digital field. As Figure 2.1 shows, about 80 percent of companies with at least 10 employees are involved in no more than 6 of the activities considered, a symptom of a still very low level of ICT adoption. The remaining 20 percent achieve high levels of digitization by performing at least 7 of the 12 functions. The most worrying fact for Italy is that the largest gap, of more than 30 percentage points, is found in the adoption of management software such as ERP or CRM.

Table 1.1: Indicators of the European and Italian digital transition from 2011 to 2021.ISTAT.

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Obiettivi 2030
PMI con almeno un livello base di intensità digitale (1)	Ue27	:	:	:	:	57	56	57	52; 47	60	60	56	90
	IT	:	:	:	:	49	46	44	45; 38	58	69	60	
Imprese che acquistano servizi *cloud* di livello medio-alto o intermedio-sofisticato(2)	Ue27	:	:	:	10	:	12	:	15	:	25	*nd* (35)	75
	IT	:	:	:	20	:	11	:	14	:	38	42 (52)	
Imprese che hanno ERP	Ue27	:	24	29	34	38	:	36	:	36	:	39	
	IT	:	21	27	37	36	:	37	:	35	:	32	
Imprese 10+ che utilizzano due o più *social media*	Ue27	:	:	:	14	15	17	18	:	23	:	30	
	IT	:	:	:	12	14	16	17	:	22	:	27	
PMI con vendite e-commerce di almeno l'1% del fatturato	Ue27	12	13	13	14	16	17	17	16	17	17	18	
	IT	4	4	5	5	7	7	8	10	10	11	13	
Fatturato totale delle PMI derivante dalle vendite e-commerce	Ue27	8	8	8	9	10	9	10	10	11	12	12	
	IT	3	4	5	5	8	6	6	8	8	9	9	
PMI con vendite e-commerce in altri paesi dell'Ue	Ue27	6	:	6	:	7	:	8	:	8	:	9	
	IT	3	:	4	:	5	:	6	:	6	:	7	

This is also evident from Table 1.1. It points out that Italy, rising from 37 percent in 2017 to 32 percent in 2021, is bucking the trend of the European Union, which is rising from 36 percent in 2017 to 39 percent in 2021.

On the other hand, major strides have been made in the adoption of cloud services in the use of social media. 52 percent of Italian companies use an intermediate or sophisticated online storage service, up from 14 percent in 2018, and 27 percent use social media, registering a 10-point increase over 2017. This is largely due to the boost received from the pandemic. Cloud and social networks were the only means through which information could be shared internally and externally, to have contact with the end customer.

These statistics, as pointed out earlier, indicate that we are on the right track but that we still have a long way to go, especially regarding the adoption of certain digital technologies such as ERP and CRM, which are very important for the management of companies and everything around them. In addition, these doubts about digital change and the resulting lack of strategy mean that companies are currently more prone to risk, are less productive, and are reducing most of their possibilities, avoiding the significant benefits on business performance that are created by implementing new technologies.

2. Information System: an overview

As specified in previous chapters, globalization can be defined as the profound process of merging the economies of all countries and districts into one connected global environment. Improvements in Information Technology (IT) and the Internet enable companies to operate around the world and bring people closer together by engaging with one another. Reducing the cost of transmitting information is a critical factor in knowing how to trade products using Web technology.

Many companies still have sufficient internal management structure to deal with a partially competitive and predictable market, but problems arise when there are periods of high uncertainty due to radical changes in the market. Without the extensive use of information technology, in fact, several industries would not be able to survive. They would not achieve their business objectives including operational excellence, intimacy with customers and suppliers, improved decision making, competitive advantage and development of new goods and services.

Companies, therefore, are faced with a complex management situation where they must manage large amounts of information effectively, efficiently and timely to adapt to market changes. The ability to make decisions requires access to all necessary information quickly. For this reason, it is essential for companies to have an information system that can provide real-time information.

The use of information technology offers great opportunities for companies to control, plan and manage all activities in an integrated way, as well as to process more data and information more quickly than in the past. This sub-chapter explores the significance and contributions of information systems within organizational contexts.

2.1 Components of Information System

Information management, therefore, entails the need for an information system, which is defined as the coordinated combination of people, processes, data and technology used to collect, store, manage and distribute information within an organisation. The information system is based on the fundamental concepts of data, information and processes, which do not necessarily require the use of information technology. In fact, an information system is composed of several components that work together to manage information within an organisation. The main components of an information system include:

- Data which are the raw material of the information system. They can be numbers, text, images or other types of raw information. Data can be structured or unstructured and are collected from different sources.
- Processes that concern the activities that are performed within the information system to transform data into meaningful information. These processes may include data collection, processing, analysis and distribution.
- People are the users and operators who interact with the information system. There are different roles within an information system, such as end users who access information, system administrators who manage the technological infrastructure and software developers who create and maintain applications.
- Hardware representing the physical infrastructure used to support the information system. This may include computers, servers, storage devices, communication networks and other technological devices required for data processing and transmission.
- Software, the heart of the information system. It includes the applications, programs and operating systems used to manage the data and support the functionality of the information system. Software can be customised to meet the organisation's specific needs.
- Computer networks enable communication and information exchange between the different components of the information system. They can include local area networks (LANs), wide area networks (WANs) and Internet access, allowing information to be shared and accessed from different geographical locations.

- Procedures that are the rules and processes defined to ensure the proper functioning of the information system. These procedures may include guidelines for data collection, information access, data security and other operational practices.
- Security is a critical aspect of an information system. It includes measures and controls to protect data and sensitive information from unauthorised access, fraud or loss. This may involve data encryption, controlled access and other security solutions.

These components interact with each other to create a complete information system, providing organisations with the information they need to make decisions, manage operations and gain competitive advantages (Fig 2.1).

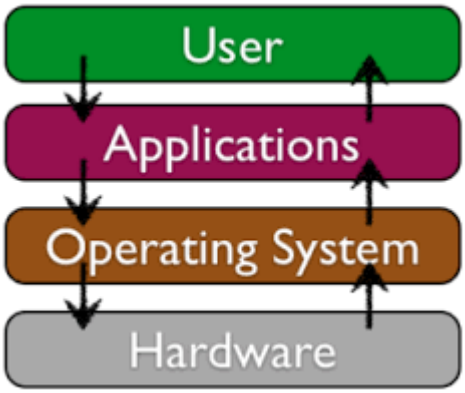

Figure 2.1: How an information system works.

In practice, therefore, the information system often makes use of one or more databases for storing and retrieving information, as well as specific software modules for data entry and management. Therefore, while the existence of the information system is independent of automation, the use of information technology is common in the information system to facilitate its operation.

2.2 Function and roles of Information System within the organization

In Information systems play a crucial role in organisations, supporting decision-making, improving operational efficiency and facilitating the achievement of strategic objectives. In today's environment of increasing uncertainty, companies must try to anticipate future events and base their daily decisions and strategic direction on structured information flows. These flows, which occur both from the outside to the inside and within the company, and from the inside to the outside, are as important as flows of goods and financial resources.

This concept gives rise to the concept of a 'business process', which can be defined as a logical set of activities that take inputs and transform them into valuable outputs for the company itself or for potential customers. Managing a business, as well as a specific activity, means observing one or more variables (acquiring information) and taking the appropriate consequent actions (making decisions) to maintain the trend envisaged by business planning.

Proper business digitisation is the tool that aims to enable and facilitate the objectives of the business organisation in a rational manner. This is achieved through the implementation of interconnected information systems that offer solutions and tools for continuous improvement (Fig 2.2).

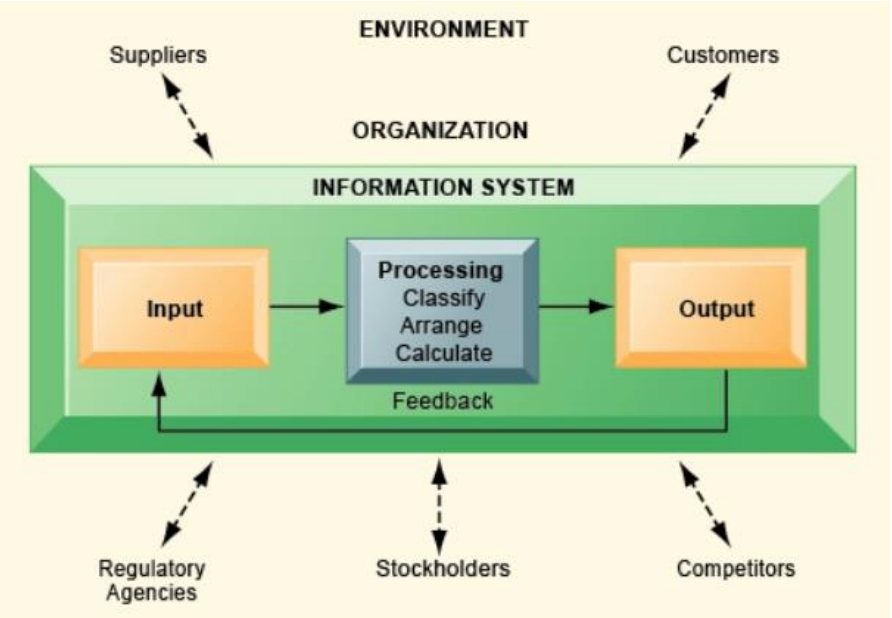

Figure 2.2: Role of Information System in an organizations.

The functions that information systems perform can be summarised as follows:

- Data management and storage as they allow information to be collected in a structured manner, ensuring accessibility, accuracy and security of information. By centralising data in databases, organisations can manage and retrieve information efficiently, thus supporting various business processes.
- Information processing and analysis processes and analyses data in order to generate meaningful information. Through the use of advanced algorithms and computational techniques, information systems transform raw data into valuable information. This facilitates the manipulation, aggregation and analysis of data, enabling organisations to identify trends, patterns and relationships. The resulting information supports strategic planning, resource allocation and performance evaluation.
- Decision support because they provide tools and technologies for decision support. Decision support systems (DSS) and executive information systems (EIS) use data analysis and modelling techniques to assist managers and executives with business decisions. These systems provide access to relevant information, generate reports and visualisations, and facilitate what-if analysis and scenario planning.
- They foster communication and collaboration within organisations. Technologies such as e-mail, instant messaging, video conferencing and collaboration platforms enable employees to exchange information, share knowledge and collaborate on projects regardless of their geographical location. These technologies improve productivity, teamwork and innovation, creating a more connected and efficient working environment.
- Another important function of information systems is the automation and simplification of business processes. By integrating technology into processes, organisations can automate repetitive tasks, reduce human error and improve efficiency. Systems such as work processes management, enterprise resource planning (ERP) and supply chain management enable organisations to streamline processes, simplify operations and improve overall productivity.
- Information systems play a crucial role in customer relationship management. Customer relationship management (CRM) systems help organisations track and analyse customer interactions, preferences and behaviour.

The functions and roles of information systems within organisations are of paramount importance to ensure effective management and support decision-making. These systems perform various functions that enable organisations to harness the value of information as a strategic resource. Through the use of technology, information systems contribute to the optimisation of business operations and improve efficiency, productivity and competitiveness in the changing business environment.

2.3 Classification of Information Systems

The main information systems used within a company are firstly by function, secondly by activity and finally by process as we can see from the Fig 2.3.

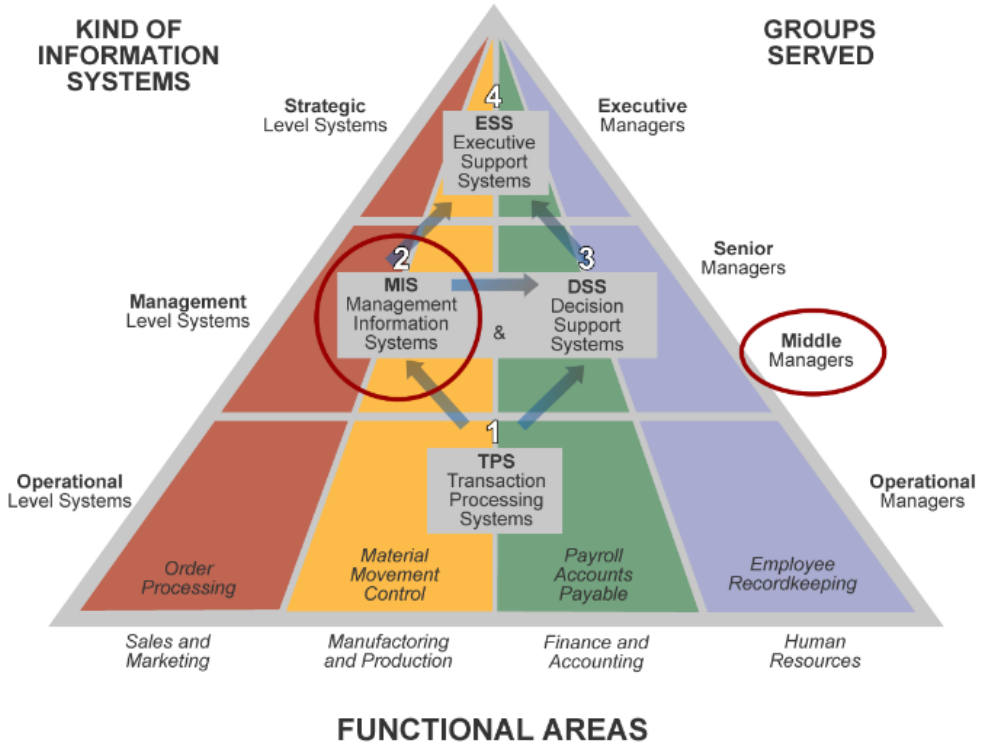

Figure 2.3: Classification of information system.

As we said above the first division is by function, in fact organizations have recognized the importance of information systems in supporting various business functions. Each department or business module within an organization requires specific information systems tailored to its unique requirements. This division by function allows for efficient management of different aspects of the business.

For example, the Logistics department relies on dedicated systems to effectively manage suppliers and orders, ensuring smooth operations throughout the supply chain. The Marketing department utilizes information systems to process data and facilitate the acquisition of orders, enabling targeted marketing campaigns and improved customer engagement. In the Finance department, managerial systems play a crucial role in effectively managing cash flow, tracking income and expenditure, and generating financial reports. The Research and Development (R&D) department requires specialized systems to plan, control, and analyse information in the technical-scientific domain. These systems support the development of innovative products and technologies, enabling organizations to stay ahead in a competitive market. Additionally, the Production department relies on systems for planning and control, optimizing production processes, monitoring inventory levels, and ensuring timely delivery of products.

By aligning information systems with specific business functions, organizations can enhance efficiency, streamline operations, and improve overall performance. The utilization of dedicated systems tailored to each department's needs enables effective decision-making, improved collaboration, and the ability to respond swiftly to market demands. This approach ensures that information flows seamlessly across the organization, facilitating informed decision-making and contributing to the organization's success.

Within the organizational structure, activities can be categorized into strategic, tactical, and operational levels. Information systems align with this division and are classified accordingly. Strategic Support Systems (SSS) are information systems utilized at the strategic level to address problems that lack specific resolution procedures. These systems integrate external data and enable management-level monitoring through advanced graphical representations that highlight critical issues.

Decision Support Systems (DSS) share similarities with SSS but offer a broader range of data as output. Users can interactively analyze this data to facilitate decision-making operations.

Management Information Systems (MIS) are information systems employed at the tactical level. They acquire data from Transaction Processing Systems (TPS) and present it in the form of reports, historical data, or current performance indicators.

TPS, on the other hand, serve operational decisions as they are specifically designed for day-to-day routine operations, supporting essential business processes.

This hierarchical framework of information systems allows organizations to effectively address decision-making needs at different levels. SSS and DSS empower strategic decision-making by providing comprehensive insights and analysis, while MIS supports tactical decision-making with timely and relevant information. TPS, being operational systems, play a crucial role in the smooth execution of routine tasks.

Information systems are categorized based on processes to enhance resource management and improve output, resulting in various benefits.

Customer Relationship Management (CRM) systems focus on nurturing customer relationships. They enable companies to establish and maintain long-term connections with customers, facilitating effective management of customer interactions over time.

Supply Chain Management (SCM) systems are dedicated to optimizing the performance of individual components within the supply chain. By adopting a holistic approach that encompasses logistics, marketing, and other functions, SCM aims to enhance service levels while optimizing capital and costs.

Enterprise Resource Planning (ERP) systems, on the other hand, streamline the management of diverse resources to optimize multiple business processes. ERP is typically divided into modules such as production, finance, and more. What sets ERP systems apart and makes them widely adopted is the utilization of a unified database that houses comprehensive information and data related to both active and passive cycles, including supplier receipts and payments.

These information systems play crucial roles in organizations by fostering effective customer relationship management, enhancing supply chain performance, and optimizing overall business processes. By leveraging these systems, companies can achieve improved efficiency, streamlined operations, and better utilization of resources.

3 Enterprise resource system

The ERP (Enterprise Resource Planning) system is, therefore, the main information system adopted by companies due to its ability to integrate and rationalise the entire organisational structure, encompassing functions ranging from sales and logistics to production and budget management. According to the American Production and Inventory Control Society (APICS, 2001), ERP is defined as "an effective approach for planning and controlling all resources required for supply, production, accounting, and order fulfilment in a manufacturing, distribution, or service company". As the Fig 3.1 shows, the main objective of ERP is to achieve seamless integration of information within the company and to facilitate information sharing between the company and its partners. This is achieved by establishing connections between the different stages of the supply chain, resulting in improved efficiency, reduced costs and accelerated processes.

Figure 3.1: Enterprise resource system.

3.1 Historical background and emerge of ERP system

The need for a comprehensive system that could effectively balance and coordinate the entire company arose in the 1960s, coinciding with the economic boom, when businesses began adopting information technology to manage various organizational functions. During this period, companies started implementing separate information systems for different departments, including finance, production, and inventory management. However, these systems operated independently and lacked integration, resulting in inefficiencies and challenges in sharing information across departments.

In 1964, the concept of Material Requirements Planning (MRP) emerged, drawing on fundamental industrial production concepts such as economic order quantity (EOQ). MRP systems provided production planning capabilities to meet specific operational needs. While they addressed these needs, MRP systems did not encompass the broader scope of organizational functions.

During the 1970s, software development companies began to emerge, focusing on implementing management information systems. The primary concern during this period was the cost associated with production. The commercialization of this software brought significant advantages, leading to rapid technological advancements. In 1983, MRP II (Manufacturing Resource Planning) was introduced, integrating production tools such as material purchasing, planning, contract management, and leveraging superior computing power.

The evolution from MRP to ERP occurred in the 1990s, driven by the recognition among software developers of the need to integrate all business functions into a unified system. This was particularly important for large enterprises. The ERP system expanded beyond the integrated production capabilities of MRP and encompassed departments such as finance, sales, human resources, and customer relationship management. This integration facilitated improved coordination, data sharing, and process streamlining across the organization. Companies could now utilize a comprehensive software solution that integrated multiple functions and provided real-time visibility into their activities.

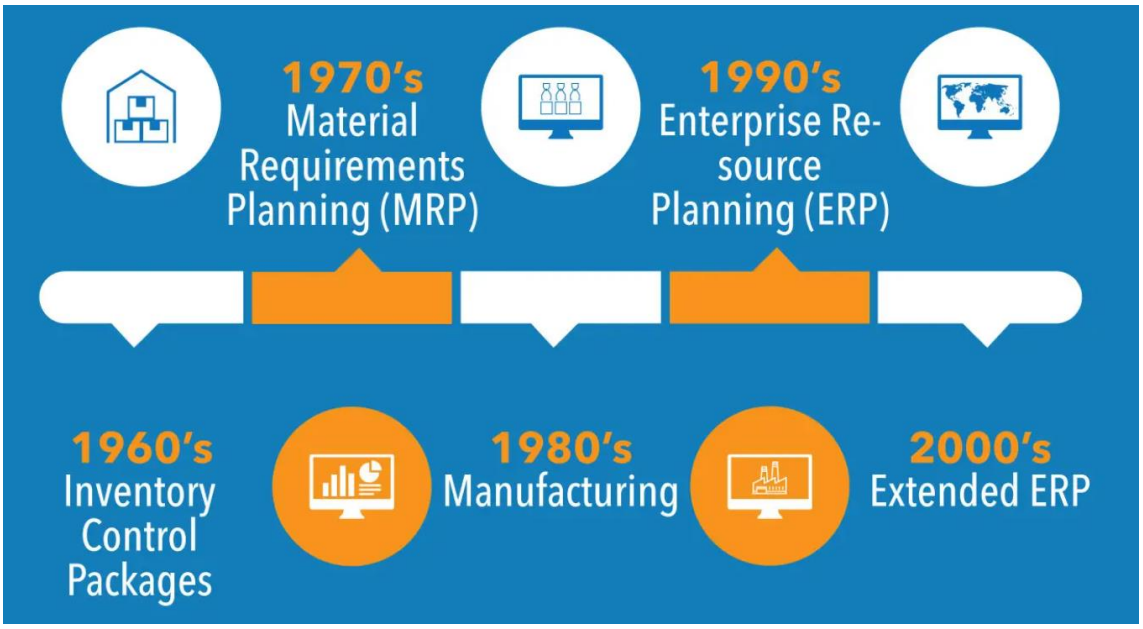

Figure 3.2: History of ERP system.

Overall, the historical context and emergence of the ERP system (Fig 3.2) underscore the importance of organizations adopting a unified and integrated approach to resource management, streamlined operations, and overall business success.

3.2 Key features and functionality of ERP system

The Enterprise Resource Planning (ERP) system, therefore, is an IT solution that offers fundamental features for companies. It consists of integrated subsystems that share a common database and are designed to interact and cooperate. This allows for real-time data sharing between different departments, providing a unified and comprehensive view of activities.

Figure 3.3: Essential ERP features.

As shown in the Fig 3.3 above, one key aspect of an ERP system, in fact, is the centralization of data. It provides a broad and complete view of the company's core processes, with a single database management system (DBMS) facilitating data sharing and communication between independent modules, exchanging information from each department, facilitating the flow between the different functions and with the stakeholders. This ensures data consistency and avoids duplications or discrepancies.

The ERP system is modular, with functional modules covering various business areas. Each module offers specialized functionality to support related activities and processes. The modularity allows companies to customize and configure the system according to their specific needs. Furthermore as independent modules can be purchased separately, related to the others or detached, which means that they can be customised by the company to follow its needs.

Customization and configuration options allow companies to align the ERP system with their operational practices and industry requirements. This ensures a tailored solution that meets specific business needs and maximizes the benefits of the ERP system. Scalability and flexibility, in fact, are essential features of an ERP system. It should adapt to changing business needs and support the growth of the organization. Additionally, an ERP system can integrate with heterogeneous systems, accommodating the unique functions and platforms of different organizations.

Automation is another important feature of an ERP system. It enables the automation of approval procedures, work processes, order management, and report generation. This streamlines operations, optimizes employee time, and reduces errors.

By collecting and processing data from different business functions, the system can generate reports and provide advanced tools for data analysis. Data analysis is a valuable capability of an ERP system. This helps identify trends, patterns, and inefficiencies, enabling informed decision-making and future predictions.

Data security and transparency is a critical aspect of an ERP system. Security measures are implemented to protect sensitive business data, such as secure access, role-based access control and data encryption. These controls are also useful because ERP systems track finished products and raw materials from production to delivery. This not only allows for understanding and anticipating problems such as delays and stock outages, but also prevents sensitive data from being stolen.

In terms of functionality, instead, the integration of ERP tools provides various benefits, allows for centralized storage of customer information, encompassing contact details, order history, personal data, purchase orders, and invoicing details. This integration facilitates easy access to billing information and customer addresses during shipment processing. CRM functionalities within ERP systems (FIG 3.4) handle marketing automation, sales pipeline activities, lead management, and comprehensive customer service solutions. By leveraging ERP's customer service management capabilities, companies can enhance long-term customer retention and satisfaction.

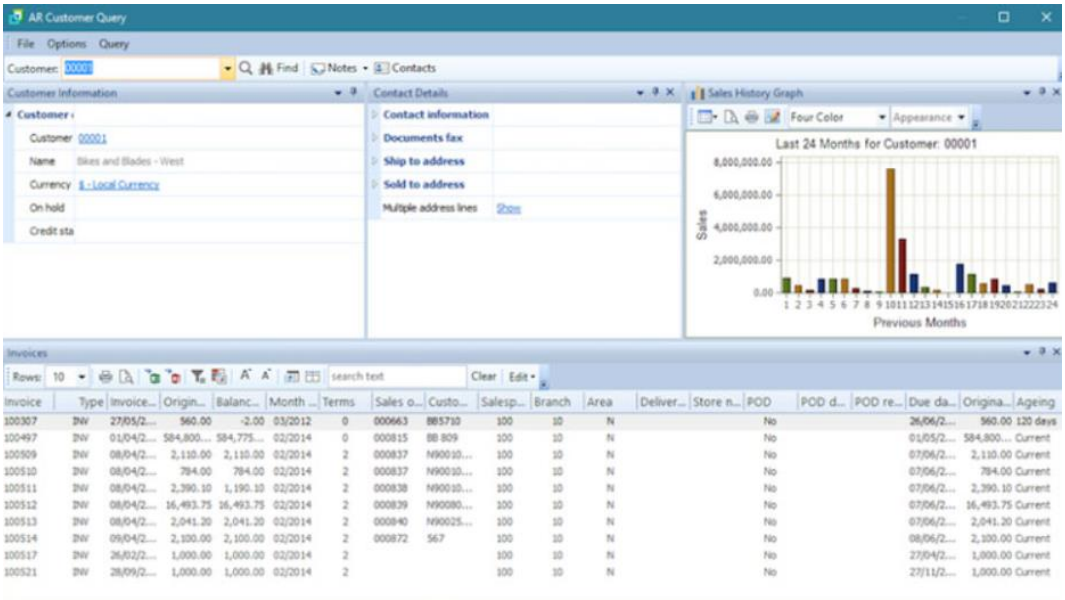

Figure 3.4: Access to customer data in an ERP.

Financial management is a critical aspect also supported by ERP systems. These systems effectively manage debts, receivables, fixed assets, risks, and taxes as shown in the FIG 3.5 below. Accounting functions such as payment processing, sales analysis, and expense management are automated, resulting in improved accuracy, processing time and reduced staff workload.

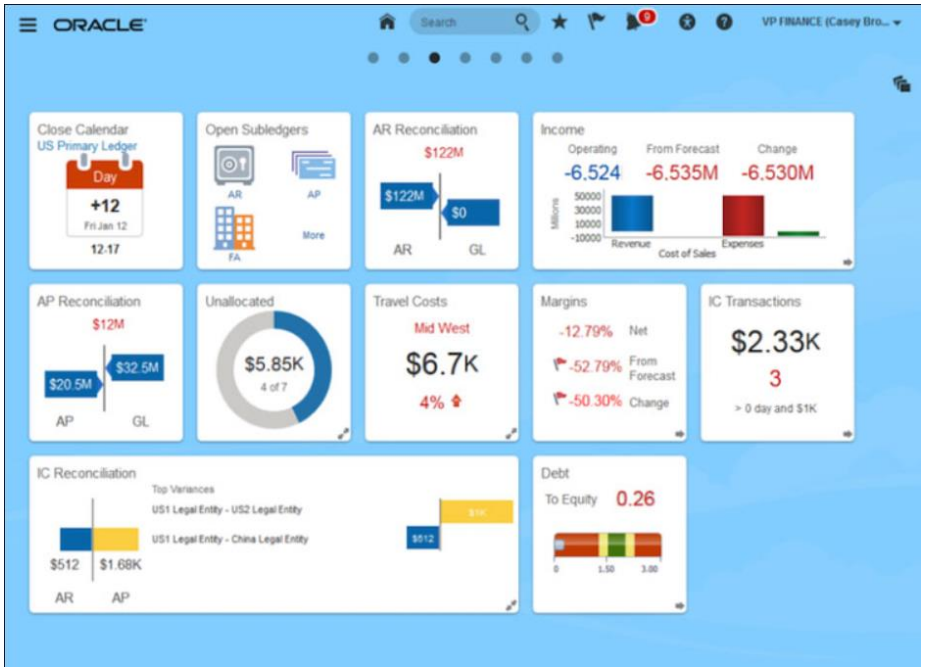

Figure 3.5: Finance management with ERP.

The HR module within ERP systems optimizes various HR activities including recruitment, hiring, payroll, onboarding, and learning management. It automates complex functions like tax deductions, improving efficiency while minimizing errors.

For manufacturing companies, ERP systems play a pivotal role in supply chain planning and management. They streamline the procurement of raw materials, selection of marketing channels, inventory management, production processes, as well as transportation and distribution. By reducing inefficiencies and providing real-time visibility, ERP systems make operations flexible and cost-effective, offering a competitive edge.

The sales and marketing module of ERP software provides a range of functionalities, including customer contact management, order tracking, invoicing, payment processing and return order management. Additionally, it offers features like expense tracking, target implementation for marketing personnel, lost order tracking, and comprehensive reporting. Detailed customer profiles and sales histories maintained by ERP systems enhance understanding of customer preferences, leading to improved product marketing and opportunities for upselling and cross-selling.

So, the modules that the ERP system can support by integrating their functionality are:

- Accounting management
- Financial management
- Production management
- Transport management
- Sales and distribution management
- Human resources management
- Supply chain management
- Customer relations management
- E-Business

The integration of ERP tools provides comprehensive solutions for various business functions, improving efficiency, accuracy, and decision-making within organization.

3.3 ERP implementation life cycle

The implementation phase, therefore, is the most critical phase in fact the decision-making process regarding the implementation of the Enterprise Resource Planning (ERP) system requires a great deal of responsibility on the part of management, as it has significant consequences for the organisation as a whole. The objective is to establish an efficient information flow link along the entire supply chain.

The introduction of an ERP in the company entails an extensive change that requires the consideration of crucial variables such as time, labour and available resources. These elements are crucial for a successful implementation and must be placed at the centre of the project.

To ensure he successful implementation of ERP, two types of implementation approaches must be considered:

- Aggressive scheduling: aims to achieve maximum benefits in the shortest possible time. This type of implementation maintains staff enthusiasm and commitment, as results will be visible in the short term, unlike long-term projects that can take years to complete.
- Proven Path: this is a well-established path with several steps for implementing the system.

There are also two forms of implementation:

1. Company-wide implementation: involves the entire enterprise, including all business functions. This type of implementation takes one to two years to complete.
2. Quick-Slice implementation: involves the introduction of ERP only for certain product lines that are considered most profitable for the company. Only certain ERP functions are implemented in a short period, usually between three and five months.

To ensure a successful ERP system implementation, many companies rely on the 'Proven Path'. This structured and proven approach follows best practices identified through past experiences in the field of ERP system implementation. The 'Proven Path' is a framework developed specifically to guide companies through the entire implementation process. It is based on a solid foundation of proven experience and best practice, providing a structured approach that can be followed by companies to achieve optimal results.

It represents, so, a series of defined steps to achieve the set goal within the set timeframe, as illustrated in Fig. 3.6

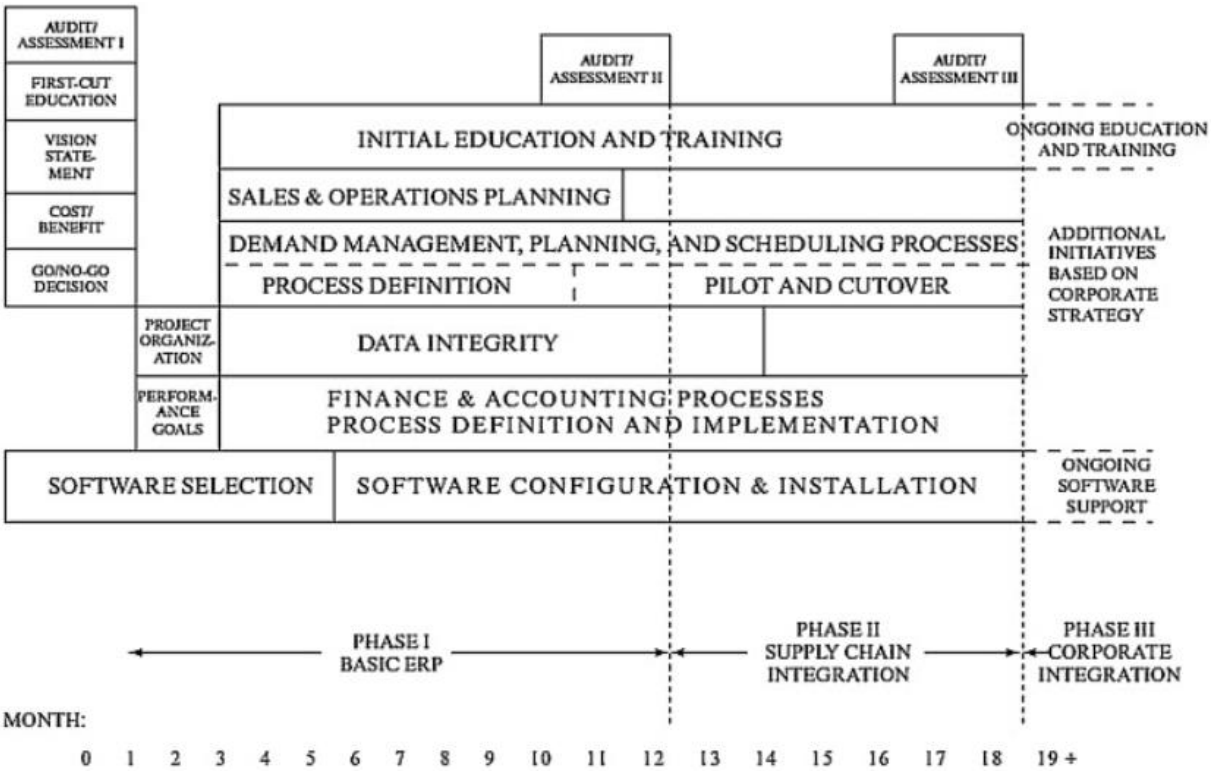

Figure 3.6: ERP proven path.

The implementation project is divided into three macro-phases, each with its own time period. The initial phase includes the analysis of existing problems within the company and generally takes nine to twelve months. During the extension phase, ERP is extended along the entire supply chain, linking the upstream market to the downstream market. Towards the upstream, supplier planning tools are adopted and a direct connection with suppliers is established to achieve direct procurement of materials, thus avoiding unnecessary stocks and costs. Towards the downstream market, distribution is improved to detect and promptly meet consumer needs. This phase takes about six months. During the last macro-phase, the business integration phase, the system is extended to the entire organisation to continue to introduce changes and adaptations over time. Continuous training of staff is planned to ensure that they are able to use the new system correctly and request any changes to improve it according to internal and external needs.

Education and training are present both at the beginning and at the end of the process, as change comes from management and the operational core, who feel the need to reorganise the way they work to facilitate operations and make the flow of information smoother and more reliable.

Implementing an ERP system in a company using the 'Proven Path' method, so, offers a structured and proven approach that reduces risk, accelerates implementation, and maximises the business value gained. Companies that choose to follow the 'Proven Path' can benefit from a successful implementation, resulting in improved operational efficiency, optimised business processes and stimulated growth. It is important to consider the adoption of the Proven Path as an investment in ensuring the success of the implementation in the company, as it allows the company to follow a path based on best practices, avoiding common obstacles and maximising the benefits of ERP implementation.

4 The implementation of SAP ERP by Accenture: optimising business processes through a strong partnership

Over the years, ERP systems have continued to evolve, incorporating advanced technologies such as cloud computing, mobility and analytics. Modern ERP systems offer greater flexibility, scalability and customisation possibilities to meet the specific needs of different industries and organisations. Nowadays, the best expression of ERP is SAP (Fig 4.1).

Figure 4.1: Logo of SAP ERP.

The SAP ERP application is a system developed by the multinational SAP SE. The acronym SAP stands for 'Systems, Applications and Products in Data Processing'.

Founded in 1972 by a group of former IBM employees, SAP SE has become one of the world's leading companies in the field of ERP and IT solutions for businesses. The company's initial goal was to create standardised management software that would integrate all business processes and enable real-time data processing. This goal was achieved through close cooperation with customers, thanks to which the five members were able to understand what the real needs of the business were, and the first company to implement the software was 'Imperial Chemical Industries', a nylon manufacturer in Germany. Prior to the introduction of SAP software, the company was using mainframe calculation programmes for payroll and accounting. With the implementation of the new system, data was stored locally using a logical database common to all company activities, eliminating the need for manual data entry.

In 1979, SAP began developing SAP R/2, the second generation of its software, which expanded the product's functionality to include materials management and production planning. In 1992, SAP R/3 was launched on the market, and several versions of R/3 were developed and released until 1995. With the transition from mainframe to client/server system, SAP established itself as a global player in the industry, opening offices and development centres around the world.

In 1999, in response to the advent of the Internet, SAP developed the Internet strategy mySAP.com, which redefined the concept of business processes by including integration via the Internet for the first time. In 2014, with the launch of SAP S/4HANA, the company adopted an in-memory database, which allowed data analysis to be completed in seconds rather than days or weeks. Over the years, SAP has expanded into three market sectors: mobile technology, database technology and cloud.

4.1 Accenture's history: origins, evolution and impact in the professional services sector

Accenture is a leading global professional services firm. Its history is rooted in Arthur Andersen, one of the world's largest accounting firms founded in 1913 by Arthur Andersen and Clarence DeLany. Accenture's origins date back to 1953, when Arthur and Clarence conducted a feasibility study for General Electric. GE asked them to examine the possibility of automating the payroll process at GE's Appliance Park Facility. This project marked one of the first examples of IT consulting for payment process automation and laid the foundation for Accenture's future development in technology consulting.

In 1989, the consulting division of Arthur Andersen separated from its parent company and took the name Andersen Consulting. Thanks to its established reputation, Andersen Consulting experienced rapid growth and provided high-level consulting services to a wide range of global clients. The company furthermore developed a wide range of expertise, offering strategy consulting, technology consulting and business outsourcing services.

However, in the 1990s, tension escalated between Andersen Consulting and Arthur Andersen. Andersen Consulting paid up to 15 per cent of its annual profits to Arthur Andersen, while the latter started to compete with Andersen Consulting through its consulting service called Arthur Andersen Business Consulting. In 1998, the dispute reached a pivotal point when Andersen Consulting asked for a breach of contract with Arthur Andersen. In 2000, the US Chamber of Commerce ruled that Andersen Consulting could break all contracts with Arthur Andersen. At that time, a name change was also requested and the company was renamed Accenture (Fig 4.2). This marked the beginning of a new phase of independent development and growth for the company.

Figure 4.2: First logo of Accenture (year 2000).

After the separation, Accenture continued to expand globally by opening new offices and acquiring other strategy and technology consulting companies. The company also diversified its service portfolio, expanding its offerings to include areas such as business process outsourcing, IT service management, cybersecurity and artificial intelligence. This diversification has contributed to Accenture's continued growth and success.

Today, Accenture has a significant impact in the professional services industry, introducing cutting-edge innovations and solutions to help companies improve their operations and achieve success. The company has developed advanced competencies in emerging technologies, such as data analytics, artificial intelligence, the Internet of Things and cloud computing, providing its clients with cutting-edge solutions to address business challenges and take advantage of growth opportunities. In addition, Accenture has established partnerships with leading technology providers, including SAP, Microsoft and Oracle, to offer integrated, value-added solutions.

With a global presence in over 120 countries, the company currently employs around 700,000 people. Its prominent position in the industry is also reflected in its financial performance, as evidenced by the stock's return offered to shareholders in the period between 2017 and 2021, averaging an impressive 26% return per annum.

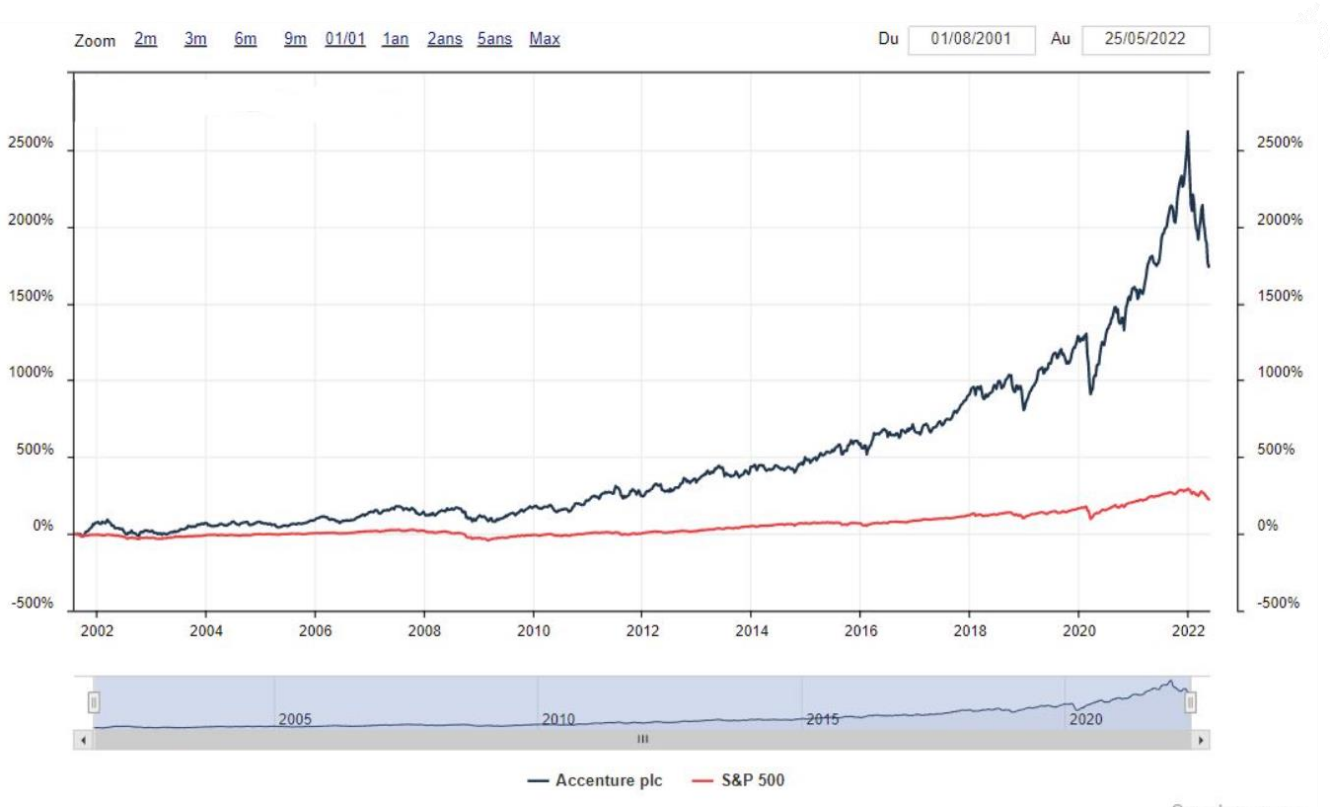

Figure 4.3: Accenture plc share performance from year 2001 to year 20022.

Since its listing in 2001, as shown in Fig 4.3, Accenture's stock has shown a remarkable ability to outperform the benchmark S&P 500 index. This means that investors who have chosen to invest in Accenture have performed significantly better than the US stock market average. This financial success is a testament to the company's strength and reliability in providing innovative solutions and high-quality consulting services.

Moreover, over the past decade (2011-2021), Accenture has experienced remarkable revenue growth from USD 25 billion to USD 50 billion, while maintaining a constant operating margin of 15% (Fig 4.4). This extraordinary result was achieved thanks to sustained demand and a structurally growing market, but also thanks to a very well-managed acquisition strategy. During this period, Accenture invested approximately $13 billion in targeted acquisitions, which helped consolidate its leadership position. These investments generated an increasing free cash flow, from USD 2.5 billion to USD 7 billion. Thanks to its growth strategy and actions, Accenture has achieved a truly outstanding return on investment (ROI) for a company of this size. This success is the result of prudent resource management and a well-defined expansion strategy.

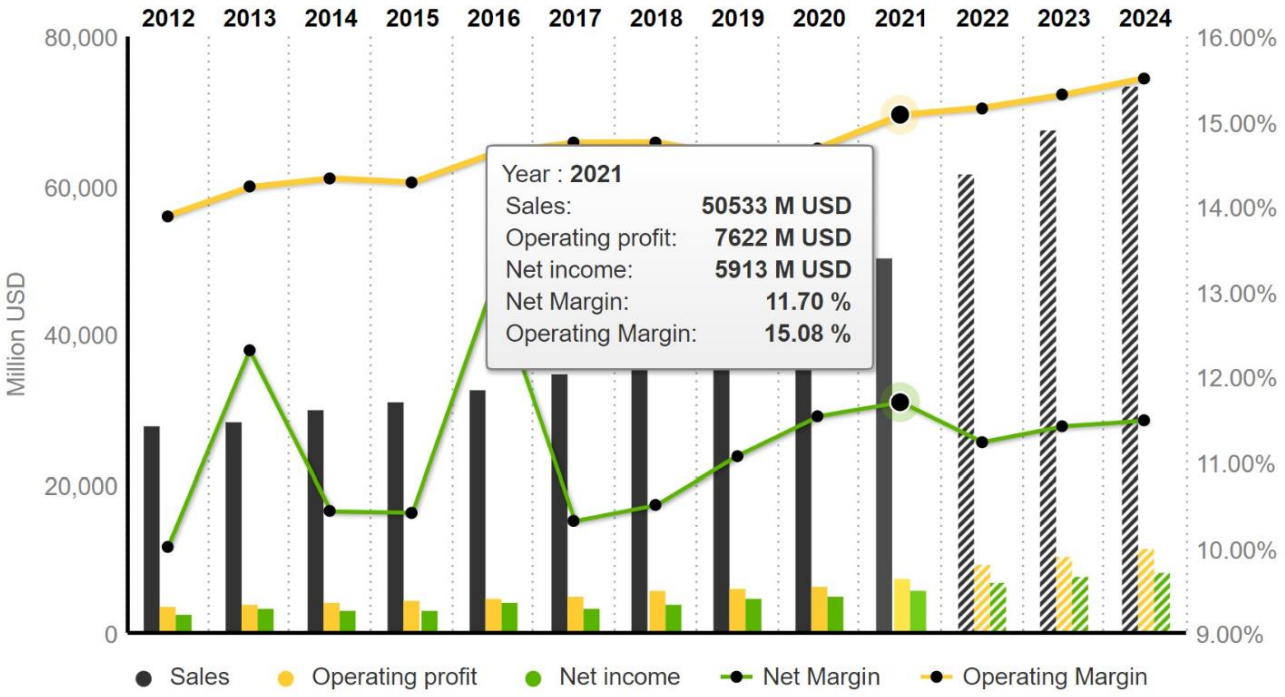

Figure 4.4: Accenture plc income statement evolution (annual data).

The group's size and wide range of services in all sectors gives it a significant competitive advantage. Thanks to its 'one-stop shop' concept, the company offers its customers the convenience of finding all the solutions they need under one roof. This approach allows them to save significantly by avoiding friction costs and technological hurdles that often arise when working with several partners. At the same time, the consultancy business model remains highly attractive as it has a low fixed cost structure and variable costs that can adapt to economic conditions. Therefore, if demand decreases, the company can easily separate itself from consultants and preserve profit margins. This is a significant advantage for ensuring sustainable profitability in the long term.

Moreover, the company's external growth is largely self-financed. Accenture has demonstrated management focused on returning capital to shareholders without compromising growth prospects. In the period between 2011 and 2021, a total of USD 29 billion was returned to shareholders through share buy-back programmes and USD 15 billion through dividends. This is a hallmark of high-quality companies: they are able to finance their growth and provide generous returns to shareholders using the cash flow generated, without having to resort to debt or capital increases.

In summary, Accenture's history is characterised by steady growth, diversification of expertise and an innovative footprint in the professional services sector. The company has adapted to market changes, anticipating clients' needs and maintaining a leadership position, influencing the evolution of business best practices.

4.2 Optimising business flow with SAP and Accenture: integrative solutions and best practices

The collaboration between SAP and Accenture represents an important alliance in the field of business solutions and professional services. Over the years, this partnership has been consolidated through a combination of key factors. Both companies recognised the opportunity to combine their skills to offer clients integrated solutions, leveraging SAP's expertise in enterprise software and platforms and Accenture's skills in strategic consulting and implementation of complex projects.

The motivations behind the formation of this partnership are many. On the one hand, both companies realised the importance of providing comprehensive, state-of-the-art solutions to address clients' business challenges. This collaboration allowed them to offer a wide range of services under one roof, combining SAP's extensive software portfolio with Accenture's experience and consulting expertise. This approach has helped organisations streamline operations, improve efficiency and achieve digital transformation.

On the other hand, the partnership enabled both companies to access new market opportunities and expand globally. SAP was able to leverage Accenture's extensive customer network and expertise to reach new industries and markets, enabling significant growth. At the same time, Accenture benefited from access to SAP's cutting-edge technology solutions to enrich its service offerings, providing tailored solutions that address clients' unique needs and challenges.

Accenture's expertise in SAP solutions and their deep knowledge of the technology stack is a key element of this partnership. This allows them to design and implement customised solutions, ensuring that clients can make the most of SAP's extensive software portfolio. Through the implementation of solutions such as ERP, CRM and SCM, Accenture supports organisations in streamlining operations, promoting efficiency and achieving successful digital transformation.

Caspar Borggreve, senior managing director and head of Accenture SAP Business Group, emphasised that the supply chains of the future require a complete business reinvention enabled by data and a strong digital core. In line with this vision, Accenture and SAP have collaborated to extend the power of the SAP Business Network, introducing new capabilities, resources and accelerators that deliver significant benefits in the following areas:

- Logistics: Accenture and SAP have developed advanced capabilities to enable better collaboration with carriers, track goods in transit and capture and validate emissions and product genealogy data.

These innovations aim to ensure that trading partners operate in a sustainable manner, promoting environmental responsibility throughout the supply chain.

- Sourcing: The partnership has enabled responsible sourcing monitoring, verifying suppliers' compliance with established network metrics and values. This helps ensure the integrity and sustainability of procurement practices, promoting trusting relationships with suppliers and reducing the risks associated with the supply chain.
- Supply chain: Accenture and SAP integrated business-to-business (B2B) solutions to support supply chain processes across different industries. This has resulted in specialised solutions for supply chain planning, purchase order collaboration and quality management processes. With these integrations, companies can improve operational efficiency, optimise authorization processes and ensure higher quality of the products and services provided.
- Resource management: The partnership led to the development of intelligent functionalities to optimise the performance of corporate resources. Through a central repository that shares information with equipment, resource operators, manufacturers/EMOs and suppliers, trust and collaboration between the parties involved has increased. This has enabled more efficient management of resources, reduced errors, accelerated maintenance and repair times and improved the overall availability of assets.

Accenture and SAP's joint efforts in enhancing the SAP Business Network have enabled them to innovatively address the challenges of supply chains, providing advanced solutions that promote sustainability, efficiency and operational excellence.

Companies followed by Accenture also have the opportunity to collaboratively manage and optimise their business, leveraging advanced analytics, outcome simulations and next-generation human-computer interactions. Users can benefit from the following possibilities:

- Intuitive data interaction and secure resource management: through an engaging digital experience, users can interact more intuitively with data and manage resources securely.
- Proactive resource monitoring and downtime prediction: with advanced functionality, the status of resources can be proactively monitored and potential downtime predicted, enabling companies to take timely preventive action.
- Real-time visualisation of goods movement in the supply chain: through a real-time supply chain network, users can visualise the movement of goods and zoom in on specific data points.

In addition, they can manipulate data using virtual tools and interfaces.

- Simulation of scenarios and assessment of the impact of business decisions: the partnership allows users to simulate different scenarios and assess the impact of business decisions before implementing them in the real world. This enables companies to make more informed decisions and reduce risks.

This demonstrates how customers can more easily exploit SAP data and use their existing SAP landscape for immersive business applications.

The results achieved through this partnership have been remarkable. The combination of SAP and Accenture's expertise and resources has enabled them to deliver innovative, cutting-edge solutions to clients, supporting their digital transformation, improving operational efficiency and increasing competitiveness. In addition, the partnership has consolidated the leadership position of both companies in the industry and opened up new opportunities for growth.

4.3 Revolutionizing sales and invoicing process: Accenture's impact through SAP in a leading automotive company

Accenture, in collaboration with SAP, has played a crucial role in driving operational excellence for numerous clients, including a prominent automotive company. Over the course of their partnership, Accenture has undertaken significant initiatives to enhance material and process management, ranging from streamlined procurement to optimized fiscal invoicing. This chapter explores a specific project undertaken by Accenture, aimed at improving a critical flow within the supply chain of this renowned automotive manufacturer.

In this chapter, we explore the pivotal project undertaken by Accenture in collaboration with SAP, with the objective of replacing the outdated invoicing management system for General Distributors. The primary focus was to streamline business operations and simplify the complexities associated with sales and accounting processes. The implementation of a new system within the SAP environment, tightly integrated with the existing landscape, enabled efficient management of sales, logistics, and invoicing processes. This replacement project holds significant importance as it establishes a global model that can be replicated across other supply chains and customers. Additionally, it is considered a crucial milestone within the Revenue Cycle project, albeit limited to the importers' business in Italy.

In order to improve the billing process and provide support to the commercial and logistics departments, Accenture, in collaboration with SAP, developed a user-friendly interface. This interface was designed to streamline the billing flow and incorporate necessary controls. Additionally, an authorization procedure was implemented to expedite the process by bypassing certain controls, with approvals from the business. This approach aimed to enhance efficiency and facilitate seamless communication between teams. The processes covered within SAP for revenue cycle management were specified in Fig 4.5 below, showcasing the comprehensive functionalities and modules utilized. The development of the user-friendly interface and implementation of the authorization procedure have significantly contributed to optimizing the billing process and supporting the commercial and logistics areas.

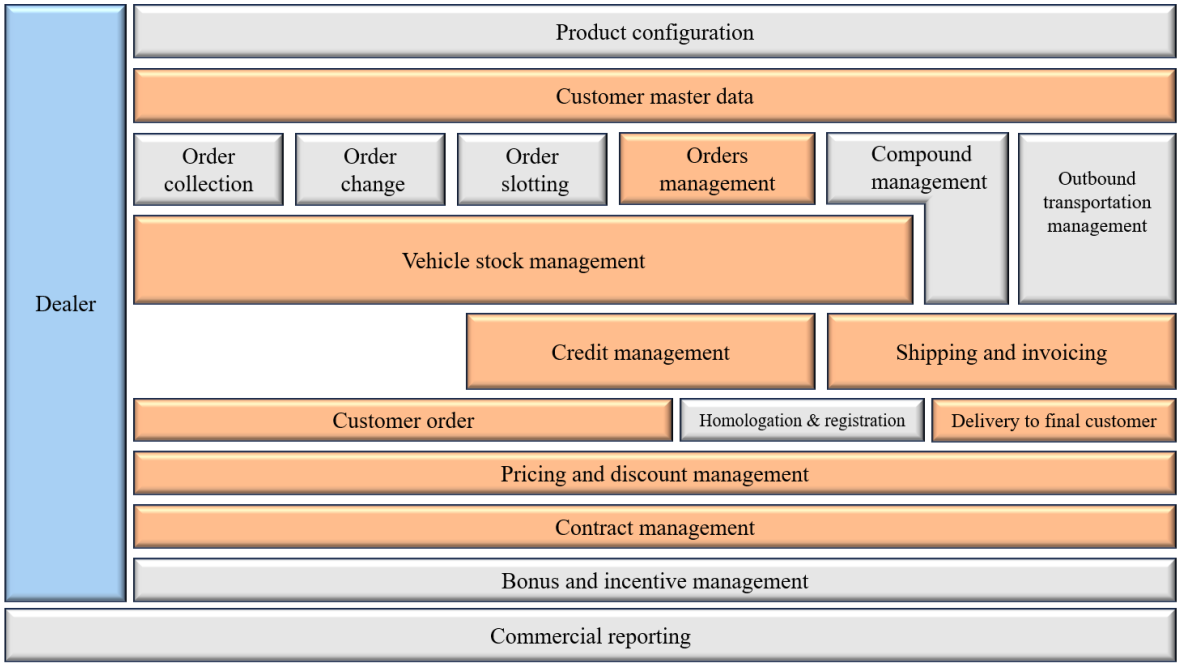

Figure 4.5: List of process to cover revenue cycle.

The project encompassed three modules: MM (Materials Management), SD (Sales and Distribution), and FI (Financial Accounting), covering various aspects related to materials, ordering, and invoicing. Seamless coordination among these modules was crucial to prevent duplication errors and optimize the overall process.

Configuring the SAP MM processes involved defining and designing the purchasing flow management within the system. To ensure effective management of purchasing and logistics business processes, several organizational elements needed to be established.

These organizational elements include:

- Purchasing Organization: the purchasing organization plays a crucial role in overseeing and managing all business processes associated with procurement. They are responsible for coordinating activities related to sourcing, negotiations and vendor management.
- Purchasing Group: a dedicated purchasing group is established to handle all purchasing activities within the organization. This group is responsible for executing procurement processes, ensuring compliance with procurement policies, and fostering effective communication with suppliers.
- Plant: the concept of a "plant" is utilized in the SAP system to represent a logistics division or a physical location responsible for vehicle inventory management. Each plant corresponds to a specific facility or yard where vehicle inventories are stored and managed.
- Storage Locations: within each plant, multiple storage locations are defined to further categorize and organize the vehicle inventories. Storage locations represent specific areas or sections within a plant where vehicles are stored, enabling efficient tracking and management of inventory.

By establishing and configuring these organizational elements within the SAP system, the project aimed to streamline and optimize purchasing, logistics, and inventory management processes for the organization.

In order to configure the processes within the SD module, it was essential to define the following elements within the system:

- Sales Organization: the sales organization serves as a crucial organizational unit within logistics, responsible for the distribution of goods and services. It groups the enterprise based on specific sales and distribution requirements. Each sales organization is uniquely associated with a business code, and multiple sales organizations may be assigned to a single business code.
- Distribution Channels: distribution channels play a vital role in characterizing how goods and services are distributed. Multiple distribution channels can be assigned to a sales organization, allowing for flexibility in reaching customers through different channels.

- Divisions: are utilized to group materials and services together. They can represent specific product categories or business units within the organization. Divisions provide a structured approach to managing and categorizing products or services offered by the enterprise.
- Sales Area: is a combination of the sales organization, distribution channel, and division. It represents a specific sales context within the system, defining the scope and parameters for sales-related activities.
- Shipping Point: each outbound delivery is processed from a designated shipping point. The shipping point is assigned at the plant level, and it serves as the organizational reference for managing and coordinating outbound shipments. Proper assignment and management of shipping points ensure efficient logistics operations.

By defining and configuring these elements within the SD module, the project aimed to establish a well-structured and organized sales and distribution system that enables effective management of sales processes, customer engagement, and outbound logistics.

In the FI/CO module, the project involved the participation of five key actors, each playing a crucial role in financial management and control processes. These actors include:

- Result Area: is an organizational unit within the module that focuses on profitability analysis, with a specific emphasis on gross operating margin. This analysis relies on value fields, which represent the structure and characteristics of costs and revenues, enabling comprehensive insights into financial performance.
- Control Area: serves as an organizational unit that facilitates the extraction of management data from accounting data. It enables effective control and monitoring of financial processes. Each company within the organization must be assigned to a specific control area to ensure proper management and analysis of financial information.
- Profit Center: is a managerial control unit that divides the control area into subunits. It allows for the extraction of cost and revenue budget information, enabling granular insights into the financial performance of specific business segments or departments. Profit Centers aid in effective cost allocation and performance evaluation.

- Company: represents an essential organizational unit within the FI/CO module. Each company must be assigned to a control crea, enabling the consolidation and management of financial data at the company level. Companies serve as distinct entities within the organization, each with its own financial operations and reporting requirements.
- Plant: is a logistical unit within the module, serving specific purposes related to production and inventory management. Each plant must be assigned to a specific company, ensuring proper integration of financial and logistical processes. Plants represent physical locations where production or distribution activities take place, and they play a significant role in managing inventory and related financial transactions.

By defining and configuring these actors within the FI/CO module, the project aimed to establish an effective financial management and control system. This allowed for comprehensive profitability analysis, management reporting, and cost allocation, ensuring optimized financial performance and decision-making within the organization.

The objective of this project, so, was to replace the existing billing system with a new and improved flow. The implementation of the SAP system facilitated the management of various key processes. These processes include, as we can see from the Fig 4.6 :

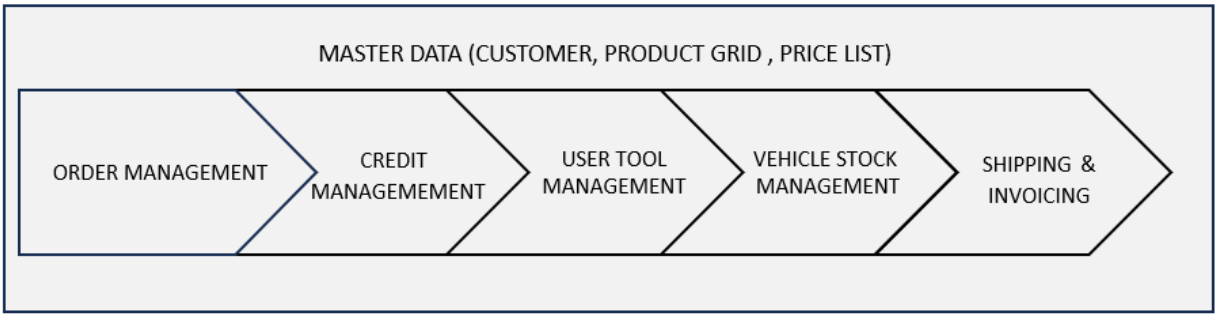

Figure 4.6: List of the 5 macroprocesses of the project.

- Master data creation
- Order management
- Credit management
- User tool
- Shipping and Invoicing

4.3.1 Master data creation

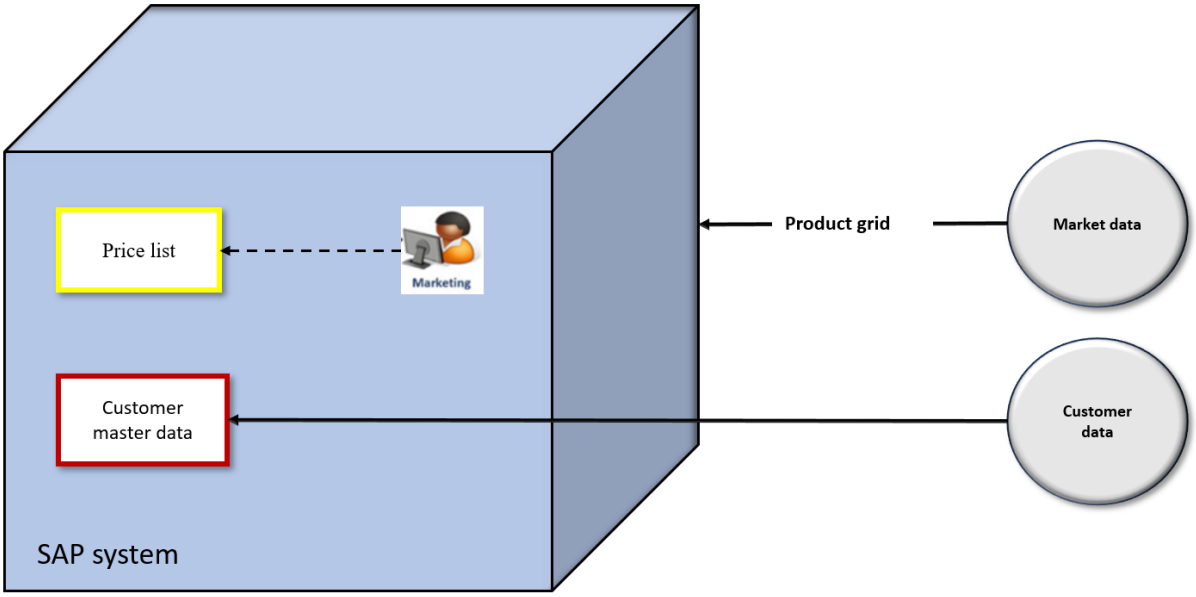

Figure 4.7: Master data information flow.

As is shown in Fig 4.7 above the main master data the process needs are:

- Customer master data,
- Product grid master data.
- Price list master data.

The customer master data comprises the essential information about the customer, including their master and tax data. Prior to creating this data in the SAP system, the system conducts functional checks on the customer's fiscal data. These checks serve the purpose of identifying critical customers, for whom orders should be processed only after receiving payment. The system receives two types of information: general data (referred to as "ship to customer") and open sales views. The general data is transmitted to SAP through an interface, which acts as a middleware. This interface performs preliminary checks on the data received and converts external codes to ensure consistency and compatibility with the information stored in Accenture-SAP's integrated database. Upon arrival in the integrated database, the data is organized into tables.

This not only facilitates easier data access but also enables the establishment of relationships among various data elements, resulting in comprehensive customer information. Additionally, the customer master data also contains shipping details.

The customer master data encompasses all the necessary information for processing orders, deliveries, invoices, and customer payments. As is shown in Fig 4.8 below, it also includes significant details concerning business customers, which are categorized into different levels, such as: general data that includes the customer's name, address, VAT number, and business partner information. Company code data, pertaining to specific company-related details. Sales area data, comprising billing information documents and partner function information.

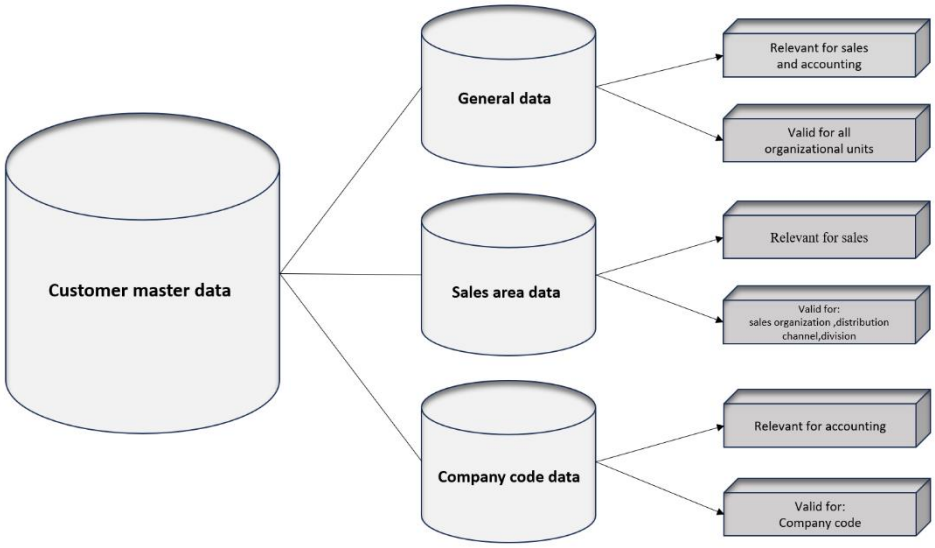

Figure 4.8: Customer master data, different categories of information.

Once the tax data has undergone validation, it is automatically transmitted to SAP via an interface. This enables the availability of customer master information for subsequent processes.

In contrast, the master data in the product grid includes product information that is updated daily. This includes details about the vehicle description, such as the model version veries, optional extras, and reference market. These product-related details are received by SAP daily.

The market data are serves a central repository for business information related to each market. It stores product descriptions in the local language and maintains business terms. To maintain data consistency with the information received from production systems, the product master data needs to be synchronized with trade requirements. Therefore, commercial information is transmitted to the SAP systems on a daily basis to ensure up-to-date and aligned product master data. The main features of the system are :

- Profile management: allows for the management of profiles related to products.
- Product data management involves the handling of various product data elements such as marketing models, commercial versions, option categories, body color types, and upholstery types.
- Creation and management of special series: facilitates the creation and management of special series of products.
- Product grids: enables the organization and management of product grids.
- Technical data: involves the storage and management of technical information related to products.

To efficiently handle this process, SAP offers an interface that connects the external data to the SAP system. This interface includes the following details:

- Material description and options: comprising comprehensive information about materials, including descriptions and options in multiple languages for each market. This data is compiled by the product manager.
- Product grid: provides the necessary information related to the product grid.
- Product configuration rules: defines the rules and guidelines for product configuration.

Using this interface, the system creates a "Material" and its corresponding configuration features within the material class. If a material already exists, the interface will update it based on the product coding. Additionally, the SAP system includes a reporting functionality that can display alerts regarding new options in the master data. The market data ,so, serves as the primary entry point for the creation of vehicle master data within the SAP system. Through the interface, the system creates or updates the material, material class, and associated configuration features, ensuring efficient management of vehicle master data.

Within the price list master data are comprehensive records that contain information regarding price conditions. The responsibility for creating or modifying price lists lies with the marketing department. However, before the price list is considered valid, it must undergo approval from the finance department. Once the finance side approves the price list, it has significant impacts on the opening sales views. Consequently, the system automatically approves all sales orders associated with the approved price list.

4.3.2 Order management

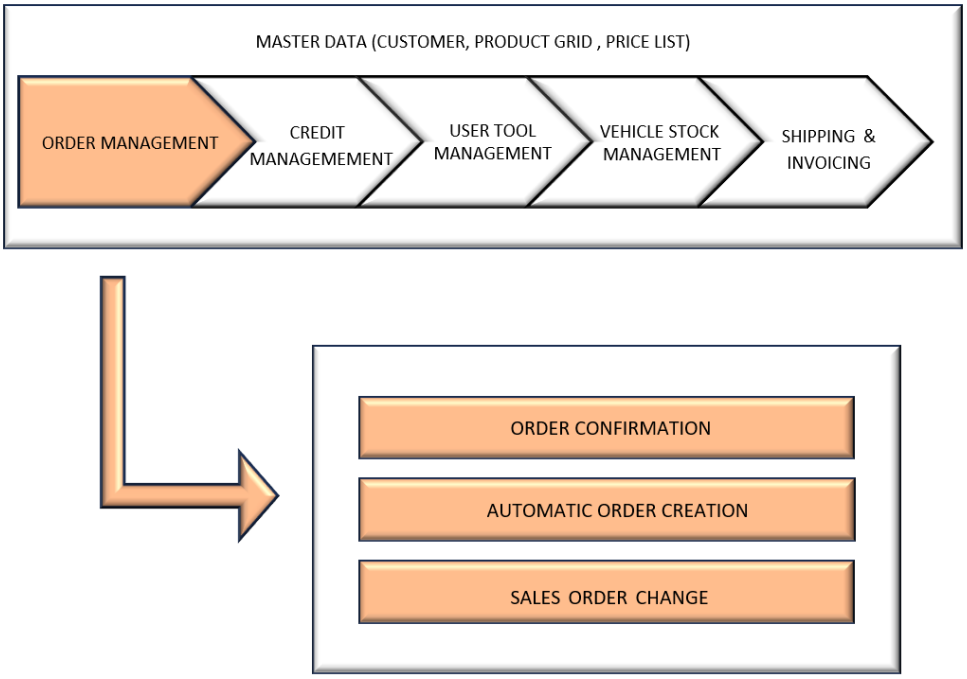

Figure 4.9: Order management process.

The process of order management involves the comprehensive management of the entire lifecycle of a vehicle, as depicted in Figure 4.8. It encompasses every stage, starting from the initial inquiry and progressing through to invoicing. Throughout this process, all modifications or changes made to the vehicle are diligently accounted for. The Fig 4.10 represents the macro flow of information that is managed in the system.

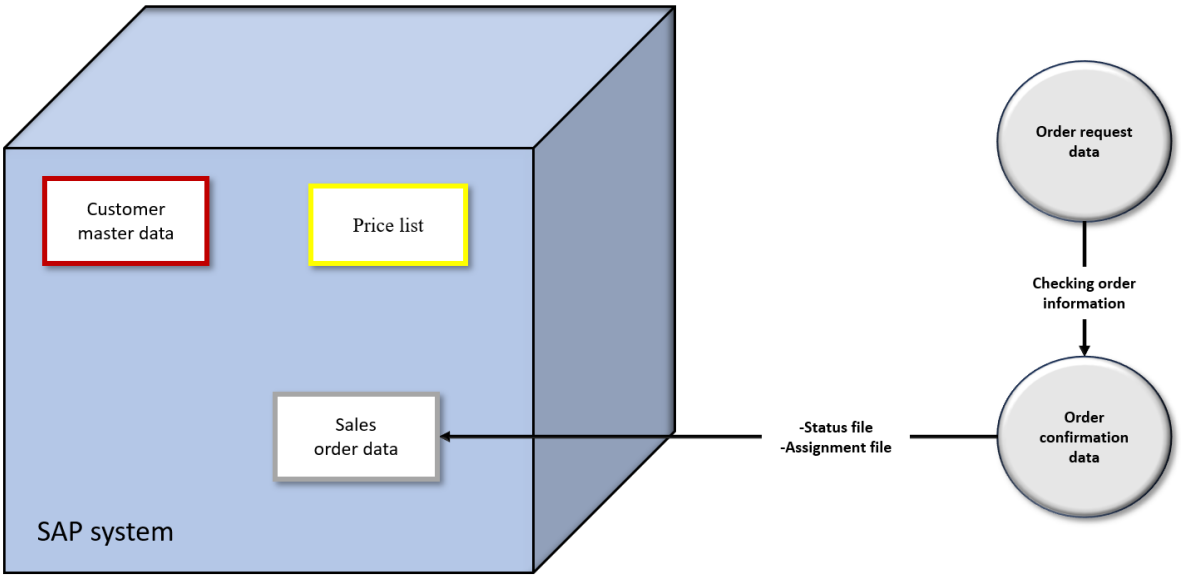

Figure 4.10: Macroflow of information to manage order.

In relation to order collection, the management process of order requests is initiated through the utilization of two type of data managed in the system. Users possess the capability to directly generate the order request within the front-end system, which concurrently oversees the adherence to configuration rules, ensuring a standardized configuration for the vehicle request. Subsequently, upon acceptance, the status is promptly updated in SAP, with the confirmation of the order is received later through the order confirmation data.

In order to confirm and allocate orders, SAP receives two distinct files containing information:

- Status file

The status file provides SAP with order confirmations and production updates for all vehicles. It encompasses various data points such as the order request number, order request date (utilized for pricing date) and customer order (used for production prioritization). The primary key in this file is the production/commercial order number. It's important to note that during the period between order confirmation and assignment, market/customer exchanges are not permitted. However, it is possible to update the vehicle configuration, and the production order number remains unchanged. The system receives this file multiple times per day.

- Assignment file

The assignment file is transmitted once a day and contains new vehicle assignments as well as any subsequent changes that may occur after the assignment. The key information in this file is the header number (series model version + chassis number) or the vehicle identification number. In cases of cancellation and reassignment, the production/commercial order number is modified. This file enables SAP to handle order variability, market/customer exchanges, and updates following the assignment phase.

4.3.3 Vehicle stock management

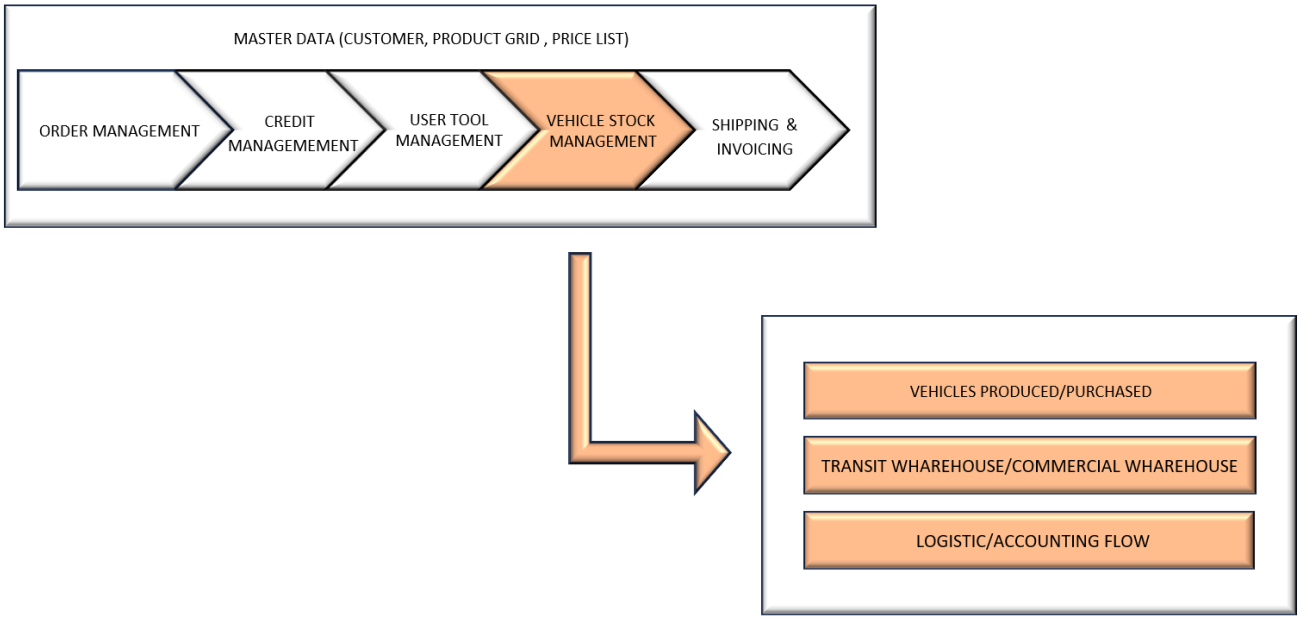

Figure 4.11: Vehicle stock management process.

Figure 4.11 depicts another integral process within the project, namely vehicle stock management. Additionally, in the following Figure 4.12, a comprehensive overview of the information handled within the system is presented. The process initiates with the handling of orders originating from assigned vehicles, specifically orders that have been allocated chassis assignments. In addition, the system must ensure the proper execution of procedures pertaining to the management of vehicle inventories, encompassing both quantity and value aspects.

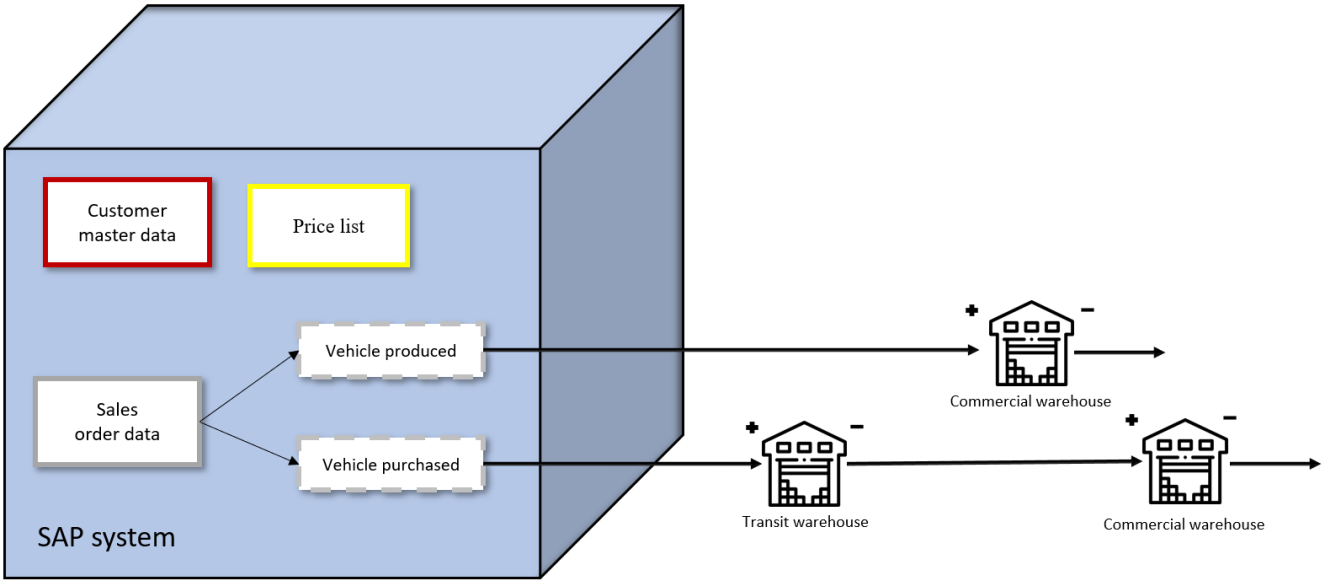

Figure 4.12: Macroflow of information to manage vehicle stock.

From a logistical perspective, warehouse stock movements encompass two distinct modes for produced vehicles and purchased vehicles. In the case of produced vehicles, SAP directly updates the commercial stock upon vehicle creation. On the other hand, for purchased vehicles, SAP first handles the loading of the transit stock and subsequently facilitates the transfer from transit stock to the commercial stock. Furthermore, issuance is initiated based on a sales order and prompts the relevant logistics movement when the vehicle is prepared for shipment to the dealer.

When it comes to the accounting flow, the stock loading phase involves distinct approaches for vehicles produced and vehicles purchased. For vehicles produced, a standard value approach is employed, considering the basic cost components. Any additional costs, such as new options, are managed through a dedicated procedure to ensure accurate accounting. On the other hand, purchased vehicles can be managed in two different ways, based on market considerations:

- Standard value: this approach involves a procedure that establishes the standard cost, accompanied by another procedure for handling any necessary adjustments.
- Purchase price: in this case, the stock is loaded through the settlement of a specific internal order. Alternatively, if additional purchase costs (e.g., transportation, customs, special equipment) are involved, a separate procedure is followed to account for them accurately.

These procedures are implemented to ensure proper accounting practices are maintained for both produced and purchased vehicles, considering their respective cost components and any additional expenses incurred.

Instead, the commercial warehouse unloading process applies to both produced and purchased vehicles. It involves receiving customer invoices, which are to SAP. In cases where certain flows are not managed by the above systems, a manual integration is conducted by the user as needed.

In SAP, the management of vehicle stocks relies on a set of already implemented procedures. The aim of this project was to replace the functionalities of the system while ensuring the continuity of existing procedures. Below is a description of the procedures for both vehicles.

For produced vehicles, upon confirmation of the production order, the relevant information is sent to SAP via the Status file. This information is utilized to manage the vehicle creation process in SAP. Concurrently, sales orders are generated for the billing process. Only upon receiving the assigned information, a goods receipt is performed to load the commercial warehouse. By utilizing the assigned file, in fact, information pertaining to vehicle assignments is received and used to load the commercial warehouses. The system updates the vehicle status and generates a movement directly in the commercial warehouse. The stock unloading process is executed using SAP data regarding invoices. This approach ensures a seamless transition in managing vehicle stocks within SAP, leveraging existing procedures and utilizing the assigned information for accurate warehouse loading and stock management.

For purchased vehicles, upon confirmation of the production order, the information is transmitted to SAP to facilitate vehicle creation. Concurrently, sales orders are generated for the billing process. The creation of the purchase order and goods receipt, to load the transit warehouse, occurs only when the assigned information is received. The vehicle stock balance is updated based on the non-valued quantity, and the vehicle status is changed accordingly. Additionally, once the incoming invoices are received and verified, they are brought into SAP. With this information, goods movement is carried out between the transit and commercial warehouses.

Furthermore, for suppliers that require invoice verification, when the billing systems send invoice details from the manufacturing companies, SAP initiates a new action to proceed with transfers between the transit and relevant commercial warehouses. Subsequently, it creates the corresponding accounts payable invoice using the value retrieved from the received file.

For suppliers that do not require invoice verification, when the billing systems send invoice details from the suppliers, the system executes a new action by modifying the previously created purchase order (PO). The PO is updated with the price stated in the invoice. SAP then proceeds with the transfer movement between the transit and relevant commercial warehouses. Subsequently, it creates the corresponding accounts payable invoice using the value retrieved from the accounts receivable invoice. In this case, the order and the invoice are always aligned, ensuring accurate financial record-keeping. The stock unloading process, so, is executed using SAP data regarding invoices.

4.3.4 Credit management

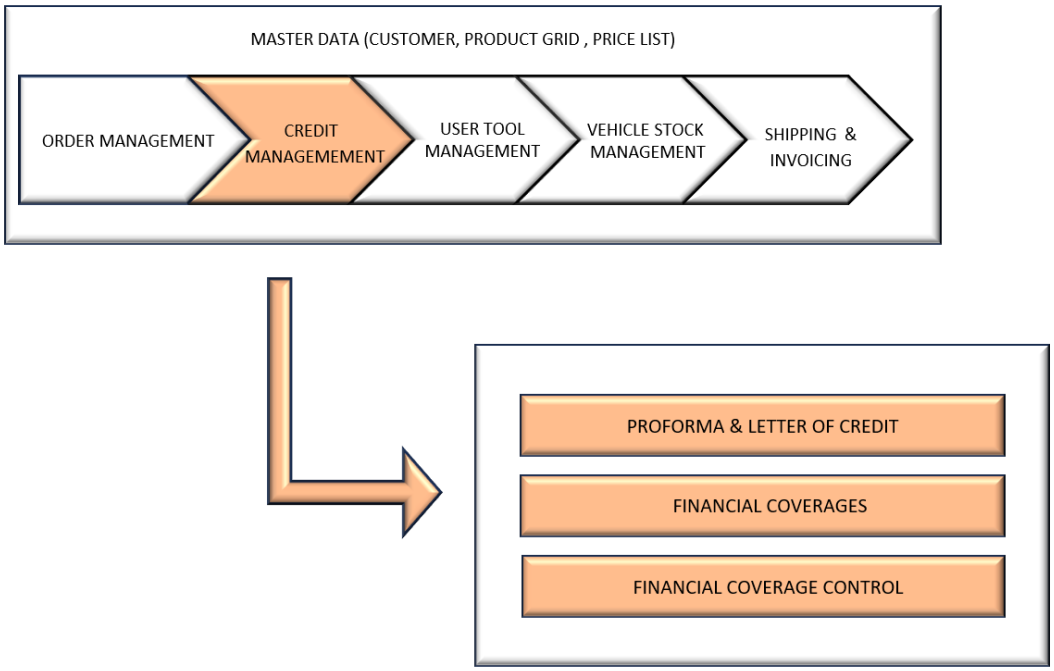

Figure 4.13: Credit management process.

The next macro-process managed in SAP is credit management as can be seen from Fig. 4.13. Undoubtedly, the performance of a business is greatly influenced by the creditworthiness of its trading partners and their payment practices. The solidity of their financial standing and their approach to settling debts play a pivotal role in effectively managing performance. Consequently, credit management becomes an integral component in mitigating financial risks and maximizing commercial relationships. Accenture's implemented system for credit management serves as vital support in promptly evaluating the potential credit losses associated with trading partners, facilitating efficient credit decision-making.

The comprehensive SAP system enables the global recording of customer financial data, with the flexibility to incorporate additional specific information as required. Various types of financial coverage are utilized to cater to diverse customer needs. Careful monitoring of each customer's credit line is carried out to assess the feasibility of selling additional products or fulfilling orders for already placed products. SAP generates credit availability calculations for each type of hedging, taking into account the agreed credit limit minus the committed amount. If the credit limit is exceeded, the customer's sales process is automatically halted, unless overridden by managerial decisions. To ensure efficient credit decision-making, specific controls and reports are provided at various stages of the sales cycle. Credit management is highly customized in accordance with the company's unique business model, employing tailored implementation methods and controls for each customer.

Within SAP, available credit for individual customers and specific lines of credit are provided. To manage credit for each customer, distinct financial hedges are employed:

- Letter of credit (linked to chassis and pre-invoice check invoice)
- Lines of credit
- Prepayments
- Risk ceiling
- Bank guarantee
- Standby letter of credit

During the chassis selection process conducted by the commercial logistics department, a plafond check can be conducted, leading to the following actions:

- If there is insufficient plafond (credit limit) specified in the letter of credit, a dedicated blocking procedure will be sent to the corresponding commercial logistics area.
- In the event of inadequate financial coverage, a specific blocking procedure will be forwarded to treasury services, along with relevant information for the relevant commercial logistics area.
- If there is a lack of plafond in other previously entered financial coverage, a distinct blocking process will be sent to treasury services, accompanied by a briefing for the responsible commercial logistics area.

The previous financial coverages encompass vehicles, parts and used cars. However, specific management is also in place for letter of credit. Within the commercial logistics department, orders are selected and corresponding proforma [1]are generated automatically in SAP, establishing a link to the source sales orders. These proforma are then transmitted to the customer and require approval from their financial institution. In the event of rejection by the customer's bank, the proforma e is promptly cancelled in SAP, triggering automatic updates to the sales orders. Conversely, if the customer's financial institution grants approval, they issue the letter of credit, which is subsequently forwarded to the treasury department. The necessary data for the letter of credit is retrieved from the system. SAP seamlessly generates the relevant letter of credit within the sales and distribution module, streamlining the process and ensuring efficient management of financial transactions.

To ensure compliance and accurate representation, the SAP "Letter of Credit" subject line in the SD form should contain the following essential details:

- Customer's alternative business name
- Partial shipment
- Port of loading, carrier, loader
- Billing notes or shipping instructions
- Border crossing
- Insurance

By accurately capturing these specific details within the SAP system, the letter of credit subject line in the SD form facilitates smooth and accurate processing of transactions, enabling efficient billing, shipping, and compliance with logistics and insurance requirements.

Instead, in order to effectively manage customer credit limits, the billing information is sourced from the system. As previously mentioned, the SAP provides the necessary data regarding the available credit for each customer's specific line of credit. This credit check, based on the actual availability, is conducted when the commercial logistics department selects sales orders after cross-referencing with the applicable financial coverage. The objective is to generate the shipping request. If, during this credit check, it is found that the requested amount exceeds the available credit, an internal flow is initiated and directed to the department manager.

[1] Proforma: pre-invoice generated used for financial control.

In the pre-invoice check phase, if the credit limit is surpassed, it prevents the issuance of the invoice and a process is triggered to notify the treasury department. The treasury team will then evaluate the situation and determine whether to approve or reject it, thereby either allowing or blocking the corresponding invoice. By performing these checks and authorization procedures, the system ensures proper monitoring and control of customer credit limits, enabling efficient decision-making.

4.3.5 Shipping and invoicing

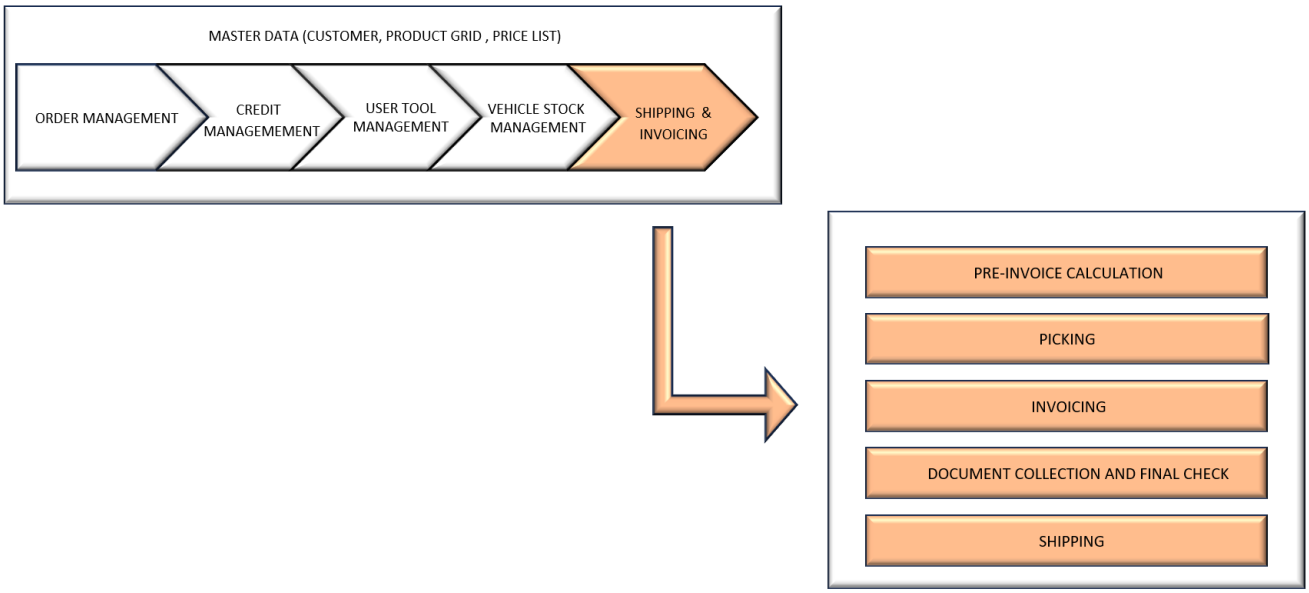

Figure 4.14: Shipping management process.

As depicted in Fig. 4.14, the shipping model enables comprehensive management of every sales order throughout its various stages, starting from production order confirmation to the final invoice and shipment. At its core, this model relies on authorization procedures, which are orchestrated and repeatable sequences facilitated by the methodical organization of resources. These processes are responsible for transforming materials, providing services, and processing information. Moreover, successful implementation of the shipping and invoicing model hinges on effective collaboration between the customer and SAP on the Accenture side. This collaboration aims to optimize processes and conduct periodic congruence checks to mitigate risks.

To facilitate the selection of orders for confirmation and shipment, a user-friendly user tool is utilized as a front-end application, designed to present SAP's integrated data in a simplified manner. Through this user tool, users gain the capability to effectively manage each sales order across various stages of its lifecycle, ranging from production order confirmation to the issuance of the final invoice and shipment. Moreover, users are provided with a range of fields to select vehicles (sales orders), including:

- Sales orders
- Vehicle chassis
- Vehicle status
- Customer
- Production order number

Following the extraction process, a list of sales orders is generated, empowering users to make their desired selections for shipping. Furthermore, the user tool allows users to make modifications to sales orders, encompassing aspects such as payment terms, pricing, incoterms and more. This includes the ability to link specific sales orders to the appropriate price list and financial coverage, particularly if different from the default settings. Throughout the entire process, the application provides real-time status updates for each sales order, indicating key milestones such as "Waiting for work procedure," "Shipment request created," "Process approved," "Process not approved," along with other relevant information pertaining to each extracted sales order.

To progress from the shipment request and invoicing stage to the final shipment execution, the user tool empowers the essential function of "pre-invoice check" which serves as a set of financial controls. This activity ensures that all necessary and mandatory checks are diligently conducted on the selected shipment requests. Upon successful pre-invoice check without any errors, the user gains the ability to manually initiate the "picking" action, which confirms the shipment of each individual vehicle. Moreover, the user tool seamlessly initiates inventory and invoicing updates, leading to the automatic generation of crucial documents within SAP, including:

- Goods issue: this document is generated to accurately update the inventory quantity in SAP.
- Invoice: depending on the system setting regarding the framework, one or more invoices are automatically generated in SAP.

The process also includes the automatic generation of shipping documentation, where SAP provides two vital documents:

- Packing list: a new layout is created to comprehensively display volume, weight, and other essential shipping information.
- Invoice layout: a new layout is created to encompass all current information required for invoicing.

Commercial logistics/transportation will supplement the user tool with necessary customs information required to complete the documentation (e.g., border crossing, license, etc.). The system integrates the collection of documentation within its own framework and alerts another system involved in the process once completion is achieved. This enables transportation to receive formal approval from SAP and proceed with the actual shipment, equipped with all the requisite shipping documentation. Furthermore, SAP will integrate information to effectively manage the physical location of the vehicles. Comprehensive details of vehicle locations will be stored within SAP, with some of this information utilized for audits and billing purposes.

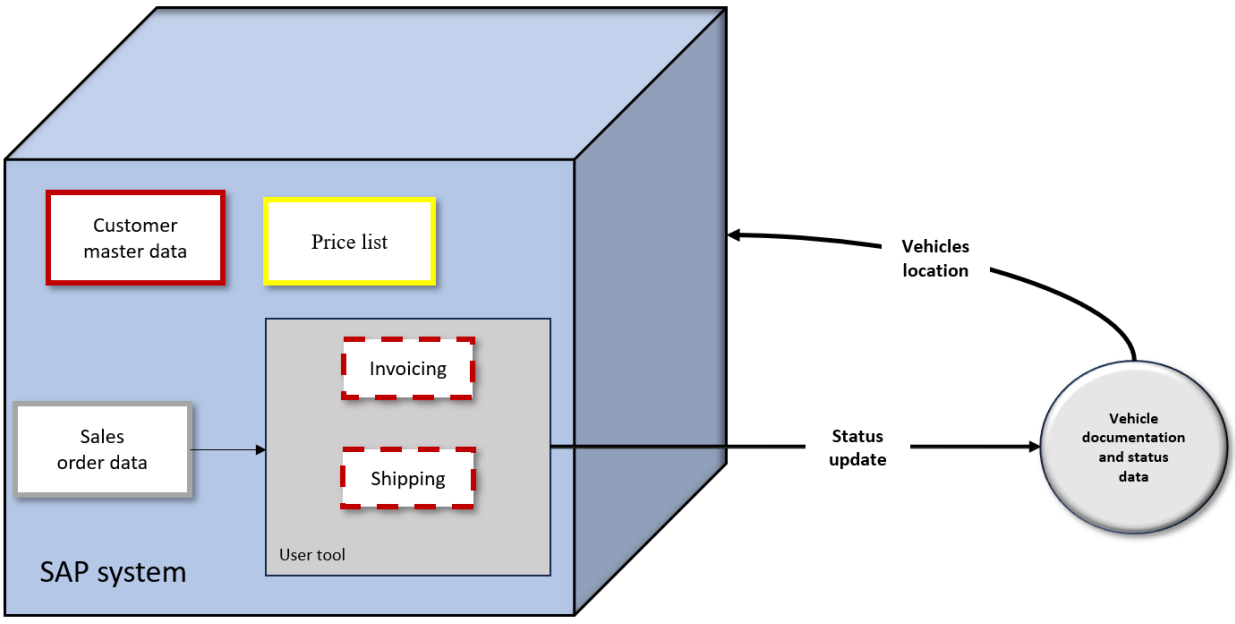

Figure 4.15: Vehicle management flow of information.

As is shown in the Fig. 4.15 the flow of information , therefore, is as follows:

1. Sap receives all information about the physical location of the vehicle;

2. SAP will return the information about all vehicle states, especially those in the "pre-invoice" and "picking" states;

3.With the information received, the system can perform its own internal checks and start shipment preparation;

4. Upon receiving the shipment information, the commercial logistics will be informed to start the invoicing process ;

5. After all the necessary documents have been collected and checked by the responsible users, SAP will initiate a flow to the system in order to send the shipment information (border crossing point, license plate, ship, flight number, etc.). In the meantime, the collected documentation will be available in SAP for the transportation department.

6. With all the documentation received, systems will be able to make the issuance of the goods. This information will also be sent to SAP to update the system and maintain a specific report related to billing and shipping information.

In this context customers are managed using two identification numbers known as CO (customer order) e CC (customer confirmation). These numbers serve to identify the actual customer and link them to the vehicle. Additionally, the CC is utilized to identify deliveries to the end customer. When a customer is directed to SAP through a system, an CO number is generated and associated with the customer. These details are stored in a dedicated custom table, which is regularly updated as new information is added. The CO is then matched with an order to streamline the process.

Simultaneously, the SAP system receives the request order number and customer information to SAP. The system then generates the CO number, records the association in the custom table, and sends the updated information back to the system. Notably, a customer order can be initiated even if the required vehicle is not currently available in the dealer's inventory. The dealer can collect the customer's request while awaiting a matching vehicle. Subsequently, the CO number is created in SAP and linked to the sales document. This CO number is also communicated back to the system, which uses it to prioritize the production order.

In addition, a CC statement can be made for orders with CO numbers. Once SAP confirms the order, the system activates the CC. This process leads to the creation of a CC number in the system and a specific interface ensures that the CC number is also updated in SAP. Subsequently, the vehicle is shipped.

Furthermore, after analyzing the entire flow, it emerges how the primary objective of this project was to replace the existing billing system with an enhanced flow that could efficiently manage and process all information. Through the integration of work processes, interfaces and controls, a coherent logic was implemented to streamline the management and storage of data. This optimization was aimed at improving the order management process and reducing the potential risk of data loss, thus ensuring a more effective and reliable system overall.

5 An in-depth look into the pricing management process

This chapter will provide a technical and specific description of one of the most crucial procedures within the entire work processes, namely the price management. Additionally, it will delve into the comprehensive utilization of various programs to effectively handle the vehicle pricing process.

Pricing within this context refers to a comprehensive set of rules that govern the determination of various price components for each item listed in the sales document, typically related to vehicles. These price objects include but are not limited to the base vehicle price, optional prices, discounts, transportation charges, other costs/revenues and taxes, which are displayed for customers in the respective documents.

The pricing process involves a combination of automated procedures and manual input to calculate the relevant amounts. Automatic transfer of pricing data from condition records to sales and billing documents is a key feature of the system. Different condition types exist, and each represents a specific price object within SAP. These condition types are characterized by the following attributes:

- Percentage or amount
- Manual or automatic application
- Validity period during which they are active

Furthermore, access sequences were developed to facilitate automatic selection of price conditions during the pricing process. An access sequence acts as a search strategy, seeking an active value for a particular condition type. It determines the sequence in which the system searches for data. The access sequence consists of one or more accesses, each represented by a table containing values governed by specific rules.

Moreover, the access sequence defines the priority among these tables to ensure accurate and efficient pricing calculations.

The pricing structure will consist of several condition types, including:

- Vehicle base price
- Optional prices
- Discounts: automatic and/or manual discounts in either value or percentage
- Freight charges
- Tax Amount (VAT amount)
- Other Conditions (fees, duties, etc.)

Updating prices in SAP will be facilitated by a dedicated upload tool, supporting both bulk updates and individual entries for creation or modification. The marketing department will upload the price list in an inactive status, and upon approval through a finance process, it will be switched to an active status. In case of rejection, the new price list will remain blocked, while the previous one will be restored, ensuring continued availability of the approved prices. Each price list is defined in a validity date (Starting date / End date) with the historicizing as below:

Existing Price List:	01/01/2022	31/12/9999
New Price List:	01/01/2023	31/12/9999

The pricing procedure in SAP is a crucial component of the SAP sales and distribution module that determines the selling price of a product or service based on a series of factors such as price conditions, discounts, taxes, and other ancillary costs. This procedure is typically activated when creating a sales document, such as a sales order or an invoice. The SAP system automatically gathers information about the customer, the item, quantity, date, and other relevant details from the document in use. First, the base price of the product or service is determined. This base price can be entered manually or retrieved from the company's price catalog. Subsequently, price conditions are determined. These conditions represent the factors that influence the final price.

They can include discounts, surcharges, taxes, shipping costs, quantity discounts, and so on. Each condition has a type, class, and category, which are used to determine when and how a condition is applied through access sequences. Access sequences are a fundamental part of the pricing process and help define the order in which various price conditions or discounts are considered to calculate the final price. An access sequence is a set of criteria or steps specifying how price conditions should be considered during the calculation of the total transaction price. Each access sequence consists of a series of access tables, each of which defines the criteria for selecting a price condition. Once the pricing procedure is determined based on the access sequence, the SAP system performs the price calculation. This process involves applying relevant price conditions to the base price and evaluating them to obtain the final price.

The calculated price is then displayed in sales documents, such as the sales order or invoice, along with all applied price conditions. This represents the final price that the customer is required to pay. Additionally, the SAP system records all information related to pricing calculations, allowing for precise price control and management. These data are also available for reporting and analysis purposes, facilitating price review and auditing when necessary.

Therefore, the pricing procedure in SAP is highly configurable and can be adapted to the specific needs of the company, enabling flexible management of prices and sales conditions.

5.1 Price list authorization process

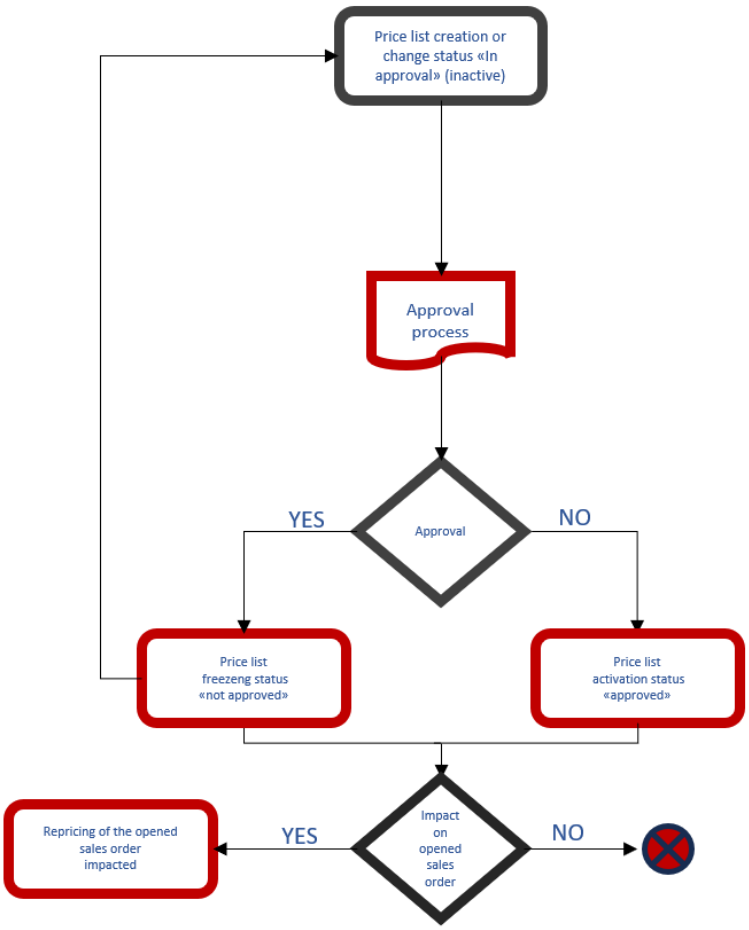

Figure 5.1: Flow chart of price management process.

In Fig 5.1, we observe the trigger event that initiates the authorization processes. This event occurs when the marketing department confirms changes made in the listings User tool, prompting the system to mark the selected listings with a status of "To be approved". To ensure seamless handling of changes and prevent any potential overlaps, the work process commences with the insertion of a block of price lists. Additionally, in cases involving retroactive dates, a block for editing all relevant sales orders is also introduced. Following these initial operations, users with the "Finance" role are promptly notified via both an informational outlook email and an SAP inbox message (work item). The message requests their approval for the proposed changes on the price lists and includes all pertinent information, such as a detailed "change description" to facilitate a timely and informed response.

When dealing with significant changes, the approver is presented with a unified work item. They have the flexibility to approve only specific portions of the lists submitted for approval, while also having the option to remove those they do not wish to approve.
Once the list changes are approved, the procedure automatically proceeds with the following actions:

- Unlocks list modification and updates the approved lists accordingly.
- Updates the status of the lists User tool to "Approved."
- Performs a search and unblocks any sales orders that may have been impacted by the changes and if necessary, initiates the repricing process.
- Sends an email notification to both the sales and marketing department, informing them of the approval outcome and providing a description of any rejections if applicable.

In the event of a rejection of the list changes, a separate work process is triggered, leading to the following steps:

- Unblocks list modification to allow for adjustments.
- Updates the status of the lists User tool to "Rejected" while including an updated description of the rejection.
- Unlocks the sales orders that were involved in the proposed changes.
- Sends an email notification to the Sales and Marketing department, communicating the approval outcome and furnishing a detailed description of the rejection, if any.

5.2 Pricing procedure

In SAP, the pricing procedure encompasses various price objects, which are as follows:

1. Price List: this contains detailed pricing information for each specific model,vehicle series and optional features. The system supports two types of price lists - a market-specific price list (valid only for a specific market) or a generic price list (valid across all markets). Additionally, users have the flexibility to manually select a special price list during the sales order process, following the same rules but specifically related to a particular type of price list (e.g., fleet). It is essential to note that the system allows the creation of a price list only for available configurations sourced from the catalog grid or an exception table directly managed within SAP.

2. Billing campaign: this includes details of discounts that the system will handle, such as optional packs. The marketing department user can select specific discounts for each model, vehicle series of vehicle (either as a percentage or a fixed value), particular optional and optional packs (which are groups of optional with a special discount based on the sum of individual prices, represented as a percentage or a fixed value). Each discount will have a designated description for the invoice. It is worth noting that all discounts are managed as negative values, displayed accordingly in both the invoice layout and accounting records.
3. Invoice agreement: this includes specific prices and discounts to be applied to the invoice, similar to the campaign. However, the application of these prices and discounts is limited to a predetermined quantity or usage .
4. Transportation: this section provides detailed information about transportation costs, which are managed based on incoterms (international commercial terms) or specific market and Incoterms guidelines.

Price lists will be uploaded into SAP with the required currency. In cases where the invoice is issued in a different currency, a dedicated exchange rate will be applied to convert the values accurately. For all of the above price objects, a validity date will be requested, ensuring the relevance and accuracy of the pricing information. During the creation of a sales order, the system will search for the applicable list values based on the order confirmation date.

Consequently, a comprehensive pricing procedure has been meticulously crafted, encompassing all the aforementioned items. This procedure is fundamentally based on sales documents, such as sales orders and invoices, with the primary objective of providing accurate accounting and controlling information for statements and reporting purposes. It includes all relevant individual amount categories that collectively contribute to the final amount to be paid by the customer. The pricing procedure is firmly established at the sales order level and is intentionally designed not to be altered in the final invoice, except for taxes. The reason for this is that the overall pricing composition may undergo changes shortly before the invoice is generated. In the event that such changes involve an initial delivery from another country, taxes must be reevaluated to reflect the new information. As such, all other values remain unaltered and are seamlessly copied from the original sales document. The default price is inherently linked to retail prices, serving as a basis for accurate and consistent pricing determination.

Furthermore, the system allows for the inclusion of manual rules for specific documents based on the authorization process in place. These manual rules encompass various aspects, such as:

- Base vehicle spot price (manual price that deactivates automatic listing).
- Base vehicle discount percentage.
- Base vehicle discount value.
- Discount on the total optional features as a percentage.
- Discount on the total optional features as a fixed value.
- Discretionary discount on the overall total.

To maintain consistency, all discounts are managed as negative values, ensuring they are appropriately displayed in the invoice layout. These manual rules provide a level of flexibility and customization to cater to specific pricing scenarios and requirements. Below in TAB.5.1 is an example of the total pricing of a vehicle.

Tab 5.1: Example of a price procedure for a vehicle.

MODEL	DESCRIPTION	PRICE	TYPE
xxxxxxx	xxxxxx		
Base vehicle price		34.300	Automatic
Pack optional sport		2.500	Automatic
Pack optional discount		-300	Manual
New optional		500	Automatic
Transport		50	Automatic
xxxxxxx	xxxxxx	37.050	

5.3 Tool developed in SAP to manage price lists

This concluding chapter showcases the creation of custom tools within SAP to enhance the management of specific objects. A case in point is the development of a tool aimed at streamlining the management of price lists. This tool not only expedites the process, thereby reducing associated risks, but also offers a more simplified view of the integrated data pertaining to the flow. Notably, the newly devised tool facilitates the loading of condition types (e.g., prices, discounts, transportation costs) either from an excel file or enables the creation and modification of existing ones through an on-screen selection list. When condition types are uploaded, they are initially assigned an "inactive version" status and subjected to an authorization process for approval. Upon approval by the finance department, these condition types are transitioned to the "active" status. In case of rejection, the new list remains locked while the previous one is retrieved. Moreover, this tool conveniently stores sales campaign information, including discounts, and allows the addition of relevant data such as names or other details for better identification. Additionally, it facilitates the search for sales documents and price objects based on campaign numbers or campaign names.

From a technical standpoint, the developed tool offers the capability to update various price objects, including:

- PRICE LIST
- DISCOUNTS (linked to sales campaigns)
- PACKS (providing percentage discounts for a group of oprional)
- TRANSPORT COSTS.

Furthermore, the tool is equipped with the following functionalities:

1. Viewing price objects based on specific selection criteria.
2. Editing price objects using designated selection criteria.
3. Enabling manual updates for individual items or multiple items.
4. Facilitating automatic updates through mass percentage or value updates on previous values.
5. Supporting the creation of new price objects.

The tool's user interface features a dashboard, wherein the left section contains filters necessary for selecting database entries, such as customers, validity dates, status, and list types. The upper part of the user tool allows users to specify the action they wish to perform, such as creating, editing, viewing, or printing the form. On the right side of the user tool, a list displays the results of the selected pricing objects, providing a comprehensive overview of the relevant data. The application also provides the user with the flexibility to update data either manually, by entering new values, or through applying a mass percentage increase or decrease on selected rows. A dedicated tab offers information on sales documents impacted by these changes and their corresponding process status. Notably, the user tool ensures that any modifications to lists still in the "Approval" status are automatically blocked. During the creation process, instead of filters on the left side, a set of fields representing common data for all changes is presented to assist the user. For instance, filling in one field will automatically populate all other relevant fields with the same value, streamlining the data entry process. In both edit and create modes, the tool provides real-time updates on sales orders affected by the newly created price objects, facilitating better tracking and management of these changes. Finally, it should be noted that users at any time have the option of downloading the list of extracted video data locally using SAP's standard download feature, which allows the data to be saved in a Microsoft Excel spreadsheet.

6 Conclusion

This thesis investigated the effects of implementing an ERP system, with particular emphasis on SAP software, on business operations. Through thorough investigation and data analysis, notable enhancements resulting from the adoption of such technologies were unveiled. The integration of an ERP system, notably SAP, has proven to yield substantial advantages within the business landscape. Its ability to consolidate data across diverse business functions has bolstered operational efficiency and improved the visibility of critical managerial insights. Real-time data sharing has facilitated seamless collaboration across departments, mitigating redundant tasks and enhancing internal communication. Another fundamental data arising from this study is process optimization. The automation provided by SAP has streamlined and expedited numerous manual operations, consequently reducing the likelihood of errors and empowering employees to focus on higher-value endeavors. Additionally, process standardization has fostered consistent procedures throughout the organization, contributing to improved control over outcomes. Furthermore, the availability of sophisticated reporting and real-time data analysis has furnished a holistic perspective of business performance, facilitating well-informed decision-making based on robust and accurate data. This heightened awareness has rendered organizations more agile in adapting to market dynamics and identifying growth opportunities. It is imperative to underscore that the successful implementation of SAP and an ERP system hinges on meticulous planning, comprehensive employee training, and unwavering management support. Effective change management and an innovation-driven organizational culture are paramount in maximizing the benefits derived from these technologies.

In conclusion, ERPs, with SAP as an exemplary model, have emerged as potent tools for enhancing business operations. Their capability to seamlessly integrate data, streamline processes, and deliver timely insights has empowered organizations to boost productivity, curtail costs, and sustain a competitive edge in the ever-evolving marketplace.

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