

Smart Dashboard - A Project by a2i (Aspire to Innovate)

by

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An internship report submitted to the Department of Computer Science and Engineering in partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering

Department of Computer Science and Engineering
Brac University
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Declaration

It is at this moment declared that

1. The thesis submitted is my original work while completing my degree at BRAC University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material that has been accepted or submitted for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

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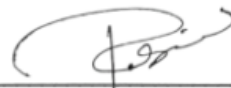
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Abstract

The official works in Bangladesh are mainly done and recorded on paper. Basically, people do paperwork in government offices. We might have seen that many private sectors have turned most of their work online or software-based. However, government work is still done on paper, which causes many problems. First of all, papers are made from trees [2]. For the reason for making those papers, we have to cut trees, which is not good for our environment. Besides, if we keep records of all of the office work on paper, there is a chance of losing that data and recording official work on paper is much more time-consuming and ineffective. That's why the government came up with the idea of making government offices paperless by 2030. Which they named Smart Dashboard, which is a part of the Data Leadership Program [3]. The goal is to make the dashboard district-wise for every government office so that people can find their desired information only by visiting the websites whenever they need and government employees can also store and find data easily through this website. That will reduce the hassle general people face in getting information from government offices and waiting for hours and hours.

Dedication

I would like to devote all my efforts and strain in my educational life to my dear parents and my elder brothers. In their absence, I am nothing. As well, I would like to dedicate this internship report to my respected supervisor, MD Anowarul Arif Khan, who guided and assisted me in forming my professional persona.

Acknowledgments

Before anything else, I want to express gratitude to the Almighty Allah, without whom my internship could not be concluded.

Furthermore, I would like to thank my supervisor, MD Anowarul Arif Khan, head of the Data Team, a2i, for his excellent guidance and support in helping me finish my internship duties and responsibilities. He supported me anytime I needed him.

Additionally, throughout the internship, I had guidance from Dr. Md. Golam Rabiul Alam Sir. Finally, without our parents' unwavering support, it may not have been achievable. We are about to graduate thanks to their amazing encouragement and prayers.

Contents

Abstract	3
Dedication	4
Acknowledgments	5
List of Figures	9
1 Introduction	10
1.1 Preamble	10
1.2 Objective	11
1.3 Information Sources	11
1.4 Document Overview	11
2 ORGANIZATION's PROFILE	13
2.1 Organization Overview	13
2.2 First day of joining a2i	14
2.3 Workshops and trainings	15
3 WORKPLACE DETAILS	16
3.1 My Responsibility	16
3.2 Organization Structure	17
3.3 Communication and Meetings	17
3.4 Remote Office	18
3.5 Work-space Facilities	18
3.5.1 Unlimited Coffee and tea	18
3.5.2 Lunch Facilities	18
3.5.3 Indoor Playground	18

3.5.4	Achievement celebration	19
3.6	Conclusion	19
4	MY CONTRIBUTIONS	20
4.1	Data Governance	20
4.2	The recent August flood in Feni-Comilla-Noakhali	20
4.2.1	Data cleaning	21
4.2.2	Key analysis and findings	23
4.2.3	Learning and Challenges:	31
4.3	Smart Dashboard Project Overview	32
4.4	Work Plan	32
4.5	Project Responsibilities	34
4.6	Implementation	35
4.6.1	Data Cleaning	35
4.6.2	Data Analysis and Visualization	35
4.7	Challenges	37
4.8	Learning	38
5	GROWTH	39
5.1	Professional Growth	39
5.1.1	Office environment	39
5.1.2	Teamwork	39
5.1.3	Time management	39
5.2	Technical Growth	40
5.2.1	Linux	40
5.2.2	Github	40
5.2.3	Tableau	40
5.2.4	Superset	40
5.2.5	Python libraries	40
5.2.6	Prediction models	41
5.3	Interpersonal Growth	41
5.3.1	Questioning	41
5.3.2	Patience	41
6	CONCLUSION	42

6.1 CONCLUSION	42
6.2 Recommendations	43
7 Bibliography	44

List of Figures

2.1	My Office Desk	15
3.1	Teams of a2i	17
4.1	Flood-project related all files	21
4.2	Data Cleaning	21
4.3	CSV file after removing sensitive information	21
4.4	file after removing unnecessary information	22
4.5	file after all edit	23
4.6	Distribution of caller needs across the districts	23
4.7	Showing caller distribution through a chart	24
4.8	resolution figure variation by gender	25
4.9	Trends in Call Volume Over Time	26
4.10	Number of calls over time	26
4.11	Common Needs in Districts with High Unresolved Cases	27
4.12	Most common needs in the district	28
4.13	Frequency of different feedback over time	29
4.14	Frequency of feedback status	29
4.15	code for heatmap for the correlation value	29
4.16	Heatmap	30
4.17	Final Outcome Prediction	30
4.18	Task Management	33
4.19	Data analysis steps (Soegaard,)	33
4.20	Organized folder I worked on in June month	34
4.21	Demo of a folder containing all the files I worked on a particular day	34
4.22	Raw Data file	35
4.23	Final output after all the possible visualizations from the file	36
4.24	Agency that has been visited	36
4.25	Statistics of work each person has done	36
4.26	Issues faced by each organization	37
4.27	Current Progress of each organization	37

Chapter 1

Introduction

1.1 Preamble

Recently, graduates and students have had the opportunity to use their knowledge in the workplace and become acclimated to realistic workflow procedures through an internship. Students get to experience relevant things to their course of study through this. It facilitates the students' moving from the academic world into the real world of work. Furthermore, the organization may assign the new intern based on their needs and best fit by understanding them. Besides, an internship also adds to a student's work experience, and this adds up to the intern's CV, which eventually makes it more worthy and hence provides great job opportunities in the future.

a2i is one of the most well-known government agencies in Bangladesh. a2i (Aspire to Innovate) believes in innovation for all [1]. That's why they have been working for Digitizing Bangladesh since 2007. From the first semester of my university life, I dreamt of working for a2i because I was so inspired by their work.

The practice of completing an internship has been growing in popularity for the past few years. In fact, many students prefer to do an internship over a thesis paper. At BRAC University, a student either needs to write a thesis paper, finish a project, or complete an internship. Even though fewer students choose to intern at BRAC, those who do so are encouraged to get as much information and experience from the industry and are given sufficient assistance by the school. Students are free to choose any specialization for their internship as long as it fits with their major. A student must earn more than 72 credits to be eligible for an internship, and this internship must last six months at a well-known organization. I chose to do an internship rather than write a thesis paper while I was a student at BRAC University because I believe an internship will help me gather experience in real-life work. I chose a2i (Aspire to

Innovate) as my internship organization. The Government of Bangladesh has developed a global catalyst for digital transformation, which is known as a2i. It's the Innovation Agency of the Government of Bangladesh. It is a major component of the government's Digital Bangladesh agenda, a special plan of the ICT Division and the Cabinet Division funded by UNDP. It is essential to the country's efforts to meet the 2030 Sustainable Development Goals and turn it into a developed nation by 2041 [1].

1.2 Objective

An internship provides a student with different unique opportunities for learning outside of academic settings and also helps to implement their learning in practical work. It can introduce you to new projects and help you acquire the abilities necessary to do those jobs. You can gain experience with people, technology, and projects that might be relevant to your career aspirations through internships. After working for 6 months as an intern at a2i, I have written this report based on my experience, which I have gathered while working in this organization. This report as well as has been generated as a requirement of an internship program under the Computer Science and Engineering Department of BRAC University. Therefore, the basic objective of this document is to give an overview of the whole journey of completing the internship program. Besides, this report will also cover an overview of a2i, their work, and working experience in a2i. This report represents my performance at a2i, deeds, project work, and professional development during my internship. Moreover, anyone looking for a quick summary of a2i can find it in this report.

1.3 Information Sources

I gathered the majority of the information that I have used in this report, which was primarily collected by me during working on a2i. Mostly, I got to know about all this information by working there and discussions and lessons taken from colleagues and team leaders by interacting with them. The secondary sources I have used were collected from the website of a2i, the internet, etc.

1.4 Document Overview

In this report, I shared my work experience with a2i. Along with it I also have discussed my achievements, knowledge I gained, and growth while working with the team. I briefly mentioned the projects I was assigned with. And also some of the problems that I faced while working on those projects and how I overcame those challenges. In

summary, this report will provide an in-depth review of a2i along with specific details on my personal development throughout my internship.

Chapter 2

ORGANIZATION'S PROFILE

2.1 Organization Overview

The Government of Bangladesh has developed a global mediator for digital transformation called a2i. With technical assistance from UNDP, it was formed in 2008 at the Prime Minister's Office as the focus of the government's much-lauded Digital Bangladesh 2021 effort. In addition to acting as an inspiration for digital governance [4], a2i changes the bureaucratic [5], and typical civil service mentality, and promotes an inclusive, citizen-centered public service innovation culture. It expands on the work of the Bangladeshi government to promote "e-Quality," or digital equity, and cultivates a flexible national framework for group planning, action, and learning in order to spark genuinely revolutionary changes in the execution of public services [1]. A2i is situated in Agargaon and offers a very work-friendly environment where a team of experienced and hardened developers produces excellent software and solutions for the people of Bangladesh.

A2i is an innovative government agency. So it needs a proper setup to be able to bring out the best outcome and provide the best service. The structure below will explain how a2i functions through the hard work and dedication of the talented, specialized, and experienced developers and engineers on the team [1].

Mainly all the funds a2i gets are from the Bangladesh government, as it is a government agency. a2i's current growth efforts are operated and supervised by the "Team Leader". There are several teams in this agency and each team has a team leader who monitors the whole work of the team. On a professional basis, this individual is the main point of contact and should be engaged in all official correspondence. Despite acting as an inspiration for digital governance, a2i upends the administrative, conventional civil service mentality and creates an inclusive, citizen-centered public service

innovation culture. By using a "whole-of-government" strategy, it also functions as an innovation intermediary, assisting the government in pioneering the integration of new, goal-oriented innovation policies and whole-of-society ways towards achieving the SDGs [1].

Furthermore, a2i is coordinating the "Digital Stewardship Community for Policymakers in Asia and the Pacific" in partnership with the UNDP and the Islamic Development Bank [6]. In order to build relationships between practitioners and policymakers and create a community of knowledge exchange for exchanging best practices and opportunities to unlock investments in their respective countries as well as throughout the Asia Pacific region, this initiative aims to use UNDP Global, Regional, and a2i assets. With financing, technology, and guidance, a2i is also striving to help the digital advancement of other least developed countries (LDCs) and several developing nations through UNDP's Accelerator Labs network and by utilizing the South-South Network for Public Service Innovation [7]. We are interacting with more than 40 nations and have developed strong relationships with nations in Africa, the Asia-Pacific area, and the Middle East, including Bhutan, Fiji, Ghana, Jordan, the Gambia, the Maldives, the Philippines, Sao Tome Principe, Somalia, Turkey, Uganda, and Yemen.

2.2 First day of joining a2i

On my first day, I was really excited and nervous. Different thoughts were in my mind. After reaching the office, I waited for some time as my supervisor had not arrived yet. A few minutes later, he arrived. Then I went to meet him. He introduced me to other teammates. He also took me to the HR office in order to tell them to make an ID card for me, which is basically an entry pass to get into the office. Then he assigned a co-supervisor for me whose name was Anik Bhaiya. Anik Bhaiya talked to me for a few minutes. Basically, he wanted to know about my skills and projects I have already worked on. Based on that, he was going to assign me tasks. He was a very friendly, comforting, and overwhelming person. All my nervousness was gone after talking with him. Then he showed me the meeting rooms, cafe, canteen, and open space, and other departments.

Before I started working, my supervisor told me to study a few important terms and methods and be familiar with some tools like Apache Superset and Tableau and also mentioned seeing their previous works. I had to log in to Preset to make dashboards and charts. To learn to make charts, I watched YouTube videos, and also my supervisor told me different tips and tricks.

On my first day, one of my colleagues, Nirjhora Apu, offered to have lunch with her. We went to the canteen together for lunch. She was so loving and sweet and was admiring me. She even paid for my lunch as it was my first day. I was so overwhelmed with her behavior. After having lunch, I take a nap on my desk for a few minutes. Basically, lunchtime in a2i is from 2 pm to 3 pm. Working at a2i has proved to be quite interesting for me, as it is a great learning experience for me. I got to know a few people from my team and research and policy team. Some of them have become my friends in a very short time. There, everyone is so helpful and open-minded. They don't judge people or overlook them if anyone fails to do something. During lunchtime, we all have lunch together. Have a conversation with one another. That makes my office life more enjoyable. Besides, the office of a2i is so beautiful, especially its interior. They make everything so eye-catching that employees will love to work here.



Figure 2.1: My Office Desk

The surrounding environment of a2i's office is so beautiful and relaxing. Also, we can have the metro rail view and also lake view from the office window.

2.3 Workshops and trainings

Our "Smart Dashboard" project goal is to make a dashboard for every organization under the government by 2025. That's why a2i organizes different workshops which last 3 days in different government offices. The main goal of this workshop is to train them how to build a dashboard through the information they need to see and digitalize the whole thing. We have already done 16 workshops in different government offices, including NAPE, DDM, BJRI, Agriculture Ministry, Cotton Institute, etc. In these workshops, I needed to see their works and help them if they were stuck somewhere. Besides, I needed to keep notes from the meetings, and organize the files or make a database and clean the database.

Chapter 3

WORKPLACE DETAILS

3.1 My Responsibility

In my first few days at the office, my supervisor told me to see the existing dashboards programmed by them. Then learn how to make dashboards and charts using Superset. For this, he provided me with the user ID and password and also gave me access to the government datasets. After that, I started exploring government websites to understand the concept of dashboards and to see whether I could find any other way to add. But before that, I learned to make charts using Superset. Though these findings were completely random, I learned several steps and rules to make some new efficient analyses. Some of the main steps are mentioned below:

- First, analyze the raw data file closely to understand which data are important and which data can be ignored.
- Secondly, cut the unwanted data from the file and try to convert the data into a row-column format to turn it into a data set.
- The more analysis we can do based on the requirement, the dataset will be more effective.
- While making a dataset, we have to keep in mind that we should try to make the dataset with fewer columns possible. Because more columns can make the dataset more complicated. But we can add as many rows as we want.
- After making the dataset, it needs to be clean. For that, we can cut the null values and repeat or duplicate data. And try to keep everything in format.
- Then we need to analyze the dataset in order to find the most efficient outcome from that.
- Finally, implement the analyzed information.

- For the project I am working on, we need charts to show in the dashboard so that people can find their information just by looking at the graph. For that, the graph needs to be simple and understandable to the general public. That's why we also need to keep that in mind.

3.2 Organization Structure

The organization has more than 21 teams, and it is growing faster and adding more teams in order to fulfill the requirements of newly taken government projects.

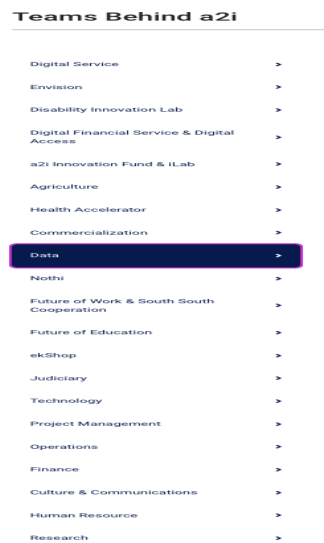


Figure 3.1: Teams of a2i

3.3 Communication and Meetings

Working in an office is a different experience for me. In our Data team, we maintain our online communication through a WhatsApp group. In that group, along with the interns, the data scientists of our team, our supervisor, and data experts are also added. Sometimes they informed us of various official notices, meetings, and workshops and assigned us new works through WhatsApp. Besides, in the office, we communicate with for different purposes.

We have weekly meetings in our office where we discuss the progress of our project and what initiatives we need to take in the future. Firstly, we discuss the feedback we get, and then we discuss the next step and plan for it. Then our supervisor assigned us different works based on the discussion.

3.4 Remote Office

During the July-August movement in 2024, it was quite difficult to do physical office as it was not safe outside, especially for the students. That's why the organization lets us conduct office work online. But in case of emergency, we need to go to the office. In that case, they organized a transportation system. From July 18 to August 25, we had a remote office. Our tasks were assigned via the WhatsUp group at that time, and by the end of the day, we had to submit our work to our co-supervisor.

3.5 Work-space Facilities

3.5.1 Unlimited Coffee and tea

Beside our department, there is a tea-coffee corner where sugar, tea, powdered milk, coffee, and hot water are kept. Anyone can have a cup of coffee or tea whenever they want. If anyone wants to sit for a while with a cup of coffee and want to enjoy the fresh air, there is also a place for that.

3.5.2 Lunch Facilities

a2i office provides lunch facilities for their employees. On the ground floor beside the parking, we have a cafe where all varieties of food are served, and the price is also reasonable. There we can have breakfast, lunch, and snacks. All types of food, including Bangla Khabar-Bhat, Bharta, fish, dal, sobji, and shak, can be found. Besides, they also serve polao, fried rice, kacchi, biriyani, khichuri, beef, mutton, and many other chicken items and desserts. Lunch generally starts at 12.30 pm every day. Moreover, we also have a renowned coffee shop on the first floor, which is "Bread and Beyond." From there, we can enjoy premium coffee with different pastries and cookies. The smell of coffee is totally amazing.

3.5.3 Indoor Playground

There is an indoor playground available in the office. There are billiards, table tennis, and carrom. Usually, there is no fixed time for that, but during the lunch period between 2 pm and 3 pm, people enjoy playing this indoor game. I am not a big fan of indoor games, but sometimes I also go there with my colleagues. I have a picture of playing billiards, though I cannot play. That was my first time trying this.

3.5.4 Achievement celebration

a2i celebrates their achievement through small get-togethers. Sometimes they do that in anyone's house, restaurants, or in the office canteen. Besides achievement celebrations, sometimes colleagues planned a tour for refreshments. My colleagues here at a2i make me feel like family, and I enjoy being with them a lot.

3.6 Conclusion

In short, the working environment of a2i is very employee-friendly, peaceful, and energetic. This place does not feel exhausting, even though the workload is high. The inside and outside environment of the office is so calm and soothing that no one can get bored here.

Chapter 4

MY CONTRIBUTIONS

4.1 Data Governance

As I was working in the data team of a2i, so much sensitive information about the government and people of our country is stored here. For security reasons, I cannot talk about all those projects or share their information. For showing work about my internship, I especially took permission from my supervisor to talk about those projects in my internship paper, which I'm going to submit to my university. My supervisor only gave me permission to show some projects as they are very sensitive and showing this information outside the data team is totally forbidden as these projects are caring for people's personal information like NID numbers, phone numbers, addresses, and many more. That's why in this report I'm only going to talk about two projects that I have done. One of these was about the recent flood in Bangladesh, which occurred in August, and the other was one of our research in our smart dashboard project. As this project is so confidential, that's why I cannot show the official dashboard of a2i. But I will try to show as much as I can here.

4.2 The recent August flood in Feni-Comilla-Noakhali

When the sudden flood started in Feni, Comillah, Noakhali district, we started working on this as we were assigned by the government [12]. Other projects were stopped at this time because of the crucial situation in that part of Bangladesh. Every day there are several calls for help coming from that area. To help people in that part of the country who are stuck in that flood, we were working day and night. My job was to find the insights of those calls and their needs and predict how many calls we were going to have next.

.ipynb_checkpoints	Fixed prediction model	last month
Flood_response.csv	Added readme and report	last month
README.md	Added readme and report	last month
calls.sql	Added .sql file and cleaned CSV file	last month
flood_response Report.pdf	Added readme and report	last month
flood_response.ipynb	Added readme and report	last month

Figure 4.1: Flood-project related all files

4.2.1 Data cleaning

Step 1: Convection of SQL to CSV

For converting SQL to CSV files, I have used an online tool, which is products.aspose

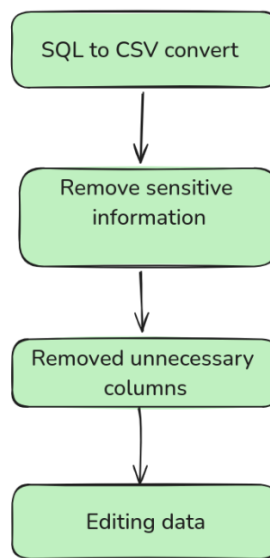


Fig: Data Cleaning

Figure 4.2: Data Cleaning

Step 2: Remove sensitive information Have removed sensitive information like name and mobile no. Which was also removed from the SQL file. Removed those columns entirely, as I won't be needing them.

id	name	gender	age	phone	email	address	city	state	country	zip	lat	lon	created_at	updated_at
1														
2														
3														
4														
5														
6														
7														
8														
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25														
26														
27														
28														
29														
30														

Figure 4.3: CSV file after removing sensitive information

Step 3: Remove unnecessary columns

Removed columns that either contain all NULL values

- Is_phy_challenge was removed because it shows that all the cell's info is "0" so it is not necessary information
- Physically_challenged has all the null values. It is also the duplicate column of is_phy_challenged.
- Location_district_id, location_upazila_id, location_union_id, location_road, map_link, municipality, mauza, location and created_by were also removed because it contains null values.
- Location_union was removed because the data got mixed with location_union_id meaning so of them contain strings whereas some contain the ID of the union.
- Ward and city columns contain some data but it is not necessary for our analysis.
- Caller_need_other was also removed as there was only 6 data.
- resolve_by contains the ID of the volunteer which was removed because of data privacy.
- Summary, event-date, call_type, agent, and ref_id all contain NULL values in all cells so it was removed.
- Updated_at contains corrupt and invalid data so it was removed.

id	gender	location_district	location_upazila	location_village	caller_name	note	status	receive_organization	feedback_status	resolve_center_receive_id	created_at
1		NOAKHALI	NOAKHALI SADAR	Shampur	Male	Food needed	Resolved	Unknown	Not Applicable	None	2020-09-09 09:00:00
2		NOAKHALI	NOAKHALI SADAR	Shampur	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
3		FENI	FENI SADAR	Shamba	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
4		FENI	FENI SADAR	Shamba	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
5		NOAKHALI	NOAKHALI SADAR	Changra	Unknown	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
6		FENI	FENI SADAR	Patu Sadar	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
7		NOAKHALI	NOAKHALI SADAR	Changra	Unknown	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
8		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
9		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
10		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
11		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	get_no_help	Reporting for 1410242024	2020-09-09 09:00:00
12		NOAKHALI	NOAKHALI SADAR	Patu Sadar	Female	Food needed	Resolved	CC Office	Resolved	Report Form F-00242024	2020-09-09 09:00:00
13		FENI	CHANGALANAYA	Patu Sadar	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
14		FENI	FENI SADAR	Shamba	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
15		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
16		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
17		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
18		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
19		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
20		CHANDIPUR	CHANDIPUR	Chandipura	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
21		FENI	FENI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
22		NOAKHALI	NOAKHALI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
23		NOAKHALI	NOAKHALI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
24		NOAKHALI	NOAKHALI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
25		NOAKHALI	NOAKHALI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
26		NOAKHALI	NOAKHALI SADAR	Changra	Female	Food needed	Resolved	Not Applicable	work_off	Reporting for 1410242024	2020-09-09 09:00:00
27		LAKSHMIPUR	LAKSHMIPUR	SAD	Female	Food needed	Resolved	UP Member	Resolved	Report Form F-1410242024	2020-09-09 09:00:00
28		CHANDIPUR	CHANDIPUR	Chandipura	Female	Food needed	Resolved	UP Member	Resolved	Report Form F-1410242024	2020-09-09 09:00:00
29		CHANDIPUR	CHANDIPUR	Chandipura	Female	Food needed	Resolved	UP Member	Resolved	Report Form F-1410242024	2020-09-09 09:00:00

Figure 4.4: file after removing unnecessary information

We have now 13 columns from 40 columns initially. We will be working with these columns for further data cleaning, analysis, and prediction.

Step 4: Editing Data

- There were many spelling mistakes and Capitalization problems in location_district, location_upazila, and location_village which were solved in the CSV file.
- The missing data in gender was filled by Unknown if it was NULL.

- The data time was formatted accordingly in resolve-at and created-at columns.
- Also, there was some missing data in created_at which was caused by the API not calling so it was not entered in the database. My instructor gave me the time frame of that data so I manually filled up the data accordingly.

Figure 4.5: file after all edit

4.2.2 Key analysis and findings

1. Distribution of Caller mainly flood-affected people needs across districts

- People of the Noakhali district have the highest count of caller needs
- Other districts have comparatively low
- Their needs are categorized into Food, Rescue, and Medicine

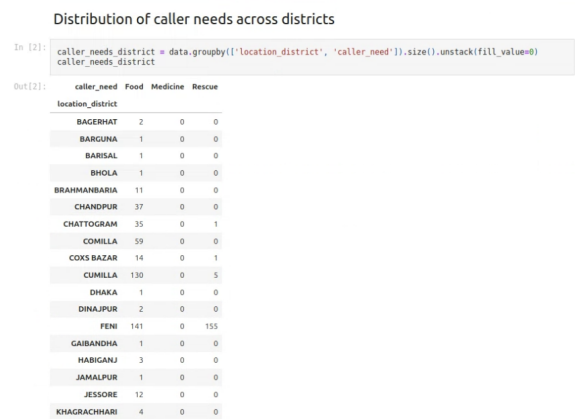


Figure 4.6: Distribution of caller needs across the districts

Work Explanation:

- Here the district column contains all the districts that were flood_affected, such as Noakhali, Feni, Cumilla, Chattogram, and others.
- Caller needs are categorized into three types, which are food rescue and medicine
- Here I use unstack () to pivot the caller_need levels into separate columns to make each row represent a district. Side by side, each column represents a specific need.
- 'fill_value=0', for filling the missing values with 0 where a combination of district and needs does not exist.

Visualization explanation:

- From the visualization, we can see Noakhali district has the highest count of caller needs compared to other districts.
- Some districts are showing minimal count which is Bagerhat, Bhola, and Chattogram

Conclusion and Insights

The distribution of caller needs is highly skewed, with Noakhali having a disproportionately high count compared to other districts. Efforts and rescues might need to be concentrated more in Noakhali due to the high volume of needs reported from the district.

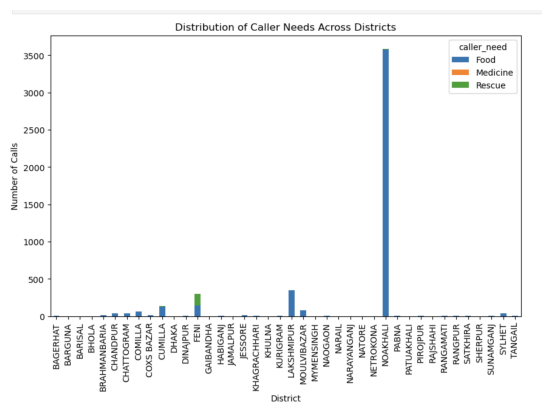


Figure 4.7: Showing caller distribution through a chart

2. Resolution Status by Gender

- The majority of cases for both males and females are pending
- The 'Unknown' gender category has a high number of resolved cases as
- Minimal data for the 'O' gender category

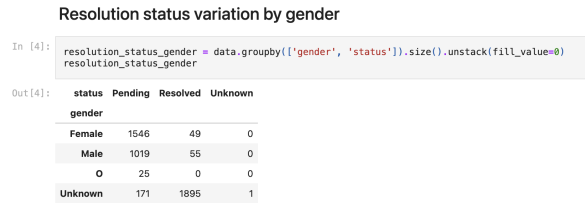


Figure 4.8: resolution figure variation by gender

Work explanation:

- From here we have found out the number of pending cases and resolved cases based on gender.
- People whose gender wasn't recorded are mentioned as unknown here.

Conclusion and Insights

- Pending status dominance: Both females and males have a high number of pending cases compared to resolved ones.
- Unknown gender anomaly: The unknown gender category has a significantly higher number of resolved cases, which is an anomaly compared to other gender
- Minimal data for 'O' gender: The 'O' gender category has very few cases, all of which are pending.

3. Trends in Call Volume Over Time

- Data spans from August 23, 2024, to September 10, 2024
- A significant spike in calls on August 26, 2024 (418 calls)
- The lowest number of calls on August 30, 2024 (10 calls)

Work explanation:

- Convert the 'created_at' column to datetime to allow proper date-time analysis.
- Used errors = 'coerce', so that any invalid dates are converted to Nat (Not a Time)
- Next, count and sort_index are used to count the number of calls per date and sort the counts in order of date.

Analyzing call data:

- Data Range: The data spans from August 23, 2024, to September 10, 2024.

Trends in the number of calls over time

```
In [6]: # Convert date columns to datetime for proper analysis
data['created_at'] = pd.to_datetime(data['created_at'], errors='coerce')

calls_over_time = data['created_at'].value_counts().sort_index()
calls_over_time
```

```
Out[6]: 2024-08-23    229
        2024-08-24    213
        2024-08-25     46
        2024-08-26    418
        2024-08-27    235
        2024-08-28    201
        2024-08-29    221
        2024-08-30     10
        2024-08-31    256
        2024-09-01    204
        2024-09-02     95
        2024-09-03     84
        2024-09-04    172
        2024-09-05    168
        2024-09-06    136
        2024-09-07    112
        2024-09-08    340
        2024-09-09    100
        2024-09-10    361
        Name: created_at, dtype: int64
```

Figure 4.9: Trends in Call Volume Over Time

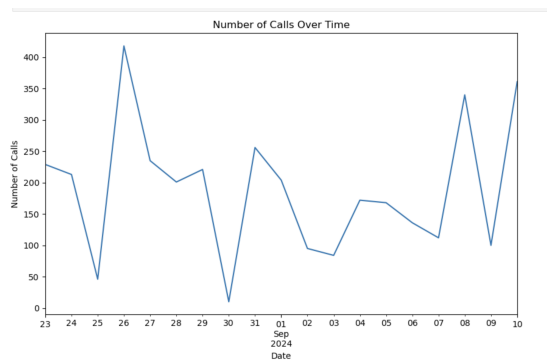


Figure 4.10: Number of calls over time

- Extremes: The maximum number of calls received in a day is 4, and the maximum is 418.

Visualization explanation:

- General Trend: The number of calls fluctuates over the observed period.
- Peak: There is a significant spike in the number of calls on August 26, 2024, with 418 calls.
- Low Points: The lowest number of calls is observed on August 30, 2024, with only 10 calls.
- Variability: The number of calls shows high variability, with several peaks and troughs throughout the period.

4. Common Needs in Districts with High Unresolved Cases

- Top districts: Noakhali, Lakshimpur, Feni, Cumilla
- Food is the primary need across all districts
- Rescue needs were reported only in Feni and Cumilla

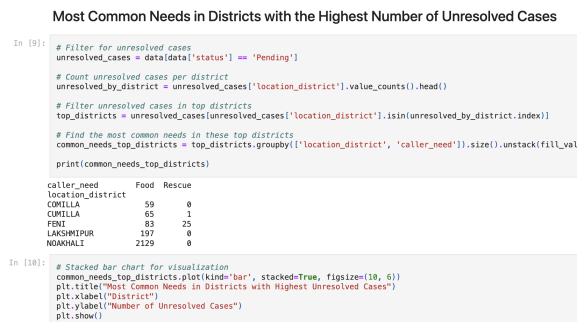


Figure 4.11: Common Needs in Districts with High Unresolved Cases

Work explanation:

- Filter for unresolved cases, this creates a new DataFrame 'unresolved_cases' by filtering rows in data where the status is 'Pending', meaning the case hasn't been resolved yet.
- Then I make a count that counts how many unresolved cases are there for each district, sorted by count, and select the top 5 districts with the most unresolved cases.

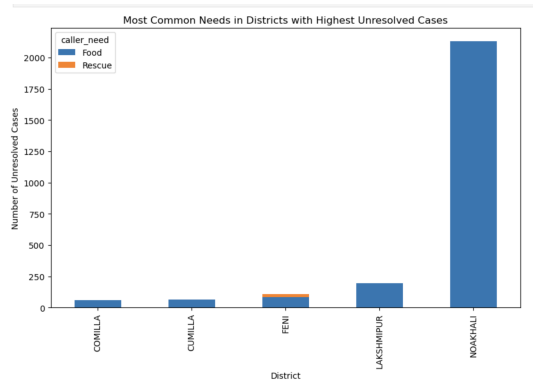


Figure 4.12: Most common needs in the district

- After that, I filtered the `unresolved_cases` dataframe to only include cases from the top 5 districts identified in the previous step. Finally, finds the most common needs in these top districts.

Visualization and insights:

The most common needs across these districts were:

- Food: This was the primary need in all districts, with Noakhali having the highest demand (2,129 cases).
- Rescue: Only Feni and Cumilla reported rescue needs, with Feni having a higher number (25 cases).

A stacked bar chart was used to visualize this data, clearly showing the dominance of food needs across all districts, with Noakhali standing out significantly.

5. Frequency of different feedback over time and Correlation Analysis

- Throughout the response period, we tracked changes.
- Heatmap visualization of relationships between various factors

Work explanation:

This code tracks how many feedbacks (split by their status) were received over time, grouped by date. The analysis tracked how different feedback statuses changed over time. The feedback status included:

- Resolved
- Unknown
- Did not answer
- Got no help

- Other
- Switch off

A line chart was created to visualize these trends, allowing for the identification of patterns in feedback for the flood response.

```

Frequency of different feedback statuses over time

In [12]: # Group by created_at and feedback status
feedback_over_time = data.groupby([data['created_at'].dt.date, 'feedback_status']).size().unstack(fill_value=0)
print(feedback_over_time)

feedback_status  Resolved  Unknown  did_not_answer  got_no_help  other \
created_at
2024-08-23         25         37          37          79         2
2024-08-24         8         15          18          97         3
2024-08-25         1          4          13          24         0
2024-08-26        22         23          68         241         2
2024-08-27         9          9          45         149         0
2024-08-28        13         11          41         118         2
2024-08-29         5         16          51         158         1
2024-08-30         1          0           2           4         0
2024-08-31         9         16          49         164         2
2024-09-01         4          9          41         137         0
2024-09-02         1         32          22          54         0
2024-09-03         1         41          18          26         1
2024-09-04         0        178           0           2         0
2024-09-05         0        168           0           0         0
2024-09-06         0        136           0           0         0
2024-09-07         0        112           0           0         0
2024-09-08         0        348           0           0         0
2024-09-09         0        188           0           0         0
2024-09-10         0        351           0           0         0

feedback_status  switch_off
created_at
2024-08-23         49
2024-08-24         32
2024-08-25         4
2024-08-26         42

```

Figure 4.13: Frequency of different feedback over time

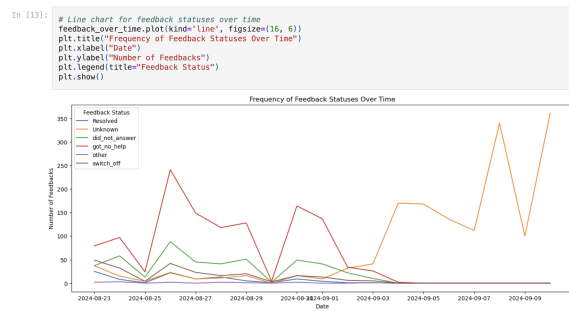


Figure 4.14: Frequency of feedback status

```

In [14]: # Encoding categorical variables
encoded_data = pd.get_dummies(data[['feedback_status', 'caller_need', 'status', 'gender']], drop_first=True)

# Adding resolution_time to the encoded data
encoded_data['resolution_time'] = data['resolution_time']

# Drop rows with missing values in resolution time
encoded_data = encoded_data.dropna(subset=['resolution_time'])

# Compute the correlation matrix
correlation_matrix = encoded_data.corr()

# Heatmap for the correlation matrix
plt.figure(figsize=(12, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f", linewidths=0.5)
plt.title("Correlation Matrix Including Feedback Status and Other Variables")
plt.show()

```

Figure 4.15: code for heatmap for the correlation value

A correlation matrix was computed to understand the relationships between various factors, including feedback status, caller needs, and resolution time. This was visualized using a heatmap, which can reveal strong positive or negative correlations between different variables in the dataset.

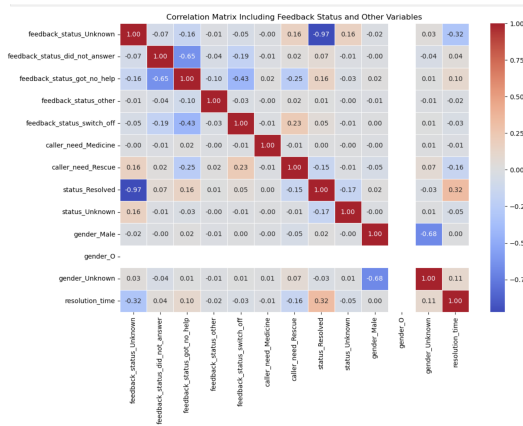


Figure 4.16: Heatmap

6. Predictive Modeling

- Linear regression model to predict caller needs for the next two days
- Prediction: 19-20 calls per day for the next two days

Predictive Modeling for Caller Needs

The final analysis used linear regression to predict caller needs for the next two days:

- The data was prepared by converting dates to a numerical format.
- A linear regression model was trained on the historical data.
- The model was then used to predict caller needs for the next two days.

```
In [15]: from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression

data['created_at'] = pd.to_datetime(data['created_at'], format='%m/%d/%Y')

# Group by district and date, and count caller needs
district_needs = data.groupby(['location_district', 'created_at']).size().reset_index(name='caller_needs')

# Feature engineering: Convert dates to numerical format for regression
district_needs['date_numeric'] = (district_needs['created_at'] - district_needs['created_at'].min()).dt.days

# Prepare the data for modeling
X = district_needs[['date_numeric']] # Independent variable: the date
y = district_needs['caller_needs'] # Dependent variable: number of caller needs

# Split data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Initialize and train the linear regression model
model = LinearRegression()
model.fit(X_train, y_train)

# Make predictions on the test set
y_pred = model.predict(X_test)

# Predict for the next two days
next_two_days = pd.DataFrame({'date_numeric': [X['date_numeric'].max() + 1, X['date_numeric'].max() + 2]})
predictions = model.predict(next_two_days)
print(f"Predicted caller needs for the next two days: {predictions}")

Predicted caller needs for the next two days: [19.61109253 19.60455028]
```

Figure 4.17: Final Outcome Prediction

The results showed:

Predicted caller needs for the next two days: [19.61109253, 19.60455028] This suggests that the model expects around 19-20 calls per day for the next two days, assuming the trend continues as per the historical data. This predictive model could be valuable for resource allocation and preparedness in the ongoing flood response efforts.

4.2.3 Learning and Challenges:

This was the data collected from 333 during the flood incident, so this is real-world data that we clean, analyze, and predict from. During that process, I faced many issues in the case of cleaning the actual data. I found that most of the data were missing, and there were many errors in the data, which I solved by using various techniques mentioned above. When it was time to analyze the data, it was necessary that we select meaningful questions and answers to those questions through different analysis and visualization methods. From doing the analysis and visualization, I faced issues like what method to use and what visualization to use in different cases.

4.3 Smart Dashboard Project Overview

a2i mainly hired me to analyze and visualize data. I have done simple analysis and chart-making from day 1 at a2i. However, as time passed, I was assigned a difficult task. I was working on a particular project, which was ‘Smart Dashboard.’ Smart Dashboard facilitates the establishment of a culture of data-driven decision-making within the government of Bangladesh and the achievement of Smart Bangladesh Vision 2041 by providing real-time insights, analytics, and visualization [8]. The primary goal of Smart Dashboard was to build a website and give access to every government head office, for example, “TAT Board,” “SHECH Bhaban,” ”DDM,” etc., to use this platform for transferring their official work into paperless work. The project requirement is given below:

- Storing data district-wise and keeping the record in Smart Dashboard so that no data gets lost.
- If the head office wants to collect data from the district office, they can get the data through this system. They do not need to send anyone to the district office to get the data. That will save more time and manpower, and this process is more efficient.
- People can also get the data they need without visiting the office.
- The particular offices can have access control so that they can only show a particular amount of data to general people, and the rest of the data they can keep for their own use.
- For better understanding, they can show the data through different data visualization charts.
- In this system, people can also get predicted decision information. For example, if anyone wants to know about any agriculture-based information, he can get it through the smart dashboard of the agriculture office. Based on the previous year’s data, predicted weather and other information will be provided.

4.4 Work Plan

The primary goal of Smart Dashboard was to build a website and give access to every government head office, for example, “TAT Board,” “SHECH Bhaban,” ”DDM,” etc., to use this platform for transferring their official work into paperless work. But as they were unable to adopt this system, that’s why we planned that we would train them how to use the platform. Side by side, we will create Smart Dashboard pages for particular

offices by analyzing their data and creating reports through visualization, as we had deadlines to do this by the end of this year. I have done all this analysis as I was assigned to this. I had to inform my supervisor daily. about my working activities. I also needed to update my activities in the Google sheet shared by my supervisor. And by the end of the week, especially on Thursday morning, we had meetings. Where we discuss our progress and problems. Based on that, I was assigned a new task for the next week.

ID	Date	Activity	Deadline	Status	Remarks	Day	Time	email
1	23/02/23	started for chart making with analyzed data		Completed		Monday	2:30 pm	soegaard@stat.gov
2	27/02/23	meeting about		Completed		Tuesday	at day class	
3	28/02/23	10:00 - 12:00		Completed		Wednesday	2:00pm	
4	28/02/23	1:00 - 2:00		Completed		Thursday	3:30 pm	
5	30/02/23	attended meeting on Progress and Terms Discussion		Completed		Friday	no class	
6	28/02	attended workshop at UN Board		Completed				
7	30/02	join the translation		Completed				
8	28/02	data added to excel file		Completed				
9	08/03	meeting @ 20 on bank Distribution and make 7 copy file for Falout shah		Completed				
10	08/03/23	attended workshop at SECOP SP5BANK, learned 2 new file via database		Completed				
11	09/03/23	attended workshop at SECOP SP5BANK		Completed				
12	13/03/23	Preparing excel tables, register, generate meeting notes, etc, journey		Completed				
13	13/03/23	created charts analyzing the id_journey dataset, Prepared new Slides		Completed				
14	16/03/23	Preparing excel table for the dataset		Completed				
15	22/03/2024	Attended SMART2C programme at Intercontinental		Completed				
16	23/03/2024	collected data of different case cases, analyzing different ml projects		Completed				
17	24/03/24	exploring ML projects for Bengali sentence		Completed				
18	27/03/24	DL dashboard adding settings and column, analyzing ICT dashboard		Completed				
19	30/03/2024	Preparing ICT dashboard, ml project using python ml dataset		Completed				
20	01/07/2024	adding details of all the charts for visualization in google sheet		Completed				
21	05/07/2024	bring out finalg version of data analysis and visualization		Completed				
22	04/07/2024	ml project with ml sheet - accuracy		Completed				
23	03/03/24	ml project with ml sheet - classification, training @ DGM		Completed				

Figure 4.18: Task Management

Based on this assigned task, I planned how I would complete it. From data collection to visualization. To do this work accordingly, I made a flow chart so that I could complete my task step by step.

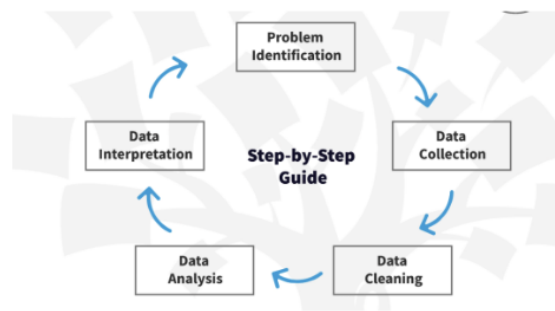


Figure 4.19: Data analysis steps (Soegaard,)

At first, I collect the data from particular offices. And I need to record everything, like from which office I collected the data, from whom I collected it, and what their designation is in their office. After collecting this information, I needed to make slides for every office regarding data collection and submit those PowerPoint files to one of my seniors who keeps records of this data collection.

Then I convert the transferred data from hard copy to soft copy. After that, I needed to clean the data and make it ready for analysis [10]. And after analyzing the data, I visualize it.

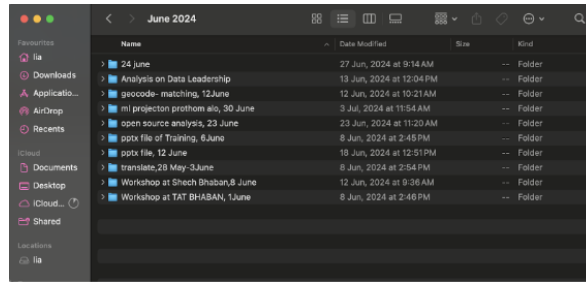


Figure 4.20: Organized folder I worked on in June month

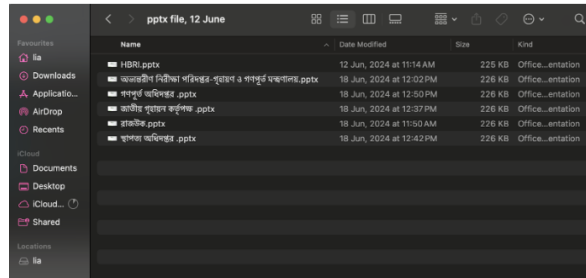


Figure 4.21: Demo of a folder containing all the files I worked on a particular day

4.5 Project Responsibilities

By the end of this internship, I am assigned to complete the following task:

- I have to analyze data related to this project and also need to visualize it on our a2i Smart Dashboard website [3].
- List out weekly tasks and range them from day-to-day activities to long-term events.
- Prioritizing projects and tasks based on deadlines, time remaining, etc.
- Record individual performance, daily tasks, and weekly goals. My supervisor has opened a Google sheet for me and all other interns, where he keeps an eye on our daily activities.
- Besides, till the government offices get the training to do their work on their own, we will help them visualize their analysis. This responsibility is given to me to analyze their data and visualize them according to the particular office need.
- Side by side, I need to join my team whenever they organize workshops at any government institution to train them. There I need to assist them in their work, and sometimes I also need to train the trainees and help them understand the things that we want to teach.

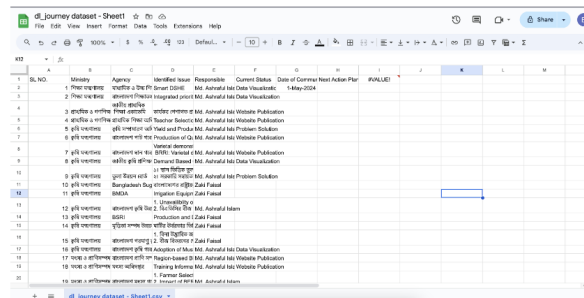
4.6 Implementation

At the start of my internship, I used to work with small data and had to do simple analysis and visualization. But with time, I was assigned more complex work. The level of complexity increases with time. In this report, I show one of my full data analysis journeys for a recent project step by step. This project is known as “Data Leadership.”

4.6.1 Data Cleaning

I took several steps to clean a dataset file [10]. The steps are listed below:

- At first, I removed duplicate values.
- Handle missing values.
- Correct Data Types [11].



SL NO	Agency	Identified Issue	Responsible	Current Status	Date of Commencement	Action Plan
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure 4.22: Raw Data file

Here is an example of raw data after collection. After cleaning this dataset, I analyze the data. I made a draft of how data can be visualized and, based on the draft, implemented the ideas.

4.6.2 Data Analysis and Visualization

The picture of the final visualization is added below. I will discuss step by step the report and the motive, analysis, and reasoning behind it.

I made this dashboard based on this database. With these visualizations, we can have different ideas at a glance only by seeing those charts. Different charts carry different types of ideas, which also helps to see the progress of the work. The ideas I have implemented here are given below:

- I have figured out how many agencies we have already collected data from and visited through ‘Big Data’ so that we can know how many have left, and based on this, we can make new strategies.



Figure 4.23: Final output after all the possible visualizations from the file

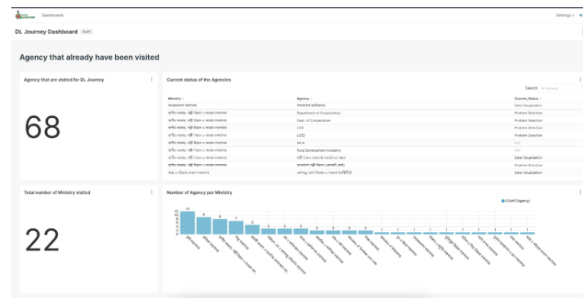


Figure 4.24: Agency that has been visited

- Current status of the agencies.
- Total number of ministries visited and how many agencies are there per ministry.

I have kept this section together as this data is relevant. Through this analysis, I discovered our work's progress and what steps we needed to follow to speed up our work. Based on these findings, we planned new strategies.



Figure 4.25: Statistics of work each person has done

- Then I made another section that shows how many people are working on this project and whether this manpower is enough to complete the task before the deadline.
- For this, I found out each person covers how many agencies, and with this rate, can we cover all the agencies by the end of this year or not?
- By analyzing this section, I have noticed that some people's working rate is quite low compared to others. For this, I proposed that extra initiative should be taken

for them, which will motivate others to work more. As an example, reward the productive person.

In the next segment, I showed the issues or the findings we got after visiting those agencies [8]. Details are given below:

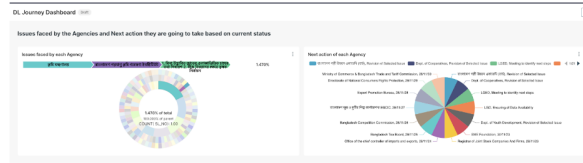


Figure 4.26: Issues faced by each organization

- I showed a Sunburst chart, which contains every ministry. And in each ministry, all of their agencies are given. And then clicking on that agency, we can see the problems they are facing. Through this diagram, I tried to show which ministry contains which agency and what problems it is facing.
- Based on this, what action do they need to take to solve those particular problems?



Figure 4.27: Current Progress of each organization

Lastly, I showed the current status of each ministry.

4.7 Challenges

If this initiative is not taken, what will happen? Government offices would have continued their work using pen and paper. Even if this process seems easy for Smart Dashboard, a few significant problems are difficult to solve:

- Information cannot be decentralized.
- Information cannot be updated in real-time till now.
- If there is any data manipulation, there is no way of tracking it.

- Most of the government employees in Bangladesh do not know how to use computers or the basic use of Excel for data storage. They find it very difficult and tiresome, and also a lack of willingness to learn has been noticed. So for training, that generation can be difficult.
- Still, there is a lack of functionalities yet to be added.
- Lack of technical people in government offices who can guide others to use the websites.
- Lack of computers in government offices.

Now my team is working to fulfill the vision of this project. Primarily, we are visiting most of the government offices in Dhaka to train them and identify their problems. Based on this, we will try to solve the issues.

4.8 Learning

While working on this project, I got to learn so many things, which are given below:

- How does the government of a country think about its people on a large scale? And how I can implement my data analytics knowledge here.
- As a2i was a part of the Bangladesh government, the impact can be seen in the whole country, and through this I can also contribute my skills and knowledge to the country.
- In case of emergency or in crucial situations, how the government thinks and how to operate for the betterment of the country, I have learned it from working in a2i.
- I also learned to work under pressure in case of emergencies.
- Lastly, my analysis skills have improved a lot through working on all these big projects. And I also got to work with real-time data, which was a big opportunity for me as a data analyst.

Chapter 5

GROWTH

5.1 Professional Growth

5.1.1 Office environment

The first professional experience I get through working on a2i. Before that, I did not know anything about corporate life, how to implement our knowledge in the real world, or about office culture.

5.1.2 Teamwork

I worked in groups and also did teamwork several times in university life. But the teamwork I did in the office was quite different. Because in the office there are different ages of people with different years of experience of work, they are working together as a team. And as an intern, this was a new experience for me. I was excited and nervous about whether I was going to make it or not. However, my supervisor, co-supervisor, and other team members helped me a lot and supported me, which made my work easy, and I got comfortable with it. The way all the members collaborate with each other makes the tasks easier and finishable and helps to complete them within time. I learned about teamwork from them.

5.1.3 Time management

Office life makes my daily life more disciplined. I woke up early, went to work on time, learned to omit deadlines, and learned to handle pressure, which helped me to manage time. This disciplined life improved my regular life a lot.

5.2 Technical Growth

My technical skills and understanding were greatly enhanced after I started working with a2i. After joining this organization, I worked with a lot of new technology that I was unaware of. I have had a great opportunity to learn a range of technology skills, and for this, I would like to give this credit to this internship. I was hopeful about being able to use them for any future duties. Some of the main technical skills I developed throughout my internship are listed below:

5.2.1 Linux

I am an iOS user. But after joining a2i, I set up a dual boot and started using Linux too. Learning the command lines does not seem very difficult to me, as I find that iOS and Linux have almost the same command line, and in both cases, I was using the zsh terminal. That helps me to become familiar with the Linux command-line interface.

5.2.2 Github

As we were working on a team, we had several parts to work on. That's why we used GitHub to manage our code and give access to our team members. I picked up information on how to manage projects with other team members, including merging, pushing to git, resolving conflicts, and more.

5.2.3 Tableau

Because of its user-friendly, interactive features, Tableau is used worldwide. It helps to create complex visualizations. For visualizing data, sometimes I need to use Tableau. I learned a lot of things, including different data visualization functionalities, which will help me in my future life in data visualization.

5.2.4 Superset

Superset has so many functionalities in common with Tableau. In Superset, we do not need to have any programming skills for data visualization. Only analyzing skills and ideas are needed. This is a new thing I got to know after joining a2i.

5.2.5 Python libraries

I learned different Python libraries such as numpy, pandas, matplotlib, sklearn, seaborn and so on. This skill will help me a lot in the future in data analysis and visualization.

5.2.6 Prediction models

I also worked with different types of prediction models while working here. Such as linear regression, decision trees, and so on. This has also given me some interest in learning machine learning in the future. I am thinking of developing my skills in machine learning in the future.

5.3 Interpersonal Growth

5.3.1 Questioning

Accurate inquiry and expression are essential to understanding and integrating knowledge in our own unique ways. I often sense that my supervisor is trying to teach me something throughout my internship. If they don't make sense to me until I ask things.

5.3.2 Patience

I realized patience is so beautiful virtue in a workshop. In that workshop, our team was given training on using a smart dashboard in a government office. As the officers were old, that's why it was difficult for them to catch the learning. They were asking the same question again and again. Capturing the simple thing was becoming so difficult for them. However, I noticed that my supervisor did not lose hope. He was calmly helping others to understand the particular fact. This makes me realize that sometimes when people don't understand our point of view and ask questions about them again and again, we should not lose our patience. We should help them understand our point of view softly rather than losing our hope.

Chapter 6

CONCLUSION

6.1 CONCLUSION

After gaining knowledge about something and then implementing those things in the real world, it is quite fun and satisfying. Through this, I can visualize my learnings and see the impact in the real world. We have seen that many countries around the world have already adopted the concept of making paperless work. As we know, paperless work is necessary for reducing environmental impact, better efficiency, and saving costs, and it is also beneficial for ensuring easier document management and accessibility. This project will be beneficial for the people of our country as it is paperless. They can get access to the data whenever they want and can find anything information very easily, so they won't have to suffer anymore and go through it. All the hassle people usually face in Bangladesh in case of getting any data from government offices will be gone. It will save a lot of time for people, so the project itself is very time-efficient. Moreover, data privacy will also be included in this project so that specific data will not lose its security. So this project is so important for our country, and I am very happy that I got the chance to work on this "Smart Dashboard" project. From this internship in data analysis, I understand that patience and thinking are the keys in terms of analysis. One thing I learned is that it is important to think about an idea again and again several times and find several ways to solve it. That will help one to find an easier way to solve a problem and think about a problem from a different perspective. The same dataset can be used for different analysis purposes and for making different graphs. That's why I always try to utilize a dataset from different patterns.

I also learned how the government of a country thinks about its people on a large scale. And how I can implement my data analytics knowledge here. As a2i was a part of the Bangladesh government, the impact can be seen in the whole country, and through this I can also contribute my skills and knowledge for the country. In case of

emergency or in crucial situations, how the government thinks and how to operate for the betterment of the country, I have learned it from working in a2i.

6.2 Recommendations

I highly recommend a2i if anyone wants to do something for the people of our country. a2i projects are mainly initiatives taken by the government for the betterment of the people of Bangladesh. Besides, the work environment, interior, and office are also eye-catching. It is not like a typical government office. So anyone who has an interest in a government job can join a2i. I would love to recommend a2i to anyone who has an interest in a government job.

Chapter 7

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