

Executive Summary

Following the acquisition of Antwerp Beer Company by Johnsmount Brewery in their aim to leverage their strengths and streamline their operations, this paper presents a comprehensive plan for integrating their IT systems through a unified ERP-CRM system.

This integration's main objectives are to streamline operations by integrating positive operational flows of both companies and introducing automation across the processes. Secondly to improve the quality, accessibility and use of data. Thirdly, to utilize enhanced analytics for better strategic decision-making. And finally, to create and optimize processes to foster internal collaboration and external client relationships.

The current state analysis revealed inefficiencies in key processes such as contract negotiation, sales quotes, promotions, customer service and hiring. These were mapped using Business Use Case Diagrams (BUCD) and Business Process Modeling Notation (BPMN) to create a clear understanding of existing workflows. Additionally allowing the exposure of possible opportunities to be capitalized upon.

To address these inefficiencies and capitalize on emerging opportunities, the future state design details the intricacies of the unified ERP-CRM system. It employs detailed system use-cases and to-be BPMN diagrams for critical processes, ensuring a comprehensive and detailed approach. The project management section calculates cost and effort estimates and outlines risk management strategies to ensure a smooth implementation.

The software and database design sections include the development of Unified Modeling Language (UML) class and sequence diagrams to represent the attributes, operations and interactions of the system. This results in the creation of an Entity Relationship Diagram (ERD) and SQL code for database implementation.

It is highlighted that in order to achieve a unified company culture an extensive change management plan should be implemented in addition to this paper. This plan should include recommendations for training, communication and employee engagement.

The strategic benefits of the integration are significant in multiple ways. Automation will reduce manual effort and minimize the risk of errors. Enhanced data analytics will provide valuable insights for strategic decision-making. A centralized ticketing system will improve customer service response times and client satisfaction. New processes will enhance internal cross-departmental collaboration and external client relationships. Iterative planning will ensure continuous improvement, adaptability and scalability.

In conclusion, the proposed ERP-CRM system will enable Johnsmount Brewery to achieve seamless operations following their acquisition of Antwerp Beer Company, driving sustained growth and operational excellence in the competitive beer industry. By following the recommendations outlined in this paper the merged entity can leverage the full potential of integrated IT systems, positioning them for future success.

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List of Abbreviations

ABC – Antwerp Beer Company

BPMN – Business Process Modeling Notation

BUCD – Business Use Case Diagram

COCOMO – Constructive Cost Model

CRM – Customer Relationship Management

CS – Customer Service

ERD – Entity Relationship Diagram

ERP – Enterprise Resource Planning

ETL – Extract, Transform, Load

H - High

HR – Human Resource

IT – Information Technology

JM – Johnsmount Brewery

M – Medium

L – Low

PO – Process Order

RUP – Rational Unified Process

SAP – System Analysis Program Development

SLOC – Source Lines of Codes (number of lines of codes)

SQL – Structured Query Language

SQ – Sales Quote

SUCD – System Use Case Diagram

UML – Unified Modeling Language

UAW – Unadjusted Actor Weight

UUCP – Unadjusted Use Case Point

UUW – Unadjusted Use Case Weight

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Introduction

In today's dynamic and competitive business environment, the integration of Information technology (IT) systems has become essential for achieving operational efficiency and strategic growth. Organizations are increasingly turning to IT consultancy services to navigate complex challenges, drive innovation, and optimize their operational capabilities. This paper delves into the pivotal analysis stage of an IT consultancy project regarding the integration of Antwerp Beer Company (ABC) and Johnsmount Brewery (JM). This stage of the project signifies a critical juncture where comprehensive assessments and evaluations are conducted to lay the groundwork for strategic decision-making and solution design.

The consultancy team in charge of the project aims to develop a unified Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) system which will streamline business processes, enhance data accuracy, provide comprehensive business analytics to support strategic decision-making, and introduce new processes to increase collaboration internally and externally by forging partnerships with clients. The integration of this new system is essential to align the operations of both companies, facilitating seamless integration and improvement of overall efficiency by capitalizing on opportunities emerging from the new system.

The pivotal analysis phase involves thorough assessments of the organization's current (as-is) state, identifying organizational needs, challenges, and opportunities. During this phase, consultants collaborate closely with key stakeholders to gather requirements, conduct interviews, and analyze existing systems and processes. Business Use Case Diagrams (BUCD) and Business Process Modeling Notation (BPMN) are used to comprehensively capture workflows, interactions, and system functionalities. By integrating BPMN's standardized graphical notation for depicting business processes with BUCD's focus on defining functional requirements and stakeholder interactions, a holistic view of the organization's operations is captured.

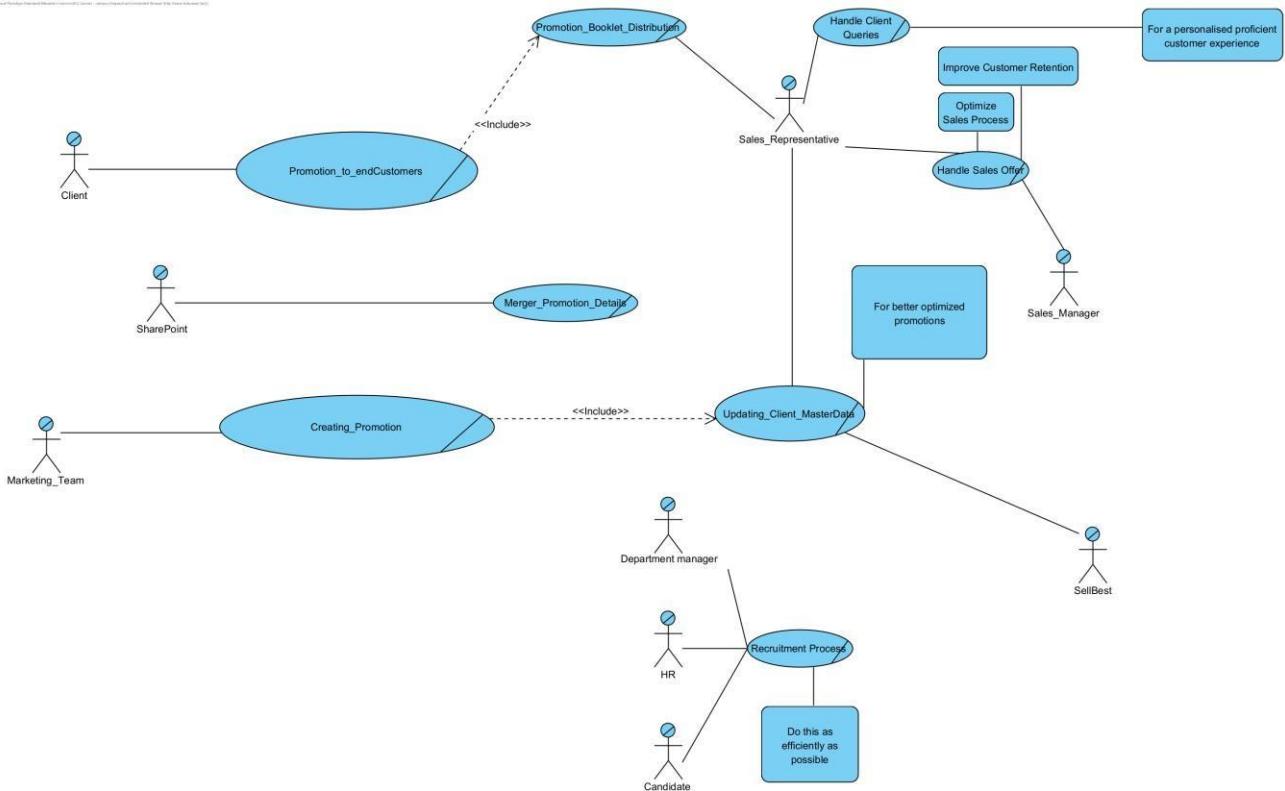
Subsequently, a detailed plan for the organization's future (to-be) state is developed, integrating the new system by incorporating system use cases in a System Use Case Diagram (SUCD) with the newly defined or adapted business process models (using BPMN).

This paper is structured into six sections. The first section details the as-is situation for ABC and JM using BUCD and BPMN. The second section outlines the to-be situation using a SUCD and BPMN. The third section provides a software project management report, including cost and effort estimation as well as risk and quality analysis. The fourth section details the software design, featuring a Unified Modeling Language (UML) class diagram and UML sequence diagrams, corresponding to the relevant system use cases and processes. The fifth section covers the database design with a generated Entity Relationship Diagram (ERD) from the class diagram and the resulting SQL code. The sixth and final section is the conclusion, summarizing the key findings and recommendations for the whole project.

1. As-is Situation

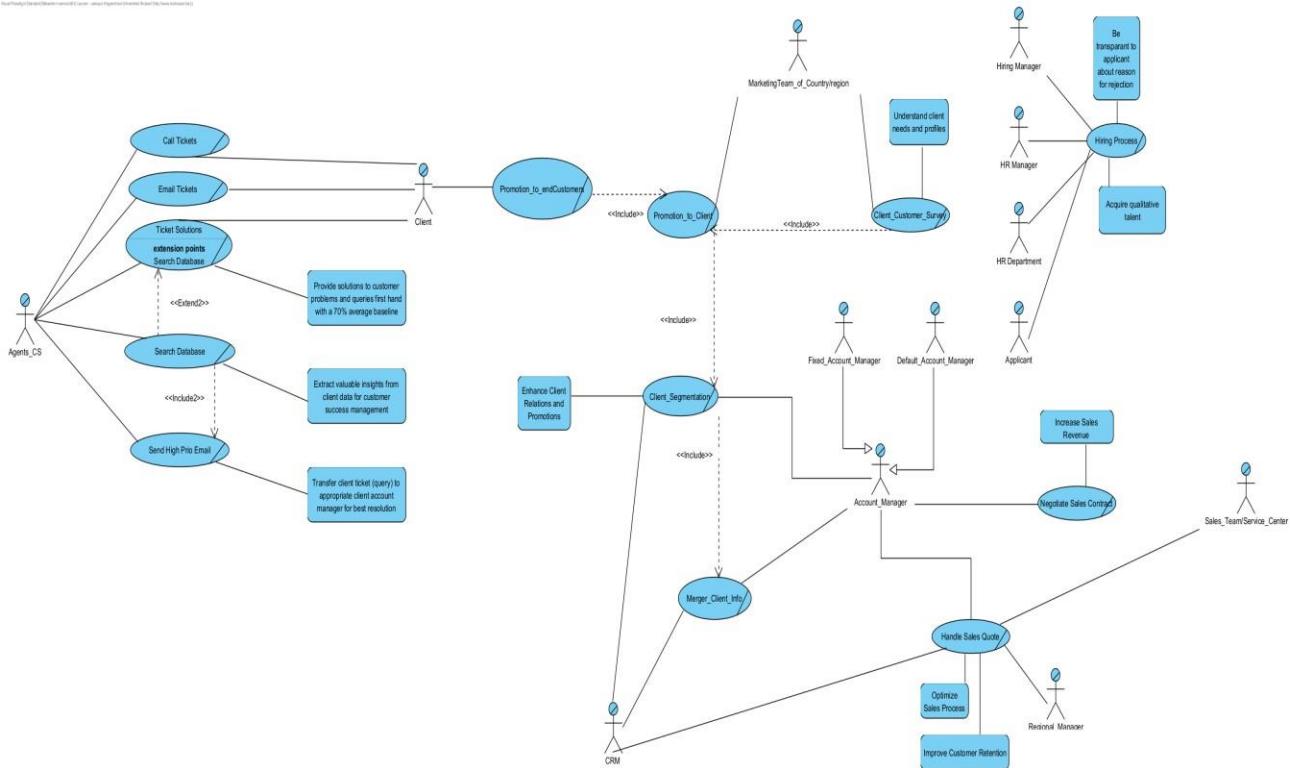
1.1. Business Use case Diagrams (BUCD)

Figure 1: AS_IS Antwerp Beer Company Business Use Case Diagram



The first BUCD applies to ABC and consists of eight business use cases, nine business actor(s), and five business goals. The ovals with a line in the bottom right corner are the business use cases and the stick figures are the business actors. The boxes with rounded corners represent the business goals. Note that this diagram serves as a high-level model that depicts the most important business actors in relation to each business case. More could be involved when expanding upon each business use case, which is not done for ABC in this report. Besides the business use cases and actors, this diagram also depicts business goals, (rectangles with rounded corners) set by ABC. Each business goal is linked to the specific use case that is responsible for achieving that goal. **Improve Customer Retention** and **Optimize Sales Proces**, for example, are two business goals linked to the business use case **Handle Sales Offer**.

Figure 2: AS_IS Johnsmount Brewery Business Use Case Diagram



The second BUCD applies to JM and consists of thirteen business use cases, thirteen business actor(s), and ten business goals. Note that the possibility of merging use cases was explored. This led to merging ‘pick-up phone’, ‘answer phone’, and ‘ticket solutions’ into ‘call tickets’ and ‘mail tickets’. Additionally, note the generalization relationship between the actors ‘Default Account Manager’ and ‘Account Manager’, and ‘Fixed Account Manager’, which clarify shared characteristics. Most business use cases are elaborated upon at the operational level by using BPMN.

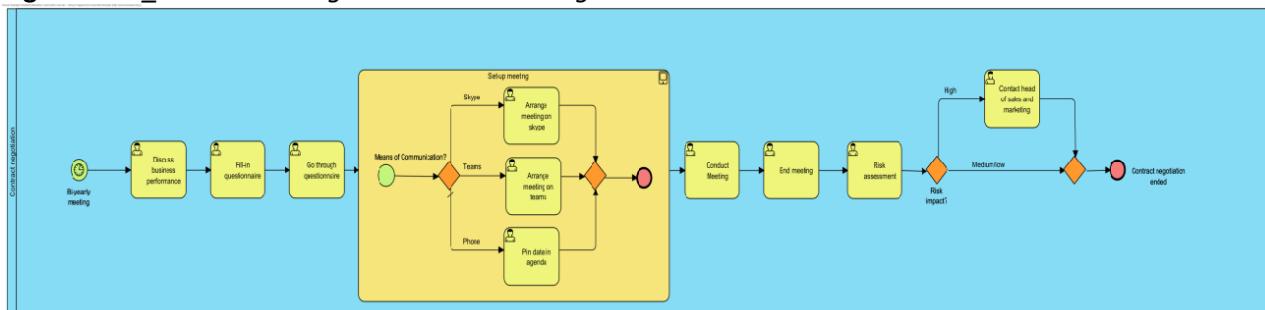
1.1. As-is BPMN Diagrams

1.1.1. “Contract Negotiation” business process

‘Negotiate sales’ contract belongs to the operations of the front sales department. The vital elements in this process are the gateways which guide the flow based on conditions. The first gateway has the condition ‘means of communication’. It represents the possibilities of means to correspond during a meeting. Furthermore, the second gateway has as condition ‘the impact of the risk’ that a client has for the company.

There are two important points to consider when creating the BPMN model. First, there are three ways of setting up the meeting. This enables flexibility for both parties, JM and its client. Second, the assessment of the risk of losing a client must be considered too. The assessment happens after the client left the meeting. There are two possibilities: high risk or low to medium risk of losing the sales contract. When the risk is high the head of sales and marketing needs to be contacted.

Figure 3: AS_IS Contract Negotiations BPMN Diagram

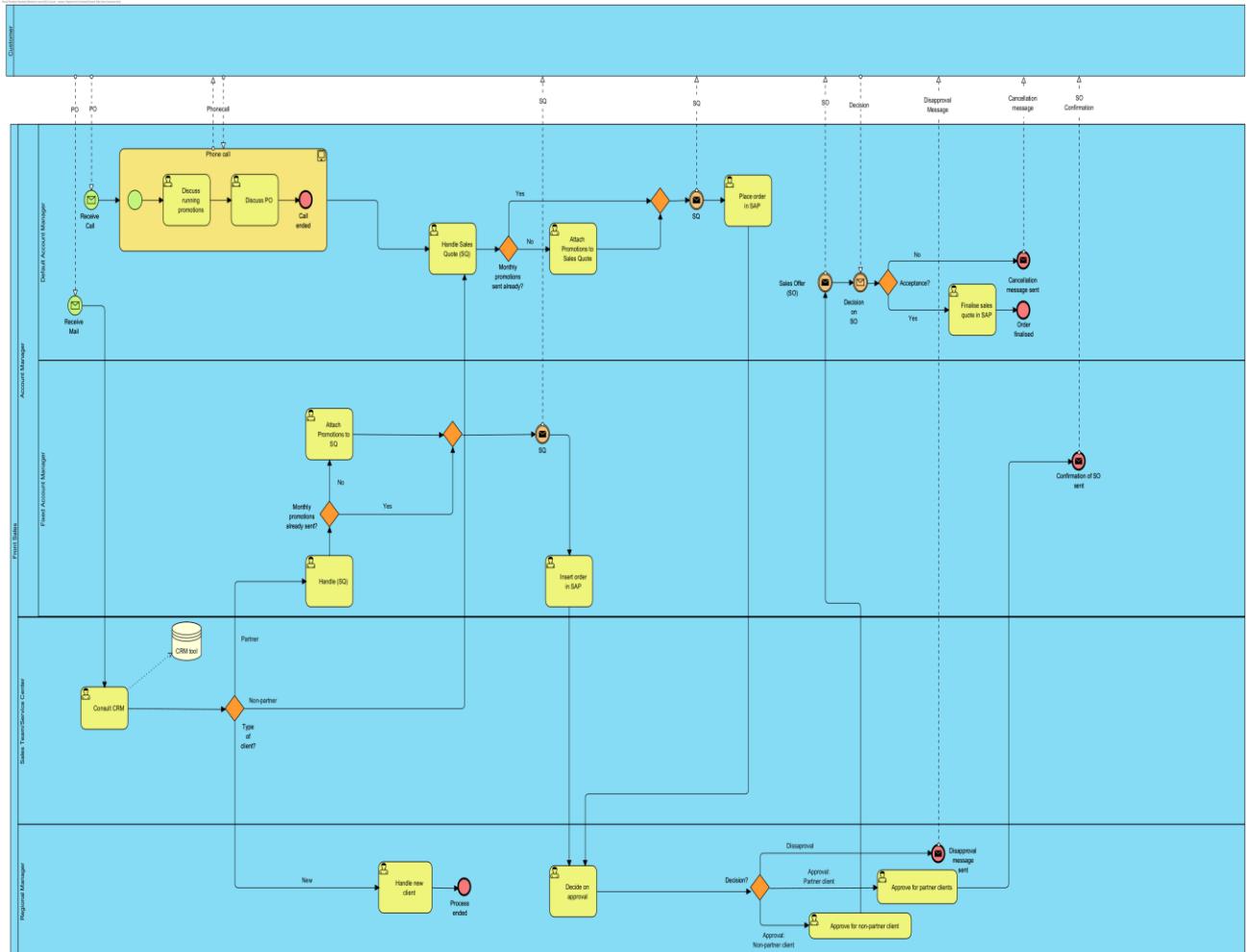


1.1.2. "Handle Sales Quote" business process

Figure 4 displays the BPMN model of Business Use case 'handle sales quote'. This is a process executed by the employees of the front sales department. Gateways in this process are invaluable. This is because the organizational process flows based on conditions. One of the possibilities in the model is the flow regarding an incoming call, within this flow a check needs to be performed whether a mail is sent with this month's promotions or not, hence the first gateway. The second gateway, concerning "call" as means of communication, controls the management's decision regarding the sales order. Another possibility in the model is the flow regarding an incoming e-mail as the first means of communication. The first gateway in this flow checks what type of customer is corresponding. This could only be a partner client, a non-partner client, and a new client. In the case of a partner client, there are two additional gateways. Firstly, the condition is checking if this month's promotions are sent as well. In the latter stages of the flow there is a gateway that separates the end states. These could only be disapproval or approval. There are three end states where two of them indicate the approval for partner clients or non-partner clients.

Furthermore, communicating with the customer is crucial as well. Firstly, the customer can send a purchase order to the company via mail. On the other hand, the customer can also call the company. In BPMN language it is called synchronous communication. The created sales order is sent to the customer. Additionally, the sales order may be rejected or approved. In both cases, the customer receives a message from JM. Other explanations may be needed to fully understand the model. For example, the representations of different account managers in this model. According to the case provided by JM, their process involves two types of account managers, default account managers on the one hand and fixed account managers on the other hand. Since no explicit explanation was given about the exact differences between these roles, assumptions are made. These assumptions being default account managers handle the PO's of non-partner clients and fixed account managers handle the PO's of partner clients, hence the aforementioned gateway 'type of client'.

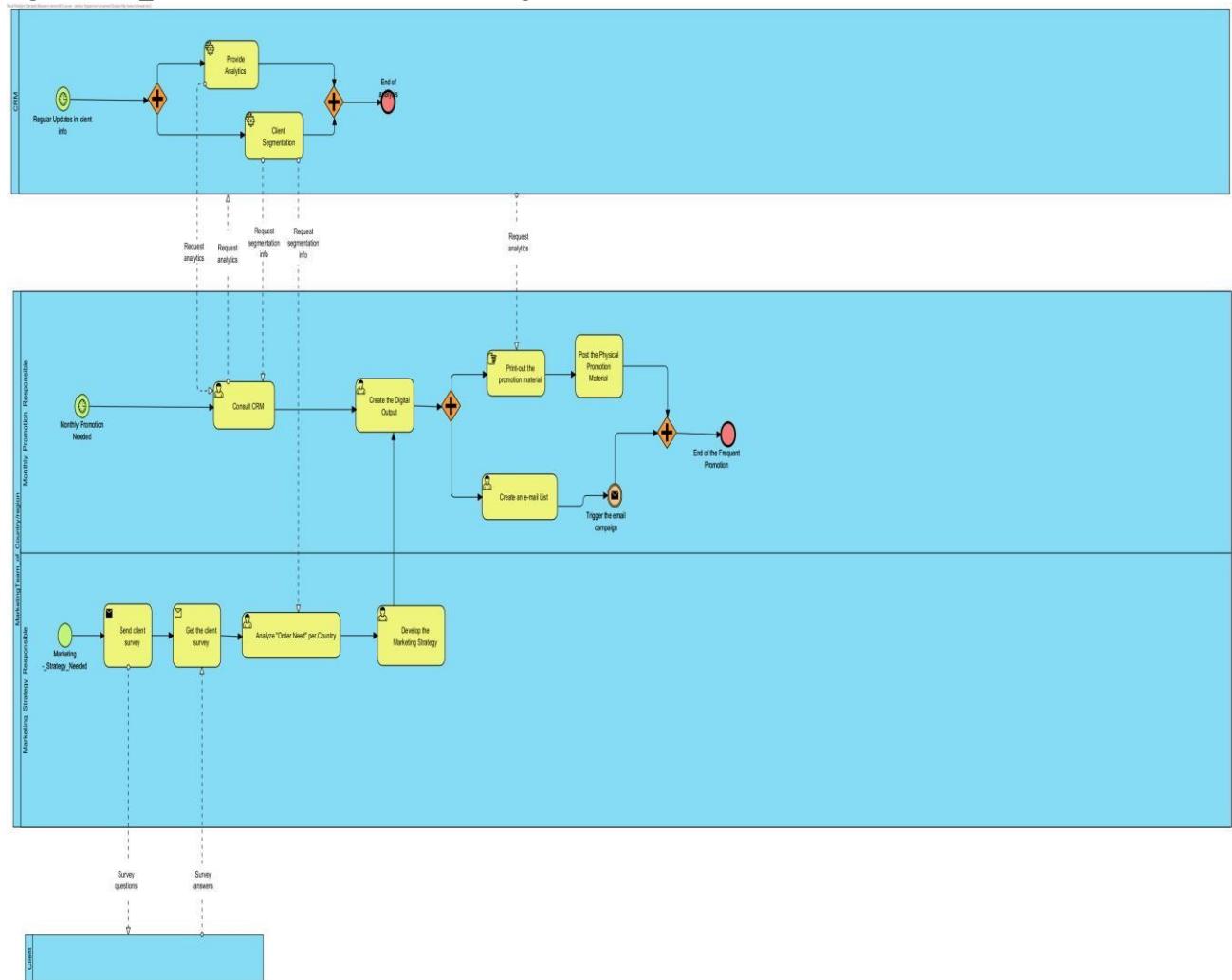
Figure 4: AS_IS Handle Sales Quote BPMN Diagram



1.1.3. "Promotion to Client" business process

For this business process, there is a close collaboration between the marketing team of the country/region and the CRM tool observed. A possible BPMN is shown below. The CRM tool updates the client information regularly depending on the data coming from the sales team (that process is shown on the sales team BPMN). When there is a need for a promotion, usually once a month, the marketing team consults the CRM tool for the latest information about the clients and conducts separate client surveys to develop the marketing strategy. Once the marketing strategy is developed, digital output is created. This digital output is then sent to the client via an email campaign and at the same time printed out and sent as physical promotion material.

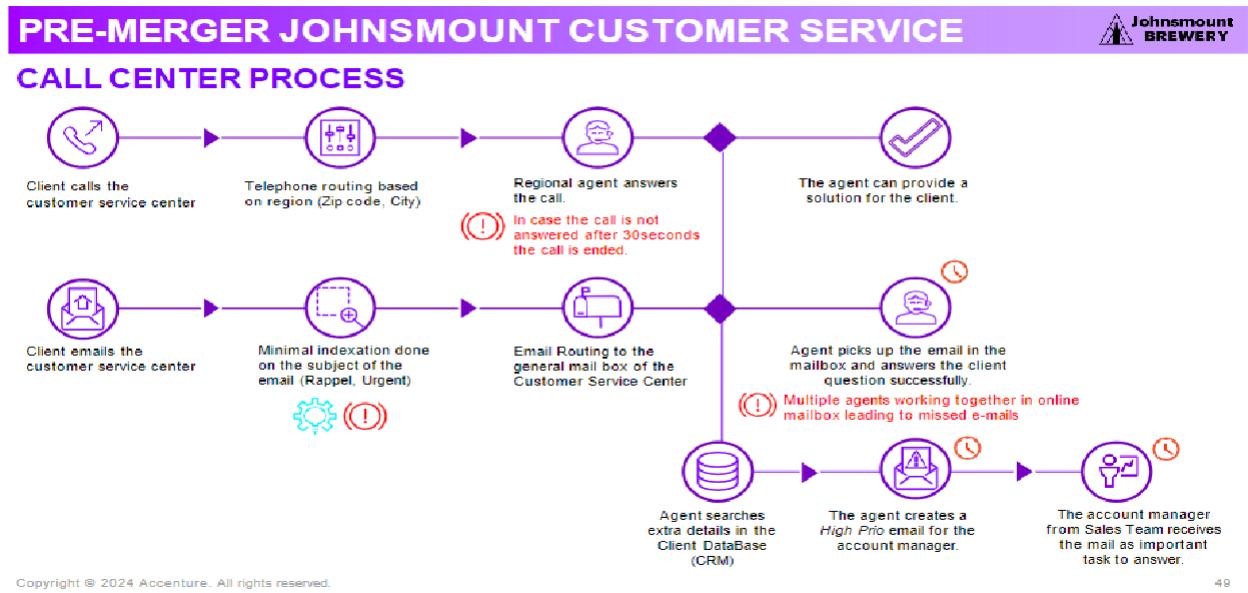
Figure 5: AS_IS Promotion to Client BPMN Diagram



1.1.4. "Provide Call Solution" business process

The following 'general process' was provided by Johnsmount, which served as the basis to model both the call and e-mail solution processes in BPMN:

Figure 6: Johnsmount Brewery Pre-Merger Customer Service General Process Flow Chart

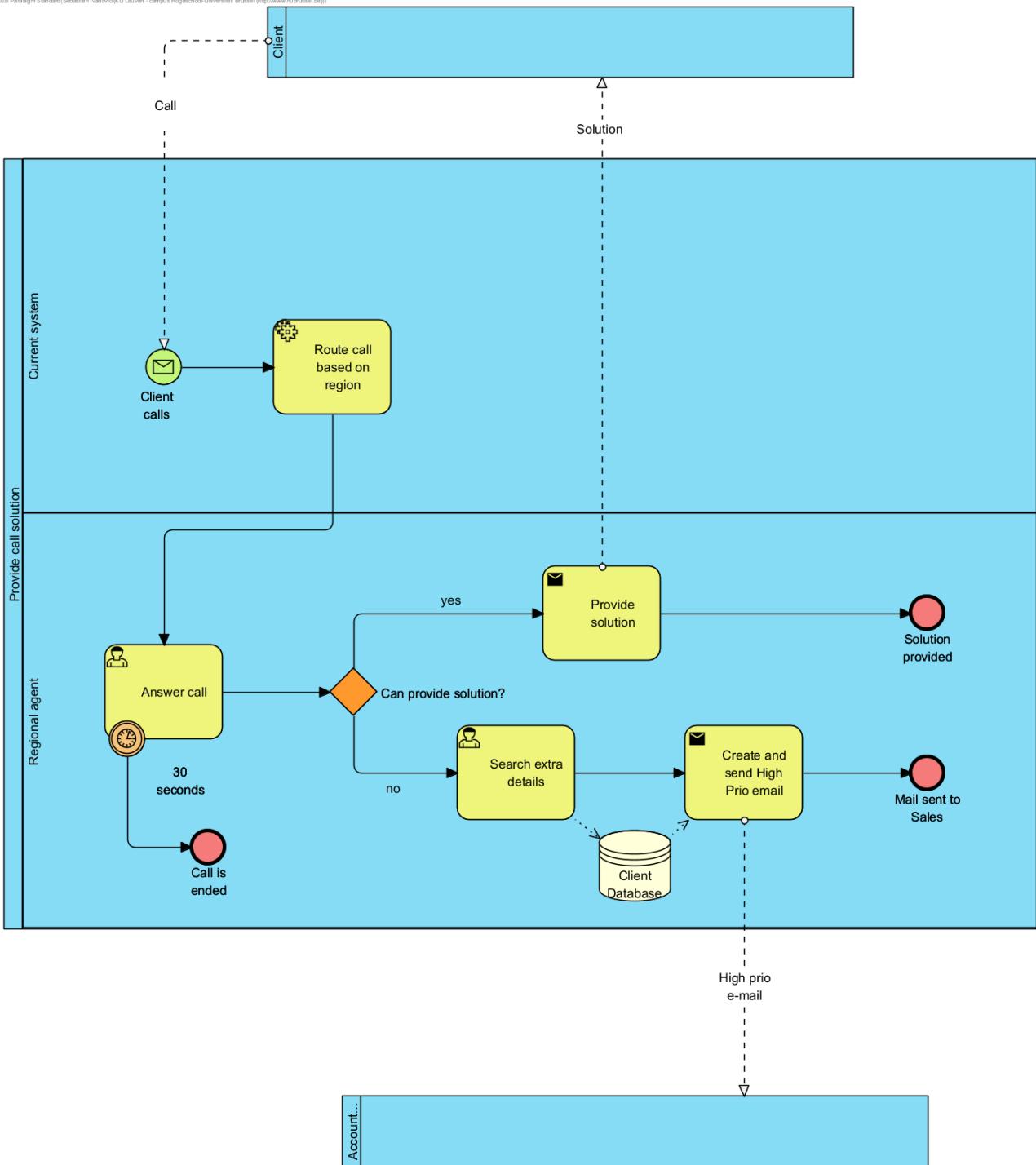


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A possible BPMN model related to the call center process is shown below. This BPMN model only considers the calling process, so in other words, when a client calls the customer service center. The model does not include the process of providing solutions to customer emails. Note that when a call is not answered in 30 seconds, the call is ended, and the process is finished. When the customer service employees cannot provide a solution themselves, the client database is consulted for extra details, and a high-priority email is sent to an account manager in the sales department. Post-merger analytics show that the average time spent on a phone call is 25 minutes resolving 42% of issues on the first call and 49% on the second. Seventeen minutes is the average time spent on email solutions resolving 57% issues on the first email and 70% on the second. Main issue revolves around order delivery dates plus wrong orders or missing items.

Figure 7: AS_IS Provide Call Solution BPMN Diagram

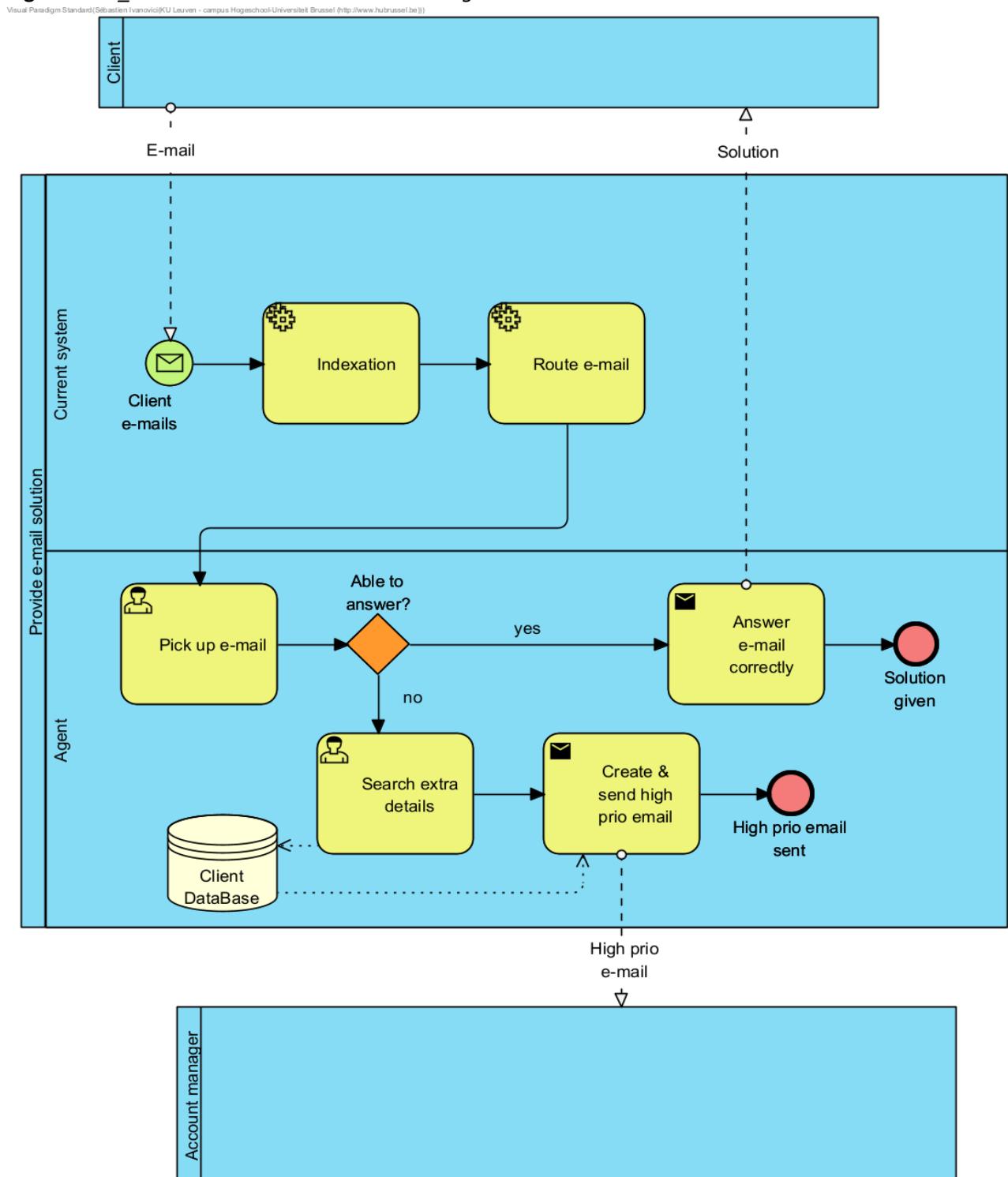
Visual Paradigm Standard| Sébastien Ivanov (KU Leuven - campus Hogeschool Universiteit Brussel (<http://www.hubrussel.be>))



1.1.5. "Provide e-mail solution" business process

A second possible BPMN model for the call center process is shown below. This was also modeled based on the 'general process' for the call center provided by Johnsmount (Figure 6). This BPMN model focuses explicitly on the customer e-mailing process. To start off the process, a simple indexing is done based on the subject of the e-mail, after which it is routed to the general mailbox of the customer service department. It is partly analogous to the calling process in the sense that when a customer service employee cannot provide a suitable answer, a high-priority e-mail containing extra details extracted from the customer database is yet again sent to an account manager in the sales department.

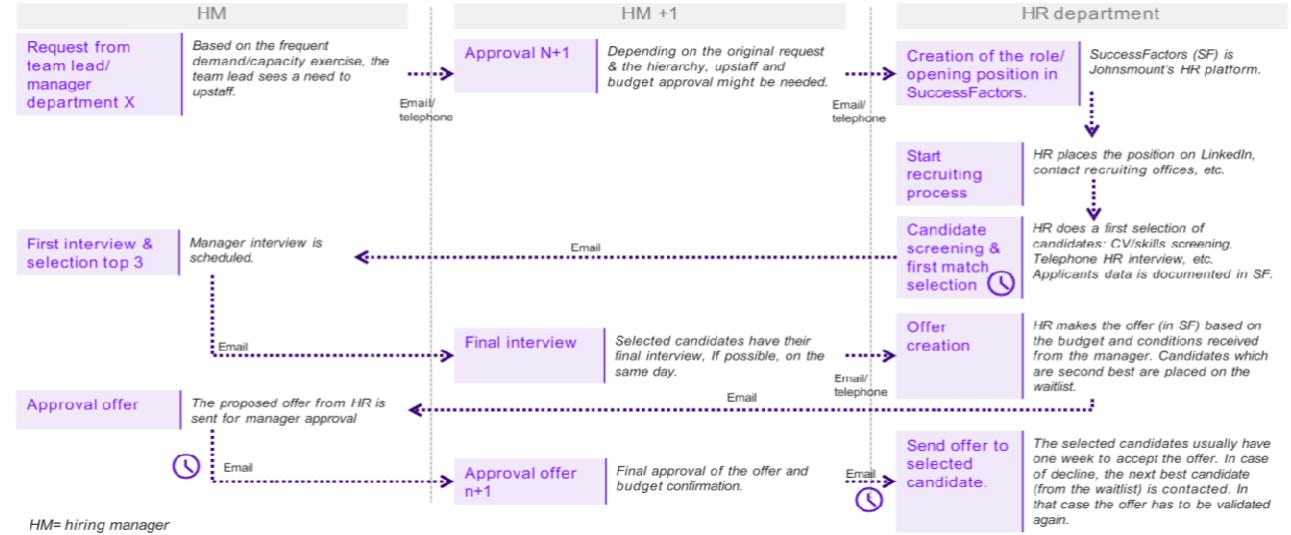
Figure 8: AS_IS Provide Email Solution BPMN Diagram



1.1.6. "Hiring Process" business process

The following 'general process' was provided by Johnsmount, which served as the basis to model the hiring process in BPMN:

**Figure 9: Johnsmount Brewery Pre-Merger Recruitment Process Flow Chart
GENERAL PROCESS (1/2)**



A possible BPMN model is depicted below. The BPMN model is split to improve readability.

Note that an assumed timeline of a month per hiring process was used, in reality this might differ per position the hiring process is triggered for, which might cause a difference in the intermediate sourcing timeframe of two weeks. This assumption was made based on a selected top three, which indicates the vacancy is closed at some point during the hiring process and the process continues with the received applications within this timeframe, which are then used in the included subprocess of selecting candidates. It is also assumed that the first parallel gateway probably consists of more tasks but as these are unknown, it is limited to the two general tasks provided in the description (LinkedIn and recruiting offices).

Figure 10: AS_IS Hiring Process BPMN Diagram (left side)

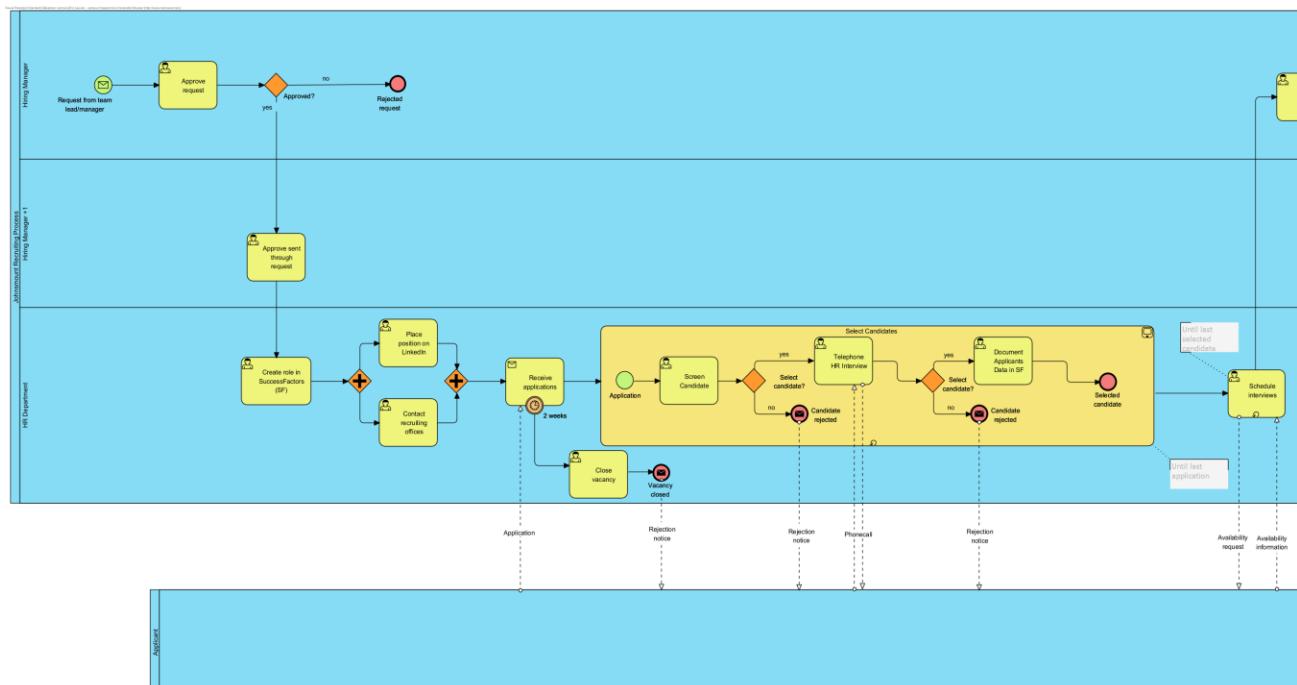
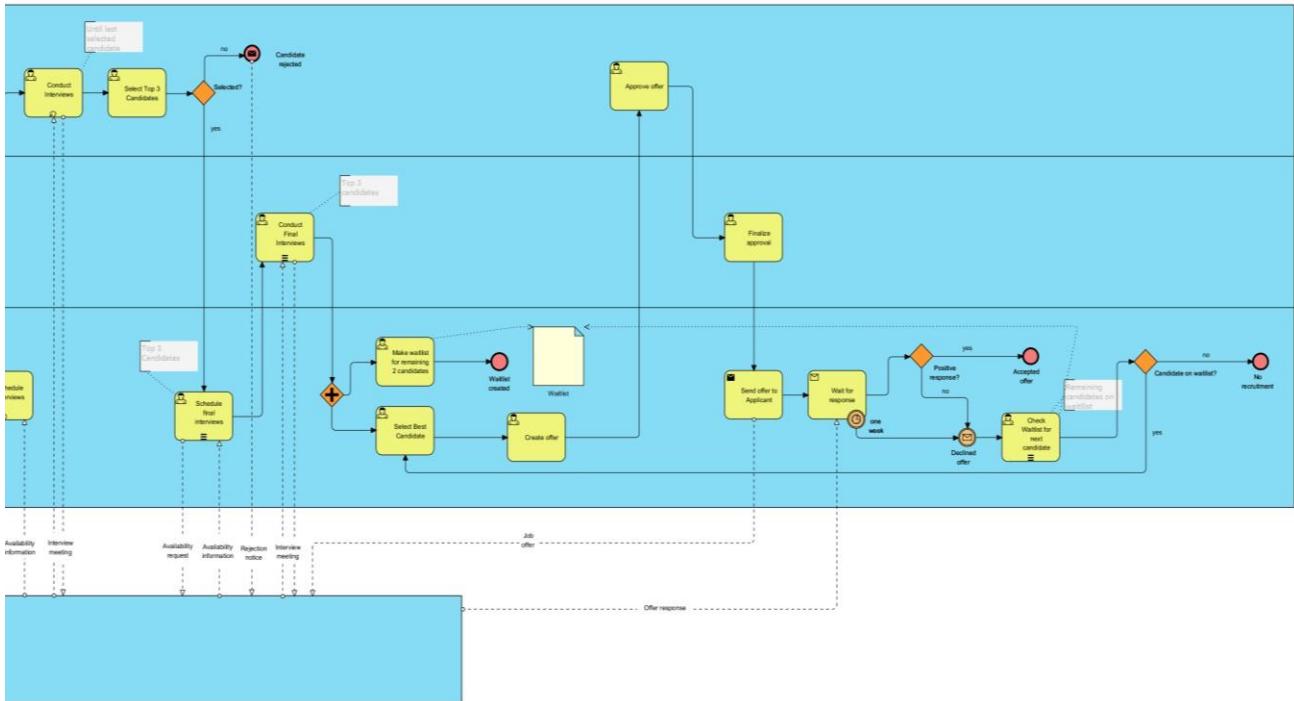


Figure 11: AS_IS Hiring Process BPMN Diagram (right side)



2. To-be Situation

The to-be situation aims to mitigate issues observed in the as-is situation. This paper focuses on centralizing scattered customer data from ABC and JM into a new ERP CRM system that manages and stores it. Based on research, several enhancements were identified compared to JM's existing solutions. The system now includes eleven core processes, detailed further in subsequent sections.

In the customer service department, the CRM tool's key function is **providing ticket solutions** through a unified ticketing system to optimize ticket creation and processing via standardization. A centralized **knowledge database** is crucial for ensuring consistent information across JM and ABC. This enhances operational efficiency in both companies. The **Process Order** use case ensures seamless order management from initiation to fulfillment. This automates the order entry, tracking, and confirmation.

Updating Client Information maintains an extensive client record including contact details, preferences, account status, previous vouchers, store details and the information that would be relevant to collect data in the future. This ensures data consistency between the companies. The **Grant Customer** use case integrates customer profiles for personalized experiences, and promotions based on customer preferences, behavior and the achievement of pre-defined sales metrics to foster loyalty and enhance partnerships.

Initiating Promotion Verification validates and applies promotions to customer accounts, ensuring accurate redemption and aims to solve the problem of getting feedback from the promotional campaigns. **Checking Inventory** monitors real-time stock levels, providing accurate data to optimize stock availability and minimize overstocking or stockouts.

The **Client Segmentation** use case categorizes clients into non-partner and partner clients based on purchase behavior and demographics. The **Analyse Social Media Data** process leverages insights from social media to understand customer sentiment and trends. The **Analyze Sales Data** use case examines sales metrics to identify trends and areas for improvement. These processes enable targeted marketing strategies, personalized engagement and improved performance insights. The **Use Incentive System** process handles incentives for sales representatives for them to collaborate with marketing teams in verifying promotional usage through a newly introduced phone application, by applying bonuses based on a structured incentive program.

2.1. System Use case Diagram

Figure 12: TO_BE System Use Case Diagram

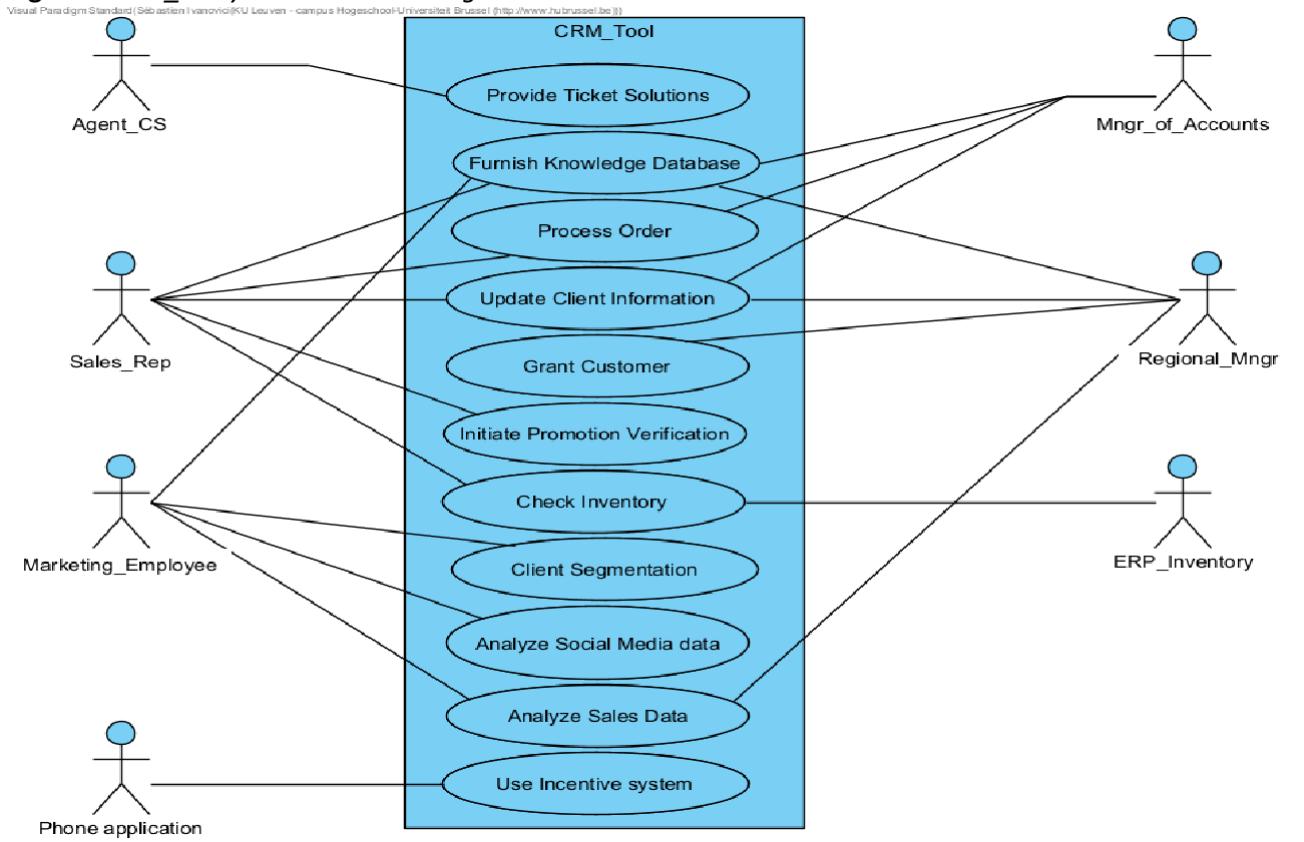


Table 1: System Use Case to Business Use Cases Traceability Table

System Use case	Realizes Business Use case(s)	Comment
Provide ticket solution	Send High Prio Email, Call Tickets, Email Tickets, Ticket Solutions	A newly defined process, the call and e-mail solutions are integrated into one centralized ticketing system.
Furnish Knowledge Database		Newly defined process for business analytics in gathered data between stakeholders and cache
Process order	Handle Sales Quote, Handle Sales Offer	As described above, the two business use cases are combined into one new system use case which ensures consistency
Update Client Information	Update_Client_Masterdata, Merger_Client_Info	The process logic and steps remain the same, but more actors have access to this functionality.
Grant Customer	/	Newly defined process is crucial for ensuring consistent information across JM and ABC
Initiate Promotion verification	/	Newly defined process to make sure & check whether newly sent promotions are being used
Check inventory	Handle Sales Quote, Handle Sales Offer	Functionality implemented in 'Process order', to smoothen the process
Client Segmentation	Client_segmentation	The process logic and steps remain unchanged
Analyze Social Media Data	/	Newly defined process gathering data through social media platforms for mining and analysis
Analyze Sales Data	/	Newly defined process for data gathering mining and analysis on sales information
Use Incentive System	/	Newly defined process to incentivize the sales representatives in evaluating promotion usage

2.2. To-be BPMN Diagrams

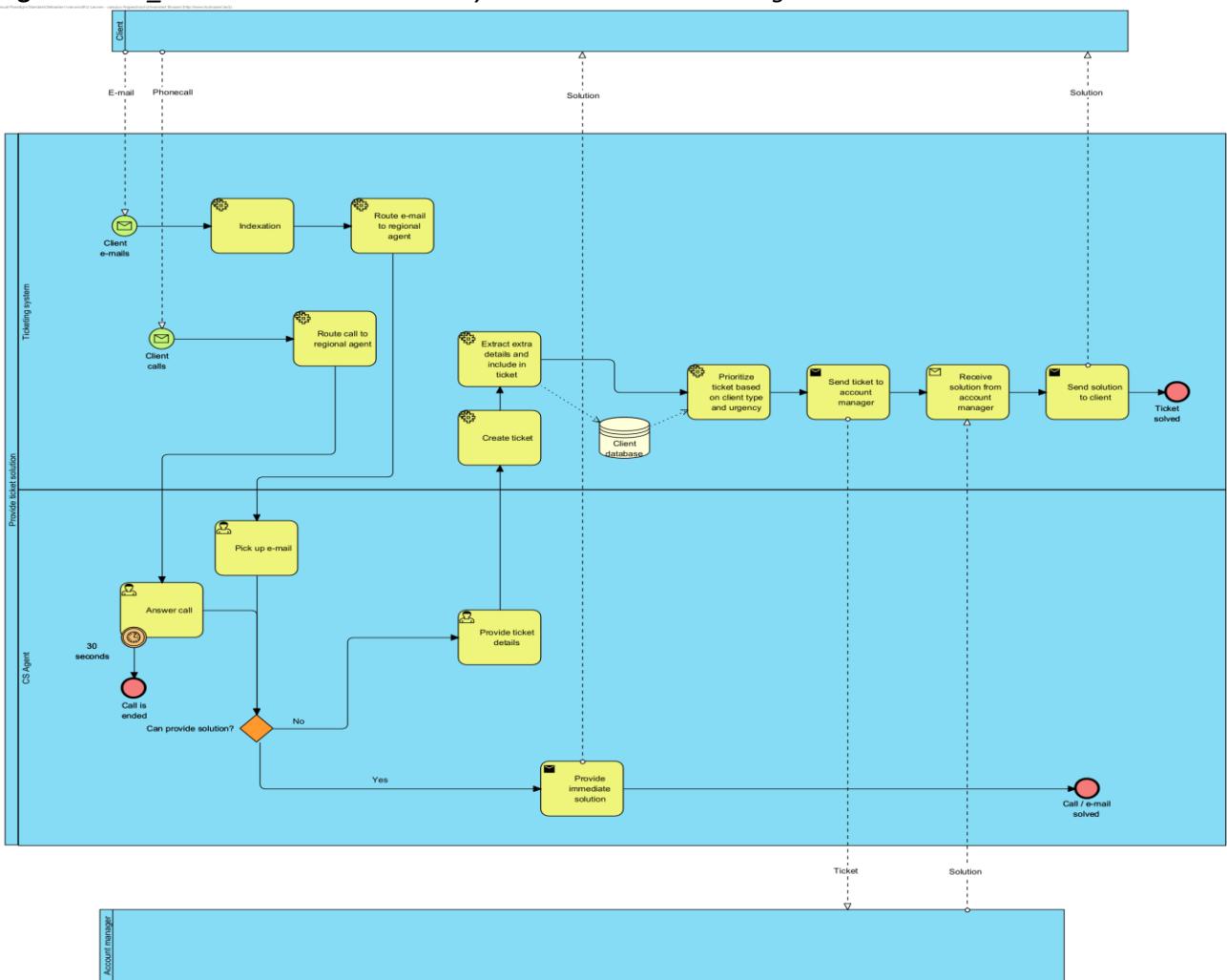
2.2.1. "Provide Ticket Solutions" Process

The system integrates the call and e-mail solutions into one 'Provide ticket solution' process. The process starts when a client sends an e-mail to the general CS e-mail address, by doing the same small indexation (for e-mail only) and routing (for both calls and e-mails) towards the regional CS agent. The CS agent will then pick up the e-mail or answer the call and see if he/she can provide an immediate solution. If the agent can provide an immediate solution, the solution is immediately communicated to the client and the process is ended.

If the CS agent cannot immediately provide a solution, they will provide the details of the ticket into the ticketing system and a corresponding ticket is created by the system. The system will then automatically extract extra details from the client database and include them in the ticket. The system will then prioritize the ticket based on client type and urgency. The ticket will then be routed to the account manager's ticket inbox, and the process will be on halt until the account manager provides a solution. When the account manager's solution is provided to the ticketing system, the system will automatically communicate the solution to the client.

This centralized process will make the service faster and more efficient, as well as save costs in the long run. The e-mails would also be assigned to their specific regional CS agent instead of a general mailbox. This way clients will be in contact with someone that is familiar with their company and values. This will be possible due to the automatization of many of the CS agent's previous tasks, which should also help with the excessive workload they were previously experiencing. Furthermore, by indexing the tickets by client type and urgency, the most important tickets will be addressed first. This will increase customer satisfaction (especially for more important customers) by a sizable margin. Having all the tickets in one place will also create a better environment for clarity and communication overall.

Figure 13: TO_BE Provide Ticket Solution System Use Case BPMN Diagram

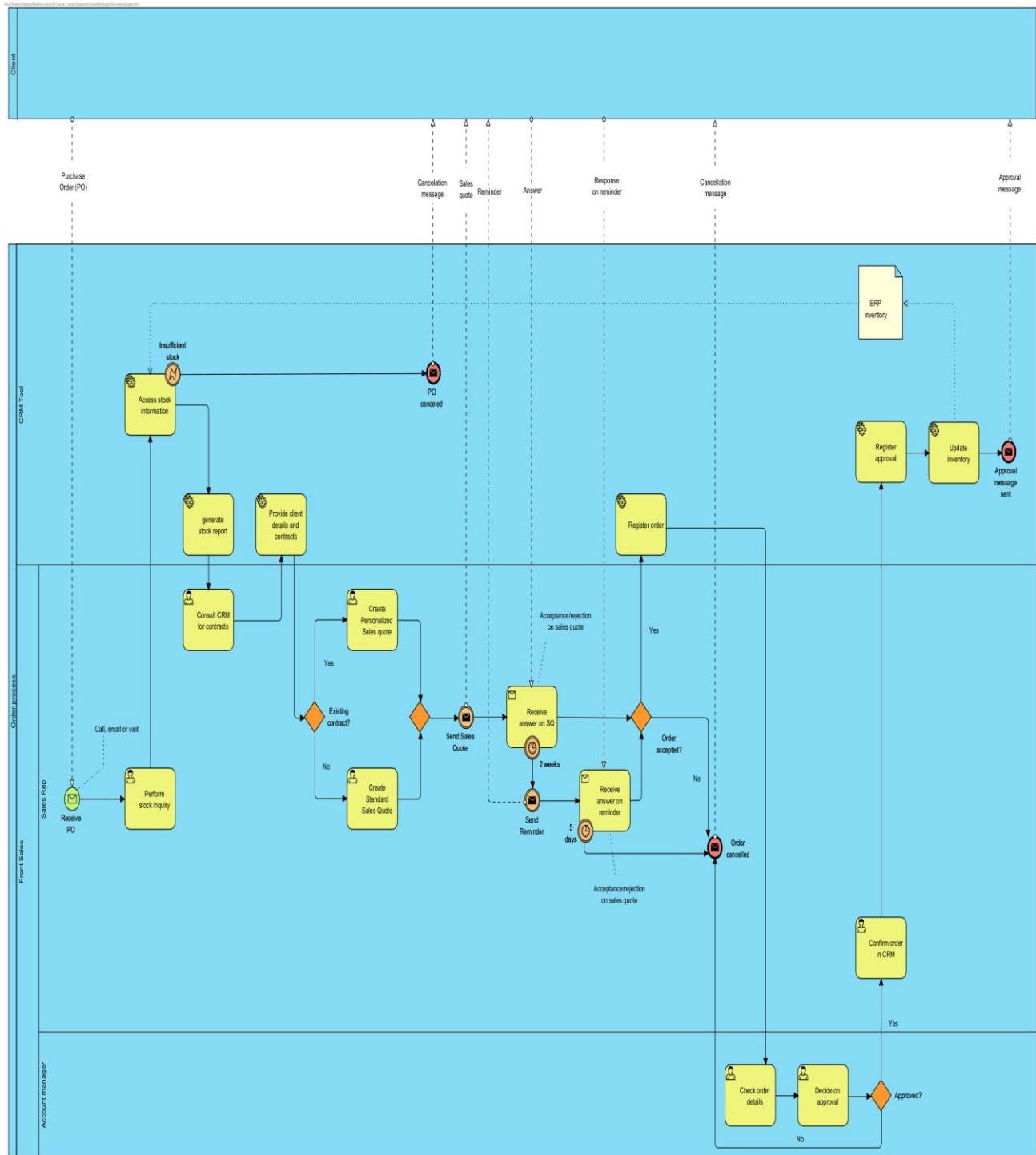


2.2.2. "Process Order" Process

Figure 14 displays the BPMN model for the Process Order System Use Case. In contrast to the as-is 'Handle Sales Quote' process, this process is more automated to enhance efficiency and reduce PO cycle time. Therefore, effective implementation of the SAP CRM tool in this process is essential. In addition, the process starts either with a call, email or visit from the client and follows the same process flow in those three cases to achieve more consistency and standardization. After the PO receipt from a client, the sales rep performs a stock inquiry to the CRM tool to make sure sufficient stock is in place. If there's sufficient stock the CRM tool will provide the sales rep with a stock report. However, if the stock is insufficient, the PO will automatically be canceled. After receiving the stock report, the sales rep consults the CRM tool to see whether contracts for the specific client exist. This information is crucial because it determines whether to create a personalized sales quote or a standard sales quote.

First, the personalized SQ concerns partner clients. Partner clients enjoy personalized SQ's because they place orders regularly, therefore are seen as important clients and thus contracts were negotiated with them. After creating a SQ, the sales rep sends it to the client and awaits an answer, either acceptance or rejection of the sales quote. To ensure a smooth process flow, there is a deadline present for answering the sales quote. If the customer does not respond on the SQ within a two-week period, a reminder is sent. If the customer then does not answer within five days, the SQ is cancelled. Contrarily, when the customer does respond there is a check to see if the order is accepted. If so, the order is placed in the SAP CRM tool. If not, the whole process ends. After registration of the order, approval by the account manager is needed. In case of approval the sales rep confirms the order in the CRM tool after which it registers the approval and updates the ERP inventory.

Figure 14: TO_BE Process Order Systems Use Case BPMN Diagram



2.2.3. "Grant Customer" Process

In this competitive market, expanding sales channels is crucial. This approach not only enhances brand awareness but also generates new revenue streams, ensuring continuous growth and market presence. By refining data-driven decision-making processes, risks associated with client investments can be managed in a market-dominating way.

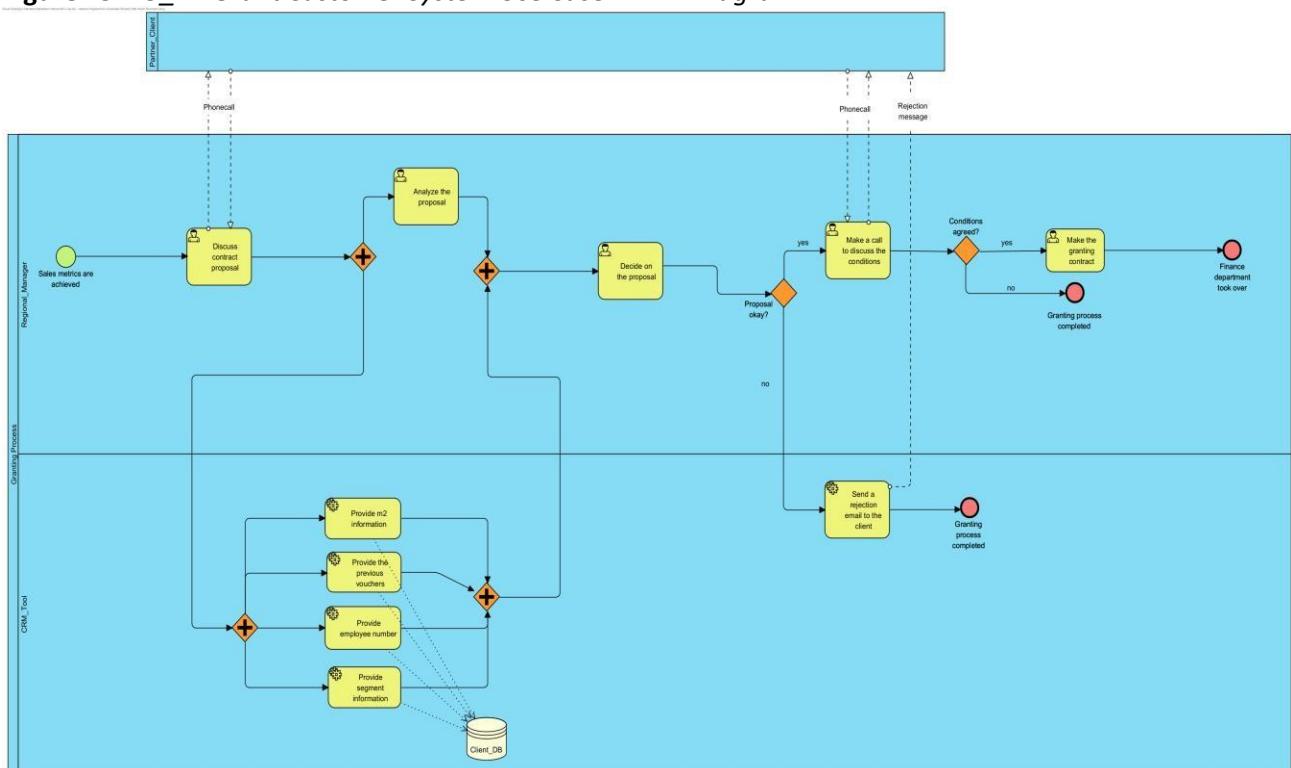
The brewery company (JM) is focused on enhancing its relationship with partner clients by offering monetary grants to expand or improve their selling points, offering discounts, personalized aisles, logistic support, or promotional materials or even for opening new locations, in return for committing to significant contracts. The goal is to first create, then streamline and optimize the granting process to ensure efficiency and clarity.

The diagram provided illustrates the granting process, which begins when sales metrics are achieved by a partner client, prompting the Regional Manager to initiate contact with the client. Upon receiving a proposal detailing the client's expansion plans and required grants, the Regional Manager analyzes the proposal using predefined criteria while already requesting further information about the client, to have a better view of the situation. After analyzing the proposal while considering the detailed report provided by CRM, a decision is made on whether to proceed with the proposal.

If the decision is positive, the Regional Manager calls the client to discuss and agree on the conditions of the grant. If conditions are agreed upon, the process moves to contract creation. A formal contract is then created and signed by both parties, completing the granting process, with the Finance Department taking over for monetary disbursement and monitoring. If both parties cannot agree after, a rejection email is sent to the client. On the background there is an automation of data collection through integrating the CRM tool for automatic data retrieval and report generation.

Long-term gains involve improved client relations through faster and more transparent processes, enhanced decision-making through data-driven analysis, and overall operational efficiency with reduced manual data handling and streamlined workflows. This developed process sets the foundation for sustainable growth and stronger client partnerships by leveraging automation and clear communication through the way of growth. Lastly, it is important to note that, for JM to utilize this system fully, each actor needs to get used to this new data-oriented way of working. So, the maximal scale of granting, which is granting a project to open a new store, would be done in the long-term, once the implementation has completed.

Figure 15: TO_BE Grant Customer System Use Case BPMN Diagram



2.2.4. "Analyze Social Media Data" Process

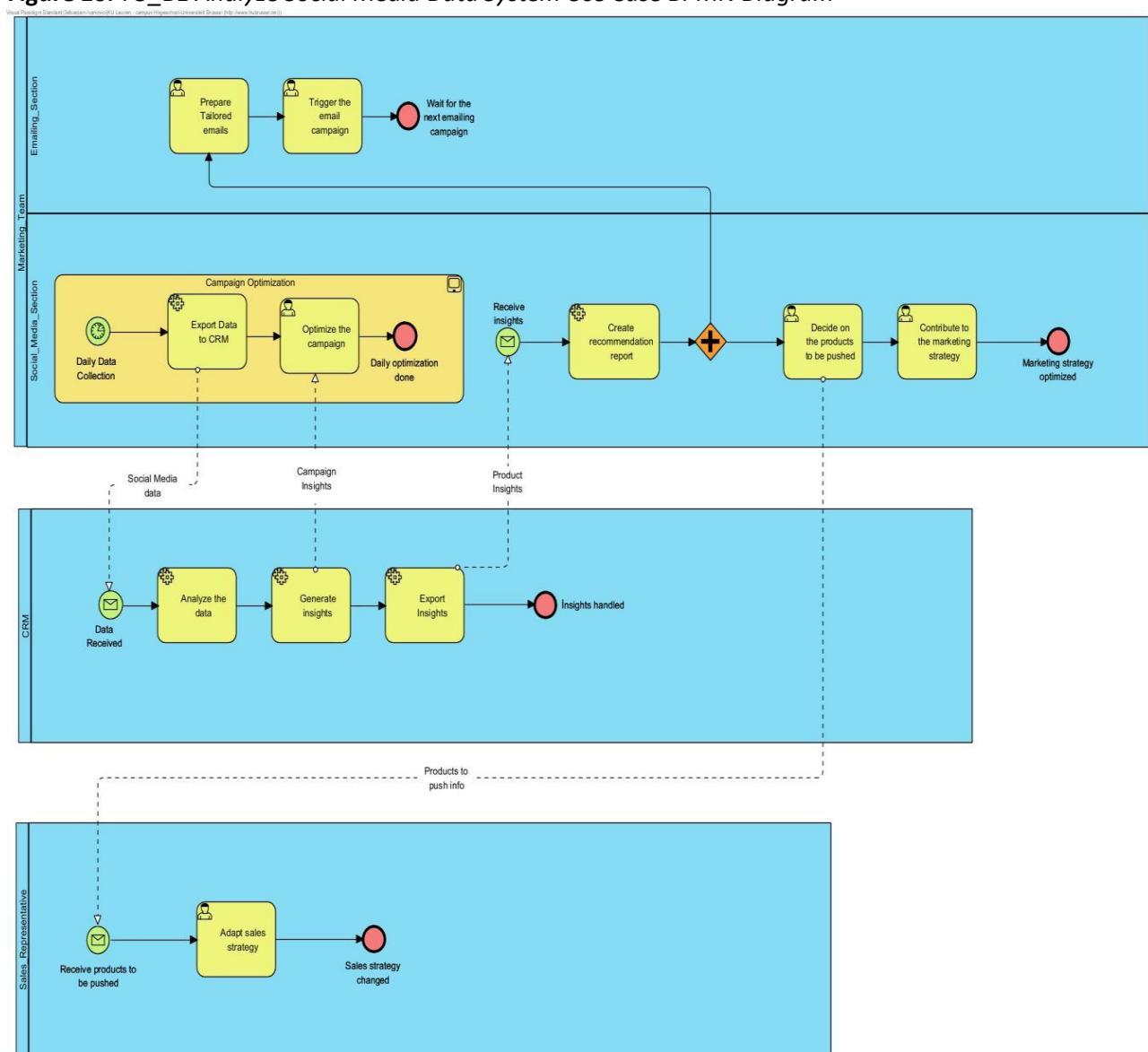
The core aspect of this process is making effective use of the acquired social media data by the marketing team and the sales representatives with the help of the CRM tool. The process essentially starts with the daily collection of data through social media platforms. This data contains customer feedback, trending topics, demographic data, engagement rates, influencer impact, etc. The collected data is then exported to the CRM tool and analyzed further to generate insights.

These insights are exported back to the marketing team and a recommendation report is created accordingly. The process then splits into two simultaneous tasks. The marketing team prepares tailored emails and at the same time decides on products to be pushed with the marketing campaign. The marketing team's tasks end with triggering the email campaign and contributing to the marketing strategy.

The sales representative, after receiving the information on the products that are decided to be pushed, adopts the sales strategy and the strategy is changed accordingly.

Overall, by following this process social media activities can have a meaningful impact on the marketing campaigns and a positive effect on sales. The process is repeated frequently by its nature (daily data collection through social media) and consequently helps the company to stay up to date with its data analysis and ongoing marketing campaigns and strategy.

Figure 16: TO_BE Analyze Social Media Data System Use Case BPMN Diagram



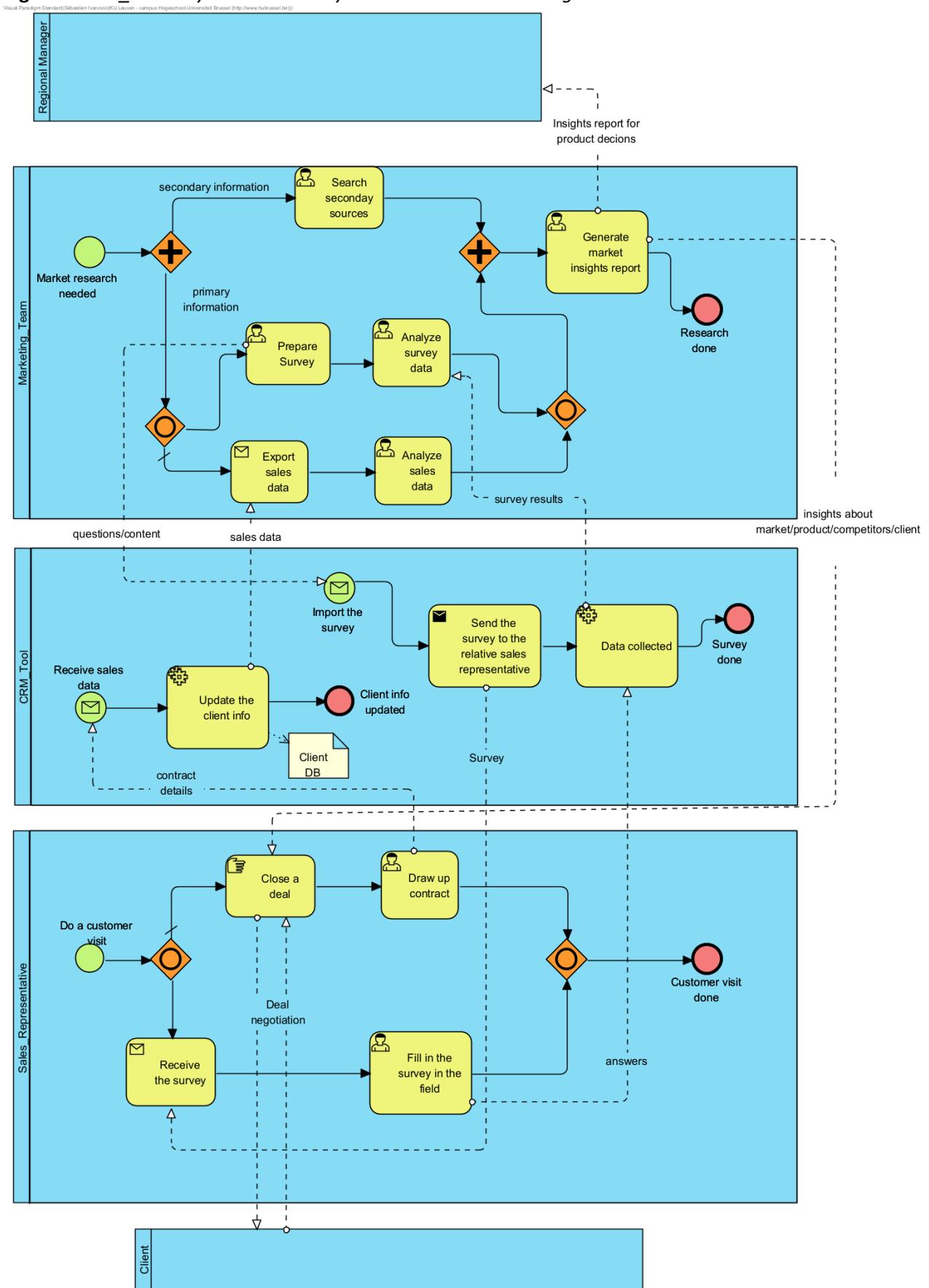
2.2.5. "Analyze Sales Data" Process

The improved sales process is designed to leverage data creation and utilization throughout sales and marketing procedures, starting with the identification of the need for market research. The marketing team satisfies this by exporting existing sales data for the primary research while also doing a secondary one in parallel. Concurrently, the team prepares a detailed survey aimed at collecting primary data directly from the field. The sales representatives play a crucial role at this stage by conducting customer visits, during which they fill out the surveys with relevant customer insights. Upon completion, the surveys are received and imported into the CRM tool, which facilitates the integration of this new data with existing client information.

The marketing team then analyzes the survey data, combining it with insights from secondary sources to generate a comprehensive market insights report. This report offers valuable information about the market, products, competitors, and clients, aiding the company in making informed product decisions. Meanwhile, sales representatives continue their routine tasks of closing deals and making contracts, now empowered with enriched data that enhances their understanding of the market and customer needs. The CRM tool plays a pivotal role throughout this process by receiving sales data and updating the client database with new information, ensuring that the data collected from surveys is seamlessly integrated and accessible.

Sales representatives can determine which products to sell, where, and when. The marketing team gains insights into market trends, competitor strategies, and the effectiveness of their campaigns. Upper management can use these insights to develop new strategies for different products. The continuous flow of data between the marketing team, sales representatives, CRM tool, and regional managers creates a dynamic system where insights and information are constantly updated and utilized for decision-making. This process not only enhances the company's ability to respond to market trends and customer needs but also fosters a more efficient and effective sales strategy, ultimately driving better business outcomes.

Figure 17: TO_BE Analyze Sales Data System Use Case BPMN Diagram

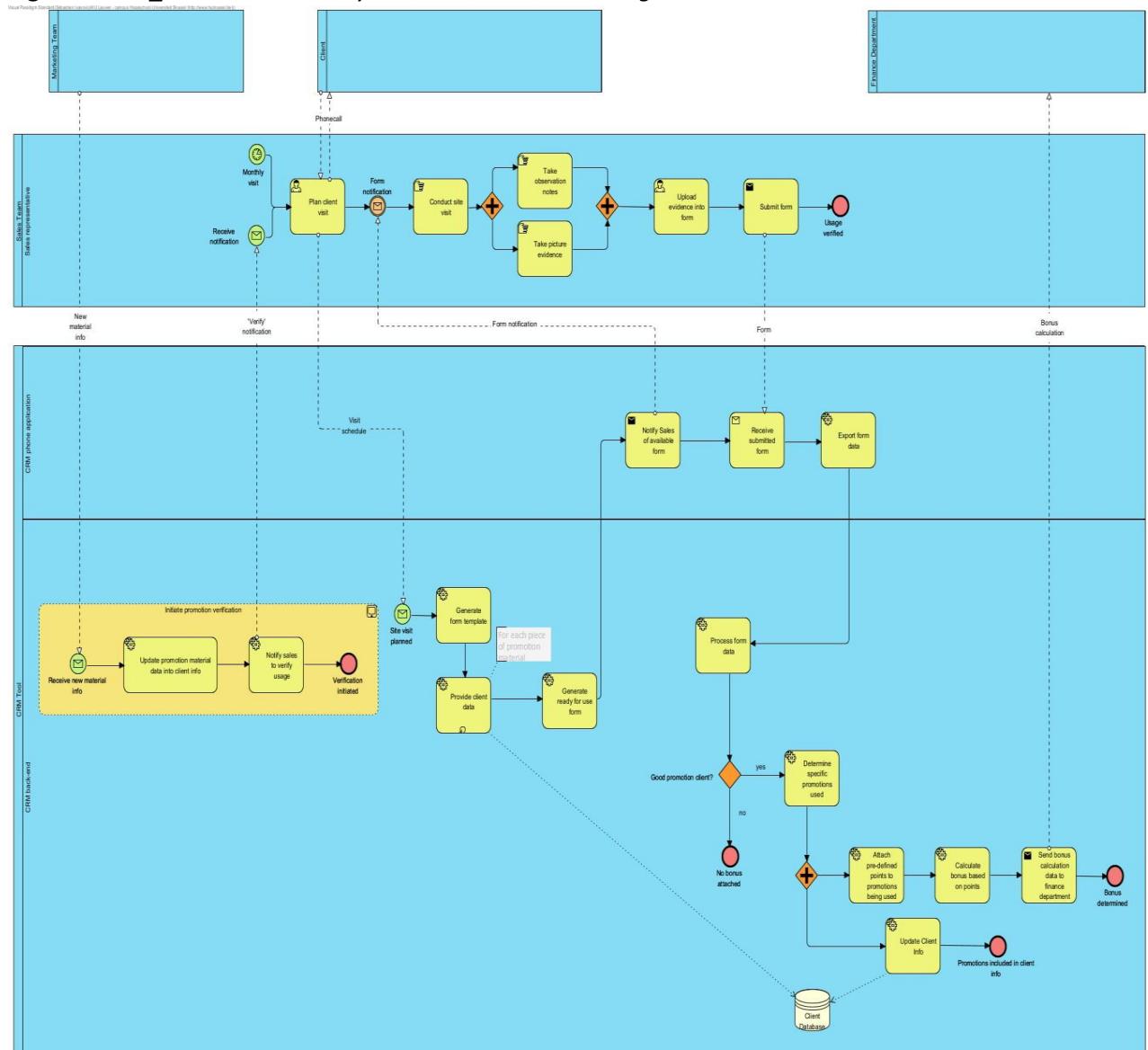


2.2.6. "Use Incentive System" Process

A new way of incentivizing the sales representatives (reps) to work coherently with the Marketing team is introduced by this use case. It triggers the sales reps to check on the use of promotion material by the clients, provided their direct contact with the client, during the regular visits (assumed as monthly) or whenever new promotion material is sent. Note that a subprocess is made in the second case within the CRM tool, which represents the 'Initiate Promotion Verification' use case. It is not represented by a separate BPMN but will have a separate sequence diagram from which the end message is a possible trigger for the sequence diagram which corresponds to the 'Use Incentive System' use case.

When sales reps are prompted by the CRM to go and visit the client they receive a form on a newly introduced phone application, interacting with the CRM, where they can fill in a form which requires the photos of specific promotions which are currently in use. Additionally, the location data from their phone will correct that information for the specific client. By implementing this business process, JM will also be able to do A/B tests on promotional materials. Once the form is filled in, the CRM receives it and connects it to pre-determined points for each used promotion material per client (how important determines a weighted percentage), this point system accumulates and determines a monthly bonus for the sales rep as they provided the knowledge on the use of promotional materials. It incentivizes them in two ways. Firstly, it gives them a reason to encourage the use of promotional materials towards their clients and secondly it gives them a good reason to check their use thoroughly.

Figure 18: TO_BE Use Incentive System Use Case BPMN Diagram



3. Software Project Management Report

3.1. Actor Weight

In table 2 all actors that will be using the CRM tool in one way or another are summed up. Depending on the complexity of the actor, they are given a weight which is one for simple actors, two for average actors and three for complex actors. Also, the rationale behind the given weight is provided.

Table 2: CRM Tool System and Business Actors Description and Complexity Weightage

Actor Name	Stereotype	Brief description	Rationale	Actor complexity
Regional_Mngr	Business worker	Sales manager responsible for a specific region	Human actor interacting through GUI	Complex (3)
Mngr_of_Accounts	Business worker	Sales manager responsible for several accounts	Human actor interacting through GUI	Complex (3)
Sales_Rep	Business worker	Worker in the sales team	Human actor interacting through GUI	Complex (3)
Marketing_team	Business worker	Worker(s) in marketing team	Human actor interacting through GUI	Complex (3)
Agent_CS	Business worker	Worker in the customer service department	Human actor interacting through GUI	Complex (3)
ERP Inventory	System actor	Separate information system connected with CRM tool	External system that must interact with the system using standard communication protocols	Average (2)
Phone application	System actor		External system that must interact with the system using a well-defined API	Simple (1)

3.2. Use case Weight

In table 3 below, the most important system use cases of the new system are listed. Furthermore, the actors connected to the system use cases are specified to give a clear picture of who has access to specific functionalities. Every system use case has been given a weight based on complexity as well. This can be a weight of 5 for simple use cases, 10 for average use cases and 15 for complex use cases. Additionally, a brief description of the use case and which business use case the system use case realizes is added.

Table 3: System Use Case and Business Actor Traceability, Description, and Weightage

#	Use case title	Actor	Brief description	Complexity	Realizes BUC(s)
1	Process order	Mngr_of_Accounts, Sales_Rep	Includes the process of entering the PO into the system as well as the processing of it	Complex (15)	Handle Sales Quote, Handle Sales Offer
2	Furnish Knowledge Database	Mngr_of_Accounts, Regional_Mngr, Sales_Rep, Marketing_team	Provides business analytics on sales, customers, suppliers...	Complex (15)	/
3	Update Client Information	Sales_Rep, Mngr_of_Accounts, Regional_Mngr,	Keep customer data up to date	Complex (15)	Update_Client_Masterdata, Merger_Client_Info
4	Client segmentation	Marketing team	Target different customer groups	Complex (15)	Client_segmentation
5	Provide ticket solution	Agent_CS	Provide solutions to complaints from customers	Simple (5)	Send High Prio Email, Call Tickets, Email Tickets, Ticket Solutions
6	Check inventory	Sales_rep, ERP Inventory	Checking inventory to see if it is sufficient for PO's	Complex (15)	Handle Sales Quote, Handle Sales Offer
7	Use incentive system	Phone application	Process to make sure & check whether sent promotions are being used and thus bonuses are in order	Simple (5)	/
8	Grant Customer	Regional manager	Process to enhance relationships with clients + push more volume	Simple (5)	/
9	Analyze Social Media Data	Marketing team	Process to support marketing team in designing campaigns and/or promotions	Complex (15)	Promotion_to_Client
10	Analyze Sales Data	Marketing team, Regional_Mngr, Mngr_of_Accounts	Process to support marketing team in designing campaigns and/or promotions	Complex (15)	Promotion_to_Client
11	Initiate Promotion verification	Sales_rep	Process to support sales rep in verifying promotion material usage	Simple (5)	/

3.3. Unadjusted Use case Point & SLOC

Based on tables 2 and 3 of section 3.1 and 3.2, both the total unadjusted use case weight (UUW) and the total unadjusted actor weight (UAW) are computed in the tables below. These figures are necessary to calculate the unadjusted use case point (UUCP), which is then needed to estimate the SLOC. Factor 150 was applied since our solution is an off the shelf CRM tool.

Table 4: Computation of Unadjusted Use Case Weight

Use case complexity level	Weight	Number of use cases	Unadjusted use case weight
Simple	5	4	20
Average	10	0	0
Complex	15	7	105
Total UUW	125		

Table 5: Computation of Unadjusted Actor Weight

Actor complexity level	Weight	Number of actors	Unadjusted Actor Weight (UAW)
Simple	1	1	1
Average	2	1	2
Complex	3	5	15
Total UAW	18		

3.4. COCOMO II Estimation

Table 6 below gives the output for the COCOMO II estimation done in the Costar 7.0 software. For each phase of the project in Rational Unified Process (RUP), the effort expressed in person-month, the duration expressed in months and the costs expressed in thousands of euros are given as well as the totals for the entire project. Additionally, in table 8 the total cost is estimated. This cost includes the project cost, a training fee, an ETL tool license, an SAP license, a consultancy fee and lastly the hardware costs. The training fee justification can be found in table 7, both the ETL tool license and SAP license are estimated according to industry standards, a slight deviation could be possible. Lastly, the hardware cost is estimated using 30% of development costs. Regarding the total costs there are two numbers given, the first excluding the hardware cost, since you may prefer to outsource this cost item and the second including the hardware cost.

Table 6: COCOMO II Estimation Outputs (Costar 7.0 Tool)

Totals for entire project	Effort (PM)	Duration (mo)	Costs (K€)	Productivity
Inception (IN)	4,9	1,8	93,8	
Development (EL+CN)	82,4	14,8	1.220,2	232,4
Transition (TR)	9,9	1,8	146,3	
Total (IN+EL+CN+TR)	97,3	18,5	1.460,3	220,6

3.4.1. Effort Estimation

Table 7: Project Effort Estimation Computation

Effort	Implementation	Total duration: 18,5 months Time consumption per phase: <ul style="list-style-type: none">• Inception: 10%• Development: 80%• Transition: 10%
	Training	3 consultants train the users of the system In total ~300 employees require training (estimation, exact employment distribution is not given) <ul style="list-style-type: none">• 30 groups of 10• Weekly training session of 2 hours per group• 2 months before the go live

3.4.2. Cost Estimation

Table 8: Project Cost Estimation Computation

Cost	IN+EL+CN+TR	Cost per phase: <ul style="list-style-type: none">• Inception (6,4%)• Development (83,6%)• Transition (10%)	€1.460.300
	Training		€84.000
	ETL tool		€100.000
	SAP License		€100.000
	Consultancy fee		€1.940.400
	Hardware		(€366.060)
	Total		= €3.684.700 = (€4.050.760)

3.5. Price

Due to the limited experience of the consultancy team, a margin of 20% is applied for this project. The industry margin for ‘standard IT consulting & services’ ranges from 20% up to 40%. The price set, including hardware, is €4.860.912. Excluding the hardware, if opted for an external provider, the price will be €4.421.640.

3.6. Risk, Quality Management and Iterative Planning

To proceed towards the system development, a risk and quality analysis plus iterative planning are determined and computed, detailing the system use cases order, risk exposure, and quality exposure. The risk exposure consists of considered threats posed to the system use cases within the customer relation management tool. A scale of one, two, and three is used to measure the negative impact of represented threats as threat weight, with the higher number relating to a higher impact. The values High (H)=4, Medium (M)=2 and Low (L)=1 represent the risk exposure of a threat to a use case. Figure 19 illustrates these computations.

Figure 19: Use case Risk Exposure Computation

	Threat Weight	Provide Ticket Solutions	Client Segmentation	Furnish Knowledge Database	Process Order	Update Client Information	Check Inventory	Use Incentive System	Grant Customer	Analyse Social Media Data	Analyse Sales Data	Initiate Promotion Verification
Customer Dissatisfaction	3	H	L	H	H	L	L	H	H	H	H	H
Opportunity Loss	2	H	M	H	H	L	H	H	H	H	H	H
Legal Actions	3	H	L	H	H	L	H	H	H	H	H	H
Compliance Risk	2	H	M	H	H	M	H	H	H	H	H	H
Financial Losses	2	H	M	H	H	M	M	H	H	M	H	H
Data Loss	3	M	M	H	H	M	M	M	L	H	H	L
Data Breach	3	M	L	H	H	M	M	M	M	H	H	L
System Failure / Service Disruption	3	H	L	H	H	M	H	H	L	H	H	H
Requirements Poorly Understood	3	H	L	H	H	M	H	H	L	H	H	H
Phishing	3	H	L	H	H	M	L	H	H	M	L	H
Security Vulnerability	3	H	L	H	H	M	H	H	M	H	H	H
Inadequate Training	2	H	L	H	H	M	M	M	L	H	H	L
Third Party Risk	2	H	L	H	H	L	H	H	H	H	H	H
Reputation Damage	3	H	L	H	H	L	M	H	H	H	H	H
System Overload	2	H	L	M	M	M	H	L	L	H	H	M
Routing Issues	3	H	L	L	M	M	L	H	L	L	L	M
Inadequate Monitoring	2	H	L	H	H	L	H	M	M	H	H	H
Manual Sorting Error	1	H	L	M	H	M	H	H	H	L	L	H
Use Case Risk Exposure		168	54	165	170	75	127	154	116	158	159	146

Likewise, using the same measures, the importance of each system use case is evaluated through quality dimension drivers, having the quality factor weight measuring their positive impact weightage through a scale of one, two, and three. The values High (H)=4, Medium (M)=2 and Low (L)=1 represent the respective quality dimensions exposure to each use case as illustrated in Figure 19. A total risk and quality exposure is summated for each use case thereafter.

Figure 20: Use case Quality Exposure Computation

	Quality Factor Weight	Provide Ticket Solutions	Client Segmentation	Furnish Knowledge Database	Process Order	Update Client Information	Check Inventory	Use Incentive System	Grant Customer	Analyse Social Media Data	Analyse Sales Data	Initiate Promotion Verification
Reliability	3	H	M	H	H	L	H	H	H	H	H	M
Efficiency	3	H	M	H	H	M	H	M	H	H	H	M
Usability	3	H	L	H	H	M	H	H	H	H	H	H
Integrity	3	H	L	H	H	H	H	H	H	H	H	M
Testability	2	H	L	H	H	L	H	H	H	H	H	M
Flexibility	2	H	M	H	H	M	H	M	M	H	H	L
Interoperability	2	H	M	H	H	M	H	M	H	H	H	H
Use Case Quality Exposure		72	28	72	72	37	72	58	68	72	72	44

Next, priority level of the use cases is computed using the relative risk and quality exposures for each use case obtained through the summation of all use cases overall risk and quality exposure. The weight of the risks is more important, carrying 75% weight while quality is at 25% when computing the priority level. Figure 21 represents these computations and results.

Figure 21: Use Cases Relative Risk and Quality Exposure, and Priority Level Determination Computation

Use Case	Overall Risk Exposure	Relative Risk Exposure	Overall Quality Exposure	Relative Quality Exposure	Priority Level	Use Case Priority
Provide Ticket Solutions	168	0,126888	72	0,121008	0,125418	2
Client Segmentation	54	0,040785	28	0,047059	0,042354	11
Furnish Knowledge Database	165	0,124622	72	0,121008	0,123719	3
Process Order	170	0,128399	72	0,121008	0,126551	1
Update Client Information	75	0,056647	37	0,062185	0,058031	10
Check Inventory	127	0,095921	72	0,121008	0,102193	7
Use Incentive System	154	0,116314	58	0,097479	0,111605	6
Grant Customer	116	0,087613	68	0,114286	0,094281	9
Analyse Social Media Data	158	0,119335	72	0,121008	0,119754	5
Analyse Sales Data	159	0,120091	72	0,121008	0,120320	4
Initiate Promotion Verification	146	0,110272	44	0,073950	0,101191	8
Sum	1324	1	595	1	1	

The priority level further distinguishes the order of use case development in prototype at the elaboration phase and receive incremental priority at the construction phase of the project life cycle as illustrated in the RUP Template shown in Figure 22 below.

Figure 22: Iterative Planning using the RUP Template

Use Case	Priority	Use Case Complexity (see UCP)	Elaboration 1				Elaboration 2				Elaboration 3				Elaboration 4				Construction 1				Construction 2				Construction 3				Construction 4					
			X				X				X				X				X				X				X									
Process Order	1	Complex	X																																	
Provide Ticket Solutions	2	Simple	X																																	
Furnish Knowledge Database	3	Complex		X																																
Analyse Sales Data	4	Complex		X																																
Analyse Social Media Data	5	Complex		X																																
Use Incentive System	6	Simple			X																															
Check Inventory	7	Complex			X																															
Initiate Promotion Verification	8	Simple			X																															
Grant Customer	9	Simple			X																															
Update Client Information	10	Complex				X																														
Client Segmentation	11	Complex					X																													
Total Effort Weight			125	20	45	30	30	20	45	30	30																									

From the risk and quality analysis, this system is derived in implementation priority, for the full ERP-CRM tool. With a highly reliable, usable, efficient and integrity driven system as our highest quality dimensions and evaluations of the risk and quality exposure, the process order use case comes first in development followed by the unified ticket solution. This quickly deals with the operational support of the systems for continuous operations amid the overall strategic improvements that are derived and supported by the subsequent use cases and generating real-time data for analysis and reliable decision making. Thirdly, the furnished knowledge database that provides business analytics on sales, customers, and supplier data is developed while sales and social media data analysis comes in fourth and fifth. These use cases store, utilize and analyze data, dealing with the accumulation of sales data, market research, and social media integration campaigns for customer success and customer experience improvements through data driven insights.

Afterwards, the incentive system involves the marketing promotion usage monitoring, motivating sales representatives' promotional interaction with clients and marketing team plus rewarding customer loyalties for customer engagements and satisfaction, while check inventory is a monitoring implementation as part of a latter intermediary stage of the process order to ensure streamlined flows by guaranteeing sufficient supply for purchase requisitions. From these the initiate promotion verification, and grant customers are generated to further follow up on the incentivized customer relationship and engagement to fulfilment. Lastly with the generated data, information, analyses and monitor models, clients can be categorized into customer segments with updated client information for personalized experiences and interactions.

4. Software Design

This section of the paper delves into the software design of the ERP-CRM system and outlines the blueprint of the system's architecture, ensuring alignment with the functional requirements.

Firstly, a UML class diagram is developed. The class diagram visually represents the static structure of a system, including classes, associations, attributes and operations. It serves as the foundation for the creation of the subsequent UML sequence diagrams, which illustrate the dynamic interactions between objects and their lifelines during runtime.

4.1. Class diagram

Note:

- The CRM tool and its aggregation of different functionalities, at the core of the data flow of the surrounding classes.
- The different departments of the company interacting with these functionalities and the main CRM-tool to execute processes and serve clients.
- The classes, which have all been made persistable and the addition of role names, both facilitating the transformation to the ERD in section 5.
- The full display of the class diagram in figure 23 and then the split display horizontally in two halves to improve readability in figure 24 and 25.

Figure 23: Full Class Diagram Output

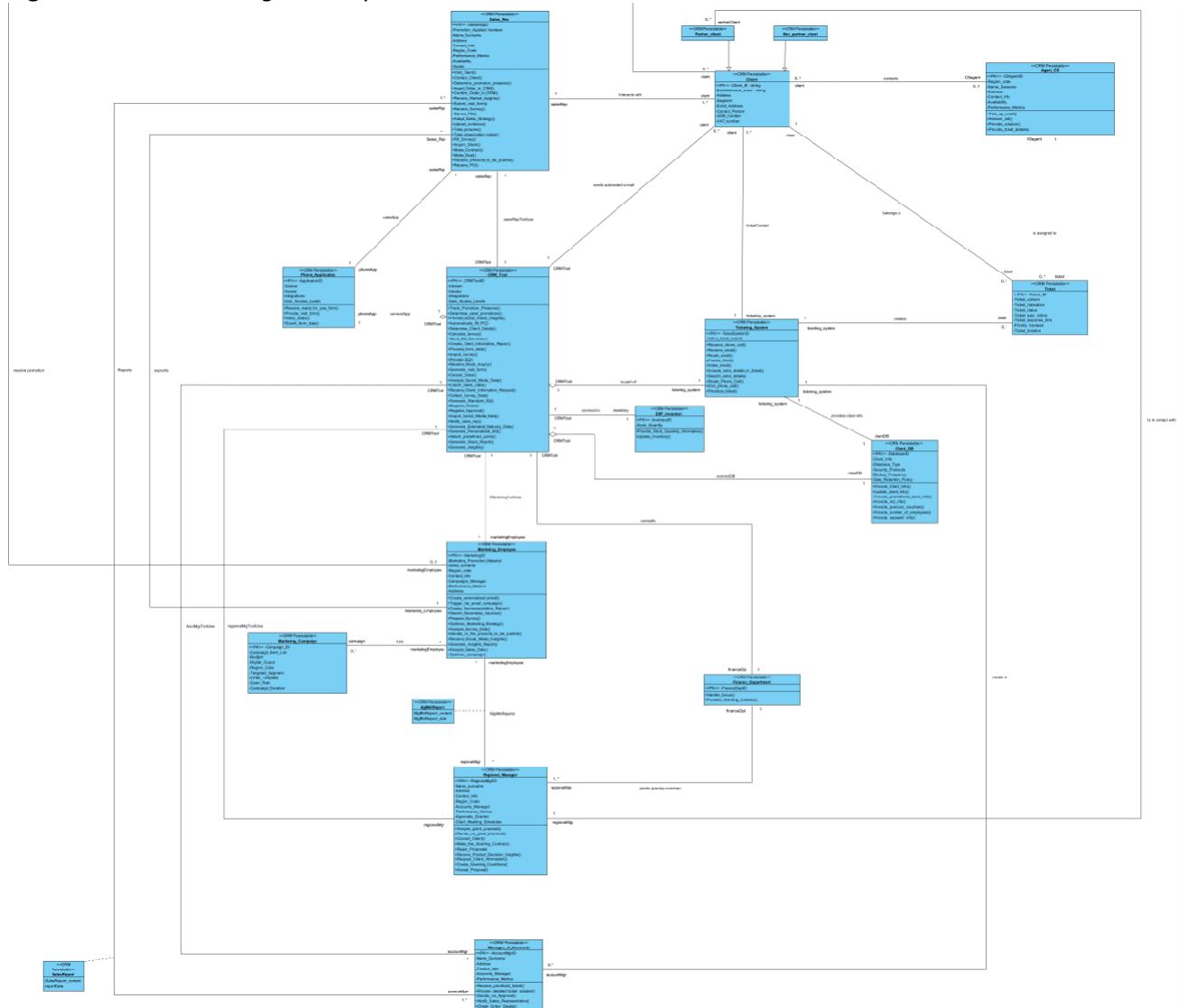


Figure 24: Magnified Class Diagram Output (Top Half)

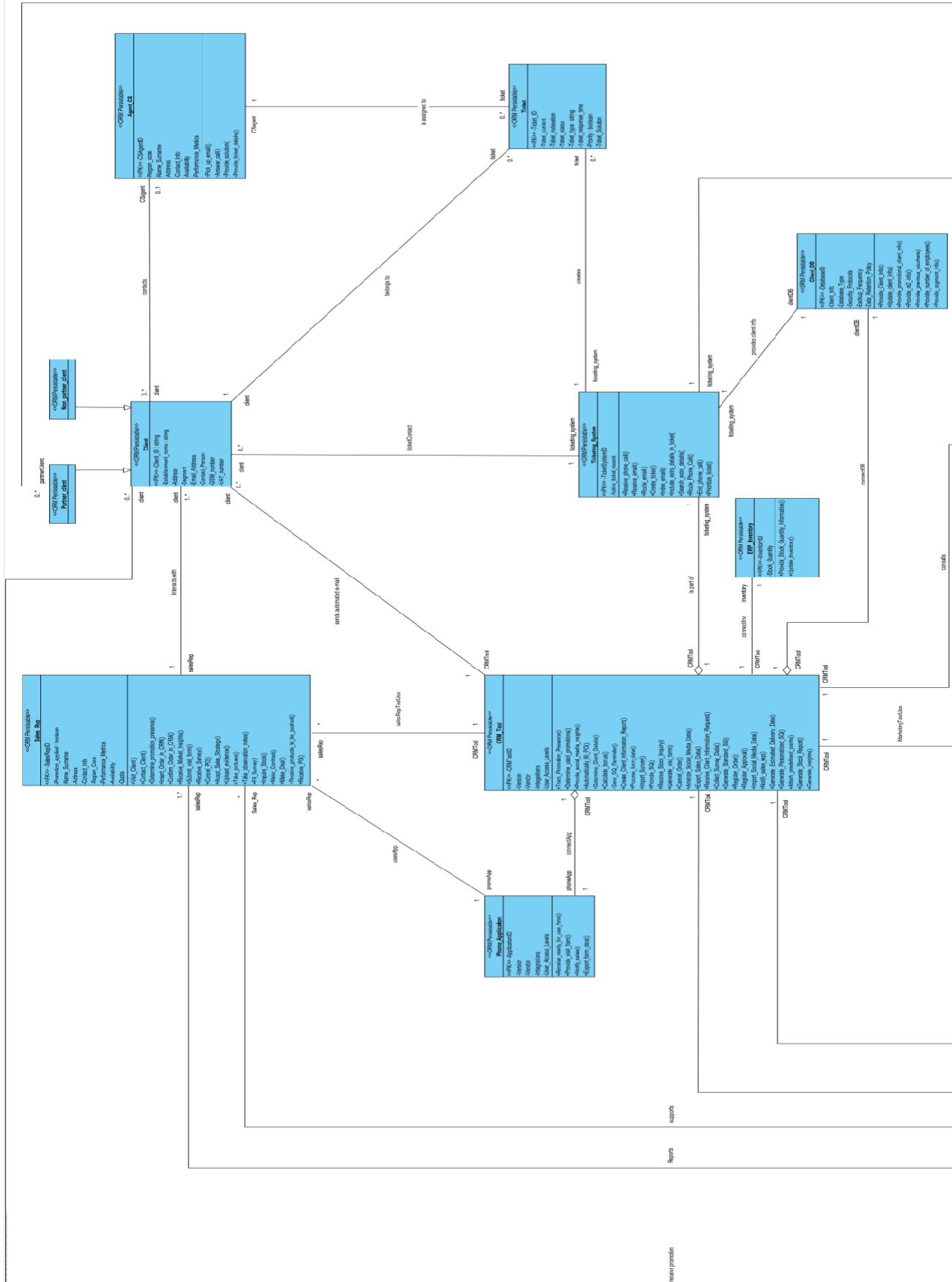
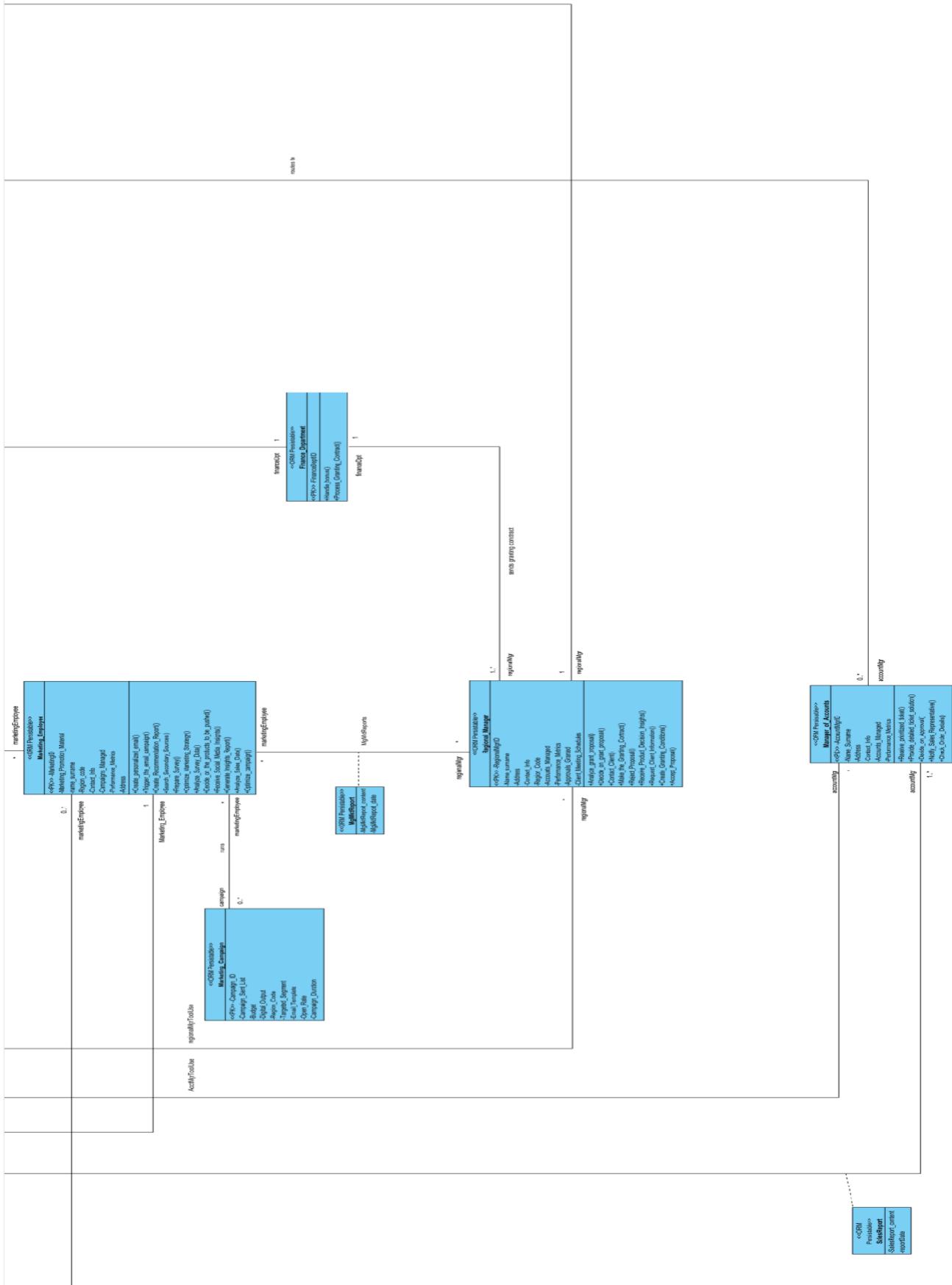


Figure 25: Magnified Class Diagram Output (Bottom Half)

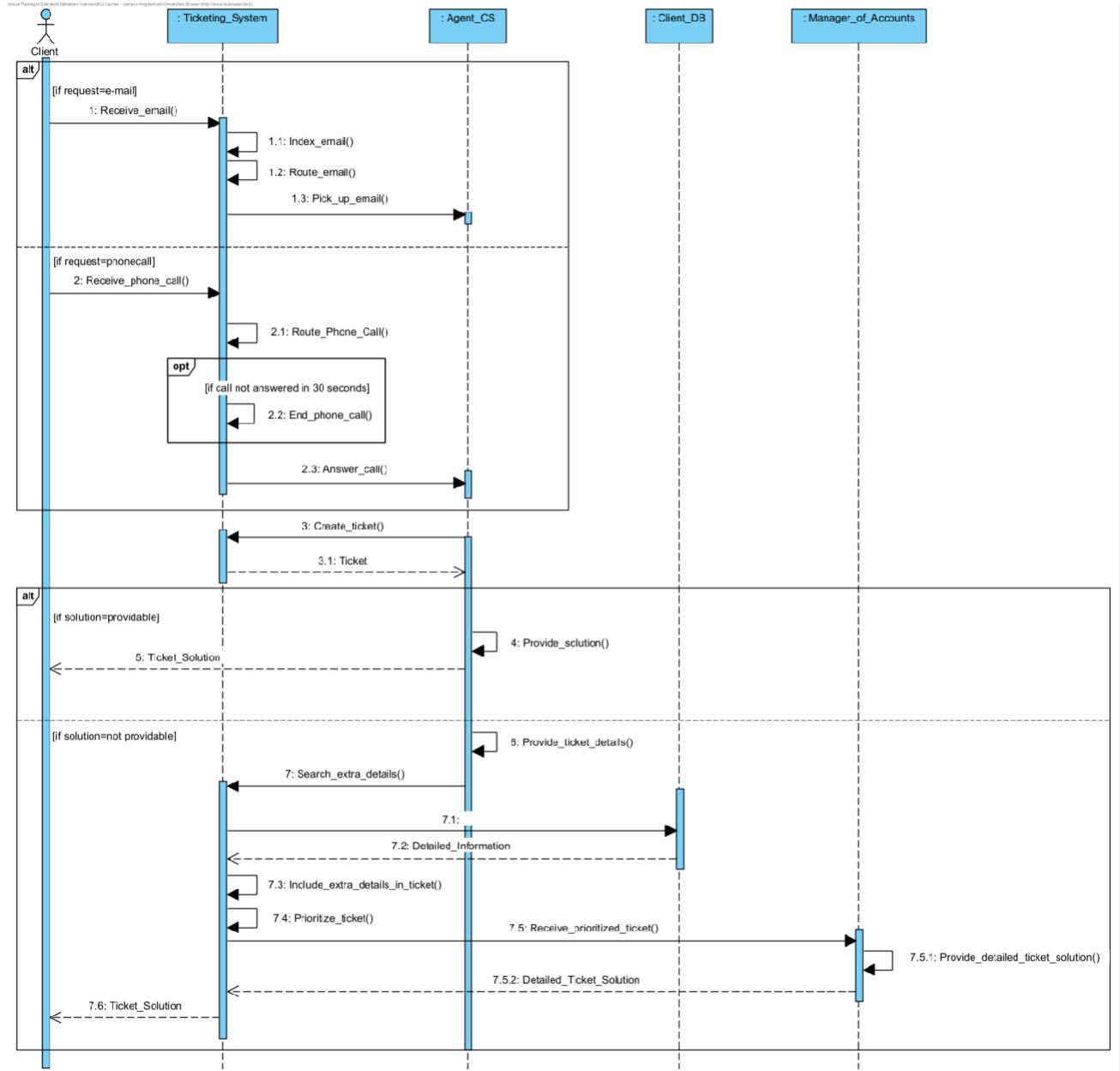


4.2. Sequence diagrams, corresponding to relevant system use cases

The sequence diagrams display the dynamic interaction between objects over time to realize the defined system use cases and operations to fulfilment and the explicit sequences of messages within.

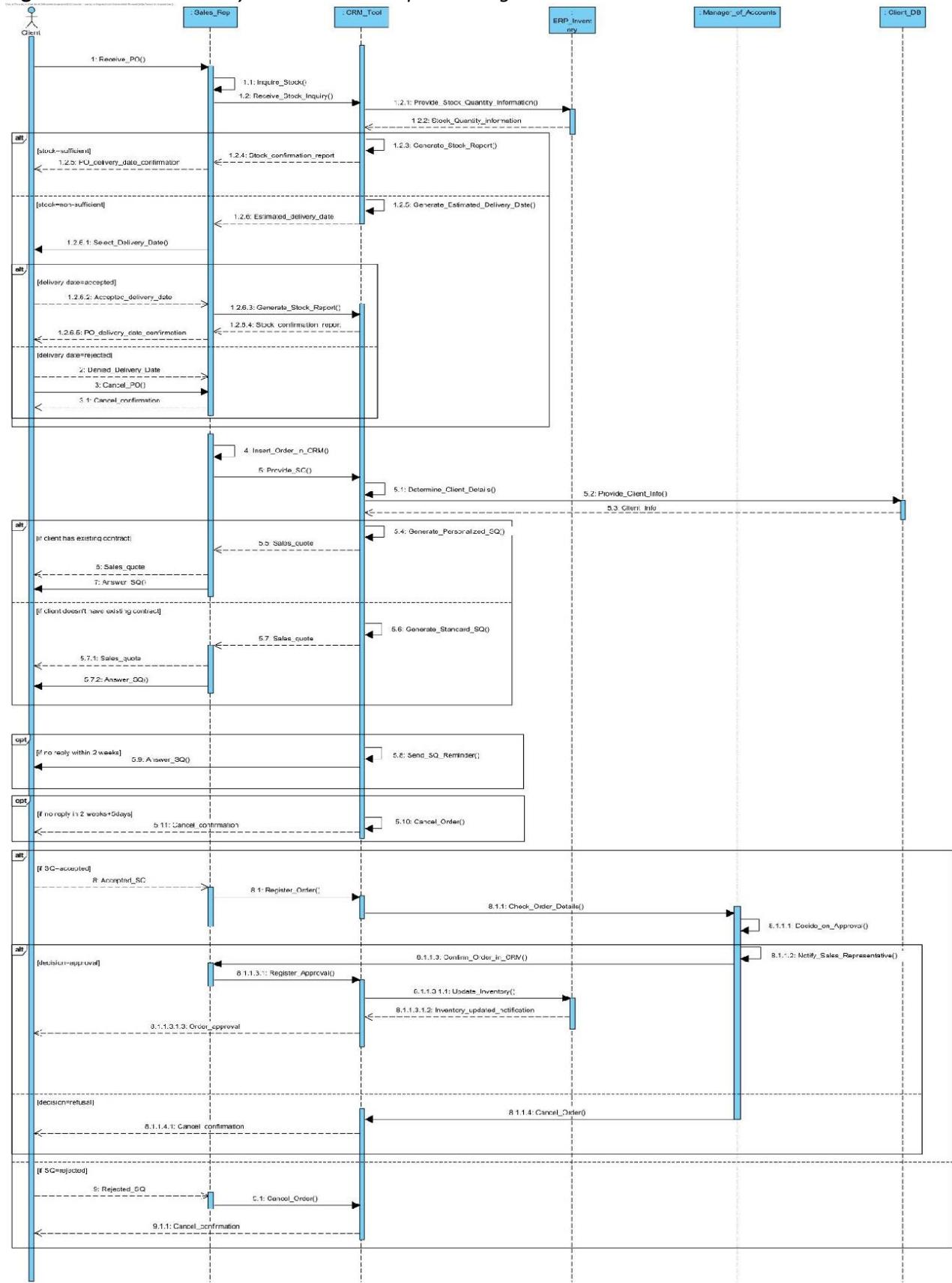
4.2.1. Provide ticket solutions

Figure 26: Provide Ticket Solutions System Use Case Sequence Diagram



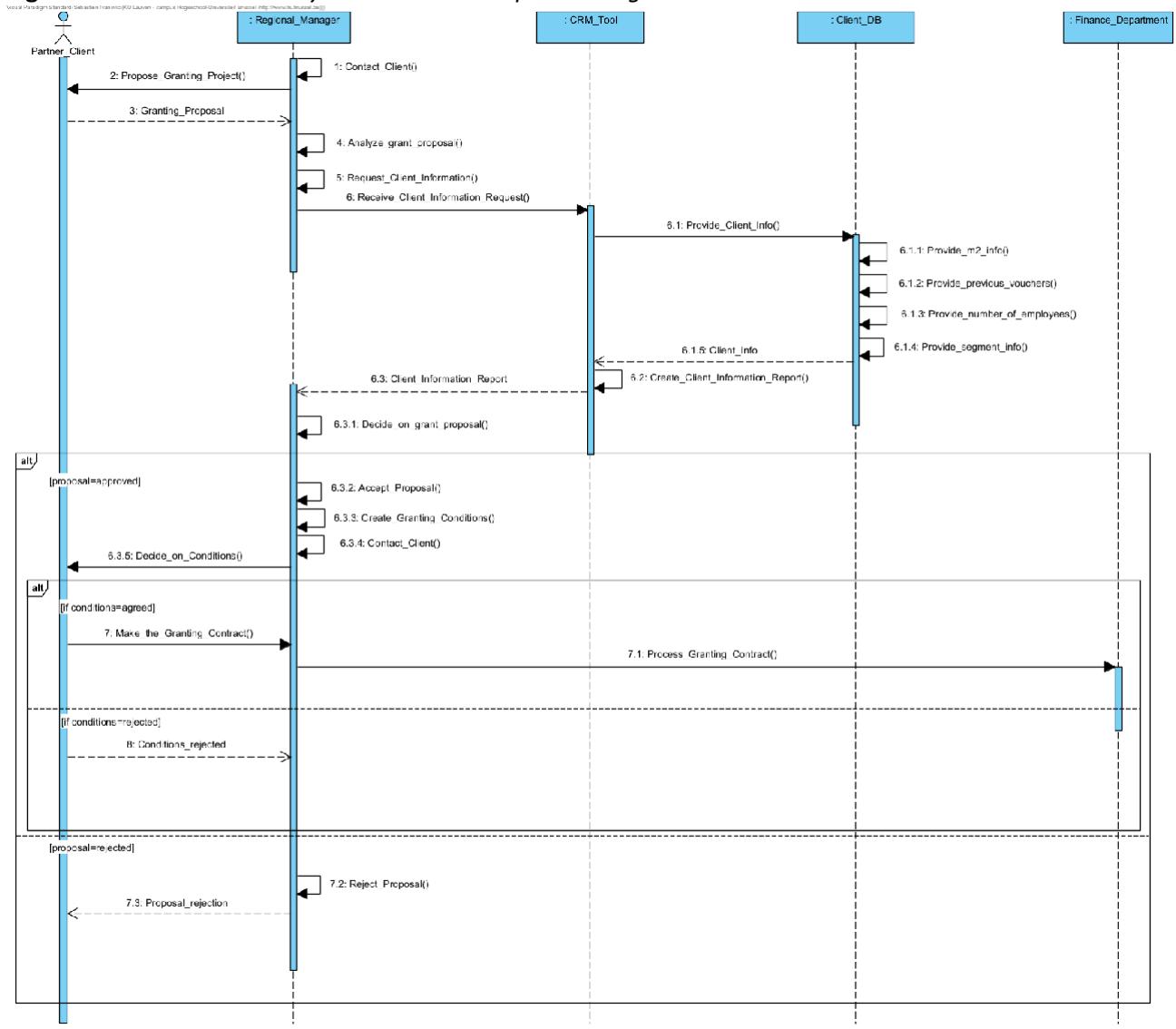
4.2.2. Process Order

Figure 27: Process Order System Use Case Sequence Diagram



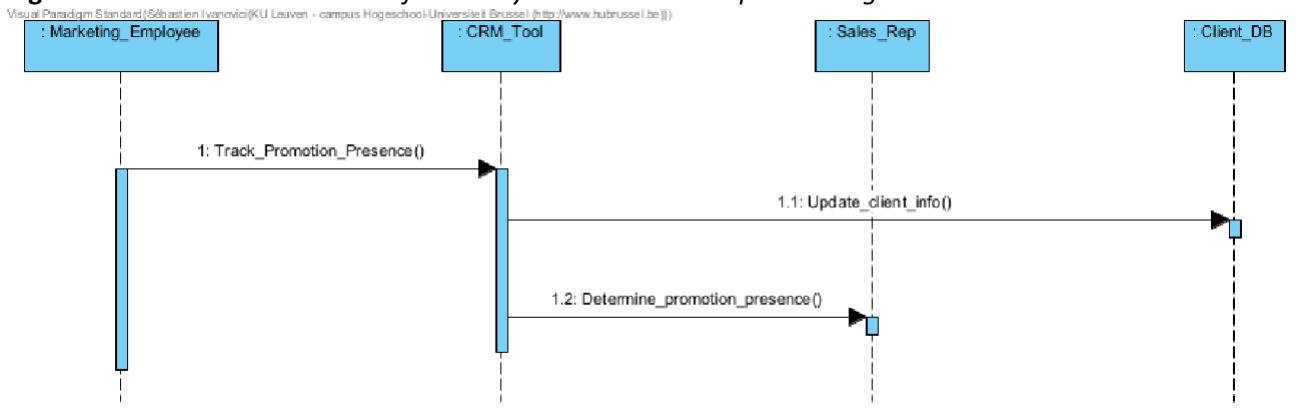
4.2.3. Grant Customer

Figure 28: Grant Customer System Use Case Sequence Diagram



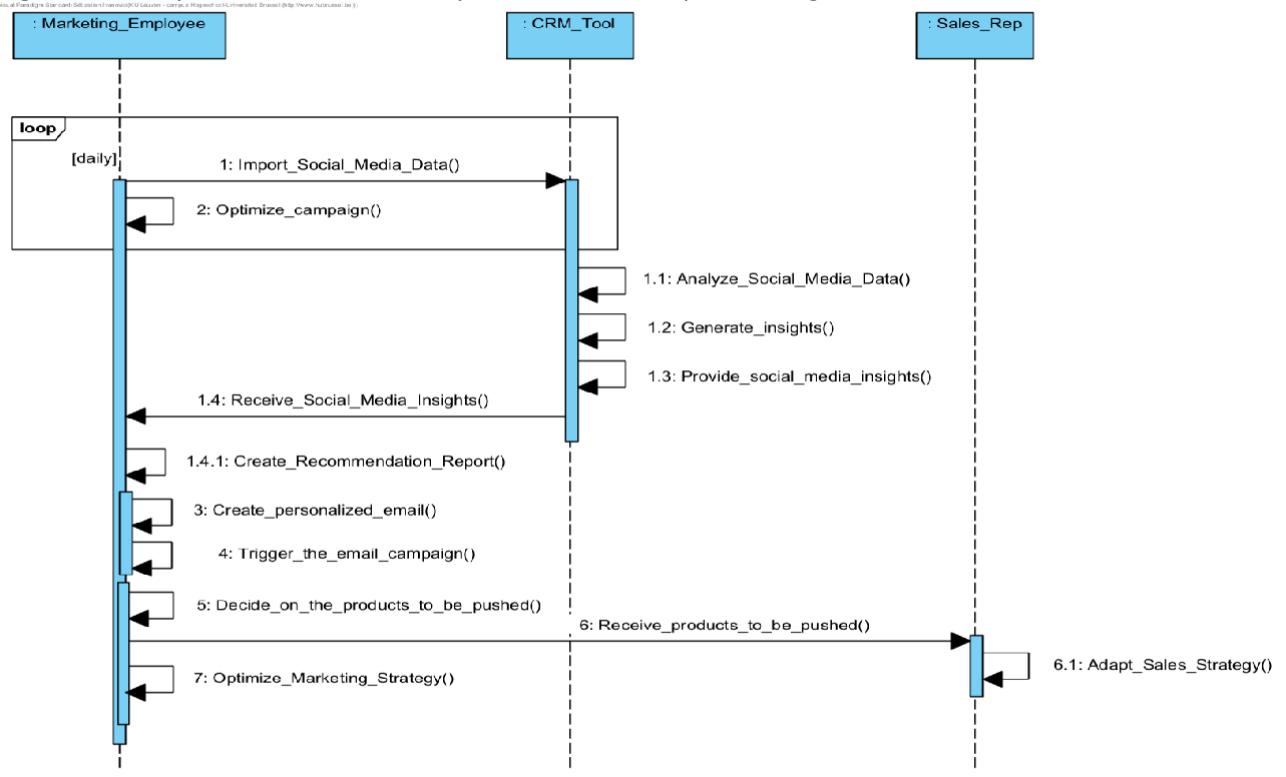
4.2.4. Initiate Promotion Verification

Figure 29: Initiate Promotion Verification System Use Case Sequence Diagram



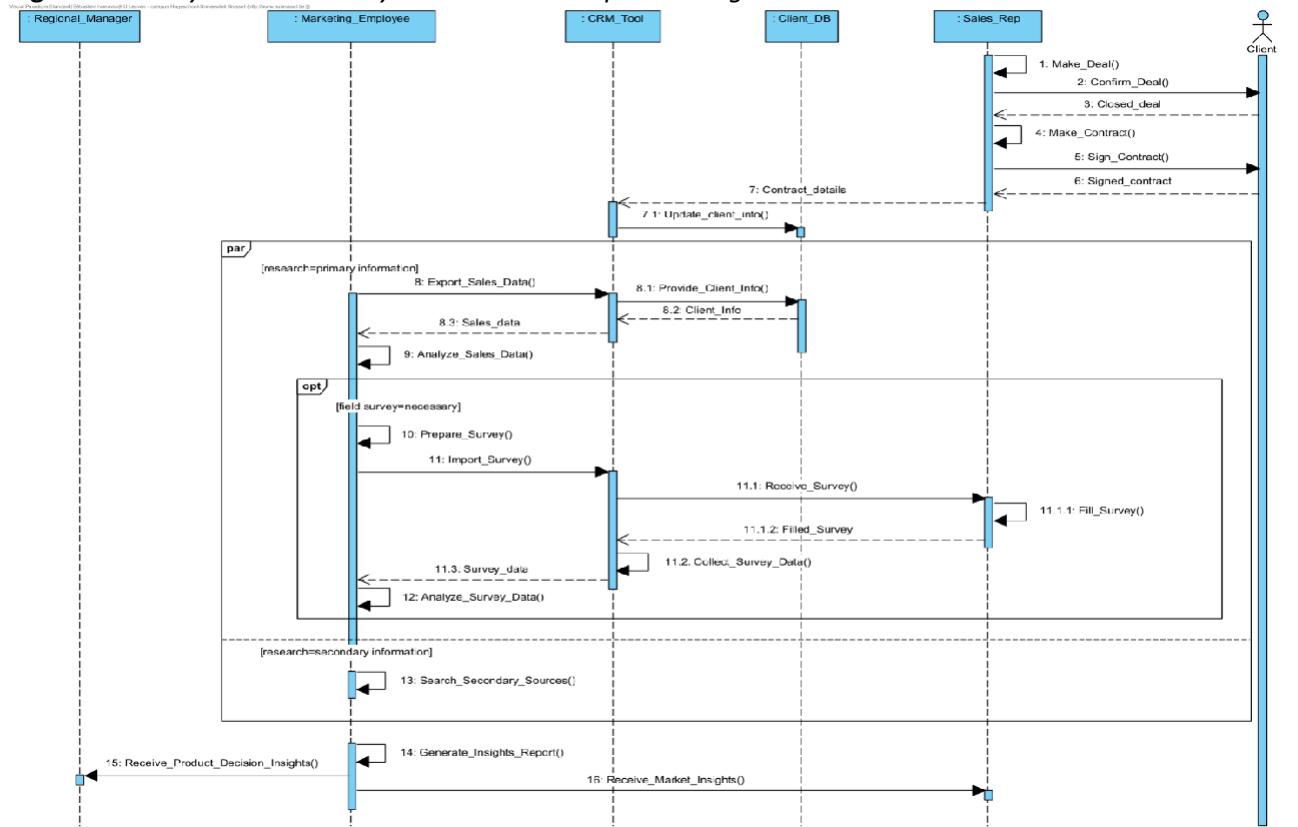
4.2.5. Analyze Social Media Data

Figure 30: Analyze Social Media Data System Use Case Sequence Diagram



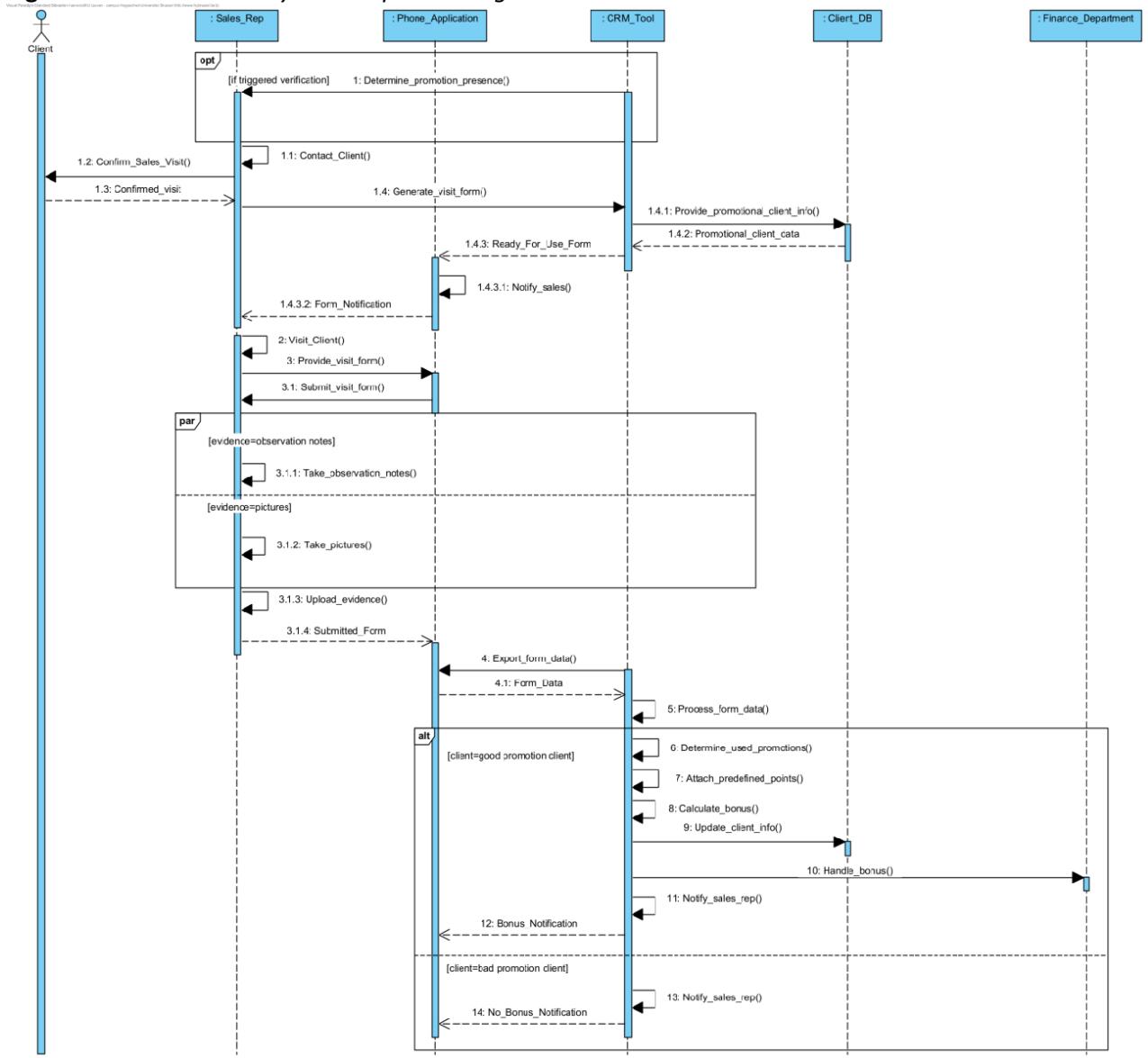
4.2.6. Analyze Sales Data

Figure 31: Analyze Sales Data System Use Case Sequence Diagram



4.2.7. Use Incentive System

Figure 32: Use Incentive System Sequence Diagram

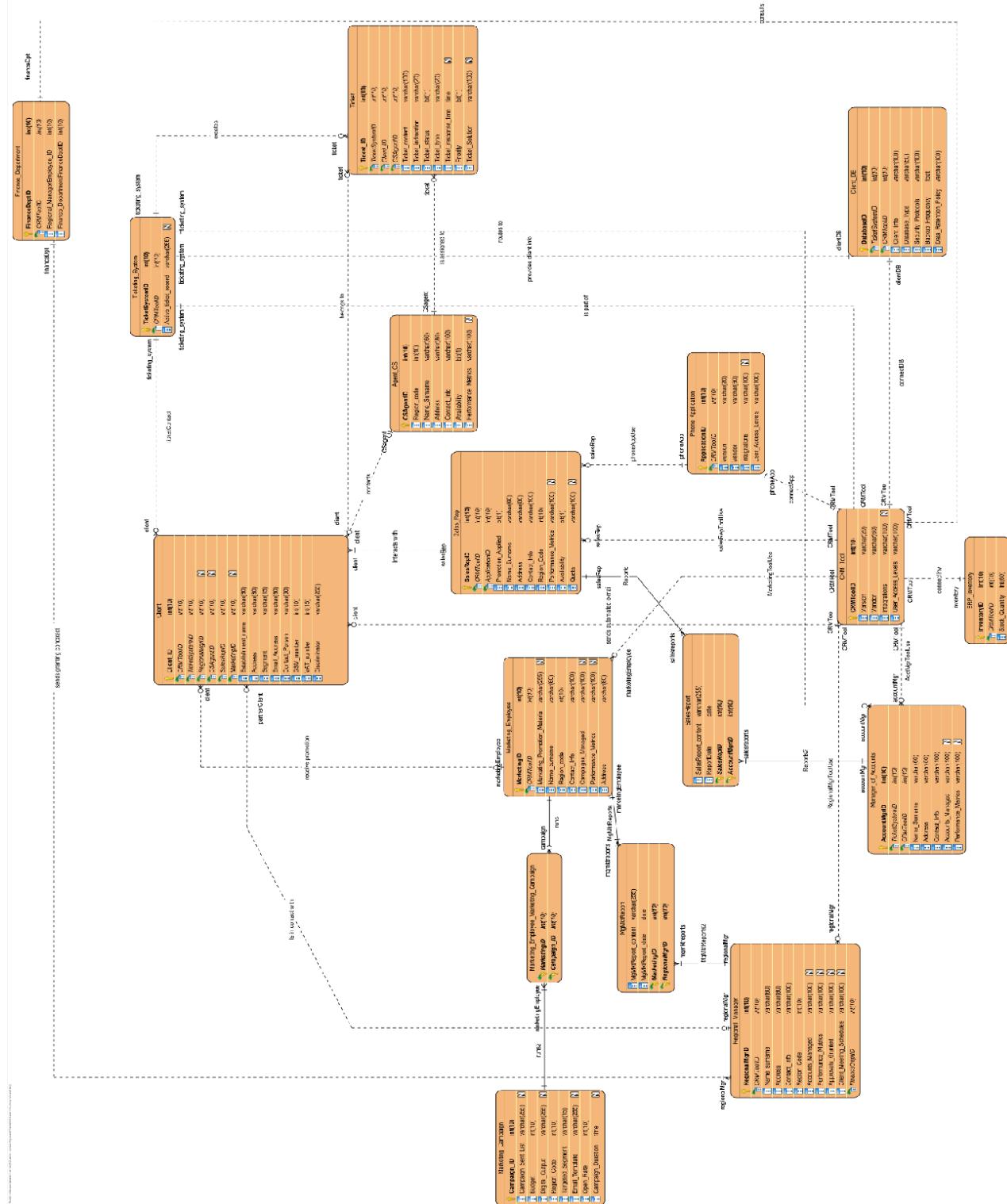


5. Database Design

This section provides the result of the database design process, where the UML class diagram served as a blueprint, ensuring that after transformation all necessary data entities and relationships are accurately captured and structured. Following the ERD the corresponding SQL code is generated and checked for errors. The systematic approach ensures alignment with the previously established overall system architecture.

5.1. Corresponding ERD

Figure 33: Solution Entity Relationship Diagram



5.2. Physical Relational Database (SQL code)

The generated SQL code (in a .DLL file, opened in Word) based on the ERD above.

Note:

- The difference between the **CREATE** and **ALTER** statements;
- No “auto-increment”.

```
CREATE TABLE Client (Client_ID int(10) NOT NULL, CRMToolID int(10) NOT NULL,
TicketSystemID int(10) NOT NULL, RegionalMgrID int(10), CSAgentID int(10),
SalesRepID int(10) NOT NULL, MarketingID int(10), Establishment_name
varchar(60) NOT NULL, Address varchar(80) NOT NULL, Segment varchar(15) NOT
NULL, Email_Address varchar(80) NOT NULL, Contact_Person varchar(60) NOT
NULL, GSM_number int(10) NOT NULL, VAT_number int(15) NOT NULL, Discriminator
varchar(255) NOT NULL, PRIMARY KEY (Client_ID));
CREATE TABLE Sales_Rep (SalesRepID int(10) NOT NULL, CRMToolID int(10) NOT
NULL, ApplicationID int(10) NOT NULL, Promotion_Applied bit(1) NOT NULL,
Name_Surname varchar(60) NOT NULL, Address varchar(80) NOT NULL, Contact_Info
varchar(100) NOT NULL, Region_Code int(10) NOT NULL, Performance_Metrics
varchar(100), Availability bit(1) NOT NULL, Quota varchar(100), PRIMARY KEY
(SalesRepID));
CREATE TABLE Agent_CS (CSAgentID int(10) NOT NULL, Region_code int(10) NOT
NULL, Name_Surname varchar(60) NOT NULL, Address varchar(80) NOT NULL,
Contact_Info varchar(100) NOT NULL, Availability bit(1) NOT NULL,
Performance_Metrics varchar(100), PRIMARY KEY (CSAgentID));
CREATE TABLE Marketing_Employee (MarketingID int(10) NOT NULL, CRMToolID
int(10) NOT NULL, Marketing_Promotion_Material varchar(255), Name_surname
varchar(60) NOT NULL, Region_code int(10) NOT NULL, Contact_Info varchar(100)
NOT NULL, Campaigns_Managed varchar(100), Performance_Metrics varchar(100),
Address varchar(80) NOT NULL, PRIMARY KEY (MarketingID));
CREATE TABLE Manager_of_Accounts (AccountMgrID int(10) NOT NULL,
TicketSystemID int(10) NOT NULL, CRMToolID int(10) NOT NULL, Name_Surname
varchar(60) NOT NULL, Address varchar(80) NOT NULL, Contact_Info varchar(100)
NOT NULL, Accounts_Managed varchar(100), Performance_Metrics varchar(100),
PRIMARY KEY (AccountMgrID));
CREATE TABLE Regional_Manager (RegionalMgrID int(10) NOT NULL, CRMToolID
int(10) NOT NULL, Name_surname varchar(60) NOT NULL, Address varchar(80) NOT
NULL, Contact_Info varchar(100) NOT NULL, Region_Code int(10) NOT NULL,
Accounts_Managed varchar(100), Performance_Metrics varchar(100),
Approvals_Granted varchar(100), Client_Meeting_Schedules varchar(100),
FinanceDeptID int(10) NOT NULL, PRIMARY KEY (RegionalMgrID));
CREATE TABLE Marketing_Campaign (Campaign_ID int(10) NOT NULL,
Campaign_Sent_List varchar(255), Budget int(10) NOT NULL, Digital_Output
varchar(255), Region_Code int(10) NOT NULL, Targeted_Segment varchar(15) NOT
NULL, Email_Template varchar(255), Open_Rate int(10) NOT NULL,
Campaign_Duration time, PRIMARY KEY (Campaign_ID));
CREATE TABLE Ticket (Ticket_ID int(10) NOT NULL, TicketSystemID int(10) NOT
NULL, Client_ID int(10) NOT NULL, CSAgentID int(10) NOT NULL, Ticket_content
varchar(100) NOT NULL, Ticket_indexation varchar(20) NOT NULL, Ticket_status
bit(1) NOT NULL, Ticket_type varchar(20) NOT NULL, Ticket_response_time time,
Priority bit(1) NOT NULL, Ticket_Solution varchar(100), PRIMARY KEY
(Ticket_ID));
CREATE TABLE SalesReport (SalesReport_content varchar(255) NOT NULL,
ReportDate date NOT NULL, SalesRepID int(10) NOT NULL, AccountMgrID int(10)
NOT NULL, PRIMARY KEY (SalesRepID, AccountMgrID));
CREATE TABLE MgMktReport (MgMktReport_content varchar(255) NOT NULL,
MgMktReport_date date NOT NULL, MarketingID int(10) NOT NULL, RegionalMgrID
int(10) NOT NULL, PRIMARY KEY (MarketingID, RegionalMgrID));
```

```

CREATE TABLE Marketing_Employee_Marketing_Campaign (MarketingID int(10) NOT NULL, Campaign_ID int(10) NOT NULL, PRIMARY KEY (MarketingID, Campaign_ID));
CREATE TABLE CRM_Tool (CRMToolID int(10) NOT NULL, Version varchar(20) NOT NULL, Vendor varchar(60) NOT NULL, Integrations varchar(100), User_Access_Levels varchar(100) NOT NULL, PRIMARY KEY (CRMToolID));
CREATE TABLE ERP_Inventory (InventoryID int(10) NOT NULL, CRMToolID int(10) NOT NULL, Stock_Quantity int(60) NOT NULL, PRIMARY KEY (InventoryID));
CREATE TABLE Client_DB (DatabaseID int(10) NOT NULL, TicketSystemID int(10) NOT NULL, CRMToolID int(10) NOT NULL, Client_Info varchar(100) NOT NULL, Database_Type varchar(50) NOT NULL, Security_Proocols varchar(100) NOT NULL, Backup_Frequency float NOT NULL, Data_Retention_Policy varchar(100) NOT NULL, PRIMARY KEY (DatabaseID));
CREATE TABLE Phone_Application (ApplicationID int(10) NOT NULL, CRMToolID int(10) NOT NULL, Version varchar(20) NOT NULL, Vendor varchar(60) NOT NULL, Integrations varchar(100), User_Access_Levels varchar(100) NOT NULL, PRIMARY KEY (ApplicationID));
CREATE TABLE Ticketing_System (TicketSystemID int(10) NOT NULL, CRMToolID int(10) NOT NULL, Active_ticket_record varchar(255), PRIMARY KEY (TicketSystemID));
CREATE TABLE Finance_Department (FinanceDeptID int(10) NOT NULL, CRMToolID int(10) NOT NULL, Regional_ManagerEmployee_ID int(10) NOT NULL, Finance_DepartmentFinanceDeptID int(10) NOT NULL, PRIMARY KEY (FinanceDeptID));
ALTER TABLE Client ADD CONSTRAINT `receive promotion` FOREIGN KEY (MarketingID) REFERENCES Marketing_Employee (MarketingID);
ALTER TABLE Client ADD CONSTRAINT `Interacts with` FOREIGN KEY (SalesRepID) REFERENCES Sales_Rep (SalesRepID);
ALTER TABLE Marketing_Employee_Marketing_Campaign ADD CONSTRAINT runs FOREIGN KEY (MarketingID) REFERENCES Marketing_Employee (MarketingID);
ALTER TABLE Marketing_Employee_Marketing_Campaign ADD CONSTRAINT runs2 FOREIGN KEY (Campaign_ID) REFERENCES Marketing_Campaign (Campaign_ID);
ALTER TABLE Ticket ADD CONSTRAINT `is assigned to` FOREIGN KEY (CSAgentID) REFERENCES Agent_CS (CSAgentID);
ALTER TABLE SalesReport ADD CONSTRAINT Reports FOREIGN KEY (SalesRepID) REFERENCES Sales_Rep (SalesRepID);
ALTER TABLE SalesReport ADD CONSTRAINT Reports2 FOREIGN KEY (AccountMgrID) REFERENCES Manager_of_Accounts (AccountMgrID);
ALTER TABLE MgMktReport ADD CONSTRAINT MgMktReports FOREIGN KEY (MarketingID) REFERENCES Marketing_Employee (MarketingID);
ALTER TABLE MgMktReport ADD CONSTRAINT MgMktReports2 FOREIGN KEY (RegionalMgrID) REFERENCES Regional_Manager (RegionalMgrID);
ALTER TABLE Client ADD CONSTRAINT contacts FOREIGN KEY (CSAgentID) REFERENCES Agent_CS (CSAgentID);
ALTER TABLE Ticket ADD CONSTRAINT `belongs to` FOREIGN KEY (Client_ID) REFERENCES Client (Client_ID);
ALTER TABLE Manager_of_Accounts ADD CONSTRAINT AcctMgrToolUse FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Marketing_Employee ADD CONSTRAINT MarketingToolUse FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Regional_Manager ADD CONSTRAINT RegionalMgrToolUse FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Client ADD CONSTRAINT `Is in contact with` FOREIGN KEY (RegionalMgrID) REFERENCES Regional_Manager (RegionalMgrID);
ALTER TABLE Client_DB ADD CONSTRAINT connectDB FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Sales_Rep ADD CONSTRAINT phoneAppUse FOREIGN KEY (ApplicationID) REFERENCES Phone_Application (ApplicationID);

```

```


ALTER TABLE Sales_Rep ADD CONSTRAINT salesRepToolUse FOREIGN KEY (CRMToolID)
REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE ERP_Inventory ADD CONSTRAINT connectInv FOREIGN KEY (CRMToolID)
REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Regional_Manager ADD CONSTRAINT `sends granting contract` FOREIGN KEY (FinanceDeptID) REFERENCES Finance_Department (FinanceDeptID);
ALTER TABLE Finance_Department ADD CONSTRAINT consults FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Client ADD CONSTRAINT ticketContact FOREIGN KEY (TicketSystemID)
REFERENCES Ticketing_System (TicketSystemID);
ALTER TABLE Ticketing_System ADD CONSTRAINT `is part of` FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Phone_Application ADD CONSTRAINT connectApp FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);
ALTER TABLE Ticket ADD CONSTRAINT creates FOREIGN KEY (TicketSystemID)
REFERENCES Ticketing_System (TicketSystemID);
ALTER TABLE Client_DB ADD CONSTRAINT `provides client info` FOREIGN KEY (TicketSystemID) REFERENCES Ticketing_System (TicketSystemID);
ALTER TABLE Manager_of_Accounts ADD CONSTRAINT `is routed to` FOREIGN KEY (TicketSystemID) REFERENCES Ticketing_System (TicketSystemID);
ALTER TABLE Client ADD CONSTRAINT `sends automated e-mail` FOREIGN KEY (CRMToolID) REFERENCES CRM_Tool (CRMToolID);


```

No errors when executing the code in MySQL:

Figure 34: MySQL Workbench Code Execution

The screenshot shows the MySQL Workbench interface with the following details:

- Schemas:** The current schema is 'accenturegroup3'.
- Object Info:** Shows the status of objects like 'Ticketing_System' and 'Client'.
- Query 1:** Contains the executed SQL code from Figure 34, which includes various ALTER TABLE statements creating constraints between tables such as Sales_Rep, ERP_Inventory, Regional_Manager, Finance_Department, Client, Ticketing_System, Phone_Application, Ticket, Client_DB, Manager_of_Accounts, and Client.
- Results:** The results pane shows 30 rows affected with 0 warnings and 0 errors, indicating successful execution.

6. Conclusion

In conclusion, this paper provides a detailed analysis and design plan for the IT integration of Antwerp Beer Company and Johnsmount Brewery by focusing on implementing a unified ERP-CRM system. This implementation ensures streamlined processes across both parts of the company, effectively capitalizing on the acquisition and setting up for sustained growth and operational efficiency. The iterative approach used for the planning and implementation of the project through regular reviews and updates, allows for continuous improvement and constant alignment with business goals. Constant adaptations to evolving needs are possible, making the system scalable for future growth.

The introduction of automation into processes like order processing and updating relevant information (client info, promotional info, etc.) reduces manual effort and minimizes the risk of errors. Enhanced data analytics will provide valuable insights (e.g. better customer segmentation) at different operational levels of the business, across multiple departments such as sales and marketing. In turn these insights will support strategic decision-making, allowing for strategic data-driven growth. Introducing the change of a centralized ticketing system will also improve external relationships with clients by internally improving customer service efficiency, ensuring higher client satisfaction.

The implementation of the system also poses opportunities for developing new business processes. These include the newly introduced incentive system and the granting process. The incentive system fosters internal cross-departmental collaboration by encouraging sales representatives to monitor and report on the usage of promotional material by the clients, providing insights to the marketing department. The granting process ensures the use of client sales metrics and opens opportunities to create partnerships with clients in an automated way. Partnering with clients as much as possible is seen as a pillar to fuel growth and prioritize customer relationships.

The cost & effort estimation provided in this paper ensures a clear understanding of the resources required for the project, ensuring successful integration of the ERP-CRM system. By breaking down the effort into phases and adding the associated costs, the project can be managed according to a specified budget and schedule.

The paper also highlights risk management strategies to mitigate potential issues associated with the integration process, such as data migration problems and possible system downtime. By identifying and addressing these risks early, the project ensures a smooth transition to maintain business continuity and minimize disruptions.

The success of the ERP-CRM system integration not only depends on technological risks but also on human and cultural risks. A comprehensive change management plan must be implemented in addition to this paper, including:

- Training programs: Comprehensive sessions for employees to adapt to new systems and processes (as mentioned in effort estimation).
- Communication strategies: Regular updates and feedback channels to ensure transparency and employee engagement during and after transitioning.
- Engagement initiatives: Activities and workshops designed to foster collaboration and build a unified company culture.

Overall, the system integration offers numerous benefits;

- Improved operational efficiency
- Improved customer service
- Enhanced data accuracy
- Increased strategic decision-making capabilities
- Enhanced consistency across both companies
- Improved collaboration between both companies

By following the recommendations outlined in this paper, the merged entity of Johnsmount Brewery (including ABC) can achieve a seamless integration, leading to sustained growth and success in the competitive beer industry. This is achieved through the operational consolidation of both companies and by leveraging the full potential of integrated IT systems, positioning them for future success.