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ANALYTICAL CRM FOR GOOGLE EDGE - DATA MINING FRAMEWORK WITH REFERENCE TO PHARMACEUTICALS INDUSTRY IN INDIA

Devda Pareshkumar Pravinchandra

Student MBA (Business Analytics)
Centre for Management Studies and Research,
Ganpat University,
Contact No: - +91 9624918799
Email Id: pareshkumardevda21@gnu.ac.in

Dr. Suraj M. Shah

Assistant Professor,
Centre for Management Studies and Research,
Ganpat University,
Kherva, Mehsana.
Contact No: - +91 9099537372
Email Id: sms01@ganpatuniversity.ac.in

Dr. Maurvi Vasavada

Professor and Head, Chairperson,
Centre for Management Studies and Research,
Ganpat University,
Kherva, Mehsana

ABSTRACT

As well as increasing the utilization of analytical CRM software over time, as you collect more and more valuable data, you'll also gain more benefits over time by using analytical CRM. It's vital role to the business strategy before you buy and introduce a program and make sure that the sort of CRM software solutions that you simply choose is that the best choice to maximize your sales volume and boost your business. Many businesses have recognized the importance of implementing new technological trends to assist them make decisions and satisfy their customers.

Research Objective

Research objectives explain what your study's goals are and why you are conducting it. They serve to focus your research by providing an overview of your project's methodology and goals.

Your research paper's introduction should include your objectives after the problem statement. They ought to:

• Identify the project's depth and scope.
• Add to the planning of your research
• Explain how your project will advance our knowledge.

Design enables researchers to fine-tune research methods appropriate for the subject matter.

Research Methodology

The term "research methodology" simply refers to the actual "how" of any given piece of research. More specifically, it pertains to how a researcher systematically designs a study to guarantee valid and reliable results that address the research aims and objectives

Due to the nature of CRM and data mining research, which makes it challenging to confine to particular disciplines, the pertinent materials are dispersed throughout numerous journals. For data mining research in CRM, business intelligence and knowledge discovery are the most popular academic fields. Consequently, to compile a thorough

bibliography of the academic literature on CRM and Data Mining, the following online journal databases were searched.

Data Analysis

In quantitative research, collect data and use statistical analyses in SPSS. Using Regression method, find out whether data demonstrate support for research predictions. Inconsistencies and errors are examples of dirty data. These data can originate from any stage of the research process, such as poor research design, insufficient measurement materials, or incorrect data entry.

Social Implication

CRM analytics offers you insights approximately your clients and the way properly your income and customer support groups are attaining them. CRM analytics enables you display your customer support efforts, validate your client data, examine your clients' conduct and generate higher leads.

Originality/Value

Customer techniques entails analyzing the prevailing and capability consumer primarily based totally and become aware of which sorts of segment are maximum suitable. This look at believes whether or not a macro, micro, or one-to-tone segmentation method is suitable is a selection for a commercial enterprise to make.

Keywords: Analytical CRM, Data Mining Framework, Data Mining, Customer Relationship management, Pharmaceuticals Industry.

INTRODUCTION

1.1 CRM (Customer Relationship Management):

Customer relationship management (CRM) is an approach for managing a company's interactions with current and potential customers. Leverage data analysis of customer history with your company to improve business relationships with your customers. In particular, it focuses on customer retention, ultimately driving revenue growth. The main goal of CRM is to increase customer loyalty and thereby improve the profitability of the company.

1.1.1 Important parts of CRM:

Analysis: - Analysis is the process of examining, manipulating, and presenting data in charts, tables, trends, and so on. in order to observe trends in the market.

Business Report: - business Report contains detailed reports on sales, customer support, and marketing.

Customer Service: -Customer Service includes collecting the following customer-related information and sending it to relevant departments: -

- Personal information such as name, address, age
- Previous purchase patterns.
- Requirements and preferences.
- Complaints and suggestions

- Human Resource Management: Human resource management involves recruiting and placing the most suitable human resources in the required positions within the company.
- Sales Automation: Sales automation includes forecasting, recording sales, processing, and tracking potential interactions.
- Workflow Automation: Workflow automation involves streamlining and scheduling various processes running in parallel. Reduce costs and time and avoid assigning the same task to multiple employees.
- Lead Management: Lead management including lead and sales tracking, managing campaigns, designing custom forms, filling email lists and researching customer buying behavior client.
- Marketing: Marketing is the development and execution of a sales strategy by interviewing current and potential customers to sell a product.

1.1.2 Classification of CRM:

CRM systems are classified based on their distinguishing features. CRM systems are classified into four types.

- Strategic CRM
- Operational CRM
- Analytical CRM

- Collaborative CRM

Analytical CRM:

Analytical CRM is based on the collection, interpretation, segregation, storage, modification, processing and reporting of customer-related data. This also includes internal data such as sales data (products, quantities, purchase history), financial data (purchase history, creditworthiness), marketing data (responses to campaign numbers, data on customer loyalty programs). Analytical CRM is represented by Base CRM. Provides in-depth analytics and custom reports.

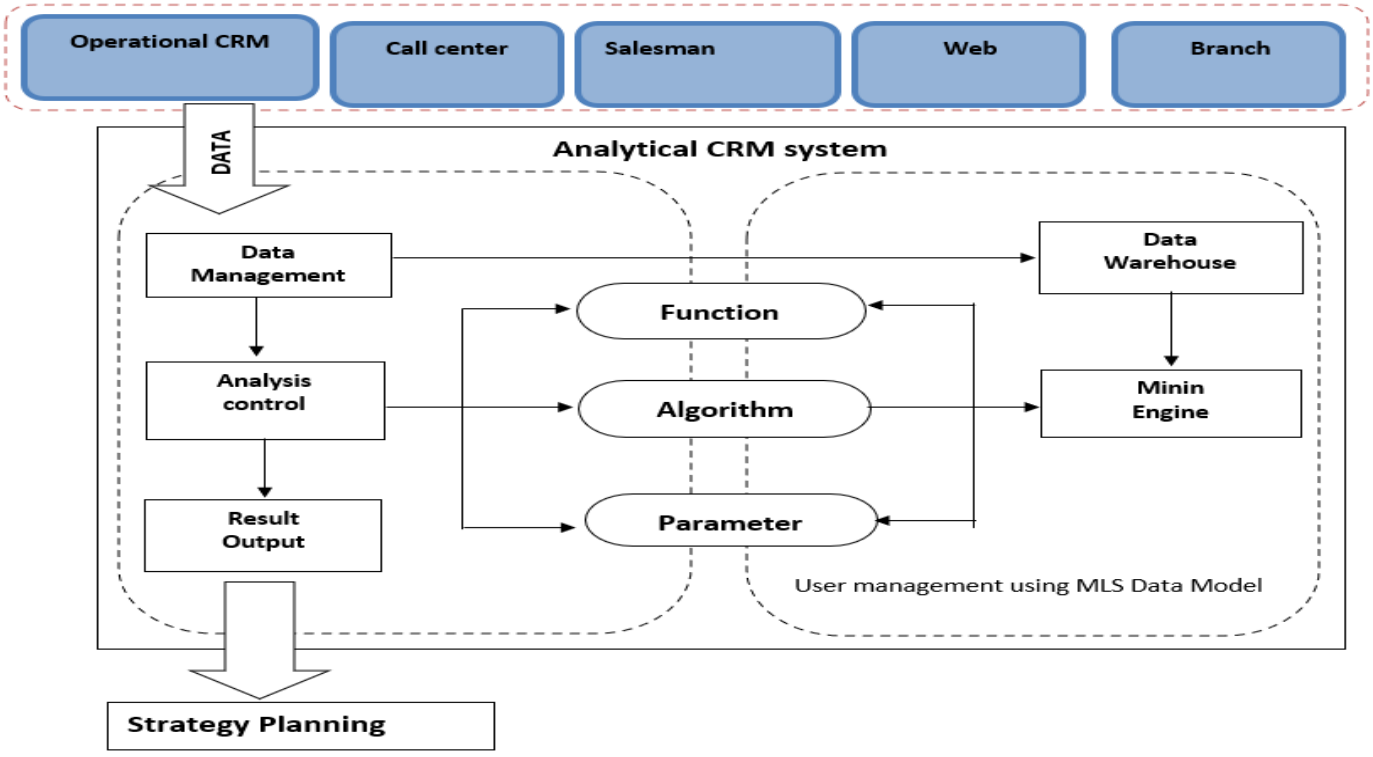
Analytical CRM allows you to configure different sales approaches for different customer segments. Additionally, you can offer different content and designs to different customer segments. For customers, an analytical CRM provides personalized and timely problem resolution. This increases your business sales and customer acquisition and retention opportunities.

Analytical CRM is a subset of his CRM, where businesses collect data on customer interactions to improve customer satisfaction and retention. Analytics CRM is a behind-the-scenes process. You are not aware that your behavior and interactions with us are being collected and analyzed.

Based on information gathered about consumer behavior, experiences, and the ultimate impact of those experiences, businesses can predict consumer behavior and recommend products that are likely to respond appropriately.

Analytics CRM is an integral part of customer relationship management. Analytics CRMs collect and analyze different types of consumer data, including:

- Sales data: Purchase history, return history, brand preferences, etc.
- Financial data: Payment and credit history, including payment types, credit history, etc.
- Marketing Data: Customer response rate to marketing campaigns, customer satisfaction data, customer retention data, etc.



Analytical CRM System

LITERATURE REVIEW

Ubiquitous computing is no longer a technological dream. RFID has already reached a high level of maturity and is expanding into new applications. In today's world, each individual can interact anytime, anywhere and from any device to offer a unique and customized product. As a result, ubiquitous commerce technology helps customers get a fully customized experience with contextual big data marketing. (Chien-hung Liu, 2015)

A company's success depends on its ability to understand its customers. Retailers, like any other business, need to understand why customers come to their stores in order to gain a competitive advantage and maintain market share. With the advent of business analytics, retailers have new opportunities to turn the vast amounts of data they possess into valuable knowledge to gain customer insights and improve customer relationships. However, there is not enough research done to analyze point-of-sale (POS) retail data to study consumer behavior and understand why they visit retail stores. This study attempts to fill this gap by introducing a data mining-based framework. Use this framework to discover patterns in a customer's supermarket visits and identify them as his shopping missions. (Anastasia Griva, Cleopatra Bardaki, Sarantopoulos Panagiotis, Dimitris, Papakiriakopoulos, 2014)

CRM solutions are becoming more popular among businesses. CRM contains critical customer information that can help guide decision-making. As a result, CRM analysis leads to increased customer loyalty and satisfaction, as well as improved competitive and financial performance. Data mining techniques are used to better understand customers and uncover unusual patterns. However, non-technical decision makers and administrators regard data mining techniques as a difficult process. As a result, the technical difficulty of large-scale CRM solutions for novice administrators and decision makers exacerbates the problem. This paper proposes a framework for the data mining process in the context of analytical CRM to improve decision-making. The paper also discusses the role of data mining in analytical CRM and how it helps businesses manage customer information more effectively. Two senior CRM experts evaluated and approved the framework. The proposed framework revealed that there are still issues with customer data privacy and issues with the types of data collected. (Maruthi Rohit Ayyagari,2019)

A CRM system is used to manage a company's relationship with current and potential customers. Data mining is used in organizations to make decisions and predict potential customers. We reviewed the current literature on the use of data mining techniques in CRM. Based on a review of the current literature, we examined different data mining techniques used by different types of companies, business sectors, and organizations. During this study, we presented a key summary table containing the problems resolved, the proposed techniques, their significance, limitations, and possible improvements for each proposed technique reviewed. This white paper provides an important overview of the data mining techniques used in CRM. (Abdur Rahman, M.N.A. Khan, 2017)

The CRM data mining framework builds strong customer relationships and manages relationships between companies and customers in today's modern business world. Data mining has gained popularity in various CRM applications in recent years, and classification models are an important data mining technique to use in practice. This model is used to predict customer behavior and improve the decision-making process to retain valued customers. In this paper, we propose an efficient CRM data mining framework and compare the accuracy of his two classification models, Nave Bayes and Neural Networks. (Femina Bahari T, Sudheep Elayidom M,2014)

This paper uses data mining techniques to develop a methodology to support CRM in the retail sector. The purpose of this study is to improve the relationship between trading companies and their customers. A company is used as a case study to confirm that the proposed methodology is applicable in real situations. The methodology proposed in this work contributes to the marketing literature by examining several analytical CRM dimensions in retail. He also advises companies on how to leverage analytical CRM to help gain customer knowledge and strengthen customer relationships. Furthermore, this work demonstrates the potential of data mining techniques applied to large databases in the context of CRM. (Vera Lucia Migueis Oliveira,2012)

Despite the importance of data mining techniques in CRM, comprehensive literature reviews and classification schemes are lacking. This is the first scientific literature review of data mining techniques applied to CRM. It provides an academic literature database covering 24 journals from 2000 to 2006 and proposes a classification scheme for articles. A total of 900 articles were identified and checked for direct relevance to the application of

data mining techniques to CRM. After that, 87 articles were selected, checked and categorized. Each of the 87 selected articles was assigned a CRM dimension and one of seven data mining functions. Based on the main focus of each study, various data mining techniques were used to further classify the studies into nine subcategories of his CRM elements. (E.W.T. Ngai a, Li Xiu b, D.C.K. Chau, 2008).

Due to the improvement of living standards and long-term changes in people's lifestyles, beauty services are utilized by many people today. In this paper, we apply data mining techniques to a Taiwanese hair salon, combine self-organizing maps and k-means to segment customers, and use RFM (recency, frequency, and monetary) models to develop marketing strategies. develop. In this case, data mining techniques help identify her four types of customers: loyal customers, prospective customers, new customers, and lost customers, and create marketing strategies specific to each type of customer. increase. Correct. (Wei, J. T., Lee, M. C., Chen, H. K., & Wu, H. H. (2013)).

Web mining has grown in popularity over the past decade. This increase is consistent with a growing number of pure players, multiple challenges from data inundation, a trend toward automation and consolidation within organizations, and a desire for hyper-segmentation. Faced with these multiple challenges, organizations are increasingly turning to web data to replicate their data mining toolbox. Much is known about the technical aspects of WM, but little is known about how it fits into a CRM system designed to attract and retain as many customers as possible. not. An exploratory survey of 12 high-level professionals and academics found that KM was well suited to accomplish most of her CRM goals of profiling her existing web customers. rice field. The results of this study suggest that integrating the KM process into an analytical CRM system can yield highly beneficial results if certain guidelines are strictly followed. (Ertz, M., & Graf, R. (2016))

Rising risks, technological advances, and increasing information overload in supply chain networks are driving organizations to adopt a data-driven approach to supply chain risk management (SCRM). Data mining (DM) uses multiple analytical techniques to make intelligent and timely decisions. However, the potential for SCRM has not been fully explored. The purpose of this document is to provide a DM-based framework for identifying, assessing, and mitigating various types of risks in your supply chain. A holistic approach integrates DM and risk management activities into a unique risk management framework. Semi-structured interviews, discussions, and case studies based on focus group studies validate the framework. This study shows how DM can help you discover useful information hidden in unstructured risk data and make intelligent risk management decisions. (Kara, M. E., Fırat, S. Ü. O., & Ghadge, A. (2020)).

Intense competition and constant innovation in the information technology field are rapidly changing marketing trends in the services sector. The marketing approach has changed from a product-centric to a customer-centric mindset. Adopting a customer-centric strategy has become an important part of the business philosophy, especially in service industries where customers are treated as guests. The philosophy of hospitality underpins the entire concept of business performance. Our efforts are focused on meeting the needs of each individual client, resulting in a personal relationship through our bespoke service. CRM has replaced traditional marketing concepts. (Srivastava, S. K., Chandra, B., & Srivastava, P. (2019)).

Decision makers must integrate, embed and embody these three principles, strategies, policies, processes, methods, tools and technologies into a successful organizational paradigm. Organizations that can perceive, quickly capture, find, organize and apply knowledge with much faster response times outperform their competitors. It applies leadership that understands the timeless and immutable principles of KM and analytical CRM, and employs a data mining framework that transforms organizations into much more responsive and effective players in a growing economy. (Josiah, A., Ikenna, O., Jennifer, A., Chinaedum, I., Justina, R., & Nnamonso, A. (2015)).

Analytical CRM's use of MAS technology embodies the intelligence of Analytical CRM. MAS technology not only reduces the degree of coupling between modules in analytical CRM systems and improves the flexibility and scalability of business processes, but also maximizes the capabilities of MAS systems to solve complex problems and effectively Promote a smart CRM system. Collaboration between modules in Analytical CRM. This post introduced an analytical CRM system framework based on MAS technology. To demonstrate the effectiveness and feasibility of introducing MAS into analytical CRM systems, we developed a prototype system that can be used for

customer value segmentation by investigating the working principles of several core agents in detail. (Liu, P., Li, R., & Jiang, G. (2007)).

The purpose of this white paper is to create a framework for integrating business intelligence, knowledge management, and analytical CRM concepts through an in-depth analysis of each concept. This white paper uses data mining techniques to create a knowledge management and customer relationship management framework that supports business decision making. The purpose is to explain how KM and analytic CRM can be integrated into this fluid analytic framework to use effective data mining techniques to sustain better decision-making and help organizations deliver comprehensive solutions. In order to be able to do so, it is necessary to explore how to effectively use such analytical CRM systems. (Ranjan, Jayanthi, and Vishal Bhatnagar,2011)

Today, thanks to the growth of the Internet, organizations are using different tools to communicate with their customers and different e-CRM strategies to gain a competitive advantage. One of the goals of companies using e-CRM is to maintain and increase customer loyalty. This is essential to create a company's competitive advantage and profitability. Therefore, given the importance of the impact of various e-CRM services on customer loyalty, the purpose of this study was to investigate the impact of e-CRM on Bank Mellat's customer loyalty using data mining techniques. is to the information required for this study was obtained from the Bank Mellat database. Data were analyzed using data mining techniques such as the K-Means algorithm, clustering with neural networks (using error relay algorithms), and LRFM models programmed in MATLAB and Excel software. As a result, we found that customer loyalty increases as the frequency of use of the e-CRM service increases. (Rangriz, H., & Bayrami Shahrivar, Z. (2019)).

In this study, financial issues such as fraud detection in insurance and churn prediction in bank credit card users were resolved. Based on sensitivity measurements, the empirical findings imply that the modified active learning-based rule extraction approach that has been proposed produced the best sensitivity and reduced the length and number of rules, improving comprehensibility. The most critical customer attributes are identified through feature selection, and the rules that are extracted act as an early warning system for management to enact better CRM procedures and identify/avoid potential frauds (Farquad, M. A. H., Ravi, V., & Raju, S. B. (2012)).

Large online communities centered on social media present a chance to strengthen analytic customer relationship management (CRM) strategies. This paper aims to advance the conceptual design of business intelligence (BI) systems for putting CRM strategies into practice. In order to demonstrate the strategic value of these data, the authors first discuss social CRM and social BI as emerging fields of study and then pair CRM tactics with a re-engineered conceptual data model of Facebook. The authors then create a multi-dimensional data model for social BI and show how it can be used by creating management reports for a retail environment. The authors propose a structured research agenda for the newly emerging field of social BI, building on the service blueprinting framework (Rosemann, M. (2013)).

A large online community focused on social media presents an opportunity to improve analytical tactics for customer relationship management (CRM). To put your CRM strategy into practice, this article aims to guide you through the conceptual design of a business intelligence (BI) system. The authors first describe social CRM and social BI as new research areas to illustrate the strategic value of this data before combining CRM strategies with the revised Facebook conceptual data model. The authors then develop a multidimensional data model for social BI and demonstrate its application by creating management reports for a retail environment. (Frieß, M., Hartl, K., & Jacob, O. (2019)).

Rural commercial banks are not as effective in managing customers and organizing information as state-owned banks and other commercial banks. Beijing Rural Commercial Bank decided to take "customer-centric" as its business strategy and develop a CRM system based on its market positioning and long-term development plan. This helps banks identify their core markets and customers. Based on the situation and requirements of Beijing Rural Commercial Bank, this white paper proposed a CRM system framework including operational CRM, analytical CRM and joint CRM hierarchy. (Zhang, L., Li, J., & Wang, Y. (2008, October)).

Need for Study

CRMs allow businesses to learn about their customers, including who they are and why they buy products, in addition to characteristics of their purchase history. This allows companies to better understand their customers' wishes and satisfy them.

Scope of The Study

Implement the right structures so that consumers can understand their acquisition, share and measure the effectiveness of your CRM.

Integrate marketing, income and career sports to achieve goals in uncommon locations.

Applying consumer understanding to constantly enhance overall performance via a system of getting to know from successes and failures.

Acquiring and constantly updating understanding approximately consumer wishes, motivations and conduct over the life of the relationship.

Measuring each input throughout all capabilities which includes marketing, income and carrier prices and outputs in phrases of consumer revenue, earnings and value.

Constantly flexing the stability among marketing, income and carrier inputs towards converting consumer wishes to maximize earnings

.

Aim of The Study

The aim of CRM is to create long-term, mutually beneficial relationships with customers by satisfying their needs and expectations

DATA ANALYSIS

Afghanistan					
Year	**Population**	**GDP (In Billions USD)**	**Inflation**	**Budget expenditure (In %)**	**Budget**
2012	31.2	19.91	7.30	7.90	1.5723277
2013	32.3	20.15	4.82	8.81	1.774397037
2014	33.4	20.50	0.57	9.53	1.953418469
2015	34.4	19.13	2.45	10.11	1.933153002
2016	35.4	18.12	-2.20	11.82	2.141523353
2017	36.3	18.75	2.40	12.62	2.366403221
2018	37.2	18.05	2.07	14.13	2.549877169
2019	38	18.80	6.52	13.24	2.48953394
2020	38.9	20.12	7.82	15.04	3.025345084
2021	39.8	18.57	4.37	15.93	2.958676274
2022	40.8	18.43	4.54	16.82	3.100726608

- **Ex 1. Country** = Afghanistan

Afghanistan country Data

- **Regression Analysis:**

Model	Variables Entered	Variables Removed	Method
1	Budget, Inflation, GDP (In Billions USD), Population	.	Enter

a. Dependent Variable: Year
b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000[a]	.999	.999	.0973

a. Predictors: (Constant), Budget, Inflation, GDP (In Billions USD), Population
b. Dependent Variable: Year

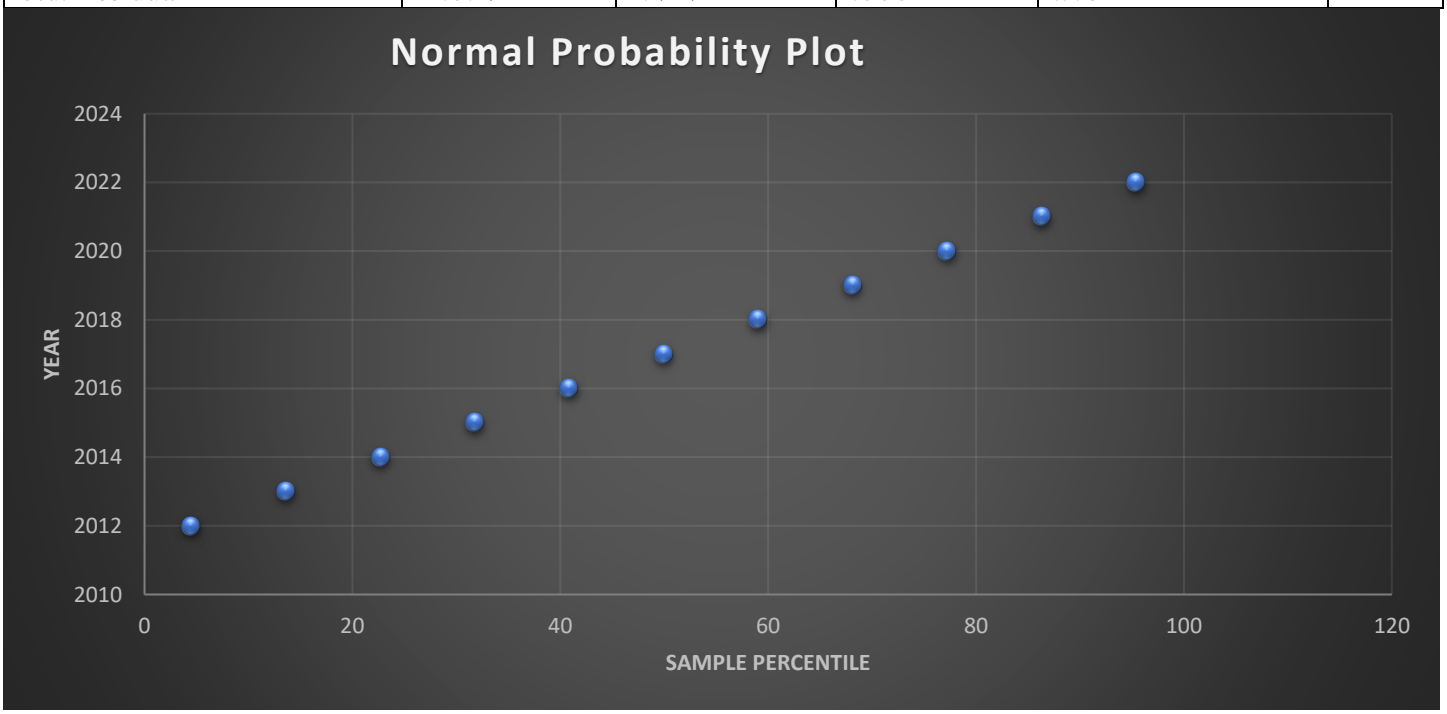
ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	109.943	4	27.486	2901.667	.000[b]
	Residual	.057	6	.009		
	Total	110.000	10			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1979.665	2.700		733.170	.000
	Population	1.025	.072 .063	.965	14.244	.000 .833 .017
	GDP (In Billions USD)	-.014 .041	.012	-.004	-.220	.681
	Inflation	.169	.393	.037	3.258	
	Budget			.027	.431	

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2011.926	2021.932	2017.000	3.3158	11 11
Residual	-.1043	.1258	.0000	.0754	11
Std. Predicted Value	-1.530	1.487	.000	1.000	11
Std. Residual	-1.072	1.292	.000	.775	



3.1 CRM MODEL & DATA MINING FRAMEWORK:

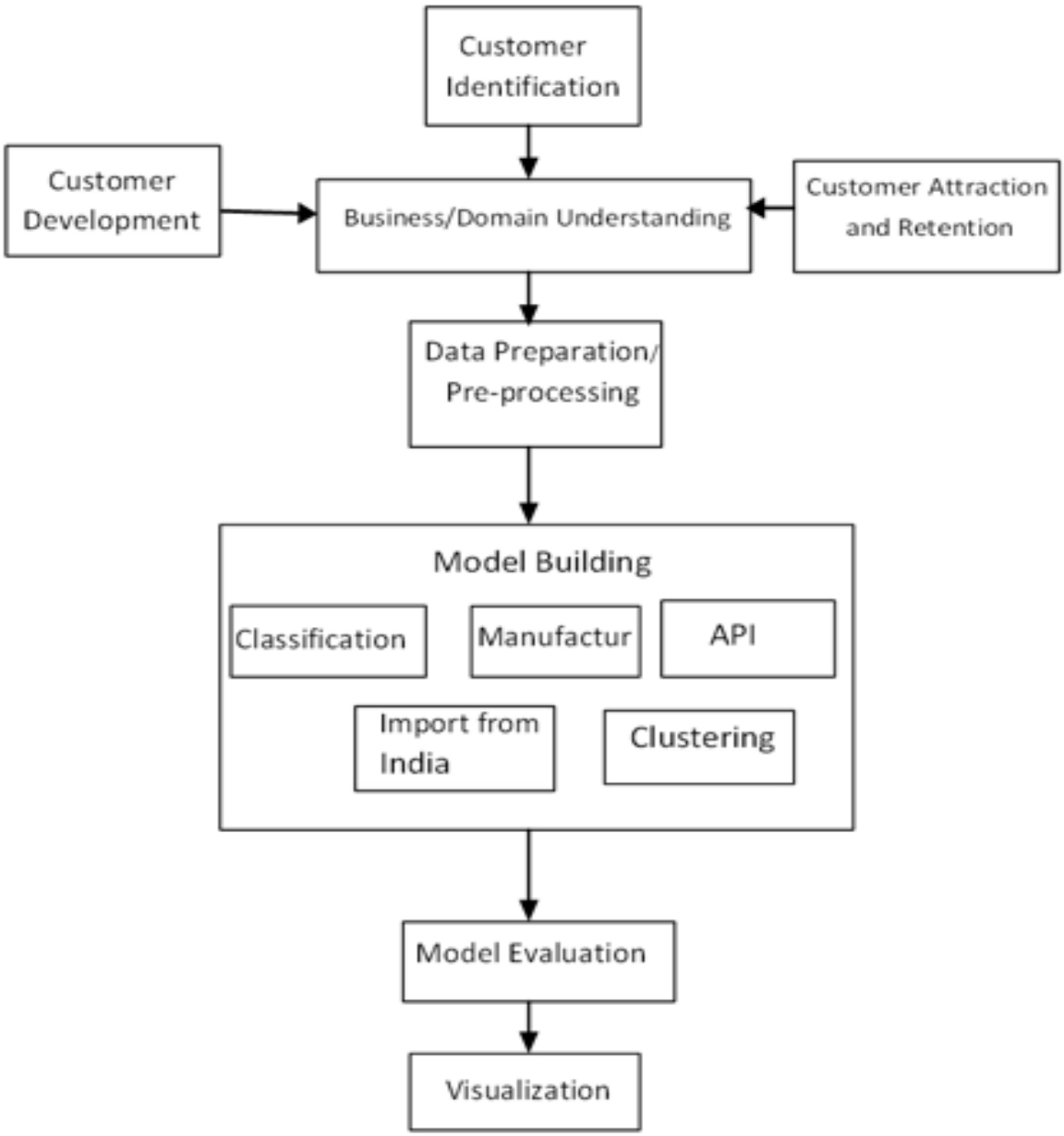
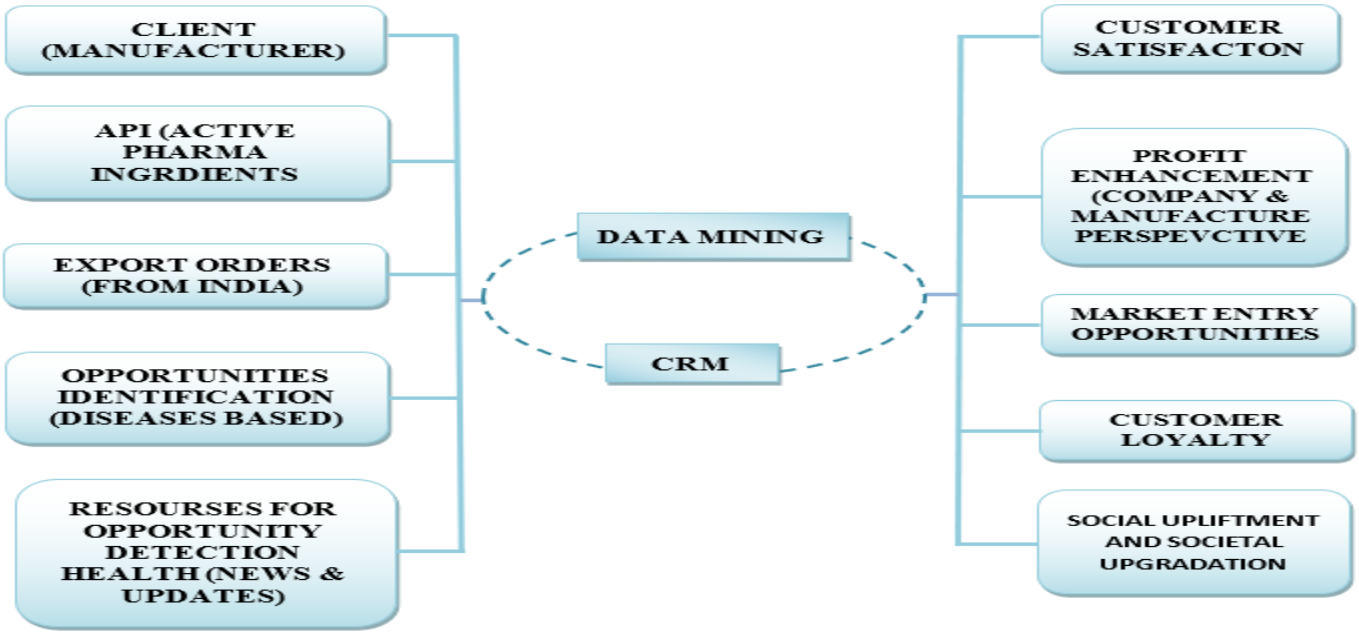


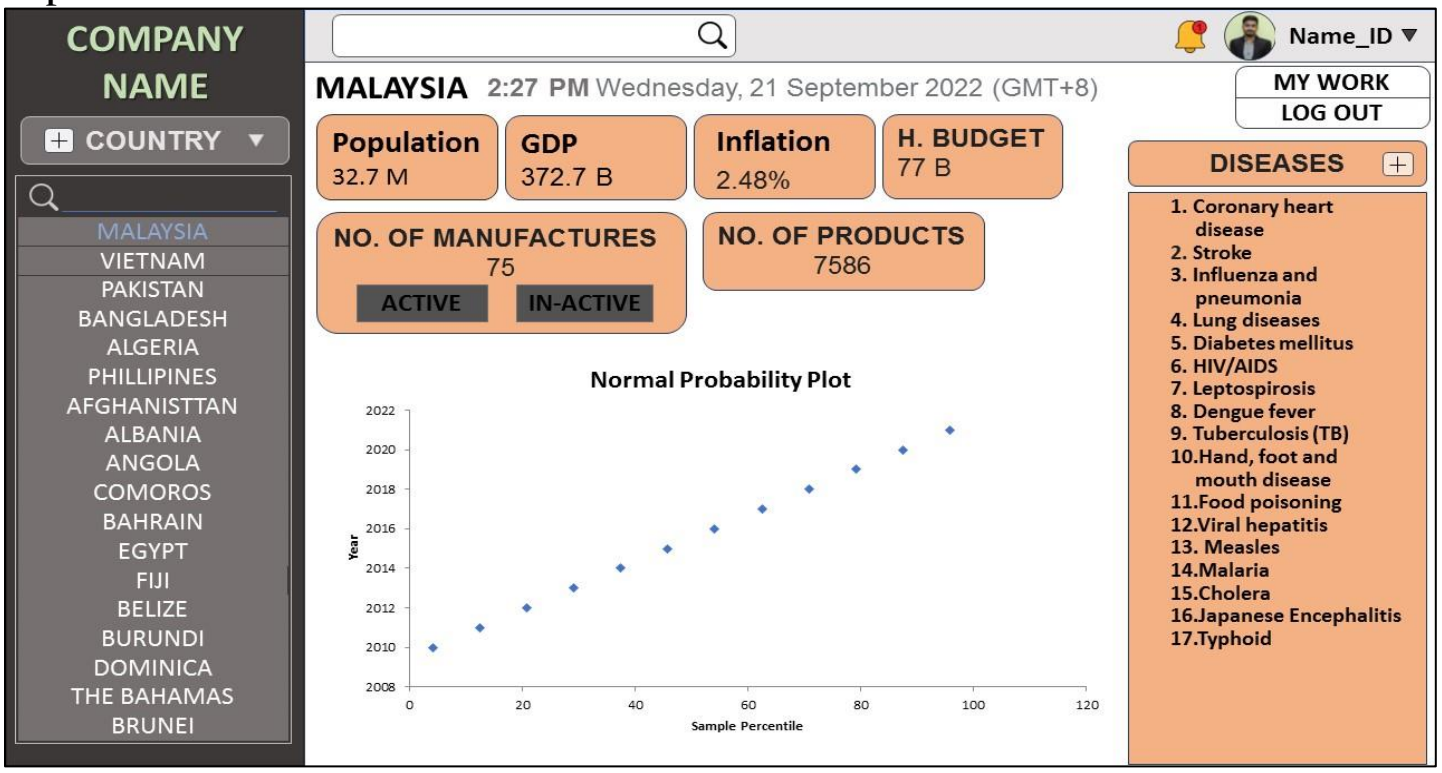
Fig CRM–data mining framework.

3.2 Proposed Framework of data mining and CRM:



ANALYTICAL CRM PROTOTYPE

Step 1: Dashboard- Live Data



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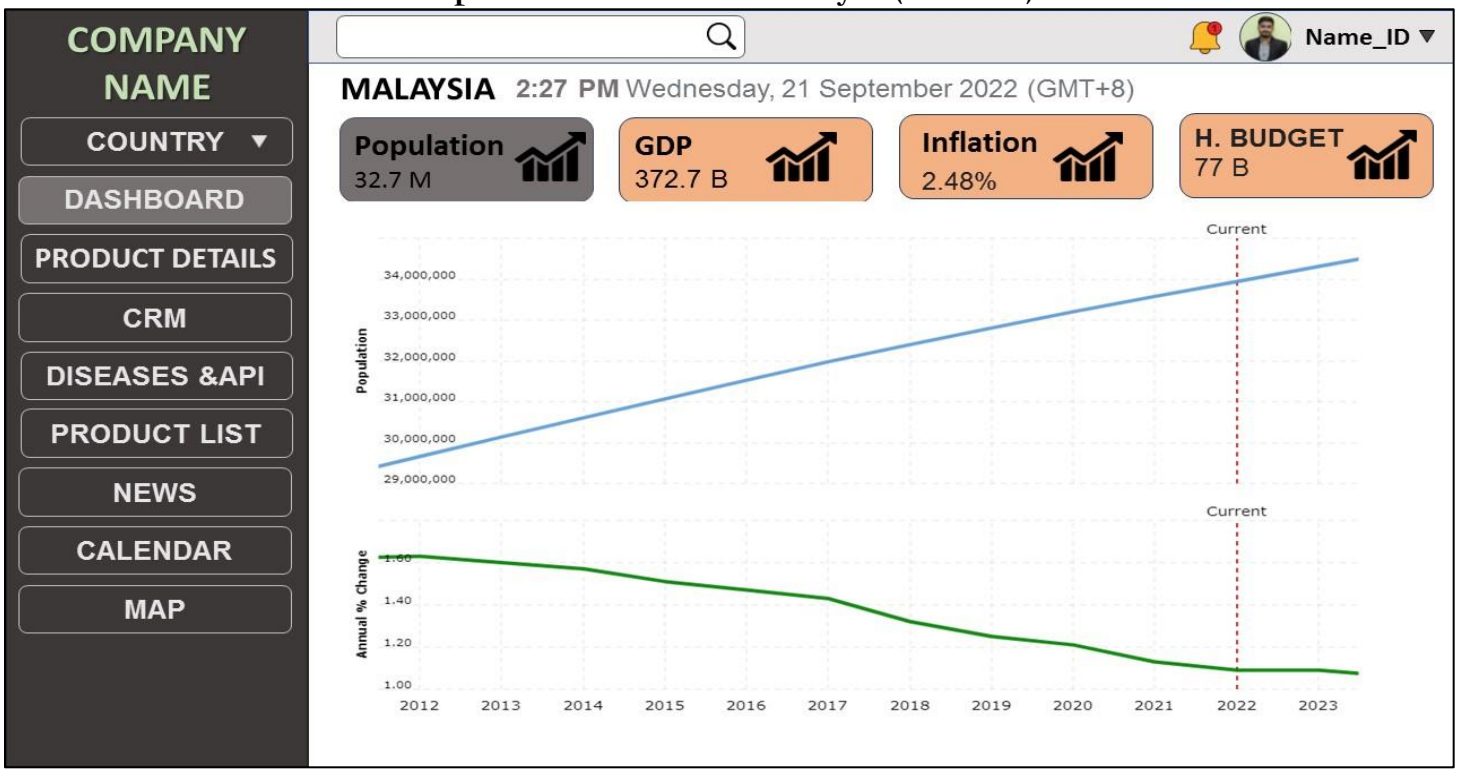
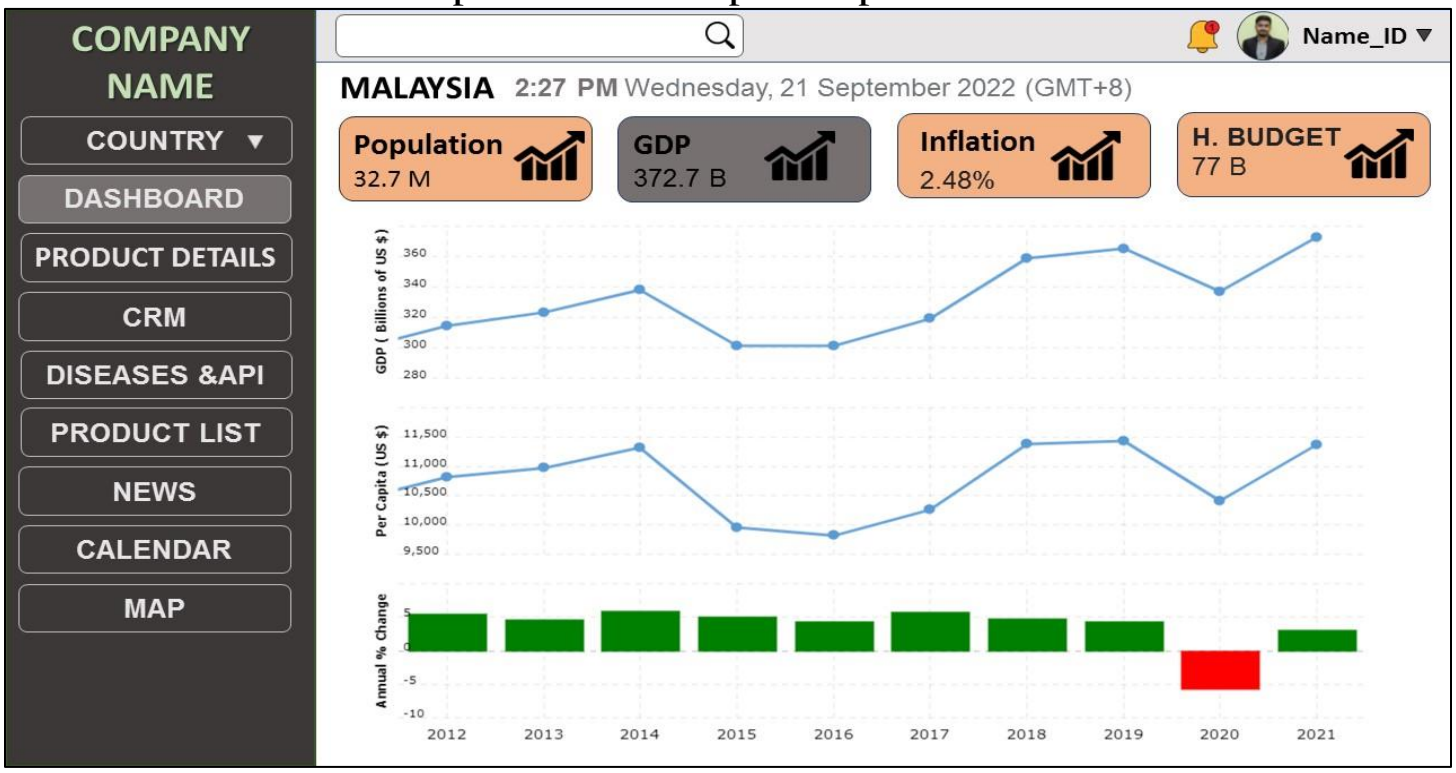
Step 2: Dashboard- Trend Analysis (Till Date)



Step 3: Dashboard- Graphical Representation



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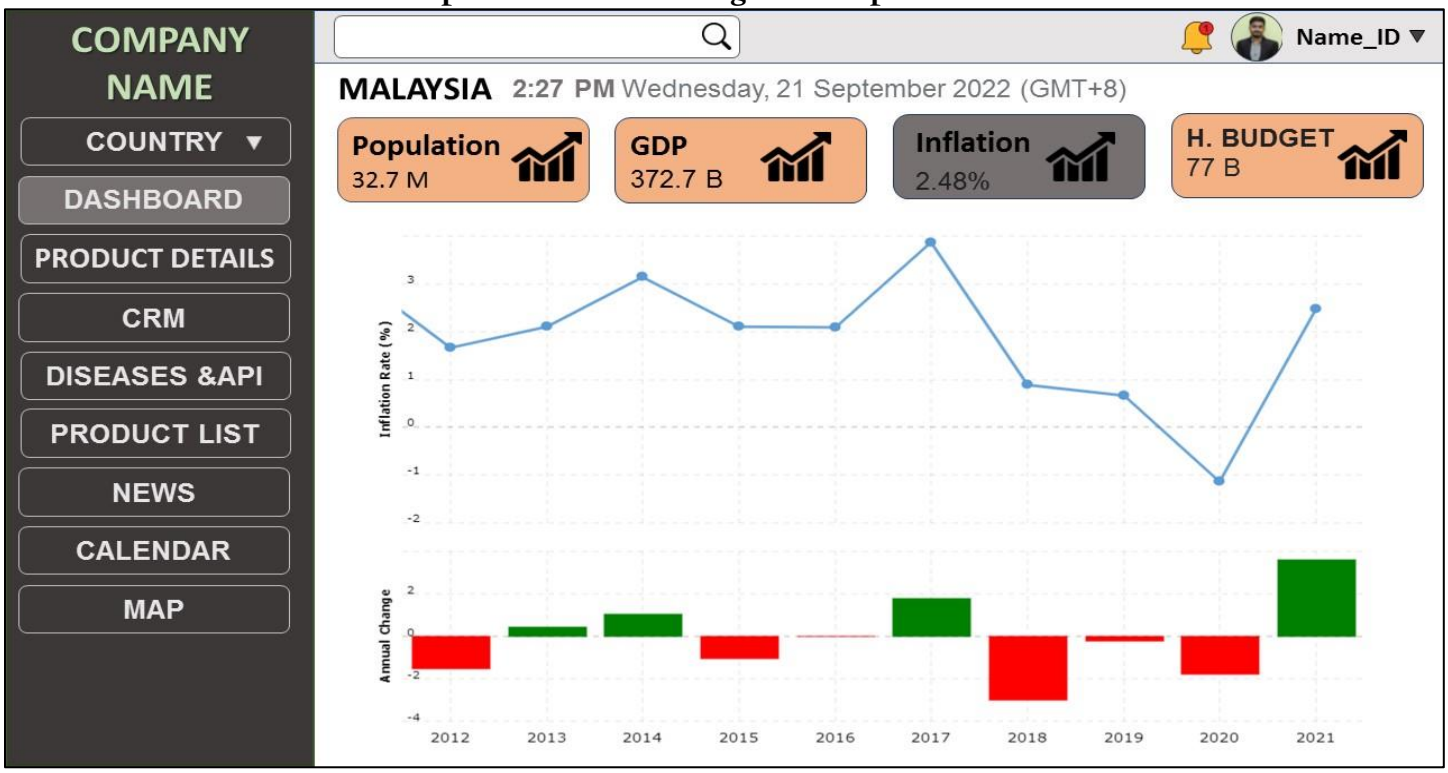
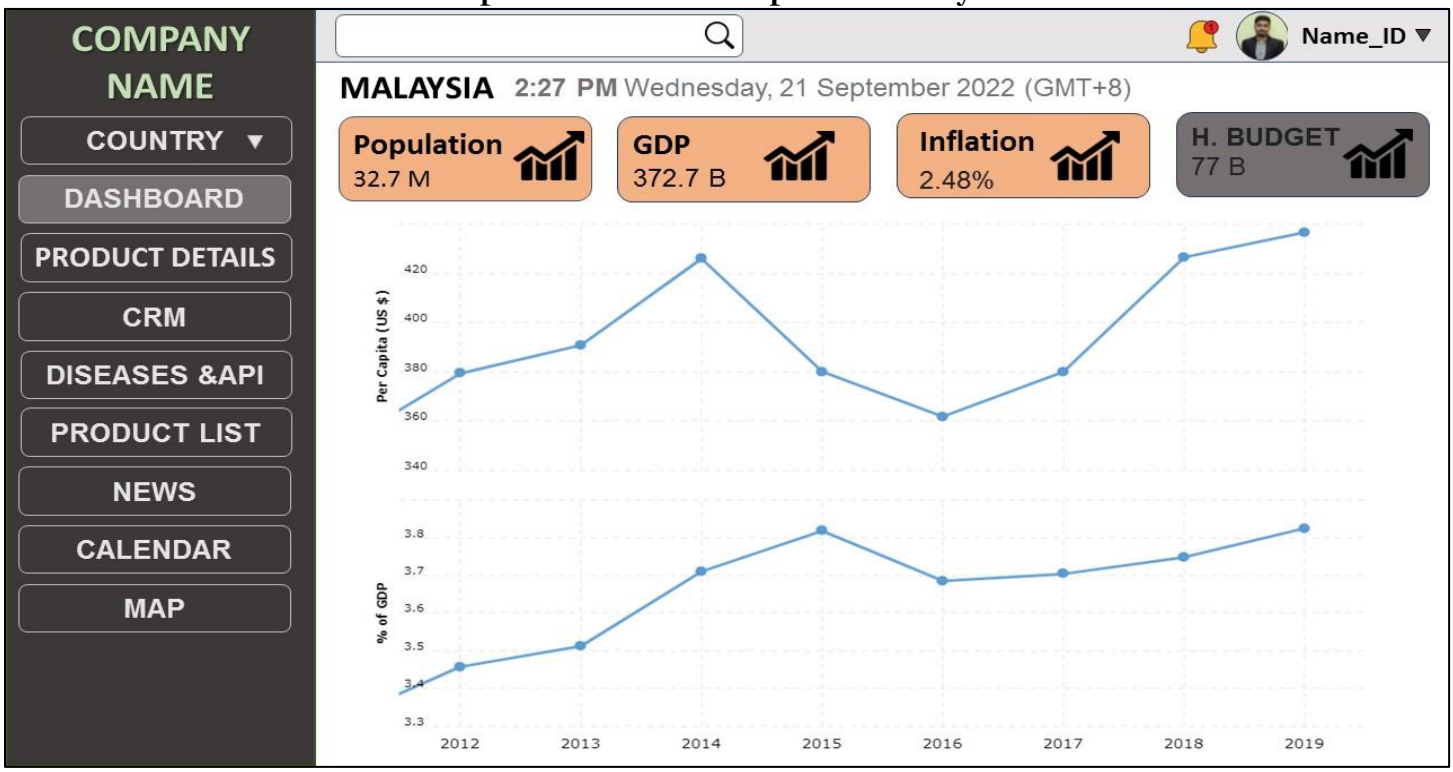
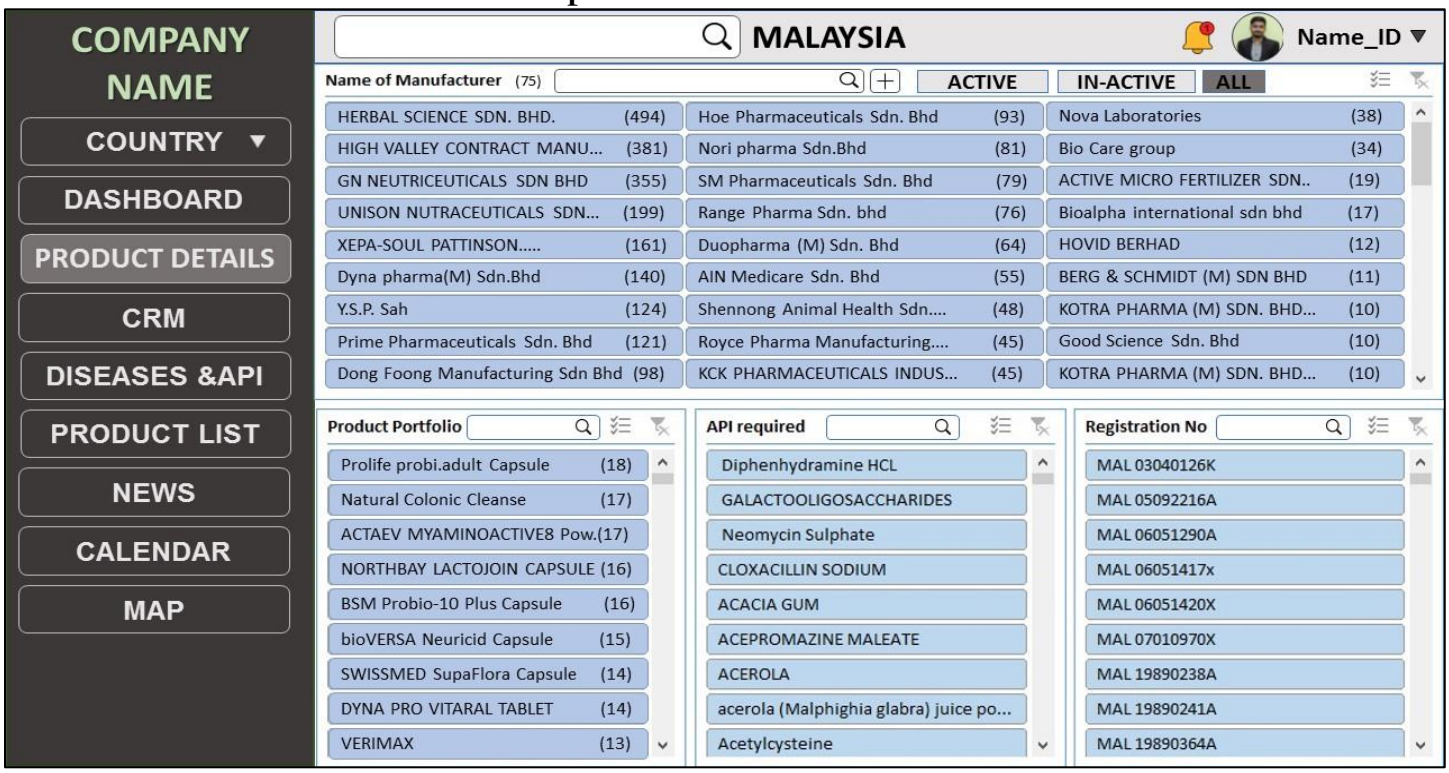
Step 4: Dashboard- Categorical Representation



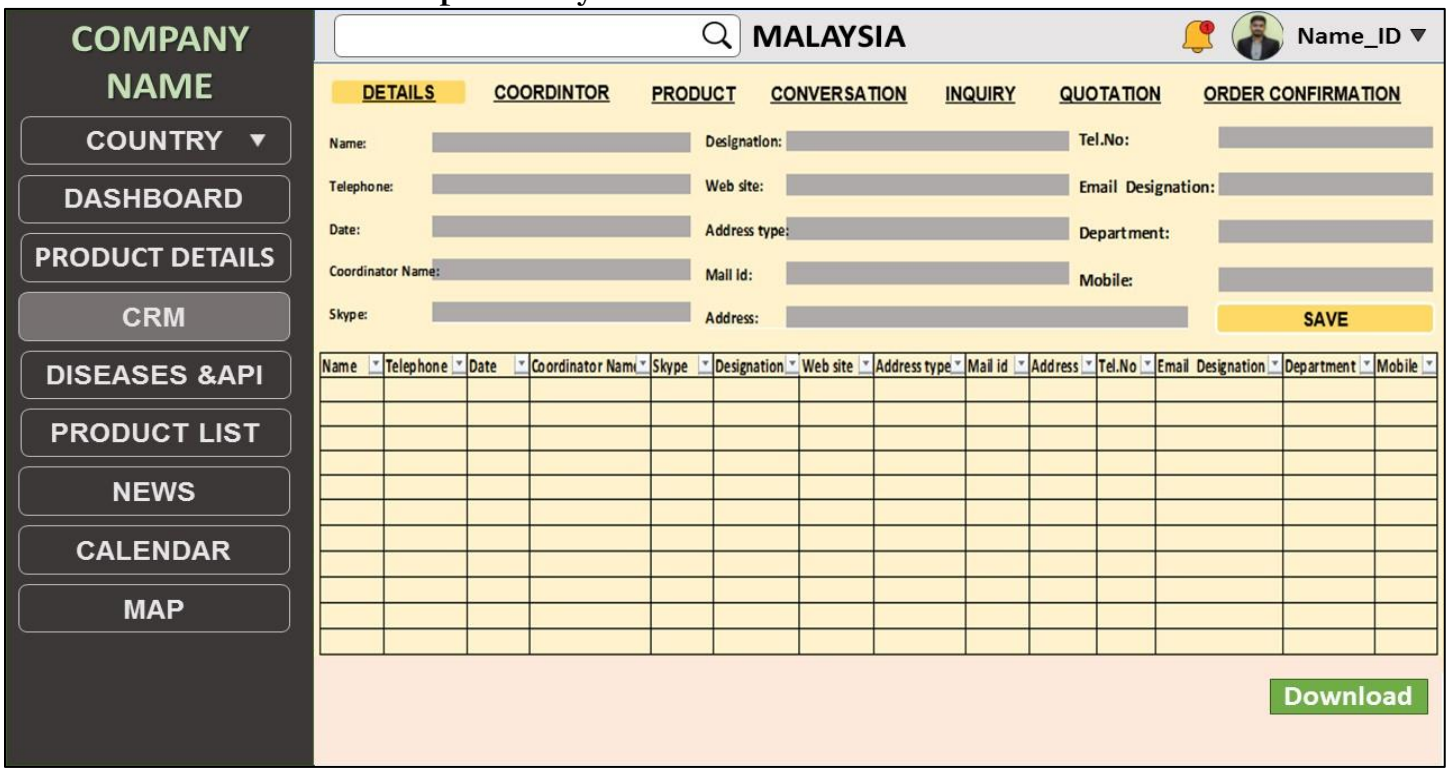
Step 5: Dashboard- Comparative Analysis



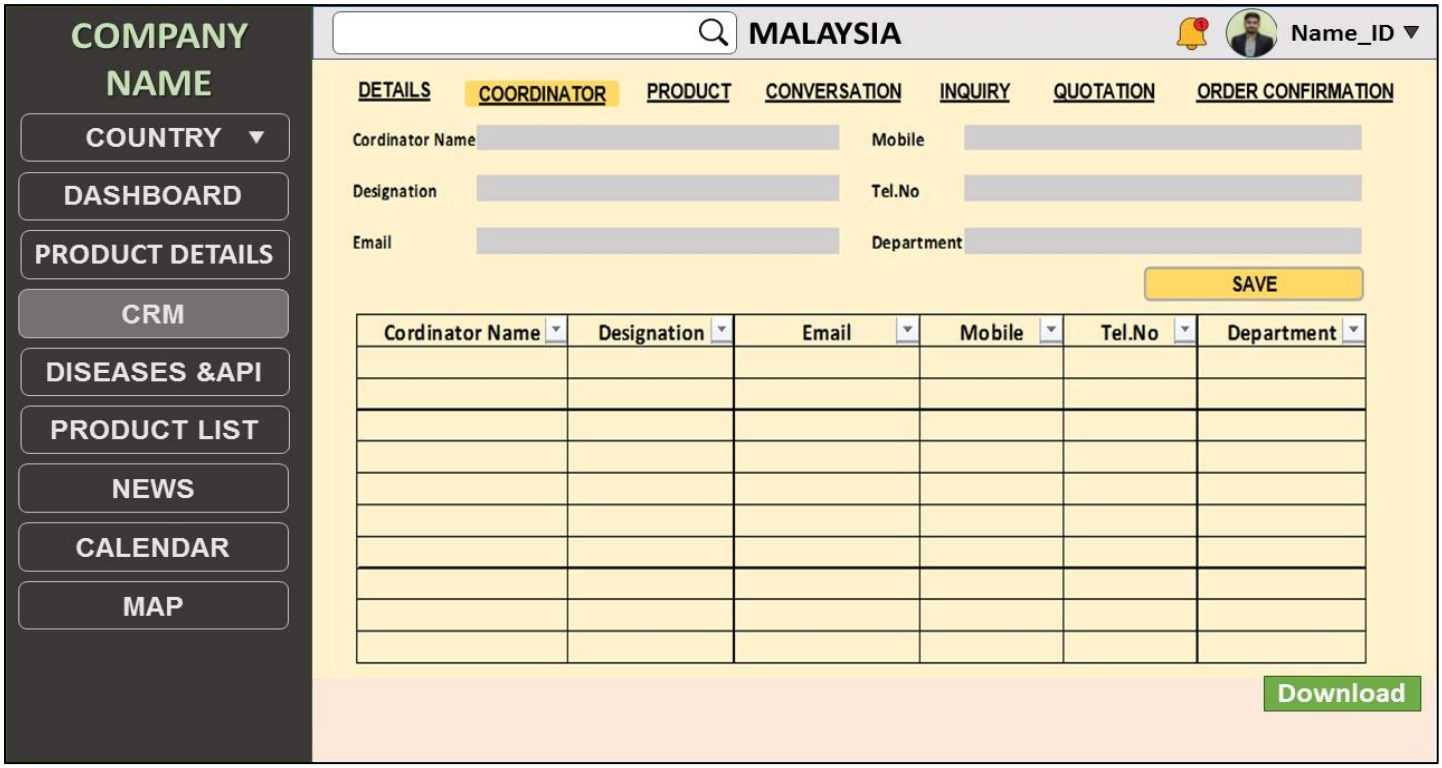
Step 6: Base- Product Details



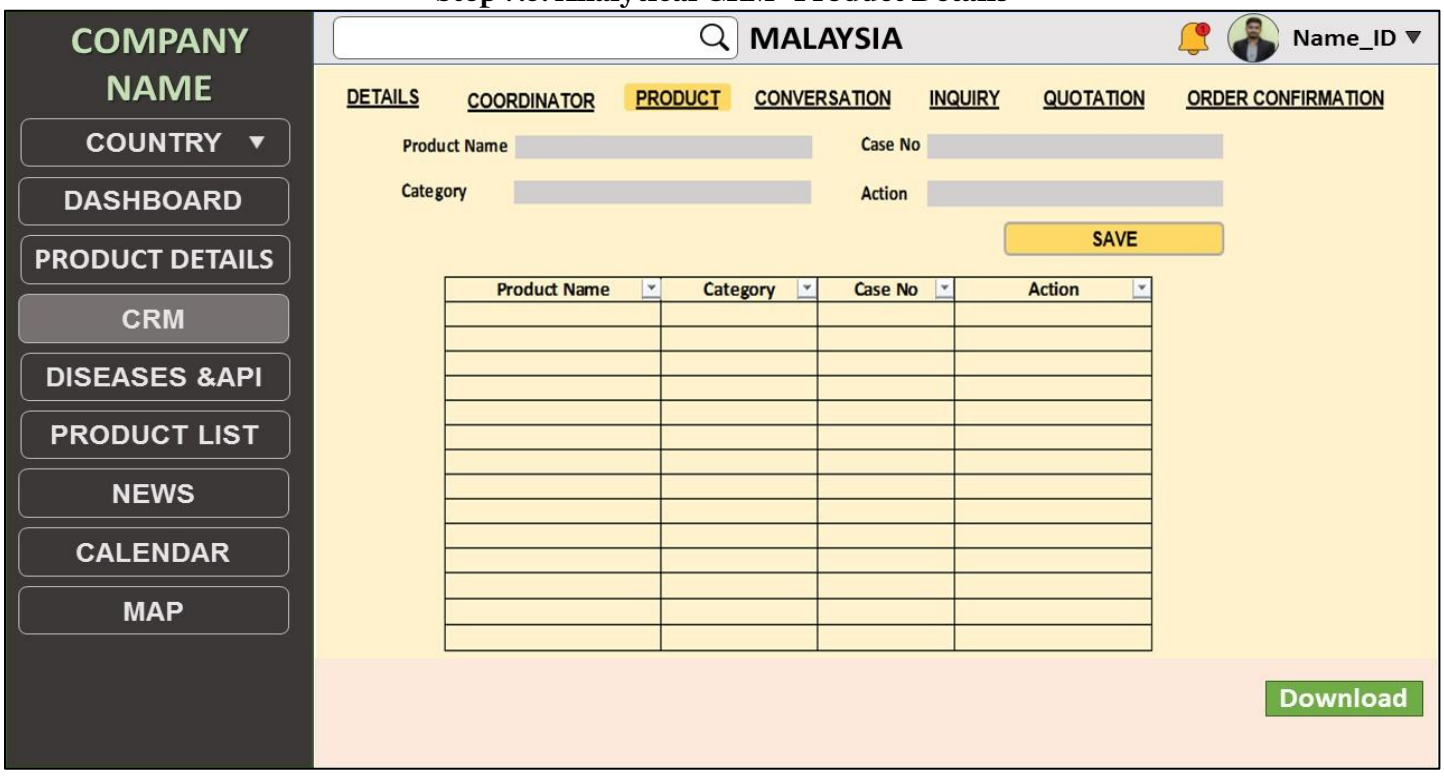
Step 7.1: Analytical CRM- Manufacturer Details



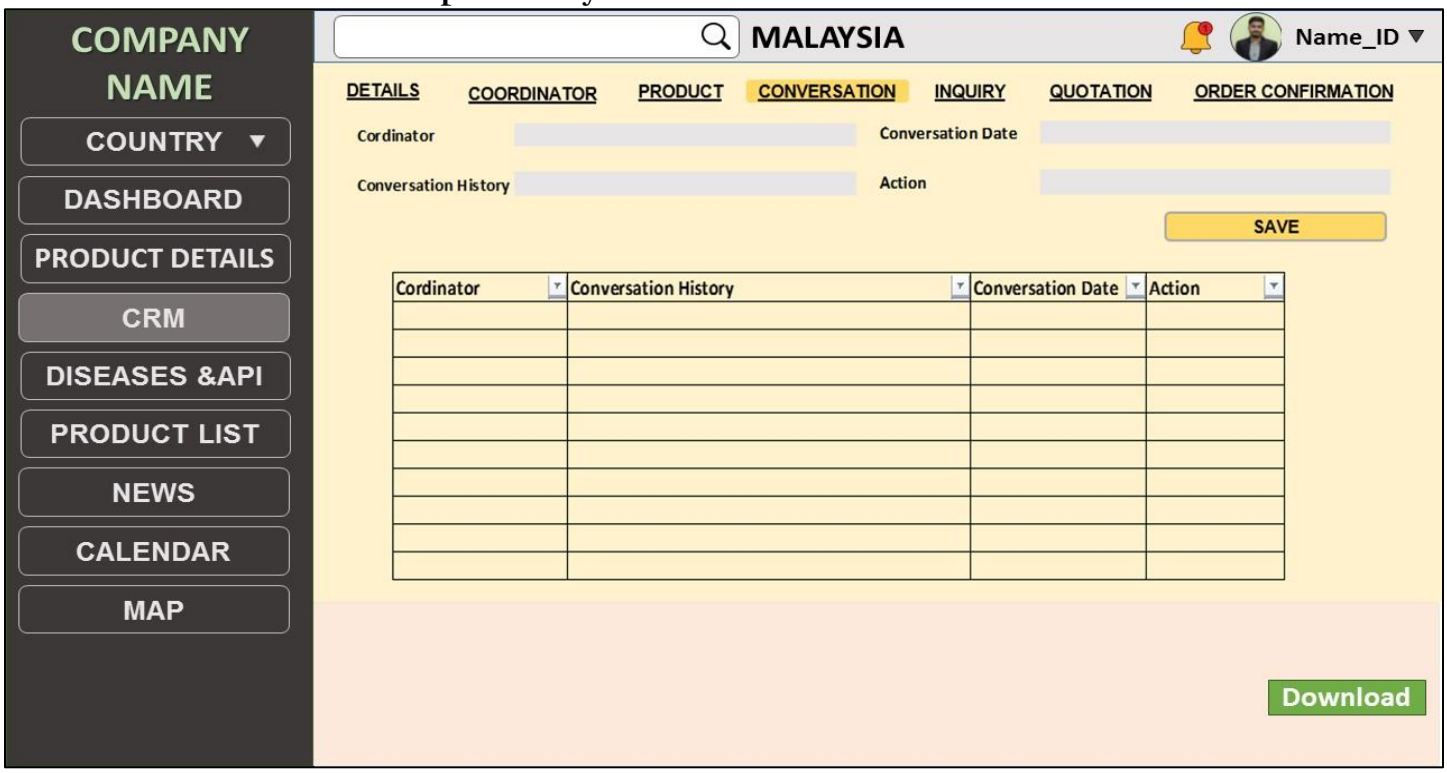
Step 7.2: Analytical CRM- Coordinator Details



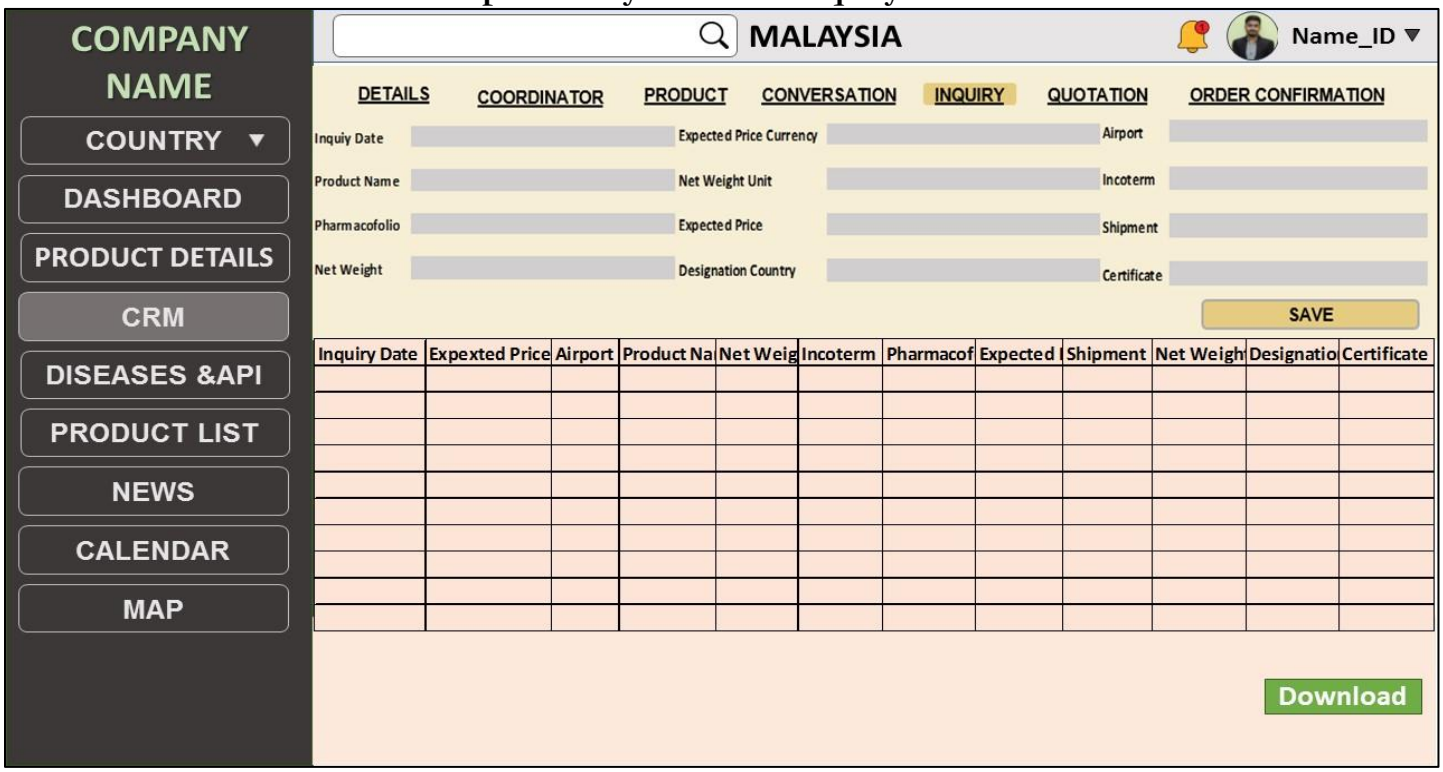
Step 7.3: Analytical CRM- Product Details



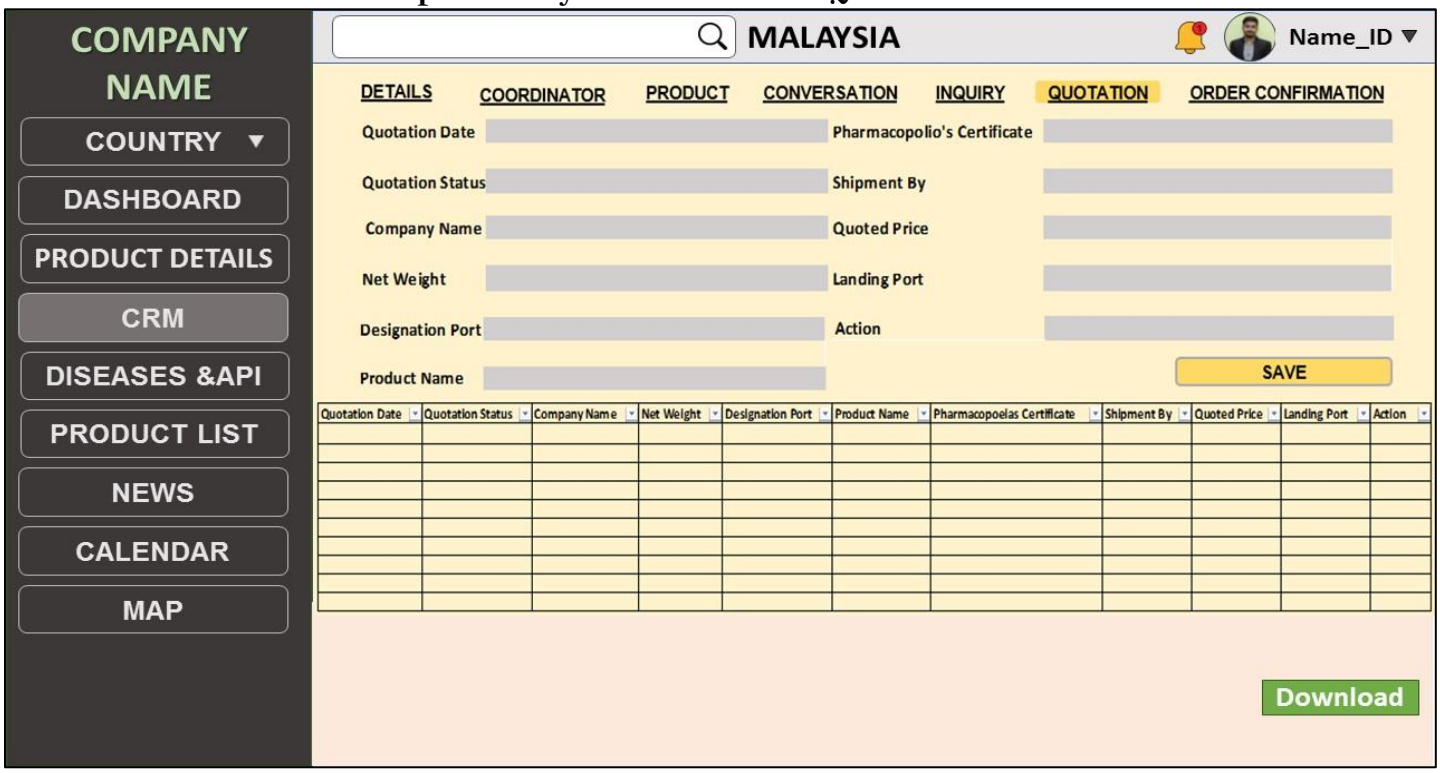
Step 7.4: Analytical CRM- Conversation Details



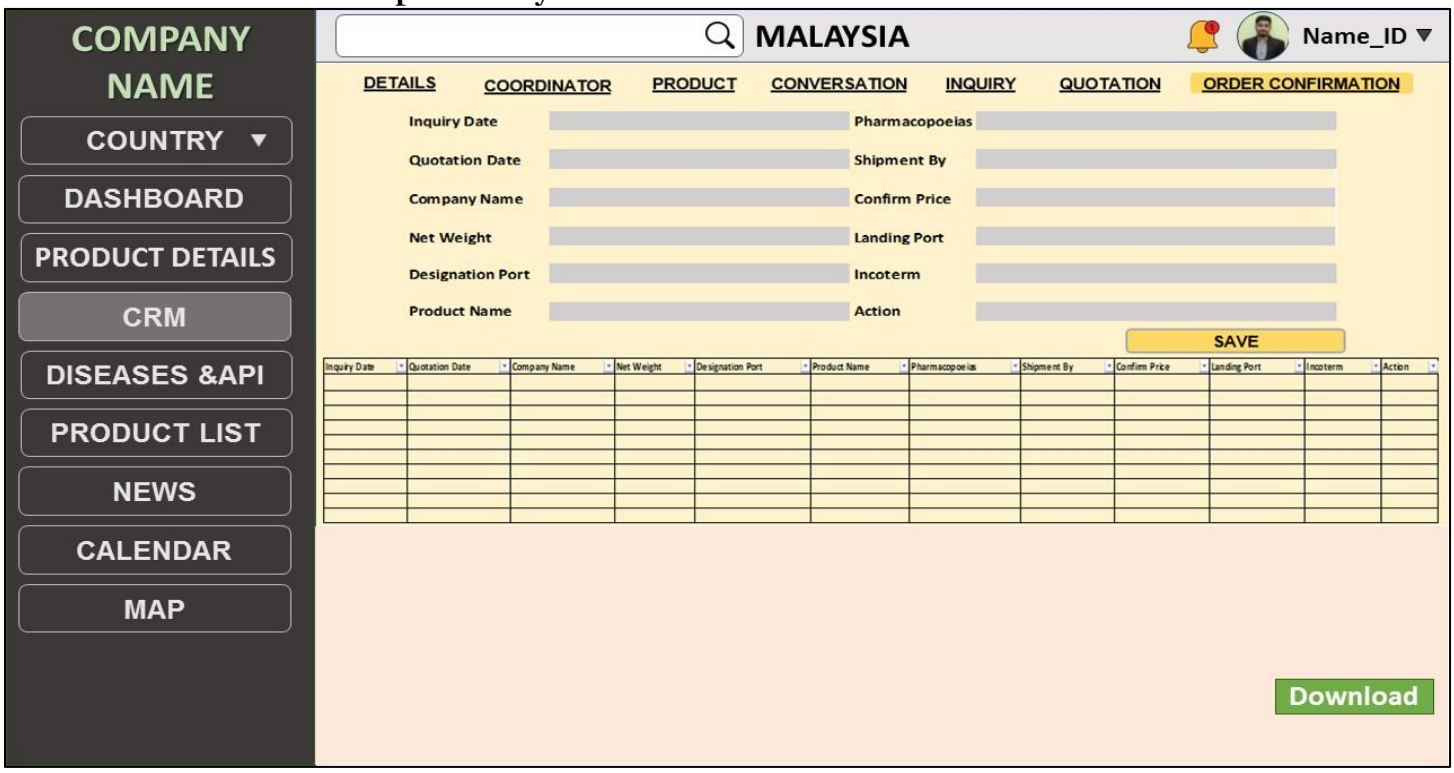
Step 7.5: Analytical CRM- Inquiry Details



Step 7.6: Analytical CRM- Client Quotation Details



Step 7.7: Analytical CRM- Order Confirmation Details



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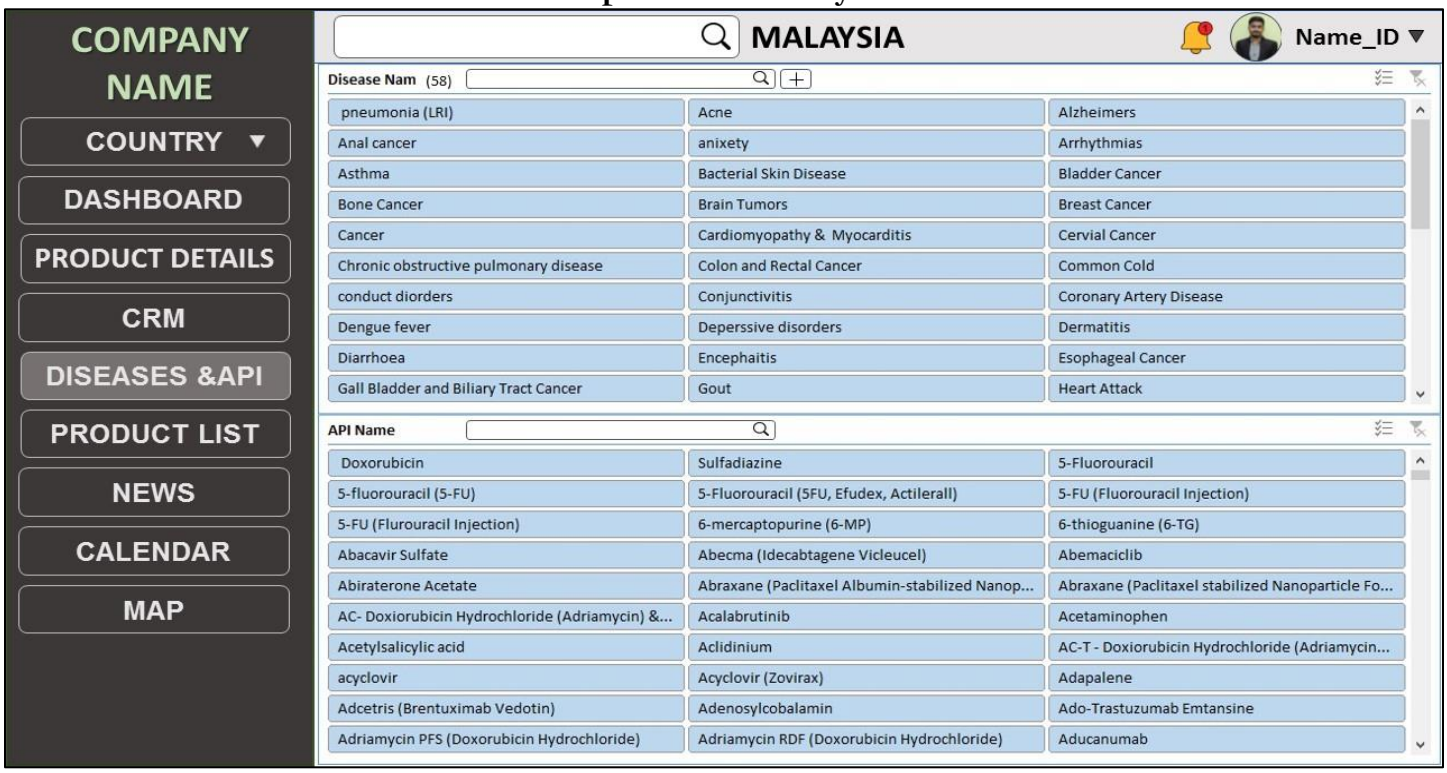
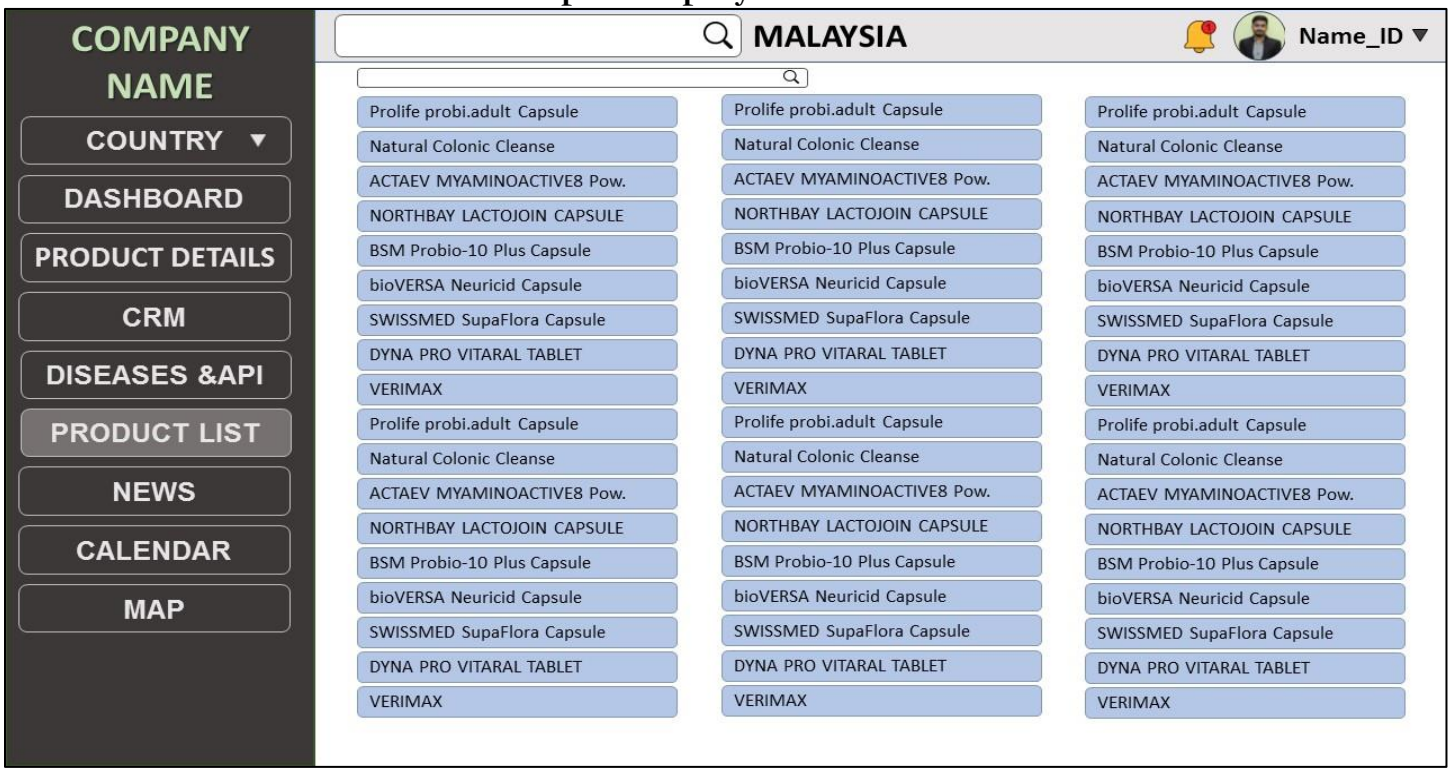
Step 8: Disease Analysis



Step 9: Company Product List



Step 10: Dashboard- Country wise live news

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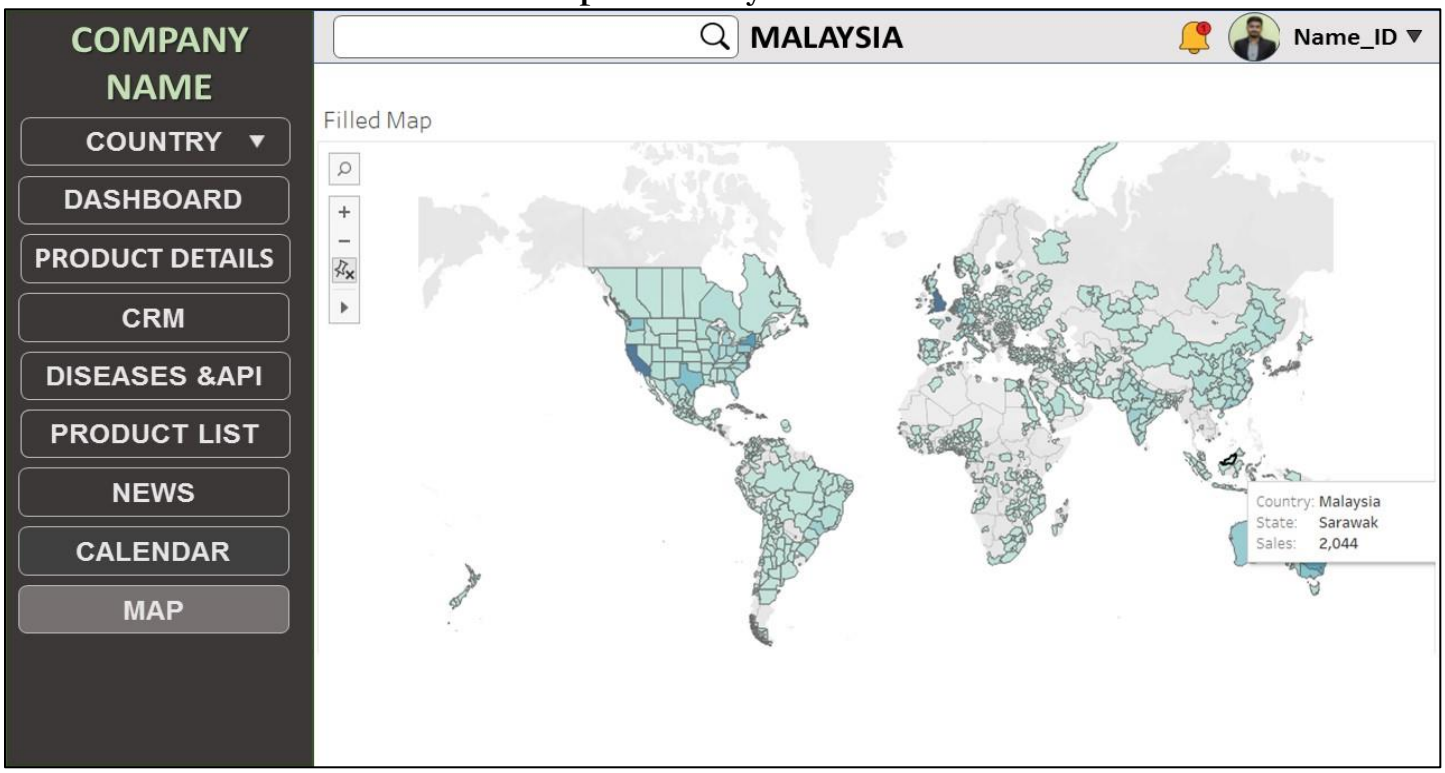
Step 11: Country wise Calendar

Step 12: Country wise MAP



5. MANAGERIAL IMPLICATION:

5.1 Client:

Gives companies the ability to analyze data gathered from various channels and use it to improve customer satisfaction. To identify customer preferences and gain insight into the customer lifecycle, detailed customer profiles are useful. These insights help convert leads and retain customers.

5.2 Company:

Maintain records of direct interactions with clients and prospects. It helps organizations track sales and marketing activities and is based on data entry. A CRM that mines data from all levels of the organization to provide awareness and information to support efficient business operations.

5.3 Government:

Systems for CRM assist local governments in providing services and enhancing citizen engagement without adding to staff workload. A government CRM that is cloud-based increases productivity, lowers costs, and makes everything run more smoothly.

Government data requires impenetrable security. Since data is stored in the cloud, you can access it whenever you want and from anywhere without worrying about data theft. In addition to being secure, your data is backed up continuously, ensuring complete information security.

5.4 Marketing and Sales:

You can analyze customer preferences and trends to determine which sales and marketing methods are most likely to produce the best results. Furthermore, they can continuously monitor sales activity to refine it for maximum gains.

You can assess marketing effectiveness and streamline marketing spend. Analytical CRM also makes it easy to track leads across multiple channels and build customer profiles.

6. CONCLUSION

In addition to increasing your use of analytical CRM software over time, as you collect more and more valuable data, you can also reap more benefits over time by using an analytical CRM. And that said, the time to get started is as good as any. It is essential to think about business strategy before purchasing and recommending a program and

to ensure that the type of CRM software solution you choose is the best choice to maximize sales and drive sales. your business operations. Many businesses have recognized the importance of implementing new technological trends to help them make decisions and satisfy their customers. This study aims to assist businesses in satisfying their demanding customers by utilizing data mining techniques. We propose a data mining-based framework for detecting patterns in customer behavior. This framework has the potential to alter/improve the nature of company-client relationships. This study provides a conceptual framework for analytic CRM that takes into account big data emerging in ubiquitous computing environments, which can help practitioners or marketers prepare for big data marketing. This conceptual framework was created by combining previous literature, experience and expert opinion. However, this study has certain limitations. Given the expertise and experience devoted to this study, future researchers should consider adding field validation to make this framework as robust and practical as it should be.

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