Process	System roles					
	Human	Non-computing Hardware	Computing hardware	Software	Database	Communication & Network
Data entry and validation	**A. Data provider from the data sources** 1. Logs into the AQM system. 2. After logging in, Select the appropriate button for providing data form. 3. Enter the data list in the AQM system. 4. click on the save button to store the data. 5. if data is invalid then the system will show the error notification and also a cancel button ,by clicking on cancel button it will take them to the home page again, if the data is valid then it will save in the system. 6. Logs out from the system. **B. Data Entry Manager:**	**A. Paper and Stationery** 1. Paper is used by the Data Analyst Team for analyzing manual copy of data. 2. Data Analyst and Data Entry MAnager can print the data and keep a manual databese. **B. Data Sheet in Printed Version** 1. The data sheet can be collected as a printed version, by the Data Analyst and Data Entry Manager. **C. File Holder** 1. For holding the printed version of data sheets. **D. Cabinets** 1. Cabinets used to store the Data sheets .	**A. PC/Laptop/Other computing device** 1. Computers, Mouse, Keyboards used by data entry manager and data analyst for displaying, selecting, and inputting data on the AQM system. **B. Scanner** 1. Scanners to scan the data by the data analyst and data entry manager if they want to store the data manually. **C. Servers** 1. Database servers used by the AQM system for data providers,data entry manager and data analysts for data	**A. AQM system** 1. Validate the User. 2. It provides an interface for the data entry manager and data analysts for data entries. 3. The data providers from the data sources and the Data entry manager can use the AQM system to directly input their own data and generate reports for their own purposes. **B. Operating System** 1. Any Operating System used by the data providers,data analysts and the data entry manager like Mac, Windows,	**A. Database System of AQM system** 1. Collection of data is entered into a database system of AQM by the data providers and the data entry manager. **B. MS Excel files** 1. MS Excel files can be used to store the data by the data providers and the data entry manager. **C. MySQL** 1. The data providers can also use database systems like MySQL to store the raw data.	**A. Telecommunication** 1. Data entry manager can communicate with data providers for exchange of information or if any mishap occurs. **B. Internet Connection** 1. Internet connection used by data providers,Data entry manager for data entry to the AQM system or used by the Data analysts. C. **Mail** 1. Mails can be exchanged between the Data entry manager and data analysts

	1. Logs in to the AQM system 2. After logging in,Select the appropriate button for providing data form. 3. Enter the data in the AQM system. 4. Click on the save button. 5. If data is invalid then get the error notification,and also show the cancel button ,by pressing on cancel button it will bring them to the homepage again. If the data is valid the data will be saved. 6. If the data entry manager selects faulty data button then the data entry manager can see the list of faulty datas. 7. Logs out from the system.		entries **D. Router/ Internet Cables by ISP Providers/ Switch** 1. From the networking side, internet cables by the ISP providers or router or switch used by the data provider Data entry manager and data analysts.	C. **Application Softwar**e 1. Application software used by the data providers,data analysts and the data entry manager like MS Excel. **D. Scanning Software** 1. Data can be scanned by the data analysts and data entry manager if they want to store the data manually. **E. Printing Software** 1. Printingsoftware used for printing the data sheet like Printer Management or HP Print and Scan Doctor. F. **PDF Viewer** 1. Software used to view the PDF like WPS		if any mishap occurs. Data entry managers can also exchange mails to the data providers.
3. Data verification and update	**A. Data Analyst** 1. Logs into the	**A. Paper and stationary** 1. Papers used for	**A. PC/ Laptop/ Other computing device**	**A. AQI System** 1. The system	**A. Database of AQM System**	**A. Internet**

	AQM system 2. Once identified as a validated user by the system, he is allowed to enter the dashboard. 3. Views the data trend, graphs which were provided by the Data Source and Data Entry Manager into the AQM system. 4. Observes and analyzes the data trend and graphs thoroughly to start the process of verification. 5. While verifying , if the data in a particular period of time seems suspicious, he flags/ marks that particular point in the graph. 6. Write a comment beside the faulty data so that it's easier for the Data Entry Manager to understand where the problem lies. 7. Notifies the Data Entry Manager about the faulty data using the AQM system.	printing purposes by the Data Analyst. 2. Pen used by Data Analyst while signing the compiled manual document which was stored as a backup. **B. Seal stamps** 1. Used by Data Analyst to stamp the verified manual document **C. File holder** 1. For holding the printed version of the compiled verified physical document of data as a manual backup. **D. Cabinet** 1. It is used for storing the printed data version (the physical document) as a manual backup **E. Journal / Research Paper/ Books / Newspaper** 1. Data Analysts can use these to analyze when verifying data trends/ graphs. **F. Printed Datasheets** 1. Data Entry Manager can keep	1. Used by the Data Analyst to observe and analyze the data trend/ graphs. 2. Used by Data Analyst to store the verified and updated data in the computer as a backup. 3. Data Entry Manager also can store the CSV received from the Data Source in the computer as a backup. **B. Printer** 1. Used by the Data Entry Manager for printing the data sheet for manual backup. 2. Used by Data Analyst for printing the updated verified data for manual backup. **C. Server** 1. Database uses the server to store the updated air quality data	validates and verifies the users. 2. Provides an appropriate interface for the users. 3. Used for viewing the monthly Air Quality data trends/ graphs by Data Entry Manager and Data Analyst. 4. Stores data inputted by Data Entry Manager and Smart weather stations. 5. Stores flagged/ marked faulty data in the particular timestamp. 6. Stores the comments given by the Data Analyst beside the faulty data. 7. Used to send and receive notification from Data Entry Manager, Data Analyst, Data Source. 8. Converts the CSV form provided by Data Entry Manager into graphical representation using an in-built function. 9. System checks and validates the data provided by both	1. AQM database stores information of all the appropriate users.(this is useful while the system validates the user while logging in into the system) 2. AQM database stores data provided by Data Source, Data Entry Manager and Data Analyst. 3. After new data is inputted(to replace the faulty data in the particular timestamp) by Data Entry Manager and Smart weather station, Database is validated , verified and updated using the in-built function. 4. This update change is viewed by Data Entry Manager and Data Analyst. 5. After the faulty data has been validated and verified, the new updated and verified data is stored in the AQM database. **B. Physical log book** 1. Used by Data Analyst to store the verified and	1. Internet connection used by Data Source, Data Analyst, Data Entry Manager to log in, log out, viewing the AQM system. 2. Used when Data Entry Manager and Smart weather stations are inputting data into the AQM system. 3. Used when the AQM system is storing all the data. 4. Used when the Data Analyst is flagging/ marking the faulty data. 5. Used when the Data Analyst is commenting beside the faulty data. 6. Used when the AQM system automatically notifies Data Source, Data Entry Manager, Data Analyst and vice versa. 7. Used when AQM system updates the specified faulty data automatically

	8. Receives confirmation notification about the new validated and verified data changes from the Data Entry Manager. 9. Checks whether the changes made in the particular flagged/ marked point in the data trend seems correct or not. 10. If no further anomaly is found in the data trend/ graphs, he clicks on the saved button to store the verified updated data in the AQM system. 11. If an anomaly was found in the data trend/ graphs even after further verification, the Data Analyst will again inform the Data Entry Manager about the faulty data by flagging/ marking the particular timestamp. 12. Logs out of the AQM system. 13. Keeps the	the printed datasheets as a manual backup for future references(can use it to compare before after data if needed)	trends/ graphs. 2. The AQM System is hosted on the server. 3. The data in the AQM System is provided from the server. 4. AQM system uses the Database server to let Data Entry Manager, Data Analyst view/analyze/observe all the data trends and graphs. **E. Routers/ Internet Cables by ISP Providers** 1. From the networking side, internet cables by the ISP providers or router are used by the Data Analyst, Data Entry Manager.	the Data Entry Manager and Smart weather station using an in-built function. 10. Immediately gives error/ alert if data inputted does not match system's validation in-built function. 11. Requests Data Entry Manager to re-input correct dataset again in the particular timestamp where data failed to be validated. 12. Requests for data from Smart weather station for the particular timestamp where data failed to be validated 13. Update the data in the particular faulty timestamp 14. Store the validated, verified and updated data in the system. **B. Operating System** 1. Any operating system used by Data Entry Manager, Data Analyst . Eg : Mac, Windows, Linux etc **C. Application**	updated printed manual document as a manual backup. 2. Used by Data Entry Manager to store the printed datasheets as a manual backup for future references(if needed). **C. MySQL** 1. Data Entry Manager stores all the CSV files in the MySQL database to avoid losing it in the future. 2. Data Entry Manager stores the datasheets here. 3. Stores all the information related to air quality reports in the MySQL database. **D. Excel file** 1. Used by Data Analyst to store the specific timestamps where data was found faulty. 2. After the verification process has been executed, the Data	using the in-built function. 8. Used when the AQM system stores the updated and verified air quality report in the system.

	updated verified data in a form of manual document to ensure further backup. 14. Sign and seal the manual document to mark that these files have been verified. **B. Data Entry Manager** 1. Logs into the AQM system 2. Once identified as a validated user by the system, he is allowed to enter the dashboard. 3. Receives notification from Data Analyst about the faulty data in a particular timestamp. 4. Views the data trends/ graphs. 5. Sees that particular data has been flagged/ marked by the Data Analyst. 6. Read the comments written beside the faulty data. 7. Requests Data Source to provide data again for that particular			**Software** 1. Data Entry Manager can initially make a draft of the datasheet provided by the Data Source in MS Word/ Ms Excel. **D. PDF Viewer** 1. Data Analyst, Data Entry Manager can view the data trends / graphs in the pdf version. 2. Data Entry Manager can view the datasheet in PDF version. **E. Web- based Application Software** 1. Data Entry Manager, Data Analyst use browser to log in into the AQM system. 2. Data Entry Manager, Data Analyst use to view the data trends/ graphs. 3. Data Analyst use to store the verified and updated data on the AQM system. **F. Printing Software** 1. Printing software used for printing the	Analyst will simply mark the timestamps as being done.(through this technique, he is tracking and ensuring all the specified timestamps has been verified and updated)	

	timestamp where data was found faulty. 8. Receives new dataset from Data Source in CSV format. 9. Inputs the new dataset in the AQM System particularly where data was flagged/ marked. 10. Notifies Data Analyst about the updated changes in the data trend/ graph. 11. Logs out from the AQM system. **C. Data Source** 1. Receives request for recollecting data for a particular timestamp from Data Entry Manager and directly from the AQM system. 2. Gather air quality data from the enlisted sources for that particular timestamp. 3. Provides data by sending a dataset in CSV format to the Data Entry Manager. 4. Smart weather			data sheets by Data Entry Manager as manual backup. 2. Used by Data Analyst for printing updated and verified AQM air quality reports as manual backup.		

	stations directly provide data into the AQM system. **D. Internal IT Expert** 1. AQM system has its own IT experts who make sure data in the database is always protected from unwanted, unvalidated users. 2. Make sure the website is running smoothly without any lagging. 3. They have a backup ready in case of any power failure.					
Report generation	**A. Executives** 1. Executives log into the AQM system 2. Once they get into the system they will see a report button. 3. Click on that specific button to see the report. 4. Once they get into this there they will see all the reports. 5. First report will be the latest one and they can also	**A. Paper and Stationery** 1. Executives or software developers might also need to take notes on the report. 2. For manual verification and calculation pen and papers are used. 3. For printing purpose **B. PDF version** 1. Executives or software	**A. PC/ Laptop/ Other Computing Device** 1. Executives for viewing,downloading and giving feedback or list of changes to the software developers,and also giving the confirmation of final changes of the system. 2. Software developer for viewing,downloading and seeing the list of	**A. AQM System** 1. It provides an interface which stores the data and gives a report to the executives. **B. Operating System** 1. Any Operating System used by the executives and software devlopers like windows ,mac.	**A. AQM Database System** 1. To store the report into the AQM system by themselves as a record. **B. MySQL** 1. Executives and software developers can store the reports for further research purposes in MySQL	**A. Telecommunication** 1. Telecommunication like BTCL for phone calls or text messages by the executives or software developers for exchange of information or if any mishap occurs. **B. Internet**

	search the report by the date. 6. Once the specific report is showing they can click on that. 7. After clicking on that they will see the “download pdf” button,if they click there they can download the pdf of the report. 8. If they click on the “feedback” button there will show the text bar ,where they can write about their feedback to the developers after analyzing it. 9. If they select the cancel button then it will take them again to the homepage. **B. Software Developer** 1. Logs into the AQM system. 2. Once identified as a validated user by the system they are allowed to enter the dashboard. 3. Gets the list of changes as a	developers might need to download a pdf version of the report for analyzing. **C. Printed Version** 1. Executives or software developers might want to store the report as the printed version. **D. Cabinet** 1. For storing the report which was printed as manual backup by the executives or the software developers. **E File Holder** 1. For holding the printed version of the report stored by executives or the software developers	changes to the software developers,and also giving the changed report to the executives 3. Reports can be stored inside the computing device by Executives and software developers. 4. Can be used for searching for research purposes. **B. Printer** 1. For printing the report for manual backup. **C. Scanner** 1. To scan the report by the executives and software developers. **D. Routers/ Internet Cables by ISP Providers/ Switch** 1. From the	**C. Application Software** 1. Executives and software developers can view the report. **D. Web-based Application Software** 1. Executives and software developers will use browsers to login …… **E. Scanning Software** 1. Report can be scanned by the Executives and software developers if they want to store the data manually. **F. Printing Software** 1. Printing software used for printing reports as a manual backup by the Executives and software developers.	Database to avoid losing them. **C. Printed Version** 1. Printed version of the report can be stored as a manual backup by the Executives and software developers.	**Connection** 1. Internet connection used by executives or software developers for generating viewing the report. **C. Mail** 1. Mails can be exchanged between executives and software developers if any mishap occurs.

	feedback from executives. 4. Analyze the problems and try to solve the problems of the system. 5. Then continuously go through trial and error sessions with the new changes. 6. Once they have the best solution then they again report to the executives about changes done in the software. 7. If they get confirmation permission then they add the final changes to the system. 8. Otherwise, analyze the problems and try to make the best solution again.		networking side, internet cables by the ISP executives and software developers. **E.Card Reader** 1. For the executives and software developers.if they want to use this as a medium to transmit the report or store. **F. Server** 1. Database servers used by the AQM system for Executives and software developers to view data and generate the report..	**G. PDF Viewer** 1. To view the report in PDF version by the Executives and software developers		
4. Viewing	**A. Executives the developers** 1. Logs into the AQM system. 2. Once identified as a validated user by the system, he is allowed to enter the dashboard. 3. Views all reports,	**A. Paper** 1. Used for printing purposes by the Researcher, Policy Makers, Executives.	**A. PC/ Laptop/ Other computing device** 1. Used by Executives, Policy Maker, Researcher to view reports, data trends , graphs from the AQM system.	**A. AQI System** 1. The system validates and verifies the users. 2. Provides an appropriate interface for the users. 3. Used for	**A. Database of AQM System** **1.** AQM database stores information of all the appropriate users.(this is useful while the system	**A. Internet** 1. Internet connection used by Executives, Policy Maker, Researcher, Data Entry Manager to log in, log out,

	data trends/ graphs. 4. Checks whether the AQM system has data provided in every timestamp or not. 5. If data in a particular timestamp is found missing, he notifies the Data Entry Manager to input data there. 6. Logs out of the AQM system. **B. Policy Maker** 1. Logs into the AQM system.(user not validated as logged in as guest) 2. Enters the dashboard 3. Observes/ Analyzes Air Quality Reports, data trends/ graphs thoroughly. 4. Make their own policy level decisions. 5. Logs out from the AQM system. **C. Researcher/ General Viewer** 1. Logs into the AQM		2. Data Entry Manager stores the CSV received from the Data Source in the computer as a backup. 3. Data Entry Manager stores the datasheets in the computer as a backup. **B. Printer** 1. Executive, Policy Maker, Researcher can use it to print Air Quality reports, data trends , graphs. **C. Server** 1. Database uses the server to store the updated air quality data trends/ graphs. 2. The AQM System is hosted on the server. 3. The data in the AQM System is provided from the server. **D. Routers/ Internet Cables by ISP Providers** 1. From the	viewing the monthly Air Quality data trends/ graphs, reports by Data Entry Manager, Executives, Policy maker, researchers. 4. Stores validated and verified data inputted by Data Entry Manager and Smart weather stations. **B. Operating System** 1. Any operating system used by Data Entry Manager, Executives, Policy maker, researchers. . Eg : Mac, Windows, Linux etc **C. Application Software** 1. Policy Makers, Researchers can jot down important notes by using MS Word. 2. Executives can use MS Excel to list the timestamps where data was	validates the user while logging in into the system) 2. After new data is inputted in the missing timestamps by Data Entry Manager and Smart weather station, Database is validated , verified and updated using the in-built function. 3. This update change is viewed by the Data Entry Manager and Executive. 4. After the missing data has been validated and verified, the new updated and verified data is stored in the AQM database. **B. MySQL** 1. Data Entry Manager stores all the CSV files in the MySQL database to	viewing the AQM system. 2. Used when Data Entry Manager and Smart weather stations are inputting data into the AQM system. 3. Used when the AQM system is storing all the data. 4. Used when the AQM system automatically notifies Data Entry Manager, Executive and vice versa. 5. Used when the AQM system updates the missing data in the particular timestamp automatically using the in-built function. 6. Used when the AQM system stores the updated

	system.(user not validated as logged in as guest) 2. Enters the dashboard 3. Observes/ Analyzes Air Quality Reports, data trends/ graphs thoroughly. 4. Extracts information as much as needed for their research purpose. 5. Logs out from the AQM system **D. Data Entry Manager** 1. Logs into the AQM system. 2. Once identified as a validated user by the system, he is allowed to enter the dashboard. 3. Receives notification about the missing data in a particular timestamp from the Executives. 4. Notifies Data Source to provide data for that particular timestamp. 5. The process of Basic Data Entry is executed.		networking side, internet cables by the ISP providers or router are used by the Executives, Policy Maker, Researcher, Data Entry Manager.	found missing and then send this file to the Data Entry Manager. **D. PDF Viewer** **1.** Data Entry Manager,Executives, Policy maker, researchers can view the data trends / graphs , reports in the PDF version. 2. Data Entry Manager can view the datasheet in PDF version. **E. Web- based Application Software** 1. Data Entry Manager,Executives, Policy maker, researchers use browsers to log in into the AQM system. 2. Data Entry Manager,Executives, Policy maker, researchers use to view the data trends/ graphs , reports.	avoid losing it in the future. 2. Data Entry Manager stores the datasheets here. 3. Stores all the information related to air quality reports in the MySQL database. **C. Excel file** 1. Executives can use MS Excel to list the timestamps where data was found missing and then send this file to the Data Entry Manager.	and verified air quality report in the system.

	6. Notifies the Executives about the updated changes. 7. Logs out from the AQM system. **E. Internal IT Expert** 4. AQM system has its own IT experts who make sure data in the database is always protected from unwanted, unvalidated users. 5. Make sure the website is running smoothly without any lagging. 6. They have a backup ready in case of any power failure.			3. Data Entry Manager use to input missing data in the particular timestamp on the AQM system. **F. Printing Software** 1. Printing software used for printing the Air Quality reports, data trends, graphs by Data Entry Manager,Executives, Policy maker, researchers.		