FACULTY OF ECONOMICS TUL

Master Thesis

Business process management and optimization in the digital era.

Study programme: N0413A050008 Business Administration
Study branch: Management of Business Processes

Author: **Bc. Aparna Dwivedi**
Thesis Supervisors: Ing. Athanasios Podaras, Ph.D.
Department of Informatics

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- MILANI, Fredrik, 2019. *Digital Business Analysis*. Cham: Springer. ISBN 978-3-030-05718-3
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Anotace

Tato prace pojednává o různých nástrojích, které lze použít k implementaci optimálního podnikového procesu a mohou podnikům pomoci vizualizovat jejich procesy, simulovat a testovat různé scénáře, efektivně řídit své procesy a neustále je zlepšovat. Primárním cílem je navrhnout řešení pro implementaci optimálního podnikového procesu, které může zvýšit efektivitu, snížit náklady a zvýšit spokojenost zákazníků.

Teoretická část informuje čtenáře o konceptu obchodní inteligence an objasňuje fungování systému správy databází a jak vyvinout vyhovující architekturu pro systém správy databází. Kromě toho jsou důkladně analyzovány nástroje pro modelování podnikových procesů, které jsou využívány pro dynamické znázornění obchodních rozhodnutí, která mohou být odvozena na základě webových.

Praktická část se zabývá analýzou podnikových procesů v organizaci, identifikací neefektivnosti, zmapováním procesu, analýzou dat, zefektivněním pracovních postupů, automatizací tam, kde je to možné, a neustálým monitorováním a zlepšováním procesu. Praktická část také ukazuje několik nástrojů podnikových procesů, které jsou podporovány navrhovaným procesním designem. Omezení jsou analyzována v sekci diskuse a souvisí s neschopností začlenit realistická data. Nakonec jsou v části se závěry vysvětleny dosažené výsledky i důsledky budoucího výzkumu.

Klíčová slova

Modelování procesů, Mapování procesů, Reengineering podnikových procesů, Standardizace procesů, Monitorování procesů

Annotation

The present thesis discusses various tools that can be used to implement an optimal business process and can help businesses visualize their processes, simulate and test different scenarios, manage their processes effectively, and continuously improve them. The main aim is to analyse the existing gaps in the current lead or Prospect management process and suggest an automated way with the help of digitalize tools available in today's era to make the process more quick, efficient, cost effective, less manual and customer friendly.

The theoretical section of this paper aims to provide the reader with an understanding of the implementation of digital optimal business processes. It also explores the functioning of an automated process management system and outlines the steps involved in developing a suitable architecture for a comprehensive framework of processes, tools, and strategies that can assist organizations in managing their operations and resources effectively to attain their objectives. Furthermore, the paper highlights the use of business process automated tools for the dynamic representation of the management of business processes, which may be inferred-based but undergo thorough analysis.

The practical part deals with analysing business processes in an organization, identifying inefficiencies, mapping out the process, analysing data, streamlining workflows, automating where possible, and continuously monitoring and improving the process.
The practical aspect of the thesis is to showcase several business process tools that align with the suggested process design. The discussion section analyses prospects, mainly cantered around integrating realistic data. Finally, the conclusion section presents the outcomes of the research, along with the implications for future studies.

Keywords

Process modelling, Process Automation, Business process reengineering, Process standardization, Process monitoring, Process Digitalization

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List of Abbreviations & Symbols

BI – Business Intelligence

BPM – Business Process Management

ABPM – Advanced Business Process Management

BPA – Business Process Analysis

BPR – Business Process Reengineering

DMN – Decision Model and Notation

CMMN – Case Management Model and Notation

DFD – Data Flow Diagram

EPC – Event-driven Process Chain

KPI – Key Performance Indicator

GUI – Graphical User Interface

SQL – Structured Query Language

UML – Unified Modeling Language

IoT – Internet of Things

AI – Artificial Intelligence

DPA – Digital Process Automation

BPO – Business Process Outsourcing

IPA – Intelligent Process Automation

NLP – Natural Language Processing

RPA – Robotic Process Automation

BAM – Business Activity Monitoring

OCR – Optical Character Recognition

CEP – Complex Event Processing

SQL – Structured Query Language

JSON – JavaScript Object Notation

CRM – Customer Relationship Management

1. Introduction

Optimal business process implementation is the act of introducing new or improved processes to an organization to increase efficiency, reduce costs, and improve overall performance. The goal of BPM is to achieve operational excellence through the alignment of all aspects of an organization with the wants and needs of clients and stakeholders (Swenson, 2015, p.1). The process of implementing new or improved business processes can be complex and challenging. It requires a structured approach and a clear understanding of the current processes, desired outcomes, and the steps required to achieve them. This can include identifying and understanding the current processes, defining the desired outcomes, designing new processes, testing, and validating the new processes, training employees, and monitoring and measuring results. The main challenge in BPM is to align business processes with the strategic goals of an organization, to make them flexible and adaptable to changes in the business environment, and to support continuous process improvement (Schreck & Stumptner, 2017, p. 1).

This diploma thesis focuses on exploring and applying digital automated methods for implementing business processes to assist the operations of a small business. The primary objective is to enhance efficiency, productivity, customer satisfaction, and employee engagement, while simultaneously offering a competitive edge, ensuring compliance with industry norms, and being adaptable to changes in the market. To achieve this goal, the thesis aims to fulfil the following objectives.

- **Identifying and understanding the current processes**: This includes mapping out the current processes, identifying bottlenecks, and understanding how they are currently being executed.

- **Defining the desired outcomes:** This includes identifying the key performance indicators (KPIs) to be improved and goals that need to be achieved. This step is important as it sets clear targets and provides a framework for measuring the success.

- **Designing new processes:** This includes creating flow charts, process maps, and other documentation to clearly define the new processes. Process design is the initial phase of process management, where the process to be managed is designed, modelled, and documented (Schreck & Stumptner, 2017, p. 131).

- **Testing and validating the new processes:** Before rolling out the new processes, it is important to evaluate and validate them to ensure they will meet the desired outcomes. This includes pilot assessing the new processes with a small group of employees and making any necessary adjustments.
- **Training employees and communicating changes:** Once the new processes have been validated, the next step is to train employees in the new processes and communicate the changes to all stakeholders. This includes providing clear instructions, guidelines, and training materials to ensure employees understand the new processes and how they should be executed.
- **Evaluation and measuring results:** Finally, it is crucial to keep track and evaluate the outcomes of the newly implemented procedures. This includes tracking the KPIs and other metrics to ensure the desired outcomes are achieved. Advanced analytics techniques can provide significant value by allowing digital businesses to rapidly identify and respond to new business opportunities and to improve operational efficiency (Hanafy, and Mohamed S. Abdelsamea, Chapter 9, p. 216).

The focus of this thesis is on a small, local IT company located in India that specializes in assisting businesses with turning data into insights through a range of services including self-service and embeddable analytics, machine learning, and IoT. The thesis is divided into two sections, namely theoretical foundations, and practical implementations. The theoretical section examines existing theories related to automating business process implementation, business process modelling, design, and its various types. The practical application section is based on theoretical analysis and involves evaluating the company's existing processes to suggest digital automated optimization strategies. It includes the implementation of the proposed design with more automation and lea manual tasks along with relevant designs illustrate to process.

2. Motivation and Problem Statement

With globalization and digitalization in the business world, it has become increasingly critical for organizations to enhance their online presence. Tools for optimal business process implementation can provide a wide range of benefits to companies, including automation, data collection and analysis, improved communication and collaboration, visibility, and transparency, streamlining compliance, and adaptability. These tools can help companies achieve their goals of improving efficiency, productivity, customer satisfaction, and overall competitiveness. Automation can greatly increase efficiency and reduce the time and resources required to complete tasks, and automation can also reduce the risk of human error, which can lead to improved accuracy and quality. Improved communication and collaboration can lead to better alignment and faster completion of tasks.

In addition, tools for optimal business process implementation can also help companies to scale their processes as they grow, allowing them to maintain efficiency and productivity while expanding. They can also help companies comply with industry regulations and standards and be adaptable to changes in the market and changing customer needs. These tools can provide greater visibility and transparency into processes and performance, which can be used to identify areas for improvement and track progress over time. Streamlining processes by eliminating redundant tasks and automating repetitive tasks can greatly improve efficiency and productivity. Furthermore, these tools can help companies reduce costs, increase profitability, improve the quality of products or services, and gain a competitive advantage.

The purpose of this thesis is to introduce fundamental concepts related to Business Process Management, Process Automation, and Design, and to demonstrate practical examples of these strategies. The research involves the collection of test data from various sources and presents the most effective automated design. Various charts, including flowcharts and process model and notation (BPMN), are utilized to highlight activities that can enhance the overall performance of the business.

3. Business Process Optimization – Literature Review

In this chapter, a comprehensive overview of the current literature on Business Process Management, Process Reengineering, and Process Standardization is provided. The following sections are included:

I. Overview - This section offers a concise explanation of a methodology that uses contemporary technology to streamline and automate business processes. It presents an extensive summary of the critical concepts and practices in the field of **Business Process Management (BPM)**.

II. Business Process Automation & Mapping – This section is about an approach that leverages modern technology to create more detailed and accurate process models. This may include the use of advanced automated digital tools, as well as the incorporation of machine learning algorithms to predict process outcomes. This section also visualizes the flow of activities, decision points, and inputs/outputs of a process, which can help identify inefficiencies and opportunities for improvement.

III. Transformative Process Automation Techniques -This section highlights methodologies used to improve business processes and automate them by making significant changes to their underlying structure. These techniques can include reengineering, process mapping, value stream mapping, Lean Six Sigma, Agile, and Design Thinking. They focus on improving efficiency, reducing waste, and enhancing customer satisfaction.

IV. Business Process Operationalization – This section refers to the use of innovative technologies and methodologies to streamline and optimize complex business processes. This can include automation, artificial intelligence, machine learning, and cloud computing. The goal is to increase efficiency, reduce costs, and improve the overall performance of the organization.

V. Monitoring and Continuous Feedback – This process involves using sophisticated analytical techniques and simulation models to analyse data and predict outcomes. This can include machine learning, data mining, predictive modelling, and simulation modelling. The goal is to improve decision-making and optimize processes.

VI. Advanced Analytics and Simulation Process – This section discusses the utilization of sophisticated models and techniques to evaluate data and improve business processes.

VII. Tools for Advance Process Optimization – This section outlines the concept of advanced tools that support business process optimizations within an organization. It also delineates the specific steps and processes involved in detail.

3.1 Business Process Management – Overview

Business process management (BPM) has evolved over the years, *"BPM is a discipline that leverages software and services to provide total visibility into an organization's workflows. BPM software and services allow organizations to model, implement, execute, monitor, and optimize their processes, all in one place."* (Dumas et al., 2018, p. 3).

BPM has its existence in the field of operations management and process improvement, which have been around since the early 20th century. However, BPM as a distinct discipline emerged in the 1990s with the advancement of **Business Process Reengineering (BPR),** a management approach that aimed to radically redesign business processes for improved efficiency and effectiveness. BPM gained further momentum in the early 2000s with the introduction of Business Process Management Systems (BPMS), software platforms that automate and manage business processes.

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Today, BPM is widely recognized as a key enabler of organizational agility, innovation, and digital transformation, with many organizations investing in BPM initiatives to improve their competitiveness and customer satisfaction. According to Marlos Dumas (2018) "*BPM is an approach to manage an organization's processes in a structured way, to achieve more efficient and effective business processes that lead to better business performance."* (Dumas et al., 2018, p. 25)

3.1.1 Analysis and Improvement of Business Processes

Advance analysis and improvement of business processes management is a systematic approach that organizations use to identify and address inefficiencies, bottlenecks, and other issues in their business processes. "*Advance business analysis is a multidisciplinary approach to data analysis and decision-making that combines business acumen, technical skills, and domain expertise to identify opportunities and drive organizational performance*." (Milani, 2019, p. 78)

This process is needed because they are at the heart of any organization, and they play a necessary role in achieving business objectives. Inefficient or ineffective processes can lead to mediocre performance, wasted resources, lost opportunities, and unhappy customers. In contrast, optimized processes can drive business growth, improve operational efficiency, and enhance the customer experience. Through advanced analysis and improvement, organizations can gain a deeper understanding of their processes, identify opportunities for improvement, and implement changes that increase efficiency, productivity, and effectiveness.

In summary, it is essential for organizations that want to remain competitive, enhance their performance, and achieve their business objectives. By optimizing their processes, organizations can increase efficiency, reduce costs, improve quality, and enhance the customer experience, which can lead to sustainable business growth and success Data Variety – In today's world the source of data is continuously expanding, thus increasing the diversity of data available.

The following key points are included in the overall process:

- **Identify the process to be analysed**: The first step is to identify the process that needs to be analysed and improved. This could be any process within the organization, such as order processing, customer service, or inventory management.
- **Map the process:** The next step is to map out the process in detail, including all the steps and tasks involved, the people or departments responsible for each step, and the resources needed to complete the process. This helps to identify any inefficiencies or bottlenecks that may be hindering the process.

- **Design the improved process:** Based on the analysis, the next step is to design an improved process. This involves identifying the changes that need to be made to the current process, such as new or improved tools, automation, or process redesign.

- **Implement the new process:** Once the new process has been developed, the next crucial step is to put it into action. This involves informing all stakeholders about the changes made, offering comprehensive training and support to all employees, and closely monitoring the implementation to ensure that it is being followed accurately.

- **Continuously monitor and improve:** The ultimate step is to continuously monitor and improve the process. This involves measuring **key performance indicators (KPIs)** to assess the effectiveness of the new process, identifying any issues or bottlenecks that arise, and adjusting as necessary to improve the process further.

The following figure represents the core concepts in advanced business analysis that make up the conceptual framework for business analysis known as **BACCM (Business Analysis Core Concept Model)**

Figure 1: BACCM framework

Source: (Norton and Kaplan, 1996)

3.1.2 Process Identification

"*Process identification refers to those management activities that aim to systematically define the set of business processes of an organization and establish clear criteria for selecting specific processes for improvement. The output of process identification is a process architecture*" (Dumas et al., 2018, p. 25). The purpose of process identification is to develop a comprehensive overview or analysis of the organization's processes to provide a foundation for further analysis and improvement.

The process identification phase is usually initiated by mapping out the organization's processes, which is a visual representation of the sequence of steps and tasks required to complete a particular process. In advanced BPM, this process mapping is done at a granular level and includes identifying the inputs, outputs, and key performance indicators (KPIs) associated with each process. This level of detail enables the identification of inefficiencies and bottlenecks, leading to targeted improvements.

Business analysts and process experts are usually responsible for conducting process identification in advanced BPM, leveraging their skills to understand and document processes in detail. They also collaborate with stakeholders, including customers, employees, and managers, to gain a deeper understanding of the processes and their performance. This collaboration provides insights into the processes' limitations and potential improvements.

The use of process mining is also essential in advanced BPM for process identification. Advanced BPM leverages process mining to analyze the performance of the current processes and identify areas that require improvement. This level of analysis provides a detailed understanding of the process's performance, leading to targeted improvements.

Once the processes have been identified, they can be documented and mapped using various tools, such as flowcharts, diagrams, or process models. By documenting business processes, a shared vocabulary is established that can be used to discuss and evaluate them effectively. This documentation forms the basis for more in-depth analysis and potential enhancements.

3.2 Business Process Modelling and Mapping

Business Process Modelling and Mapping (BPMM) is the process of creating visual representations of an organization's business processes to improve performance, optimize resources, and achieve strategic goals. It involves identifying the sequence of steps and tasks required to complete a process and visualizing the flow of information and resources through the organization.

It provides a comprehensive understanding of the organization's processes, enabling stakeholders to identify inefficiencies, bottlenecks, and areas for improvement. This understanding is necessary for the development of targeted solutions that optimize resources, reduce costs, and improve performance. It provides a clear and standardized representation of the organization's processes, creating a common language for stakeholders to discuss and analyse processes. This standardization enables stakeholders to communicate effectively, facilitating decision-making, and improving overall organizational efficiency.

BPMM also enables the identification of interdependencies and interactions between processes, highlighting areas of the organization that require optimization. This allows organizations to prioritize their efforts to improve processes that will have the greatest impact on performance. It is also an essential tool for **process automation**, which is a crucial aspect of advanced BPM. Process automation involves the use of technology to automate routine and repetitive tasks, freeing up resources to focus on higher-value activities. **BPMM** provides the blueprint for process automation, enabling the development of automated workflows that mirror the organization's processes.

This enables organizations to adapt to changing business environments, identify new opportunities, and maintain a competitive advantage in the market. *"Business process modelling and mapping involves the use of various techniques and tools to represent the sequence of activities, inputs, outputs, and decision points that comprise a business process. The goal is to improve understanding, communication, and management of the process, and to support process improvement and optimization."* (Krogstie, 2016, p. 42)

3.2.1 Advance Process Mapping

According to Dumas, La Rosa, Mendling, and Reijers, *"Advanced process mapping is a technique for modelling complex processes that involve multiple stakeholders, systems, and interactions. This technique involves the use of advanced modelling tools and techniques, such as collaborative modelling and simulation, to create accurate and comprehensive process models that can be used for analysis and optimization."* (Dumas et al., 2018, p. 234).

The advanced process mapping technique refers in Business Process Management is based on **Business Process Model and Notation (BPMN)**, a standardized notation used to represent business processes visually. BPMN is a graphical notation that provides a clear and concise representation of an organization's processes, making them easier to understand, analyse, and improve.

There are several key concepts and methods used in advanced process mapping, which are essential to understanding and optimizing business processes. These include:

- **Business Process Model and Notation:** (BPMN): BPMN is a standardized notation used to represent business processes visually. It provides a common language for mapping that is understood across different organizations.

- **Process flow diagram**: A process flow diagram is a visual representation of a business process, showing the sequence of activities, inputs, outputs, and dependencies.

- **Swimlane diagram:** A swimlane diagram is a type of process flow diagram that shows the distinct roles or departments involved in a process. It helps to clarify responsibilities and handoffs between different departments.

- **Value stream mapping:** Value stream mapping is a technique used to identify and eliminate waste in a process. It involves mapping out the entire value stream for a process, including all inputs, outputs, and value-added activities.

- **Process improvement methodologies**: There are several methodologies used to

improve processes including Lean Six Sigma and Kaizen. These methodologies provide structured approaches to identify, analyse, and optimize processes.

- **Root cause analysis:** It is a method used to identify the underlying causes of problems in a process. It involves systematically analysing the process to identify the root cause of a problem and develop solutions to address it.

To optimize and improve processes, advanced process modelling incorporates several essential components. These are three crucial components:

- **Abstraction:** Abstraction entails disassembling complicated corporate procedures into smaller, easier-to-manage parts. It is simpler to comprehend and analyse the process, spot inefficiencies and chances for improvement, and create optimization strategies.

- **Decomposition:** It is the process of disassembling a process into its components, such as tasks, sub-processes, inputs, outputs, and decision points. This makes it easier to spot inefficiencies as well as chances for automation and improvement.

- **Formalization:** Using process models, diagrams, and other visual aids, formalization produces a standardized, formal representation of the process and it also serves as the foundation for analysis, optimization, and automation.

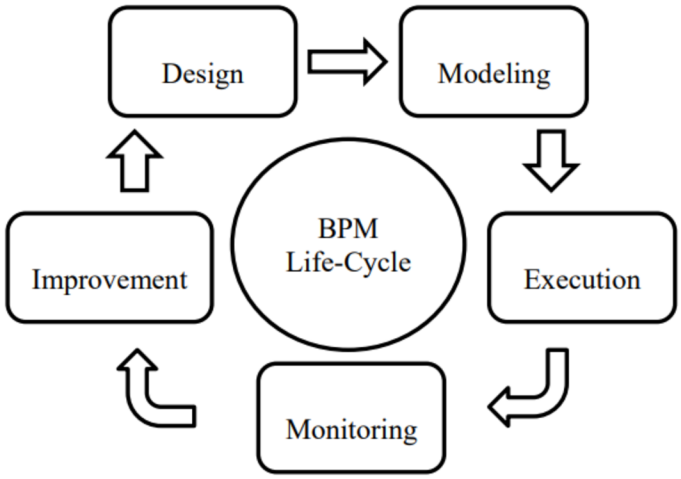


Figure 2: Bpm Lifecycle

Source: Blokdijk (2008, p. 101)

3.2.2 Quality of Business Process Models

Business process models are essential tools for organizations to improve their operational efficiency, reduce costs, and enhance customer satisfaction. However, the quality of business process models is critical to their effectiveness. "*Quality in business process models refers to the degree to which models accurately represent the real-world processes they describe, are understandable and usable by stakeholders, and support effective communication and decision-making*." (Krogstie, 2016, p. 5)

Quality of Process Models is needed to confirm that the models accurately represent the business process, support communication and collaboration, and lead to improved operational performance and customer satisfaction. "*Quality in business process models means that they accurately represent the real-world processes, are understandable and unambiguous to stakeholders, and have the appropriate level of detail for the intended use. The models should also adhere to standard modelling practices and conventions, be consistent with other models, and be easily maintainable over time*." (Milani, 2019, p. 36)

Critical aspects of business process model quality are its ability to accurately represent the business process it is designed to describe. A high-quality model should provide a clear and comprehensive representation of the process, including all its components, activities, and decision points. Another critical aspect of business process model quality is its ability to support communication and collaboration among stakeholders. A high-quality model should be easy to understand and communicate with all stakeholders, including process owners, designers, analysts, and end-users. This requires clear and consistent modelling language, appropriate visual representations, and effective documentation.

Usability is also a crucial factor in business process model quality. A high-quality model should be easy to use, navigate, and modify. This requires a user-friendly interface, clear navigation, and appropriate levels of detail. In addition to these factors, Krogstie emphasizes the importance of model validation and verification. A high-quality model should be validated against real-world data and verified against established standards and best practices. This ensures that the model accurately represents the process and can be used effectively to improve operations.

To achieve high-quality business process models, Krogstie recommends using a systematic and iterative modelling approach. This involves identifying the essential characteristics of the process, developing a preliminary model, testing, and validating the model, and refining it based on feedback and data.

If we conclude the various analysis, the quality standards of business process models are essential to their effectiveness in improving business operations. The concept of "quality" is complex, and there are numerous quality-related approaches that have been developed in the field of information systems. According to Rumbaugh "*A good model feels right and does not appear to have extraneous detail.*" (Rumbaugh et al. 1991).

The following figure gives an example or an overview of the frameworks for discussing quality or its parameters that can be taken as an idea in today's information systems world.

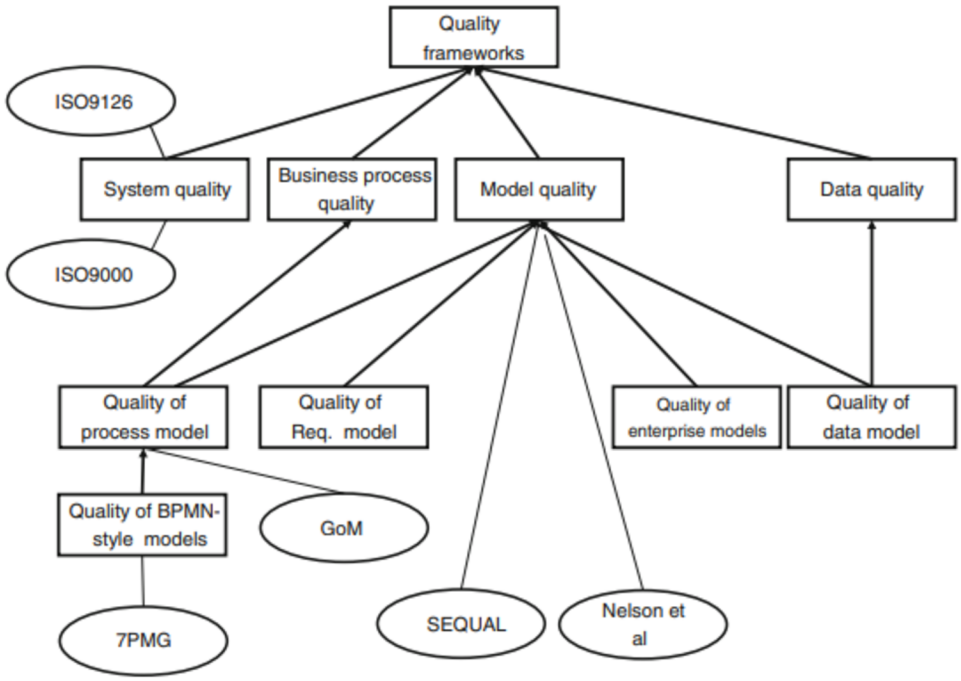


Figure 3:Frameworks for discussing Quality.

Source: (Krogstie, 2016, p. 55)

3.2.3 Value of Business Process Modelling for Organizations

"Process models can be used as a basis for simulation, analysis, optimization, monitoring, and control of business processes." (Van der Aalst, 2011, p. 16). Business process modelling is becoming more significant in the digital age because it enables businesses to streamline operations, increase productivity, cut costs, and provide customers with better goods and services. It makes sure that digital technologies are being used efficiently as they are revolutionizing how firms run. According to van der Aalst, "*Process modelling involves creating a graphical representation of a business process, while process mapping involves analysing and improving the process*." (Van der Aalst, 2011, p. 14)

The following are some of the factors that make business process modelling crucial in the digital age:

- **Process simplification**: Business process modelling aids firms in locating bottlenecks and inefficiencies in their workflows. Processes may be streamlined, and expenses may be decreased as a result, increasing production and efficiency.
- **Better Customer Experience**: By streamlining procedures, businesses may provide their clients with better goods and services. Increased client satisfaction and loyalty may result from this.
- **Agility**: Digital technologies are enabling businesses to be more agile and responsive to changing market conditions. Business process modelling provides a way to ensure that processes are adaptable, which helps and allows organizations to quickly respond to changing customer needs and market trends. According to experts, "*Agility is essential for multinational organizations to remain competitive in a rapidly changing business environment*." (Berman & Kim, 2017).
- **Innovation**: Process modelling can also help organizations to identify opportunities for innovation. By analysing processes and identifying areas for improvement, organizations can develop new products and services that meet

the evolving needs of customers.

- **Compliance**: Multinational organizations often operate in multiple countries and are subject to a variety of regulations and compliance requirements. Business process modelling can help organizations to ensure compliance with these requirements. According to researchers, "*Compliance can be improved through the use of process modelling tools that provide visibility and control over processes*." (Williams & Holzner, 2010).
- **Collaboration**: Business process modelling promotes collaboration between different departments and teams within an organization. By creating a shared understanding of processes, teams can work together more effectively to achieve common goals.

In ARIS, process chains are used to depict the order of functions (activities) as they relate to business processes. Process chain models fall under the control view because they incorporate inputs and outputs, data, informational inputs, and outputs, in addition to the sequence of functions systems, organizational components, participants in particular processes, dangers, etc.

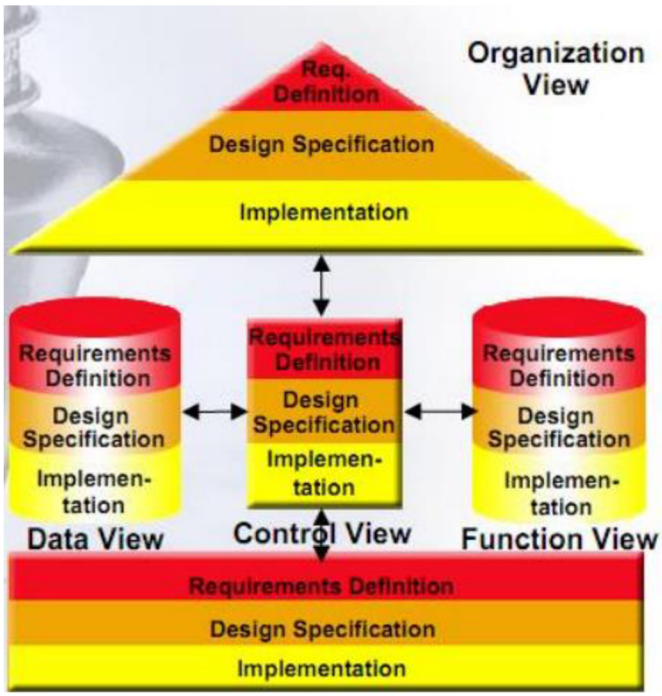


Figure 4: ARIS Analytical Views of the Process Model

Source: (Software AG, p. 2-6)

3.2.4 Future of Business Process Modelling

The future of Advanced Business Process Modelling (BPM) looks promising as the technology and tools for process modelling continue to improve. Here are some of the potential developments that could shape the future of advanced BPM:

- Increased use of **Artificial Intelligence (AI)**: The incorporation of AI into BPM could lead to more accurate and efficient process modelling. AI could be used to automate process mapping and modelling, identify patterns and anomalies, and make predictions based on historical data.

- Integration with the **Internet of Things (IoT)**: As more devices become connected to the Internet, there will be an increased need for businesses to model and optimize their processes to take advantage of the data generated by IoT devices.

- **Adoption of cloud-based BPM solutions:** The use of cloud-based BPM solutions could lead to increased collaboration and accessibility, allowing teams to work on process modelling from anywhere in the world.

- The emergence of blockchain-based BPM: The use of blockchain technology in BPM could lead to increased transparency, security, and efficiency. It could also enable the creation of decentralized process networks, where different organizations can collaborate on shared processes without the need for intermediaries.

- Continued focus on process improvement: Businesses will continue to seek ways to optimize their operations, emphasis on process improvement through advanced techniques such as simulation, automation, and optimization.

Overall, the future of advanced BPM looks bright, with the potential to create significant value for businesses in terms of efficiency and competitiveness.

3.3 Transformative Process Design Techniques

Transformative Advance BPM Process Design Techniques are focused on reimagining and redefining an organization's business processes. These techniques aim to drive efficiency and effectiveness by designing new processes or redesigning existing ones to meet changing business needs.

There are several techniques that organizations can use to transform their business processes, including:

- **Customer Journey Mapping:** This technique involves mapping out the customer experience at every touchpoint with an organization. This helps to identify pain points and areas for improvement in the customer journey, which can inform the redesign of business processes to enhance the customer experience.

- **Process Mining:** The process mining approach entails scrutinizing available process data to pinpoint shortcomings and opportunities for enhancement. By utilizing process mining, organizations can detect process bottlenecks and deficiencies, as well as track process efficiency over time.

- **Design Thinking:** This technique involves a human-centred approach to problem-solving, with a focus on empathy, ideation, and experimentation. Design thinking can be used to redesign business processes with a focus on user needs and experiences.

- **Lean Six Sigma:** This technique combines Lean and Six Sigma methodologies to identify and eliminate waste in business processes. It involves continuous improvement and a data-driven approach to process design.

- **Agile BPM:** This technique involves an iterative approach to design, with a focus on collaboration, flexibility, and continuous improvement. Agile BPM can quickly prototype and test new processes and respond to change.

3.4 Business Process Operationalization

Famous researcher Krogstie (2016) in his book emphasizes that "*Business process implementation involves "monitoring and controlling the processes to ensure they are functioning correctly and making adjustments as needed to optimize their performance"*. Process improvement is needed to enhance the efficiency and effectiveness of business processes, increase productivity, reduce costs, improve customer satisfaction, and keep up with changing market demands and technology advancements.

Advanced business process implementation is a strategic approach to managing and improving business processes to achieve organizational goals and improve operational efficiency. It involves applying advanced techniques to automate, optimize, and continuously improve processes.

To implement advanced business processes, it is important to follow a structured approach that involves several steps, such as:

- **Process documentation**: The first step is to document existing business processes to identify areas for improvement. This includes identifying the inputs, outputs, activities, and resources required to perform each process.

- **Process analysis**: This step involves analysing the documented processes to identify bottlenecks, inefficiencies, and areas for improvement. This includes using tools such as process maps, flowcharts, and value stream maps to identify opportunities for optimization.

- **Process redesign**: Based on the analysis, the next step is to redesign the processes to eliminate bottlenecks and inefficiencies. This can involve reengineering the process from scratch or making incremental changes to optimize the existing process.

- **Process automation**: After redesigning the process, the next step is to automate it using advanced technologies such as robotic process automation (RPA), artificial

intelligence (AI), and machine learning (ML). This involves creating workflows and automating repetitive tasks to improve operational efficiency.

- **Process monitoring and improvement**: Once the processes are automated, it is important to continuously monitor and improve them to ensure they are delivering the desired results. This involves using advanced analytics and monitoring tools to track key performance indicators (KPIs) and identify areas for improvement.

Business process implementation brings a host of benefits to an organization, including:

- **Improved Efficiency**: Business process implementation helps to streamline workflows and improve efficiency by automating tasks, reducing redundant efforts, and enabling collaboration. By using tools such as workflow management systems, process automation, and process improvement methodologies, organizations can optimize their processes, saving time and resources.

- **Increased Quality**: Effective process implementation can lead to increased quality in the products or services being delivered. By ensuring consistency and standardization in the way work is performed, an organization can reduce errors, improve customer satisfaction, and enhance its reputation.

- **Better Control**: With well-defined business processes, an organization can have better control over its operations. Clear roles and responsibilities defined process steps, and decision-making criteria can help to ensure that work is performed consistently and in accordance with established guidelines.

- **Enhanced Agility**: Business process implementation allows organizations to respond quickly to changing market conditions, customer needs, or regulatory requirements. By having agile, adaptable processes in place, an organization can quickly adjust its operations to meet new demands.

- **Increased Transparency**: It provides increased visibility into organizational performance, making it easier to identify areas for improvement and track progress

over time. By collecting data and analysing it to identify trends, organizations can make data-driven decisions and optimize their operations.

Overall, implementing effective business processes can lead to significant improvements in organizational performance, customer satisfaction, and employee morale. By continually evaluating and refining its processes, an organization can achieve ongoing success in the long term.

Here are some tips for successful process implementation:

- **Clearly define the process**: Before implementing any process, it is important to clearly define it. This means identifying the inputs, outputs, resources, roles and responsibilities, requirements and the steps involved in the process.

- **Identify the process owners**: Assign ownership of the process to individuals or departments that have the necessary skills, authority, and resources to manage it effectively.

- **Communicate the process**: Ensure that all stakeholders are informed about the new process and understand their roles and responsibilities.

- **Obtain buy-in**: Obtain buy-in from stakeholders, including employees, management, and customers, by explaining the benefits of the new process and addressing any concerns.

- **Evaluate the process**: Before rolling out the new process, test it on a small scale to identify any issues and make necessary adjustments.

- **Provide training**: Ensure that all stakeholders, especially employees, are trained in the new process and understand their roles and responsibilities.

- **Monitor the process**: Monitor the new process to ensure it is working effectively

and make necessary adjustments as needed.

- **Continuously improve the process**: Once the process has been implemented, continue to review, and improve it to ensure it is meeting the organization's needs and goals.

By following these tips, organizations can successfully implement new processes and realize the benefits of improved efficiency, productivity, and customer satisfaction.

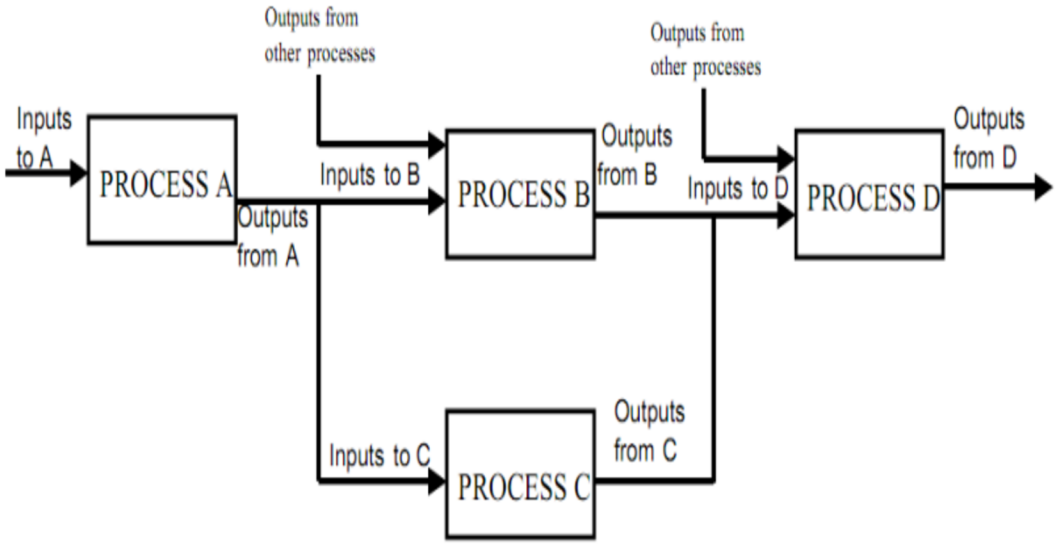


Figure 5: An illustration of a Typical Process Flow in an Organization

Source; ISO, 2008.

3.5 Model-Based Process Implementation

Data Process implementation with executable models is an approach to implementing business process models using software tools that can execute the models as automated workflows. This approach allows the creation of more efficient and effective business processes that are more adaptable to changes in the business environment.

Executable models are process models that are equipped with an underlying execution environment, which enables them to be executed as workflows by a software system. "*Process implementation with executable models involves the use of executable*

process models, which can be directly executed by a process engine or a similar system, to automate the execution of business processes." (Dumas et al., 2018, p. 57).

The process of implementing executable models starts with the creation of the process model using a modelling language, such as **Business Process Model and Notation (BPMN)** or **Unified Modelling Language (UML)**. The model is then enhanced with executable semantics, which defines how the model should be executed by the software system.

Once the model is complete, it is translated into a machine-readable format, such as **Business Process Execution Language (BPEL)** or **Event-driven Process Chain (EPC).** The software system can then execute the model as a workflow, with each step in the model automatically triggering the next. "*Executable process models can be used to ensure that the actual execution of a business process conforms to the intended design, as expressed in the model*." (Dumas et al., 2018, p. 58)

Implementing executable models has many advantages, including faster and more accurate execution of business processes, greater agility in reacts to changes in the business environment, and increased visibility into the status of business processes. It also reduces the need for manual intervention in process execution, freeing up resources and reducing costs. Overall, process implementation with executable models is a powerful tool for improving process management and driving organizational efficiency and effectiveness.

In the digital era, there are several models available for process implementation with executable models. Here are some of the most common ones:

- **Business Process Model and Notation (BPMN)**: BPMN is a graphical modelling language used for process modelling and process implementation. It allows for the creation of executable models that can be implemented in a process execution platform.

- **Decision Model and Notation (DMN)**: DMN is a modelling language used to model decision-making processes. It allows for the creation of executable

decision models that can be integrated with BPMN models to create end-to-end process implementations.

- **Event-driven Process Chain (EPC):** EPC is a process modelling language that focuses on the events and functions that take place in a process. It can be used to create executable process models that can be implemented in a process execution platform.

- **Service-oriented Architecture (SOA)**: SOA is an architectural model that allows for the creation of modular, reusable services that can be used to implement business processes. It can be used to create executable service models that can be integrated with BPMN models.

- **Unified Modelling Language (UML)**: UML is a general-purpose modelling language used in software engineering. It can be used to create executable models for business processes by incorporating business rules, use cases, and actors.

- **Adaptive Case Management (ACM)**: ACM is a framework for managing unpredictable, knowledge-based business processes. It allows for the creation of executable case models that can be implemented in a process execution platform.

3.5.1 Automated Process execution

Automated process execution in advanced **Business Process Management (BPM)** refers to the use of technology to automate and optimize business processes. This involves the use of process execution platforms, which are software systems that support the modelling, design, execution, and monitoring of business processes. "*Automated process execution involves the use of process engines or similar systems to automatically execute business processes according to their executable models.*" (Dumas et al., 2018, p. 57)

In advanced BPM, automated process execution can be achieved using executable models, which are models that can be executed directly on process execution platforms. These models can be created using graphical modelling languages like **Business Process Model and Notation (BPMN)** or **Decision Model and Notation (DMN).**

The process execution platforms can then be used to execute these models and to automate the flow of work and data through the business process. Automated process execution enables organizations to achieve greater efficiency, reduce errors, and improve the quality of their services.

There are several benefits to using automated process execution in advanced BPM. One of the most significant benefits is the ability to achieve greater process efficiency. By automating routine tasks and streamlining the flow of work, organizations can reduce the time it takes to complete processes, while also reducing the risk of errors and inconsistencies. "*Automated process execution is the ability to execute a process flow using software automation. The process flow is typically modelled using a process modelling language such as Business Process Model and Notation (BPMN), and the automation is achieved using workflow engines and other software tools.*" (Leymann & Roller, 2015, p. 8)

Automated process execution also enables organizations to achieve greater process transparency and control. With process execution platforms, organizations can monitor the progress of processes in real-time, and make changes as needed to optimize performance.

Another benefit of automated process execution is the ability to integrate processes with other systems and services. By automating processes, organizations can easily integrate them with other systems, such as **Enterprise Resource Planning** (ERP) systems or **Customer Relationship Management (CRM)** systems, enabling greater data sharing and collaboration. "*Automated process execution enables the rapid and consistent execution of business processes, the enforcement of business rules, and the real-time monitoring of process performance and compliance, among other benefits.*" (Dumas et al., 2018, p. 57)

However, it is important to note that automated process execution is not a one-size-fits-all solution. Organizations must carefully evaluate their processes, and determine which ones are best suited for automation. They must also ensure that the process execution platform they choose can support their specific needs and requirements. "*Automated process*

execution refers to the use of software tools to execute and manage business processes. These tools can handle tasks such as routing work items, triggering events, and executing business rules." (Weske, 2007, p. 187)

In summary, automated process execution is a key component of advanced BPM, enabling organizations to automate and optimize their business processes, achieve greater efficiency and transparency, and integrate processes with other systems and services.

3.5.2 Advanced Automation techniques

Advanced implementation techniques in advanced business process management (BPM) involve the use of technology and best practices to implement and optimize business processes. These techniques are designed to improve efficiency, increase productivity, and reduce errors, while also ensuring compliance with regulations and standards.

Here are some advanced implementation techniques in advanced BPM:

- **Process Automation**: This involves the use of technology to automate routine tasks and streamline the flow of work through a process. Process automation can be achieved using process execution platforms, robotic process automation (RPA), or other automation tools. Process automation enables organizations to achieve greater efficiency and reduce the risk of errors and inconsistencies. Manufacturing companies are using process automation to improve their efficiency and reduce errors in their production processes. For example, a manufacturer might use **Robotic Process Automation (RPA)** to automate the assembly line or use sensors and automation to monitor and control the temperature and humidity in a production facility.

- **Process Mining**: This involves the use of data mining techniques to analyse and optimize business processes. Process mining enables organizations to identify **process bottlenecks**, **inefficiencies**, and **areas for improvement**, enabling them to optimize their processes for greater efficiency and effectiveness. Healthcare organizations are using process mining to optimize their patient care processes. For example, a hospital might use process mining

to analyse the patient intake process, identify bottlenecks and inefficiencies, and make changes to improve the patient experience and reduce wait times.

- **Process Simulation**: This involves the use of simulation tools to model and test business processes before they are implemented. Process simulation enables organizations to identify potential issues and risks before they occur, enabling them to optimize their processes for greater efficiency and effectiveness.

- **Predictive Analytics**: This involves the use of data analytics techniques to identify patterns and trends in data, and to make predictions about future outcomes. Predictive analytics can be used to optimize business processes by identifying potential issues and risks, enabling organizations to take initiative-taking steps to mitigate these risks.

- **Agile Development**: This involves the use of agile methodologies to develop and implement business processes. Agile development enables organizations to quickly and iteratively develop and test processes, enabling them to rapidly respond to changing business requirements. Software development teams are using agile development methodologies to quickly and iteratively develop and test software applications. For example, a software development team might use agile development to rapidly develop and test a mobile application, making changes based on user feedback and continuously improving the application until it meets the needs of its users.

- **Continuous Improvement**: This involves the ongoing monitoring and optimization of business processes. Continuous improvement enables organizations to identify and address issues as they arise, and to continuously optimize their processes for greater efficiency and effectiveness.

To implement these advanced techniques, organizations must first ensure that they have a solid foundation in BPM. This involves establishing clear goals and objectives, developing a process architecture, and selecting the right tools and technology to support the implementation of their processes.

Organizations must also ensure that they have the right skills and expertise in-house to implement these advanced techniques. This may involve hiring fresh staff or partnering with external experts and consultants. In addition, organizations must ensure that they have a strong culture of process excellence. This involves creating a culture that values continuous improvement and encourages innovation and collaboration.

Finally, organizations must ensure that they have the right governance and oversight in place to ensure compliance with regulations and standards. This may involve implementing controls and processes to ensure data privacy and security, as well as ensuring compliance with industry-specific regulations and standards.

In today's digital era, advanced implementation techniques in advanced business process management (BPM) offer many benefits, but there are also some limitations:

- **The rapid pace of technological change**: The rapid pace of technological change in the digital era means that innovative technologies and approaches to BPM are constantly emerging. This can make it difficult for organizations to keep up with the latest advances and adopt them in a timely manner. Organizations may invest in technologies that become obsolete quickly or be unable to take full advantage of the benefits of advanced BPM due to the limitations of their technology infrastructure.
- **Need for specialized skills and expertise:** Advanced implementation techniques often require experts with specific skills in areas such as data analytics, artificial intelligence, and automation. These skills are in high demand, and it can be challenging for organizations to find and retain the necessary talent. This can result in implementation delays or ineffective implementations due to a lack of expertise.
- **Data quality and availability**: Advanced implementation techniques rely heavily on data, and the proliferation of data sources and data types can make it challenging to manage data quality and availability. Organizations must invest in data management and quality control to ensure that they have the data they need to take full advantage of advanced BPM techniques. Without high-quality and available data, the implementation will not be effective.
- **Security and privacy concerns:** Advanced implementation techniques often

involve the use of sensitive data, and organizations must take steps to ensure that this data is secure and protected from unauthorized access. This can be challenging in an environment where cyber threats are constantly evolving, and organizations must invest in cybersecurity measures to protect their data and their operations.

- **Cost:** Cost is still a concern, as advanced BPM implementation can be expensive. Organizations must invest in the technology, expertise, and infrastructure required to implement advanced BPM techniques, and this can be a significant financial commitment. Additionally, advanced implementation techniques may require ongoing investment to keep up with the latest advances in BPM technology.
- **Organizational culture and resistance to change:** Organizational culture and resistance to change can still be a major limitation in today's digital era. Advanced implementation techniques often require significant changes to an organization's processes, and this can be met with resistance from employees who are used to doing things a certain way. Organizations need to invest in change management & communication strategies to ensure that employees understand the benefits of changes and willing to adapt to new ways of working.

Advanced implementation techniques in advanced BPM offer many benefits but there are still several limitations that must be carefully considered and managed to ensure successful implementation and to invest in the right technology and strategies.

3.6 Process Monitoring and Continuous Improvement

Process monitoring and continuous improvement are key components of advanced BPM techniques. Process monitoring involves the ongoing observation and measurement of processes to ensure that they are operating as intended and to identify areas for improvement. Continuous improvement involves using the information gathered through process monitoring to make changes to processes and improve their performance over time.

In advanced BPM, process monitoring is typically done using real-time data from sensors and other monitoring devices. This data is used to track the performance of processes and identify potential issues in real-time. With this information, organizations can quickly address issues before they become significant problems, ensuring that processes remain efficient and effective.

Continuous improvement in advanced BPM involves using data from process monitoring to make changes to processes and improve their performance. This can involve automating certain tasks, optimizing the use of resources, or making other changes to improve process efficiency and effectiveness. The goal is to make incremental improvements to processes over time, ensuring that they continue to meet the needs of the organization and its stakeholders.

One of the key benefits of process monitoring and continuous improvement in advanced BPM is the ability to identify and address issues before they become significant problems. This helps organizations to avoid costly downtime or delays and ensures that processes continue to operate efficiently and effectively. Additionally, continuous improvement can help organizations to remain competitive in a rapidly changing business environment, by enabling them to quickly adapt to new challenges and opportunities.

To implement process monitoring and continuous improvement in advanced BPM, organizations typically need to invest in the right technology and expertise. This can involve deploying sensors and other monitoring devices, implementing data analytics tools, and hiring experts in areas such as data analysis and process improvement. With the right technology and expertise in place, organizations can take full advantage of the benefits of process monitoring and continuous improvement in advanced BPM and ensure that their processes continue to operate at peak efficiency and effectiveness.

3.6.1 Process Mining

Process mining is a technique used in advanced BPM to analyse business

processes and identify areas for improvement. It involves the use of software tools to extract information from digital systems and databases and then analyse that information to gain insights into how processes are being executed. "*Process mining is a relatively young research discipline that sits between computational intelligence and data mining on the one hand and process modelling and analysis on the other hand. The idea of process mining is to discover, monitor, and improve real processes by extracting knowledge from event logs readily available in today's information systems.*" (Van der Aalst, 2011, Springer, 2011)

According to Markus Nauroth and Ralf Peters in their book "*Process Mining: Discovery, Conformance, and Enhancement of Business Processes*," the three main types of process mining are:

- **Discovery** - This involves extracting information from digital systems and databases to gain insights into how processes are being executed. This can include analysing transaction logs, application logs, and other data sources to identify process flows, bottlenecks, and other patterns.

- **Conformance** - this involves comparing the actual execution of a process to the intended process model, to identify any deviations or non-compliance. This can include analysing data to identify areas where processes are not being executed as intended, or where bottlenecks or other issues are causing delays or inefficiencies.

- **Enhancement** - this involves using the insights gained from process mining to improve processes and drive continuous improvement. This can include identifying areas where processes can be automated or optimized, or where additional resources or training may be needed to improve performance.

One of the key benefits of process mining is that it provides a way to gain insights into how processes are being executed in real-world settings. This is important because many organizations have complex processes that are difficult to fully understand or analyse using traditional methods.

Process mining can also help organizations to identify areas where they may be at risk of compliance violations or other issues. By analysing transaction logs and other data sources, organizations can identify potential bottlenecks or other issues that may be causing delays or inefficiencies in their processes. They can then take steps to address these issues before they become significant problems.

"*Process mining aims at discovering, monitoring, and improving processes by extracting process-related knowledge from event logs that record process execution data. Process mining tools typically use process models and other types of analyses to visualize and analyse the behaviour of processes, and they can be applied to a variety of domains and processes, including logistics, healthcare, and software engineering*." (J.C.A.M. Buijs, H.A. Reijers, and W.M.P. van der Aalst, "Process Mining in Healthcare: A Literature Review", Journal of Biomedical Informatics, Vol. 61, 2016.)

However, there are also some limitations to process mining that should be considered. For example:

- **Data availability** - process mining relies on having access to large volumes of data from digital systems and databases. If data is not available, incomplete, or inaccurate, the insights gained from process mining may be limited.
- **Data quality** - the accuracy and completeness of the data used in process mining can impact the validity of the insights gained. If data is incomplete, inaccurate, or inconsistent, it can lead to incorrect or misleading conclusions.
- **Complexity** - some processes may be so complex that they are difficult to fully understand or analyse using process mining. In these cases, additional methods may be needed to fully understand and optimize the process.

Despite these limitations, process mining is a valuable tool for organizations looking to improve their business processes and drive continuous improvement. By providing insights into how processes are being executed, and identifying areas for improvement, organizations can optimize their operations and remain competitive in a rapidly changing business environment.

3.6.2 Advanced Predictive Analytics

Advanced Predictive Analytics is the application of advanced analytical techniques to identify patterns and relationships in data to predict future outcomes with a high degree of accuracy. In the context of Business Process Management (BPM), predictive analytics can be used to identify potential process bottlenecks, predict future performance, and optimize business processes to increase efficiency and effectiveness.

There are several key aspects to Advanced Predictive Analytics in BPM, including:

- **Data Preparation:** Before any predictive analysis can be conducted, data must be collected and prepared for analysis. This may involve cleaning and formatting data, merging data from diverse sources, and identifying key variables to analyse.

- **Predictive Modelling:** Predictive modelling is the process of developing a mathematical model that predicts the likelihood of a particular outcome based on historical data. Advanced predictive modelling techniques include machine learning, neural networks, and decision trees.

- **Model Validation:** Once a predictive model has been developed, it must be validated to ensure that it is accurate and dependable. This involves testing the model against a separate set of data to see how well it predicts future outcomes.

- **Model Deployment:** Once a predictive model has been validated, it can be deployed in a production environment to make predictions on new data. This may involve integrating the model into an existing system or application.

- **Continuous Improvement**: Predictive models must be regularly monitored and updated to ensure that they remain accurate over time. This may involve retraining the model on new data, refining the model's parameters, or adjusting the model's inputs.

One example of Advanced Predictive Analytics in BPM is predictive maintenance, where algorithms are used to predict when a machine is likely to fail based on historical data

and other variables such as temperature, humidity, and vibration. This information can be used to schedule maintenance proactively, minimizing downtime and reducing costs.

Another example is customer churn prediction, where predictive models are used to identify customers who are likely to stop using a product or service. This information can be used to develop targeted retention strategies and reduce customer churn.

One key benefit of Advanced Predictive Analytics is that it can help organizations to identify potential problems before they occur, enabling them to take initiative-taking steps to prevent or mitigate them. This can help to improve efficiency and reduce costs, as well as improve customer satisfaction and retention.

However, there are also several challenges associated with Advanced Predictive Analytics, including:

- **Data Quality:** Predictive models are only as good as the data they are trained on. Poor data quality, including missing or inaccurate data, can lead to inaccurate predictions.

- **Data Integration:** To develop accurate predictive models, data from multiple sources may need to be integrated. This can be challenging if the data is stored in different formats or distinct locations.

- **Model Complexity:** Advanced predictive models can be complex and difficult to interpret. This can make it challenging to explain the results to non-technical stakeholders.

- **Model Overfitting:** Predictive models can sometimes be overfitting to the training data, leading to deficient performance on new data.

- **Model Drift:** Predictive models can become less accurate over time as the underlying data changes. This can require regular monitoring and retraining of the model.

To address these challenges, organizations may need to invest in data quality initiatives, data integration tools, and skilled data analysts and data scientists. They may also need to establish clear governance policies around the use of predictive models, including guidelines for model validation and deployment. In conclusion, Advanced Predictive Analytics is a powerful tool for organizations looking to optimize their business processes and improve their bottom line.

3.6.3 Documentation and Continual Improvement

Documentation and continual improvement are essential aspects of Business Process Management (BPM). Effective documentation and continual improvement strategies enable organizations to manage their processes more efficiently and effectively. In this context, BPM documentation refers to the process of creating and maintaining process-related documents, while BPM continual improvement refers to the process of identifying areas for improvement and making the necessary changes to optimize the processes. In this article, we will explore the importance of documentation and continual improvement in BPM, key points, and strategies to improve BPM processes.

Continual improvement is essential for BPM because it enables organizations to identify areas for improvement and optimize their processes. Without continual improvement, organizations run the risk of becoming complacent and failing to adapt to changing business environments, resulting in lost opportunities for growth and competitive advantage.

To achieve effective documentation and continual improvement in BPM, organizations should consider the following strategies:

- **Define Clear Objectives**: Organizations should define clear objectives for their BPM processes.
- **Identify Stakeholders**: Organizations should identify all stakeholders who are involved in the process and ensure that their needs are considered when documenting.
- **Data Analysis**: Organizations should collect and analyse data related to their processes to identify areas for improvement.
- **Process Mapping**: Organizations should use process mapping techniques such as flowcharts or swimlane diagrams to document their processes. This will help to identify areas for improvement and ensure that the process is executed consistently.

- **Stakeholder Feedback**: Organizations should seek feedback from stakeholders on the effectiveness of the process. This will help to identify areas for improvement and ensure that the process meets the needs of all stakeholders.

There are several active methods that organizations can use to continually improve their BPM processes. Some of these methods include:

- **Process reviews**: This involves conducting a review of the BPM process to identify areas of improvement. It helps to evaluate the effectiveness and efficiency of the process, identify any bottlenecks, and identify potential areas for improvement.

- **Root cause analysis**: This involves identifying the underlying cause of any issues with the BPM process, rather than simply addressing the symptoms. It helps to determine the root cause of the problem, which can then be addressed to prevent the issue from occurring again in the future.

- **Lean process improvement**: This is a method that focuses on reducing waste and increasing efficiency in the BPM process. It involves the identification of any areas where waste occurs, and the implementation of changes to the process to eliminate this waste.

- **Six Sigma**: This is a data-driven method that is focused on reducing defects and errors in the BPM process. It involves the use of statistical analysis to identify areas where errors are occurring, and the implementation of changes to reduce or eliminate these errors.

- **Kaizen**: This is an improvement method that involves making small, incremental changes to the BPM process over time and involves the identification of small improvements that can implement these changes on an ongoing basis.

- **Total Quality Management (TQM)**: This is a comprehensive approach to BPM process improvement that involves a focus on continuous improvement, customer

satisfaction, and employee involvement. It involves the use of a variety of methods, including process reviews, process analysis, root cause analysis, and Lean process improvement, to continually improve the BPM process.

- **Plan-Do-Check-Act (PDCA):** This is a structured approach to BPM process improvement that involves four key steps: planning, doing, checking, and acting. It involves the use of data to identify areas for improvement, the implementation of changes, and the monitoring of the results to ensure that the changes are effective.

- **Agile methodologies**: This is an iterative approach to BPM process improvement that involves the use of small, incremental changes to the process. It involves the use of frequent feedback and collaboration to continuously improve the BPM process over time.

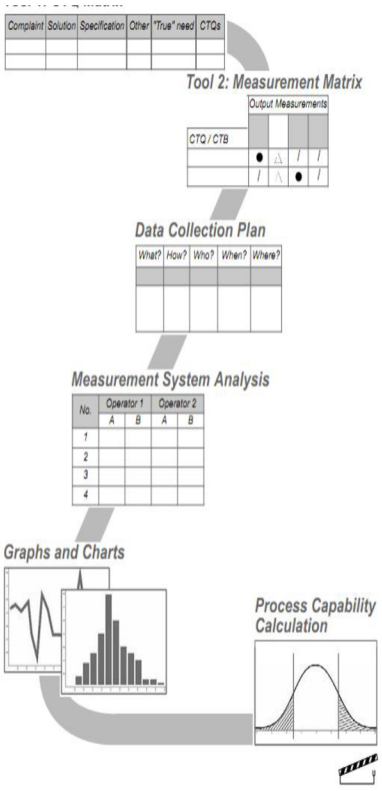


Figure 6: An Illustration of the Business Process Monitoring Procedure.

Source; Lunau, 2008, p. 55

3.7 Advanced Analytics and Simulation Process

Advanced analytics and simulation are essential tools in **Business Process Management (BPM)** that allow organizations to improve their operations, optimize resource allocation, and predict the outcomes of various scenarios. In this context, advanced analytics refers to the use of techniques such as data mining, machine learning, and statistical analysis to gain insights from large and complex data sets. Simulation, on the other hand, involves the use of computer-based models to simulate the behaviour of a process or system under different conditions. Together, these techniques enable organizations to make informed decisions, optimize their processes, and achieve their business goals.

Advanced analytics refers to the use of advanced techniques such as data mining, machine learning, and statistical analysis to gain insights from large and complex data sets. In BPM, advanced analytics is used to analyse process data, identify process bottlenecks, predict process outcomes, and identify opportunities for process improvement.

The following are many practical examples of advanced analytics in BPM in today's world. Here are a few examples:

- **Customer Analytics**: Many organizations are using advanced analytics to better understand their customers and improve customer experience. By analysing customer data, organizations can identify patterns and trends in customer behaviour, preferences, and needs. This can help organizations to better target their marketing efforts, personalize their products and services, and improve customer engagement and retention.
- **Supply Chain Analytics**: Supply chain analytics can help organizations to optimize their supply chain processes and improve operational efficiency. By analysing data on inventory levels, demand patterns, and supplier performance, organizations can identify opportunities to reduce costs, improve delivery times, and enhance overall supply chain performance.
- **Fraud Detection**: Advanced analytics can be used to detect and prevent fraud in

many industries, including finance, healthcare, and insurance. By analysing data from multiple sources, organizations can identify suspicious patterns and anomalies that may indicate fraud and take appropriate action.

- **HR Analytics**: HR analytics is a rapidly growing area that is helping organizations to better understand their workforce and improve employee engagement and retention. By analysing data on employee performance, satisfaction, and other factors, organizations can identify areas for improvement and develop more effective HR strategies.
- **Process Analytics**: Process analytics is a key area of advanced analytics in BPM that helps organizations to optimize their business processes. By analysing data on process performance and identifying bottlenecks and other areas of inefficiency, organizations can make targeted improvements that lead to better operational efficiency and productivity.
- Simulation involves the use of computer-based models to simulate the behaviour of a process or system under different conditions. In BPM, simulation is used to optimize process performance, predict process outcomes, and identify opportunities for process improvement. Some of the key techniques used in simulation include:
- **Discrete-Event Simulation**: Discrete-event simulation is a simulation technique used to model systems that involve discrete events, such as arrivals, departures, and service times. In BPM, discrete-event simulation is used to simulate process behaviour, predict process outcomes, and optimize process performance.
- **Process Simulation**: Process simulation involves the use of computer-based models to simulate the behaviour of a process or system under different conditions. In BPM, process simulation is used to optimize process performance, predict process outcomes, and identify opportunities for process improvement.
- **Agent-Based Simulation**: Agent-based simulation is a simulation technique used to model complex systems that involve multiple agents interacting with each other. In BPM, agent-based simulation is used to simulate process behaviour, predict process outcomes, and optimize process performance.

Applications of Advanced Analytics and Simulation in BPM:

Advanced analytics and simulation have numerous applications in BPM, including:

Process Optimization: Advanced analytics and simulation can be used to optimize process performance by identifying process bottlenecks, simulating process behaviour, and predicting process outcomes.

- **Resource Allocation**: Advanced analytics and simulation can be used to optimize resource allocation by predicting the impact of different resource allocation scenarios, simulating resource utilization, and identifying opportunities for improvement.
- **Risk Management:** Advanced analytics and simulation can be used to predict and manage risks associated with different process scenarios, such as delays, errors, and resource shortages.
- **Forecasting:** Advanced analytics and simulation can be used to forecast process outcomes, such as production volumes, cycle times, and delivery times, based on historical data.
- **Process Design:** Advanced analytics and simulation can be used to design new processes, optimize existing processes, and identify opportunities for improvement.

3.8 Tools Supporting BPM in Digital ERA

Tools supporting advanced process optimization typically have a multi-layered architecture that includes several components to perform various tasks. The following is an overview of the typical architecture of such tools:

- **Data Ingestion Layer:** Topmost layer in architecture is the data ingestion layer. This layer typically includes connectors to various systems, databases, and other data sources, and can also include data cleansing and transformation capabilities to ensure that the data is standardized and consistent.
- **Data Storage and Management Layer:** This layer is responsible for storing and managing the data ingested in the previous layer. It typically includes a data repository or data warehouse where the data is stored, along with tools for data retrieval, indexing, and search.
- **Data Processing and Analysis Layer:** The data processing and analysis layer is the core of the architecture and is responsible for performing advanced

analytics and optimization on the data. This layer typically includes a range of tools and algorithms for data analysis, including machine learning, artificial intelligence, statistical analysis, and other advanced techniques.

- **Visualization and Reporting Layer:** The visualization and reporting layer is responsible for presenting the results of the data analysis to users. This layer typically includes dashboards, reports, and other visualization tools to help users understand the data and make informed decisions.
- **Workflow and Automation Layer:** The final layer in the architecture is the workflow and automation layer, which is responsible for automating processes and workflows based on the results of the analysis. This layer typically includes tools for process modelling, automation, and optimization, and can also include integration with other enterprise systems such as ERP, CRM, and SCM.

3.8.1 Evolution of BPM in Today's Digital World

Advanced BPM (Business Process Management) has undergone significant changes and evolution in today's digital world. Here are some of the ways BPM has evolved:

- **Automation**: With the advancements in technology, businesses are increasingly automating their processes to improve efficiency and reduce errors. BPM tools have evolved to support automation, making it easier to design, implement and manage automated processes.
- **Integration:** Today's digital world requires businesses to be interconnected and have seamless integration between different systems and processes. BPM tools have evolved to support integration with other systems, making it easier to manage complex processes that involve multiple systems.
- **Analytics:** BPM tools now offer advanced analytics capabilities that provide insights into the performance of business processes. This helps businesses to identify bottlenecks, optimize processes, and make data-driven decisions.
- **Mobile:** With the proliferation of mobile devices, BPM tools have evolved to support mobile access. This allows employees to access and manage business processes from anywhere, at any time.

- **Cloud:** BPM tools have also evolved to be available as cloud-based services, which offer scalability, flexibility, and lower costs. Cloud-based BPM solutions enable businesses to access their processes from anywhere, on any device easily.

Overall, BPM has evolved to become more flexible, agile, and capable of handling complex processes in today's digital world. Businesses that embrace BPM and leverage the latest tools and technologies are better equipped to streamline their processes, reduce costs, and improve their overall performance.

3.8.2 Sophisticated Business Process Modelling Tools

These are just a few of the numerous instruments for business process modelling that are currently on the market. Depending on specific needs and preferences, we can choose a tool that best fits:

- **Microsoft Visio**: It is a powerful diagramming and vector graphics application that is used to create flowcharts, diagrams, and other types of visual representations of business processes.
- **Bizagi Modeler:** It is a free and easy-to-use process modelling tool that allows you to create and publish process diagrams, flowcharts, and other process models. It offers a user-friendly interface, drag-and-drop functionality, and the ability to export your models in a variety of formats.
- **Lucidchart:** It is an online diagramming and flowchart tool that allows you to create, edit, and share process diagrams, flowcharts, and other visualizations. It offers a wide range of templates, icons, and shapes, as well as real-time collaboration features, so you can work on your models with your team in real time.
- **Gliffy:** It is a cloud-based diagramming and flowchart tool that allows you to create, share, and collaborate on process diagrams, flowcharts, and other visualizations. It allows you to import and export your models in a few different file types, including PDF and SVG and provides a broad selection of templates, icons, and shapes.
- **Signavio:** It is a cloud-based business process modelling tool that allows you to create, analyse, and optimize your business processes. It offers a range of features, including process modelling, process analysis, and process optimization, as well

as the ability to collaborate with your team in real time.

- **ARIS Express:** It is a free business process modelling tool that allows you to create, analyse, and optimize your business processes. It offers a range of features, including process modelling, process analysis, and process optimization, as well as the ability to export your models in a variety of formats, including PDF and Microsoft Excel.
- **Camunda Modeler:** It is an open-source business process modelling tool that allows you to create, analyse, and optimize your business processes. It offers a range of features, including process modelling, process analysis, and process optimization, as well as the ability to export your models in a variety of formats, including BPMN 2.0 and DMN 1.2.

4. Company Overview

The SME company devoted under study is an It company in India, which provides IT solutions to clients in various industries. Established in 2010, the company has gained a reputation for delivering high-quality, cost-effective solutions that meet the specific needs of its clients. Kalsi Infotech offers a range of services, including web development, mobile app development, e-commerce solutions, digital marketing, and software development. The company has expertise in a wide range of technologies, including PHP, NodeJS, AngularJS, ReactJS, and React Native, among others. The company is committed to delivering high-quality solutions that are both efficient and cost-effective. It follows a customer-centric approach and works closely with its clients. Overall, Kalsi Infotech is well-positioned to capitalize on the growing demand for IT solutions, particularly in emerging technologies. With its commitment to quality and customer satisfaction, the company is poised for continued growth in the years ahead.

The goal of this research is to optimize the current Prospect management process of the company more effectively and quickly compatible with the digital world, an optimized lead management process is essential for companies as it enables them to effectively engage with potential customers online. By utilizing digital marketing techniques, companies can identify, track, and analyse customer behaviour, preferences, and needs. An optimized lead management process allows companies to prioritize and nurture the promising leads, resulting in higher conversion rates & improved efficiency.

4.1 Pilot Data

This research is done to optimize the current customer management process in a company. The models and datasets used in the database were produced to test the functionality and efficiency of the active business process. Although the database's material is not based on facts, it was nonetheless built to meet the demands of the current thesis. The dataset creates a situation where the tools discussed in the thesis may be implemented and serves as an illustration of the data kept and used by a small firm.

Observations were made during participation in each of the tasks. Stakeholders were also consulted after each task to seek their feedback on the benefits and issues arising from the application of the approaches, techniques, and technologies both within the case organization and within Small Businesses generally.

5. Review of Lead Management Process

A prospect management system is a process or set of processes that a company is using to identify, qualify, and prioritize potential customers and manage interactions with them in a more quick and advanced way using some tools, throughout the customer journey. It typically involves various tactics and technologies, such as lead scoring, lead nurturing, and **Customer Relationship Management (CRM)** software, to ensure that leads are effectively managed and engaged with. The goal of a lead management system is to convert potential customers into paying customers by providing them with targeted and personalized communication, and by guiding them through the sales funnel to a successful conversion.

5.1 Sales or Lead Management Process Framework

"*A Process Framework provides a high-level layer of BPM definition and a frame of reference to guide activities and ensure consistency of approach*." (Kirchmer 2011a). The company's current lead management process is a combination of digital marketing tactics and lead scoring to identify, qualify, and prioritize potential customers. The system

involves various tools and processes, including:

- **Digital marketing tactics**: The company is utilizing various digital marketing tactics, such as social media advertising, content marketing, company website, and email marketing, to attract potential customers to its website.

- **Lead scoring**: The company is using a lead scoring method to prioritize leads based on their potential value. They assign scores to each lead based on factors such as demographics, behaviour, and engagement with the company's website and marketing materials, newsletters, or webinars.

- **Lead nurturing**: Once leads are identified and scored, the company uses targeted marketing campaigns to nurture and engage with them. This may include personalized email campaigns, webinars, case studies, customer success stories, and other content designed to educate and inform potential customers.

- **CRM software**: Kalsi Infotech uses customer relationship management (CRM) software to track and manage interactions with potential and existing customers. This enables them to provide personalized communication and customer service and to track the customer's journey throughout the sales funnel. Right now, they are using Salesforce as CRM software.

- **Analytics tools**: The company utilizes various analytics tools to track the performance of its lead management system. This enables them to identify areas for improvement and adjust their strategies as needed. Right now, they are using the internal analytics tool, CRM reports.

Overall, the process is a comprehensive process that utilizes various tools and tactics to effectively manage and engage with potential customers throughout the sales funnel. Kalsi InfoTech is using HubSpot, outreach, salesforce, ZoomInfo, LinkedIn sales navigator for attracting their leads and setting up offer deals with or reaching out to them with offer. They are using company's internal BI tools for their reporting purpose but as these tools are not exchanging 100% information between them ae in sync, so it is very

hard to get the exact or real time data sometimes. As once all these tools will sync and then the information's can flow between them.

Sales representative once figure out the hot leads or the qualify leads than they manually enter them in their CRM system and start sending them the communication via emails, zoom or phone calls with their offers or product prices. As this process are manual so it takes time and some time there is data errors in system.

5.2 Old Sales Management Process Layout

Process Architecture sets out at an elevated level how business processes are coordinated to support the achievement of organizational strategy and objectives.

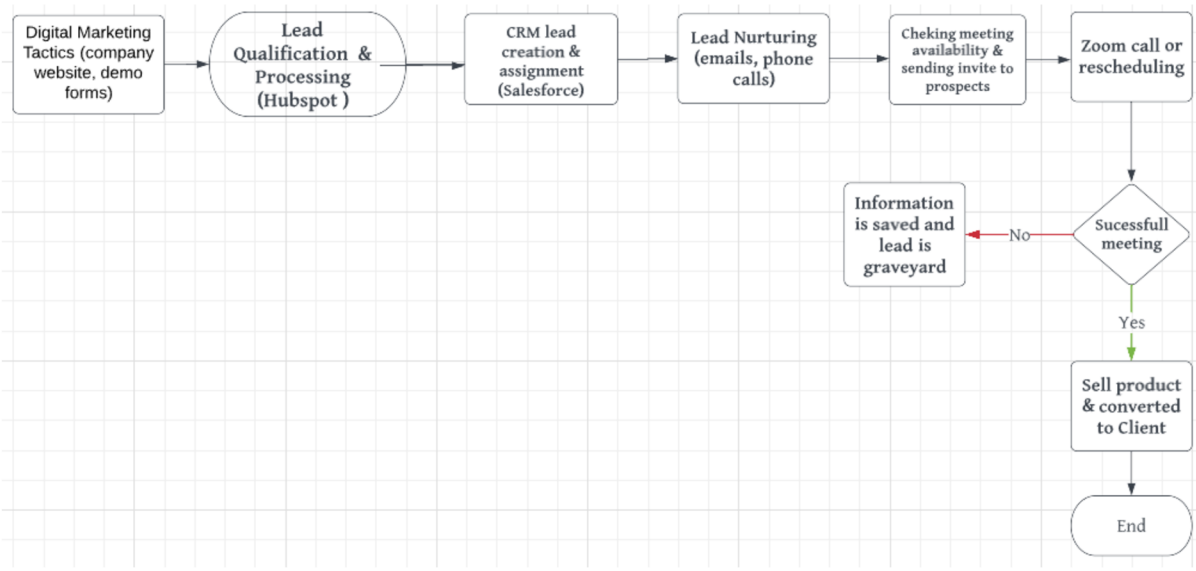


Figure 7: Existing Lead Management Flow

Source: Own Contribution

The above figure represents the company's old sales management process, you can find details about each step and tools they are using:

- **Lead Generation** (digital Marketing Tactics)– In this step, a company is using various methods to attract customers and to sell their services. For example: A customer visits

the company's website and fills out the demo form, A customer can attend a webinar, visit the company website, and fills out the information form. Once the customer does any of these activities his information is stored in a database and the system gets notified about the captured lead.

- **Lead Qualification**: In this step, Lead scoring based on country is executed. it is the process of assigning a numerical value to leads based on their country of origin. This involves analysing leads to determine which countries they are from and evaluating their potential value to the company. For example, the company has blocklisted clients from Iraq, North Korea, Pakistan, etc. so any lead coming from these countries automatically graveyard.

- **Lead Creation & Nurturing**: Company right now using Salesforce as the CRM software to manage or track all leads, lead information, assignment, communication, and billing information. They track all this information in Salesforce as it is important to track all interactions with leads. This includes emails, phone calls, meetings, and so on. Tracking interactions allows you to see what approaches are working and which ones are not. It is important to follow up with leads promptly and on time. If a lead does not hear from a sales rep within a few days, they may lose interest.

- **Zoom meetings:** Sales reps manually follow the lead after the lead, or the prospective customer assigned to them. Based on the lead scoring and other information such as email, phone, and company they contact them and ask about their availability for their call so that they can have face-to-face discussions and convert the lead into a customer, and it is an opportunity for a company to convert it into the deal.

- **Client:** After the successful outcome of the meeting if the client agrees to the terms and conditions and the offer company closes a deal with them and they become a client and the opportunity converts to a successful deal.

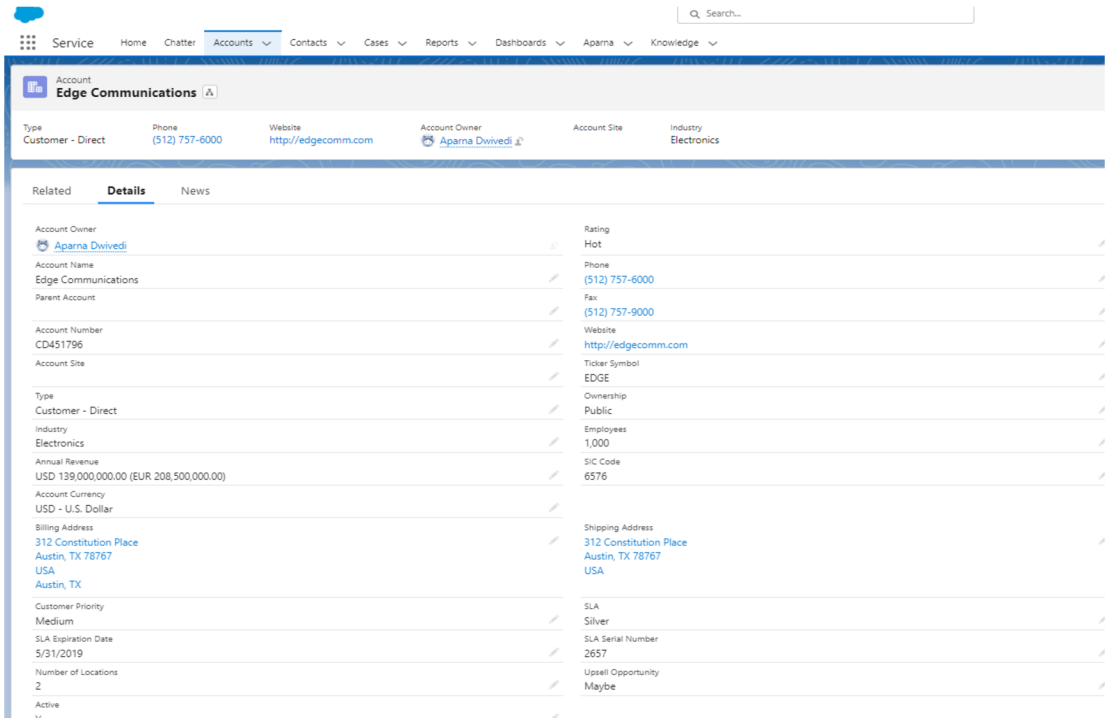


Figure 8:CRM Lead Creation and Assignment in Salesforce

Source: Own Contribution

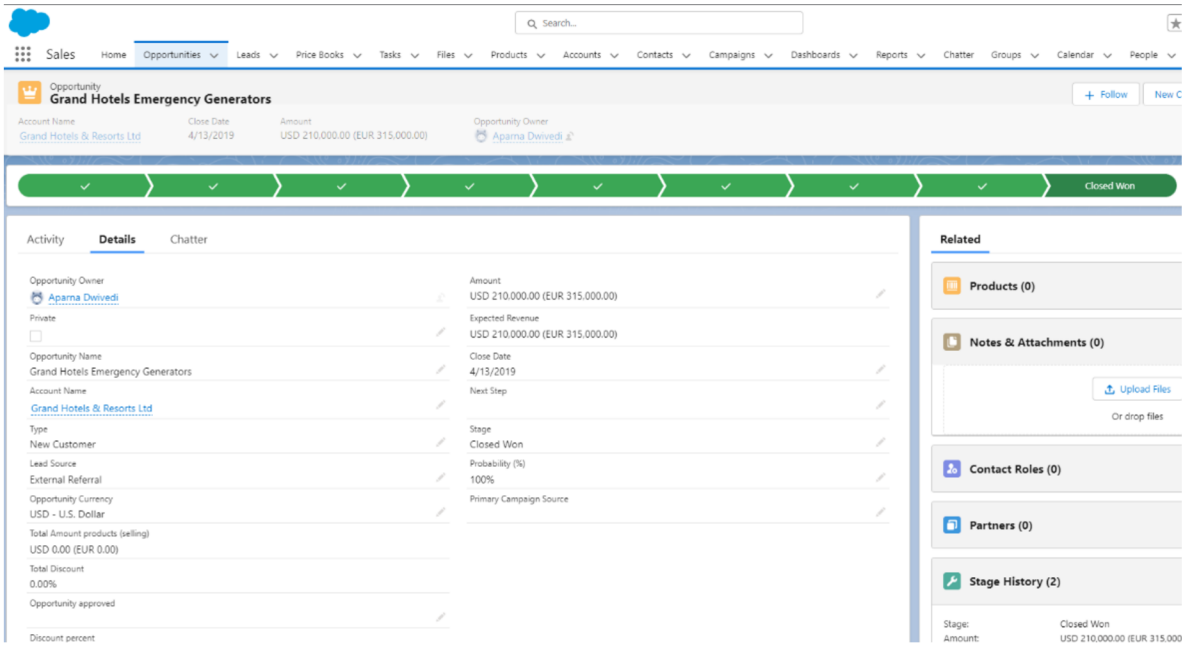


Figure 9: CRM Opportunity Management in Salesforce

Source: Own Contribution

Opportunity Management in Salesforce refers to the process of managing

and tracking potential sales deals or opportunities in the Salesforce CRM system. It enables sales teams to manage their sales pipeline, forecast sales revenue, and prioritize their sales efforts. In Salesforce, an opportunity represents a potential sale to a customer or a prospect. It includes information about the deal, such as the opportunity name, account name, deal value, close date, stage, and probability of closing. Fig. 10 represents how an opportunity record is currently maintained and processed in the salesforce of Kalsi Infotech company.

Salesforce's Opportunity Management features provide sales teams with tools for:

- Tracking and managing the progress of sales opportunities through the sales pipeline.
- Assigning ownership of opportunities to sales reps and tracking their activities.
- Forecasting revenue based on the probability of closing each opportunity.
- Creating sales reports and dashboards to analyse performance and identify trends.
- Integrating with other Salesforce features like marketing automation and customer service to create a unified view of the customer.

Right Now, the company has no tool to manage all communication inside salesforce or direct communication with the CRM system, so they are using an external tool called outreach for their communication of the meetings with clients and tracking the conversation.

Outreach is integrated with the company's CRM software Salesforce and helps them to manage their clients and track all information in the outreach tool. Outreach is getting all the information from the sales force. The Google Chrome extension for Outreach, called Outreach Everywhere, allows users to access Outreach's capabilities directly from their Gmail inbox. By installing and activating Outreach Everywhere, users can:

- Automatically generate opportunities and associate email activity with them
- Sequences should include recipients.
- Snippets and Templates can be inserted.
- Set reminders or bump emails.
- Meeting times are set.

Outreach is integrated directly into Gmail, so sales reps get an email about the communication and notification if a prospect replies or books a meeting. Fig 10 will represent how this integration between outreach and Gmail works.

Whereas Fig 11 represents how the email communication or meetings with the lead is tracked and the record is maintained in the outreach tool. Once the sales rep starts reaching out to the prospect, maintain or use an outreach tool to track all their emails and meeting conversation in outreach. Outreach provides all information on how many emails has sent, received, bounced, or replied to by the prospect.

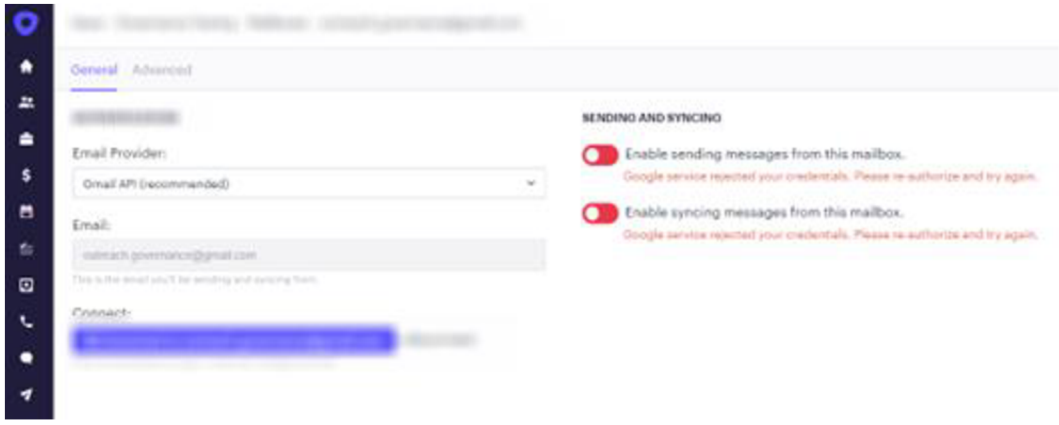


Figure 10: Gmail Integration with Outreach

Source: Own Contribution

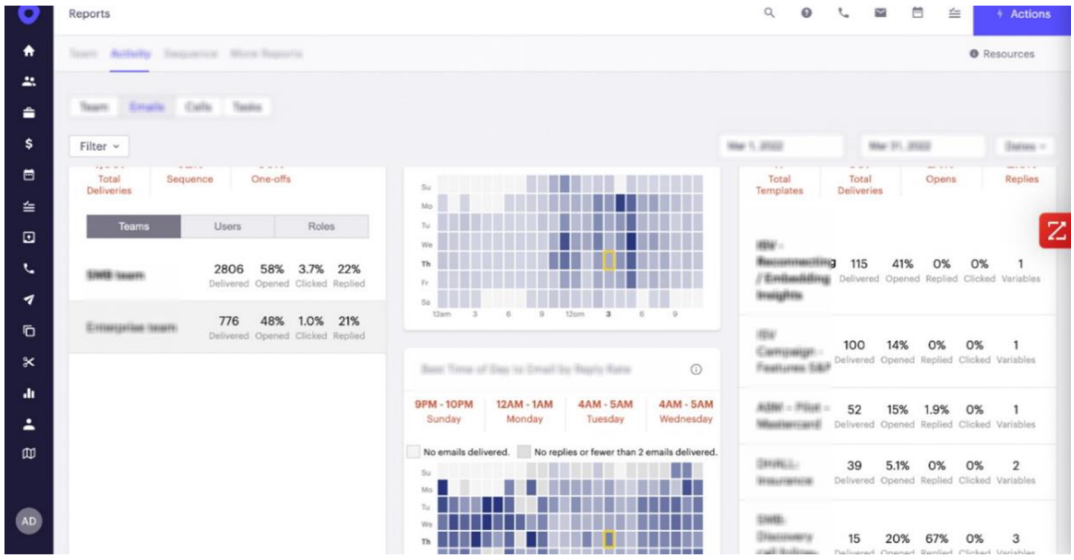


Figure 11: Conversation Tracking with Lead

Source: Own Contribution

Once the meeting is successful with the prospect and he is ready to buy the company's services and product he becomes the customer or client. The company signs a legal contract with the customer and sells their products or services to them. This is how a company generates revenue.

The following are the kind of options currently company using for generating revenue or making customers or selling their products:

- **Direct sales**: The company can sell its products directly to customers through different channels, such as online sales, physical stores, and sales representatives.
- **Wholesale**: The company can sell its products in bulk to retailers or distributors, who then sell the products to end customers.
- **Licensing**: The company can license its products to other businesses for a fee or royalty, allowing them to manufacture and sell the product under their brand name.
- **Subscription**: The company can charge customers a recurring fee for access to its products or services, such as a Software as a Service (SaaS) subscription.
- **Advertising**: The company can generate revenue by displaying advertisements on its website or with its products.
- **Freemium**: The company can offer a basic version of its product for free while charging for additional features or functionality.

To make informed decisions, assess performance, efficiently allocate resources, track objective progress, and promote effective communication throughout the organization, an organization needs reporting and analysis of its present corporate performance through data and reports. This makes it possible for the business to spot chances for growth and areas for improvement, as well as to collaborate toward shared objectives more effectively.

Right now, as the outreach tool has some limitations in analytics or reporting part currently company is using CRM reporting or Salesforce reporting for their analysis purpose called HubSpot. By reporting they are analysing the current performance of their firm. For example: what is the conversion rate, how many customers they have currently, how many deals they have closed? The following figures are some examples of those reporting from the company's database.

As the company does not have any other alternatives, they are using this tool and it is kind of a bit expensive for them. Apart from that sales representatives also need proper training about this tool and customizations are not possible inside it.

We can do some automation and there are already built templates, and meeting types that currently sales team is using as well, but when need something different or based on individual prospect level there is a limitation here and many times it is not possible. Reporting and dashboard or live data analysis is a critical feature that is needed, and it is not available in this tool at a quality level, so right now the company is synchronizing all information to the CRM database and there they are doing live data analysis.

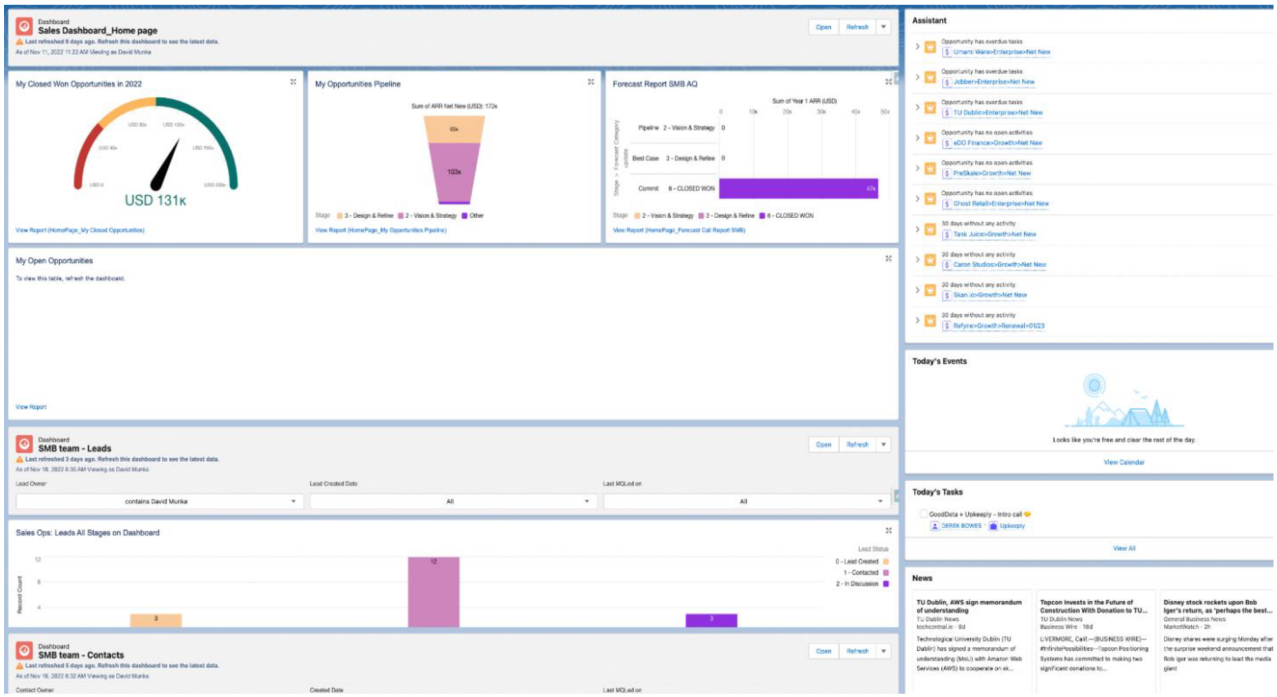


Figure 12:Contacts, Accounts & Opportunity Analysis CRM

Source: Own Contribution

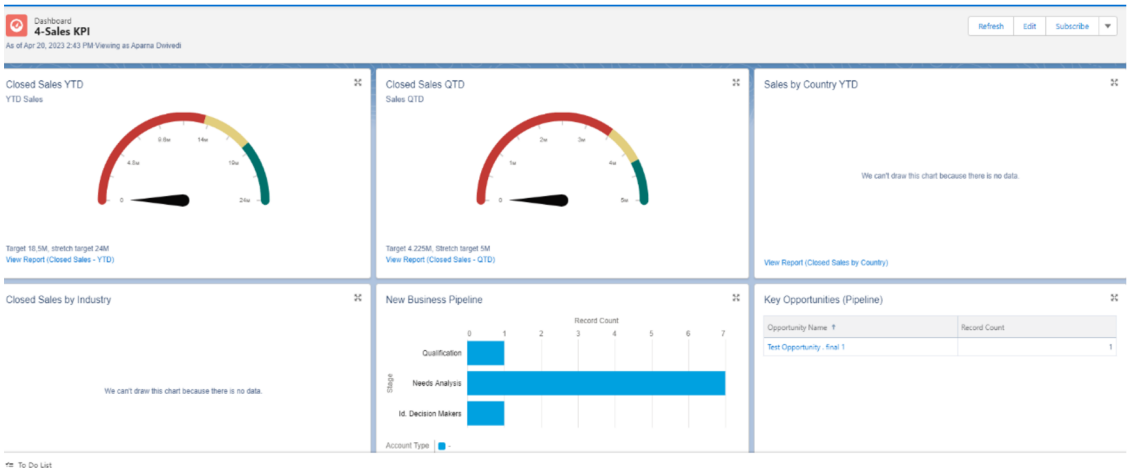


Figure 13: Dashboard Sales KPIs Metric

Source: Own Contribution

5.3 Gaps in Old Lead or Prospect Management System

Till now we have seen how a company is using different tools and integration to maintain its customer data, manage all the email or video communications, and manage reporting or performance most efficiently and securely. Data security is a critical aspect of the company. But there are a lot of gaps or cracks in the current lead management process which are making the process more costly and with some delayed versions. Especially when we are in the 21St century and with the internet almost everything is digitalized, and we have many more automated options available.

Following are the issues figured out in the current lead management process on which analysis can be done and the current process can be optimized:

- **Pricey**: Right company is using three different tools CRM (salesforce), Outreach, and HubSpot to manage their whole prospect management which makes it costly for the company as they are paying licenses for three different platforms as each tool has some limitations and to fulfil that they must use a different one.

- **Time delay**: We can see that sales reps working on the prospect has to manually set up an email communication with the customers or keep on following up with them to schedule meetings according to everyone's availability, which ends up

delaying the process as its days to a month to follow up customers, making sure they have received an email, or they are reading it out or for their replies. On average sales reps spend almost 15-20 days to complete this process for one customer.

- **Poor Communication**: We can see that as the maximum of the steps in the process is manual it is hard to set up frequent communication, track it, or maintain the flow between them.

- **Lack of Data Analysis**: We can see that each tool has some limitations and for reporting company is using salesforce reporting only which is not much efficient to track every single activity as it can only track the activities entered in Crm other activities getting tracked in outreach are missed.

- **Inadequate training or documentation**: As the company is using different platforms it's kind of tough job to maintain documentation for training or reference for the sales representatives. Every time the company must train them for each tool and to support them for errors, queries, or questions, specifically for the new joiners. It can add up to their performance issues.

- **Manual Steps**: We can see a few steps in the process are manual especially related to prospect communication. Manual processes are often time-consuming, error-prone, and require significant resources. Automating these steps can help to reduce costs and improve efficiency.

- **No Real Time Data Tracking**: As all the tools have some limitations and the CRM, HubSpot, outreach needs to sync frequently with the system. It is hard to generate real time reports and specially with some customization criteria or requirements.

As per the analysis, there is a possibility to remove these gaps with standardization and automation. We have a lot of automated tools available which are compatible with digital standards and can help to maintain everything in one place. Out of them the tool which can be perfect for here to optimize this current process and improve its efficiency.

5.4 Optimization and Automation with Chili Piper

We can optimize the company's current sales process or Lead management more effectively with the automation of Chili Piper. Chili Piper is a compatible digital tool that is designed to help businesses improve their sales processes. It is focused on helping sales teams manage their calendar, automate meeting scheduling, and streamline the sales process.

Chili Piper's includes features that can optimize the current process:

- **Instant Booker**: A scheduling tool that allows sales reps to schedule meetings with leads or customers directly from their inboxes.

- **Concierge**: A tool that automatically schedules and assigns meetings to the appropriate sales rep, based on factors such as location, product interest, or other criteria.

- **Routing**: It allows businesses to route inbound leads to the appropriate sales rep or team, based on geography, product interest, or other criteria.

- **Insights:** A reporting and analytics tool that provides visibility into sales performance and allows businesses to track their progress toward sales targets.

- **Accelerate**: It automates the sales process, allowing sales teams to focus on high-value activities and close deals more quickly.

- It can easily integrate with the company's current database or CRM (salesforce) and track everything in both places, which makes it a perfect fit for tracking all information in one place.

- It has an advanced reporting feature to track each prospect's details and communication and synchronize it with the company database.

6. Setup and Automation Performed

Now we will talk about how chili piper is set up, integrated with the company's CRM system, and the automation performed. How the complete process works with Chili Piper.

6.1 Dataflow of Chili Piper Prospect

Lead generation is the starting step of the sales process of the company. Firstly, we will integrate the CP with the company's website or demo form. The lead or prospect whenever visits the company's website or submits a demo form with the required field details and information gets tracked in the company database or CRM. Fig 12 represents an example of the demo form which is a company on the company website to attract leads and get their information.

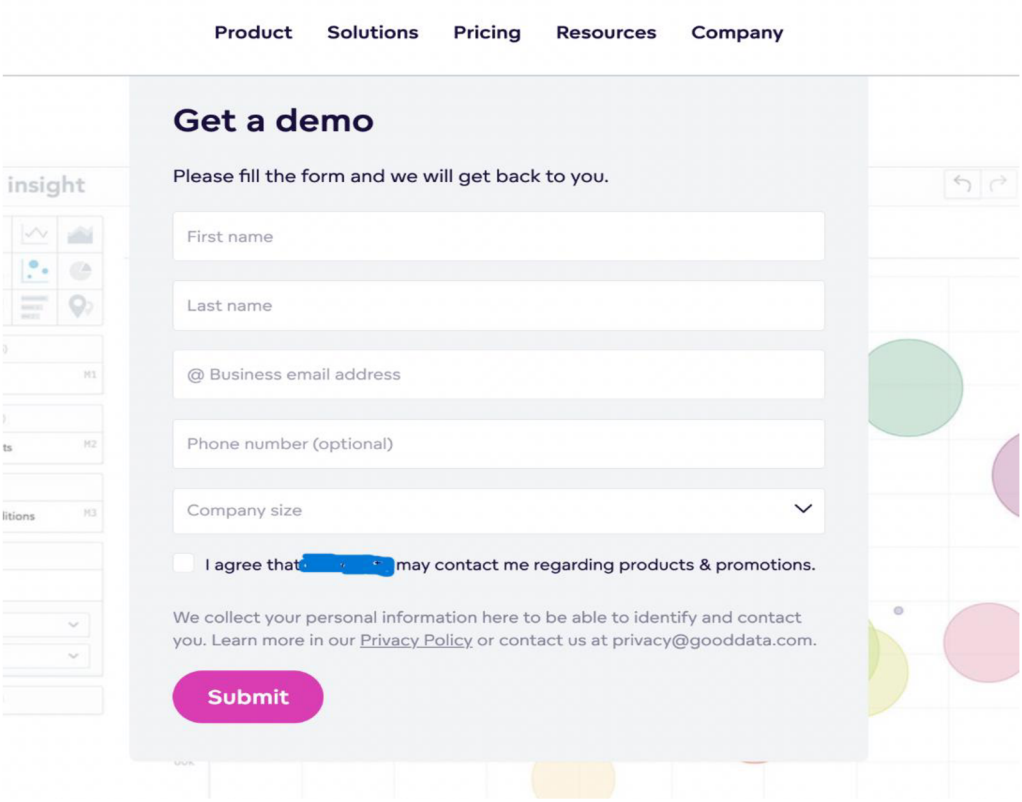


Figure 14: Demo Form on Company Website

Source: Own Contribution

Following diagram Fig 15. represents a complete dataflow of Chili Piper:

1. The meeting request is initiated by Chili Piper when Prospect submits the form.
2. Within a few seconds, Chili Piper checks whether the person already exists as a Lead or Contact in your CRM instance. If they do, Chili Piper checks your Ownership Queues to see if the Prospect matches one of them.
3. If the Prospect is new or you have chosen to redistribute existing contacts, Chili Piper scans your non-Ownership Queues to find a match and then displays the rep's calendar availability.
4. Once a time is chosen, Chili Piper instantly sends out the calendar invite to both the Prospect and the Assignee.
5. Depending on Concierge || Inbound Router settings, either Chili Piper or an existing system of yours will create the lead in your CRM, which could be Salesforce or HubSpot CRM.

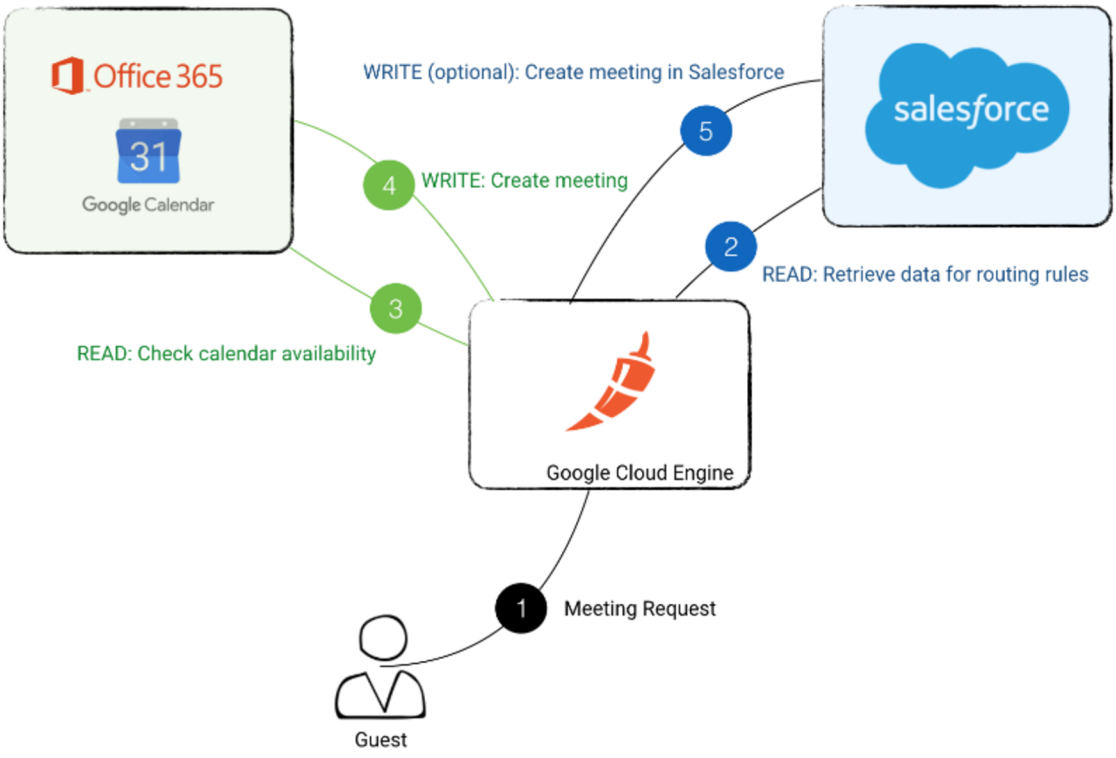


Figure 15: CRM Dataflow in Chili Piper

Source: Own Contribution

Once the scheduler finds a match, it displays the calendar availability of the relevant

representative. The Prospect selects a suitable time slot, and the Chili Piper scheduler sends out a calendar invite instantly to both the Prospect and the representative. Depending on the configuration settings, either the Chili Piper scheduler or the existing CRM (Salesforce) system writes the lead in the CRM system, which is Salesforce.

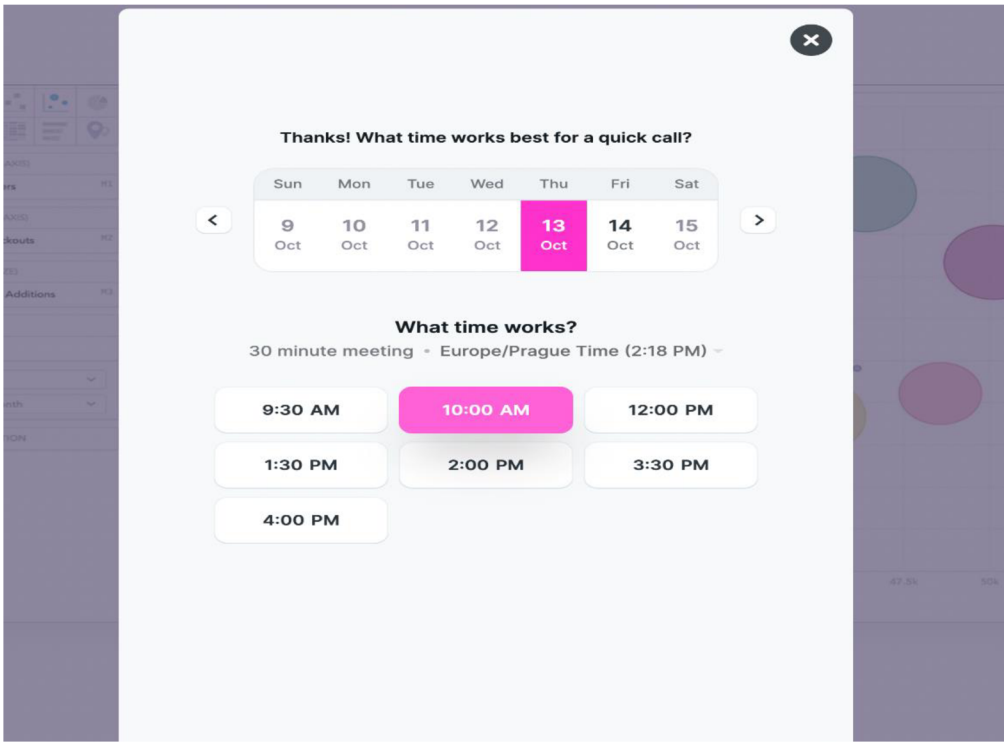


Figure 16: Meeting Schedular for Prospect

Source: Own Contribution

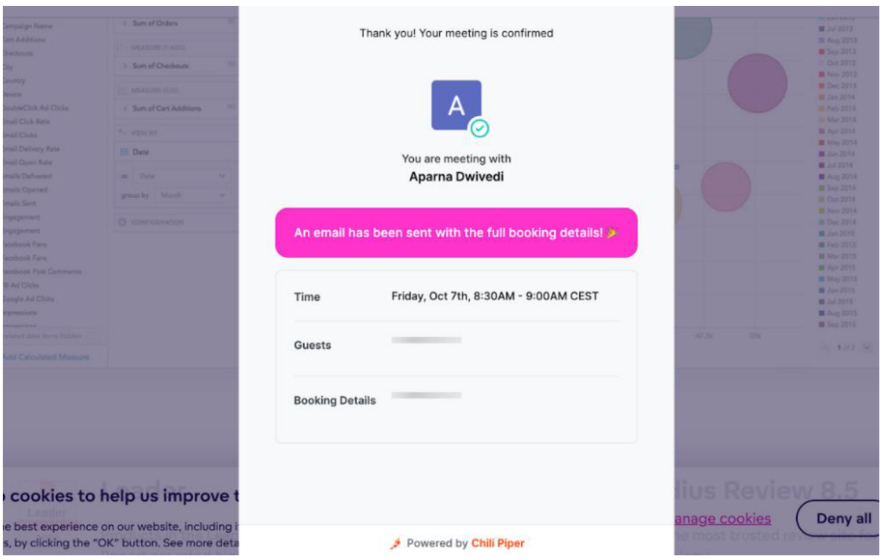


Figure 17: Successful Meeting with a Prospect

Source: Own Contribution

6.2 Mapping Out & Passing UTM Parameters

Integrating existing demo forms with Chili Piper by mapping them enables the sales team to streamline scheduling and routing processes. By doing so, once someone completes the form on the website, Chili Piper takes over and handles the rest.

This feature allows you to automate and manage your appointments more efficiently. To integrate demo forms with Chili Piper, it's essential to identify the API names of the required fields, including First Name, Last Name, and Email. Other fields that you may choose to map are only necessary if they are utilized in your Queue rules or if Lead/Contact creation is enabled in your Router settings. Hence, it's crucial to identify and map the fields to ensure smooth functioning.

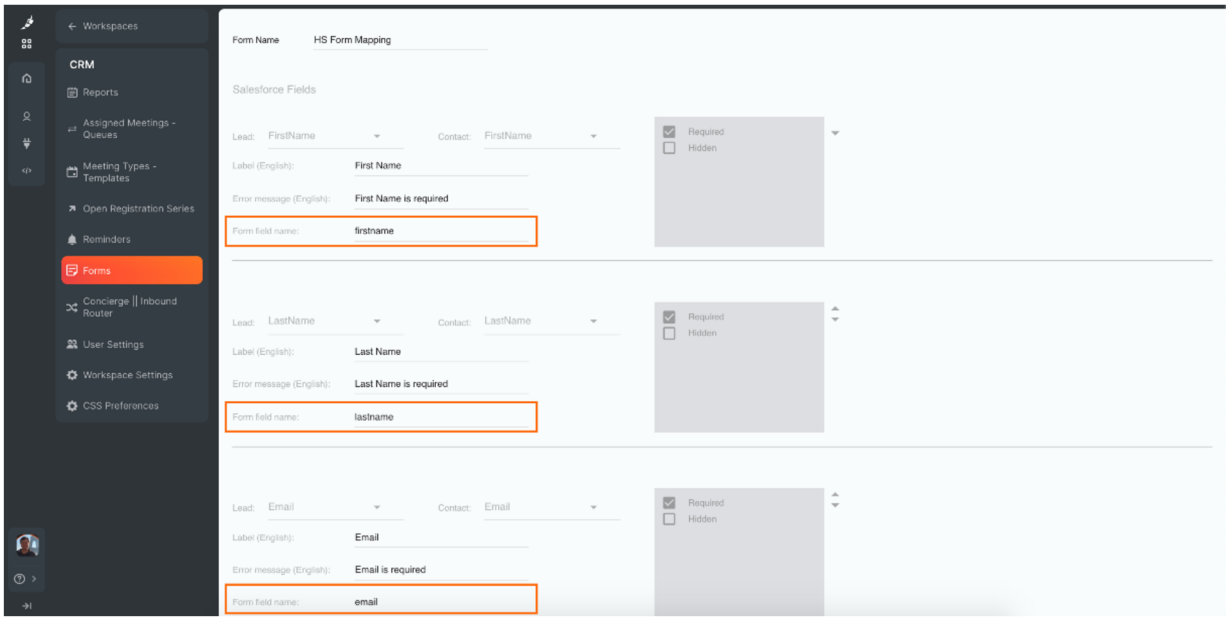


Figure 18:Mapping Out CRM Fields.

Source: Own Contribution

After mapping out the demo fields with CRM (Salesforce) database the form will be added to the router and will use JavaScript API or custom code to save or pass through inputs. This will set up automatic communication between the tool and the CRM database. This cannot be modified once implanted because the router's name makes it distinct.

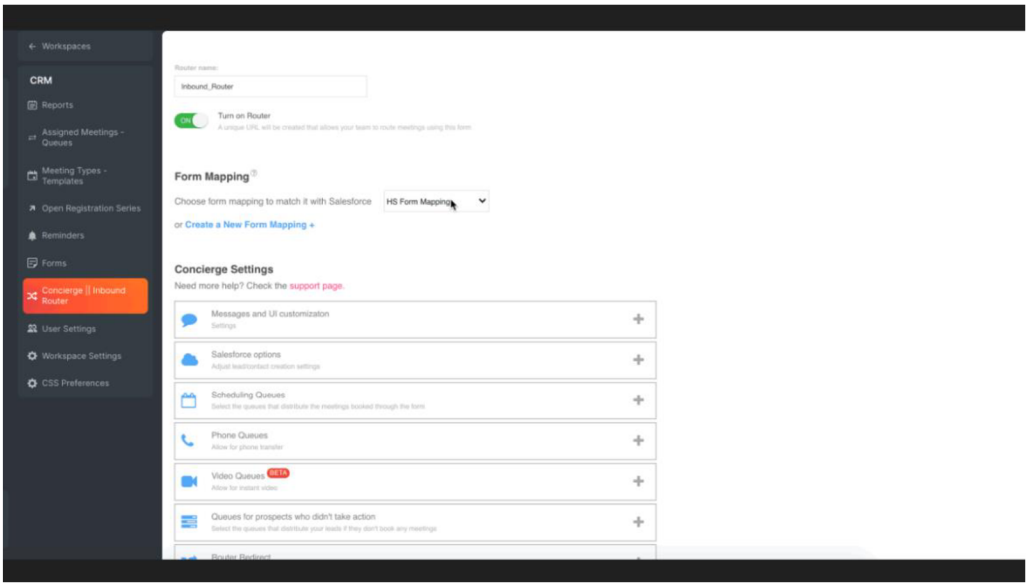
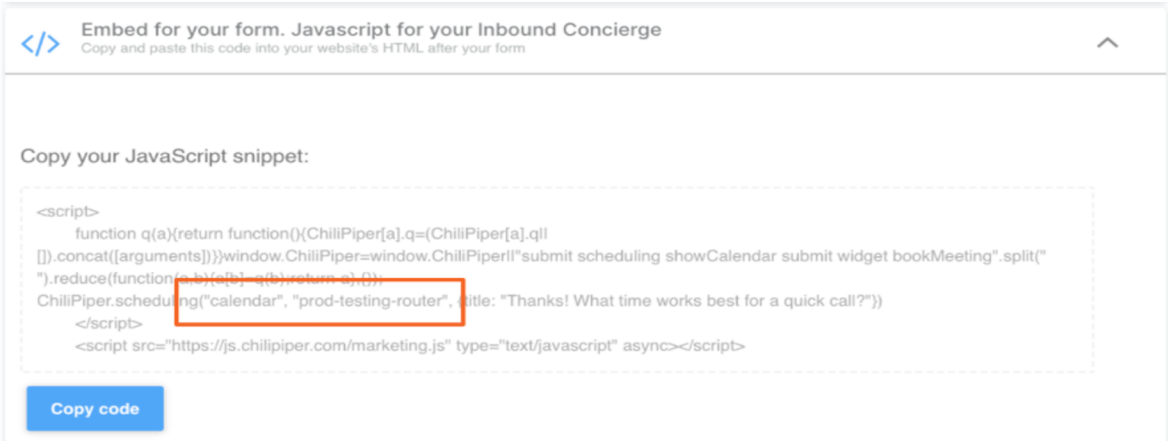


Figure 19: Chili Piper Router Automation

Source: Own Contribution

Below is an example of the JavaScript API code:




```
$form.serializeArray().forEach(function(el){data[el.name]=el.value})
ChiliPiper.submit("account", "inbound-router", {
lead: {
FirstName: data.firstname,
LastName: data.lastname,
Email: data.email,
Company: data.company
```

Figure 20: Java Script Inbound Concierge Code

Source: Own Contribution

```
<script src="https://js.chilipiper.com/marketing.js" type="text/javascript"></script>
<script>
var cpTenantDomain = "account_domain"; // replace with your subdomain
var cpRouterName = "router_name"; // replace with the router's name
var lead = {};
window.addEventListener("message", function (event) {
   if (event.data.type === "hsFormCallback") {
       if (event.data.eventName === "onFormSubmit") {
           for (var key in event.data.data) {
               if (Array.isArray(event.data.data[key].value))
{event.data.data[key].value =
event.data.data[key].value.toString().replaceAll(",",";");}
               lead[event.data.data[key].name] = event.data.data[key].value;
           }
           if(Object.keys(lead).length <= 1){lead = event.data.data;}
       } else if (event.data.eventName === "onFormSubmitted") {
           ChiliPiper.submit(cpTenantDomain, cpRouterName, {map:true,lead:lead});
       }
   }
});
</script>
```

Figure 21: JavaScript API Custom Code

Source: Own Contribution

6.3 Queue Automation for Assignment

A queue refers to a set of Sales representatives who are potential assignees and are chosen based on specific rules established. An assignee is a person who is booked for a meeting, whereas a booker is a user who schedules the meeting and is a prospect in our case. This is the most frequently used queue type. The allocation of meetings to users in the queue is performed using a flexible round-robin algorithm. The user with the fewest number of meetings is highlighted as the next assignee to receive a meeting. In case an account or lead already has an owner, the meeting assignment will go to that owner.

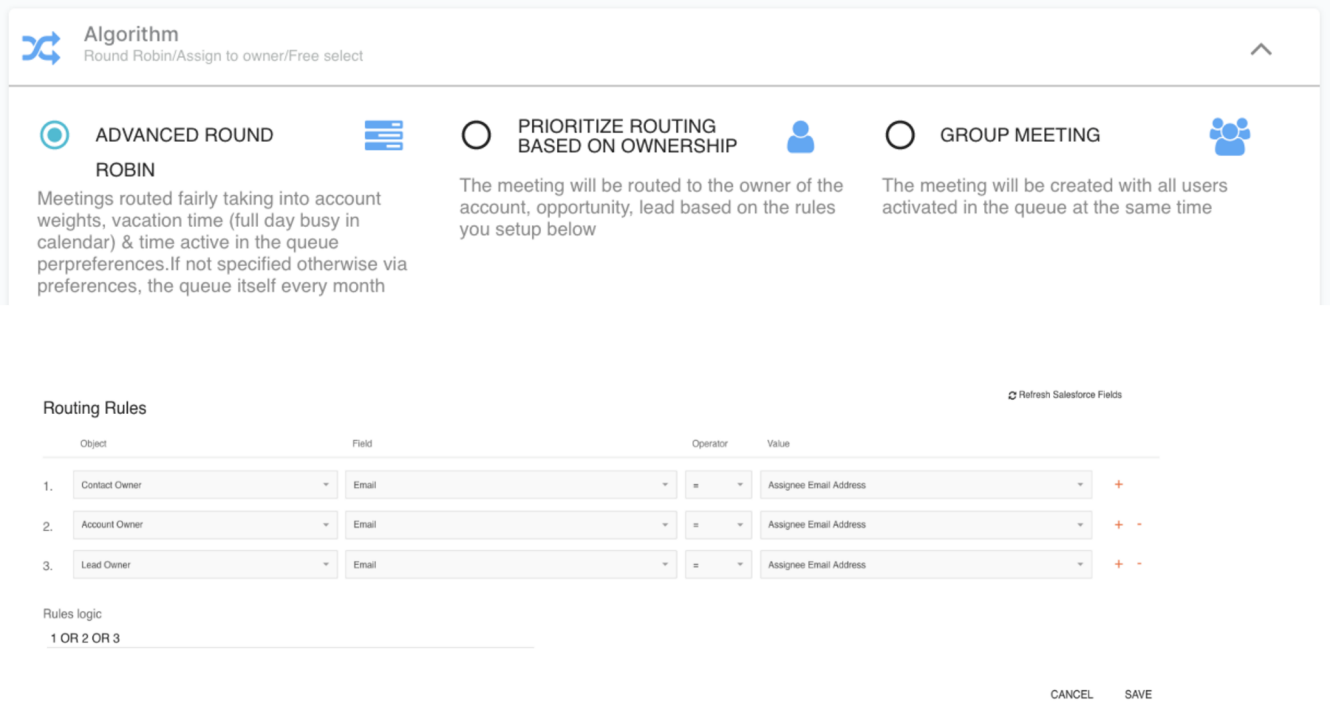


Figure 22: Queue Assignment & Routing Rules

Source: Own Contribution

Once the Queue is created and routing rules are set up. Admin activates sales representatives in the queues, and they started getting meetings from the prospect based on the rules and the criteria created.

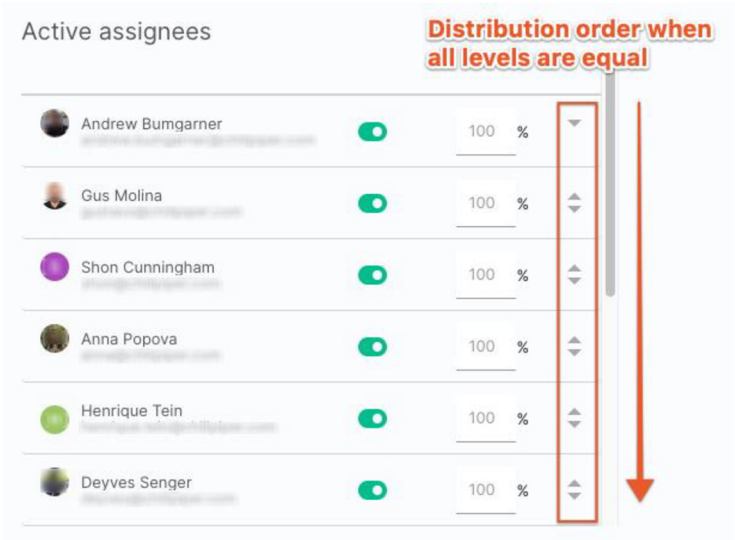


Figure 23: Activation of SDRs in Queue

Source: Own Contribution

After setting this up, an admin needs to provide access to the sales representative working in the sales in a company and ask them to set up their details such as name, contact information, time zone, and availability to ensure that appointments are booked at a convenient time for both the sales representative and the customer, avoiding scheduling conflicts. Moreover, it enhances communication with customers by automating confirmation emails and reminders. The following Figures show some screenshots of it.

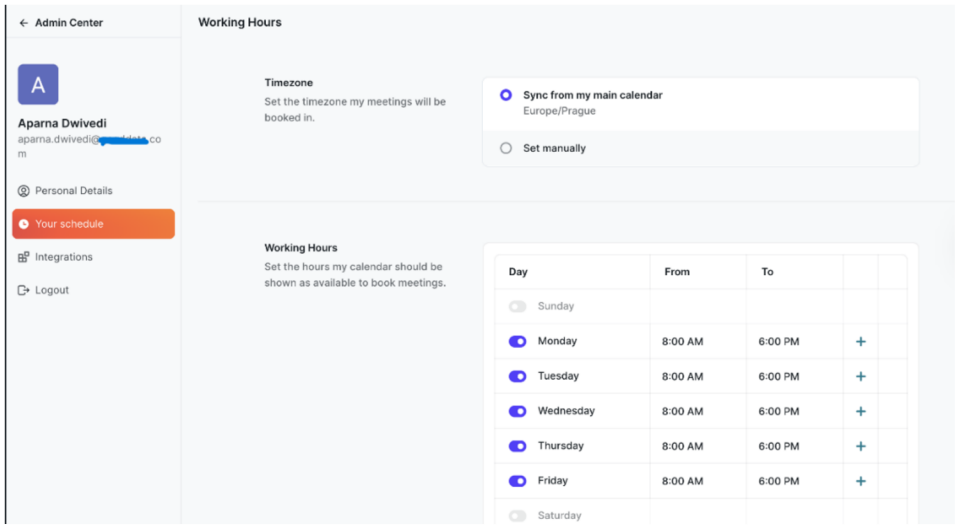


Figure 24: Sales Representatives' details set up.

Source: Own Contribution

Once the personal details and other installations are completed for the sales representative, he can successfully use the tool. They can manage their meetings, prospect details, and prospect meetings along with reporting features in one place instead of using multiple tools, and now their manual steps are automated.

They can send communication and automatic reminders to their prospect which can improve their business communication and remove the delays. The following figures show the meeting types and automated reminder set-up examples.

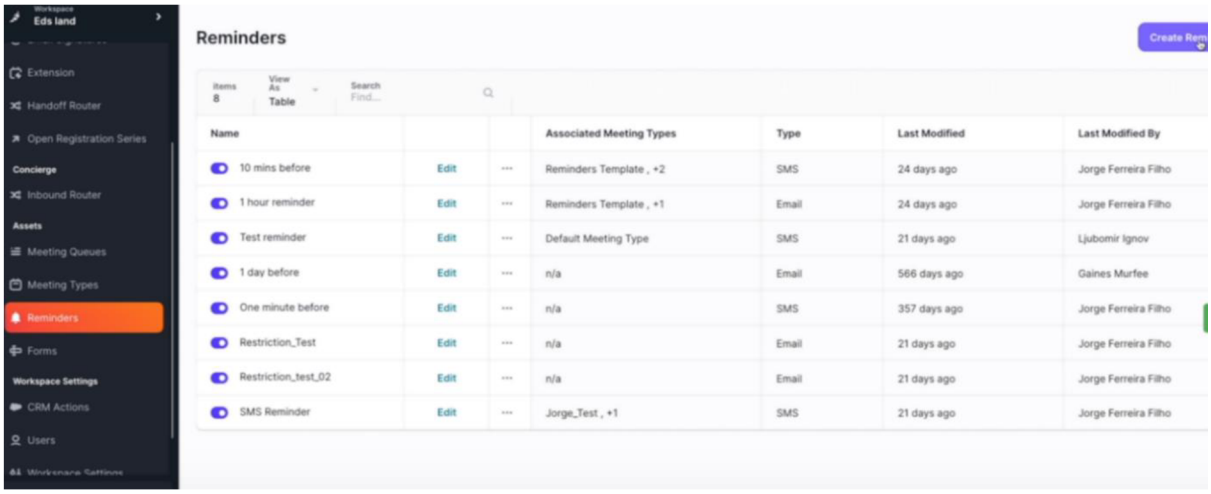


Figure 25: Meeting remainders and template set Up.

Source: Own Contribution

Sales representatives now set up meeting templates, remainder or their way of the meeting template to attract potential customers. With the triggers, it is possible to automate all these digital communications on the team level or at an individual level.

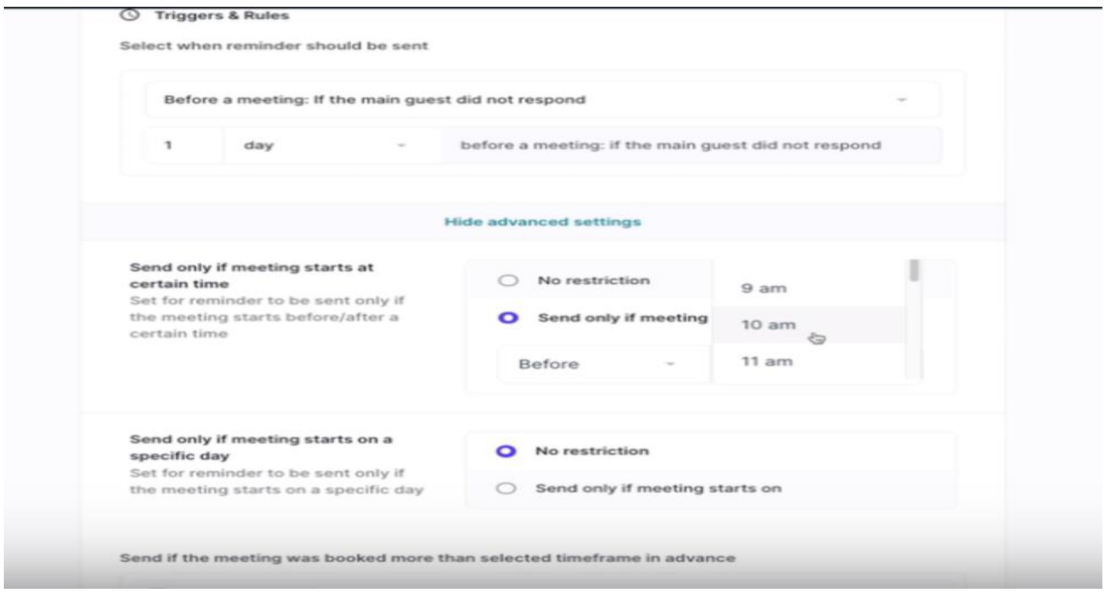


Figure 26:Trigger Automation of Prospect Communication

Source: Own Contribution

Once the Sales representatives are active, they set up everything on the platform. They can access the workspace and their dashboard, where they can easily see the number of meetings they are booked with, how many of them are scheduled and they can keep track of everything.

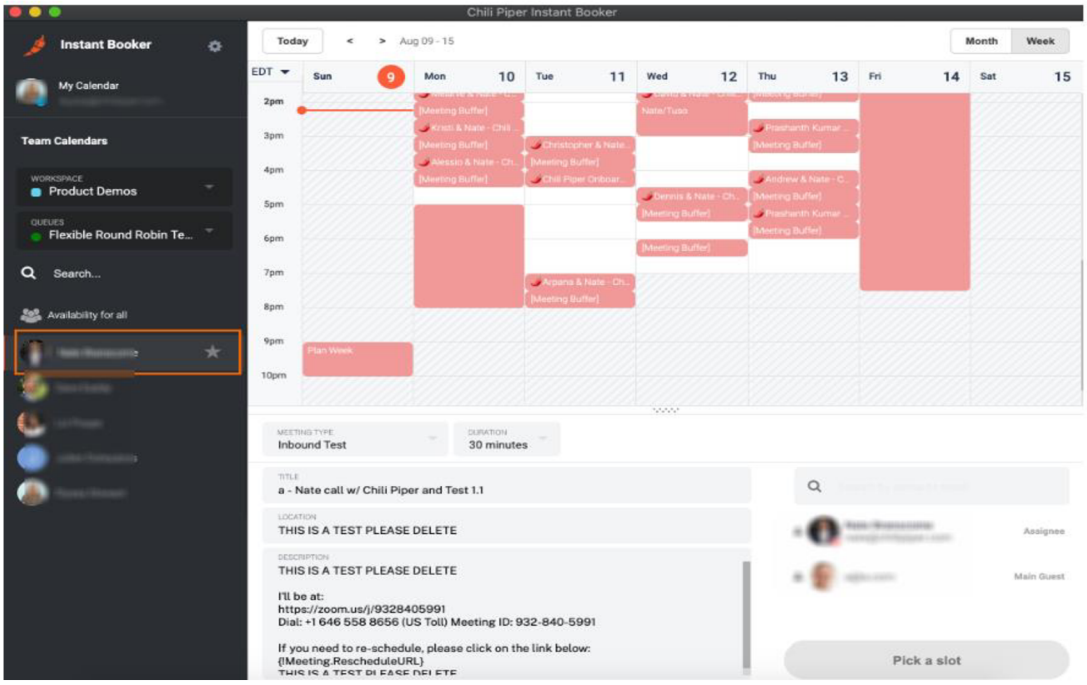


Figure 27:Chili Piper SDRs Booker Workspace

Source: Own contribution

6.4 CRM Database Sync

The company is using CRM (salesforce) as its main database to track the leads prospect and other billing or deals processes or records or in other words as a main database. Chili Piper automatically synchronizes with Salesforce once it is integrated or connected with the CRM and exchanges information between both systems and keeps them coordinated. After a meeting is scheduled, the individual will receive a link to join the meeting. This action will create a new Lead in Salesforce with Open Activity. The meeting specifics, along with UTM values, can be viewed. Salesforce Activity information is updated in real-time based on the person's response to the meeting. The native Salesforce integration synchronizes event details automatically when scheduled via

Chili Piper with CRM.

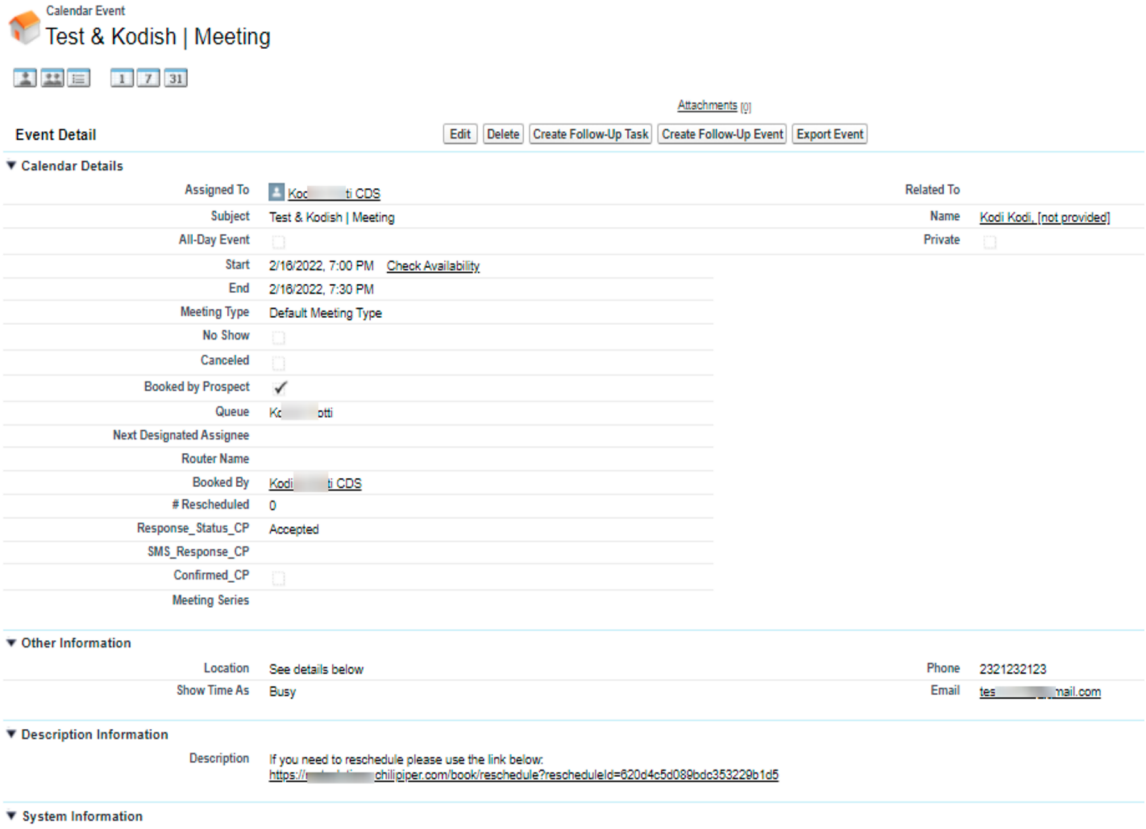


Figure 28:Activity Record in Salesforce

Source: Own contribution

Chili Piper checks Salesforce for an existing account owner and accesses information about the prospect's technographic and firmographics when a customer books a meeting. With the information obtained from Salesforce and the form, Chili Piper assigns and schedules every lead with the appropriate representative. This approach enhances the number of inbound leads that turn into qualified meetings.

6.5 Current Sales Management Process

The following figure represents the current lead management or sales management process of the company after the implementation of the Chili Piper tool and making all processes automated. We can see the difference that manual work and

unnecessary steps are removed, and the maximum task is automated which makes the current process more optimized, quick, and compatible with the current digitalization.

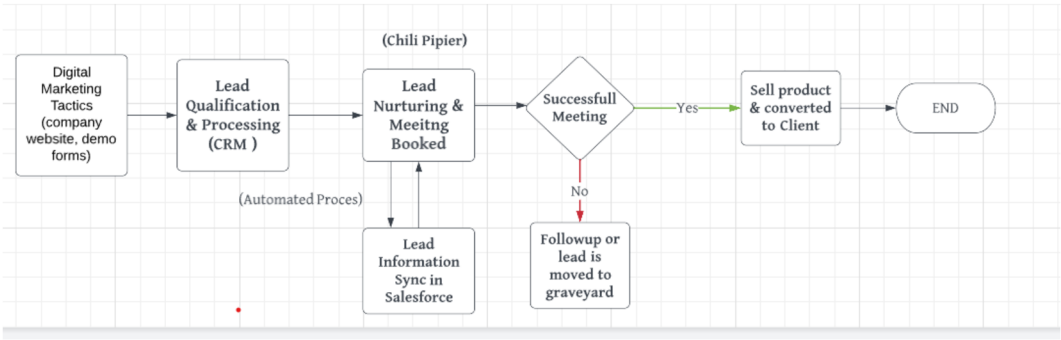


Figure 29: Current Lead Management Process of the Company

Source: Own contribution

Following is the explanation of each step:

- **Lead Generation (**digital Marketing Tactics)– In this step as shown in previous images the customer demo form of the company with the required fields such as first name, last name email address.
- **Lead qualification:** As this process is automated now and is based on certain criteria if a prospect qualifies and is interested in the company's services, they will get an instant meeting scheduler to book a direct Zoom call with one of the sales representatives (assignee) according to their time which suits them best and an invite with the details of the meeting will be sent an assignee as well and SDRs will be notified.
- **Lead Nurturing & Communication:** This whole step is automated now it is used manually in the old system, once a meeting is assigned to the SDRs they can continue with their meetings or Zoom call with their prospects, maintain their dashboard in chili piper tool and convert the lead into a successful client. As this system is fully automated all the tracking and the records will be synchronized to the CRM (salesforce) system. reps don't need to separately maintain the records in Salesforce. The information will already get tracked and updated and will it be synchronized with chili piper.
- **Client:** After the successful outcome of the meeting if the client agrees to the terms & conditions the company closes a deal with them and they become customers.

7. Discussion of Results

The case study points to a range of potential automated tools available in today's digital world which can optimize and make the processes of the company fully automated instead of manual tasks which will help organizations to achieve **more profit** with **less labour cost**. Let's discuss some key observations and the differences that came in the performance of the company **after optimizing their sales process** in a digital way and with the advanced tool.

7.1 Comparison between the Old and Current Processes.

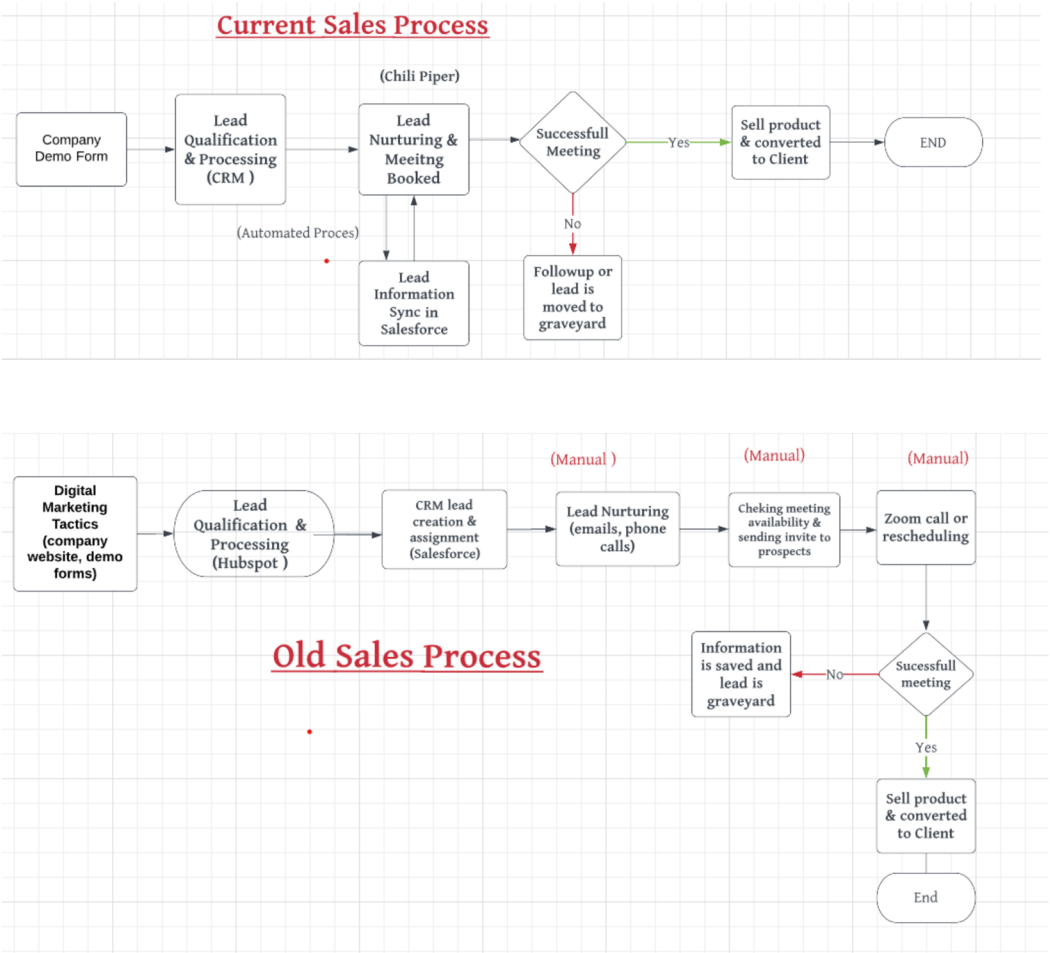


Figure 30:Comparison between Old and New Processes

Source: Own contribution

If we compare old and new lead management process of the organization before and after the automation with the chili piper is applied, we can clearly see from the

flowchart boxes the current process has become streamlined, faster, more consistent, and higher in quality due to reduced human error because manual work is automated now. The justifications for each result in the significant areas are as follows:

- **Cost Reduction:** The company was using three different tools CRM (salesforce), Outreach, and HubSpot to manage their whole lead management process which makes it costly for the company as they are paying licenses for three different platforms. Now it has been replaced with just one tool. This has saved the labour and tool costs for the company.

- **Fast and Quick Process**: Previously sales reps worked manually on the maximum of the tasks and on average spent almost 15-20 days to complete this process for one customer. Now with the current set up 90% of tasks are automated, which has made their work faster and easier to handle with fewer errors and reduced the average time spent to 6-7 days.

- **Effective Communication**: The communication between prospects and sales teams is more effective now with real-time scheduling and routing of meetings, ensuring a seamless experience. It eliminates the need for back-and-forth emails and missed opportunities, increasing efficiency and conversions.

- **Better data insights**: It allows for the collection and analysis of valuable data related to the sales process, such as lead sources and conversion rates. This information can be used to optimize sales strategies and identify areas for improvement. Additionally, Chili Piper's reporting features provide real-time analytics that can help organizations make data-driven decisions to improve their sales processes.

- **Hassle-free training or documentation**: Now it has become easier as there is only one tool to maintain and to be documented. The maximum things are automated so there is very less areas for training now.

- **Increased conversion rates**: The automatic lead routing and assignment feature improves the efficiency and accuracy of routing leads to appropriate representatives, which in turn increases conversion rates. Figure 31 displays a sample of the conversion rate dashboard, providing an illustration of how it would appear. It is important to note that this figure is based on test data and should not be considered representative of actual performance. The figure shows a higher number of cancelled meetings than meetings booked with customers, which is since it was captured during the implementation of the tool when it was being tested internally. As such, the cancellation rate is higher because the tool was not yet live and had not been tested with actual customer calls.

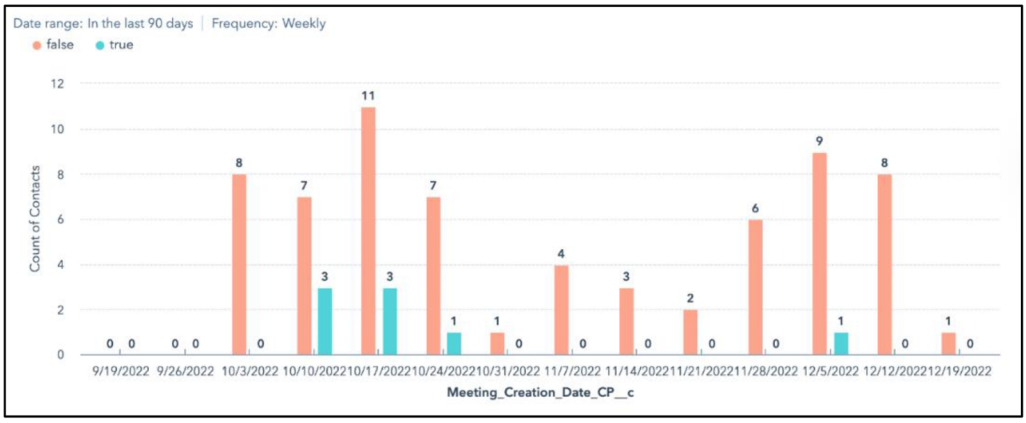


Figure 31:Weekly Conversion Rate Test Meetings

Source: Own contribution

- **Improved productivity:** By automating, scheduling, and reducing manual tasks, there is an increase in productivity and reduced administrative burdens.

- **Enhanced customer experience:** With features such as real-time calendar availability and automated reminders, the Company is creating a positive and seamless customer experience.

7.2 Advanced Analytics and Reporting.

It provides Advanced analytics and reporting through its integration with Salesforce and other CRMs. It offers real-time reporting and analytics that provide valuable insights into the sales process, such as **lead sources, conversion rates**, and **pipeline performance**. It has advanced reporting features that enable organizations to track key metrics, such as response time, conversion rates, and revenue generated, and create custom reports to measure performance. It offers features such as **A/B testing**, which enables organizations to test different sales strategies and determine which approach is most effective.

Chili Piper collects data from various sources such as customer interactions, sales data, and marketing metrics. This process may involve the use of tools like **tracking codes**, cookies, and other **analytics software**.

After collecting data, Chili Piper integrates the data from various sources into one data centre. This helps to enable **comprehensive data analysis** on a single platform. It uses advanced data analysis tools and techniques to analyse integrated data. These tools may include **predictive analytics**, **segmentation**, and **data visualization software**. This process helps to identify trends, patterns, and insights from the data.

Currently, managers and sales representatives have their dashboard where they can see real-time data of how many meetings are booked. Managers can see how many sales representatives are working, which prospects, and what is the conversion rate of the customers.

Figure 32. shows an almost 0 number of qualified prospects is since it was captured during the implementation of the tool when it was being tested internally. As such, the qualified rate is none because the tool was not yet live and had not been tested with actual customer calls. This is from the internal testing demonstrating an example how it will show the actual data with the actual customers.

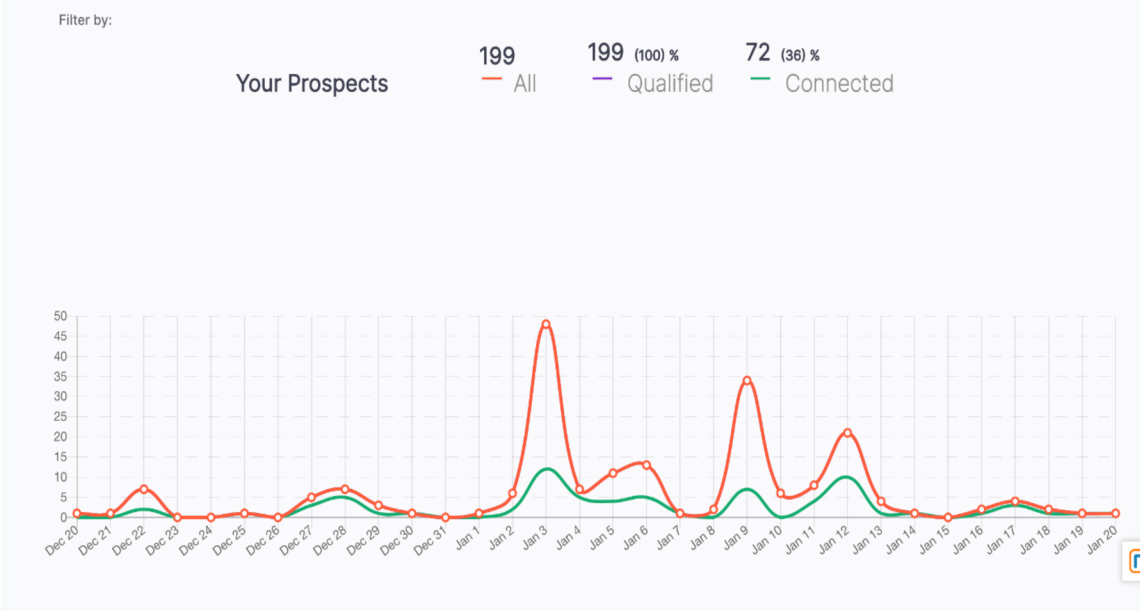


Figure 32: Monthly Prospect Conversion Rate Test Data

Source: Own contribution

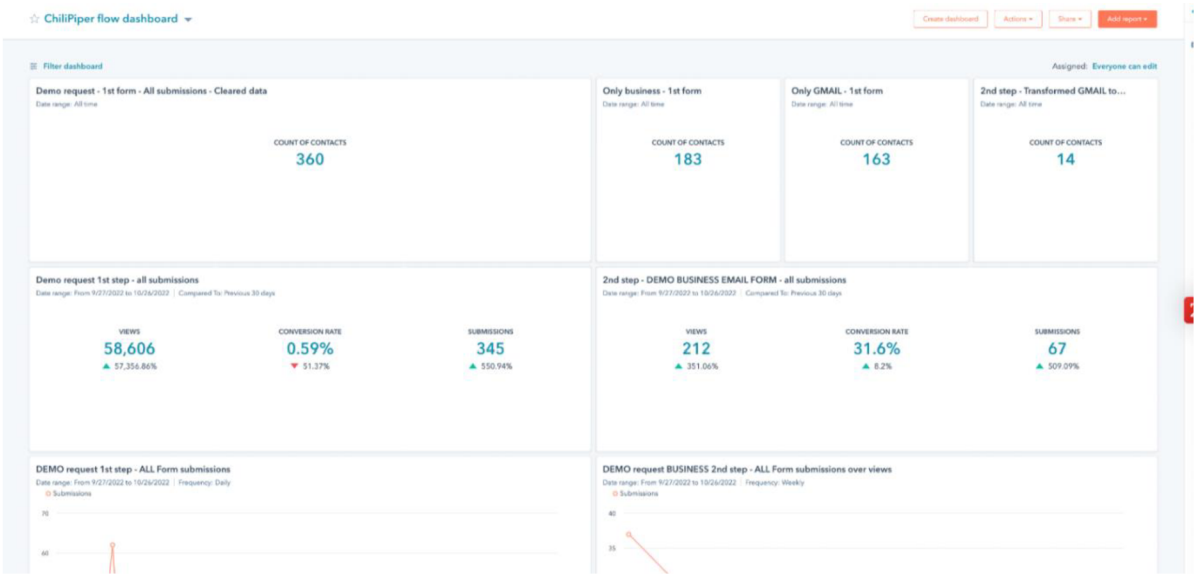


Figure 33:Overall Organization Performance Dashboard

Source: Own contribution

We can see the conversion rate is high from the above screenshots and high numbers of meetings are booked because now the process is automated and Fast. As the

customers directly can book the meeting with the salesperson there are a lot of interested prospects and meetings getting compared to old times when a sales rep manually followed up with the prospects and it took days to fix an actual call because of many issues like unavailability, sometimes prospect gets some other better options and other factors.

As the prospects are directly connected with the SDRs and getting quick responses, the company is getting more prospects and they can convert a few of them into better deals. Which in the end generates revenue for the company.

The conversion rate is giving us an idea about how many prospects are reaching to us and how quickly we can respond and convert them into customers which will ultimately increase company profit and revenue only. This is one of the critical parameters among other parameters such as deal conversion.

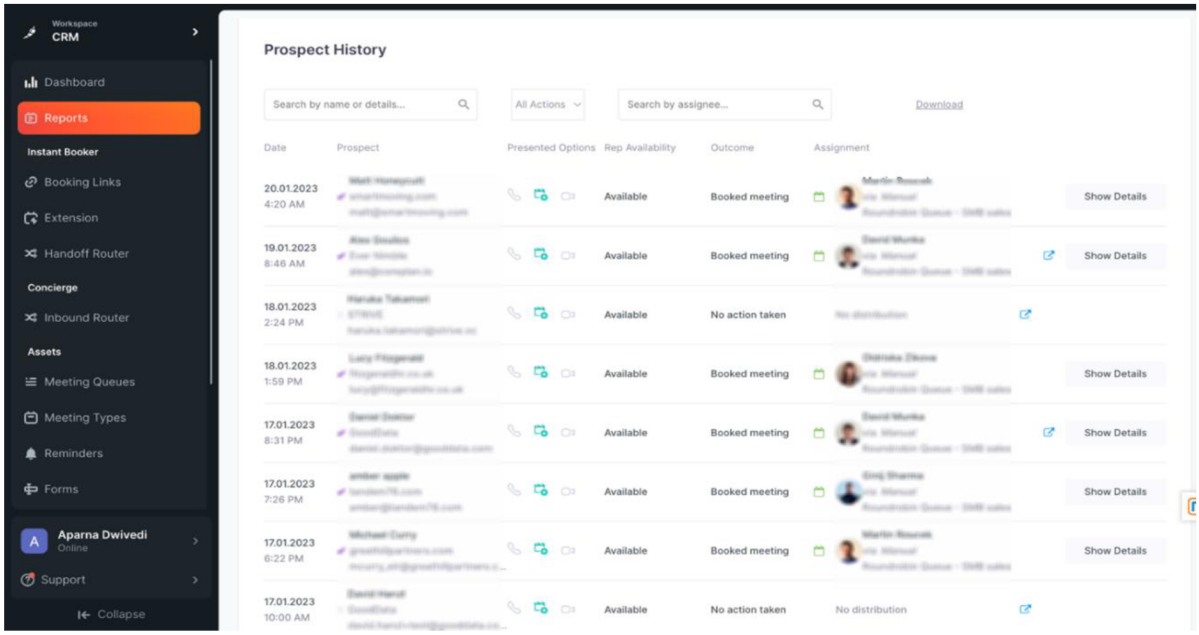


Figure 34: Prospect History Dashboard

Source: Own contribution

7.3 Influence of Digitalization on BPM

The pursuit of social media and other digital platforms has had a significant impact on BPM (Business Process Management) processes in organizations. Here are some of the ways social media is influencing BPM processes influencing the small organization analysis in the case study:

- **Customer feedback:** social media provides a platform for customers to provide feedback about products and services in real time. BPM tools can be used to collect, analyse, and respond to customer feedback, allowing businesses to improve their products and services based on customer needs and preferences.

- **Collaboration:** Social media platforms facilitate collaboration and communication among employees, customers, and partners. BPM tools can leverage these platforms to enable collaborative decision-making, problem-solving, and innovation.

- **Marketing:** social media has become an essential tool for marketing and promoting products and services. BPM processes can be used to manage social media marketing campaigns, track metrics, and analyse customer engagement.

- **Recruitment:** Social media platforms provide access to a large pool of talent, making it easier for businesses to recruit employees. BPM processes can be used to streamline the recruitment process, track progress, & manage onboarding.

8. Conclusion – Digital Future of Automated BPM

This thesis studied the potential of various automated tools like chili piper, Calendly, & Doodle in supporting an organization's business process strategies. The

optimization of a live prospect management process at Kalsi Infotech demonstrated the tools' effectiveness in improving productivity & reducing manual tasks, resulting in revenue growth.

Currently there are many processes in company like sales process, internal metric review process, IT analysis and engagement process, salesforce deal closing process, customer feedback and resolution process and we can apply same automation in this process as well by analysis and developing the best strategy.

In the results and discussion of the thesis results we can see that the old customer management process of the company was really complicated, full of manual tasks and there no reporting and real time data analysis of the data was available. The company was using three tools to manage their whole customer interaction which was costing the company a lot for those tools license and subscriptions. Because of the manual tasks there were lots of mistakes and errors in data sometime and it took almost 2-3 weeks for a representative for customer engagement and finalize any deal for the company.

But we can see after we have implemented the engagement automation with the help of chili piper tool, the workload of the sales representative becomes and less and the customer engagement process becomes quick and customer friendly. Now a representative can easily reach out to a customer and finalize in approximately 7-8 days. As the maximum of the tasks are automated with the help of the tool now the chances are errors are reduced or almost null. The representative can see manage his meetings, customize them, and maintain them easily with the live data statistics in their dashboards.

The advanced reporting features provide live data for reports and dashboards to track critical metrics such as conversion rate, prospects, deals closed, and meetings booked providing valuable insights into their business processes. By monitoring metrics such as conversion rates, prospects, deals closed, and meetings booked, organizations can identify areas for improvement and make data-driven decisions. Additionally, live data reports and dashboards provide a way for organizations to keep track of their performance and ensure that they are meeting their goals and objectives.

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