

IITBombay X MAPP (Monitoring Application)

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Abstract—The IITBombayX MAPP is a utility developed to provide a single place for various users/stakeholders of the MOOC platform to view the program metrics. It aims to provide an efficient interface to the teachers of MOOC courses and students attending MOOC courses across the country. These users can track students' progress, generate and view their performance reports on a regular basis. To the system administrators,

it provides one place to view the health of system being monitored by them. This will help them identify problematic areas at one glance. General public/researchers interested in the MOOC program can look for data of their interest. Members of management can view high level metrics. These reports are based on numerous aspects and provide an overall glimpse of the level of engagement of students in various courses and their performance respectively. This project is a full scale industry standard MIS, complete with a user interface for faculty, administration and students.

It is a technology aimed to mainly reduce the manual labour considering both teachers and students. It is an affordable, interactive software utility for generating reports and that too in lesser time. Besides, it helps the instructor in analyzing student performance and reports with ease moving a step forward towards Advance Personalized Learning considering 14 Grand Challenges of Engineering in 21 st century.

1. INTRODUCTION

1.1 Purpose

Web based development for this project has provided an efficient and easier way to manage it. It does not require any installation and hence is user friendly. The main purpose of this application is to provide the user with a suitable environment to view the reports and monitor the performance based on a number of aspects. It is also developed with a view to provide an efficient way of learning, as the faculty can evaluate the level of engagement and performance of each student and provide them with necessary guidance to develop their overall concepts.

The main purpose in making this document is to describe all the features and working of the aforementioned application and at the same time, allow for any enhancements in the future.

1.2 Scope

The scope of this project is not just limited to the IITBombayX platform. This application can be integrated with and adopted for different platforms like the Open edX platform [1] which does not have such kind of application as yet. It can also be integrated with any kind of platform providing online courses similar to IITBombayX.

In short, the IITBombayX MAPP has a vast scope which is beyond the reach of the extent of this project. There are a number of aspects of this application that are yet to be explored and expanded in subsequent years.

1.3 Motivation

The principle motivation behind this project was that the existing Open edX [1]architecture used by IITBombayX has no provision for a monitoring application similar to the one that we have developed. Though the current system provides information to the students about their performance in various courses among others, these reports are not available in an integrated form as given by this application. The feature to view and access student performance is available in the present system but it is cumbersome. Besides, it allows only for download of data into files. And that too, a limited number of records. So, primarily this application is developed with the motive of assisting the existing architecture by providing it an additional functionality which will take its overall performance to the next level.

2. OBJECTIVE

The main objective of this project is to create an interface for students and faculty of various institutes to assist in the improvement of performance evaluation and hence, result in better e-learning experience for students. This technology will also enable the institutes to uplift the overall education standard in India as the reports generated by this software will give each institute a better idea of various aspects of their curriculum where its students are lagging behind. The different sections of this project are as follows:-

2.1 Faculty Module

The Faculty module is aimed at allowing the faculty of a particular course to keep track of and get regular updates on the performance of their students. It also allows the faculty to take necessary action to improve it. For instance, the faculty may provide some extra study material based on topics where individual performances are poor.

2.2 Student Module

This module gives the students a snapshot of their own performance for all courses in one place. Students can also check the course components which they have visited and the ones which are yet to be visited. It is similar to viewing the result of a particular exam or viewing attendance record. The students are provided access to the list of courses they have enrolled for and their respective performances in the quizzes or tutorials of those courses in form of grades.

2.3 Program Manager Module

This module deals with information about the courses provided by the participating institutes. The Program Manager can check the IITBombayX metrics at the partner-institute level.

2.4 Administrator Module

The aim of designing this module is to provide the administrator the functionality to view the disk usage of system for various courses hosted on it, view the participants registered for different courses per day, view the enrollments of students under numerous courses and also handle the number of emails sent per day as well as course-wise.

2.5 General Information Module

This module is available to all users irrespective of them being authorized users at IITBombayX. The reports available here are divided into different categories like those based on gender, level of education, age and geographical background. These reports are expected to assist those wishing to study the education pattern on blended MOOCs[5].

3. DESIGN CONSIDERATIONS.

3.1 Assumptions and Dependencies

The following softwares have been used to develop the web based version of MAPP:

- Python 2.7.3
- Django 1.8.2
- MySQL Server 5.6.21
- MongoDB Shell Version 2.6.6.
- IITBombayX Source Code
- Spyder

- Google Chrome, Firefox

The dependencies of various modules are as follows:

1. The users must login through their unique ID and password and after this login, they are redirected to their corresponding module- Student, Faculty or Admin.
2. The General Information Module is however available to all.
3. The users can login from anywhere in the country using unique user name and password.
4. IITBombayX platform must have the videos and source contents so that every registered student can access the content and data on MAPP.

3.2 General Constraints

1. The application requires a PC or tablet or mobile and an internet connection.
2. A classroom environment for evaluation of student performance is required to get real time responses.
3. GUI is in English only.
4. GUI data cannot be changed by the applicant, he/she can only view the generated reports, i.e. it is read-only.
5. Login with user name and password is required for authentication purpose, but the general information module does not require login.
6. Only registered faculty and students will be authorized to use the application.
7. It is limited to HTTP/HTTPS.
8. The application works best in latest version of Mozilla Firefox and Google Chrome.

4. ARCHITECTURE DIAGRAM.

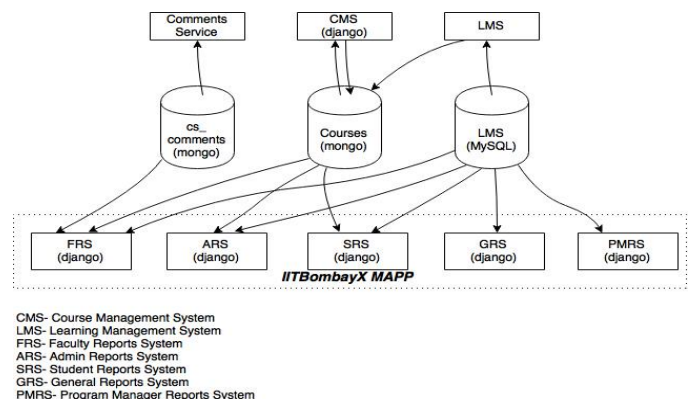


Fig. 1: First Level of Abstraction

The architecture diagram shows the two-way data transfer between IITBombayX Comments Service, CMS and LMS and

MySQL [12] and MongoDB databases[3] used for this application. The courses are stored in mongo and LMS stored in MySQL[12]. The FRS, ARS, SRS, GRS and PMRS retrieve data from the databases as shown above.

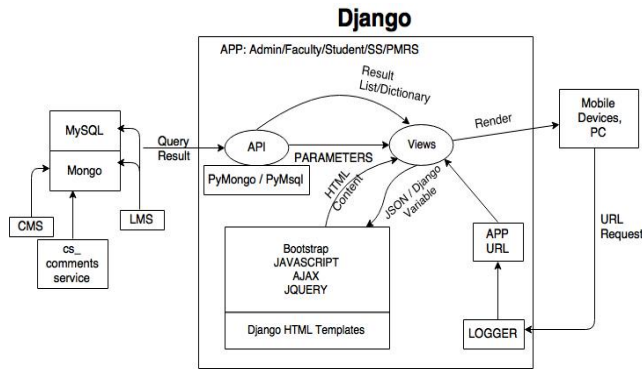


Fig. 2: Second Level of Abstraction

From mobile devices and PCs, a url request is made. The logger logs in the application. He is redirected to either Admin, Faculty or student or any other module.

The query string containing the required parameters is directed to views.py file. In views.py, it is decided which function to call. The parameters are passed to an API called from it. This API then processes the data using MySQL [12] and PyMongo[3] and the query result comes back in API which is returned to the views in form of list or dictionary. This result is sent to the HTML templates as JSON or Django[2] variables(JSON High charts;username or date etc. as Django variables). From views, the response is rendered as HTML content again to the browser. This process is illustrated in Fig. 2.

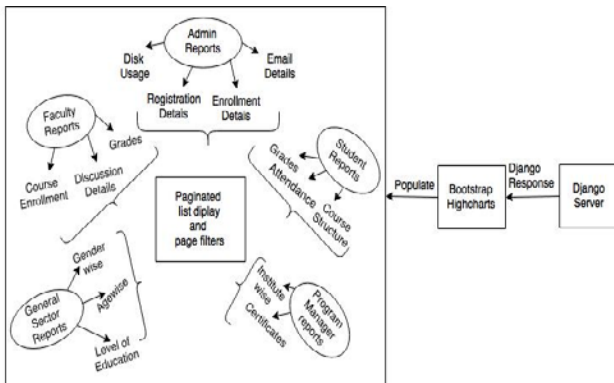


Fig. 3: Third Level of Abstraction

Django response [2] from views is rendered as HTML content using bootstrap and is populated using highcharts[10]. Each of the panels display reports in paginated format. Data filters are also used to segregate the data.

5. DETAILED DESCRIPTION.

When the faculty or student gets logged-in through the main page, their corresponding IDs are preserved in the session. The data shown on these panels is in the form of highcharts[10].

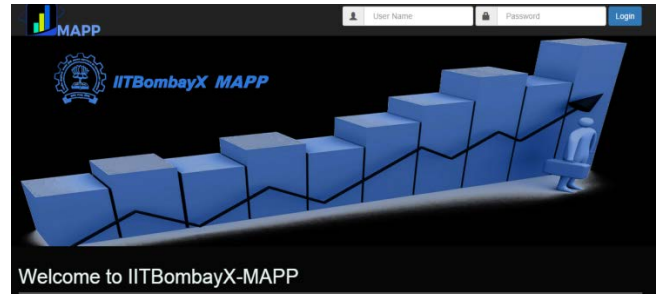


Fig. 4: Login

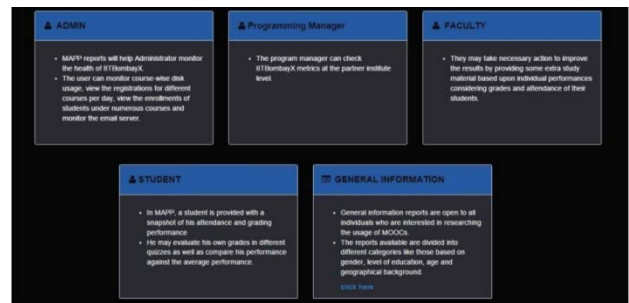


Fig. 5: Login

5.1 Faculty Module

The faculty is the one who guides the students and give answers to questions raised by students on discussion forum. They also provide the content and videos for courses. Faculty panel shows these types of reports:

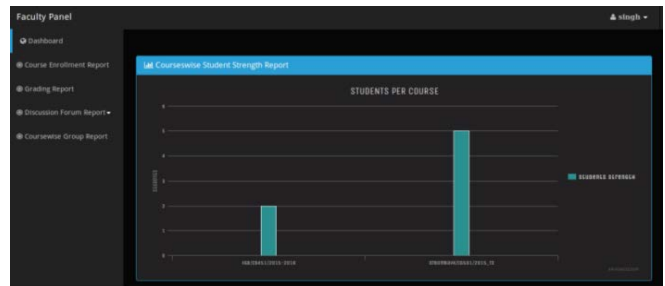


Fig. 6: Faculty Module Summary

1. **Course Enrollment:** The landing page of faculty dashboard shows the list of students of courses for which faculty is assigned. On clicking the bar of any course in the graph, the detailed description of the course will be shown with student name, id, grade for enrolled students.

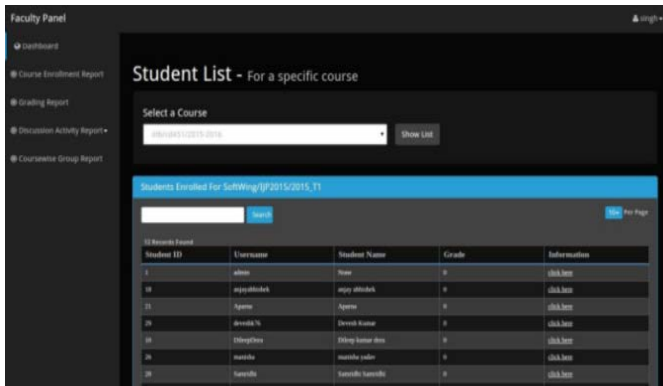


Fig. 7: Student List for a Course

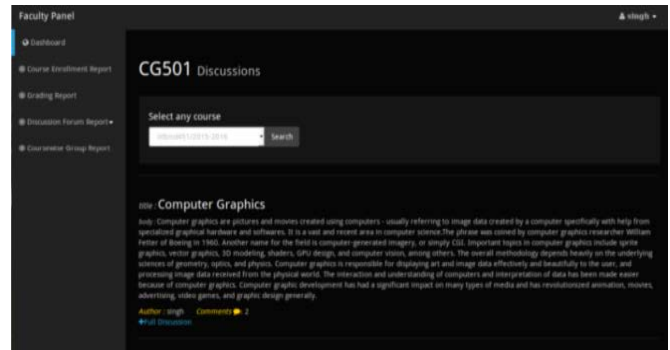


Fig. 10: Discussions for a course

2. **Grading Report:** It is represented in two levels. The first level shows the average grade of the quizzes in each course as a bar graph. Further drilling for a specific course shows username, total marks and quiz-wise marks for each enrolled student.

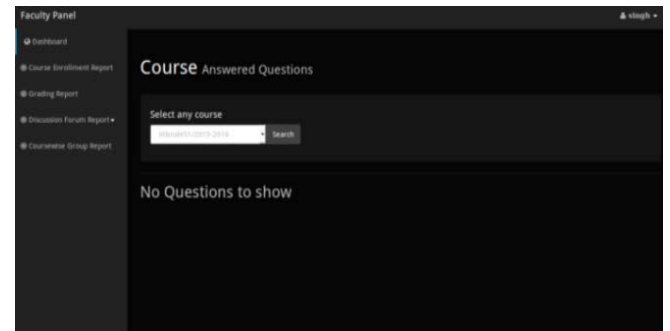


Fig. 11: Answered Questions for a course



Fig. 8: Course-wise Grade Report

4. **Cohort Reports:** This report shows the number of cohorts or groups per course. On further drilling, the discussion report for that course is displayed as a stacked bar graph showing answered and unanswered discussions for each cohort.

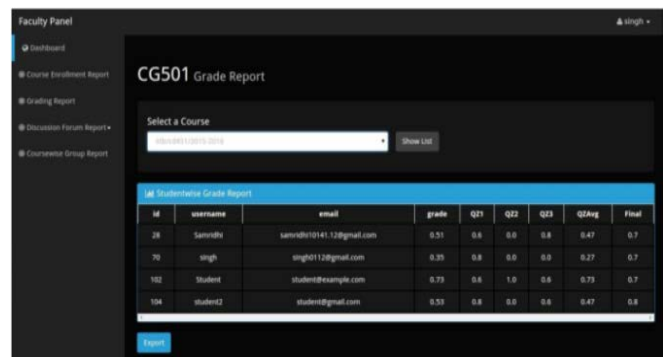


Fig. 9: Student-wise Grade Report

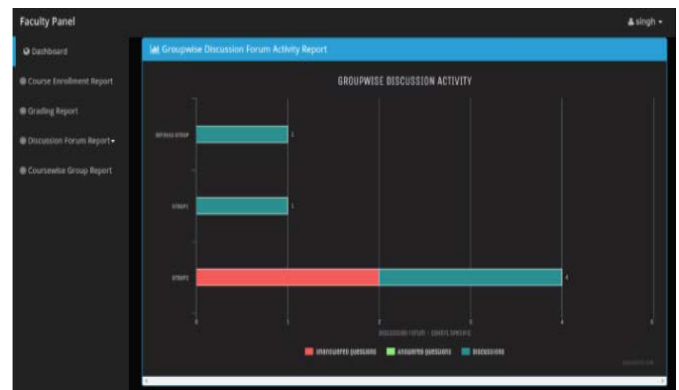


Fig. 12: Group-wise Discussion Activity Report

3. **Discussion Forum Activity Report:** These reports show the answered and unanswered questions and discussion on each course to which faculty is assigned in the form of a stacked bar graph. The faculty can filter the data course-wise. In further level, they can also answer the unanswered questions.

5.2 Student Module

This whole system is basically designed for the development and enhancement of education for students to increase the attentiveness and quality of education.

1. **Student Attendance Course-wise:** For each course, attendance of each student is conveyed in form of visited

sections over total sections. This allows the student to evaluate his progress in the course.

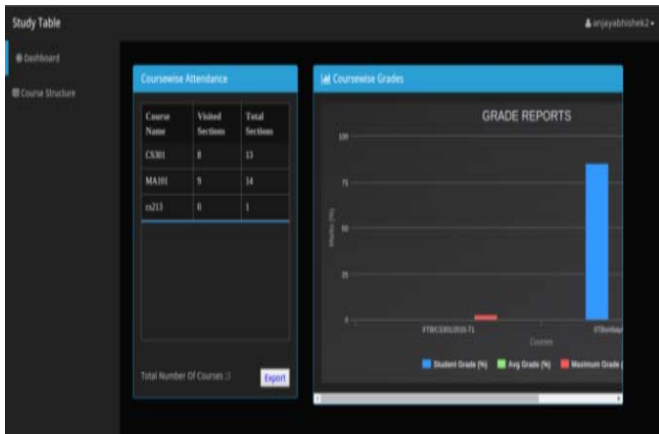


Fig. 13: Course-wise attendance and grades

2. **Course-wise Marks:** Graph at first level depicts the grades of the student for each attended quiz in course. The utility of the graph increases as it also shows the maximum and average grade for the course along with student's own grade. Healthy competition always enhances performance.



Fig. 14: Student Performance Quiz-wise

3. **Discussion Forum Reports:** The students can view all the posts they have posted in the discussion forum for all the courses .

5.3 Program Manager Module

The role of a Program Manager is similar to that of a CEO. This panel contains the information about all the institutes that are partners of IITBombayX and the courses which are organized by these institutes.

1. **Institute-wise Total Number of Enrollments:** The Program Manager thus can view student participation for all the institutes and can compare between all the institutes.

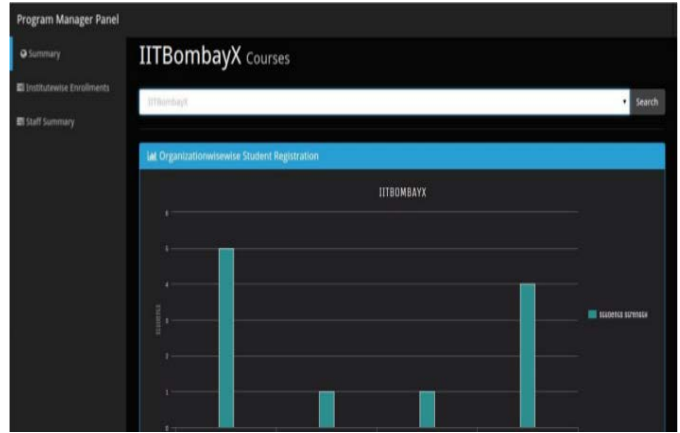


Fig. 15: Institute-wise Student Registration

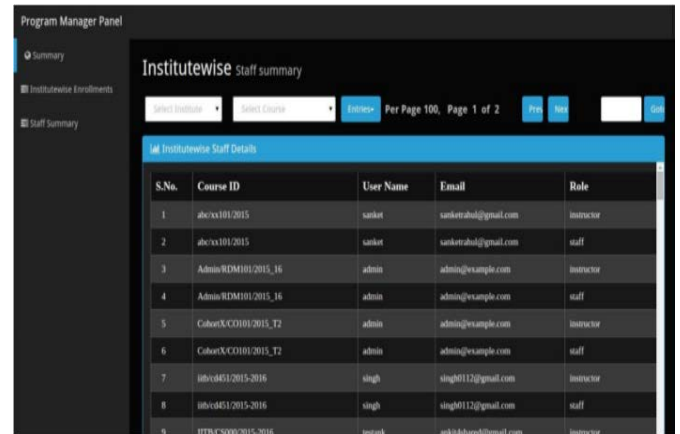


Fig. 16: Institute-wise Staff Summary

2. **Certificate Details:** Firstly the graph gives institutewise detail about the number of courses which provide verified and number of courses which provide honour certificates. The second level of the bar chart has detailed description about the number of students who have got their respective certificates accord- ingly (honour or verified) enrolled for courses under an institute.

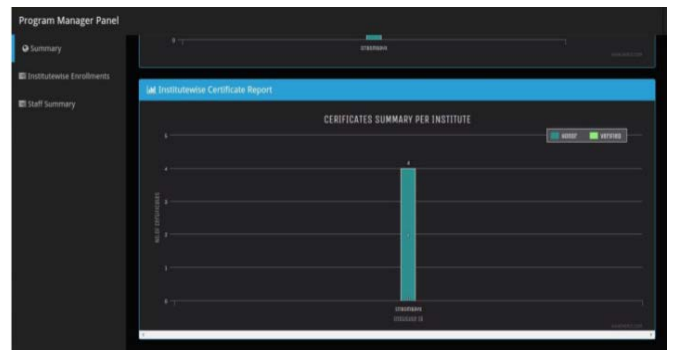


Fig. 17: Certificate Summary per Institute

5.4 Administrator Module

This panel is used by the administrator to view the overall performance and health of the system running the courses. The reports provided on this panel can be classified into four categories:

Report for Disk Usage: This report is the most important aspect for efficient management of the health of system because different courses are continuously added on a daily basis.



Fig. 18: Course-wise disk usage, Enrollment details

2. Course Enrollment Details: The highchart[10] used for this report is a bar graph which shows the student strength per course. On clicking each bar of the highchart[10], the number of enrollments on a particular date is shown. On further clicking a particular date, the course name and number of enrollments for a particular course are shown, which can be filtered date wise.

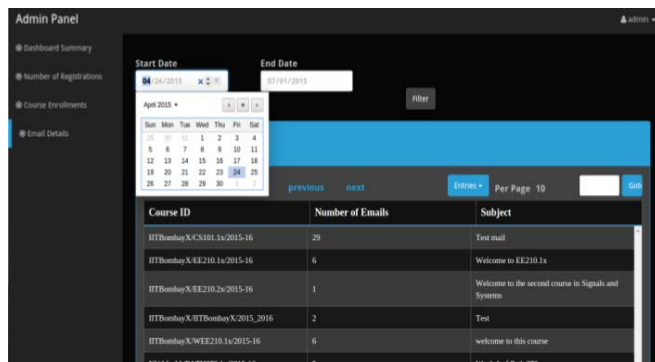


Fig. 19: Date Filter

3. Number of Registrations: This report gives the number of users registering on IITBombayX per day in the form of a line graph in which each node corresponds to a particular date. On clicking the node, the user is redirected to a page on which the date, username and userid are shown.

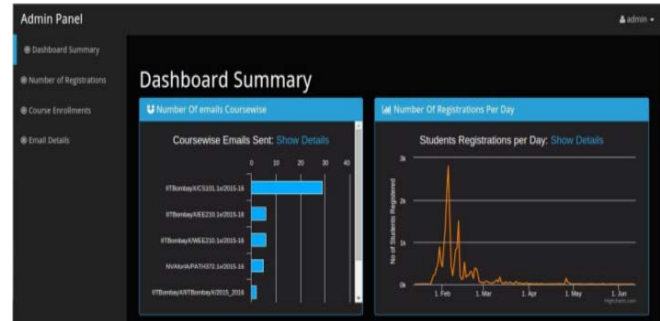


Fig. 20: Email reports and daily registrations reports

4. Email Details: This report shows the number of emails sent for each course in the form of a bar graph. The second level of this highchart [10] shows the date created, course id, number of emails sent and the subject in a tabular form, filtered date wise.

5.5 General Information Module

The general information panel, as the name suggests, is not specific to a particular user. It is open to all as it shows the strength of our application.

It specifies how much socially beneficial our system is to the people of the country through some reports generated based on level of education, age, gender, state and subject:

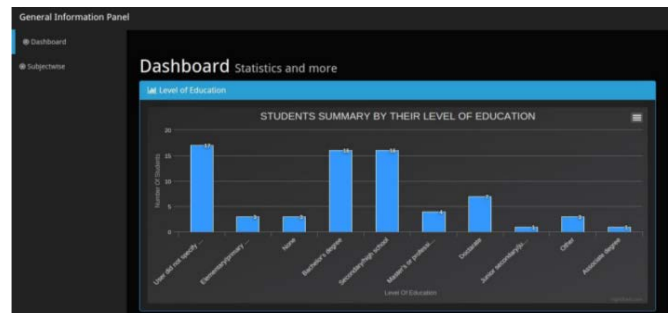


Fig. 21: Education wise report

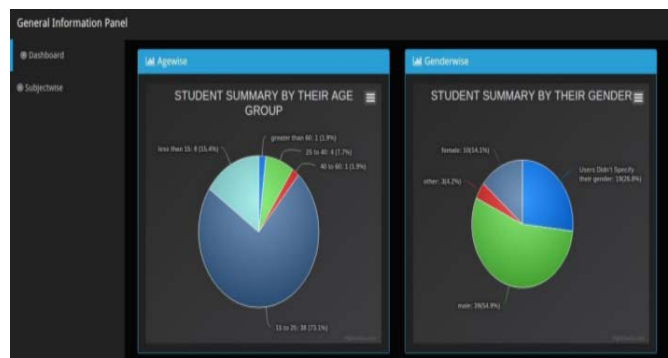


Fig. 22: Agewise and Genderwise Report



Fig. 23: Statewise Report

6. FUTURE WORK AND CONCLUSION.

- Enabling single sign-on for the users to navigate directly from this system to IITBombayX is a future work as the users registered on IIT- BombayX will be able to directly access this independent application.
- Bandwidth utilization in admin reports too needs to be implemented in future as the administrator will definitely be interested in the bandwidth to effectively manage the traffic on the web application.
- Code optimization in some of the APIs[2,8] could not be done due to lack of time. So, to reduce the time complexity, it should be done.
- Xblocks[4] implementation for surveying remained unexplored due to lack of time and it is one of the features that would be very helpful in knowing the review of users of application.

- Oauth[9] implementation for effective authorization of users logging in the system is also an important tool.
- For the implementation of ORM[9]calls, we found the solution lately. In order to maintain the standard of IITBombayX, it is recommended to convert the queries into ORM calls.

7. ACKNOWLEDGEMENTS

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REFERENCES

There are a number of resources and references that have contributed to the successful completion of this project. These resources are listed below in no particular order:

- [1] <http://edx.readthedocs.org/>
- [2] <http://docs.djangoproject.com/>
- [3] <http://www.mongodb.com/>
- [4] <http://xblocks.readthedoc.org/>
- [5] <http://edx-partner-course-staff.readthedocs.org/>
- [6] <http://tutorialspoint.com/>
- [7] <http://w3schools.com/>
- [8] <http://www.python.org/>
- [9] <http://stackoverflow.com/>
- [10] <http://highcharts.com/>
- [11] <http://getbootstrap.com/>
- [12] <http://www.mysql.com/>