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Group 2
SMART FORECASTER

Design Document

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I. Introduction

Description of the system in narrative form:

Scheduling is an important element of any business, but especially when it comes to hospitality industry the smart forecasting and planning of labor is vital. Fulfilling the business needs during high and low times becomes complicated and might vary depending on the particular department. The front office operations strongly depend on scheduling procedures and smart staffing. This includes not only "covering the desk'" at all times, but also being efficient, strategic and analytical when it comes to labor costs estimation.

The main concept of "Smart Forecaster" application is based on the check in amount of guests in the particular date range in the last few years. The application will forecast, according to the database, and advise management staff about the amount of workers they will need to schedule at any given time of the day.

To prepare for this project and to measure the actual business need of the project, some of the group members had a chance to interview for the professional advice and discuss some data with the Director of Front Operations from one of Las Vegas resort properties. During our meeting, she confirmed that as a person, who is in charge of scheduling, this particular prediction application could be of great help, especially during abnormal times such as high and low level of occupancy.

The background, business problems, value and user needs:

"Smart Forecaster" application consists of the database of the arrivals and employees present during day, swing and graveyard shifts, from the middle of December to January, which was imported from the last two years for one given property. The team is going to input the data from 2017 -2018 and 2018-2019 for the guest arrival. Also, the amount of employees or the amount of stations open will be input as well. This gives an opportunity for the program to analyse the data from previous years and provide the prediction numbers for 2019-2020 period, which is approaching.

Our team chose this particular time frame since the time right before Christmas is the slowest time of the year and starting from Christmas Day up to CES convention time frame has the highest arrival amount. Initially the application will advise the scheduling manager how many employees are necessary at the desk during Morning, Swing and Graveyard shift according to the appropriate business need. It is very important for the management team to have an application, which can provide an estimate prediction of the amount of workers necessary in different times of the day and during the week.

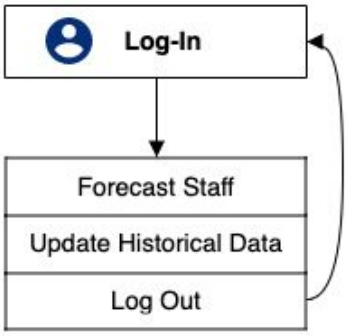
The advised amount of employees will include the amount of full time employees, which have to be present based on their scheduled shift, and the remaining amount employees necessary will be consistent from part -time employees, who do not have a steady shift at the moment and are available to get scheduled for three possible shift times.

Apart from forecasting the amount of employees necessary, the application also includes another important feature, which was brought up earlier. “Smart Forecaster” is able to calculate the estimated labor expense for each week and for the 4-week period total. This feature gives scheduling managers a clear representation of the cost of labor during down times and during high business demand, which is a vital tool for the successful and profitable business, since it keeps labor costs efficient.

The “Smart Forecaster” application has a serious business value. According to the research that has been done so far, it is feasible and can be easily implemented in the near future, especially since the new season of 2019-2020 is coming up. This application can save a lot of time for the scheduling managers, provide more effective and labor cost efficient schedule.

II. Application Flow

Application Flow Overview:



Smart Forecaster has 3 main flows for users to access:

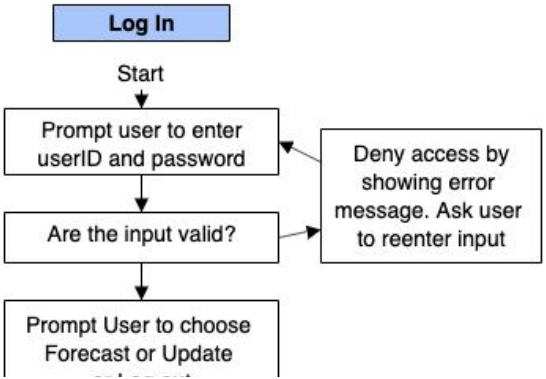
- Log-in
- Forecast Staff
- Update Historical Data

Two main functionalities of the application include:

- Labor Forecast Function: Staff forecast over a 7-day period per 3 shifts day, afternoon and grave is recommended in data frame format based on expected number of arrivals and historical data. User can optionally modify the forecast before exporting it to excel.
- Expense Report Function: after staff number forecast has been generated, user receives an estimation of labor expense

All users with valid username and password can navigate to all functions in the application without restriction. Forecast function will finish by logging the user out and ending the program.

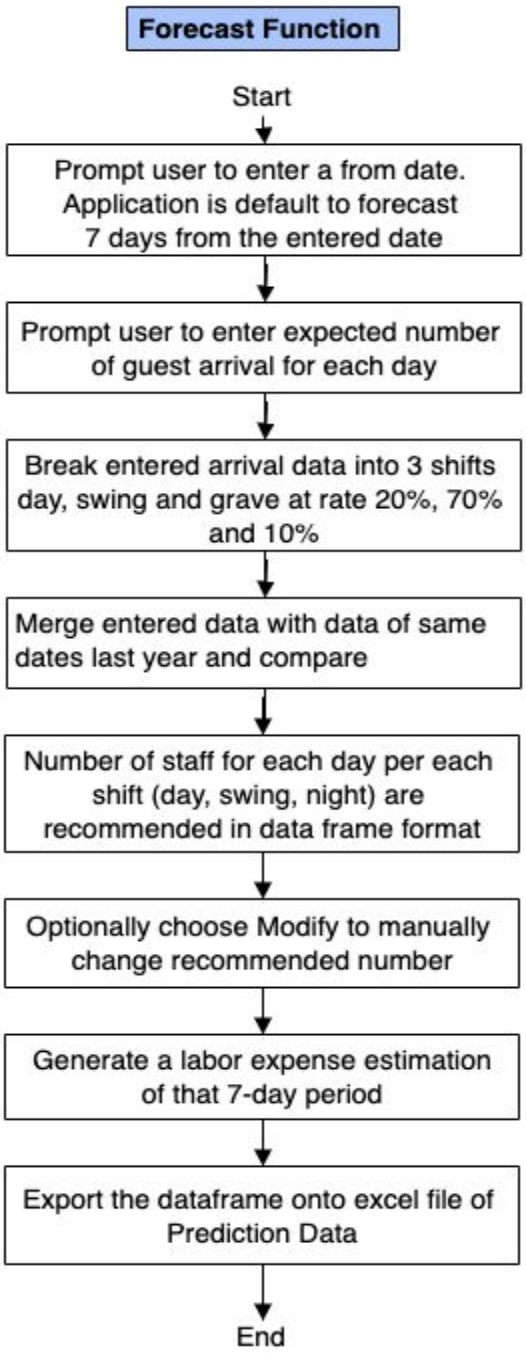
1. Log-In Diagram



Once the application is opened, the user will be prompted to enter authenticated username and password. When the validification of the input

is confirmed, the user can access Forecast or Update data function or back to log out application. If not, access will be denied and an error message will appear and ask users to re-enter username and password. New users or forgotten password needs to be handled by the IT department who manages user data file.

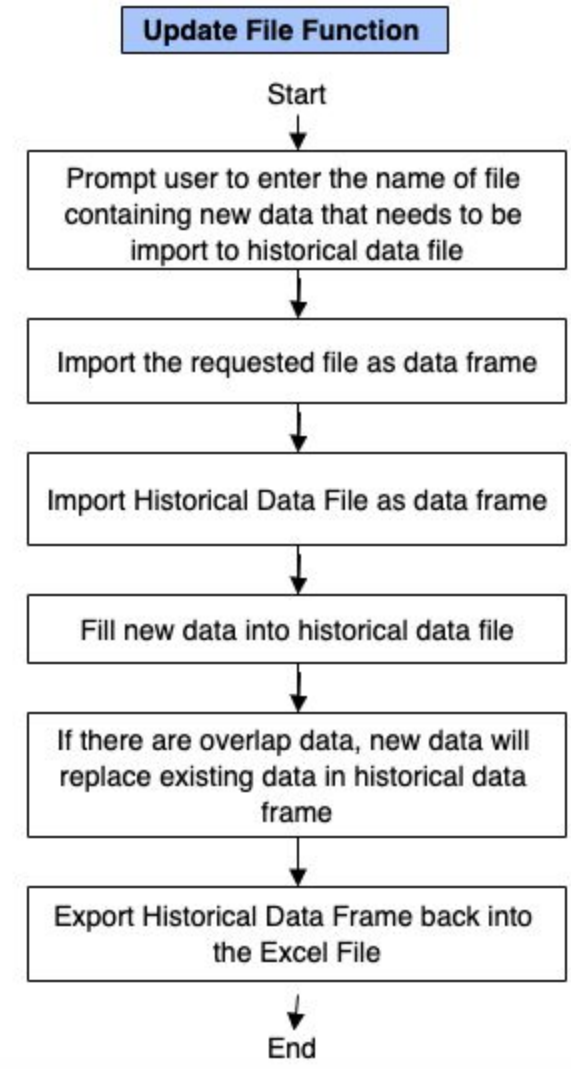
2. Forecast Function Diagram



-User will be prompted to enter a start date for forecast. The date range is defaulted to be 7 days starting from the input date.
-Then, after entering daily guest arrival load, user gets a recommendation matrix of how many staff are needed for every shift (morning, swing, grave) for each day starting from the entered start date.
-Optionally, user can click "**Modify**" and manually modify the recommended numbers as preference.
-Optionally, user click "**Report**" button and get an estimated labor expense report of that 7-day period. Hourly wage is set at $18.
-Once data meets the user's preference, user can click save to save data and exit back to the home screen where log out is available.

Forecast Computation:
-Recommended number of staff are based on historical data and daily expected guest arrival load. Once daily arrival is entered, Smart Forecaster will break down the number into day, swing and grave shift on proportion of 20%, 70% and 10%, relatively.
-If the number of expected arrivals is within a fluctuation range of 100 reservations compared to arrival at the same time last year, the recommended data is the same with historical data of staffing at the same time last year.
-If more, 2 more/fewer staff members are recommended per 100 more/fewer reservations.

3. Update Historical Database Function



- Once managers receive weekly report of how many workers were working per shift for the past 7 days, they update the historical data file with new records.
- Import the file in as a dataframe, import the historical data file as another dataframe
- Fill the historical data frame with new data by dates.
- In case there are overlap data, this means the existing data in historical file needs to be updated, and will be replaced with new data when being updated.
- Program will then export the updated historical data back into the excel file which can be downloaded by users.

III. Interface - Command Line

LOGIN

```
Welcome to SmartForecaster!

Please enter username: manager1

Please enter password:
```

INPUT: User enters user_name

User enters password

OUTPUT: Message to user confirming login

PROCESS: If user enters correct user_name and password the . If user_name and user_password are incorrect, the system will display an error message and ask the user to reenter input.

FUNCTIONS: Verifies the correct user_id and user_password combination

FUNCTION SELECTION

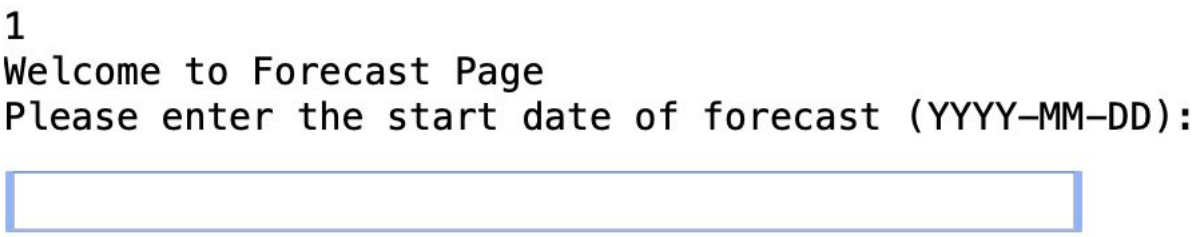
```
Welcome to SmartForecaster!

Please enter username: manager1
Please enter password: ........
You are logged in.

Enter 1 to Forecast.
Enter 2 to Update Historical Data.
Enter 3 to Logout
```

INPUT: User chooses corresponding options of forecast, update or log out
OUTPUT: User accesses the requested option. After each option, user will exit program
FUNCTION: Using if-else to take user to requested option.

1. **FORECAST**
   a. **Request Forecast Calendar**



INPUT: User selects start date.

PROCESS: Application defaults to forecast 7 days from the selected start date

FUNCTION: Using datetime format to make sure date was entered in the right format and using for loop to generate and list to store next 6 days

   b. **Estimated Arrival**

```
Welcome to Forecast Page
Please enter the start date of forecast (YYYY-MM-DD):
2019-12-01
Please enter arrival for the date 2019-12-01 00:00:00
123
Please enter arrival for the date 2019-12-02 00:00:00
131
Please enter arrival for the date 2019-12-03 00:00:00
154
Please enter arrival for the date 2019-12-04 00:00:00
222
Please enter arrival for the date 2019-12-05 00:00:00
199
Please enter arrival for the date 2019-12-06 00:00:00
111
Please enter arrival for the date 2019-12-07 00:00:00
312
```

INPUT: User prompted to enter expected number of guest arrivals for each day of 7 day period

PROCESS: User enters number of arrivals.

c. Forecast Data Frame Generation

```
    Date  Total_Arrival  New Arrival  Year_x  Amount of workers at day  \
0  12-01            452          123    2019                         4
1  12-02            339          131    2019                         3
2  12-03            212          154    2019                         3
3  12-04            351          222    2019                         3
4  12-05            871          199    2019                         5
5  12-06            987          111    2019                         4
6  12-07            561          312    2019                         5

   Amount of workers at swing  Amount of workers at grave  day Diff  \
0                           5                           3    -150.4
1                           4                           3     -35.8
2                           4                           2     -43.2
3                           5                           4     -33.6
4                           8                           5    -171.2
5                           8                           5    -178.8
6                           6                           3    -135.6
```

INPUT: current date-arrival dictionary as a dataframe merged with historical data of same dates last year

OUTPUT: A data frame showing predicted number of staff working in each shift for 7 days.

FUNCTION: select data of same date last year, merge with this-year data and compare.

- If the number of arrivals each shift are different within 100 reservations between last year and this year, the predicted staff schedule are the same with staffing last year.
- If the number of arrivals difference each shift exceed 100, 2 employees are added per 100 reservations more.

d. <u>Forecast Modification</u>

```
Enter an option from the below content ( -1 to exit editing ):
1. Modify Day staff
2. Modify Swing staff
3. Modify Grave staff
1
Enter the index of the day which you want to edit:
1
Enter the value:
3.0
```

INPUT: User can manually change prediction number by entering specific shift and date

OUTPUT: Modification is processed and reflected in dataframe

FUNCTIONS: Using If-else in a while loop of options to modify different shifts to address user's selected number for modification.

- Using set_value to modify the number per user's request.

e. <u>Labor Expense Report</u>

```
Enter an option from the below content ( -1 to exit editing ):
1. Modify Day staff
2. Modify Swing staff
3. Modify Grave staff
-1
Total employees required for the week 42.0
Labor expenses for the week is estimated at $6048.0
```

INPUT: User enters -1 to exit editing

OUTPUT: Displays estimated labor expense report based on wage of $18 and full-time shifto of 8 hours
FUNCTION: - Using .sum() for each shift column and adding all sums to calculate total employees required for the week

- Calculate total expense by formula: total expected employees *8*18

f. <u>Predicted Staff File Export</u>

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Date	Total_Arrival	New Arrival	Year_x	Amount of workers at day	Amount of workers at swing	Amount of workers at grave	day Diff	swing Diff	grave Diff	Expected day Staff	Expected swing Staff	Expected grave Staff
2	12-26	239	100	2019	3	4	2	-22	-46	-71	3	3	1
3	12-27	345	356	2019	3	4	2	-40.8	93.2	-41.4	2	6	1
4	12-28	1159	456	2019	5	10	4	-184.8	-328.8	-189.4	1	3	1
5	12-29	1219	764	2019	5	11	4	-140.2	-130.2	-184.6	2	8	1
6	12-30	642	874	2019	5	6	3	0.8	237.8	-6.6	5	11	3
7	12-31	987	342	2019	4	8	5	-132.6	-312.6	-199.8	1	2	1
8	01-01	787	123	2020	6	6	4	-227.4	-281.9	-154.7	1	0	1
9													
10													
11													

INPUT: the merged data frame containing expected staff volume (optionally reflect the manually modified data)
OUTPUT: Prediction Data excel file
FUNCTION: Using .to_excel command

<u>2. UPDATE HISTORICAL ARRIVAL FILE</u>

```
Welcome to SmartForecaster!

Please enter username: manager1
Please enter password: ••••••••
You are logged in.

Enter 1 to Forecast.
Enter 2 to Update Historical Data.
Enter 3 to Logout

2
Please enter the file name for uploading (include csv ending):HR Report on Scheduled Staff 05_01-05_07 - Sheet1.xlsx
```

INPUT: User enter the file name that needs to be uploaded
OUTPUT: The Historical Data File with updated data from entered file
FUNCTION: Using export command to export file for user to download and view

IV. File design

A. The design of database structure associated with the system

Our application will incorporate a non relational database management system (DBMS) in which we will utilize a key-value storage via csv and excel file. The DBMS will consist of the amount of arrivals as well as amount of employees present on the shift during all three periods: Day, Swing and Grave within the 2018 through 2019 period. When we manually input the information for the arrivals amount for the upcoming dates which is broken down into the three shift periods mentioned above. This information is retrieved from the Workforce team in Human Resources department of the particular property. It is important to note that this data is not being stored in the associated excel file of the application as this information is generated on a daily basis and is handled in accordance by an external department.

After the forecast amount of employees is generated (can be modified if needed), program automatically exports data of the respective information and updates the database for that particular date for the anticipated arrivals and how many employees will need to be scheduled. This updated data will then be used to predict for 2020-2021 period.

Below you will find a table summarizing the fields found within Smart Forecaster.

1. Users - The data in this csv file simply maintain the login credentials to use the Smart Forecaster, this application is for management only.

Users			
Name	*Type*	*Length*	*Description*
User_ID	varchar	15	Management ID to login into application
User_Password	varchar	15	Management password to login into application

2. Historical Arrival Data- The data found within this excel file contains records of hotel operations from both December 2018 to May 2019, below you will find a description of the records.

Historical Arrival Data			
Name	*Type*	*Length*	*Description*
Date	datetime	datetime	Date and time of hotel operations
Arrival of guests during day	int	4	Number of guests arriving during swing shift (7am to 3pm)
Arrival of guests during	int	4	Number of guests arriving during day

swing			shift (3pm to 11pm)
Arrival of guests during grave	int	4	Number of guests arriving during grave shift (11pm to 7am)
Amount of workers at Day	int	4	Number of employees working during swing shift (7am to 3pm)
Amount of workers at Swing	int	4	Number of employees working during day shift (3pm to 11pm)
Amount of workers at Grave	int	4	Number of employees working during grave shift (11pm to 7am)
Emp_Hourly_Pay	float	4	The hourly rate earned by employees

3. Prediction Data - The data found within this excel file contains staffing volume predicted by the application

Prediction			
Name	*Type*	*Length*	*Description*
Date	datetime	datetime	Date and time of hotel operations
Total_Arrival	int	4	Arrival of same dates last year
New_Arrival	int	4	Arrival of each date this year
Year_x	int	4	The current year
Amount of workers at day	int	4	Number of guests arriving during swing shift (7am to 3pm)
Amount of workers at swing	int	4	Number of guests arriving during day shift (3pm to 11pm)
Amount of workers at grave	int	4	Number of guests arriving during grave shift (11pm to 7am)
day Diff	int	4	Difference in number of arrivals in day shift
swing Diff	int	4	Difference in number of arrivals in swing shift
grave Diff	int	4	Difference in number of arrivals in grave shift
Expected day Staff	int	4	Number of employees expected to be scheduled during day shift
Expected swing Staff	int	4	Number of employees expected to be scheduled during grave shift
Expected grave Staff	float	4	Number of employees expected to be scheduled during grave shift

V. Detailed design

This project potentially has 5 sections: the Login, Forecast Home, Arrival Info, Forecast Data and Reports screen. The anatomy of the screens and the functions involved in each section are described below

- **Login Section:** In this login section, the application input as user ID and password and authenticates whether the user has the necessary permissions to use the application. When the user enters a username & password**,** the authenticate function validates the data entered in the text fields to evaluate with the data present in the database (.csv file). If the keys match, user will be logged in. Otherwise, the application throws an error for the user to recheck the credentials he/she entered.

- **Forecast Home:** This input text field is used for entering the date for which the manager using the application wants to predict the number of the employees he will require for the coming week. Once the user enters a 'From' date and clicks enter the application prompts him to enter the arrival information.

- **Arrival Info:** In this page manager will be prompted to enter the arrival information for the next seven days. The seven labels are populated dynamically depending on the date the manager enters in 'Forecast Home' section. The semantic of this is he/she will have the labels defined for the next seven days. In the text fields corresponding to each date, he/she has to enter the arrival information available with the organization. Once the arrival data is entered, the user then has to click **Enter** for the application to forecast the employees required for covering all shifts for the next week.

- **Forecast Data:** This page is the crux of the application. When we dissect this page, there are several columns which are displayed. The last three columns are named with the Expected Day, Swing & Grave shifts. This is where the application predicts the numbers. Depending on the arrival information entered in the previous page and the historical information which is available in the database

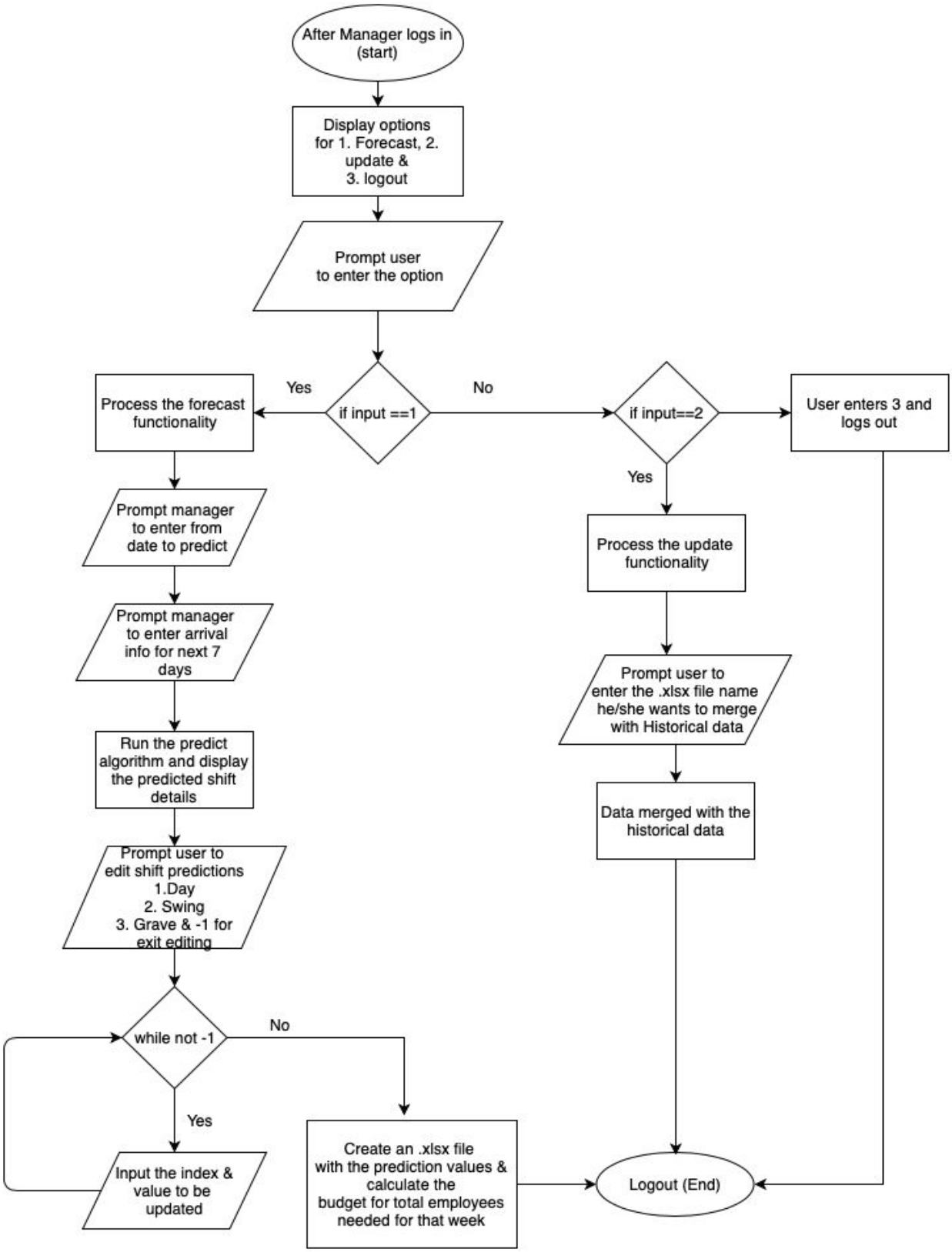
  There will be an option on this page to **Modify** the predicted values.
  The modifications can be done on the prediction columns for Day, Swing & Grave shifts. The user will be prompted to enter either of the 4 options given below:
  1. Option 1 to modify the Expected Day Shift
  2. Option 2 to modify the Expected Swing Shift
  3. Option 3 to modify the Expected Grave Shift

4. Or Enter -1 to end the editing (This is implemented to give an option for the manager to modify multiple predicted values generated)

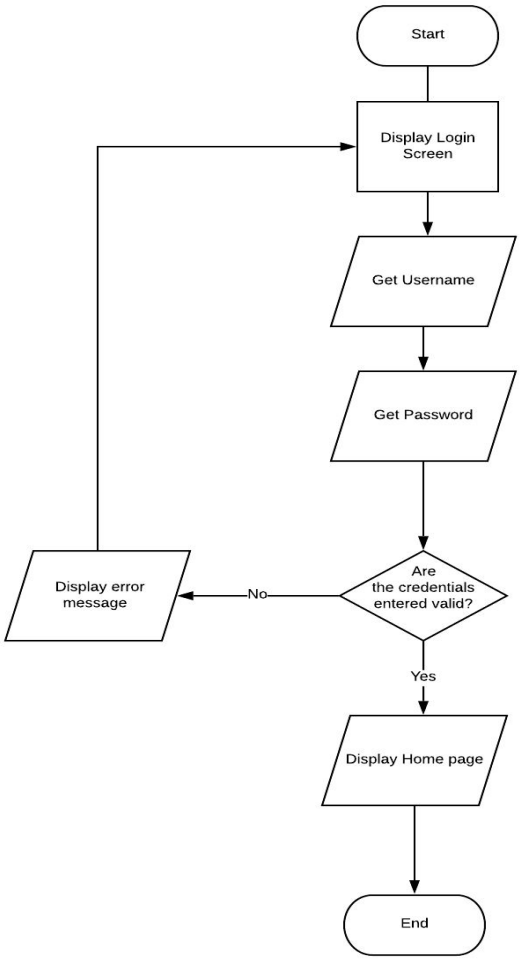
Once the required values are modified, a file with the name ‘Prediction Data.xlsx’ is generated in the Home directory.

- **Reports Section:** In this page, the total employees required for covering all shifts for the next week & the labor expense is calculated. This expense is calculated based on the formula for the hourly charges per full time employee. Total number of employees needed for the week. Keeping all these parameters into consideration script will be developed to populate this values. Future enhancement would be to show a prediction of monthly expenses and if the part time workers are appointed, shift allocation and payment details will be added as additional functionality.

Project Flowchart Overall



Detailed Login Flowchart

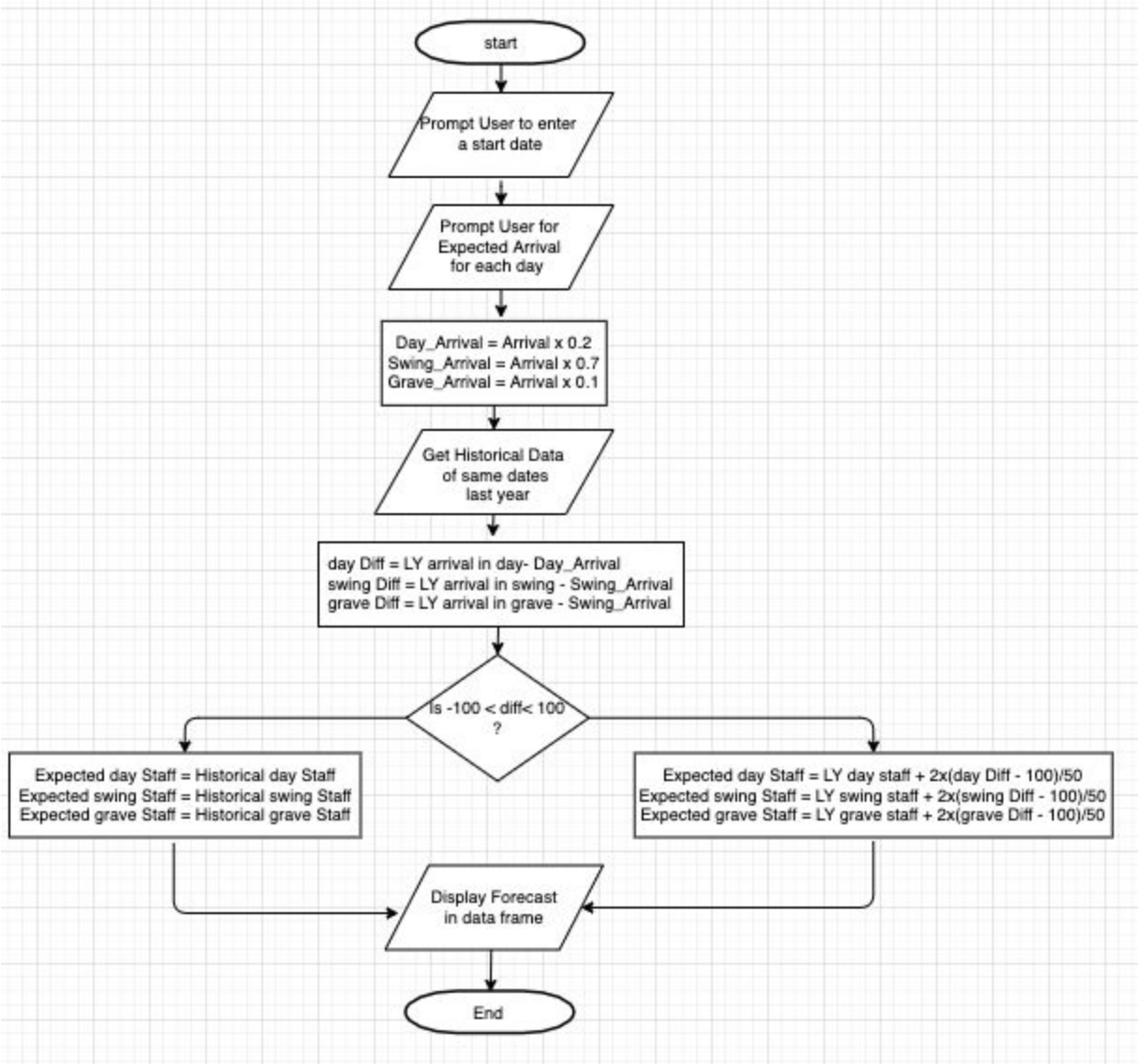


Input: Login credentials which include username and password

Process: Credentials are validated by comparing against User database

Output: If credentials are valid, then the user will be directed to the home page. Otherwise an error message will display, asking for login re-entry.

Detailed Forecast Flowchart



INPUT: Start date of forecast week, arrival for each date
PROCESS: Calculate arrival for each shift and compare with last year data
OUTPUT: A data frame of expected number of staff for each shift and date

VI. Project fulfillment estimation

The description of the system, which fulfills each of the requirements for the final system

a) Variables and Constants:

Used in: Log-in Screen, Home Screen, Forecast Home Screen, Arrival Info Screen, Forecast Data Screen, Reports Screen

Variable will be used to get user input, get data from database, temporarily store values , used in instructions and methods. Constant will be used everywhere to store fixed values.

b) Flow control:

Used in: Log-in Screen, Home Screen, Forecast Home Screen, Arrival Info Screen, Forecast Data Screen, Reports Screen

Decision structure will be used in login information verification and in the manager selection from the main menu, mostly in if...else and elif loops.

c) Functions:

Used in: calculating the labor expense in forecast option

Program has mainly two functions: a) Forecast Function, where certain number of employees is suggested based on the expected number of arrivals and historical data; b) Report Function, where after the number of employees forecast is generated, user can optionally click on Report. The Forecast function screen will finish by bringing the user back to the home screen where users can click on log-out to exit back to the log-in screen.

Other functions are implemented throughout the application within Log in and log out buttons. Functions implemented in the Login Screen. Functions implemented In the Forecast screen include a Forecast Button that opens the prediction screen. Functions implemented in the prediction screen include a Modify Button which is used to allow user to change required employees and a Save Button which is used to save the newly entered data.

d) Lists and Dictionaries:

List was used to store 7 dates requested by user. Dictionary was used to stored corresponding arrival value to date key.

e) Multiple Modules:

There will be multiple forms in the program, login forms, main menu forms, Historical Archives 2018 and Current 2019 forms, shift assignment forms, arrivals forms, labor optimization forecast forms.

f) File or Database CRUD (Create, Read, Update, Delete) operations

Read, Update and Delete was used in update historical data function

Create, Read, Update was used in forecast function, to create Prediction Data Files, read historical Data, and modify prediction per user's request.

g) Data Computation and Presentation:

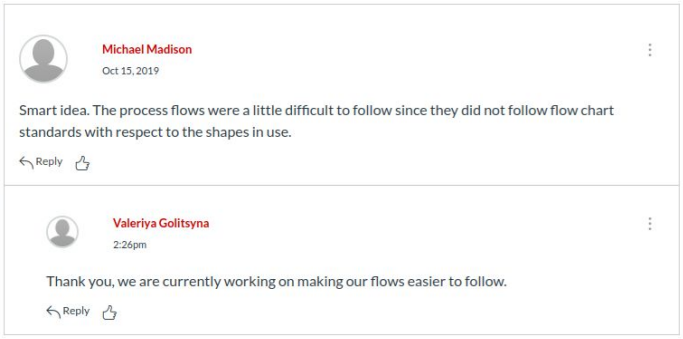
Used in calculating estimated arrival for each shift per day once user enters the total arrival. What it does is, it takes the previous year arrival information, previous years staff volume and

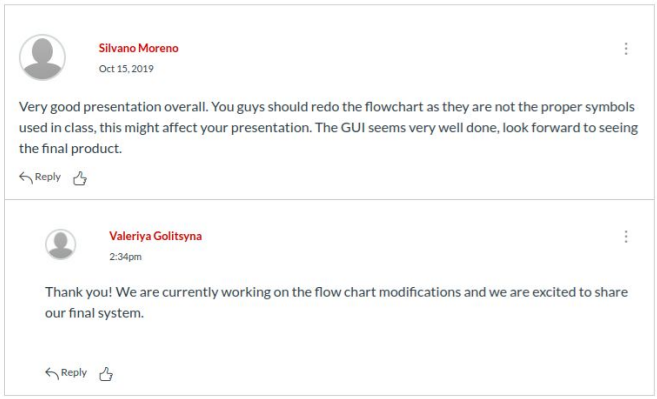
the current week arrival information and calculates this week's staff needed. We do this in the database because it is efficiently maintained and fetching values on to the application takes less time when compared to calculating within the application.

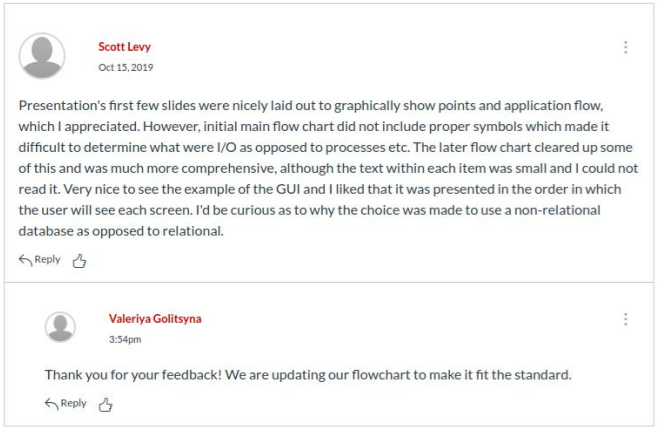
Response sheet for “Smart Forecaster”

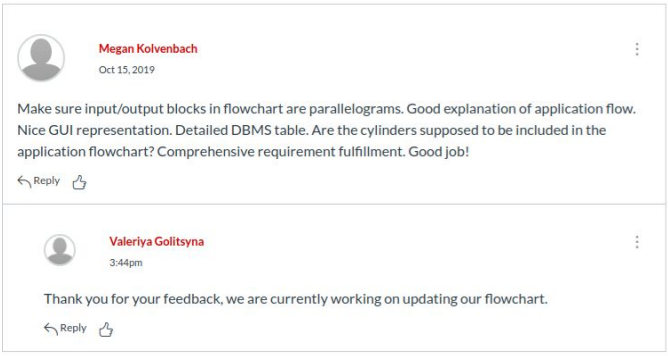
In order to be able to make adjustments to the Milestone 2 and update all the important issues for the Final Project we considered all the comments, which were provided to us.
In order to address every issue one by one and make sure to take into consideration every detail, we grouped our fellow students’ comments and also addressed Professor’s comments:

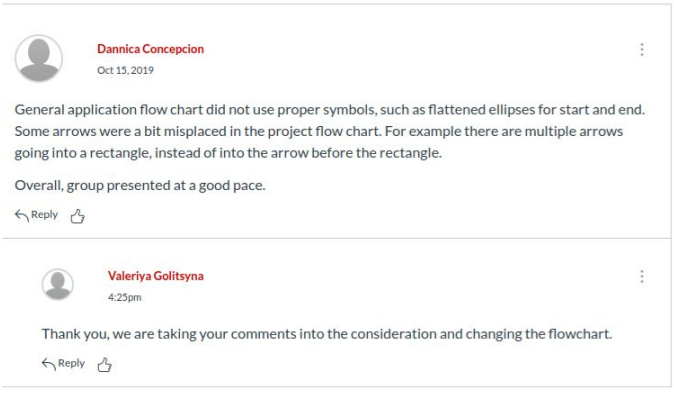
a) Comments regarding flow-chart

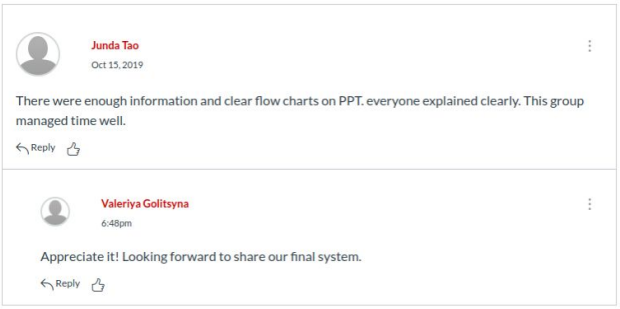


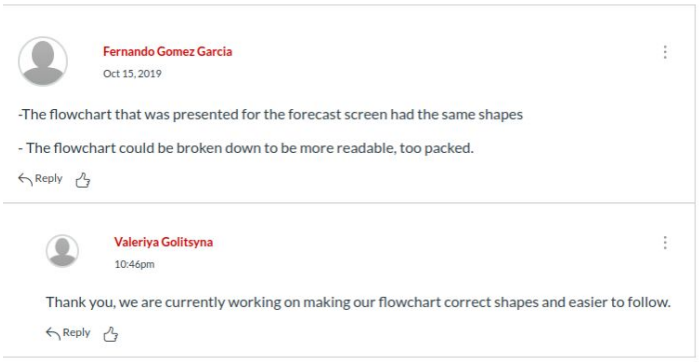






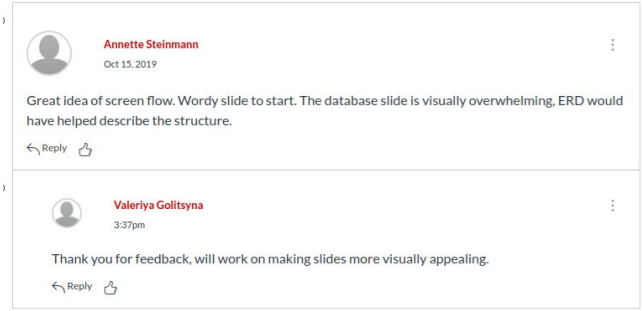


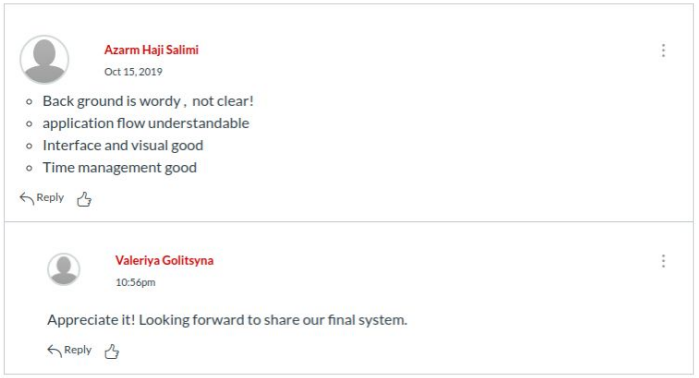




As a group we totally understand that the flow chart is an important step in the creation of the program. Our fellow classmates pointed out that some of our shapes are not correct and more importantly, our flow chart was a bit complicated. We wanted to make sure that this issue doesn't have a significant influence on our final system. So we took all the comments into consideration and simplified the steps in order to create a successfully running system.

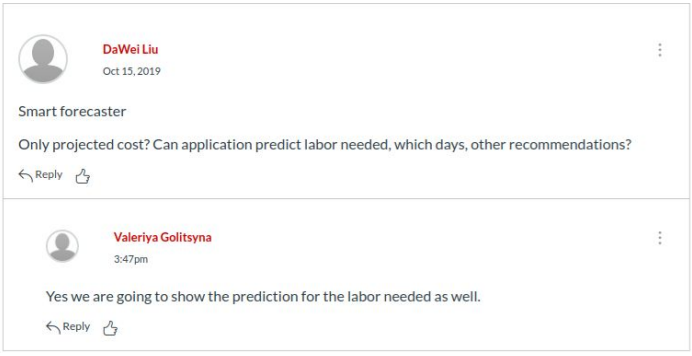
b) Presentation quality





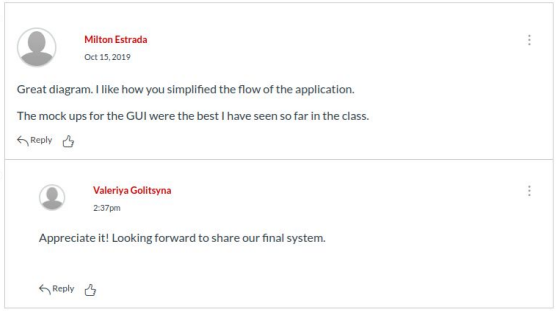
Another comment that we received was about our presentation quality. Some slides were too wordy and it was acknowledged that we need to engage audience while presenting. We appreciate all the comments and definitely will consider it while preparing for the final presentation.

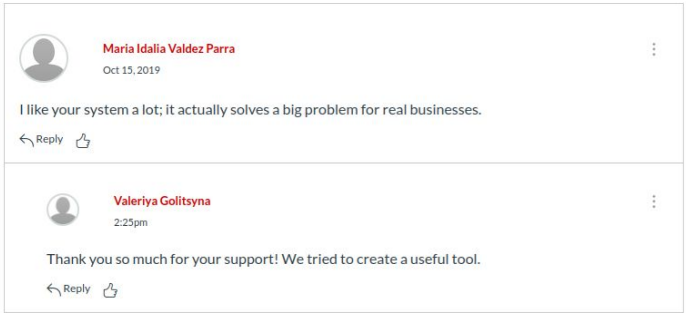
c) System Functionality

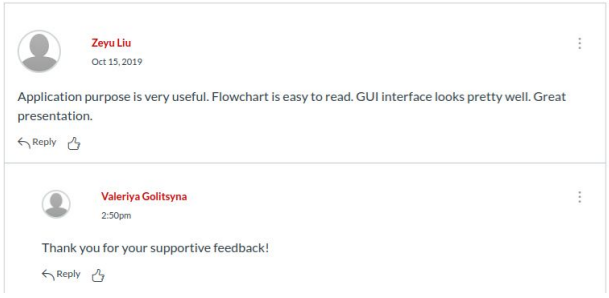


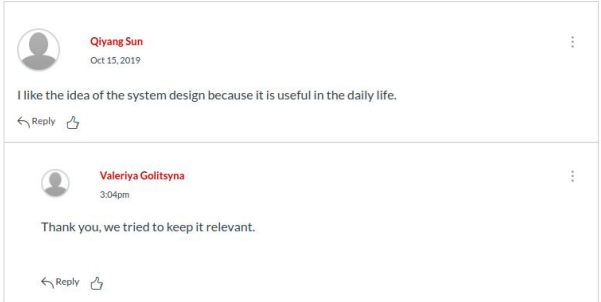
This comment left us a bit puzzled since the main purpose of our program is to predict the amount of people needed for ach shift in the future. However, we take it as a sign that we need to be more clear on what are the main purposes and goals our program has.

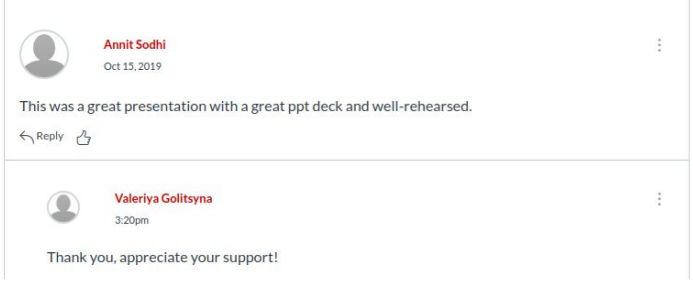
d) Positive and supportive feedback

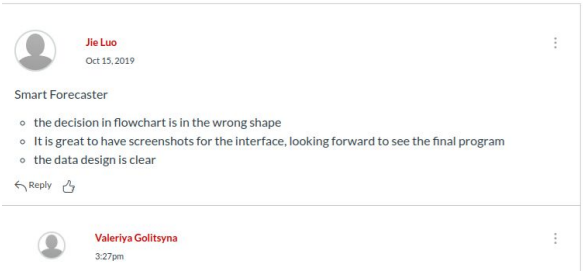


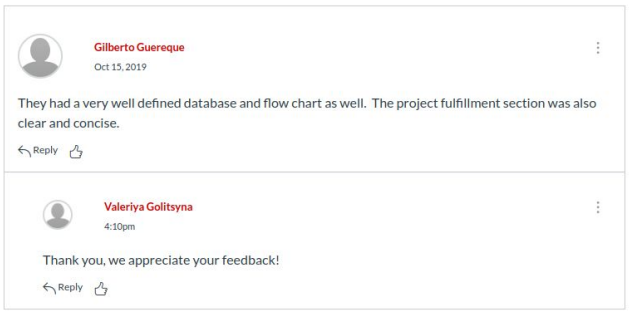












Gilberto Guereque
Oct 15, 2019

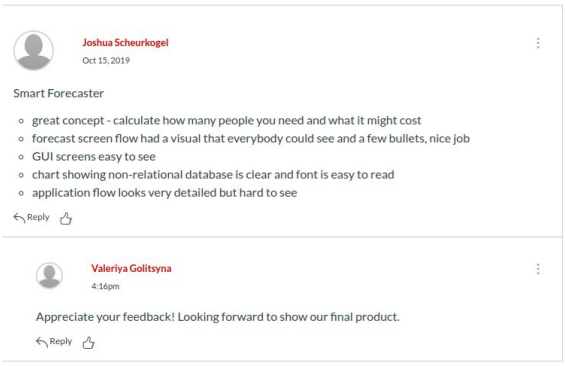
They had a very well defined database and flow chart as well. The project fulfillment section was also clear and concise.

Reply

Valeriya Golitsyna
4:10pm

Thank you, we appreciate your feedback!

Reply



Joshua Scheurkogel
Oct 15, 2019

Smart Forecaster

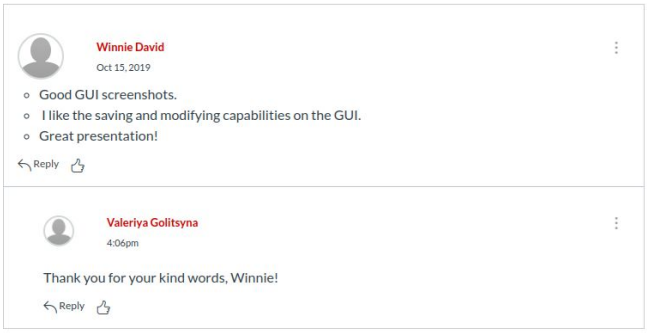
- great concept - calculate how many people you need and what it might cost
- forecast screen flow had a visual that everybody could see and a few bullets, nice job
- GUI screens easy to see
- chart showing non-relational database is clear and font is easy to read
- application flow looks very detailed but hard to see

Reply

Valeriya Golitsyna
4:16pm

Appreciate your feedback! Looking forward to show our final product.

Reply



Winnie David
Oct 15, 2019

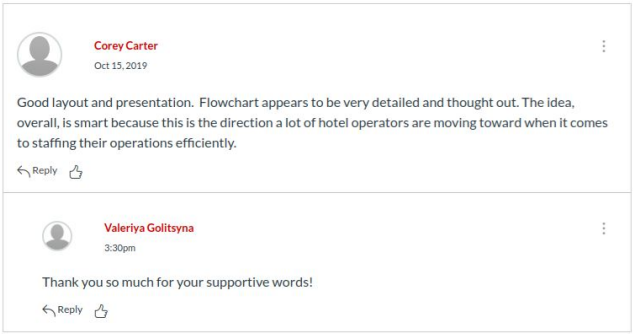
- Good GUI screenshots.
- I like the saving and modifying capabilities on the GUI.
- Great presentation!

Reply

Valeriya Golitsyna
4:06pm

Thank you for your kind words, Winnie!

Reply



Corey Carter
Oct 15, 2019

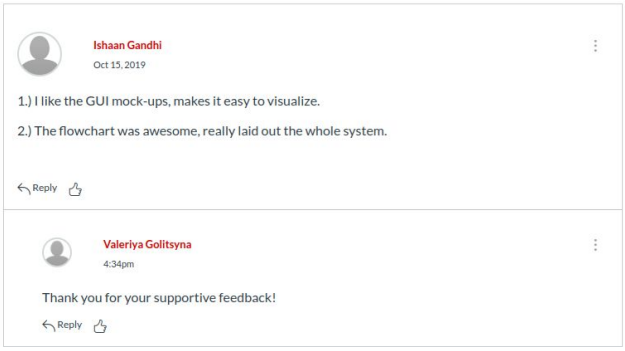
Good layout and presentation. Flowchart appears to be very detailed and thought out. The idea, overall, is smart because this is the direction a lot of hotel operators are moving toward when it comes to staffing their operations efficiently.

Reply

Valeriya Golitsyna
3:30pm

Thank you so much for your supportive words!

Reply



Ishaan Gandhi
Oct 15, 2019

1.) I like the GUI mock-ups, makes it easy to visualize.

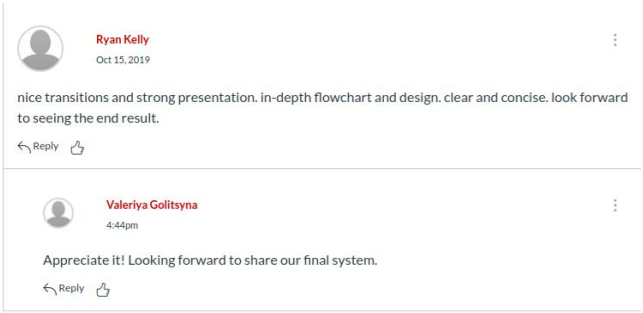
2.) The flowchart was awesome, really laid out the whole system.

Reply

Valeriya Golitsyna
4:34pm

Thank you for your supportive feedback!

Reply



Ryan Kelly
Oct 15, 2019

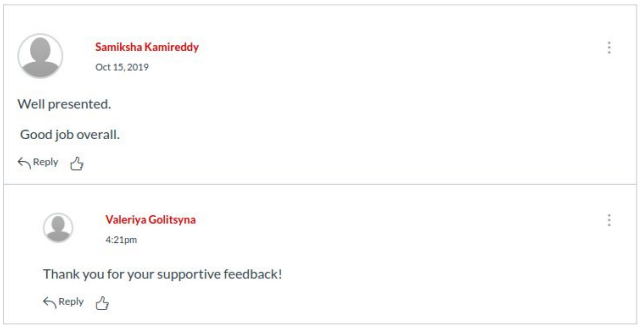
nice transitions and strong presentation. in-depth flowchart and design. clear and concise. look forward to seeing the end result.

Reply

Valeriya Golitsyna
4:44pm

Appreciate it! Looking forward to share our final system.

Reply



Samiksha Kamireddy
Oct 15, 2019

Well presented.

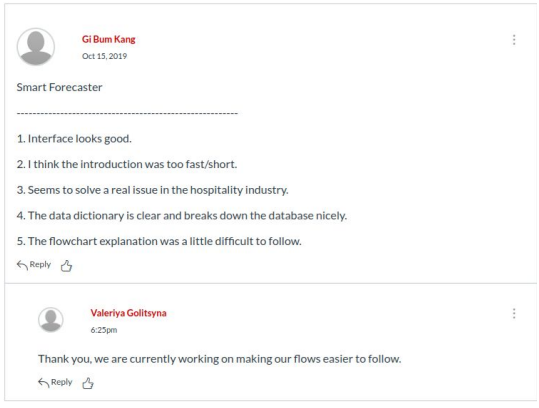
Good job overall.

Reply

Valeriya Golitsyna
4:21pm

Thank you for your supportive feedback!

Reply



Gi Bum Kang
Oct 15, 2019

Smart Forecaster

---

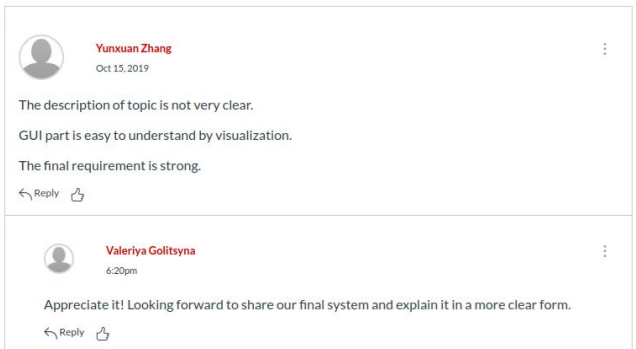
1. Interface looks good.
2. I think the introduction was too fast/short.
3. Seems to solve a real issue in the hospitality industry.
4. The data dictionary is clear and breaks down the database nicely.
5. The flowchart explanation was a little difficult to follow.

Reply

Valeriya Golitsyna
6:25pm

Thank you, we are currently working on making our flows easier to follow.

Reply



Yunxuan Zhang
Oct 15, 2019

The description of topic is not very clear.

GUI part is easy to understand by visualization.

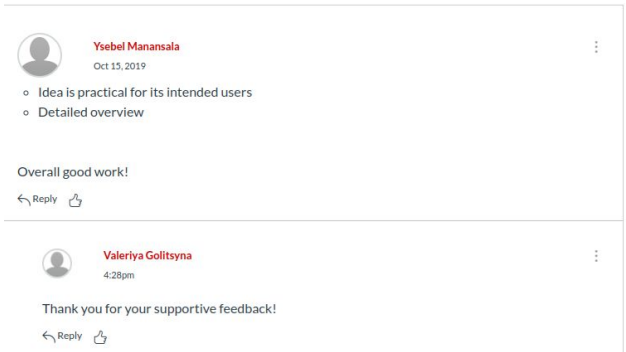
The final requirement is strong.

Reply

Valeriya Golitsyna
6:20pm

Appreciate it! Looking forward to share our final system and explain it in a more clear form.

Reply



Ysebel Manansala
Oct 15, 2019

- Idea is practical for its intended users
- Detailed overview

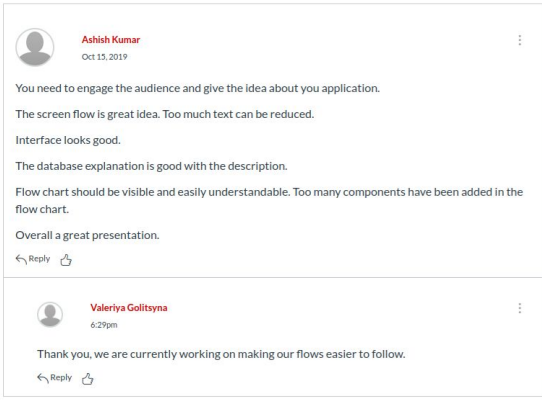
Overall good work!

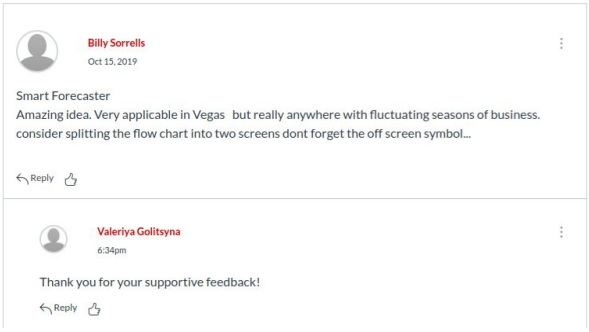
Reply

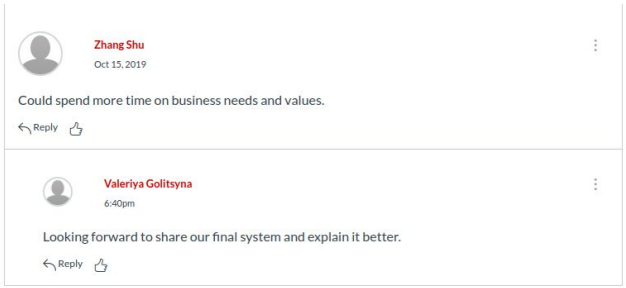
Valeriya Golitsyna
4:28pm

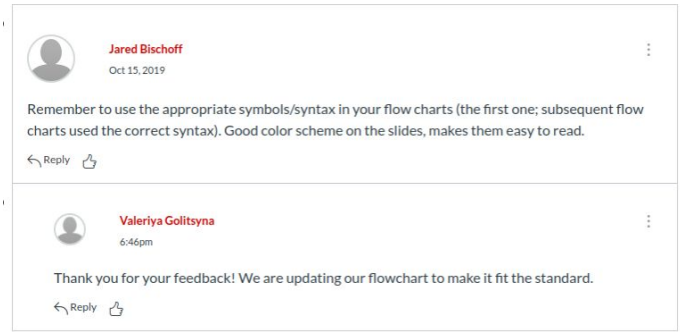
Thank you for your supportive feedback!

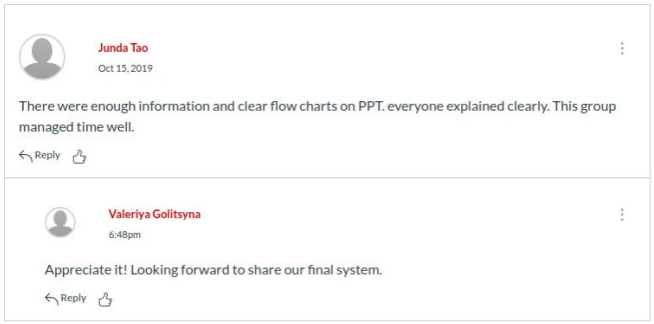
Reply

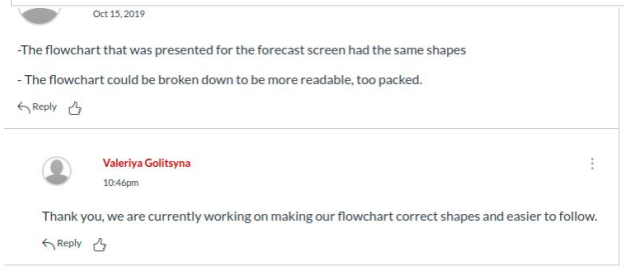












There is no doubt that it is very encouraging to receive positive and supportive comments. We are very excited to share our system and the final project details.

Professor's Hu comments:

Comments Close

Presentation: 2.5/ 2.5
The presentation was smooth and good. For the next presentation, please work on engaging the audience if you can.

Design Document: 4/5
1. Graphical user interface design (GUI) will not be covered in this class given the limited time we have. You will need to do additional research on GUI in Python. Please feel free to let me know if you need any helps.
2. It is unclear how the arrival information will be incorporated into the system. In the design, there are no functions about read/link/import the arrival data.
The project requires data CRUD. Please make sure you include all of the four aspects in the system.
3. I did not see how you will generate the prediction. I hope you already have a formula/equation in mind for prediction.
4. The computation should be done in Python, not stored procedure, for the purpose of this class.

Han-Fen Hu, Oct 31 at 3:44pm

It was very important for us to take time to review every comment by Professor in order to correct our project flow and successfully finish our final system. As it was mentioned earlier, we are looking into implementing the way we will engage the audience in our presentation in order to "sell the product ". In regards to the design of the program, we decided to go with the command line interface and focus more on the calculation part of the system.

We made sure to describe how the arrival data will be imported and read by the system in order to get the final desirable result. We implemented CRUD for the .csv files, which we are planning to use as our database source. The fundamental part of the project is coding, so it was very important to implement and identify the formulas we will be using to calculate outcomes and also be able to demonstrate them during the presentation in Python.

Summary

To sum up, we appreciated all the feedback we received from classmates and Professor. We took into consideration all the comments in order to perfect our system. We are looking forward to sharing our final product with the audience.

Smart Forecaster User Manual

December 2019

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Product name	**30**
Intended use, description of product elements and the user interface	**31**
Description of how to use/operate the product	**32**
Contact details	**36**

➔Product name

Welcome to the "Smart Forecaster" User Manual!

This Manual will provide guidance on how to use this system and how it can become one of the most important and useful tools in the scheduling process.

If you came across this application, this means you are a hospitality professional responsible for scheduling in certain departments in operations.

We, as vendors, believe that the most useful way for this application to be used is for a scheduling procedure at the Front Office department.

We provide a 30 day trial and guarantee that this system will be a great tool in smart scheduling and optimizing costs for your business!

We hope you will find this application bug-free and easy to use, if we could improve it in any way possible, please let us know.

➔Intended use, description of product elements and the user interface

The “Smart Forecaster” system is an application that focuses on three main functions:

- Predicting the amount of workers needed for day, swing and graveyard for each week
- Estimating the labor expense based on the prediction
- Expanding the database with new data added after getting an HR Report

The interface of the “Smart Forecaster” is a command line. Thurther, in the section “Description of how to use/operate the product” we will walk you through the process step by stem on how to use the system to achieve the desired results.

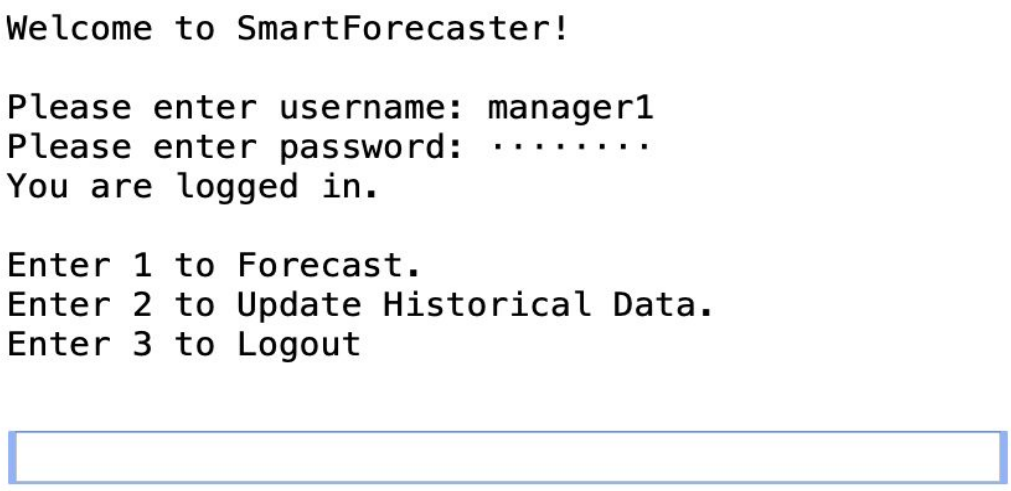
The system itself includes a prediction and estimation tool and also a database, which is expandable as more time passes by,

It is important to mention, that this is an advising tool, the information which will be produced by an application is calculated based on previous year data. It can be and welcomed to modified and changed based on changing business needs. Only the finalized numbers will be added to the database as the actual data, which becomes historical after it is added to the file.

➔ Description of how to use/operate the product

The first screen that you will encounter is the Login Page, where you will be able to log in with the given username “manager1” and a password, which was separately shared with you.
Please, make sure to enter the right password to be able to proceed.
The first page look is presented below:

The next step in the process after logging in is the step which offers you to make a choice on how to approach and use the given system.
Option 1 is made for a Forecast option. If you would like to proceed with this option, put 1 and click Enter.
Option 2 is made for an Update Historical Data option. If you would like to proceed with this option, put 2 and click Enter.
Option 3 is made for a Logout option. If you would like to proceed with this option, put 3 and click Enter.



1) If you proceeded with an **Option 1**, the screen displayed below will appear. This is requested to insert the first date (start) which you are interested in forecasting. Please make sure to follow the format (YYYY-MM-DD) in order to receive the desired outcome.

```
1
Welcome to Forecast Page
Please enter the start date of forecast (YYYY-MM-DD):
```

The next screen will appear 7 times and will request you to enter the arrival amount for the next week (7 days in the row).
Please follow the dates appearing on the screen and put in the correct arrival amount.

```
Welcome to Forecast Page
Please enter the start date of forecast (YYYY-MM-DD):
2019-12-01
Please enter arrival for the date 2019-12-01 00:00:00
123
Please enter arrival for the date 2019-12-02 00:00:00
131
Please enter arrival for the date 2019-12-03 00:00:00
154
Please enter arrival for the date 2019-12-04 00:00:00
222
Please enter arrival for the date 2019-12-05 00:00:00
199
Please enter arrival for the date 2019-12-06 00:00:00
111
Please enter arrival for the date 2019-12-07 00:00:00
312
```

The next step, which will appear in front of you will generate the amount of workers for Day, Swing and Grave shift. Also it will show the difference between the arrivals in comparison with the data from the previous years.

```
    Date  Total_Arrival  New Arrival  Year_x  Amount of workers at day  \
0  12-01            452          123    2019                         4
1  12-02            339          131    2019                         3
2  12-03            212          154    2019                         3
3  12-04            351          222    2019                         3
4  12-05            871          199    2019                         5
5  12-06            987          111    2019                         4
6  12-07            561          312    2019                         5

   Amount of workers at swing  Amount of workers at grave  day Diff  \
0                           5                           3    -150.4
1                           4                           3     -35.8
2                           4                           2     -43.2
3                           5                           4     -33.6
4                           8                           5    -171.2
5                           8                           5    -178.8
6                           6                           3    -135.6
```

The next step provides an opportunity to modify the data, which was generated by the system. **Option 1** is made for a Modify Day staff option. If you would like to proceed with this option, put 1 and click Enter. The next step the system will ask you to enter the value. Please choose it based on the line which matches the data you would like to modify.

Option 2 is made for a Modify Swing staff option. If you would like to proceed with this option, put 2 and click Enter. The next step the system will ask you to enter the value. Please choose it based on the line which matches the data you would like to modify.

Option 3 is made for a Modify Grave staff option. If you would like to proceed with this option, put 3 and click Enter. The next step the system will ask you to enter the value. Please choose it based on the line which matches the data you would like to modify.

This modified prediction information will download into Excel Sheet and will be available for use in the scheduling process.

```
Enter an option from the below content ( -1 to exit editing ):
1. Modify Day staff
2. Modify Swing staff
3. Modify Grave staff
1
Enter the index of the day which you want to edit:
1
Enter the value:
3.0
```

```
Enter an option from the below content ( -1 to exit editing ):
1. Modify Day staff
2. Modify Swing staff
3. Modify Grave staff
-1
Total employees required for the week 42.0
Labor expenses for the week is estimated at $6048.0
```

After you are satisfied with the modification part, you can print -1 and Enter. This action will print the estimated amount of employees for the week and also generate the labor expense for the following week.

This is how the Data will look before Modify option:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Date	Total_Arrival	New Arrival	Year_x	Amount of workers at day	Amount of workers at swing	Amount of workers at grave	day Diff	swing Diff	grave Diff	Expected day Staff	Expected swing Staff	Expected grave Staff
2	12-26	239	100	2019	3	4	2	-22	-46	-71	3	3	1
3	12-27	345	356	2019	3	4	2	-40.8	93.2	-41.4	2	6	1
4	12-28	1159	456	2019	5	10	4	-184.8	-328.8	-189.4	1	3	1
5	12-29	1219	764	2019	5	11	4	-140.2	-130.2	-184.6	2	8	1
6	12-30	642	874	2019	5	6	3	0.8	237.8	-6.6	5	11	3
7	12-31	987	342	2019	4	8	5	-132.6	-312.6	-199.8	1	2	1
8	01-01	787	123	2020	6	6	4	-227.4	-281.9	-154.7	1	0	1
9													
10													
11													

This is the way it will look after the necessary Modifications:

Date	Total_Arrival	New Arrival	Year_x	Amount of workers at day	Amount of workers at swing	Amount of workers at grave	day Diff	swing Diff	grave Diff	Expected day Staff	Expected swing Staff	Expected grave Staff
12-26	239	100	2019	3	4	2	-22	-46	-71	3	3	1
12-27	345	356	2019	3	4	2	-40.8	93.2	-41.4	3	6	1
12-28	1159	456	2019	5	10	4	-184.8	-328.8	-189.4	1	3	1
12-29	1219	764	2019	5	11	4	-140.2	-130.2	-184.6	2	8	1
12-30	642	874	2019	5	6	3	0.8	237.8	-6.6	5	11	3
12-31	987	342	2019	4	8	5	-132.6	-312.6	-199.8	1	2	1
01-01	787	123	2020	6	6	4	-227.4	-281.9	-154.7	1	0	1

Latest +

2) If you proceeded with an **Option 2**, please make sure to insert a file, which is received from HR after the working week has passed (example: “HR Report on Scheduled Staff 05/01-05/07”). Overlap data about date 05/01 in existing historical data will be replaced with data from new file.

```
You are logged in.

Enter 1 to Forecast.
Enter 2 to Update Historical Data.
Enter 3 to Logout

2

Please enter the file name for uploading (include .xlsx file): HR Report on Scheduled Staff 05_01-05_07.xlsx
```

3) If you proceeded with an **Option 3**, please enter 3 and Enter in order to Log out.

➔ Contact details

We hope you enjoy our system and find it useful in your operational scheduling!

Please let us know if you have any questions or comments regarding the “Smart Forecaster”.

Our contact info:

MIS 740 “Smart Forecaster” LLC

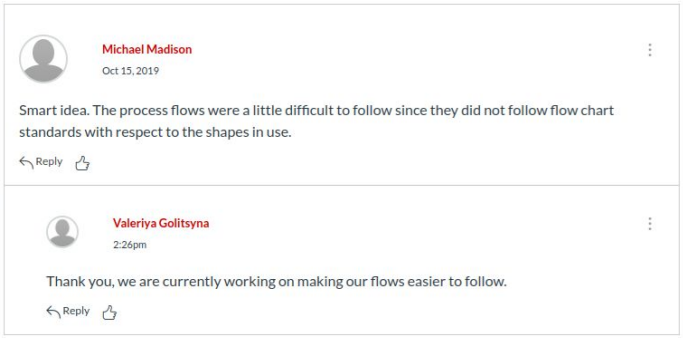
702-000-0000

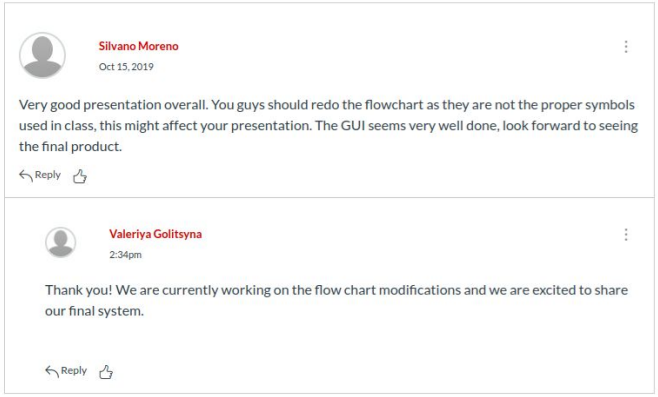
MIS740@gmail.com

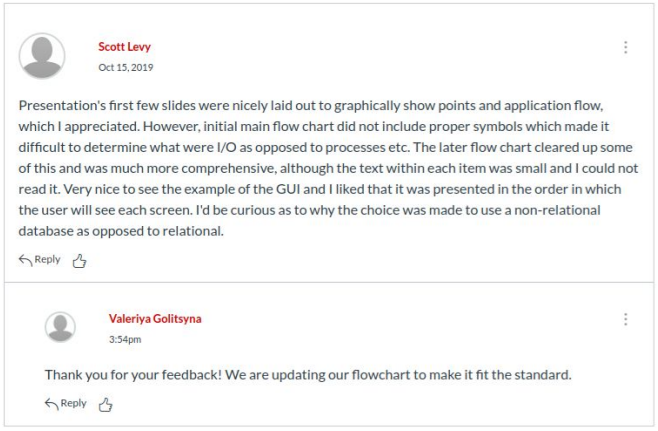
Response sheet for “Smart Forecaster”

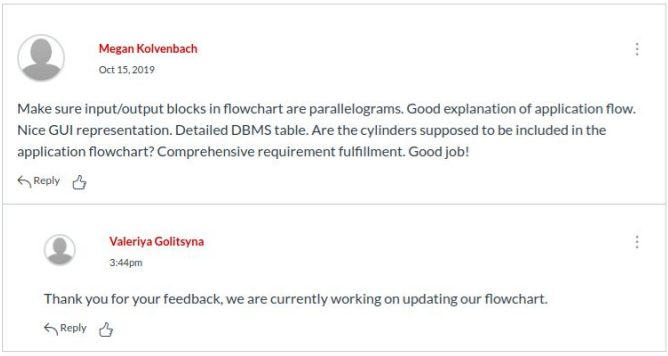
In order to be able to make adjustments to the Milestone 2 and update all the important issues for the Final Project we considered all the comments, which were provided to us.
In order to address every issue one by one and make sure to take into consideration every detail, we grouped our fellow students’ comments and also addressed Professor’s comments:

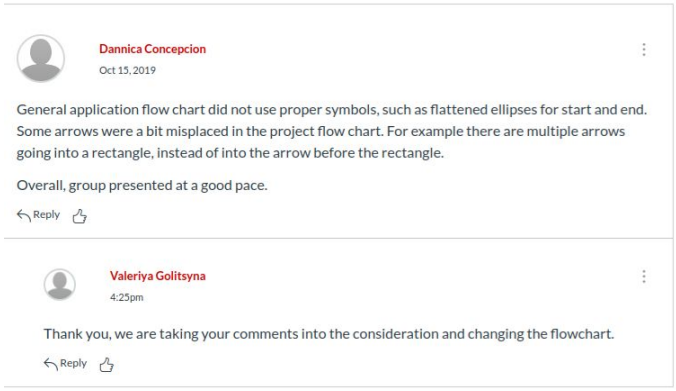
a) Comments regarding flow-chart

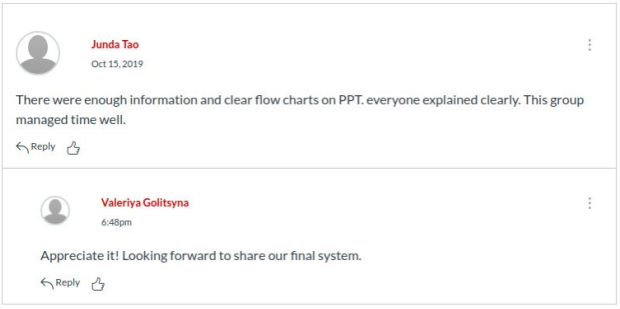


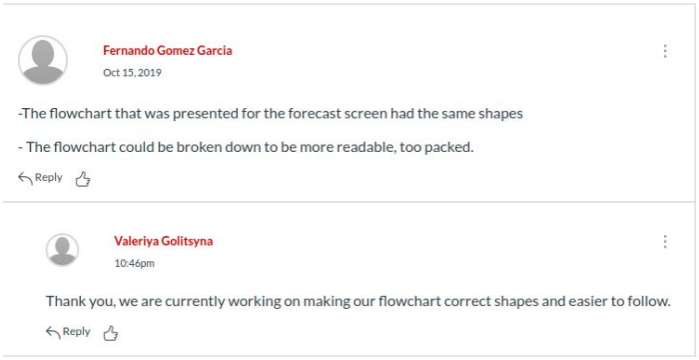






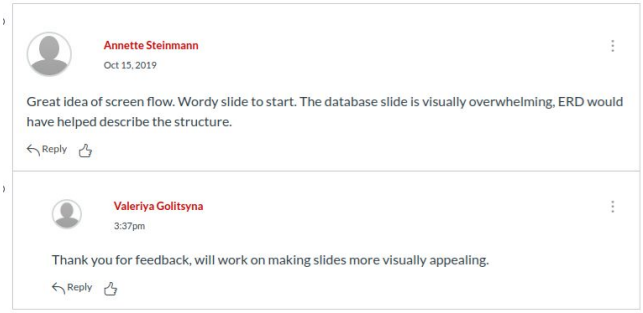


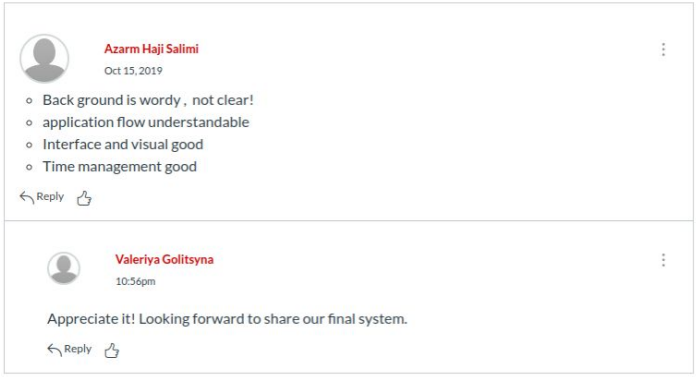




As a group we totally understand that the flow chart is an important step in the creation of the program. Our fellow classmates pointed out that some of our shapes are not correct and more importantly, our flow chart was a bit complicated. We wanted to make sure that this issue doesn't have a significant influence on our final system. So we took all the comments into consideration and simplified the steps in order to create a successfully running system.

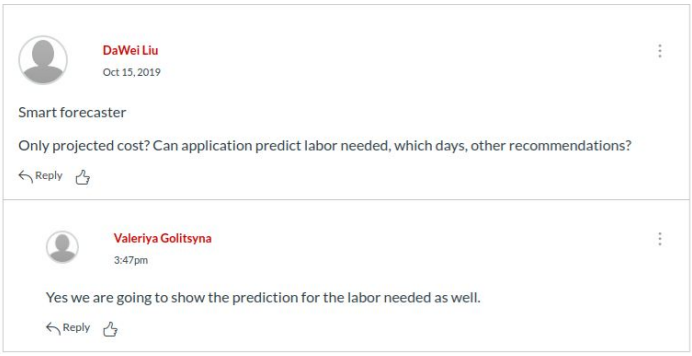
b) Presentation quality





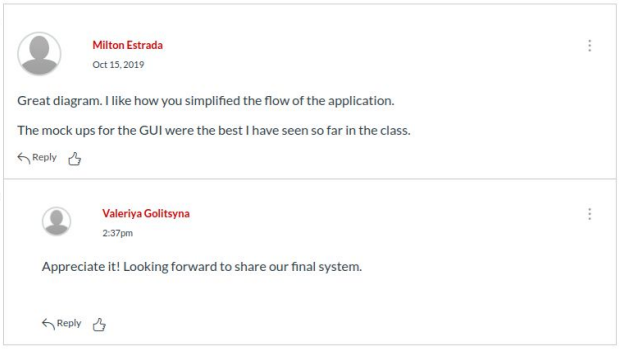
Another comment that we received was about our presentation quality. Some slides were too wordy and it was acknowledged that we need to engage audience while presenting. We appreciate all the comments and definitely will consider it while preparing for the final presentation.

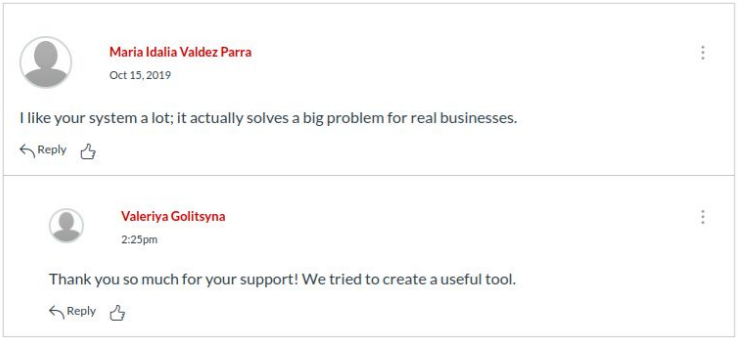
c) System Functionality

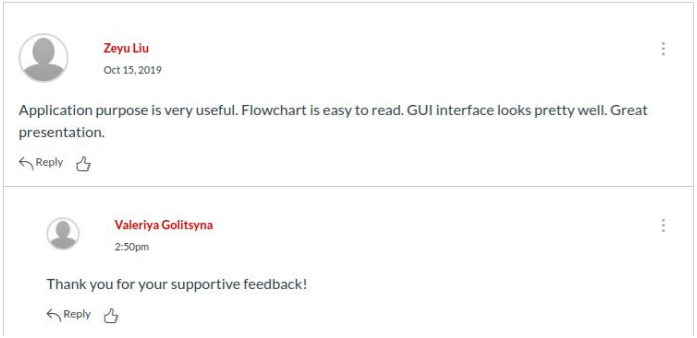


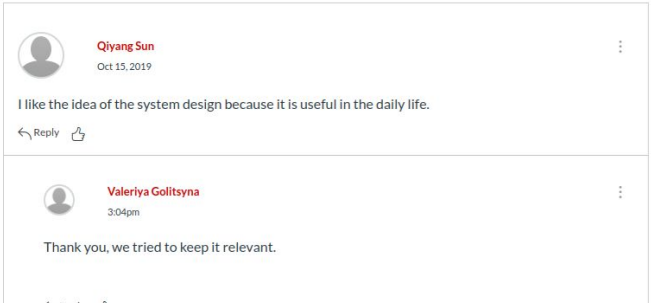
This comment left us a bit puzzled since the main purpose of our program is to predict the amount of people needed for ach shift in the future. However, we take it as a sign that we need to be more clear on what are the main purposes and goals our program has.

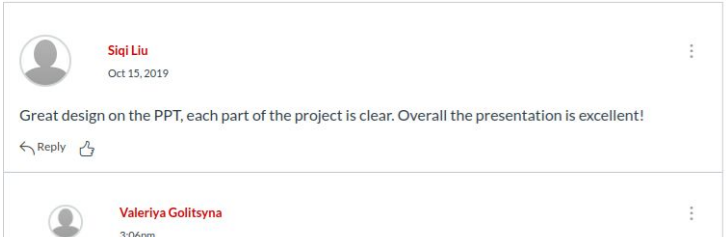
d) Positive and supportive feedback

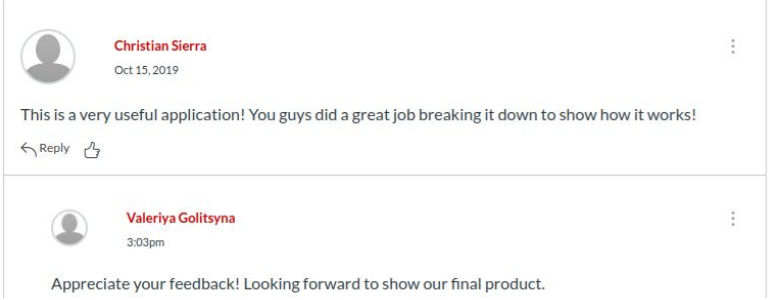


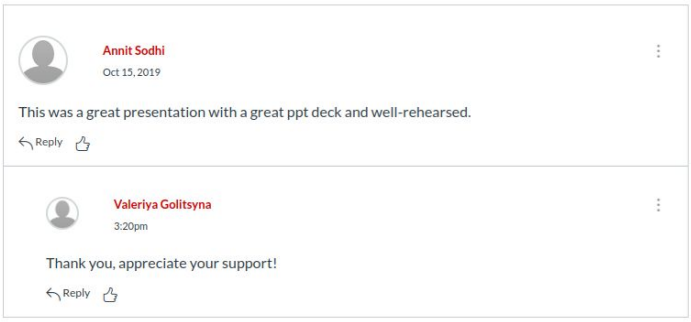












Annit Sodhi
Oct 15, 2019

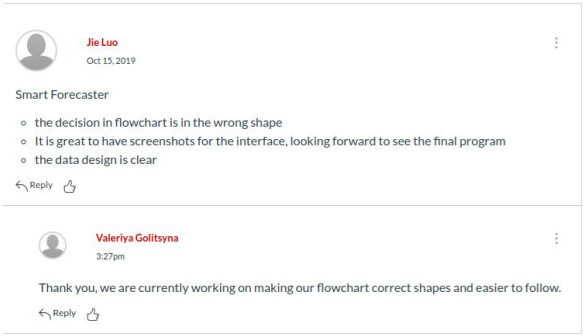
This was a great presentation with a great ppt deck and well-rehearsed.

Reply

Valeriya Golitsyna
3:20pm

Thank you, appreciate your support!

Reply



Jie Luo
Oct 15, 2019

Smart Forecaster

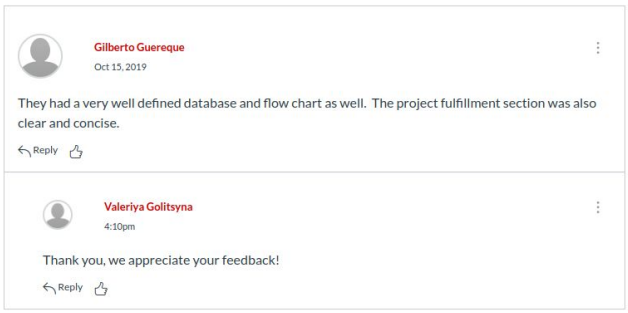
- the decision in flowchart is in the wrong shape
- It is great to have screenshots for the interface, looking forward to see the final program
- the data design is clear

Reply

Valeriya Golitsyna
3:27pm

Thank you, we are currently working on making our flowchart correct shapes and easier to follow.

Reply



Gilberto Guereque
Oct 15, 2019

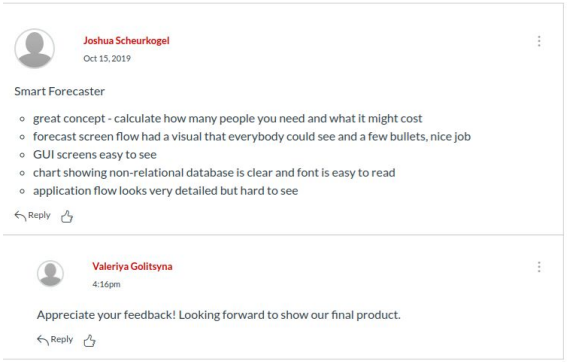
They had a very well defined database and flow chart as well. The project fulfillment section was also clear and concise.

Reply

Valeriya Golitsyna
4:10pm

Thank you, we appreciate your feedback!

Reply



Joshua Scheurkogel
Oct 15, 2019

Smart Forecaster

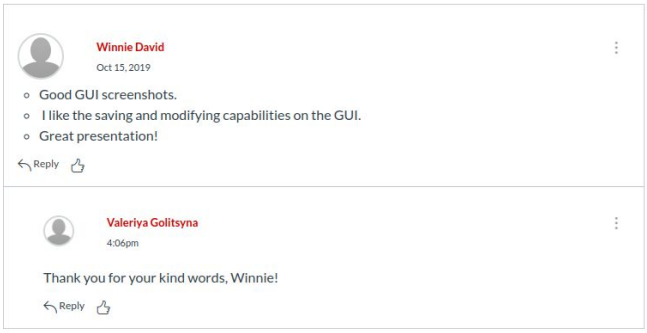
- great concept - calculate how many people you need and what it might cost
- forecast screen flow had a visual that everybody could see and a few bullets, nice job
- GUI screens easy to see
- chart showing non-relational database is clear and font is easy to read
- application flow looks very detailed but hard to see

Reply

Valeriya Golitsyna
4:16pm

Appreciate your feedback! Looking forward to show our final product.

Reply



Winnie David
Oct 15, 2019

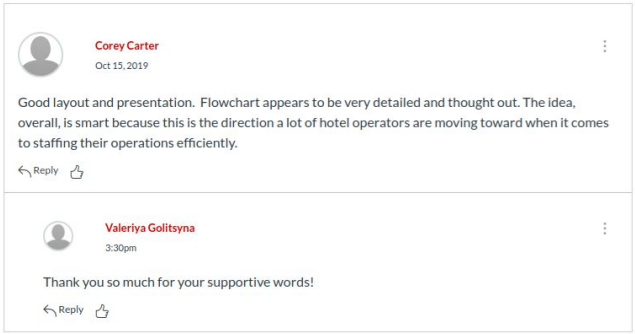
- Good GUI screenshots.
- I like the saving and modifying capabilities on the GUI.
- Great presentation!

Reply

Valeriya Golitsyna
4:06pm

Thank you for your kind words, Winnie!

Reply



Corey Carter
Oct 15, 2019

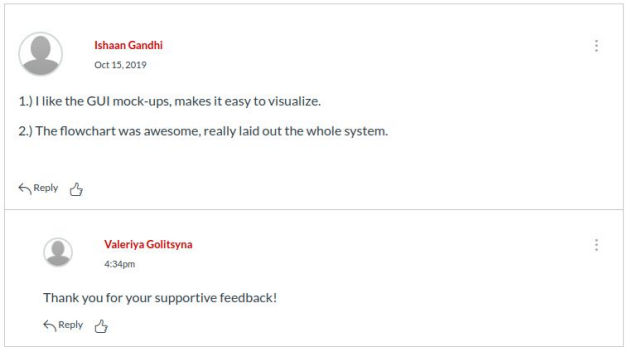
Good layout and presentation. Flowchart appears to be very detailed and thought out. The idea, overall, is smart because this is the direction a lot of hotel operators are moving toward when it comes to staffing their operations efficiently.

Reply

Valeriya Golitsyna
3:30pm

Thank you so much for your supportive words!

Reply



Ishaan Gandhi
Oct 15, 2019

1.) I like the GUI mock-ups, makes it easy to visualize.

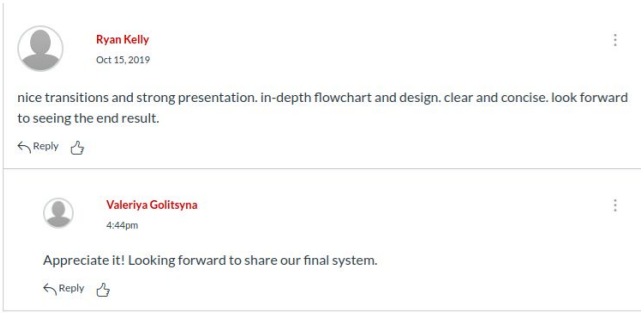
2.) The flowchart was awesome, really laid out the whole system.

Reply

Valeriya Golitsyna
4:34pm

Thank you for your supportive feedback!

Reply



Ryan Kelly
Oct 15, 2019

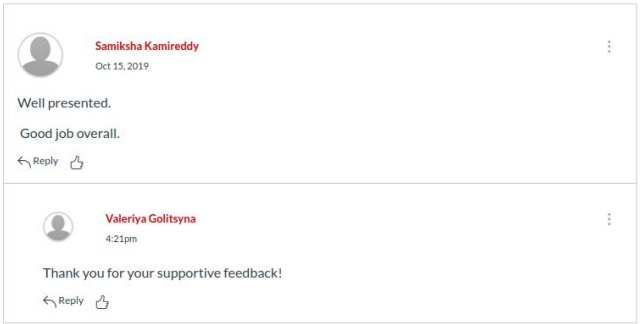
nice transitions and strong presentation. in-depth flowchart and design. clear and concise. look forward to seeing the end result.

Reply

Valeriya Golitsyna
4:44pm

Appreciate it! Looking forward to share our final system.

Reply



Samiksha Kamireddy
Oct 15, 2019

Well presented.

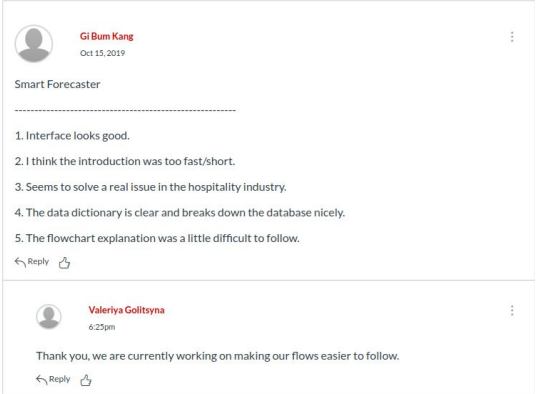
Good job overall.

Reply

Valeriya Golitsyna
4:21pm

Thank you for your supportive feedback!

Reply



Gi Bum Kang
Oct 15, 2019

Smart Forecaster

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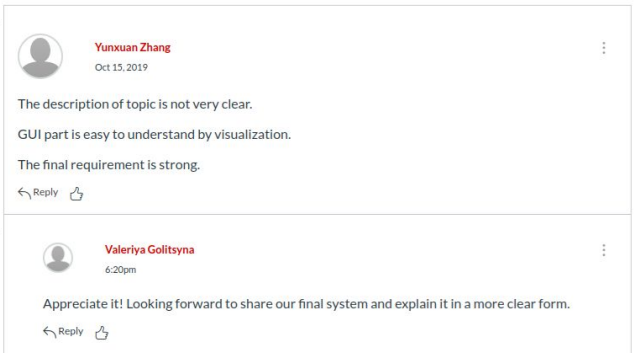
1. Interface looks good.
2. I think the introduction was too fast/short.
3. Seems to solve a real issue in the hospitality industry.
4. The data dictionary is clear and breaks down the database nicely.
5. The flowchart explanation was a little difficult to follow.

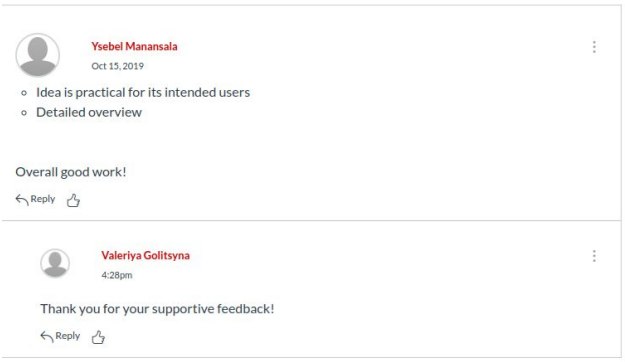
Reply

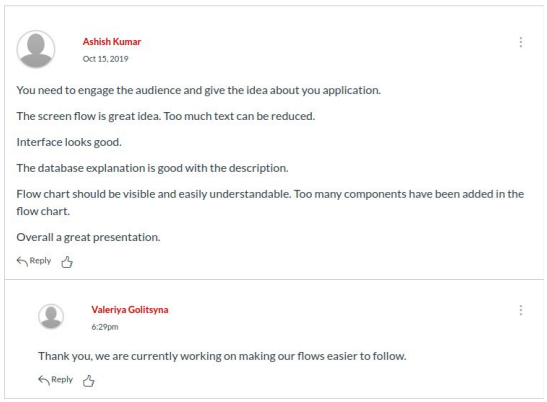
Valeriya Golitsyna
6:25pm

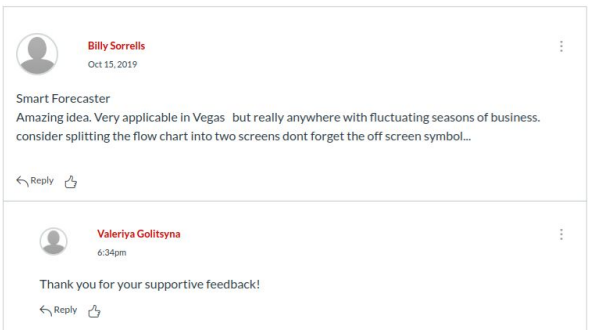
Thank you, we are currently working on making our flows easier to follow.

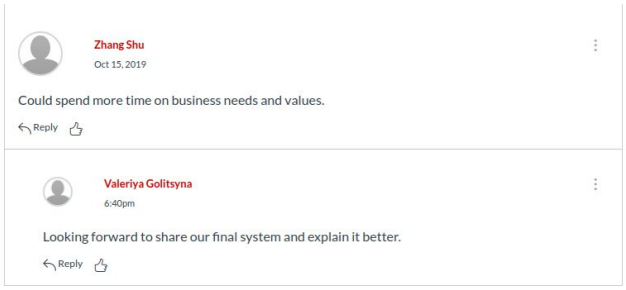
Reply

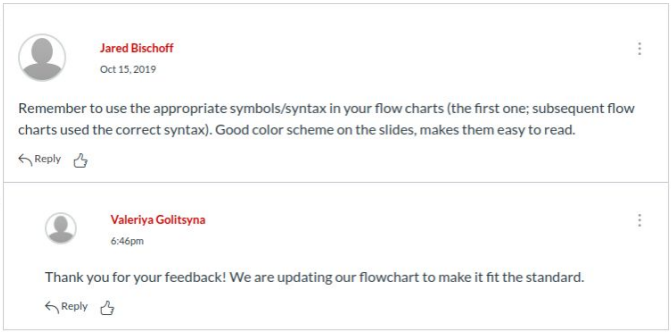


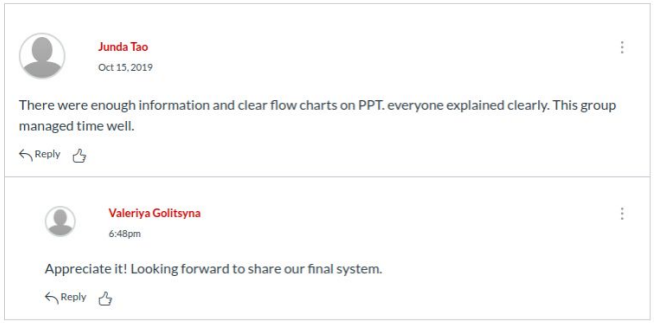


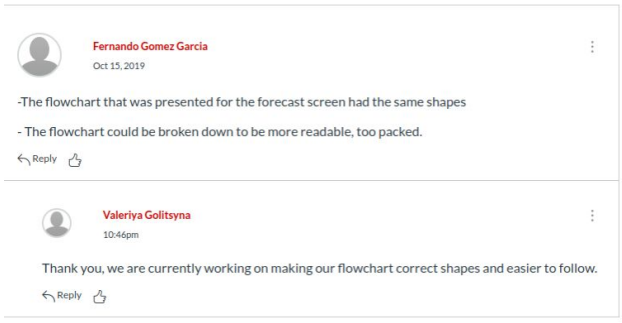












There is no doubt that it is very encouraging to receive positive and supportive comments. We are very excited to share our system and the final project details.

Professor's Hu comments:

Comments Close

Presentation: 2.5/ 2.5
The presentation was smooth and good. For the next presentation, please work on engaging the audience if you can.

Design Document: 4/5
1. Graphical user interface design (GUI) will not be covered in this class given the limited time we have. You will need to do additional research on GUI in Python. Please feel free to let me know if you need any helps.
2. It is unclear how the arrival information will be incorporated into the system. In the design, there are no functions about read/link/import the arrival data.
The project requires data CRUD. Please make sure you include all of the four aspects in the system.
3. I did not see how you will generate the prediction. I hope you already have a formula/equation in mind for prediction.
4. The computation should be done in Python, not stored procedure, for the purpose of this class.

Han-Fen Hu, Oct 31 at 3:44pm

It was very important for us to take time to review every comment by Professor in order to correct our project flow and successfully finish our final system. As it was mentioned earlier, we are looking into implementing the way we will engage the audience in our presentation in order to "sell the product ". In regards to the design of the program, we decided to go with the command line interface and focus more on the calculation part of the system.

We made sure to describe how the arrival data will be imported and read by the system in order to get the final desirable result. We implemented CRUD for the .csv files, which we are planning to use as our database source. The fundamental part of the project is coding, so it was very important to implement and identify the formulas we will be using to calculate outcomes and also be able to demonstrate them during the presentation in Python.

Summary

To sum up, we appreciated all the feedback we received from classmates and Professor. We took into consideration all the comments in order to perfect our system. We are looking forward to sharing our final product with the audience.