بسم الله الرحمن الرحيم

SUDAN UNIVERSITY OF SCIENCE & TECHNOLOGY

FACULTY OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

POSTING/SENDING MESSAGES ACROSS FACEBOOK, MESSENGER, TWITTER AND WHATSAPP ALL FROM SINGLE DASHBOARD

THESIS SUMITTED AS A PARTIAL REQUIREMENTS 0F B.Sc. (HONOR) DEGREE IN COMPUTER SCIENCE

OCTOBER 2017

{ وَمِن كُلِّ شَيْءٍ خَلَقْنَا زَوْجَيْنِ لَعَلَّكُمْ تَذَكَّرُونَ }
الذاريات - 51:49

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Abstract – المستخلص

من أكثر الأشياء التي تجذب الإنتباه عندما يتعلق الأمر بأدوات إدارة وسائل الاعلام الاجتماعية هي أنها تسمح لك بنشر أو إرسال الرسائل والإرتباط مع المستخدمين على مختلف حساباتك في وسائل التواصل الاجتماعي، كل هذا من شاشة أو لوحة تحكم واحدة. سيكون أمرا مضيعا للوقت إذا تمت هذه العمليات من خلال الذهاب إلى كل حساب وسائل اجتماعي بشكل فردي، وهنا تصبح الحاجة ملحة الي أتمتة هذه العمليات لحل هذه المسألة. تم ربط أربعة واجهات برمجة تطبيقات (APIs) لوسائل التواصل الاجتماعي من ال واتساب، تويتر، فيسبوك ماسينجر، والفيسبوك بوست بوحدة أودو من أجل أتمتة العمليات المتعلقة بنشر أو إرسال الرسائل بشكل متزامن من لوحة تحكم واحدة. وأخيرا نجحنا في بناء وحدة أودو التي تقوم بتنفيذ هذه المهام مع أخذ الإعتبار بالمتطلبات التي تم تحديدها في نطاق البحث. الطريقة الوحيدة لنشر المحتوى على نحو فعال عبر وسائل الاعلام الاجتماعية المختلفة على نطاق واسع يكون عن طريق استخدام أدوات إدارة وسائل الاعلام الاجتماعية التي يمكن أن تحسن الكفاءة، ومع مرور الوقت تمكّنك الحصول على نتائج أفضل.

One of the biggest attractions when it comes to social media management tools is that they allow you to post or send messages and engage with users on your various social accounts, all from one single dashboard. It will be a time-consuming if these processes performed through going to each social media individually, and here the automation of these processes becomes an urgent need for the solution of these issue. Four social media APIs of WhatsApp, Twitter, Facebook-Messenger, and Facebook-Post were integrated in an ODOO module in order to automate the processes related posting and/or sending messages synchronously from one dashboard. We finally succeed to build an ODOO module that performs these tasks with the respect of the requirement defined in the research scope. The only way to effectively publish content across different social media at scale is with the use of social media management tools that can improve your efficiency, and over time get you better results.

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Glossary of Terms

Abbreviation	Meaning
API	Application Programming Interface
SDK	Software Development kit
HTTP	Hypertext Transfer Protocol
App	Application
Odoo	On Demand Open Object.
QR-Code	Quick Response Code
OpenERP	Open Source Enterprise Resource Planning
W3C	World Wide Web Consortium
UML	Unified Modeling Language
Fbchat	Facebook Chat API for Messenger
Tweepy	Tweeter API

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

In this part of the research we provide a general overview to the study, we cover the Conceptual and theoretical framework of the research.

In today's technology driven world, social media have become an avenue where you can extend easily your message to a wider range of people like friends, family, customers, employees or even students. The tools and approaches for communicating have changed greatly with the emergence of social media; therefore, which made organizations to think about how to use social media in a way that is consistent with their business plan.

Enterprise resource planning (ERP) is business process management software that allows organizations to use a system of integrated applications to manage the business and automate many back office functions related to technology, services and human resources.

In this research we will build an ODOO module that integrates four social media including Facebook Messenger, Twitter, Facebook-Post and WhatsApp.

1.2 The Definition of the Problem

Most of current social media management tools do not offer the automation of processes related to posting or sending messages on several social media through a one click of button. This problem can be solved by implementing a successful integrated social media Management tool to cut down on the number of times a person must visit each network individually while posting and/or sending message out to an individual or a group of people at a time.

An ODOO module that automates this processes by integrating four social media including Facebook Messenger, WhatsApp, Twitter, and Facebook-Post was proposed in order to save a time and effort. No more remembering pesky passwords

or having to go to each social media individually. A static say that 53% of people say they are more likely to do business with a business they can message. [1]

In the proposed system, simply you configure your social media accounts correctly, and then you will be able to post and/or send message on the social media account(s) that you selected with just one click of button. Social Media Suite, is for sharing contents on your different social media accounts, so you can work smarter, and not harder.

1.3 The core features of the proposed system

1. Integrated four social media apps in one dashboard.
2. Automation of posting and/or sending message on various social media.
3. Extracting the required report.
4. Easy and well-organized dashboard.
5. Ability to be integrated with other Modules.

1.4 Objectives

1. To integrate Facebook Messenger, WhatsApp, Facebook Post, and Twitter in a one dashboard.
2. To automate posting and/or sending message on various social media.
3. To give required reports.
4. To enable the module to integrate with other modules in Odoo.

1.5 Research Questions

1. How to integrate four social media apps in one dashboard.
2. How to automate posting and/or sending message on various social media.
3. How to extract any required report.
4. How to make and an easy and well-organized dashboard.
5. How to enable the module to be integrate with other modules.

1.6 Scope of the research

This research aims to the design and implementation of an ODOO Module that integrates Facebook-Messenger, Twitter, Facebook-Post and WhatsApp, where the main focus will be on how to link them to provide an easy way in posting and/or sending a message with just one click of button.

1.7 Structure of the Research

This research is divided into five chapters, chapter 1 provides a general overview to the study and covers the Conceptual and theoretical framework of the research. Chapter 2 surveys the research that already has been completed in our topic area and provides an analysis of all current information relevant to the topic. Chapter 3 covers the instruments used for implementation, and design models which illustrate the behavioral and dynamical structures of the system. In Chapter 4 we will give a finer level of details of the implementation, we mention the experimental findings and Screenshots of the module. In chapter 5 we discuss the results of the research study and possible future research directions and finally we list the resources that we collected data and information.

CHAPTER TWO: LITERATURE REVIEWS

2.1 Introduction

In this chapter we will focus on issues that are more specifically related to the work in our project with mentioning the key differences and similarities between them and our topic area.

In today's world, social media is one of the best ways for your business to stand out in its field and to reach a wider audience. Having an active presence on all major social networks, from Facebook to LinkedIn and beyond, is a necessity for any brand that wants to become an industry leader while engaging with its potential and current customers in new ways.

Many literature reviews were searched on the Internet and more than one study was found.

2.2 Buffer

Buffer is a software application for the web and mobile, designed to manage accounts in social networks, by providing the means for a user to schedule posts to Twitter (Profiles), Facebook (Profiles, pages and groups), LinkedIn (Profiles and pages), Google+ (Pages), Pinterest (Multiple boards) and Facebook-Post (Profiles). It offers social media analytics, social media management features, and a scheduling calendar tool. The Buffer application is compatible with three different platforms:

- *Browser*: allows the application to work as downloaded extensions for three browsers, Google Chrome, Safari and Mozilla Firefox.
- *Mobile:* allows the application to be installed on iOS systems and Android phones.
- *Newsreader:* allows the application to be integrated with various newsreader applications, such as Flipboard and Zite.

Add content directly to a queue that is customized to publish your updates at the best times:

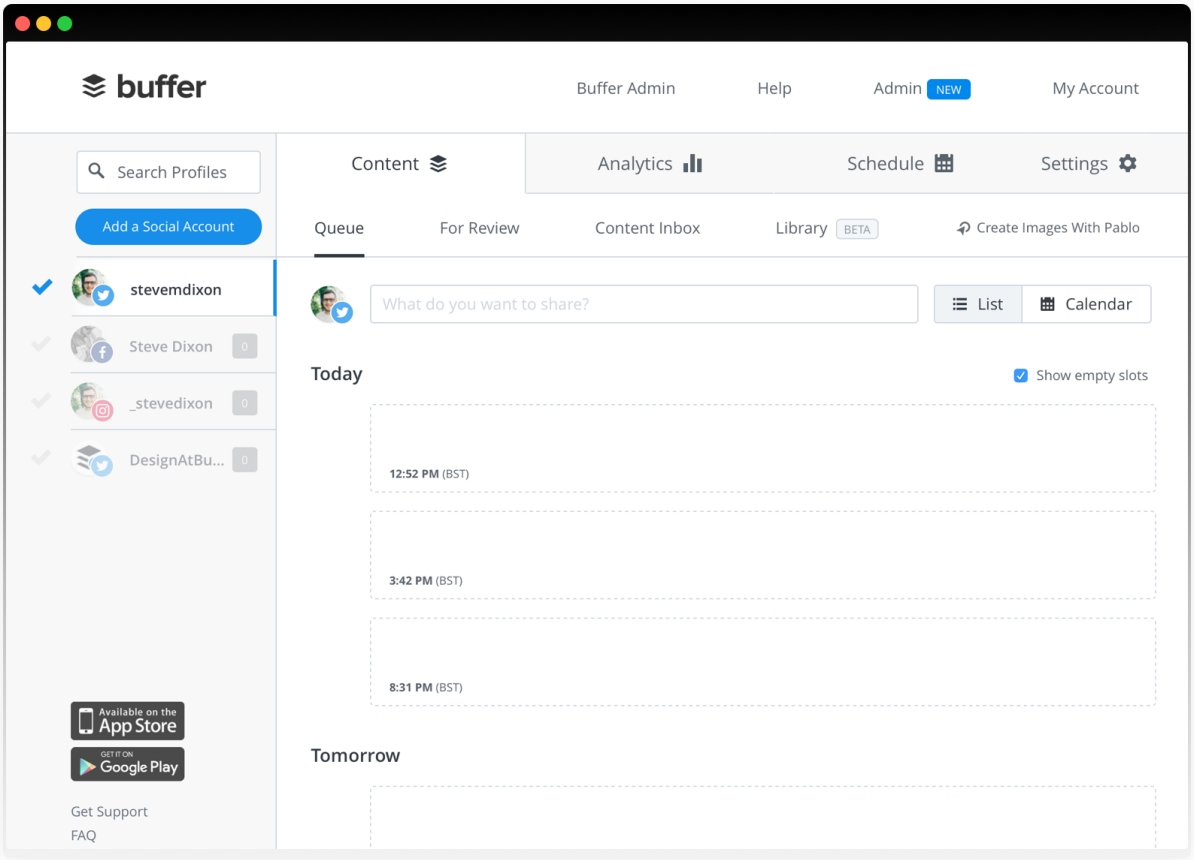

Figure 2.1: Buffer web dashboard

Choose the specific days and times when you'd like your updates to publish. Buffer will take care of the rest:

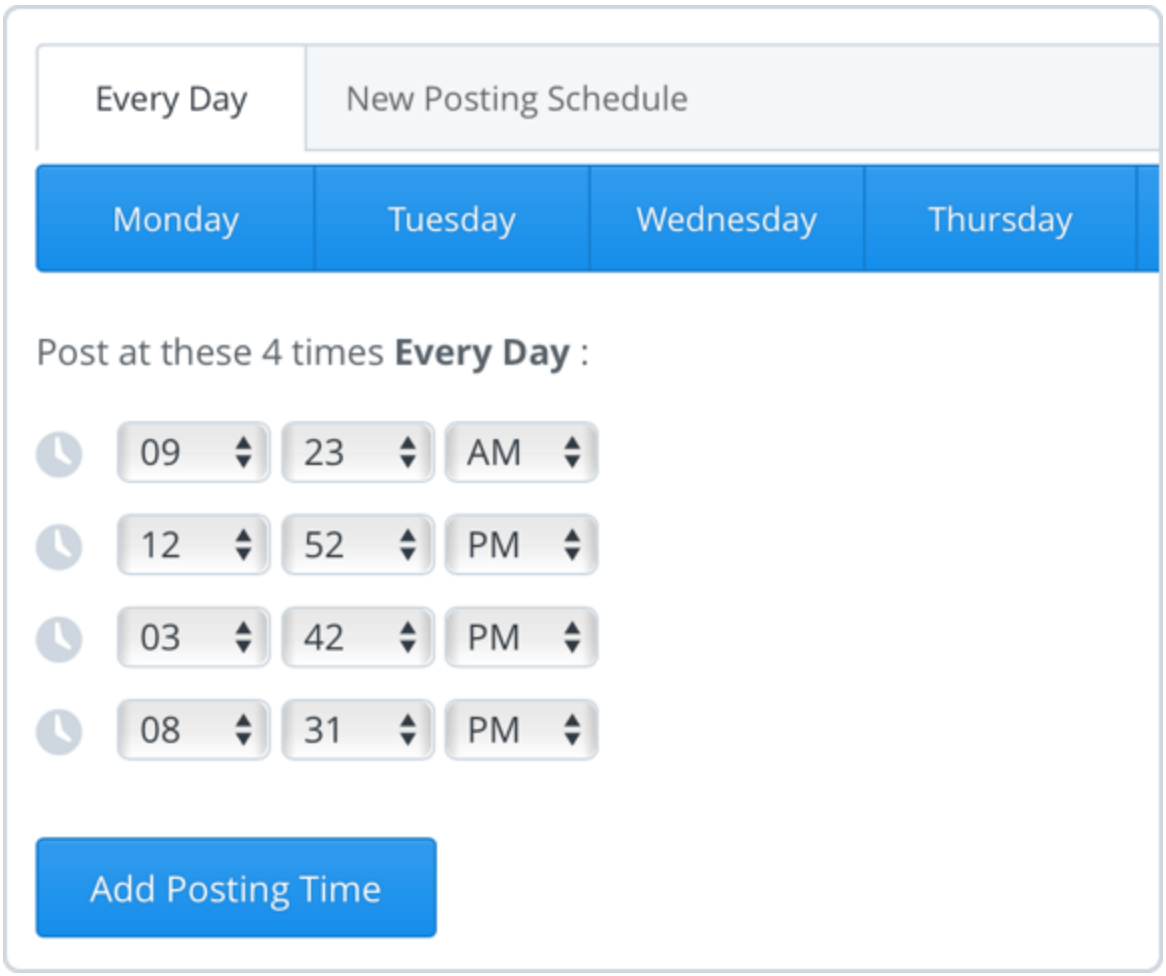

Figure 2.2: Custom Buffer Schedule

The free version of the application allows a maximum limit of 10 posts to be scheduled at any given time, and only allows the management of one social media account per social media website.

2.3 Hootsuite

Hootsuite is another useful application for managing social media network channels. Often referred to as a social media management system or tool, it enables you to view multiple streams at once and monitor what customers are saying. You can post updates, read responses, schedule messages, view statistics, and much more. Many international brands—including Coca-Cola and Sony Music—utilize this timesaving approach to social media marketing. With Hootsuite, you can post updates, review responses, and connect with your customer base on over thirty-five popular social networks, including Twitter, Facebook (includes Profiles, Events, Groups, and Fan Pages), LinkedIn (includes Profiles, Pages, and Groups), Google+, Foursquare, WordPress blogs and several other platforms via third party apps. [2]

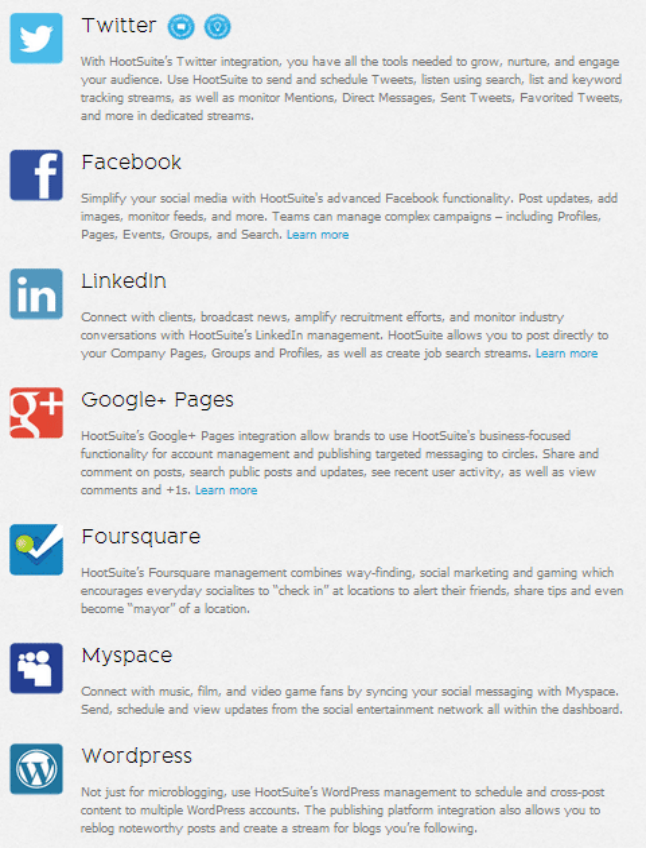

Figure 2.3: Hootsuite Multiple Streams in one place

Below is an example of a draft message and the scheduling functionality. HootSuite can also shorten long URL links into shorter links to ensure your messages stay within character limits. [3]

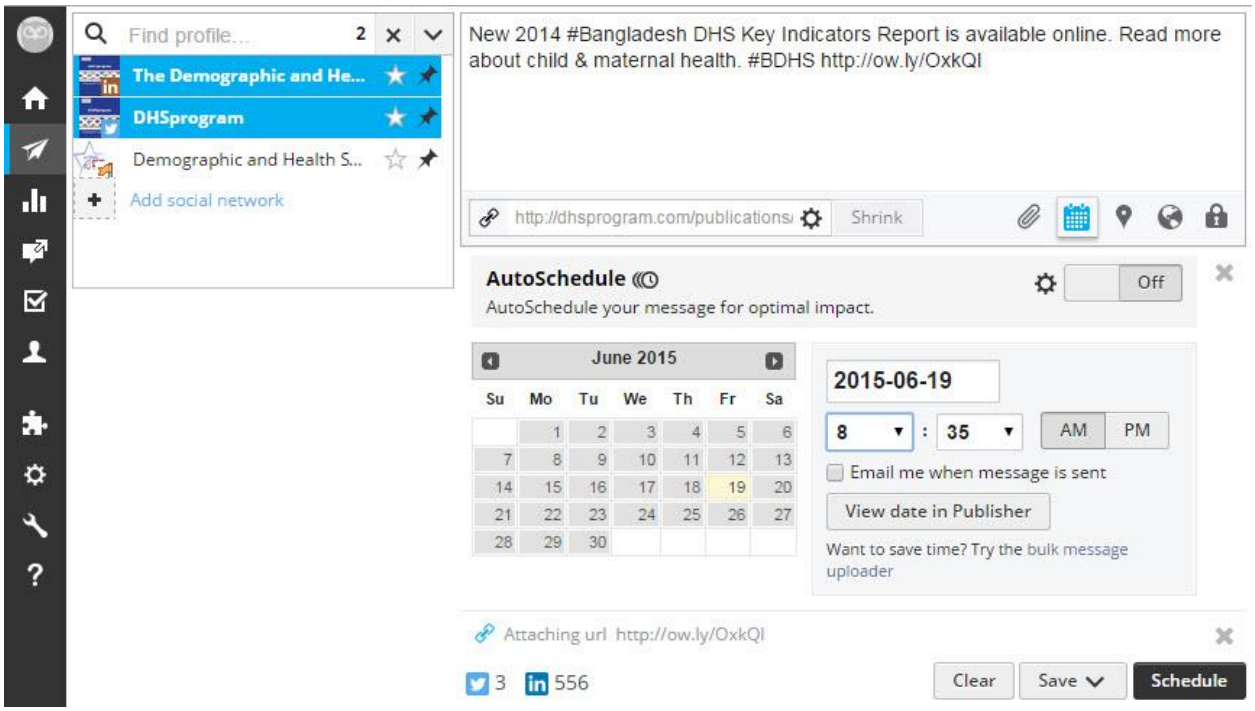

Figure 2.4: Hootsuite example of a draft message and the scheduling

2.4 Sprout Social

Sprout Social is another nifty tool that can manage, post, monitor, and analyze multiple social media accounts from one location. For example, you could schedule posts, and reply to messages on Facebook and Twitter.

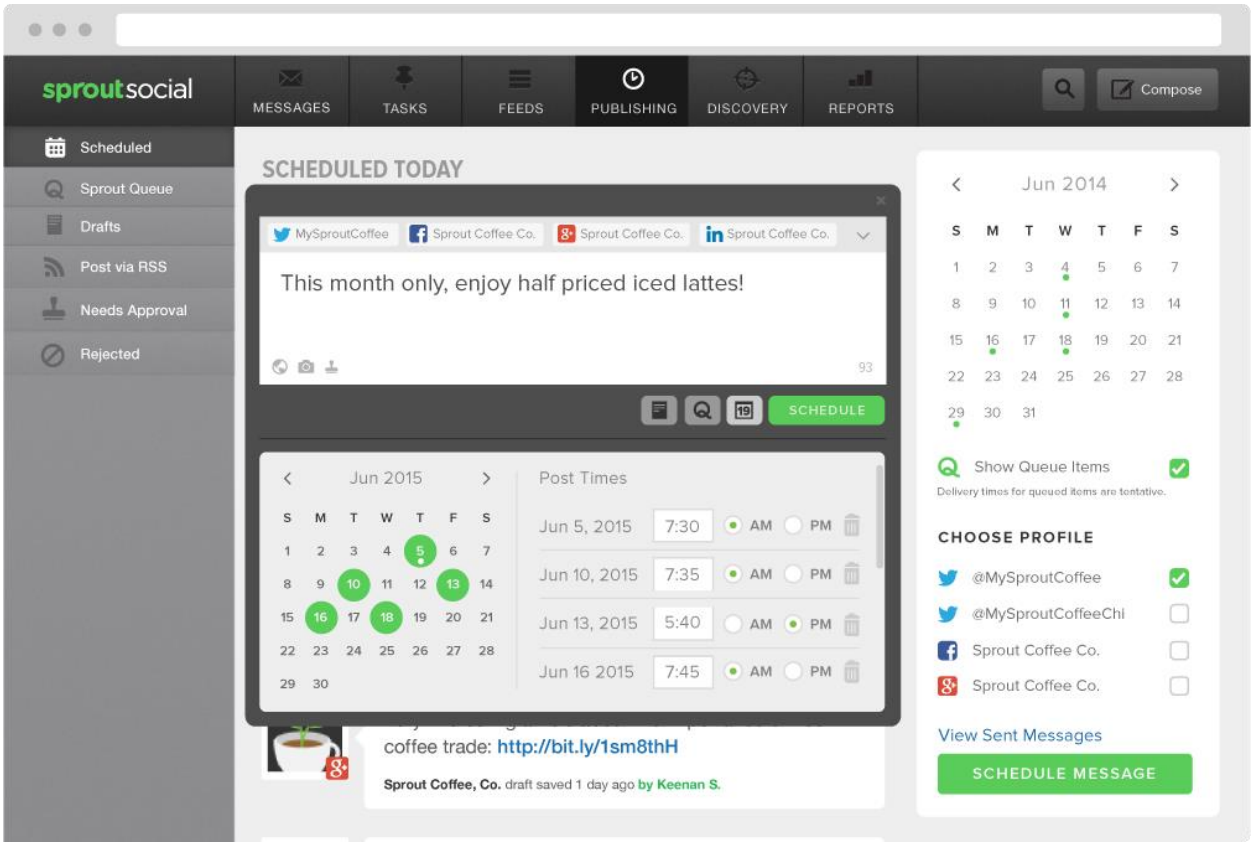

Figure 2.5: a custom sprout social scheduling

Their goal is to help businesses build lasting and meaningful relationships with their customers.

You can also monitor messages across Facebook, Twitter, Google+, and LinkedIn personal profiles all through on streaming inbox, as well as it integrates with ZenDesk, UserVoice, and Salesforce to allow you to manage all your customer support, interactions, and relationships from a single dashboard.

But, that's not all. Sprout Social also offers analytics so that you can visualize important metrics.

Figure 2.6: a custom sproutsocial analytic dashboard

It enables you to improve customers' return on social media and easily manage your entire portfolio from a single tool. Bring all of your messages from all of your profiles into a single stream. With sprout social you can find opportunities to engage, tag incoming messages, join conversations, and respond to customers across Twitter, Facebook, Messenger, Google+ and Facebook-Post. [4]

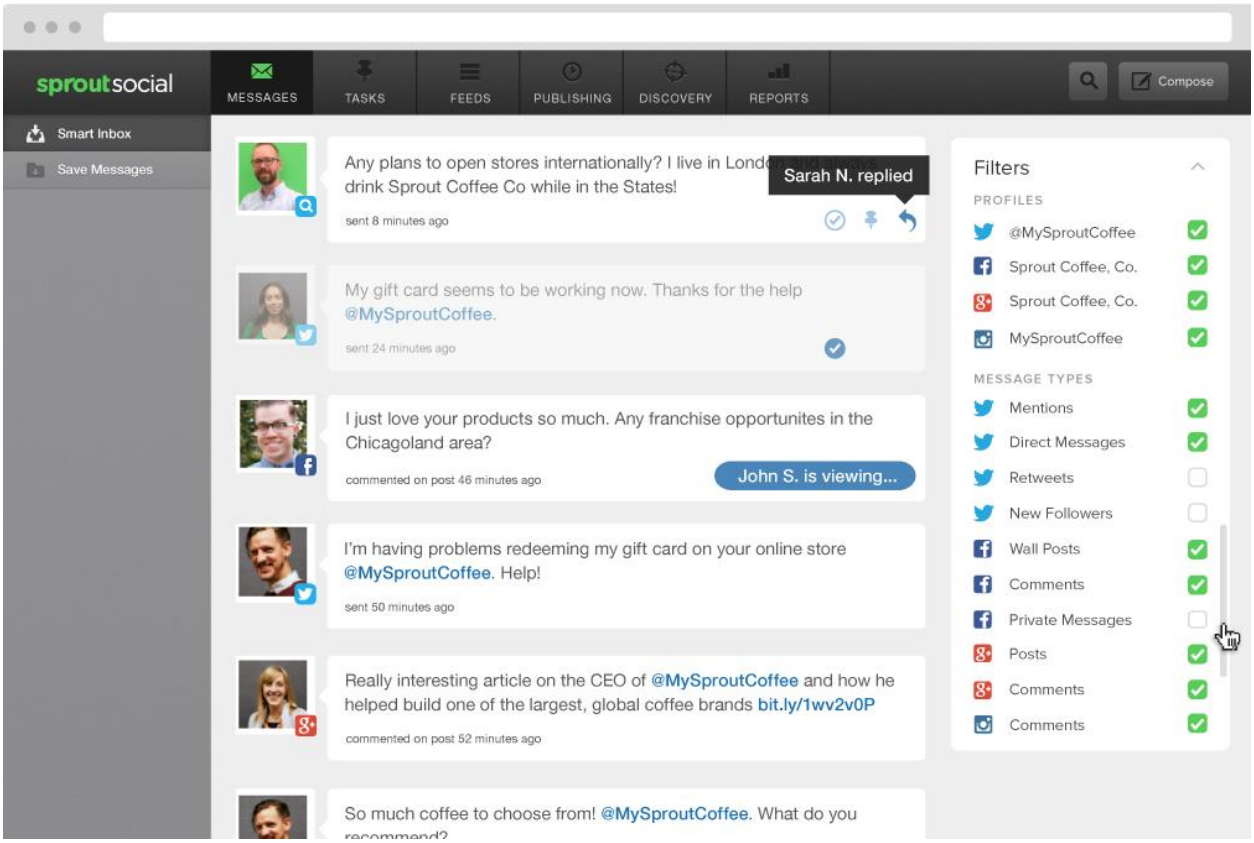

Figure 2.7: a custom sproutsocial smart inbox

2.5 The similarities and differences

Both the system we proposed and the above mentioned systems combine several social media accounts in one dashboard.

The key difference is that the social media management tools listed above (Buffer, Hootsuite and Sprout Social.) each pay attention to scheduling posts and reacting feedbacks from followers and friends on different social media and analyzes them, but we our tool is ODOO based module which integrates four social media and automates their processes related to posting and sending messages. The Module will support posting or sending across Twitter, WhatsApp, Facebook-Messenger and Facebook-Post.

CHAPTER THREE: SYSTEM TOOLS AND DESIGN MODELS

3.1 Introduction

In this chapter, we will be covered by the instruments or tools that we used for implementing this system, and design models which illustrate the behavioral and dynamical structures of the system.

3.2 Tools

3.2.1 Ubuntu 16.4

Ubuntu is a complete desktop Linux operating system, freely available with both community and professional support. The Ubuntu community is built on the ideas enshrined in the Ubuntu Manifesto: that software should be available free of charge, that software tools should be usable by people in their local language and despite any disabilities, and that people should have the freedom to customize and alter their software in whatever way they see fit. "Ubuntu" is an ancient African word, meaning "humanity to others". The Ubuntu distribution brings the spirit of Ubuntu to the software world [5].

In a word, Ubuntu is an open source software operating system that runs from the desktop, to the cloud, to all your internet connected things

3.2.2 ERP

The acronym ERP stands for enterprise resource planning. It refers to the systems and software packages used by organizations to manage day-to-day business activities, such as accounting, procurement, project management and manufacturing. ERP systems tie together and define a plethora of business processes and enable the flow of data between them.

By collecting an organization's shared transactional 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.

RP systems are designed around a common, defined data structure (schema) that usually has a common database. ERP systems provide access to enterprise data from multiple activities using common constructs and definitions and common user experiences.

A key ERP principle is the central collection of data for wide distribution. Instead of several standalone databases with an endless inventory of disconnected spreadsheets, ERP systems bring order to the chaos so that all users—from the CEO to accounts payable clerks—create, store, and use the same data derived through common processes. With a secure and centralized data repository, everyone in the organization can be confident that data is correct, up to date, and complete. Data integrity is assured for every task performed throughout the organization, from a quarterly financial statement to a single outstanding receivables report, without deploying error-prone spreadsheets.

It's impossible to ignore the impact of ERP in today's business world. As enterprise data and processes are corralled into ERP systems, businesses are able to align separate departments and improve workflow, resulting in significant bottom-line savings [6].

3.2.3 Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

Often, programmers fall in love with Python because of the increased productivity it provides. Since there is no compilation step, the edit-test-debug cycle is incredibly fast. Debugging Python programs is easy: a bug or bad input will never cause a segmentation fault. Instead, when the interpreter discovers an error, it raises an exception. When the program doesn't catch the exception, the interpreter prints a stack trace. A source level debugger allows inspection of local and global variables, evaluation of arbitrary expressions, setting breakpoints, stepping through the code a line at a time, and so on. The debugger is written in Python itself, testifying to Python's introspective power.

On the other hand, often the quickest way to debug a program is to add a few print statements to the source: the fast edit-test-debug cycle makes this simple approach very effective. [7]

3.2.4 XML

XML stands for Extensible Markup Language. It is a text-based markup language derived from Standard Generalized Markup Language (SGML).

XML tags identify the data and are used to store and organize the data, rather than specifying how to display it like HTML tags, which are used to display the data. XML is not going to replace HTML in the near future, but it introduces new possibilities by adopting many successful features of HTML. There are three important characteristics of XML that make it useful in a variety of systems and solutions:

- XML is extensible: XML allows you to create your own self-descriptive tags, or language, that suits your application.
- XML carries the data, does not present it: XML allows you to store the data irrespective of how it will be presented.
- XML is a public standard: XML was developed by an organization called the World Wide Web Consortium (W3C) and is available as an open standard.

A short list of XML usage says it all:

- XML can work behind the scene to simplify the creation of HTML documents for large web sites.
- XML can be used to exchange the information between organizations and systems.
- XML can be used for offloading and reloading of databases.
- XML can be used to store and arrange the data, which can customize your data handling needs.
- XML can easily be merged with style sheets to create almost any desired output.

- Virtually, any type of data can be expressed as an XML document.

XML is a markup language that defines set of rules for encoding documents in a format that is both human-readable and machine-readable. So what exactly is a markup language? Markup is information added to a document that enhances its meaning in certain ways, in that it identifies the parts and how they relate to each other. More specifically, a markup language is a set of symbols that can be placed in the text of a document to demarcate and label the parts of that document [8].

3.2.5 UML

UML is a standard language for specifying, visualizing, constructing, and documenting the artifacts of software systems.

UML was created by the Object Management Group (OMG) and UML 1.0 specification draft was proposed to the OMG in January 1997.

OMG is continuously making efforts to create a truly industry standard.

- UML stands for Unified Modeling Language.
- UML is different from the other common programming languages such as C++, Java, COBOL, etc.
- UML is a pictorial language used to make software blueprints.
- UML can be described as a general purpose visual modeling language to visualize, specify, construct, and document software system.
- Although UML is generally used to model software systems, it is not limited within this boundary. It is also used to model non-software systems as well. For example, the process flow in a manufacturing unit, etc.

- UML is not a programming language but tools can be used to generate code in various languages using UML diagrams. UML has a direct relation with object oriented analysis and design. After some standardization, UML has become an OMG standard. [9]

3.2.6 Selenium

Selenium Python bindings provides a simple API to write functional/acceptance tests using Selenium WebDriver. Through Selenium Python API you can access all functionalities of Selenium WebDriver in an intuitive way.

Selenium Python bindings provide a convenient API to access Selenium Web Drivers like Firefox, I.e., Chrome, Remote etc. The current supported Python versions are 2.7, 3.5 and above.

Selenium requires a driver to interface with the chosen browser. Firefox, for example, requires gecko driver, which needs to be installed before the programs can be run. [10]

3.2.7 PostgreSQL

PostgreSQL is a general purpose and object-relational database management system, the most advanced open source database system.

PostgreSQL was designed to run on UNIX-like platforms. However, PostgreSQL was then also designed to be portable so that it could run on various platforms such as Mac OS X, Solaris, and Windows.

In odoo, the PostgreSQL database server contains all of the databases, each of which contains all data and most elements of the Odoo system configuration. [11]

3.3 Design models

3.3.1 Use Case Diagram

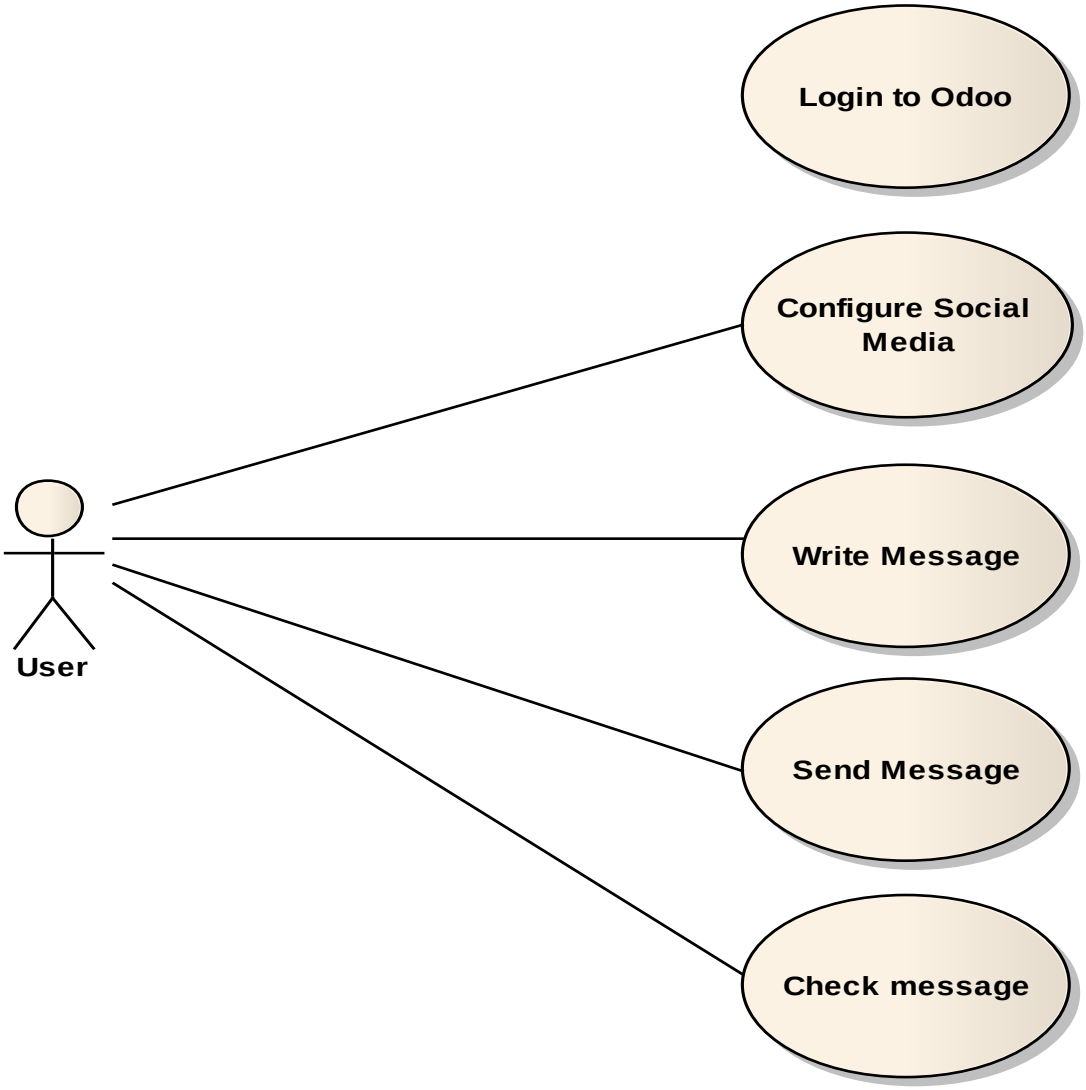

Figure 3.1: Use Case Diagram

3.3.2 Sequence Diagram

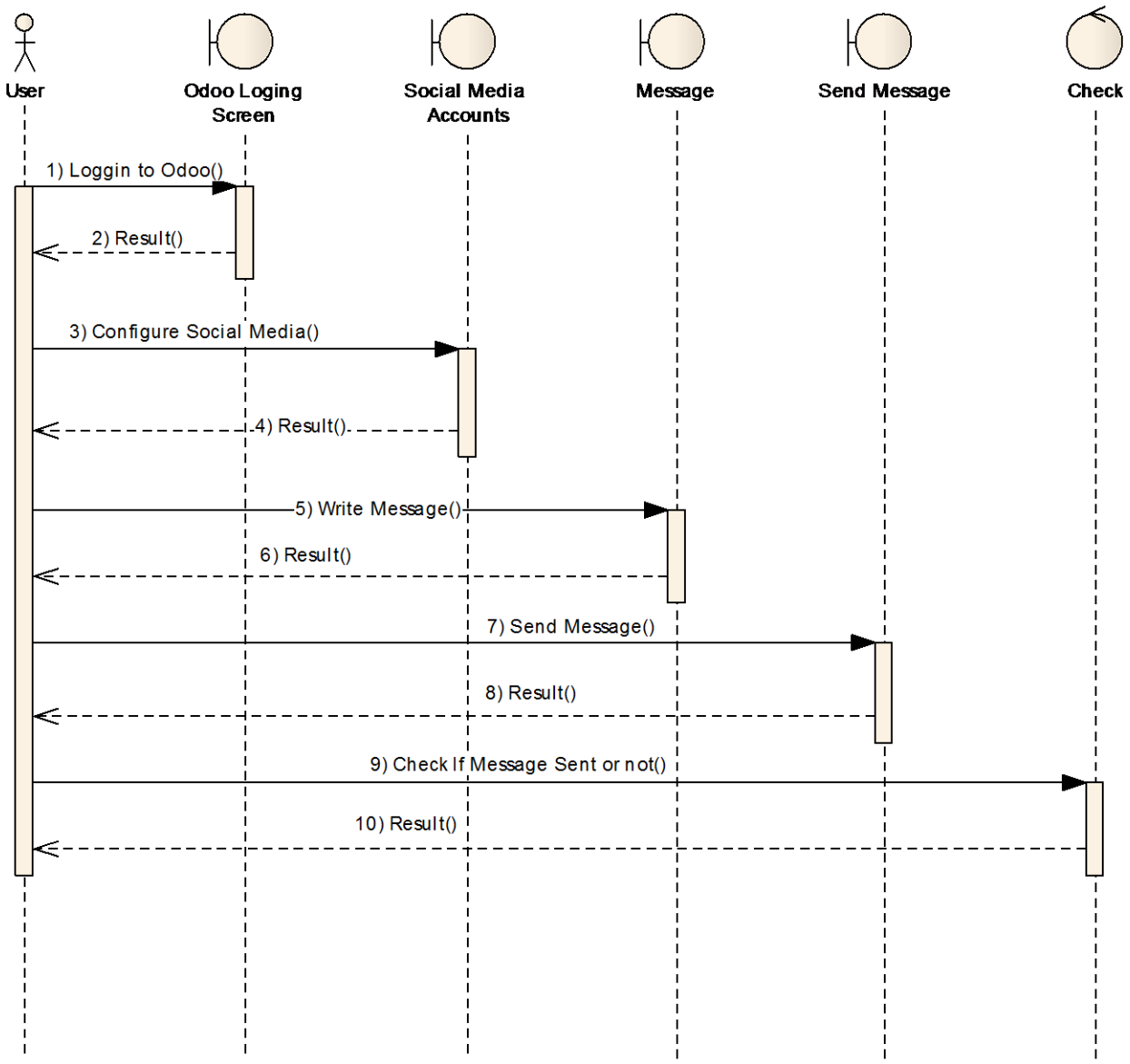

Figure 3.2: Sequence Diagram

3.3.3 Activity Diagram

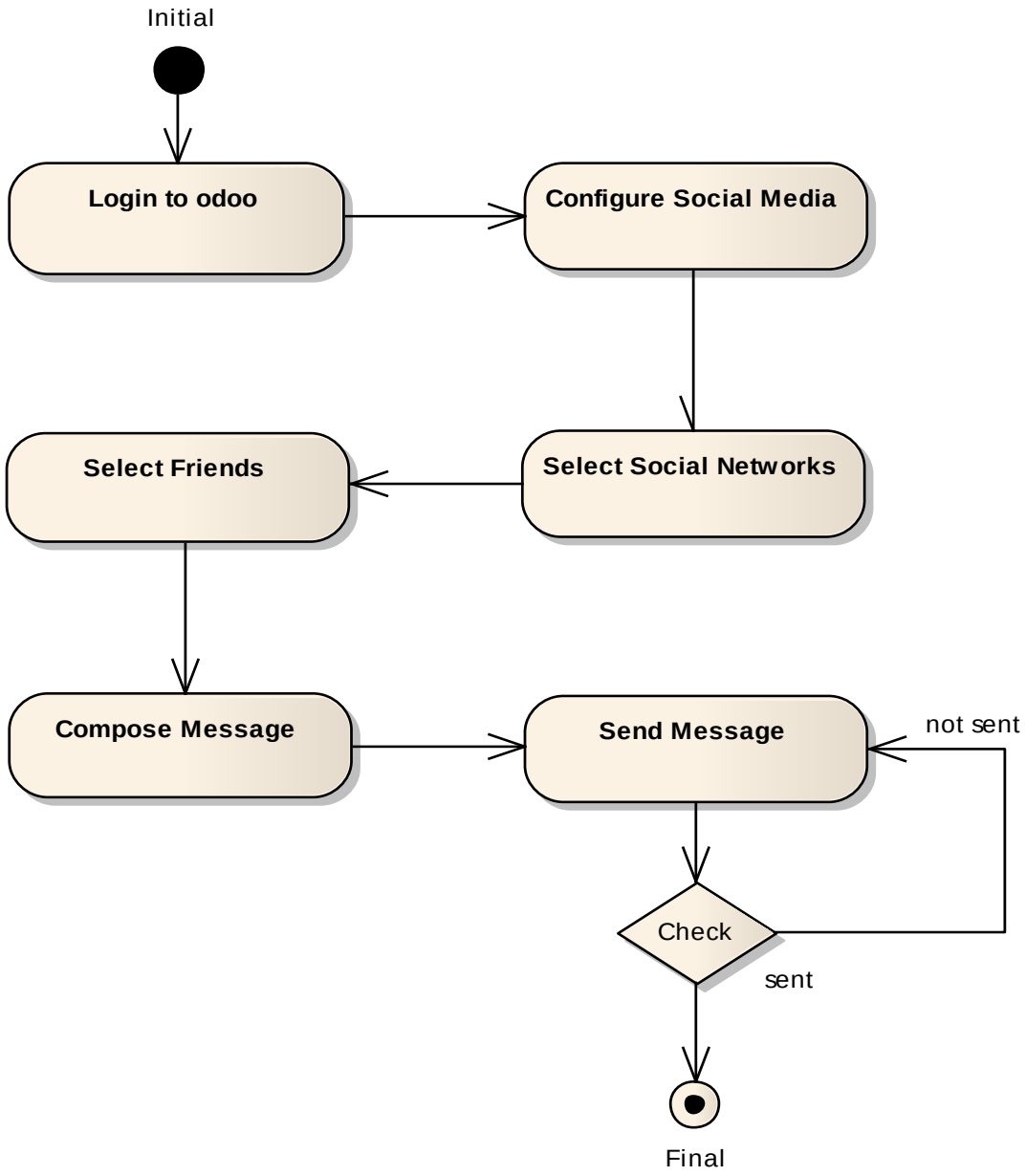

Figure 3.3: Activity Diagram

CHAPTER FOUR: SYSTEM IMPLEMENTATION

4.1 Introduction

This chapter shows the implementation details of Social Media Suite project. It also shows the steps required to achieve the complete Social Media Suite process. Also, it introduces a GUI we implement to facilitate interaction with the system and make it very comfortable. The architecture of the social media suite module consists of four models including (Facebook-Post, Messenger, Twitter and WhatsApp), an interface, web controller, and PostgreSQL. The below figure illustrates this.

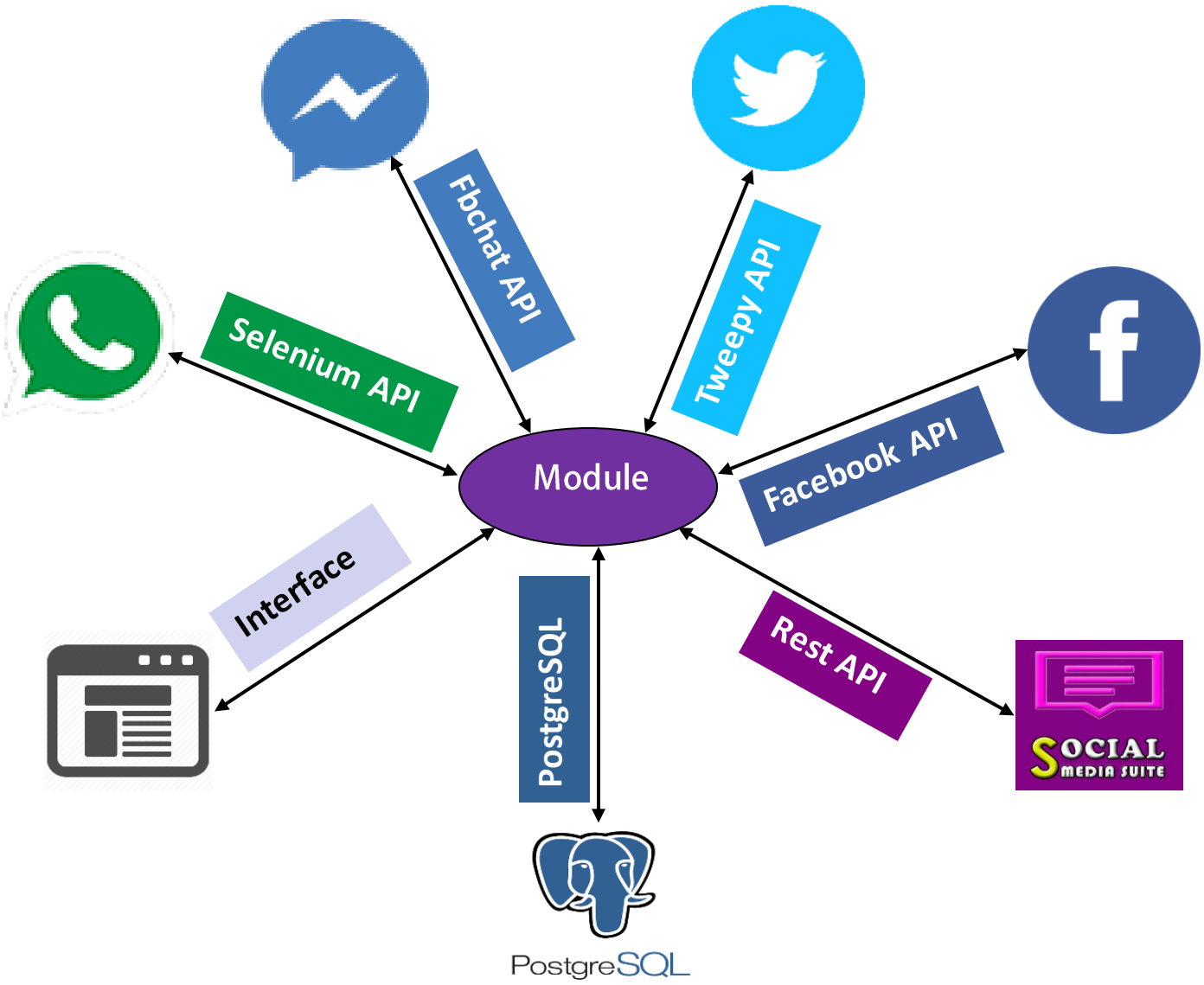

Figure 4.1: Social Media Suite Architecture

4.2 Technical APIs

4.2.1 Fbchat: Facebook Chat (Messenger) for Python

Facebook Chat (Messenger) for Python. This project was inspired by facebook-chat-api. No XMPP (Extensible Messaging and Presence Protocol) or API key is needed.

fbchat uses your email and password to communicate with the Facebook server. That means that you should always store your password in a separate file, in case e.g. someone looks over your shoulder while you're writing code. You should also make sure that the file's access control is appropriately restrictive.

Currently fbchat support Python 2.7, 3.4, 3.5 and 3.6. fbchat works by emulating the browser. This means doing the exact same GET/POST requests and tricking Facebook into thinking it's accessing the website normally. Therefore, this API requires the credentials of a Facebook account. [12]

4.2.2 Tweepy: Twitter for Python

Tweepy is an easy-to-use Python library for accessing the Twitter API. Twitter offers an interface to a wide variety of information one would like to get his hands on. These can in essence be accessed through a REST interface, which might be rather unintuitive to novel users. Luckily most programming languages offer a wrapper for this API, Tweepy for Python being one of them.

To access the API, you need a Twitter account and developer credentials - the latter of which can be obtained by creating an 'app', for which one can refer to apps section. After receiving your brand spanking new app environment, it will list a manage keys and access tokens point near the Consumer Key.

From that section, you can generate the tokens needed to fill in for authorization, which I will refer to as *cons_key, cons_sec, accs_tok, accs_sec.*

There are two steps to this authorization; app-level authorization, and-user level authorization. The cons_ keys are needed for app-level, and need to be combined with the *accs_* ones for user-level authorization. [13]

4.2.3 Facebook-sdk 2.0.0 for Python

This client library is designed to support the Facebook Graph API and the official Facebook JavaScript SDK, which is the canonical way to implement Facebook authentication. The SDK currently supports Python 2.7, 3.3, 3.4, and 3.5.

The Graph API is the primary way to get data in and out of Facebook's social graph. It's a low-level HTTP-based API that is used to query data, post new stories, upload photos and a variety of other tasks that an app might need to do.

To be able to extract data from Facebook using a python code you need to register as a developer on Facebook and then have an access token. Here are the steps for it:

1 Go to link developers.facebook.com, create an account there.
2 Go to link developers.facebook.com/tools/explorer.
3 Go to "My apps" drop down in the top right corner and select "add a new app". Choose a display name and a category and then "Create App ID".
4 Again get back to the same link developers.facebook.com/tools /explorer. You will see "Graph API Explorer" below "My Apps" in the top right corner. From "Graph API Explorer" drop down, select your app.
5 Then, select "Get Token". From this drop down, select "Get User Access Token". Select permissions from the menu that appears and then select "Get Access Token."

6 Go to link developers.facebook.com/tools/accesstoken. Select "Debug" corresponding to "User Token". Go to "Extend Token Access". This will ensure that your token does not expire every two hours. [14]

4.2.4 Selenium web-driver for WhatsApp-web

We used Selenium python bindings web driver called geckodrive to interact with WhatsApp web browser. Then we created a custom automated script for WhatsApp web browser to automate processes like selecting the friend's name and sending message to him.

We used XPath to find the dynamic elements on a WhatsApp account page, such as the search contact field to search for the contact's name and the message field to write the message in its body.

4.3 Interface

We have Main Menu called Social Suite and it consists of three sub-menu including Dashboard, Configurations and Mailbox.

4.3.1 Dashboard

This menu has an action called (Send Message) which when the user clicks on it opens a new window, where the user makes the desired actions to send a message.

4.3.2 Configurations

This menu has four actions including (Twitter), (Facebook-Post), (Facebook Messenger) and (WhatsApp), here the user enters what an each social media requires to enable him/her post or send a message.

4.3.3 Mailbox

This menu has an action called (Message's Queue) and show to the user the sent and unsent messages along with its social media type, date and time, it's subject and content.

4.4 Web Controllers

Odoo web controller provides the facility to create frontend modules which can be easily integrate with the backend modules.

Here backend is refers to the modules which provides functionalities like Human Resource, sales management, purchase management, inventory, warehouse etc. These functionalities are mostly accessed by user with permission to access these modules.

Frontend modules refers odoo website functionalities like website, website sale,

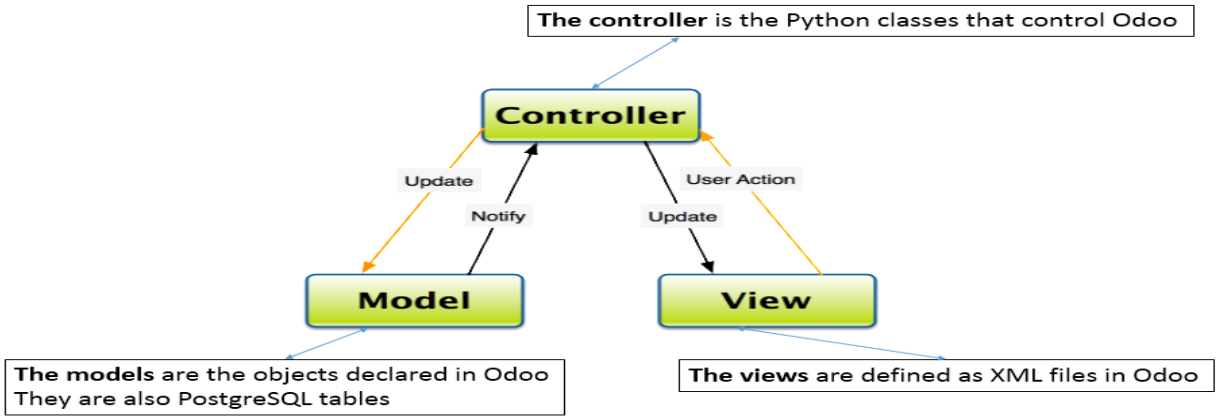

Figure 4.2: MVC Structure

website blog etc. These modules creates a website pages for the public users with both static and dynamic contents. [15]

We can post and/or send message through the web service we provided, like below:

- If we want to send across Facebook-post we can do it like this: *localhost:8069/send/Facebook? msg="Hello".*
- For twitter just we replace Facebook with twitter and the same thing for messenger and WhatsApp but we just replace instead of twitter and Facebook with messenger or WhatsApp.
- If we want to post or send across all social media we can do it like this: *localhost:8069/send/FacebookTwitterMessengerWhatsApp? mgs="Hello".*

4.5 Demo

After Logging in to the Odoo Account and installing the Social Media Suite Module; the first thing to do is configuration of the four social platforms including Twitter, Facebook-Post, Facebook-Messenger and WhatsApp Configuration.

4.5.1 Twitter Configuration

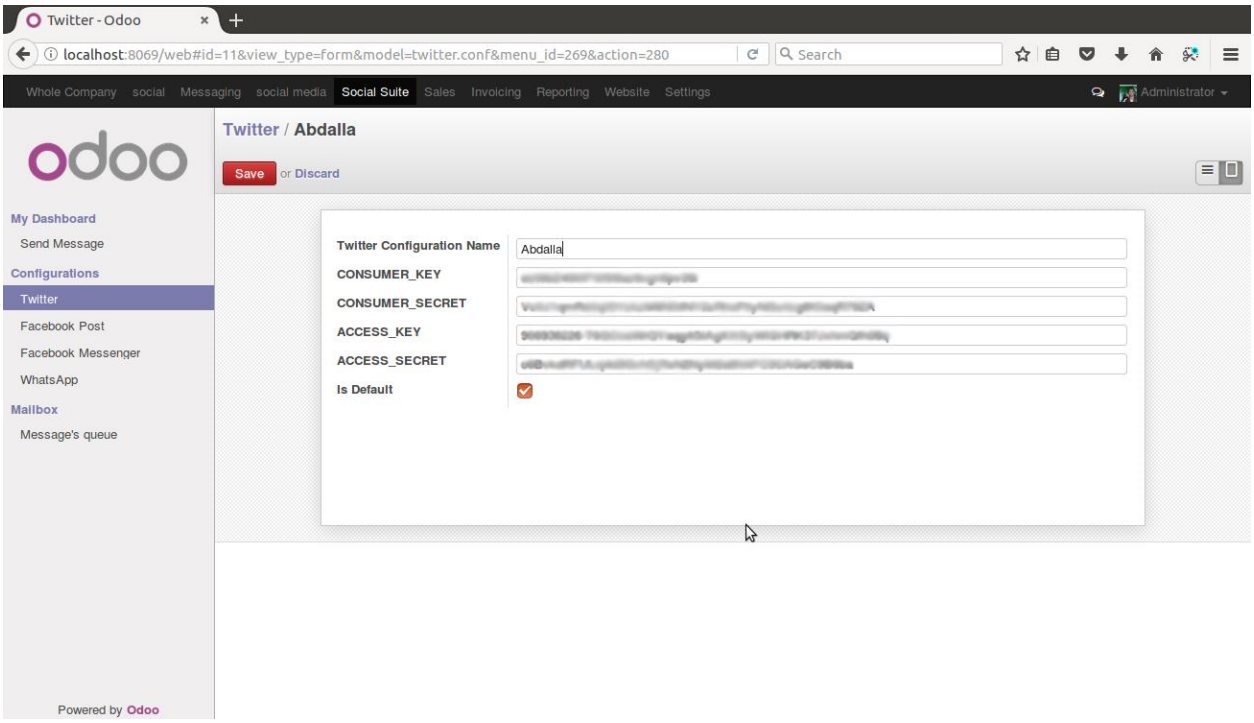

Figure 4.3: Twitter Configuration Screen

4.5.2 Facebook-Post Configuration

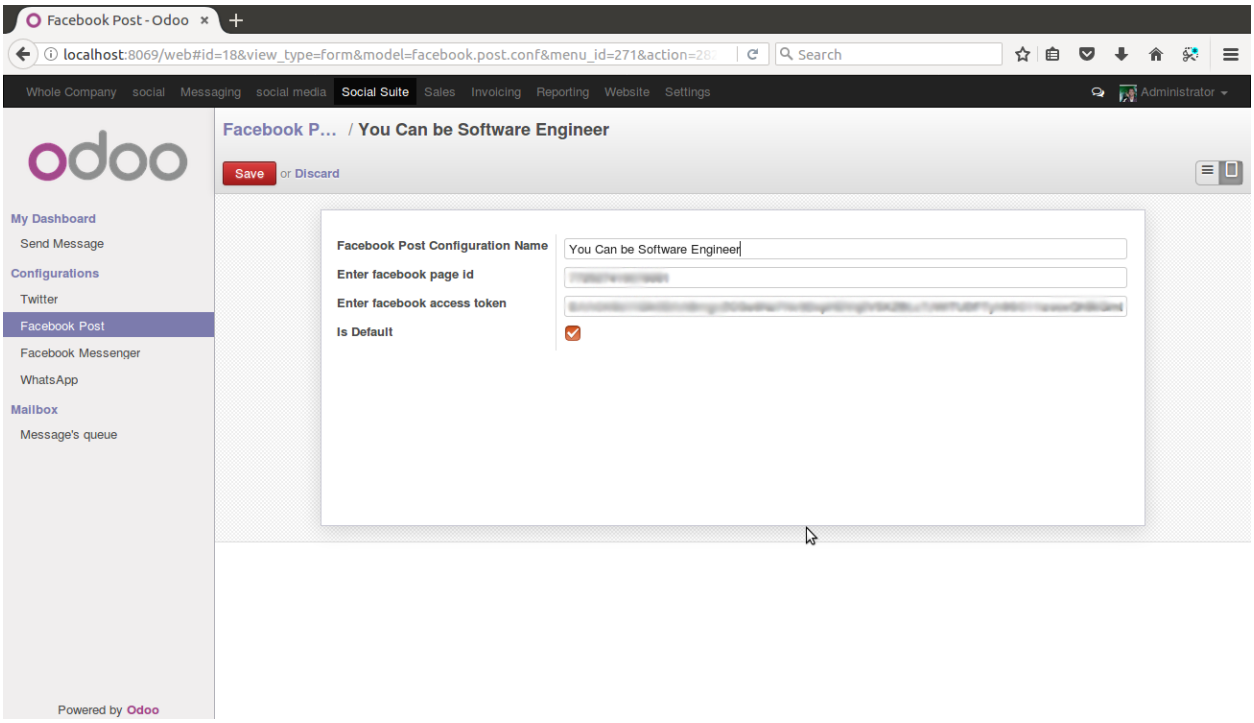

Figure 4.4: Facebook-Post Configuration Screen

4.5.3 Facebook-Messenger Configuration

Messenger requires your email, password and friend's Full name who must be already there in your friends list. The below figure shows the configuration of Messenger:

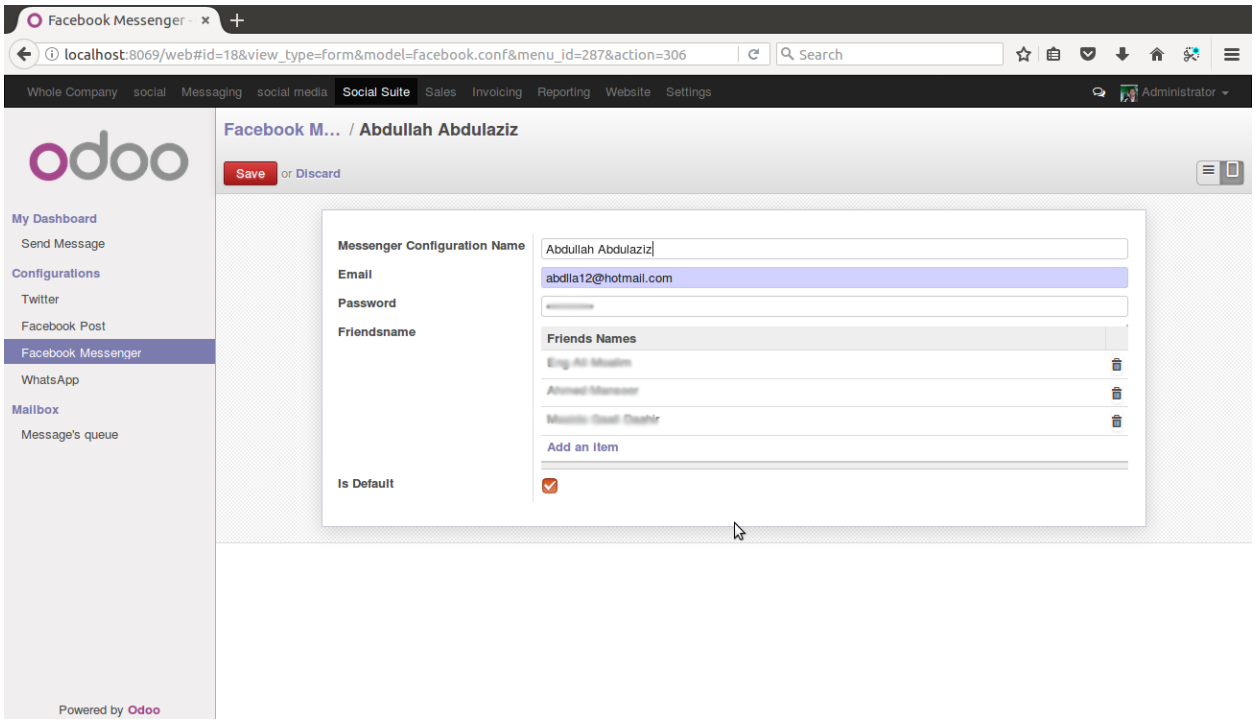

Figure 4.5: Facebook-Messenger Configuration Screen

To add a friend in the list, you can do it by clicking the "Add item" button shown in figure 4.2.3.3 which then will appear under the "Friends Names" field. The following window will appear after clicking the "Add item" button to fill your friend's full name like below:

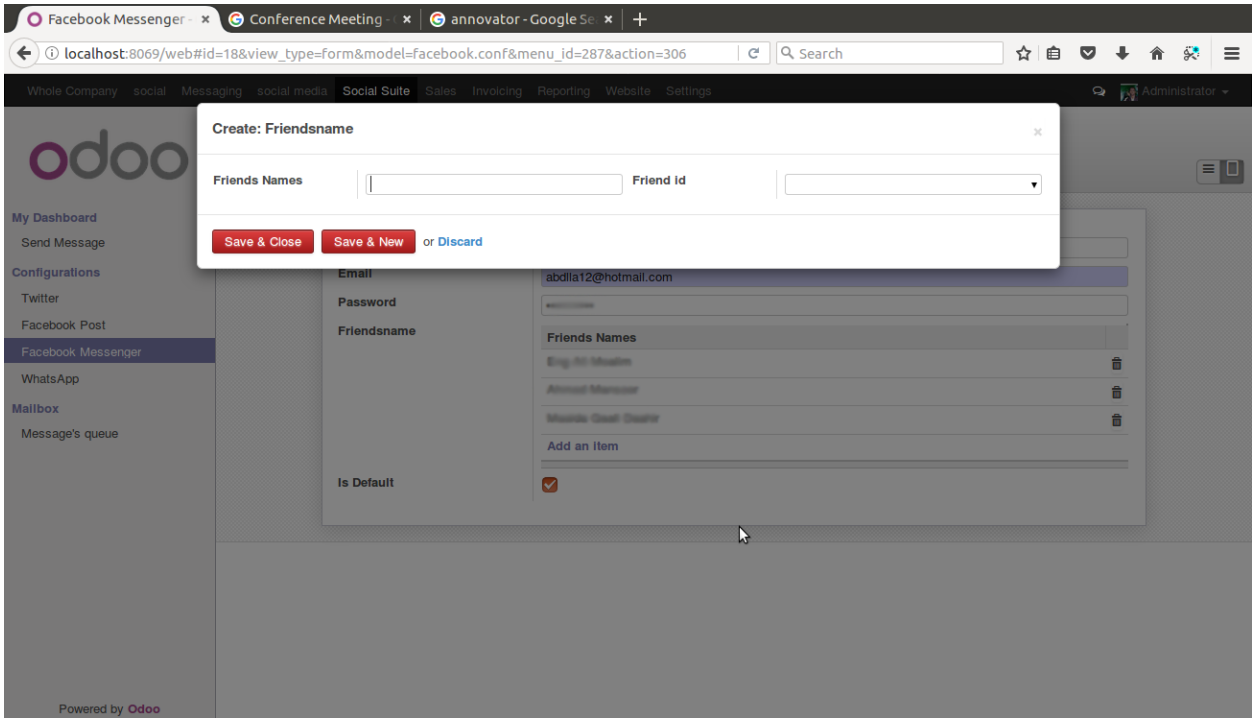

Figure 4.6: Adding a friend to the friends' list Screen

4.5.4 Sending Message

In the Message sending process, the user writes the message and then he selects the social Media Account(s) he wants to send, it's something like below.

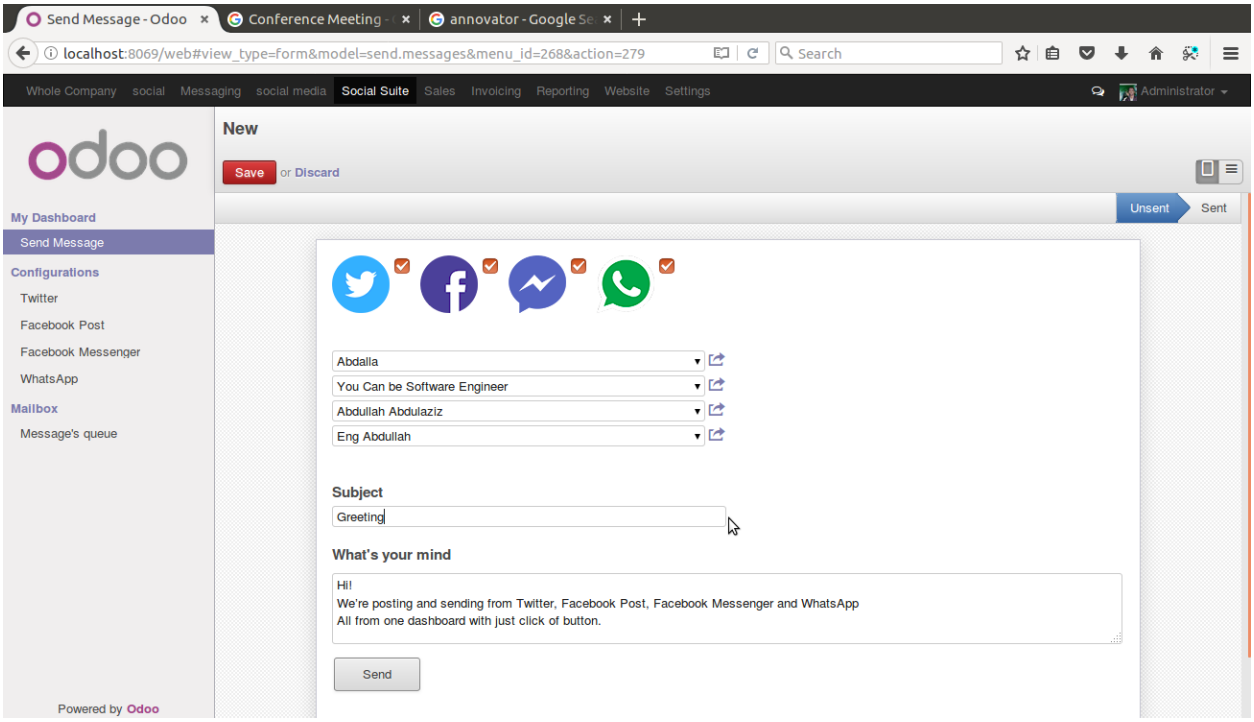

Figure 4.7: Messaging Screen

The message will be sent concurrently through all the social media accounts, but one step will be required, which is scanning the WhatsApp web QR-Code. The root cause of this issue will be described well in the following section.

4.5.5 WhatsApp Configuration

The complete Configuration of the Previous Social Media Accounts can be made and saved already in the system's Configurations, but according to WhatsApp, we can only configure the friend name in the system configuration, and the remaining part of the configuration –which is Scanning QR-code- proceeds after clicking on send button, this is due to the mechanism behind the WhatsApp QR-Code and Security issues.

WhatsApp web application is opened by user via web browser and QR-Code appears:

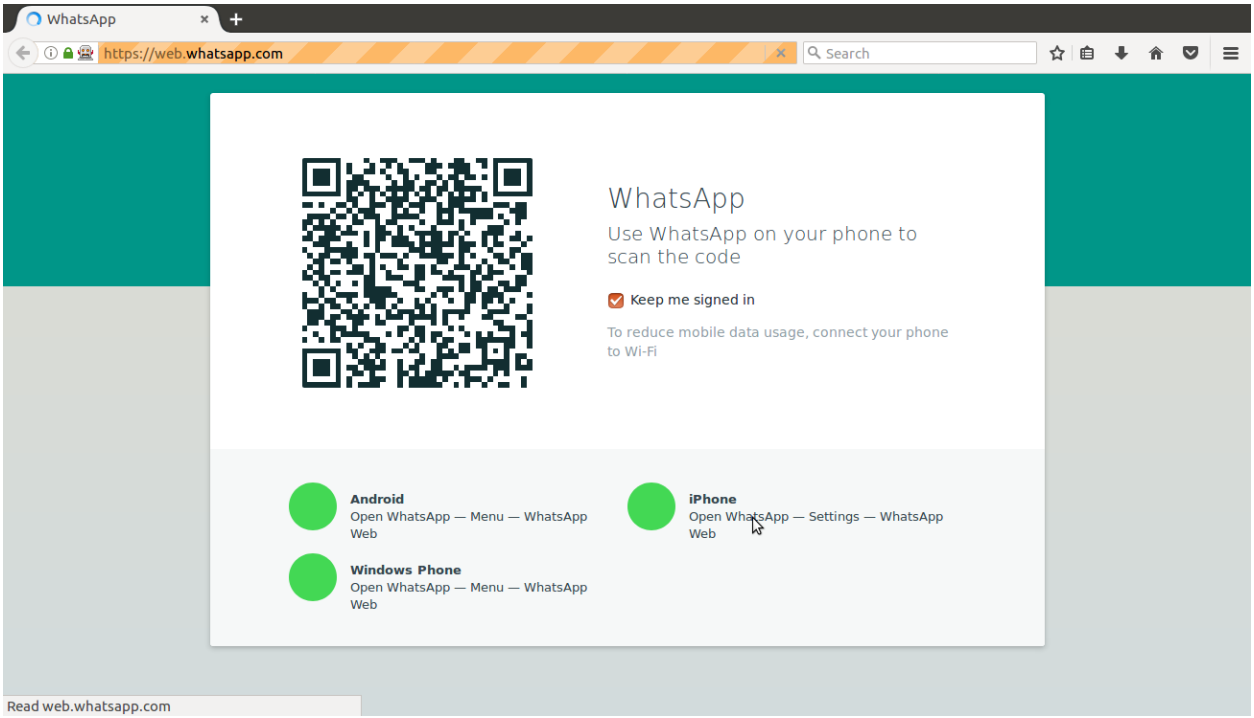

Figure 4.8: WhatsApp Web QR-Code Screen

The user scans the QR-Code through his WhatsApp phone application which reads the QR-Code and sends information about its current user as shown below.

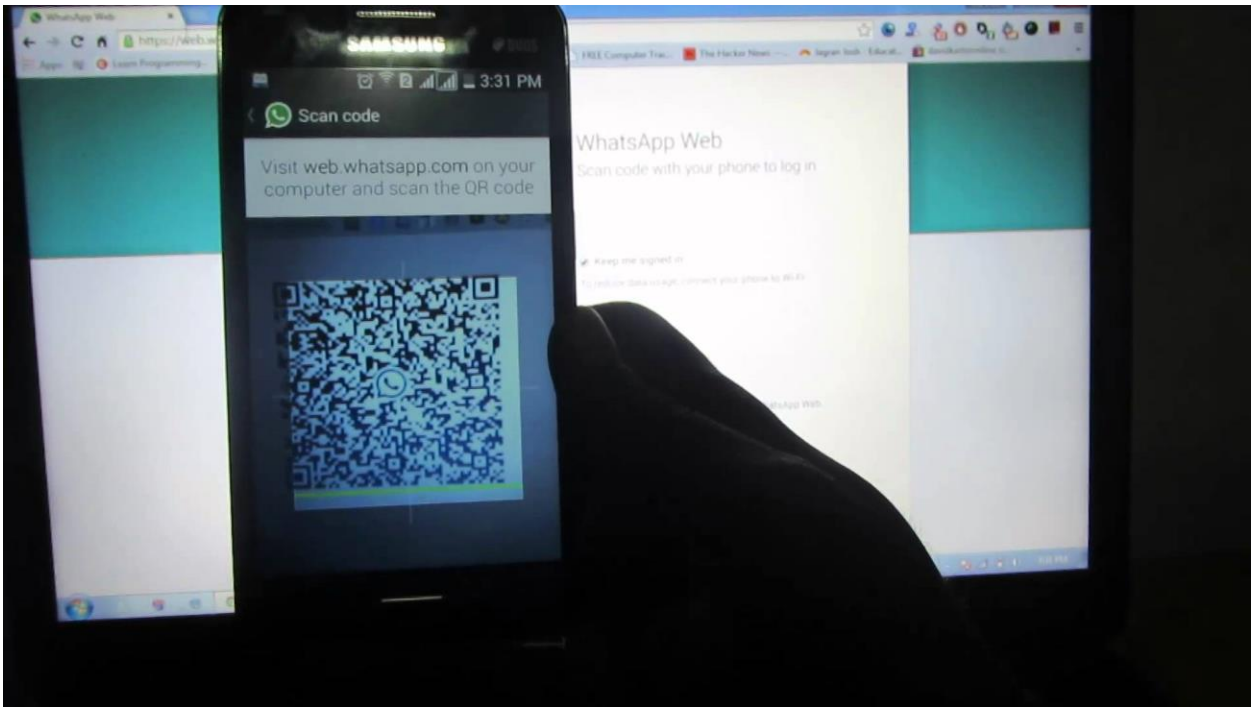

Figure 4.9: WhatsApp Web QR-Code scan through WhatsApp phone

It automatically authenticates user and opens new web page with his/her information on it, and the messages gets sent.

Finally, the sent and unsent messages can be checked in the mailbox along with the date and time, content of the message and their social media type.

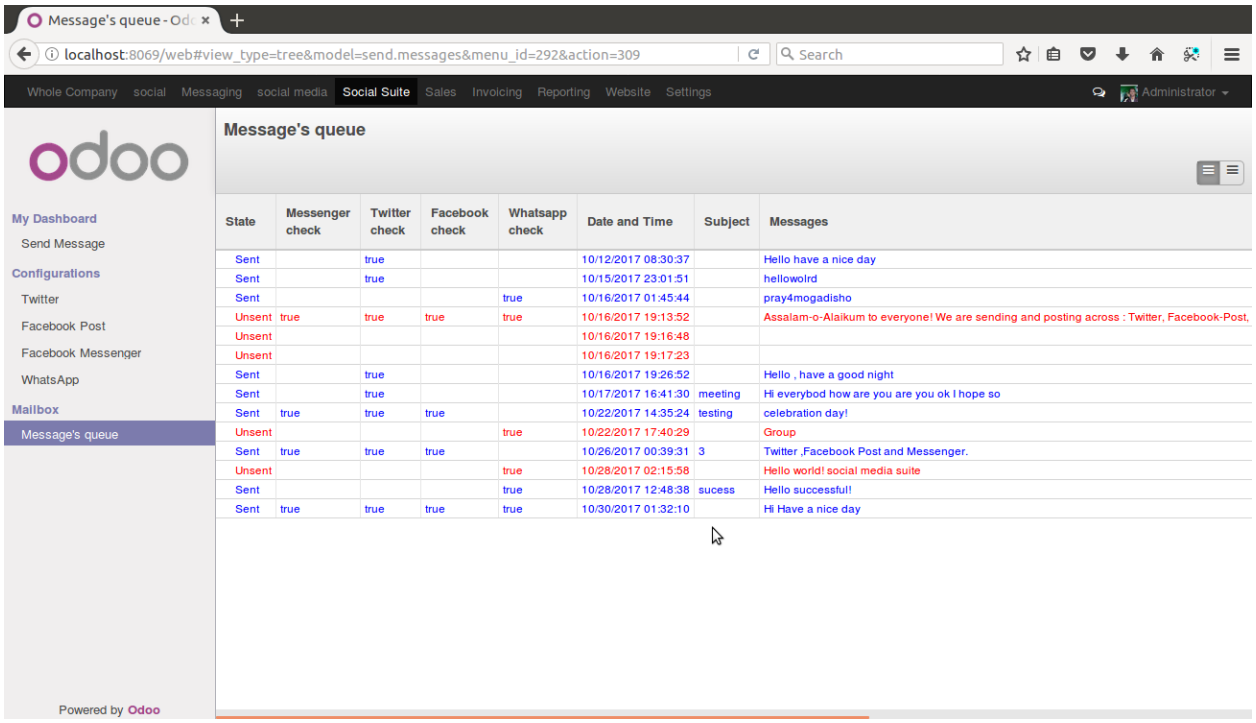

Figure 4.10: Messages' Queue Screen

CHAPTER FIVE: RESULTS AND RECOMMENDATIONS

5.1 Introduction

In this section, we will discuss the findings from our research study, the limitations of this study and possible future research directions.

5.2 Results

After the implementation of an ODOO module for social media APIs of Facebook-Post, Facebook-Messenger, Twitter and WhatsApp, we got the following outcomes:

- An ODOO module that integrates four Social Media apps including Facebook Post, Facebook Messenger, Twitter and WhatsApp to automate the posting or sending messages across this different apps from one dashboard with just a click of button.
- A module that can be integrated with other modules.
- A Module that can generate any required report which makes easy to audit and review the messages. It's possible to filter the messages and group them by more options.

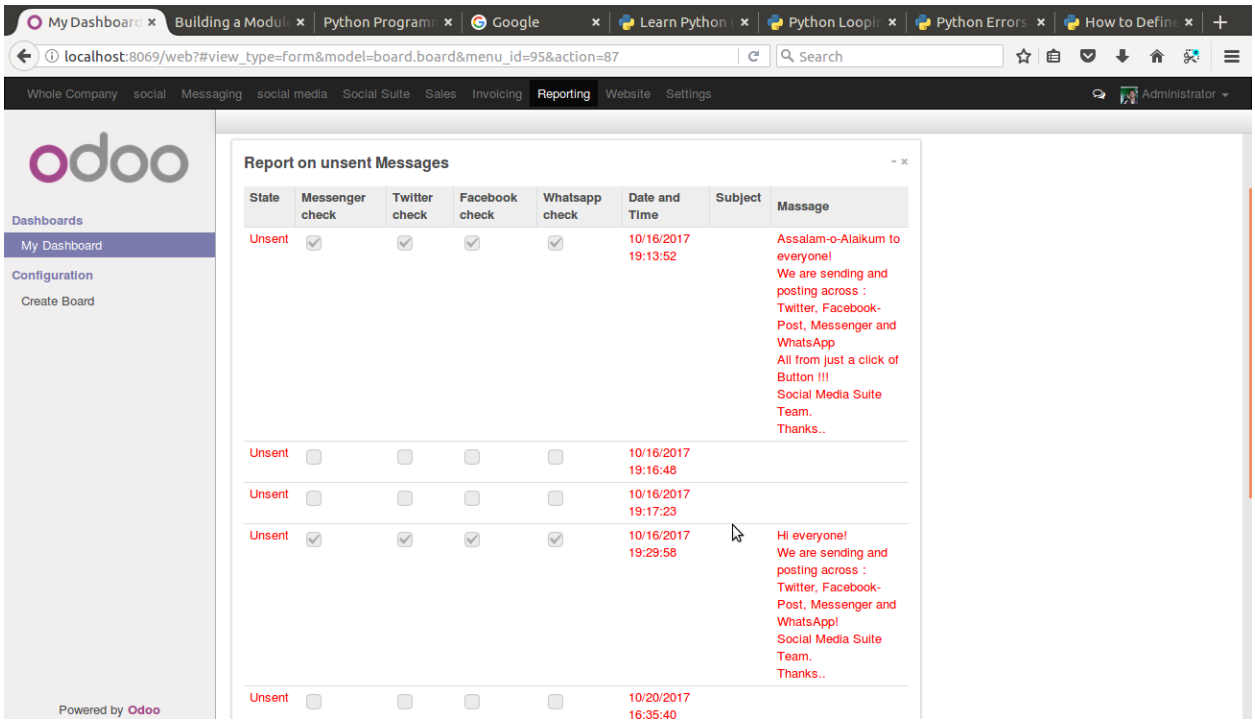

Figure 5.1: Report on the Unsent Messages

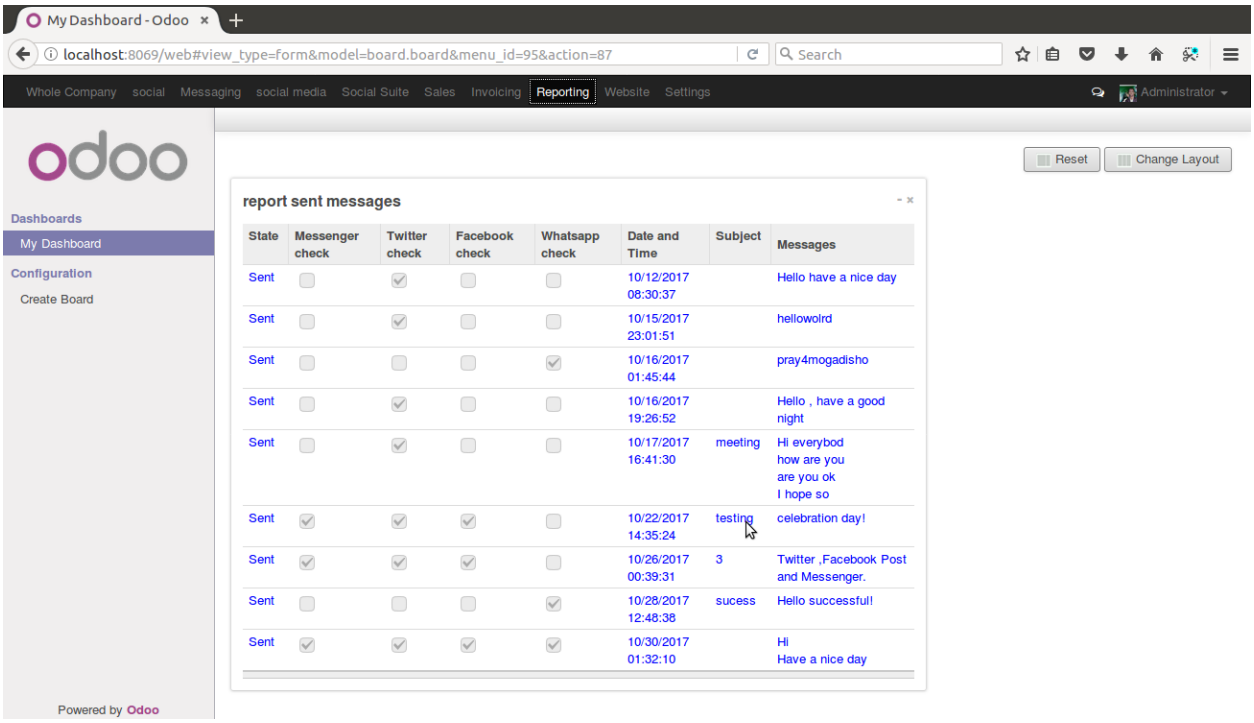

Figure 5.2: Report on Sent Messages

5.3 Further Works and Recommendations

While this research has demonstrated the potential of integrating four different social media Apps in a module, many opportunities for extending the scope of this research remain. This section presents some of these directions:

- We recommend to make integration with other Social Media Apps.
- Possibility to react with feedbacks like, comments, likes and replaying on messages.
- Possibility to schedule posts and messages.
- Develop the module so that it is easy to use and fits a large segment of users.
- When we were generating the twitter access token, it required us to enter a phone number to authenticate, and we did not find Sudan in the list of the available countries, in this case it can be handled by using a friend's phone number who stays an available region.
- Another thing to keep in mind is that twitter allows 140 characters only to use.
- The twitter does not allow tweets duplication meaning that you cannot post 'hello' twice.

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