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**ONLINE SYSTEM FOR HANDLING STAFF DETAILS AND  
FORECASTING CADRE POSITIONS IN  
UNIVERSITY SYSTEM**

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**ONLINE SYSTEM FOR HANDLING STAFF DETAILS AND  
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UNIVERSITY SYSTEM**

**N.A.D.K.A. Jayawardana**

**139166L**

**Dissertation submitted to the Faculty of Information Technology,  
University of Moratuwa, Sri Lanka for the partial fulfillment of the requirements of  
the Degree of Master of Science in  
Information Technology**

**March 2016**

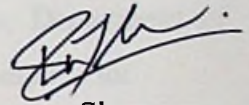
## DECLARATION

I declare that this dissertation does not incorporate, without acknowledgement, any material previously submitted for a Degree or a Diploma in any University to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available photocopying and for interlibrary, and for the title and summary to be made available to outside organization.

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## ABSTRACT

University Grant Commission is the apex body of the government university system in Sri Lanka. Maintaining optimum staff is one of the main challenges in the government university system. The proper combination of quality and quantity of human capital is a measure of an organization's strength and success. Further University Grant Commission is seeking to find staff member in quick time frame. Neither have they had proper software tool nor up-to-date database of staff members.

This research has been conducted to develop a web based automated software solution to evaluate cadre position in university system. Principle objective of this research is to forecast cadre positions. In addition to that several features such as calculating current cadre requirement, searching staff members and generate charts and reports are included.

Statistical forecasting method, Time Series Trend Analysis is applied to evaluate cadre positions. This proposed system is generated using equations based on the past 5 or 10 year enrollment data of each faculty and related fixed norms which are accepted by the UGC is used for evaluation part. Web based software with real time updated database driven on Apache web server, which is available to access authenticated users only.

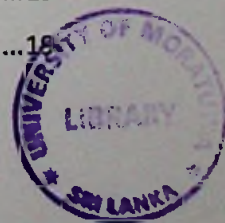
This research concludes that the presented solution has solved the above problems in the university and university grant commission in maintaining proper cadre positions in university teaching staff. Although widely varying approaches to forecasting the cadre positions are exists but most of them are not applicable for this issue. This method might not precisely predict the exact cadre position requirement of an university system in Sri Lanka. It is recommended that demonstration of fixed norm should be further drilled.

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# ABBREVIATION

1. UGC – University Grant Commission
2. HEIs – Higher Educational Institutions
3. SAR – Senior Assistant Registrar
4. HTML – Hyper Text Markup Language
5. UoM – University of Moratuwa
6. VPA – Visual Performing Art

## Introduction

### 1.0 Prolegomena

This chapter contains the detailed description about introduction of the research that can be used as an approach to new system. All details of study of problem, observations, objectives, study of technology are included.

### 1.1 Background and Motivation

The University Grant Commission (UGC) is the apex body of the University System in Sri Lanka.

The official functions of the UGC are;

- Allocation of funds to Higher Educational Institutions (HEIs) that come under it.
- Planning and co-ordination of university education
- Maintenance of academic standards
- Regulation of the administration of HEIs
- Regulation of student admissions to HEIs

**Vision:** To be an excellent regulatory body which guide, develop and sustain a network of 'Centers of Excellence' in higher education meeting the national needs and aspirations in keeping with global trends.

**Mission:** To establish, guide, develop and sustain through resource allocation and good governance and Management, a widely acclaimed and accessible higher education system that is accountable to the public and dedicated to become the highest levels of learning, research and innovation relevant to the needs of the country by fostering and/or facilitating in partnership with other stakeholders of higher education, the diversity, maintenance of standards and quality and the relevance of academic study programmes to national and global needs, and providing guidance to higher education system to become a network of 'centres of excellence' in teaching, research, innovation and services of global standing.

**Government Vision:** Sri Lanka to be the knowledge hub in the region and a leader in higher education in Asia by 2020.

**Universities coming under the purview of the UGC:**

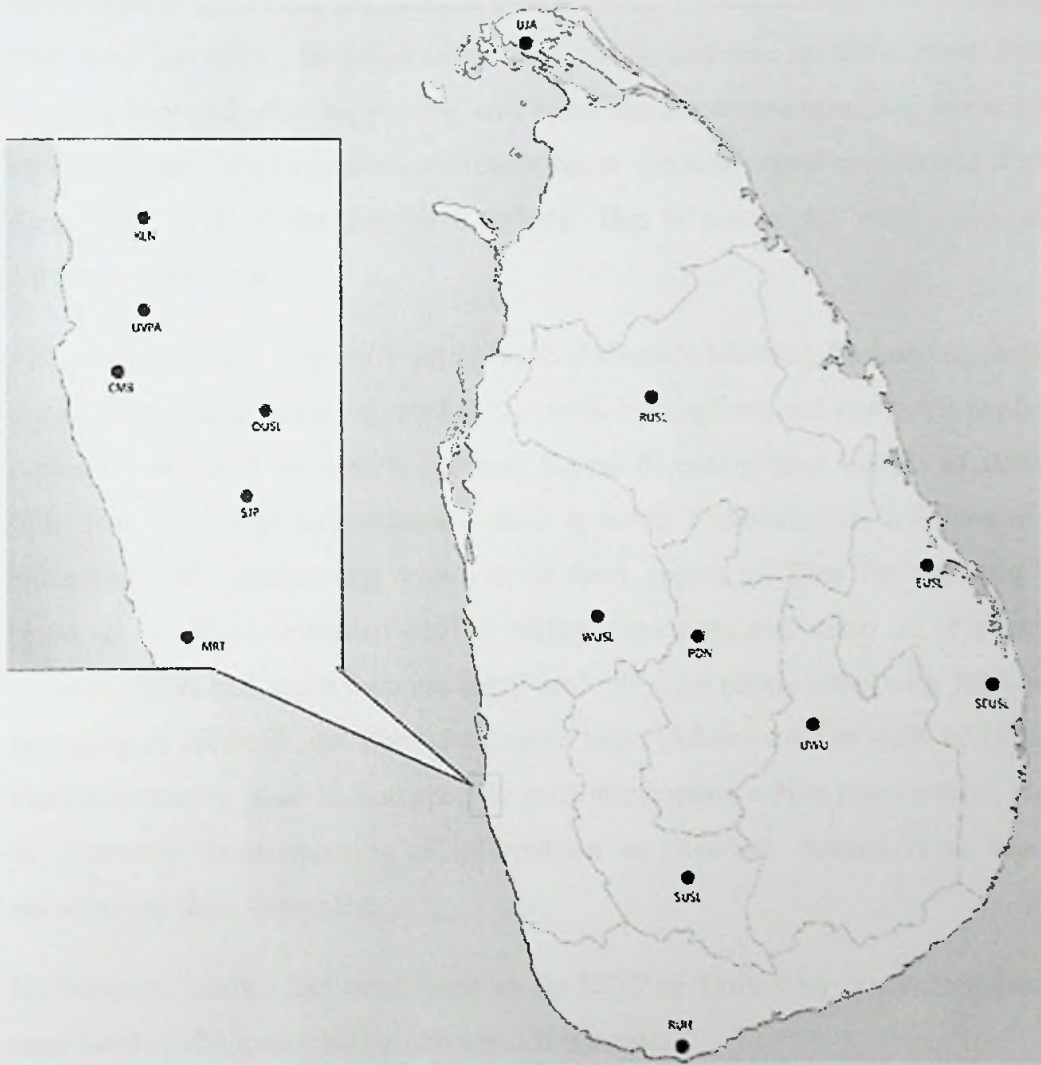


Figure 1: Universities coming under the purview of the UGC

**Name of Universities :** CMB : University of Colombo, EUSL : Eastern University, Sri Lanka, KLN : University of Kelaniya, MRT : University of Moratuwa, OUSL : Open University of Sri Lanka, PDN : University of Peradeniya, RUH : University of Ruhuna, RUSL : Rajarata University of Sri Lanka, SEUSL : South Eastern University of Sri Lanka, SJP : University of Sri Jayewardenepura, SUSL : Sabaragamuwa University of Sri Lanka, UJA : University of Jaffna, UVPA : University of the Visual



and Performing Arts, UWU : Uva Wellassa University of Sri Lanka, WUSL : Wayamba University of Sri Lanka.

## **1.2 Problem Definition**

At present academic, non-academic staff and students based activities of the relevant universities in Sri Lanka are handled by the UGC. Student intakes of the universities have been increasing in immense amount during last two decades. Head count of teaching staff and other supporting staff were increased corresponding to the student intake numbers. Staff recruitment process takes minimum three months and it always starts after batch of students have arrived. This is one of the main issue, all the universities are facing.

All universities still deals with paper based document handling for keeping personnel details of the staff. Some universities use software applications, computer application packages such as Microsoft Excel and Access to ease getting details of university staff. But UGC staff cannot access those systems. Establishment divisions of most universities are maintaining numbers of hard copies of files for handling staff. However to obtain details of staff is taking more time and same set of papers are repeated again and again because there isn't flexible relationship with folders. File managing is difficult and consumes more time. Administrative staff of UGC and Universities have goals to find specific staff information within short notice. There is no guarantee about accuracy of information so retrieved. Reason is all searching activities are done manually.

No adequate studies had been done so far UGC or University levels to solve these issues and all the mentioned problems still remains.

## **1.3 Aim and Objectives**

### **1.3.1 Aim**

The existing system is manual. It has limited number of operations and also it consumes more time to complete task (minimum two weeks). The main aim of this project is to reduce the time & improve accuracy of the processes. Another aim is reducing paper work of UGC as well as University system.

### **1.3.2 Objectives**

The main objective of this project is to solve above mentioned problems by introducing a web based solution. This system deals with single database; consisting of staff information instead of maintaining several databases in different locations.

- Facilitate universities to enter/ alter their staff information such as personnel details, educational qualification, specialized areas, designation....etc.
- Facilitate UGC to search staff member or list by using name/ specialized area within whole university system.
- Facilitate Universities to search their staff member or list by using name/ specialized area.
- Facilitate UGC to get available carder positions in universities.
- Facilitate UGC to get reports & charts with distribution of carder positions in selected universities.
- Facilitate UGC to get forecasted carder position details in any selected faculty of university.
- Facilitate admin user to give privileges to specific persons to do specific tasks of limited time period.

### **1.4 Scope of the project**

The proposed web based system will have following processes, which are planned to develop in this project.

#### **1. Staff Information Module**

This function is used by staff of establish divisions' of the universities. Authorized persons of the division of respective universities will enter/alter the staff information.

#### **2. Search Module**

This function is used to retrieve information of relevant staff member/ list of staff members by giving specific name/ field specialized/ specific university/ ....etc.

### 3. Calculate Current Carder Requirement

This part is gathering all information provided by the universities and find quantity of carder positions exist and calculate the actual requirement of carder positions based on the terms and conditions.

### 4. Forecasting

This part is used past 5-10 year enrolment data from database and applied Time Series – Trend Analysis for forecast cadre positions then provide answers.

### 5. Report Generation

This part provides reports and charts, which are useful to prepare annual reports of UGC and Universities.

### 6. Privilege Tables

Privileges will be given by the administrator of this system to specific staff member of the university, who is nominated by SAR of establishment divisions of each university.

## 1.5 Structure of the thesis

The rest of the thesis is structured as follows. Chapter 2 is on critical review of the area of forecasting method for forecast cadre positions. Chapter 3 presents technology adapted toward an online solution for forecasting cadre positions. Chapter 4 provides the overall picture of our novel approach to automated solution to forecast cadre positions. Chapter 5 discusses design of the system. Chapter 6 is about implementation of the system. Chapter 7 is about evaluation part of the system. Chapter 8 is about conclusion further works. End of the thesis references are available.

## 1.6 Summary

This chapter demonstrated the introduction of this research. The next chapter explains development of forecasting.



## Development of forecasting

### 2.1 Introduction

This chapter contains the description about other related researches that have been done during recent past. Special concentration will be paid for following areas such as how they handle problem, which technology they used and what are the unsolved problems.

### 2.2 Others' Work

Armstrong has defined demand forecasting as the process of estimating the future numbers of people required and the likely skills and competences they will need (Armstrong, 2014, p. 216). There are several good reasons to conduct demand forecasting such as quantify the jobs necessary for producing a given number of goods, or offering a given amount of services, determine what staff-mix is desirable in the future, assess appropriate staffing levels in different parts of the organization so as to avoid unnecessary costs, prevent shortage of people where and when they are needed most, and monitor compliance with legal requirements & regard to reservation of jobs. There are several forecasting techniques, which vary from simple to sophisticated ones. Some organizations generally follow more than one technique. (Aswathappa, 2005, p. 74). In contrast Wurim Ben Pam has proved that widely varying approaches to forecasting the employee needs of an organization exist and effective forecasting requires a combination of quantitative methods and subjective judgement (Ben Pam, 2013). However Tang Jianxiong introduced the gray model and BP neural networks forecast model, the predicted data and the actual data have wide differences from 2006 to 2008 in the gray forecasting model, the main reason is that there are relatively large fluctuations in data of these two years. But the BP neural network forecast accuracy is relatively high. As a whole, the combined model's forecast accuracy is superior to single model's forecast (Haibo and Dong, 2012). And also Rashmi Agrawal confirmed that application one single method for forecasting may neither be feasible nor appropriate. Variety of pragmatic approaches have been adopted ranging from detailed trend analysis of data available to assessments on the

basis of qualitative information collected through experts' opinions. Mixed methodology approach has been followed for human resource forecast in Agricultural sector in India (Agarwal, 2013). James Wong has produced an essential base for further development of manpower forecasting model at sectoral level. Review and the comparative evaluations of the four different types of forecasting methodologies would be valuable for academics, policy-makers of government, public employment services and employment agencies, employers' organizations, union and education institutions (Wong et al., 2012). Fred C. Lunenburg has demonstrated forecasting demand and supply, involves using any number of sophisticated statistical procedures based on analysis and projections. It begins with a forecast of the number and types of employees needed to achieve the organization's objectives by considering job analysis and legal restraints (Lunenburg, 2012). Brian K. Carriere presented succession planning in healthcare is addressed the issue in nursing shortage concerns and the demand for retaining knowledgeable personnel to meet organizational needs. To mitigate knowledge loss, current CEOs, Directors and healthcare leaders need to integrate succession planning with organizational needs by developing and promoting its best resources into future leadership positions (Carriere et al., 2009).

In spite of the numerous functions and methods of demand forecasting, most organizations are yet to take advantage of this scientific way of forecasting. Therefore in this research is applied to quantitative forecasting method of statistics for separated homogeneous groups in University system in Sri Lanka.

### 1.1 Definition

<b>Authors</b>	<b>Limitation</b>
Armstrong	-
Aswathappa	-
Wurim Ben Pam	Seeks to find out which demand forecasting techniques are used in determination of employee requirements.
Tang Jianxiong	Forecast result is difficult to get absolute accuracy and still need to practical test.
Rashmi Agrawal	Splitting total employment into occupational and educational forecasts presents severe data problem.

James Wong	Macro approaches are relatively deficient.
Fred C. Lunenburg	Additional top level post need to recruit.
Brian K. Carriere	Will not provide consistency in succession planning in healthcare.

Table 01: Related research work & limitations

## 1.2 Summary

This chapter discussed the development of forecasting methods. So there were several problems, which had been solved using combination of two or more techniques to get more precise output. The next chapter explains the technology adopted of the research.



## Technology adopted statistical forecasting

### 3.1 Introduction

Chapter 2 discussed the literature review part and how researchers were handled in the past, which methods and technologies were applied, and what are the unsolved problems. This chapter presents, which technology is going to be used with the online system.

### 3.2 Introduction of Forecasting

This chapter is mainly devoted to discuss the adopted technology in this research. Forecasting is a process of predicting future event. There are many events such as demand for products and services, availability/ need for manpower inventory and material needs daily/ weekly/ monthly/ annually, involved with forecasting. Good forecast should be reliable, timely, efficient, and easy to use and understand.

### 3.3 Quantitative Forecasting

Qualitative and quantitative methods are two categories of forecasting. Quantitative is used when situation is stable and historical data available. This research is dealing with quantitative methods rather than qualitative methods. Distribution of quantitative methods is given below.

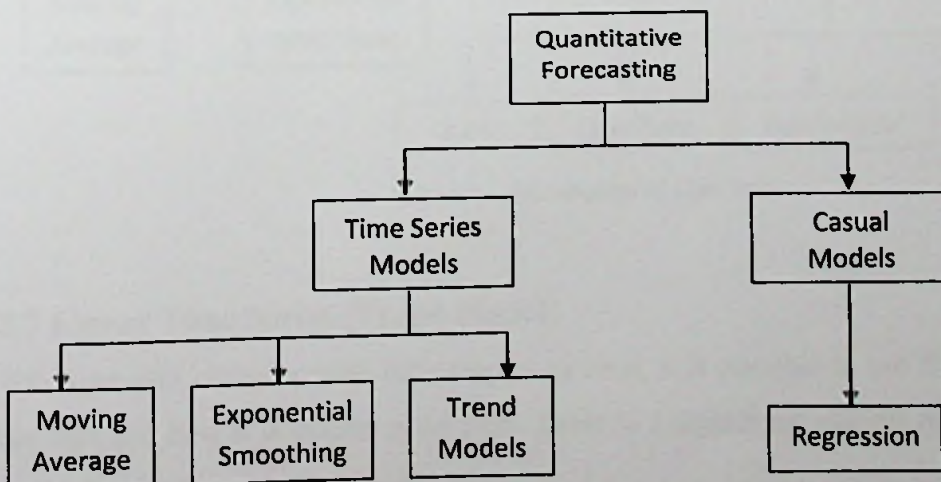


Figure 02: Distribution of Quantitative Forecasting

### 3.4 Time Series

Set of evenly spaced data or obtained by observing response variable at regular time period said to be time series. Forecast is based only on past values. It is assumed that factors influencing past, present and future are same.

### 3.5 Time Series Components

There are several components in Time Series, which are based on behavior of observing variables.

- Trend
- Cyclical
- Seasonal
- Irregular

### 3.6 Time Series Forecasting

Distribution of time series forecasting is given below.

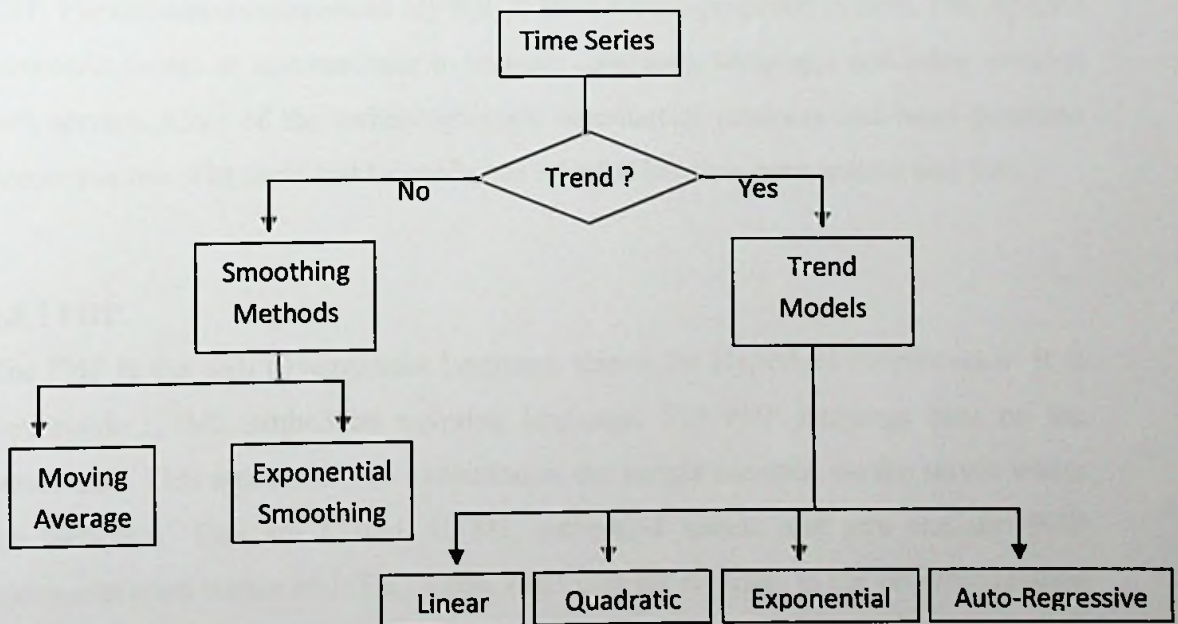


Figure 03: Distribution of Time Series

### 3.7 Linear Time Series (Trend Model)

When we plot observed data with respect to time. It is possible to see distribution of the data and how it is placed in 2d plan. There is a significant growth or trend in the

data. Therefore it is used for forecasting trend. Relationship between response variable Y and time X is a linear function.

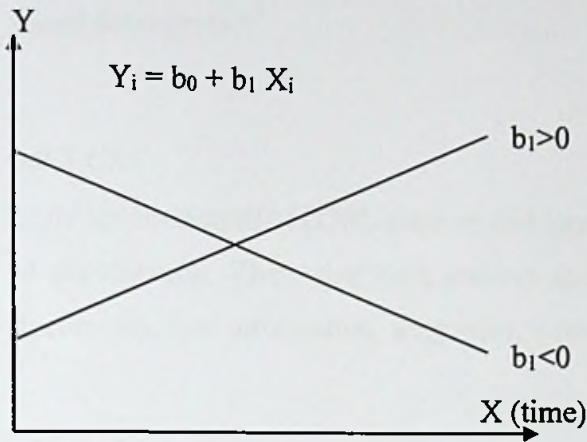


Figure 04: Trend Models

### 3.8 Other Technologies

There are several web technologies available for implementing this module such as PHP, Java, PERL and ASP. Among these one prominent technology is PHP. There are several supporting tools such as HTML with CSS, Java Script, AJAX used with PHP. For database management MySQL is ideal for the proposed system. The Apache webserver works as intermediary to connect databases, webpages and other external web servers. Most of the technologies are commercial products and need purchase licenses to use. The tools and technologies selected here are open source and free.

#### 3.8.1 PHP

The PHP is the web development language, stands for Hypertext Preprocessor. It is server-side HTML embedded scripting language. The PHP language runs on the server-side. This means that the execution of the scripts are done on the server where the web-sites' files are hosted. HTML embedded means that you can use PHP statements from within an HTML code. PHP files are returned to the browser as plain HTML. PHP is widely used and special for development web pages. Several features of PHP are supporting many databases (MySQL, Oracle, Sybase,...etc.), runs on different platforms (Windows, Linux, Unix), compatible with almost all web servers (Apache, IIS,.. etc.).



### **3.8.2 HTML**

HTML stands for Hyper Text Markup Language and is a language used to create web based documents.

### **3.8.3 CSS**

Style sheets simplify HTML markup and largely relieve HTML of the responsibilities of presentation. They give both authors and users control over the presentation of documents, font information, alignment, colors, etc.

### **3.8.4 MySQL**

MySQL is an open source, SQL Relational Database Management System. It runs on a server. MySQL is ideal for web based applications. It is one of the most popular databases and very fast, reliable, easy to use and free. The data in a MySQL database are stored in tables. A table is a collection of related data.

### **3.8.5 Apache Web Server**

Apache is the most popular web server available. The reasons behind its popularity are, it is open source and free. A web server job is basically to accept requests from clients and send responses to those requests. It is open source, which basically enables anyone to adjust the code, optimize it, and fix errors and security holes. Apache can be used for small websites of one or two pages and huge websites of hundreds or thousands of pages, serving millions of visitors simultaneously. It can serve both static and dynamic content.

### **3.9 Summary**

Time series trend analysis was selected to forecast the cadre positions. PHP, MYSQL, HTML with CSS technologies were selected for implementation of this system. MYSQL is the database. The next chapter explains the approach of the research.

## **A novel approach to automate cadre position forecasting**

### **4.1 Introduction**

Chapter 3 discussed the technology for statistical method for cadre position forecasting related to problem. This chapter presents our approach to developing the online system for forecasting cadre positions and other functions under several headings namely hypothesis, input, output, process, users and features. This chapter highlights the features that distinguishes our novel approach which offers an efficient and time saving solution for forecast.

### **4.2 Hypothesis**

Using online web based system cadre position forecasting can be addressed.

### **4.3 Inputs**

Input details are;

- Staff information of all academic staff of the universities
- Intake details of the faculties

Before enter to this data preprocesses the inputs are entered to the system by using computers of client-end.

### **4.4 Outputs**

Output details are;

- Forecasted cadre positions
- Required cadre positions
- Reports and charts
- Searching results

#### **4.5 Processes**

This system is primarily divided into several sub processes. Each sub process performs unique functions such as data input, searching, cadre position forecasting, admin functions and generate reports and charts.

#### **4.6 Features**

Main objective of this research is to develop online web based system for forecasting cadre positions. This system can be accessed for 24 hours for 7 days. And also it has powerful staff searching facility and report/ chart.

#### **4.7 Users**

There are several users such as administrator, authorized users of the UGC and the universities, administrative staff of UGC and the universities who are eligible to access the system. This system can be accessed through mobile phones, tabs and desktop computers too.

#### **4.8 Summary**

This chapter stated the hypothesis and also described the input, output, processes, features and users. The next chapter explains the design part of the research.



## Design

### 5.1 Introduction

This chapter contains the description about user requirements, system requirements and design that can be used as base for developing new system. This is most important part of this research. Ultimately all of the requirements must be satisfied by the system.

### 5.2 Existing System

At present academic staff, non-academic staff and students based activities of the universities are handled by the UGC. Most of the universities still deals with paper based documents handling to keep personnel details of the staff. Following activities are being done by UGC staff.

- Find out the actual requirement of the carder positions
- Find out information of staff members/ list of members for special training/ participate meetings/ consultations/ promotion approval....etc.

Above activities are done by manually sending letters or emails to the relevant universities and waiting two to three weeks to get response.

### 5.3 System Overview

Overview of the proposed system is given below. UGC and University staff members are connected to webserver through university network.

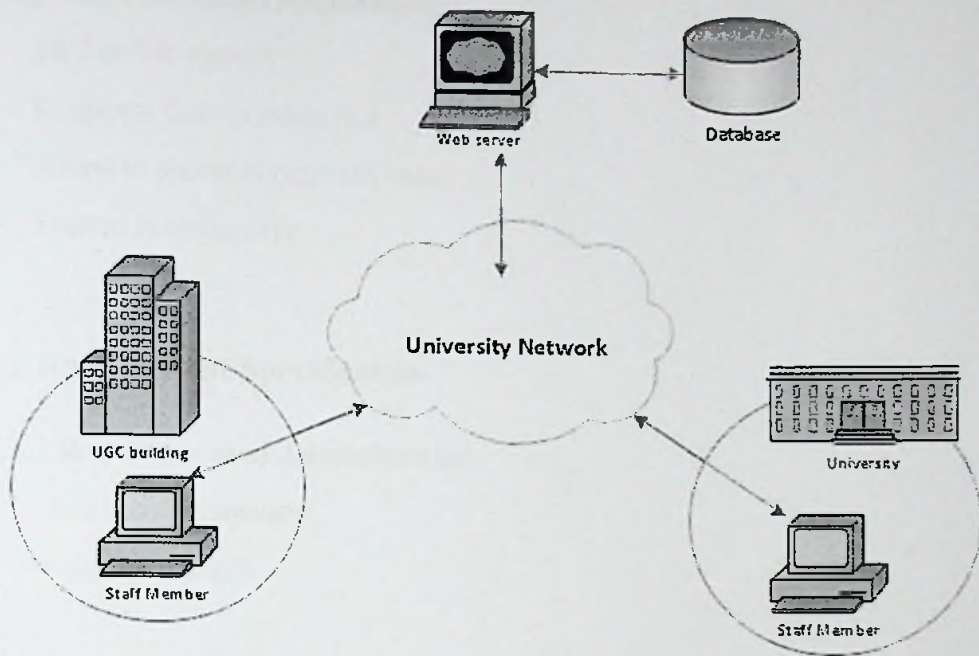


Figure 05: System Overview

## 5.4 Requirement Analysis

All the requirements were identified clearly; therefore more concerns had to exercise in order to ensure the accuracy of the outcome of this stage. Several methods were used such as interviewing end users, studying existing systems and referencing documents and getting ideas of experts and, experienced persons.

### 5.4.1 Functional Requirements

- Recording staff information such as contact details, designation, qualifications, specialized areas...etc.
- Recording student enrolments/ details such as year ...etc.
- Add new university, subject streams
- Generating required carder positions
- Generating reports and charts
- Forecasting carder positions
- Giving privileges staff members

## **5.4.2 Non Functional Requirements**

- 24/7 online system
- Response time is minimum
- Allow to access concurrent users
- System is responsive

## **5.5 Requirement Specification**

### **5.5.1 Requirement of Administrator**

- User account creation
- Assign privileges

### **5.5.2 Requirement of MIS Division**

- View Reports & Charts
- View Forecasted Cadre Positions
- Add Universities
- Add Subject Streams

### **5.5.3 Requirement of HR Division**

- View Reports & Charts
- View Forecasted Cadre Positions
- Search Staff Member with Given Selection Criteria

### **5.5.4 Requirement of Chairman**

- View Reports & Charts
- Search Staff Member with Given Selection Criteria

### **5.5.5 Requirement of University**

- View Reports & Charts of Own University
- View Forecasted Cadre Positions Own University
- Search Staff Member with Given Selection Criteria of Own University



## 5.6 Accepted Norms for Fixing of the Cadre of the Universities

### 5.6.1 The Norms Fixed for Determination of Teaching Staff

The norms accepted by the UGC for determination of the academic staff cadre of conventional Universities are as follows:

Faculty	Student : Teacher Ratio
Humanities/ Visual & Performing Arts	15 : 1
Arts/ Social Sciences	18 : 1
Law	18 : 1
Education	18 : 1
Science	10 : 1
Medicine	7 : 1
Dental Science	7 : 1
Veterinary Science	7 : 1
Agriculture	10 : 1
Engineering	10 : 1
Architecture	10 : 1
Ayurveda/ Unani/ Siddha	10 : 1

Table 02: Accepted Norms of Academic Staff Determination

**Note:** In calculation of Undergraduate Equivalent Number (UGE) for conventional universities, only the undergraduate student numbers were considered.

### 5.6.2 Norms for Fixing of Cadre of Supporting Staff in Faculties

In practice cadre is determined on the basis of past experience and evaluation of the necessity while ensuring not exceeding the following limits in case of the faculty support staff.

- For science based faculties : 3 for every 2 academic staff
- For Art based faculties : 1 for every 2 academic staff

### 5.6.3 Norms for Fixing of Cadre of Library Staff in Universities

The accepted norms in determination of the cadre of Library staff are as follows:

- The Professional Staff: Reader ratio should be 1 : 400
- Composition of the staff in a University Library should be as
  - 1.0 Professional Staff = 15%
  - 2.0 Para-Professional Staff = 40%
  - 3.0 Support Staff = 25%
  - 4.0 Labourers = 20%

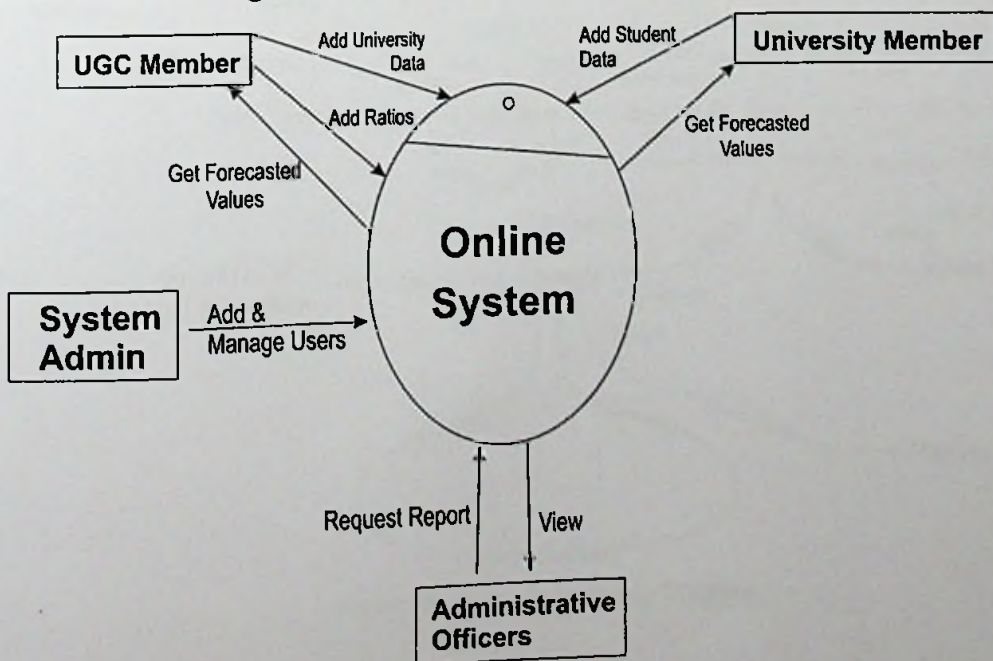
### 5.6.4 Norms for Fixing of Cadre of Library Staff in Universities

So far it has been developed the norms for General Administration and Other Services Department in the Universities. Therefore, in 2011, Cadre requirements were considered by evaluating the operative conditions in such Department and students enrolment in the Universities.

## 5.7 Diagrams

This system designing part consists of several diagrams, which are useful to identify how system data flow, how external entities are dealt with the system, which kind of relations they have...etc.

### 5.7.1 Context Diagram



## 5.7.2 Use Case Diagram

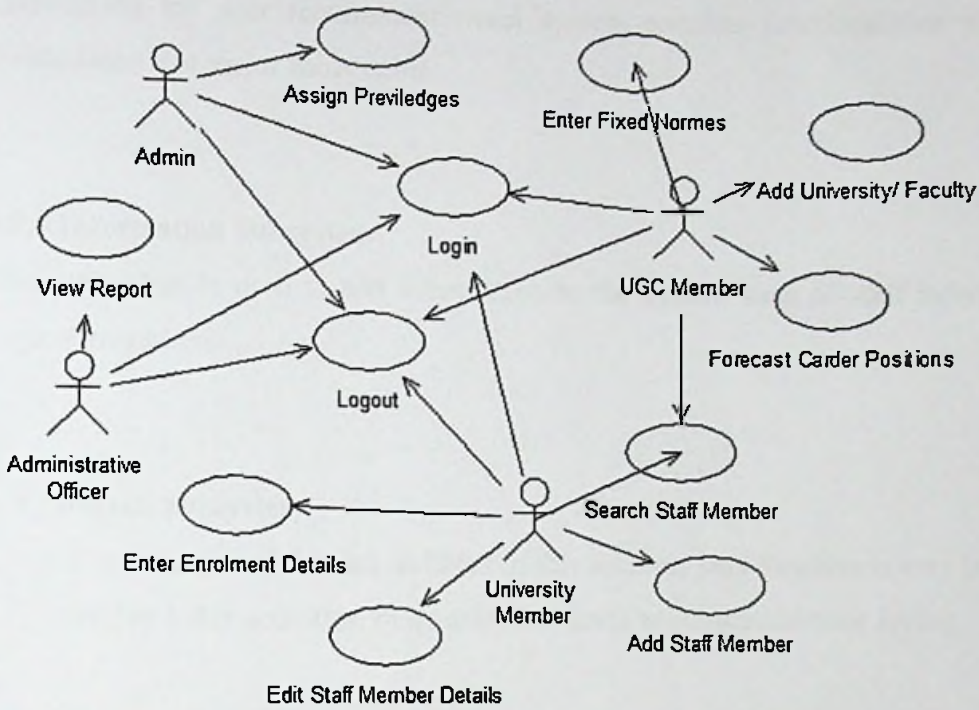


Figure 07: Use Case Diagram

## 5.7.3 Entity Relationship Diagram

Entity relationship diagram shows entities, its attributes and relationships graphically.

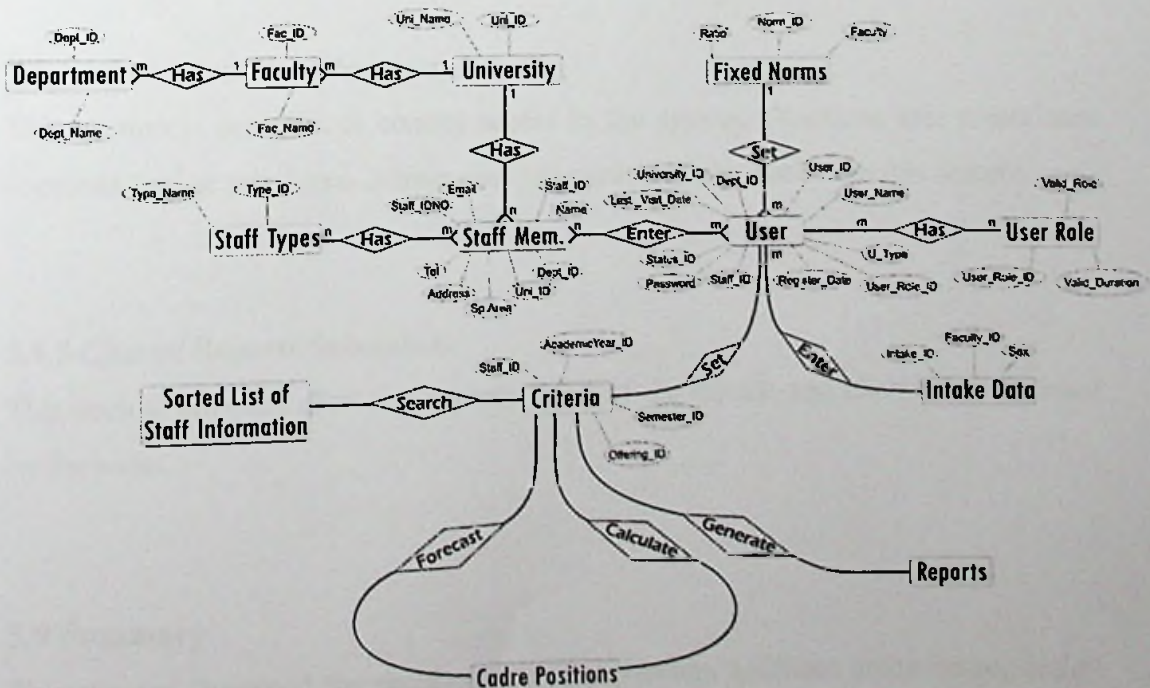


Figure 08: Entity Relationship Diagram



## **5.8 System Architecture**

Considering the user requirement navel system consists functionalities which is divided into five major subsystems.

### **5.8.1 Information Subsystem**

This subsystem is used to add information to the system such as staff information, student enrolment

### **5.8.2 Search Subsystem**

Several searching facilities are included in this section. This function is very useful to client for day today activities. In contrast that leads to substantial time saving.

### **5.8.3 Cadre Positions Subsystem**

This is the key section focusing in this research. Available functions are cadre position forecasting, current cadre positions, current required cadre positions.

### **5.8.4 Administration Subsystem**

This section is designed to control access to the system. Functions are; create user accounts, assign privileges. Admin user has permission to work with this feature.

### **5.8.5 Charts/ Reports Subsystem**

This section provides chart and reports. Most of the reports and charts are requested by the users.

## **5.9 Summary**

This chapter illustrated the requirements specification, software architecture, design charts. The next chapter explains implementation chapter of the research.

## Implementation

### 6.1 Introduction

This chapter illustrates detailed steps of implementation of proposed system. Implementation part is the most complicated and time consuming part of research.

### 6.2 User Interfaces

User interface facilitate the s to interact with the system for the users, administrators and developers. These interfaces are responsive; it can be access through web, mobile phone, tab ... etc.

#### 6.2.1 Login Form

Login form enables to enter users to the system by authenticating.



Sign in to CF Tool

Username

Password

Remember me

Not registered? Sign up here

Sign In

Forget password?  
Figure 09: Login Form

## 6.2.2 Staff Information Form

Staff information form enables to enter academic staff information to the system.

### Staff Information

#### Details of Employment

University/ Campus

Faculty

Department

Designation Category

(As at 31st December of last year)

Date of Join

If on leave state the nature

#### Personnel Details

Title <input type="text" value="Select"/> <input type="button" value="v"/>	Address
Initials <input type="text"/>	No <input type="text"/>
Last Name <input type="text"/>	Street 1 <input type="text"/>
Date of Birth <input type="text"/> <input type="button" value="v"/>	Street 2 <input type="text"/>
Sex <input type="radio"/> Male <input type="radio"/> Female	City <input type="text"/>
NIC <input type="text"/>	
Direct Phone <input type="text"/>	
Extention <input type="text"/>	
Mobile <input type="text"/>	
E-mail <input type="text"/>	

#### Details of Educational & Professional Qualification

Highest Qualification

Field of Qualify

Year Obtained

Field of Expertise

Remarks (if any)

Figure 10: Staff Information Form





### 6.2.3 Student Enrolment Details Form

This form is enabled to enter faculty wise enrollment details of students. The form is facilitated to enter enrolment data of past years too.

Details of Enrolment

University/ Campus

Faculty

Year

Number of Students Enrolled

Figure 11: Enrolment Detail Form

### 6.2.4 User Creation Student Enrolment Details Form

This form is enabled to enter detail of users. The form is facilitated to enter enrolment data of past years too.

#### User Creation

Details of User

University/ Campus

Name

Privilege Level

Login ID

Password

Confirm Password

Figure 12: User Creation Form

### 6.2.5 User Privilege Table

This form is enabled to enter faculty wise enrollment details of students. The form is facilitated to enter enrolment data of past years too.

Priviledge Table

User Role	Priviledge Level			
	Admin	Manager	Supervisor	User
1. User Creation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Data Entry	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3. Search	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. Forecasting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5. Reporting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. Priviledge Assigning	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Submit

Table 3: User privilege Table

### 6.2.6 Search Member

This form is enabled to enter faculty wise enrollment details of students. The form is facilitated to enter enrolment data of past years too.

### 6.3 Output

The system can produced several outputs which are requested by the client. Most of the reports are able to include annual reports too.

### 6.3.1 Required Cadre Positions

🏠 Cadre Positions **Required Cadre Positions**

#### Required Cadre Position Detail

University :	Moratuwa
Faculty :	Information Technology
Existing Cadre Positions:	21
Fixed Norm Ratio:	10 : 1
Enrolment (2015):	1049
Required Cadre Positions (2015):	84

Figure 13: Required Cadre Positions

### 6.3.2 Forecast Cadre Positions

🏠 Cadre Positions **Forecast Cadre Positions**

#### Forecast Cadre Position Detail

University :	Moratuwa
Faculty :	Engineering
Existing Cadre Positions:	205
Forecast Year:	2020
Forecast Cadre Positions:	415

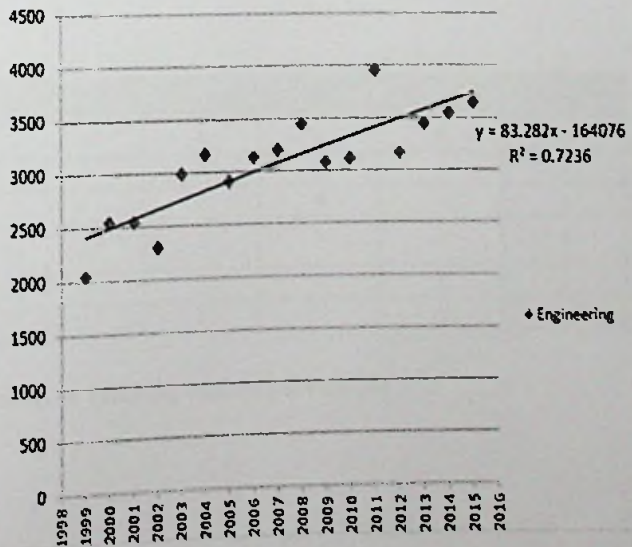


Figure 14: Forecast Cadre Positions



### 6.3.3 Reports

#### Enrolment of Higher Education Institutions

University of Moratuwa		University of Visual and Performing Arts	
<b>Faculty: Information Technology</b>		<b>Faculty: Music</b>	
Intake	Total	Intake	Total
2015	1049	2015	739
2014	887	2014	658
2013	720	2013	722
<b>Faculty: Architecture</b>		<b>Faculty: Dance and Drama</b>	
Intake	Total	Intake	Total
2015	1522	2015	1015
2014	1436	2014	952
2013	1376	2013	1076
<b>Faculty: Engineering</b>		<b>Faculty: Visual Arts</b>	
Intake	Total	Intake	Total
2015	3644	2015	427
2014	3546	2014	401
2013	3441	2013	417

Table 4: Enrolment Details

#### Distribution of Teaching Staff in Universities

University	Senior Professor	Professor	Associate Professor	Senior Lecturer 1	Senior Lecturer 1	Lecturer	Assistant Lecturer	
Moratuwa	Engineering	13	24	4	45	67	52	0
	Architecture	1	1	1	16	24	27	0
	IT	1	0	0	3	10	7	0
Visual Performing Art	Dance & Drama	2	2	2	16	2	15	0
	Music	0	1	1	15	5	19	0
	Visual Art	0	1	2	3	4	14	0

Table 5: Distribution of Teaching Staff in Universities

### 6.3.4 Charts

## Distribution of Teaching Staff

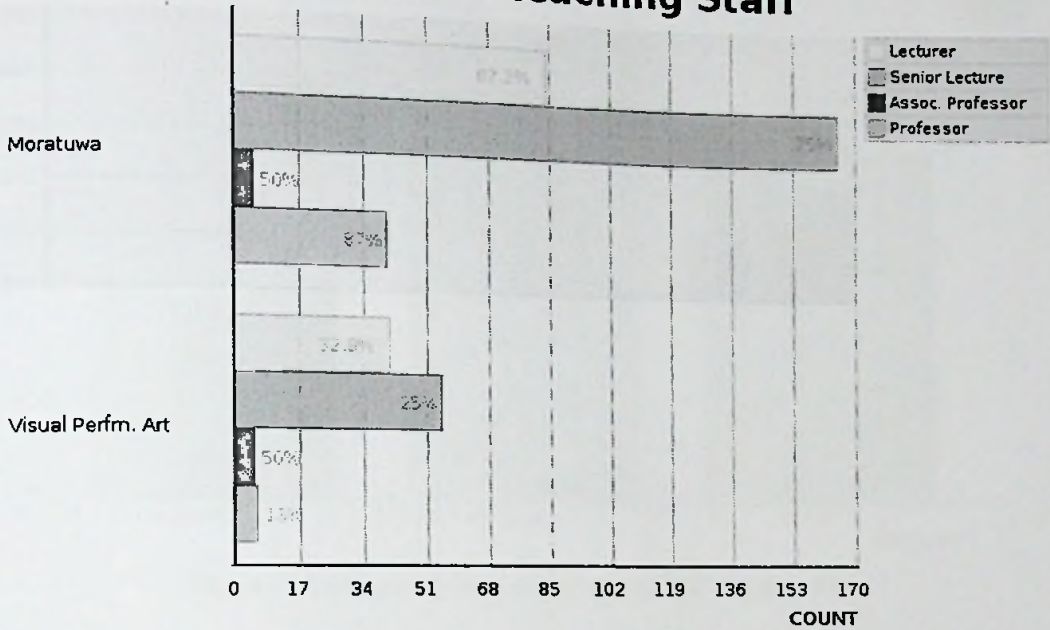


Figure 15: Composition of Teaching Staff in Universities

## UOM-ENROLMENTS

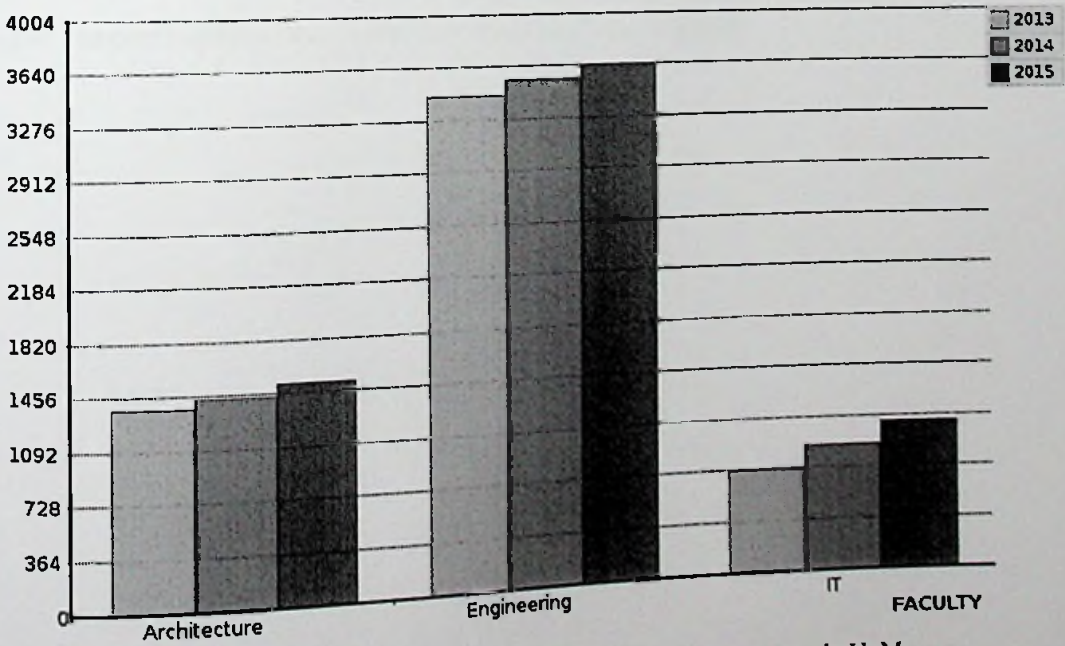


Figure 16: Undergraduate Enrolment by Academic Program in UoM

## VPA-ENROLMENTS

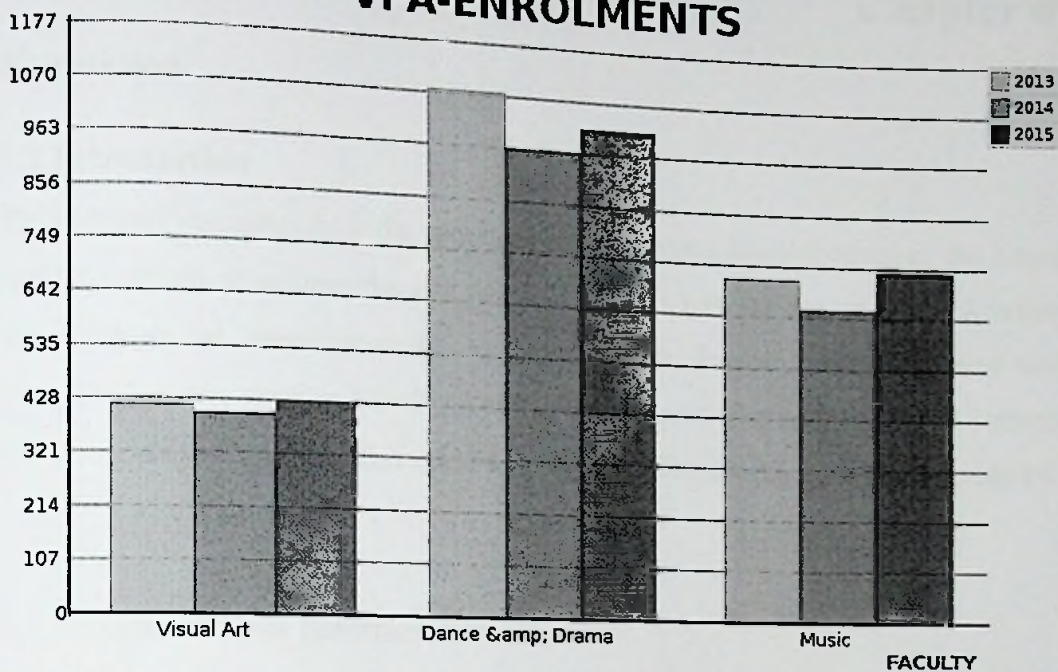


Figure 17: Undergraduate Enrolment by Academic Program VPA

### 6.4 Summary

This chapter demonstrated snap shot of input interfaces and output report/ charts. The next chapter explains the evaluation chapter of the research.



## Evaluation

### 7.1 Introduction

This chapter discusses how the proposed solution meets the objectives of the project and accordingly to achieve the ultimate goal. Further, how far and up to which extend, the solution has been successful to its objectives. Further, technology and tools associated in this work and their suitability is discussed. Performance of the software and possibility of applying this system for other similar job titles are also considered.

### 7.2 Graphical User Interface

Initially login page is available to all visitors. Permitted users are directed to place called dash board. Which have all the sub-systems placed as links. User privileges are assigned to registered users according to that successfully logged users are enabled to perform the activities.

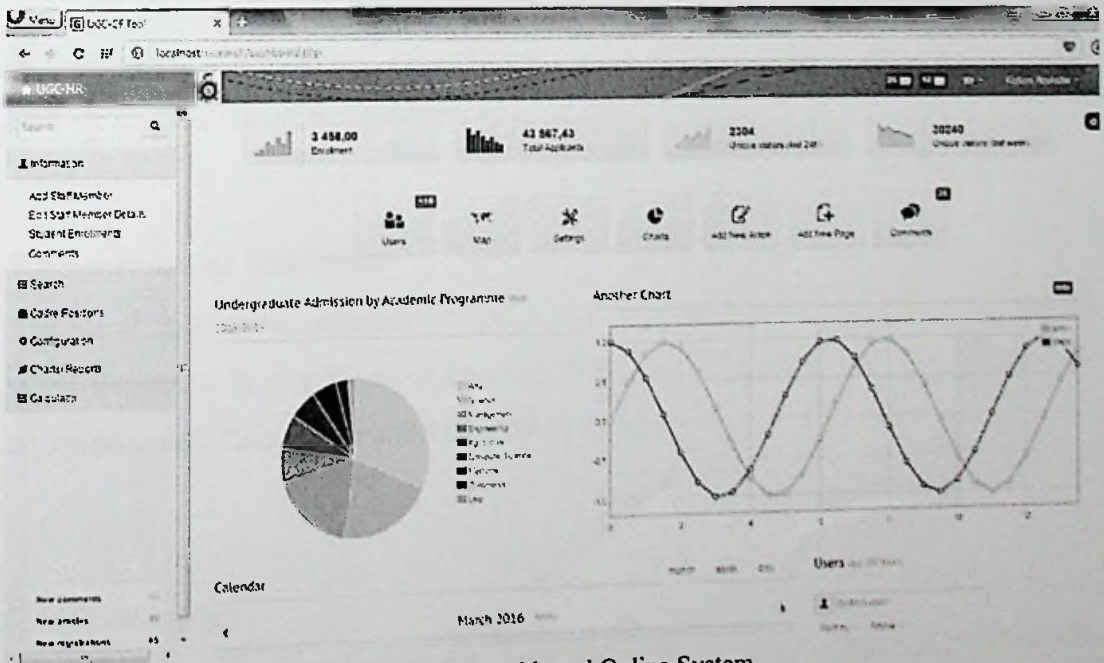


Figure 18: Dashboard Online System

### 7.3 Assessment

This software application is a web based system that can be accessed through web browser. Transmission media may be intranet or World Wide Web (Internet). In this

research proposed system might be deployed in web server of UGC or University of Moratuwa. Any access request come through internet must follow IT/ security policy of hosted company/ organization. There are several advantages over a web based software application.

- Cross platform compatibility
- More manageable
- Highly deployable
- Reduces costs
- Efficiency advantages
- Improves communications and coordination
- Offers greater security

#### **7.4 Deviation from Human Resource Software Tools**

Study the similar system may be a challenging task because draw backs and features must be clearly identified. When analyzing various web based Human Resource products and its features, most of the software has common modules which are Leave Management, Attendance, Recruitment,...etc. Carder position forecasting is the newest feature, which is included to the proposed system.

#### **7.5 Increase of Efficiency**

Statistical forecasting method is applied for separate homogeneous groups. In other word the research considered individual faculties and its past data to generate trend equation rather than whole university takes as one.

#### **7.6 Technology**

This system can be installed on any host that runs on Apache Web Server, MySQL, and PHP.

## 7.7 System Appraisal

After the deployment of the system, comprehensive training session is provided. System users' feedback was obtained through questionnaire (Appendix 1). The questionnaire was distributed to ten system users of university of Moratuwa. They were randomly selected and allowed all privileges. Completed questionnaire were collected and tabulated (Table 6).

Assessment	Responses %				
	A Very Good	B Good	C Normal	D Not up to the expected level	Total
1. User friendliness	10.0	60.0	30.0	0.0	100.0
2. Speed	20.0	50.0	30.0	0.0	100.0
3. Appearance	40.0	50.0	10.0	0.0	100.0
4. Security	10.0	60.0	30.0	0.0	100.0
<b>Modules</b>					
5. Login	10.0	60.0	30.0	0.0	100.0
6. Information	20.0	70.0	10.0	0.0	100.0
7. Search	10.0	70.0	20.0	0.0	100.0
8. Cadre Position	0.0	50.0	50.0	0.0	100.0
9. Administration	10.0	70.0	20.0	0.0	100.0
10. Charts/ Report	20.0	50.0	30.0	0.0	100.0

Table 6: Assessment Results

This table describes, 60% of users have stated user friendliness is good. 10% and 30% of users have stated respectively very good and Normal. And also 50% of users have stated speed and appearance of the system is good. Further 60% of users have stated security of the system is good. Likewise analysis of user responses of module operation have displayed in above table.

## 7.8 Summary

This chapter demonstrated the evaluation of the online system. The next chapter explains conclusion and further works of the research.



### Conclusion & Future Works

#### 4.1 Introduction

Conclusion is one of the most important chapters of this research. Achievements, conclusion and the future works are presented in detail.

#### 8.2 Achievements and Lessons Learnt

The cadre position forecast method introduced in this research is not straight forward calculation. This differs based on the nature of the faculty such as Art, Science, Medicine, Engineering, and Management...etc., and equation which is generated by the statistical method. The generated equations are based on the past 5 or 10 year enrollment data of each faculty, and Trend Analysis of Time Series.

Collecting data and analyzing the system enabled improve knowledge of existing system, which helped a lot in system, database design part and implementation stage as well in future.

Some weaknesses were identified during that period. Most of them have done by the UGC and University staff members, who have been working with personnel files. And also it consumes much time for above activities.

Calculating cadre positions requirement is also taking more time. This process must have latest details of existing cadre positions and student details of relevant course, faculty with intake. Otherwise result will not be correct. The issue is latest updated details never receive in given time period. So real time updating system is required for such a calculation.

The requirement of real time updating system is crucial for the decision makers of the UGC and academic, administrative staff of the universities. This project is mainly addressing and may be overcome these issues.

The problem domain is large. Therefore the system will be address limited and most important areas only. Thus it considers academic staff members only.

### **8.3 Conclusion**

This research produced online web based solution, which addressed the prevailing problem in universities and university grant commission with maintaining proper cadre positions of university teaching staff. Further it has powerful searching facility to find staff member within several seconds in any university with given criteria such as expert field of expertise, field of qualify, highest qualification... etc.

### **8.4 Future Works**

This is still not a potent tool for forecasting the cadre positions in university system. This method might not predict precisely the exact cadre position requirement of the university system in Sri Lanka. The thesis recommends that demonstration of fixed norm should be drilled down further until department/ subject, within the faculty there are various departments and subjects with different qualitative and quantitative requirements. Those factors must be considered by the University Grant Commission, before taking decisions to get the precise results.

### **4.2 Summary**

This chapter described the lesson learnt, conclusion, and future works of the research. All the references are included in next chapter.



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# APPENDIX

## SYSTEM APPRAISAL FORM

### of Online System for Cadre Position Forecasting

#### Overall Assessment

Please study the system carefully. Read question and underline on appropriate answers.

1. User friendliness

A. Very Good    B. Good    C. Normal    D. Not up to the expected level

2. Speed

A. Very Good    B. Good    C. Normal    D. Not up to the expected level

3. Appearance

A. Very Good    B. Good    C. Normal    D. Not up to the expected level

4. Security

A. Very Good    B. Good    C. Normal    D. Not up to the expected level

5. Login Module

A. Very Good    B. Good    C. Normal    D. Not up to the expected level

6. Information Module

A. Very Good    B. Good    C. Normal    D. Not up to the expected level

7. Search Module

A. Very Good    B. Good    C. Normal    D. Not up to the expected level

8. Cadre Position Module

- A. Very Good    B. Good    C. Normal    D. Not up to the expected level

9. Administration Module

- A. Very Good    B. Good    C. Normal    D. Not up to the expected level

10. Charts/ Reports Module

- A. Very Good    B. Good    C. Normal    D. Not up to the expected level

