Criterion B – Design

Contents

Use Cases

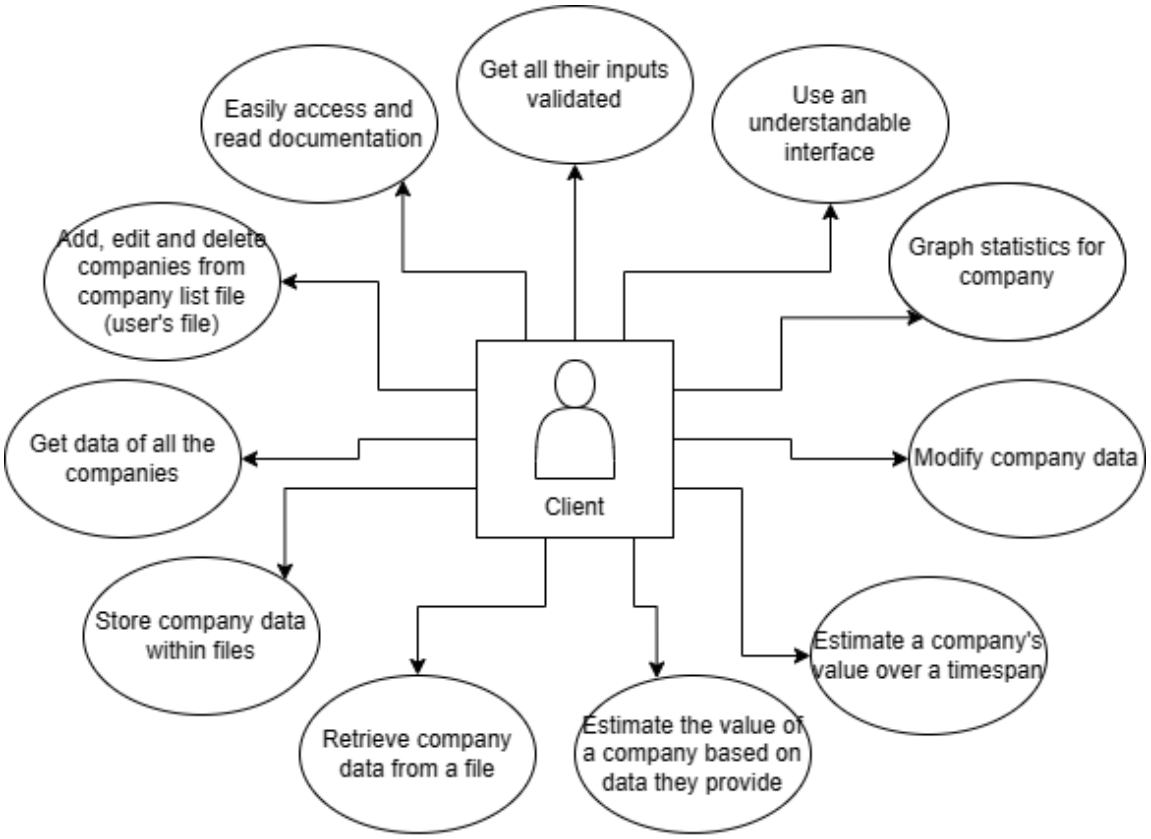
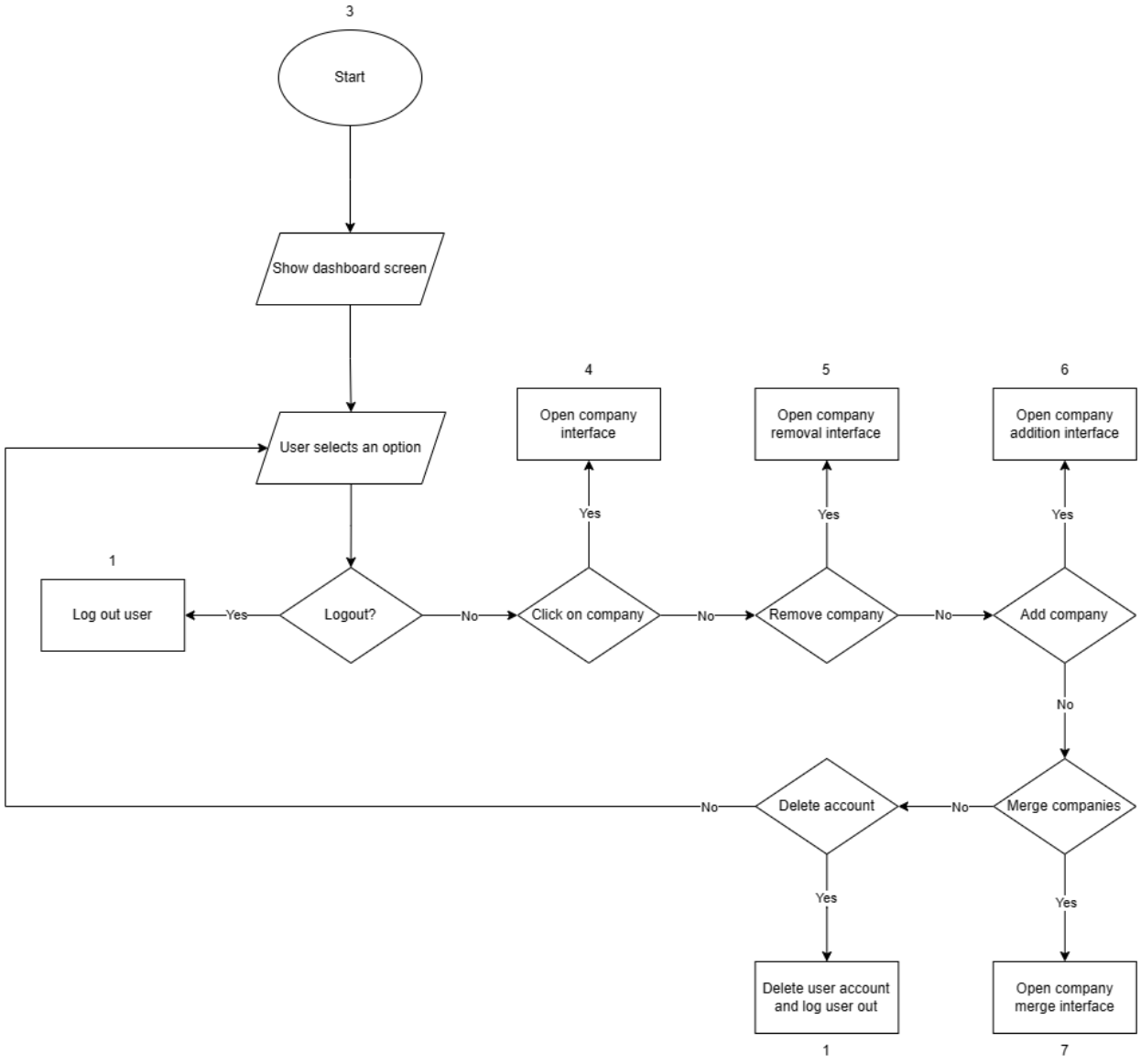


Figure 1 All use cases which the client should be able to do.

Flowchart Overview



Flowchart 1 Main dashboard.

Prototype Design

Designs created after the initial meeting with the client.[1]

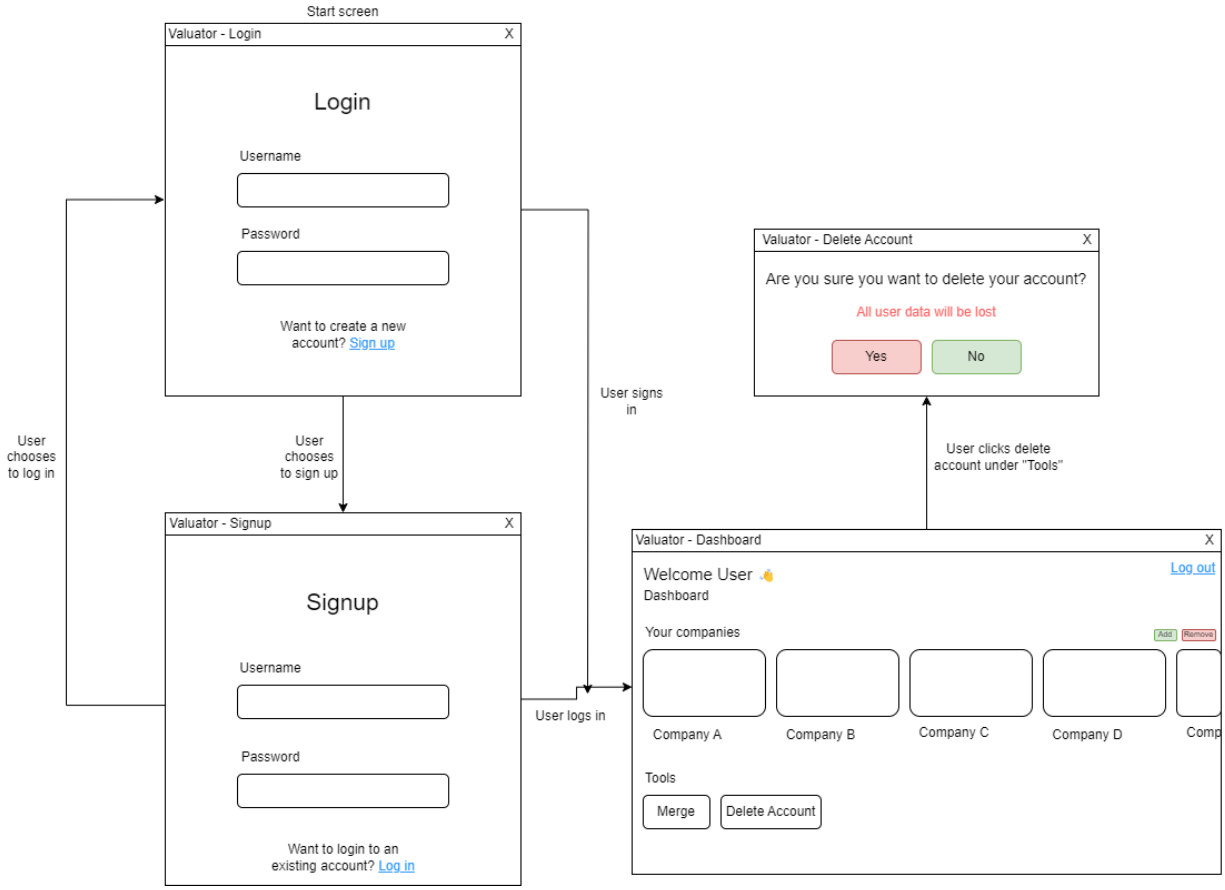


Figure 2 Login, signup, and user dashboard.

[1] Please see Appendix A: 1st Meeting with the Client.

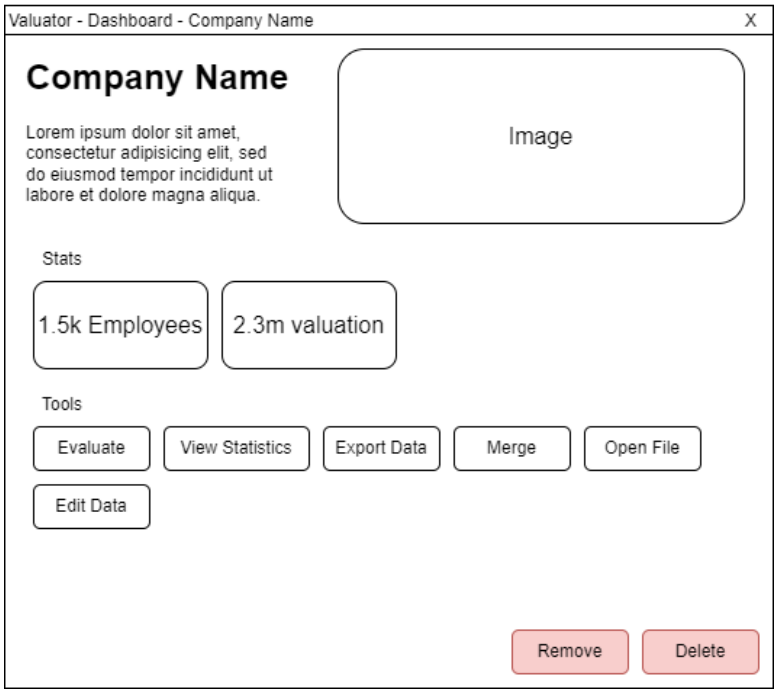


Figure 3 Company window.

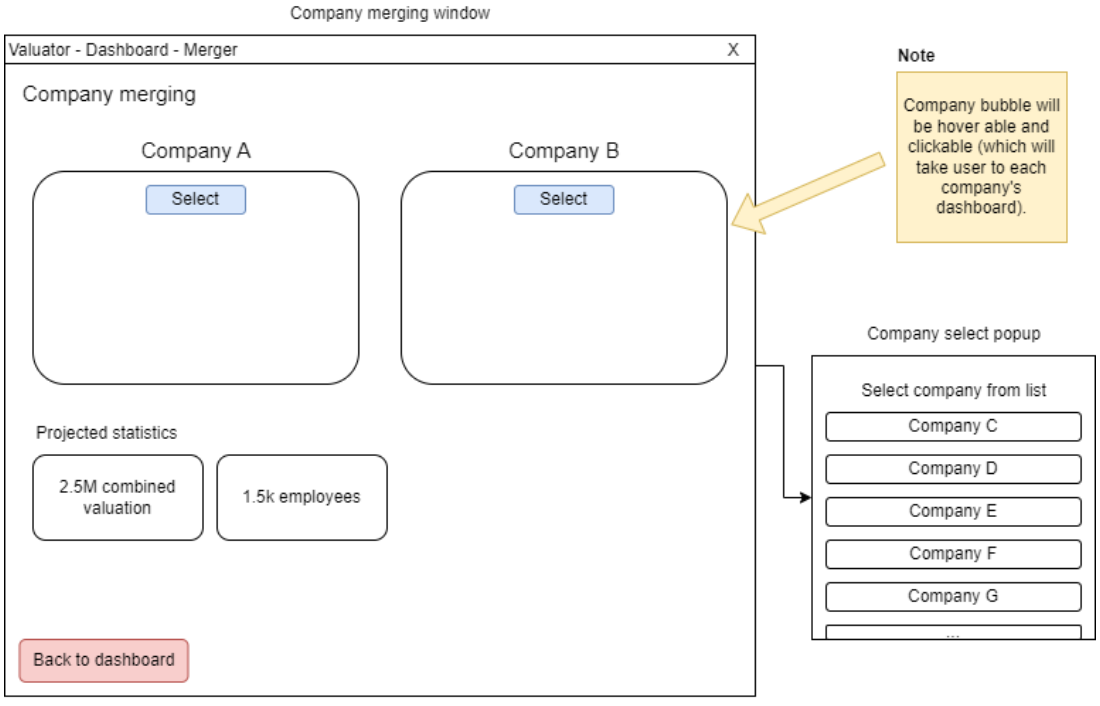


Figure 4 Company merging.

Final Design

Designs created after second meeting with the client.[2]

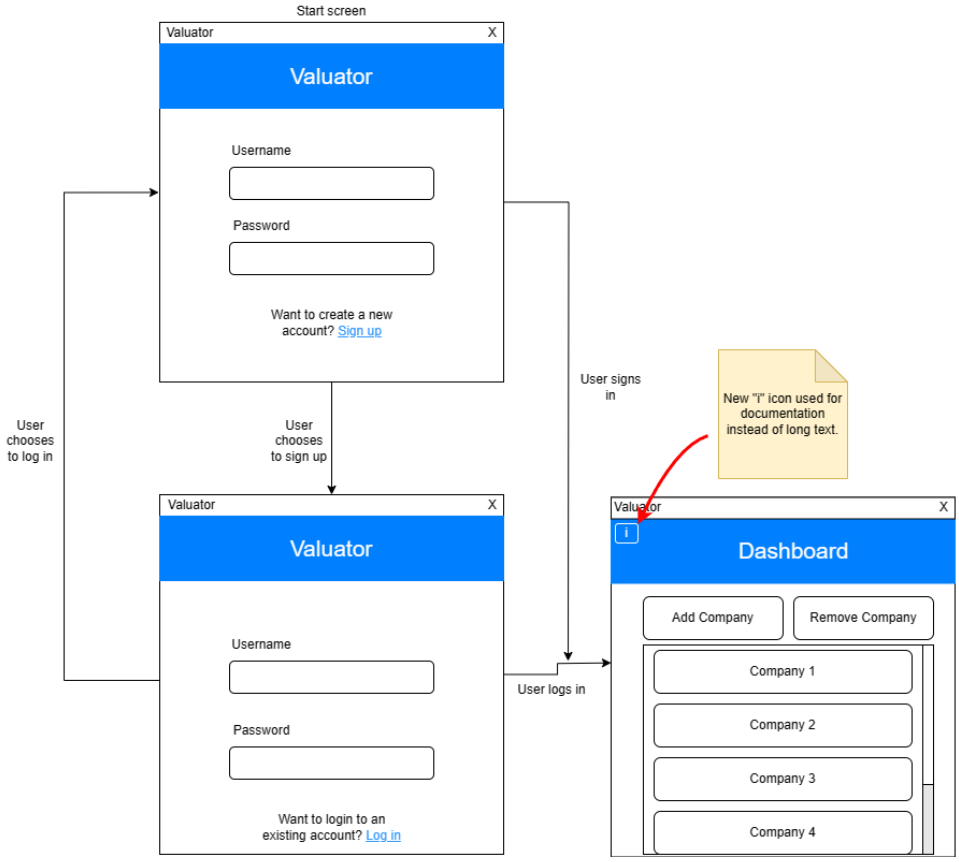


Figure 5 Login, signup, and user dashboard.

[2] Please see Appendix B: 2nd Interview with the Client.

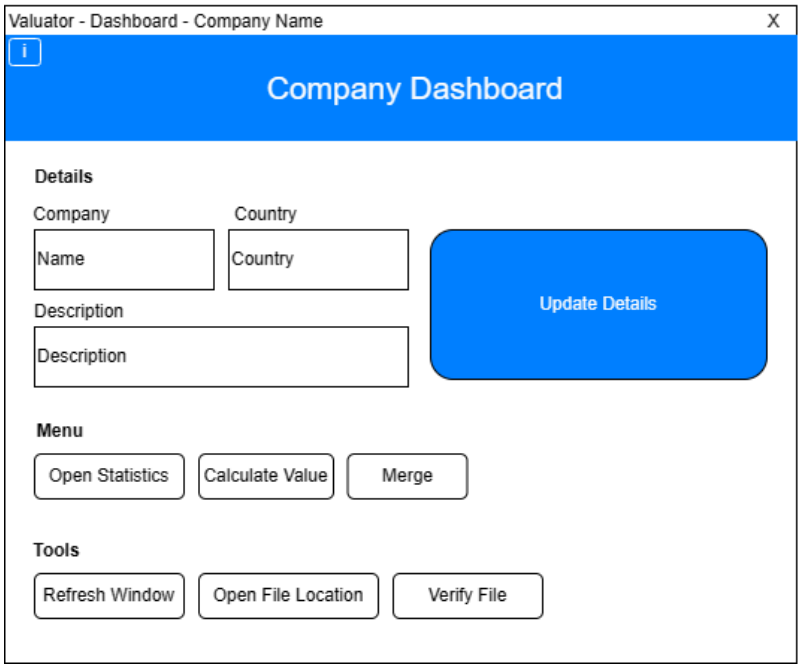


Figure 6 Company dashboard.

Company merging window

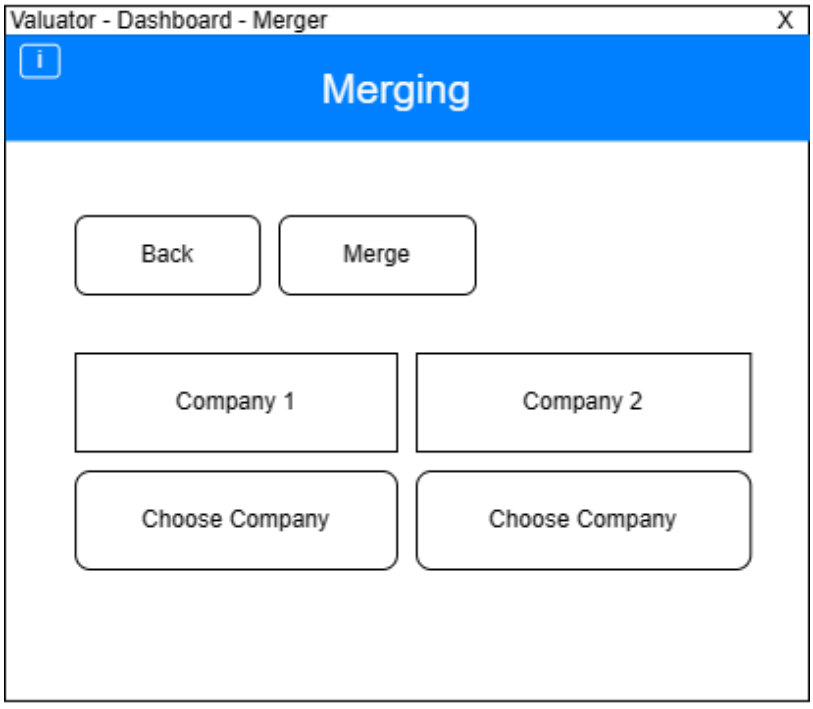


Figure 7 Merging interface.

Data Types Used

Table 1 Data types used.

Data Type	Variable	Reasoning
String	username	• Strings allowed for usernames to have any characters.
	password	• More choice of characters means more secure password.
File	file	• File object from java.io.File library[3]. • File object is used by various libraries. • Company or user file can be loaded as File object.

User	currentUser	• Current user represented as variable of User type.
		  ○ Descriptive variable.
		  ○ Serves purpose of constructing user as an object.
		  ○ User object has useful methods I created.
		• Current user object has data which needs to be accessed.

Company	head	• Used in CompanyList class as beginning of linked list.
	current	• Current company in linked list. • Useful when looping through linked list. • Allows for checking if there is a next company with methods.

[3] See Libraries section of this document.

Unified Modeling Language (UML) Diagrams

Models of each proposed class.

Authentication	
-	usersFile: String
-	currentUser: User
-	debug: boolean
+	Authentication()
-	signUp(username: String, password: String): User
-	logIn(username: String, password: String): User
-	writeString(file: RandomAccessFile, string: String): void
-	readString(file: RandomAccessFile, string: String): void
+	getUser(): User
-	toggleDebug(toggle: boolean): void

UML Diagram 1 Authentication class.

User	
-	username: String
-	isAdmin: boolean
-	file: File
-	companyList: CompanyList
-	debug: boolean
+	User(username: String, isAdmin: Boolean, filePath: String)
+	User()
+	getUsername(): String
+	getIsAdmin(): boolean
+	getCompanyList(): CompanyList
-	toggleDebug(toggle: boolean)

UML Diagram 2 User class.

CompanyList	
-	head: Company
-	file: File
+	debug: boolean
+	companyListLoaded: boolean
+	CompanyList(file: File)
+	add(company: Company)
+	save()
+	toArray(): Company[]
+	length(): int
+	isEmpty(): boolean
+	exists(fileName: String): boolean.
+	getHead(): Company

UML Diagram 3 CompanyList class

Company	
-	next: Company
-	name: String
-	description: String
-	country: String
-	tickerSymbol: String
-	revenues: ArrayList<Statistic>
-	costs: ArrayList<Statistic>
+	debug: boolean
+	companyLoaded: boolean
+	Company(filePath: String)
+	Company()
+	getNext(): Company
+	setNext(next: Company)

UML Diagram 4 Company class

Statistic	
-	name: String
-	filePath: String
-	data: ArrayList<Data>
+	Statistic(name: String, filePath: String)
+	Statistic(name: String, data: ArrayList<Data>)
+	getName(): String
+	readData()
+	getData(): ArrayList<data>
+	toString(): String
+	extrapolateData(monthsToExtrapolate: int): ArrayList<Data>

UML Diagram 5 Statistic class

Data	
-	year: int
-	month: int
-	value: int
+	Data(year: int, month: int, value: int)
+	getYear(): int
+	getMonth(): int
+	getValue(): int
+	toString(): String

UML Diagram 6 Data class

Hierarchical Chart

Illustration of how proposed windows and interfaces could be linked together.

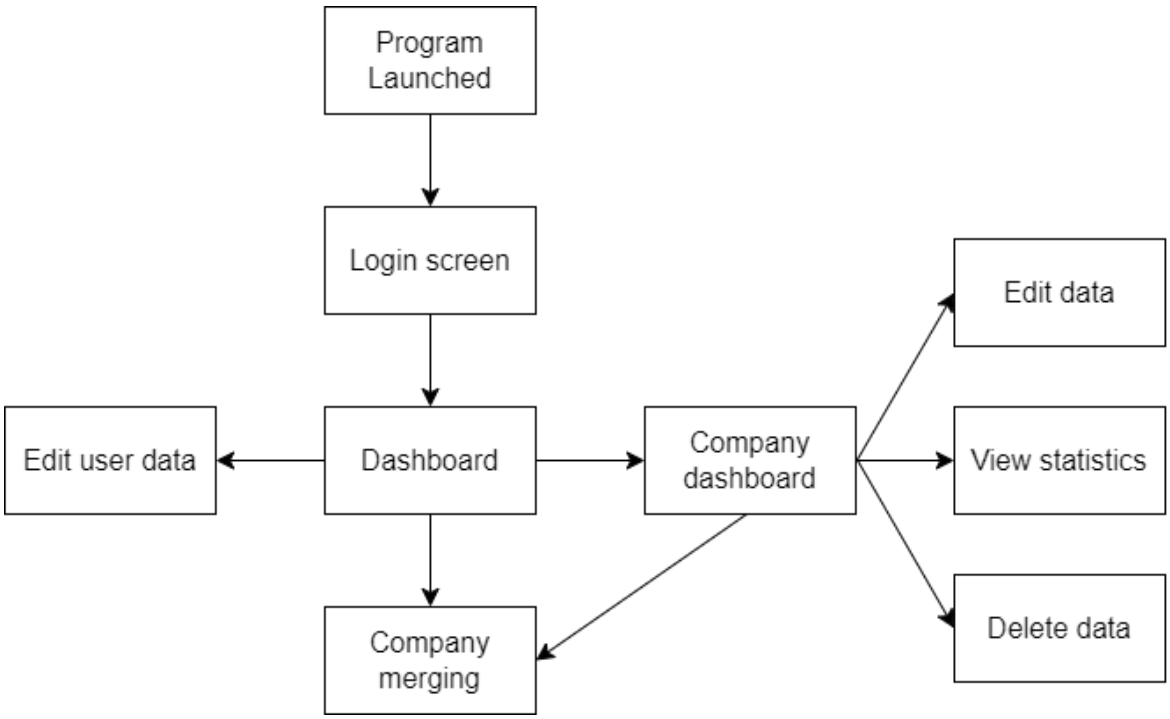


Figure 8 Hierarchal chart.

Connection Chart

A representation of the proposed class relationships.

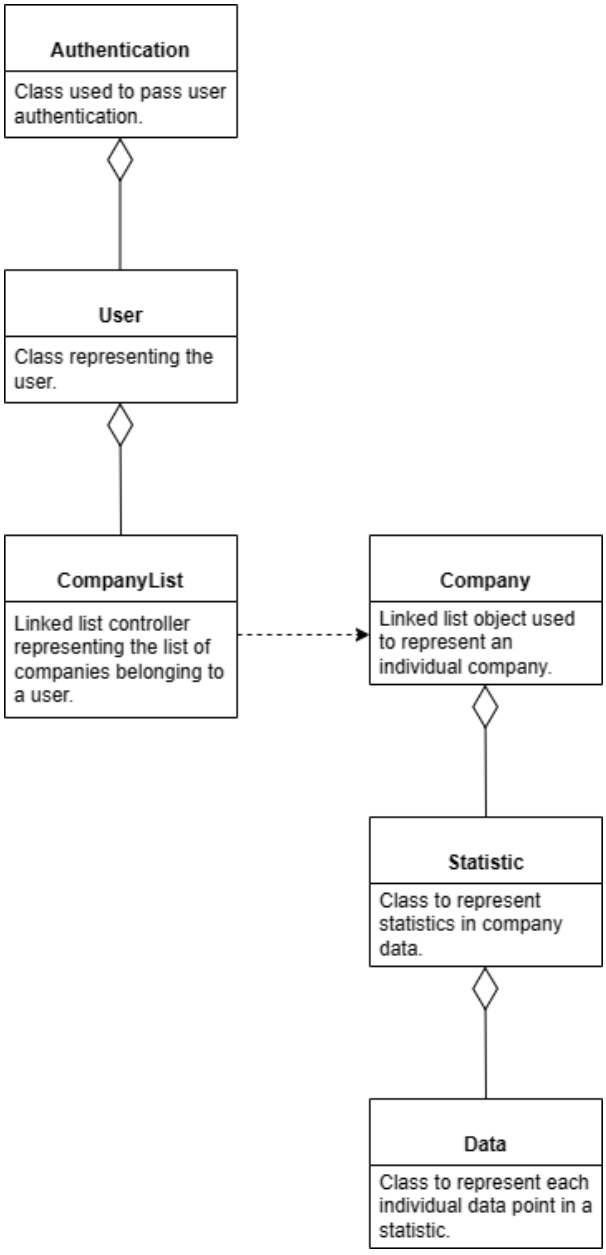
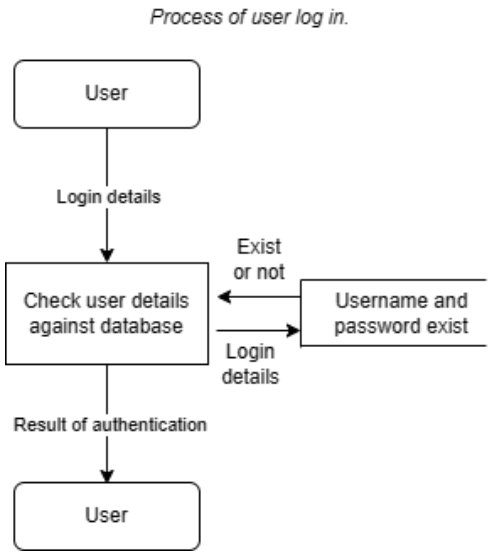
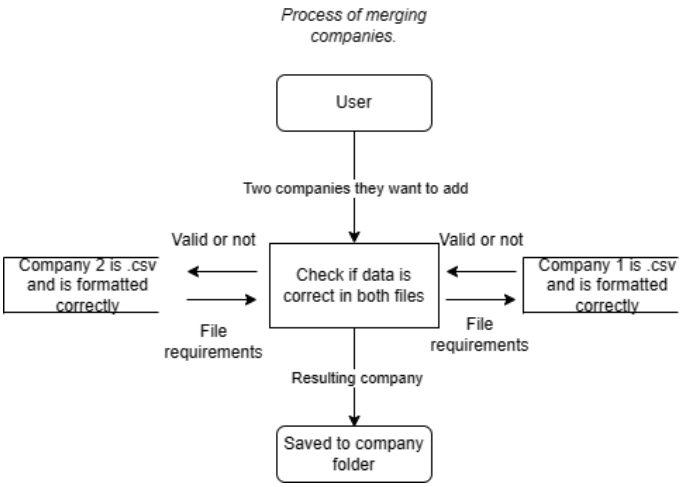


Figure 9 Connection chart.

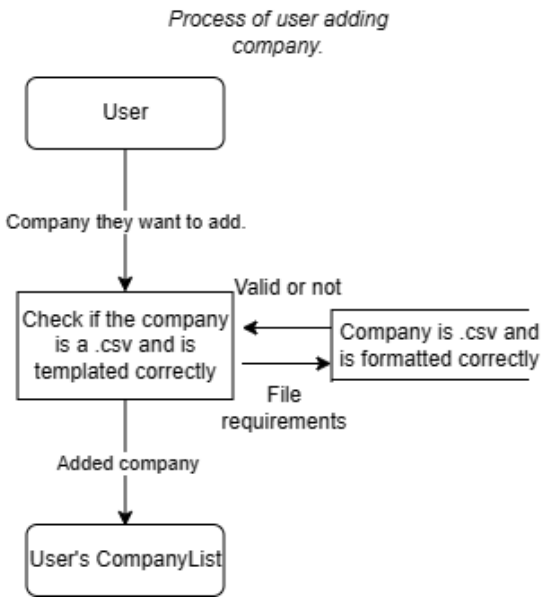
Data Flow



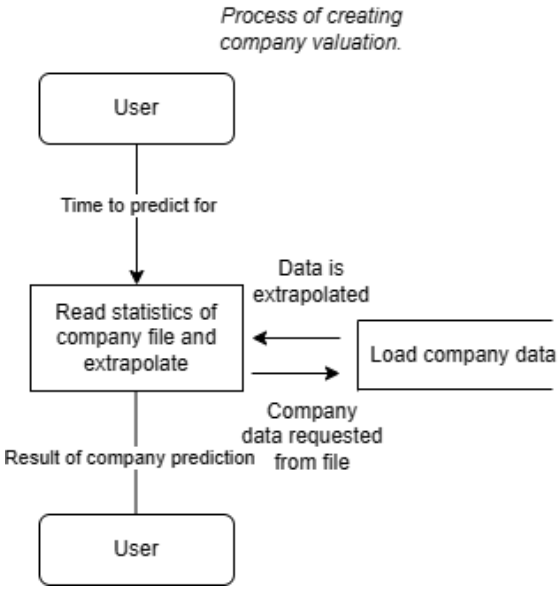
Data Flow 1 Process of user log in.



Data Flow 2 Process of merging companies.

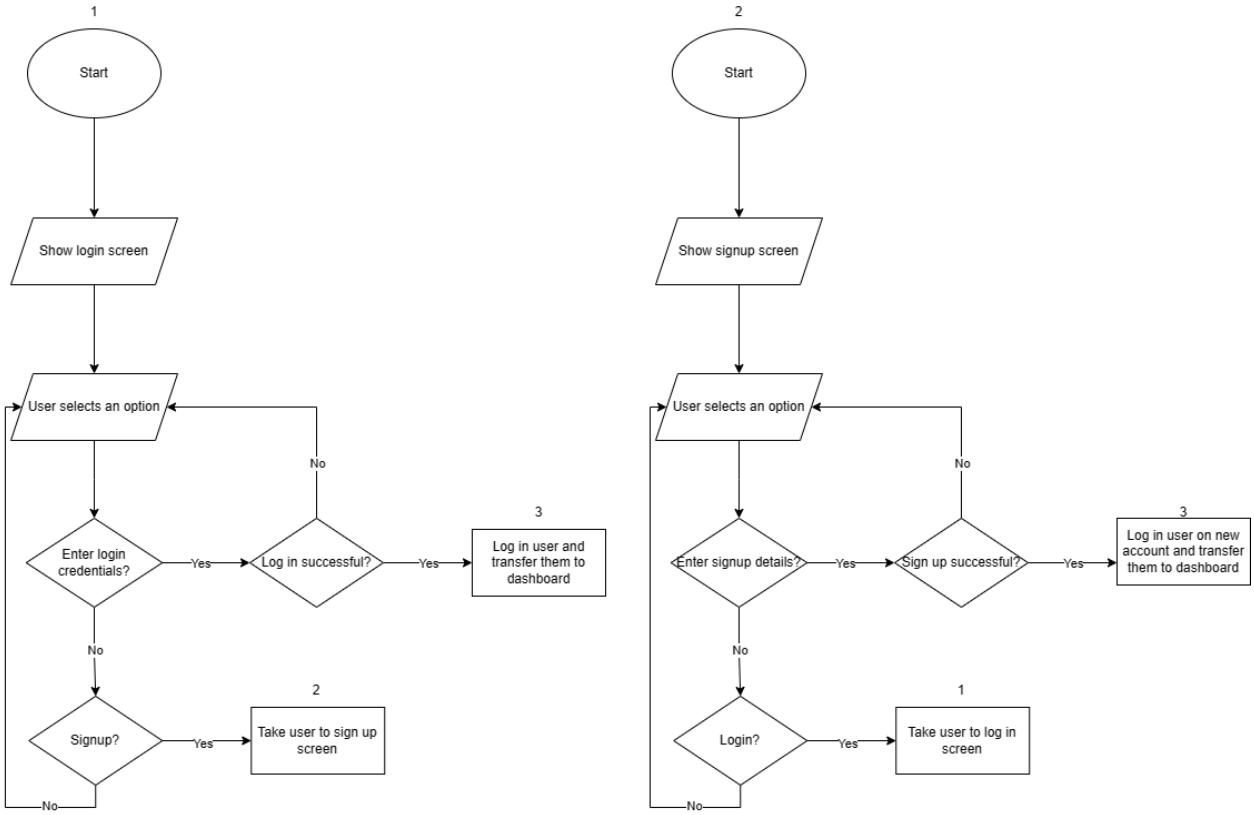


Data Flow 3 Process of user adding a company.

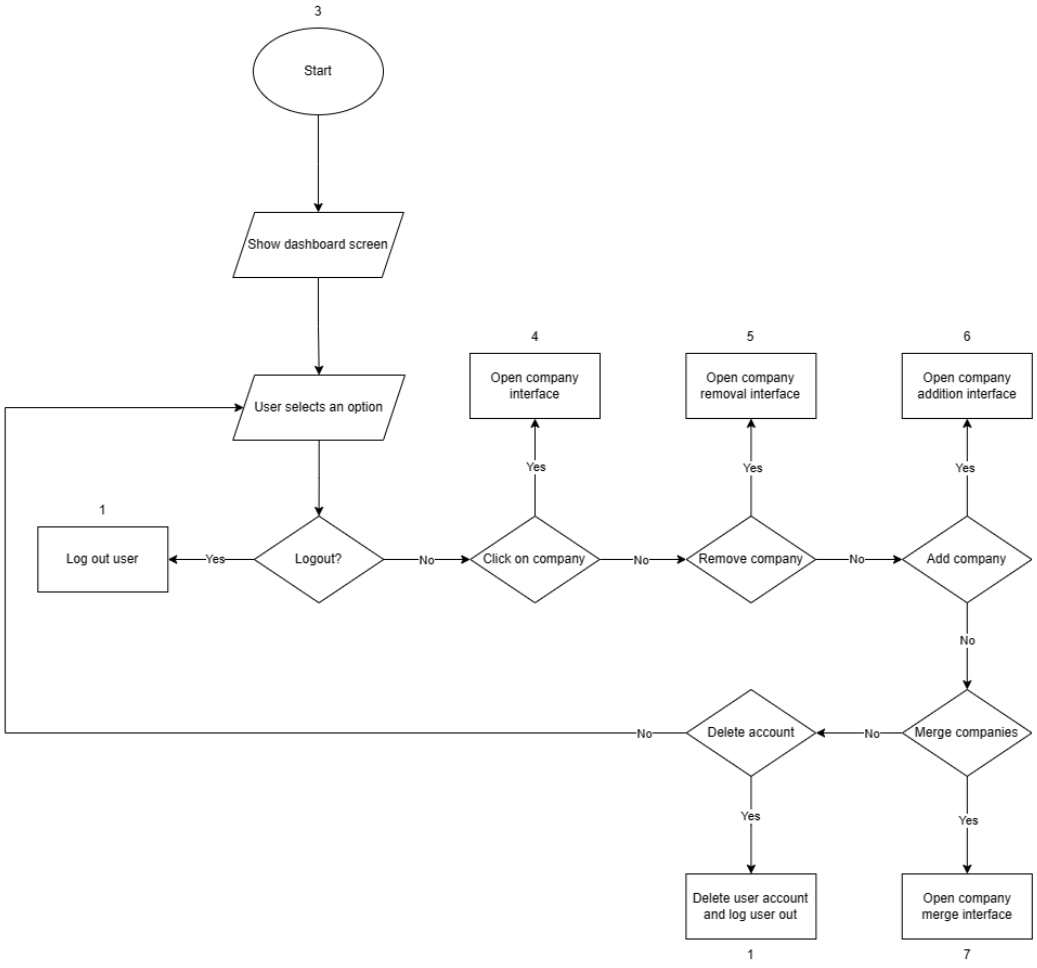


Data Flow 4 Process of creating company valuation.

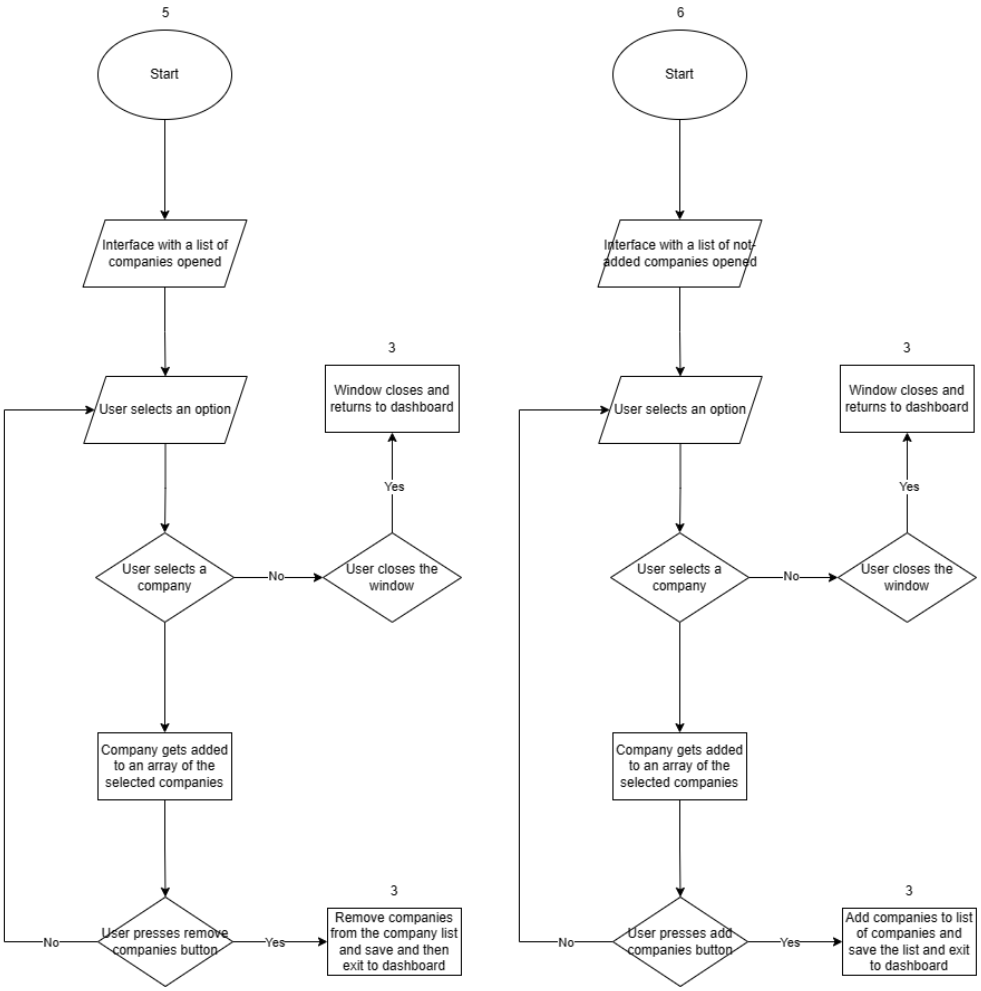
Flowcharts



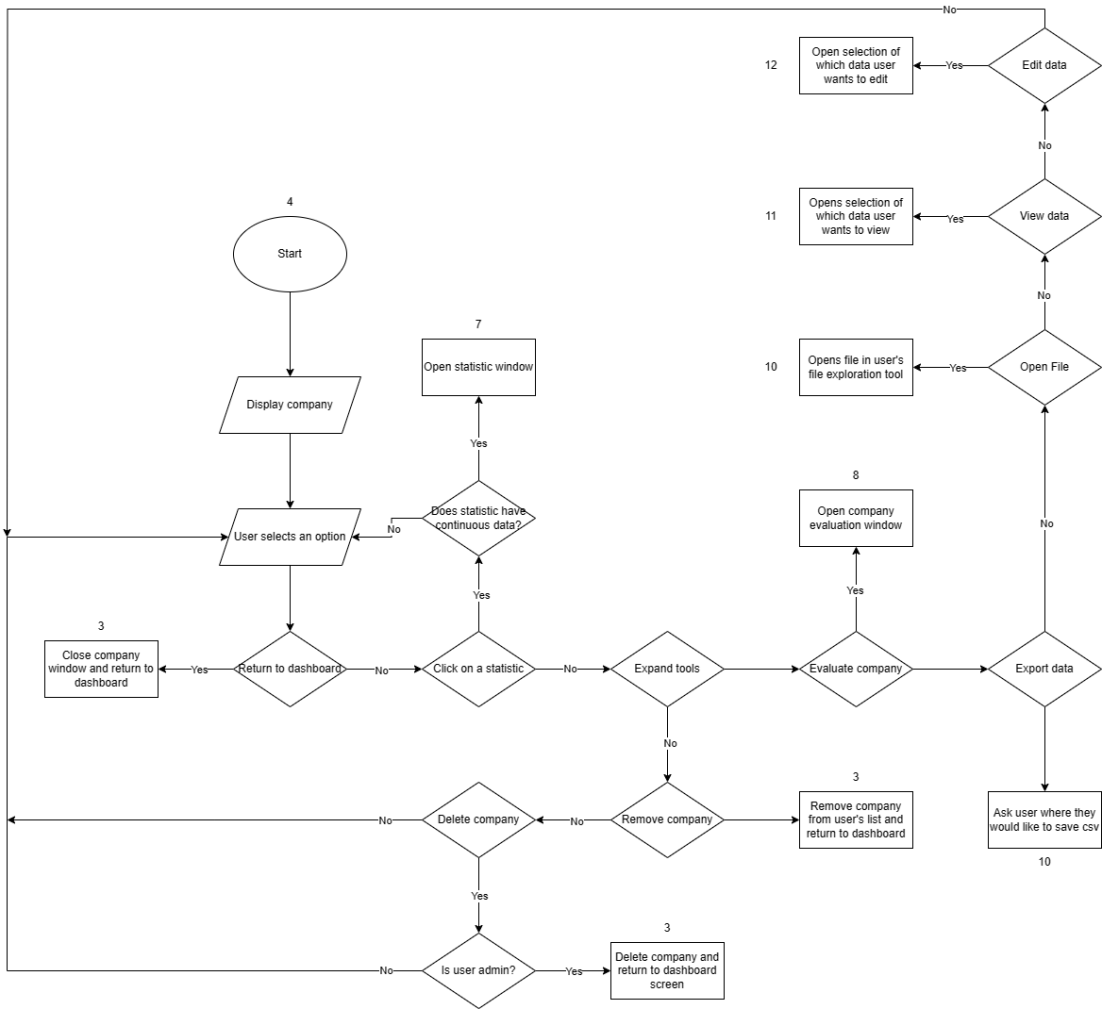
Flowchart 2 Initial screen.



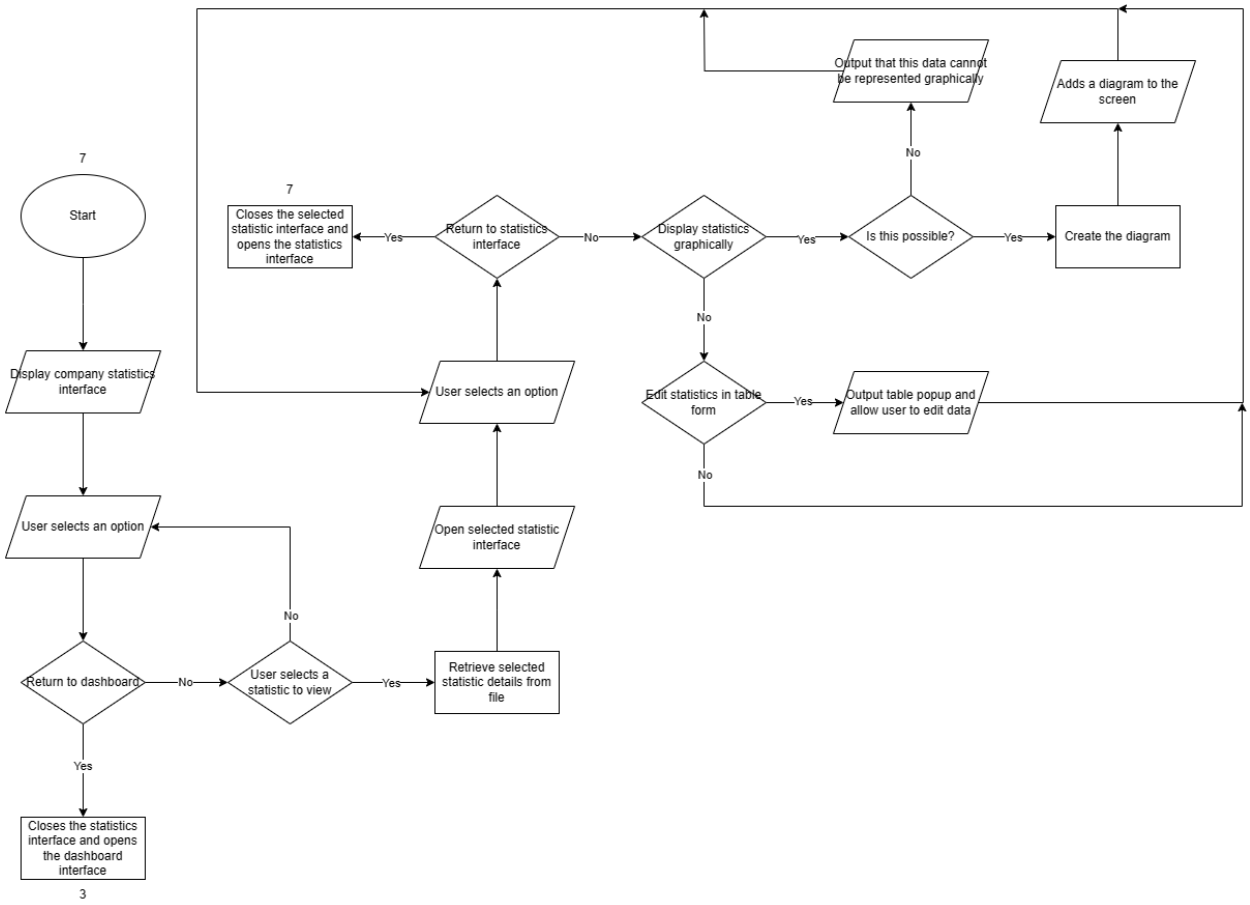
Flowchart 3 User dashboard.



Flowchart 4 Company addition and removal.



Flowchart 5 Company dashboard flowchart.



Flowchart 6 Company statistics interface.

Pseudocode

Data Linear Extrapolation

Pseudocode 1 Data linear extrapolation.

```
calculateLinearExtrapolationData(dataLastYear, month, nextYear)
    n = LENGTH(dataLastYear)
    sumX = 0
    sumY = 0
    sumXY = 0
    sumX2 = 0

    LOOP i FROM 0 TO n-1
        IF dataLastYear[i].month = month + 1 THEN
            x = dataLastYear[i].year
            y = dataLastYear[i].value
            sumX = sumX + x
            sumY = sumí + y
            sumXY = sumXY + x * y
            sumX2 = sumX2 + x^2
        ENDIF
    END LOOP

    exaggeratedFactor = 2.0
    slope = ((n * sumXY - sumX * sumY) / (n * sumX2 - sumX^2)) *
exaggeratedFactor
    intercept = (sumY - slope * sumX) / n

    projectedValue = intercept + slope * (nextYear + 1)

    RETURN NEW Data(month + 1, nextYear + 1,
ROUND(projectedValue))
END calculateLinearExtrapolationData
```

Preconditions

1. “dataLastYear” must be a non-empty ArrayList of Data objects.

2. Each data object in the “dataLastYear” ArrayList must have the attributes “month,” “year,” and “value” initialized.
3. “month” should be an integer between 1 and 12, where 1 corresponds to January and 12 corresponds to December.
4. “nextYear” should be a positive integer representing the future year for which the projection is to be calculated.

Postconditions

1. The function returns a new “Data” object representing the data point that was extrapolated.
2. The “value” attribute from the returned “Data” object holds the rounded result of the linear extrapolation.
3. The “value” is determined through linear regression and is exaggerated by a scale factor of 2.0 to project the future value of the data point.

Getting the Latest Complete Year

Pseudocode 2 Getting latest complete year.

```
getLatestCompleteYear()
    CALL readData()

    IF LENGTH(data) >= 12 THEN

        lastYear = data[LENGTH(data) - 1].year

        dataLastYear = NEW LIST FROM data[LENGTH(data) - 12 TO
LENGTH(data)]

        FOR EACH dataPoint IN dataLastYear
            IF dataPoint.year != lastYear THEN
                LOG name + " is not a full year."
                RETURN -1
            ENDIF
        END LOOP

        RETURN lastYear
    ENDIF

    RETURN -1  // If there are less than 12 datapoints
END getLatestCompleteYear
```

Preconditions

1. The call to “readData()” must be successful, meaning that the data for the Statistic object must be successfully read.
2. The “data” list needs to hold data in a chronological order. Additionally, each Data object must have the “month” and “year” attributes properly initialized.
3. For the function to perform as expected, it requires that there are at least 12 datapoints (a full year’s worth) to consider the latest year as complete.

Postconditions

1. If the function identifies 12 datapoints in “data” list that belong to the same year, the last full year that it finds is the year that is returned.

2. If the function returns -1 it means that it cannot verify a complete year as the latest one in the dataset. This scenario occurs if the dataset contains less than 12 datapoints in total or if there is not a single consecutive year within the dataset.

Data Combination

Pseudocode 3 Data combination.

```
FUNCTION combineData(data1, data2)
    combineData = NEW LIST

    data1copy = COPY OF data1
    data2copy = COPY OF data2

    FOR EACH dataPoint1 IN data1
        PRINT dataPoint1

        FOR EACH dataPoint2 IN data2
            PRINT dataPoint2

            IF    dataPoint1.year    =    dataPoint2.year    AND
dataPoint1.month = dataPoint2.month THEN
                REMOVE dataPoint1 FROM data1copy
                REMOVE dataPoint2 FROM data2copy

                combined    Value    =    dataPoint1.value    +
dataPoint2.value
                ADD NEW Data(dataPoint1.year, dataPoint1.month,
combinedValue) TO combinedData
            ENDIF
        END LOOP
    END LOOP

    ADD ALL data1copy TO combinedData
    ADD ALL data2copy TO combinedData

    SORT combinedData BY year, THEN month

    PRINT combinedData

    RETURN combinedData
END FUNCTION
```

Preconditions

1. Both the “data1” and “data2” lists are lists of “Data” object, each “Data” object containing the attributes of “year,” “month,” and “value”. These values must be initialized for the method to work.
2. The “data1” and “data2” lists must be initialized lists before the “combineData” method is called. They should not be “null”.
3. Although not strictly enforced by the method’s logic the lists should be in the correct order in ascending ordered first by “year” then by “month.”

Postconditions

1. The function returns a new list called “combinedData” containing all the unique data from “data1” and “data2”. If a “Data” object exists in both lists, a single combined data point is added with the value being the sum of the values from “data1” and “data2”.
2. Any data points that were combined due to having the same year and month are not included in their original form in “combinedData” meaning that duplicates are removed.
3. The output list is sorted first by the “year” attribute then by “month” attribute, ensuring that the data points follow a chronological order.
4. Both initial lists remain the same after the method, this being achieved by operating on copies of the original lists.

Testing Plan

Table 2 Testing plan outlining tests that will need to be performed on the program to ensure it meets success criteria.

Success Criterion Tested	Description of Test	Method of Test	Expected Outcome
1	Check if company can be added to user file.	• Open the file before adding. • Check contents of file. • Run program and open dashboard. • Press “Add Company” button. • Close program and check contents of user file.	• User file should have new company file name added.
	Test if companies can be deleted from user file.	• Open file before adding it, check contents. • Run program and open dashboard. • Open company that has been added. • Click “Delete” button. • Close program. • Open user file.	• User file should not have name of removed company file.

2	Check if all company data is stored on file.	• Open company file. • Check data. • Open program. • Perform action that would change data.	• Contents of company file altered.
3	Check if user inputs are valid.	• Input abnormal values into input forms in program.	• Program should output data is invalid. • You should be prompted to enter data again. • Or kicked out of input process.
	Check if existing username check is performed.	• Open signup interface. • Input existing username.	• Program should output that username already exists.
	Check if company file added by user is CSV file.	• Open main dashboard. • Go to add company. • Try to add a file of other file type.	• Program should output that the file is not CSV. • File should be rejected.
4	Check if interface is easy-to-use.	• Give a program to someone unfamiliar with the program. • Command them to perform simple task.	• They should be able to perform it without needing help. • Completion in a reasonable amount of time.
5	Check if documentation is embedded.	• Check if “i” button exists. • Check if it exists on all interfaces.	• Information should pop up. • Information for almost every

		• Click the button.	page should exist.
	Check if documentation is easily accessible.	• Check if the “i” button appears on every interface. • Open all main program interfaces. • Check top left corner for button.	• “i” button should be in top left corner. • True for all main interfaces.
		• Give program to user unfamiliar. • Ask them to open documentation.	• They should intuitively click “i” button to get documentation.
7	Check if company data is retrievable from opening file.	• Open company file.	• Company files should be readable by the user. • User should be able to edit file as well.
	Check if company data is retrievable by program from company file.	• Open program dashboard. • Add company.	• Company should be added. • Name should appear properly. • Name indicates data was loaded.
		• Open company dashboard. • Open statistics.	• If statistics are listed, it means data was loaded.

7	Check if statistics can be graphed.	• Open company panel. • Click on “Statistics” button. • Click on a statistic button.	• Popup with a graph of the data for that statistic should popup.
8	Check if user can edit basic company details.	• Open company dashboard. • Input new name, description, and country. • Click the button that updates the details.	• Open company file. • Company file should have new values.
9	Test if user can use program to estimate value of company.	• Calculate company value beforehand. • Open company dashboard. • Press the “Calculate Value” button. • Input number of years to predict for (enter 0).	• A popup should appear with estimated value. • The company value that you calculated earlier should somewhat align. • Or estimate should be reasonable.
10	Test if program can project company value.	• Open company dashboard. • Press the “Calculate Value” button. • Input random number of years. • Repeat.	• Every time different value should be predicted.

11	Test if merging works.	• Open company dashboard. • Click “Merge” button. • Select two companies to be merged. • Perform merge.	• New CSV file for merged company should be created. • New file should have combined statistics data.