POLITECNICO DI TORINO

Analysis of CRM and Product Configuration
In the Context of Industry 4.0

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ABSTRACT

Analysis of CRM and product configuration in the Context of Industry 4.0

In 2011, Industry revolutionized to the maximum level itself which is Industry 4.0.

As time goes on, products, software, integrations, and all the industrial processes are changing and will be more technological and intelligent. Now we are experiencing the fourth generation of the industry which is Industry 4.0 in the concepts of major changes and transitions in manufacturing and industrial process with the new innovative technologies to exchange information freely and gravitate towards change in real-time.

CRM (Customer Relationship Management) software are helping to keep track of the customers and relationships in every section from sales and marketing to commerce and IT.

Configurator software is another part that talks about the technical description of the system and how its components and parts interconnect.

In this paper, objectives evolve around the analysis of the CRM software and configurator software from an industry 4.0 point of view.

Then CAS software looks at how CRM/XRM and CPQ are described more in detail. CAS software with Innovation researchers is examined based on more than 100 innovation indicators from five categories: Top Management Promoting Innovation, Innovation Climate, Innovative Processes and Organization, External Orientation/Open Innovation, and Innovation Success.

Keywords: CRM, Product Configurator, Industry 4.0, KPIs, Indicator

Contents

Chapter 1 : Introduction 10

1. Objective 10

1. Structure 11

Chapter 2 : THEORETICAL BACKGROUND 12

1. CRM (Customer Relationship Management) software 12

1.1 Definition Of CRM 12

1.2 Components of CRM 13

1.3 Benefits Of Using CRM 14

2. Product Configurator 16

2.1 Definition of Product Configurator 16

2.2 Configurable Product 16

2.3 The Impact of Product Configurators on Lead Times 17

2.4 Benefits of product configurators 18

3. Industry 4.0 18

3.1 Definition of Industry 4.0 18

3.2 Benefits of Industry 4.0 19

Chapter 3 : CAS genesisWorld and CAS Merlin Functionalities 20

1. CAS genesisWorld? 20

1.1 What Can We Do With Cas genesisWorld? 20

1.2 Architecture 20

1.3 External Archive 24

2. CAS Merlin 25

2.1 CAS Merlin's Functionality 25

2.2 CAS Configurator Merlin Overall Process 26

2.3 Feature Structure 26

Chapter 4 : CAS Merlin and CAS genesisWorld Integration 28

1. Quote Processes With Configurator 28

1.1 CPQ Solution 28

1.2 Configuring products with CAS Configurator Merlin Steps 29

1.3 The Graphical Editor M.Model 32

2. A Comprehensive Guide to CRM Implementation with Cas genesisWorld 38

2.1 Creating Contact (The customer) 38
3. Streamlining Sales Quoting Process with CAS genesisWorld CRM Software: A How-to Guide" 39
Chapter 5 : Industry 4.0 Key Performance Indicators for Analyzing Software Adoption in Organizations 43
1. Stages of the Adoption 44
1.1 Pre-Adoption Stage 44
1.2 Adoption Stage 45
1.3 Post-Adoption Stage 45
2. The Significance of the Post-Adoption Stage 45
3. KPIs (Key Performance Indicators) 46
3.1 KPIs Definition 46
3.2 Innovation Indicator publications At The Industry Level 46
3.3 Importance of Measuring KPIs 47
3.4 The Dimensions of Indicators 47
3.5 Indicators of the Industry 4.0 Implementation 48
3.6 Methodology of Selecting Indicators and KPIs 50
4. Selection of Indicators and KPIs of Industry 4.0 50
4.1 Which Indicators and KPIs 50
4.2 Indicators and KPIs For Product Configuration 51
4.3 Indicators and KPIs For CRM 57
Chapter 6 : Analyzing CRM and Product Configurators in Companies 61
1. The Surveys 62
1.1 Survey 1: Analyzing Product Configurator Process 62
1.2 Survey 2: Analyzing CRM 63
1.3 The Experts 63
1.4 Analysis of Product Configurator's Survey 65
1.5 Analysis of CRM Survey 72
Chapter 7 Conclusion 78
Chapter 8 References 82

LIST OF ACRONYMS

CRM	Customer Relationship Management
CPQ	Configure, Price, Quote Software
IoT	Internet of Things
AI	Artificial Intelligence
GPS	Global Positioning System
HRM	Human Resource Management
ERP	Enterprise Resource Planning
SaaS	Software as a Service
IT	Information Technology
BOM	Bill Of Material
OEM	Original Equipment Manufacturers
AIA	Artificial Intelligence Assistant
CPS	Cyber-Physical Systems
NPD	New Product Development
SMEs	Small and Medium Enterprises

List of Figures and Tables

Figure 1. CRM Software……12
Figure 2. CRM Components……..14
Figure 3. Benefits of Using CRM……...16
Figure 4. Benefits of Using a product configurator……...18
Figure 5. The Industry Evolution……19
Figure 6. Industry 4.0 and its benefits……...19
Figure 7. CAS genesisWorld Architecture……21
Figure 8. Hardware Data Server……22
Figure 9. CAS genesisWorld Architecture 1……23
Figure 10. CAS genesisWorld Architecture 2……...23
Figure 11. Service Model Diagram……24
Figure 12. Flexible Implementation of CAS Merlin……25
Figure 13. CAS Merlin Overall Process……26
Table 1. CAS Merlin Feature Structure……....27
Figure 14. CAS Merlin M.Model……..28
Figure 15. ERP, CRM Product Configuration Cycle……...29
Figure 16. ERP Systems and CPQ Solution……30
Figure 17. Product experts modeling product knowledge……...30
Figure 18. Configuring Products……31
Figure 19. Configuration by the End Customer……..31
Figure 20. Creating Documents and Prices……32
Figure 21. M.Model Workspace……..33
Figure 22. M.Model, Sports Cars Features Structure……34
Figure 23. Sports Car Rule Tree……..35
Figure 24. M.Customer Sports Car……...36
Figure 25. M.Sales Sports Car……37
Figure 26. Web Client. Contact Creation……..38
Figure 27. Contact Person on CAS genesisWorld……38
Figure 28. Opportunity Sales on CAS CRM……39
Figure 29. M.Sales Quotes on CRM……..40
Figure 30. Start Page of M.Sales……40
Figure 31. Price Table on M.Sales……41
Figure 32. Quote on M.Sales……..42
Figure 33. Quote Created on CRM after Configuration……...43
Figure 34. Adoption Stages of Industry 4.0 Technologies……...44
Figure 35. Survey Structure……...62
Figure 36. Country Dispersion for Product Configurator Survey……65

Figure 37. Customer Co-Creation Indicator Radar Diagram……...**67**
Figure 38. Knowledge Transformation Radar Diagram ……...……....**69**
Table 2. Customer Co-Creation Indicator…….…….….**69**
Figure 39. Knowledge Transformation……....**69**
Figure 40. Financial Evaluation Indicator Radar Diagram…….…….**70**
Table 4. Financial Evaluation Indicator…….…….……**70**
Table 5. Total Average…….…….**71**
Figure 41. Dispersion of the Experts' Role……**73**
Figure 42. DESI Index (EU) in 2021……**74**
Figure 43. Knowledge Transformation Radar Diagram……...**75**
Table 6. Knowledge Transformation KPIs…….……**76**
Figure 44. Management Knowledge Radar Diagram……**76**
Table 7. Management Style KPIs…….……**77**
Figure 45. Financial Evaluation and CRM Radar Diagram…….……**77**
Table 8. Financial Evaluation Indicator…….…….……**77**
Figure 46. Total Result of CRM Survey…….…….**79**
Table 9. Total Average……..……..……..**79**
Figure 47. Result of CRM and Product Configurator…….……..**80**

Chapter 1 : Introduction

1. Objective

In the era of Industry 4.0, where advanced technologies and digital transformation are reshaping industries, it is essential to assess the compatibility and integration of existing business tools with this new paradigm. This thesis aims to investigate whether Customer Relationship Management (CRM) systems and Product Configurator tools can be considered integral components of Industry 4.0. The thesis begins with an article from (entrate, 2017) which highlights enterprise management software in a broad sense (e.g., administration, accounting, control and finance, customer relationship management, supplier relationship management, offer management, billing, document management, project management, organizational or business process analysis, etc.) is not eligible for the facilitation. Therefore, a Customer Relationship Management (CRM) system, a product configurator aimed at sales rather than design, a Document Manager tool, Enterprise Performance Management, and Business Process Management should be considered excluded.

Industry 4.0 represents the convergence of cyber-physical systems, data analytics, automation, and connectivity to drive intelligent and interconnected production processes. It emphasizes the utilization of emerging technologies such as the Internet of Things (IoT), artificial intelligence (AI), machine learning, and big data analytics to enhance operational efficiency, productivity, and customer-centricity.

CRM systems play a critical role in managing and nurturing customer relationships throughout the customer journey. They enable businesses to capture, analyze, and utilize customer data to drive personalized interactions, targeted marketing campaigns, and optimized sales processes. CRM systems provide a comprehensive platform for managing customer information, sales pipelines, and customer service interactions.

Product Configurator tools, on the other hand, empower businesses to offer customizable and personalized products or services to their customers. These tools allow customers to configure and customize products based on their specific needs, preferences, and requirements. By leveraging automation and advanced algorithms, Product Configurators streamline the design, configuration, and quoting processes, enabling efficient and accurate order management.

Given the transformative nature of Industry 4.0, it is crucial to examine whether CRM systems and Product Configurator tools align with the principles and requirements of this new industrial paradigm. This thesis seeks to explore the following research questions:

To what extent do CRM systems integrate with Industry 4.0 technologies and concepts, such as IoT, AI, and data analytics?

How do CRM systems contribute to improving operational efficiency, customer engagement, and sales performance within the context of Industry 4.0?

Can Product Configurator tools be considered enablers of customization and personalization in the Industry 4.0 environment?

How do Product Configurator tools enhance manufacturing processes, order management, and customer satisfaction in the context of Industry 4.0?

By addressing these research questions, this thesis aims to provide insights into the role of CRM systems and Product Configurator tools within the Industry 4.0 landscape. The findings will contribute to understanding the compatibility, integration, and potential benefits of these tools in driving digital transformation, improving customer experiences, and optimizing manufacturing processes.

Ultimately, the objective of this research is to shed light on the relationship between CRMs, Product Configurators tools, and Industry 4.0, providing valuable insights for businesses seeking to leverage these tools in the era of digital transformation. Through a comprehensive examination of their functionalities, benefits, and potential limitations, this thesis aims to contribute to the broader understanding of the digitalization and industrial revolution taking place in modern business environments.

1. Structure

This study serves as a valuable reference for companies utilizing Customer Relationship Management (CRM) systems and Product Configurator tools. It can also serve as an introduction for enterprises seeking to assess whether their tools align with the principles of Industry 4.0. To achieve this, the thesis presents the following structure:

Chapter 1. Introduction to this work and its objectives. Moreover, it describes why this thesis is done.

Chapter 2. This chapter introduces the basic theoretical background to CRM systems, Product Configurator tools, and Industry 4.0, components, and benefits of using each of them.

Chapter 3. Functionalities of two software CAS Merlin and CAS genesisWorld, the software that is an example of CRM and Product Configurator tools.

Chapter 4. The explanation of how two software CAS Merlin and CAS genesisWorld integrate with explaining the whole process.

Chapter 5. This chapter discusses the spreading of both software in companies and their effectiveness in the concept of Industrial 4.0 in different stages, considering some important KPIs.

Chapter 6. The final chapter of this thesis presents the conclusions drawn from the results of the surveys conducted, as described in Chapter 5.

Chapter 2 : THEORETICAL BACKGROUND

This chapter is a brief introduction, benefits, and history of the different terms and definitions that deal with production and planning and the relation around the concept of customer relationship and Product Configurators, their role in the industry in all aspects of production and planning that are favored by the academic community as well as the current and future state of the industry for which these systems should prove to be indispensable. In this chapter, They are integrated.
Cas software is considered a tool for tracking the changes and improvements both for configuration done by CAS Merlin and for CRM done by Cas genesisWorld.

1. CRM (Customer Relationship Management) software

1.1 Definition Of CRM

CRM is an acronym that stands for Customer Relationship Management. Customer relationship management is any tool, strategy, or process that helps businesses better organize and access customer data. It all started with handwritten notes and Rolodexes, but with the advent and proliferation of digital technology, it eventually evolved into databases stored on individual computers, and then the CRM definition shifted into something far more complex. It was no longer just notes. Managing your business's relationships with customers became a complicated process. Now, to compete in any industry, you need a reliable system built on CRM software. It is a platform that connects your different departments, from marketing to sales to customer service and organizes their notes, activities, and metrics into one cohesive system.

Every user has easy, direct access to the real-time client data they need. This allows for unparalleled coordination across teams and departments and makes it possible for businesses to provide their customers with something extraordinary: personalized, one-to-one customer journeys.

Compare that to the limited functionality of old analog and legacy systems, and you have something that can revolutionize how you connect with customers. It is not possible to define CRM software without taking into consideration SaaS and cloud computing, both of which work together to allow CRM platforms to be available wherever a user has the internet. Because of these technologies, cloud-based CRM software can grow and scale with businesses, so every company, no matter the size, can benefit from a CRM-software-based system.

Figure 1. CRM Software (Pvt, n.d.)

1.2 Components of CRM

CRM software consolidates customer information and documents it into a single CRM database at the most basic level, so business users can access and manage it more easily.

Over time, many additional functions have been added to CRM systems to make them more useful. Some of these functions include recording various customer interactions ns over email, phone, social media, or other channels; depending on system capabilities, automating various workflow automation processes, such as tasks, calendars, and alerts; and giving managers the ability to track performance and productivity based on information logged within the system.

Marketing automation. CRM tools with marketing automation capabilities can automate repetitive tasks to enhance marketing efforts at different points in the lifecycle for lead generation. For example, as sales prospects come into the system, it might automatically send email marketing content, to turn a sales lead into a full-fledged customer.

Sales force automation. Sales force automation tools track customer interactions and automate certain business functions of the sales cycle that are necessary to follow leads, obtain new customers, and build customer loyalty.

Contact center automation. Designed to reduce tedious aspects of a contact center agent's job, contact center automation might include pre-recorded audio that assists in customer problem-solving and information dissemination. Various software tools that integrate with the agent's desktop tools can handle customer requests to cut down on the length of calls and simplify customer service processes. Automated contact center tools, such as chatbots, can improve customer user experiences.

Geolocation technology, or location-based services: Some CRM systems include technology that can create geographic marketing campaigns based on customers' physical locations, sometimes integrating with popular location-based GPS (global positioning system) apps. Geolocation technology canal networking or contact management tool to find sales prospects based on a location.

Workflow automation: CRM systems help businesses optimize processes by streamlining mundane workloads, enabling employees to focus on creative and more high-level tasks.

Lead management: Sales leads can be tracked through CRM, enabling sales teams to input, track and analyze data for leads in one place.

Human resource management (HRM): CRM systems help track employee information, such as contact information, performance reviews, and benefits within a company. This enables the HR department to manage the internal workforce.

Analytics: CRM analytics help create better customer satisfaction rates by analyzing user data and helping create targeted marketing campaigns.

Artificial intelligence: AI technologies, such as Salesforce Einstein, have been built into CRM platforms to automate repetitive tasks, identify customer-buying patterns to predict future customer behaviors, and more.

Project management: Some CRM systems include features to help users keep track of client project details such as objectives, strategic alignment, processes, risk management, and progress.

Integration with other software: Many CRM systems can integrate with other software, such as call center and enterprise resource planning (ERP) systems (Wesley Chai, 25 Sep 2020).

Figure 2. CRM Components (CRM S. , February 4, 2010)

1.3 Benefits Of using CRM

The benefits of using CRM software in the eyes of Lunk consist of being kept in touch, personalization of communications, providing consistency, delivering relevant offers, and being able to respond quickly. With these pros, building a relationship that drives more revenue from the customers you already have is possible. (Lunk, Jun, 19th, 2019, p. 5 Ways a CRM Can Improve the Customer Experience)

If we want to get more into it, we can talk about 10 benefits with a little more description.
Several kinds of businesses today across different industries have trouble keeping up with their leads or are developing so fast that their customer service is suffering. While others do not have a precise and defined way to track sales. Established and new businesses as well can face these problems. But a CRM can be the solution to all these challenges.

CRM software can provide several advantages for all types of businesses whether small or large, from consumer retention to improved productivity. Defined below are some of the key benefits that a CRM can provide:

1) Better customer service

A CRM system efficiently manages all your contacts and collects crucial customer information – like purchase records, demographics, and prior messages across all channels – and makes it effortlessly accessible to anyone who needs it within the organization. This provides a better customer experience.

2) Improved sales

A CRM tool streamlines your sales process, creates a sales pipeline, automates key tasks, and analyses all your sales data in one centralized location while increasing sales and productivity.

3) Enhanced customer retention

CRM provides sentiment analysis, customer support automation, and user behavior tracking to help you determine problems and quickly handle them with your consumers.

4) Detailed analytics

The CRM system generally has built-in analytic abilities to contextualize data, splitting it into actionable items and readily understood metrics.

5) Higher efficiency and productivity

CRM software utilizes marketing automation technology, which expedites common tasks like drip campaigns and releases your employees' time to concentrate on work only humans can handle, like developing content and more.

6) Managed communications with prospective leads

A CRM automatically handles the process, sending your employees alerts and notifications when they need to reach out to the prospect, and tracks every interaction right from phone calls to emails.

7) Enhanced customer segmentation

A CRM automatically segments your contact lists based on your measures, making it effortless to discover the ones you want to contact at any provided time.

8) Automated sales reports

CRM software with its dashboard and reporting features lets teams collect and organize data about prospective and current customers, this allows employees to automate and handle their processes and pipelines.

9) Accurate sales forecasting

Utilizing the automated sales reports in CRM software, you can determine key trends and gain an idea of what to expect from your forthcoming sales cycle performance while altering your objectives and metrics to suit those projections.

10) Streamlined internal communications

A CRM makes it straightforward to see how other employees are interacting with a possible customer, which helps your team keep a unified brand voice.
Businesses in the following industries – Financial Services, Insurance, Retail, Consulting, Banking, and even Agriculture have realized that all of them can benefit from CRM. If your business has a billing team, a CRM solution along with managing customer relations can furthermore help you manage your invoicing too. (Solutions, Mar 3, 2022)

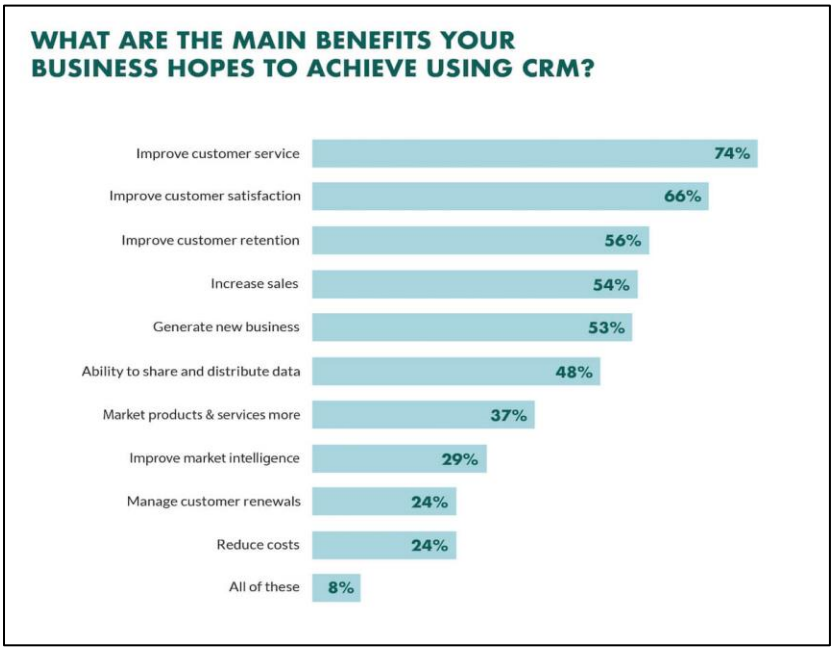

Figure 3. Benefits of Using CRM (2021)

2. Product Configurator

2.1 Definition of Product Configurator

A product configurator is a piece of software used by manufacturers. This software portrays the product rules that need user input to finish. This step needs to be completed before an order is sent to production. At its simplest level, the product configuration is an interactive process where the user chooses a feature, which is validated via a configuration rules engine, before allowing the user to make the next choice about the remaining features on their product. The seeming simplicity of this process hides the complexity in the construction and validation of the rules used to drive the product configurator.

2.2 Configurable Product

A product is configurable if it is capable of being customized, or if it can be rearranged or adjusted post-production. To configure simply means to design or adapt to form a specific combination of features for a specific purpose. Products with multiple features (or "variants") can be configured either by the end user to match needs or want (e.g., the color of, or the choice to include a sunroof in, a car). For the manufacturer, proper configuration ensures that the product lives up to regulatory purposes. This is a detail we as customers do not want to consider

when buying an electronic product. We expect it to come with the correct adapter for our geography (Hesselfeldt, September 3rd, 2019).

2.3 The Impact of Product Configurators on Lead Times

The development in Information Technology (IT) made available also for SMEs a class of software tools called 'product configurator': they are "a software-based expert system that supports the user in the creation of product specifications" through the combination of different standard modules and enables to reduce the trade-off between product variety and delivery time. A standard module is a consistent product unit that can be identified and replaced in the product architecture several times to boost product variety and adaptability. A product configurator is an important tool for the alignment of the supply chain to new product development, assuring the coordination between the development of new products and the business processes. Moreover, configuration design has been recognized as an effective means to implement mass customization. Empirical studies were performed to identify all the consequences that a product configurator generates for a company and its surrounding environment. The findings from the literature can be classified into the following two classes.
Impacts on the internal business activities. Zhang et al. developed an analysis of the implications of product configurators on companies' business activities. Changes result in sales order processing, generation of BOMs, and manufacturing documentation. Such changes can be supported by the integration between the product configurator and the Enterprise Resource Planning (ERP) of the company. The automation of traditionally manual activities leads to a substantial reduction in the time necessary for processing orders and for design and, in turn, to an overall lead time reduction which is particularly significant for engineering-oriented companies. In highly complex products, the adoption of a product configurator also drives improved quality, preservation of knowledge, lowered time for employee training, and improved certainty of delivery. The latter point is achieved from the standardization of the selling process, which reduces the possibility of changes by the customer in the product design after the order has been approved.
Other impacts on internal business activities, in terms of performance improvements, are identified by Zhang: increased correct sales orders, increased customers' orders, and increased IT capacity. Besides the business tasks, possible changes concerning the company's internal organization must be considered. The automation of design activities may lead employees to reject the novel tool, considering it a threat to their position.

Impacts on the supply chain. The effective adoption of a product configurator requires tight collaboration and integration with the two terminal nodes of the supply chain system, namely customers and suppliers. A product configurator promotes co-designing processes in which the customers are actively involved in the design of their product, and, in some cases, in the production. Hence, considering both sides of the supply chain, suppliers and customers become key partners. To this purpose, Belkaldi underlines the importance of linking a modular product strategy with the suppliers' selection, particularly for original equipment manufacturers (OEM). (Anders Haug, 2011)

2.4 Benefits of Product Configurators

The benefits of using the Product Configurators are being interested 1 in 3 customers in customization feel that standard products do not meet their expectations, 50% of customers believe customized products make great gifts, having more willing to pay for customized products, 48% of consumers are willing to wait longer to receive a customized product. (Teasdale, February 22nd, 2022)

Other benefits in the figure below:

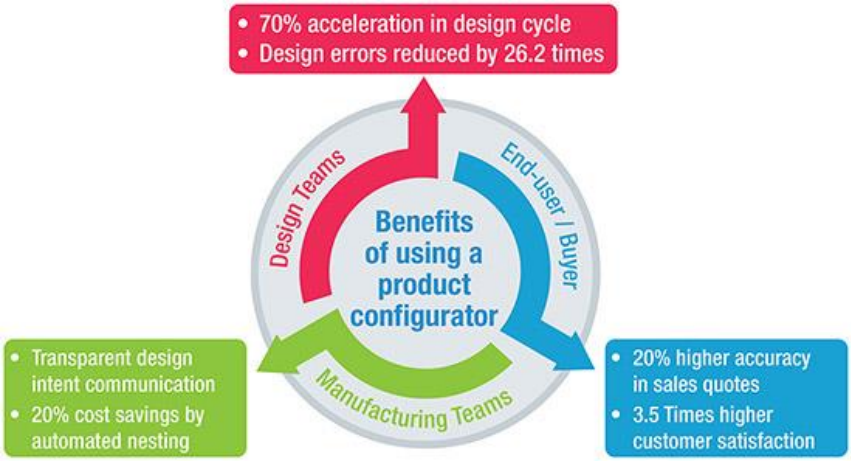

Figure 4. Benefits of using a product configurator (Trivedi, 2019)

3. Industry 4.0

3.1 Definition of Industry 4.0

The Fourth Industrial Revolution refers to the technological transformation society is undergoing in the 21st Century. Technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and autonomous vehicles are increasingly merging with human lives and creating a radical shift for employees, organizations, and society. Work and the meaning of work are revolutionizing as technology matures and organizations are driven by digitalization and smart ecosystems. This shift will require a balance between technological innovation in the workplace with new jobs and employment concepts. The technologies driving the Fourth Industrial Revolution are changing the demands and expectations of the buildings and cities we work and live in. The next industrial revolution will move on from 'smart buildings' and 'smart cities' to the beginning of autonomous, intelligent, and sentient urban infrastructure. The Fourth Industrial Revolution is a catalyst of change that will disrupt how we communicate, learn, behave, and relate to each other and our surroundings and it presents an optimistic view of the opportunities for change. (Maynard, 12 March 2021)

The 4th industrial revolution is where; the first marked by the adoption of steam power, the second was marked mainly using electrical power, and the 3rd was characterized by the implementation of digital technology. Figure 5 nicely represents the progression of industrial revolutions. (Perotti, 2020 – 2021)

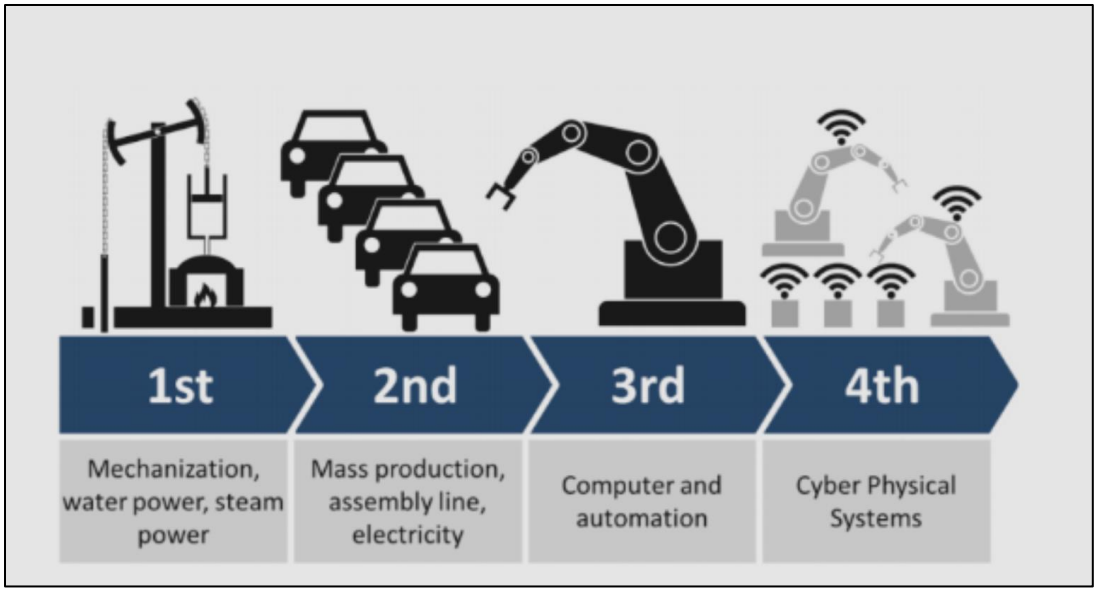

Figure 5. The Industry Evolution (Alin, 2017)

3.2 Benefits of Industry 4.0

The benefits of Industry 4.0 are Strategic competitive advantage, Organizational efficiency & effectiveness, Organization agility, Manufacturing innovation, Profitability, Improved product safety & quality, delightful customer experience, Improved operations, and Environmental and social benefits. (Sony, 22 Jun 2020)

Figure 6. Industry 4.0 and Its Benefits (Ruane, September 1, 2022)

Chapter 3 : CAS genesisWorld and CAS Merlin Functionalities

In this chapter, we will delve deeper into Cas genesisWorld (CRM software) and Cas Merlin which were mentioned in Chapters 1 and 2. We will start with an introduction and an architectural explanation to get more familiar with how they work.

1. CAS genesisWorld?

1.1 What Can We Do With Cas genesisWorld?

CAS genesisWorld is a CRM software that can be tailored to your specific needs and requirements. It can help you manage your customer relationships and information more effectively and efficiently.

CAS genesisWorld has different clients that you can use depending on your preferences and devices. You can use Desktop Client1, Web Client2 or, Thiele apps2 to access your CRM data anytime and anywhere. (CRM C. , n.d.)

This platform allows you to connect CAS genesisWorld and SmartWe with any system via an intuitive user interface. You can use ready-to-use connectors to common systems such as ERP, marketing automation, and webinars.

By integrating CAS genesisWorld with other applications, you can enhance your CRM capabilities and streamline your workflows. You can also avoid data duplication and inconsistency across different systems. (CAS CRM (A smart company of Cas Software AG), n.d.)

1.2 Architecture

1.2.1 Software Architecture

In CAS genesisWorld's n-tier architecture, the software system comprises three key areas (or layers):

- The database layer includes all services that are required for storing data.
- The application server layer comprises services that encapsulate business logic, log changes, check user rights, and then provide this information to the presentation services.
- The presentation client layer comprises all the services that display information on the user interface.

The functions of the CAS genesisWorld application server are implemented using COM objects. This means that its services can also be provided to third parties who can then present or process the information from CAS genesisWorld in their applications.

Basic services include User Service for logging on and managing rights and Data Service as the central service for accessing CAS genesisWorld data.

The Business Services interfaces (page) provide business services based on these basic services. These interfaces offer specific functions for the respective application areas.

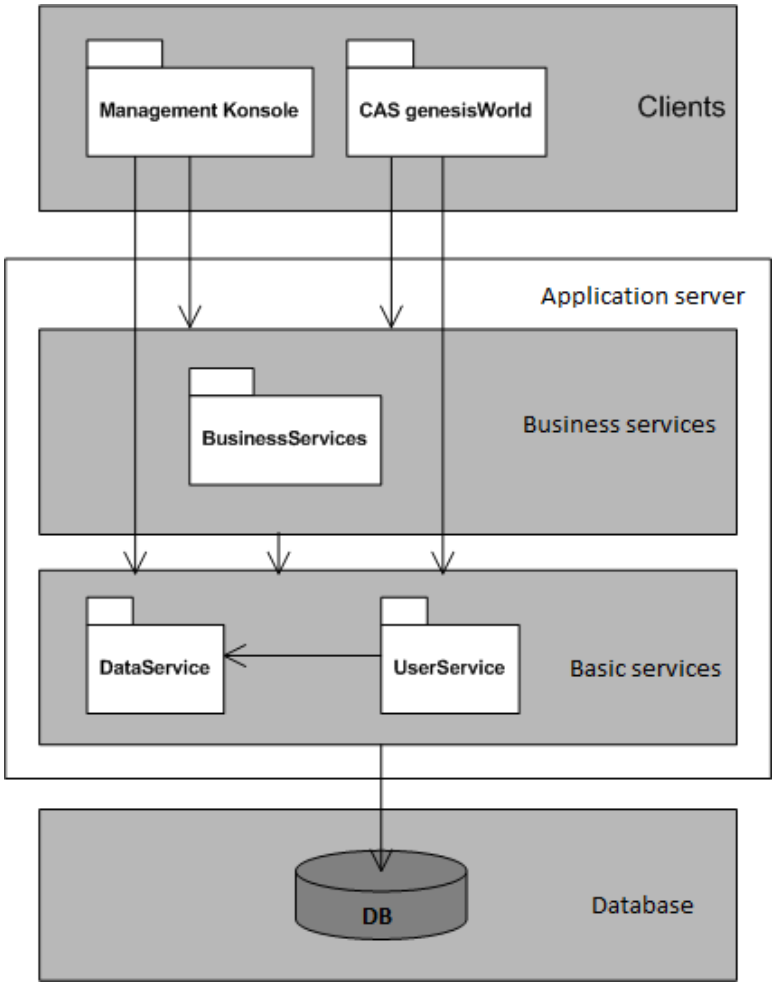

Figure 7. CAS genesisWorld architecture
(Adapted from Partner portal Cas)

1.2.2 CAS genesisWorld Hardware

It consists of processors with four cores for the application. It can only use just one core and the other three cores will be available for the system. More cores would not increase the speed of an application server, but the highest cycle in the 16 gigabytes should be available as RAM. Up to 50 users can install the application server, the database, and Document Archive. If the number of users increases even further, you can outsource the Document Archive to a separate file. (genesisWolrd)

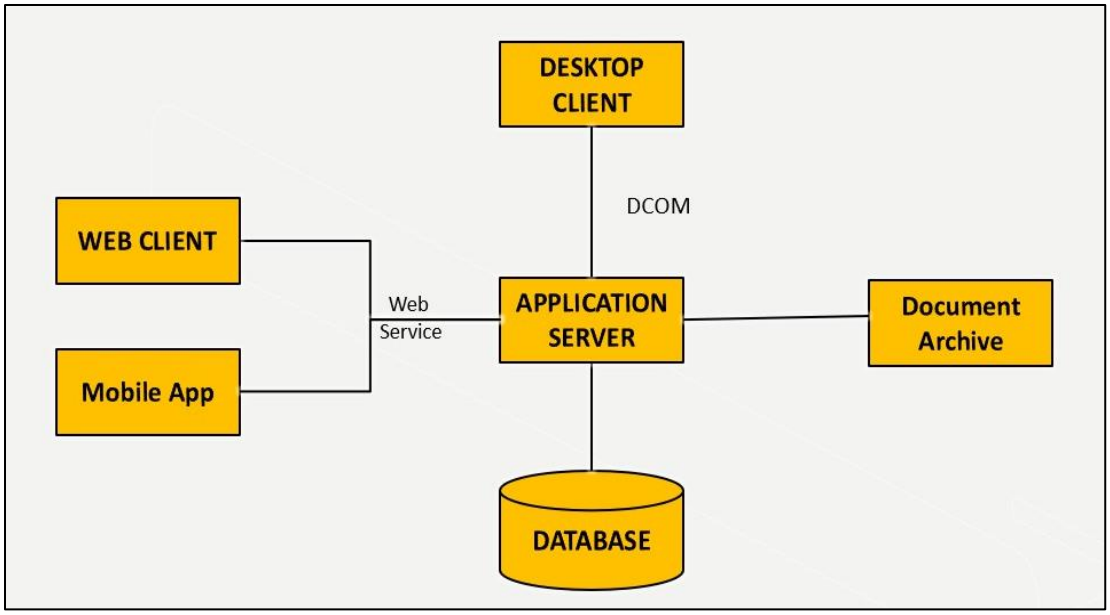

Figure 8. Hardware Data Server (Adapted from materials of the company)

1.2.3 CAS genesisWorld ERP Connect

CAS genesisWorld ERP Connect provides an easy and standardized way of integrating an ERP system with CAS genesisWorld. CAS genesisWorld has three data record types for storing data from the ERP system: receipts, products, and product groups. These data record types have the usual CAS genesisWorld list views, input masks, dossier views, and so on.

The framework for synchronization data between ERP systems and CAS genesisWorld is fully integrated into CAS genesisWorld's architecture.

The following two schematic diagrams show you the route the data travels from the ERP system to CAS genesisWorld and vice versa. Both diagrams show which components are part of the framework and which ones need to be developed specifically for an ERP system as so-called plug-ins (shown in red) Plugins.

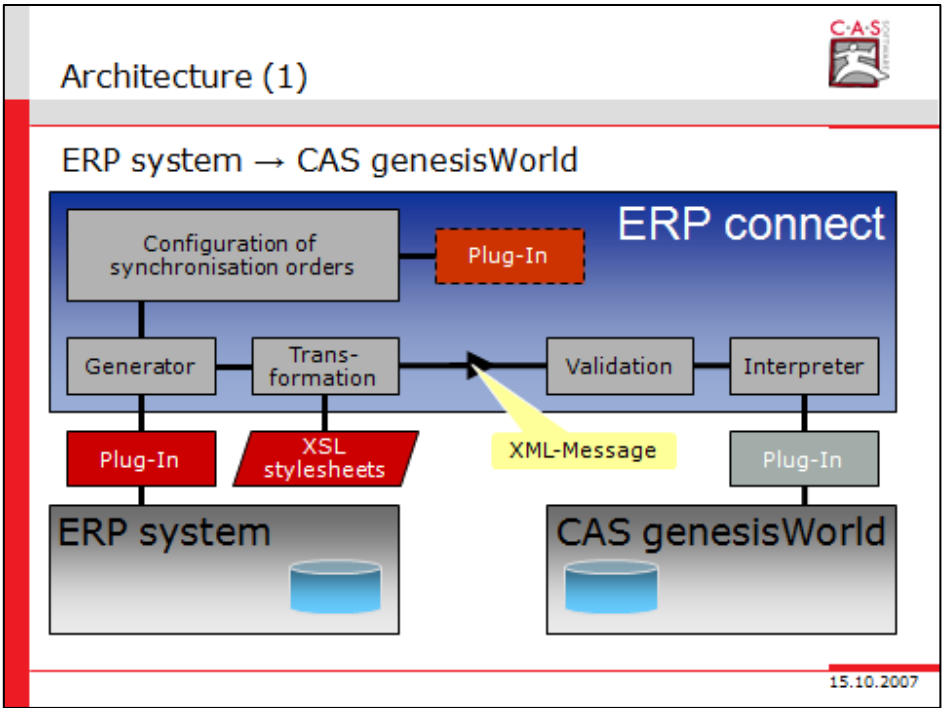

Figure 9. CAS genesisWorld Architecture 1 (Adapted from Cas partnerportal)

The corresponding plug-ins facilitate access to the two systems that are to be synchronized. The CAS genesisWorld system is no exception. As a result, ERP connect does not need to "know" the end system in detail; its read-and-write requirements are implemented by the plug-ins. As a result, the ERP plug-in fully controls access to the ERP system.

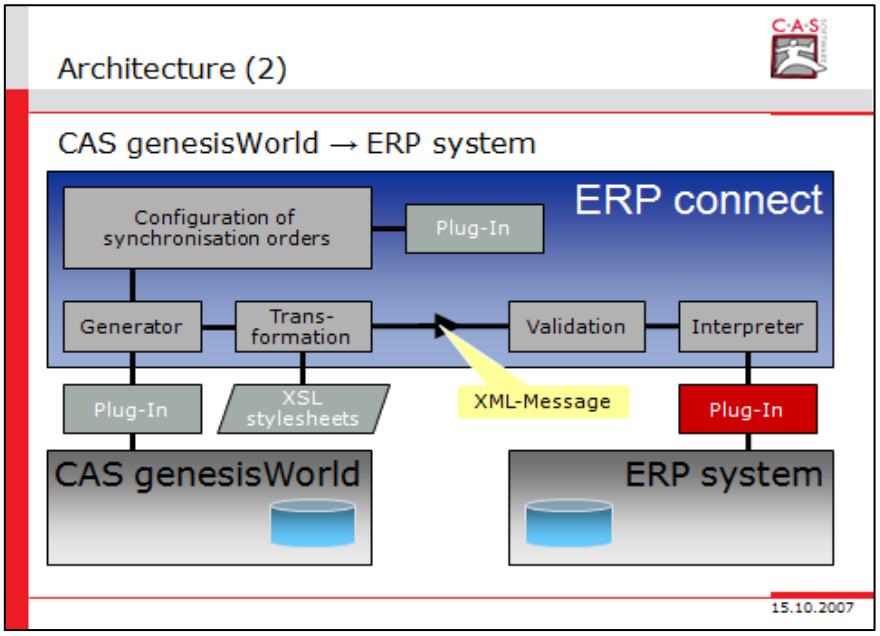

Figure 10. CAS genesisWorld Architecture 2 (Adapted from Cas partnerportal)

1.3 External Archive

This documentation describes the structure of CAS genesisWorld document management and outlines your options for integration of an external archive system. The first stage consists of integration at the application server level (document server). Now, no modifications to the CAS genesisWorld user interface have been planned.

CAS genesisWorld document management can capture, save, edit, and search for documents of all types.

For example, CAS genesisWorld documents can consist of notes or represent internet addresses - or a document can function as a container for any kind of file such as a Microsoft Word file.

Users can decide whether a CAS genesisWorld document should contain a link to a locally stored file, or whether the file itself should be stored in the CAS genesisWorld document archive.

In the first scenario, users get to decide where the document will be saved, whereas, in the second scenario, the CAS genesisWorld document server manages the location of the document and controls access to it. This has the double benefit of ensuring that the user's access rights are upheld and that external access to the file from third parties is prevented.

1.3.1 Service Model

The following diagram shows an overview of the services involved:

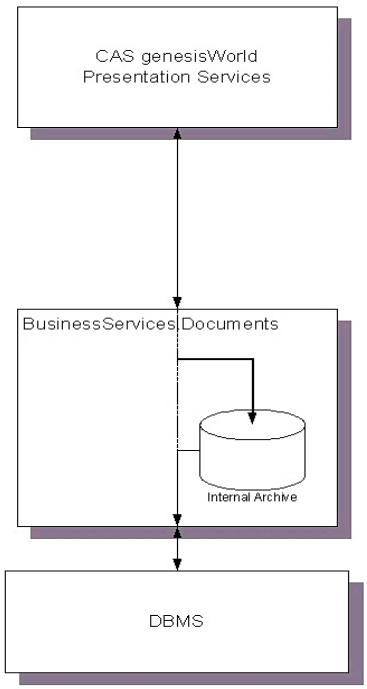

Figure 11. Service Model Diagram (Adapted from Cas partner portal)

While presentation services are executed locally via the network for every user, there is only one instance of the document server, and it is located on the central application server. It provides all clients with the required data records and, if necessary, can also provide users with archived files. In addition to the general interfaces for accessing CAS genesisWorld tables. Once a user has finished editing, the edited working copy is saved to the archive. As with all other CAS genesisWorld information, the document tables are stored. The data records contain fields such as Keywords, Numbers, Dates, and so on. If the data record represents an archive document, then the respective file is not stored on the database server but is instead stored in either an internal or external archive.

2. CAS Merlin

Now, look at the functionalities of CAS Merlin to have a better understanding of it.

The CAS Configurator Merlin is a flexible and customized modular solution to meet our customers' requirements. The result is a configurator that is tailor-made and allows for a fascinatingly simple product configuration. (Meike Sennert)

Figure 12. Flexible Implementation of CAS Merlin (Adapted from CAS Merlin Brochure)

2.1 CAS Merlin's functionality

Cas Merlin is a software product that helps you create and manage complex documents such as offers, specifications, and contracts (CAS Merlin, n.d.). It also allows you to configure and sell customized products and services using smart assistants (CAS Merlin, n.d.). It is developed by CAS Software AG, a German company that specializes in customer relationship

management (CRM) and CPQ solutions (It is a process that helps salespeople quickly and accurately generate quotes for orders based on configurable products and services (FinancesOnline, n.d.))

2.2 CAS Configurator Merlin Overall Process

- **End customer configurator:** your customer enters their requirements into the Merlin CPQ end customer configurator on your homepage, finds the perfect product, creates a rough configuration, and then sends a quote request to your sales department.
- **Inbox:** the customer's quote request is now in your inbox. The inbox is integrated into CAS genesisWorld as a structured sales dashboard and contains all saved configurations. Your inbox enables you to easily manage quote requests and assign them to your sales employees.
- **Opportunity:** you can create new opportunities for the quote requests of customers directly from within the inbox in CAS genesisWorld. In these opportunities, you can record any further sales actions.
- **Sales configurator:** the rough configuration by the customer can be accessed directly from within the opportunity in CAS genesisWorld. In consultation with the end customer, the first rough configuration becomes a complete quote in Merlin CPQ. You can save the quote document in the opportunity and directly send it to the end customer.

  At the same time, the selected values in the quote are automatically entered into the opportunity so that your sales employees can keep an overview of all relevant information in the opportunity data record. (Consistent processes with CAS genesisWorld and Merlin CPQ)

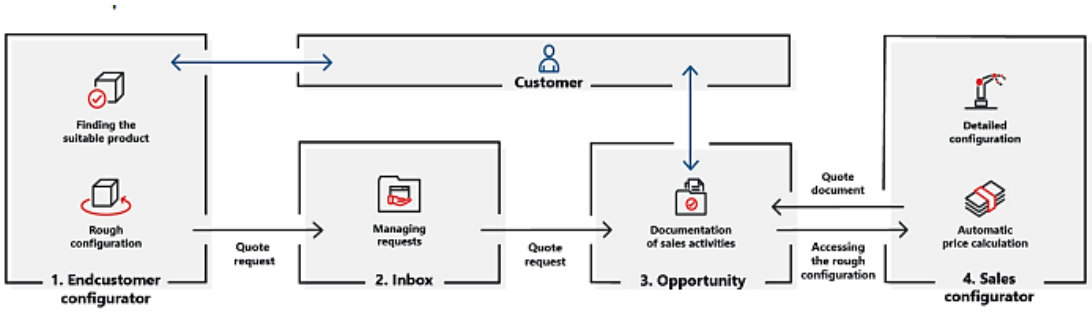

Figure 13. CAS Merlin Overall Process (Adapted from Factsheet user process Merlin CPQ)

2.3 Feature Structure

2.3.1 Product Structure

To model products for configuration and quote generation, you compile the products using the **Product** and **Knowledge module** rule files. In the rule files, the properties, and rules for the configuration of the product are defined. Together, the products and knowledge modules make up the product structure according to which the product configuration is

performed.

As different products can contain common and specific product knowledge, all commonalities can be recorded in modular knowledge modules. Using the knowledge modules, you can more efficiently reuse common product knowledge for the different products. Product-specific product knowledge can be modeled in the individual products.

2.3.2 Product

The **Product** file type displays the products in M.Sales and M.Customer. Each product requires an individual rule file. In the product, the specific product knowledge is modeled using the graphic rule modeling functions. Besides the definition of a specific product logic and structure, you can define products, for example, as start modules or add article numbers and keywords.

2.3.3 Knowledge Module

The **knowledge module** file type contains the entire product knowledge of the different products which has been modeled using the graphic rule modeling functions.

By reusing rules and feature elements, modeling becomes efficient as any changes to knowledge modules are automatically transferred to all linked products.

2.3.4 Feature Structure

In the Feature structure view, you define the product properties. Using the product properties, you model rules for the product logic and create the configuration in M.Sales and M.Customer.

To model product properties, you use feature elements that follow the product structure in the Feature structure view. The available feature elements include feature folders, features, attributes, and variables (Merlin C. C., September 18, 2022).

	Feature element	Function
	Feature folder	Feature folders are used to structure information. A feature folder displays easily intelligible product information such as features, attributes, and variables. A feature folder located on the top level of the feature structure is displayed as a bullet point in the Categories column in M.Sales.
	Feature	Using features, you model the product properties and divide them into selection fields for the configuration. The features contain attributes or variables which represent the possible values of a feature.
	Attribute	Using attributes, you define a fixed value for a feature. Each attribute can only be assigned to one feature. A feature can contain multiple attributes of which one or multiple can be selected in the configuration.
	Variable	Using variables, you define a variable value for a feature. Each variable can only be assigned to one feature. The quantity variable is an exception

		as these variable-variant issues the number of attributes. There are different variable types whose values are calculated and defined either before or after the configuration.

Table 1. CAS Merlin feature structure (CAS Merlin , 2022)

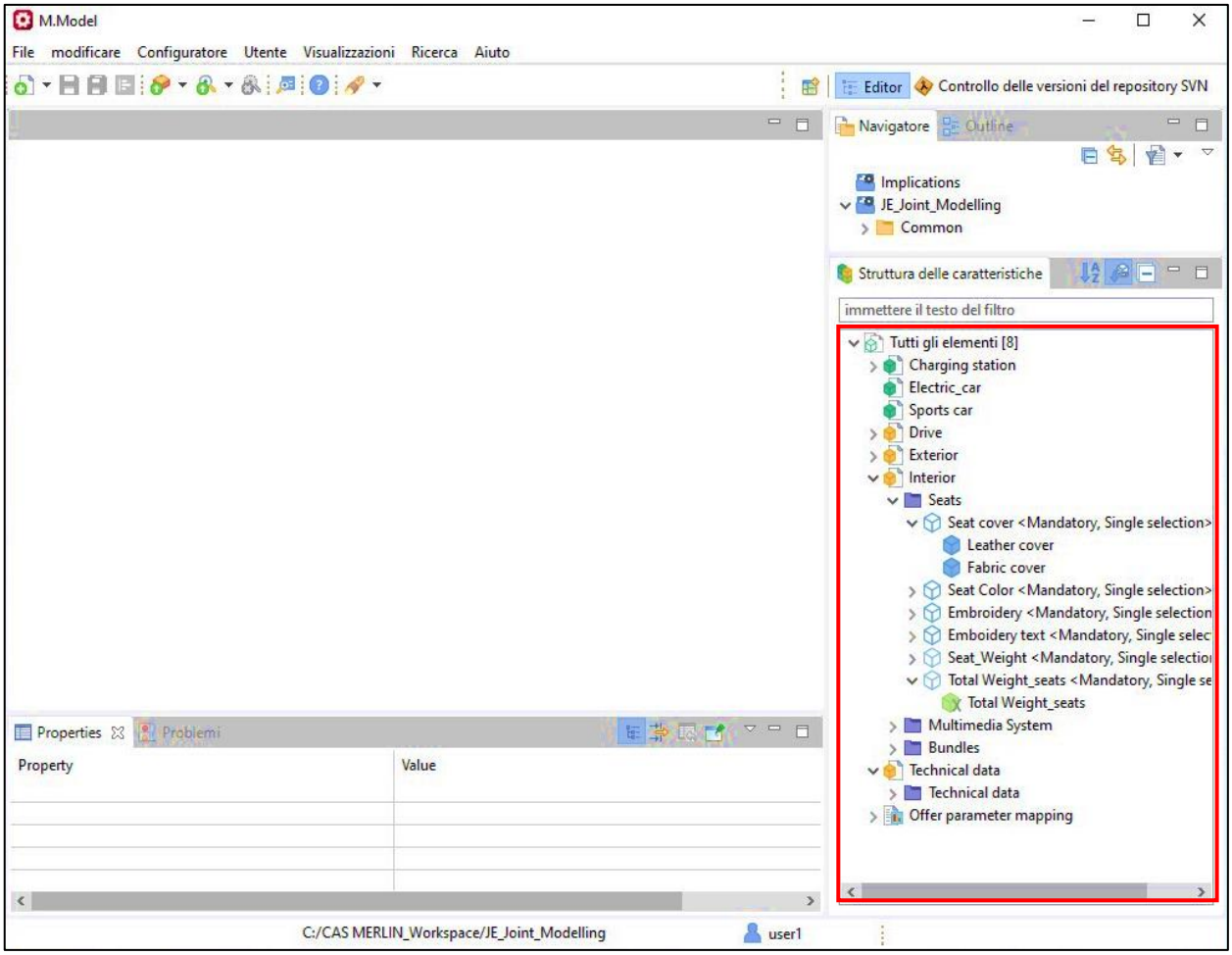

Figure 14. CAS Merlin M.Model (Adapted from CAS Merlin software)

Chapter 4 : CAS Merlin and CAS genesisWorld Integration

1. Quote Processes With the Configurator

1.1 CPQ Solution

A Configure Price Quote solution (CPQ solution) is software that supports companies in creating custom products and error-free quotes. Some solutions support both your sales department during the configuration and quote generation processes, as well as software for your customers to configure custom products on their own. On the one hand, the CPQ solution provides an interface between product experts and sales. On the other hand, it offers an interface between the sales department and the end customer.

The CPQ solution can also be integrated as a connective link between different IT systems. Data from, for example, ERP and CRM systems feed into the configuration of complex products and can later be saved again in the system in which they originated. And here, you can see how it works:

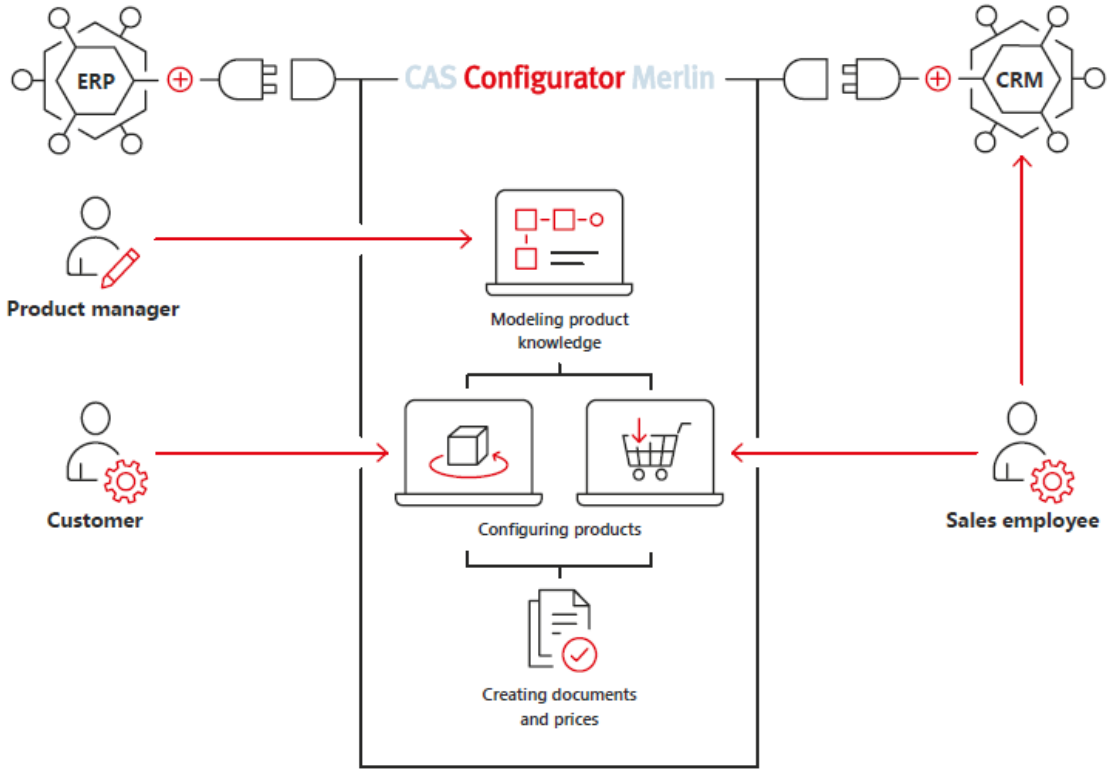

Figure 15. ERP, CRM Product Configuration Cycle

- An Enterprise Resource Planning system (ERP system) supports the smooth operation of cross-functional business processes in a company.
- A Customer Relationship Management system (CRM system) stores customer contacts and any related communications in one central location where all authorized users can access the data.

1.2 Configuring Products With CAS Configurator Merlin Steps

1.2.1 Data Transmission from ERP Systems

Current material data (e.g., bills of material) and price data that can change hourly are stored in the ERP system. The configurator can access those data via an interface. The data exchange can occur at any point in time. Thus, you can store information at one location and the CPQ solution still works with current data always. CAS Configurator Merlin offers standard connectors for all popular ERP systems. You can supplement the technical information from the ERP system in the CPQ solution anytime.

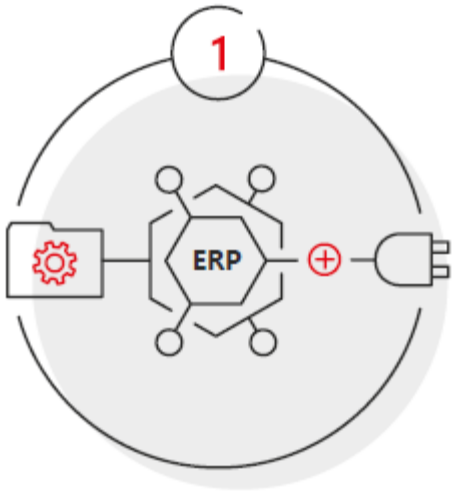

Figure 16. ERP systems and CPQ solution

1.2.2 Product Experts Modeling Product Knowledge.

The product expert or product manager transfers their knowledge into the CPQ solution as the central knowledge storage. Using the intuitive, graphical modeling interface of CAS Configurator Merlin, you do not need programming knowledge. for this transfer. As a result, the entire product landscape including dependencies and price logic is stored in the product configurator. Predefined text modules and documents are also stored in the CPQ solution. These modules and templates are later used by the CPQ solution to automatically generate and create quote documents.

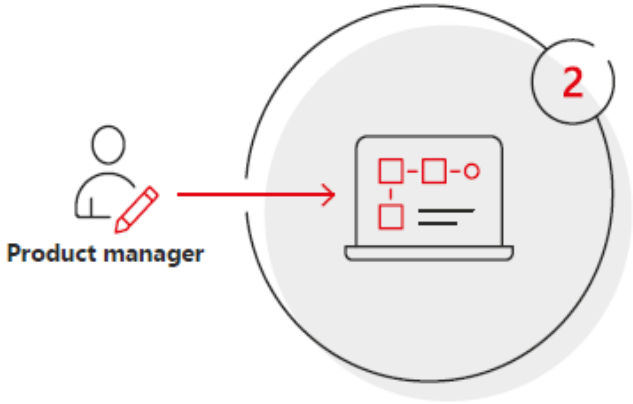

Figure 17. Product Experts Modeling Product Knowledge

1.2.3 Configuring Products

The stored product knowledge and rules enable sales employees as well as end customers to easily configure a perfect custom product. (We will look at this part later).

Figure18. Configuring Products

1.2.4 Configuration By the End Customer

CAS Configurator Merlin offers its customers a configuration interface for end customers. The customer can configure a product according to their requirements directly on the website or in the webshop of the respective company. During the configuration, the customer is supported with the help of images, hint texts, and smart wizards so that they can easily configure even complex products. If the customer wants to configure a combination that is not feasible, a change dialog supports them in finding alternative, feasible combinations. Then, the customer can send the configuration to themselves as well as send a request for a quote or an order to the company. The requested configuration reaches a sales employee who can add to the quote in consultation with the customer or directly pass it on to production.

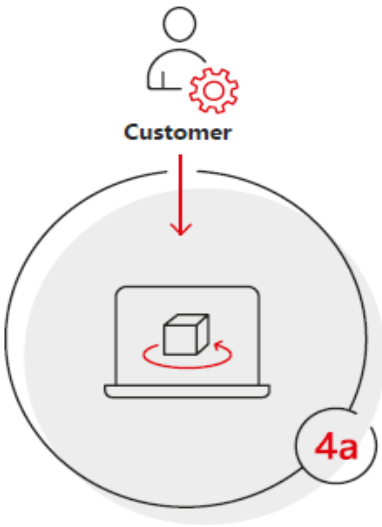

Figure 19. Configuration by the End Customer

1.2.5 Creating Documents and Prices

The CPQ solution automatically generates custom documents using predefined text modules (e.g., quotes, overviews, user guides, bill of material summaries, and so on). The

price of the individual product is calculated and recorded in the documents. Finished quotes are automatically stored in the corresponding opportunity in the CRM system but can also simply be printed and saved. Thus, the customer receives an error-free quote in no time. (CAS Configurator Merlin in a nutshell)

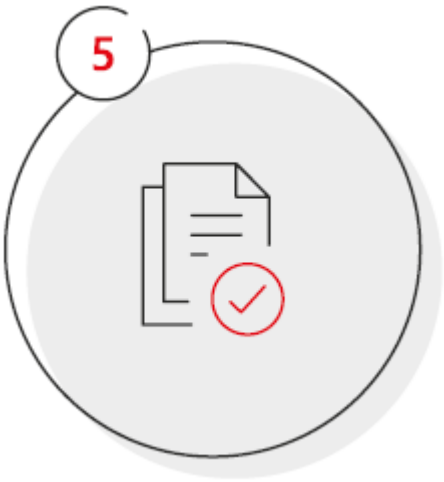

Figure 20. Creating Documents and Prices

1.3 The Graphical Editor M.Model

To explain this part first we need to know more about the case study then we will look at how it works and the results in M.Customer and M.sales.

- The case study that we want to work on is about two different types of cars, Sports cars, and Electric cars with charging stations. The cars have different features and characteristics.

Each product consists of two parts, a rule tree, and a description area which after creating products on the Navigator area are produced.

In the feature characteristics part, it is possible to make folder features, new features, attributes, and variables.

In the Edit area, it is possible to make specific operations and these operations will consist of some operators from the left- sidebar which consist of Structure, Modules, logic, calculation, and product realization.

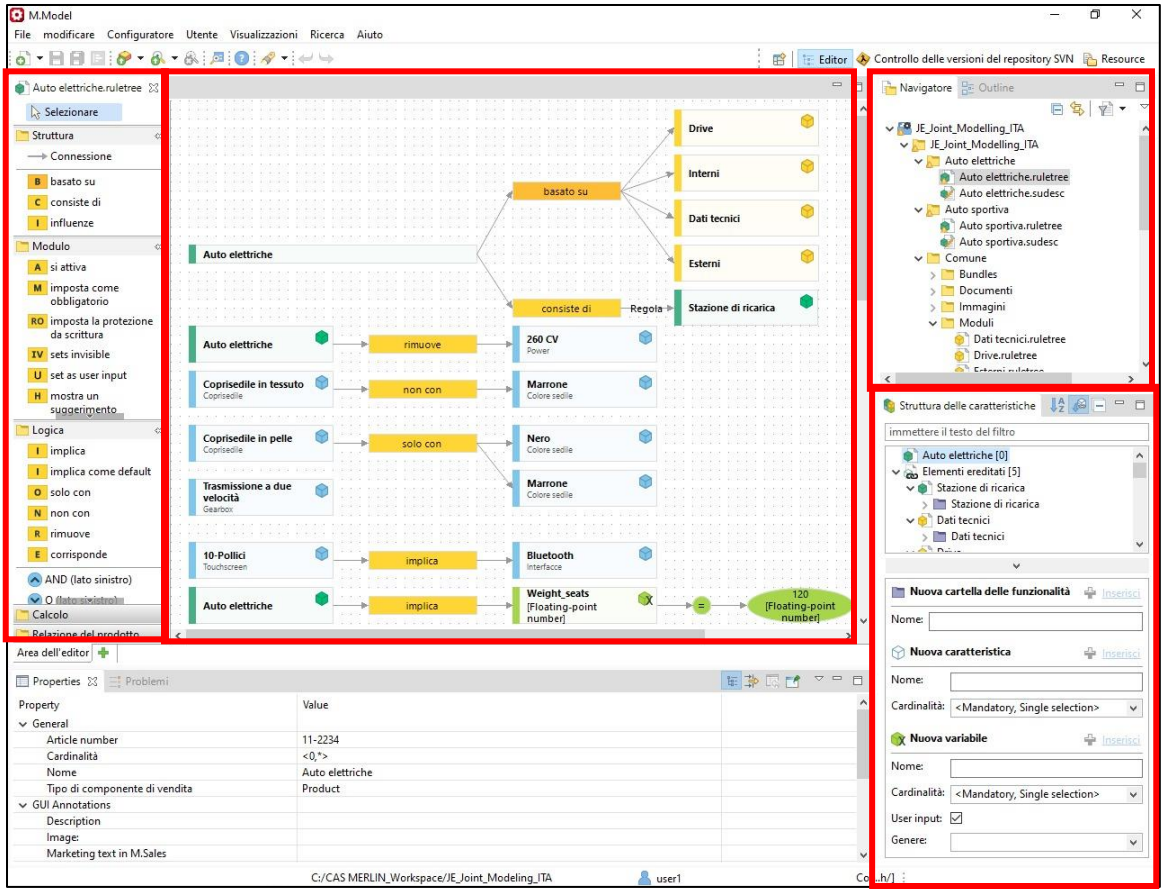

Figure 21. M.Model Workspace

The core function of M.Model is ruling modeling. It means to have a valid product configuration; the product should be modeled using logic rules. Graphical rules are modeled using files, feature elements, and operators in the rule file. Using rule modeling in M.Model, all relationships between products, feature elements, and knowledge models (entire product knowledge of the different products) are modeled, and as a result the behavior of the products in M.Sales and M.Customer.

Here we can look at a specific part of the case study to understand better how they are correlated.

First, it is better to define the product **(Sports Car)** in M.Model,

- The Drive module contains the "power" features and the "drive" features, in the "Drive" feature folder:

(i) The "power" features 100 hp, 150hp, 260 hp, and 400hp.

(ii) The "drive" features of Manual gearbox, Automatic gearbox, and Two-speed gearbox attributes.

❖ Exterior module consists of the "Car Body" and "Rim" feature folders:

(i) The "Car Body" feature folder consists of three different colors (Black, Gray, and white).

(ii) "Rim" feature folder consists of "Rim color" (Black, White, Green, and Gray) and Rim type (Steel Rims and Allor Rims) attributes.

❖ “Interior” module consists of three feature folders od Seats, Bundles, and Multimedia Systems:

(i) Seat feature folder contains the Seat cover (Leather cover and Fabric cover attributes), Seat Color, and embroidery (Yes or No attributes) features.

(ii) Multimedia System feature folder contains speakers (50W, 100W attributes), Touch screen (7-, 8-, and 10-inches attributes), and Interface (USB and Bluetooth attributes) features.

- Technical data module consists of the technical data feature folder:

(i) Technical data feature folder contains the Total weight feature with the Total Weight Variable

It is possible to see the entities entered in M.Model in Figure 22:

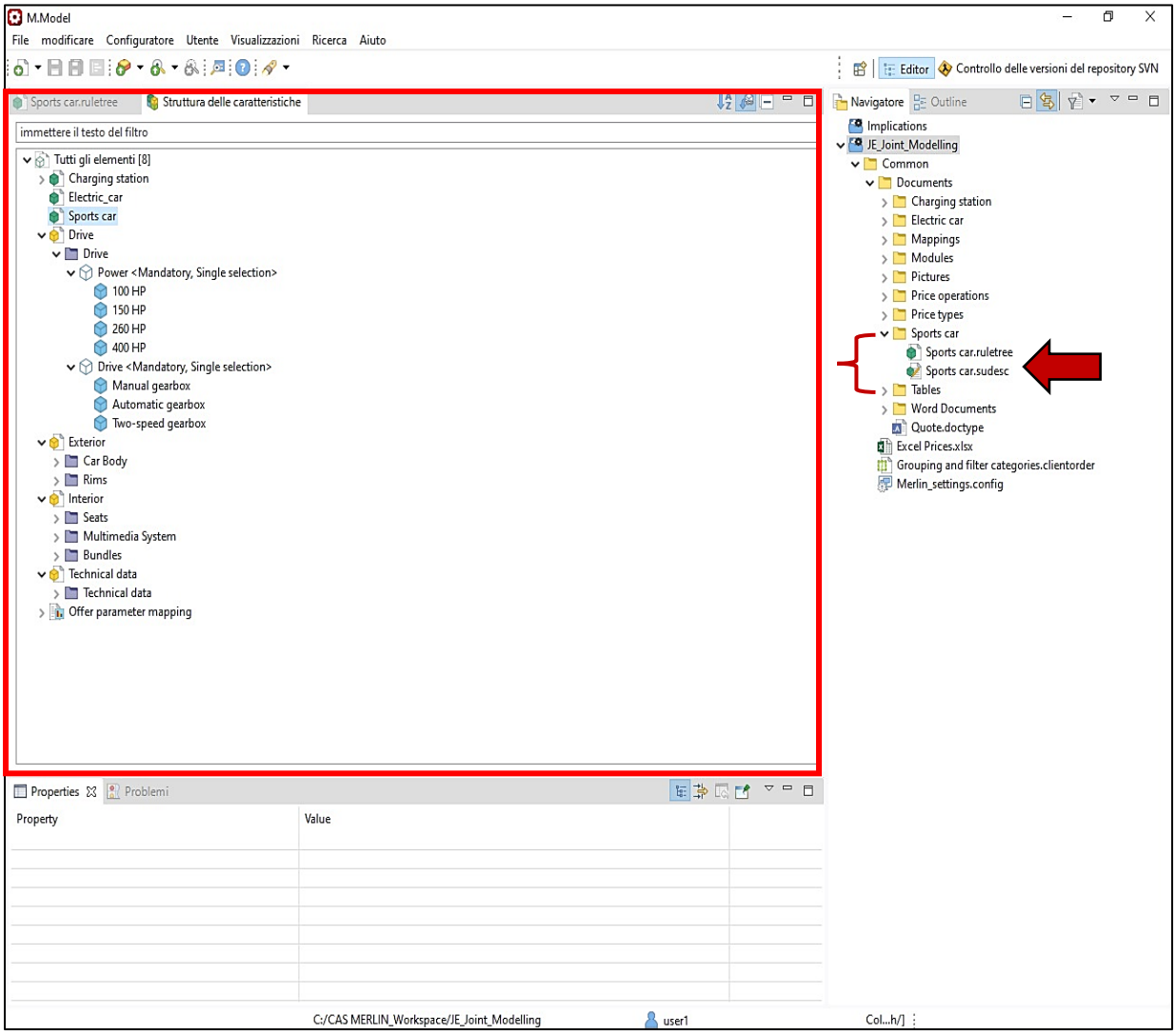

Figure 22. M.Model, Sports Cars Features Structure.

Now it is time to model the rules on the Editor area with the help of Operators from the left side palette:

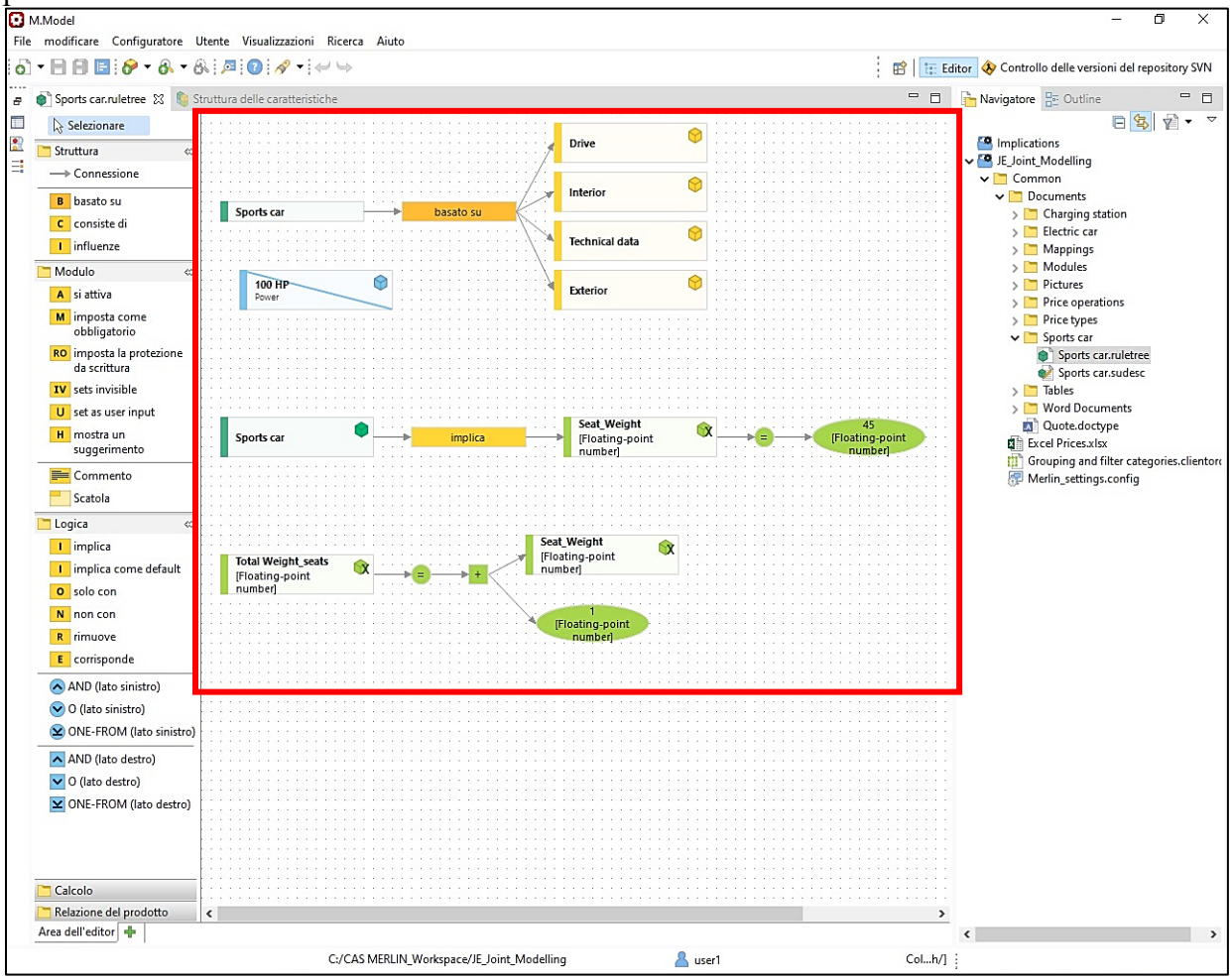

Figure 23. Sports Car Rule Tree

As it is mentioned before it is possible to see the result both on M.Customer and M.Sales depending on the modules and Merlin setting. find the graphical result in Figures 24 and 25 below.

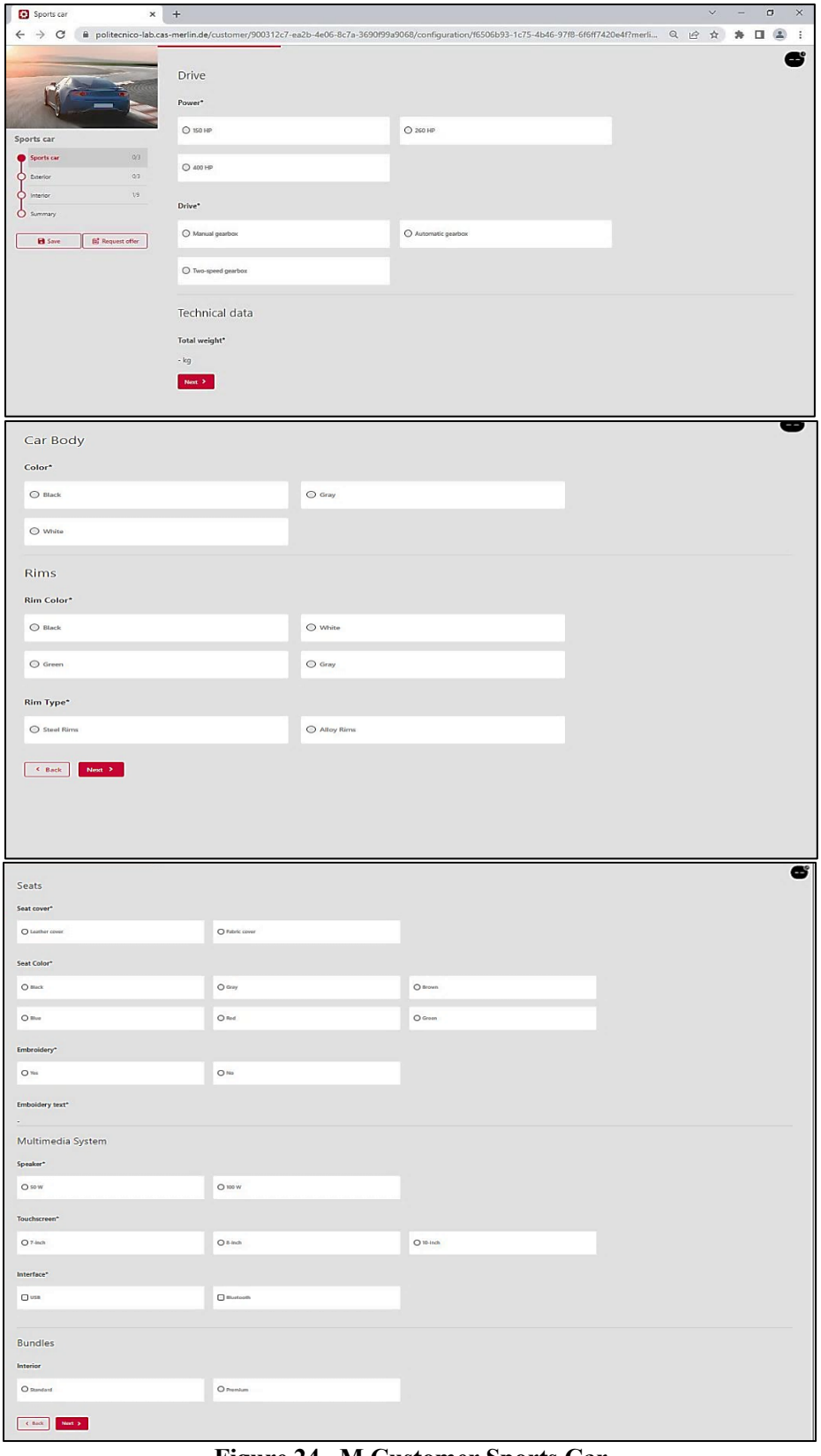

Figure 24. M.Customer Sports Car

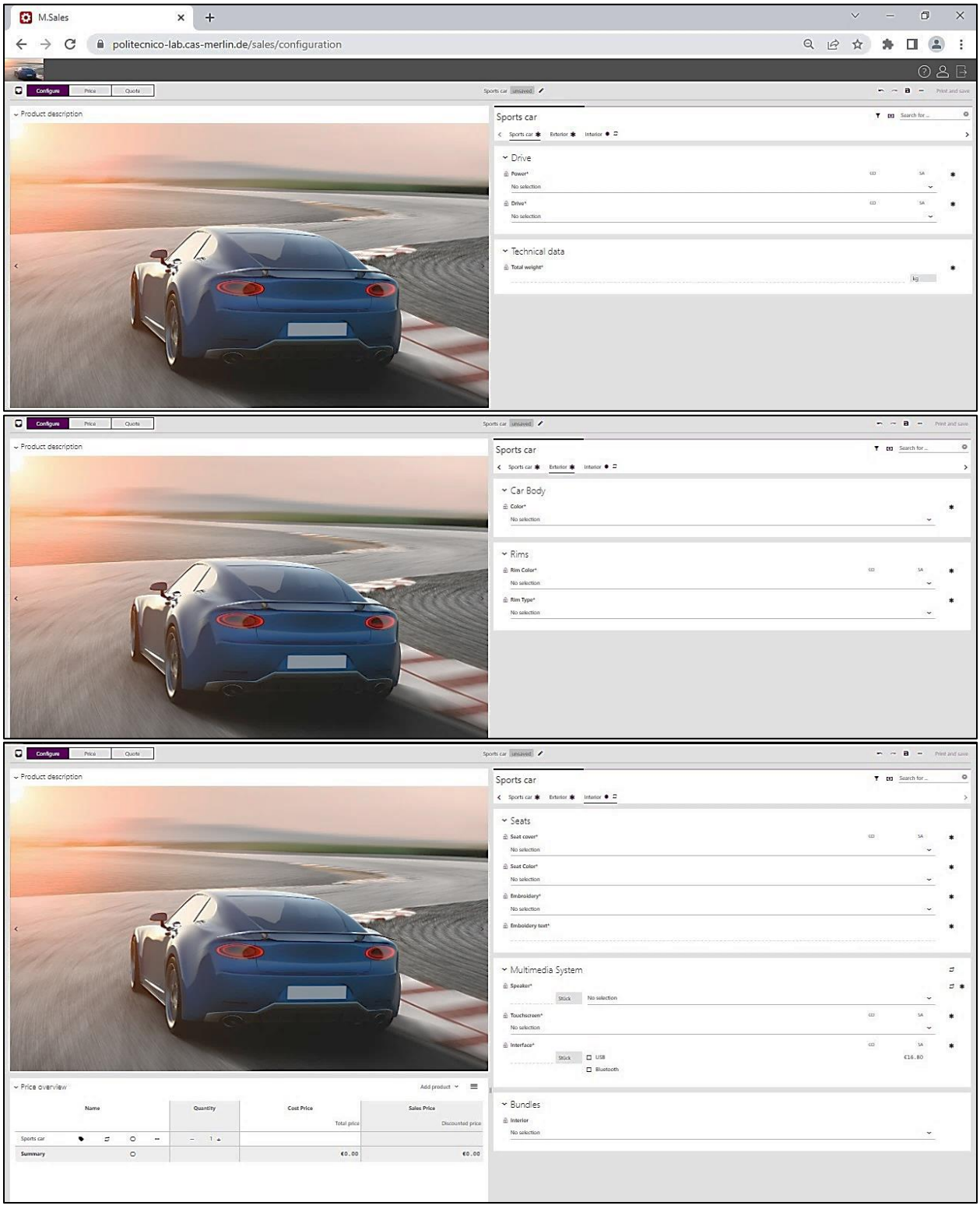

Figure 25. M.Sales Sports Car

2. A Comprehensive Guide to CRM Implementation with Cas genesisWorld

2.1 Creating Contact (The customer)

To do this, first, you must log in with your user account. Open the Contact Application from the Apps area and click on Plus and choose "**Create individual Contact**".

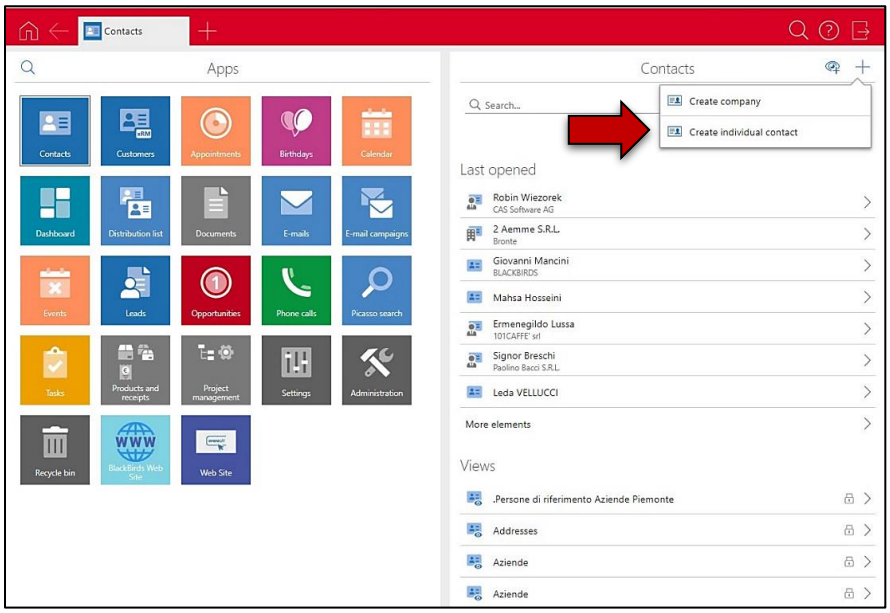

Figure 26. Web Client. Contact Creation.

Now you must enter all the information about the customer to create it on the CAS genesisWorld.

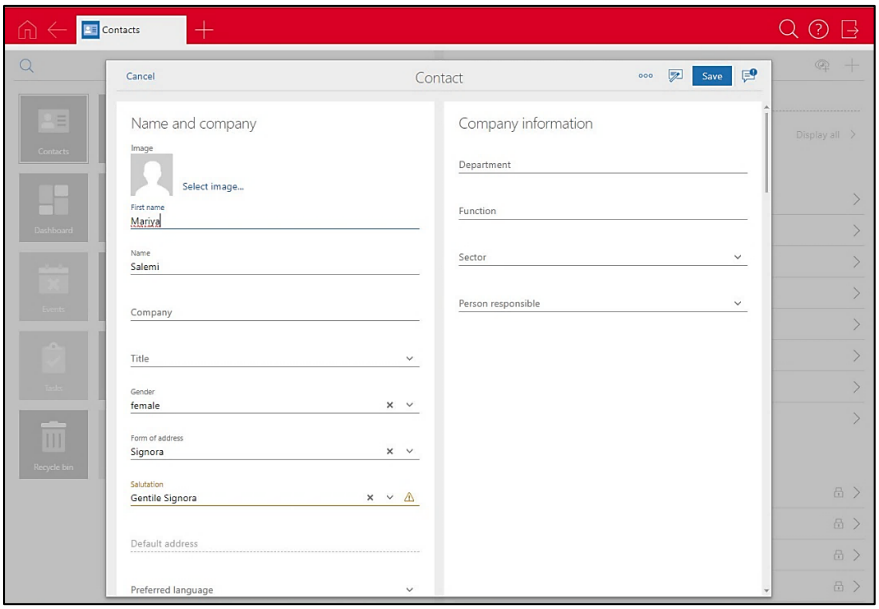

Figure 27. Contact Person on CAS genesisWorld.

3. Streamlining Sales Quoting Process with CAS genesisWorld CRM Software: A How-to Guide"

Now, we will make a sales module by creating an opportunity for sales in the CAS CRM for the customer by right-clicking on it and creating it immediately:

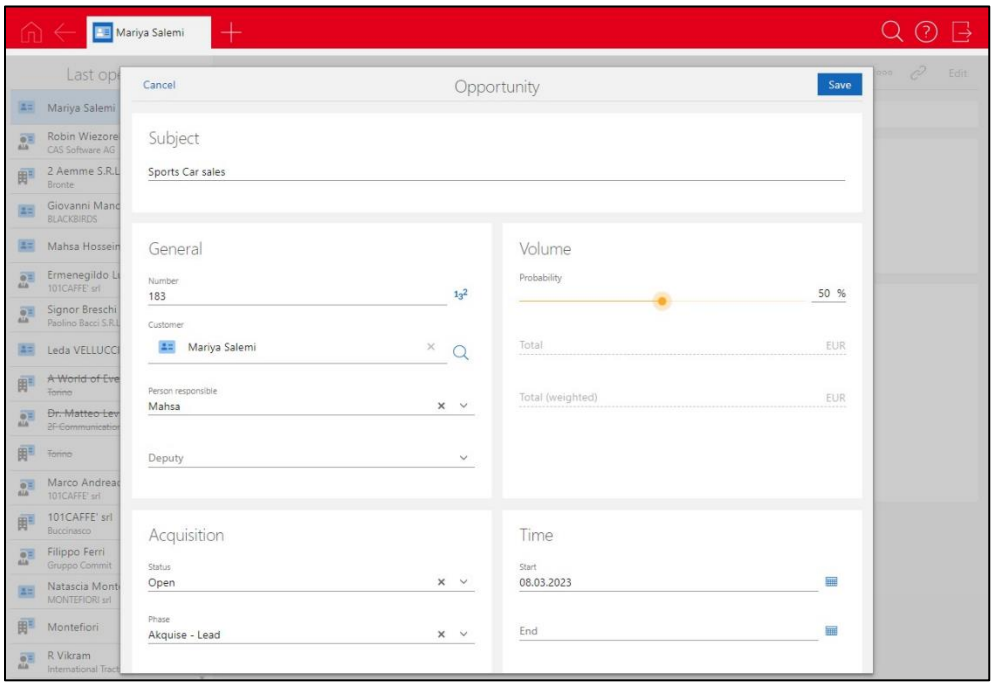

Figure 28. Opportunity Sales on CAS CRM

After creating the opportunity sales, we can see the Quote on M.Sales in the Opportunity tab of the customer:

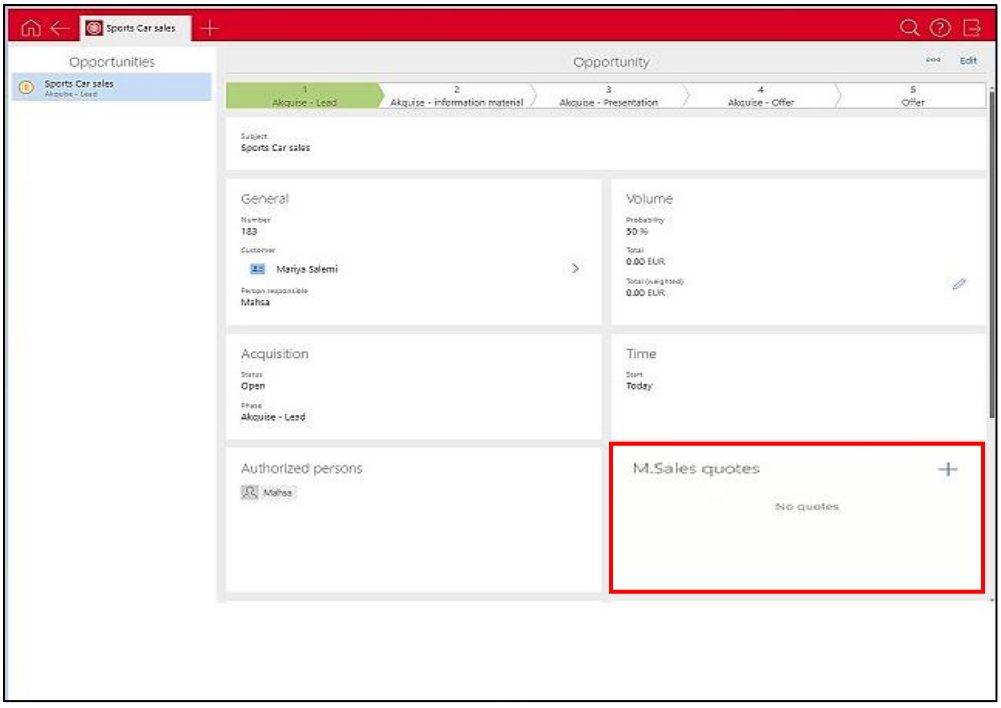

Figure 29. M.Sales Quotes on CRM

From here you can directly go to the M.Sales and create a quote. After choosing the plus icon you can see that it will go directly to the page for creating a new quote. This is how they integrate.

Figure 30. Start Page of M.Sales

In M.sales you can as the seller configure the car as your customer wishes, then on the Price tab and see the Price detail on a specific table. You can see this table in Figure 31 below:

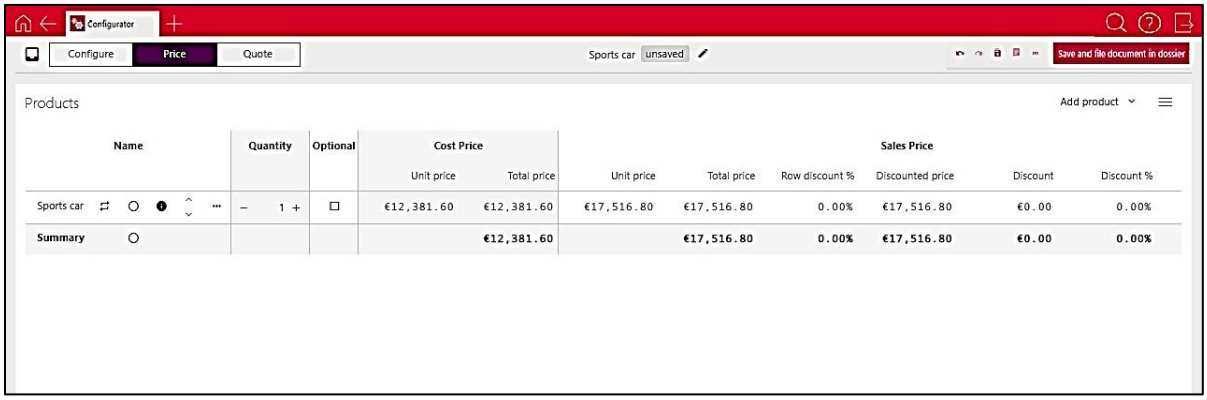

Figure 31. Price Table on M.Sales

Finally, you can produce the Quote to send to the customer on the next Tab. You can see the example in Figure 32 below:

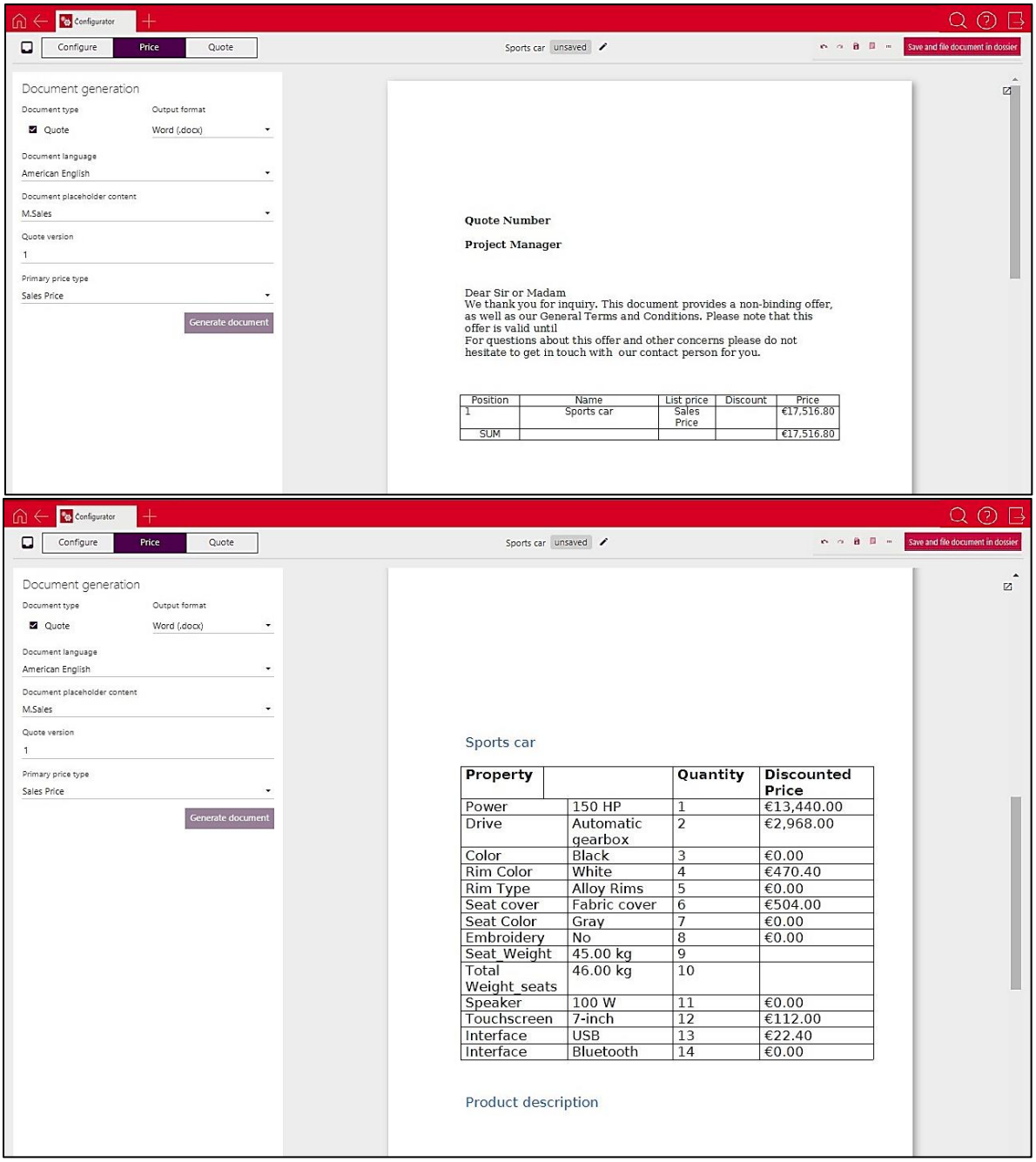

Figure 32. Quote on M.Sales

After checking the quote and prices you can click on the "Save and file document in the dossier" and finally you can see the details on the Quote box on CRM:

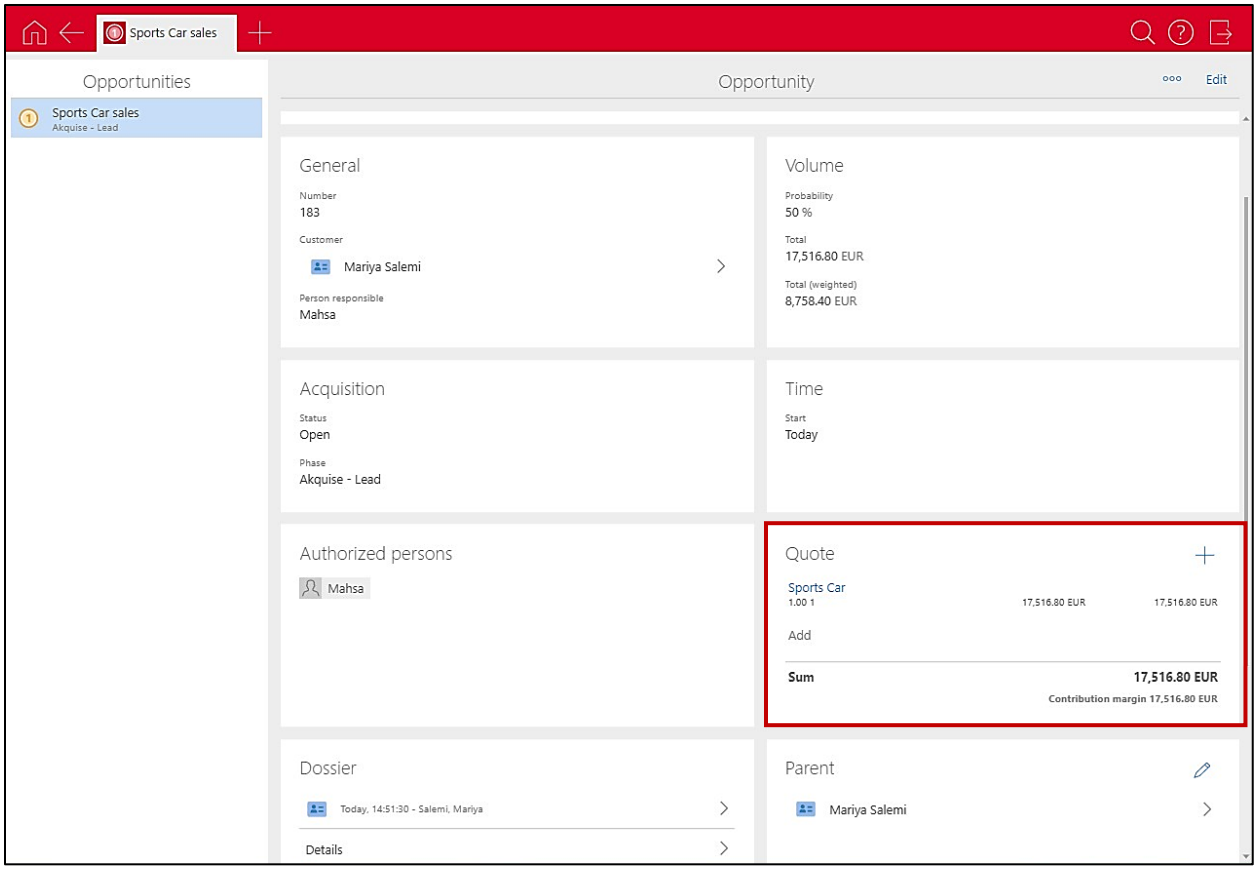

Figure 33. Quote Created on CRM after Configuration

As it reveals, the quotations are based on technical rules and this process is also timesaving. This combination enables you to create an efficient sales process from the first contact to quote generation for complex products. The process offers an automatic data exchange.

Chapter 5 : Industry 4.0 Key Performance Indicators for Analyzing Software Adoption in Organizations

This chapter discusses the spreading of both software in companies and their effectiveness in the concept of Industrial 4.0 in different stages, considering some important KPIs; product configurators are considered **cutting-edge technology** for most organizations (CPQ) and CRM is considered a **technology** that helps manage the entire customer information and interactions to build and maintain superior customer relationships (Inc, n.d.). By these KPIs, it is possible to evaluate the emergence of the two software, their effectiveness, and their success to achieve the result. The first step is to know better the stages of the adoption. In this paper regarding the "innovation adoption stages", the technology of product configuration process and CRM are considered as technology innovation. The software has become a critical component in achieving automation and efficiency in the industrial sectors. The main part of this chapter is to list the Industry 4.0 Indicators and check their performance in different organizations to get deeper sight

into the CRM and Product Configurator process evaluations in the presence of the same Industry 4.0. Let us start with the definition of adoption stages to better understand the progress.

1. Stages of the Adoption

The swift progress of technology is leading to the rapid adoption of digital transformation across various organizations. This has resulted in significant changes to their business models, production processes, and corporate governance methods (Celbert Himang Lanndon Ocampo Jun-Jun Obiso Miriam BongoShirley Ann Caballes Dharyll Prince Abellana Custer Deocaris Rosein Ancheta, received: 5 February 2019 accepted: 15 June 2020). To keep up with this pace of change, companies must make informed decisions about adopting solutions. Therefore, organizations with strong capabilities are better equipped to identify the impact of digital transformation on their business models and leverage insights gained from their initiatives (OECD, 2005). In this paper, we use the adoption stages which Himang and his colleagues used in their research in 2019-2020, to start, there is a rapid definition of each stage to have a clear image of each stage.
The three stages of adoption are:

- Pre-Adoption Stage
- Adoption Stage
- Post-Adoption Stage

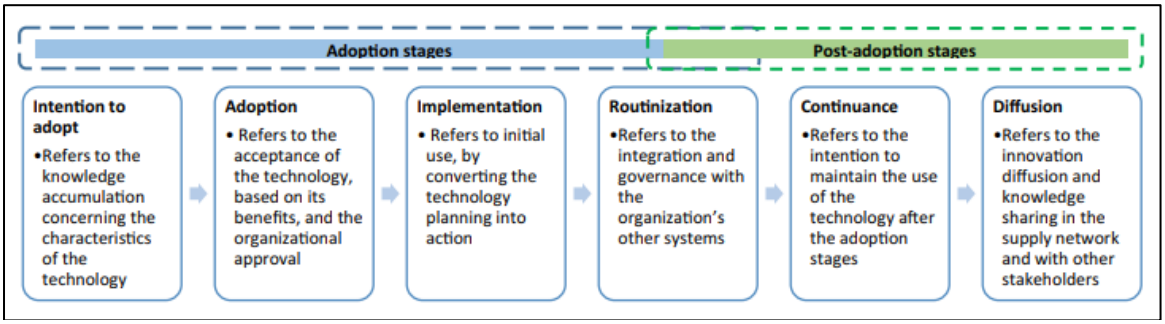

Figure 34. Adoption Stages of Industry 4.0 Technologies

According to (Machado, 21 September 2022) two adoption Stages consist of sub-stages which are revealed in Figure 34, and they are integrated.

1.1 Pre-Adoption Stage

The pre-adoption stage involves the previous conditions for adoption, knowledge or awareness, and the perception of the potential adopter by acquiring more profound knowledge. If potential adopters positively perceive the technology during this stage, they are more likely to move to the next stage of the adoption process, which is the decision stage. Conversely, if they negatively perceive the technology, they are more likely to reject it and not move forward with adoption. The initiation (pre-adoption) stage according to (Press, 01 Dec. 2015), reflects the activities related to recognizing a need, searching for solutions, acquiring knowledge or awareness of existing technology, forming an initial attitude towards it, and proposing technology for adoption.

perceived usefulness, perceived ease of use, relative advantage, trialability, observability, compatibility, and complexity, are indicators strongly supported in the literature and related to the perception of potential adopters (Rogers 1995).

1.2 Adoption Stage

According to (Miranda, 2016) the adoption stage encompasses the period, in which the decision unit is engaged in activities that lead to the choice to adopt or reject the technology, otherwise known as the decision stage. In this stage, the organization should decide whether to accept or reject it. In other words, it comprises activities (e.g., financial, technical, and strategic) that evaluate the readiness of systems to implement Industry 4.0 in an organization (Hameed, 2012). Organizations must also have the technical capability to evaluate these technologies (Boh, 2014), for this reason, it is crucial the indicators of the organization evaluate the readiness of Industry 4.0 in this stage (Hameed et al., 2014). In this stage (Manral L. , 2010) says that e level of customer interaction is a critical determinant of organizational performance; thus, also important for the adoption decision.

1.3 Post-Adoption Stage

The post-adoption stage occurs when a decision unit puts the technology into use (Rogers, 1995) and is also important for organizations to ensure that the technology is being used effectively and efficiently and is the stage of implementation by evaluating the advantages and disadvantages. In the case of the I4.0 adoption, it is a necessity to ensure open access to critical technologies, such as IoT, CPS, smart manufacturing, and cloud computing (Priyadarshinee P. R., 2017). An organization that implemented Industry 4.0 is expected to have a system that is adaptive by plug and-work mechanism (Monostori, 2016), autonomous (Letia, 2018) decentralized (Terziyan, 2018), dependable (Alguliyev, 2018), interoperable (Priyadarshinee P. R., 2017), remote monitoring and control (Sung, 2018).

Other strategic activities, such as the formalization of systems development (Mathiassen, 2007), knowledge transformation (Chor, 2014), customer co-creation (Sung, 2018), intense research and development (Chor, 2014), and partnership establishment (Priyadarshinee, 2017), are also considered as indicators of this post-adoption phase.

2. The Significance of the Post-Adoption Stage

After defining each stage of the technology adoption for an organization depending on Himang and his colleagues' research, the next step is to choose which stage is more accurate to use the related Indicators of that stage. The Post-adoption stage is a suitable stage to analyze the indicators of Industry 4.0 when evaluating whether a particular technology or system, such as Customer Relationship Management (CRM) and Product Configurator process, is part of Industry 4.0 or not. (Everett Rogers, 2003) says this is because the Post-adoption stage is when organizations have already implemented the technology and are looking to improve its performance and integrate it with other systems and processes.

In this stage, organizations are likely to be more aware of the potential benefits of Industry 4.0 technologies and are actively looking for ways to incorporate them into their existing systems. Therefore, analyzing the indicators of Industry 4.0 during the Post-adoption stage can help determine whether a particular technology, such as CRM and Product Configurator process, is compatible with Industry 4.0 or not.

Furthermore, Industry 4.0 is characterized by the integration of physical and digital systems (Schwab, January 2016), the use of data and analytics to drive decision-making, and the automation of processes (Lefebvre, 2016). By analyzing the indicators of Industry 4.0 during the Post-adoption stage, organizations can determine whether the CRM system meets these criteria and is truly part of Industry 4.0 or not. This analysis can also help organizations identify areas for improvement and determine how they can further integrate Industry 4.0 technologies into their CRM system to improve its performance and achieve better outcomes.

At the Post-adoption stage, organizations have already implemented the technology and are now seeking ways to improve its performance and integrate it with other systems and processes. The analysis of the KPIs in this paper will be done at this stage.

3. KPIs (Key Performance Indicators)

3.1 KPIs Definition

Depending on (QLik, 2022) a key performance indicator (KPI) is a quantifiable measure of performance over time for a specific strategic objective and (Norton, 1996) describes it as a subset of indicators that are more specific and directly tied to strategic objectives. Business leaders and senior executives use KPIs to judge the effectiveness of their efforts and make better-informed decisions.

KPIs should have 4 important features which we mention here from (company, n.d.), SMART is an acronym that stands for Specific, Measurable, Assignable, Relevant, and Time-bound. Each of these criteria can help you set strategic goals and improve your business performance.

- **"S"** stands for Specific: The power of creating **specific** goals is that they drive action.
- **"M"** stands for Measurable: When you measure a goal, you can quantify its progress and see whether you've achieved anything. Measurable goals are also motivating goals.
- **"A"** stands for Assignable: Goals and the metrics that measure them should be assigned to one person who can then make decisions, direct the efforts of the team, and follow up to make sure progress is being made.
- **"R"** stands for Relevant: To meet the fourth "**SMART**" goal criteria, you may need to do some soul-searching because relevance is all about the big picture.
- **"T"** is for Time-bound: When you don't have a deadline attached to your goals, it can be easy to put off the work required to achieve them.

3.2 Innovation Indicator Publications at the Industry Level

The manufacturing industry, which has been studied the most, has a score of 74%. The huge amount of research on innovation indicators in the manufacturing industry underlines the

interest in the evaluation criteria for innovations at the company level. The remaining industries account for 1–4% of the relevant publications. These other studied industries are usually situated in the service sector. The data show a shift from manufacturing to the service industry (Marisa Dziallasa, 09 July 2018.). This shift could have resulted from specific trends, such as digitization, big data movement, and the need for companies to focus on services for customers to be successful in the market (Christiane Hipp, 2005).

3.3 Importance of Measuring KPIs

For most companies, the design and implementation of indicators are deemed crucial for better management and control of emerging concepts and ideas regarding digital technologies. Furthermore, indicators are significant for an appropriate and efficient allocation of resources, and assessment of performance at a specific innovation stage. (Marcello Bragliaa, 2022). A performance measurement system is important. It consists of a set of procedures and indicators that precisely and constantly measure the performance of activities, processes, and the organization as a whole, and is a vital aspect regarding the management of companies (Andy Neely, 2005), (Parmenter, 2007) connected a performance measurement system with key performance indicators (KPI) and they are defined as a set of measures that focus on the main critical activities. KPIs are not only financial but also non-financial indicators that organizations use to estimate and define how successful they are, aiming at previously established long-term lasting goals. (Velimirović Dragana, 2011).

3.4 The Dimensions of Indicators

The dimensions of indicators are as follows (Clemens Lohman, 2004) summarized after (Zorzut, 2009) :

- The **name** of the indicator.
- **Objective**: Describe the meaning and purpose of using the indicator so that the user knows what a particular indicator represents.
- **Unit of measure**: this is the metric used to calculate the indicator.
- **Scope**: Defines the range in which the indicator values may be located.
- **Level:** which level in the hierarchy of implementation priorities does the indicator belong to?
- **The frame (retaliation):** determines how far the company wants to go by measuring the indicator (e.g., production line, plant, individual machine, ...).
- **Measurement type**: absolute or recalculated; the indicator can indicate the total quantity or the calculated quantity and for this research, it is done with the survey of 5-scale and short answer questions.
- **Period:** the period of tracking and calculating the indicator (e.g., week, day, shift).
- **Sources of data:** which data are needed to calculate the indicator, where they are captured/measured, and who is responsible for them.
- **Owner:** Each indicator also has its administrator, who is responsible for its calculation, as well as evaluating and making decisions based on the information obtained.

3.5 Indicators of the Industry 4.0 Implementation

This section illustrates how to establish the final list of indicators by way of a comprehensive review of related literature and demonstrates the applicability of the list by conducting relevant case studies (Celbert Himang, June 2020).

3.5.1 The Benefits of KPIs' Implementation

Depending to (Simona Šarotar Žižek, 2020) some of the benefits of implementation of Indicators are mentioned below:

- A more precise standardization of the work of employees, which would be the basis for achieving a higher level of productivity and establishing a reward system or rewarding the performance of employees, would positively impact the motivation and commitment of employees.
- More efficient exploitation of production facilities, as one would have precise data on capacity utilization or availability of equipment.
- More precise planning of production would lead to improvement in the achievement of the agreed delivery times/equipment of the product, as it would be possible to specify the maximum production capacities, which could also be timed.
- Realizing the company's default strategy - i.e., transition to Industry 4.0, which would be reflected in digitization and automation.

KPI performance measurement importance could also be expressed by the next statement: KPI tells you where performance has been in the past, where it is now, and perhaps more useful, where performance is likely to be in the future (Smith, 2001).

3.5.2 Categorization of the Industry 4.0 Indicators

The indicators are categorized into four clusters driven by the categorization provided by (Rita Rahayu, 3 July 2015) which are technological, organizational, environmental, and individual. Moreover, (Lanndon Ocampo, 2021) categorizes the Industry 4.0 indicators depending on Rita Rahayu and Day into 4 categorizations which are (i) technological, (ii) organizational, (iii) inter-organizational, and (iv) social and regulatory. For this paper, the choice of indicators will be concerning these four clusters. First, for the sake of clarification, a brief description for each category is provided:

(i) **Technological indicators**: Technological indicators are focused on the technical capacity of Industry 4.0 and are used to measure them. They are valuable to determine the level of sustainability and allow comparisons between products, processes, companies, sectors, or countries, and help to assess the level of use (Che B. Joung J. C., January 2013). Lanndon Ocampo believes that the characteristics of the key technologies of Industry 4.0 are such as CPS, IoT, cloud computing, and smart manufacturing and are crucial in that they can be used to empower the production economy as well as manage operational processes. Examples of these

indicators are the “Compatibility” indicator which measures the degree of perception to usually consider the adoption of new technology when technology is recognized as compatible with work application systems or the “Degree of integration” which is the extent of integrating technology into an organization for effective and diffused use of technology and getting management to the established standards.

(ii) **Organizational indicators:** In the context of Industry 4.0, organizational indicators impact the shape of manufacturing and service systems through various manufacturing capabilities, which have a direct bearing on organizational performance (Roberto Chavez, February 2017). The measurement is a base for continual improvements in organizational performance that is one of the most important management principles (Dragana Velimirovića, 2010). The reduction of costs is an important indicator in Industry 4.0 adoption, which is one of the organizational KPIs and will be assessed for both software to realize the firm's economic objectives. A major organizational challenge in implementing Industry 4.0 is the lack of expertise in adopting new business models. To overcome this, organizations need a clear strategy to improve their skills and effectively embrace new technologies and ways of doing business (Castells, 2017) 1–6). On the other side, based on Lanndon Ocampo’s paper, information-related indicators like the “knowledge transformation” indicator are also crucial because of managerial decision-making responsibilities to fulfill the goal of the company. Knowledge is contextual information and experience from experts.

(iii) **Inter-organizational indicators:** partners (Worarat Krathu, 2013). For this type of indicator Lanndon Ocampo considers “the geographical location of the organization” (Manral L. , 2010) for three fundamental reasons: First, firms station themselves approximately to their customers and suppliers to minimize logistical costs of inputs and final products; second, firms locate closer to acquire labor market information; and third, firms group to increase knowledge transfer of workers (Marshall). Moreover, the Reputation of suppliers is a perceptual representation of an organization's past actions and prospects. The “partnerships” of suppliers are valuable strategies for obtaining stability and a “level of competitive pressure” (Priyadarshinee, P.R. 2017).

(iv) **Social and regulatory indicators:** These indicators determine the performance of an organization through interaction with external sources and the environment (Lanndon Ocampo)due to social well-being (Chun-Cheng Lin, 2016), activities on customers and the community (Che B. Joung J. C., 2013), level of customer interaction and customer co-creation (Sung, T.K) and the number of external information sources (Anand Jeyaraj, 2006). They utilize Industry 4.0 technologies particularly Big Data and IoT (Tan & Wang, 2010).

3.6 Methodology of Selecting Indicators and KPIs

First, choosing KPIs is essential to figure out whether they are reaching the goals and second, KPIs should measure your most essential indicators (Mawhinney, 2022). The methodology of identifying and selecting the appropriate Indicators and KPIs in this paper is described below in four different steps:

- **Understanding of Industry 4.0 Principles:** The very first step to start is to understand what the characteristics of Industry 4.0 are, such as connectivity, interoperability, data-driven decision-making, and autonomous systems and to choose the best KPIs it is essential to understand what Industry 4.0 does exactly is. This foundational knowledge will guide the selection of relevant KPIs.
- **Finding a source of Industry 4.0 Indicators:** After realizing the characteristics of Industry 4.0 in the first step, the second step will be done by searching the sources due to find a drop-down list of Industry 4.0 indicators which would be a base for choosing the appropriate and more precise KPIs. For this step, the Journal Article of Lanndon Ocampo was published on the "World Scientific" website. There are the tables of Industry 4.0 Indicators and their roles in strategy formulation and for this paper the indicators are selected from these tables.
- **Identifying Industry 4.0, product configurator, and CRM Objectives:** We tried to find the specific Industry 4.0 objectives for CRM and Product Configurators which can be analyzed in any organization. For instance, in CRM, the objective of integration of CRM systems with other Industry 4.0 technologies such as Internet of Things (IoT) devices to view customer interactions and preferences, or the other objective would be management and optimization of the sales cycle and streamline business processes. on the other hand, for the product configurator context, the objective is to provide customers with the ability to configure products according to their unique preferences, needs, and specifications, resulting in tailored products that meet individual requirements. Industry 4.0 aims to leverage it to enable mass customization and personalized product offerings.
- **Selecting the Indicators and then KPIs**: This step is done after analyzing three other steps. This stage will be completely explained.

4. Selection of Indicators and KPIs of Industry 4.0

4.1 Which Indicators and KPIs

After analyzing the Industry 4.0 indicators based on the methodology of part 3.6 of Chapter 5, a list of them is provided to analyze both CRM and product configuration, some of these indicators are considered for both software. The indicators facilitate two different strategies, "business strategy" and "corporate strategy". Each Industry 4.0 Indicator focuses on one of these functional strategies or both. In the case of supporting both strategies, it means that two functional strategies should be considered complementary. The business-level strategy focuses on how an organization differentiates itself from its competitors to attract, retain, and deepen

relationships with its target customers (Burlton, 01 January 2010). corporate strategies are concerned with the principal policies and plans of the organization that ensures its success as a whole (Ting, 2004). The following parts will describe the indicators and their KPIs and the reason for selecting them, separately.

4.2 Indicators and KPIs For Product Configuration

This part contains indicators and KPIs to analyze product configuration processes in organizations:

4.2.1 Customer Co-Creation Indicator

Objective: As it is mentioned before "the dimensions of indicators" describes the meaning and purpose of using the indicator so that the user knows what a particular indicator represents.

The first Industry 4.0 Indicator which is the Customer Co-Creation is considered a social and regulatory indicator category which means the social well-being of an Industry 4.0 adopter can be measured by this indicator. In a newly emerging Co-Creation paradigm, customers are central and vital participants in the NPD(New Product Development) process and, in some cases, can create new products with little help from firms (Matthew S. OHern, 2010). So, it is possible to say, Product configuration can be considered a form of "customer Co-Creation" which is defined as a collaborative NPD (New Product Development) activity in which customers actively contribute and/or select the content of a new product offering, known as "Co-designing", which is one of the four types of Customer Co-Creation (Matthew S, OHern, 2010). This approach should dramatically reduce a firm's cost of developing its own original designs or creative content, as this function is largely outsourced to customers, also firms should reduce their cycle times and launch new products more quickly compared to traditional NPD processes (Matthew S, OHern, 2010), co-designing should allow a firm to attain higher levels of customer satisfaction and commitment (Guido Hertel, 2003), in addition, by subjecting designs to prelaunch evaluation by a large network of customers, co-designing should reduce the risk of product failure (Ogawa, 2006).

Sources of data: For this indicator, the sources of data are Marketing, Engineering, and R&D., and

Responsible person: For this indicator, each company will be asked during a survey who is going to answer the analysis parts.

Measurement Type: The survey with 5-scale and short-answer open questions.

Based on what is mentioned it is possible to define the KPIs for this Indicator:

KPI 1: Customer Participation: Measuring customer participation is essential for understanding the level of customer engagement and involvement in the business.

Scope: The scope of this KPI is based on the average order processing and delivery time of each company, the number of customers you complete the process successfully and.

Units of measurement: Units of measurement are the metrics to evaluate the KPI, the metrics for this KPI includes:

- ✓ *The speed of the orders:* The metric "speed of the orders" describes the measure of the time for a customer to place an order and its influence on the time to verify the order details, manufacture or assemble the customized product, and deliver it to the customer.
- ✓ *Percentage of customers who complete the orders:* This metric measures the percentage of customers who can process and complete the orders till the end of submitting the order without failing. The benchmark for this metric is around 70% or higher.
- ✓ *Cycle time of market research:* The cycle time of the market is considered as the time for product specifications from the market research. This metric shows how the customers could help the company to get market demand information and more attractive or useful specifications of the products they produce.

KPI 2: Cost of developing original designs: Potential cost savings that can be achieved by using the product configuration process instead of investing in the development of unique and custom designs from scratch.

Unit of measure: The unit of measuring this KPI is the cost of developing the original designs. As (Matthew S, OHern, 2010) says because customers actively assist a firm by both contributing new content and selecting the content that should appear in future product releases.

The scopes to be considered for this unit of measure are:

- ✓ *Design Development Costs:* This includes direct costs associated with design activities, such as salaries and wages of design team members, design software and tools, prototyping materials, and any external design services or consultants engaged for the project.
- ✓ *Research and Conceptualization Expenses:* They encompass the costs related to research, market analysis, brainstorming, ideation, and conceptualization stages of design development. This may involve conducting user research, trend analysis, market surveys, and other activities aimed at generating innovative design ideas.
- ✓ *Overhead and Support Costs:* This covers indirect costs that support the design development process, including administrative expenses, utilities, facility costs, and other overhead expenses directly attributable to the design team's operations.

KPI 3: Time Cycle: The Time Cycle refers to the duration it takes from the initiation of a product's development process to its final launch in the market.

Unit of measure: The time cycle for launching a new product by 20% to 30% compared to the traditional "New Product Development"(NPD) process of the company.

Scope: The scope is the range and boundaries within which the duration of a process or task is measured, including the start and end points. This research will be considered just the average time cycle for each company.

KPI 4: The level of Customer satisfaction and commitment: How the product configuration has influenced customer satisfaction by providing a personalized experience, meeting their specific needs, and fostering an emotional connection and how the customer committed to the brand or company and are more likely to be satisfied with their product configurations.

Units of measure:

- ✓ *The number of satisfied customers:* This metric shows the average number of customers satisfied with the final product and commitment according to the feedback.
- ✓ *Repeat purchase rate:* The percentage of customers who make repeat purchases in a period.

Period: The period of this KPI is within a year.

KPI 5: Product Failure Risk: Product failure risk refers to the likelihood of a product not meeting customer expectations, underperforming, or encountering significant issues.

Units of measure:

- ✓ *Potential final product failures:* It evaluates the extent to which the product configurator affects the risks of product failures that do not meet the customer's expectations or requirements.
- ✓ *The impact rate on potential failures:* This measurement evaluates the influence and effectiveness of the product configurator in accurately capturing all the required information and constraints, including compatibility requirements, during the configuration process. It assesses how well the configurator minimizes the risk of errors, inconsistencies, and failures in the resulting configurations. A higher impact rate indicates a configurator that successfully mitigates potential failure risks.

Period: The period considered for this KPI is a year.

4.2.2 Reason to Choose the Customer Co-Creation Indicator

The main question would be, why choose the Customer Co-Creation indicator to analyze the product configuration process? The reasons to choose this indicator are listed below:

- Customer Co-Creation, where customers actively participate in designing and customizing products, aligns perfectly with this customer-centric approach. By analyzing the level of customer co-creation in a product configuration software, you can determine the extent to which it embraces Industry 4.0 principles.
- Use of the Customer Co-Creation indicator empowers customers to design products that meet their specific needs, preferences, and requirements. By assessing the presence and effectiveness of the Customer Co-Creation indicator in the product configuration

process, you can evaluate whether it enables a high level of customization and contributes to an enhanced customer experience.

- With the Customer Co-Creation indicator, it is possible to generate valuable data and feedback from customers, providing insights into their preferences, design choices, and requirements. By analyzing the data collected through the Customer Co-Creation activities in the product configuration process, it is possible to leverage this information for data-driven decision-making, aligning with Industry 4.0.
- Organizations with Customer Co-Creation involve customers in the product development process, leveraging their ideas and creativity. Analyzing the extent of the Customer Co-Creation in the product configuration process allows the organizations to assess whether it promotes collaborative innovation and facilitates the exchange of knowledge and ideas between customers and manufacturers.

Choosing the Customer Co-Creation indicator to analyze the alignment of the product configuration process with Industry 4.0 provides a strong rationale. Evaluating the presence and effectiveness of the Customer Co-Creation indicator within the product configuration process will help to determine its compatibility with Industry 4.0 principles and identify areas for improvement.

4.2.3 Knowledge Transformation Indicator

Objective: The knowledge Transformation indicator is the ability to gather, understand, use, safeguard, and share information effectively. It is measured by the number of new product ideas or projects initiated by an organization. (George, 2002) This indicator is from the "organizational" category and deals with business strategy which means how an organization differentiates itself from its competitors to attract, retain, and deepen relationships with its target customers. It is considered a KPI for this research.
Source of data: The sources of data for this indicator are Engineering and R&D.
Responsible person: Each company will be asked during a survey who is going to answer the analysis parts.
Measurement Type: The survey with 5-scale and short open questions.
Units of measure: To evaluate the units of measurement for this KPI, the 6 dimensions of absorptive capacity by Zahra and George (2002) in the context of Knowledge transformation are included and for evaluating the product configurator two of them are picked. To understand more the six dimensions are listed below:

1. Acquisition: The ability to identify and access external knowledge sources.
2. Assimilation: The ability to understand and interpret the acquired external knowledge and connect it with the organization's existing knowledge base.
3. Transformation: The ability to modify and reconfigure the organization's existing knowledge structures based on the newly acquired knowledge.

4. Exploitation: The ability to apply and utilize the transformed knowledge to enhance performance, innovate, and create value.
5. Protection: The ability to safeguard and protect the acquired knowledge from leakage or appropriation by external entities.
6. Dissemination: The ability to effectively distribute and share knowledge within the organization to facilitate learning and collaboration.

The metrics are listed below:

- ✓ *The level of External knowledge-seeking (Acquisition):* External knowledge-seeking refers to valuable information, insights, and expertise obtained from customers or external stakeholders through the product configuration process. By actively seeking and incorporating external knowledge, organizations can enrich their understanding of customer needs, preferences, and market trends, leading to improved product offerings and decision-making.
- ✓ *The level of learning and collaboration*(*Dissemination):* Facilitating the exchange of knowledge and ideas among employees, promoting a collaborative mindset, and fostering a culture of continuous learning and improvement.
- ✓ *The speed of Sharing and distribution of external knowledge:* The effectiveness of the product configuration process in facilitating the rapid exchange and distribution of external knowledge related to the product.

Period: The period for evaluating this indicator is a year.

4.2.4 Reason to Choose the Knowledge Transformation Indicator

The reasons to choose this indicator are listed below:

- The product configuration process requires making informed decisions about product features, options, and customization. Organizations can effectively manage and utilize knowledge resources to support decision-making processes by leveraging knowledge transformation. By leveraging knowledge transformation and advanced technologies, organizations can streamline decision-making, reduce errors, and enhance the overall efficiency of the product configuration process.
- Knowledge is an asset in the era of Industry 4.0. The effective transformation of knowledge within an organization can optimize its knowledge economy. This involves leveraging knowledge to enhance performance, productivity, and competitiveness. By applying knowledge management principles and practices, organizations can capture, organize, and distribute knowledge related to the product configuration process.

4.2.5 Financial Evaluation Indicator

Objective: With this Indicator, it is possible to focus on the financial performance of the company. It has two key performance indicators (KPIs) which are Return on Investment(ROI) and Gross Margin Ratio. These two KPIs are selected from a list of 50 Finance Indicators provided by (Boucher, 2023). This indicator is different from the other

two indicators because it deals with both “Business Strategy” and “Corporate Strategy”. It is from the “Organizational” category.

Source of data: The source of data for this indicator is Finance.

responsible person: For this indicator, also like the other indicators each company will be asked during a survey who is going to answer the analysis parts.

Measurement Type: The survey with 5-scale and short-answer open questions.

KPI 1: ROI (Return On Investment): ROI is an “Investor KPI” and it measures how much money the company made compared to the investment.

Units of measure: The measurement of this KPI is acquired from its Formula which is :

The formula is: ROI = (Net Profit / Total Investment) x 100

Net Profit = Total Benefits - Total Costs

Total Investment = Costs of Implementation or Cost of Investment

Calculate the net profit by subtracting the total costs from the total benefits. Then divide the net profit by the total investment and multiply by 100 to get the ROI percentage.

But instead of putting the numbers for each metric they will be evaluated with a survey and some questions which will be completely described in the next chapter.

So, considering the ROI formula the list of metrics will be as below:

- ✓ *The total cost of producing:* It evaluates the "Total Investment" component of the ROI formula. It assesses the expenses incurred during the implementation of the product configurator.
- ✓ *The cost savings:* It evaluates the positive financial outcomes or gains resulting from the implementation of the product configurator.
- ✓ *The sales revenue*: It is related to the "Net Profit" component of the ROI formula. It focuses specifically on the impact of the product configurator implementation on sales revenue.
- ✓ *The profitability:* It evaluates the cost savings achieved by utilizing the software to enhance operational efficiency.

Period: The period for evaluating this KPI is based on the company’s start time to invest in the product configurator.

KPI 2: Gross Margin Ratio: Gross Margin Ratio is also an “Investor KPI” and it is the profitability of the company’s product or services. For this indicator, the metrics are observed from the formula. The formula for Gross Margin Ratio is:

Gross Margin Ratio: (Total Revenue – Cost of Goods Sold)/Total Revenue

Units of measure:

- ✓ *The accuracy of cost estimation:* This metric is related to the "Cost of Goods Sold" component of the Gross Margin Ratio formula. By improving the accuracy of cost estimation, the software can help ensure that the costs associated with producing each product configuration are calculated more precisely.
- ✓ *Errors and inconsistencies in cost estimation:* Also, this metric is related to the "Cost of Goods Sold" component as well. By improving the efficiency and speed

of the cost calculation process, the software can help reduce the time and effort required to determine the costs associated with producing each product configuration.

- ✓ *Speed of the cost calculation process:* like the other two metrics above this metric is also related to the "Cost of Goods Sold" component. By reducing errors and inconsistencies in cost estimation, the software can contribute to more accurate calculations of the costs associated with producing each product configuration, ultimately impacting the gross margin calculation.
- ✓ *Ability to the cost calculation:* It refers to the "Sales Revenue" component of the Gross Margin Ratio formula. By providing real-time insights and data on sales prices, the software can contribute to a more accurate determination of the revenue generated from each product configuration.

Period: The evaluation period of this KPI depends on the frequent product turnover of each company.

4.2.6 Reason to Choose the ROI as a KPI

- With the Industry 4.0 technologies, including product configurator, there is often an expectation of improving cost efficiency. ROI helps evaluate whether the configurator is driving cost reductions by streamlining the configuration process, reducing errors, optimizing resources, or minimizing material waste.
- In the context of Industry 4.0, there are often multiple technology investments competing for resources. ROI enables decision-makers to prioritize investments based on their potential returns.
- ROI provides a quantitative value that can be easily understood and compared across different investments or projects.

4.2.7 Reason to Choose the Gross Margin Ratio as a KPI

- The implementation of Industry 4.0 technologies, such as product configurator software, enhances a firm's manufacturing capabilities. These capabilities, aligned with strategic goals, impact the firm's performance, including the Gross Margin Ratio. Accurate cost estimation, improved efficiency, error reduction, and pricing optimization, facilitated by the software, can positively influence the Gross Margin Ratio.
- Industry 4.0 aims also to optimize operations and enhance cost efficiency.)The Gross Margin Ratio helps identify the direct costs incurred in producing configured products.

4.3 Indicators and KPIs For CRM

4.3.1 Knowledge Transformation Indicator

Objective: This indicator is also useful to evaluate the CRM and as for the Product configurator it is also considered as a KPI for CRM. The number of new product ideas or

projects initiated by an organization and by applying the dimensions in the following questions to a CRM, a company can evaluate its absorptiveness.

Units of measure: To evaluate the units of measurement for this KPI, the 6 dimensions of absorptive capacity by Zahra and George (2002) in the context of Knowledge transformation are included.

To measure this KPI for the CRM all 6 dimensions are used as the metrics:

- ✓ *Level of seeking and gathering external knowledge (*Acquisition)*:* Refers to the ability of a company to identify and access external knowledge sources related to CRM. This could include gathering information about industry best practices, customer feedback, market trends, and emerging technologies relevant to CRM.
- ✓ *Level of sharing and distributing external knowledge(Assimilation):* Relates to the ability of a company to understand and interpret the acquired external knowledge and connect it with the organization's existing knowledge base. In the context of CRM, it involves integrating external knowledge into CRM strategies, processes, and customer insights to enhance customer understanding and relationship management.
- ✓ *Level of reconfiguration of the existing knowledge(Transformation):* Focuses on modifying and reconfiguring the organization's existing knowledge structures based on newly acquired knowledge. In CRM, this could involve adapting CRM systems, processes, and strategies to leverage the acquired knowledge and align them with the organization's goals and customer needs.
- ✓ *Level of application and utilization of the transformed knowledge(Exploitation):* Refers to the ability of a company to apply and utilize the transformed knowledge to enhance CRM performance, innovate customer engagement strategies, and create value for both the company and its customers. It involves leveraging CRM insights to drive effective sales, marketing, and customer service activities.
- ✓ *Level of safeguarded and protection(Protection):* Relates to safeguarding and protecting the acquired CRM knowledge from unauthorized access, leakage, or appropriation by external entities. This includes implementing data security measures, and privacy policies, and ensuring compliance with regulations like GDPR to protect customer data and maintain trust.
- ✓ *Collaboration and learning(Dissemination):* Focuses on effectively distributing and sharing CRM knowledge within the organization to facilitate learning and collaboration. This involves sharing best practices, CRM insights, and customer feedback across departments, encouraging knowledge sharing, and fostering a customer-centric culture.
- ✓ *The level of effectiveness on sales and marketing:* besides the 6 dimensions of absorptive capacity with the implementation of CRM in the company, the exploitation of the knowledge gained, how improves customer relationships, the effectiveness of sales and marketing, and fosters business growth.

Source of data: The sources of data for this indicator are Engineering and R&D.
Responsible person: Also, for this indicator, each company will be asked during a survey who is going to answer the analysis parts.
Measurement Type: The survey with 5-scale and short-answer open questions.
Period: The period for evaluating this indicator is a year.

4.3.2 Management Style Indicator

Objective: This Indicator or KPI is taken from the research of (Pragati Priyadarshinee, 2017), and it is a concept that is associated with the overview of new management practices, procedures, or structures proposed for future organizational goals (Saeed Khanagha, 2013). There is a significant relationship between management style and cloud computing adoption with different functionality characteristics which is suitable for CRMs. This indicator deals with "Business strategy", and it is from the "Organizational" category because it focuses on the aspects related to the internal functioning and structure of an organization, including its management practices, leadership style, decision-making processes, and organizational culture. Implementing CRM (Customer Relationship Management) in an organization impacts management style and learning routines, as well as resource allocation mechanisms within an organization. It helps to remove the inability to develop new capabilities and routines, the unwillingness to assign resources, and the limited motivation for experimentation and learning (Saeed Khanagha, 2013).
Units of measure: For this indicator, there are three metrics to measure:

- ✓ *Level of adaption and learning new routines(Adoption Rate):* The percentage of employees or users who have actively adopted and are regularly using CRM tools. This can be measured by tracking the number of employees/users who have logged into the CRM system and performed specific actions within a given time.
- ✓ *Level of facilitation of the adoption of new routines and practices:* The effectiveness of CRM training and onboarding programs in facilitating user adoption and utilization. This can be measured by conducting surveys or assessments to gather feedback from employees regarding their understanding of CRM, their proficiency in using them, and their overall satisfaction.
- ✓ *The level of Integration with workflow:* The integration of CRM tools into existing workflows and processes. This can be measured by assessing the level of integration between CRM and other business systems, such as marketing automation, sales enablement, customer support, or ERP systems.

Responsible persons: the Board, Executive administration, and IT administration.
Source of data: The sources of data for this indicator are Engineering and R&D.
Period: The period for evaluating this indicator is a year.

4.3.3 Reason to Choose the Management Style as a KPI

- Industry 4.0 emphasizes collaboration and integration across departments, systems, and functions. Assessing the management style can help identify if managers promote collaboration, knowledge sharing, and cross-functional cooperation which are the more organizational part of Industry 4.0.
- In evaluating the CRM in the context of Industry 4.0 it is not possible to ignore the changes in routines and management style of the organizations by using this technology. Therefore, it is better also to check this aspect and as it is obvious by implementing an Industry 4.0 in an organization the routines will be changed as it is obvious that an Industry 4.0 technology enables automation and optimization of routine tasks. This can lead to increased operational efficiency, reduced manual errors, and faster processes, and using it requires a skilled workforce with the ability to operate and manage these advanced systems. Therefore, if we want to check these routines the metrics of part 4.3.2 as unit measurements are critical to be evaluated.

4.3.4 Financial Evaluation Indicator

Objective: With this Indicator, it is possible to focus on the financial performance of the company with the CRM. It has two key performance indicators (KPIs) which are Return on Investment(ROI) and Average Deal Size. As for the Product configurator mentioned before ROI is selected from a 50 financial KPIs list by (Boucher, 2023), this is true also for the second KPI which is Average deal size. And as mentioned before this the Financial indicator deals with both "Business Strategy" and "Corporate Strategy" and it is from the "Organizational" category.
Source of data: The source of data for this indicator is Finance.
responsible person: For this indicator, also like the other indicators each company will be asked during a survey who is going to answer the analysis parts.
Measurement Type: The survey with 5-scale and short-answer open questions.
KPI 1: ROI (Return On Investment): ROI is an "Investor KPI" and it measures how much money the company made compared to the investment.
Units of measure: The measurement of this KPI for the CRM is the same process and metrics as the product configurator and is acquired from its Formula which is :
The formula is: ROI = (Net Profit / Total Investment) x 100
Net Profit = Total Benefits - Total Costs
Total Investment = Costs of Implementation or Cost of Investment
Calculate the net profit by subtracting the total costs from the total benefits. Then divide the net profit by the total investment and multiply by 100 to get the ROI percentage.
Therefore, considering the ROI formula the list of metrics will be as below:

- ✓ *The total cost of producing:* It evaluates the "Total Investment" component of the ROI formula. It assesses the expenses incurred during the implementation of the CRM.

- ✓ *The cost savings:* It evaluates the positive financial outcomes or gains resulting from the implementation of the CRM.
- ✓ *The sales revenue*: It is related to the "Net Profit" component of the ROI formula. It focuses specifically on the impact of CRM implementation on sales revenue.
- ✓ *The profitability:* It evaluates the cost savings achieved by utilizing the software to enhance operational efficiency.

Period: The period for evaluating this KPI is based on the company's start time to invest in the product configurator.

KPI 2: Average Deal Size: Average deal size is a key performance indicator used to measure the financial impact of sales transactions. It is a valuable tool for businesses, as it provides an overarching snapshot of how their products and services are doing in terms of sales volume, cost, and revenue growth (experts, 2023).

The formula for Average Deal Size is: Total value of all Deals/Number of Deals

Units of measure: The metrics to measure are as below:

- ✓ *Volume of the average Sales transaction:* It helps evaluate whether the software implementation has led to any noticeable changes in deal sizes, indicating the effectiveness of the CRM system in driving larger sales transactions.
- ✓ *Level of upselling and cross-selling:* Assessing the effectiveness of the software in recognizing and suggesting additional products or services to customers, helps determine whether the CRM contributes to increasing deal sizes through strategic sales techniques.
- ✓ *Segmentation of customers and targeting deal sizes:* Analyzing whether the software implementation has improved the ability to segment customers based on various criteria and tailor sales strategies to target higher deal sizes helps determine the CRM's effectiveness in driving revenue growth.

Period: The evaluation period of this KPI depends on the frequent product turnover of each company.

There are more Industry 4.0 indicators to be evaluated for each software. However, the indicators which are used to be evaluated are the most appropriate ones based on the reasons mentioned for each one.

Chapter 6 : Analyzing CRM and Product Configurators in Companies

In this chapter two software, CRM, and Product Configurator process are going to be evaluated through a survey of the companies that are using them. The group of experts who are chosen to be the person who has an overall view of the functionalities of the company and has the specialized qualification and enough knowledge to respond to the questions. These experts are selected from "Sales and Marketing" managers, "Data Analysts", "R&D (Resource and Development)"

departments, HR(Human Resource) managers, “And CEOs (Chief Executive Officers)”, Directors, and managers of the IT department. Moreover, for responding to the Financial questions of the Surveys the Financial experts are selected. The software chosen for this research as mentioned before is the “CAS Merlin” software as a Product Configurator tool and the “Cas genesisWorld” as a CRM tool.

The first section which is related to the “Company Characteristic Section”, consists of questions include of: from which country and which sector is the company, the role of the responder in the company, the type of company's trade relations is B2B or B2C, Turnover of 2022 and from when they are using the Product configurator and CRM and for both software is the same.
The questions are provided related to the Indicators and KPIs and the metrics to be measured at the end.

1. The Surveys

For this research the methodology to gather data, two surveys in both English and Italian language are provided and sent to the expert person of each company. Each survey is related to each software and sent separately and is prepared with both 5-scale and short answer questions. The answers are anonymous and will be analyzed based on the statistical information of the company. Each survey will be described separately to be more clarified.

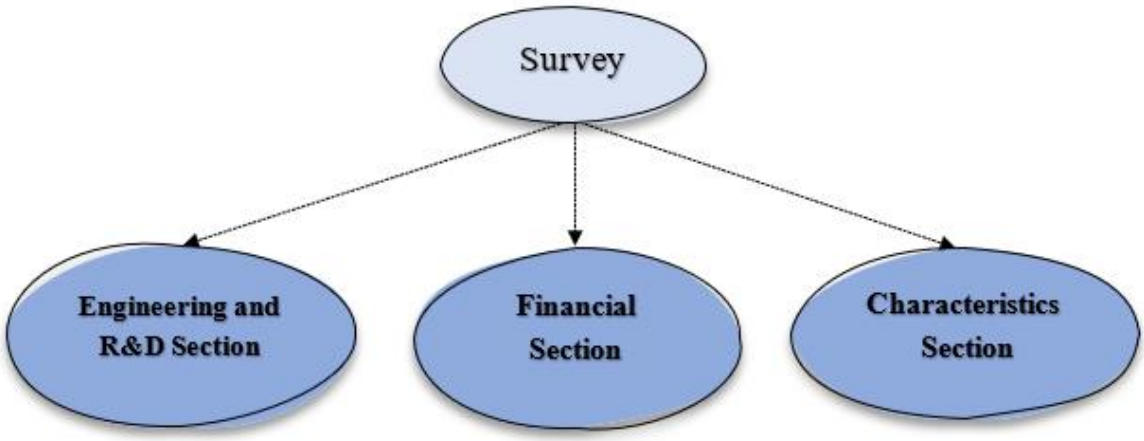

Figure 35. Survey Structure

1.1 Survey 1: Analyzing Product Configurator Process

This Survey aims to investigate the effectiveness of the Product Configurator Process in companies embracing Industry 4.0. The survey comprises two sections, the "Company Characteristic Section" with 6 questions to have statistical information about the companies which respond to help for better analysis. The "Engineering and R&D section" with two indicators including 12 questions to provide valuable analyzes on the "Customer Co-Creation" and "Knowledge transformation" indicators from the Industry 4.0 organizational

category indicators drop-down list, and the "Financial section" with 8 questions focusing on the financial performance of your company. This Survey examines two key performance indicators (KPIs): Return on Investment (ROI) and Gross Margin Ratio from the "organizational" and "Social and regularity" categories plus the Financial KPIs and the questions are asked in the "Post-adoption stage". the appropriate ratings for each item based on expert judgments are assigned. For multiple questions, the experts answer the question with the level of their agreement in five different scales:

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

1.2 Survey 2: Analyzing CRM

This survey aims at investigating the effectiveness of CRM (Customer Relationship Management) software in companies embracing Industry 4.0. The survey comprises three sections, the "Company Characteristic Section" with 5 questions, the "Engineering and R&D Section" with 10 questions, and the "Financial Section" with 7 questions. The indicators are from the "organizational" category and the questions are asked in the "Post-adoption stage". This Survey examines the "Knowledge transformation" and "Management Style" indicators from Industry 4.0 organizational category indicators drop-down list plus the Financial KPIs. The same as The Survey for Product Configurator, For this Survey the experts will provide the answers in 5-scale agreements related to the multiple questions.

1.3 The Experts

These experts are selected from “Sales and Marketing” managers, “Data Annalists”, “R&D (Resource and Development)” departments, HR(Human Resource) managers, “And CEOs (Chief Executive Officers)”, Directors, and the managers of the IT department. Moreover, for responding to the Financial questions of the Surveys the Financial experts are selected.
For each expert group for both CRM then for the Product Configurator will be explained.

1.3.1 IT and Technical Managers:

The IT and Technical managers possess the technical expertise required to analyze and understand the data and systems associated with CRM. They are well-versed in handling the technical aspects of CRM platforms, data integration, and analytics tools, allowing them to effectively evaluate the knowledge transformation and management style’s KPIs within the CRM. They often collaborate with other departments, including sales, marketing, and customer service, to ensure seamless CRM functionality. This collaborative approach allows them to gather insights and perspectives from departments, facilitating a

comprehensive analysis of knowledge transformation and management style across departments.
They are selected for the same reasons to evaluate the “Knowledge transformation” indicator for Product Configurator. Moreover, Product Configurators often integrate with other systems within an organization, such as CRM or manufacturing systems. Therefore, the IT or Technical manager is proficient in system integration and can assess how the “Customer Co-Creation” and the “Knowledge transformation” indicators are integrated into these systems, ensuring seamless data flow and collaboration. Their involvement ensures a comprehensive evaluation of the configurator's capabilities and alignment with Industry 4.0 principles, leading to valuable evaluations for the “Customer Co-Creation” and “Knowledge transformation” indicators.

1.3.2 Sales and Marketing Managers

Sales and Marketing Managers have a deep understanding of customer needs, preferences, and behaviors. They can assess how the Knowledge transformation and the Management style indicators within the CRM impact customer interactions, personalized experiences, and overall customer satisfaction. Their customer-centric perspective ensures that the analysis aligns to deliver exceptional customer experiences in the context of Industry 4.0.
They can evaluate how the configurator enables quick adaptations to change market demands and the extent to which it supports agile product development processes. They can evaluate how the Product Configurators enable Customer Co-creation by allowing customers to customize and personalize products based on their specific requirements. Their understanding of customer behavior and preferences contributes to analyzing the effectiveness of the Customer Co-Creation indicator within the configurator.

1.3.3 Data Analysts

Data Analysts possess the technical skills and expertise in analyzing large datasets. They can effectively extract, transform, and analyze CRM data to gain insights into knowledge transformation and management style within the CRM system. Their data-driven approach ensures accurate and comprehensive analysis of these KPIs. They are skilled in defining and measuring performance metrics. They can identify relevant key performance indicators (KPIs).
Data Analysts are skilled in presenting data visually and creating meaningful reports. They can create visualizations, dashboards, and reports that provide actionable insights on customer co-creation and knowledge transformation within the product configurator.

1.3.4 R&D (Resource and Development) Departments

They possess a deep understanding of emerging technologies and trends, making them well-equipped to analyze the impact of knowledge transformation and management style on CRM systems. R&D departments focus on optimizing user experiences and driving user

adoption of technological solutions so if they have this much detailed knowledge, they would be an appropriate group to answer the questions related to these two indicators.
They focus on innovation and customization, user experience and engagement, integration with emerging technologies, and contribution to future development. Their involvement ensures a forward-thinking analysis of how these indicators impact the configurator's performance and alignment with Industry 4.0 principles.

1.3.5 CEOs, CIOs, and Directors

CEOs (Chief Executive Officers), CIOs (Chief Information Officers), and Directors are responsible for strategic decision-making within the organization. They can assess how the Knowledge transformation and the Management style indicators within the CRM system align with other departments and processes, ensuring seamless integration and collaboration across the organization.
They have a strategic perspective and are responsible for aligning the organization with its goals. They can analyze how Customer Co-Creation and knowledge transformation indicators within the product configurator align with the organization's strategic objectives.

1.3.6 The Financial Experts

They can assess the initial investments, ongoing operational expenses, and potential cost reductions achieved through automation and process optimization. Their insights contribute to cost analysis and identifying opportunities for cost optimization in line with Industry 4.0 principles. The Financial department is skilled in calculating return on investment (ROI) for various initiatives. They can assess the ROI of implementing CRM and Product Configurator software, considering the financial benefits derived from improved customer satisfaction, operational efficiency, and sales effectiveness. Their analysis helps determine the profitability and value-creation potential of these software. In general, with their expertise and insights, it is possible to evaluate the financial performance assessment, cost analysis, revenue generation, ROI calculation, and financial reporting.

1.4 Analysis of Product Configurator's Survey

The Product Configurator survey was distributed to approximately 3000 experts from Germany and Italy, and the response rate was 7.67%, which was expected considering the limited usage of Product Configurators in companies. The majority of responses came from Italy (65.21%), followed by Germany (13.04%). It should be noted that some companies with multiple branches worldwide, including Italy, were also included in the analysis, which contributes to the higher representation of Italian responses (totaling almost 74%). The participating experts primarily belonged to technical and managerial roles, such as engineers, CTOs, CEOs, IT managers, technical directors, administrators, and service and sales managers. The main portion of them

is from the Manufacturing section which is 34.78% of the total companies both in Germany and Italy together.

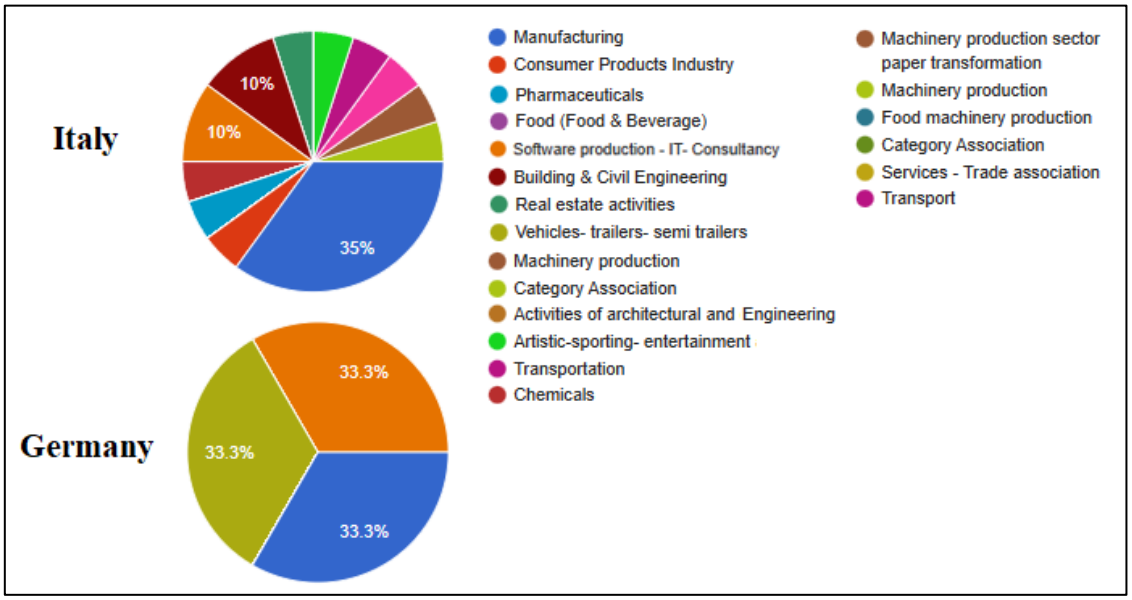

Figure 36. Country Dispersion for Product Configurator Survey

It includes 56.54% B2B (Business-to-Business)form and the rest is B2C, therefore, the companies which are using Product Configurator tools are selling their products to other businesses rather than directly to individual consumers. Therefore, transactions often involve larger order volumes, longer sales cycles, and more complex purchasing processes compared to B2C. Dealing with complex products or solutions which require making this process easier, customization of the products would be the solution for these companies to meet the specific needs of their customers. Moreover, from the turnover in 2022, it is possible to understand that Larger companies are more willing to use the product Configurator tool, the result of responders show that 65.21% of the total is large companies (Included of 34.78% 50-250 million euros, 17.39% 250-500 million euros and 13.04% more than 500 million euros) and the rest is SME (Small and Medium Enterprises) and microenterprises. The average duration of using the Product Configurator tools is 6.61 years.

1.4.1 Customer Co-Creation Indicator, Its KPIs, and Product Configurator Analysis

The result of the Survey related to the Customer Co-Creation Indicator and Its KPIs with the Product Configurator tool is as below:

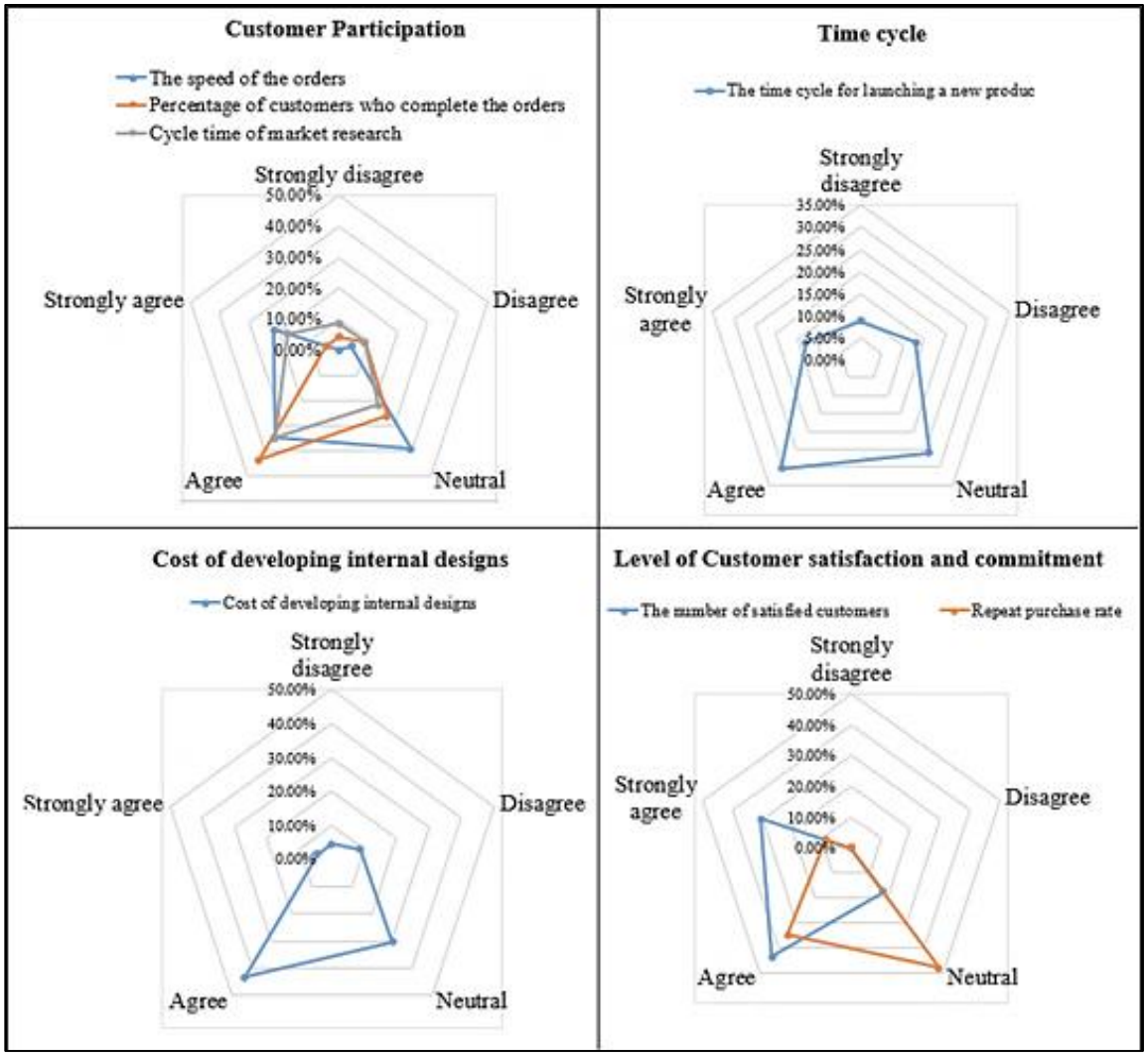

Figure 37. Customer Co-Creation Indicator Radar Diagram

These four Radar diagrams of each KPI are showing that the tendency of the responses is much closer to agreeing and Neutral, which is an almost positive result for this Indicator. For a deeper vision, we are going to calculate the Standard Deviation and Average Value (Mean) of each unit of measurement. the average value provides a measure of the central tendency and indicates the overall sentiment or tendency of the respondents, and the standard deviation measures the average distance of each response from the mean. A higher standard deviation indicates greater variability in the responses, while a lower standard deviation suggests more agreement or consistency among respondents.

The formula to calculate the Standard deviation: $\sqrt{\frac{\sum(x_i - x_{bar})^2}{(n-1)}}$

Where:

∑: A symbol that means "Sum"

x_i: The i^{th} value in the sample

x_{bar}: The mean of the sample

n: The sample size

- **Using the Coefficient of Variation:**

One way to determine if a standard deviation is high is to compare it to the mean of the dataset.

A coefficient of variation, often abbreviated as CV, is a way to measure how spread-out values are in a dataset relative to the mean. It is calculated as:

$CV = s / \bar{x}$

Where:

s: The standard deviation of the dataset

$\bar{x}$**:** The mean of the dataset

The higher the CV, the higher the standard deviation relative to the mean. In general, a CV value greater than 1 is often considered high (Zach, 2023).

To be clearer, the first KPI is Customer Participation with the first unit of measure which is "The speed of the orders" and the calculation of the standard deviation and the average value for it are as these steps using the provided responses:

1. Calculate the average value (mean): Adding up all the individual responses and dividing by the total number of responses. (5 + 5 + 5 + 5 + 8 + 8 + 8 + 8 + 8 + 8 + 8 + 8 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 2) / 22 = 144 / 22 = 6.545
2. Calculate the squared difference between each response and the average value: Subtract the average value from each response, square the result, and list them. (5 - 6.545)^2 = 1.928025 (5 - 6.545)^2 = 1.928025 (5 - 6.545)^2 = 1.928025 (5 - 6.545)^2 = 1.928025 (8 - 6.545)^2 = 2.106025 (8 - 6.545)^2 = 2.106025 (8 - 6.545)^2 = 2.106025 (8 - 6.545)^2 = 2.106025 (8 - 6.545)^2 = 2.106025 (8 - 6.545)^2 = 2.106025 (8 - 6.545)^2 = 2.106025 (8 - 6.545)^2 = 2.106025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (3 - 6.545)^2 = 11.845025 (2 - 6.545)^2 = 16.282025
3. Calculating the sum of squared differences: Add up all the squared differences obtained in step 2. 1.928025 + 1.928025 + 1.928025 + 1.928025 + 2.106025 + 2.106025 + 2.106025 + 2.106025 + 2.106025 + 2.106025 + 2.106025 + 2.106025 + 11.845025 + 11.845025 + 11.845025 + 11.845025 + 11.845025 + 11.845025 + 11.845025 + 11.845025 + 11.845025 + 16.282025 = 175.69755
4. Dividing the sum of squared differences by the total number of responses: Dividing the sum from step 3 by the total number of responses (22 in this case). 175.69755 / 22 = 7.98625227
5. Take the square root of the result: Calculate the square root of the value obtained in step 4 to obtain the standard deviation. $\sqrt{7.98625227} \approx 2.827$

   The standard deviation of the responses is approximately 2.827.

   The same process will be done for all the KPIs and units of measurement. See the next table for Customer Participation Indicator:

Indicators	KPIs (Key Performance Indicators)	Units of measurement	The average value (Mean)	Standards Deviation	No.Answers	Coefficient of variations
Financial Evaluation	ROI (Return On Investments)	The total cost of producing	3.86	1.080	22	0.280
		Sales Revenue	4.09	0.970	22	0.237
		The cost savings	3.77	1.013	22	0.269
		The profitability	4.22	0.849	22	0.201
	Gross Margin Ratio	Volume of the average Sales transaction	4.19	0.895	21	0.214
		Level of upselling and cross-selling	4.50	0.977	22	0.217
		Segmentation of customers and targeting deal sizes	4.28	0.812	21	0.190
		Total Average	4.13	0.94	21.71	0.23

Table 2. Customer Co-Creation Indicator

Depending on the table it is obvious the tendency of the answers is 3.77 the value of "Agree", which is almost 4. The total average Standard deviation is 1.24" and the total CV is 0.33 which is less than 1 and it reveals the responses are consistent and reliable. According to the experts, the use of the Product Configurator process and tool in a company has a positive impact on various aspects. They agree that it improves the speed and completion rate of orders, reduces the cycle time, and decreases the potential for failures. Additionally, there is a consensus among the experts with a low standard deviation that it increases customer satisfaction.

1.4.2 Knowledge Transformation Indicator, Its KPIs, and Product Configurator Analysis

For analyzing the data of this Indicator, the same practice will be done.

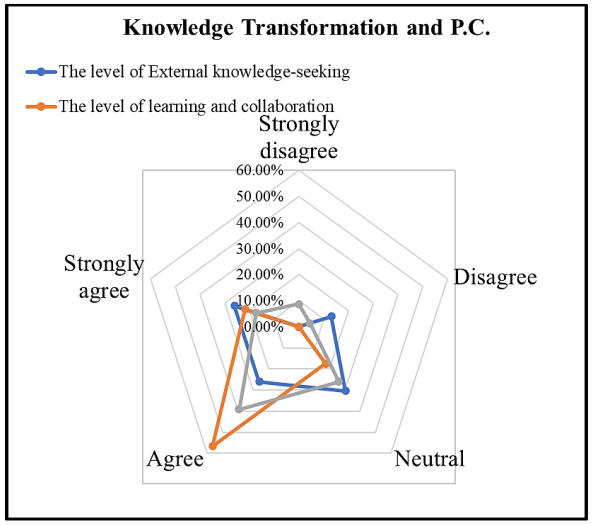

Figure 38. Knowledge Transformation Radar Diagram

The Radar diagram reveals that the experts do agree more that using a Product Configurator tool can affect positively the process of knowledge transformation by measuring the related units of measurement. Almost 60% of them believe that it increases the level of collaboration. However, to have a deeper insight into the data look at the table below:

Indicators	KPIs (Key Performance Indicators)	Units of measurement	The average Value (Mean)	Standards Deviation	No.Answers	Coefficient of variations
	Knowledge Transformation	The level of External knowledge-seeking	4.14	1.09	21	0.263
		The level of learning and collaboration	4.23	0.61	21	0.144
		The speed of Sharing and distribution of external knowledge	3.59	1.14	22	0.318
		Total Average	3.99	0.95	21.3	0.24

Table 3. Knowledge Transformation

The average value of the three metrics is 3.99 and close to 4. Which is the value of "Agree", and the average total Coefficient of variations is 0.24 and below 1. This shows that the experts who answered the Survey tend more to agree with the positive effect of Product Configurator tools and processes in the context of Customer Co-Creation which means the level of collaboration and sharing the knowledge improves by using this tool.

1.4.3 Financial Evaluation Indicator, Its KPIs, and Product Configurator Analysis

The creation of the Radar diagram for the Financial Evaluation Indicator provides a comprehensive view of the responses, allowing for a clearer understanding of the effectiveness of the Product Configurator process and tool. Look at the figure below:

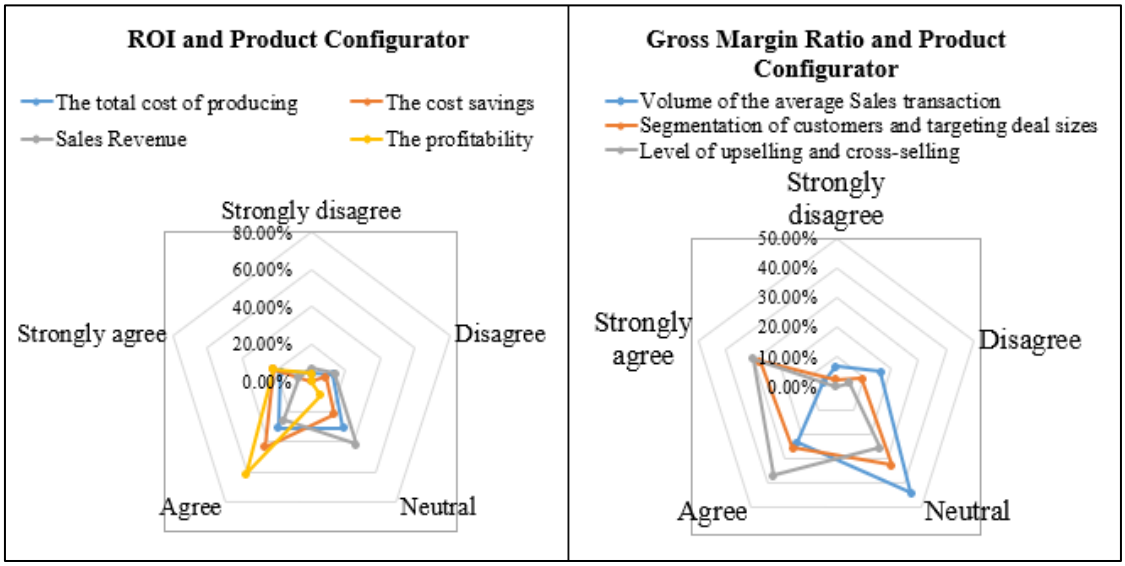

Figure 39. Financial Evaluation Indicator Radar Diagram

The two Radar diagrams presented above depict the responses related to the KPIs of ROI and Gross Margin Ratio. The diagrams indicate that approximately 40% of the experts agree that implementing the tool has a positive impact on the Gross Margin Ratio, leading to improvements in upselling and cross-selling. Additionally, nearly 60% of the experts agree on the increase in the company's profitability. The more in detail data of the responses is below:

Indicators	KPIs (Key Performance Indicators)	Units of measurement	The average value (Mean)	Standards Deviation	No.Answers	Coefficient of variations
Financial Evaluation	ROI (Return On Investments)	The total cost of producing	3.86	1.080	22	0.280
		Sales Revenue	4.09	0.970	22	0.237
		The cost savings	3.77	1.013	22	0.269
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		Segmentation of customers and targeting deal sizes	4.28	0.812	21	0.190
		Total Average	4.13	0.94	21.71	0.23

Table 4. Financial Evaluation Indicator, Product Configurator

The total average value of the responders is 4.13 which is close to the "Agree", the total average Standard deviation is 0.94 and finally the total average Coefficient of Variation depending on the data above is 0.23 and less than 1, which means the data is reliable and coherent. This shows the average respondent believes and agrees with the positive impact

of the Product Configurator tools in the context of Financial evaluation as an Industry 4.0 Indicator and its relatable KPIs. Moreover, they more agree on Gross Margin Ration than ROI but still agree with the improvements in sales revenue, cost savings, profitability, and total cost production as the metric of the Return On Investments KPI.

1.4.4 Total Result of Product Configurator Analysis

In this part, it is possible to have an overview from the analysis of all the Indicators and KPIs selected to evaluate using the Product Configurator tool and process.

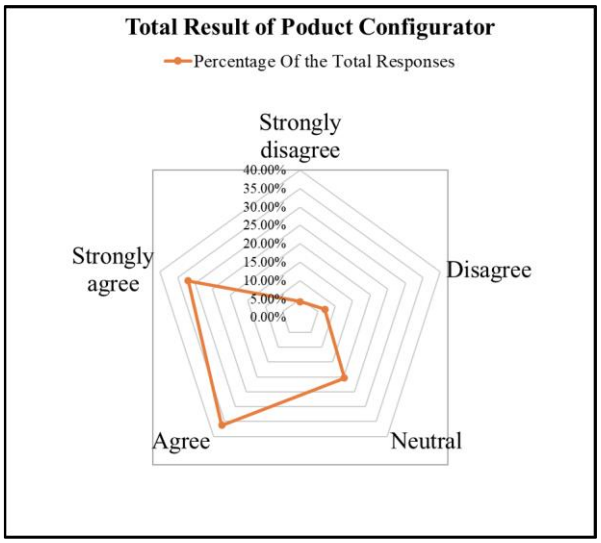

Figure 40. Total Result of Product Configurator

The Radar diagram, based on the aggregated responses of the experts, indicates a higher tendency towards the "Agree" and "Strongly Agree" categories, with approximately 37% and 28% of the responses, respectively. Conversely, the percentages for "Disagree", "Strongly Disagree", and "Neutral" are 5%, 9%, and 25%, respectively. However, it is better to create a table consisting of all Indicators (with KPIs calculated inside of the related Indicator) and get an eventual result for analysis using the Product Configurator process tool. The table below shows the final average of the responses for “the average of mean value”, “the average Standard deviation”, “the average number of answers” and finally “the average of the Coefficient of Variations”. In the Average row, it is possible to see the final analysis of the data related to the Product Configurator’s Survey:

Inadicators & KPIs for Product Configurator Analysis	The Averarage of Mean value	Average Standards Deviation	The Average No. of Answers	Average of Coefficient of variations
Customers Co-Creation	3.77	1.24	20.89	0.329
Knowledge transformation	3.99	0.95	21.30	0.238
Financial Evaluation	4.13	0.94	21.7	0.228
Total Average	3.96	1.04	21.30	0.26

Table 5. Total Average

This survey was administered in both English and Italian versions and aimed at companies in Germany and Italy, respectively. The majority of respondents were from the manufacturing sector, accounting for 39.53% of the total, followed by the "Software production and IT Consultancy" sector, which constituted 13.95% of the sample. The

remaining companies represented a diverse range of sectors. Moreover, almost 21 out of 23 answers are calculated for each question. The total average of the coefficient of variation is under 1, which shows that the answers to the Survey are coherent and reliable. The low amount of Standard deviation shows the low dispersion among different experts' opinions relative to the result. Another reason that the Survey is reliable is that the respondent can leave the questions without answering them obligatory, this is because not all of them know every aspect of the company from different departments, in consequence, all the answers are responded to just by the relative person, this increases the risk of random answers.

1.5 Analysis of CRM Survey

1.5.1 Overall Analysis of Companies and Experts' Characteristics

his survey was conducted in both English and Italian versions, targeting companies in Germany and Italy, respectively. The majority of participating companies belong to the manufacturing sector (39.53%), followed by the "Software production and IT Consultancy" sector (13.95%). The remaining companies represent various other sectors.

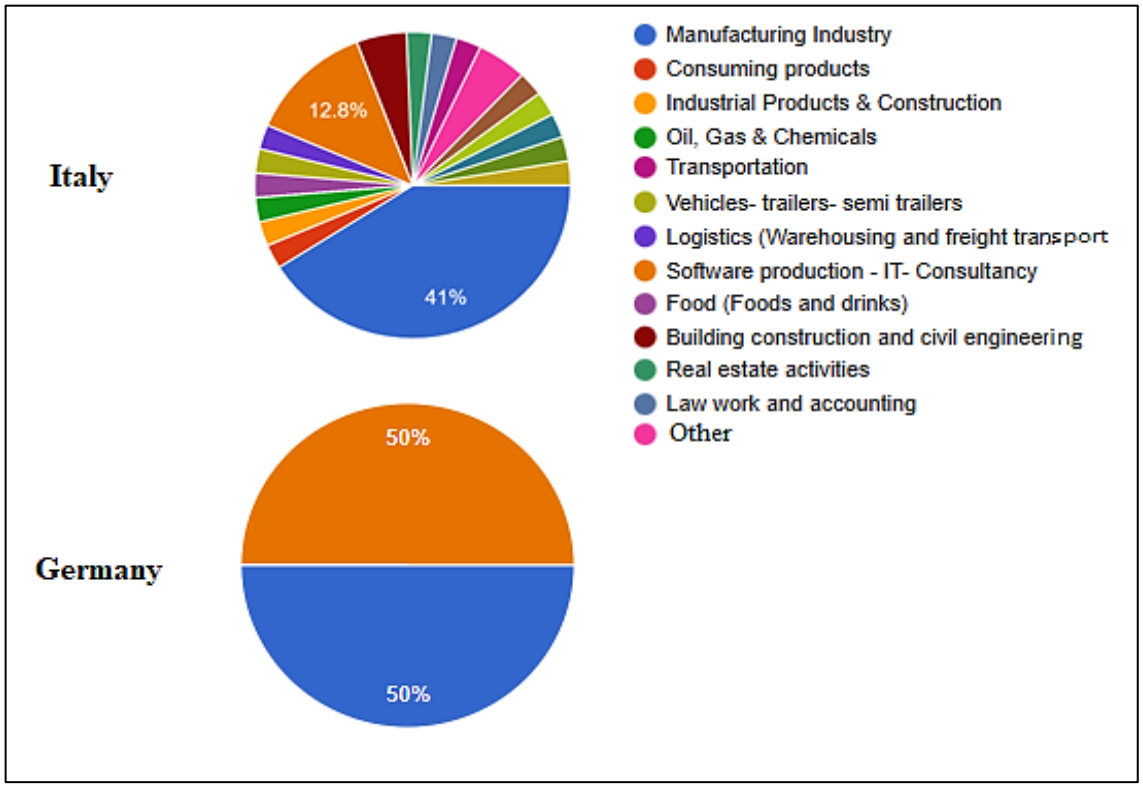

Figure 41. Dispersion of the Experts' Role

The survey was primarily conducted among Italian experts, with responses from approximately 81.33% of the total participants. A small percentage of responses were received from experts in Germany (0.69%), France (0.46%), and companies with multiple branches worldwide but also based in Italy (such as Romania, the USA, China, Canada, Hong Kong, and Spain). Hence, it is reasonable to consider these respondents as Italian

experts. The survey attracted a diverse range of participants, with a significant number of CIOs (Chief Information Officers) and IT managers, along with other responsible individuals mentioned in section 5.3.

Among the participating companies, a significant majority (67.44%) have been using CRM for a period ranging from 6 months to 10 years, followed by 32.55% who have been using it for 10 to 30 years. In terms of company relations, 72.09% of the respondents operate in the B2B sector, while 27.9% operate in the B2C sector. Considering the turnover in 2022, the majority of companies (75.1%) are large enterprises. This includes 60.46% of companies with a turnover between 50-250 million euros, 13.95% with a turnover between 250-500 million euros, and 0.69% with a turnover exceeding 500 million euros. The remaining portion (0.18% of the total) represents Micro and Medium-sized enterprises with a turnover of fewer than 50 million euros in 2022. Thus, it can be concluded that the responses are primarily from larger enterprises, indicating a greater inclination for CRM usage among these companies to enhance their business outcomes.

Depending on the report of DESI Index (EU) or Digital Intensity Index indicators tracking digitalization processes in 2021 in the figure below:

	Large	SMEs
The maximum contracted download speed of the fastest fixed line internet connection is at least 30 Mb/s	95%	80%
Use any social media	83%	58%
Enterprises where more than 50% of the persons employed used computers with access to the internet for business purposes	58%	49%
Use of any cloud service	72%	40%
Have ERP software package to share information between different functional areas	81%	37%
Have CRM	65%	34%
Buy intermediate-sophisticated CC services	60%	33%
Use of at least 2 social media	61%	28%
Use any IoT	48%	28%
Enterprises with e-commerce sales of at least 1% turnover	38%	18%
Enterprises where web sales are more than 1% of the total turnover and B2C web sales more than 10% of the web sales	12%	11%
Use any AI technology	28%	7%

Figure 42. DESI Index (EU) in 2021

1.5.2 Knowledge Transformation Indicator and CRM Analysis

It is analyzed with three different units of measurement and the result is revealed in the Radar diagram in the figure below:

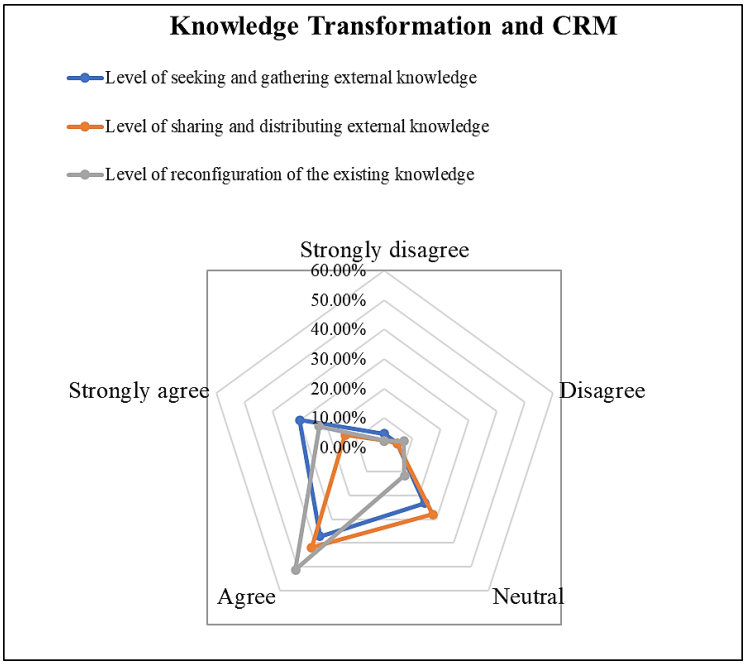

Figure 43 Knowledge Transformation Radar Diagram

The data indicates that a majority (65%) of the enterprises using CRM are classified as large organizations, while 34% of them fall under the category of Small and Medium Enterprises (SMEs). This suggests that while it is important to prioritize the needs of large enterprises.

Based on the Radar Diagram, it can be observed that approximately 55% of the respondents chose the "Agree" option regarding the effectiveness of CRM in terms of sharing and distributing external knowledge. This indicates a significant agreement among the participants regarding the positive impact of CRM on the sharing and distribution of knowledge within the organization. Around 44% of the participants agreed with the positive effect of CRM on the level of sharing and distributing external knowledge, while approximately 39% agreed with its impact on the level of seeking and gathering external knowledge. These responses highlight a considerable consensus among the respondents regarding the beneficial influence of CRM in facilitating knowledge sharing and acquisition from external sources. These percentages represent the highest proportions compared to the other response options based on the diagram. However, to gain a comprehensive understanding of the findings, it is important to consider additional statistical measures such as the Standard Deviation, Coefficient of Variation, and Mean value. These measures provide insights into the variability, spread, and central tendency of the responses, allowing for a more comprehensive analysis of the data. Look at Table 6:

Indicators	KPIs (Key Performance Indicators)	Units of measurement	The average value (Mean)	Standards Deviation	No.Answers	Coefficient of variations
	Knowledge Transformation	Level of seeking and gathering external knowledge	4.27	1.275	40	0.299
		Level of sharing and distributing external knowledge	3.75	0.778	40	0.207
		Level of reconfiguration of the existing knowledge	4.42	1.018	40	0.230
		Level of application and utilization of the transformed	4.92	1.050	40	0.213
		Level of safeguarded and protection	4.63	1.121	41	0.242
		Collaboration and learning	4.76	1.390	43	0.292
		The level of effectiveness on sales and marketing	4.88	0.616	43	0.126
		Total Average	4.52	1.04	41	0.23

Table 6. Knowledge Transformation KPIs

The table indicates that the respondents, on average, tend to select options with values exceeding 4, particularly favoring the "Agree" option. This is evident in the total average score of 4.52 for the Knowledge Transformation KPI, where experts predominantly chose the "Strongly Agree" option. This demonstrates a strong consensus among the participants regarding the effectiveness of knowledge transformation facilitated by CRM. Moreover, if we want to check the reliability of these answers, all the units of metrics have a Coefficient of variation even under 0.5, this is obvious that the answers are so reliable and coherent with low dispersion. Most agreement on an option is dedicated to the utilization and transformation of knowledge (with a value of 4.97), they strongly agree on the positive effect of a CRM presence on their company. The distribution of answers for each question indicates that respondents who were unfamiliar with the concept or had no knowledge about it chose to leave the answer blank. This demonstrates the reliability of the responses, as it shows that participants only provided answers when they had sufficient knowledge and understanding of the question.

1.5.3 Management Style Indicator and CRM Analysis

This KPI has almost the same situation as the previous KPI (Knowledge Transformation) if we look at the Radar Diagram:

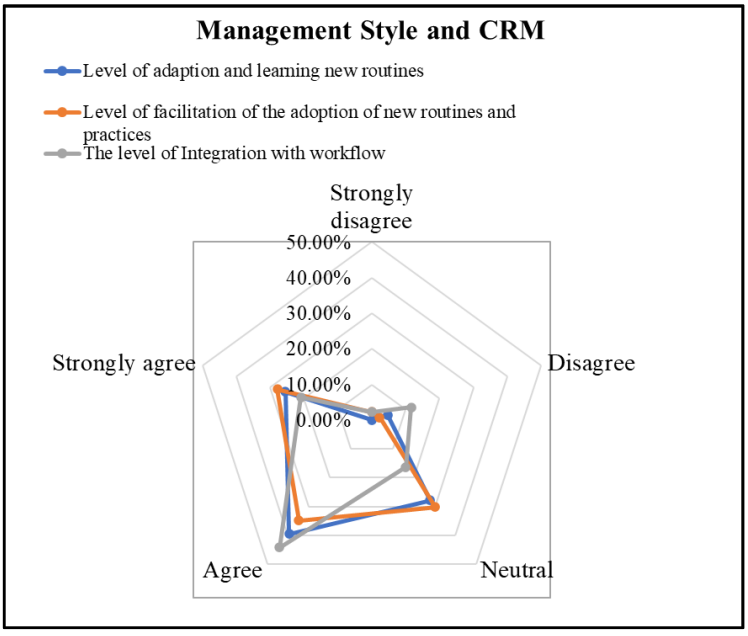

Figure 44. Management Knowledge Radar Diagram

The experts' opinions on this KPI indicate a general inclination towards the "Agree" option regarding the positive effects of using a CRM in the company. Approximately 45% of experts agree on the positive impact of CRM integration with workflow, 40% agree on the level of adaption and learning new routines, and around 22% agree on the facilitation of the adoption process. The respondents leaned toward the positive values ("Strongly Agree", "Agree" and "Neutral" than the negative ones.
More details in Table 7:

Indicators	KPIs (Key Performance Indicators)	Units of measurement	The average value (Mean)	Standards Deviation	No.Answers	Coefficient of variations
	Management Style	Level of adaption and learning new routines	4.90	0.868	41	0.177
		Level of facilitation of the adoption of new routines and practices	4.85	0.852	41	0.176
		The level of Integration with workflow	4.70	1.134	41	0.241
		Total Average	4.82	0.95	41	0.20

Table 7. Management Style KPIs

This table also shows the high average mean answer which is 4.82 and it tends to be the highest value of the options, the Coefficient of variation is less than 1.

1.5.4 Financial Evaluation Indicator, Its KPIs, and CRM Analysis

This Financial Evaluation indicator consists of two different KPIs to be analyzed, in the figure below it is possible to see a Radar Diagram separated for each KPI:

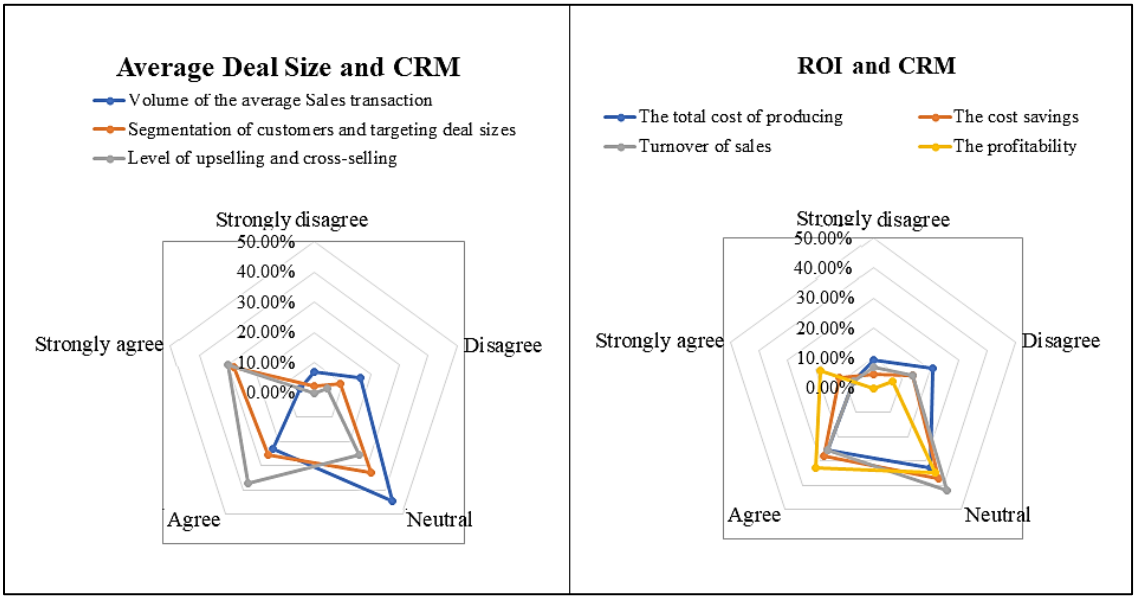

Figure 45. Financial Evaluation and CRM Radar Diagram

Upon examining the Radar Diagram for Average Deal Size, it is evident that approximately 40% of the responses lean towards the "Agree" option, while about 49% of the responses align with the "Neutral" option. This indicates the perceived impact of using a CRM on the level of upselling and cross-selling, as well as the volume of average sales transactions. For Segmentation of customers and targeting deal sizes, their opinion is much closer to "Strongly Agree". This Diagram for all three units of measurement shows that the less percentage is related to "Strongly Disagree" which is less than 10%.

The second Radar Diagram focuses on ROI, and it reveals a similar level of dispersion across all units of measurement. However, the majority of the responses tend to lean towards the positive side of the Diagram, with approximately 30% of the answers falling in this category. This suggests that there is a positive perception of the impact of ROI when using a CRM, indicating the potential effectiveness of implementing such a system in improving financial performance. Now, more details in Table 8:

Indicators	KPIs (Key Performance Indicators)	Units of measurement	The average value (Mean)	Standards Deviation	No.Answers	Coefficient of variations
Financial Evaluation	ROI (Return On Investments)	The total cost of producing	2.89	1.100	39	0.381
		Sales Revenue	3.20	1.100	40	0.344
		The cost savings	3.07	1.102	40	0.359
		The profitability	3.67	0.862	40	0.235
	Average Deal Size	Volume of the average Sales transaction	2.92	1.16	40	0.397
		Level of upselling and cross-selling	2.97	0.961	40	0.324
		Segmentation of customers and targeting deal sizes	4.5	1.470	42	0.327
		Total Average	3.32	1.11	40.14	0.34

Table 8. Financial Evaluation Indicator, CRM

The data presented in the table aligns with the observations from the Radar Diagrams. The average values for the selected options in ROI are centered around "Neutral" (3), indicating a balanced perspective on the impact of ROI when using a CRM. Similarly, for Average Deal Size, the average values fall between "Neutral" (3) and "Agree" (4), suggesting a positive perception regarding the influence of CRM on deal sizes. However, the total average value of both KPIs for this Indicator is around 3 and the average number of answers is 40, which means, some of the respondents because they are not experts in the financial section or using CRM not for a long time (Some Respondents mentioned, the company is using CRM for less than one year) could not answer some of the questions or selected “Neutral”. These elements can affect the result. All in all, the conclusion of these Two KPIs tends to be positive options of the Survey.

1.5.4 The Total Results of CRM Analysis

In this section, the overall outcome of the Indicators and their Key Performance Indicators (KPIs) will be discussed.

The outcome is the result of a thorough analysis of all the key performance indicators (KPIs) and indicators related to the CRM survey, as well as the valuable insights provided by the experts. Initially, the Radar Diagram provides a visual overview of the responses, offering a comprehensive view of the data:

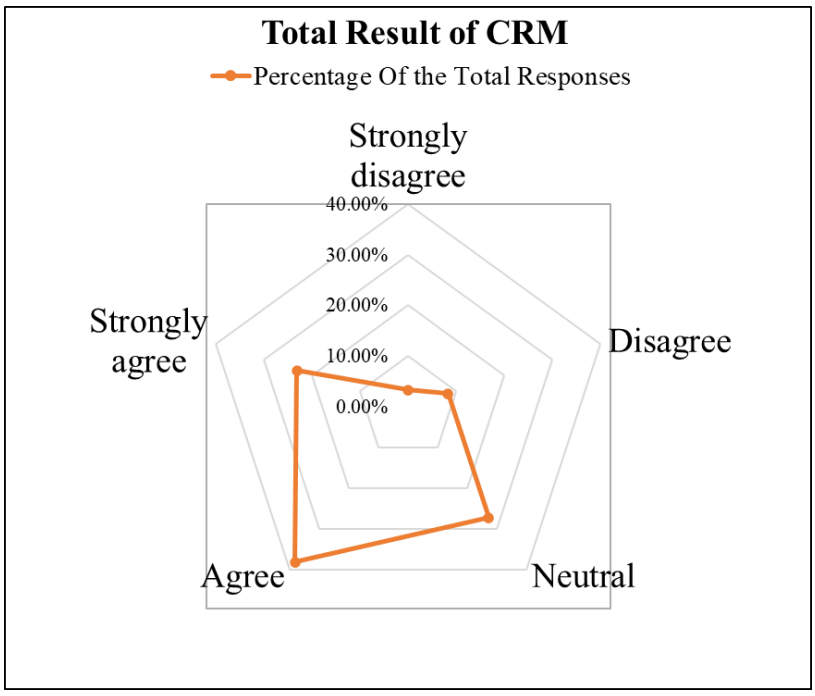

Figure 46. Total Result of CRM Survey

The diagram indicates that a significant portion of the responses, approximately 40%, aligns with the "Agree" category, reflecting a strong consensus among participants. Furthermore, around 30% of the responses fall into the "Neutral" category, indicating a balanced perspective, while approximately 25% of the responses express a strong agreement with the given statements.

Looking more in detail with Table9:

Indicators and KPIs (Key Performance Indicators)	The average Mean value	The average of Standards Deviation	The average No. of Answers	The average of Coefficient of variations
Knowledge Transformation	4.52	1.035	41	0.230
Management Style	4.82	0.951	41	0.198
Financial Evaluation	3.32	1.11	40.14	0.34
Total Average	4.22	1.03	41	0.26

Table 9. Total Average

The presented table demonstrates that the overall average value is 4.22, indicating a close alignment with the "Agree" option. Additionally, the relatively low standard deviation of approximately 1 reflects a minimal variability in the responses, suggesting a consistent and cohesive pattern among the participant responses. Furthermore, the calculated total average value of the Coefficient of Variation is 0.26, which is below 1. This indicates that the responses are not widely dispersed about the mean value, suggesting a relatively narrow range of variation among the participants' answers.

Chapter 7 Conclusion

Compared to the limited functionality of old analog and legacy systems, you have something that can revolutionize how you connect with customers with CRM, because of these technologies,

cloud-based CRM software can grow and scale with businesses, so every company, no matter the size, can benefit from a CRM-software-based system.

Many CRM systems can integrate with other software. The components of a CRM are Marketing Automation. Contact and Account Management, Sales Automation, Customer service, and Integration, and each component helps a special part of the organization, and this makes this tool very useful.

The benefits of using a CRM are Better customer service, improved sales, enhance customer retention, detailed analytics, higher efficiency, and productivity, managed communication with prospective leads, enhance customer segmentation, automated sales reports, accurate sales forecasting, and streamlined internal communications.

On the other hand, a product is configurable if it is capable of being customized, or if it can be rearranged or adjusted post-production and this can be done by a Product Configurator tool. A product configurator promotes Co-designing processes in which the customers are actively involved in the design of their product, even production, and has an effective means to implement mass customization.

To analyze two tools that are excluded from Industry 4.0 tools or not, some Industry 4.0 Indicators should be evaluated, the Fourth Industrial Revolution which refers to the technological transformation society, undergoing in the 21st Century. Technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and autonomous vehicles are increasingly merging with human lives and creating a radical shift for employees, organizations, and society. The selection of the companies which are using CAS Merlin (as a Product Configurator tool) and Cas genesisWorld(As a CRM tool) made the result as the diagrams below:

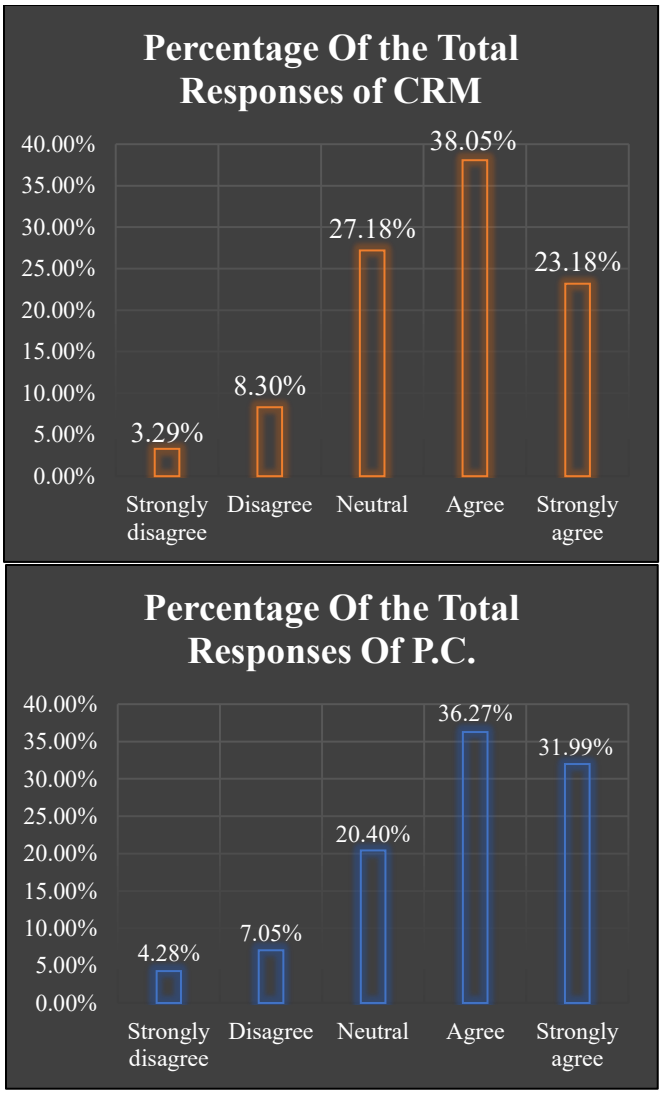

Figure 47. Result of CRM and Product Configurator

his result is based on two surveys that were conducted among approximately 3000 companies mostly from Italy, Germany and a fewer number of other countries. The majority of these companies operate in the B2B (Business-to-Business) sector and have a turnover of 50-250 million euros in 2022. The respondents of the survey were experts from various departments within the companies, including IT and Technical, Sales and Marketing, Data Analysts, R&D department managers, CEOs (Chief Executive Officers), CIOs (Chief Information Officers), and Directors and Financial experts.

The bar charts indicate that 38.05% of the respondents agree and 23.18% strongly agree with the positive impact of using a CRM tool in their company. Additionally, 36.27% of the respondents agree and 31.99% strongly agree with the positive effect of using a Product Configurator tool in their company.

This data is observed by analyzing the units of measurement relative to the Industry 4.0 Indicators and KPIs including Knowledge Transformation, Management Style, and Financial Evaluation (With KPIs: Return On Investments and Average Deal Size) for CRM, and Customers Co-Creation (with KPIs: Customer Participation, Cost of developing original designs, Time Cycle, The level of Customer satisfaction and commitment, and Product Failure Risk), Knowledge transformation, and Financial Evaluation (with KPIs: Return On Investment and Gross Margin Ratio).

After conducting a comprehensive analysis of the tools within the framework of Industry 4.0 in the relevant companies and considering the insights from experts, it is evident that excluding CRM systems and Product Configurators from the list of Industry 4.0 tools would be impractical. The research and expert opinions strongly indicate that these tools play a significant role in the digital transformation and success of companies in the Industry 4.0 era.

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