DESIGN A WEBSITE FOR THE NATIONAL SCIENCE AND TECHNOLOGY COMMISSION AND DEVELOP A WEB BASED INFORMATION SYSTEM FOR RESEARCH GRANTS OF THE NATIONAL SCIENCE FOUNDATION

BY

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DECLARATION

I certify to the best of my knowledge that this dissertation does not incorporate without acknowledgement, any material previously submitted for a degree or diploma in any university, and does not contain any material previously published or written or orally communicated by another person except where due references are made in the text.

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Affectionately Dedicated To My Parents

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ABSTRACT

The software project undertaken had two components. The first was to design a new website for the National Science and Technology Commission (NASTEC) and the second was to develop a web based information system for improving the research grant award scheme of the National Science Foundation (NSF).

The NASTEC website provides information to the general public on activities of the organization and access to various science and technology policy related documents and recommendations of the Commission. It was developed a year ago but because of lack of qualified staff at NASTEC, has not been updated regularly. And the existing web site was inadequate and lacks appearance and presentation.

The main purpose of the project was to update and design a new website to improve its presentation. Therefore a new website was developed to overcome the drawbacks of the existing web site of NASTEC.

One of the major functions of the National Science Foundation (NSF) is the awarding of research grants to scientists in research and development institutions. The information related to research grants was handled using a computer-based system. But it was incomplete and does not provide adequate information to the grantee, since it was being accessed and maintained by the scientific staff of the NSF. It would be desirable that the grantee has access to information related to his/her own grant, including information related to deadlines for progress reports, account balance etc. The present database holds limited information and a more user friendly database would be desirable.

An information system was developed to meet all the requirements of research grants of NSF. An authorized person holding a research grant of the NSF would be given access to the system through the internet. He/she would be able to monitor the progress of the grant which will include the scientific as well as financial progress.

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Chapter 1

INTRODUCTION

1.1 National Science and Technology Commission

1.1.1 Background

The National Science and Technology Commission (NASTEC) is the apex policy formulating and advisory body to the government of Sri Lanka on science and technology matters. It was created by an act of parliament and came into operation in August 1998. NASTEC fulfills a need that has been highlighted for a long time by the scientific community, the establishment of a policy making apex body of scientists.

1.1.2 Services

Advice the government on policies and plans for the development of science and technology in Sri Lanka with regard to;

- Economic growth,
- Efficiency and competitiveness of industry, agriculture and services,
- Health, nutrition & poverty alleviation with a view to improving the quality of life of the people,
- The development of human and other resources for S & T in consultation with education, training and research institutions,
- Management of natural resources,
- Identification and prioritization of areas of national importance,

- Creating an appropriate climate to build up, retain and attract science and technology expertise,
- Allocating and prioritizing funds for R & D in S & T institutions

NASTEC will take particular cognizance of the inputs from bodies such as the National Science Foundation (NSF), the Council for Agricultural Research Policy (CARP) and the National Health Research Council (NHRC) and Professional bodies such as Sri Lanka Association for the Advancement of Science (SLAAS), Institute of Chemistry, Institute of Physics, Institute of Engineers and Institute of Biology.

1.2 National Science Foundation

1.2.1 Background

NSF was established in 1998 as the successor to the Natural Resources Energy & Science Authority of Sri Lanka (NARESA) established in 1981 and the National Science Council set up in 1968.

The main activity of NSF is the awarding of research grants. These grants are intended to provide assistance to supplement the financial, physical and manpower resources available for scientific research in the scientists' own institutions.

1.2.2 Services

1. To initiate, facilitate and support basic and applied scientific research by universities, science and technology institutions and scientists, with a view to;
   - strengthening scientific research potential, including research in the social sciences, and scientific education programs;

- developing the natural resources of Sri Lanka;
- promoting the welfare of the people of Sri Lanka; and
- training research personnel in science and technology.

2. To foster the interchange of scientific information among scientists in Sri Lanka and foreign countries;

3. To award scholarships and fellowships for scientific study or scientific work at science and technology institutions;

4. To maintain a current register of scientific and technical personnel, and in other ways to provide a central clearing house for the collection, interpretation and analysis of data, on the availability of, and the current and projected need for, scientific and technical resources in Sri Lanka, and to provide a source of information for policy formulation on science, technology and other fields;

5. To popularize science amongst the people by funding program for that purpose.

1.3 Project

1.3.1 Project Background

1.3.1.1 National Science and Technology Commission

The NASTEC website www.nastec.lk provides information to the general public on activities of the organization. It provides access to various science and technology policy related documents and recommendations of the Commission. It was developed a year ago but because of lack of qualified staff at NASTEC, has not been updated regularly. Furthermore it requires better organization and presentation and should be an attractive website providing up to date information to the scientific community on science and technology related matters.

1.3.1.2 National Science Foundation

One of the major functions of the National Science Foundation is the awarding of research grants to scientists in research and development institutions. The information related to research grants was handled using a computer based system. But the users of this system face a problem with data entering. The type of data it can hold is also limited because of its existing structure. Therefore there was a need to improve upon the structure and fields of the database in order to keep as well as access all the data in a user-friendly manner.

1.3.2 Objectives

The objectives of this project were two;

1. Design a website for the National Science and Technology Commission with a new interface and information and

2. Develop user-friendly web based information systems to meet all the user requirements for research grants at the National Science Foundation.

1.3.2.1 Specific Objectives

1. Design a website for the National Science and Technology Commission.
   - 1.1 Design new web pages
   - 1.2 Update information
   - 1.3 Properly added new links

2. Develop web based information system for research grants of the National Science Foundation.
   - 2.1 Add new entities and attributes
   - 2.2 Ability to enter data easily through new user interfaces
   - 2.3 Access the database online

Chapter 2

LITERATURE REVIEW

2.1 Basics of Web Applications

A Web application consists of web components, static resource files such as images, and helper classes and libraries. Certain aspects of Web application behavior can be configured when the application is deployed. The configuration information is maintained in a text file in XML format called a Web application deployment descriptor. A deployment descriptor must conform to the schema in the JavaServlet specifications. The process for creating, deploying, and executing a Web application can be summarized as follows:

1. Develop the Web component code (including possibly a deployment descriptor).

2. Build the Web application components along with any static resources (for example, images) and helper classes referenced by the component.

3. Install or deploy the application into a Web container.

4. Access a URL that references the Web application.

2.2 Hyper Text Markup Language

Hyper Text Markup Language (HTML) is the language for publishing hypertext on the World Wide Web. It is a non-proprietary format, based upon SGML, for describing the structure of hypermedia documents - plain text (ASCII) files with embedded codes for logical markup, using tags to structure text into tables, hypertext links interactive forms, headings, paragraphs, lists, and more.

One of the original design goals of HTML was to be device independent. Accordingly, it was designed to be a language to describe document structure, rather than document presentation. So the basic HTML elements specify such things as headings, titles, and paragraphs - but not margins and fonts. It was left up to the browser on any specific system to take care of rendering the document in whatever way the browser author thought most suitable.

Dynamic HTML (DHTML) is built on an object model that extends the traditional static HTML document that enables web authors to create more engaging and interactive web pages. DHTML provides authors with enhanced creative control so they can manipulate any page element at any time. DHTML is also the easiest way to make web pages interactive, using open, standards-based technologies.

2.3 Cascading Style Sheets

Cascading Style Sheets (CSS) are a collection of formatting rules which control the appearance of content in a web page. With the use of CSS styles can have great flexibility and control of the exact page appearance, from precise positioning of layout to specific fonts and styles.

CSS styles let control many properties that cannot be controlled using HTML alone. By using CSS styles and setting font sizes in pixels, can ensure a more consistent treatment

of page layout and appearance in multiple browsers. In addition to text formatting, CSS can control the format and positioning of a block-level elements in a web page.

A CSS style rule consists of two parts, the selector and the declaration. The selector is the name of the style (such as TR, or P) and the declaration defines what the style elements are. The declaration consists of two parts, the property (such as font-family), and value (such as Arial). The term cascading refers to the ability to apply multiple style sheets to the same web page.

A major advantage of CSS styles is that it provide easy update capability; when update a CSS style, the formatting of all the documents that use that style are automatically updated to the new style.

2.4 JavaScript

JavaScript is a primarily client-side scripting language for use on the web. It is a powerful scripting language that produces more powerful, more user-friendly and interactive web pages. With JavaScript can:

- process data collected in HTML forms right on the user's computer, without involving a server (or a programmer with advanced Perl, C, or other programming language skills)
- create and store data on the user's machine
- add interactivity to graphics
- change page elements on the fly based on user input; and
- integrate HTML data more tightly with other Web technologies.(Campbell, 1998)

2.5 Approaches to Dynamic Web Pages

2.5.1 Common Gateway Interface (CGI) Scripts

Common Gateway Interface (CGI) is a standard that describs how web servers should connect to external programs, which in turn generate new web pages. CGI programs are called scripts, and they usually describe how to handle input submitted by a web form.

CGI scripts offer a lot of power and flexibility in their operation. CGI script can interact with databases or create web pages with user-specific content. Other possibilities include creating sites that depend on various forms of information management, such as order processing or access to archieves.(Campbell,1998)

2.5.2 Java Applets

A Java applet is a Java program that's constructed using the class applet and the abstract windows tool kit. An applet is included in a Web page using the HTML tags. An applet is compiled or translated into byte codes and made available to a Web browser through the use of the tag in HTML. The code is downloaded from its source location by the browser. After the code arrives it is interpreted by the computer using the browser, the client, and executes there. In order to include a Java applet on a Web page you either have the applet in the same directory as the Web page or include a URL to the directory that holds the applet.

2.6 System Development Life Cycle

The systems development life cycle (SDLC) is a conceptual model used in project management that describes the stages involved in an information system development project, from an initial feasibility study through maintenance of the completed application. Various SDLC methodologies have been developed to guide the processes involved, including the waterfall model (which was the original SDLC method); rapid application development (RAD); joint application development (JAD); the fountain model; the spiral model; build and fix; and synchronize-and-stabilize. Frequently, several models are combined into some sort of hybrid methodology. Documentation is crucial regardless of the type of model chosen or devised for any application, and is usually done in parallel with the development process. Some methods work better for specific types of projects, but in the final analysis, the most important factor for the success of a project may be how closely the particular plan was followed.

In general, an SDLC methodology follows the following steps;

1. Feasibility study
2. Requirements analysis and specification
3. Design
4. Coding
5. System testing
6. Maintenance

2.6.1 Feasibility Study

The feasibility study phase is highly dependent on the type of software developer and the application at hand. The purpose of this phase is to produce a feasibility study document that evaluates the costs and benefits of the proposed application. To do so it is first necessary to analyze the problem, at least at a global level.

What the feasibility study phase does is a short of simulation of the future development process through which it possible to drive information that helps decide whether development is worthwhile and, if so, which development process should be followed.

The feasibility study tries to anticipate future scenario of software development. Its result is a document that should contain at least the following items;

1. A definition of the problem.
2. Alternative solutions and their expected benefits.
3. Required resources, costs and delivery dates in each proposed alternative solution.

2.6.2 Requirements Analysis and Specification

The purpose of requirements analysis is to identify the qualities of the application, in terms of functionality, performance, ease of use, portability, and so on. The result of this phase is a requirement specification document, which documents what the analysis has produced. The purpose of this document is twofold: on the one hand, it must be analyzed and confirmed by the customer in order to verify whether it capture all the customer's expectations; on the other hand, it is used by the software engineer to develop a solution that meets the requirements.

A possible checklist of the contents of the requirement specification document that might guide in its production is the following:

- Functional requirements.
  These describe what the product does by using informal, semiformal, formal notation or a suitable mixture.

- Non-functional requirements.
  These may be classified into the following categories: reliability, accuracy of results, performance, human-computer interface issues, operating constrains, physical constrains, portability issues and others.

- Requirements on the development and maintenance process.
  These include quality control procedures-in particular, system test procedure-priorities of the required functions, likely changes to the system maintenance procedures and other requirements.

2.6.3 Design

Design involves decomposing the system in to modules. The result is design specification document, which contains a description of the software architecture: what each module is intended to do and relationship among modules.

2.6.4 Coding

In coding phase actually write programs using a programming language. The output of this phase is an implemented and tested collection of modules. Module testing is the main quality control activity that is carried out in this phase.

2.6.5 System Testing

Once the code is generated, the software program testing begins. Different testing methodologies are available to unravel the bugs that were committed during the previous phases. Different testing tools and methodologies are already available.

2.6.6 Maintenance

The delivery of software is often done in two stages. In the first stage, the application is distributed among a selected group of customers prior to its official release. The purpose of this procedure is to perform a kind of controlled experiment to determine, on the basis of feedback from users, whether any changes are necessary prior to the official release. This kind of system testing done by selected customers is called beta testing. In the second stage, the product is distributed to the customer. (Ghezzi,1996)

2.7 System Development Methodologies

2.7.1 Linear Sequential Model

The waterfall model is a popular version of the systems development life cycle model for software engineering. Often considered the classic approach to the systems development life cycle, the waterfall model describes a development method that is linear and sequential. Waterfall development has distinct goals for each phase of development. Once a phase of development is completed, the development proceeds to the next phase and there is no turning back.

The advantage of waterfall development is that it allows for departmentalization and managerial control. A schedule can be set with deadlines for each stage of development. Development moves from concept, through design, implementation, testing, installation, troubleshooting, and ends up at operation and maintenance. Each phase of development proceeds in strict order, without any overlapping or iterative steps.

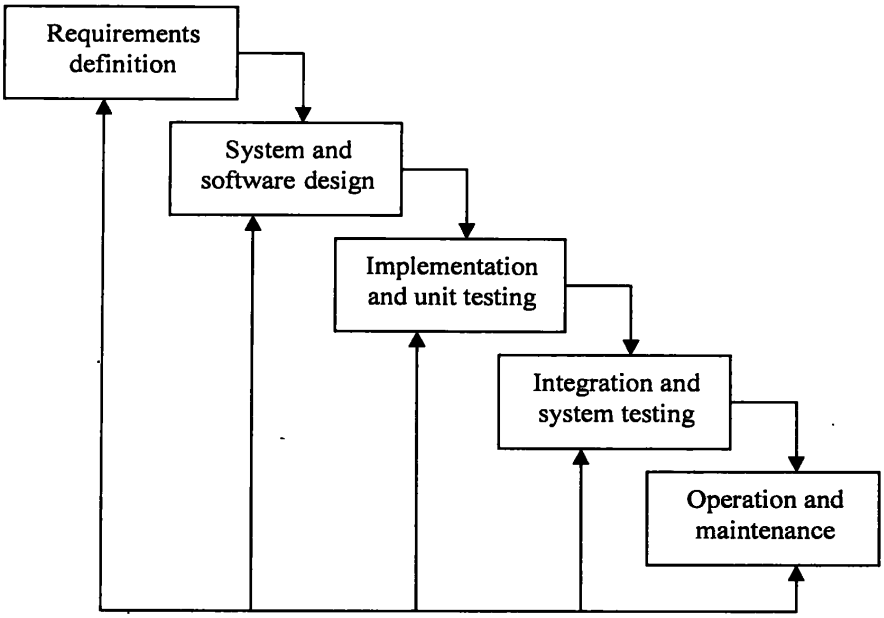

Figure 2.1 Structure of Linear Sequential Model

2.7.2 Evolutionary Model

According to this approach, the first version of a product is viewed as a trial whose main purpose is to assess the feasibility of the product and to verify the requirements. Then the product is thrown away, and the real development starts on more solid foundations provided by firmly established requirements. This process cycle is repeated until every stakeholder is satisfied. It has been observed that the software engineer should be ready to accept the fact that failures in the first version of an application inevitably lead to the need for redoing the application.

2.7.3 Spiral Model

The goal of the spiral model of the software production process is to provide a framework for designing such processes, guiding by the risk levels in the project at hand. As opposed to the previously presented models, the spiral model may be viewed as a metamodel, because it can accommodate any process development model. The spiral model provides a view of the production process that supports risk management.

The main characteristic of the spiral model is that is cyclic and not linear like the waterfall model. Each cycle of the spiral consist of four stages, and each stage is represented by one quadrant of the Cartesian diagram. The radius of the spiral represented by the cost accumulated so far in the process; the angular dimension represents the progress in the process. (Ghezzi, 1996)

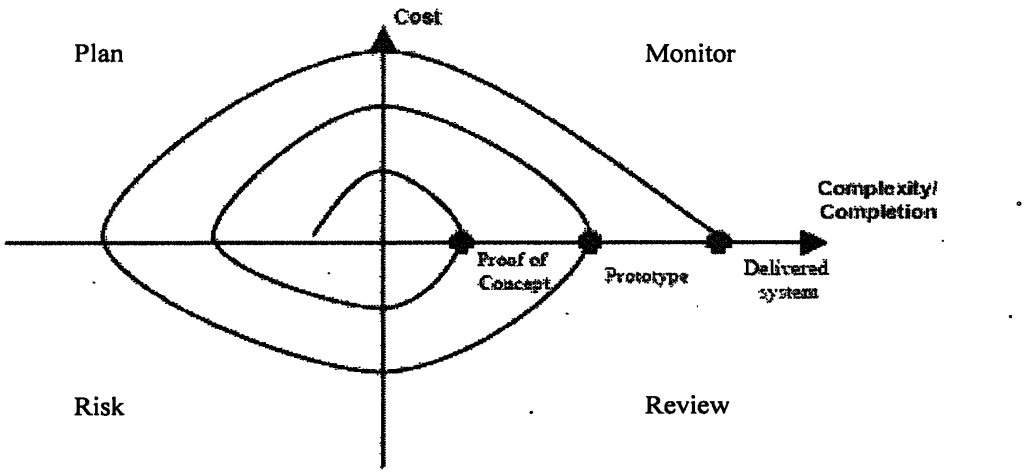

Figure 2.2 Structure of Spiral Model

2.8 Database Designing

The information system design process is evolutionary. The following describes software design phases;

1. Conceptual design

   This phase gives an understanding of what the user really needs to do, and creates a clear set of objectives that capture this understanding. Much of conceptual design is an analysis activity that leads to determining which processes and activities will go in to the new system, how the needs of those processes and activities will be met, and what the user's experience will be of those activities.

2. Logical design

   In this phase, layout the structure of the solution, and provide a basis for physical design. This describes the organization of the elements that make up the solution and how they interact.

3. Physical design

   The physical design represents the solution from the developer's perspective. It defines the solutions' components, services and technologies. (Microsoft Corporation, 2001)

2.8.1 Data Modeling

A data model is a conceptual representation of the data structures that are required by a database. The data structures include the data objects, the associations between data objects, and the rules which govern operations on the objects. As the name implies, the data model focuses on what data is required and how it should be organized rather than what operations will be performed on the data.

A data model is independent of hardware or software constraints. Rather than try to represent the data as a database would see it, the data model focuses on representing the data as the user sees it in the "real world". It serves as a bridge between the concepts that make up real-world events and processes and the physical representation of those concepts in a database.

The goal of the data model is to make sure that the all data objects required by the database are completely and accurately represented. Because the data model uses easily understood notations and natural language, it can be reviewed and verified as correct by the end-users.

The data model is also detailed enough to be used by the database developers to use as a "blueprint" for building the physical database. The information contained in the data model will be used to define the relational tables, primary and foreign keys, stored procedures, and triggers. A poorly designed database will require more time in the long-term. Without careful planning you may create a database that omits data required to create critical reports, produces results that are incorrect or inconsistent, and is unable to accommodate changes in the user's requirements.

2.8.1.1 Components of a Data Model

The data model gets its inputs from the planning and analysis stage. Here the modeler, along with analysts, collects information about the requirements of the database by reviewing existing documentation and interviewing end-users.

The data model has two outputs. The first is an entity-relationship diagram which represents the data structures in a pictorial form. Because the diagram is easily learned, it is valuable tool to communicate the model to the end-user. The second component is a data document. This is a document that describes in detail the data objects, relationships, and rules required by the database. The dictionary provides the detail required by the database developer to construct the physical database.

2.8.1.2 Relational Database Concepts

The relational model is the standard for database design. The database stores and presents data as a collection of tables. A structure is defined by establishing relationships between tables; this links data in the database instead of modeling the relationships of the data according to the way it is physically stored. The relational database model offers the following benefits:

- Organizes data in s collection of tables making the design easy to understand.
- Provides a relationally complete language for data definition, retrieval and update. It is nonprocedural and criteria-based.
- Provides data integrity rules that define consistent states of the database to improve data reliability.

A relational database management system (RDBMS) is software that allows represent data according to the relational model. Relational databases support a standard language called Structured Query Language (SQL). SQL has evolved in to a comprehensive language for controlling and interacting with a database management system (DBMS). SQL is a standard approved by the American National Standards Institute (ANSI).

2.8.1.3 Entity Relationship (ER) Diagram

The ER model is a conceptual data model that views the real world as entities and relationships. A basic component of the model is the Entity-Relationship diagram which is used to visually represent data objects.

The utility of the ER model is:

- It maps well to the relational model. The constructs used in the ER model can easily be transformed into relational tables.

- It is simple and easy to understand with a minimum of training. Therefore, the model can be used by the database designer to communicate the design to the end user.

- In addition, the model can be used as a design plan by the database developer to implement a data model in specific database management software.

2.8.1.4 Normalization

Normalization is a design technique that is used as a guide in designing relational databases. Normalization is essentially a two step process that puts data into tabular form by removing repeating groups and then removes duplicated data from the relational tables.

Normalization theory is based on the concepts of normal forms. A relational table is said to be a particular normal form if it satisfied a certain set of constraints. There are currently five normal forms that have been defined.

The goal of normalization is to create a set of relational tables that are free of redundant data and that can be consistently and correctly modified. This means that all tables in a relational database should be in the third normal form (3NF). A relational table is in 3NF if and only if all non-key columns are mutually independent and fully dependent upon the primary key. Mutual independence means that no non-key column is dependent upon any combination of the other columns. The first two normal forms are intermediate steps to achieve the goal of having all tables in 3NF. In order to better understand the 2NF and higher forms, it is necessary to understand the concepts of functional dependencies and lossless decomposition. The concept of functional dependencies is the basis for the first three normal forms.

2.9 User Interface Design

The user interface is the link between the audience and the capabilities of the application. A well designed user interface makes it easy for target audience to learn and to use the application and the code behind the interface will be more efficient. A poorly designed interface, on the other hand, can result in confusion, frustration and even lack even of use as well as increased training time and costs.

Interface design is important for two reasons:

- User can quickly understand and learn applications that have a well-designed interface, thus saving training time and costs as well as encouraging use of the application.

- Programming is easier with a properly designed interface.

A good application begins with a carefully planned design and attention to the following principles;

- Simplicity
- Positioning of controls
- Consistency: fewer, carefully chosen controls; standardized color, font, size; and similarity of grouping.
- Affordances: choose what the average user would expect for buttons, toolbar icons, etc.
- White space: including white space in the user interface can help to emphasize elements and improve usability. (Microsoft Corporation, 2001)

2.10 Accessing Data

Almost all applications require some form of data access. For stand-alone desktop applications, local data access is typically easy to implement with little or no programming effort. For enterprise applications, data access is considerably more complex, often involving remote databases with different data formats and storage mechanisms. The data access technologies provided by Visual Basic typically reduce development time, simplify code and yet still provide high performance while exposing many features.

2.10.1 Data Access Interfaces

A data access interface is an object model that represents various facts of accessing data. In Visual Basic, three data access interfaces are available:

- Data Access Objects (DAO)
- Remote Data Objects (RDO)
- ActiveX Data Objects (ADO)

2.10.1.1 Data Access Objects (DAO)

Data Access Objects (DAO) lets access and manipulate data in local or remote database and manage the structure of certain types of databases. DAO Provides a hierarchical object model, which makes using DAO easy. DAO supports two basic ways to access data.

Microsoft Joint Engine Technology (Jet) allows to access data in desktop data sources, such as Microsoft Access, Fox Pro, Paradox, or Lotus 1-2-3.

ODBCDirect allows to access remote database servers without using the Microsoft Jet database engine. This provides better performance and also requires less memory.

The biggest limitation to DAO is the fact it was not designed to connect to remote database, such as in a client/server environment. While ODBCDirect provides this functionality, it is not very efficient. In addition, DAO was only designed to work with databases and cannot access other sources, such as an e-mail system.

2.10.1.2 Remote Data Objects (RDO)

Unlike DAO, which is designed to access desktop databases, RDO provides an object model for accessing remote data. The RDO programming model is similar to the DAO model, except that it is designed to work with client/server databases rather than desktop databases. RDO takes advantage of intelligent database servers that use sophisticated query engines, such as SQL Server and Oracle. More emphasis is therefore placed on using compiled queries that are stored in the database and utilizing server functionality.

RDO was designed to give the Visual Basic developers the ability to access remote data without having to code to the open database connectivity (ODBC) application programming interface (API).

The ODBC API is a component of Microsoft Windows implemented to provide a standard, open, vendor-neutral way of accessing data stored in a variety of proprietary personal computer, minicomputer and mainframe computer databases. RDO is a programming interface to the ODBC API and provides most of the functionality of ODBC in the form of an object model.

RDO is limited in that it does not access desktop databases very efficiently and can access relational databases only through existing ODBC drivers. In addition, RDO does not meet the needs of Internet developers, who must access special types of data in addition to traditional relational sources, as ADO does.

2.10.1.3 ActiveX Data Objects (ADO)

ADO is an interface to OLE DB. OLE DB is Microsoft's strategic low-level interface to all types of data. This concept is called Universal Data Access (UDA). For example, OLE DB and ADO provide developers the same interface to not only access data from relational and non relational database, but also other data sources, such as e-mail, file systems, project management tools, spreadsheets and custom business objects. OLE DB has been designed to build on the success of ODBC by providing an open standard for accessing all kinds of data. However, OLE DB does not use, nor require, ODBC. It effectively replaces the ODBC layer. Because of OLE DB, you can build solutions that span desktop, midrange, mainframe and Internet technologies using a variety of data stores. (Microsoft Corporation, 2001)

2.11 Overview of Structured Query Language (SQL)

Structured Query Language (SQL) is a language used for querying, updating and managing relational databases. SQL can be used to retrieve, sort, and filter specific data from the database. In addition, can add, change and delete data in a database using SQL statements.

By using SQL, an application can ask the database to perform tasks rather than requiring application code and processing cycles to achieve the same result. More importantly, effective use of SQL can minimize the amount of data that must be read from and written to a remote database server. Finally, effective use of SQL can minimize the amount of data sent across the network. Minimizing disk I/O and network I/O are the most important factors for improving application performance.

2.12 Database Management Systems

Database Management Systems (DBMS) are important. They underpin all the activities of a library management system by providing the basic storage and retrieval technology. The library application software sends data to and receives data from the DBMS which if it is working properly, is hardly noticed at all. Yet great claims are made for different types of database and their particular offerings. You should at least be able to understand the basics to understand what you might be getting - or missing when you choose a Library Management System (LMS).

A DBMS can be viewed as a more sophisticated and flexible form of file management together with a flexible tool for data extraction and often other "high level" tools. Without being too fussy about the niceties of DBMS, and ignoring those that do not figure much in library systems, these are the main types - in a rough chronological/sophistication order of their development.

2.13 Creating Internet Applications

2.13.1 Overview of IIS Applications

An Internet Information Server (IIS) application is a server-side Web application created in Visual Basic. An IIS application lives on a Web server and responds to requests from the browser. The application uses HTML to represent its user interface and compiled Visual Basic code to process requests and respond to events in the browser.

A user sees an IIS application as a series of HTML pages. A developer sees it as a WebClass that is made up of WebItems. A WebClass is a Visual Basic component that resides on a Web server and responds to input from the browser. A WebItem is an element that can be returned to the browser as part of a response to an HTTP request. A

WebItem is usually an HTML page, but it could also be a MIME-type file, such as an image, a .wav file, etc.

Element	Forms-based application	Web-based application
User Interface	Visual Basic forms	HTML Page
User Interface Elements	Controls	Elements
File Format	.frm files	.htm file
Creator	Developer	Web designer and/or Visual Basic developer
Run Time	Visual Basic IDE, Windows	Web browser

Table 2.1 Difference between form-based applications and Web-based applications

2.13.1.1 Structure of IIS Applications

An IIS application consists of several components. Many of these are generated automatically when build the project. The components include:

- One or more WebClasses, which are generated automatically when you create a WebClass project.
- One or more HTML templates and their events.
- One or more custom WebItems and their events.
- An .asp (Active Server Pages) file that hosts the WebClass in IIS. The .asp is generated automatically when you create a Webclass project; Visual Basic gives it the name that specify in the NameInURL property.
- A WebClass run-time component, Mswcrun.dll, which helps process requests.

- A project DLL (generate automatically on compile) that contains Visual Basic code and is accessed by the run-time component. (Microsoft Corporation, 2001)

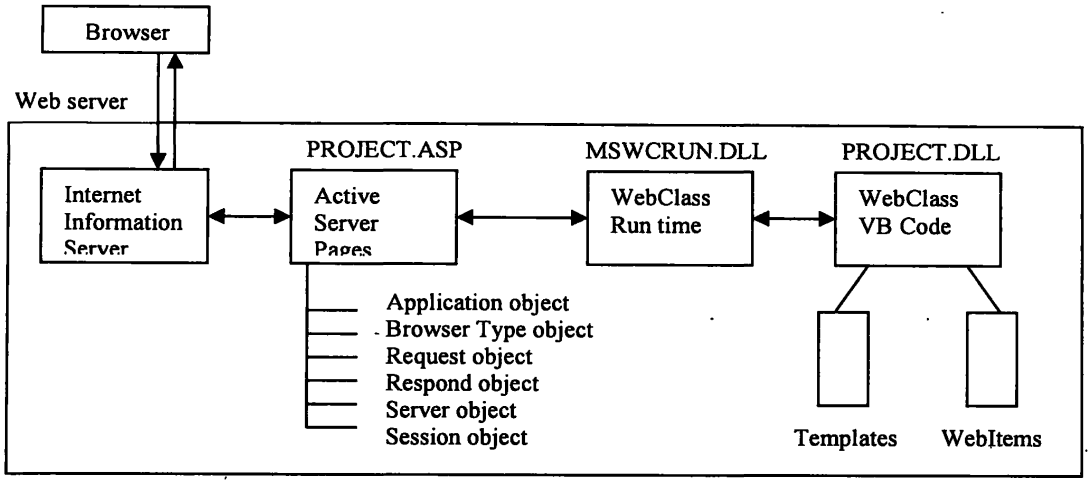

Figure 2.3 Structure of an IIS application

2.13.2 Active Server Pages (ASP)

Active Server Pages or ASP is a technology developed by Microsoft to further the ability to write applications for the web. Active Server Pages can be written in Visual Basic Script or JavaScript and contain the ability to be dynamic.

Normally, when someone visits a site, his browser sends a request for a certain file, such as index.htm. The server will then return this file to the client PC, and it will be displayed in the browser:

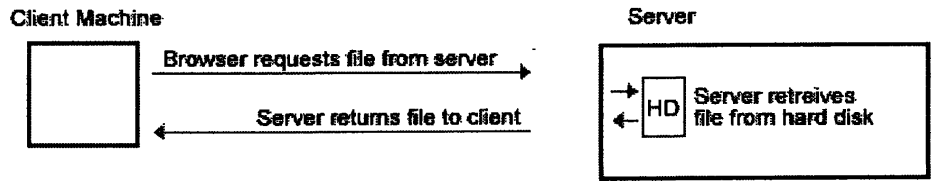

Figure 2.4 Processing Standard HTML Interaction

Active Server Pages, meanwhile, allow Visual Basic script to be processed on the server before sending the file back to the client.

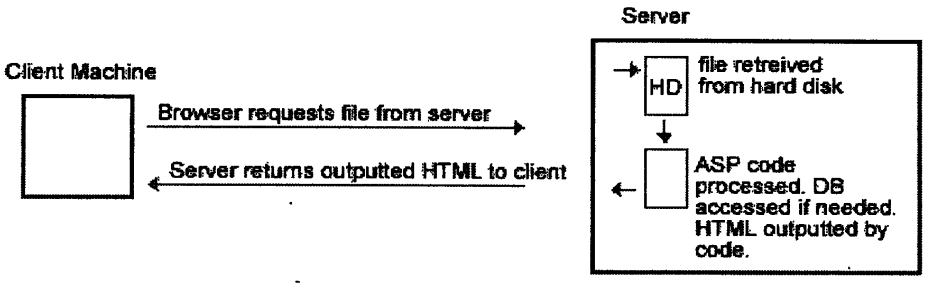

Figure 2.5 Processing Active Server Pages

This has a number of benefits

- Unlike client-side code, such as the JavaScript that makes ad windows popup, the browser does not need to understand VB - it doesn't even get to see it.

- The VB code can act on information passed to the page, such as from an internet form or a query string. It can then use this information to display data, or retrieve specific information from a database

- Only the smallest amount of data is sent to the client - only the HTML that the page outputs is sent, not the VB code. (Microsoft Corporation, 2001)

2.13.3 VBScript

Microsoft Visual Basic Scripting Edition brings active scripting to a wide variety of environments, including web client scripting in Microsoft Internet Explorer and web server scripting in Microsoft Internet Information Service.

Chapter 3

METHODOLOGY

3.1 Development of the Web Site

3.1.1 Requirements Analysis

Requirements analysis was carried out according to the methods below.

- Met the relevant employees and determine the full scope of requirements.
- Gathered all the documents and reports they issued.

According to the detailed requirements the functionalities of the system were identified.

3.1.2 Designing and Implementation

User interfaces were designed using Macromedia Dreamweaver and Fireworks. Coding was carried out using Hyper Text Markup Language (HTML). Cascading Style Sheets (CSS) used to apply style elements consistently across multiple pages. Java Applets also used as a designing language.

3.2 Development of the Web Based Information System

The requirements were preciously defined. The system could be used for a long time without any changes. Therefore the Linear Sequential model was used to develop the system.

Development process;

1. Requirements Analysis
2. System Analysis and Design
   2.1 Data and Database Design
   2.2 Interface and User Interface Design
3. Coding and Implementation
4. Testing
   4.1 Unit Testing
   4.2 System Testing

3.2.1 Requirements Analysis

In this phase the users of the system, what information or functionality must the system provide in support of the users, specific inputs, outputs were identified.

The analysis was carried out according to the following methods.

- Discussed with the relevant employees what were the functions of the system must be.
- Documents were observed that used to manipulate data.

3.2.2 System Analysis and Design

According to the requirements the entire system description was written. Then the designing was started following the rules in the description.

3.2.2.1 Data and Database Design

According to the description of the requirements the entities, attributes and their relationships were identified and relevant Entity Relationship (ER) diagram was designed. The ER diagram was illustrated in Appendix II.

The relevant tables were created according to the ER diagram and normalization was done up to third normal form.

3.2.2.2 Interface and User Interfaces Design

According to the user requirements interfaces and user interfaces were designed using Visual Basic 6.0.

For building the web application, Active Server Technology was used. Interfaces were built using scripting languages such as Vbscript and Jscript as well as user interfaces were built using Hyper Text Markup Language (HTML) and Cascading Style Sheets (CSS).

3.2.3 Coding and Implementation

Coding was carried out using Visual Basic 6.0. Structured Query Language (SQL) utilized as the tool for establishing the connection between the database and the respective interface.

The database was implemented using Microsoft Access. User interfaces, links and images were implemented using Macromedia Dreamweaver.

The system was implemented using object based language called Visual Basic 6.0 and the web application was implemented using ASP technology, Jscript & Vbscript as the scripting languages.

3.2.4 Testing

After completing the designing & implementation testing phase was continued in two major phases. The process was done according to a test plan. This was allowed the detection of errors or bugs in the system and to be fixed.

3.2.4.1 Unit Testing

At this stage each interface of information system were tested individually using the VB 6.0 platform. The web application was also tested at this stage using the Internet Information Service (IIS).

3.2.4.2 System Testing

The entire system was tested and after integration of tested units, was considered as a single unit.

Before testing the web application IIS was configured and was tested whether it is working correctly.Then the pages were loaded to the IIS and was tested as a single system.

Chapter 4

RESULTS AND DISCUSSION

With covering all the user requirements, the new website was developed for the National Science and Technology Commission. Adding all the necessary information, the site was created with a new interface and overcome drawbacks of the existing web site. The new web site provide information on workshops, publications etc. and also have facility to download copies of their publications.

An authorized person holding a research grant of the National Science Foundation would be given access to the system through the internet.

A web based information system for research grants of the National Science Foundation, was developed with covering all the user requirements. An authorized person holding a research grant of the National Science Foundation would be given access to the system through the internet.

Implementation of this system would important in such away:

- The system would enhance the efficiency.
- Very reliably handled data.
- Less man work.
- Handling data through the intranet courses less cost of money.

Chapter 5

CONCLUSION

A new web site was developed with a good appearance and with relevant information for the National Science and Technology Commission.

The development of the web based information system for research grants of National Science Foundation, endup with successful software project with a user-friendly information system that meets all the user requirements and overcome all the drawbacks of the existing system.

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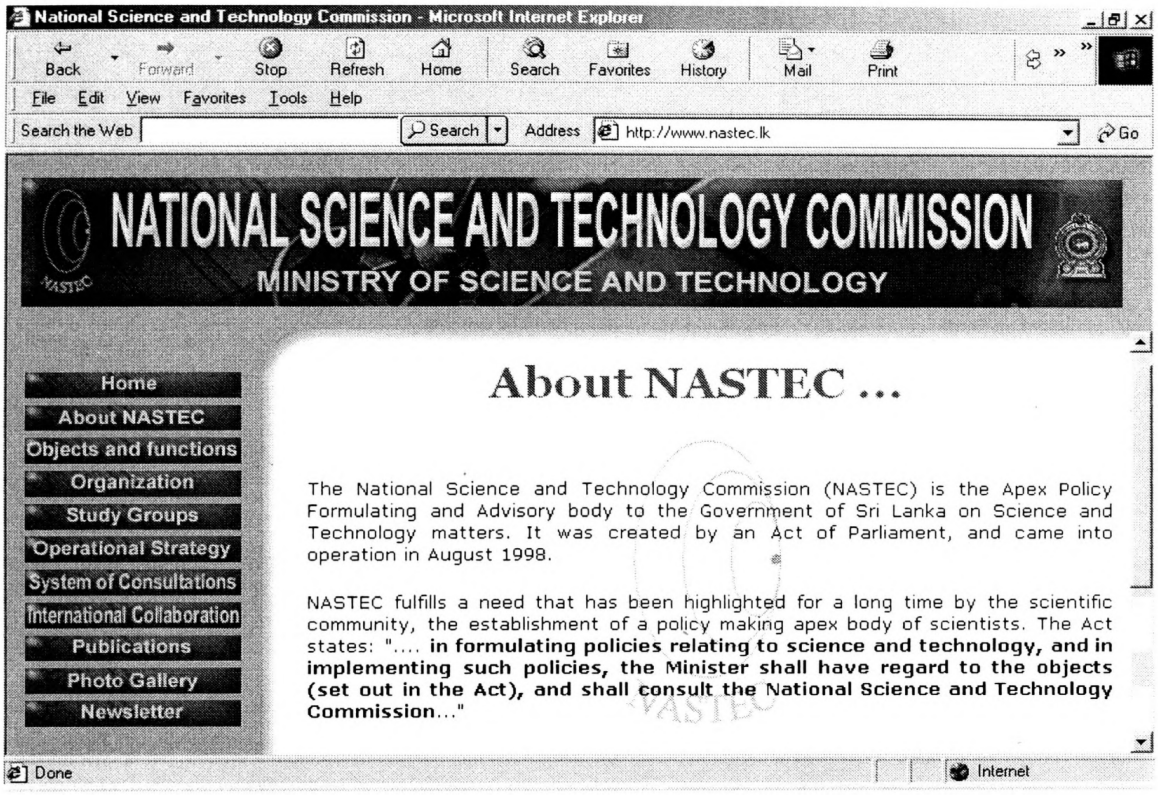
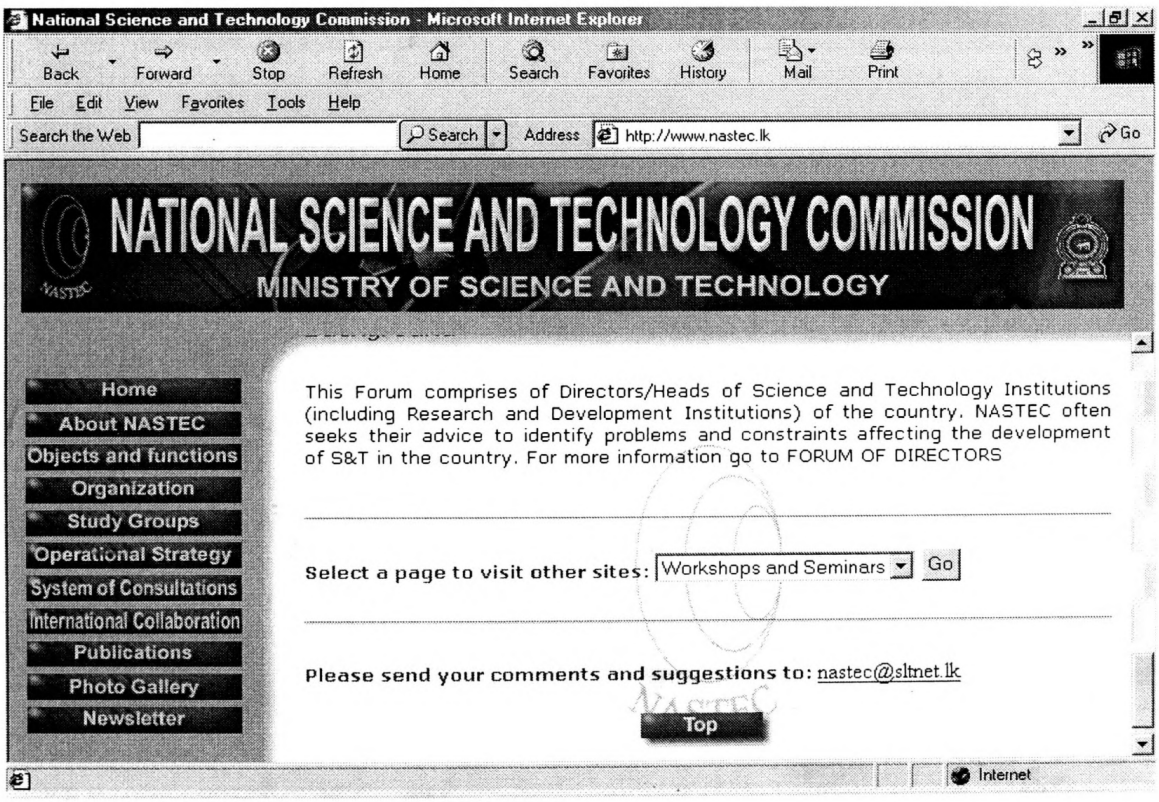
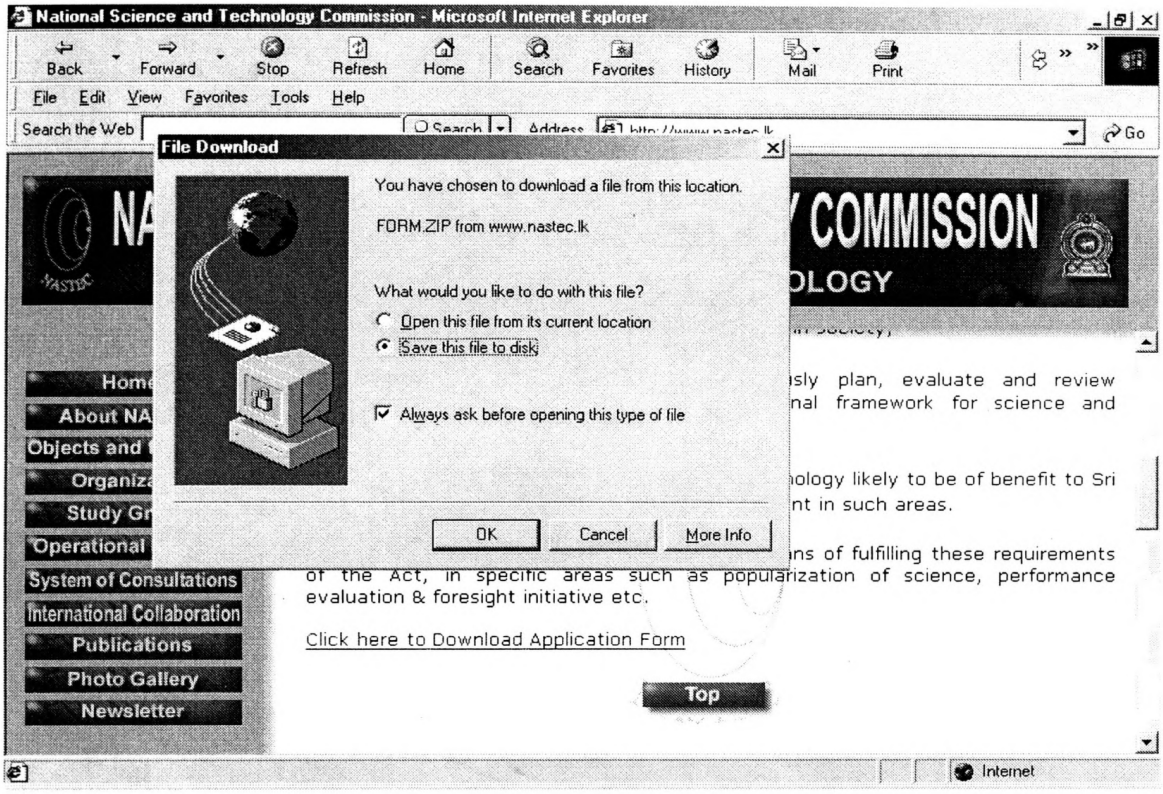
APPENDIX I

Web Pages






National Science and Technology Commission - Microsoft Internet Explorer
Back
Forward
Stop
Refresh
Home
Search
Favorites
History
Mail
Print
File Edit View Favorites Tools Help
Search the Web
Search
Address
Go
File Download
You have chosen to download a file from this location.
FORM.ZIP from www.nastec.lk
What would you like to do with this file?
Open this file from its current location
Save this file to disk
Always ask before opening this type of file
OK
Cancel
More Info
COMMISSION
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Home
About NA
Objects and
Organiz
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International Collaboration
Publications
Photo Gallery
Newsletter
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of the Act, in specific areas such as popularization of science, performance
evaluation & foresight initiative etc.
Click here to Download Application Form
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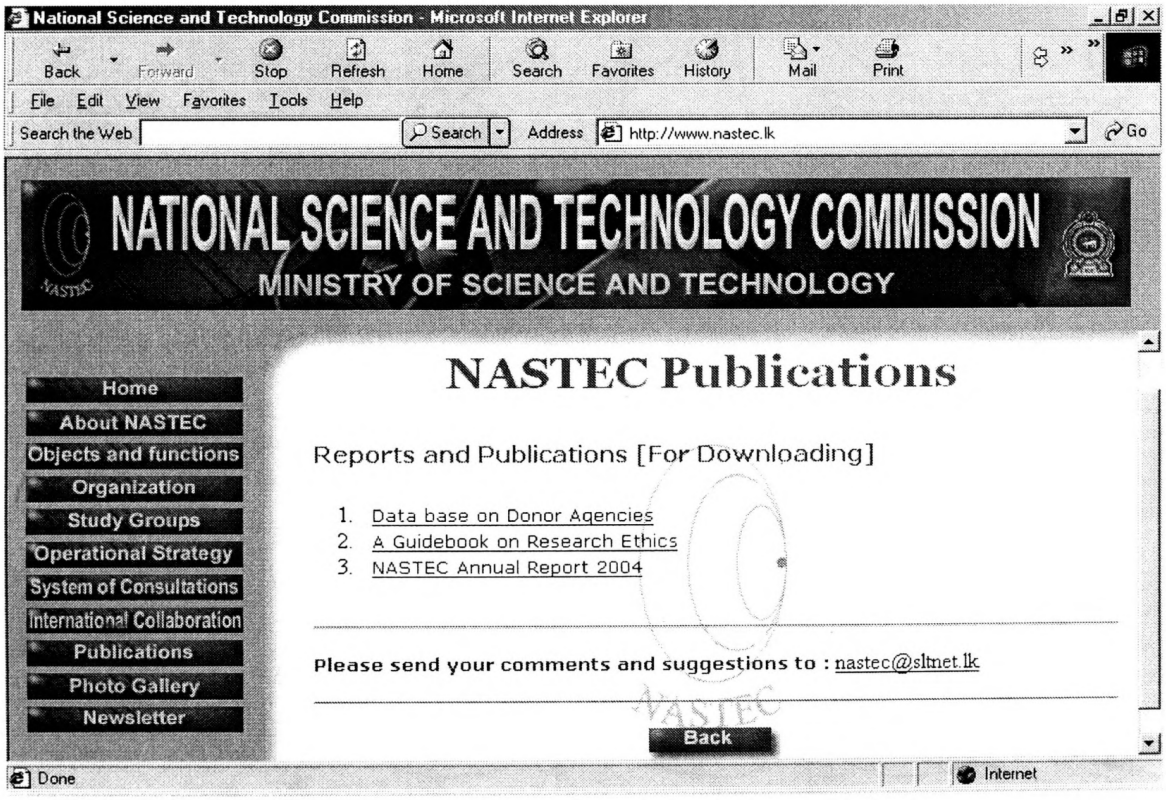
National Science and Technology Commission - Microsoft Internet Explorer
Back
Forward
Stop
Refresh
Home
Search
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Mail
Print
File Edit View Favorites Tools Help
Search the Web
Search
Address
http://www.nastec.lk
Go
NATIONAL SCIENCE AND TECHNOLOGY COMMISSION
MINISTRY OF SCIENCE AND TECHNOLOGY
Home
About NASTEC
Objects and functions
Organization
Study Groups
Operational Strategy
System of Consultations
International Collaboration
Publications
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2. A Guidebook on Research Ethics
3. NASTEC Annual Report 2004
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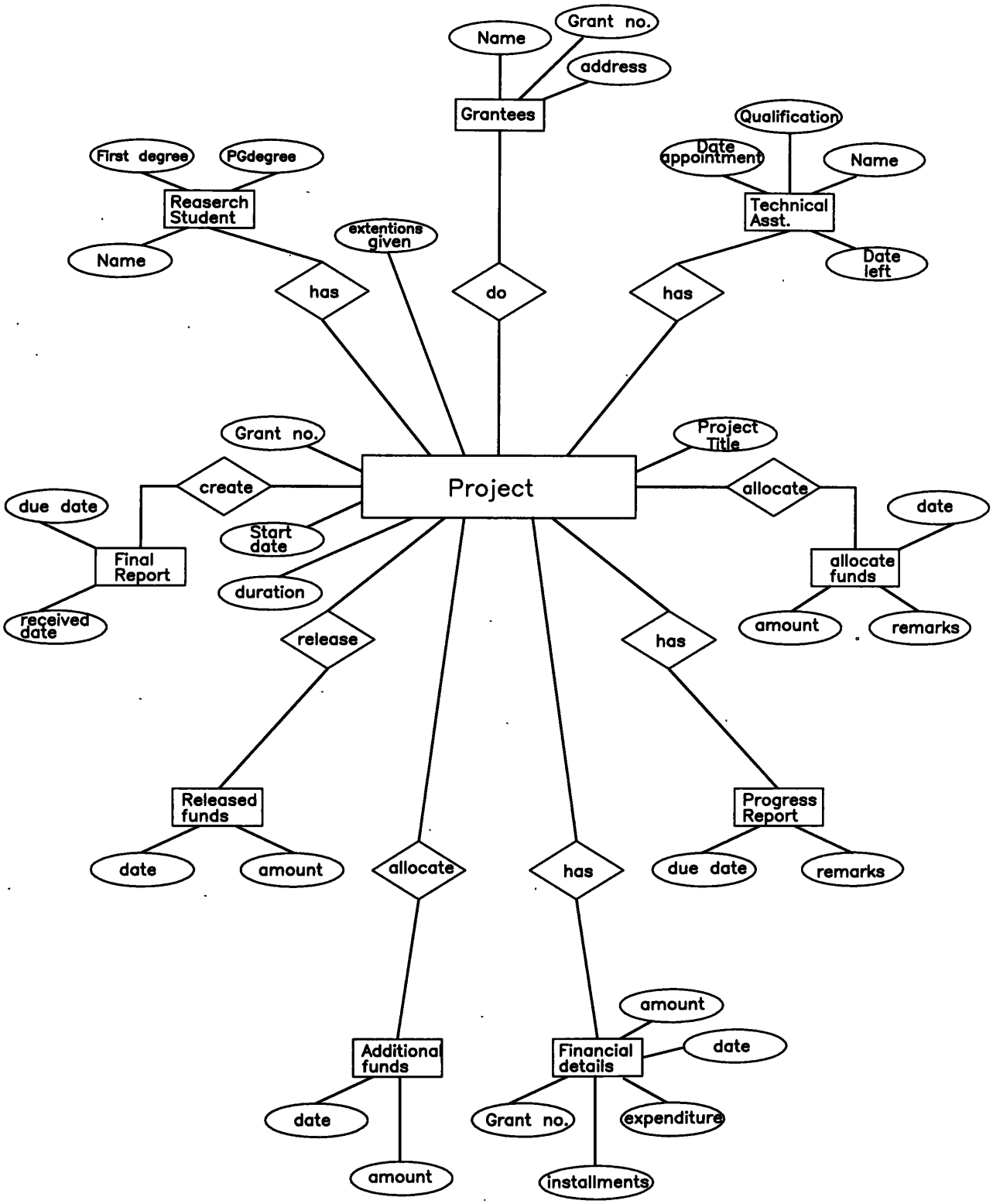
APPENDIX II

E-R Diagram



APPENDIX III

Tables

Table for General Information

Field Name	Data Type
Grant No.	Number
Project Title	Text
Field of Study/Research Committee	Text
Work Started On	Date/Time
First Installment Released	Date/Time
Duration	Date/Time

Table for Progress Reports

Field Name	Data Type
Report No	Number
Due Date	Date/Time
Received/Not	Text
Received Date	Date/Time
Remarks	Text
Work Started On	Date/Time

Table for Financial Report

Field Name	Data Type
Budget Item	Text
Financial Report As At	Date/Time
Report Received At NSF	Date/Time
Amount	Number
Duration	Date/Time

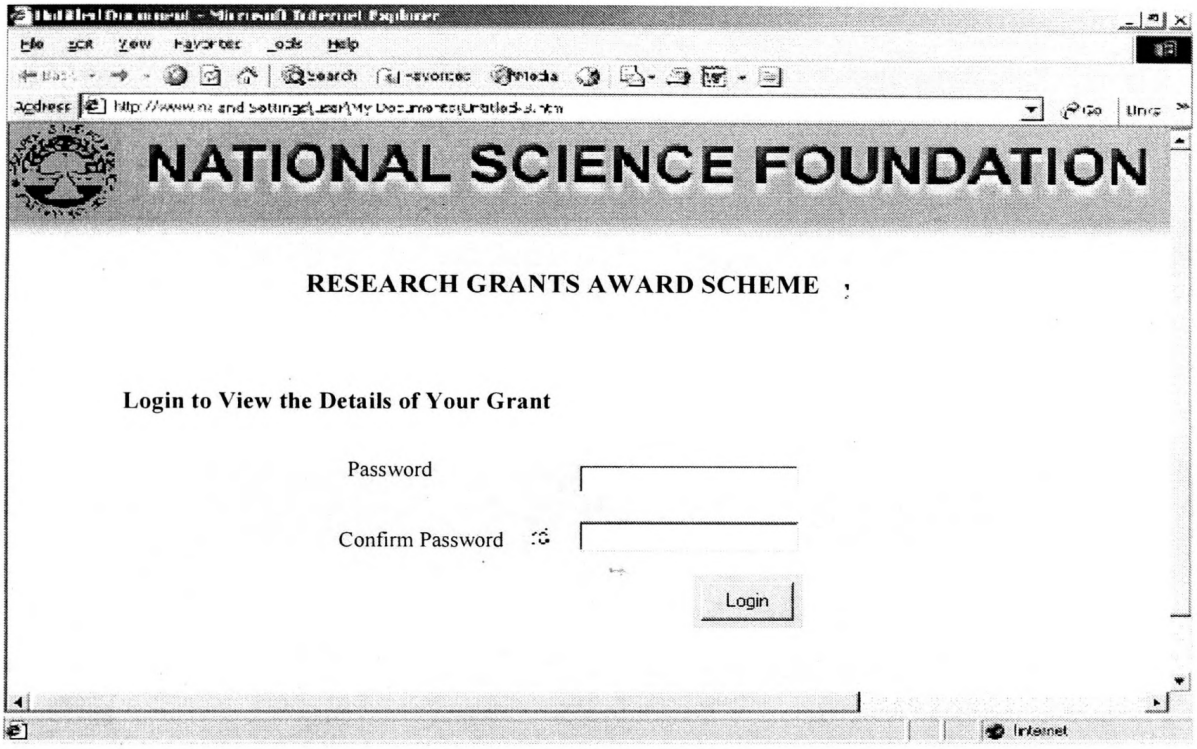
Table for Final Report

Field Name	Data Type
Due Date	Date/Time
Received/Not	Date/Time
Received Date	Date/Time
Grading Given	Text

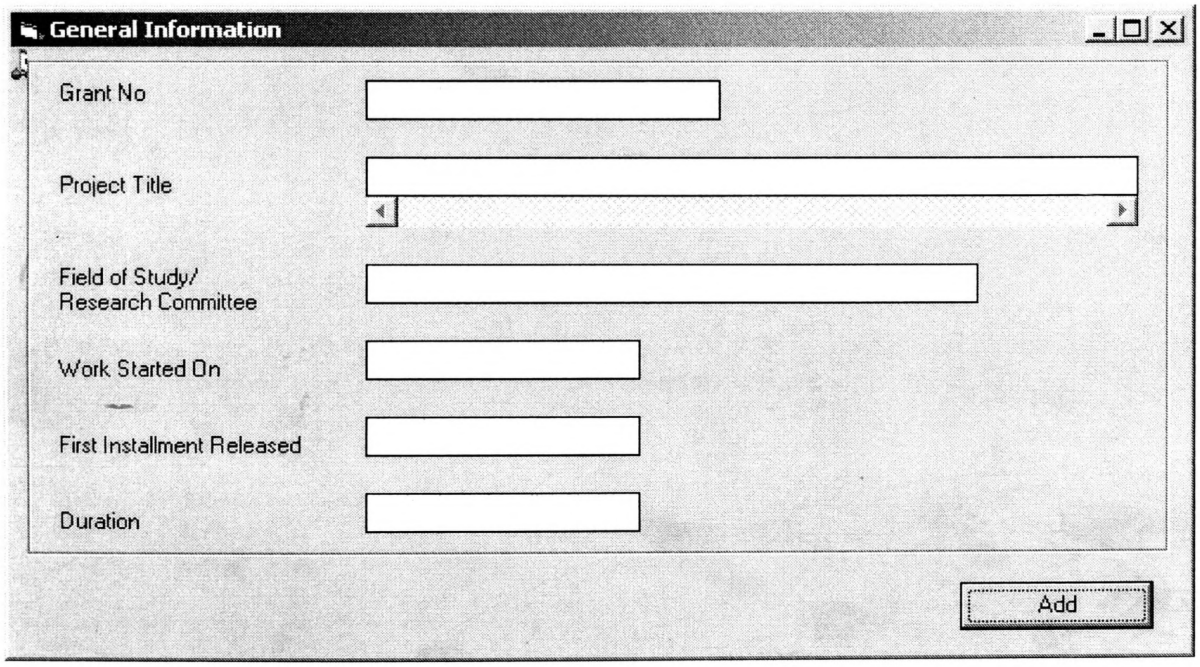
APPENDIX IV

User Interfaces

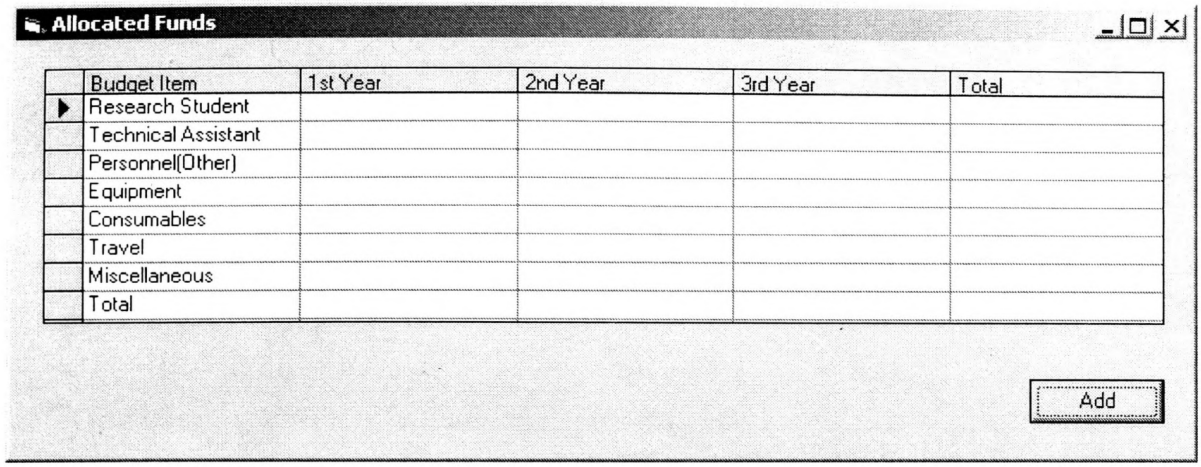
Interface for the Login Menu



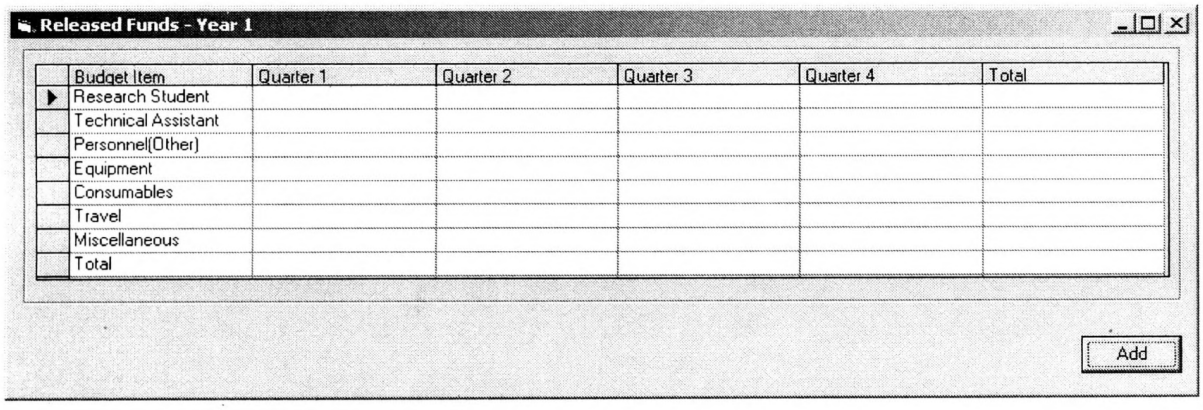
Interface for the General Information



Interface for the Allocated Funds



Interface for the Released Funds



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