Implementing Data Driven Business Model at InsideMaps

By

Samsul Amin

1710393

Spring, 2022

Supervisor:

Md. Fahad Monir

Internship Supervisor & Lecturer

Department of Computer Science & Engineering

Independent University, Bangladesh

May 12, 2022

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

This is to certify that the report is completed by me, Samsul Amin (ID:1710393), submitted in partial fulfillment of the requirement for the Degree of Computer Science and Engineering from Independent University, Bangladesh (IUB). It has been completed under the guidance of Md. Fahad Monir. I also certify that all my work is genuine which I have learned during my Internship. All the sources of information used in this project and report have been duly acknowledged in it.

_____

Signature & Date

_____

Name

Acknowledgement

At the very beginning, I would like to thank the Almighty Allah for all His blessings that helped me to complete this report successfully.

Firstly, I would like to thank my Internship supervisor Md. Fahad Monir, Lecturer, Department of Computer Science & Engineering, Independent University, Bangladesh for his invaluable guidance, patience, time, constructive criticism and thoughtful advice regarding various aspects of my internship and preparation of this report. I would also like to thank Subrata Kumar Dey Senior Lecturer and Coordinator of Internship Coordination Task Force for allowing me to continue my internship and coordinating all the required tasks for creating a smooth transition from university to professional life for me. Also, my parents for their unconditional love and support that have sustained, nurtured, and got me ready for this challenge.

I would like to thank my senior coworkers Sadia Rowshan, Nadia Prionty and all the others who made me feel at home from day one in the company and helped me navigate throughout the projects. And I would like to thank Ipshita Rehnuma for the sincere guidance in the project. I am thankful for the continuous guidance and support along with the vast pool of knowledge which was key for the completion of the project.

Lastly, I would like to acknowledge my external supervisor and my mentor Khawja Nayeem Ather and Ipshita Rehnuma for appointing me as an Intern at InsideMaps and allowing me to be a part of this company. Without their extreme energetic support and guidance, I could not finish the project successfully. I feel proud and gratified that I was always under the supervision of the INvision team and got advice directly from Ipshita Rehnuma, Head of INvision.

Letter of Transmittal

May 12, 2022

Md. Fahad Monir
Lecturer
Department of Computer Science and Engineering
Independent University, Bangladesh.

Subject: Internship Report Submission Spring, 2022.

With due honor and respect, I, Samsul Amin, from Spring 2022, Section 10, would like to submit my Internship report. This report is written to kindly inform you that I have completed my internship program and its report. My internship was conducted from August 2nd, 2021 to February 28th, 2022 . I completed my internship at InsideMaps and currently I am working as a full time employee there.

This report is based on my experience and the work I did at InsideMaps during my internship. The primary goal for my internship was to gain experience in all the different technology related fields of the company, including research and development, documentation, content-writing, software development, and to get acquainted with software development processes and practices.

Over the period of my internship at InsideMaps, I found out that I learned and applied a lot of new skills and technologies. The company comprises a small team for data collection, who learn, collaborate, and innovate together.

I would like to thank you immensely for all your guidance and support. I hope and pray that this report fulfills all the requirements and is up to your expectations.

Sincerely,
Samsul Amin
1710393

Evaluation Committee

.....

Signature

.....

Name

.....

Supervisor

.....

Signature

.....

Name

.....

Internal Examiner / Panel Member

.....

Signature

.....

Name

.....

External Examiner / Organizational Supervisor

.....

Signature

.....

Name

.....

Head of the Department / Convener

Abstract

The growing importance of data and analytics in a broad range of industries has led to an increased attention of business model literature on this matter. The question of how to capture the business potential associated with data, drives researchers to explore the impact of data and analytics on the business model concept. Our new plan at insidemaps aims to address this issue by providing a process model for data-driven business model innovation. Therefore, we conduct an extensive review of existing business model innovation processes and derive distinct requirements, taking into account both data specific and business model innovation specific characteristics. The requirements are used to assess the suitability of the identified processes for the development of a data-driven business model. We disclose that existing processes are not appropriate for creating such business models. Based on these findings, we design a new, data-driven business model innovation process that meets the data specific requirements.

Contents

Implementing Data Driven Business Model at InsideMaps **1**
Attestation 2
Acknowledgement 3
Letter of Transmittal 4
Evaluation Committee 5
Abstract 6
Contents 7

Chapter 1 **10**
Introduction 10
Overview 10
Objectives 10
Scopes 11

Chapter 2 **12**
Literature Review 12
Relationship with Undergraduate Studies 12
Related works 12

Chapter 3 **14**
Project Management 14
Internship Duties and Work Breakdown 14
Activity wise Time Distribution 14
Gantt Chart 16
Organizational Structure 16
Operation in Bangladesh 16
Backend Team 17
DevOps Team 17
Finance 17
Marketing 17
Sales 18
Operations Quality Assurance 18
Human Resource Team 18

Chapter 4 **19**
Methodology 19
Agile Scrum Methodology 19
Data Collection & Statistical Tool 19
Variables 20
Product Offering 21
Product Pricing 21

Chapter 5 **22**
Body of the Project 22
Work Background 22
Work Description 22
Data Analysis 22
Quality Control 22
INsight 23
Rich Picture 24
Six Element Analysis 24
Swimlane Diagram 25
Input and Output 25
Assignee vs Month 25
Orders vs Day 26

Chapter 6 **28**
Results & Analysis 28
SWOT Analysis 28
Strengths 28
Weaknesses 28
Opportunities 28
Threats 29
R 29
Live Dashboard 30
Quality Analysis 32
Desktop 32
Progressive Web Application 33
Acuity 34
INsight 34
Google Analytics 34
Completed Orders Dashboard 35
Live Orders Dashboard 37

Chapter 7 **38**
Project as Engineering Problem Analysis 38
Sustainability of the Project/Work 38
Social and Environmental Effects and Analysis 38
Ethics and Ethical Issues 39

Chapter 8 **41**
Lesson Learned 41
Problems Faced During this Period 41
Organizational Issues 41
Personal Issues 41
Solution of those Problems 42

Chapter 9 **43**
Future Work & Conclusion 43
Future Works 43
Conclusion 43
Bibliography 44
Appendix 45
List of Acronyms 45

Chapter 1

Introduction

Overview

The mortgage industry of the United States is a major financial sector. The federal government created several programs, or government sponsored entities, to foster mortgage lending, construction and encourage home ownership.

InsideMaps' INvision department works with one of the largest service providers in the mortgage industry which helps appraisers inspect a house virtually before it is being sold in the market. Due to the pandemic there has been a huge boom in the virtual touring sector of such an industry because of the strict restrictions.

However as this used to be a market with not a lot of data as the virtual 3D tours business model itself is quite new, any decision made by the company was taken by the shareholders. That can lead to multiple issues as predicting can be hard.

Insidemaps has taken an initiative to reduce the guess work required to make vital decisions and have decided to go with a data driven approach. Data based decision making provides businesses with the capabilities to generate real time insights and predictions to optimize their performance. Like this, they can test the success of different strategies and make informed business decisions for sustainable growth.

Objectives

- ➔ **Rectification of the current inaccurate data collection practices:** Before the project was implemented all the data was collected in a disorganized way. We wish to streamline the collection workflow.
- ➔ **Increasing the data source points:** Only a few dimensions were collected which made it quite difficult to analyze the data which we plan to change.
- ➔ **Reducing the manual labor needed for repetitive activities:** Day to day data collection was done manually, which we aim to resolve by automating some of the mundane tasks.

- ➔ **Better analysis of the data for a more accurate forecasting:** Little to no analysis was done on the projects which made it impossible to predict let's say the number of orders we can expect in the coming weeks.
- ➔ **Introducing automated reports and dashboards:** A dashboard should be implemented by the end of the internship period on Google Sheets or Google Analytics to better understand day to day activities.
- ➔ **Data modeling for in-depth analysis:** The Data Model's main focus is on what data is needed and how we have to organize data rather than what operations we have to perform. We plan to create a robust design with a data model that can show our entire data on the same platform.

Scopes

- Versatile ecosystem for tracking the day-to-day activities
- Producing duration and order count reports using existing datasets
- Creating individual profile for each of the members
- Re-modification of the data tracking system for Team Red
- Building a system for automated reports and dashboards
- Data modeling to reduce the bottlenecks
- Better forecasting to increase business growth

Chapter 2

Literature Review

Relationship with Undergraduate Studies

I would say more or less each and every course helped to shape me for the professional world. However I would like to mention a few courses that directly correlated with my day to day work at InsideMaps.

● CSE 203, Data Structures: This is the most basic course that helped with the ideas of several data structures and their applications. As coding was necessary in multiple instances the skills gained from this course made handling them much easier.

• CSE 213, Object Oriented Programming: In the developing industry most of the data is represented as an object. It also taught how to write modular programs which made codes less repetitive and more reusable. This course allowed me to divide my work in small black boxes in which an input gave me a specific output. The concept of object oriented programming definitely helped me design and implement my project much more efficiently.

• CSE 303, Database Management: This was the first course which taught how to design and plan a project. It covered popular planning and strategy practices such as System Development Life Cycle, Rich Picture, Requirement Analysis, Entity Relationship Diagram, Business Process Model and Notation Diagram and many more.

• CSE 307, System Analysis and Design: This course gives an overview of different SDLCs and how to implement them in my own project.

• CSE 309, Web Application and Internet: This is the course where the development of web applications were taught. It covered very important technologies that are highly in demand in the industry, such as HTML, CSS, JavaScript, jQuery. The tools and technologies learned from this course immensely contributed to the development of the analytical tool that I use on a daily basis.

Related works

A data-driven company is one that has established a framework and culture where data is prized and effectively utilized to make decisions across an organization – from the marketing departments to product development and human resources. [1]

- **Netflix:** Using data to create new blockbuster hit series. Netflix intelligently utilized the power of their data
- **Google:** Utilizing people analytics for a better workplace. With data & analytics, organizations will be able to understand their workforce better, manage their talent pipeline more effectively as well as retain employees that are performing.
- **Coca-Cola**: Serving customers the ads more effectively. Coca-Cola cleverly leverages the power of image recognition technology and data analytics to target users based on the photos they share socially – giving them insights into the individuals drinking their products, where they are from and how (and why) their brand is being mentioned.
- **DBS Bank:** Harnessing AI & analytics to serve customers better. With over SG$ 4.4 billion invested over the last 4 years into technology, DBS has invested heavily into AI and data analytics to provide their customers with hyper-personalized insights and recommendations to allow customers to make better financial decisions.
- **Uber:** Providing faster & more efficient rides with data. With predictive analytics, the company is able to analyze historical data and key metrics that include the number of ride requests and trips getting fulfilled in different parts of a city as well as the time and day where this is happening.

Chapter 3

Project Management

Internship Duties and Work Breakdown

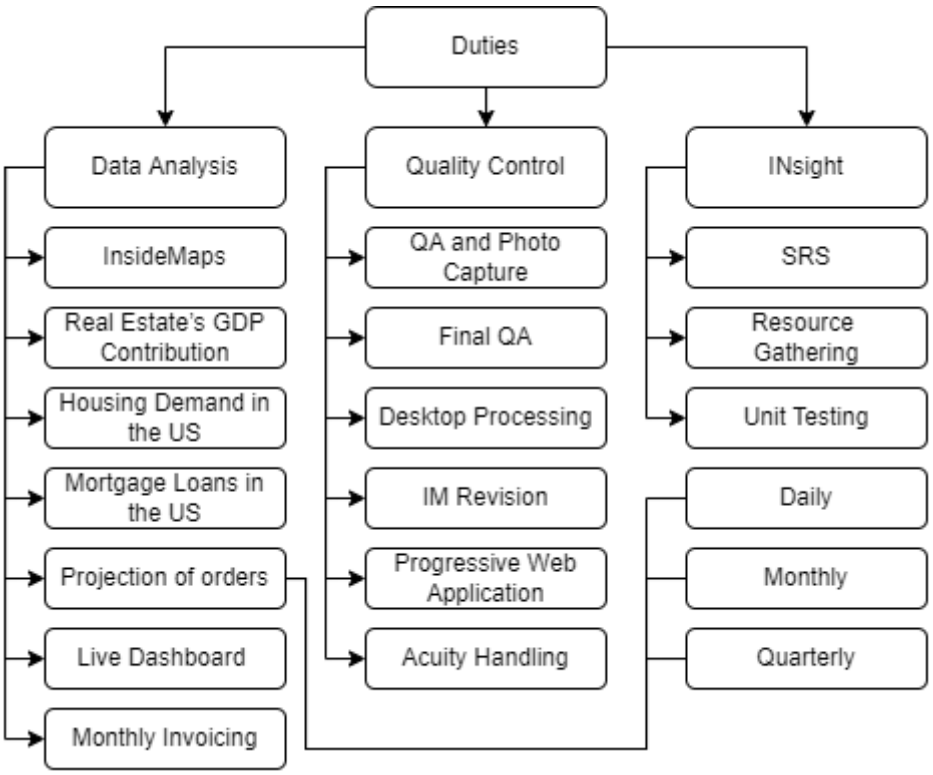


Figure 3.1: Work breakdown of the Internship duties at InsideMaps

Activity wise Time Distribution

For the INsight section of my internship duty I have described above, here is a process wise time allocation. The table below shows them in detail.

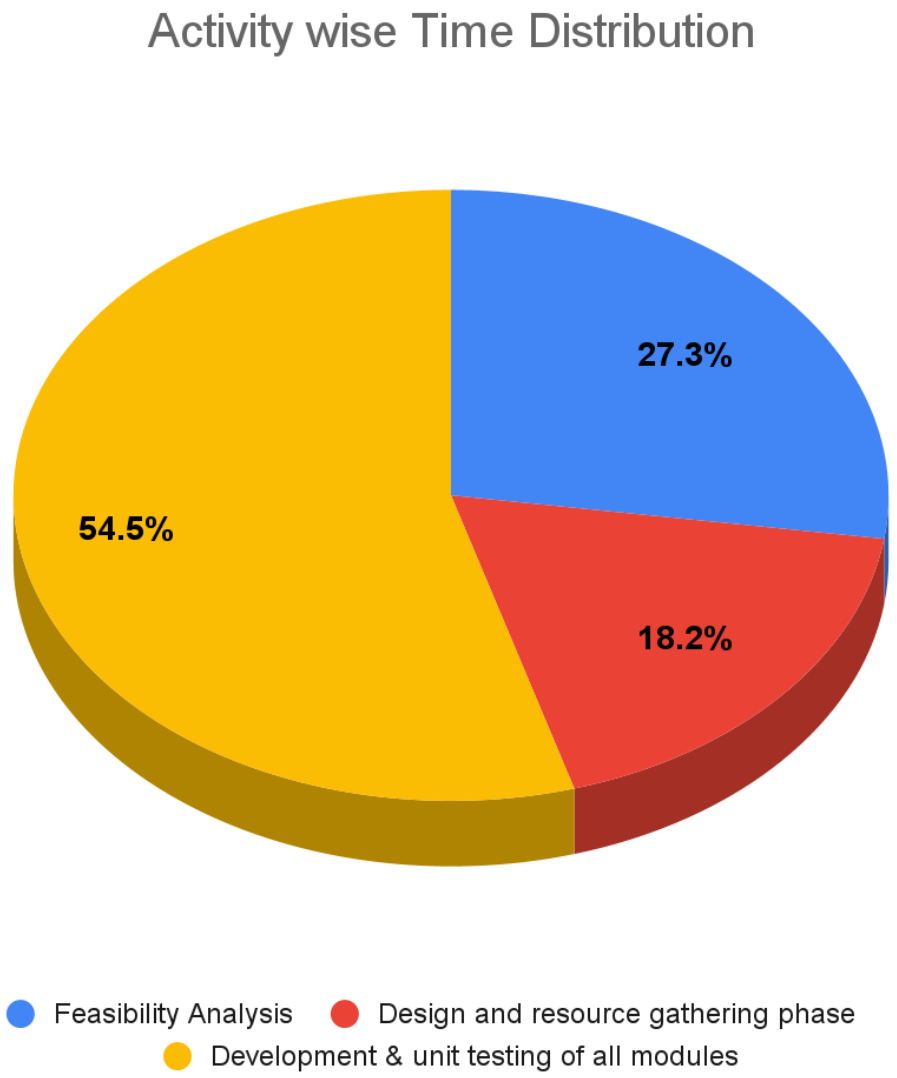


Figure 3.2: Activity wise Time Diagram

Task	Days	Percentage
Feasibility Analysis	45	27%
Design and resource gathering phase	30	18%
Development & unit testing of all modules	90	55%

Table 3.1: Activity wise Time Distribution for INsight

Gantt Chart

WBS NUMBER	TASK TITLE	February				March				April			
		Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
1	Data Analysis												
1.1	Growth of InsideMaps												
1.2	Growth of Real Estate's GDP Contribution												
1.3	Predicting in Housing Demand in the US												
1.4	State of Mortgage Loans in the US												
1.5	Projection of orders												
1.6	Live dashboard												
1.7	Monthly Invoicing												
2	Quality Control												
2.1	Operations QA & Photo Capture												
2.2	Final QA												
2.3	Desktop Processing												
2.4	IM Revision												
2.5	Progressive Web Application												
2.6	Acuity Handling												
3	INsight												
3.1	Feasibility Analysis												
3.2	Design and resource gathering phase												
3.3	Development & unit testing of all modules												

Figure 3.3: Gantt Chart

Organizational Structure

Operation in Bangladesh

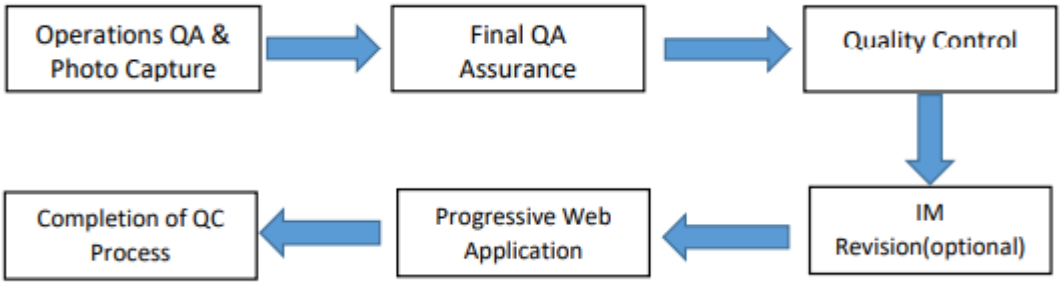


Figure 3.4: Operation in Bangladesh

InsideMaps has quickly become one of the most well-known companies in the United States. It currently has branches in the United States, Bangladesh, Serbia, and Ukraine. InsideMaps began hiring individuals in Bangladesh in 2016 under the name VCube for backend operations, client assistance, customer management, quality assurance engineering, and other positions. Vcube is a 17 geospatial firm that aspires to benefit society by providing a Geometrical Home Measurement and Visualization Solution. Vcube is the first firm in Bangladesh that creates and provides property/space management and presentation visuals, 3D tours, modern floor plans, 360 photos (Panos), HDRs, 3D models, and innovative video technology for the regional and international real estate market. InsideMaps has also entered the Bangladesh market, creating virtual tours for offices, renting spaces, cafés, and real estate. As of now, InsideMaps has 250 employees working for them. In the past year, they

have increased their employee count by a staggering 90% and their intake consists mainly of Bangladesh.

Backend Team

This team is the core of the entire organization as it is responsible for the application logic, efficient code, and data structure. Most often, it consists of the following experts:

a) Backend Engineers

b) Middle Stack Developer

c) Team Leader

Engineers are involved in coding, refining algorithms, and application logic, but middle-stack developers are required to interact between the backend and front-end sides. They're in charge of sanitizing user input, rest API endpoints, etc. As a result, developers will be able to concentrate on their work without being distracted by third-party concerns. Middle-stack developers will deal with all of these difficulties. Like any other team, a leader organizes the workflow, assigns responsibilities, and coordinates the efforts of all team members.

DevOps Team

The DevOps team delivers a faultless user experience, ensures that the product is released on time, tests new product versions, and manages the cloud infrastructure. A cloud architect, system administrator, site reliability engineer, and team lead are frequently included in this team. The primary responsibility of the cloud architect is to design and manage the cloud infrastructure; the site reliability engineer ensures the smooth operation of all critical systems; the system 18 administrator is in charge of cloud maintenance, and the team lead distributes tasks and responsibilities within the team and manages the workflow.

Finance

The finance department is one of the vital departments of InsideMaps precisely because of its continuous raising of finances through investors. Any fast-growing startup's finance team is the actual engine room for expansion. They assist strategic decisions such as fundraising, cash flow, and business guidance and lay the basis for development by building up critical business procedures and reporting.

Marketing

InsideMaps believes that it will be challenging to run the entire company without sales and proper cash collection. InsideMaps has grown at a breakneck pace in market share, and sales growth as sales grew by 30% in 2021 compared to the previous year. The marketing department is responsible for the following:

a) Engaging in brand management

b) Organizing a marketing initiative campaign and determining the primary services or items for selling

c) Optimizes, builds, and frequently refreshes an organization's website.

d) Monitors and handles internal communication and social media.

e) Coordinates the efforts of third-party marketing consultants. For instance, advertising and public relations firms and web-hosting companies.

Sales

Sales managers in startups like InsideMaps do more than sell. They customize the sales process based on customer pain points and lead generation, deal closing, and customer relationship management.

Operations Quality Assurance

A successful product is usually a high-quality product, so any startup needs a quality assurance staff. Experts test the application, uncover flaws, and submit them to the developers, correcting the faults and making the application more efficient and stable. The QA team consists of QA Lead, QA Analyst & Testers. The QA lead has the most responsibilities since they define the quality standard indicators, ensure they are followed, determine the primary strategies, lead the team, prepare tasks, assign duties to specialists, and monitor their work. The QA analyst prepares and performs test strategies. One may need a manual QA professional or an automation testing specialist who can undertake manual testing if necessary, depending on the project kind, timeline, budget, and customer requirements. Both forms of testing are effective, but each has its perks and limitations, so the decision is on the company. QA analysts generate the relevant documentation and test scripts regardless of the decision taken.

Human Resource Team

Professional employees are critical for business growth, so HR managers use various tactics to ensure that your staff grows and collaborates to help your startup succeed. As a result, managers provide a variety of perks and fair compensation to employees, contribute to management training, foster a positive and strong workplace culture, and develop career paths as your company grows.

Chapter 4

Methodology

Agile Scrum Methodology

We at InsideMaps decided to base our development process loosely on Scrum Methodology. Agile scrum methodology is a project management system that relies on incremental development. Each iteration consists of two- to four-week sprints, where the goal of each sprint is to build the most important features first and come out with a potentially deliverable product. More features are built into the product in subsequent sprints and are adjusted based on stakeholder and customer feedback between sprints. Scrum is a type of agile technology that consists of meetings, roles, and tools to help teams working on complex projects collaborate and better structure and manage their workload.

Data Collection & Statistical Tool

This report is based on primary quantitative data where key factors affecting InsideMaps were surveyed. The sampling was done by selecting InsideMaps employees and its ex-employees cumulating to 80 responses. The data was collected through a google form where participants were required to fill the questions in the survey. For arranging the dataset, google sheets were used to record all the responses from google forms and were then used to sort the dependent and the independent variables. For the statistical analysis, factor analysis was carried out in Google Analytics.

Variables

Variables	Description	Source
Dependent	InsideMaps' Growth	
Independent	Reduction of Mortgage Loans	Saiz, Albert (2020)
	Government Policies	Nikolai Siniak et al (2020)
	Real Estate's GDP Contribution	Braesemann, Baum (2020)
	Rise in Housing Demand	Kim, Cho (2020)
	Co-working & Co-living	Saiz, Albert (2020)

Table 4.1: Dependent and Independent Variables during Analysis

Product Offering

Marketing	Operations	Data
3D Tours	3D Tours	Comprehensive BIM's
HDR Photos Procured	HDR Photos Procured	Versioning
HDR videos from 3D Tour	Floor Plans	Structure Data
Floor Plans	Asset Information	Asset Information
3D Models	Physical Property Data	Material/Surface Info
Virtual Staging	Inspection Tools	Accurate GLA
360 Panos	Scoping Tools(Beta)	Hosted Data w/Client API

Table 4.2: Insidemaps' Product Offering

Product Pricing

Packages	2000 square feet	3000 square feet	4000 square feet	4000+ square feet
Standard Package a) Photos b) Floorplan c) 3D Tour	$49.95	$69.95	$89.95	$89.95
Pro Package a) Basic Features b) 3D Model	$89.95	$129.95	$169.95	$169.95+$40/1000 square feet

Table 4.1: InsideMaps' product pricing

Chapter 5

Body of the Project

Work Background

InsideMaps carries out its operational work in Bangladesh through VCube. The projects are handled initially by the Operations team at VCube where they are tasked with operational quality assurance followed by the usage of a photo capture tool which takes images from the 3D tours accessible through the scanners. Once those projects have gone through the procedure of quality assurance and photo capture, they are then uploaded in a database that contains the projects and its corresponding images. In order to comply with the specific demands of the clients, Analysts were hired through a very comprehensive screening process in Bangladesh. The sole purpose behind the hiring was to ensure the quality of the projects sent to InsideMaps' clients as well as checking if the specific criteria were being met for particular clients. I was hired as a Business Analyst intern in the Operations department. I was mentored by the business analysts of the firm who were tasked with the accuracy of projects as well as communicating with clients regarding confusions surrounding projects.

Work Description

As an intern I was responsible for 3 specific categories in the company. I carried out my tasks in one or multiple categories mentioned below on a daily basis.

1. **Data Analysis**
    1.1 Growth of InsideMaps
    1.2 Growth of Real Estate's GDP Contribution
    1.3 Predicting in Housing Demand in the US
    1.4 State of Mortgage Loans in the US
    1.5 Projection of orders (weekly, monthly, quarterly)
    1.6 Creating a live dashboard in google sheets for daily activities
    1.7 Processing the completed orders
    1.8 Monthly Invoicing

2. **Quality Control**
    2.1 Operations QA & Photo Capture
    2.2 Final QA
    2.3 Desktop Processing

2.4 IM Revision

2.5 Progressive Web Application

2.6 Acuity Handling

3. **INsight**

3.1 Creating live dashboard in google analytics

3.2 Design and resource gathering phase

3.3 Development & unit testing of all modules

For the data analysis part I am responsible for creating reports and doing analysis on a weekly/monthly basis. Day to day ad-hoc activities are also present which can arise at any given time.

For the quality control part, I was assigned to the operations department of InsideMaps. Specifically, I was tasked with carrying out a thorough quality assurance of the projects and then importing the data through an application. I was trained initially by the senior business analysts of InsideMaps for a week before working on live projects. After the completion of training, I was mentored by them and after a month of rigorous guidance, I was finally allowed to submit projects without a senior business analyst's approval.

The final aspect of my internship project is to create a mock website in google analytics using google's big query to understand the requirements of such a website. This is a fairly new project that we have just started working on.

Rich Picture

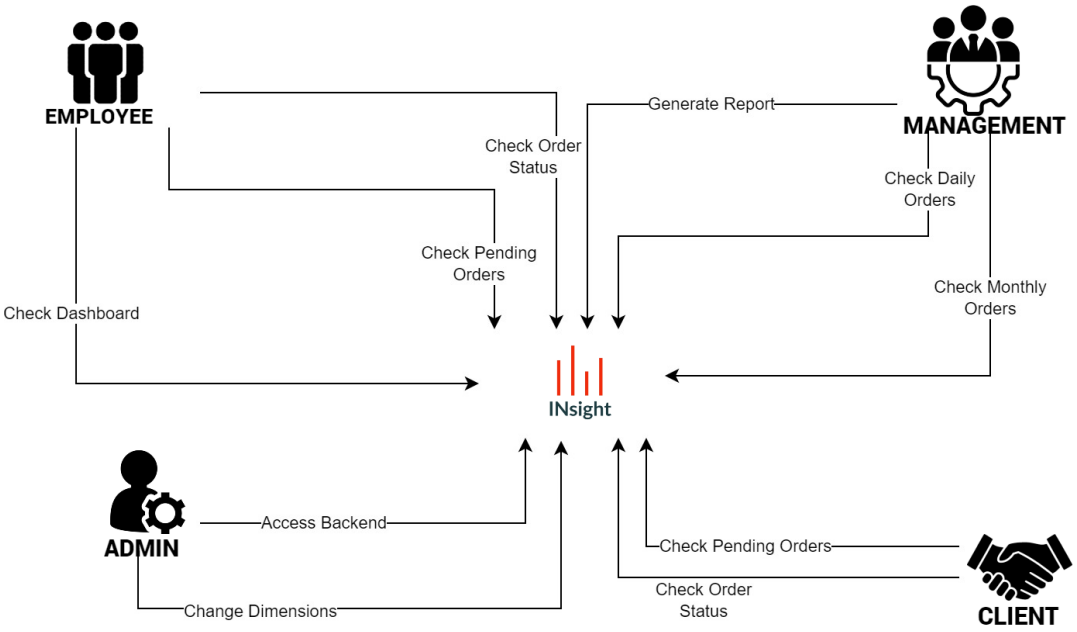


Figure 5.1: INsight Rich Picture

Six Element Analysis

Process	System Roles					
	Human	**Non Computing Hardware**	**Computing Hardware**	**Software**	**Database**	**Com. & Network**
Check Order Status	Employee, Client	N/A	Computer, Smartphone	Web Browser	Google BigQuery	WAN/LAN
Check Pending Orders	Employee, Client, Management	N/A	Computer, Smartphone	Web Browser	Google BigQuery	WAN/LAN
Check Dashboard	Employee, Management	N/A	Computer, Smartphone	Web Browser	Google BigQuery	WAN/LAN
Change Dimensions	Admin	N/A	Computer	Web Browser	Google BigQuery	WAN/LAN

Check Daily Orders	Management	N/A	Computer	Web Browser	Google BigQuery	WAN/LAN
Check Monthly Orders	Management	N/A	Computer	Web Browser	Google BigQuery	WAN/LAN
Generate Report	Management	N/A	Computer	Web Browser	Google BigQuery	WAN/LAN

Table 5.1: INsight Six Element Analysis

Swimlane Diagram

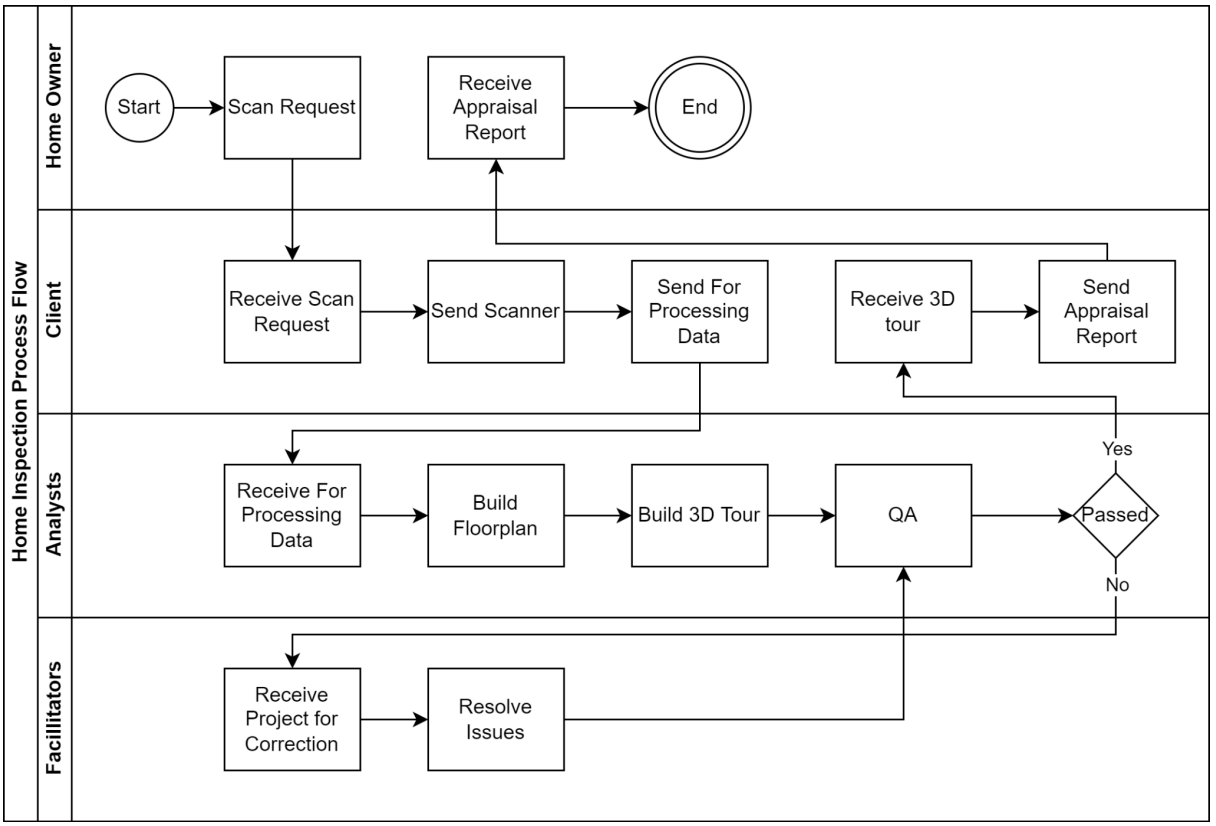


Figure 5.2: QA Home Inspection Swimlane Diagram

Input and Output

Assignee vs Month

```
library(ggplot2)
library(tidyr)
library(dplyr)
```

```
tracker <- read.csv("data_mar22.csv")
tracker$date <- as.Date(tracker$date,"%m/%d/%Y")


date <- tracker$date
assignee <- tracker$assignee
order <- tracker$order
type <- tracker$type

length(unique(assignee))
length(unique(order))

ggplot(tracker,aes(x = date, y = assignee, fill = type, colour =
type)) +
  geom_bar(stat = "identity") +
  theme(axis.text.x=element_blank(), #remove x axis labels
        axis.ticks.x=element_blank(),) +
  labs(x="Total Orders", y="Assignee")
```

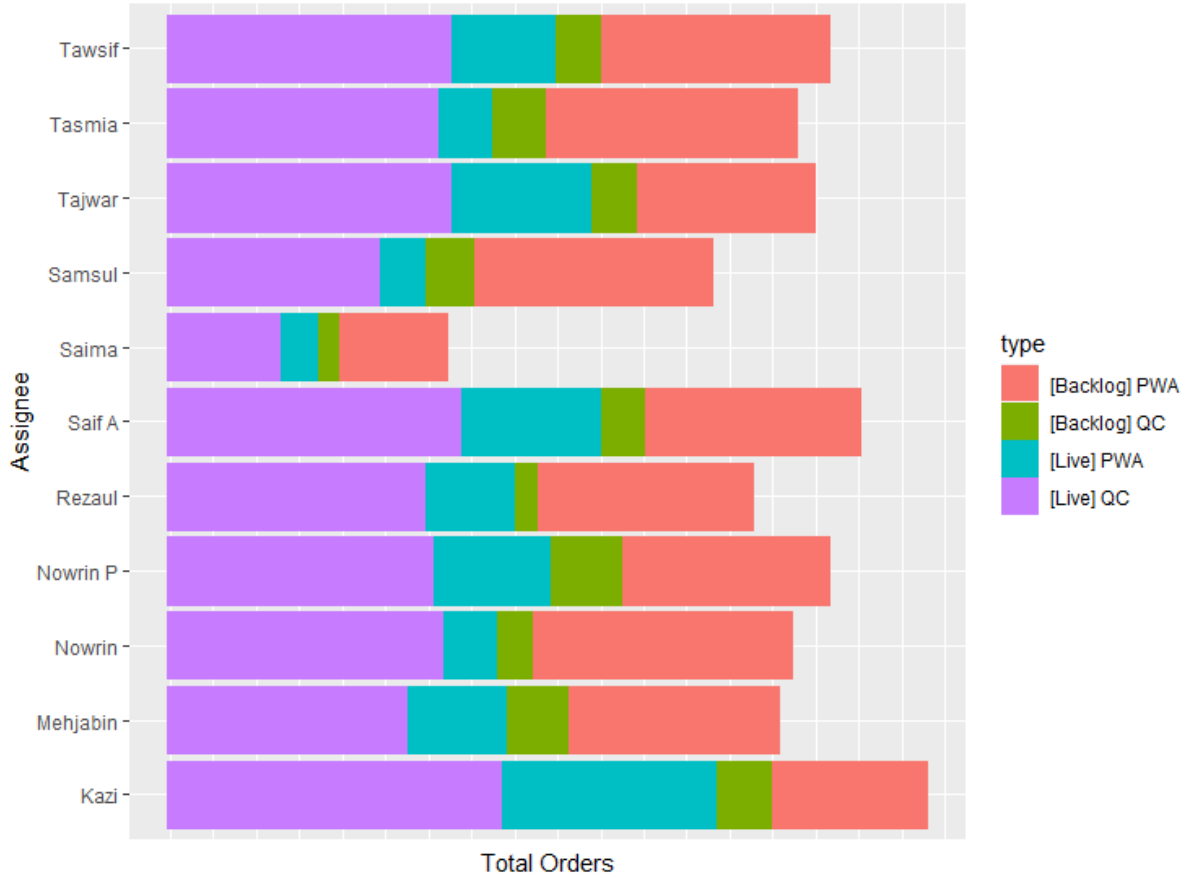


Figure 5.3: Graph plotted in R for Assignee and the Total Orders

Orders vs Day

```
library(ggplot2)
library(tidyr)
library(dplyr)
```

```
tracker <- read.csv("data_mar22.csv")
tracker$date <- as.Date(tracker$date,"%m/%d/%Y")


date <- tracker$date
assignee <- tracker$assignee
order <- tracker$order
type <- tracker$type

length(unique(assignee))
length(unique(order))

ggplot(tracker,aes(x = date, y = order, fill=date)) +
  geom_bar(stat="identity") +
  labs(x="Total Orders", y="Date")
```

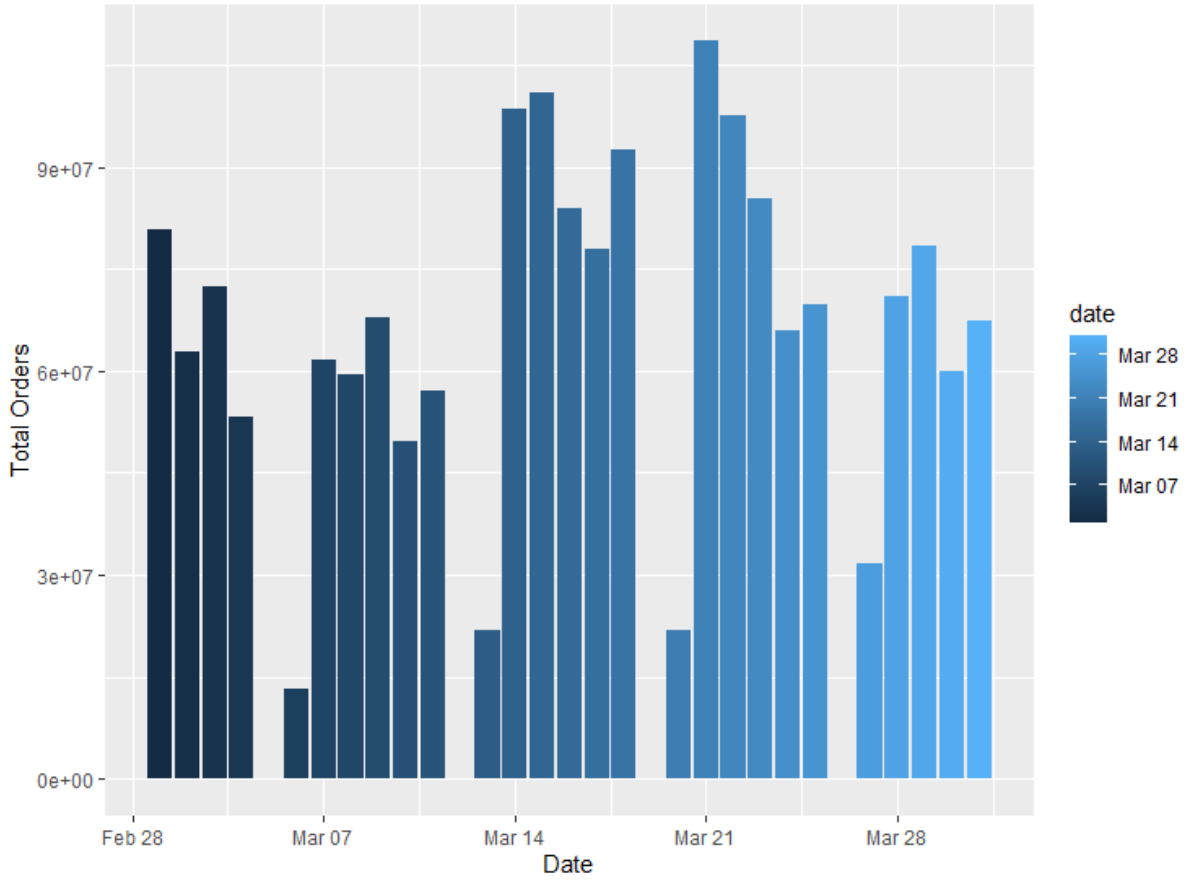


Figure 5.4: Graph plotted in R for Total Orders and Date

Chapter 6

Results & Analysis

SWOT Analysis

Strengths

i) Comprehensive software services The fact that InsideMaps' platform is constantly improving is one of the company's greatest assets. The company offers services ranging from 3D modeling to aiding content exchange and distribution through its platform. It provides an SDK that allows third-party applications to integrate with its technologies. As a result, InsideMaps can accommodate a wide range of customer needs and ensure that they can fully utilize the platform's capabilities.

ii) Real estate market leaders as clients Within a short period, InsideMaps has earned the trust of some of the top property managers in the US. Some of the top clients include invitation Homes, Tricon Residential, Property Frameworks, American Homes & Turnkey Vacation Rentals.

iii) Product differentiation Compared to other companies, InsideMaps' services can be available through an iPhone only. Additionally, access to information is much easier and higher than any other PropTech company in the US.

Weaknesses

i) Dilution of Focus Real estate search and discovery, lead creation, and customer engagement are just a few of the uses for InsideMaps's service. Instead of focusing on one component, the company is attempting to serve multiple verticals simultaneously. This lack of concentration can dilute the company's brand identity and weaken its market position.

ii) Highly competitive industry As there are considerably bigger players in the market, it will be difficult for the company to gain the lion's share of the market size. In addition to that, the industry is likely to become more competitive in the future.

Opportunities

i) Scope for more property scans There are still a lot of places that haven't been documented digitally. Despite InsideMaps's substantial presence, there is still room to grow its market share and grab the untapped market. There are an estimated four billion buildings worth

$230 trillion that have yet to be scanned worldwide. InsideMaps can capture this market through innovative partnerships with other firms or developers.

ii) Expansion into emerging technologies InsideMaps should expand its software ecosystem to accommodate emerging technologies such as virtual reality to maintain its dominance in the market. It can improve its service and stay competitive in the growing technological space by exploring new options.

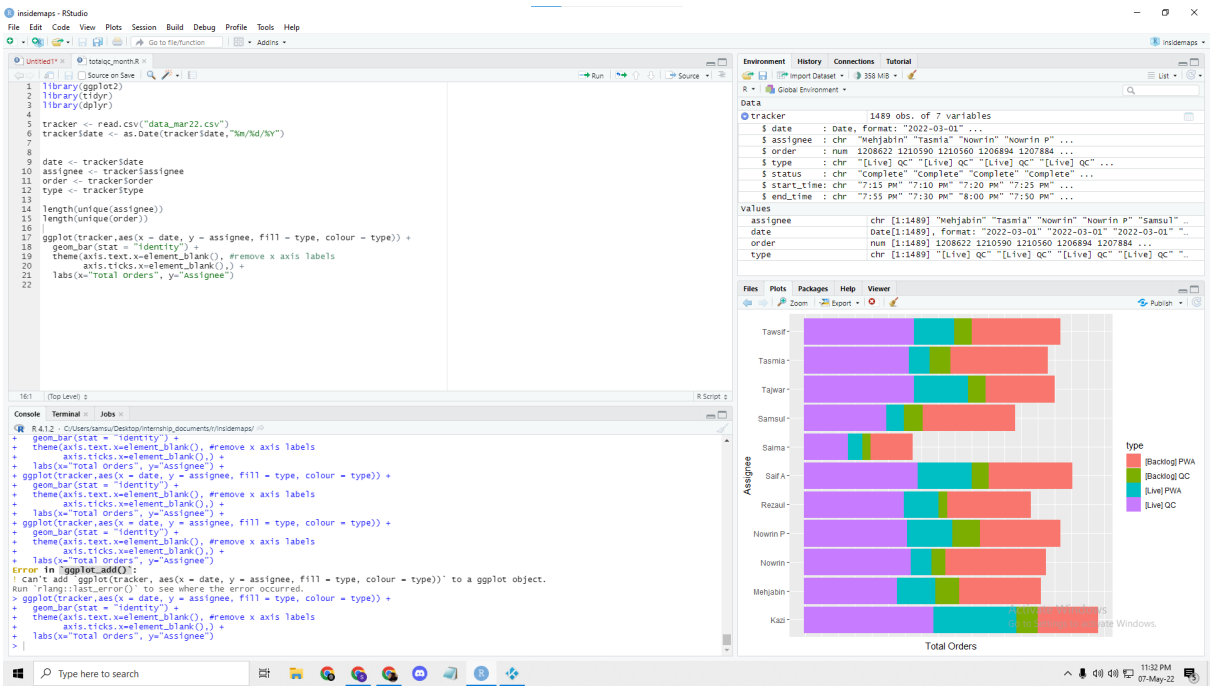
Threats

i) High volatility in the market The 3D/VR industry is still in its early stages. As a result, of a lack of industry standards and customer understanding of the technology, it is characterized by severe uncertainty. As a result, InsideMaps has difficulty forecasting demand levels, resulting in resource over-provisioning or under-provisioning.

ii) Competition from other industries Various businesses, including media and entertainment, real estate, healthcare, defense, and aerospace, are pursuing the 3D/VR market. Each vertical has its own set of client demands that InsideMaps must meet to compete. Furthermore, disruptive technologies like 5G are predicted to lower the cost of 3D/VR equipment, making it more accessible to consumers. This could allow other companies to enter the market and compete with InsideMaps.

R

We have been slowly transitioning to R to do our daily activities and I have been assigned to create some of the metrics we need for daily operations.



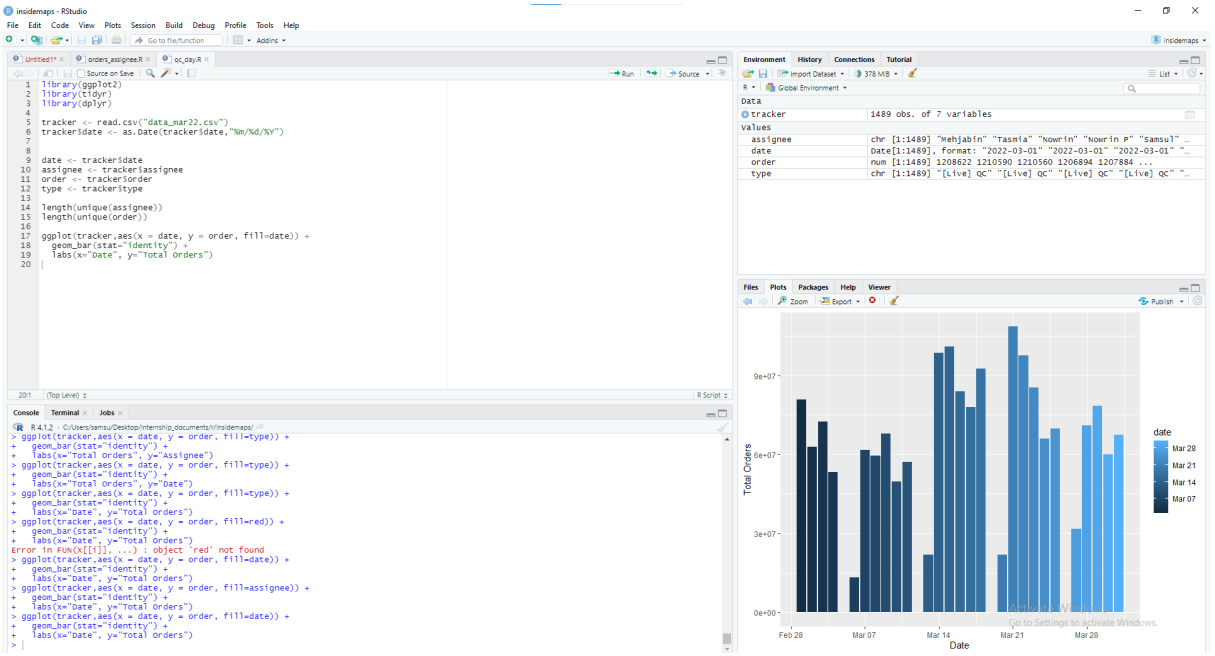
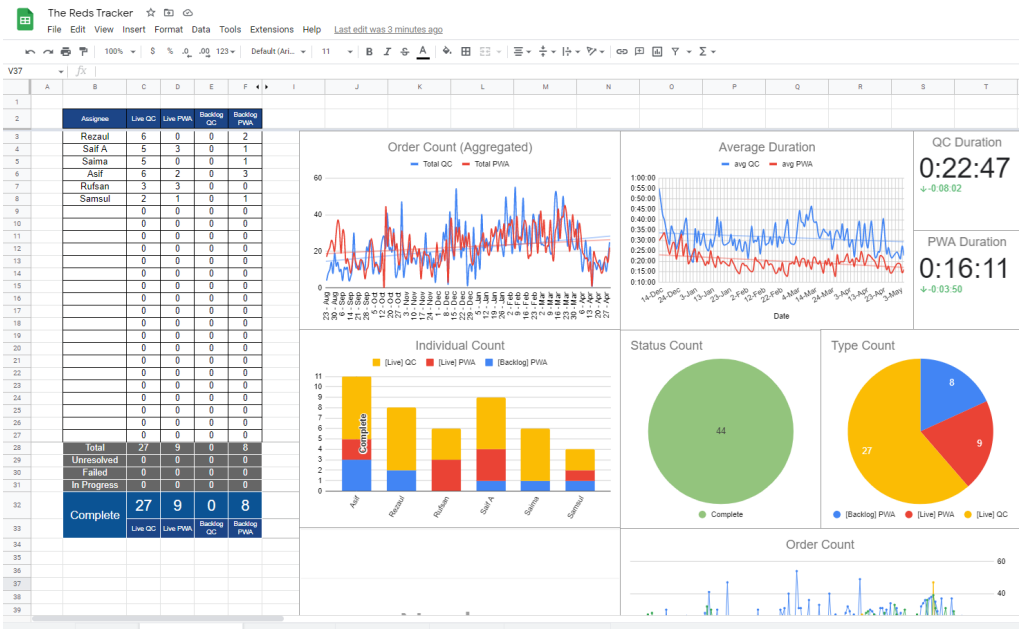


Figure 6.1: Snapshot of working in R

- Total Number of Orders per Month
- Total Number of QCs per month
- Total Number of PWAs per Month
- Average Duration of QCs per Month
- Average Duration of PWAs per Month
- Plotting QCs done each day
- Plotting PWAs done each day
- Time Taken for a specific order

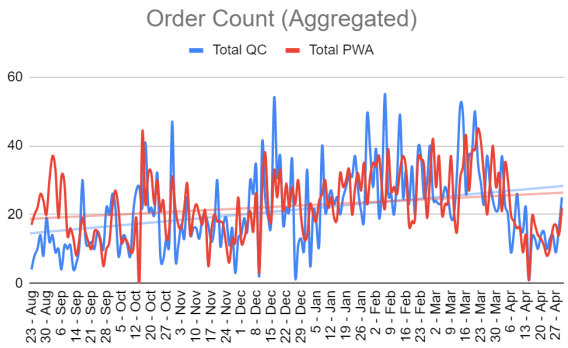
Live Dashboard

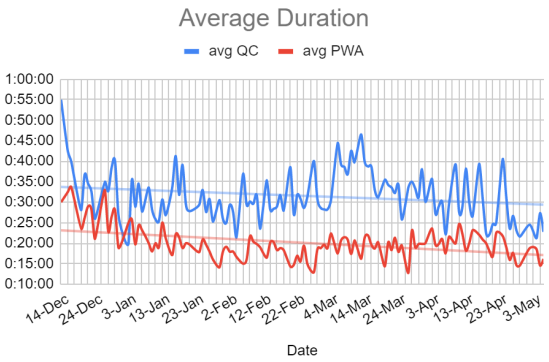


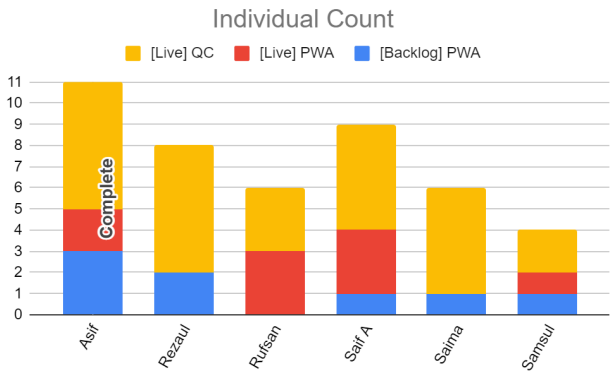
I was responsible for creating a live dashboard in google sheets. I had to redesign the entire sheets platform as in the beginning it was quite disorganized and most of the time it used to provide a wrong set of data. Priority was to make sure the live data is provided given that management will be constantly surveying this website.

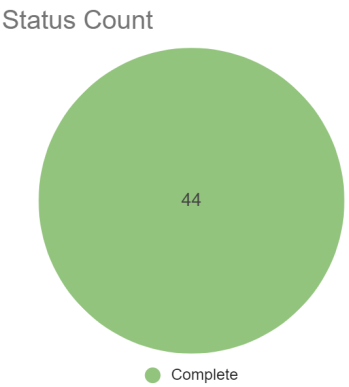
Data will be updated for the following dimensions

1. Total Order Count can be calculated and separated by date. They are categorized between QC and PWA.
2. Average Duration Team-wise is calculated and plotted per day.
3. Individual count is calculated per assignee on a daily basis.
4. The current status of orders are calculated as well.
5. The order count categorized between live and backlog can also be calculated and plotted in a chart.









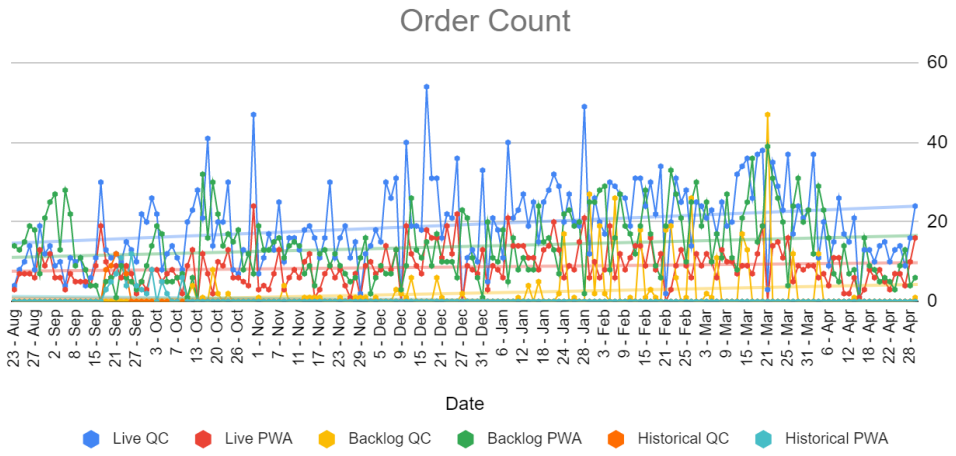


Figure 6.2: Snapshot of the live dashboard in google sheets

Quality Analysis

Desktop

The operational QA team is responsible for the initial phase of the project management. They are tasked with the designing of floor plans along with its geometry i.e. height and dimensions. This plays a key role as those measurements can potentially alter the gross living area of the project which can sometimes differ quite a lot compared to the actual gross living area of a project. The Photo Capture team is tasked with taking a sufficient number of pictures from the 360-degree virtual tour of particular rooms. There are certain guidelines set by the clients and the operators are required to follow those accordingly. For example: The plumbing fixtures of kitchen and bathrooms are required to have isolated images as these can impact the prices of US houses.

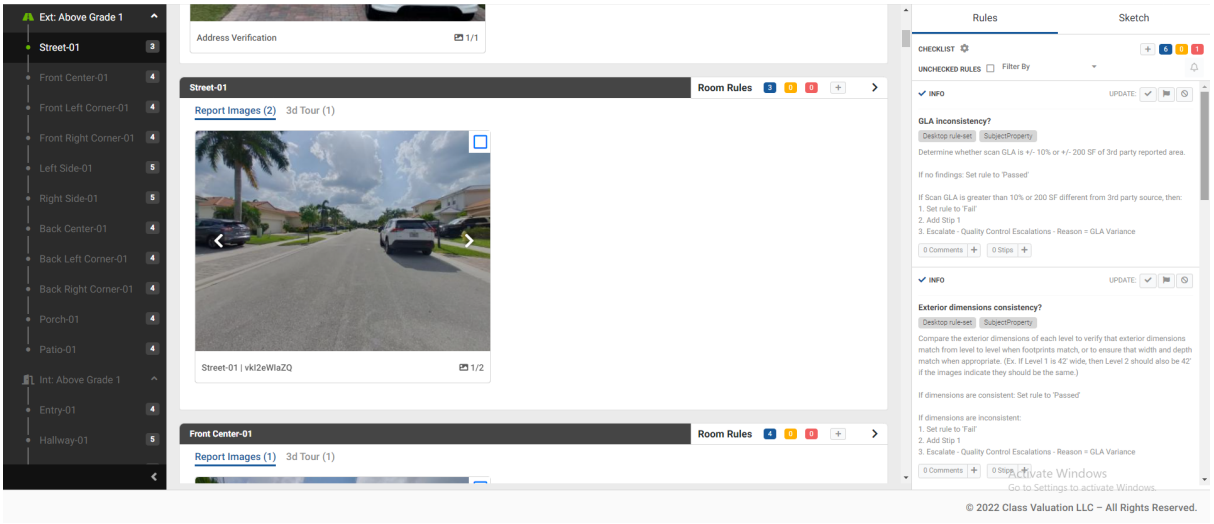


Figure 6.3: Snapshot of working in the desktop application

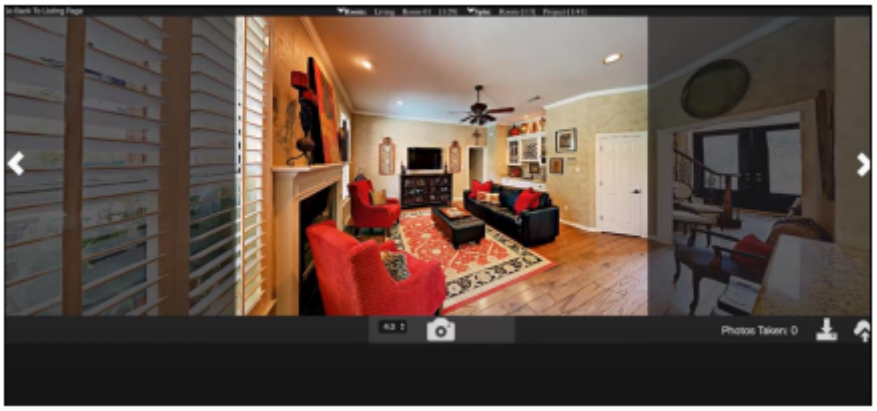


Figure 6.4: Snapshot of working in the photo capturing application

Initially, I was introduced to a platform where various projects along with its necessary materials are uploaded. A huge chunk of the responsibilities included spotting the errors made by scanners. For example: lack of 3D tours, poor quality of 3D tours, insufficient images etc. This required a great bit of attention-to-detail as the service was centered around finding the most intricate of errors and then either rectifying them through IM Revision or mentioning them in the tracker sheet followed by all the interns. After a close inspection of the entire property through the system, a 'Quality Control' google form was filled up listing all the errors made by scanners along with corrections that had to be made.

The next phase of the operation i.e. IM Revisions are only required when there are problems that can be fixed by operators or facilitators. I took on the role of facilitators and carried out all the IM 23 Revisions while consulting with the concerned analyst's order. Besides, a lot of orders require the opinion of clients. In those cases, I used to send those queries to the clients abroad and their opinion used to dictate the next direction of the order. Once all the queries have been cleared, the project is said to have gone through all the quality control procedures. Once IM Revisions were completed, I could then move on to the next phase of the operation i.e. Progressive Web Application (PWA).

Progressive Web Application

During the process of progressive web application, all the images of a particular project are populated from the system. The location of a house and the institutions in its close proximity are some of the key pieces of information that are to be included as per client's instructions as these hold the key to the valuation of a house. Besides, the condition of the house plays a vital role in PWA as this creates a massive fluctuation in housing prices. Once the PWA is completed, the project is sent to an appraiser who looks for further errors and then rectifies them before submitting the project to the client.

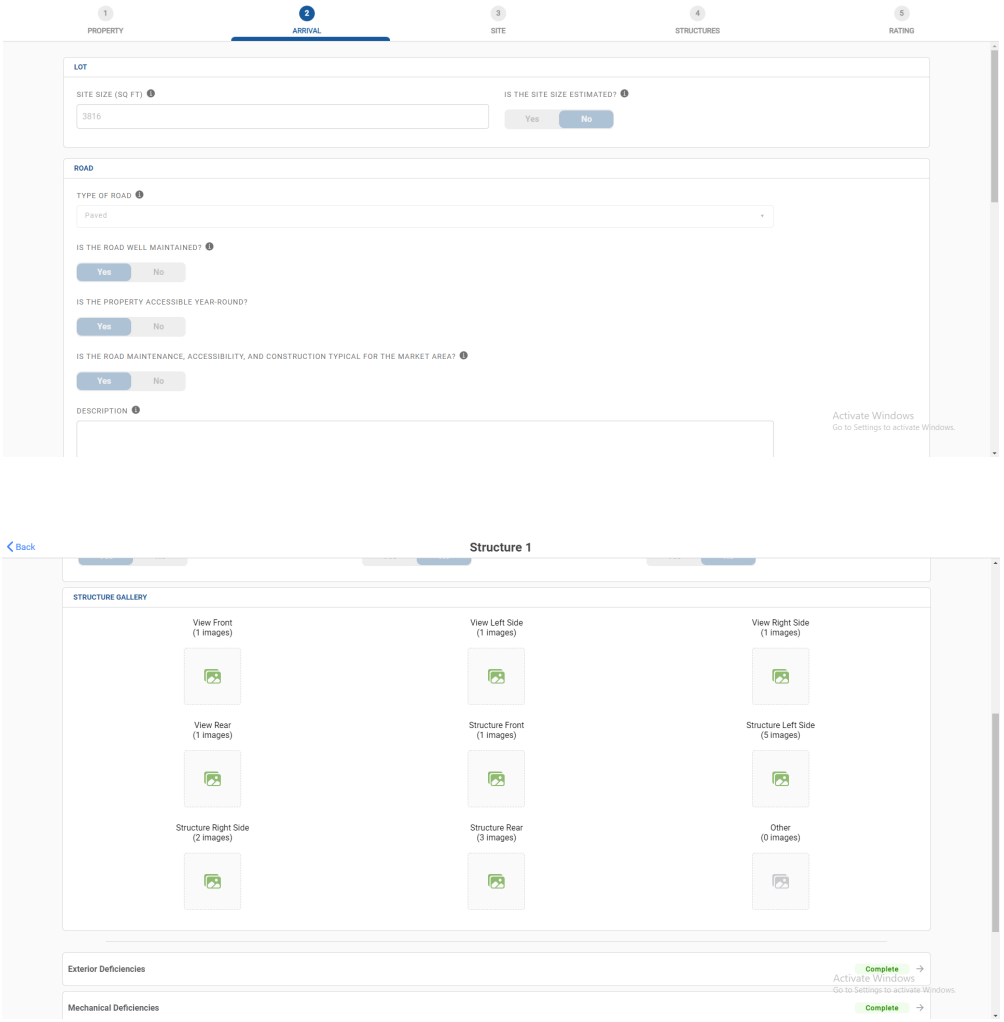


Figure 6.5: Snapshot of working in the progessive web application

Acuity

The project is then closed through an acuity portal where all the information including the client and the analyst's exchange of communication are stored. All of these steps are recorded in a portal where all the updates regarding the orders are found. This ensures a smooth flow of communication between the analyst and the client and bridges any sort of gap between the clients abroad and the employees working in Bangladesh.

INsight

Google Analytics

I was responsible for creating a mock website using google's own analytics software. It uses BigData query to look from the existing sources to find and plot the results. At the time of writing this report I was able to finish two of the requirements as this is a fairly new project.

Completed Orders Dashboard

Using the specific link provided to the management and the client, users can plot a chart of all the completed orders by an Assignee within a given time period.

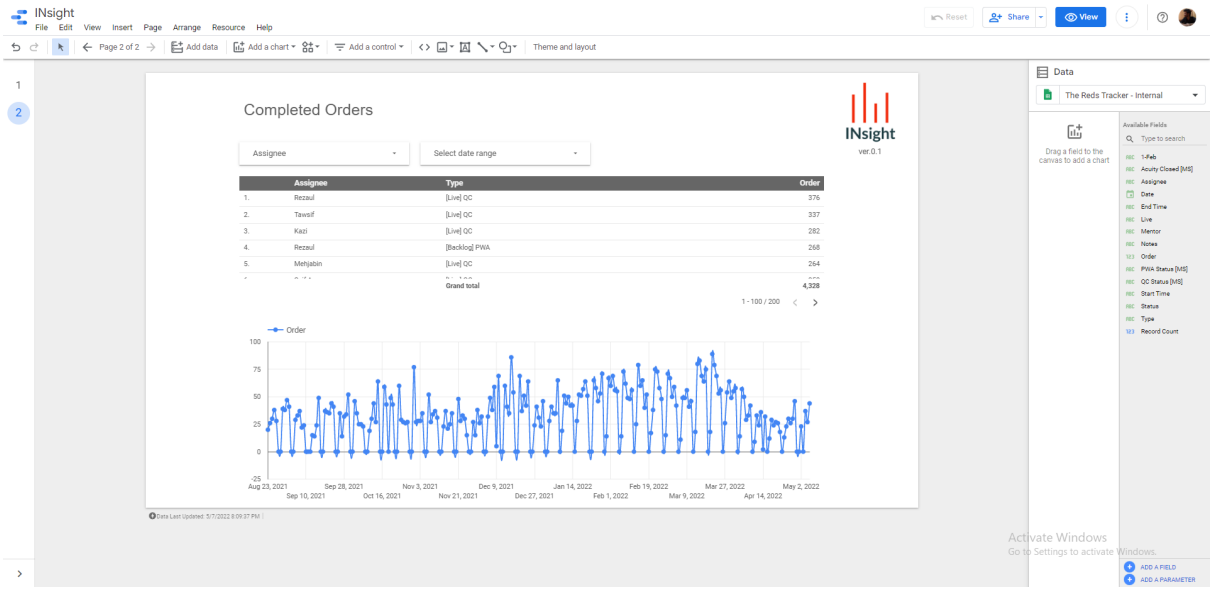


Figure 6.6: Completed Orders Dashboard in INsight

Select Assignee

At first the user is requested to select the assignee of choice. Please note a user can select multiple users to compare the results between them.

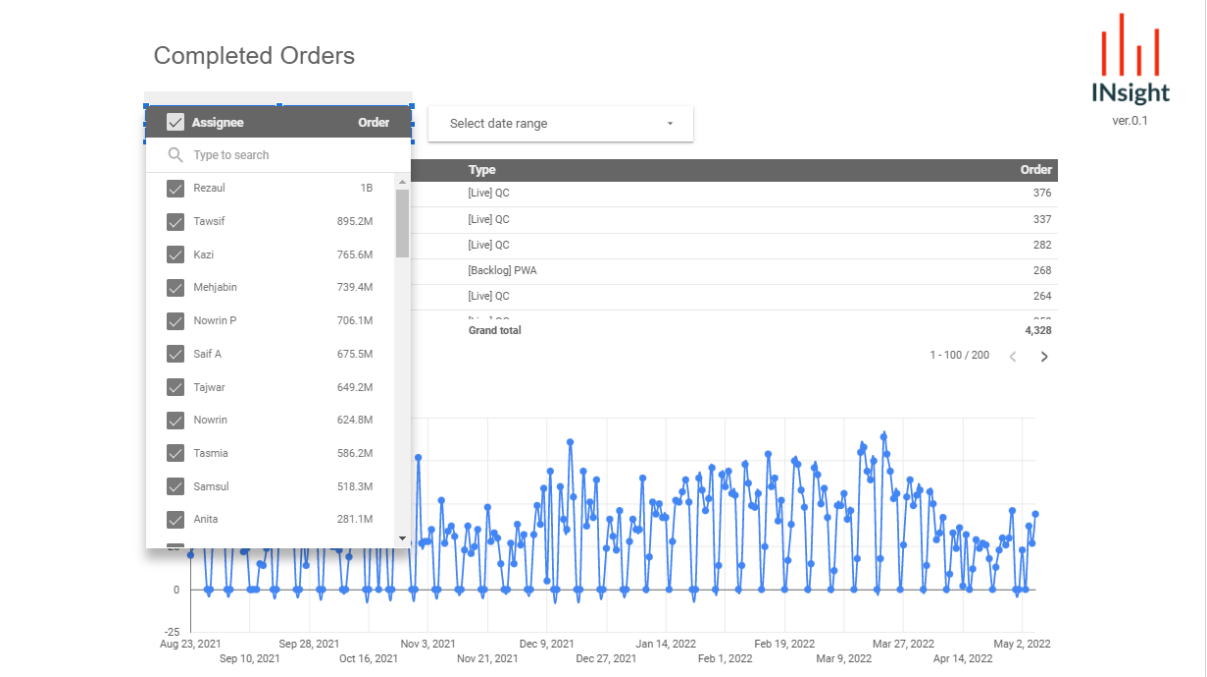


Figure 6.7: Selecting assignees in INsight Dashboard

Select Date Range

Then the user is prompted to select the date range of choice and the results are plotted automatically in INsight.

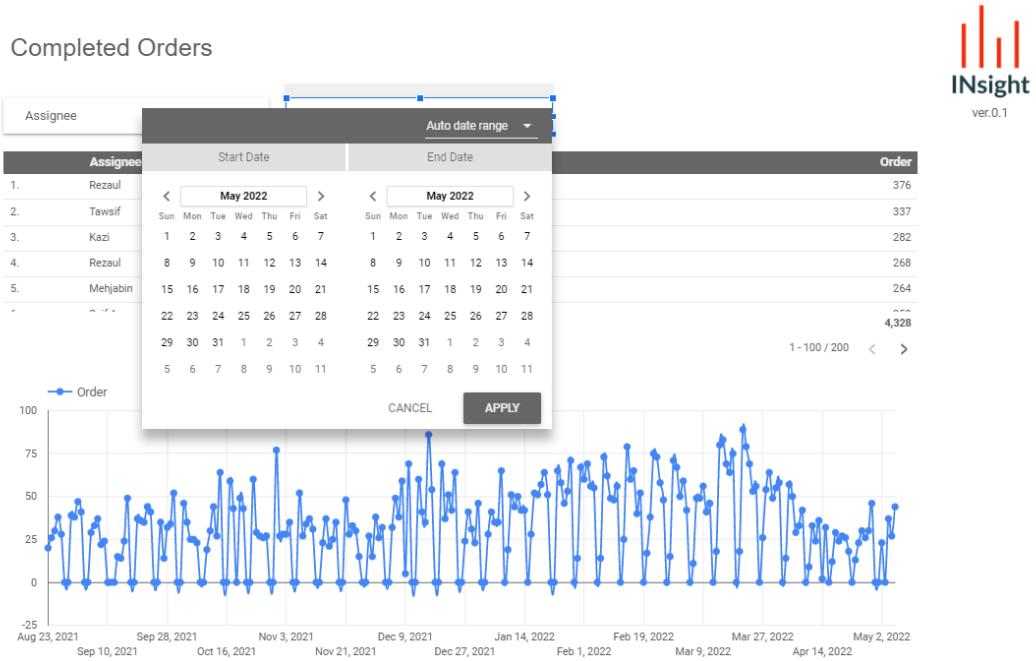


Figure 6.7: Selecting date range in INsight Dashboard

Live Orders Dashboard

As the company is trying to switch from google sheets to a more robust and scalable platform, the live counter is also added in INsight to show its potential. Through INsight, users can be presented with a live counter of all the orders done by all the analysts to provide a more in depth analysis and monitoring system for the management. Hovering over a column would give the type of the order that was done.

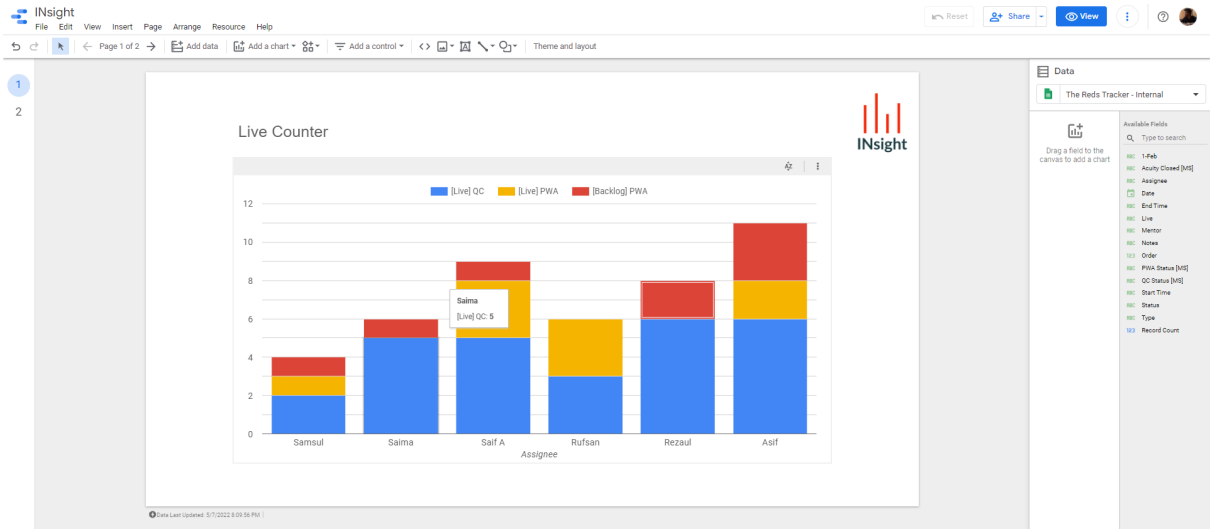


Figure 6.8: Live dashboard in INsight

Chapter 7

Project as Engineering Problem Analysis

Sustainability of the Project/Work

Sustainability of the product refers to its ability to be maintained and updated. In the modern world, every application being released needs to be maintained and continuously updated for its user base. A product can be sustainable in three main categories:

- **Organizational Sustainability**:
  It relates to how the organization will continue to operate after the release of the application. After the release of an application, usually the organization maintains the application via its current team, an extended team or by a fresh new team. Also, organizations update their project by adding newer features to it and organization may pivot to other projects, expand the teams, create new teams, etc. InsideMaps has many more future planned features to be worked on and released. Since it is a unique application, the project will be maintained and updated after its release as well. Adding premium features to it and working on. In conclusion, it can be said that the project is Organizationally Sustainable.
- **Community Sustainability**:
  This type of support comes in many forms such as using the application and providing feedback which is taken into consideration for future iterations.
- **Financial Sustainability:**
  This refers to how the application's running cost will be maintained after it has been released and whether it will generate enough revenue as acceptable profit. An application's running cost includes - server cost, database storage cost, third party API cost, etc.

Social and Environmental Effects and Analysis

- **Social Effect**:
  InsideMaps aims to create better predictive modeling for all of our clients so that we are able to grow and help the new 3D virtual tour industry to grow. Virtual tours are used extensively for universities and in the real estate and hospitality industries. Virtual tours can allow a user to view an environment while on-line. Currently a variety

of industries use such technology to help market their services and products. We plan to increase it even further by creating a better market for it.

- ➔ **Environmental effect**:
  As we slowly move to a more virtual environment, AR and VR can directly minimize environmental degradation by reducing greenhouse gas emissions. For example, almost half of Americans went to a movie theater in 2019. The amount of transportation emissions associated with entertainment-related trips significantly contributes to atmospheric pollution.

Ethics and Ethical Issues

In the world of smartphones with so much data collection, hacking, cybercrime, etc. there are some unspoken rules and ethics guidelines that need to be followed when working on creating and releasing an application. We at InsideMaps believe that the application does not breach any code of conduct of application release and development since they all have been taken into serious concern. Some of them are:

- ➔ **Collecting only relevant data**:
  The data that is collected will strictly be used for analysis and predictive modeling.

- ➔ **Not sharing or selling any user data**:
  The data for our clients and their associates are always kept confidential and is never sold to any third parties.

- ➔ **Data storage security**:
  Only the project lead and the lead developer have access to the server and the database. Since they are hosted in the cloud and can only be accessed via lead developer's and the owner's login credentials; the data stored can be deemed as safe and secure.

- ➔ **Proper use of third-party services and API**:
  Our data collection practices do not violate any rules of the third-party services or the APIs that have been used in its development.

- ➔ **No discrimination or favoritism**:

InsideMaps does not discriminate of any kind based on race, sexuality, gender, religious beliefs, color, language, political or other opinion, national or social origin, property, birth, or other status.

➔ **Clear promotion**:

InsideMaps only intends to promote the company that created it,itself, and clients growth. Other than what has been mentioned, InsideMaps has no intention of promoting anything or anybody else.

Chapter 8

Lesson Learned

Problems Faced During this Period

Organizational Issues

While making our transition from a majority based decision model to a data driven business model we faced a few issues or acknowledged the issues that can arise in the future. Here are some of the common challenges we encountered on the journey to becoming a data-driven organization.

- ➔ **Accessibility & Autonomy**

  There's a big difference between making technology available to employees and having them embrace it. One of the first challenges we had to address was how to make data available in a secure way for all of our InsideMaps' members to use.

  To increase analytics adoption, we had to ensure that data and analytics are available in a format that is tangible and understandable to all of InsideMaps' employees, and can directly correlate with processes we run and decisions we make.

- ➔ **Trust in Data**

  We struggled with establishing trust in our data and making critical decisions based on them, despite a significant investment of time and resources into quality assuring data to ensure it meets requirements. We are acquiring data from multiple clients and it is often received in different formats. This resulted in a lot of manual labor of reformatting the data and streamlining the process.

Personal Issues

It was quite difficult to continue the internship program while continuing three other courses. I always tried to give my all during my internship period. However there were times I had to juggle between everything and that happened to take a toll on my mental and physical health.

Solution of those Problems

During my internship period I have gained new knowledge, skills, and met so many new people. I got insights into professional practice and its relative and required skill set. The internship was also good to find out what my strengths and weaknesses are. I learned about Data Analysis, R, Google Analytics, structures of data etc. Now I know how to make a project successful and what are the requirements. The most interesting part that I enjoyed and loved to do is meeting with the top authorities of the company and gathering requirements. I also learnt how to solve problems and give solution feedback. I believe even though my mental and physical health was affected during the internship period, the pros overweigh the cons and I will be able to bounce back in no time.

Chapter 9

Future Work & Conclusion

Future Works

As the project is still evolving, InsideMaps plans on improving INsight for making the day to day activities much more simpler. Some of the planned new features are as follows

- ➔ Predicting incoming orders using a machine learning model
- ➔ Implementing the data analysis parts in the dashboard
- ➔ Constant simplification of day to day activities
- ➔ Implementing roster attendance into INsight

Conclusion

It was a wonderful experience working with the INvision family in InsideMaps as an intern. During the internship period, I have learned and applied a great deal. I was introduced to new cutting-edge technologies and I was pushed to do even better. I was pushed to adapt to changes rapidly and come up with logical solutions. I have used all my knowledge on analyzing the data. During my project, I cooperated with my mentors and seniors to solve the challenges faced. Despite their workload, my supervisors were always there to answer any queries and help me settle nicely. I would like to appreciate once again everyone who has made my life as an intern such a great experience. I had learnt to work under pressure and fulfill under the deadline.

I had the best experience an intern can hope for during their undergraduate studies. The experience at InsideMaps was a paradigm shift for me in terms of organizational work. Unlike most firms, InsideMaps maintains a culture which is best described as ‘the survival of the fittest’. This culture brought out the best in my quest for personal growth as I was always under pressure to perform well. My learning has been ever-present since Day 1 as they organized different training sessions every day for the first week and informed us about the company policies, laws, and regulations, as well as providing us with a view of the work of various divisions and departments. These sessions were attended by all team leaders and department heads, and they expanded our knowledge and broadened our perspective on the InsideMaps work culture. Working for a startup firm always fascinated me as startups generally try to teach everything about their system to the interns. The team lead was very

detail-oriented and this helped to achieve perfection in every job that I was assigned. As the learning curve was steep, I prepared myself strategically which ensured my rise to prominence as an intern. Additionally, my communication skill has taken off ever since I joined InsideMaps. In a dynamic environment like InsideMaps, lack of communication would ensure that the intern would miss out on a lot of vital information. I had to communicate regularly with my mentor regarding confusions related to projects and this enriched my learning experience rapidly. While InsideMaps does maintain a corporate environment, the atmosphere there was very friendly and this made people feel more at ease with the pressure of the deadlines at work. When things went wrong, I was provided with constructive feedback and this was arguably the biggest takeaway from my internship experience. The mistakes along the way transformed and shaped me as an individual & as an employee. So, all of these workshops and development activities have undoubtedly been beneficial to my personal growth, and I am confident that the learning experience gained during this five-month internship with a corporate institution will prove invaluable in my future profession.

Bibliography

[1] Braesemann, F., Baum, Correspondence, F. and Braesemann (2020.). PropTech: Turning real estate into a data-driven market?

[2] Libby Porter, Desiree Fields, Ani Landau-Ward, Dallas Rogers, Jathan Sadowski, Sophia Maalsen, Rob Kitchin, Oliver Dawkins, Gareth Young & Lisa K Bates (2019) Planning, Land and Housing in the Digital Data Revolution/The Politics of Digital Transformations of Housing/Digital Innovations, PropTech and Housing – the View from Melbourne/Digital Housing and Renters: Disrupting the Australian Rental Bond System and Tenant Advocacy/Prospects for an Intelligent Planning System/What are the Prospects for a Politically Intelligent Planning System?, Planning Theory & Practice, 20:4, 575-603, DOI: 10.1080/14649357.2019.1651997

[3] Saiz, A. (2020), "Bricks, mortar, and proptech: The economics of IT in brokerage, space utilization and commercial real estate finance", Journal of Property Investment & Finance, Vol. 38 No. 4, pp. 327-347. https://doi.org/10.1108/JPIF-10-2019-0139

[4] Seraj, Md. Islam, (2003), “The Real Estate Financing in Bangladesh”, Journal of Marketing, Melbourne University, Vol.20, No.3, pp.50-85.

[5] Sing, T.F. and Zou, Y. (2020). Mortgage Payments and Equity Premium Puzzle.

[6] Siniak, Nikolai & Kauko, Tom & Shavrov, Sergey & Marina, Ninoslav. (2020). The impact of proptech on real estate industry growth. IOP Conference Series: Materials Science and Engineering. 869. 062041. 10.1088/1757-899X/869/6/062041.

Appendix

List of Acronyms

AI Artificial Intelligence
API Application Programming Interface
AR Augmented Reality
BIM Building Information Model
CAD Computer-aided design
CADD Computer aided design and drafting
HVAC Heating, Ventilation, and Air Conditioning
IM InsideMaps
IoT Internet of Things
KMO Kaiser-Meyer-Olkin
PWA Progressive Web Application
QA Quality Assurance
QC Quality Control
REHAB Real Estate & Housing Association of Bangladesh
REIT Real Estate Investment Trust
VDC Virtual Design and Construction
VR Virtual Reality