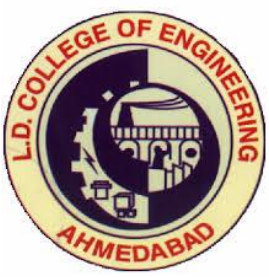

CERTIFICATE

This is to certify that work embodied in this report entitled **"CBA : Customer Behavior Analysis in Malls"** was carried out by **Group id:23143** (Computer) at L.D.College of Engineering, Ahmedabad (GTU code 028) for partial fulfillment of B.E. degree to be awarded by Gujarat Technological University. This research work has been carried out under my supervision.

Team members:

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Academic year (2017-2018)

Acknowledgements

The satisfaction that accompanies that the successful completion of any task would be incomplete without the mention of people whose ceaseless cooperation made it possible, whose constant guidance and encouragement crown all efforts with success.

We wish to thank **Prof. Pragnesh G. Patel** from L.D. College of Engineering for their active involvement at various stages of the project. We appreciate their valuable inputs in preparation of the Final Report. We wish to thank all of them who helped us to complete this project and report.

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GUJARAT TECHNOLOGICAL UNIVERSITY CHANDKHEDA, AHMEDABAD AFFILIATED L.D. College of Engineering A report on- Behavior analysis on mall culture Under subject of Final year Project B.E. IV, Semester-VIII (COMPUTER Branch) Submitted By: Group ID: 23143 Sr. Name of student Enrollment No Shukla Avani M. 140280107096 Shah Pinal P.

140280107087 Shah Sukruti R. 140280107089 Prof. Pragnesh G. Patel (Faculty Guide) Prof. D. A. Parikh (Head of the Department) Academic year (2017-2018) CERTIFICATE This is to certify that work embodied in this report entitled “Behavior analysis on mall culture” was carried out by Group id:23143 (Computer) at L.D. College of Engineering, Ahmedabad (GTU code 028) for partial fulfillment of B.E.

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1. Project Details

1.1 Definition

To develop a web application which can analyze tendency (facial behavior) of customers towards the products of mall or mart and generate report regarding the impact of the product in the market.

1.2 Basic Objective

The CBA will analyze facial behavior of the customers towards particular products. And according to that manage the products and location of the products in malls or marts to gain benefits for the customers and seller both. It will also generate the graphical representation of that behavior so that we can use that information to increase selling possibilities and thereby increasing profit.

1.3 Working principle

The system works on the principle of behavior analysis which is done using machine learning and image processing. The system will capture the face of the customer from the frame of the CCTV camera. Then the system will recognize the facial expression and product. And store that data to storage and derives result from such so many observations. The result is derived in form of a report which is accessible by the staff and admin. Thus same procedure is followed for every products in the mall or mart. The report gives idea about whether to keep the product at the same location or to relocate it.

- We have many footages of products available in the shopping mall or brand outlet stored in system.
- Admin can add new products and remove old ones.
- Admin can also add the staff members to the database so that the staff can analyze the footages.
- Once we start analyzing by pushing analysis button, we can see the execution of video analysis as well.
- Once analysis is done, one graph will be shown which will give the percentage numeric about the response of the customers.
- Also, the visual form of analysis will be stored in the computer so that the buyers can have good interface.
- Also, we can see previously analyzed videos to get the better idea about the product.

Thus the basic need of the system to work is machine learning.

2. Introduction

2.1 Background details

In a huge shopping mall or mart or shopping center, the whole campus is surrounded with the CCTV camera usually due to security purposes. Using this as a benefit to our system, we use CCTV camera to capture different frames of the mall to locate customers and products. Also mostly the malls and such big building have their own LAN connections so we get ease to get internet connectivity also. Also malls have computer systems for administration purposes. So, using all these facilities it becomes easy to set up the CBA in malls or marts.

2.2 The Overall Description

This web application is made in such a manner, so that proper analysis regarding customers' tendencies can be done. As sometimes it happens, due to lack of management of the products, customers stop visiting the malls and marts and due to this scenario some good brands also has to suffer the loss and also in some scenarios the mall gets closed which turn into a very huge property loss.

2.2.1 Product Perspective

CBA is an online application for analyzing customer tendency towards the products using behavior analysis. The website must work correctly in Chrome, Internet Explorer and Mozilla Firefox. As stated by the user, there are no software requirements beyond these including, but not limited to, memory or specific software packages that need to be utilized nor software packages that need not be utilized.

2.3 Literature Review

It is necessary to analyze the tendency of customers, what customers need, how they feel about the product for the benefits of customers and sellers both. If we do it manually, it becomes tedious to ask each, and every customer about their opinion and also there uncertainty about their opinion. So solution is to get the idea through their behavior.

To solve this problem, we are going to develop a web application called CBA (Customer behavior analyzer), which derives whether the customers like particular product or not. So that we can remove manual work and get effective results.

As of now, there is no such application with similarities to ours. There are some applications for facial recognition, application which provide statistical analysis, etc.

2.4 Tools and Technology

In CBA we will use Technologies like Machine learning, python, J2EE, Dlib Library, OpenCV, Flask. The tools which we will use are Eclipse-IDE, SQL-yog as Database client, MySQL as database server, PyCharm, Web-Services.

2.5 Environmental Characteristics

2.5.1 Hardware & Peripherals

Hardware Interface 1: The system should be use in any laptops or computer.

Hardware Interface 2: Laptops or computer should be connected to the internet.

Hardware Interface 3: CCTV camera is necessary!!

The system has no software interface requirements.

2.5.2 Users

Staff /Supervisor and Admin of shopping mall or mart or shopping center or brand outlet are primary users of the system.

3. Requirement Analysis

3.1 Functional Requirements

3.1.1 Registration

3.1.1.1 The system should allow admin to add staff Members.

3.1.2 Log-In

3.1.2.1 The system should allow staff members and admin to login.

3.1.2.2 It should redirect them to respective pages after verifying.

3.1.3 Manage Products

3.1.3.1 Admin and staff should be allowed to add and delete the product according to analysis given by the system.

3.1.3.2 Admin should be allowed to categorize(subcategorize) the products according to the tendency of customer.

3.1.4 Generate Report

3.1.4.1 The system should generate a report of the analysis of products.

3.1.5 Manage Videos

3.1.5.1 Admin and staff should be allowed manage videos of each products for the analysis.

3.1.5.2 The system should manage result of analyzed videos and store graphical representation of result.

3.2 Nonfunctional Requirements

Following are the System attributes or non-functional requirements required in the system.

3.2.1 Reliability

The system should not lose data on sudden internet connection loss. The system should be reliable and data should be replicated to ensure no data lose even if server crashes.

3.2.2 Availability

The system should be available all the time for its user.

The data must be synchronized with the remote database after every certain time period to ensure that the users are made available, updated data every time.

3.2.3 Security

Security is an important issue in the designing of this system. Because the details of users are stored in database.

Remote database must not be vulnerable to the hacker's attacks, it should be made secure by using firewall.

3.2.4 Maintainability

The application is online so when we want to maintain anything we have to put site offline.

The maintainability of site will be little bit hard but we have designed the application

in a way that it will be easy to maintain the application.

3.3 Performance Requirements

This system should work concurrently on multiple devices. The system should support 1000 users at time.

3.4 Behavioral Description

Event and actions:

i. Customers and staff registers themselves.

ii. Any customer can view ongoing schemes.
iii. Registered customers will get notifications for ongoing schemes.
iv. Admin manages staff.
v. Admin manages categories and subcategories of the products..
vi. Admin approves relocation of products.
vii. Staff and admin can access the analysis report generated by the system.
viii. Staff changes the location of product.
ix. Customers and staff can send feedback and post complaints.

3.5 Feasibility Studies

A feasibility study is a preliminary study undertaken to determine and document a project's viability. The results of this study are used to make a decision whether to proceed with the project, or table it. If it indeed leads to a project being approved, it will - before the real work of the proposed Project starts - be used to ascertain the likelihood of the project's success. It is an analysis of possible alternative solutions to a problem and a recommendation on the best alternative.

Three types of project feasibility have been considered:

i) Technical Feasibility
ii) Economic Feasibility
ii) Operational Feasibility

3.5.1 Technical Feasibility

System developed using java technology is secure, well known so we can get help easily through internet resources.

We have used this technology and similar types of tools that can be useful to develop this system.

3.5.2 Economic Feasibility

Economic feasibility is very important in development of the software for any company. Because it gives an idea, whether the project going to be developed can be completed at a cost affordable both by the client and developer. The availability of the required hardware and software used to develop our project makes it economically very feasible.

Also we are having all the other required resources needed for the project hence the project is feasible with respect to economy.

3.5.3 Operational Feasibility

Proposed System is beneficial only if they are turned into Information Systems that will meet the organization's operating requirements. This test of feasibility asks if the system will work when it is developed and deployed. Are there any major barriers to implementation?

We have many malls and marts in the all city so we can easily implement the project after its development.

3.6 Constraints

The application will need to synchronize data with the database stored at server and hence internet connection is required.

The system can potentially have more than thousands of users. It is unrealistic to provide training for everyone. Therefore, the system should be designed for easy to use, providing help instructions, and appropriate error messages.

3.7 Assumptions and Dependencies

The following is a list of assumptions and dependencies which would affect the software requirements, if they turned out to be false.

a. Users have basic understanding of computer devices and internet.
b. Users have internet access.
c. All cameras are in working mode and accessible by system.

4. Design Methodology and Implementation strategy

4.1 Scheduling

Month	Work carried	Deliverable	Milestones
June	Definition search, finalize project, basic tasks about project's tools and technologies.		
July	Learned technology Like JSP, J2EE, JDBC, JSTL, SQL.	Deliverable 1st finished	
August	Connection of java with database, core java, studied diagrams of projects, understood functionalities,		
September	Framework spring, form designing, data dictionary, CSS, java script, template.	Deliverable 2nd finished	
October	Completed documentation work, system architecture.		1st milestone finished.
November	Advance designing, Machine learning algorithms, template customization, template integration.		
December	On paper form designing, admin panel, designing admin panel static flow.	Deliverable 3rd finished	
January	Database schema,		

	relationships, verification, admin panel programming.		
February	Form integration, bug, error solving, template designing.	Deliverable 4th finished.	2nd Milestone finished.
March	Admin , Customer and staff module programming.	Deliverable 5th finished.	
April	Integration, error, bug solving, checking integration, testing	Deliverable 6th finished.	3rd Milestone finished.

Table 1. Scheduling

4.2 Ideation Canvas

Fig. 4.1 Ideation Canvas

Ideation canvas is subject to the idea of the project.

Idea goes like capturing of customer and product.

Recognising expression and according to that deriving impact of the product in the market.

Also the system needs to generate a report on the analysis so that staff can easily relocate the products.

4.3 Product development canvas

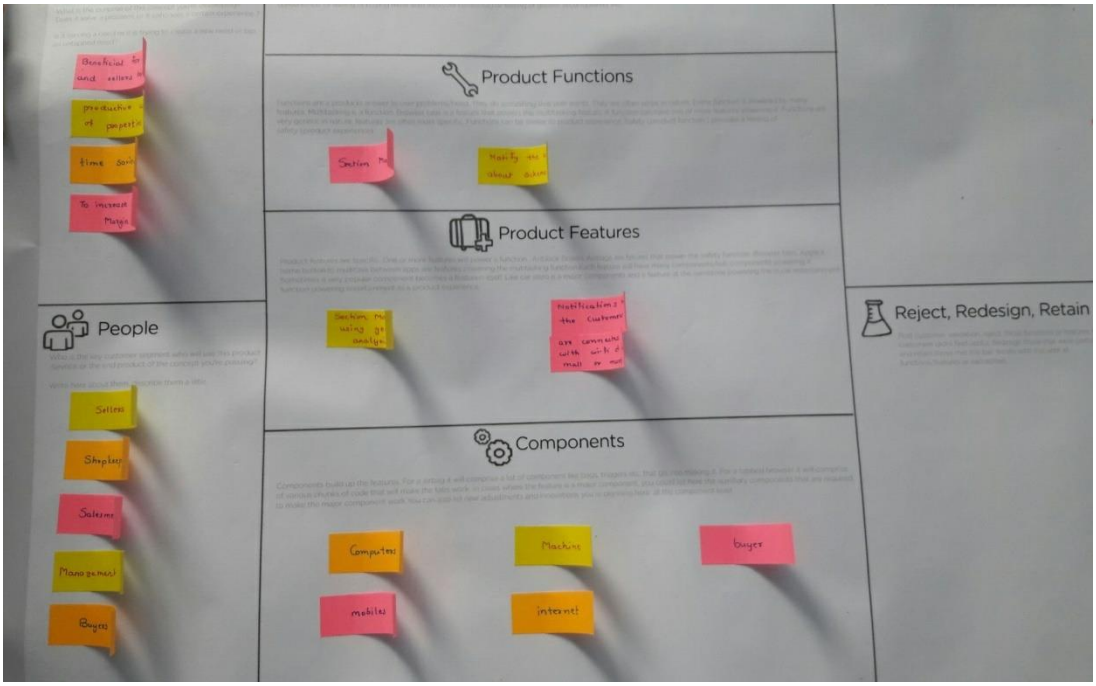

Fig. 4.2 production Development Canvas

Purpose

To analyze the impact of product in market using machine learning and generate report regarding the analysis

People

Important entity is customers. Staff and admin are subject to manage the system

Components

Computer, machine, mobile and internet are used as components

Functions

Captures frame from CCTV camera, detects expressions and generates report of analysis.

4.4 AEIOU summary

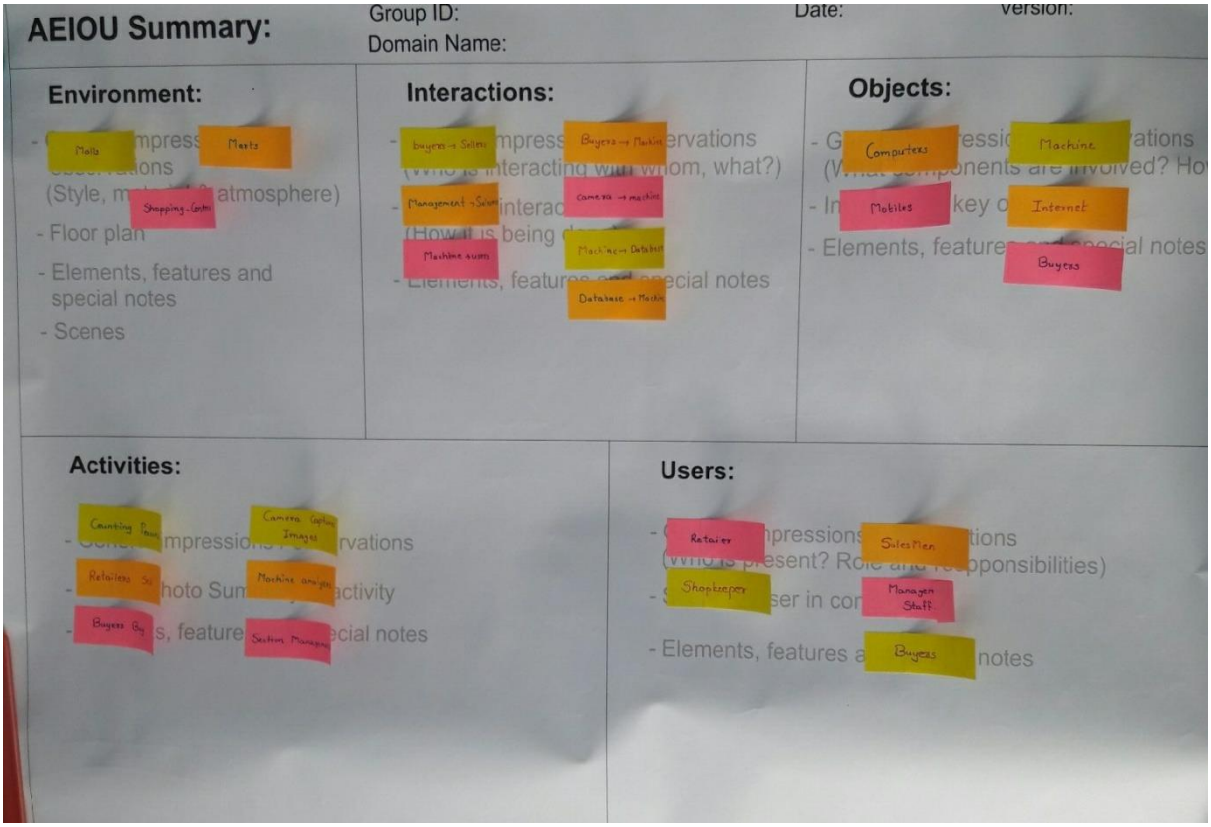

Fig. 4.3 AEIOU Summary

Activities shows the acts occur at the location where the system is to be implanted. For CBA activities done are video capturing, analysis of facial expression and identifying the product.

Environment shows the surroundings of the location which can be mall or mart.

Interaction shows how the system would interact with the users or other devices. For our project interaction can be customer to staff, camera to machine,machine to staff, staff to admin/manager,etc.

Objects are camera, system, users.

Users are admin, staff, customers etc.

4.5 Empathy mapping

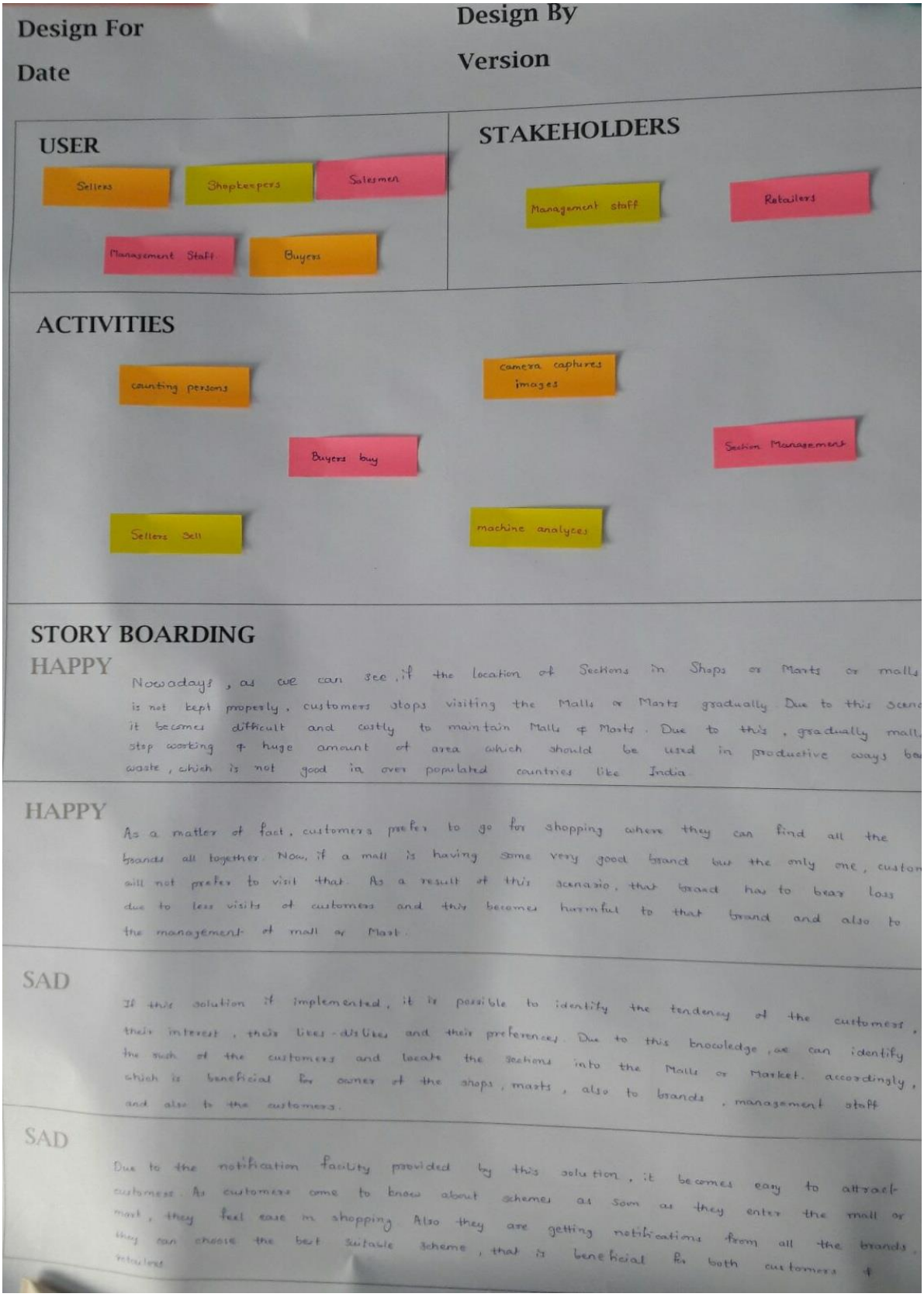

Fig. 4.4 Empathy Mapping

4.6 Data Dictionary

Tbl_login

Column Name	Data type	Length	Constraint
Login_id	Int	6	Primary Key
username	Varchar	30	Not null
Password	Varchar	20	Not null
User_type	varchar	20	Not null
enabled	Boolean	1	Not null

Tbl_output

Column Name	Data type	Length	Constraint
Output_id	Int	6	Primary Key
Video_path	Varchar	100	-
Image_path	Int	100	-
Video_id	Int	6	Foreign key

Tbl_staff

Column Name	Data type	Length	Constraint
Staff_id	Int	6	Primary Key
First Name	Varchar	20	Not null
Last Name	Varchar	20	Not null
Login_id	varchar	6	Foreign Key
Address	varchar	50	Not null
Phone_No	Int	10	Not null
Post_id	Int	6	Foreign key

Tbl_postInfo

Column Name	Data type	Length	Constraint
Post_id	Int	6	Primary Key
Post_Name	Varchar	10	Not null
Description	Varchar	100	Not null

Tbl_videoInfo

Column Name	Data type	Length	Constraint
Video_id	Int	6	Primary Key
Video_Name	Varchar	10	Not null
Video_path	Varchar	100	Not null
Product_id	Int	6	Foreign Key

Tbl_product

Column Name	Data type	Length	Constraint

Product_id	Int	6	Primary Key
Product_name	Varchar	20	Not null
Description	varchar	100	Not null

Table 2. Data Dictionary

4.7 UML Diagram

4.7.1 Data Flow Diagram

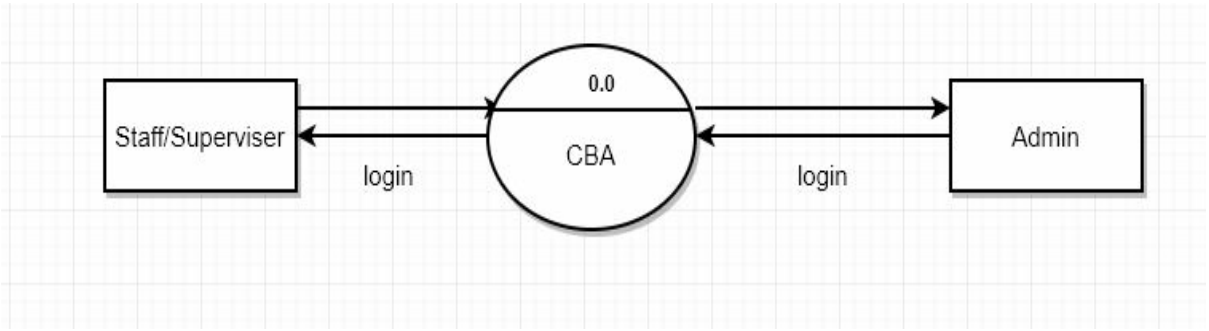

Fig. 4.5 Data Flow diagram level-0

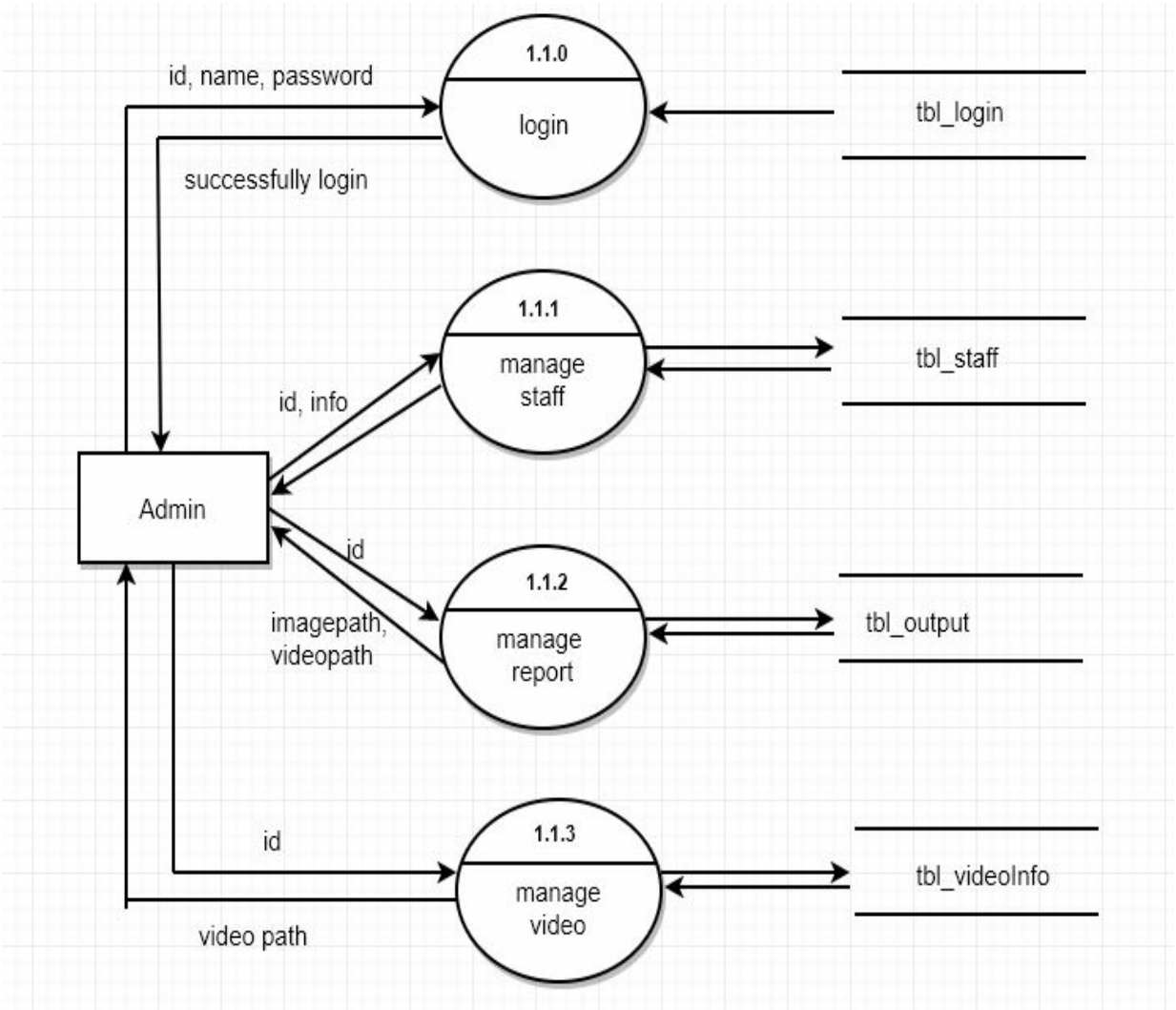

Fig. 4.6 Data Flow diagram level-1 for Admin

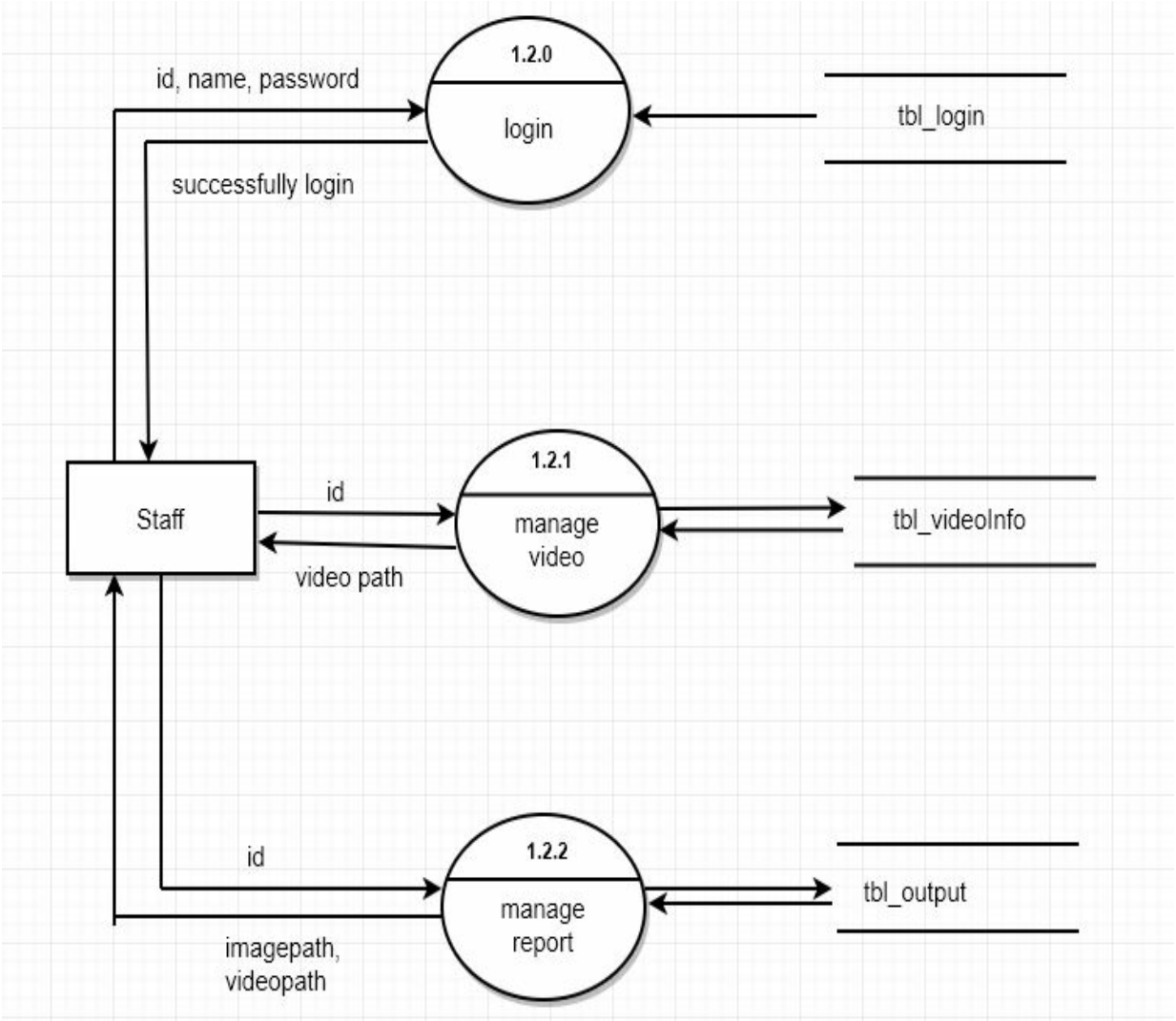

Fig. 4.7 Data Flow diagram level-1 for staff

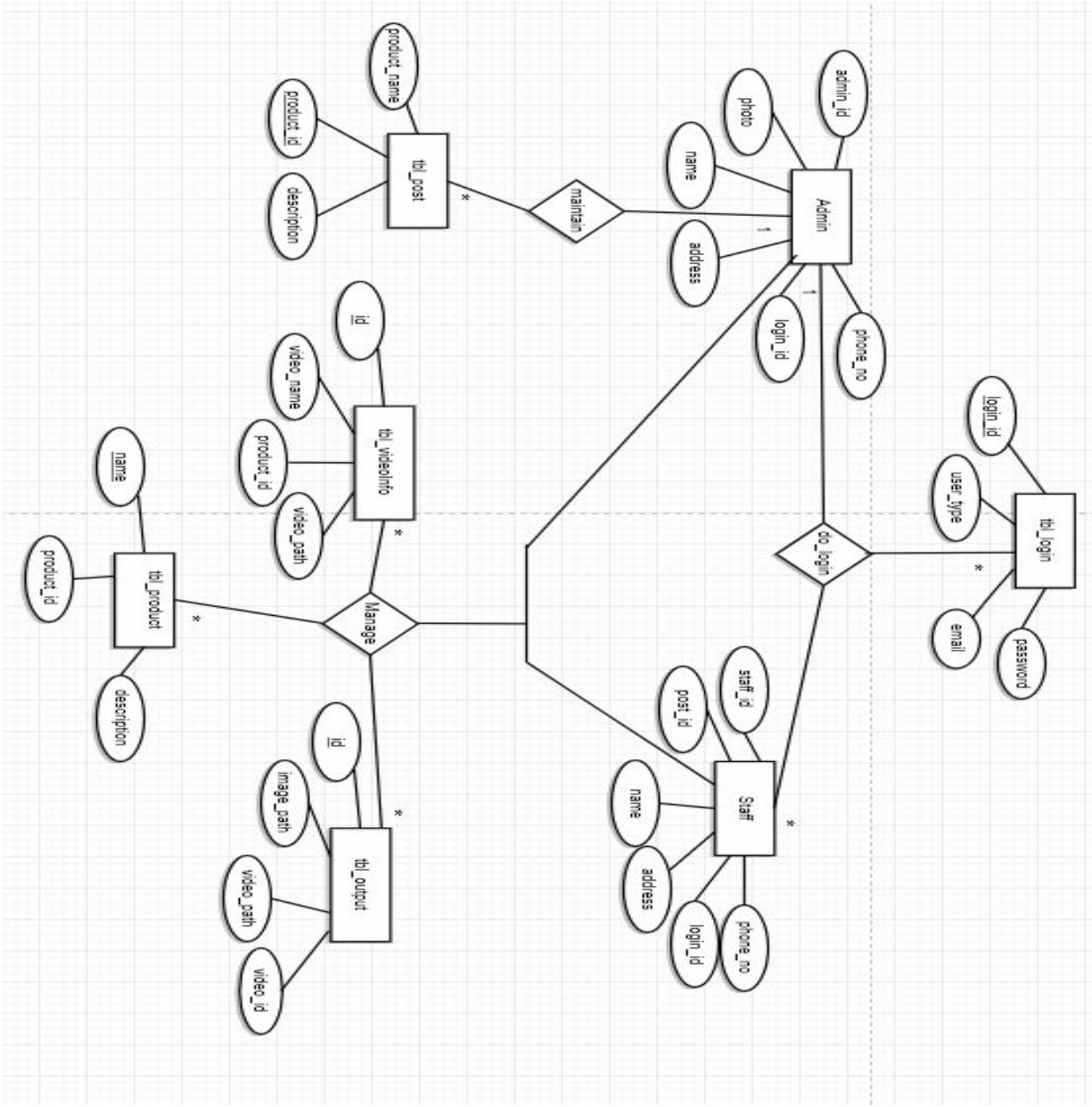

Fig. 4.8 ER diagram

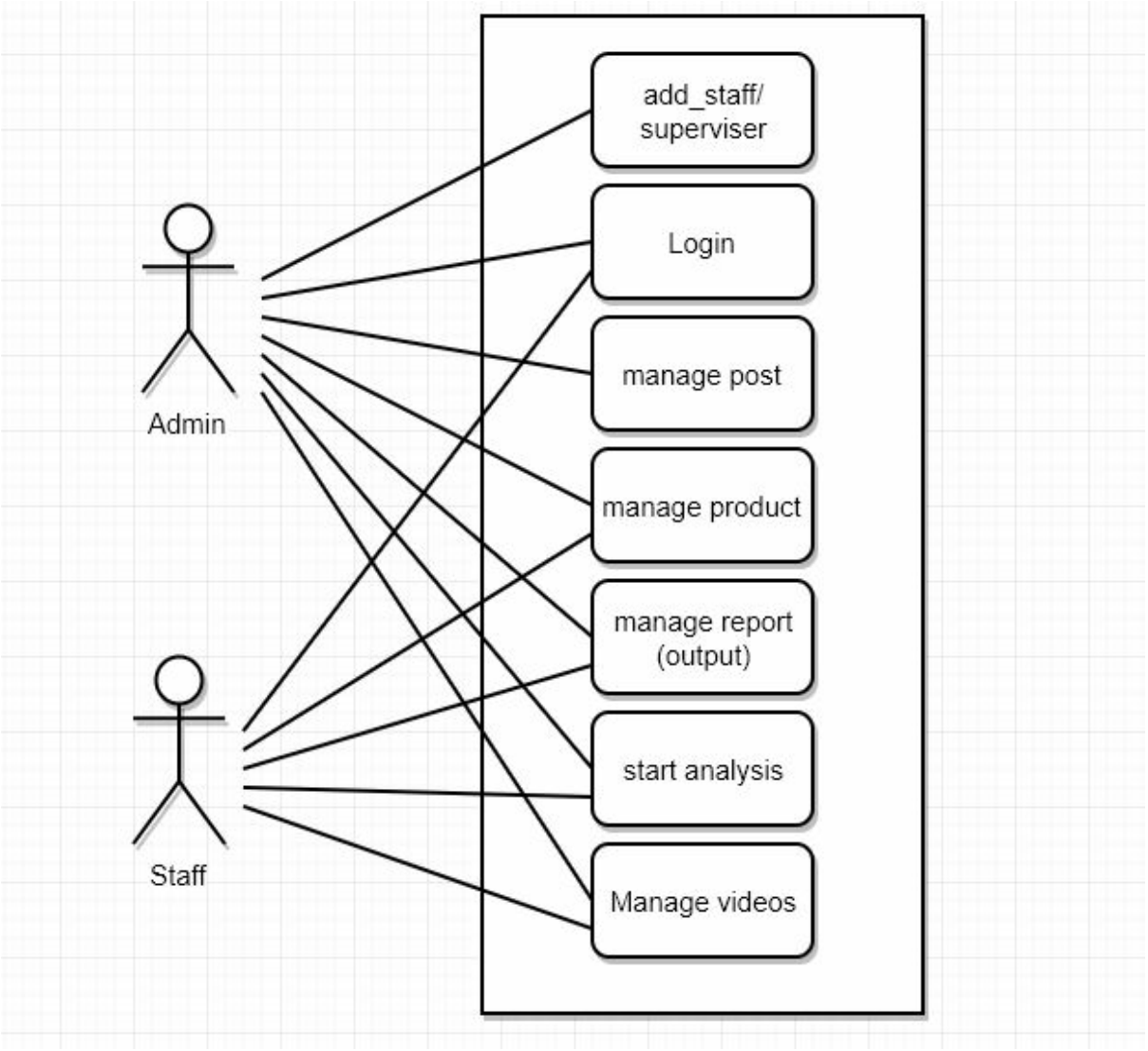

Fig. 4.9 Use Case diagram

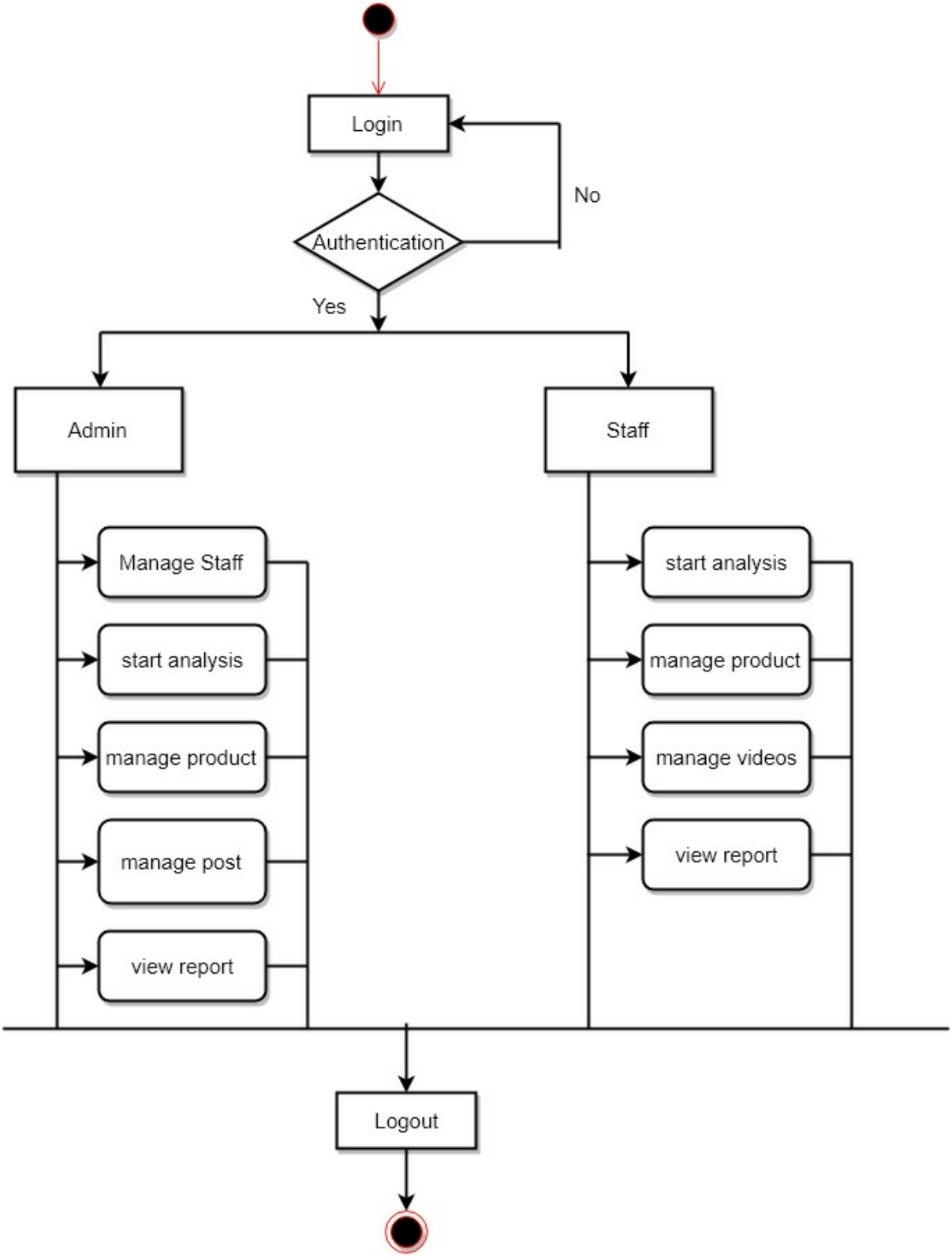

Fig. 4.10 Activity diagram

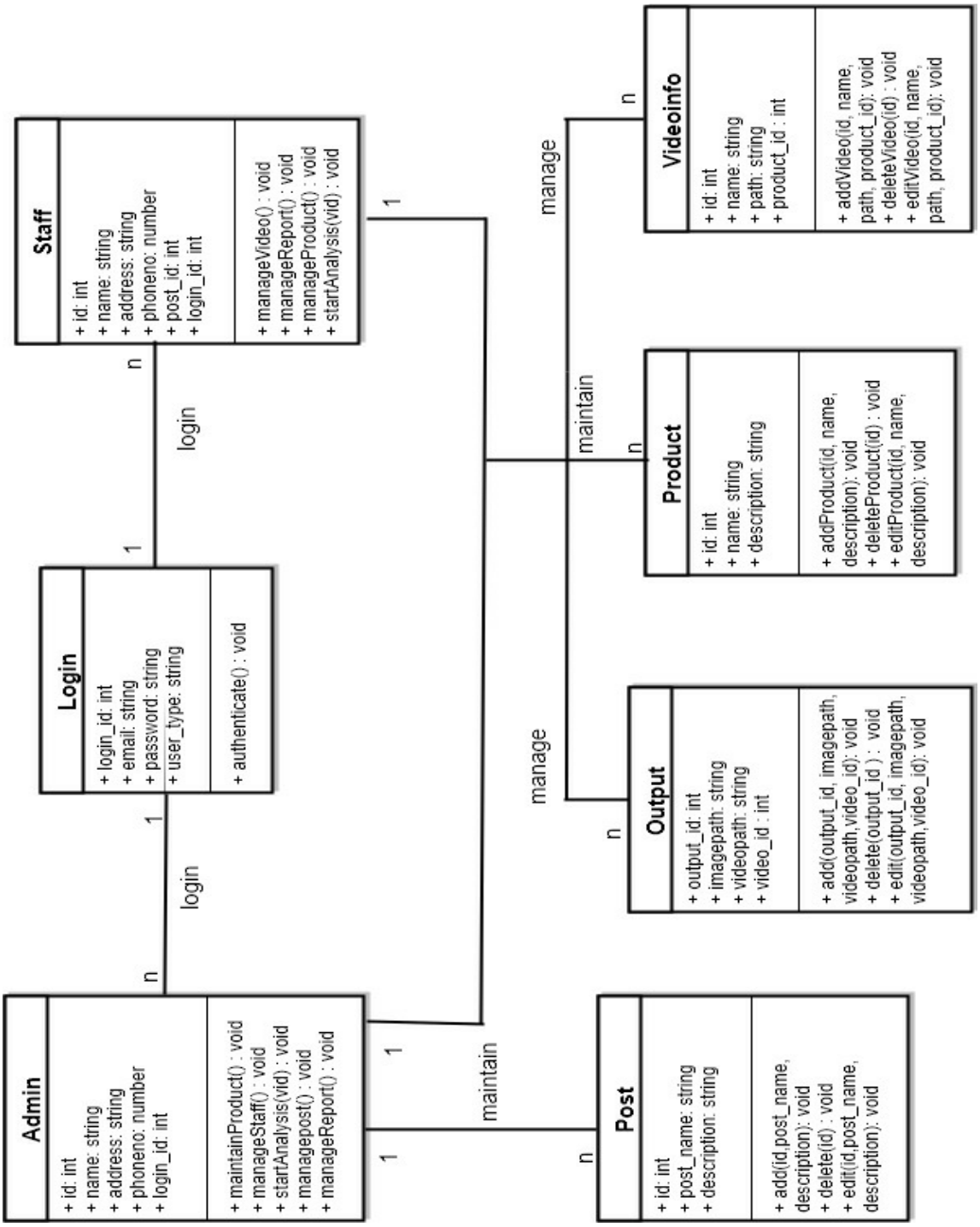

Fig. 4.11 Class Diagram

5. Implementation

Implementation of our web application is basically divided into 2 parts:

1) Designing
2) Business logic

1) Designing:
   We have used Spring MVC for developing our web application. We have divide the design in two major modules. Those are:
   a) Admin module
   b) Staff module

   a) Admin module:
      - To log into the web application, we have created login.jsp page, which automatically is loaded when the application is opened.
      - In admin module, we have created JSP pages to manage the tables datasetinfo, output, postinfo, superwiserinfo, videoinfo, superwiserlogininfo, superwiserregisterinfo.
      - We have different JSP pages to add, delete and edit records in above mentioned tables using forms.
      - Even we have JSP pages for header and footer of the web application, so that we can include them to any page easily.
      - We have a separate JSP page for starting the analysis of the video named startanalysis.jsp which leads the control to the business logic of the web application.
      - To receive the outcome of the analysis of the video from the business logic written using python language, we have used flask web services and implemented it using AJAX. Also for output we have viewoutput.jsp page in admin module.

   b) Staff module:
      - To log into the web application, we have created login.jsp page in staff module as well.
      - In staff module, we have created JSP pages to manage the tables productinfo, videoinfo.
      - Even staff should be able to carry out the analysis therefore we have kept the JSP page to start the analysis in staff module also.
      - We have JSP pages for header and footer of the web application, so that we can include them to any page easily.
      - Also for output we have viewoutput.jsp page in staff module too.

2) Business logic:
      - We have developed the business logic using python language. As python provides many open source libraries. Using those libraries, face detection, face recognition becomes very much easy and efficient.
      - To use the machine learning algorithms, we need to provide dataset to the algorithm to train the machine.
      - The machine creates a model from the given training data, which we can use to test the data.
      - Here we have given dataset of images to train the model. Those images are of different emotions of human face like happiness, sadness, anger, surprise, neutrality etc.
      - The machine takes the frames of the video to be analyzed as images. According to the trained model, it derives what expression is there on the test image.
      - We have here used classification algorithm of machine learning technology.
      - We have used dlib and openCV libraries of python, using which we can get the 68 features of

- the human face. Now by deriving the distance of those features we can get the type of expression of human face. For example, if the distance between the feature points of lips is more than 20 pixels, we can say person is smiling and that is why person is happy.
- Our application takes one frame and derives all the human expressions in that frame and takes average of it and likewise it process all the frames.
- We have shown the graph of expressions, which is the response of the customer towards the product in graphical form.
- The execution of the logic is shown in video format.
- By increasing the dataset, we can increase the accuracy of the output.

5.1 Snapshot

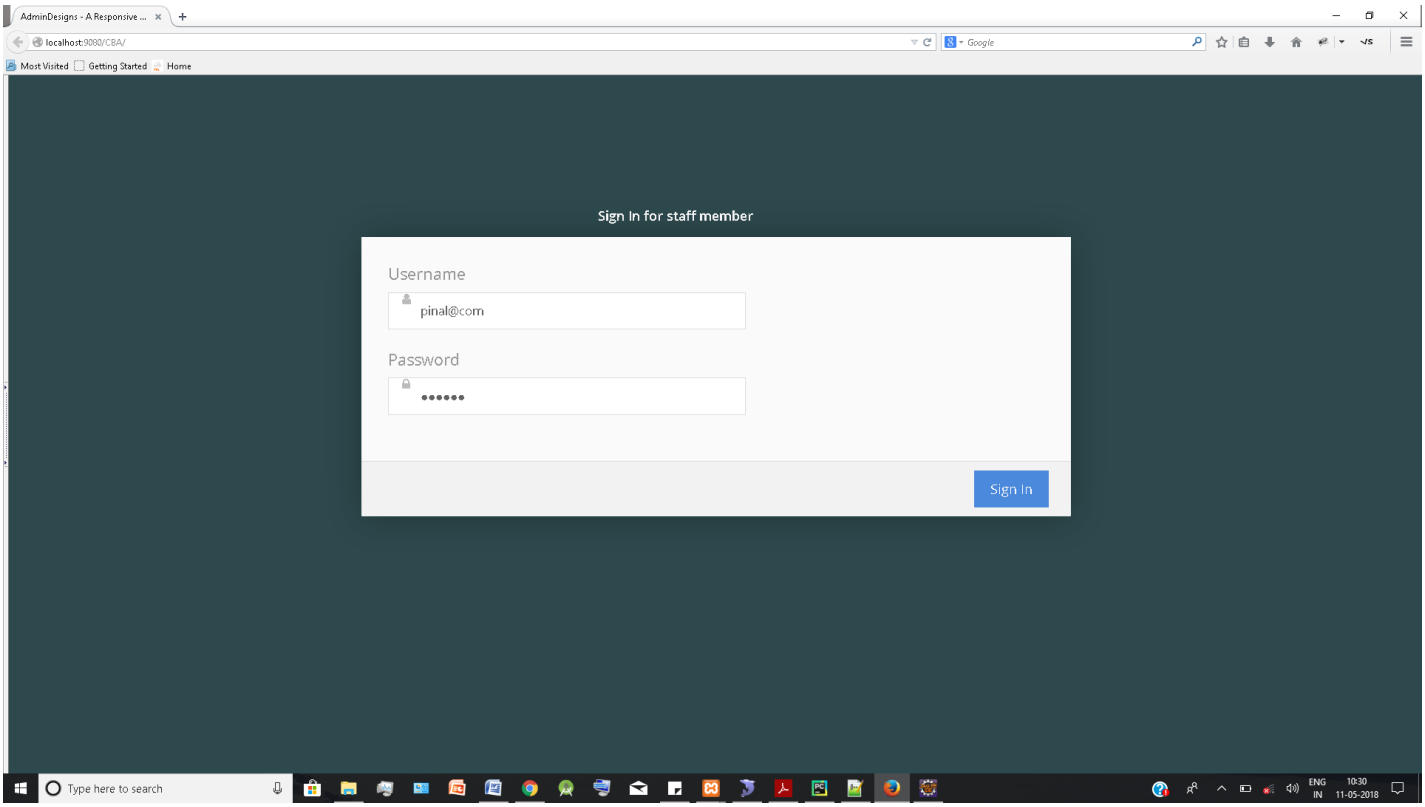

Fig. 5.1 Login Page

Fig. 5.2 Dashboard Of Admin

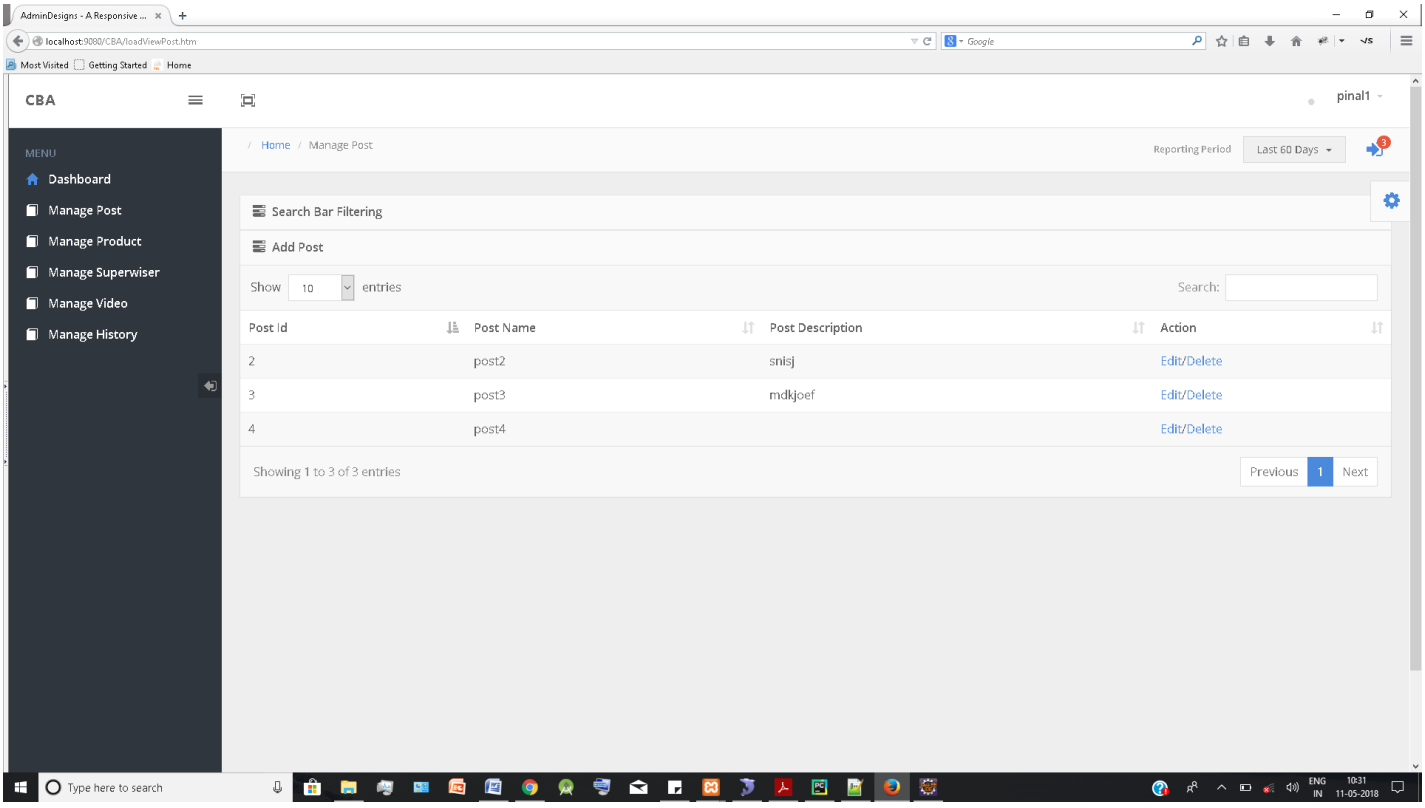

Fig. 5.3 Manage Post

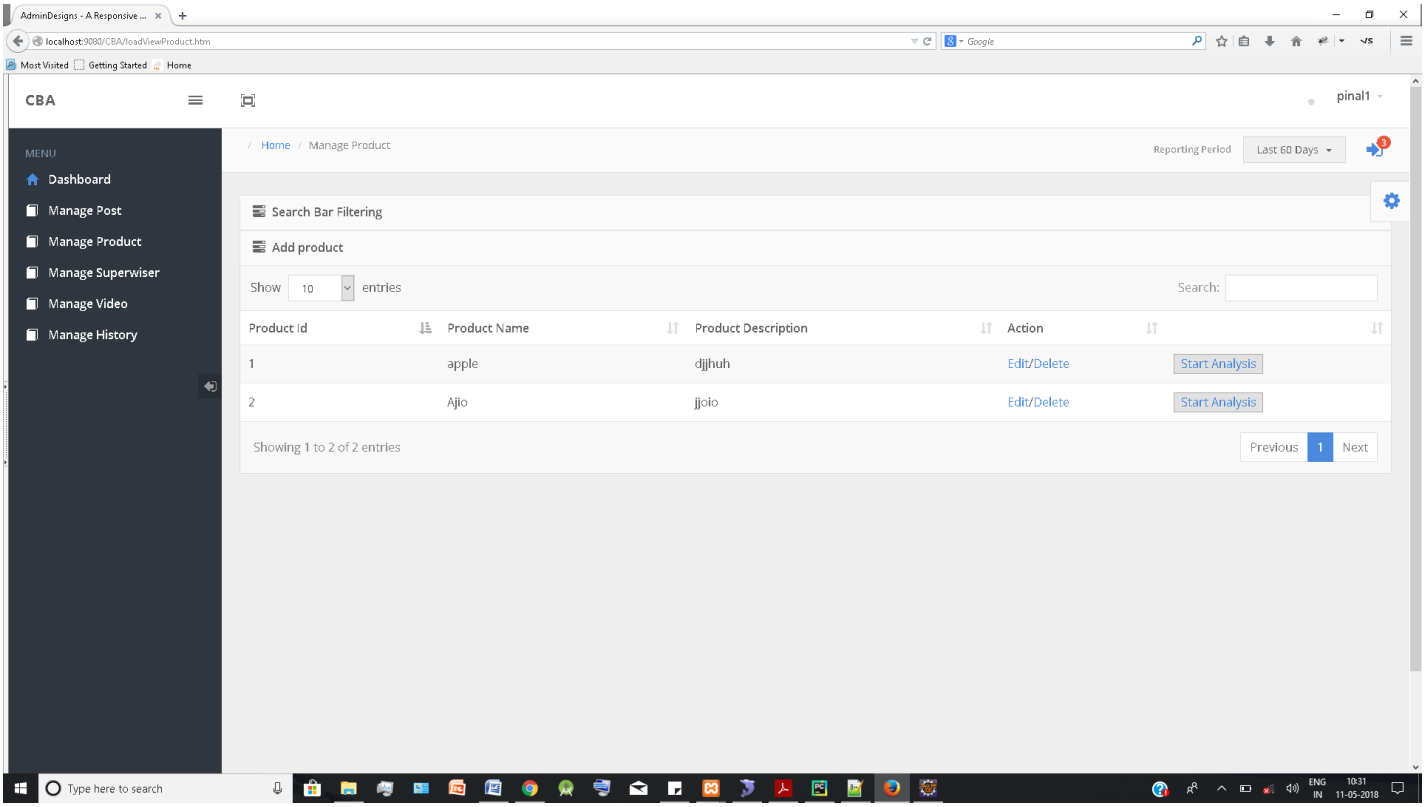

Fig. 5.4 Manage Product

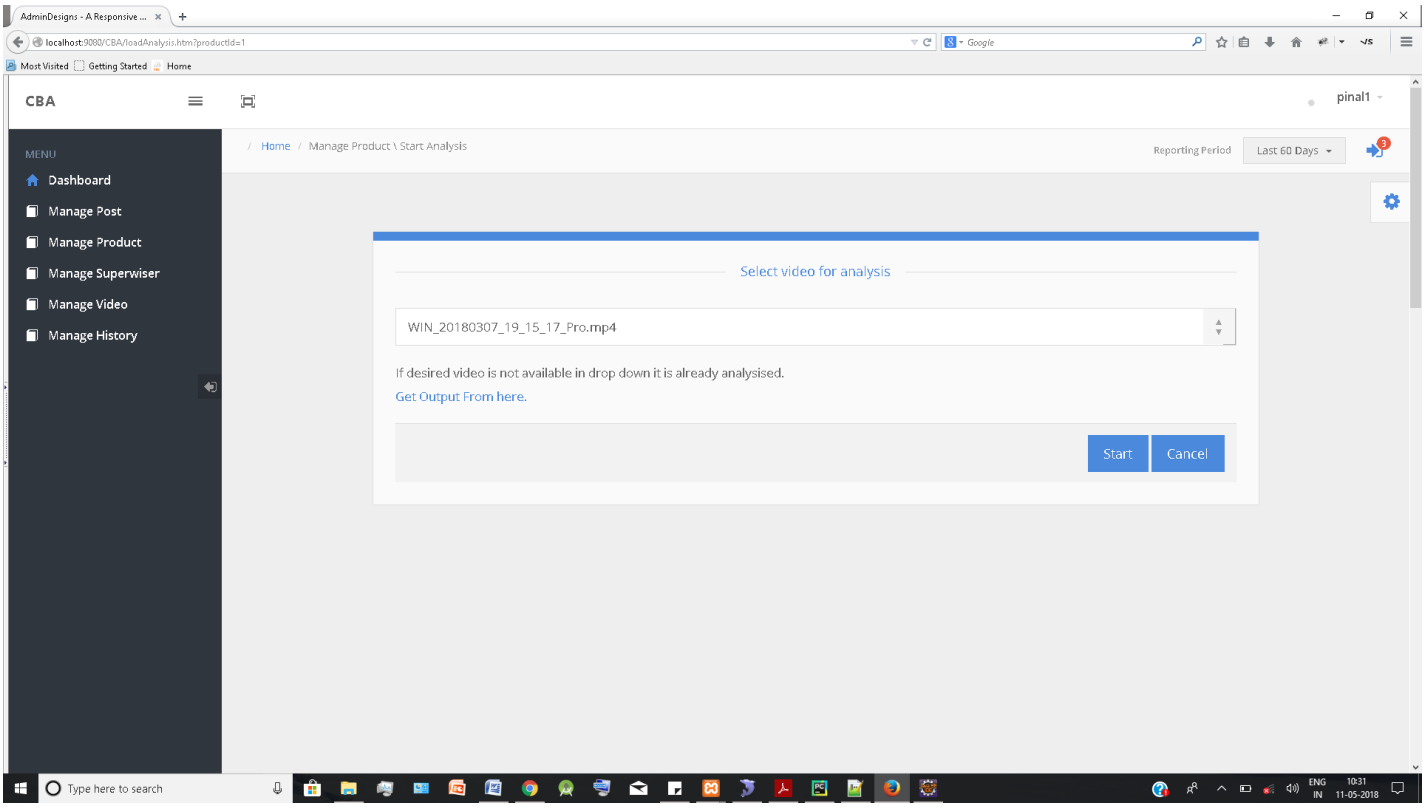

Fig. 5.5 Start Analysis

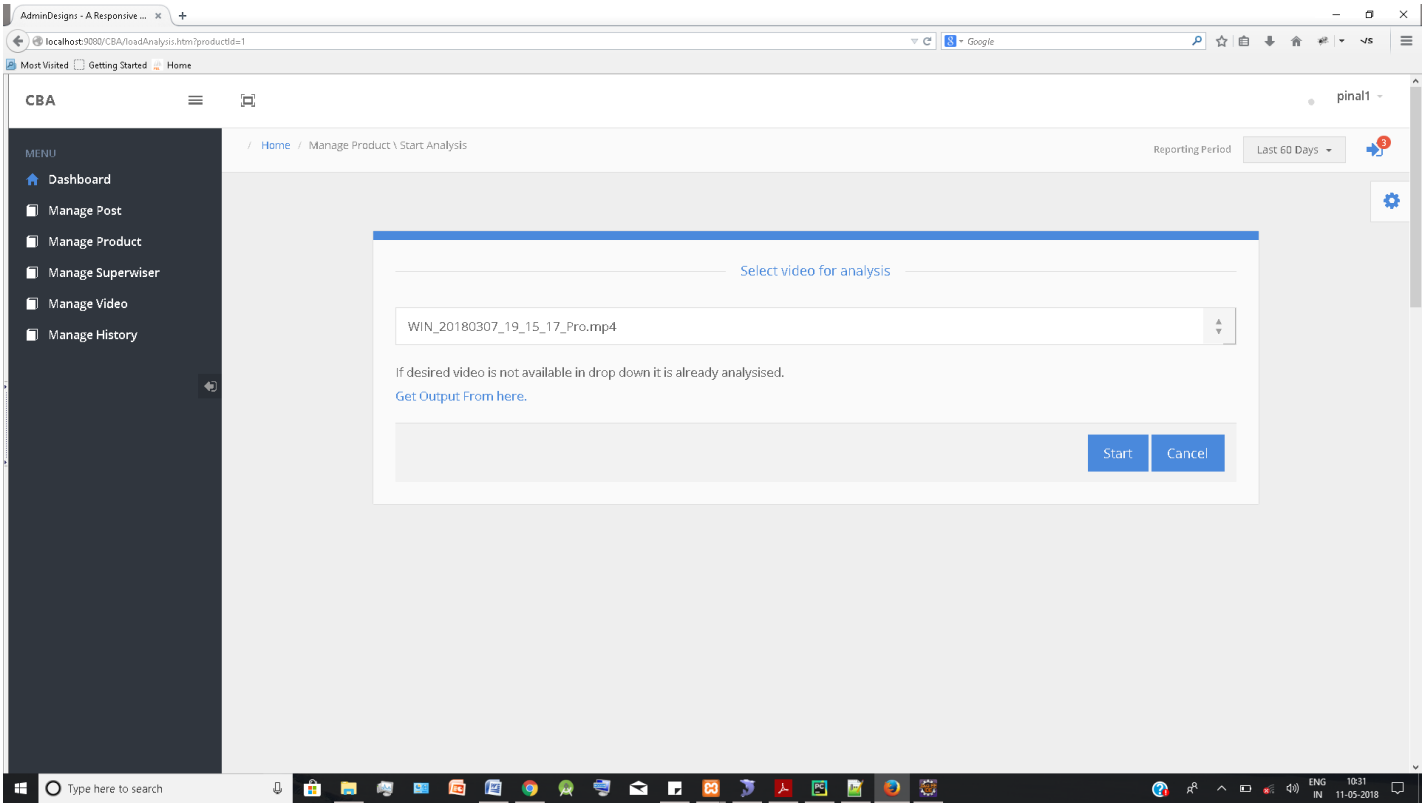

Fig. 5.6 Choose Video for analysis

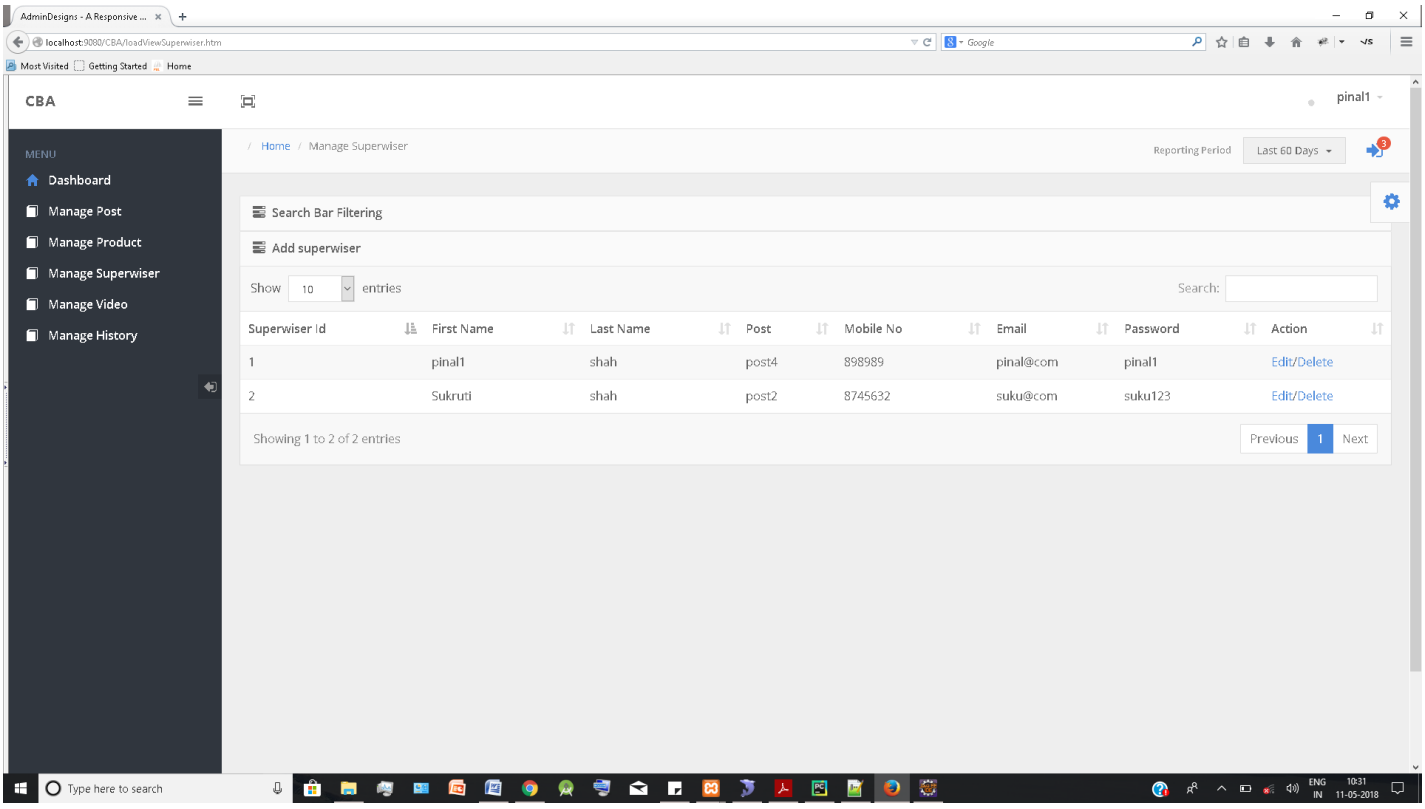

Fig. 5.7 Manage Superwiser

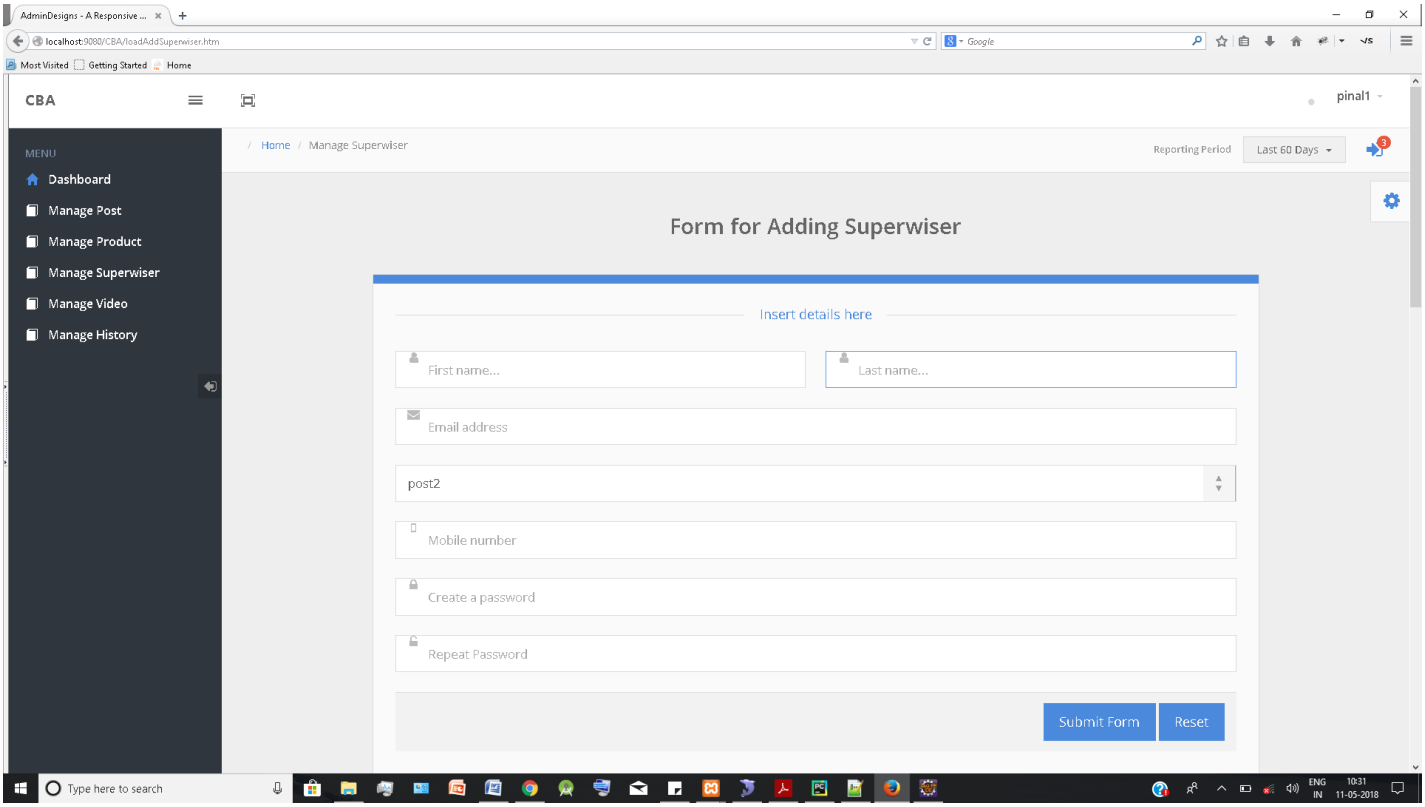

Fig. 5.8 Add Superwiser

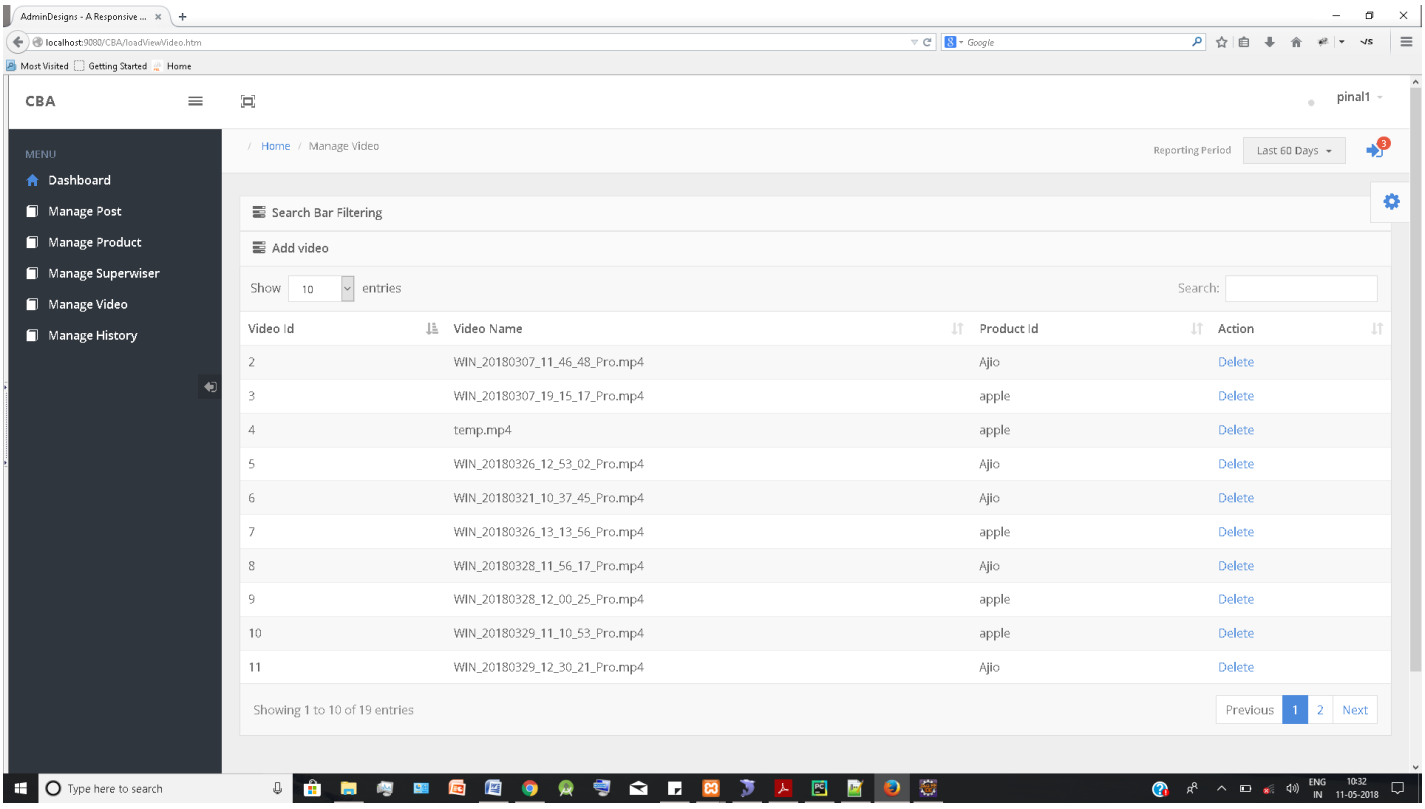

Fig. 5.9 Manage Video

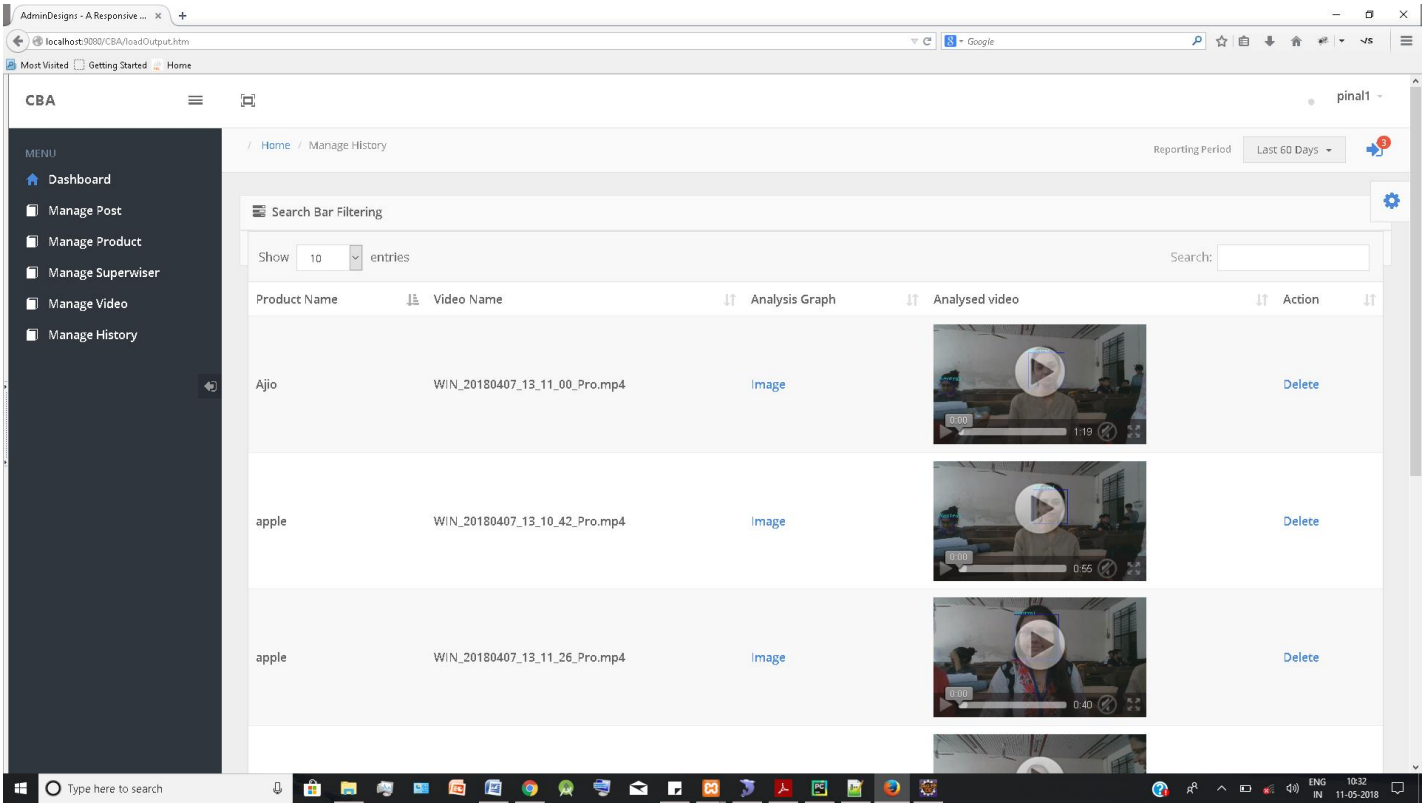

Fig. 5.10 Manage History

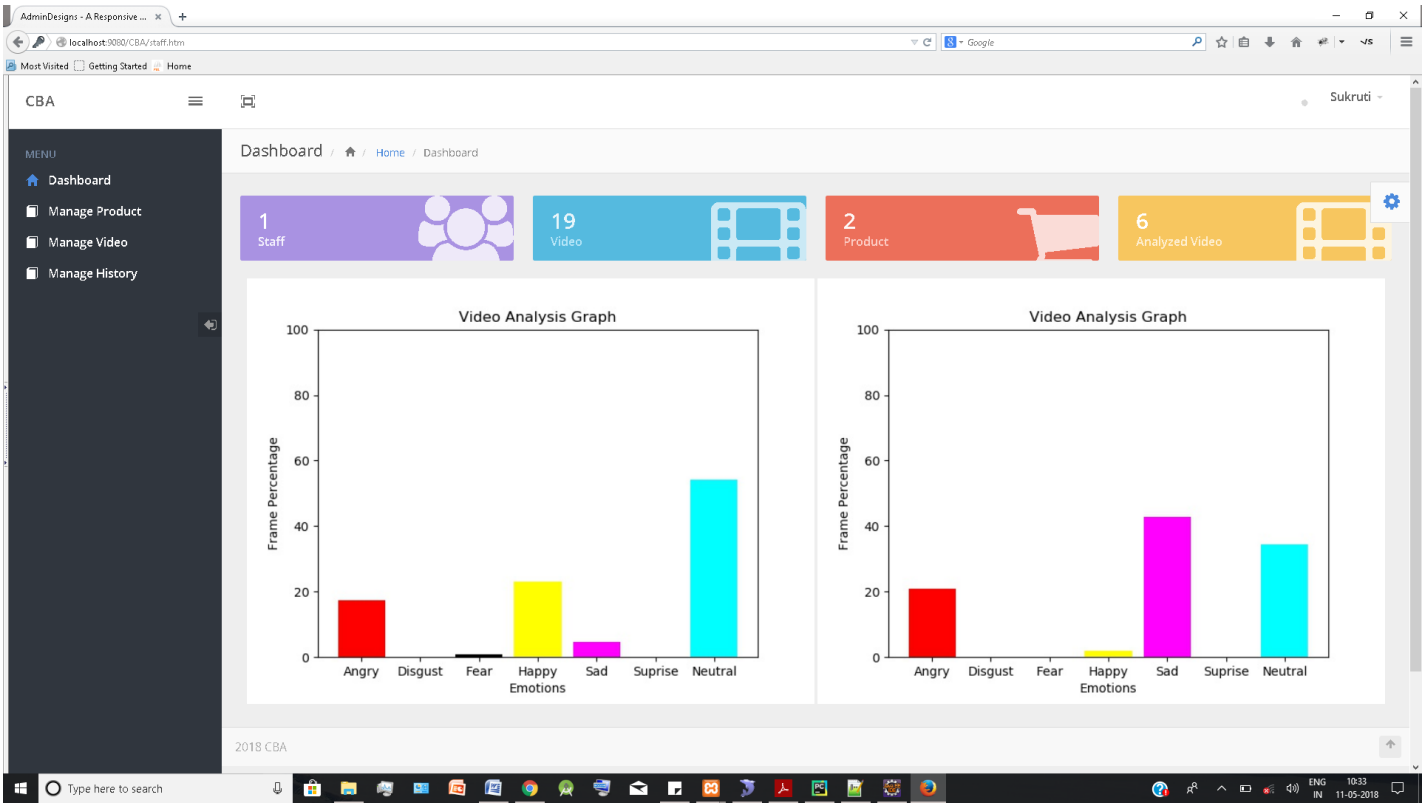

Fig. 5.11 Dashboard of Staff Member

5.3 Testing

Interface	Input	Condition	Action
Login Screen	Email, Password	Email is blank	Ask user for enter the Email
		Password is blank	Ask user for Enter the Password (move cursor to password)
		Email not Found	Tell the user that Email not Found
		Password is incorrect	Tell user to write correct password, Also show option for recovery of password
Signup Screen	Email ,Password , Re-Type Password , First name, Last name, Phone number	Email format is invalid	Tell user to again check email
		Password is not in valid form	Tell users to Retype password also display rules for Password
		Password and Retype Password does not Match	Tell user that Passwords do not match and clear password fields
		Phone no is not of length 10 digit	Tell user to Retype the Phone number.
Start Analysis Screen	Video name	Product do not have any video to analyses	Tell user to add video of the particular product.
		Video already analyzed	Tell user to view result of that video in the history screen.

Table 3- Testing

6. Conclusion

Summary of the result:

- We have shown the outcome of the analysis of the video in graphical form.
- Also we have arrangement for visual analysis display.
- We stored the visual form of analysis as analyzed videos.

Advantages:

- Mall owner or brand owner can get the idea of the current trend of the customer mindset.
- They can increase the production of trending items in order to increase the profit.
- Also they can attract more customers by putting trending items on catchy places like entrance.
- If more customers are attracted to particular product, and not buying it, there might be issue of cost. One can decrease the profit margin of that product and increase selling.

Future scope of the product:

- If we have super computing capabilities, we can provide bigger dataset in order to get more accuracy in the output.
- Also we can feed the output of the video analysis as the training dataset and get more accurate model.
- Also we can combine the statistics available at the selling counter with the output of the analysis and increase the accuracy of the result.

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