

# **INTERNATIONAL FACULTY SEARCH**

By

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A REPORT

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MASTER OF SCIENCE

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Major Professor  
Dr. Daniel Andresen

## **ABSTRACT**

This application enables users to search the database for International Faculty Members who are currently working at the veterinary department. It also helps the users to know more about the faculty members in detail that is about their specialization, area of expertise, their origin, languages they can speak and teaching experience.

The main objective of this project is to develop an online application where the faculty members could be searched based on the three major criteria that is department to which the faculty member belong to or based upon the area of expertise of the faculty member or based upon the country. The application is designed in such a way that a combination of this three drop down list would also give us the results if any such kind exists.

The major attraction for this application is that the faculty members are plotted on the world map using the Bing API. A red color dot is placed on the countries to which the faculty members belong, and a mouse over on the dot pops up when the mouse pointer is placed on the red colored dot then it would pop up the names of the faculty who hail from that country. These names are in form of hyper links when clicked on them would direct us to the respective faculties profile.

This project is implemented using C#.NET on Microsoft Visual Studio 2008 along with the xml parsing techniques and some XML files which stores the profile of the faculty members. My primary focus is to get familiar with .NET framework and to be able to code in C#.NET. Also learn to use MS Access as database for storing and retrieving the data.

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## 1.0 INTRODUCTION

This application helps students and other employees to search a particular International faculty member and to know more about his/her research, experiences and expertise. In the profile, we provide the picture of the faculty member along with other basic contact details like the email address, phone number and the department to which he/she belongs to. Most of the new students who would like to work under a particular professor based upon their area of interest they could search for a faculty with respect to their area of interest. We also use the world map to mark the faculty members on the map so that computer savvy users could also just place the mouse pointer on the red dots which would pop up names of the faculty who hail from that country. Upon clicking a name they would be taken to that respective faculty's profile.

### 1.1 Objective

The objective of the project is to develop a website which provides students, faculty and employees to search for a particular International Faculty and provides the details in a simple and easy manner. The application is implemented using C#.NET programming language on Visual Studio 2008. Bing API used to plot the faculty members on the world map. All the faculty members are listed in a grid view, in the ascending order of their name. The name of the faculty member's act as a hyper link to their profile, when clicked on their name would take to their respective profile page. Each profile is stored in an xml file along with their image.

### 1.2 Intended Users

**Current Students:** It would help students research and learn about the faculty members in the department, making it easier for them to choose professors to work with.

**Future Students:** In order to carry out research most of the prospective students choose a particular professor, all the details of all the faculty members could easily be know by using this application.

**Faculty and other Employee:** Using this application the head of the department could browse all the faculties profile and know their details instead of going through their resumes and other

files. Thus, the task of assigning particular projects or a subject to a faculty by the Head of the department would be easier.

### **1.3 Motivation**

I had to work with xml parsing techniques along with C# code in order to provide confidentiality to the research work of some faculty members. At the end of this project I do feel that I have gained valuable experience working on .NET platform in collaboration with xml, as well as Microsoft Access for database design.

### **1.4 Study of System**

The website design is targeted towards the students and faculty members of veterinary department and the main purpose is to provide students an easy, simple and efficient manner of finding and knowing more about the International faculty member. The user interfaces that are developed in this website help the students with different transactional states like searching the faculty member by using the drop down list or searching them by using the world map, else from the list of all the faculty members. The inclusion of this mechanism makes users feel comfortable while using the website.

#### **1.4.1 Inputs and Outputs**

##### **Inputs from the users:**

The user could choose any option from any of the following drop down lists

- Area of Expertise
- Country
- Department

A user could also select different combinations. For example, a user could choose an option from *area of expertise* dropdown list along with a country from the *country* dropdown list. A selection could also be made by choosing an option from all the three drop down list at the same time. If there exist a record based upon the options chosen then it would display the record else it would simply print a message saying “There is no particular record which satisfies the given query combination”. It would also print a suggestion which states “Try modifying your request by changing the value of one or more of your selections”.

## **Expected output:**

The output from the input above is a list of records based upon the options chosen from the dropdown lists, the names under these records have a hyper link which when clicked would take the user to the respective profile. The profile consists of the following fields:

- ❖ Name of the Department
- ❖ Phone number
- ❖ Email address
- ❖ Profile Picture
- ❖ Expertise
- ❖ Region of Interest
- ❖ Countries of Interest
- ❖ Collaborations
- ❖ Languages Known.

## **1.4.2 System Architecture**

This application uses a 3- layered architecture. Its functionality can be divided into as following

**Presentation layer:** The .ASP file (which uses the style sheet to get graphical appearance).

**Business layer:** The code behind file (.cs file) which consists the actual Business logic.

**Data layer:** The database (MS Access).

### **Scope:**

The scope of this application, “International Faculty Search” is that it provides an easy and hassle free way to search any International faculty under the Veterinary Department. It also needs good visual effects which are user friendly.

### **Goal:**

The main goal of this application is to make searching the faculty easy for the students as well as for the other faculty members and employees under the veterinary department, using the technologies like Bing API as well as the xml parsing.



### 1.4.3 System Requirement Analysis

The most important goal of the application as mentioned above is to provide students, faculty and employees an easy, efficient and interactive interface way to search and know more about the faculty members online. I have interacted with students and faculty and worked around them in order to understand what students, faculty and employees exactly need and how to make it convenient so that it will be easy for them to use.

This is kept open for the public use, anyone who is willing to know more about the faculty members those who are employed at Veterinary Department.

When the application is opened the first page is expected to display the three drop down list:

- Area of Expertise
- Country
- Department (the veterinary department is again divided into Anatomy and Physiology, Clinical Sciences, Dean's Office and Diagnostic Medicine and Pathobiology).

Once the user makes a choice from the drop down lists and submits it, we could see the faculty members who are available based upon that criteria, otherwise it would display an error message saying *there are no faculty available based upon the requested criteria, thus modify the search.*

If some faculty are available based upon the requested criteria, then a Grid view is displayed which has records with three columns: Name, Country and Department. Each faculty name is a hyperlink which is linked to their respective profile. All profiles have got the following fields:

#### a. Mandatory Fields

- Name of the faculty
- Department to which he is from
- Email
- Picture of the respective faculty member

#### b. Optional Fields

- Expertise
- Region of Interest

- Countries of Interest
- Collaborations
- Languages

The mandatory fields are displayed for every faculty member but the optional fields vary from faculty to faculty due to confidentiality reasons. Some faculty members don't want to make their research work public. This decision of displaying or not displaying is obtained by parsing the XML associated with profiles.

On the Index page of this application there are two more links

1. Map Search
2. View All

#### **1.4.4 Map Search**

This would post a world map. This map is overlaid with red dots for all countries with represents at least one faculty from that country who is currently employed at veterinary Department. When the mouse pointer is placed on a particular red mark it would pop up a box in order to display the name of the faculty who emerge from that country, again these names of the faculty act as a hyperlink to the respective profile. This is an alternative to the list-based search. The visual effect also attracts the users and makes them feel comfortable to use.

#### **1.4.5 View All**

On clicking the view all button, a grid is displayed with all the faculty members who are available in the database. This is targeted towards users who are familiar with all the departments and the names of the faculty members, and then this kind of search would make the users life much easier.

#### **Software Specifications:**

- The development environment of International Faculty Search is Microsoft Visual Studio .Net (2008).
- The coding has been done using C#.
- The application has been tested on Windows 7 platform.
- The database used in this application for storing and retrieving data is MS Access 2007.

## **2.0 RELATED WORK**

### **2.1 Tools and Technologies**

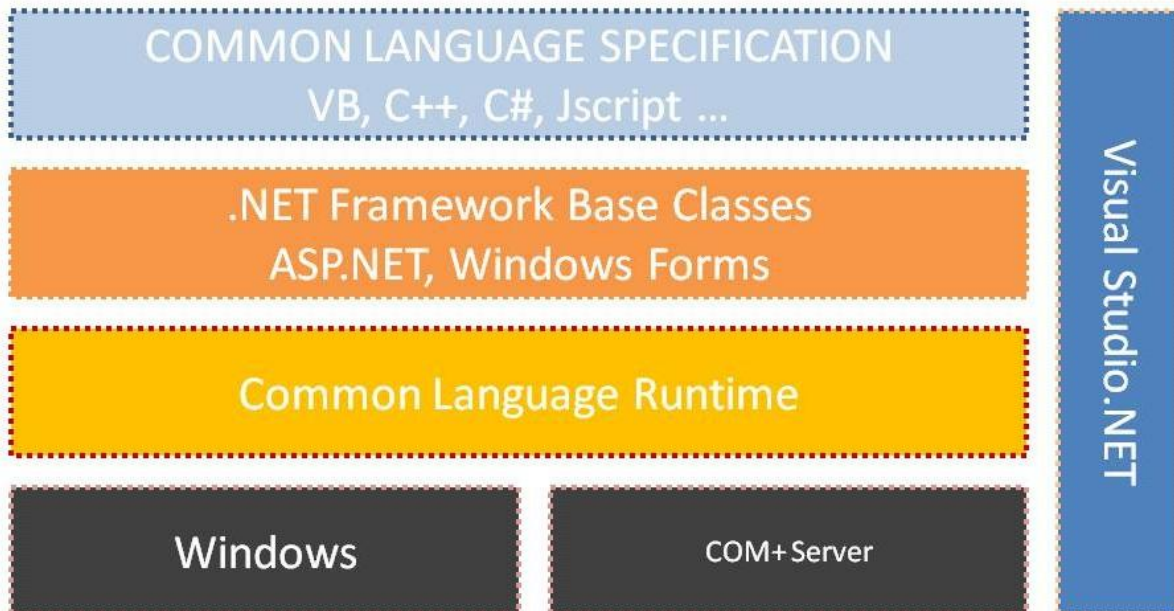
This chapter discusses in detail about the tools and technologies used in this project. The tools and technologies used in this application are ASP.NET 2.0, Microsoft visual studio 2008 and MS Access.

#### **2.1.1 ASP.NET**

ASP.NET is a part of .NET framework and is a web-application framework. It is built on the Common Language Runtime (CLR) which allows programmers to build dynamic web applications, web services and web sites and also allows them to write ASP.NET code using any .NET language.

“The ASP.NET compiler compiles all the application components including pages and controls into an assembly so that ASP.NET environment can be used to service requests from the users. It has several other features like debugging support, health monitoring and performance features, xml web services framework, an extensible designer and hosting environment and application life cycle management.” [14]

The figure 2.1 below gives an idea of the ASP.NET architecture. The architecture of ASP.NET is based on the CLR which runs as virtual machine on operating system. This CLR is layered on top of the windows and COM+ services. On top of it are the .NET framework base classes which provide classes that can be called from any .NET language. These contain ADO.NET, XML, IO, security, threading etc., ADO.NET which is a set of classes provide data access support for the .NET framework based on ADO. On the top of .NET framework base classes are ASP.NET and windows forms. ASP.NET offers web forms and web services where as the windows forms are used by traditional client applications (windows applications). Common Language Specification (CLS) is on top of these two which makes sure that each language has common set of features. Layered on top of CLS are various .NET programming languages like VB, C++, C#, J#, Jscript etc.,



**Figure 2.1: Idea of the ASP.NET architecture**

### 2.1.2 Visual studio 2008

“Visual studio is an Integrated Development Environment (IDE) developed by Microsoft and it helps to build various ASP.NET web applications and XML Web services by providing various development tools. It also helps in building console as well as GUI applications that can be in native code combined with managed code for all platforms that can be supported by Windows, .NET framework etc. There are several other built-in tools which include a forms designer which can also be used to build GUI applications, web/ class/ database schema designers etc.” [15]

### 2.1.3 MS Access

Microsoft Access is a relational model database produced by Microsoft. This is the successor to SQL server 2000 and comprises of T-SQL and ANSI SQL as its query languages.

In order to integrate with .NET framework, Access CLR was introduced with Microsoft Access. Using this integration, programmers can code stored procedures, functions and triggers in .NET framework language of their choice. VB.NET and C# languages offer object-oriented constructs,

namespaces, classes and arrays. Many tasks which are difficult to perform in Transact-SQL can be accomplished by managed code. The integration between CLR and Microsoft Access provides many benefits such as enhanced safety and security, common development environment, performance, scalability and enhanced programming model. This also supports web services in which one can develop XML web services in the database tier which makes Microsoft Access an HTTP listener.

The current application utilizes all these features of Microsoft Access to store and retrieve the data of the every faculty whenever there is a request made to display their profile.

#### **2.1.4 XML**

**Extensible Markup Language (XML)** is a set of rules for encoding documents in machine-readable form. It is defined in the XML 1.0 Specification produced by the W3C, and several other related specifications, all gratis open standards.

XML's design goals emphasize simplicity, generality, and usability over the Internet. It is a textual data format with strong support via Unicode for the languages of the world. Although the design of XML focuses on documents, it is widely used for the representation of arbitrary data structures, for example in web services.

Many libraries (APIs) have been developed that software developers use to process XML data, and several schema systems exist to aid in the definition of XML-based languages.

As of 2009, hundreds of XML-based languages have been developed, including RSS, Atom, SOAP, and XHTML. XML-based formats have become the default for most office-productivity tools, including Microsoft Office (Office Open XML), OpenOffice.org (OpenDocument), and Apple's iWork.

All these features in XML are meant to increase the web page's interactivity, speed and usability. In this application, I have used XML to store the profiles of each professor so that we could have security on some confidential data like research etc, by having a condition while parsing which node to be displayed and which should not be displayed.

## 3.0 DESIGN AND IMPLEMENTATION

### 3.1 System Architecture

This chapter the three tier architecture is used. The three tier architecture is a client-server architecture in which user interfaces, functional business logic, data storage and data access are developed and maintained as independent modules, often on different platforms. This model is considered to be a software design pattern. It allows any of the three tiers to be upgraded independently as requirements or technology change and is described in detail in the following sections.

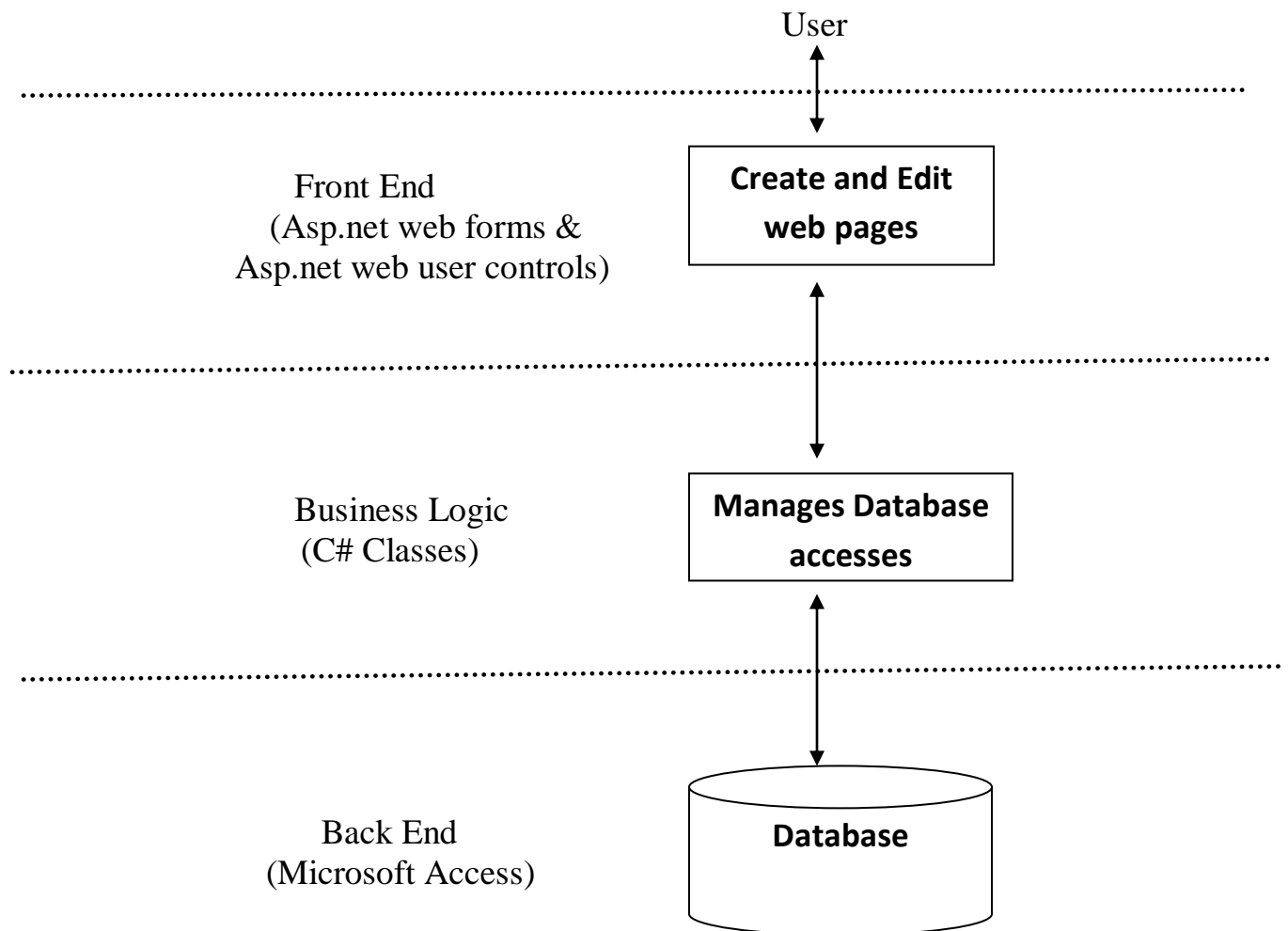


Figure 3.1: A simple three-tier architecture

### 3.2 International Faculty Search System Architecture

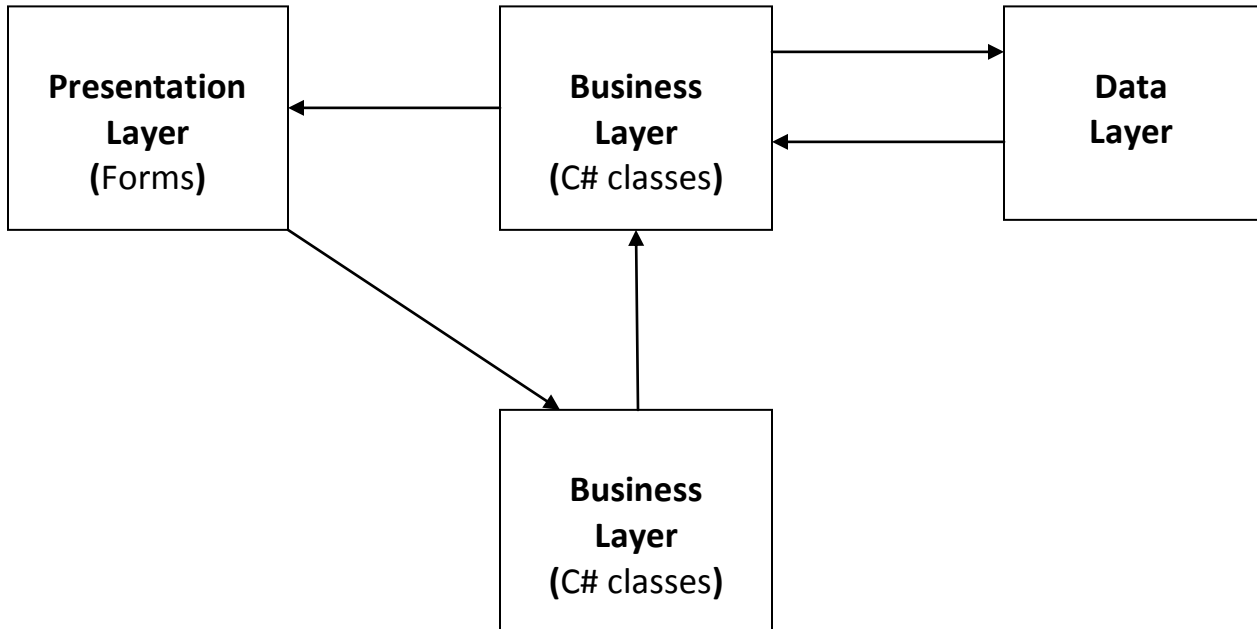
Figure 3.1 gives an idea of the three layers, which are presentation, business and data tiers. These three tiers can also be referred to as logical layers where each layer performs a specific function and forms the reusable section of the code. These layers interact with other layers in order to perform certain tasks. The presentation layer which is also known as application provides various forms web forms, user controls, etc. It has ASP.NET web forms, web controls, user controls, XML etc., for the above said purpose. Hence, I chose Visual studio .Net 2008 to design and code the ASP.NET pages to make the website more interactive and also attractive. This is the layer where the user interacts with the application part. The user provides input through this layer and further processing takes place by supplying the information to the layer below it which is the business layer or the middle layer.

The business layer which is also called the middle layer is responsible for sharing and controlling the business logic of the application. Programmers write the functions in this layer for getting data from the application layer or the presentation layer and passes through the data access layer. This contains several C# classes and this can be noticed from the figure shown above. In addition to the above said functionalities, this tier is also responsible for increasing the code transparency and also for altering the database. Some of the classes under this application are, MapSearch, Profile, View etc. The business layer can be more clearly understood by the use case and class diagrams of the application which are shown below.

The current application Faculty Search system uses Microsoft Access database. This Microsoft Access server makes the search effective and convenient whenever the user (student or the faculty member) has submitted a request. The database schema for this application is shown in figure 3.4 which comprises of Information table. From the figure all the fields and keys of the tables can be noticed.

Given all these advantages of the three tier architecture, I felt it matches with all my requirements of the project and hence I have decided to go with three tier architecture for my current application.

The figure 3.2 which is below describes the data flow among the three tiers.



**Figure 3.2: Data flow among the three tiers**

### **3.2.1 Presentation tier**

This is the top most level of the application the user interface. The main function of the interface is to translate the tasks and results to something which can be understood by the user. It communicates only with business layer by sending results to the browser/client and all other tiers in the network. In this presentation layer the programmers design the forms using the controls like dropdown list, labels, buttons, hyperlinks, Map (Bing API) etc., in the above diagram we have ASP.NET web forms, web user controls and ASP.NET master pages. In the current application this tier consists of ASP.NET web forms which contain the ASP web controls, user controls and XML controls. This Application runs on Visual studio .NET 2008 version.



### **3.2.2 Business tier**

This layer is pulled out from the presentation tier and it controls an application's functionality by performing detailed processing. This layer is the set of classes which gets the data from the above layer (presentation layer) and passes through the data access layer. The presentation layer communicates with the data access layer only through this layer. This layer validates the input and ensures that the input is correct before proceeding further and often ensures that the output is correct. The business logic lies within this layer and this makes the logic reusable in all the applications. The use case and class diagrams of this application are described in detail in the below sections.

#### **3.2.2.1 Use Case Diagrams**

In the Unified Modeling Language (UML), the use case diagram is a type of behavioral diagram defined by and created from a use-case analysis. It represents a graphical over view of the functionality of the system in terms of actors, which are persons, organizations or external system that plays a role in one or more interaction with the system. These are drawn as stick figures. The goals of these actors are represented as use cases, which describe a sequence of actions that provide something of measurable value to an actor and any dependencies between those use cases.

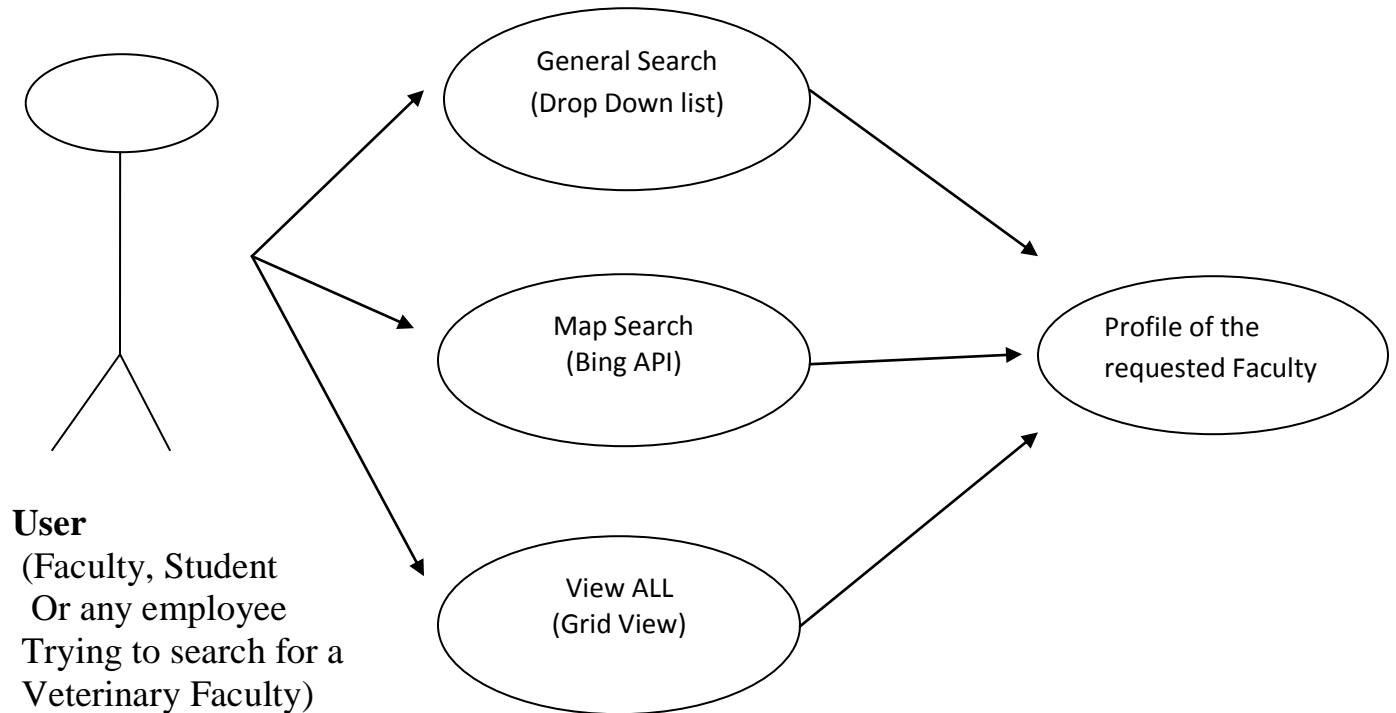
The associations between actors and use cases are indicated in use case diagrams by solid lines and this exists whenever an actor is involved with an interaction described by use case.

#### **Faculty Search Use case:**

The user can search via normal search engine i.e. using the

1. dropdown list
2. Map search
3. List of the entire faculty i.e. the Grid which displays entire list of faculty.
4. Visit the profile of each faculty – collect various information about each faculty i.e.
  - a. Contact details (email, Name, picture)
  - b. Expertise
  - c. Experience
  - d. Region of Interest

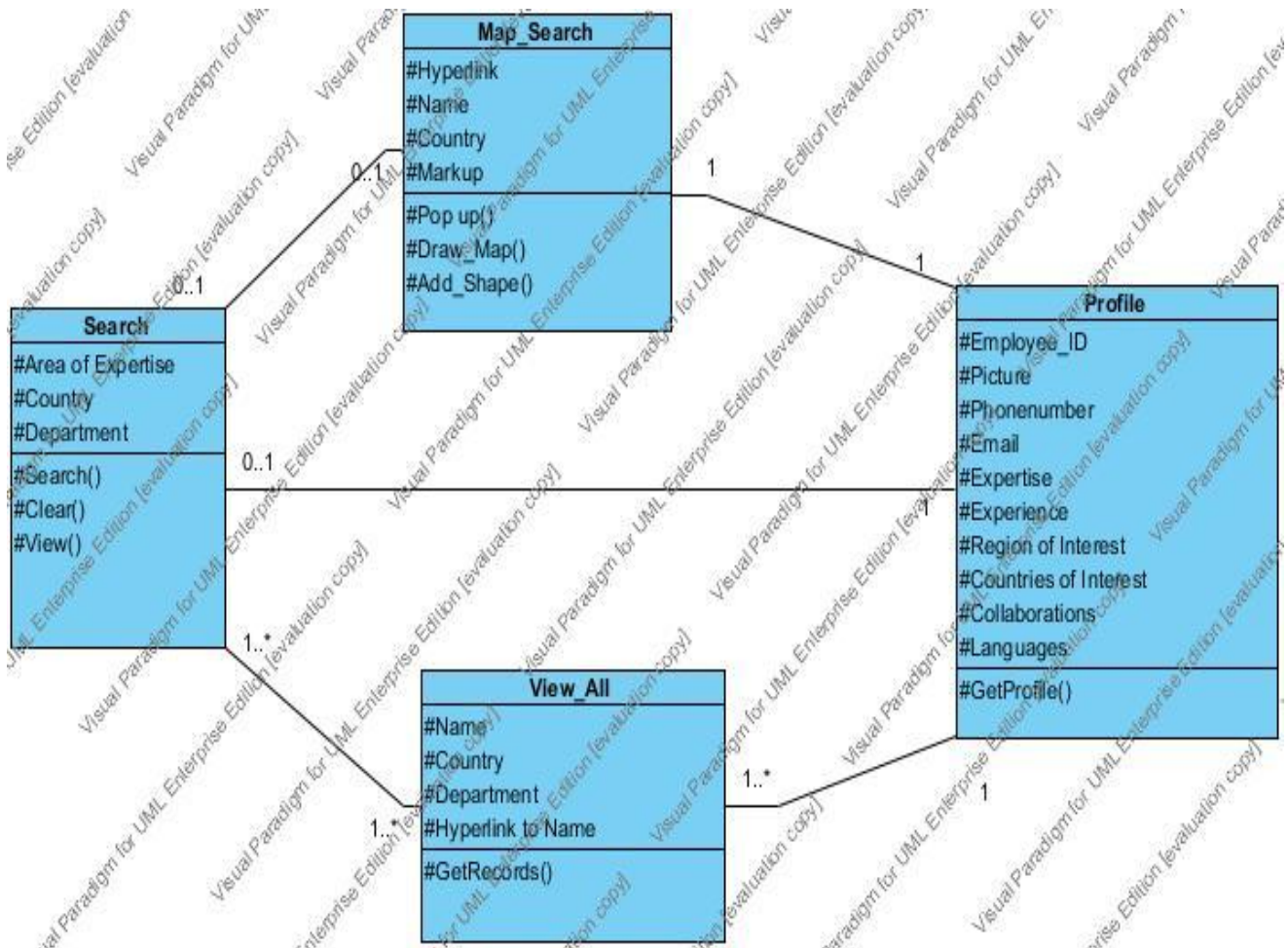
- e. Countries of Interest
- f. Collaborations
- g. Languages



**Figure 3.3: Student Use case Diagram**

### 3.2.2.2 Class Diagrams

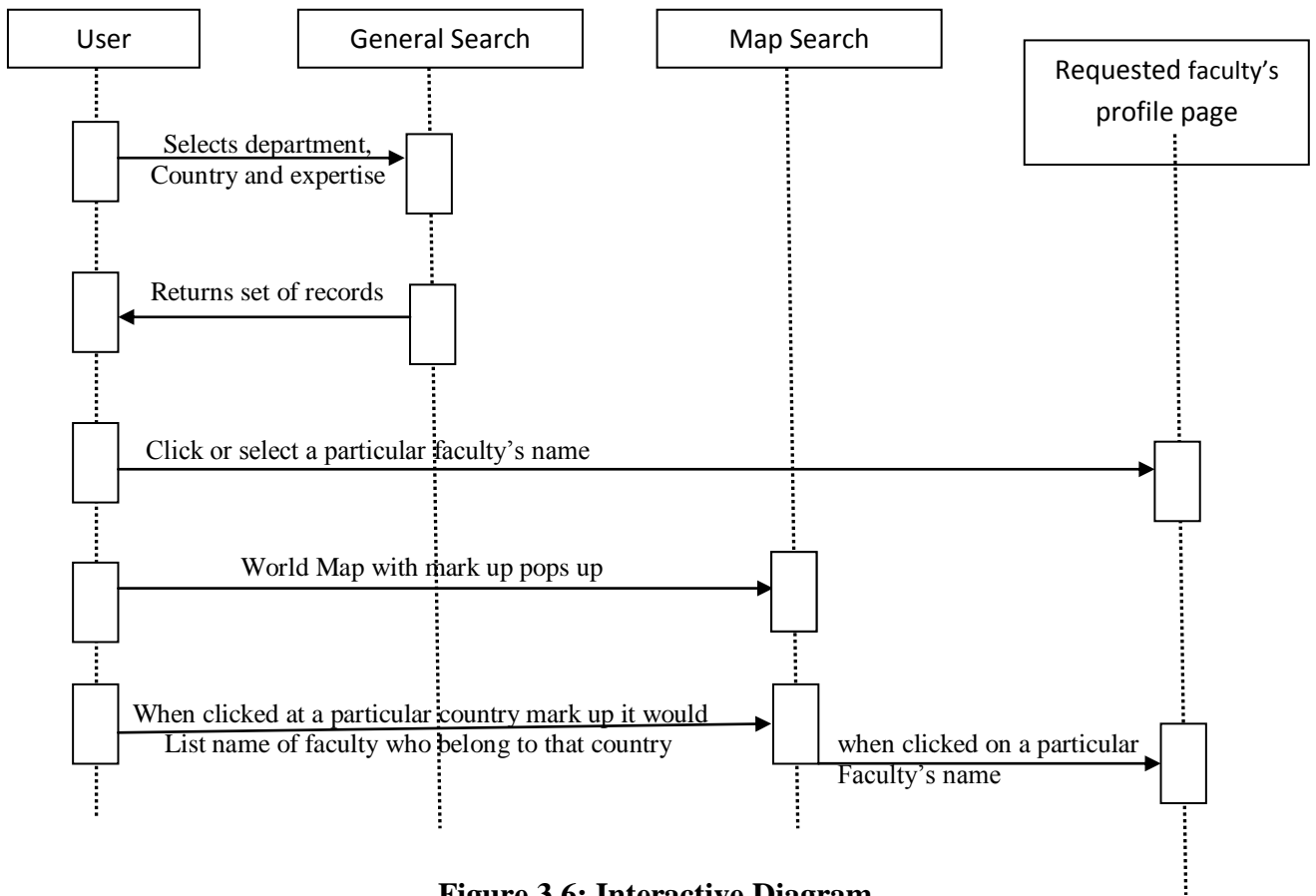
In the UML, class diagram is a type of static structure diagram which describes the structure of a system by showing the classes, attributes and the relationships between the classes of a system. It is the main building block in object oriented modeling. The classes represent both the main objects and or interactions in the application. The class diagram consists of classes which are represented in boxes which contain three parts. The name of the class is contained in upper part, with the attributes of classes in middle part and the bottom part contains the methods or operations that the classes undertake. With detailed modeling, the classes of the conceptual design are split into number of subclasses. The following figure shows the class diagram of the Faculty Search system.



**Figure 3.5: Class Diagram**

### Interactive Diagram:

The interaction overview diagram is similar to the activity diagram both visualizing a sequence of activities. The difference is that the individual activity in the interaction overview diagram is pictured as a frame, which can contain interaction - or sequence diagrams. These interaction/sequence diagrams are constructed with building blocks like: sequence, communication, interaction overview and timing diagram. The nodes in the diagram connect these sequence diagrams, which can be placed in a specific order. With these elements the interaction overview diagram can be used to "deconstruct a complex scenario that would otherwise require multiple if-then-else paths to be illustrated as a single sequence diagram". [16]



**Figure 3.6: Interactive Diagram**

### 3.2.2.3 Data tier

This tier consists of database servers and it is here where the information is stored and retrieved. The Data tier keeps data neutral and independent from application servers or business logic. This is also the classes which get the data from the business tier and stores it to the database or gets the data from the database and sends it to the business layer. In this project the Data tier runs on the Microsoft Access as database.

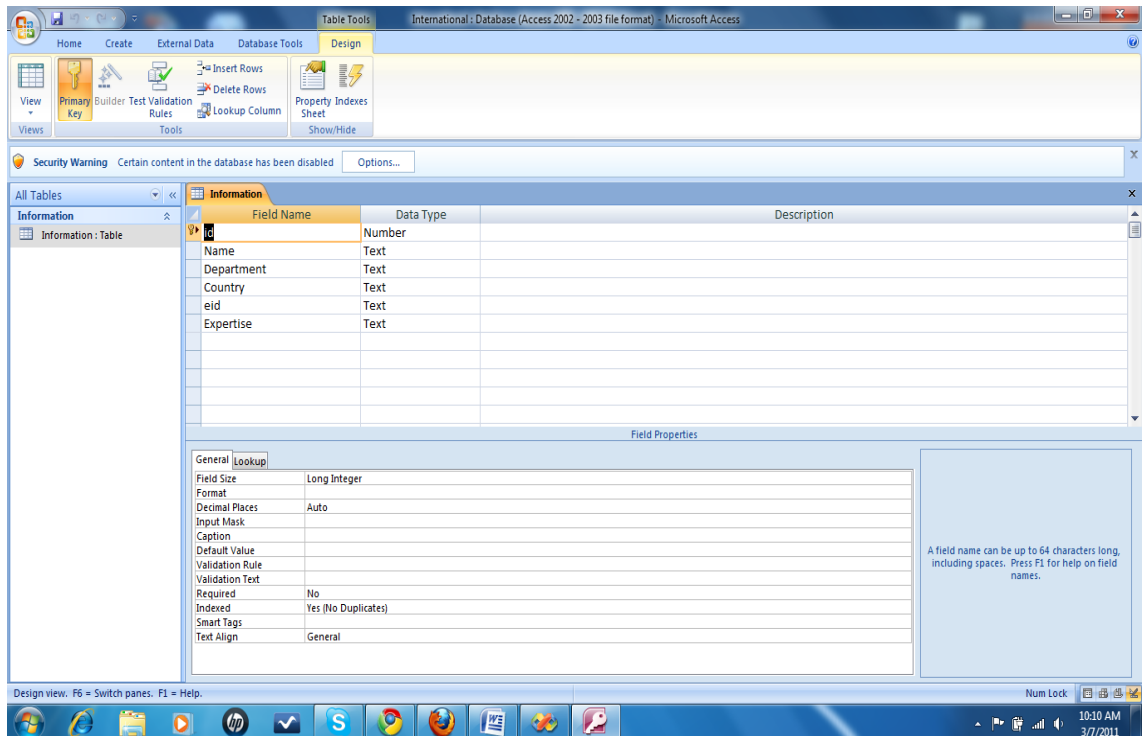
### 3.3 Database Diagram

The database schema of the project has got one table in it.

This table has got the following fields in it:

- a. Id (Primary Key)
- b. Name

- c. Department
- d. Country
- e. Eid
- f. Expertise



**Figure 3.7: Database diagram of the Faculty Search system**

# Screen Shots

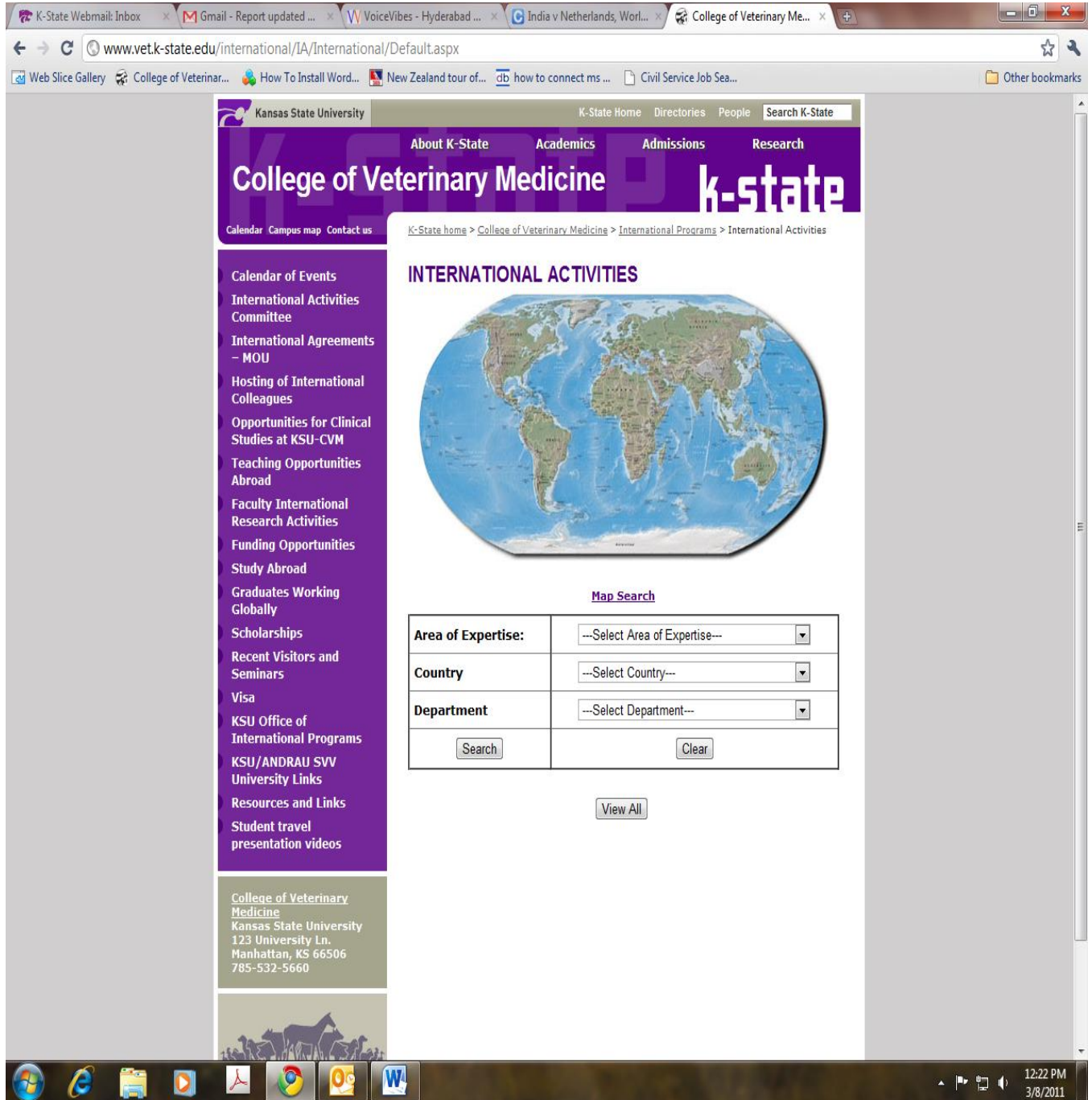
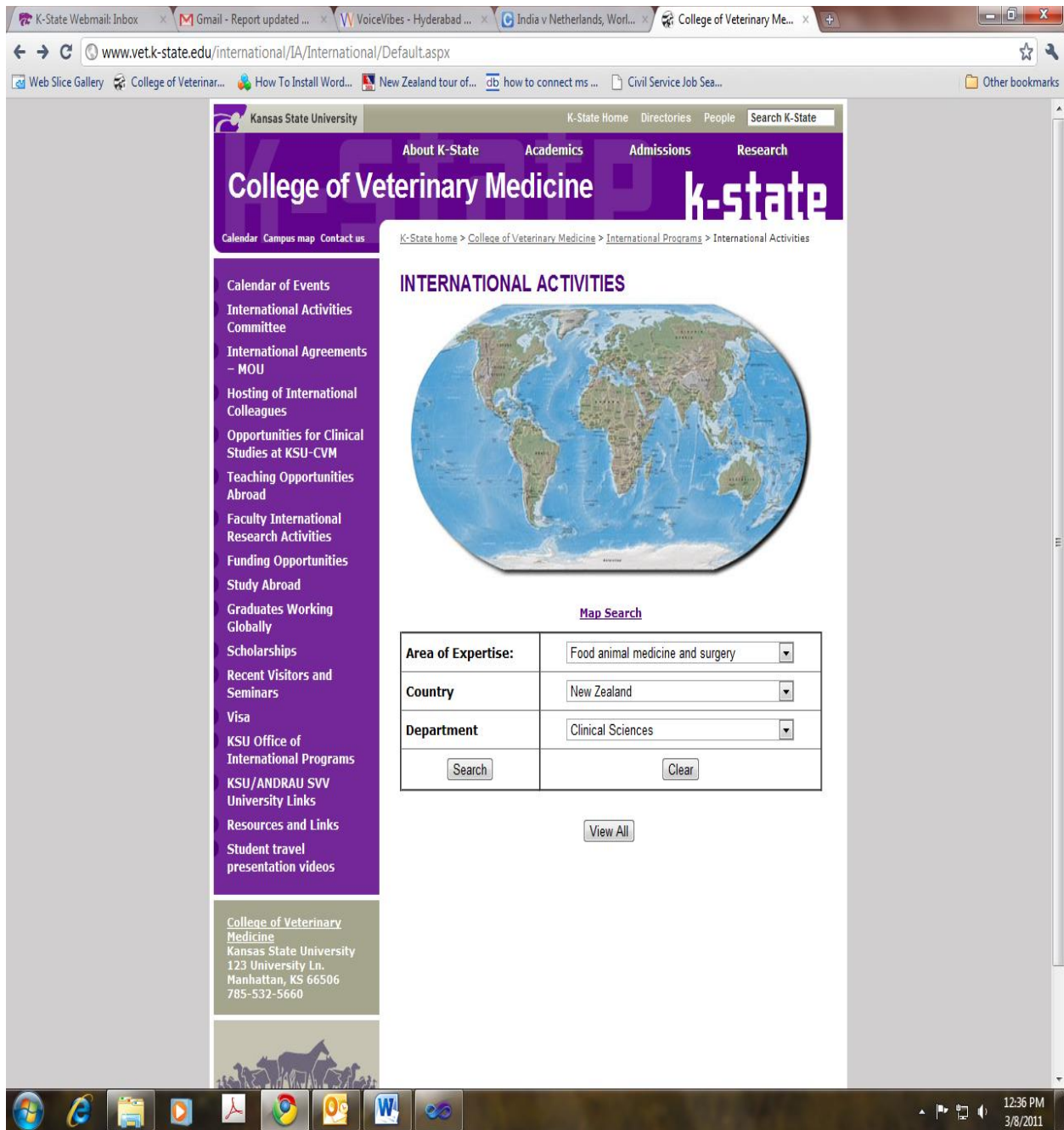
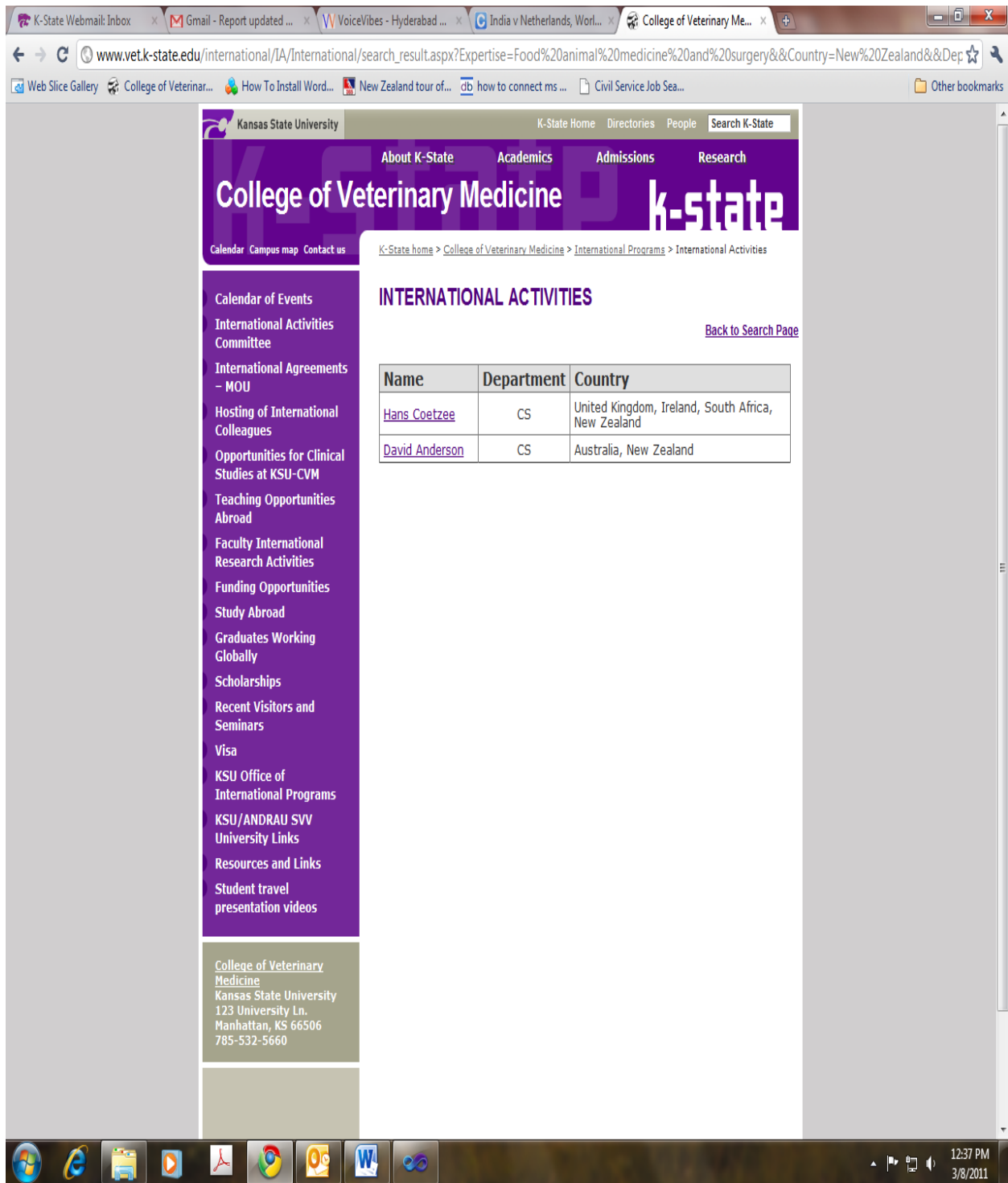


Figure 3.7: The Main page



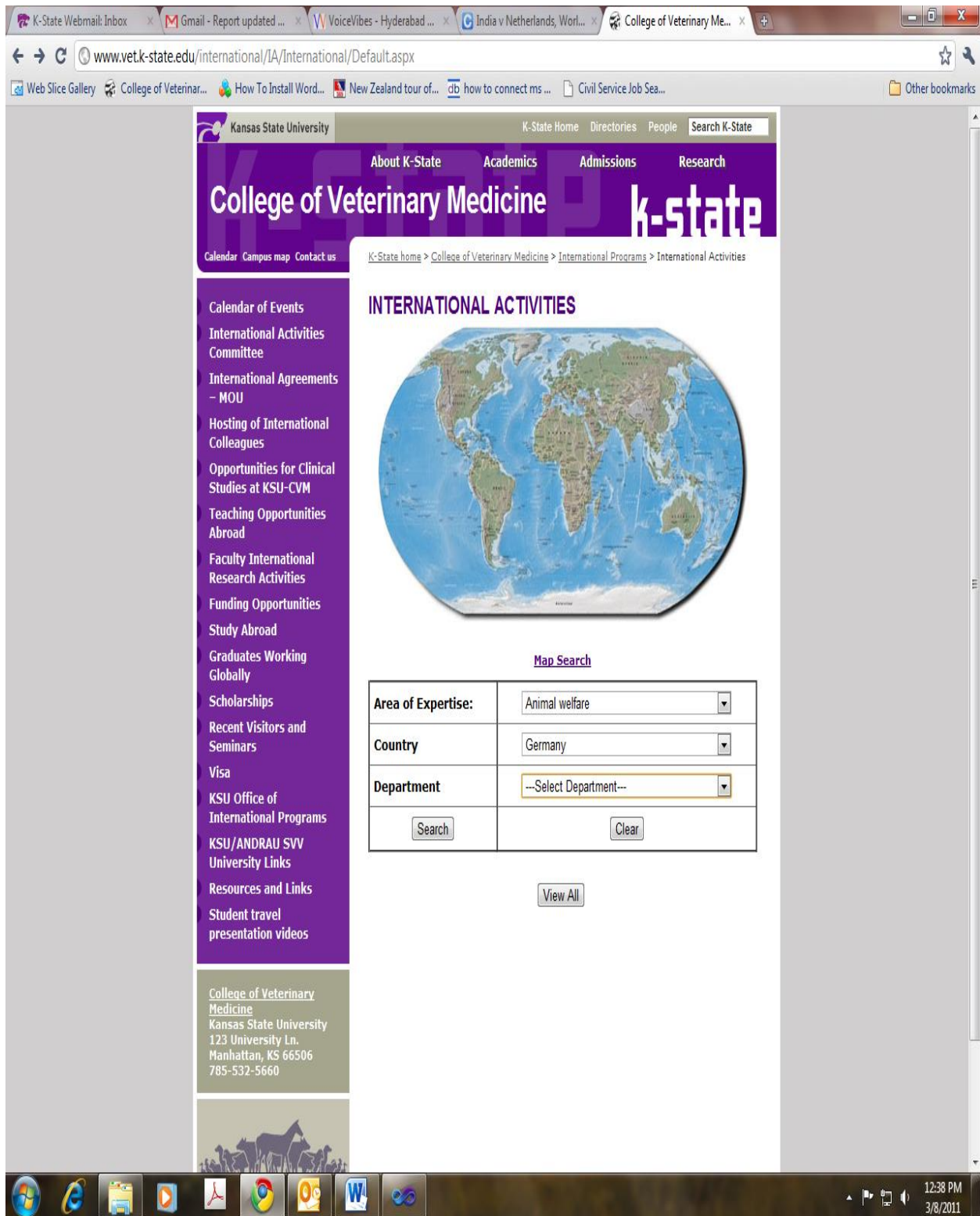
**Figure 3.8: Page displaying user's criteria**



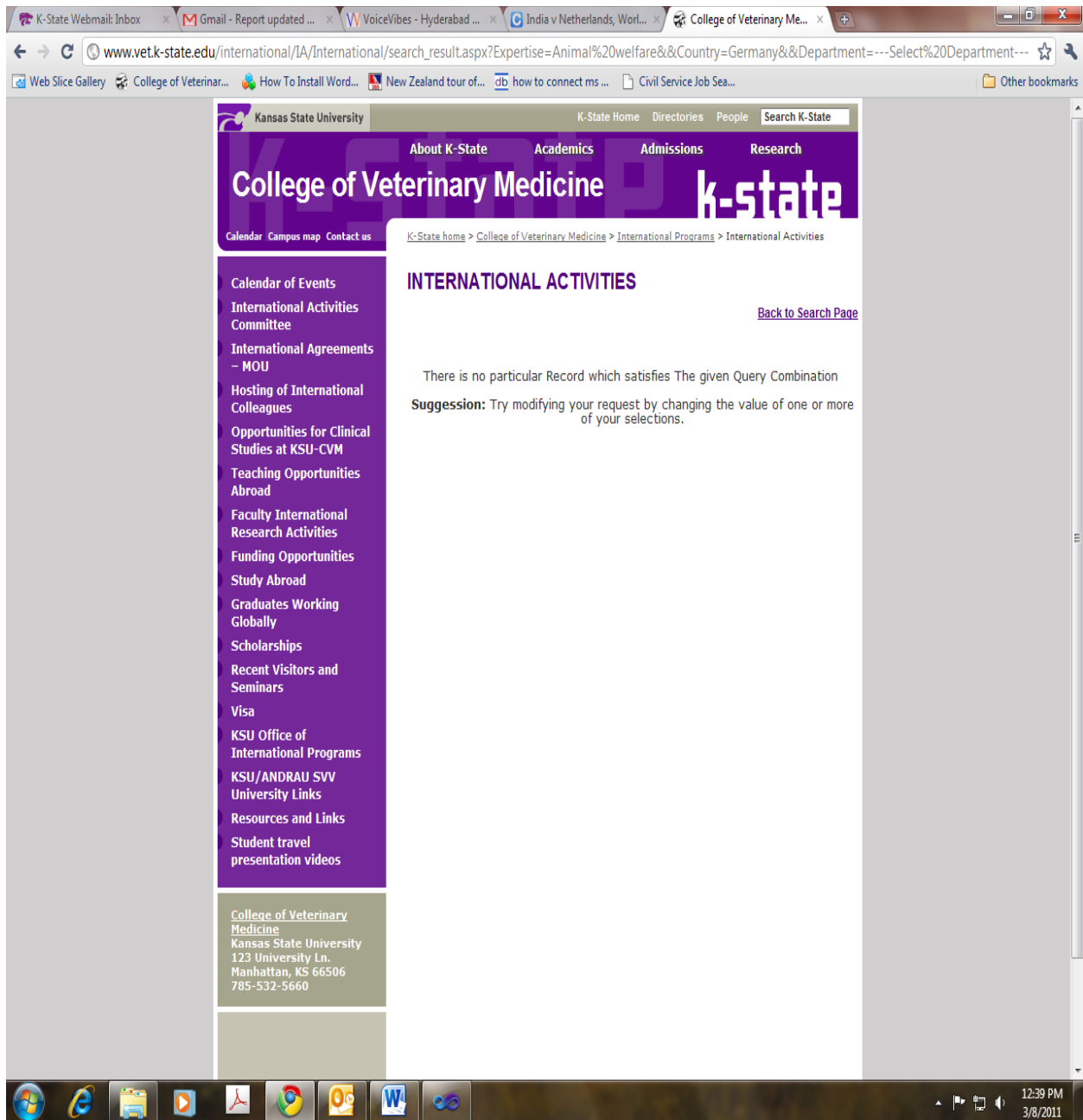


**Figure 3.9: Result based upon the submitted query**





**Figure 3.10: Criteria based only on Expertise and Country**



**Figure 3.11: Suggestion since no record has been found based upon the submitted query**

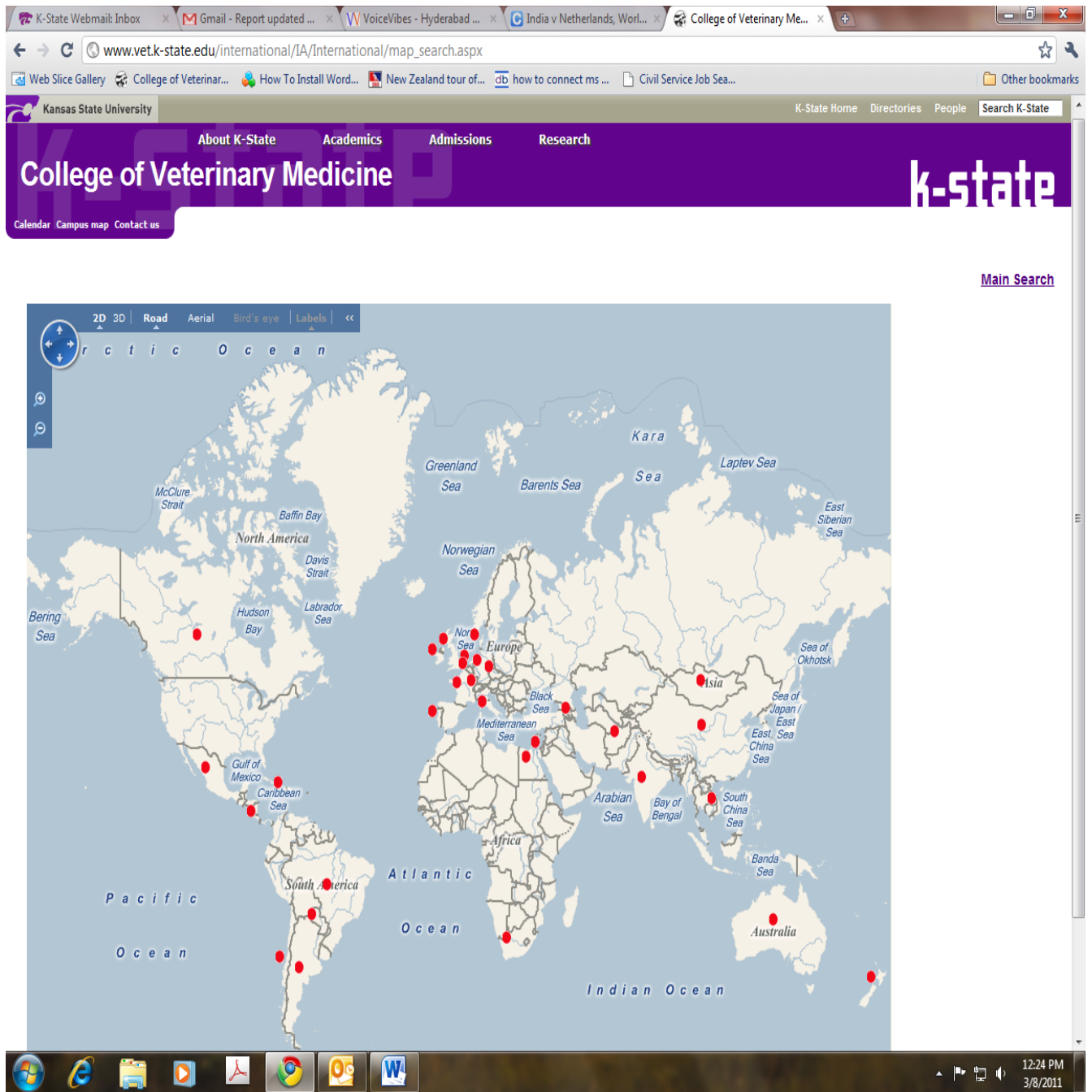
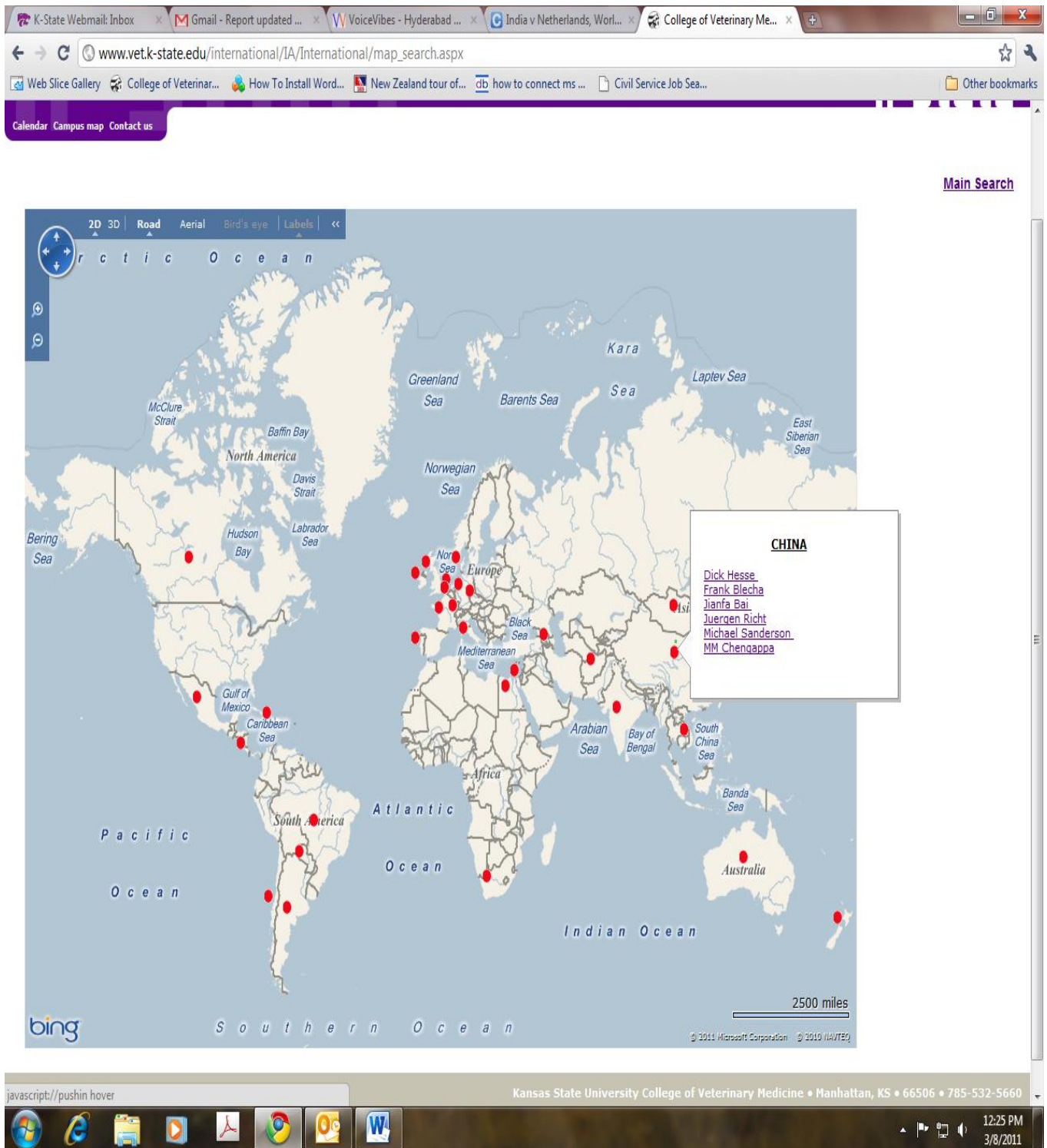


Figure 3.12: Map search page



**Figure 3.13: Mouse over event – pop up with names are displayed**

The screenshot shows a web browser window displaying the Kansas State University College of Veterinary Medicine website. The browser's address bar shows the URL: [www.vet.k-state.edu/international/IA/International/View.aspx](http://www.vet.k-state.edu/international/IA/International/View.aspx). The website header includes navigation links for "About K-State", "Academics", "Admissions", and "Research". The main content area is titled "INTERNATIONAL ACTIVITIES" and features a table listing faculty members and their international affiliations. A sidebar on the left contains various links related to international programs, such as "Calendar of Events", "International Activities Committee", and "Study Abroad".

**INTERNATIONAL ACTIVITIES**

[Main Search](#)

Name	Department	Country
<a href="#">Gary Anderson</a>	DMP	
<a href="#">David Anderson</a>	CS	Australia, New Zealand
<a href="#">Jianfa Bai</a>	DMP	China
<a href="#">David Biller</a>	CS	Israel, Chile, Czech Republic, Belgium, Italy, Brazil
<a href="#">Frank Blecha</a>	A and P	China, France, Germany
<a href="#">Michele Borgarelli</a>	CS	Italy, Portugal
<a href="#">James Carpenter</a>	CS	
<a href="#">MM Chengappa</a>	DMP	China, Brazil, Argentina
<a href="#">Hans Coetzee</a>	CS	United Kingdom, Ireland, South Africa, New Zealand
<a href="#">Howard Erickson</a>	A and P	
<a href="#">Maria Ferrer</a>	CS	Argentina
<a href="#">Roman Ganta</a>	DMP	India, Egypt
<a href="#">Dick Hesse</a>	DMP	China, Azerbaijan, Vietnam, Netherlands
<a href="#">David Hodgson</a>	CS	Afghanistan
<a href="#">Kyathanahalli Janardhan</a>	DMP	India
<a href="#">Meredyth Jones</a>	CS	Mongolia
<a href="#">Shelie Laffin</a>	CS	
<a href="#">Bob Larson</a>	CS	
<a href="#">Marco Margiocco</a>	CS	Brazil, Italy
<a href="#">Diane Mason</a>	CS	Italy
<a href="#">Rose McMurphy</a>	CS	
<a href="#">Sanjeev K. Narayanan</a>	DMP	India
<a href="#">Susan Nelson</a>	CS	Mexico
<a href="#">Anandine Newton</a>	DMP	Vietnam

College of Veterinary Medicine  
 Kansas State University  
 123 University Ln.  
 Manhattan, KS 66506  
 785-532-5660

Figure 3.14: View all page



K-State Webmail: Inbox | Gmail - Report updated ... | VoiceVibes - Hyderabad ... | India v Netherlands, Worl... | College of Veterinary Me... |

www.vet.k-state.edu/international/IA/International/Profile.aspx?eid=remberg

Web Slice Gallery | College of Veterinar... | How To Install Word... | New Zealand tour of... | db | how to connect ms ... | Civil Service Job Sea... | Other bookmarks

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# College of Veterinary Medicine

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K-State home > College of Veterinary Medicine > International Programs > Profiles


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## RENBURG, WALTER

**Department:** CS

**Phone:** N/A

**Email:** [renberg@vet.k-state.edu](mailto:renberg@vet.k-state.edu)



**Expertise:** Small animal orthopedics, international development work

**Experience:** Dr. Renberg is engaged in multiple continuing education efforts internationally, has participated in short-term veterinary mission work and is involved in international activities at the college and university level.

**Region of Interest:** Europe, Central/South America

**Countries of Interest:** Belgium, Costa Rica, Paraguay, Haiti, Mongolia

**Collaborations:** Dr. Renberg maintains collaborations with VetNet in Mongolia, as well as with universities in Belgium, Hungary, Paraguay and Costa Rica

**Languages:** Conversational French, Basic Spanish

College of Veterinary Medicine  
Kansas State University  
123 University Ln.  
Manhattan, KS 66506  
785-532-5660

12:40 PM  
3/8/2011

Figure 3.15: Profile page

K-State Webmail: Inbox x Gmail - Report updated ... x VoiceVibes - Hyderabad ... x India v Netherlands, Worl... x College of Veterinary Me... x

www.vet.k-state.edu/international/IA/International/Profile.aspx?eid=carpentr

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Figure 3.16: Profile page

## 4.0 TESTING

Software testing is the process of executing a program with the intension of finding errors. This can also be stated as the process of validating and verifying that a software program is working as expected and is meeting the technical as well as business requirements. This can be implemented at any time in the development process. There are many types of testing software viz., unit testing, black box testing, performance testing, stress testing, regression testing, white box testing etc. I have conducted unit as well as performance testing on Faculty Search application and these two types of testing are described below.

### 4.1 Unit Testing

“Unit testing refers to those tests that verify the functionality of a specific section of the code, usually at the function level. In an object oriented environment this is usually at the class level and the unit tests include the constructors and the destructors. The primary goal is to take the smallest piece of testable software, isolate it from the rest of the code and check if it is behaving exactly as expected. Each unit is tested separately before integrating them into modules to test the interfaces between modules.” [12]

This application has been tested individually for each view and made sure that each module is generating the desired output for the corresponding input. There are various modules involved in the application like page navigation, retrieving the profile information from the database etc.

In the first place the page navigation has been tested for the correct functionality and the results show that it has meet a set of testing requirements; this involves all the search buttons. Button navigation is one of the main functionality to be tested individually making sure the user gets redirected to the desired page.

Secondly, the user selects required search option and submits it; the tests have been developed to ensure that the output is correct.

Also, the user submission functionality is tested individually as the user submits a different query which differs based upon the options they choose from the drop down list. And lastly, the data retrieval functionality is tested to make sure that the user gets the desired information from the



database. Each record was tested independently for its functionality. The test has ensured that the user is given the exact requested information. In case if the quires are such that there are no record in database then it gives an error message and this has been tested using the negative test cases.

#### 4.1.1 Tool for Unit testing

NUnit is the most popular automated unit testing frame work which is used in .Net applications. This is an open source product. This is initially ported from JUnit, which is a framework to test Java applications. It is written entirely in C# and is redesigned to take advantage of many .Net language features. The examples of these features include custom attributes and other reflection related capabilities.

In order to conduct unit testing using this tool we have to create test cases for each web method that is being used by this application. After designing the test cases, compile them which would result in a dll file, load this dll file into NUnit GUI and execute it.

#### 4.1.2 Test cases and Results

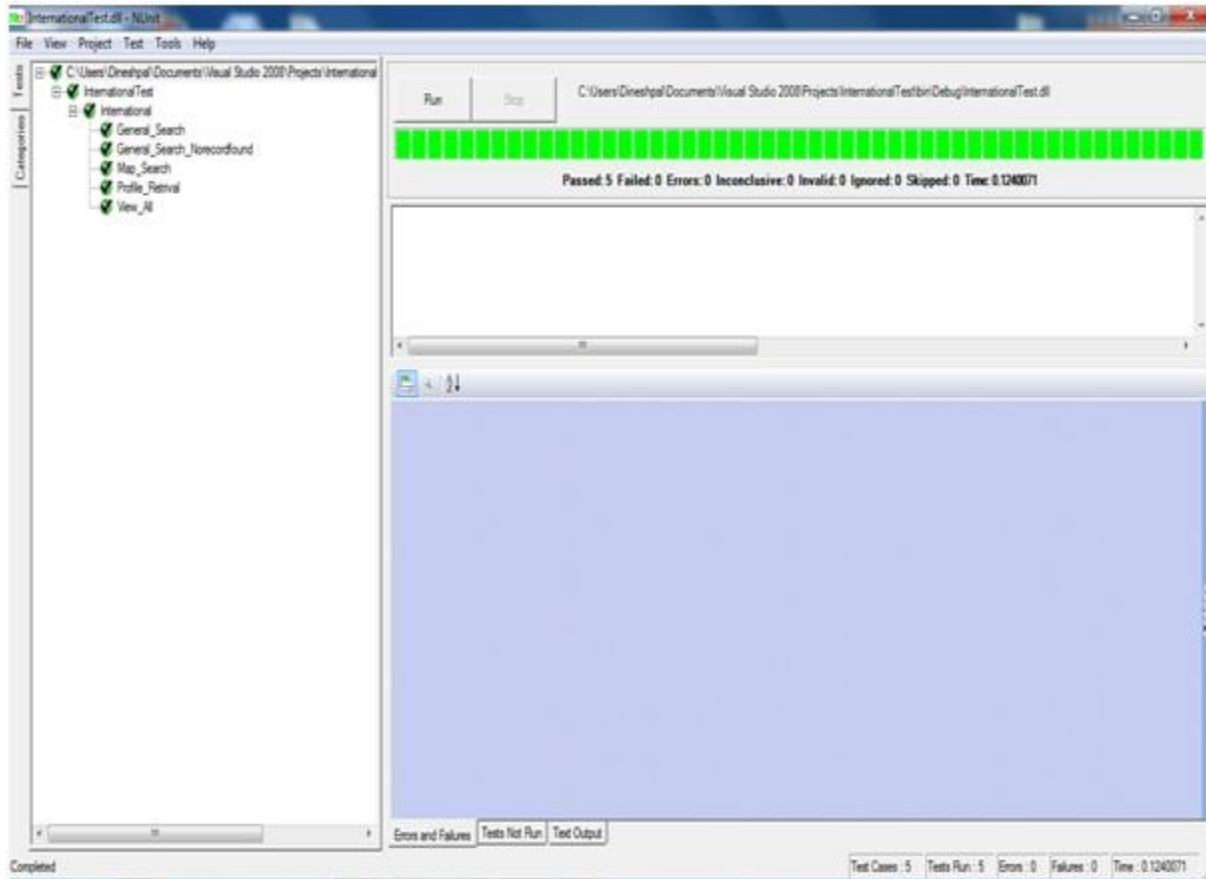
Each test case tests the functionality of a particular function. Following are the test cases that were designed and executed to check the unit testing:

**Table 4.1: Test case input and outputs with explanation**

<b>Test Case</b>	<b>Input</b>	<b>Output</b>	<b>Explanation</b>
<b>General_Search</b>	Area of Expertise or Country or Department	Set of Records with name, department and country	This test case has been designed in such a way that it would test and confirm that the correct records were pulled when a user makes his selections and submits the query.

<b>General_Search_</b> <b>No record found</b>	Area of Expertise or Country or Department	There is no particular record which satisfies the given query combination Suggestion:Try modifying your request by changing the value of one or more of your selections.	In this test case the application has been tested for queries that returns empty results.
<b>Map_Search</b>	To map or point various countries we pass latitudes, longitudes and also the zoom level of the map etc	World map is displayed with red dot images on the countries whose latitudes and longitudes are passed.	Under this test case the methods that are using the Bing API are tested, where we use these methods to draw the circle images with different latitude and longitude. Also there are many other methods that are used like set title, set description, Add shape, set zoom level etc.
<b>View_All</b>	Default selection of all the area of expertise, countries and departments	List of records with name, department and country	View all test case is designed in order to test pulling of all the records in the database. The main functionality of this method is to display the list of the faculty members in ascending order

<p><b>Profile_Retrieval</b></p>	<p>Eid of desired faculty is passed</p>	<p>Corresponding profile is pulled up which displays name, department, phone, email along with the picture. There are also specific fields related to that faculty like the expertise, experience, region of interest, countries of interest, Collaborations and Languages.</p>	<p>This test case has been implemented to ensure that the exact requested profile of the faculty is retrieved. In this case the profile information is retrieved from the files when it runs on the XML parsing techniques.</p>
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**Figure 4.1: Screen Shot of NUnit Test case Execution**

**Test Cases: -**

In the following table I have given a brief description of every test case, the method it tests and the purpose of the method (functionality). Test cases from 1-5, test all the web services, and the general functionality of this website.

**Table 4.2: Test case Methods and its results**

<b>Sno</b>	<b>Test Case Name</b>	<b>(Web) Method</b>	<b>Web Method Purpose</b>	<b>Success Criteria</b>
1.	General_Search	Search_Click()	To search the records based upon submitted Expertise, Country, Department	Returns the successful records with Name, Department and Country
2.	General_Search_Norecordfound	Search_Click()	Check if error message is displayed when there is no record found	Returns the error message since it has not found record based upon the criteria selected
3.	Map_Search	Map_Search()	To search faculty profile using the Bing Map	Returns the profile based upon the hyper link clicked on the map search page
4.	Profile_Retrieval	Get_Profile()	To view the profile of request faculty member	Returns name, phone, email, picture, Expertise, Region of Interest, Countries of Interest, Collaborations, Languages
5.	View_All	ReadRecords()	To see all the records that are present in the database	Returns the Name, Department and the country of every faculty

## 4.2 Performance Testing

Software performance testing is used to determine the speed or effectiveness of a software program or device. Qualitative attributes of software such as reliability, scalability and interoperability may also be evaluated during this testing.

The performance of a website comes into picture when some hundreds or thousands of users are accessing the website and performance testing ensures that all the users are getting efficient results in less time. By performance testing we can estimate the maximum number of users accessing the web site simultaneously and by means of these testing results one can analyze the measures to further improve the performance of the application. The tool for performance testing and the testing results are described below.

#### **4.2.1 Tool for performance testing**

The website has been tested for its performance by the tool Apache JMeter, “which is open source software and a pure java based application. JMeter has been designed to load the test functional behavior and measure performance. This can be used to test performance on static and dynamic resources such as files, databases and queries and more. It can also be used to simulate heavy load on a server, network or to test the strength or to analyze the overall performance under different load types.” [11]

#### **4.2.2 System Configuration**

The details of the configuration of the system which has been used for testing the application are listed in the table below:-

**Table 4.3: System Configuration**

<b>Operating System</b>	Windows 7 – 64 bit
<b>RAM</b>	4 GB
<b>Processor</b>	Intel core i7
<b>Processor Speed</b>	1.60GHz

The test 4.2.3 that is listed below has been conducted on the system with the above mentioned configuration.

#### **4.2.3 Test plans Results and Evaluation**

##### **Test 1: Jmeter Test for Default search page:**

The Default page is tested to analyze its behavior and to get the idea about the performance of the application. The analyses would show the through put as well as response times of the web

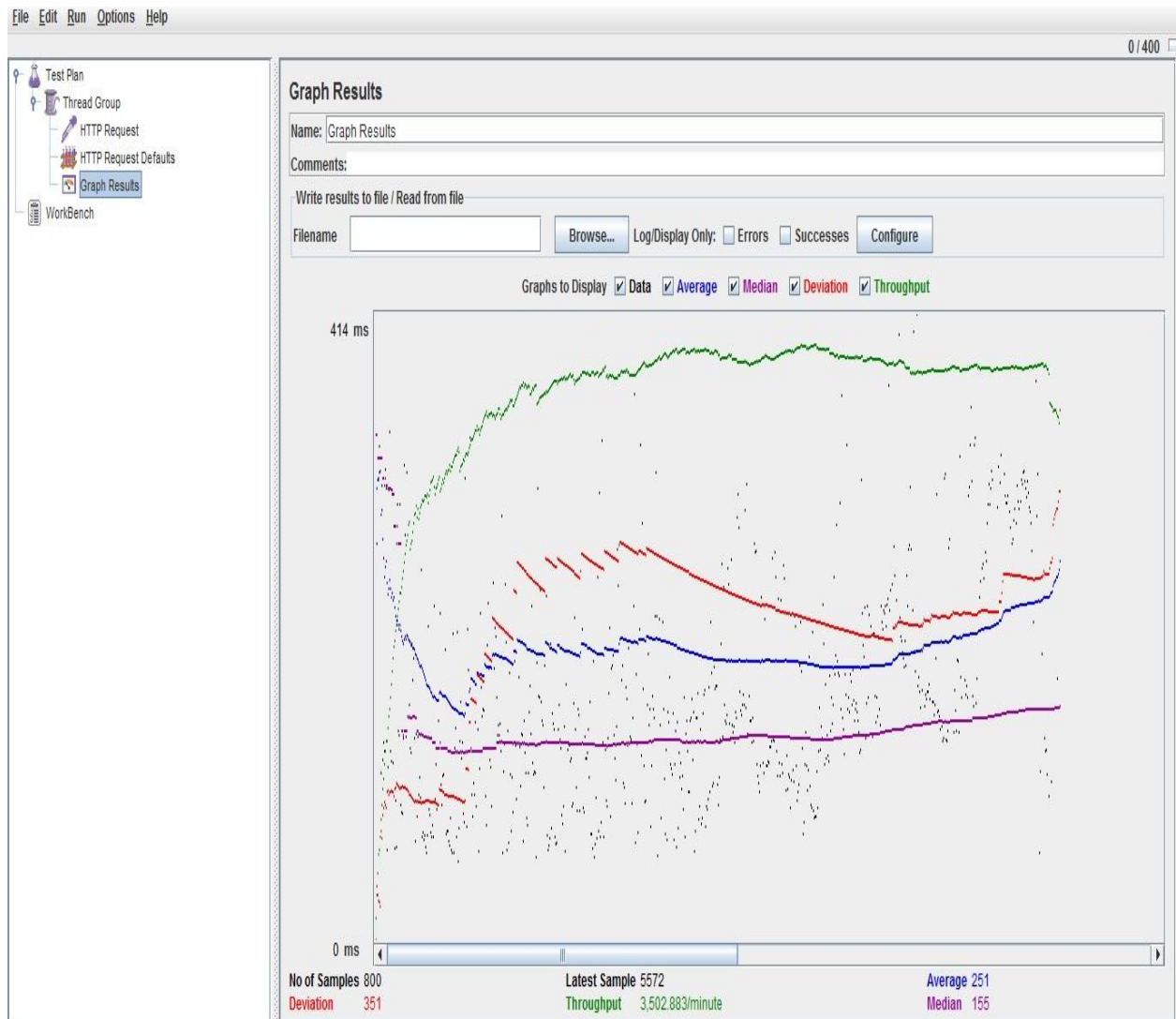
page when number of users is accessing it. This test plan is also used to get an approximate estimation of maximum number of users who can access it at the same time.

In order to test the Default page which is the main or the home page of the application, I have used a total of 400 threads, simulating 400 simultaneous users, looping 2 times, with a ramp period of 10 seconds, with a total of 800 requests. Since the strength including students and faculty all together of veterinary department is about 365 which are close to 400 that is the reason why I have chosen 400 threads. It is clear from the graph that the website performs consistently under heavy load generated by many simultaneous users. The throughput was around 3500, which indicates that the web site can handle 3500 requests per minute.

The graph below explains all the characteristics of the web page along with all the statistics. The graph shown below gives an idea about the test results of the Default page.

#### **4.2.1 Bottle Neck for Default Page:**

- The information retrieval from the database is also one hindrance for the less number of requests per minute and more average time.
- CPU utilization can be considered as a bottle neck when we have more than 4300 requests per minute.



**Figure 4.2: Graph results for Default page.**

### **Test 2: Jmeter Test for Map search page:**

This page is also tested with similar test case specifications that are 400 threads in total, simulating 400 simultaneous users, looping 2 times, with a ramp period of 10 seconds, with a total of 800 requests. This has got a throughput approximately equal to 2029 request per minute and which is almost half compare to that of the default search page. The average time is also

more which is 702, the reason behind this is because it is using the Bing API which takes few extra seconds to download.

#### 4.2.2 Bottle Neck for Map Search Page:

Uses Bing API which needs few extra seconds to download as well as load the world map.

It also requires extra cache in the browser to store the map.

Mozilla Fire Fox 4 – the latest version does not support this Bing API.



Figure 4.3: Graph results for Map Search page.

#### Test 3: Jmeter Test for Profile page:

The profile page is tested by running the a test case with following test specifications 400 threads in total, simulating 400 simultaneous users, looping 2 times, with a ramp period of 10 seconds, with a total of 800 requests. This has got a throughput approximately equal to 4571 request per minute. The average time 96 which is the least compare to all the other pages because



in the process of displaying the contents of this page we are not accessing the database nor taking the help of Bing API.

### 4.2.3 Bottle Neck for Profile Page:

- If we extend the application to the whole university then scalability would be limited.

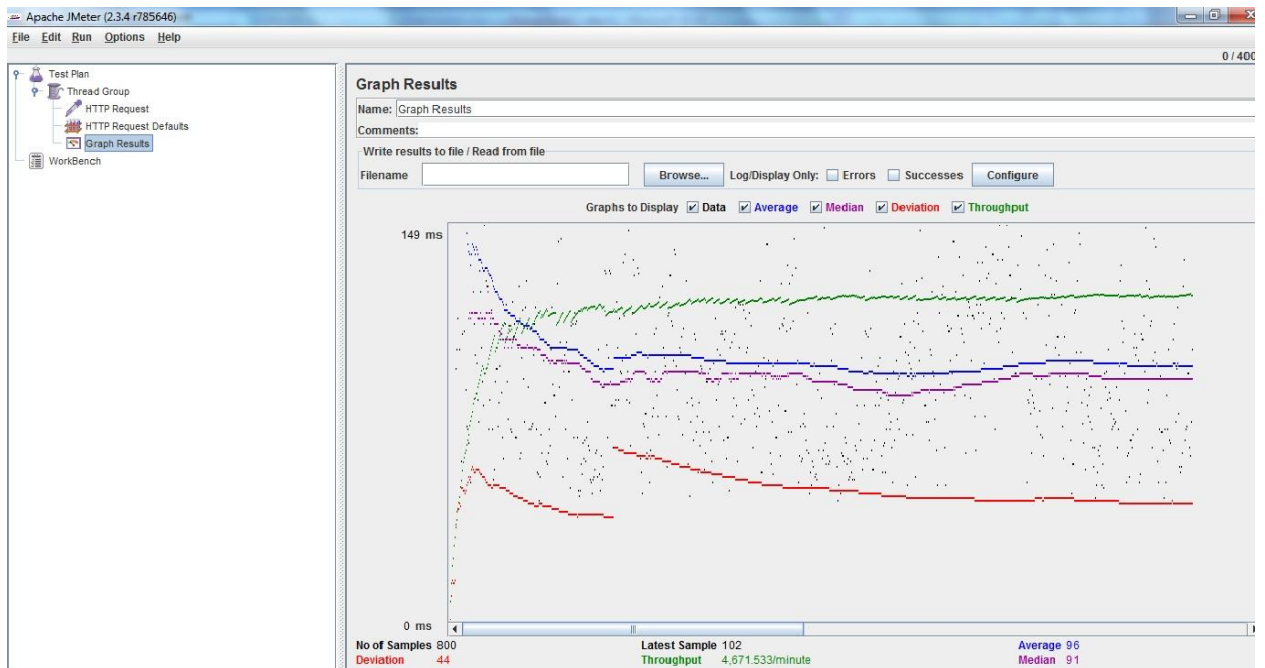


Figure 4.4: Graph results for Profile page.

## 5.0 CONCLUSION AND FUTURE WORK

### 5.1 Conclusion

The Faculty search is been designed for the students, faculty and employees to make a search of an International faculty in the veterinary department. The user can easily search by using three different options.

1. **General Search:** User can submit different quires by making selections from the drop down list.
2. **Map Search:** This search is made on a world map; this world map is drawn by using the Bing API. Few countries on this world map are marked in order to show that there is at least one faculty member who is working currently in the veterinary department and basically is from that country.
3. **View All:** In case any user is familiar with all the faculty members name's then it would be easy if the user get a list of all the faculty members who are currently employed. Then they could just click on their name in the list and follow up to his profile in order to know him in more detail.

Implementing of this application gave me a good learning experience and exposure to the technologies which I have used in this project viz., Visual Studio 2008, C#.NET language and XML parsing.

### 5.2 Over all Experience

The current application, Faculty Search system which is a .NET web application has been developed using ASP.NET 2.0, Microsoft Access in the C# programming language.

It has been a great pleasure for me to work on this challenging project. This project provided me a good practical knowledge of various things like programming in C#.Net web based application and SQL queries to retrieve information from Microsoft Access. It also provided me a good knowledge about the latest technologies in web based applications. This learning experience helps me a lot in providing guidance to working in my future projects involving these technologies.

Currently I have used Visual Studio 2008 version while doing this project, I came to know about the newer version of Visual studio which is VS 2010 and its salient features after starting the project. I would have used Visual studio 2010 version instead of 2008. As I was comfortable working with VS 2008 I have continued to work on it and similar is the case with Microsoft Access.

### **5.3 Future Enhancements to the project**

The following changes can be made to the application in future:-

- The scope of the application is also been restricted to be for International faculties who are currently working with veterinary department, this also could be extended to all the faculties working at veterinary department.
- This application is only for the veterinary department, but it could be extended to other departments just by adding the details for faculty members in other departments to the database.
- This application could also be extended towards students involved in research and give them a platform to share their work with fellow students and faculty members.
- Can add more features and refine the current website in order to make it appear prettier and more interactive.

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