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**Desktop application connected to an ERP platform to  
manage the work of street vendors**

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# Acronyms

<b>ERP</b>	Enterprise Resource Planning
<b>MRP</b>	Materials Requirements Planning
<b>MRP II</b>	Manufacturing Resource Planning II
<b>CRM</b>	Customer Relationship Management
<b>BI</b>	Business Intelligence
<b>B2B</b>	Business To Business
<b>B2C</b>	business To Consumer
<b>SAAS</b>	Software As A Service
<b>PAAS</b>	Platform As A Service
<b>IAAS</b>	Infrastructure As A Service
<b>SOA</b>	Service Oriented Architecture
<b>IT</b>	Information Systems

# General introduction

This part contains the general introduction of our dissertation which have an overview, motivation, and Organization of the dissertation

## Overview

Today, and with the growth of industries business and with the complication and the interconnection of tasks has become, the need of sharing pieces of information and automate tasks to accelerate the workflow of business has become a vital thing to achieve for gaining the best profit and to meet the competition, so with the growth of technologies and communication technologies over time ERP software becomes a flexible solution for different industries and changed the way people work.

## Motivation

ERP systems have been involved in different industries and become an essential piece in the field of corporate and business management, Which leads these systems to involve dozens of technologies and architectures so that is what attracted me to these systems is my passion to learn different architectures and paradigms.

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An ERP system is a group of tightly interfaced modules that act in cascading layers to facilitate business processes, And the development of a custom application means taking into consideration exactly the specific needs of the customer and mapping its workflow and providing the maximum ease of use, Because of our desire of involved in the workflow of understanding and designing a solution for a specific client we have proposed a program that can do that.

SAOUDI omar

## **Problem statement**

Managing street vendors work and its valuable data is a critical thing to avoid the information lost and the manipulating, and auditing this huge data and extracting insight about the bills or each staff or statistics is a quite stressful task.

## **Organization of dissertation**

We start our dissertation with a General Introduction that contains an overview and motivations as well as the general structure of our dissertation, In the second chapter we provide two topics that help the reader to understand and take an overview of the domain and the field that we are going to work on it which is the enterprise resource planning (ERP) systems, then we take the third chapter to represent the company details that offer us the chance to implement our work in real word uses and solve a problem that faced this organization, the fourth chapter contains all details about design and implementation of our proposed solution,Finally the last chapter is a general conclusion and future work,

# 1

## Chapter One

In this chapter we will discuss ERP systems with their evolution history and the types of it from different perspectives with their effect on businesses, as well as the different architectures use to develop these ERP systems.

## 1.1 Enterprise resource planning (ERP) definition

Enterprise resource planning refers to a type of software that organizations use to manage day-to-day business activities such as accounting, procurement, project management, risk management, compliance, supply chain operations, and much more.

ERP systems tie together a multitude of business processes and enable the flow of data between them by collecting an organizations shared data from multiple sources, ERP systems eliminate data duplication and provide data integrity with a single source of truth. Today, ERP systems are critical for managing thousands of businesses of all sizes and in all industries. To these companies, ERP is as indispensable as the electricity that keeps the lights on. [47]

Figure 1.1: Illustration shows ERP application in real world

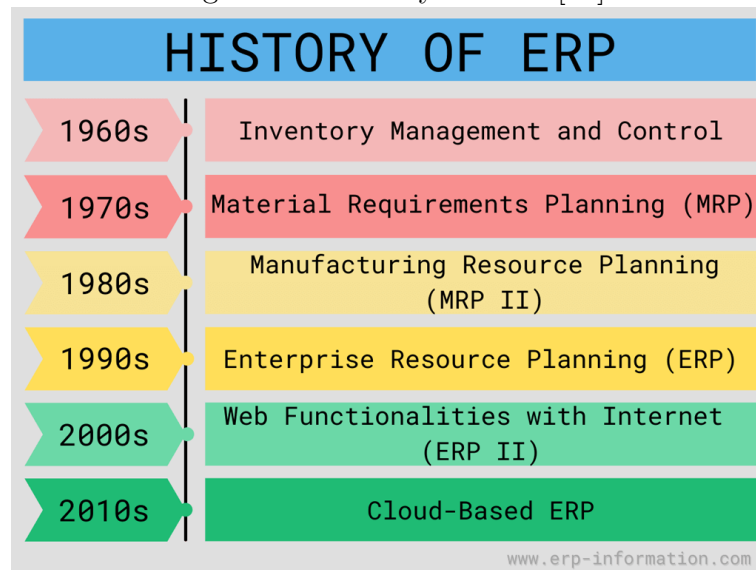


## 1.2 History of ERP

The history of ERP systems date back to the 1960s is closely tied to the stunning development of computer hardware that characterized much of the tech space in the latter half of the 20th century, Each decade has seemingly brought its own new permutation of ERP software alongside the latest developments.

However, they have only become understood in their current form in the past few decades, And the term 'ERP' was not coined until 1990 as seen in Figure 1.2, and has had several variations on that classification in the intervening years, which we will list it in this part. [52]

Figure 1.2: History of ERP [32]



### 1.2.1 Inventory control systems

These systems emerged in the 1960s and were usually organizations developed internally and used their own centralized computing systems that automated inventory and rarely went beyond tracking the presence or lack of final products against monthly or quarterly production quotas.

### 1.2.2 MRP software

Materials Requirements Planning software emerged from a collaboration between IBM and a manufacturer of tractors and construction machinery: J.I Case. By applying computational machines to the day-to-day operations of their business, the manufacturers found they were able to meet and even surpass the markets increasing needs to achieve a greater level of coordination between manufacturing products, procuring raw materials, and the delivery of goods to and from their factories, The software achieved this by automating the scheduling of operations and procurement.

The limits of computational technology were also keenly felt by many organizations in the 1970s; the hardware needed to run a complex program like MRP software could often require entire rooms in order to access the same processing power we can access in our smartphones today.

### 1.2.3 MRP II

The 1980s saw several advances in technology, including the invention of the CD and launch of Nintendo's Game Boy. For production software, it saw the development of Manufacturing Resource Planning (MRP II) systems, this software had an emphasis on

the optimization of manufacturing processes through the integration of raw material requirements and production schedules.

These systems included the functionality of old MRP systems, but began to integrate overarching coordination between the different departments responsible for the creation of the organization's end product

#### **1.2.4 ERP**

It was not until the 1990s that we first saw proper ERP software entering the arena, This saw the full integration of entire business across one single database, ERP systems are defined by how they build a database that acts as the single 'source of truth' for production-based businesses.

The advancement this software shows over MRP systems is in the integration of seemingly disparate departments, such as marketing, finance, and Human Resource (HR) into one digital ecosystem.

#### **1.2.5 ERP II**

The release and subsequent widespread adoption of ERP systems saw many of the software respective vendors develop even more functions beyond the core front-to-back integration.

These add-ons or 'apps' created the idea of extended ERPs which could tackle a wide variety of different business issues such as incorporating consumer interactions into the core dataset customer relationship management through integration with customer relationship management (CRM) systems, At this point, it might seem like ERP systems had simply grown to be far bigger than was reasonable. However, the truth is that each subsequent add-on to the base software in fact served to increase the predictive power of the program. The more sources of data an ERP system has at its disposal through external programs such as a CRM the better users are able to react to changes in demand or new trends in their industry.

This is what characterized ERP II an integration with other efficient business software solutions that allows the otherwise slow and ponderous machinery of large businesses to instead strike like lightning when an otherwise unattainable opportunity presents itself.

#### **1.2.6 ERP and the cloud**

Due to the staggering advances made in the internet ERP becomes able to be delivered remotely over the internet, because of that many organizations adopting ERP remotely

This has vastly lowered the barrier to entry for many businesses and has been increasingly responsible for the proliferation of ERP software amongst mid-market organizations.

## **1.3 Types of ERP systems**

ERP system is a massive software and there are dozens of different ERP systems that are designed for a variety of specialized companies, categorizing these systems can be based on different factors and different perspectives, in this section, we will take look at types of ERP systems based on the most vital factors out there.

### **1.3.1 Types of ERP based on the size of business**

The distinction between full ERP vs. industry-specific ERP comes down to whether the system is designed for a variety of industries or is specialized to just one or two. So we will categorize ERP systems based on the size of the business they target. We use the terms Tier I, Tier II, and Tier III to differentiate between systems based on the revenue and complexity of the companies they are targeting. [\[48\]](#)

#### **1.3.1.1 Tier I**

These systems are designed for large corporations with more than \$750 million in annual revenue. Most enterprises of this size are complex, either due to complex business processes or complexity in their entity structure and consolidation needs. Tier I applications address multiple industries and scalability.

#### **1.3.1.2 Upper tier II**

These systems typically serve small to midsized companies with \$250 million to \$750 million in annual revenue. Companies of this size may encompass multiple industries and multiple business units.

#### **1.3.1.3 Lower tier II**

These systems typically serve small to midsized companies with \$10 million to \$250 million in annual revenue. These companies usually represent only one industry and have a single entity to manage.

#### **1.3.1.4 Tier III**

There are hundreds of software providers in this tier serving mostly small businesses. However, there are also some very robust point solutions with niche functionality that are often used to supplement a larger ERP system.

### **1.3.2 Types of ERP based on industry specification**

Different industries demand different types of ERP software. The specification of ERP software varies in different industries. For example, a manufacturing business needs a different type of ERP software and a service-based business needs another type of ERP software. These specifications vary as the nature of the business changes. [30]

#### **1.3.2.1 Manufacturing business**

The manufacturing business is the most complex business model. It requires a lot of processes running at once. From procurement of raw material to production, from production to packaging. Other than that, sales, marketing, finance, and human resource management are commonly active departments. All the processes are managed at once. Moreover, an increase in the size of the manufacturing business increases the complexity of business management.

#### **1.3.2.2 Distribution businesses**

A second common business type is the distribution business. This business type requires strong connectivity between all its units, to make sure that the business is running seamlessly. With hundreds of thousands of vehicles, tens of loading and unloading points, hundreds of clients, and thousands of employees and contractors, the distribution industry is a difficult business to manage. ERP software providers develop some advanced features specially designed to manage distribution businesses. Moreover, the data collection and communication modules are upgraded to avoid any distress in the business process.

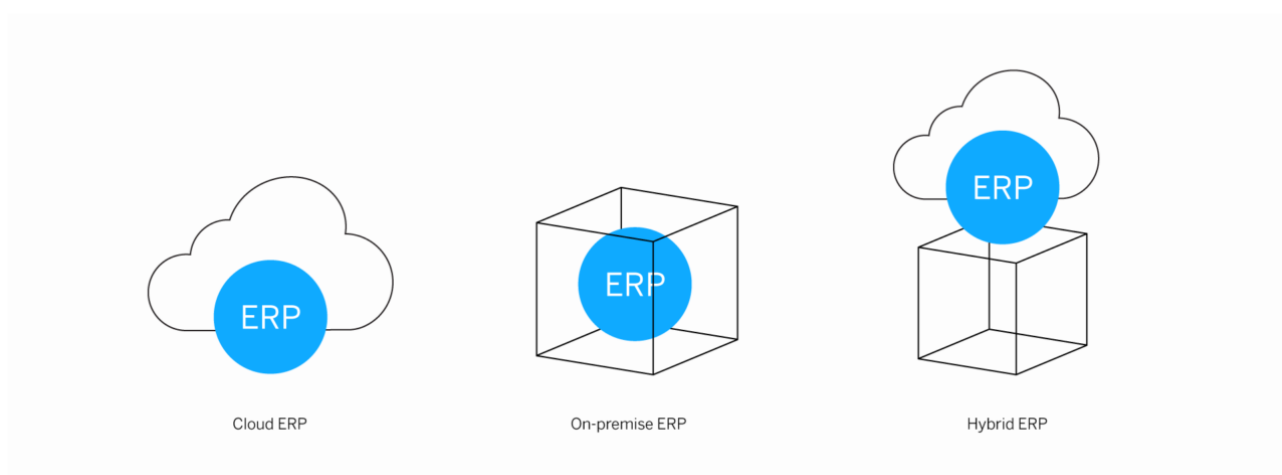
#### **1.3.2.3 Servicing business**

Servicing business is a rapidly expanding industry. With the increase in the size of the industry the complexity of the business process increases. Problems related to business management arise because the servicing business industry includes thousands of people and clients. Management is always a concern for businesses and when the business includes different resources the complexity of business management increases. To manage the business resources business started to use ERP software. ERP software enhances the productivity of the business process and helps organizations to manage their resources efficiently. Other than that, ERP software for servicing businesses has included advanced performance evaluation tools and data analytical modules that can help decision-makers in better decision-making.

### 1.3.3 Types of ERP based on deployment techniques

When it comes to actually use software, the way in which it is deployed has become an increasingly relevant factor when it comes to selecting the right piece of software, there are three deployment options as seen in Figure 1.3 that can be tailored to best fit your business needs. [53]

Figure 1.3: ERP deployment techniques



#### 1.3.3.1 On-premise ERP

On-premise systems refer to the 'traditional' style of software deployment, where the program is manually installed on the local computers and servers owned and operated by the company itself. You might want to consider an on-premise ERP system if

- You want to avoid needless software spend over a long period of time and are looking to buy a solution outright.
- Your organization already has a built-out and well-trained IT team that can assist with the maintenance of an ERP system.
- You work in the industry of manufacturing, healthcare, ore construction and have need of a system to help you manage your specific records and ensure data security.
- You work in the industry of manufacturing, healthcare, ore construction and have need of a system to help you manage your specific records and ensure data security.

Some disadvantages of on-premise ERP systems include

- An extremely high up-front cost that can limit its accessibility to all but the largest of organizations.

- Difficult implementation due to the requirement of furnishing the appropriate hardware, training your team in how to use it.

### **1.3.3.2 Cloud ERP**

With the increasing development of the Internet of Things (IoT), the ability to transfer increasingly complex software solutions over the web has never been greater. Unlike on-premise ERP systems, cloud ERP is much cheaper upfront. However, these software solutions are usually delivered as part of an ongoing monthly subscription service. These fees pay for continued access to the software while also funding continuous development from the software vendor in the realm of security and new features. You might want to consider a Cloud ERP system if

- You do not have a high amount of flexible capital to invest in an on-premise system and the surrounding supportive infrastructure.
- There is not a dedicated, on-sight IT team for your organization that can help roll-out updates and keep your data secure.
- You need to access the data in your ERP system on the go.
- You have a smaller business.
- You want to stay on the cutting edge of the software solutions for your industry.

Some disadvantages of Cloud ERP systems include

- Over a long enough period of time, you will probably end up spending more on your cloud ERP system than you might have otherwise done if you had bought an on-premise system outright.
- A lack of control over the applications you have access to. Once you choose a vendor, you are stuck with their specialty, so make sure you choose one that is well respected for your industry and organization type.
- While cloud ERP vendors remain competitive by offering strong security for their client's data, they might not quite be up to your standards, especially if you work with highly sensitive information.

### **1.3.3.3 Hybrid ERP**

Some businesses need extremely specialized systems and have to mix and match the various benefits given by on-premise and cloud solutions. The general way this works is by having companies operate business-critical modules and features with specific technical applications on-premise while gaining the added advantage of cutting-edge solutions from cloud-based vendors. These solutions offer what is known as a "two-tier" approach wherein

the backbone of the system (financials and accounting) are hosted on sight and other modules are delivered remotely based on departmental needs. That way, everyone has access to the same overall database, but there is less of a need for each department to have access to the full suite of your systems' capabilities. You might want to consider a Hybrid ERP system if

- Your organization is already using a legacy in-house system or you are already using an on-premise ERP.
- Your business requires integration with web-based services.
- You need flexibility and control over core processes but want up-to-date industry-specific modules.
- You want the benefits of an on-premise ERP system without having to build out the entire IT infrastructure that comes along with it.

Some disadvantages of Hybrid ERP systems include

- The complexity of hybrid systems can make them difficult to manage. While you do not need a full IT infrastructure as you might for an on-premise system, you still need to have a dedicated core of people able to manage and operate the aspects of the software you are hosting.
- A lack of technical specialization makes hybrid ERP systems less efficient than their more focused counterparts. It never affords quite as much control and flexibility as an on-premise system, while also lacking the true flexibility and ease of use that comes with cloud ERP.
- One of the problems that hybrid ERPs can cause is data siloing. While this can be avoided with the proper time and management, it is possible for the different modules used by separate departments to lead to a bottleneck of information or data that should be easily accessible to the entire organization.

## **1.4 Impact of ERP on business**

Using ERP software have a huge impact on business that can lead the business to make more profitable or make it loosing the cash, in this section we will represent the benefits and disadvantages of using ERP software.

### **1.4.1 Benefits of using ERP**

Taking ERP software for business have a lot of benefits. in this part, we will take look at 15 of the most common benefits of enterprise resource planning systems that companies have

reported after implementation. [54]

- **Improved process efficiency** : An ERP platform eliminates repetitive processes and greatly reduces the need to manually enter information, which eliminates the possibility of inaccurate data which could lead to making costly business mistakes.
- **Accurate forecasting** : An ERP software provide the tools to create more accurate forecasts. This helps businesses to properly plan what they need from inventory and sales down to financials and customer service. With stronger forecasting, businesses can effectively decrease business costs, which saves money as well as become a more overall proactive unit.
- **Department collaboration** : Business projects often involve more than just one department, with ERP system the data of every aspect of a business is centralized and consistent, which encourage collaborating and sharing information.
- **Integrated information** : ERP system save all information of business and departments in one single location, Which keep data consistent, accurate, and unique. There is no need to worry about whether the information that you are using from the system is accurate since it is updated in real-time across the board. This improves your data accuracy, which eliminates making business mistakes with false data and analytics.
- **Cost savings** : ERP software reduces administrative and operations costs, which allows utilizing money in other much needed areas. It allows manufacturers to proactively manage operations, and prevents disruptions and delays.
- **Mobility** : The adaptability of ERP software in different platforms and devices is crucial, to provide users the access to a centralized database from anywhere they work and from different devices including their laptop, tablet, or cell phone to make information accessible no matter where you are.
- **Regulatory compliance** : Powerful ERP platforms are designed to keep track of regulations within the industry and monitor changes in compliance. This allows users, and businesses at large, to stay abreast with laws, regulations, guidelines and specifications as it relates to business processes.
- **Flexible systems** : Modern ERP software platforms are not a one-size-fits-all proposition but can be tailored to the unique needs of a business. and can adapt to the ever-changing needs of a growing business.

## 1.4.2 Disadvantages of using ERP

ERP with its benefits they have disadvantages too and that depends on the ERP software that you choose for your business. Lets look at the most common disadvantages of ERP that companies have reported after implementation. [54]

- **Cost of ERP** : Taking ERP system can be too expensive, there are multiple fees that are applied, which can lead to higher costs. From licenses to upfront cost, implementation and recurring potential monthly fees.
- **Software experience** : Taking ERP system without training process can put your entire workforce in a vulnerable position. Not knowing exactly how the software works means there is a greater risk of making costly mistakes and spending long lengths of time trying to make the software work for you.

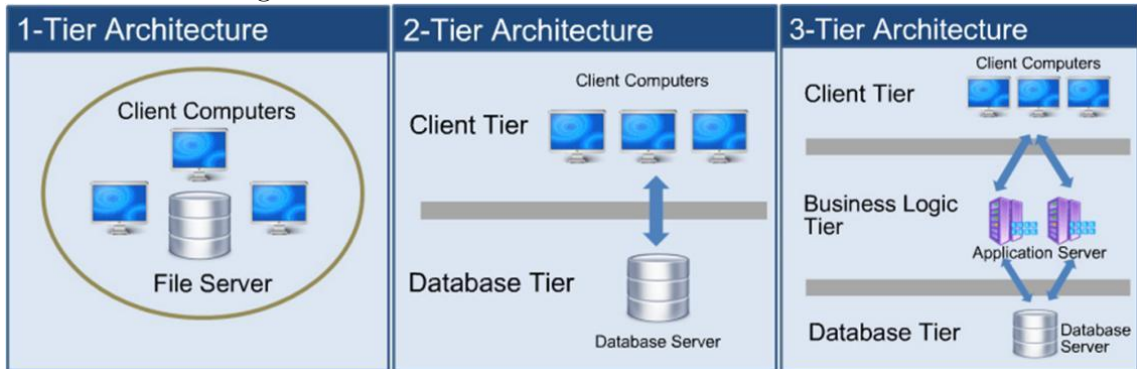
## 1.5 ERP different architecture

The architecture of the ERP system plays a major role to determine its success and durability for the institute. Today there are four major known architectures for the EPR systems which are. [34]

### 1.5.1 Client-Server architecture

Client-Server Architecture has a three-tier Architecture, It is composed of three layers Presentation, Application, and Database layer. The Figure 1.4 shows a comparison of one, two, and three-tier architectures. As can be seen in the three-tier architecture the client is no longer directly communicating with the database, as a layer responsible for carrying out the business logic is introduced. In this architecture, the presentation layer is only responsible for browsing the data and providing a user-friendly interface, which allows the user to have less powerful machines. However, the application layer is where the data get retrieved and transferred to the database servers in the database layer. The application layer is also where the logic and the business rules are implemented.

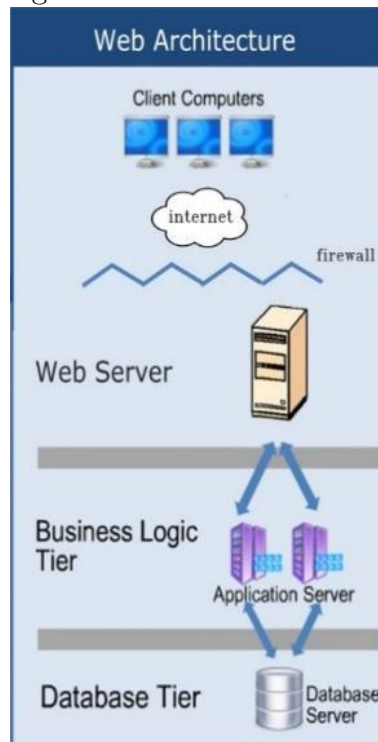
Figure 1.4: Client-Server different tier architecture



### 1.5.2 Web architecture

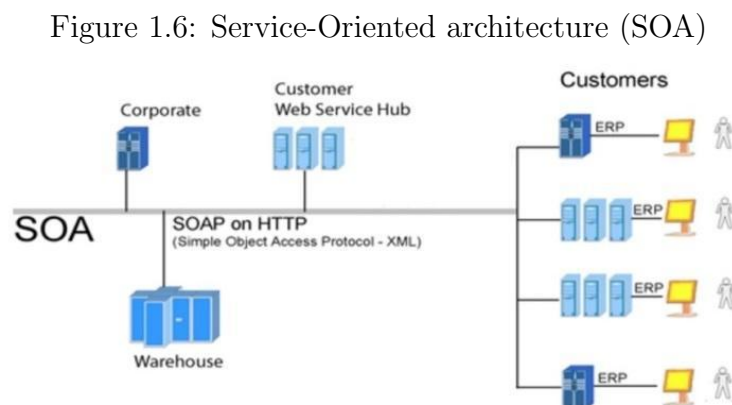
The main goal is to allow remote users to access the ERP system. The web architecture has application and database layers same as the three-tier architecture. However, the presentation layer is split into two parts, the web services and web browser to support the mobility of the devices through the internet. Many institutes do not build their ERP as a web-based architecture as accessibility outside the organization may not be a requirement at first. But with the growth of the institute, remote access becomes a necessity, in which a web-enabled architecture is a solution. A web-enabled architecture is an architecture that was not originally web-based but with additional new demands, modifications are made to make it web-enabled. This will surely limit the remote functionalities and capabilities.

Figure 1.5: Web architecture



### 1.5.3 Service-Oriented architecture (SOA)

A service-oriented architecture is an approach used to create an architecture based upon the use of services, regardless of the networking methodologies used. With the growth of institutes the number of services it is required to deliver increase. With that a single system would not be able to keep up with the number of transactions. Therefore, a system for each service is launched. SOA allows organizations to customize and modify their ERP system easily. In addition to that SOA encourages reusing existing services. It is worth mentioning that communication across the different systems could be hard if regular interfaces are used, as they would be very expensive and intensive to develop, hence came the concept to standardize messages. In the IT landscape of an organization, extensible markup language or XML is a way to standardize messages communicated between systems. XML is a way of describing information or data and is shed electronically disallows sharing of information in a consistent manner to support a concept of SOA. With XML, service-oriented architecture becomes probable.



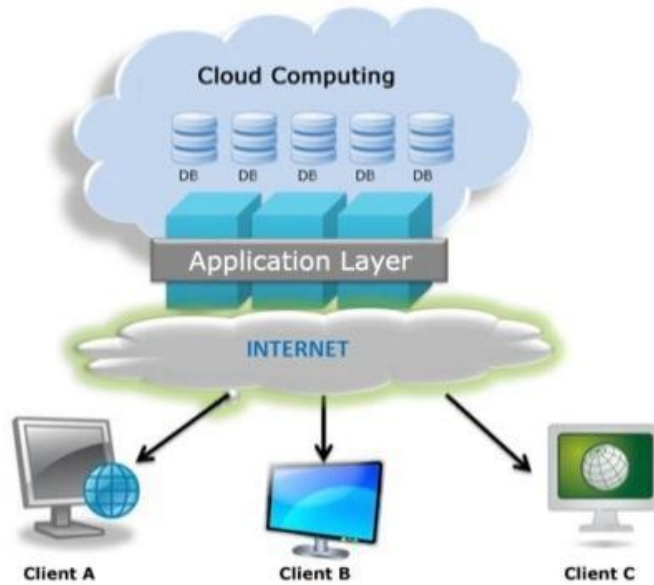
### 1.5.4 Cloud architecture

Cloud computing was defined by the National Institute of Science and Technology [40] as 'Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction'. [28]

Cloud computing is becoming increasingly popular whether a well-established institute is willing to trust a third body to store and manage all of its information is still the question. New technologies demand a new way of thinking and cloud computing is not the exception. As internet connections become faster and more reliable at least in the so called first world, the difference in access in terms of speed and conservation between local store and web-based data is decreasing considerably. As a result of access

reliability this new technology has risen and is making its way into the technological arena. Figure 1.7 below shows a basic abstraction of the cloud computing architecture.

Figure 1.7: Cloud architecture



Cloud computing systems can be described in terms of service models and deployment models. Service model are three types, Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS), and they describes types of services provided by the cloud service providers

<i>Type</i>	<i>Description</i>
SaaS	applications are hosted as a service and provided to users across the Internet, with no need to install and run on users' own computer
PaaS	development platform that allows cloud users to not only deploy but also design, model, develop and test applications directly on the cloud
IaaS	cloud consumers can directly use independent virtual machines that isolate the underlying physical hardware of the cloud from them.

Table 1.1: Cloud service types

Deployment models describe how people and organizations use different types of cloud services as shown in Table 1.2

<i>Type</i>	<i>Description</i>
Public Cloud	used by general cloud users and is fully managed by the cloud service providers
Private Cloud	cloud infrastructure belongs to and is operated by only one organization
Community Cloud	used and owned by several organizations that share the same mission, policy and security requirements
Hybrid Cloud	cloud infrastructure is a mixture of private and public clouds

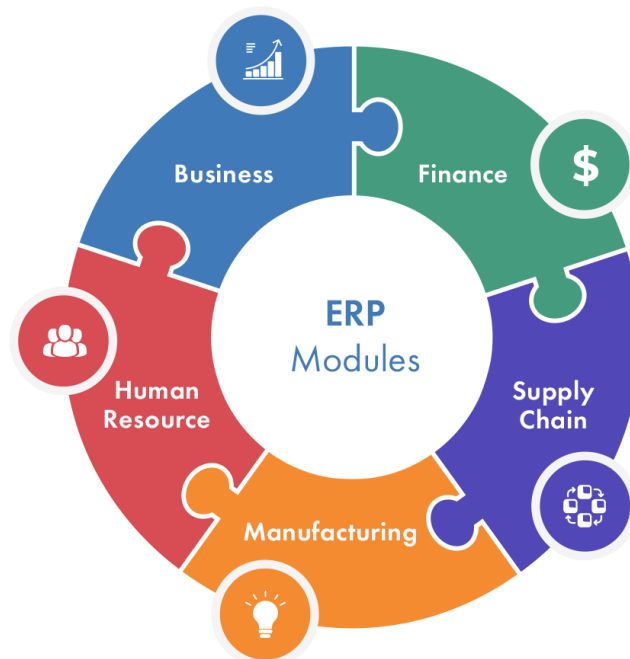
Table 1.2: Cloud deployment models

## 1.6 Different modules of ERP system

Enterprise Resource Planning (ERP) consists of various modules or components that are part of the overall system. An ERP module is a software component or part of the ERP software which has its own set of tools and serves its own unique purposes and functions that takes care of one area of business processes. The point of using modules in ERP system is to reduce the cost of implementing ERP system, so you do not need to purchase modules that do not need or do not fit your business, and eliminate human mistakes. As a result, by providing the specific functionalities for specific departments.

When implementing ERP software for business, it is important to consider the types of modules that your business will need and ensure that ERP provides them. in this part we will talk about the common modules that should be a part of ERP Software. [33]

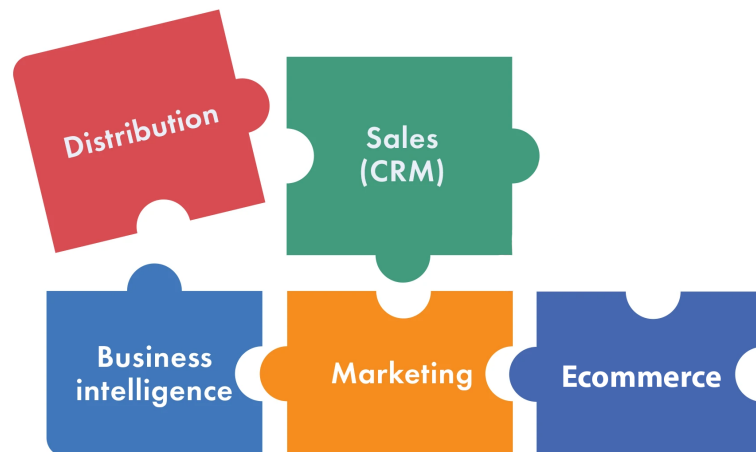
Figure 1.8: ERP modules



### 1.6.1 Business modules

Business modules in ERP help to improve the relationship between business prospects and customers, provide support and improve the customer experience.

Figure 1.9: ERP business modules



- **Customer relationship management module :** CRM module managing all your company relationships and interactions with customers and potential customers. The goal is simple: Improve business relationships to grow your business. A CRM system helps companies stay connected to customers, streamline processes, and improve profitability. [10]
- **Marketing module:** With this module Marketers can analyze, plan, execute and measure all marketing activities. by tracking and analysis of such data as customers engagement, achievement rates, promotion tactics, advertisement, etc. which let Marketers can analyze, plan, execute and measure all marketing activities. The tools and features of the marketing module, empowers marketers to acquire and develop long-term customer relationships. [36]
- **Distribution module :** ERP distribution module is firmly connected with the sales one. The data is being processed by unified performance to handle the inquiry, check the availability, transfer requirements from one department to another, create the necessary documentation, schedule the delivery, etc. In short, it is a connecting link between storage and shipping.
- **Business intelligence module :** With Business Intelligence (BI) module decision making becomes an easy exercise. to get a great competitive advantage Collecting the reports from other modular systems BI component is capable of forecasting. It touches

the business fields like cash flows, revenues, sales predictions, etc. Depending on its reports, the company is able to set some realistic expectations and work on successful service or product delivery. [37]

- **Ecommerce module** : Certain ERP vendors offer an ecommerce module for businesses that want to sell online. This module allows companies to quickly launch a business-to-business (B2B) or business-to-consumer (B2C) ecommerce website. Leading commerce applications include user-friendly tools that allow employees to easily add new items, update product content (item descriptions, titles, specs, images, etc.) and change the look and feel of the website. [39]

## 1.6.2 Finance modules

Finance modules are important ERP modules because it acts as the heartbeat of your business they enable companies to manage how money moves throughout a company and to understand their current financial situation and future prospects.

Figure 1.10: ERP finance modules



- **Accounting module** : ERP Accounting module is an app that collects data and drafts reports of accounting operations, receivables, cash flows, payables, etc. It provides your enterprise with the necessary tools to manage financial issues. There will be no mistakes in calculations and also complete transparency. You will be able to see your company's income and expenses. and it frees your employees from tons of paperwork. All your paperwork will become online reports and sheets that can be accessed by your employees. [2]
- **Purchasing module** : That module taking care the processes of identifying potential suppliers and negotiating the price. Awarding purchase orders to the supplier and

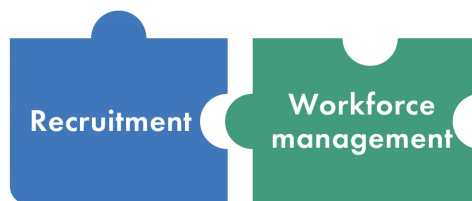
billing processes are also included.ERP procurement module is tightly integrated with the inventory control and production planning modules and is often combined with supply chain management software. [8]

- **Costing module** : Internal cost control is an inevitable business process since you need to keep track of material and operations. It requires exceptional document management on every transaction and its expenses. Therefore, the ERP costing module determines the market cost for products or services so as to make them profitable for your company.
- **Payroll module** : Receiving the data from Job costing, the payroll module can produce reports on salaries, reimbursements, travel expenses, benefits, etc. The latest should be sent to General Ledger for the next workflow stages. Furthermore, the ERP payroll module collects audit data by certain periods, tracks the duration of sick leave and vacations, deducts government taxes and reports them to the taxation authority.

### 1.6.3 Human resource modules

These modules tasks focus on automating, regulating and centralizing the data on each employee. It covers the period from application to retirement including details on recruitment, positions, promotions, assigned tasks, etc.

Figure 1.11: ERP human resource modules



- **Recruitment module** : The module functionality focuses on the efficiency and simplicity of recruiting processes. HRs obtain the possibility to post advertisements, support necessary documentation, track the talent pools including social platforms, automate the assessment process, analyze candidates profiles, schedule interviews, set up the onboarding process, etc.
- **Workforce management module** : It is a great way to streamline the management of human resources in your company. Those important ERP modules store such employees data as general information, working hours, attendance, sick leave, vacations, etc. However, it is not only about the storage but the overall

document management related to staff performance. Sharing this data with other ERP modules is inevitable for the work of the whole system. For example, the accounting department calculates the staff salary based on the reports sent from this component. HR analytics informs about necessary updates on the employees resources as well as conducts employees performance appraisals.

#### 1.6.4 Supply chain modules

Supply Chain modules, which helps companies manage the entire material flow from the manufacturer to the retailer and the end customer. Managing these moving parts is an essential business process that can be difficult to manage, which is why having a modules in place simplifies this process.

Figure 1.12: ERP supply chain modules



- **Ordering module** : If the company is interested in fulfilling orders without much delay and returns, it will draw special attention to proper order management. It requires precise and direct control of each ordering step. It is worth making an effort to meet the requirements and improve customer relationships. Both the company and customers can request real-time information on order processing.
- **Logistics module** : This involves process streamlining for supply, storage, delivery, goods redistribution, etc. The component organizes the logical grouping of clients in order to establish the most convenient supply line as well as generating the waybills. It helps to control the movements of goods both inside and outside the company.
- **Warehousing module** : The day to day operations of warehouses includes inventory preparation, order planning, and implementation. This component keeps track of real-time information about the order status including such details as receiving the

order, items in stock, production registration, delay alarms, etc. For example, the sales department automatically receives the reports from it to know exactly what products they can offer.

### 1.6.5 Manufacturing modules

The modules of this type conduct the control and deal with the improvement of the manufacturing performance. It covers all the stages from material procurement to production status.

Figure 1.13: ERP manufacturing modules



- **Inventory management module** : Since ERPs are commonly applied in the manufacturing industry that deals with loads of merchandise and raw materials, they will handle their storage and managing details. The inventory component optimizes the production and distribution planning processes. Moreover, the modules functionality sets the requirements for materials purchasing according to the needs of the enterprise and market demand.
- **Quality control module** : Any management takes control over the quality and its constant improvements. Tracking manufacturing activities ensures maximum productivity, reasonable expenses and helps to estimate the timelines properly. Timing and quality should always be carefully planned and handled in the most efficient ways.
- **Materials sourcing module** : This area might seem a challenging task, but it can be streamlined by the ERP material sourcing module. Today's market is limited by the increased regulations whereas the companies are bound to find effective ways to reduce time and costs. Therefore, the sourcing of the raw materials needs to be precisely

optimized. Proper sourcing management helps to avoid supply chain interruptions, control issues, and extra expenses. For example, the material management module in ERP stores the data about the cost of each raw material or supply whereas it is collected from the previous orders completed via the ordering component.

## 1.7 ERP applications based on industries

With the widespread digital acceptance, The development of the diparindent industries with his large volumes of data to be monitored maintained and analyzed becomes very difficult these makes the ERP systems expand to be implemented in diparindent industries, so what is the industries the most benefits from the ERP implementation. [35]

- ERP for manufacturing
- ERP for Financial services
- ERP for education
- ERP for healthcare
- ERP for retail
- ERP for construction
- ERP for goverment sector
- ERP for automotive industry
- ERP for food industry

## 1.8 ERP examples

There are dozens of ERP systems in the globe with different architectures in different industries, in this part we will take look at the most popular ERP systems in the globe. [50]

<i>ERP</i>	<i>Property</i>	<i>IsPaid</i>	<i>Deployment</i>
Oracle ERP [7]	Oracle	Paid	cloud
Dynamics 365 [3]	Microsoft	Paid	cloud, on-premise, hybrid
SAP Business One [9]	SAP	Paid	on-premise, cloud
infor m3 [4]	Infor	Paid	cloud
WorkWise [1]	aptean	Paid	on-premise, cloud
Odoo [6]	Open-Source	Paid	on-premise, cloud
ERPNext [5]	Open-Source	Free, Paid	cloud

Table 1.3: Table represent the most popular ERP systems

### 1.8.1 Odoo ERP system

Odoo ERP system is an open-source software developed in company called Odoo that achieve 7 million users and 3500+ partners with over 1700 employees. Odoo provide a range of easy to use business applications that form a complete suite of tools to accompany any business need with easy access to the software they need to run and expand their business.

Odoo have developed 30 main applications which are regularly upgraded. In addition, Odoo community of more than 1500 active members, have contributed another to 16000+ apps to cover a wide variety of business needs, the Figure 1.14 represent dashboards and app that Odoo ERP provides. [6]

Figure 1.14: Odoo ERP modules

The screenshot displays the Odoo Pricing interface. At the top, there are navigation links for 'Apps', 'Community', and 'Pricing', along with 'Sign In' and 'Try it free' buttons. The main heading is 'Odoo Pricing'. Below this, users are prompted to 'Choose the number of Users', with a selection for '1 Users' at a price of '\$8.00 USD / month' (with a note of '\$6.00 USD/user/month').

The 'Choose your Apps' section features a grid of 30 application modules, each with an icon, name, and price per month:

- CRM: \$8.00 USD / month
- Website: \$8.00 USD / month
- Accounting: \$8.00 USD / month
- Manufacturing: \$16.00 USD / month
- Email Marketing: \$4.00 USD / month
- Time Off: \$4.00 USD / month
- Subscriptions: \$8.00 USD / month
- Quality: \$4.00 USD / month
- Invoicing: \$4.00 USD / month
- eCommerce: \$4.00 USD / month
- Project: \$8.00 USD / month
- Purchase: \$4.00 USD / month
- Expenses: \$4.00 USD / month
- Recruitment: \$4.00 USD / month
- Sign: \$8.00 USD / month
- Studio: \$4.00 USD / month
- Sales: \$4.00 USD / month
- Point of Sale: \$8.00 USD / month
- Inventory: \$12.00 USD / month
- Timesheets: \$4.00 USD / month
- Events: \$4.00 USD / month
- Appraisals: \$4.00 USD / month
- Maintenance: \$8.00 USD / month
- Helpdesk: \$4.00 USD / month

On the right side, there is a pricing summary for the 'Monthly' plan:

- 1 Users: \$8.00 USD
- User Discount (1): -\$2.00 USD
- 0 Apps: \$0.00 USD
- Total / month (2): \$6.00 USD

Footnote (1): New customers get a discount on the initial number of users purchased. (\$6.00 USD instead of \$8.00 USD).  
Footnote (2): Billed annually: \$72.00 USD.

At the bottom right, there are two prominent buttons: 'TRY NOW' (with a '15-day Free Trial' subtext) and 'BUY NOW'. Below these buttons is a link to 'Send / Print the quote'.

## 1.8.2 Dynamics 365 ERP system

Dynamics 365 is a modular ERP system developed by Microsoft to easily connect Dynamics 365 applications with the systems and tools you already use to add and extend capabilities for your existing solutions. Dynamics 365 is a huge software expanded and provide the ability to handle multi Industries, the Figure 1.15 represent logo of Dynamics 365 ERP system. [3]

- Automotive
- Education
- Financial services
- Healthcare
- Manufacturing
- Media and entertainment
- Nonprofit
- Retail
- Telecommunications

Figure 1.15: Microsoft dynamics 365 ERP logo



# 2

## Chapter Two

In this Chapter we will take an overview on Group melouki with his activities and Hisba ERP system from different perspectives.

## 2.1 Representing group melouki

Group melouki is a group organized into 9 activities in Algeria, M'sila, They provide services in: Software, Pharmacy, Analysis, Logistics, Nutrition, and Beauty With over a 130 permanent employees and this group was started in 2006 by its managing director Dr.Melouki Ahmed Salim This group has a decentralized operating mode for each activity and autonomous, while working in synergic and progressing by sharing experience. [41]

Figure 2.1: Group melouki logo



### 2.1.1 Activities of group melouki

- **Melouki pharmacy** : starting in 2006. [16]

Figure 2.2: Melouki pharmacy logo



- **Melouki laboratory** : The year of 2012 is the year of creation of the Melouki laboratory. The laboratory is part of the group melouki, one of the largest medico-pharmaceutical group in Algeria. [42]

Figure 2.3: Melouki laboratory logo



- **TechnicLab** : It started 2013 is a laboratory equipment distribution company, offer a wide and varied range of quality.[51]

Figure 2.4: TechnicLab logo



- **MeloukiSante** : It started in 2014 and it is specializes in the import of medical equipment and laboratory equipment as a main activity. [43]

Figure 2.5: Melouki sante logo

**MELOUKÍ SANTÉ**

- **ParapharmStreet** : It started in 2015 and it is company of parapharmaceutical products and medical equipment that is always at the forefront of fashion by guaranteeing the new trends of products requested by all age categories. [49]

Figure 2.6: ParapharmStreet logo



- **M-Fantil** : It started in 2019 and it is specializes in the wholesale of baby products

Figure 2.7: M-Fantil logo



- **M-BioLogistix** : It is a company active in the field of transport of health products under controlled temperature, active since 2017 in the health sector. that offers total logistical support. [38]

Figure 2.8: M-BioLogistix logo



- **M-formatik** : Is started in 2018 it is an IT service provider company, aiming to produce IT products and services to bring productivity and efficiency in the performance of customer activities. [44]

Figure 2.9: M-formatik logo



- **Logistix** : started in 2018

Figure 2.10: Logistix logo



## 2.1.2 The organizational chart of melouki group

Figure 2.11: Melouki group organizational chart.

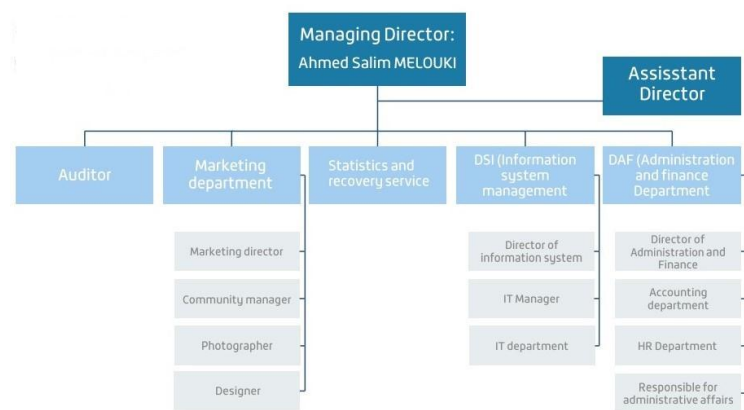


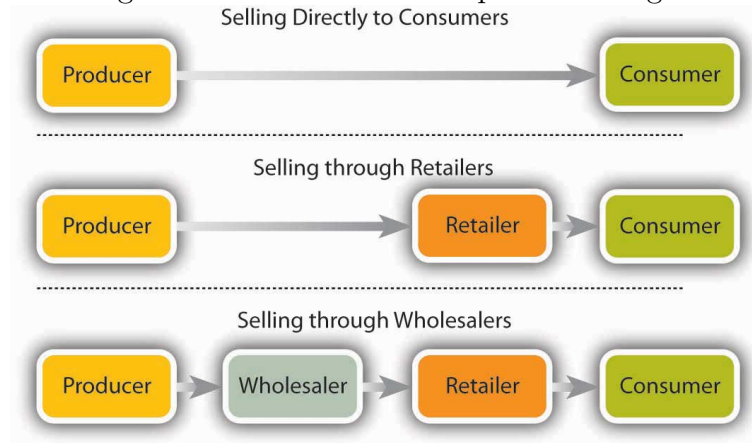
Figure 2.12: Melouki group organizational chart.



## 2.2 Activities of product distribution in melouki group

Melouki group consist of multi activities the most benefits come from who are related to the Product distribution of like M-Fantil, ParapharmStreet, Melouki Pharmacy, TechnicLab, These activities can be categorized into two categories selling through retailers and the second is selling through wholesalers as seen in the Figure 2.13.

Figure 2.13: Distribution of products stages  
Selling Directly to Consumers



## 2.2.1 Selling through retailers

Selling through retailers is the final and the crucial step in the products distribution to the final customer, in this section we will take look of what is retails and his types and how melouki group have a sell through retailers.

### 2.2.1.1 Retails definition

Retailing is the final step in distribution of merchandise [23], is the sale of goods or service from a business to a consumer for their own use. A retailer (also known as the merchant) is a person or business that you purchase goods from. Retailers typically do not manufacture their own items. They purchase goods from a manufacturer or a wholesaler and sell these goods to consumers in small quantities. [24]

### 2.2.1.2 Types of selling through retailers

There are three main types of selling through retailers which is [23]

- **Store retailers** : Is a place of business usually owned and operated by a retailer but sometimes owned and operated by a manufacturer or by someone other than a retailer in which merchandise is sold primarily to ultimate consumers. [17]
- **Non-store retailers** : Non-store retailing is a form of retailing in which a firm sells its products without a physical retail store/space. The firm sells its products via online platforms and delivers the product to customer's doorstep. Although companies have been doing non-store retailing for the past three or four decades, it rose to prominence during the 21st century. [15]

### 2.2.1.3 Selling through retailers in melouki group

Melouki Group Focuses on Retailing because it is a very profitable business and the most of the activities depend on it as Melouki Pharmacy, Melouki Laboratory, TechnicLab, ParapharmStreet, MFantil, Mformatik, and uses the two types of Retailing Store Retail and Non-Store Retail for instance, Melouki Pharmacy is the first Pharmacy in Algeria that provides online selling with the free delivery to the location of the customer. [16]

## 2.2.2 Selling through wholesalers

Selling through wholesalers is a main step in products distribution from producers, in this section we will take look of what is wholesales and his types and how melouki group have a sell through wholesalers.

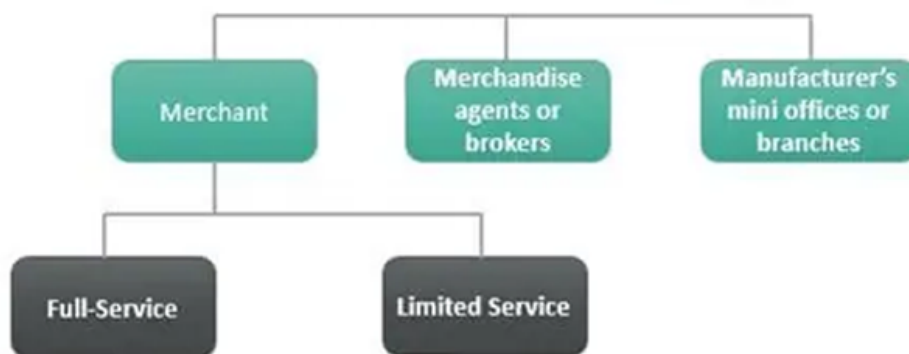
### 2.2.2.1 wholesales definition

Wholesaling involves purchasing goods in bulk from the manufacturer and then reselling them to the retailer for a profit. A wholesaler is an individual or business connecting the producer with the retailer and constituting an integral component of the supply chain. They can sell a single product, a wide range of products, or both. [27]

### 2.2.2.2 Types of selling through wholesalers

There are three main types of Selling through wholesalers as seen in Figure 2.14

Figure 2.14: Wholesaling types



- **Merchant** : The wholesaler buys vast quantities of products from the producer, takes ownership of them, stockpiles them, and sells them to anyone other than the consumer. They work independently and are mainly of two types:

- **Full-Service wholesalers** : They provide a wide range of services, from inventorying to delivering products to retailers. Furthermore, they assist with credit and management issues and provide complete customer support to retailers.
- **Limited-Service wholesalers** : These wholesalers store products in a small place, operate on a smaller scale, and provide fewer services to manufacturers, suppliers, and end-users.
- **Merchandise agents or brokers** : Merchandise agents are wholesalers who purchase products from various producers to resell them. They do not, however, take possession of the goods. Instead, they assist with their storage and display.

On the other hand, merchandise brokers act as a negotiation link between the manufacturer and the retailer. They profit from commissions earned on sales, as seen in insurance, stock, and real estate markets.

- **Mini offices and branches** : The manufacturer sets up a new branch or opens a mini-office to take part in the wholesale process. These branches or offices directly take purchase orders and sell items to retailers. They focus on inventory management, advertising, and sales, with a specific geographic region in mind.

### 2.2.2.3 Selling through wholesalers in melouki group

Some main Activities on Melouki Group stand on the Selling through wholesalers like MFantil, ParapharmStreet, these activities are categorized as Marchant Full-Service wholesales which provide services such as backhauls of the products and payments service as well as the Delivery.

## 2.3 Hisba ERP

Hisba is an ERP system [2.15](#) which is developed in M-formatik one of the companys in Group Melouki this project started in 2020 to handle and accelerate the workflow of the Group in first place and this project started because the unavailability of this kind of robust stable product in the local market.

Figure 2.15: Hisba ERP logo



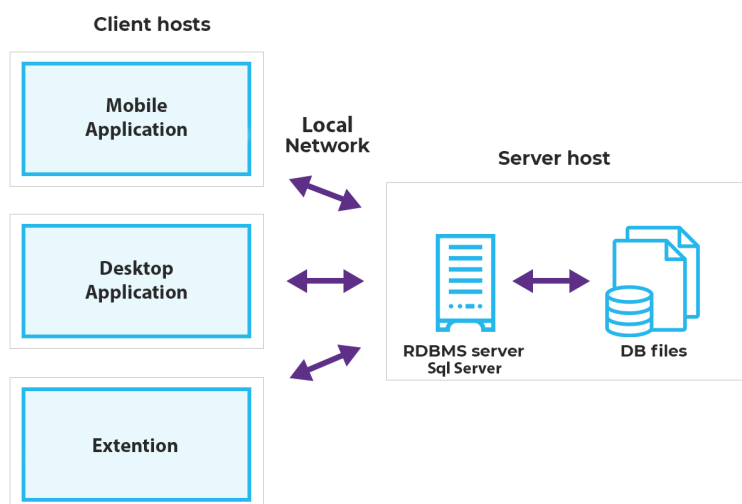
## 2.3.1 Hisba ERP architecture

Hisba ERP system have many applications in different platforms Web, Mobile, Desktop build with the latest technologies available in the market, in this section we will take view of the architecture and technologies used to build Hisba ERP from different prespectives.

### 2.3.1.1 Hisba database architecture

Hisba ERP system build with Client-Server architecture and deployed as On-Premise system, which means it deploped in local server using SQL-Server software as a Database-Managment-System as you can see in Figure 2.16.

Figure 2.16: Hisba architecture



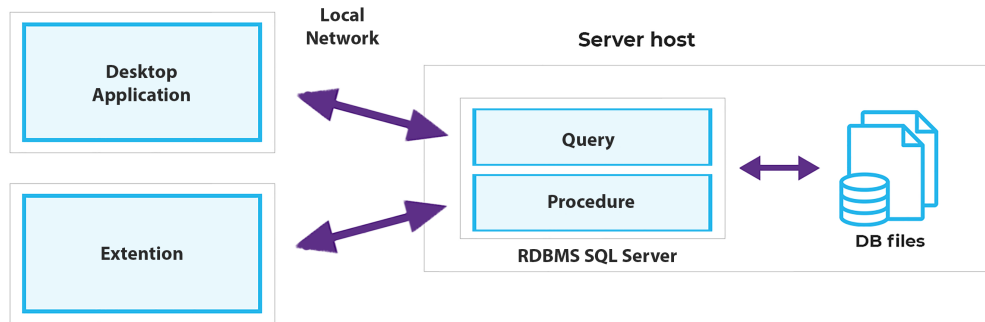
### 2.3.1.2 Hisba desktop applications architecture

Hisba ERP system have Two kind of desktop applications related to the same database.

- The first kind is the normal desktop applications that contain main function that can runs as separated application this kind is use query to communicate with Database.
- The second is the extensions that can not run in thier own but added to a normal Desktop application and runs in the process space of it to improve it, this kind of application use procedure to communicate with database to add another integrity layer to the database.

Hisba ERP system build using the framework WPF of the '.NET' platform [12], and uses the Framework DevExpress [31] for the frontend of all the desktop applications.

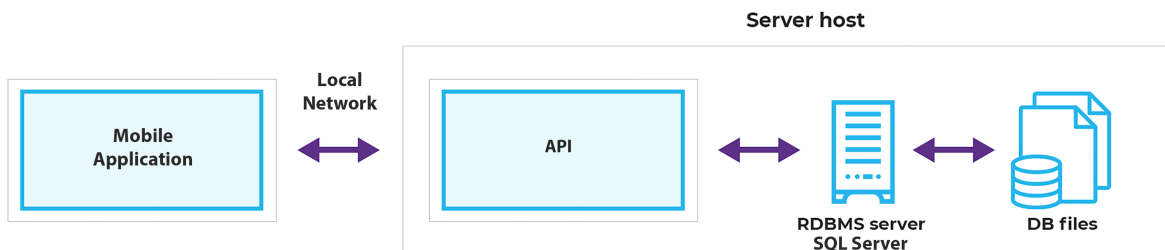
Figure 2.17: Hisba desktop architecture



### 2.3.1.3 Hisba mobile applications architecture

Hisba ERP system have different modules some modules have mobile applications to make the module flexible for users, this mobile application developed using flutter techenologie [13], the communication between the mobile application and server is imposible technically but it solved using api to mediate the communication between them and it developed using Node js technology [14].

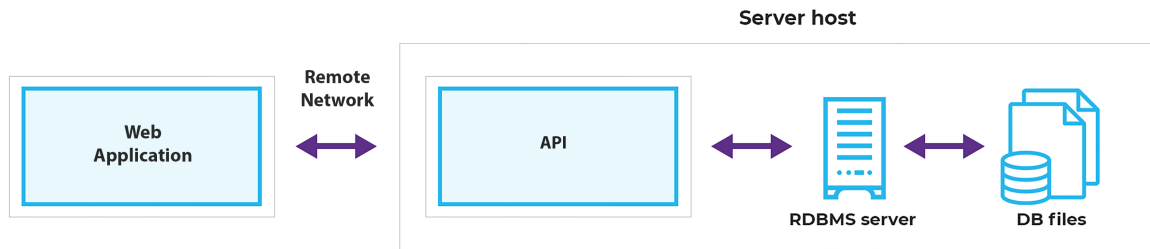
Figure 2.18: Hisba mobile architecture



### 2.3.1.4 Hisba web applications architecture

The Web applications is vital for any business now days that why Hisba ERP focus on it and use latest thechnologies as React, Boostrap, Nodejs .ect .

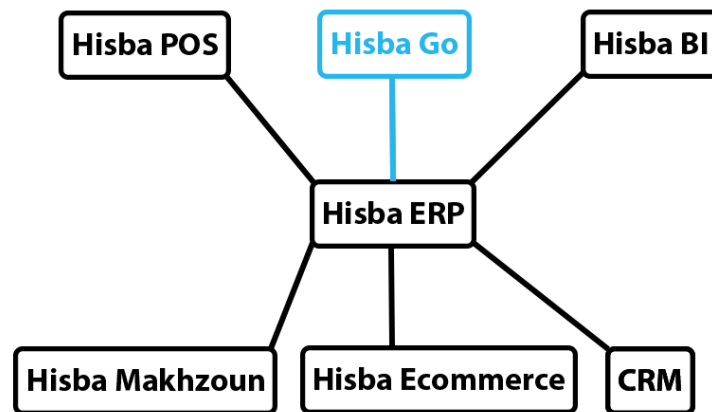
Figure 2.19: Hisba web architecture



## 2.3.2 Hisba modules

Hisba Erp is relatively new ERP system which is still under development and different modules is add to it over time, This ERP stands on four vital modules in every ERP system which is Melouki Group stands on it.

Figure 2.20: Hisba modules



### 2.3.2.1 Hisba Go

Hisba-Go is a distribution module consisting of desktop and mobile applications to provide the easiest experience for the distribution business, that desktop application is the module that we are going to develop it.

### 2.3.2.2 Hisba CRM

Hisba customer relationship management is build to managing relationships and interactions with customers, the Figure 2.21 and the Figure 2.22 provide some snapshots of Hisba CRM

Figure 2.21: Hisba CRM module snapshot 1

Wilaya de tiers	Région	Date	Montant HT	Montant Net HT	Montant Net TTC	Net à payer	Paiement	Reste à payer	Remise/ff	Remise	TVA totale	Marge	Dépôt	Mode	Catégorie	Catégorie B
Cum El Bouaghr		25/04/2022 08:38	32 558,68	32 558,68	38 744,83	38 744,83	0,00	38 744,83	0,00 %	0,00	6 186,15	5 426,47	Stock			
Djefla		25/04/2022 08:37	38 760,20	38 760,20	46 124,76	46 124,76	0,00	46 124,76	0,00 %	0,00	7 364,46	0,00	Stock			
M'Sila		24/04/2022 14:14	48 976,80	48 976,80	58 976,80	58 976,80	0,00	58 976,80	0,00 %	0,00	8 162,80	0,00	Stock			
M'Sila		24/04/2022 14:02	24 488,40	19 590,72	19 590,72	19 590,72	0,00	19 590,72	20,00 %	4 897,68	0,00	-818,28	Stock			
		24/04/2022 13:50	29 880,00	29 880,00	29 880,00	29 880,00	0,00	29 880,00	0,00 %	0,00	0,00	0,00	Stock			
		24/04/2022 13:26	138 703,00	138 703,00			0,00	138 703,00	0,00 %	0,00	0,00	0,00	Stock			
		24/04/2022 13:13	232 362,16	232 362,16			0,00	232 362,16	0,00 %	0,00	39 990,25	20 840,00	Stock			
El Bayadh		24/04/2022 12:56	158 702,62	158 702,62			0,00	158 702,62	0,00 %	0,00	29 241,50	25 813,12	Stock			
El Qued		24/04/2022 12:48	85 755,84	85 755,84			0,00	85 755,84	0,00 %	0,00	0,00	14 282,64	Stock			
M'Sila		24/04/2022 12:32	151 792,78	75 896,39			0,00	88 118,20	50,00 %	75 896,39	12 221,81	-50 441,74	Stock			
M'Sila		24/04/2022 12:32	24 488,40	24 488,40			0,00	24 488,40	0,00 %	0,00	0,00	4 081,40	Stock			
		21/04/2022 14:32	27 419,13	27 419,13			0,00	27 419,13	0,00 %	0,00	5 209,63	0,00	Stock			
		21/04/2022 12:30	220 845,90	220 845,90			0,00	220 845,90	0,00 %	0,00	0,00	0,00	Stock			
Bana		20/04/2022 15:02	24 488,40	24 488,40			0,00	24 488,40	0,00 %	0,00	0,00	4 081,40	Stock			
M'Sila		20/04/2022 11:40	24 488,40	24 488,40			0,00	24 488,40	0,00 %	0,00	0,00	4 081,40	Stock			
		20/04/2022 11:39	37 960,00	48 300,00			0,00	48 300,00	16,67 %	9 860,00	0,00	0,00	Stock			
Djefla		20/04/2022 11:35	55 500,32	55 500,32			0,00	55 500,32	0,00 %	0,00	15 548,96	0,00	Stock			
		20/04/2022 11:32	89 131,60	89 131,60			0,00	89 131,60	0,00 %	0,00	0,00	0,00	Stock			
		20/04/2022 11:32	20 799,62	20 799,62			0,00	20 799,62	0,00 %	0,00	3 951,93	0,00	Stock			
Biskra		20/04/2022 11:31	90 665,20	90 665,20			0,00	107 891,59	0,00 %	0,00	17 226,39	15 110,80	Stock			
Biskra		20/04/2022 11:29	2 100,00	2 100,00			0,00	2 499,00	0,00 %	0,00	399,00	350,00	Stock			
Djefla		20/04/2022 11:23	211 454,73	211 454,73			0,00	218 420,58	0,00 %	0,00	3 973,85	29 320,12	Stock			
M'Sila		20/04/2022 11:14	35 650,00	35 650,00	42 423,50	42 423,50	0,00	42 423,50	0,00 %	0,00	6 773,50	4 650,00	Stock			
Bordj Bou Arvendj		20/04/2022 11:14	35 650,00	35 650,00	42 423,50	42 423,50	0,00	42 423,50	0,00 %	0,00	6 773,50	4 650,00	Stock			
Bordj Bou Arvendj		20/04/2022 11:13	35 650,00	35 650,00	42 423,50	42 423,50	0,00	42 423,50	0,00 %	0,00	6 773,50	4 650,00	Stock			
Seef		19/04/2022 15:33	3 947,38	3 947,38	4 345,36	4 345,36	0,00	4 345,36	0,00 %	0,00	397,78	674,77	Stock			
Seef		19/04/2022 15:33	7 891,44	7 891,44	9 378,91	9 378,91	0,00	9 378,91	0,00 %	0,00	1 489,47	1 681,44	Stock			
Bana		19/04/2022 15:13	24 488,40	24 488,40	24 488,40	24 488,40	0,00	24 488,40	0,00 %	0,00	0,00	4 081,40	Stock			
Bana		18/04/2022 14:11	4 456,81	4 456,81	7 466,14	7 466,14	0,00	7 466,14	0,00 %	0,00	1 777,16	1 118,11	Stock			

Figure 2.22: Hisba CRM module snapshot 2

Qté	Qté réservée	Qté att...	Qté prime	Date expiration	Date fabrication	PMP	Prix d'achat HT	Marge	Prix de vente HT	TVA	Prix de vente TTC	PPA	Min prix de vente	Max prix de vente	LOG	Catégorie à barres	Vernouille	Hors inv
0	0	0	0	0	28/10/2022	140 000,00	140 000,00	10,71 %	155 000,00	0,00 %	155 000,00	0,00	0,00	0,00	0,00			
0	0	0	0	0	16/03/2022	20 118,84	20 118,84	20,00 %	24 142,73	0,00 %	24 142,73	0,00	0,00	0,00	0,00			
0	0	0	0	0	25/03/2022				24 142,73	0,00 %	24 142,73	0,00	0,00	0,00	0,00			
0	0	0	0	0	06/05/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
0	0	0	0	0	13/04/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
0	0	0	0	0	25/04/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
0	0	0	0	0	11/05/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
0	0	0	0	0	01/06/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
0	0	0	0	0	14/06/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
15	0	0	0	15	17/08/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
100	0	0	0	10	11/11/2022				3,34	0,00 %	3,34	0,00	0,00	0,00	0,00			
0	1	0	-1	01/03/2022					3,05	0,00 %	3,05	0,00	0,00	0,00	0,00			
0	0	0	0	0	01/01/2022				3,05	0,00 %	3,05	0,00	0,00	0,00	0,00			
0	2	2	-2	27/08/2022					3,05	0,00 %	3,05	0,00	0,00	0,00	0,00			
0	0	0	0	0	26/12/2021				3,58	0,00 %	3,58	0,00	0,00	0,00	0,00			
0	0	0	0	0	26/12/2021				3,58	0,00 %	3,58	0,00	0,00	0,00	0,00			
0	0	0	0	0	28/06/2022				3,58	0,00 %	3,58	0,00	0,00	0,00	0,00			
0	0	0	0	0	31/10/2022				3,00	0,00 %	3,00	0,00	0,00	0,00	0,00			
6	0	0	0	6	30/07/2023				3,00	0,00 %	3,00	0,00	0,00	0,00	0,00			
0	0	0	0	0	30/08/2023	220,00	220,00	20,00 %	264,00	0,00 %	264,00	0,00	0,00	0,00	0,00			
20	0	0	0	20	30/09/2023	220,00	220,00	20,00 %	264,00	0,00 %	264,00	0,00	0,00	0,00	0,00			
43	0	0	0	43	30/10/2023	220,00	220,00	20,00 %	264,00	0,00 %	264,00	0,00	0,00	0,00	0,00			
0	0	0	0	0	13/06/2022	15 952,73	15 952,73	10,00 %	17 548,00	0,00 %	17 548,00	0,00	0,00	0,00	0,00			
0	0	0	0	0	02/08/2022	15 952,73	15 952,73	10,00 %	17 548,00	0,00 %	17 548,00	0,00	0,00	0,00	0,00			
0	0	0	0	0	04/06/2022	16 038,78	16 038,78	10,00 %	17 548,00	0,00 %	17 548,00	0,00	0,00	0,00	0,00			

### 2.3.2.3 Hisba Makhzoun

Hisba Makhzoun is a Inventory module consist of two mobile application with the main desktop application, it takes care of warehouse storage management, the Figure 2.23 and the Figure 2.24 provide some snapshots of Hisba Makhzoun

Figure 2.23: Hisba makhzoun module snapshot 1

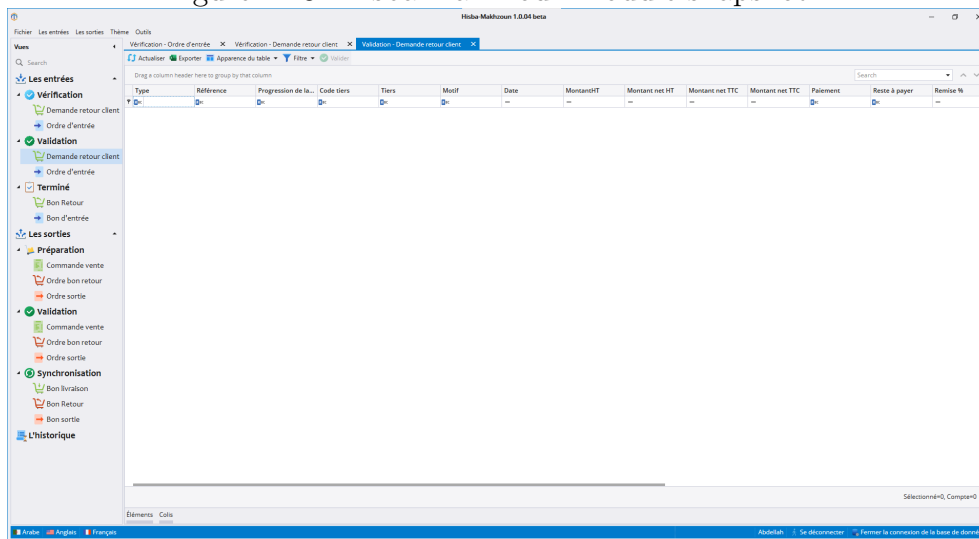
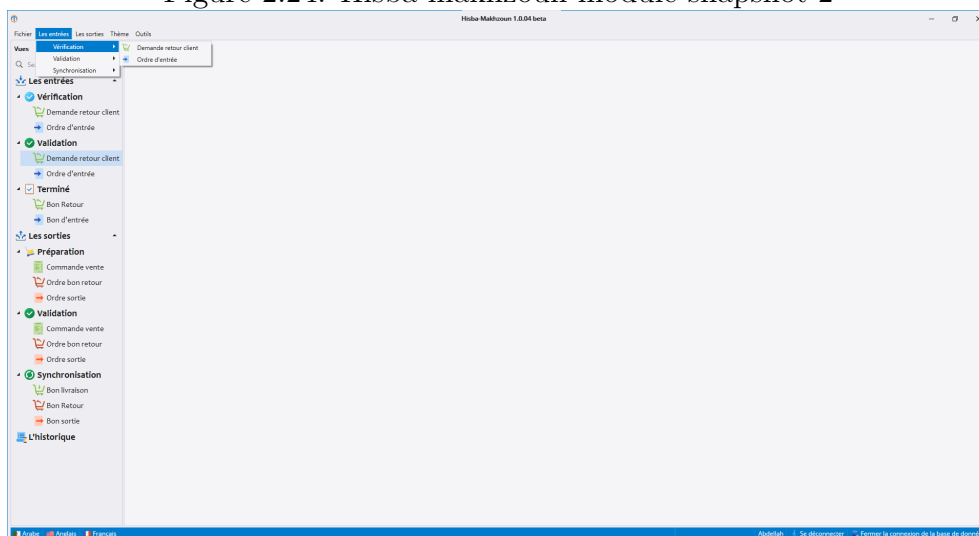


Figure 2.24: Hisba makhzoun module snapshot 2



### 2.3.2.4 Hisba Ecommerce

Hisba Ecommerce module consist of a mobile application and web application with the main desktop application, this module allow the corporation how are using Hisba ERP to quickly launch his ecommerce business with user-friendly tools and user-experience to attract costumers, and easily update the goods displayed to costumers from local database.

### 2.3.2.5 Hisba POS

Hisba Point-Of-Sale system is a desktop application build for physical store locations to improve Retailer work which is calculates the sum of the items a customer wants to buy, processes the payment, and modifies your inventory levels to reflect the sale, Is build specially for Melouki Pharmacy.

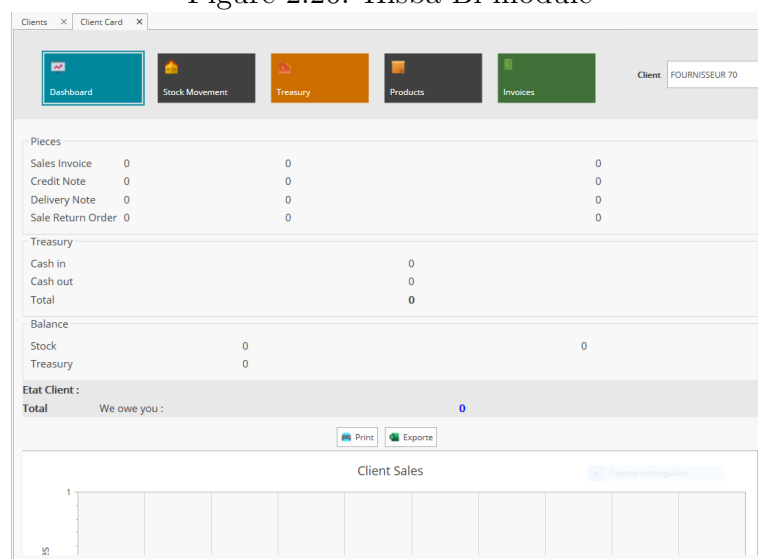
### 2.3.2.6 Hisba BI

Hisba Businesses Intelligent Module is build to extract hidden information to help decision making using data-mining, we provide some shots of Hisba Bi as you can see in Figure 2.25 and Figure 2.26

Figure 2.25: Hisba Bi module



Figure 2.26: Hisba Bi module



## **2.4 Distribution in Hisba ERP**

Hisba ERP manages distribution via a mobile application for street vendors which let them sell products directly from his car, at end of the day the vendor transfer all data of his work to Hisba ERP database and it shows in hisba as a normal sale without tracking the vendor or direct them to a specific group of clients.

# 3

## Chapter Three

This chapter contains a full view of the implementation of our product in the real world, which contains all information about the development and the design as well as the languages, frameworks, environments, and tools used to develop this product.

## 3.1 Implementation

In this part, we will present the conceptions of our work and the general structure of the environment which is an extension for desktop ERP applications, and we will show snapshots of the extension.

### 3.1.1 Objectives

This extension is developed to aim four objectives which is.

- Improve tracking and managing street vendors.
- Separate the section of managing the street vendors from the whole ERP, so that helps to improve and define the roles for who goes to use this ERP, and use permission.
- Accelerate the work of the street vendors manager by gathering all functionalities in one place.
- Implement a graphical map to provide a precise view of customers positions.

### 3.1.2 How to integrate extension in Hisba ERP

The extension build with 'Wpf user control Library' of WPF .NET project type, and tested with 'wpf' project, because 'Wpf user control Library' project is library type which means this project does not contains main function and can not run in their own, so to integrate this project in Hisba ERP follow these steps one by one.

- Compile 'Wpf user control Library' project with release mode to extract all dll files needed to integrate in the main Application
- Add all dll files to reference of the main Application, to be part of the main Application
- Finally display the views of the extension in the main Application by defining the position of each view and call it to be there

### 3.1.3 Map implementation

The map is a cutting edge feature in the Distribution module, from that reason we aim to implement the best map provider to produce a great experience using this feature.

#### 3.1.3.1 Map providers

In this section, we will represent the most famous map providers and see the pros and cons of each one of them.

- **Bing map** : Bing Maps has been around since 2005, just not as Bing Maps. The original product was a continuation of Microsoft 'MapPoint' a basic mapping program and TerraServer Microsoft collection of satellite images from the U.S. Geological Survey. The system is partially powered by HERE, which used to be called Navteq and was a Nokia property. It was sold to a collection of German car companies in 2015. Bing uses HERE for street data, pulling postal, imaging, and other data from a variety of third-party and proprietary sources. While Bing Maps leverages HERE, it does not offer some of the features that have made HERE a winner with enterprise customers (such as HERE's truck routing system). [11]

Some pros of Bing map

- Offers a birds-eye view, satellite imaging and directions..
- Support all .Net application.

Some cons of Bing map

- Does not update its map files very often.

- **Google map** : Google Maps is a Web-based service that has been around since 2005 [11] from the company of Google, it provides detailed information about geographical regions and sites around the world. In addition to conventional road maps, Google Maps offers aerial and satellite views of many places. In some cities, Google Maps offers street views comprising photographs taken from vehicles. [20]

Some pros of Google map

- People can add details about their business on the map.
- Offers street views comprising photographs taken from vehicles.
- Traffic conditions that represent the speed of vehicles on particular roads.
- In addition to conventional road maps, Google Maps offers aerial and satellite views.

Some cons of Google map

- Does not support desktop .Net application.

- **Open street map** : Is a free map provider. It was started in 2004 in the UK, out of the lack of availability of good map data that was free to use. The map is created and maintained by nearly 5 million registered users and more than 1 million map contributors in every country in the world, using free tools and software. The data is used by local people, volunteer groups, companies, governments, software developers and more. [22]

Some pros of Open street map

- The data is used by local people.
- Includes data about roads, buildings, addresses, shops and businesses, points of interest, railways, trails, transit, land use and natural features, and much more.

Some cons of Open street map

- Support desktop .Net application.

### 3.1.3.2 How integrate google map in WPF project

We found that Google map is the best provider that fits our needs for this extension, but we found it does not support WPF projects, for that reason we used some extra steps to implement it in our project which is.

- **Step one** : Build your map and its functionalities with javaScript and save it as a .html file.
- **Step two** : Add your .html file to the WPF project with the property 'Build Action' as a 'Content' to make sure that our file does not be compiled, However, make sure that our .html file exists in build files after compilation.
- **Step three** : Use 'InteropServices' object to mediate the comunion between C# and the JavaScript.
- **Step four** : Web Browser Control on windows is by default perpetually stuck in IE 7 rendering engine, Even though we are now up to IE 11. and that IE 7 rendering engine is not supported by google map javascript, for that reason we will change the registry FEATURE\_BROWSER\_EMULATION to make Web Browser Control on windows use IE 11 engine which is supported by google map javascript, we used the code below.

---

```

using (var rk = Registry.CurrentUser.OpenSubKey(@"SOFTWARE\Microsoft\
Internet Explorer\Main\FeatureControl\FEATURE_BROWSER_EMULATION", true))
{
    if (!uninstall)
    {
        dynamic value = rk.GetValue(exename);
        if (value == null)
            rk.SetValue(exename, (uint)11001, RegistryValueKind.DWord);
    }
    else
    {
        rk.DeleteValue(exename);
    }
}

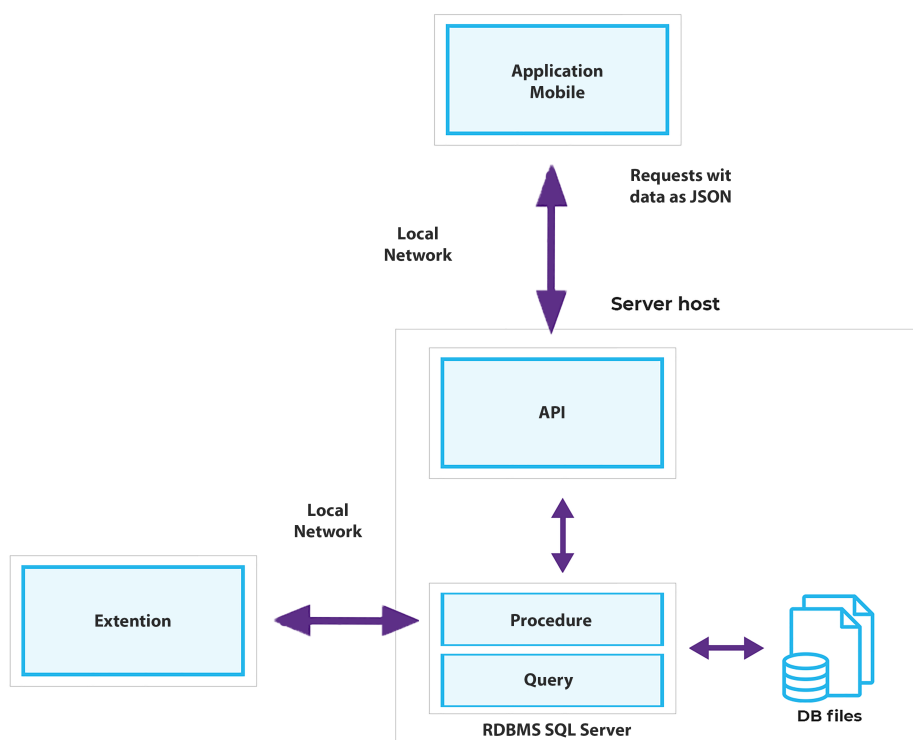
```

---

### 3.1.4 Global architecture

In this section, we will briefly describe the structure of our extension and how it interacts with ERP system that is used in, the Figure 3.1 provide an illustration to easily understand the structure of our extension that we developed.

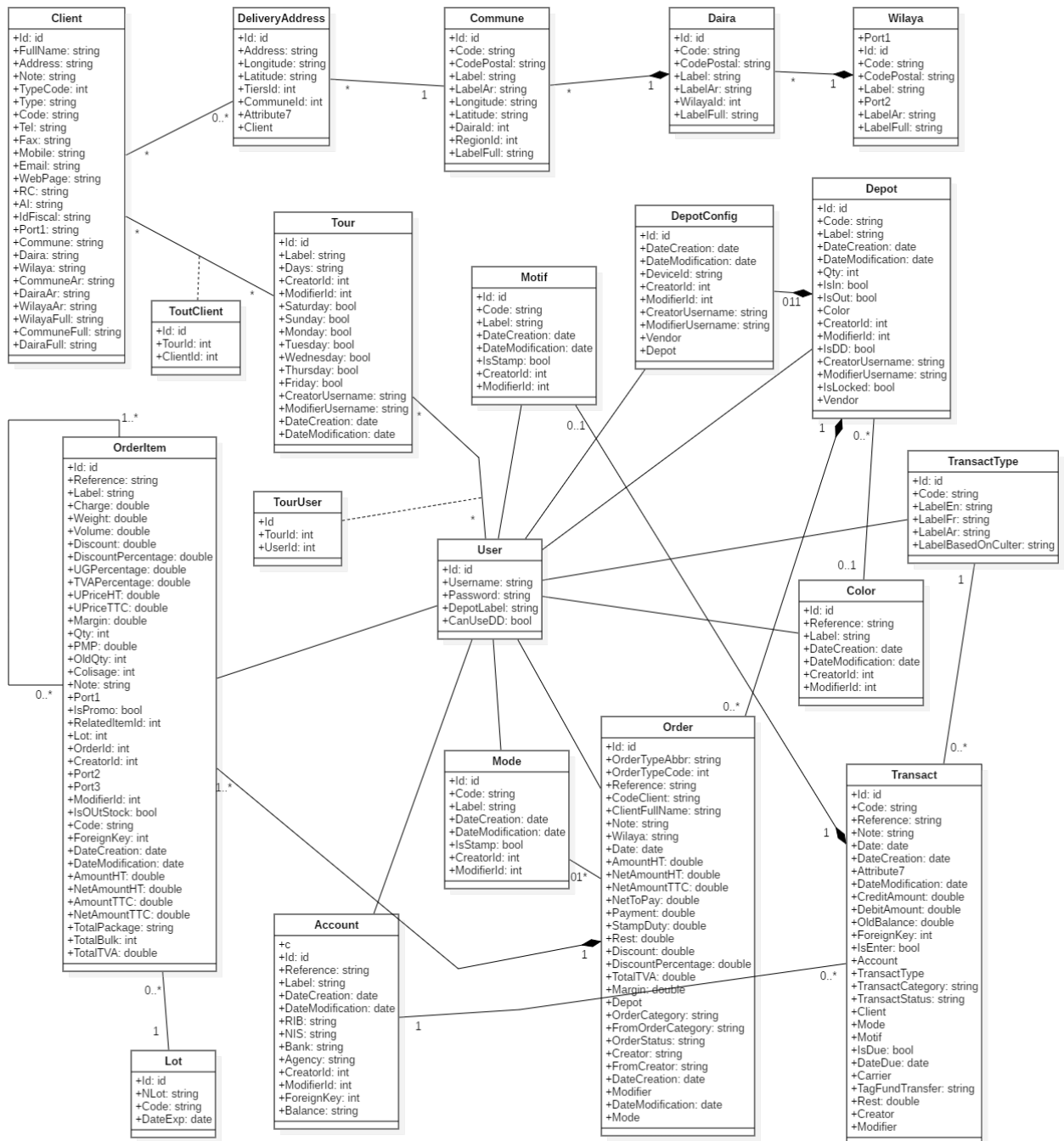
Figure 3.1: Global architecture of the system



## 3.2 Database architecture

In this section, we will use the class diagram of the Unified Modeling Language (UML) to represent how we structure the database of our system. as you can see in the Figure 3.2.

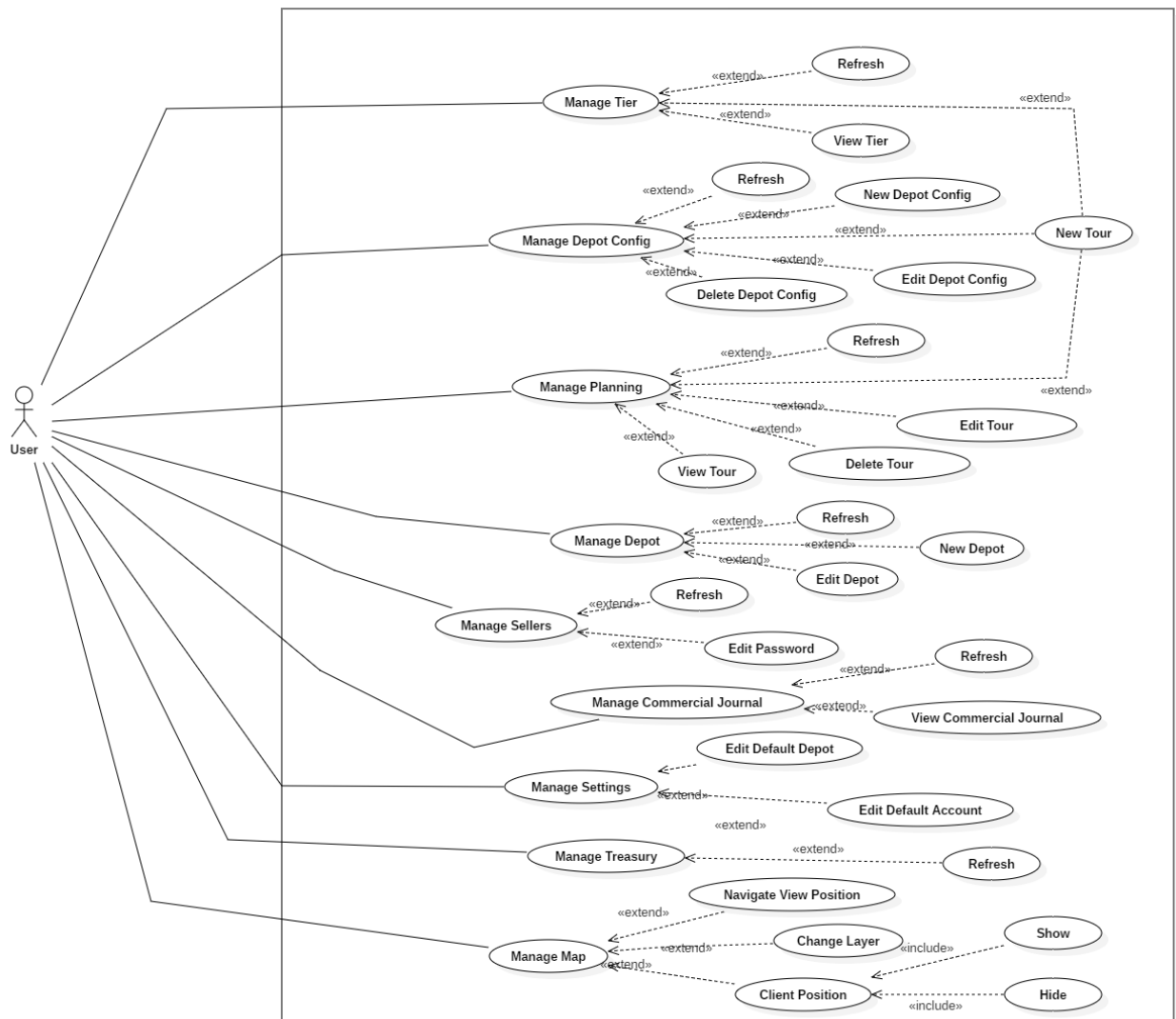
Figure 3.2: Class diagram



### 3.3 Tasks

In this section we will take a look at the tasks that users can do in our system using unified modeling language (UML) to represent it, starting with the global use-case diagram to provide a global overview of our system tasks as you can see in the Figure 3.3, then we will represent each task separately using activity and sequence diagram to provide more details and operations are performed about each task.

Figure 3.3: Globale usecase diagram



### 3.3.1 New depot config task

Figure 3.4: Sequence diagramme of new depot config task

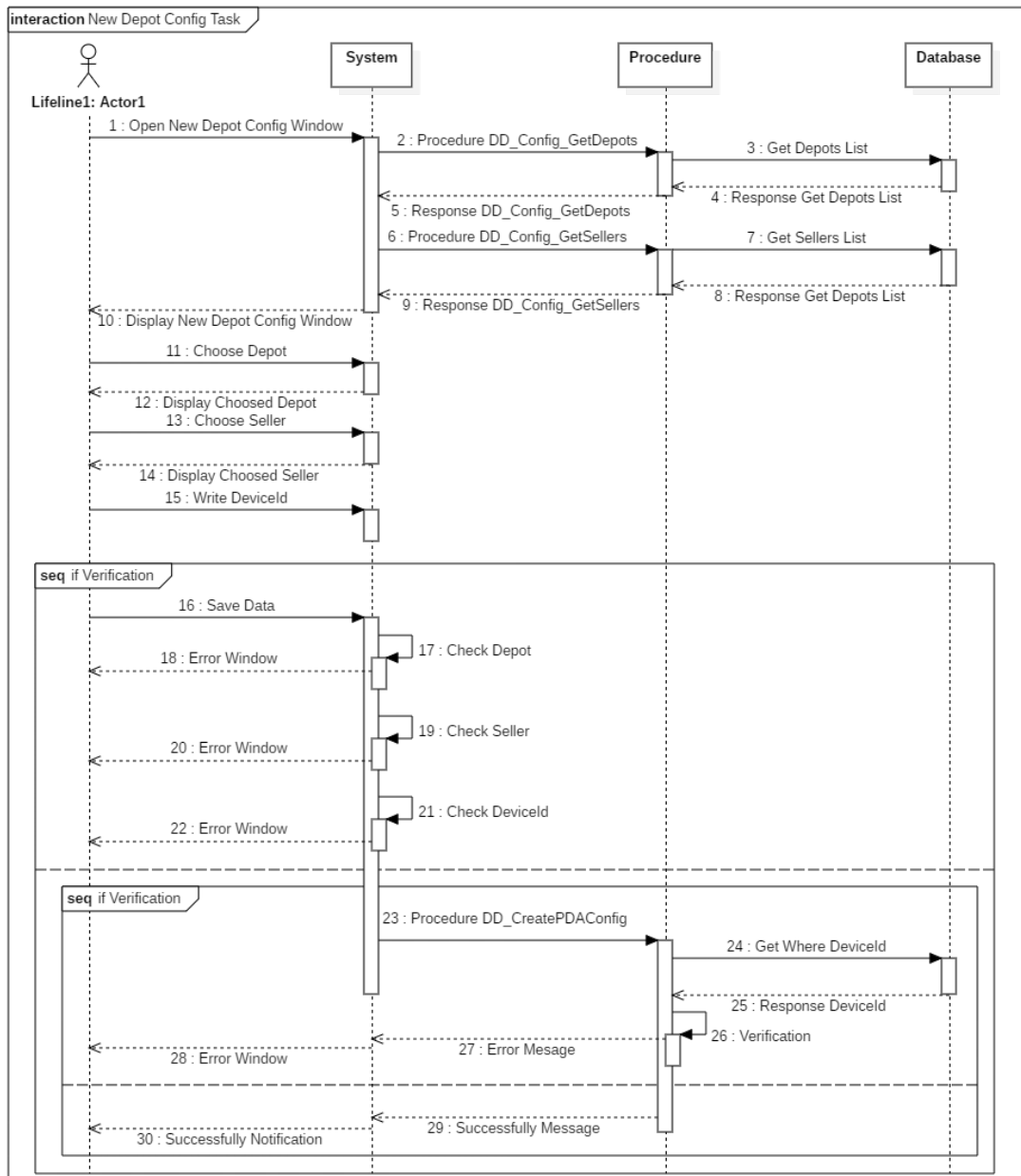
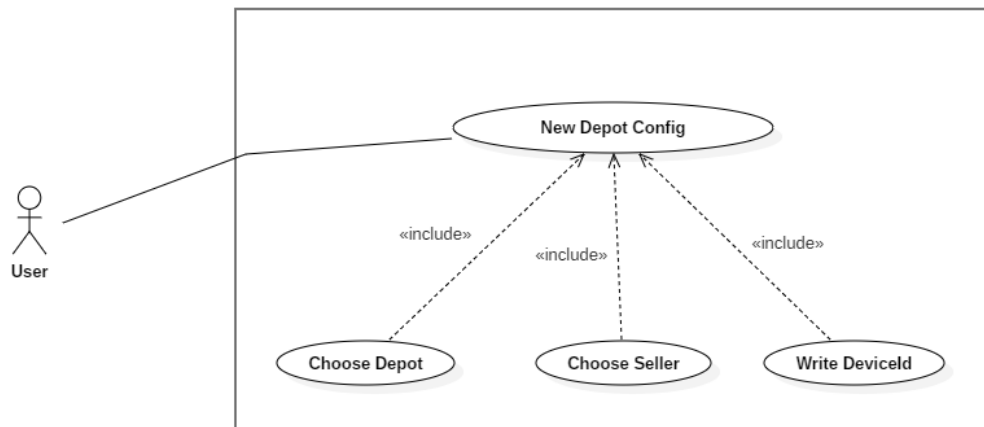


Table 3.1: Table represent the scenario of new depot config task

<b>System Use Case :</b> New depot config
<b>Actor :</b> User
<b>Script :</b> <ul style="list-style-type: none"><li>• After displaying the new depot config window</li><li>• The user selects a depot, which requires that is not being used in another depopt config before</li><li>• After that, he choose the seller and is also requires that he not be used in another depot config before</li><li>• After that he writes DeviceId and that should be not used befor in another depot config</li><li>• Finally he presses the save button</li></ul>

Figure 3.5: Usecase diagraeme of new depot config task



### 3.3.2 Delete depot config task

Figure 3.6: Sequence diagramme of delete depot config task

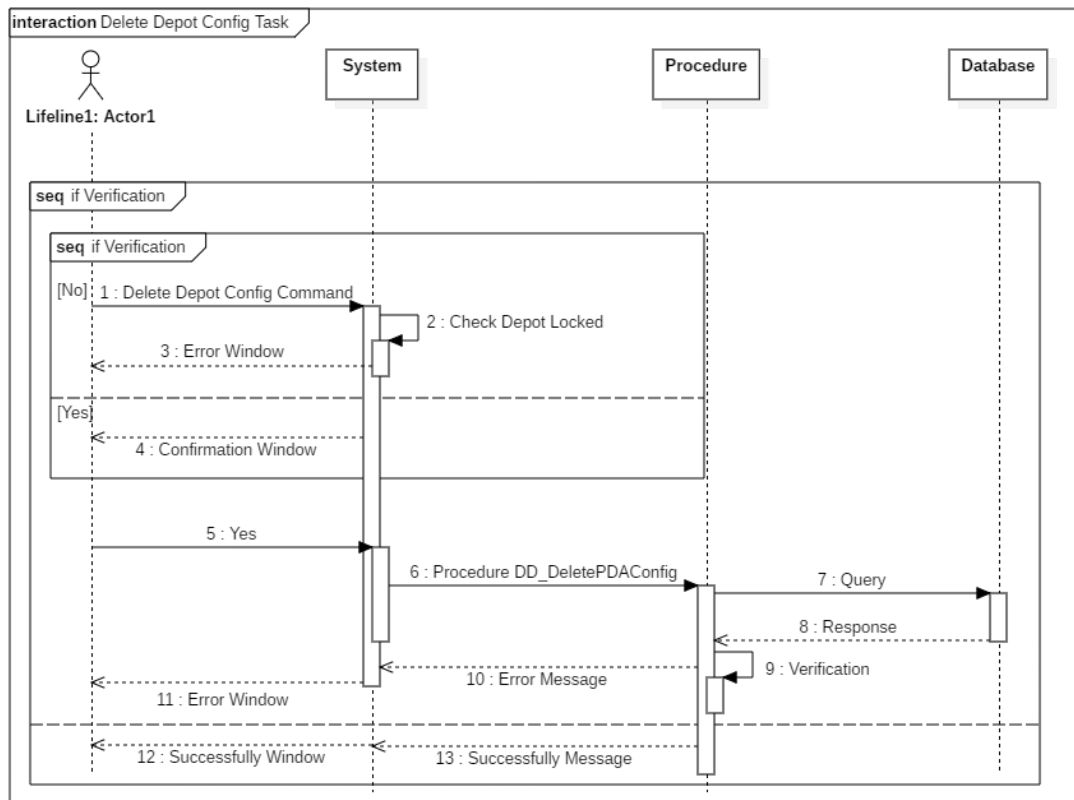
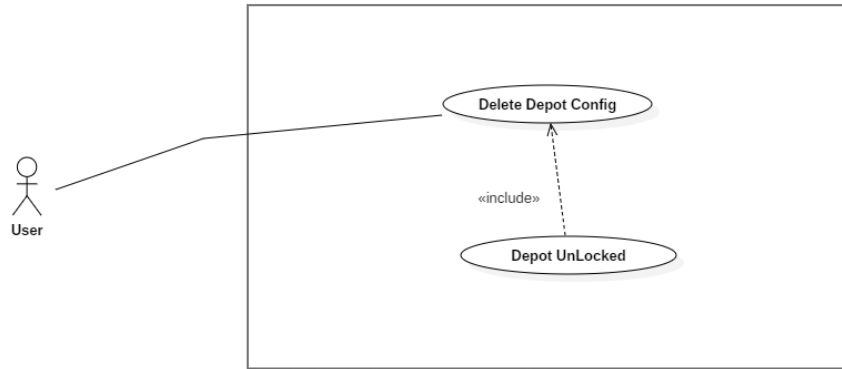


Table 3.2: Table represent the scenario of delete depot config task

<b>System Use Case :</b> Delete depot config
<b>Actor :</b> User
<b>Script :</b>
<ul style="list-style-type: none"> <li>When deleting depot config, the depot config should be Unlocked</li> </ul>

Figure 3.7: Usecase diagramme of delete depot config task



### 3.3.3 New depot task

Figure 3.8: Sequence diagramme of new depot task

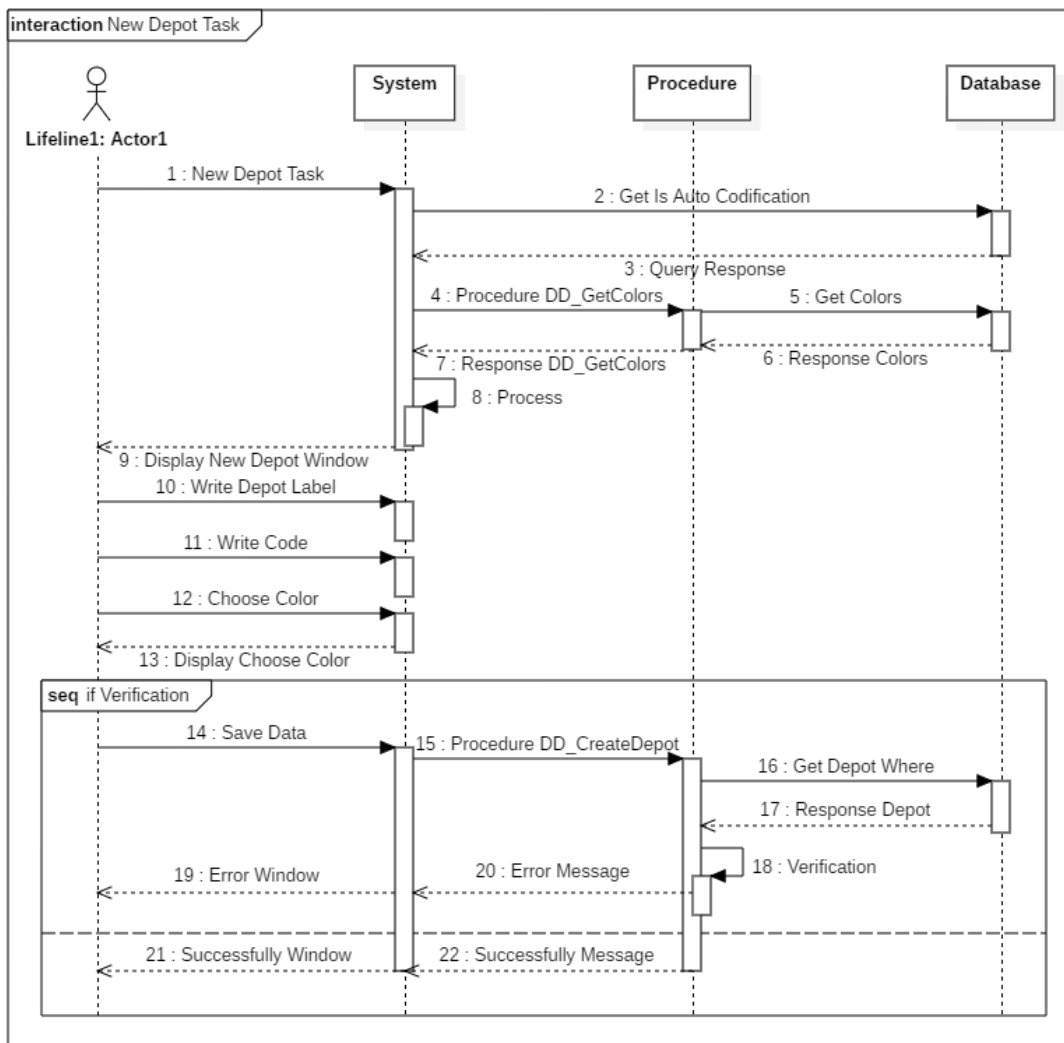
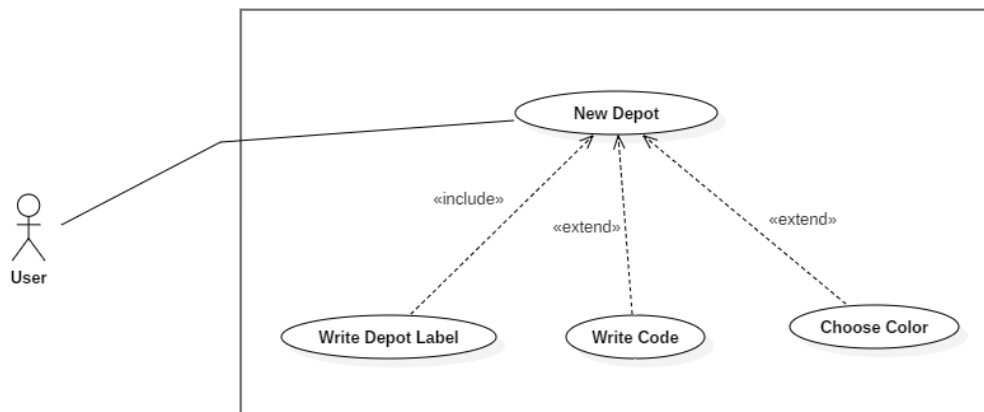


Table 3.3: Table represent the scenario of new depot task

<b>System Use Case :</b> New depot
<b>Actor :</b> User
<b>Script :</b> <ul style="list-style-type: none"><li>• After displaying the new depot window</li><li>• The user writes the Depot Label and Write the Code then choose a color</li><li>• Then press the save button</li></ul>

Figure 3.9: Usecase diagramme of new depot task



### 3.3.4 New tour task

Figure 3.10: Sequence diagramme of new tour task

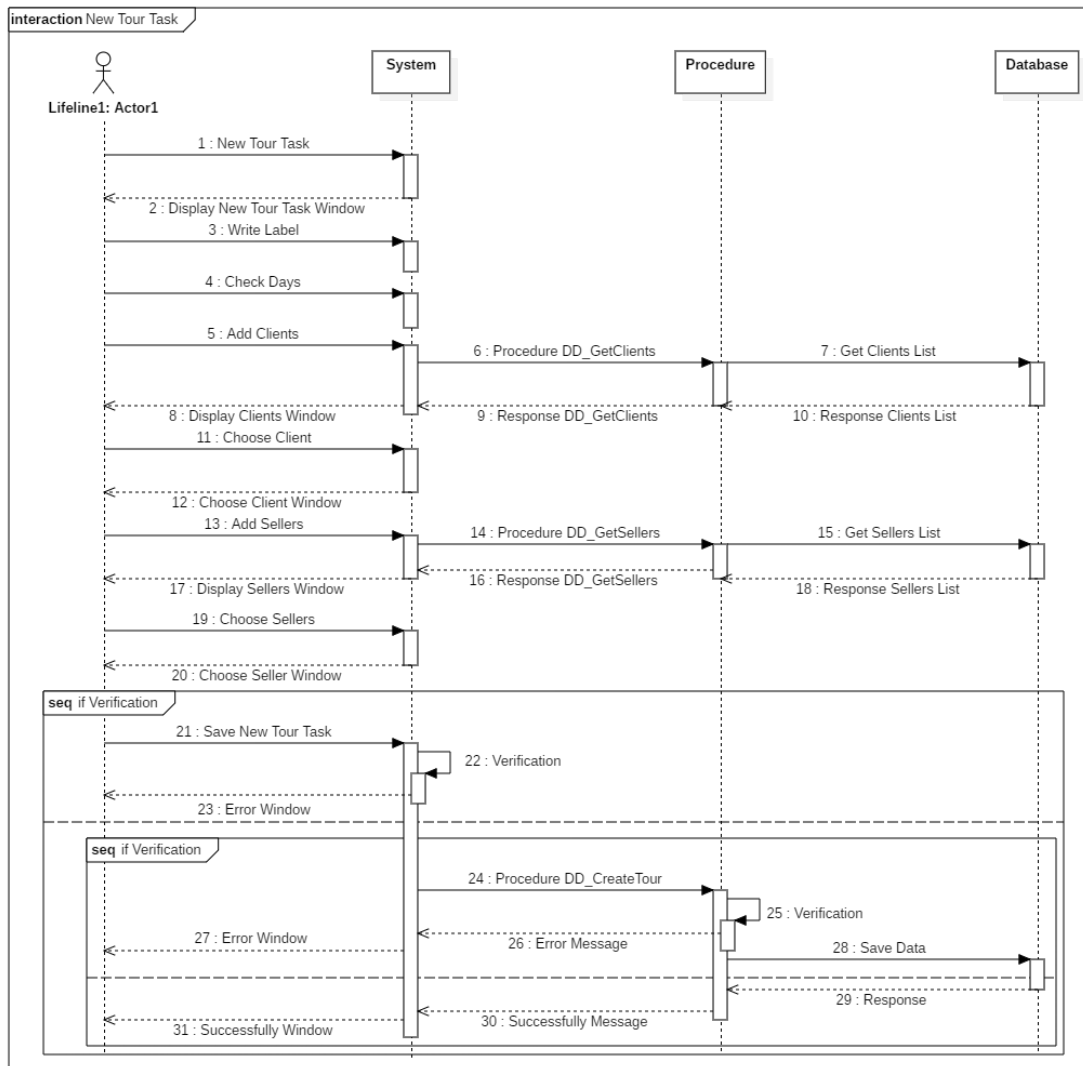


Table 3.4: Table represent the scenario of new tour task

<b>System Use Case :</b> New tour
<b>Actor :</b> User
<b>Script :</b> <ul style="list-style-type: none"> <li>• After displaying the new tour window</li> <li>• User write lable that should be not used before</li> <li>• Next, the user checks the days which is the days that should be visiting the client of this tour on</li> <li>• After that the user choose the specific clients for this tour</li> <li>• After that the user choose the specific street vendors to work on this tour</li> <li>• Finaly the use saves this tour and street vendors should start using it</li> </ul>

Figure 3.11: Usecase diagraph of new tour task

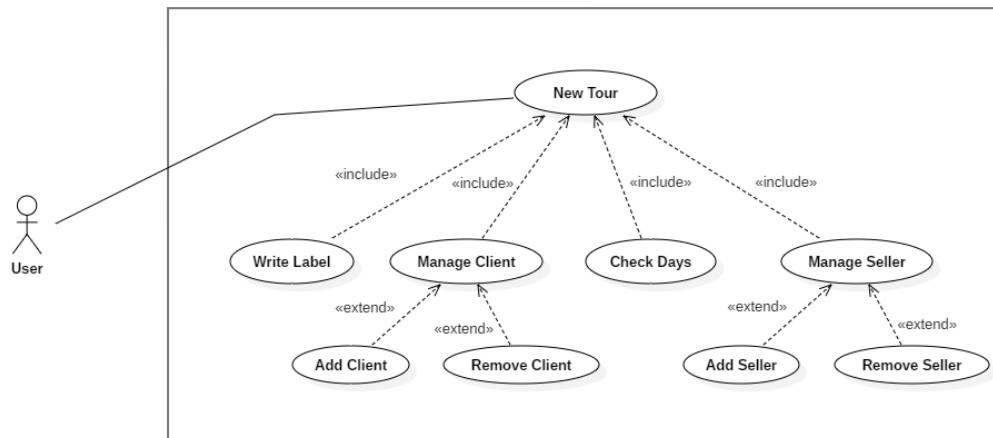
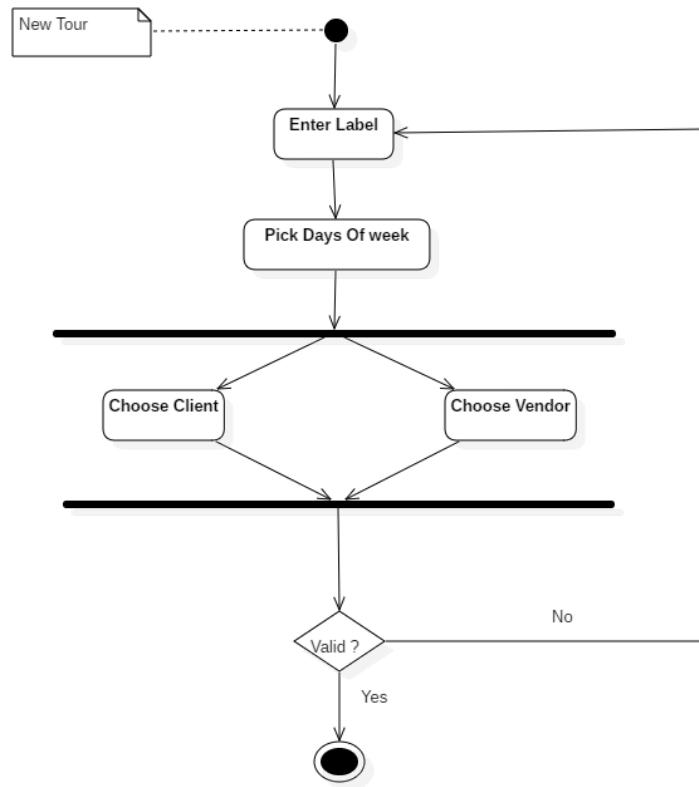


Figure 3.12: Activity diagramme of new tour task



### 3.3.5 Delete tour task

Figure 3.13: Sequence diagram of delete tour task

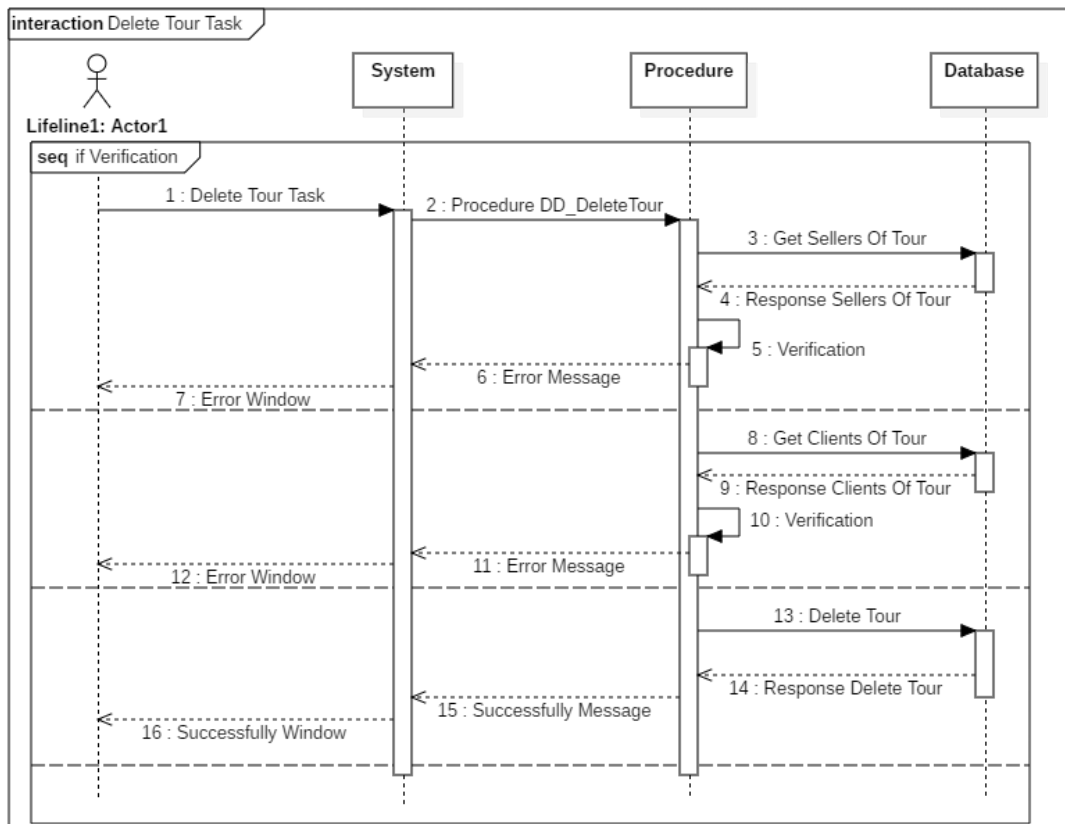
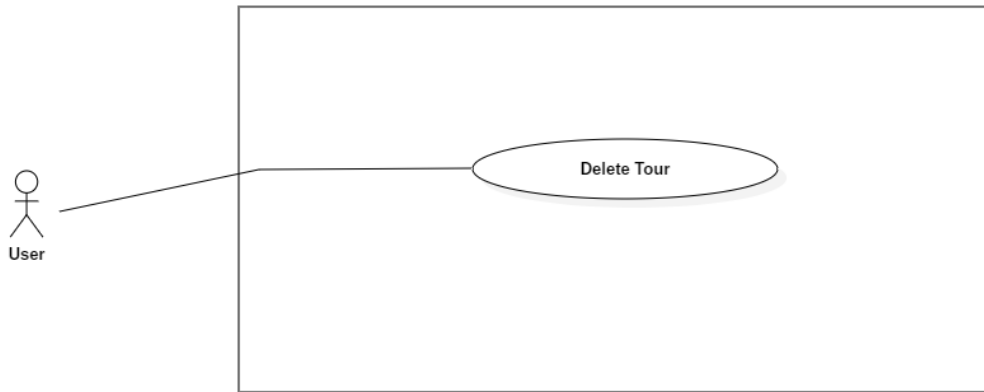


Table 3.5: Table represent the scenario of delete tour task

<b>System Use Case :</b> Delete tour
<b>Actor :</b> User
<b>Script :</b>
<ul style="list-style-type: none"> <li>When deleting tour, the tour should be not affected to any street vendor or any client</li> </ul>

Figure 3.14: Usecase diagramme of delete tour task



### 3.3.6 Refresh task

Figure 3.15: Sequence diagramme of refresh task

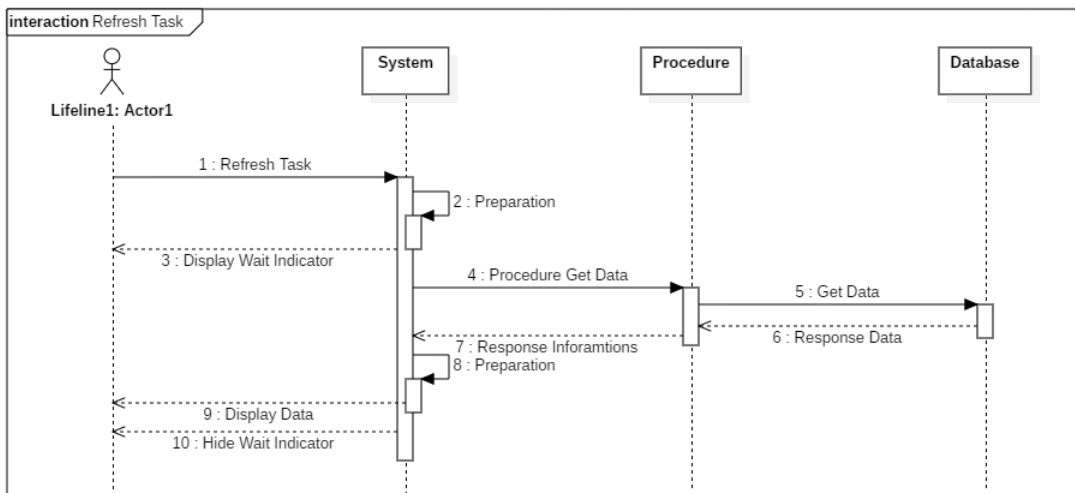
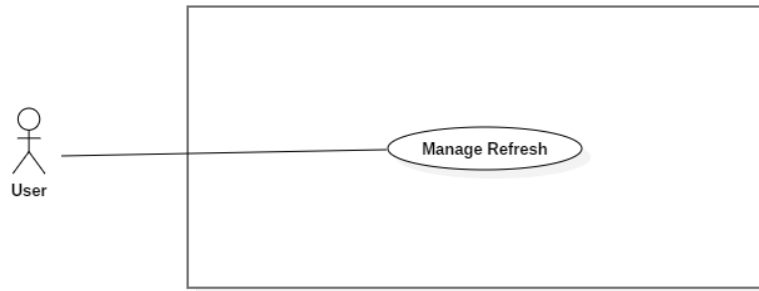


Table 3.6: Table represent the scenario of refresh task

<b>System Use Case : Refresh</b>
<b>Actor : User</b>
<b>Script :</b> <ul style="list-style-type: none"> <li>• When you press the refresh button, all the information will be retrieved from the database again with the latest changes</li> </ul>

Figure 3.16: Usecase diagramme of refresh task



### 3.3.7 Change password task

Figure 3.17: Sequence diagramme of change password task

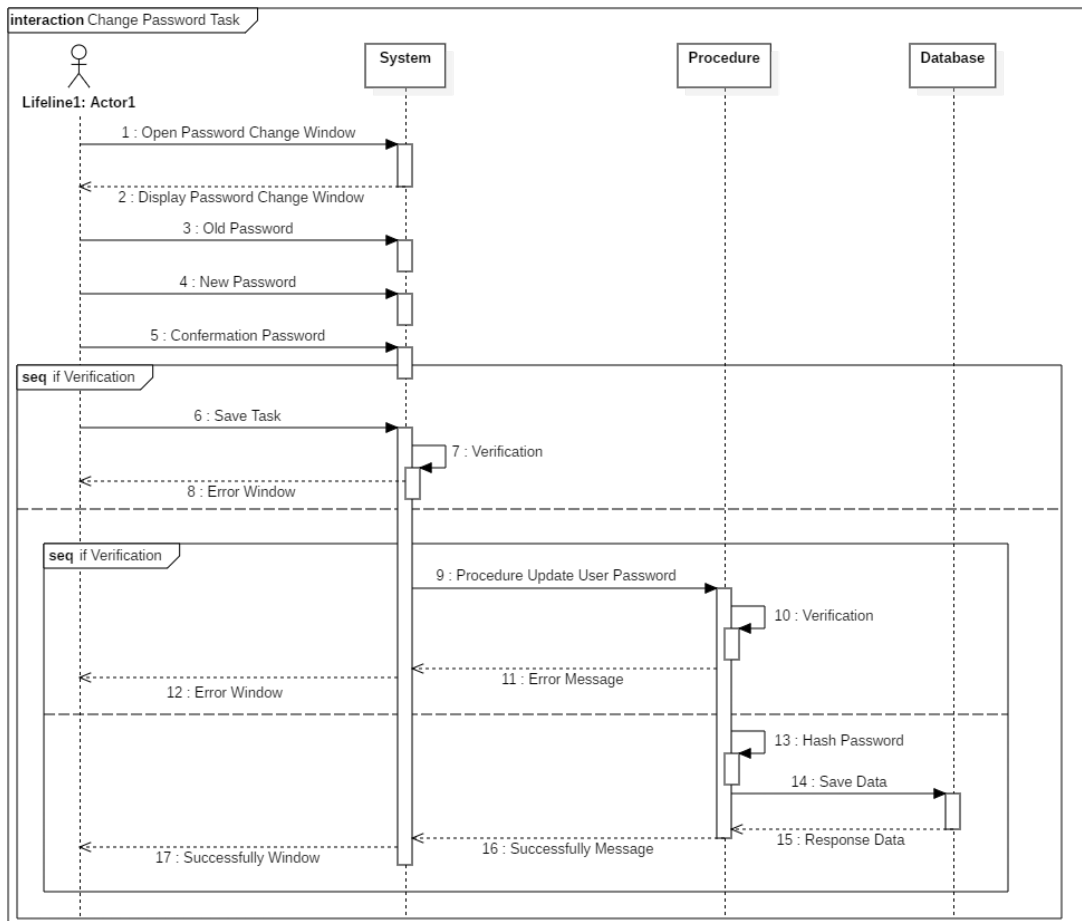


Table 3.7: Table represent the scenario of change password task

<b>System Use Case :</b> Change password
<b>Actor :</b> User
<b>Script :</b> <ul style="list-style-type: none"> <li>• After displaying the change password window</li> <li>• The user types the old password</li> <li>• Then he type the new password</li> <li>• Then type the new password again for confirmation</li> <li>• Then press the save button</li> </ul>

Figure 3.18: Usecase diagramme of change password task

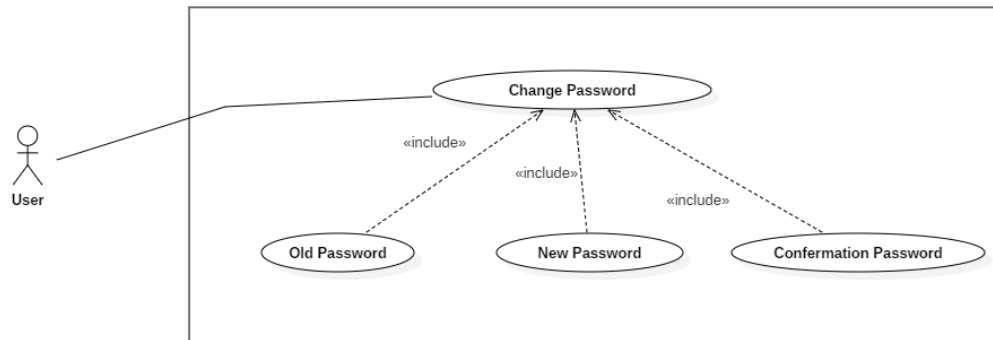
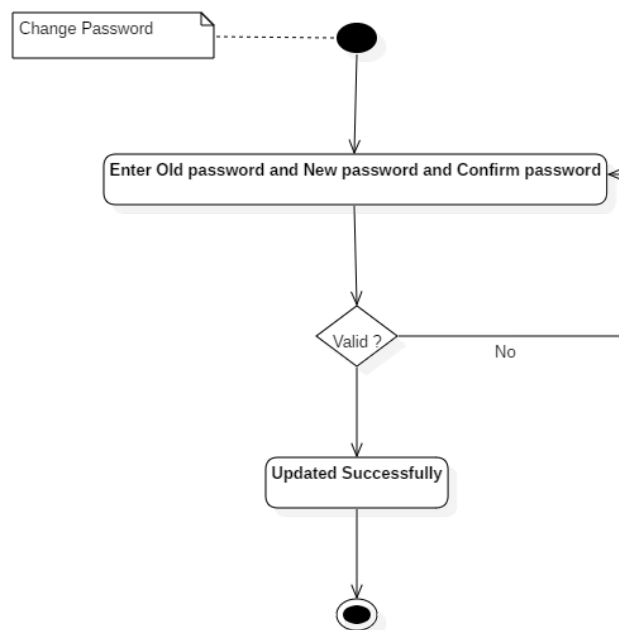


Figure 3.19: Activity diagramme of change password task



### 3.3.8 Navigate map task

Figure 3.20: Sequence diagramme of navigate map task

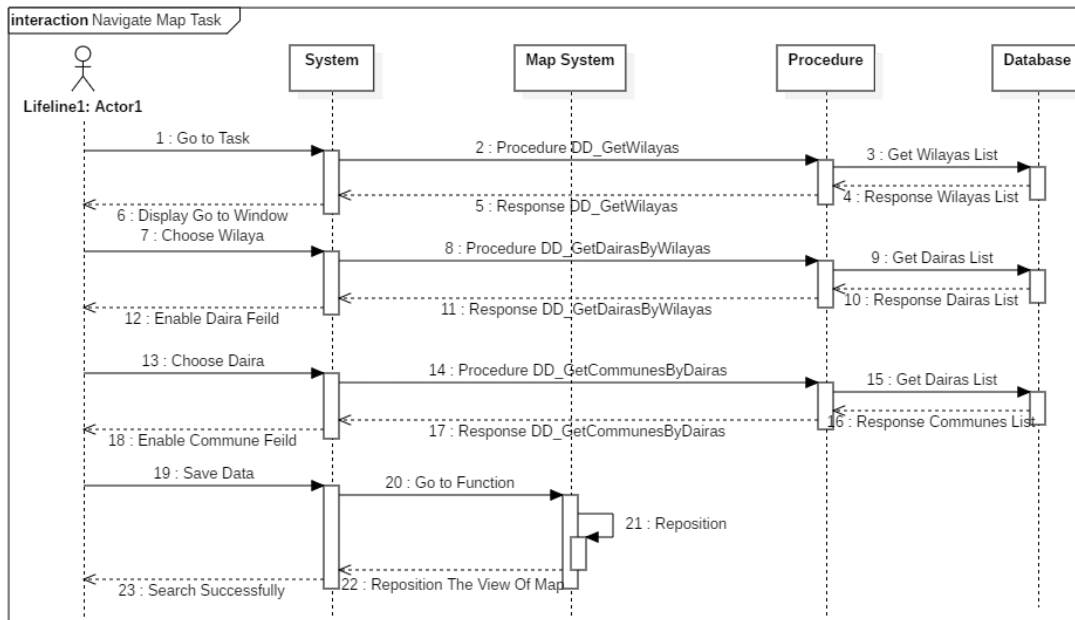
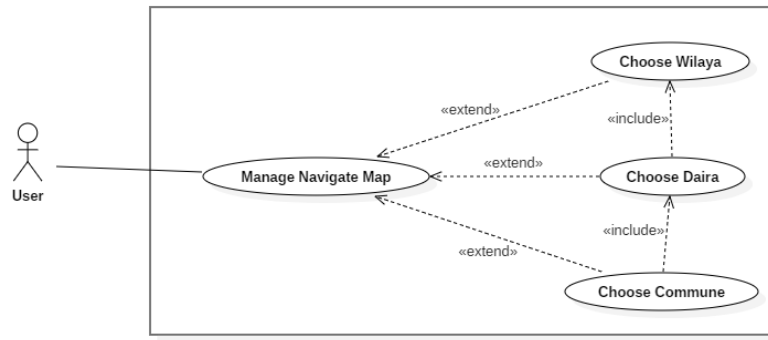


Table 3.8: Table represent the scenario of navigate map task

<b>System Use Case :</b> Navigate map
<b>Actor :</b> User
<b>Script :</b> <ul style="list-style-type: none"> <li>• The user opens the map window</li> <li>• Then he selects a wilaya which makes the feild of daira enabled</li> <li>• And then defines the daira which makes the feild of commune enabled</li> <li>• Next the user select a commune</li> <li>• Then press the go to button</li> <li>• Finally the map will move to the position of the this commune</li> </ul>

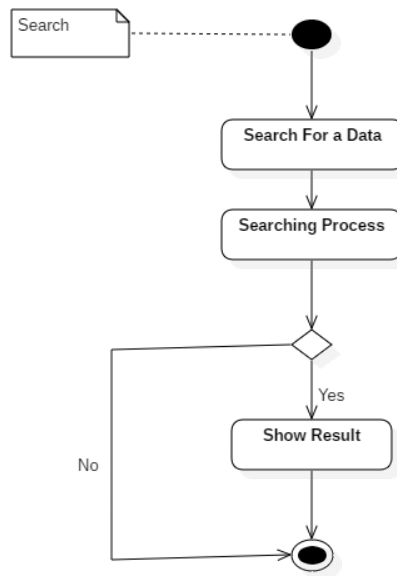
Figure 3.21: Usecase diagramme of navigate map task



### 3.3.9 Search task

A search task is a basic task that is used in all table of data visible in our extension, the Figure 3.22 represent an Activity diagram for the search task.

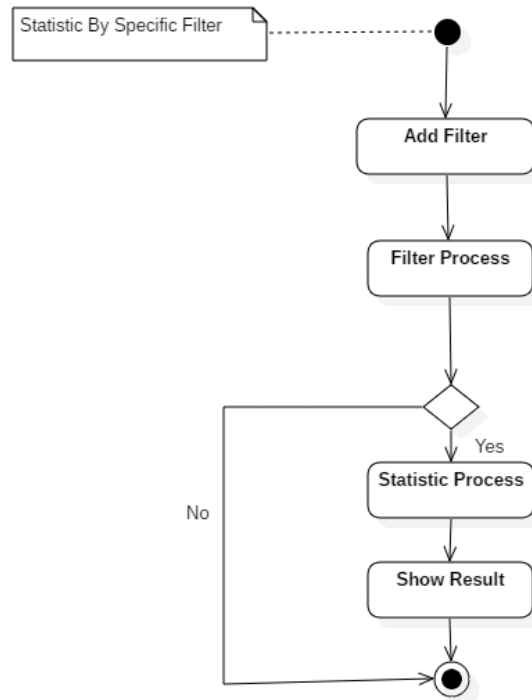
Figure 3.22: Activity diagramme of navigate map task



### 3.3.10 Statistics by filter task

Statistics by filter task is used in two screens in our extension as seen in the Figure 3.37 and the Figure 3.38, the Figure 3.23 represent an Activity diagram for the Statistics by filter task. in this task user can use the filter in the table of data to specify the statistics needed on specific data that the filter used on it.

Figure 3.23: Activity diagramme of statistics by filter task



## 3.4 Design

In this part, we will show our implementation screens and the work we have done, which consists of 8 sections.

In our design, we provide the user a multi different ways to access the functionalities of our system and that applies in all sections, the first obvious way is using the listed buttons in the top bar, and the second is a right-click on an item or set of items listed which shows a menu as seen in the Figure 3.24, and the third one is using the short cuts.

### 3.4.1 Client section

The client section contains a list that display all the clients available, with three functionalities which is

- **Refresh** : This function is used to refresh the list of clients to get the latest data.
- **View details** : This function is used to display more details about the client that does not appear in the list, and it shows a dialog as seen in the Figure 3.25.
- **New tour** : This function is used to create a new tour from selected clients as seen in the Figure 3.32.

Figure 3.24: Client screen

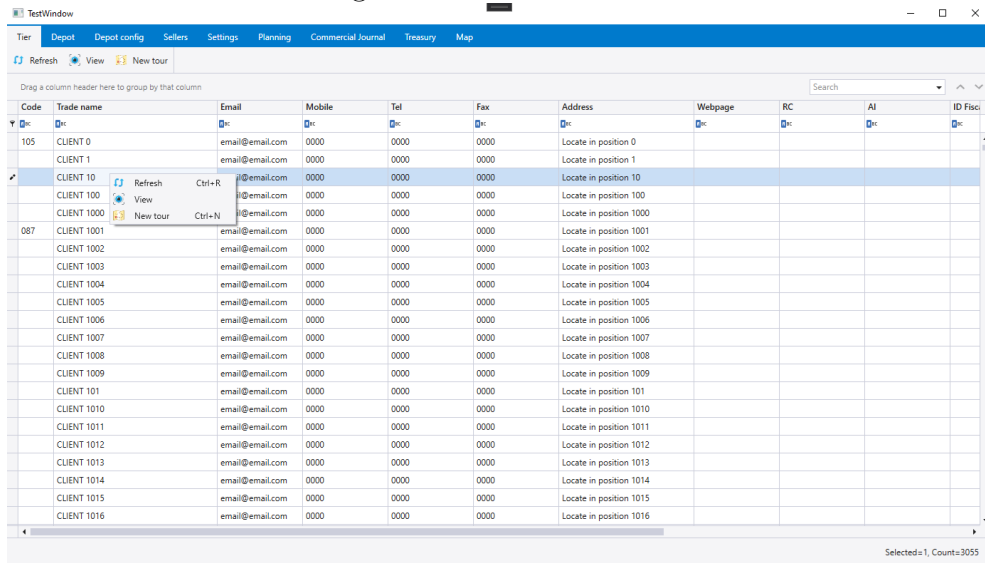
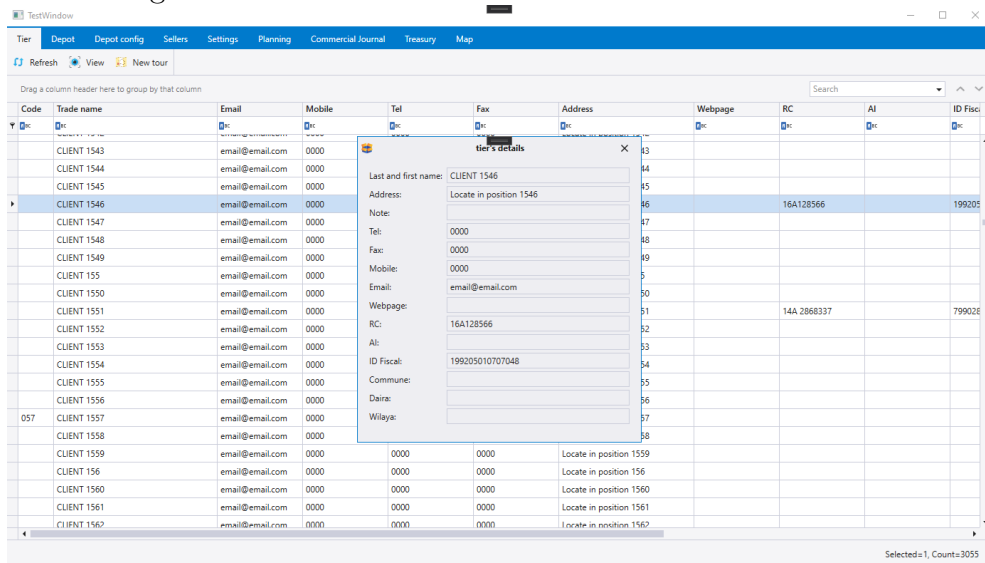


Figure 3.25: Client screen with window of client details



### 3.4.2 Depot section

The depot section contains a list that display only the depot list created for street vendors, with five functionalities which is

- **Refresh** : This function is used to refresh the list of depot to get the latest data.
- **View details** : This function is used to display more details about the depot that does not appear in the list, and it shows a dialog as seen in the Figure 3.27.
- **New** : This function is used dialog as seen in the Figure 3.26 to create a new depot that can be used by street vendors.

- **Edit** : This function is used the same dialog used for creating a new depot as seen in the Figure 3.26 to edit depot information.
- **Lock** : This function is used to make a depot locked.
- **Unlock** : This function is used to make a depot unlocked.

Figure 3.26: Creation of new depot

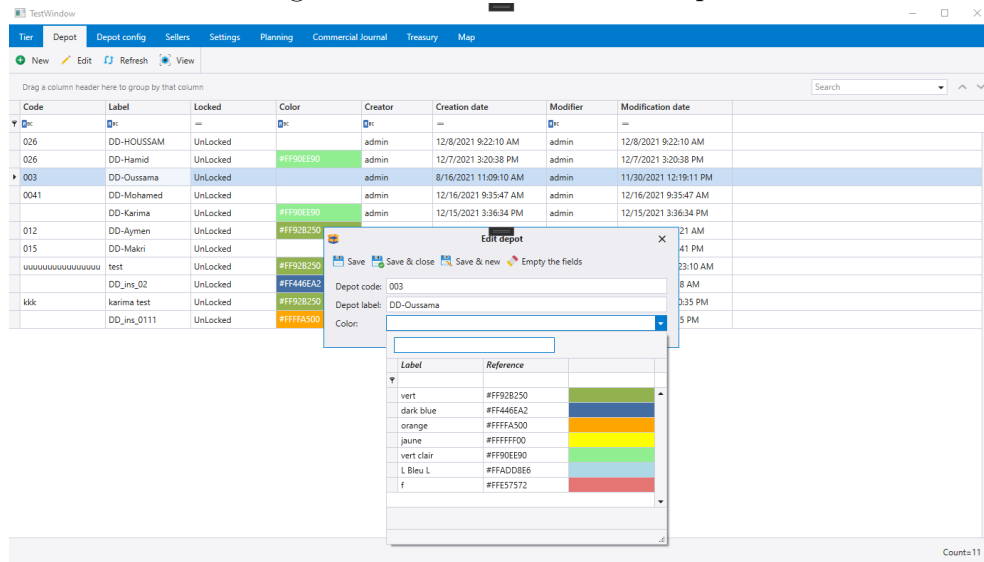
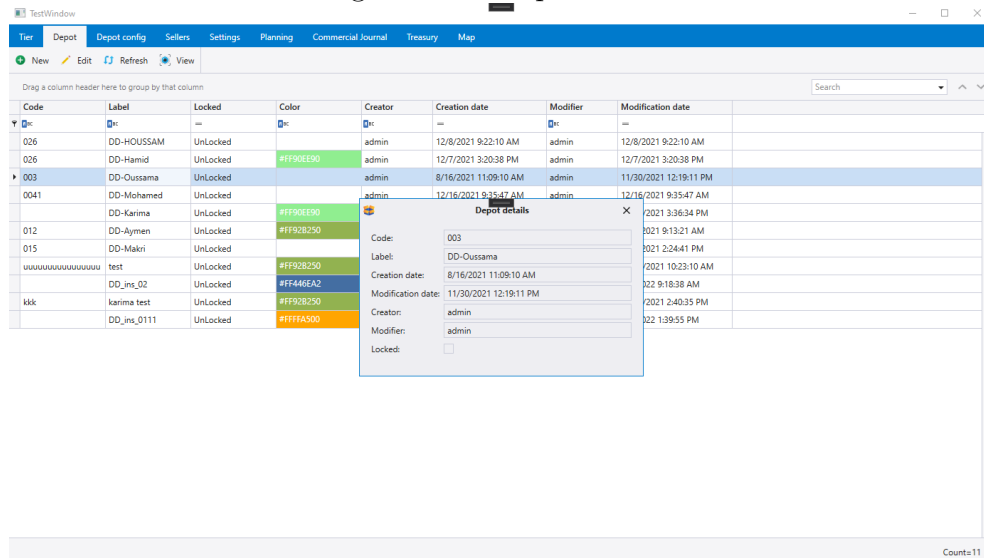


Figure 3.27: Depot details

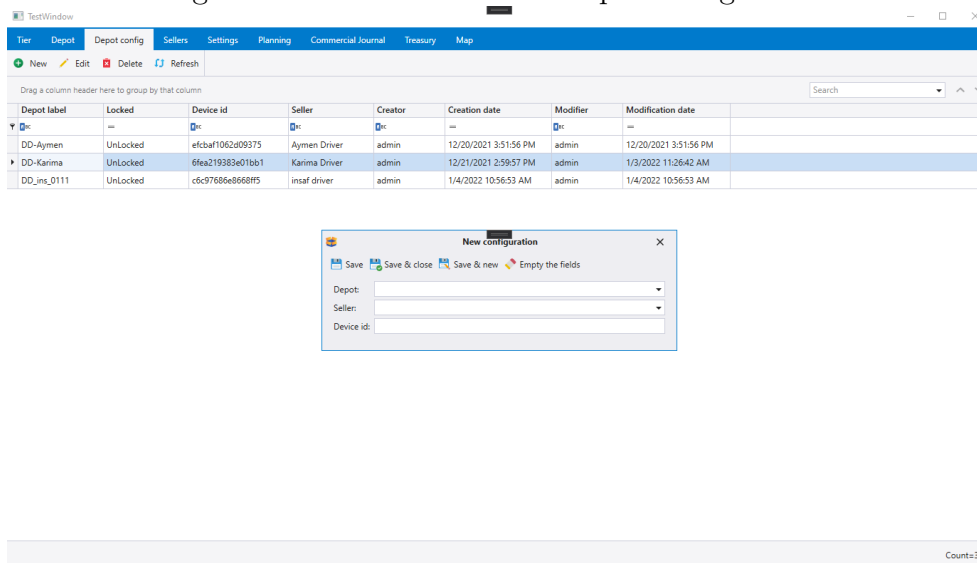


### 3.4.3 Depot config section

The depot config section contains the list of depot config list that is created to tie depot with street vendor, and contain four functionalities which is

- **Refresh** : This function is used to refresh the list of depot config to get the latest data.
- **New** : This function is used dialog as seen in the Figure 3.28 to create new depot config.
- **Edit** : This function is used the same dialog used for creating a new depot configuration as seen in the Figure 3.28 to edit the depot config information.
- **Delete** : This function is used to refresh the list of depot configs to get the latest data.

Figure 3.28: Creation of new depot configuration

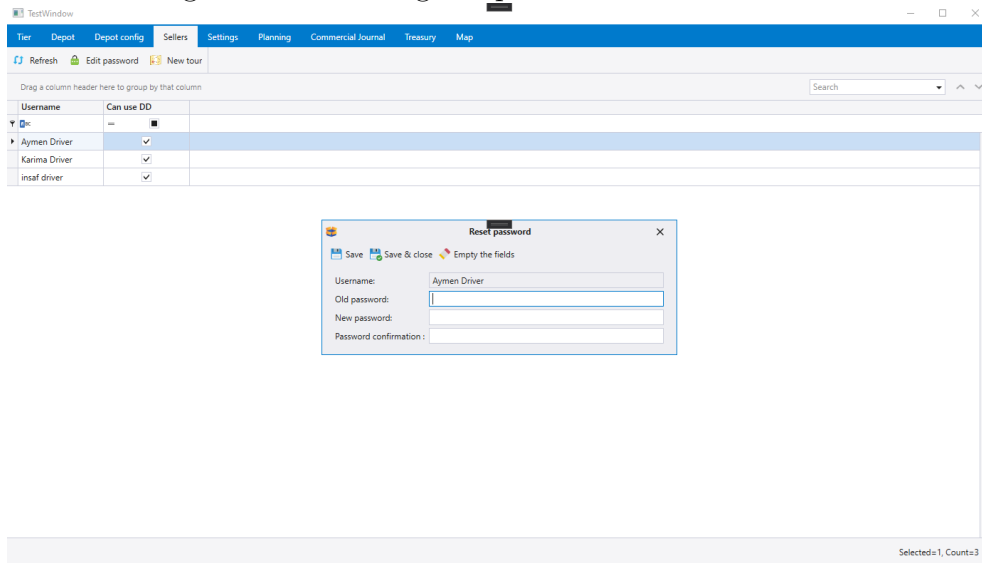


### 3.4.4 Street vendors

The street vendors section contains a list that display all the street vendors available, with five functionalities which is

- **Refresh** : This function is used to refresh the list of clients to get the latest data.
- **Edit password** : This function is used to change the password of the street vendor account that is used in the mobile application, and it shows a dialog as seen in the Figure 3.29.
- **New tour** : This function is used to create a new tour from selected street vendors as seen in the Figure 3.32.
- **Can not use DD** : This function is used to remove the permission of using the Hisba Go module.
- **Can use DD** : This function is used to give permission of using the Hisba Go module.

Figure 3.29: Editing the password of street vendor



### 3.4.5 Planning

The planning section contains a list of tour available, with seven functionalities which is

- **Refresh** : This function is used to refresh the list to get the latest data.
- **View details** : This function is used to display more details about the tour that are not appears in the list, and it shows a dialog which is the same dialog that is used to create new tour as seen in the Figure 3.32 .
- **New** : This function is used to create a new tour, and it shows as dialog as seen in the Figure 3.32, which contains two main functions which is
  - **Select clients** : This function is used to select clients for a specific tour, and it shows as dialog as seen in the Figure 3.33.
  - **Select street vendors** : This function is used to select street vendors for a specific tour, and it shows as dialog as seen in the Figure 3.34.
- **Edit** : This function is used to edit the selected tour, and it shows a dialog that is the same dialog that is used to create a new tour as seen in the Figure 3.32.
- **Delete** : This function is used to delete tour.
- **Sellers** : This function is used to display the street vendors working on this selected tour, and it shows as bottom pop up panel as seen in the Figure 3.31.
- **Tier** : This function is used to display the clients that are related to the selected tour, and it shows as bottom pop up panel as seen in the Figure 3.30.

Figure 3.30: Details of clients working in the selected tour

Label	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Creator	Creation date	Modifier	Modification date
okok	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	admin	1/4/2022 9:54:10 AM	admin	1/4/2022 9:54:10 AM
Tournée journalière	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	admin	1/4/2022 10:53:07 AM	admin	1/4/2022 10:56:22 AM
t11	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	admin	1/4/2022 2:24:46 PM	admin	1/4/2022 2:24:46 PM

Last and first name	Address	Note	Tel	Fax	Mobile	Email	Webpage	RC	AI	ID Fiscal	Corr
CLIENT 1	Locate in position 1		0000	0000	0000	email@email.com					
CLIENT 0	Locate in position 0		0000	0000	0000	email@email.com					
CLIENT 1112	Locate in position...		0000	0000	0000	email@email.com					
CLIENT 2223	Locate in position...		0000	0000	0000	email@email.com					
CLIENT 2389	Locate in position...		0000	0000	0000	email@email.com					
CLIENT 2500	Locate in position...		0000	0000	0000	email@email.com					
CLIENT 2611	Locate in position 2500		0000	0000	0000	email@email.com					

Figure 3.31: Details of street vendors working in the selected tour

Label	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Creator	Creation date	Modifier	Modification date
okok	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	admin	1/4/2022 9:54:10 AM	admin	1/4/2022 9:54:10 AM
Tournée journalière	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	admin	1/4/2022 10:53:07 AM	admin	1/4/2022 10:56:22 AM
t11	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	admin	1/4/2022 2:24:46 PM	admin	1/4/2022 2:24:46 PM

Username
Aymen Driver

Figure 3.32: Creating of new tour

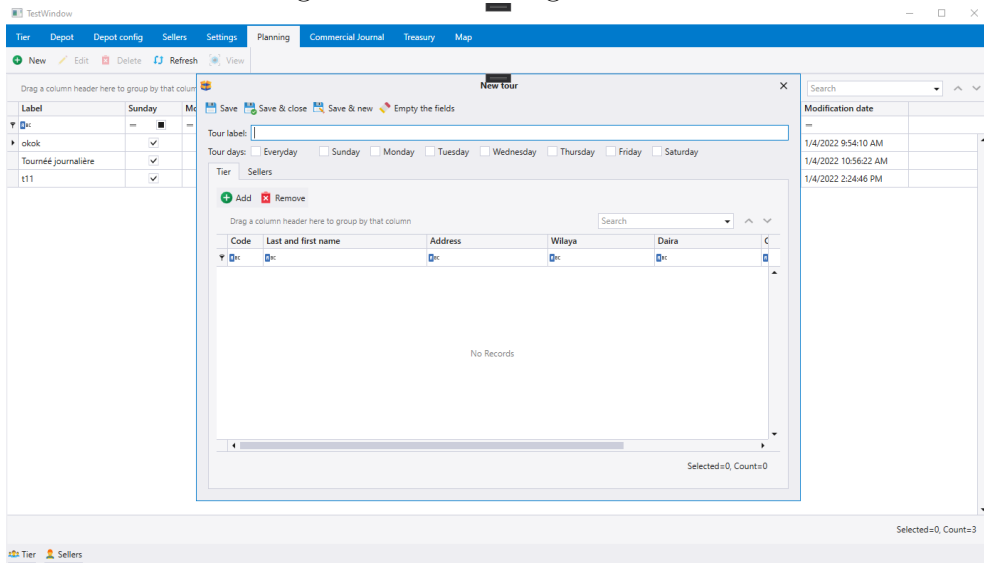


Figure 3.33: Select clients for the tour

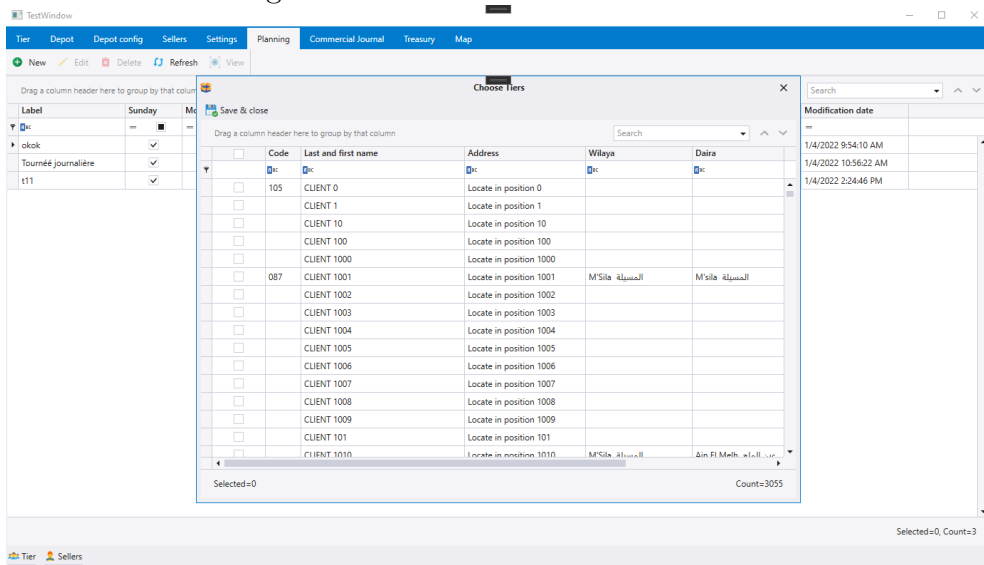
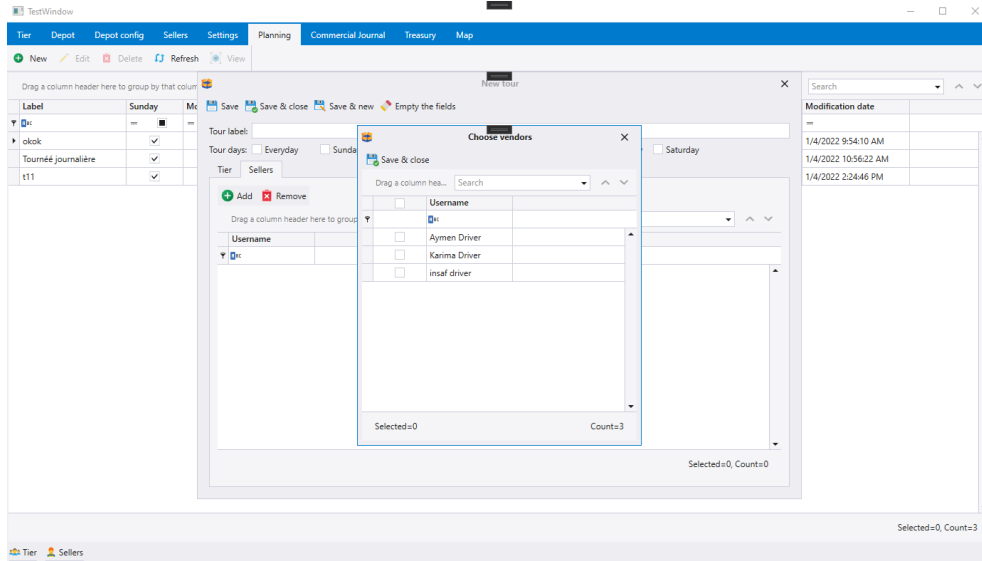


Figure 3.34: Select street vendors for the tour



### 3.4.6 Commercial journal

The commercial journal section contains a list of bills that have been done by street vendors, with four functionalities which is

- **Refresh** : This function is used to refresh the list to get the latest data.
- **View details** : This function is used to display more details about the bill that are not displayed, and it shows a dialog as seen in the Figure 3.35.
- **Totals** : This function is used to display the statistics about the displayed list of bills, and it shows as bottom pop up panel as seen in the Figure 3.37.
- **Items** : This function is used to display the items of the selected bill, and it shows as a bottom pop up panel as seen in the Figure 3.36.

Figure 3.35: Details of bill

Order Details

Depot label: DD\_ins\_0111 Reference: BL21/3167 Date: 12/22/2021 10:10:01 AM  
Tier: CLIENT 2389

Code	Reference	Lot number	Label	Qty	UG percentage	Total packa...	Total bulk	Unit price HT	Discount%	Ar
034	124529	2021.11.05	FARINE BLENDINE LACTEE CROISSANC...	100	0.00 %	100 x 1	0	260.00	0.00 %	
029		2021.11.03	FARINE BLENDINE CONFORT LACTEE B...	25	0.00 %	25 x 1	0	260.00	0.00 %	
037		17/09/2021	FARINE BLENDINE CONFORT LACTEE BANANES 6 MOIS SANS GLUTEN 200GR				0	260.00	0.00 %	

General

Discount: 0.10 % = 37.70 Amount HT: 37,700.00 Net amount HT: 37,662.30  
 Associated reference: TVA: 0.00  
 Category: Mode & Stamp: Espèce 0.00  
 Status: Net to pay: 37,662.30

Figure 3.36: Items of selected bill

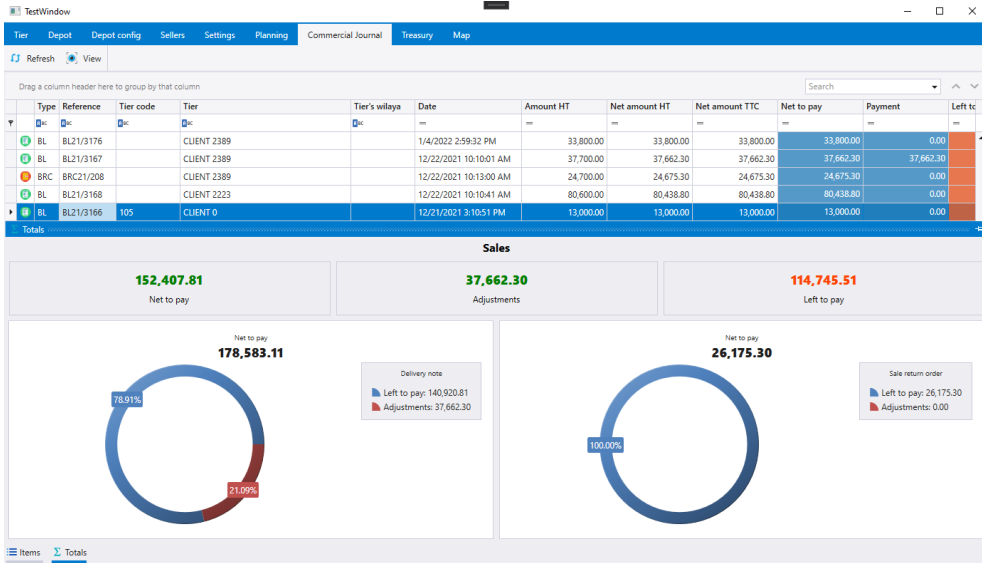
Items

Type	Reference	Tier code	Tier	Tier's wilya	Date	Amount HT	Net amount HT	Net amount TTC	Net to pay	Payment	Left to
BL	BL21/3176		CLIENT 2389		1/4/2022 2:59:32 PM	33,800.00	33,800.00	33,800.00	33,800.00	0.00	
BL	BL21/3167		CLIENT 2389		12/22/2021 10:10:01 AM	37,700.00	37,662.30	37,662.30	37,662.30	37,662.30	
BRC	BRC21/208		CLIENT 2389		12/22/2021 10:13:00 AM	24,700.00	24,675.30	24,675.30	24,675.30	0.00	
BL	BL21/3168		CLIENT 2323		12/22/2021 10:10:41 AM	80,600.00	80,438.80	80,438.80	80,438.80	0.00	
BL	BL21/3166	105	CLIENT 0		12/21/2021 3:10:51 PM	13,000.00	13,000.00	13,000.00	13,000.00	0.00	
BL	BL21/3165	105	CLIENT 0		12/21/2021 3:07:33 PM	9,800.00	9,800.00	10,682.00	10,682.00	0.00	
BL	BL21/3164		CLIENT 713		12/6/2021 10:55:24 AM	2,752.30	2,752.30	3,000.01	3,000.01	0.00	
BRC	BRC21/207		CLIENT 713		12/6/2021 10:55:34 AM	1,376.15	1,376.15	1,500.00	1,500.00	0.00	

Items

Code	Reference	Lot number	Label	Qty	UG percentage	Total packa...	Total bulk	Unit price HT	Discount%	Amount HT	Net amount HT	Net amount TTC	Total TVA
163		FB8L02	FARINE BLENDINE BLE 400 GR	10	0.00 %	10 x 1	0	1,300.00	0.00 %	13,000.00	13,000.00	13,000.00	0.00

Figure 3.37: Statistics about displayed bills

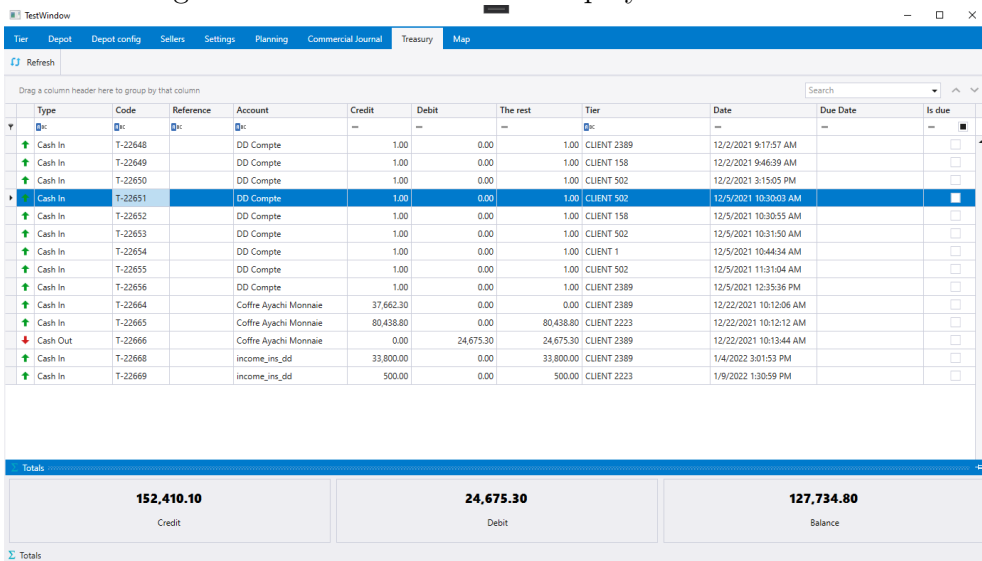


### 3.4.7 Treasury

The treasury section contains a list that displays all the money transaction available that have done by street vendors, with two functionalities which is

- **Refresh** : This function is used to refresh the list of transactions to get the latest data.
- **Totals** : This function is used to display the statistics about the list of transactions displayed, and it shows as bottom pop up panel as seen in the Figure 3.38.

Figure 3.38: Statistics about displayed transactions



### 3.4.8 Map

This section is used to display all clients positions on the map, which contain four functionalities which is

- **Refresh** : This function is used to refresh the clients position to get the latest data.
- **Layers** : This function is used to change the map layer, which the user can switch between the four layers as seen in the Figure 3.39.
- **Go to** : This function is used to navigate the map with communes, and it shows as a dialog as seen in the Figure 3.40.
- **Show and hide clients** : This function is used to display or hide clients positions from the map.

Figure 3.39: Map for displaying the positions of clients

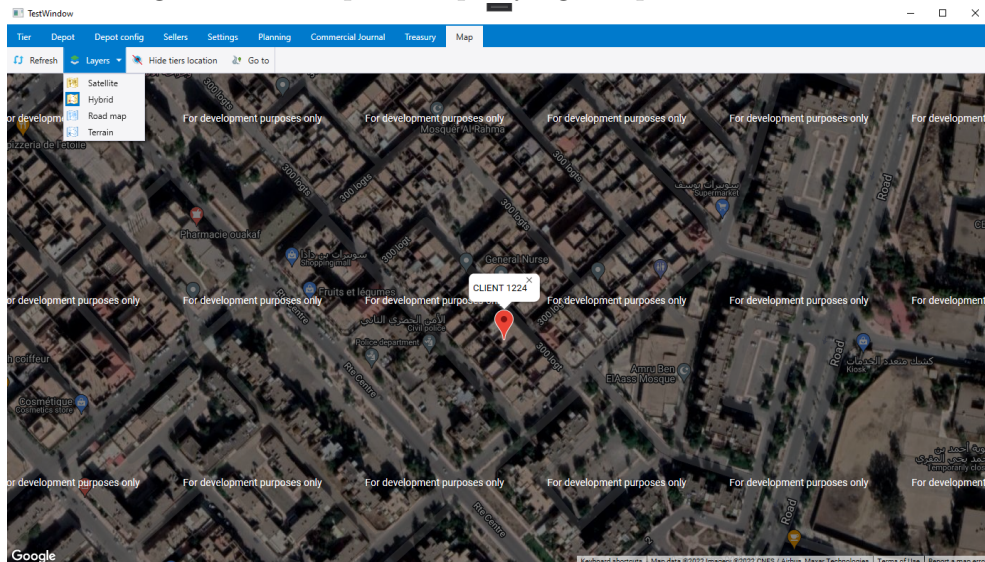
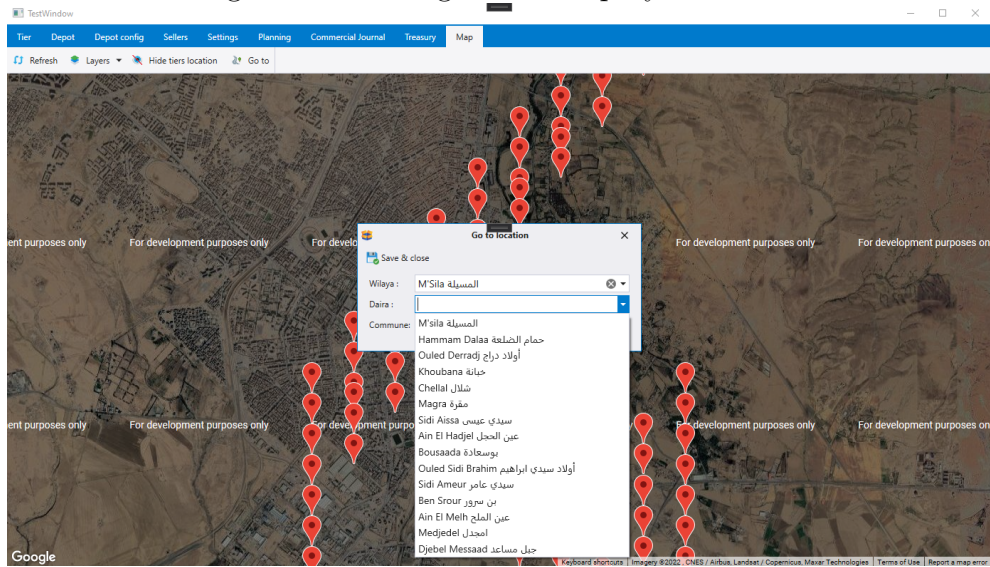


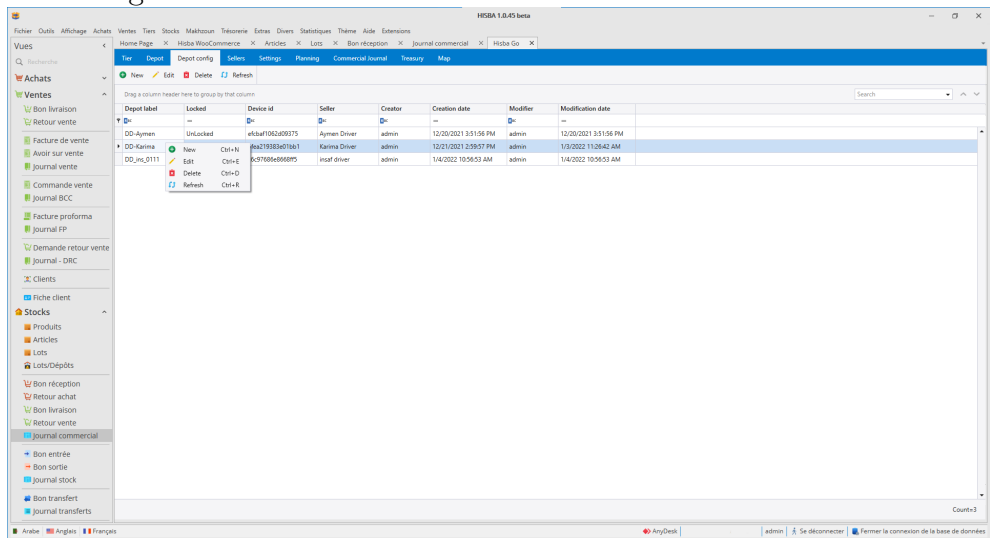
Figure 3.40: Navigate the map by commune



### 3.4.9 Final view

This section shows how Hisba Go Extension is integrated and runs inside Hisba ERP.

Figure 3.41: Final view of the extension inside Hisba ERP



# General conclusion and future work

In this dissertation, we introduce the ERP system and how they change the way the business works from different perspectives, and we discuss the different technical aspects of ERP implementation. and how the implementation of the ERP system introduces significant improvements such as easier access to reliable information, elimination of redundant data and operations, reduction of cycle times, and increased efficiency hence reducing costs, as well as the drawback found in ERP systems.

Our project is introducing an extension for Hisba ERP for a private company, and we implement it in a way that fit the architecture and design used in Hisba ERP, this extension used to manage street vendors workflow.

Adding features is the main goal for this extension to accomplish more benefits for the extension users and make this work easily as possible, and we found some of these features can not be done without involving more technics like data mining and vehicle routing problem algorithms as well as intelligence artificial, so the next step of our project is to solve the vehicle routing problem to make our project more efficient in the real world.

# Appendix

## Frameworks and languages and tools

In this section we will talk about the environment used for develop our program with programming language used and some of the vital libraries and packages and the tools used.

### Languages

- **C#** : It pronounced C-Sharp, it is an object-oriented programming language created by Microsoft that runs on the .NET Framework. C# has roots from the C family, and the language is close to other popular languages like C++ and Java. The first version was released in year 2002 it used for Mobile applications, Desktop applications, Web applications, Web services, Games and much more. [58]

Figure 3.42: C#



- **Java script** : JavaScript (js) is a light-weight object-oriented programming language which is used by several websites for scripting the webpages. It is an interpreted, full-fledged programming language that enables dynamic interactivity on websites when applied to an HTML document. It was introduced in the year 1995 for adding programs

to the webpages in the Netscape Navigator browser. Since then, it has been adopted by all other graphical web browsers. [55]

Figure 3.43: Java script



- **Sql** : Is Structured Query Language, which is a computer language for storing, manipulating and retrieving data stored in a relational database. SQL is the standard language for Relational Database System. All the Relational Database Management Systems (RDMS) like MySQL, MS Access, Oracle, Sybase, Informix, Postgres and SQL Server use SQL as their standard database language. [57]

Figure 3.44: Sql



- **Uml** : Unified Modeling Language (UML) helps you specify, visualize, and document models of software systems, including their structure and design, in a way that meets all of these requirements (You can use UML for other non-software systems too.) and representing the results using UML 2.0's thirteen standard diagram types. [26]

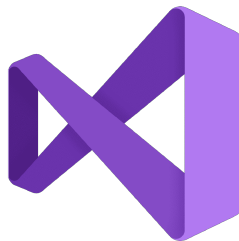
Figure 3.45: UML logo



## Development environment

- **Visual studio** : It is an IDE developed by Microsoft, the first release for developers was in 1997. in 2002 it first received a flavor of .Net, and then it underwent a revolution with many new features in every major build along with visual studio 2015, which support .NET core which is a cross-platform, free, and open-source managed software framework such as .NET. [29]

Figure 3.46: Visual studio [46]



- **Sql server** : Is a relational database management system (RDBMS) founded by Microsoft. SQL Server is built on top of SQL and tied to Transact-SQL, or T-SQL, the Microsoft implementation of SQL that adds a set of proprietary programming constructs. SQL Server works exclusively on Windows environment for more than 20 years. In 2016, Microsoft made it available on Linux. SQL Server 2017 became generally available in October 2016 that ran on both Windows and Linux. [56]

Figure 3.47: Sql server



- **DevExpress** : Is a software development company founded in 1998 with headquarters in Glendale, California. DevExpress initially started producing UI Controls for Borland Delphi / C++ Builder and ActiveX Controls for Microsoft Visual Studio. Presently, DevExpress has products targeting developers that use Delphi/C++Builder, Visual Studio and HTML5/JavaScript technologies. [31]

Figure 3.48: DevExpress



## Framework and librarys

- **Wpf** : Windows Presentation Foundation is a UI framework that creates desktop client applications. The WPF development platform supports a broad set of application development features, including an application model, resources, controls, graphics, layout, data binding, documents and security. WPF is part of .NET, so if you have previously built applications with .NET using ASP.NET or Windows Forms, the programming experience should be familiar. WPF uses the Extensible Application Markup Language (XAML) to provide a declarative model for application programming. [45]

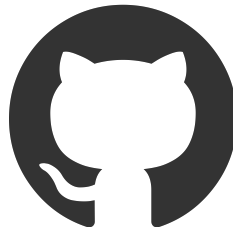
Figure 3.49: Wpf



## Tools

- **Github** : Github is a web-based version-control and collaboration platform for software developers, it was started in 2008 and was founded on Git, an open-source code management system created by Linus Torvalds to make software builds faster, then Microsoft the biggest single contributor, initiated an acquisition of GitHub for \$7.5 billion in June 2018, Git is used to storing the source code for a project and track the complete history of all changes to that code. It allows developers to collaborate on a project more effectively by providing tools for managing possibly conflicting changes from multiple developers. [19]

Figure 3.50: Github logo



- **Star uml** : Is one of the top leading software modeling tools that supports UML (Unified Modeling Language). That will guarantee to maximize the productivity and quality of your software. It is based on UML version 1.4 and provides eleven different types of diagrams, and it accepts UML 2.0 notation. It actively supports the MDA (Model Driven Architecture) approach by supporting the UML profile concept. StarUML excels in customizability to the user's environment and has high extensibility in its functionality. [25]

Figure 3.51: Star uml logo



- **Latex** : Pronounced lay-tech, is a system for creating high-quality documents. It is commonly used by scientists, engineers, software developers, mathematicians, and other professionals to produce lengthy and technical documents. LaTeX uses a plain text markup language which is compiled into a PDF document using optimal typographical rules. This results in professional-looking documents that are of a different class to the output from a word processor. The numerous customization options in LaTeX allow for the creation of a diversity of document types with precise control over layout and formatting. LaTeX lends itself well to the creation of templates that do not require advanced knowledge of LaTeX to use and manipulate, allowing a novice LaTeX users to create beautiful documents and learn LaTeX as they go. [21]

Figure 3.52: Latex logo



- **Beamer** : Beamer is a LaTeX class for creating presentations. A Beamer presentation is created like any other LaTeX document that contains sections and subsections. The obvious disadvantage of this approach is that you have to know LaTeX in order to use Beamer, The advantage is that if you know LaTeX, you can use your knowledge of LaTeX also when creating a presentation, not only when writing papers. [18]

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# Abstract

With the growth and the maturity of the tech field over time, the need to solve real-world problems increased and became a vital thing for businesses companies, and people. The purpose of this study is to develop and deliver an extension desktop as a part of an Enterprise Resource Planning system, this solution has many improvements for this Enterprise Resource Planning system which include, accelerating the work of the street vendors manager by gathering all functionalities in one place, Improve tracking and managing street vendors, and providing a graphical map to with precise view about customers positions.

## ملخص

مع نمو ونضج مجال التكنولوجيا بمرور الوقت ، زادت الحاجة إلى حل مشاكل العالم الحقيقي وأصبحت شيئاً حيوياً لشركات الأعمال والأفراد. الغرض من هذه الدراسة هو تطوير وتقديم سطح مكتب ملحق كجزء من نظام تخطيط موارد المؤسسات ، يحتوي هذا الحل على العديد من التحسينات لنظام تخطيط موارد المؤسسات هذا والتي تشمل ، تسريع عمل مدير الباعة الجائلين من خلال جمع جميع الوظائف في مكان واحد ، تحسين تتبع وإدارة الباعة الجائلين ، وتوفير خريطة بيانية لعرض دقيق لمواقع العملاء.

## Résumé

Avec la croissance et la maturité du domaine technologique au fil du temps, le besoin de résoudre des problèmes du monde réel a augmenté et est devenu une chose vitale pour les entreprises et les personnes. Le but de cette étude est de développer et de fournir un bureau d'extension dans le cadre d'un système de planification des ressources d'entreprise, cette solution comporte de nombreuses améliorations pour ce système de planification des ressources d'entreprise, notamment l'accélération du travail du responsable des vendeurs de rue en rassemblant toutes les fonctionnalités dans un seul endroit, Améliorez le suivi et la gestion des vendeurs de rue, et fournissez une carte graphique avec une vue précise sur les positions des clients.