

Honours Project:

Collaborative and Co-operative Electronic Calendar

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Abstract:

As we approach the end of the twentieth century, information is a critical force shaping the world's economic system. Fundamental changes in each sector are expected and they will be the result of technological convergence of the previously distinct telecommunications, information, and mass media industries. Networks will form the basis of evolving national and global information infrastructures, in turn creating a seamless web uniting the world in the emergent Information Age. The result will be a new information marketplace, providing opportunities and challenges for individuals, industry, and governments.

The Collaborative and Co-operative Electronic Calendar (CCEC) is an application which allows users to share events and opinions inside a group and a community of users through a web site linked to a database. This notion is interesting because entering in a new way to share information, firstly in the time/space matrix, with the use of modern support as Internet and remote devices, and secondly in the user's hierarchy. This report presents all the areas studied during the investigation for the honours project, and it also contains techniques and future orientations that the project will take.

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1. Introduction

The first orientation of the honours project was to create a CD-ROM application which would connect the client computer to a database through the Internet. The evaluation of this project involves a lot of problems, especially financially. The CD-ROM should have been developed with Macromedia Director 8, but this package does not contain any Xtras allowing the program to go through the process of connection to a database. Some corporations offer these components at a very high price. So, it was impossible to go in this way because of the cost involved.

The alternative was to do this project via the use of a web site, which is more flexible and up-to-date than a CD-ROM. The possibilities linked to the use of Internet are so huge, cheap and usable from World Wide Web. Moreover, the software required for the development of this application is already in use in Napier University.

The full implementation of this service will be effected on my own computer for a commercial point of view. I am actually working for a corporation in France that wants to use my application in its commercial web site. The first version of the prototype will be updated to the needs of this corporation, not before, because of the security of information between the linkage of the servers to the database. The financial aspect of this project is very attractive and gives me the opportunity to demonstrate my professionalism and my competence in the domain of web development.

1.1 Aims

This project has for aim to create an application which allows users to shared events and opinions over these events through an intelligent electronic calendar. This calendar gives functionalities allowing a collaborative and a co-operative work between users of a same group or/and a same community of users. This project uses directly a lot of concepts and notions of Co-operative Supported Computing Work (CSCW) to provide a GroupWare approach. The Web was invented so that scientists could use computer networks to collaborate - that is, exchange documents, discuss them, co-ordinate work, create and publish collective knowledge. It was, in other words, supposed to be a GroupWare application. So, the developed application will use the original purpose of the Internet to give the most effective tool in shared information systems.

One of the most important notion in this report in the community of users. A community regroups several groups of users. To demonstrate it, we can take the example of a Web based corporation. We can define two communities: The Business Management and the Web Development. The Business Management contains the salesmen team and the administration for instance. The Web Development community regroups a web designer team, a graphic design team and a network administration team.

In this community, for the development of a web site, all teams needs to work altogether but they do not have the same aims. Anyway, people in the graphic design team need to share data, files and calendar to produce the final work. They also need to work with the web designer team which will take their graphical works and integrate them to the web site. Finally, the network administration team will put the final site online. So, each team can directly work in a community by enrich the communication through the development process via the use of a GroupWare.

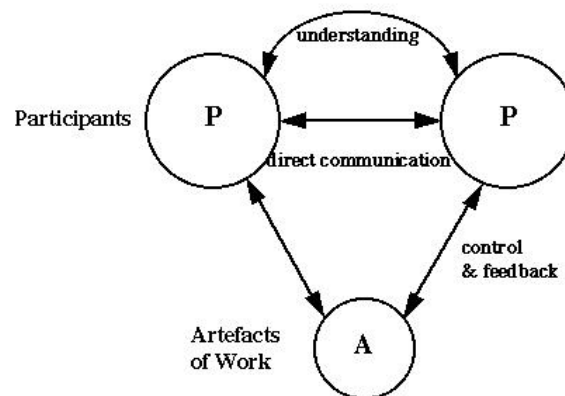


Figure 1: An alternative classification focuses on the functionality that the GroupWare supports (i.e. meeting support, group authoring)¹

In the case of this report, for first connection the users have to register to open an account. In a first step, users have to select a login and a password to create a profile. In a second step, users will have to choose a group of users and so they will belong to a community of users like it is explained below:

- **Community 1**
 - Group 1.1
 - Group 1.2
 - Group 1.3

- **Community 2**
 - Group 2.1
 - Group 2.2
 - Group 2.3

By selecting the group 1.2, the user will be automatically a member of the community 1. This feature will allow users to share information with their group or their full community. This is an important element of the exclusivity of this application, which opens a calendar to a collaborative and a co-operative environment.

1.2 Objectives

1.2.1 The first version of the application.

The first version of the application has been developed during the honours degree year related to the honour project. It includes:

- *Daily, weekly and monthly calendar:*
Users can directly display on the screen their calendar classified per days, weeks or months. The calendar is designed to present events with the idea of importance represented with a

¹ Media Computing by Dr. Michael Smyth: <http://www.dcs.napier.ac.uk/~michael/media/media52.htm> visited on the 26/10/2000

colour code. In the commercial version, this notion of importance will be improved with the use of colours and icons.

- *The possibility to add, edit or remove events for each day:*

Like in all calendars, users can create an event in the selected date. They could change the content of the description of this event or delete it. All these events are recorded in the database.

- *A collaborative calendar to share information with a group/community of users:*

During the creation of a new event, users are allowed to let other users see it if they belong to the same group or community. This is the main feature of this project.

- *Notion of level of importance of the events (normal/important/very important):*

As a personal event or a shared event, users can define its level of importance, which will be characterised in the calendar with the use of a colour code. For instance, a normal event will be blue (cold colour in visual psychology) , an important one is black and a very important is red (warm colour which attracts the attention of users).

- *The possibility to have an automatic and customised alarm reminder:*

An automatic reminder is important if users access this application for a professional purpose. This reminder is represented as an email sent to the users' mailbox (PC, WAP phone or PDA) or a SMS (short messaging service) message sent to their mobile phones or PDA.

- *Customisation of the interface:*

It is very important to give to users the possibility to customise the interface of the application and its menu. The first version of this application only allows the modification of the interface by selecting its shape and its colours. The customisation of the menu is very important as well, because users will use their menu to add their personal links. This feature allows users to redefine a part of the application and gives them the freedom to feel the ownership of the software.

1.2.2 The commercial version

The commercial version will be developed after signing contract with a French corporation. The needs are similar, but the application has to present more features:

- *Electronic address book:*

This functionality attracts users because the main application will regroup a lot of features usually found in several software/web sites. In fact, another goal of this application is to centralise a lot of components to simplify the users' accessibility.

- *Portal of information directly linked to the users' calendar to display the events in relation with their interests:*

A vortal (vertical industry portal) will be added to give more information to the users via their electronic calendar. For instance, if a group of users are interested in computing, it will be informed of new releases, events and meeting. So the *users* table needs to be improved to add more fields to record the users' interests.

- *A general vortal like NetPortal² provides:*
Customised information daily updated always in relation with the user's requirement.

- *Relationship with other Web sites to enrich the calendar of events:*
The corporation will create relationships with several corporations all around the world to enrich the events table in different area. This will give an important resource of quality content.

- *Portable devices such as WAP Phones or PDA:*
The last stage of development is the connection of this technology to portable devices. The full application will work with these devices and it will enable users to connect to its services from remote location (for example in their car, during a travel).

1.2.3 3D Forum

This application enters in the domain of forum in a different way because it allows the communication through the time, the location³ and the interest of the users. This concept can be called 3D Forum.

	Co-present/ Same Place	Distributed/Remote Different Place
Synchronous/ Same Time	Meeting Rooms Shared work surfaces & Editors	Video Confs Media Spaces
Asynchronous/ Different Time	Argumentation Tools Co-authoring systems & shared calendars	E mail Electronic Confs

Figure 2 : The time/space matrix for a GroupWare communication

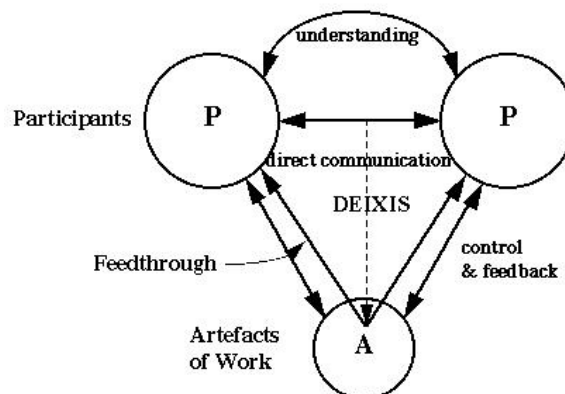


Figure 3 : Integration of Communication and Work

² NetPortal web site : <http://www.mediapps.com> visited on 3/11/2000

³ Media Computing by Dr. Michael Smyth: <http://www.dcs.napier.ac.uk/~michael/media/media52.htm> visited on the 26/10/2000

The integration of communication and work gives an idea of the aim of this application: The communication is created through the use of the electronic calendar to fix for example guidelines for management of a project. The deixis is the reference to the item. In our case, the deixis is the group or the community which are the reference to a common interest (artefact). The feedthrough is the manipulation of a shared object which can be observed by the other participants. So communication through the artefact can be as important as direct communication between the participants.

1.2.4 Collaboration

With the term “Collaboration” being used so frequently, the term needs better definition. This list should become a more specific description for different kinds of communication than the generic term “collaboration”.

- *Asynchronous* - Similar to Email, creation/ work at own time and pace.
- *Synchronous* - Similar to Chat, creation/ work concurrently with others.
- *Web Collaboration* - Threaded Discussions
- *Web Discussions* - Comments in line or by document filtering by date, person, etc.
- *Web Subscription and Notification* - Subscribe to be notified of new changes or additions.
- *Online meetings for Workgroups* - Synchronous communications between predefined individuals who share information and counsel, similar to gathering for a meeting and exchanging information, planning, and discussing. Communication is more balanced, listener/speaker, writer/reader.
- *Presentation Broadcast* - Synchronous communications similar to a presentation meeting. Communication is greater in one direction than in another, speaker, writer.
- *Advanced Security* - Who can access certain parts of the web, sub folder, etc.
- *Check in / Check out* - Reserve a page/file/folder so no one else can edit it, while someone is editing.
- *Workflow Reports* - Users assign responsibility for creation or modification to a team member, set up approval process in the publishing processes.

2. Concepts of Web marketing

The financial approach is very important in the development of a such project. All tools like software and hardware are needed to be defined properly for the development and the implementation processes. These tools are provided by Napier University, so it limits the cost of development. For the commercial version, it is very important to take in consideration the cost factor to create a product at a low cost, because the market changed to become a free place where nobody wants to pay for a service.

2.1 Financial approach

2.1.1 Free use

A lot of web sites offer free services, like MSN⁴ and Hotmail by Microsoft. These services are very powerful and useful that does explain their popularity around the world. So, it is

⁴ MSN web site : <http://www.msn.com> visited on the 1/11/2000

impossible to propose a paying service on the Internet because the concurrence will analyse the product and create the same with more functionality to kill the first one. That's why this product will be completely free for the users.

A representative example of free services can be made through the use of software like Sonique⁵ which is a direct concurrent of Winamp, free as well. The first version was developed three years ago and gave a full acceptance of the users. A few months ago, the copyright was bought by Lycos to become a sub-corporation. This method allows Sonique Corporation to earn money through advertising of Lycos⁶.

Also see:

- <http://www.freewarefiles.com/>
- <http://www.freewarehome.com/>
- <http://freeware.intrastar.net/>

2.1.2 Why a free access ?

In the earlier days of the web, it was thought that the provider of online content would be able to charge the user directly. Some corporations like newspapers, for example, started to put their content on Internet for free, which allowed them to build an audience. Since, a user can find a free information or pays for it, but the success of sites come from the aspect of marketing useful information and good services available. In fact, no one wanted to pay (except professionals).

2.1.3 How to make money ?

The first aim of this application is to become a real professional tool, it means acquire the respect of the users. This could be modelled by increasing traffic on the web site. The goal of this financial approach is to favour the maximum audience possible and so receive money from advertising by using banners.

Another source of revenue will come from sponsorship. By using links or advertising on a web site, it is possible to make some money from the revenue generated by these links to other corporations (the price of the advertisements is proportional to the traffic existing in the web site hosting it). For example, if the database directly receives information from a corporation about its products. The user selects the source of interest in his/her profile and each time he/she will use the information to go to the partners' sites, this corporation will pay a commission.

2.2 Web site advertising

Still with a financial aspect in mind, the way to advertise a web site is very important to create traffics and them earning money and win notoriety from the users.

2.2.1 Banners

Banner advertisements are still the most popular way to promote services on the Internet. Evaluations of the response rate might be as low as 0.6 per cent but when they are working the result is impressive because they are very powerful.

⁵ Sonique Corporation web site : <http://www.sonique.com> visited on the 14/01/2001

⁶ Lycos search engine : <http://www.lycos.co.uk> visited on the 14/01/2001

The best way to have the optimal result by using banners is to choose a category of site in which they will appear on to stay in a common kind of interest at the users' eyes. So the banner for this web site will appear on relevant types of site, and also to the partners' sites. The banners will be different for the language of the user

2.2.2 E-mail marketing

E-mail marketing has become a very popular promotional tool, largely because it is cheap and it can be surprisingly effective. By using email one can get their message in front of potential customers in a much more concrete way than by simply placing a banner advertisement on a site. The recipient has to deal with the e-mail in some way, even if they look at the subject line and then delete it.

There are a couple of approaches that you can take to email marketing. To keep the existing visitors returning to the web site, it will be interesting to create a mailing list to send out regular email newsletters detailing special offers or new features on the services. Spay.fr is a great exponent of the value of the email newsletter. It sends out a regular newsletter to existing customers telling them about the latest special offers on the site.

2.2.3 Search Engines

One of the most traditional ways of pulling traffic to a web site is to be registered in search engines. A study, which was analysing the process of browsing the Internet, showed that 75% of Internet users use a search engine to find the target site⁷.

2.3 Saving money on development

The important aspect in web development is the cost of production. If a corporation needs to invest millions of pounds to develop a site which will not report money, the loss is considerable. In the case of this project, the investment is low because of the use of packages as *UldraDev 4*® and *Fireworks 4*® (Macromedia⁸), *PhotoShop 6*® (Adobe⁹), *IIS*® and *SQL Server*® (Microsoft¹⁰). The global cost in software is resumed to less than three thousands pounds.

For instance, I have developed the application directly on my own computer with all the packages described above in shareware. For the development of an application like this one, a team is recommended to save time and money. In that case, the investment will stay the same:

- Licences for Adobe PhotoShop 6® and Macromedia Fireworks 4® for the graphic designer: total cost £1100.
- Licence for Macromedia Ultradev 4® for the web developer: cost £800.
- Licences for Microsoft IIS® (free with Windows NT/2000) and Microsoft SQL Server® for the network administrator: total cost £850.

⁷ Source: <http://www.receptional.com> - April 2000 visited on the 12/02/2001

⁸ Macromedia products : <http://www.macromedia.com/products> visited on the 14/11/2000

⁹ Adobe web site : <http://www.adobe.com> visited on the 14/11/2000

¹⁰ Microsoft web site : <http://www.microsoft.com> visited on 14/11/2000

3. Co-operative Supported Computing Work and Human Computer Interaction

Co-operative Supported Computing Work and Human Computer Interaction are both primordial in the development of this collaborative and co-operative electronic calendar. The CSCW accentuates relationships between users manipulating the same object. HCI is more about how the user will interact with the application.

3.1 CSCW

CSCW includes many computer science notions and technologies including HCI, networks, Multimedia, object oriented concepts, virtual reality, and artificial intelligence. These are not the only technologies used in GroupWare applications; the most appropriate technology is used for specific co-operative communication tasks. Although several technologies may be used in the collaboration process, CSCW technology usually has a set of workstations networked together in some arrangement.

3.1.1 Why GroupWare ?

First and foremost, GroupWare supports the efforts of teams and other paradigms which require people to work or interact together, even though they may not actually be together, in either time or space. GroupWare maximises human interaction while minimising technology interference. The following graphic provides a view from both the technology and human interaction perspectives.

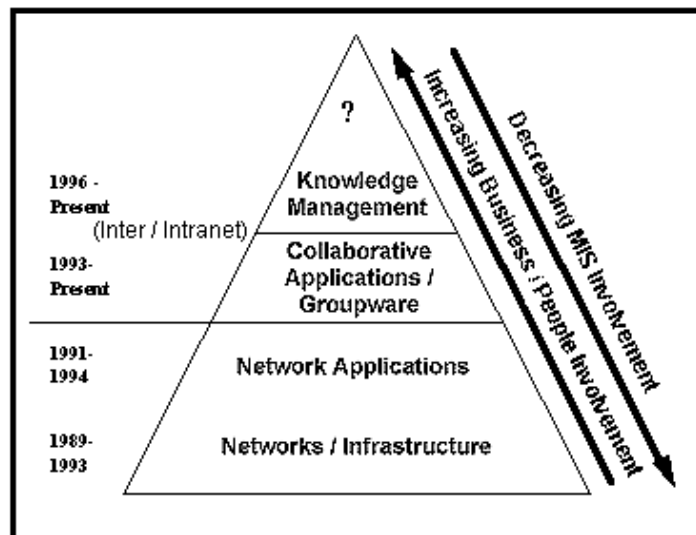


Figure 4: technology and human interaction perspectives

Downsizing and organisational restructuring or re-design and other trends of the 90's are targeted toward increasing productivity, i.e., fewer people doing more with less. These are not the only challenges for business in the 90's. Increased quality, better customer service, lower cost of sales, greater employee autonomy, and more flexible and responsive organisations are all challenges for the current business climate. The following list represents the primary motivations for making the move to GroupWare:

- Better cost control
- Increased productivity and usability
- Better services
- Less meetings
- Automating routine processes
- Extending the organisation to include both the customer and the supplier (vortal)
- Integration of geographically disparate users or teams
- Increased competitiveness through faster time to market
- Better co-ordination globally
- Providing a new service that differentiates the organisation

GroupWare uses technology to provide solutions to business processes. Looking more closely, we see six major forces that provide the initial propulsion toward GroupWare:

1. A network infrastructure capable of supporting GroupWare is now available.
2. Improved price/performance of GroupWare hardware and software has made it more available to a larger population.
3. The world-wide recession and downsizing is forcing increased productivity.
4. Well known vendors such as Microsoft, WordPerfect, IBM/Lotus, and Digital Equipment Corporation (DEC) are promoting GroupWare products, thereby increasing awareness in the marketplace.
5. Increased competition imposes change on organisations, making them flatter and more flexible, often requiring GroupWare for this transformation.
6. Increased complexity in today's products and business procedures is supported by GroupWare.

Additionally, the greatest problems with GroupWare were not technological but social¹¹. Problems stemmed from the lack of support from top management or lack of a well defined business problem, rather than infrastructure or application issues.

The current trend toward flatter organisations, decentralisation, and outsourcing is reflected in the information technologies that businesses employ. The rapid growth of networks and the decline of legacy systems has managers searching for ways to amortise LANs. Many organisations realise that they cannot be all things to all people. They have discovered the best way to stay competitive is to focus on their primary business and deliver it as efficiently as possible. This specialisation means that in order to provide a complete GroupWare or business solution, many organisations need partners and must enter into new alliances to meet these demands (cf. Section 1.2.2 - The commercial version).

However, GroupWare, because it promotes communication, can often provide a solution. In essence, GroupWare is the competitive glue of the '90s. GroupWare provides a vehicle for organisations to remain flexible, a way to stay focused on the customer yet support the

¹¹ Media Computing by Dr. Michael Smyth : <http://www.dcs.napier.ac.uk/~michael/media/media51.htm> visited on the 26/10/2000 and The Social Web Research Program site: <http://orgwis.gmd.de/projects/SocialWeb/#WiththeSocial> visited on the 12/12/2001.

external salesperson, and a way to provide all users with greater information and autonomy to be more interested and productive.

3.1.2 GroupWare over the Internet

There is a popular argument, especially as the Internet and Intranets become more commonplace, that the Internet and WWW will make "traditional" GroupWare obsolete. However, collaborative technologies will still require a hybrid network. Customers are using an "and" rather than an "or" philosophy for collaboration i.e. today they are supporting both infrastructures for collaboration.

The trend toward collaboration is a strong one, technology and culture. Technology includes the increased proliferation of networks and startling growth of the Internet. Network growth has been explosive, 30% on average, for the last eight years¹². This trend will probably continue over the next decade, as less than 60% of the computers in the U.S. are networked, only 45% of the computers in Europe are networked and less than 20% of Japan's computers are on a network¹³. Network growth is caused by economic and organisational pressures such as increased global competition and a world-wide recession which was felt first in the U.S. then Europe and most recently, in Asia.

Cultural changes are the second driver for collaboration. As our world becomes more like a global village, we have greater involvement in other cultures. Whereas, just a few years ago, people travelled thousands of miles, taking days out of our regular routines to meet with people in other countries, today, desktop video and data conferencing provides an immediate, inexpensive and minimally disruptive method to conduct the same meeting. In addition cross cultural issues, implementing any new technology or program forces change in the organisation, many of which are characterised by teams and other collaborative paradigms.

The third driver for collaboration is the "net." Even though the Internet and WWW are not fully interactive or collaborative, vendors are incorporating collaborative functionality into new versions of web-based products. Research performed by Collaborative Strategies showed that most collaborative functions were migrating onto the Internet. Interactive or discussion databases may be part of a GroupWare application. Often GroupWare applications are workgroup-oriented and not enterprise-oriented. Yet the advent of IP networks, especially the Intranet are driving this new collaborative infrastructure at a frantic pace.

3.2 HCI

Human Computer Interaction is the study of how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings. A significant number of major corporations and academic institutions now study HCI. Historically and with some exceptions, computer system developers have not paid much attention to computer ease-of-use. Many computer users today would argue that computer makers are still not paying enough attention to making their products "user-friendly." However, computer system developers might argue that computers are extremely complex products to design and make and that the demand for the services that a computers can provide has always out-driven the demand for ease-of-use.

¹² From AllHtml web site : <http://www.allhtml.com> visited on the 30/01/2001

¹³ These are approximate and derived from a report of Karl Wong of Dataquest, San Jose, CA

One important HCI factor is that different users form different conceptions or mental models about their interactions and have different ways of learning and keeping knowledge and skills (different "cognitive styles" as in, for example, "left-brained" and "right-brained" people). In addition, cultural and national differences play a part. Another consideration in studying or designing HCI is that user interface technology changes rapidly, offering new interaction possibilities to which previous research findings may not apply. Finally, user preferences change as they gradually master new interfaces.

3.2.1 The Content of Human-Computer Interaction

The aim in this section is to inventory the current state of results in the field of human-computer interaction. The topics in this table derive from a consideration of five interrelated aspects of human-computer interaction:

- (N) the nature of human-computer interaction,
- (U) the use and context of computers,
- (H) human characteristics,
- (C) computer system and interface architecture,
- (D) the development process.

Complex dialogues lead into considerations of the systems architecture necessary to support such features as inter-connectable application programs, windowing, real-time response, network communications, multi-user and co-operative interfaces, and multi-tasking of dialogue objects. Finally, there is the process of development which incorporates design for human-computer dialogues, techniques and tools for implementing them, techniques for evaluating them, and a number of classic designs for study. Each of these components of the development process is bound up with the others in a relationship of mutual, reciprocal influence whereby choices made in one area impact upon the choices and the options available in the others.

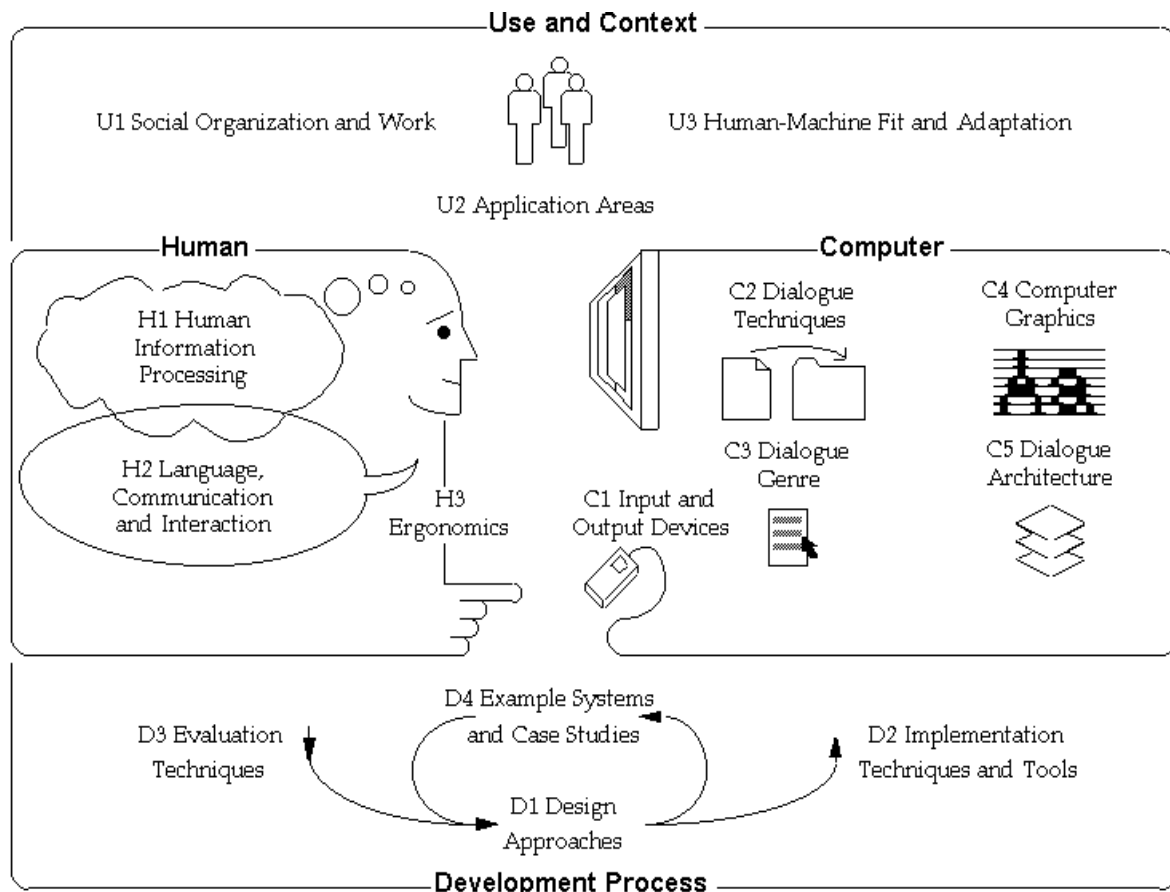


Figure 5: Human-Computer Interaction

- N The Nature of HCI**
N1 (Meta-)Models of HCI
- U Use and Context of Computers**
U1 Human Social Organisation and Work
U2 Application Areas
U3 Human-Machine Fit and Adaptation
- H Human Characteristics**
H1 Human Information Processing
H2 Language, Communication, Interaction
H3 Ergonomics

- C Computer System and Interface Architecture**
C1 Input and Output Devices
C2 Dialogue Techniques
C3 Dialogue Genre
C4 Computer Graphics
C5 Dialogue Architecture
- D Development Process**
D1 Design Approaches
D2 Implementation Techniques
D3 Evaluation Techniques
D4 Example Systems and Case Studies

3.2.2 Nature of Human-Computer Interaction (N)

Under this heading are overviews of, and theoretical frameworks for, topics in human-computer communication.

N1. The Nature of Human-Computer Interaction

- Points of view: HCI as communication, agent paradigm, tool paradigm, the work-centred point of view, human/system/tasks division, supervisory control
- Objectives (e.g. productivity, user empowerment)
- History and intellectual roots
- HCI as an academic topic: journals, literature, relation to other fields, science vs. engineering vs. design aspects

3.2.3 Use and Context of Computers (U)

The uses to which computers are put are spoken of as 'applications' in the computer world. These uses and the extent to which the interface (and the application logic in the rest of the system) fits them can have a profound impact on every part of the interface and its success. Moreover, the general social, work, and business context may be important. In addition to technical requirements, an interface may have to satisfy quality-of-work-life goals of a labour union or meet legal constraints on "look and feel" or position the image of a company in a certain market. The following topics are concerned with general problems of fitting computers, uses, and context of use together.

U1. Social Organisation and Work

This heading relates to the human as an interacting social being. It includes a concern with the nature of work, and with the notion that human systems and technical systems mutually adapt to each other and must be considered as a whole.

- Points of view¹⁴
- Models of human activity¹⁵
- Models of small-groups, community, organisations
- Models of work, workflow, co-operative activity, office work
- Socio-technical systems, human organisations as adaptive open systems, mutual impact of computer systems on work and vice versa, computer systems for group tasks, case studies
- Quality of work life and job satisfaction

U2. Application Areas

The focus of this section is on classes of application domains and particular application areas where characteristic interfaces have developed.

- Characterisation of application areas¹⁶
- Document-oriented interfaces: Text-editing, document formatting, illustrators, spreadsheets, hypertext
- Communications-oriented interfaces: Electronic mail, computer conferencing, telephone and voice messaging systems

¹⁴ Industrial engineering, operations research, Rasmussen's cognitive engineering, the Aarhus participatory design approach, Hewitt's open systems

¹⁵ Opportunistic planning, open procedures

¹⁶ e.g., individual vs. group, paced vs. no-paced

- Design environments: programming environments, CAD/CAM
- On-line tutorial systems and help systems
- Multimedia information kiosks
- Continuous control systems: process control systems, virtual reality systems, simulators, cockpits, video games
- Embedded systems: Copier controls, elevator controls, consumer electronics and home appliance controllers

U3. Human-Machine Fit and Adaptation

Part of the purpose of design is to arrange a fit between the designed object and its use. There are several dimensions to this fit and it is possible to place the burden of adjustment in different places: Adjustments can be made either at design time or at time of use by either changing the system or the user and the changes can be made by either the users themselves or, sometimes, by the system. Topics under this heading all relate to changing some component of a socio-technical system so as to improve its fit.

- Alternate techniques for achieving fit
- Nature of adaptive systems, adaptations of human systems that cancel reliability improvements, the nature of error in adaptive redundant systems, empirical findings on user improvisation with routine systems, determinants of successful systems introduction,
- System selection: theories of system adoption
- System adaptation: customisation
- User selection: compatibilities of user and system characteristics
- User adaptation: ease of learning, training methods (e.g., on-line tutorials), relation to system design
- User guidance: help techniques, documentation, error-handling techniques

3.2.4 Human Characteristics (H)

It is important to understand something about human information-processing characteristics, how human action is structured, the nature of human communication, and human physical and physiological requirements.

H1. Human Information Processing

Characteristics of the human as a processor of information.

- Models of cognitive architecture: symbol-system models, connectionist models, engineering models
- Phenomena and theories of memory
- Phenomena and theories of perception
- Phenomena and theories of motor skills
- Phenomena and theories of attention and vigilance
- Phenomena and theories of problem solving
- Phenomena and theories of learning and skill acquisition
- Phenomena and theories of motivation
- Users' conceptual models
- Models of human action
- Human diversity, including disabled populations

H2. Language, Communication and Interaction

Language as a communication and interface medium. Communication phenomena.

- Aspects of language: syntax, semantics, pragmatics
- Formal models of language
- Pragmatic phenomena of conversational interaction (e.g., turn-taking, repair)
- Language phenomena
- Specialised languages¹⁷
- Interaction reuse

H3. Ergonomics

Physiological characteristics of people and their relationship to workspace and environmental parameters.

- Arrangement of displays and controls, link analysis
- Human cognitive and sensory limits
- Sensory and perceptual effects of CRT and other display technologies, legibility, display design
- Control design
- Fatigue and health issues
- Furniture and lighting design
- Temperature and environmental noise issues
- Design for stressful or hazardous environments
- Design for the disabled

3.2.5 Computer System and Interface Architecture (C)

Machines have specialised components for interacting with humans. Some of these components are basically transducers for moving information physically between human and machine. Other components have to do with the control structure and representation of aspects of the interaction. These specialised components are covered in the following topics.

C1. Input and Output Devices

The technical construction of devices for mediating between humans and machines.

- Input devices: survey, mechanics of particular devices, performance characteristics (human and system), devices for the disabled, handwriting and gestures, speech input, eye tracking, exotic devices
- Output devices: survey, mechanics of particular devices, vector devices, raster devices, frame buffers and image stores, canvases, event handling, performance characteristics, devices for the disabled, sound and speech output, 3D displays, motion, exotic devices
- Characteristics of input/output devices¹⁸
- Virtual devices

C2. Dialogue Techniques

The basic software architecture and techniques for interacting with humans.

- Dialogue Inputs:

¹⁷ Graphical interaction, query, command, production systems, editors

¹⁸ Weight, portability, bandwidth, sensory modality

- Types of input purposes (e.g., selection, discrete parameter specification, continuous control)
- Input techniques: keyboard techniques (e.g, commands, menus), mouse-based techniques (e.g., picking, rubber-band lines), pen-based techniques (e.g., character recognition, gesture), voice-based techniques
- Dialogue Outputs:
 - Types of output purposes (e.g., convey precise information, summary information, illustrate processes, create visualizations of information)
 - Output techniques (e.g., scrolling display, windows, animation, sprites, fish-eye displays)
 - Screen layout issues (e.g., focus, clutter, visual logic)

C3. Dialogue Genre

- The conceptual uses to which the technical means are put. Such concepts arise in any media discipline¹⁹
- Workspace models
- Relevant techniques from other media (e.g., graphic design)
- Style and aesthetics

C4. Computer Graphics

Basic concepts from computer graphics that are especially useful to know for HCI.

- Geometry in 2- and 3- space, linear transformations
- Graphics primitives and attributes: bitmap and vectored representations.
- Animation
- Colour representation, colour maps, colour ranges of devices

C5. Dialogue Architecture

Software architectures and standards for user interfaces.

- Layers model of the architecture of dialogues and windowing systems, dialogue system reference models
- Screen imaging models
- Window systems Models of application-to-dialogue manager connection
- Models for specifying dialogues

3.2.6 Development Process (D)

The construction of human interfaces is both a matter of design and engineering. These topics are concerned with the methodology and practice of interface design. Other aspects of the development process include the relationship of interface development to the engineering (both software and hardware) of the rest of the system.

D1. Design Approaches

The process of design. Relevant topics from other design disciplines.

- Graphic design basics²⁰
- Alternative system development processes (e.g., waterfall model, participatory design), lifecycle model, iterative design, choice of method under time/resource constraint

¹⁹ Film, graphic design, etc.

²⁰ Design languages, typography, use of color, 2D & 3D spatial organisation, temporal sequencing, etc.

- Task analysis techniques, task allocation, market analysis
- Design specification techniques
- Design analysis techniques
- Industrial design basics
- Design case studies and empirical analyses of design

D2. Implementation Techniques and Tools

- Tactics and tools for implementation.
- Relationships among design, evaluation, and implementation
- Independence and reusability, application independence, device independence
- Prototyping techniques²¹
- Object-oriented methods
- Data representation and algorithms

D3. Evaluation Techniques

- Philosophy and specific methods for evaluations.
- Productivity
- Usability testing techniques, linking testing to specifications
- Formative and summative evaluation techniques for empirical evaluation, including, field observation methods, participant observation, interviewing techniques, questionnaire design, psychometric methods, video protocols, system logging, experiment design, methods from psychological and sociological evaluation fields, ethics of working with participants

D4. Example Systems and Case Studies

Classic designs to serve as extended examples of human interface design. In the case of the development of the collaborative and co-operative electronic calendar, the work in a same area is important. We can take the example of *linkUall.com*²².

3.2.7 Case study: linkUall.com

This company proposes the same kind of product than the one in development. There are general functionalities:



Calendars and Address books

linkUall calendars offer end-users a way to stay organised, to schedule their activities and to plan events with friends or colleagues. Our technology allows our customers to link this module with other applications such as file sharing and club package and to synchronise it with existing solutions.

Main features:

- day, week, bi-weekly, month views

²¹ Storyboarding, , rapid prototype implementations

²² linkUall.com web site : <http://www.linkuall.com> visited on 23/01/2001

- personal and group events (with RSVP)
- recurring events (repeating occurrences of the same event)
- SMS or e-mail reminder and notification
- synchronisation with Palm, Outlook, Outlook Express...
- wireless access: linkUall's calendar is accessible from any wireless devices
- external events feeds
- shared calendar: every user can decide to share his/her calendar
- availability lookup: users can check the availability of other members through a shared calendar
- library of APIs enabling full integration
- Week / bi-weekly view



Figure 6: Screen shot of the LinkUall.com project

The analysis of this case is very interesting and it will enrich the HCI aspect of the prototype during the development. Without analysing the graphic design which is subjective, the main interest of this study is the navigation and management of data. This is the way to make the user navigate through the site intuitively. The management of data is also important because it is the heart of the system and it is characterised by the database.

For instance, as soon as users are logged on the system, they will see their personal calendar with all their events. The display is simple, days are on the left side of the screen and events on the right. We notice that this system does not provide a level of importance with a colour code. Users need to click a small icon to create an event. A page is loaded and displays a form with all the information needed to record the event.

Then, the calendar is refreshed with the new information. It is also possible to update or delete an event by clicking on it. Another feature is implemented: Sharing events with people. This functionality is not present on the demonstration of this site, so I could not try it. Anyway, this system is remarkable and it helps to understand all the processes to implement during the navigation of users through the site.

This site corresponds to the collaborative and co-operative electronic calendar project without a lot of components, like the opinions or the events' level of security, which are its originality.

4. Theories

This section will introduce principal notions and techniques used during the elaboration of this project.

4.1 The Web Theory

4.1.1 HTML and JavaScript

As we approach the end of the twentieth century, information is a critical force shaping the world's economic system. In the next century, the speed with which information is created, its accessibility, and its myriad uses will cause even more fundamental changes in each nation's economy. These changes will be the result of technological convergence of the previously distinct telecommunications, information, and mass media industries.

The principal way to publish on the web is through the use of the HTML²³ language. This was a major evolution of the web and placed the Internet at the level of normal users (not computing people). The technology involved is a mark-up language based on the use of tags defining the layout and it is directly interpreted on the user's computer (client computer).

The HTML is a poor language. It will be replaced soon by new technologies like XML²⁴. Anyway, JavaScript is a language which allows to create more functions than those which include in the HTML recommendation. Scripting allows creation of interactive elements on screen for example. This technology is a client side language as the HTML

4.1.2 Dynamic HTML (DHTML)

Dynamic HTML is a collective term for a combination of new Hypertext Mark-up Language (HTML) tags and options, that will let you create Web pages more animated and more responsive to user interaction than previous versions of HTML. Much of dynamic HTML is specified in HTML 4.0. Simple examples of dynamic HTML pages would include:

- Having the colour of a text heading change when a user passes a mouse over it,
- Allowing a user to "drag and drop" an image to another place on a Web page.

Dynamic HTML can allow Web documents to look and act like desktop applications or Multimedia productions. The features that constitute dynamic HTML are included in Netscape Communications' latest Web browser, Navigator 4.0 (part of Netscape's Communicator suite), and by Microsoft's browser, Internet Explorer 4.0. While both Netscape and Microsoft browsers support HTML 4.0, only one of the browsers supports some additional capabilities. The biggest obstacle to the use of dynamic HTML is that, since many users are still using older browsers, a Web site must create two versions of each site and serve the pages appropriate to each user's browser version.

A describes the default style characteristics (including the page layout and font type style and size for text elements such as headings and body text) of a document or a portion of a document. For Web pages, a style sheet also describes the default background colour or

²³ HTML for Hyper Text Markup Language.

²⁴ XML for eXtended Markup Language.

image, hypertext link colours, and possibly the content of page. Style sheets help ensure consistency across all or a group of pages in a document or a Web site.

Dynamic HTML includes the capability to specify style sheets in a "cascading style sheet" fashion (that is, linking to or specifying different style sheets or style statements with predefined levels of precedence within the same or a set of related pages). As the result of user interaction, a new style sheet can be made applicable and result in a change of appearance of the Web page. You can have multiple layers of style sheet within a page, a style sheet within a style sheet within a style sheet. A new style sheet may only vary one element from the style sheet above it.

4.1.3 Cascading Style Sheets (CSS)

Cascading Style Sheets save bandwidth, vastly reducing the size of files when compared to old-style mark-up. With Styles, sites load faster. Designers work faster, too. Styles shave gruelling hours of grunt-work off your design workload: one brief CSS document can style an entire domain; and when it's time to redesign, you can execute site-wide changes in minutes instead of days.

They offer exciting new possibilities, from absolute positioning, to interactive manipulation of text and images. And they allow to create sophisticated layouts while doing no harm to the underlying structure of our documents - ensuring that search engines (as well as hand-held devices, web phones, and other futuristic browser morphs) can "understand" these pages as easily as readers do. Plus, unlike cross-browser DHTML, JavaScript, and other advanced technologies, CSS is bone-simple to learn and use.

In practice, what this means is using Styles to do what only Styles can do, while using more universally accessible techniques for the basics. For instance, it is possible to use Styles to establish fonts and leading on this site, but it still rely on TABLES to create our margins and other divisions.

Meanwhile, the latest released versions of Microsoft Internet Explorer and Opera Software's Opera already offer a high level of support for CSS. Even the best of the current browsers fails to support 100% of CSS Level 1 - a standard created in late 1996. This means that even if designers code pages strictly according to the spec, parts of their design will not render at all, and other parts will appear incorrectly. And that's in the best browsers we have today. IE 4.5 and 5.0 are good, but suffer from weird anomalies and omissions. The upcoming version of Netscape Navigator will be great, but the present version is quite weak where CSS is concerned. And Netscape Navigator 3 does not recognise CSS at all.

4.2 Web Servers

4.2.1 What is a Web Server ?

A Web server is a software application that runs on a computer connected to the Internet. It listens for client connections on a particular port number (80 for default). Most modern servers are multi-threaded and can deal with multiple concurrent connections from clients. As well as handling HTTP requests, some modern servers can interface to other side applications using CGI. They may also enable embedded commands (Server-Side Includes or SSI), or

scripting (ASP, PHP or JSP). There are a number of well known server packages currently in use. Two of the most popular are Microsoft Internet Information Server (IIS) and Apache.

4.2.2 Apache Web Server

The Apache project began in 1995, as a collaborative effort between a group of people who wanted to build a robust and commercial-grade implementation of the HTTP protocol. They also wanted to make this available to the user community absolutely free of charge. Originally conceived as a series of patches to the original NCSA²⁵ HTTPd daemon (the term “Apache Server” is derived from the words “A PatCHy Server”). Apache has been the most popular web server on the Internet since April of 1996.

The popularity of Apache among Web site administrators and developers can be judged from the recent Netcraft survey, which indicates that 60% of the total Web sites on the Internet, run on Apache. Its current release version is Apache 1.3.19, through Apache 2.0 (which includes multi-processing support) is available as an Alpha release. It runs on Windows NT/95/98/2000/Millennium, NetWare 5.x, OS/2 and most versions of Unix, including Linux, as well as several other operating systems. Standard configuration is usually more than satisfactory for those without special requirements. Apache also allows the user to customise its behaviour extensively.

Apache’s modular architecture makes possible for anyone to add new functions to the server. In fact, most of the code that comes as part of the Apache distribution is in the form of modules, and can be removed or replaced. Besides those included with the distribution, modules are also written to add functions not already in the code, or to do things which are needed on some sites but are not of widespread use. Some of these modules are written by Apache developers. Most of them, however, are written by other users of Apache who want to adapt its functionality for their needs.

Apache is started just like all the other server applications. On windows, Apache is normally run as a service on NT, or as a console application on Windows 95/98. On Unix, the httpd program is run as a daemon which executes continuously in the background of the Handheld requests.

4.2.3 Internet Information Server (IIS)

Microsoft have been delivering their own Web server applications for a long time. Users are familiar with their personal Web server products. Currently, their main server product is the Internet Information Server package. A few comparisons between the performances of Apache and IIS have been done – the results are usually inconclusive though Apache now concedes that MS servers out perform their free software. One test²⁶ stated that “Windows NT Server 4.0/IIS 4 significantly out-perform Linux/Apache 1.3.4 and provides much more predictable and robust performance under heavy load”.

IIS is a group of Internet server (Web or Hypertext Transfer Protocol, File Transfer Protocol, and Gopher) and other capabilities for Microsoft's Windows NT and Windows 2000 Server operating systems. IIS is Microsoft's bid to dominate the Internet server market that is also addressed by Netscape, Sun Microsystems, O'Reilly, and others. With IIS, Microsoft includes

²⁵ National Center for Supercomputing Applications at the University of Illinois

²⁶ <http://www.mindcraft.com/whitepapers/first-nts4rhlinux.html>

a set of programs for building and administering Web sites, a search engine, and support for writing Web-based applications that access database. Microsoft points out that IIS is tightly integration with the Windows NT and 2000 Servers in a number of ways, resulting in faster Web page serving.

Microsoft includes special capabilities for server administrators designed to appeal to Internet service providers (Internet service provider). It includes a single window (or "console") from which all services and users can be administered. It's designed to be easy to add components as "snap-ins" that you didn't initially install. The administrative windows can be customized for access by individual customers.

IIS includes security features and promises that it is easy to install. It works closely with the Microsoft Transaction Server to access databases and provide control at the transaction level. It also works with Microsoft's Netshow in the delivery of streaming audio and video, delayed or live.

4.2.4 Security

SSL²⁷ (Secure Sockets Layer) is a commonly-used protocol for managing the security of a message transmission on the Internet. SSL uses a program layer located between the Internet's Hypertext Transfer Protocol (HTTP) and Transport Control Protocol (TCP) layers. SSL is included as part of both the Microsoft and Netscape browsers and most Web server products. SSL was developed by Netscape and is now supported by Microsoft and other Internet client/server developers as well. The "sockets" part of the term refers to the sockets method of passing data back and forth between a client and a server program in a network or between program layers in the same computer. SSL uses the public-and-private key encryption system from RSA, which also includes the use of a digital certificate.

SSL is an integral part of most Web browsers (clients) and Web servers. If a Web site is on a server that supports SSL, SSL can be enabled and specific Web pages can be identified as requiring SSL access. Any Web server can be enabled by using Netscape's SSLRef program library which can be downloaded for non-commercial use or licensed for commercial use.

SSL is an alternative to another commonly-used security protocol, S-HTTP. Newer browsers support both SSL and S-HTTP. Currently a de facto standard, SSL has been submitted to the Internet Engineering Task Force (IETF) as a proposed official standard.

4.3 SQL and ASP

As the information that the user entered is saved in the database, it is necessary to organise each data in a database. The information needs to be accurately and traceably stored in the appropriate place, as it will be crucial, when editing, updating or deleting this information.

4.3.1 SQL

SQL stands for "Structured Query Language". This language allows us to pose complex questions of a database. It also provides a means of creating databases. SQL very widely used. Many database products support SQL, this means that if the developer has learnt how to use

²⁷ Information from the site <http://www.netscape.com> visited on 23/03/2001

SQL he will be able to apply this knowledge to MS Access or SQL Server or to Oracle and countless other databases.

SQL works with relational databases. A relational database stores data in tables (relations). A database is a collection of tables. A table consists a list of records - each record in a table has the same structure, each has a fixed number of "fields" of a given type. SQL also has commands to create tables, to add records, to delete records and to change the value of fields of existing records.

SQL requests are composed of three main elements:

- *SELECT*: to point on a field
- *FROM*: to define the table where to find the field introduce above
- *WHERE*: to characterise the condition, for instance all names starting with a "A"

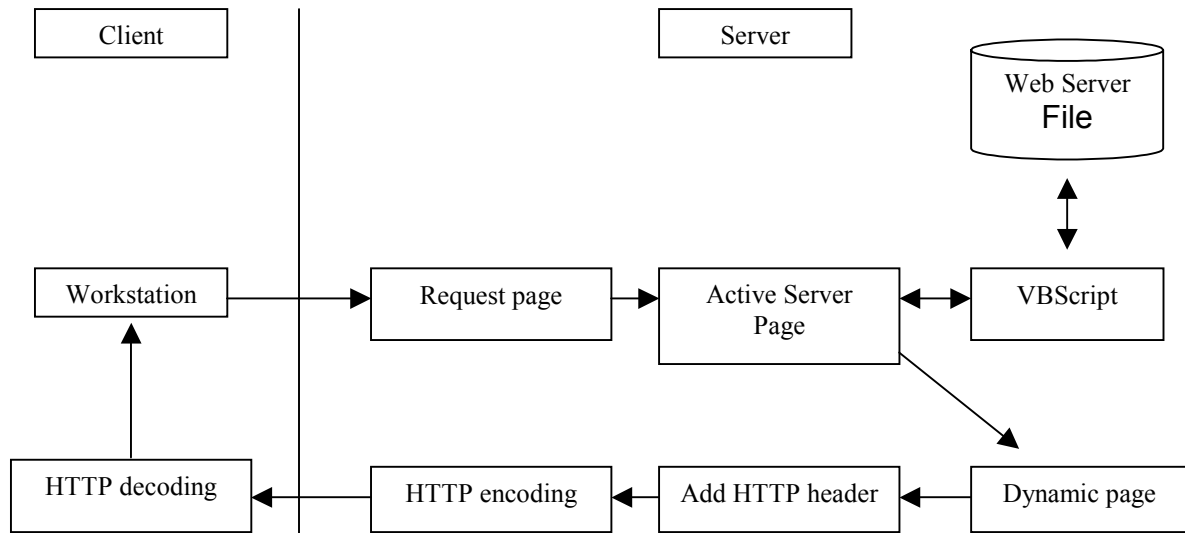
SQL will be used during the implementation of the database in the Microsoft SQL Server® to allow dynamic pages to read, record, update and delete data from tables.

4.3.2 ASP (Active Server Page)

A lot of technologies emerged to allow dynamism between a web site and a database. Nowadays, one of the most powerful technology is called ASP for Active Server Page. An Active Server Page is an HTML page that includes one or more script (small embedded programs) that are processed on a Microsoft Web server before the page is sent to the user.

An ASP is somewhat similar to a Server-side include or a common gateway interface (common gateway interface) application in that all involve programs that run on the server, usually tailoring a page for the user. Typically, the script in the Web page at the server uses input received as the result of the user's request for the page to access data from a database and then builds or customises the page on the fly before sending it to the requestor.

ASP is a feature of the Microsoft Internet Information Server (IIS), but, since the server-side script is just building a regular HTML page, it can be delivered to almost any browser. You can create an ASP file by including a script written in VBScript or JScript in an HTML file or by using ActiveX Data Objects (ActiveX Data Objects) program statements in the HTML file. You name the HTML file with the ".asp" file suffix. Microsoft recommends the use of the server-side ASP rather than a client-side script, where there is actually a choice, because the server-side script will result in an easily displayable HTML page. Client-side scripts (for example, with JavaScript) may not work as intended on older browsers.



Both, PHP and JSP, are based as the ASP model to work on server-side to provide dynamic information. For this project, the implementation of the system will focus on the ASP technology which seems to stay more powerful in database management than other technologies as PHP or JSP in the same area.

5. Implementation

The implementation passes through an investigation of needs for the development. As soon as the requirement specifications define, the implementation can start.

5.1 Definition of needs before implementation

In this section, it is relevant to speak about the technologies which will be implemented during the development. As it has been describe in the financial approach, the economical aspect is very important to succeed in the implementation of a project, that's why it is recommended to minimise the effort required to create the assets, avoiding unnecessary repetition to save time and money. The use of techniques as the CSS is relevant to that idea because it allows an easy update of the all site.

5.1.1 User interface

The recent studies on users' configuration show that around 90% of the users are using at least a version 4 or later of Microsoft Internet Explorer and Netscape. Moreover, the screen resolution tends to have a standard of 800×600 pixels, and more and more of 1024×768 pixels, for the same percentage of users. These specifications will be very useful to reach the maximum of users.

5.1.2 Software

Software involved in the implementation of the prototype are:

- **Adobe PhotoShop 6®** : used for creating, editing and manipulating graphic elements.
- **Macromedia Fireworks 4®** : used specifically for converting graphic elements to the web.
- **Macromedia Dreamweaver UltraDev 4®** : used for creating, editing and manipulating web pages and dynamically database elements:
 - **Data Bindings Inspector:** Quickly add server expressions or information from databases to your pages. Bind any object's attributes to server expressions without knowing the exact syntax.
 - **Multi-Server Design Environment:** Build ASP, JSP and CFML sites in one environment—there's no need to master a new program each time you use a different server technology.
 - **Remote Database Connectivity** : UltraDev lets you connect directly to a database through your Web application server, instead of defining connections on your development machine and server.
 - **Master Detail, Database Editing, Recordset Navigation, and Recordset Status Live Objects:** Build typical Web application layouts more quickly. UltraDev includes a set of predefined objects that generate basic layouts and server-side scripts for common actions. These actions including database inserts, database updates, master/detail relationships, Recordset statistics and Recordset navigation bars.

- **Dynamic Data Formatting:** Quickly apply currency and date formatting and URL encoding to database data or server expressions—without writing code.
 - **Server Behaviour Library:** Use the ASP, JSP and CFML library of server scripts to add basic server-side logic to pages. Make Web applications navigate through database records, show and hide regions on the layout, and insert, update and delete records.
 - **SQL Query Editor:** Easily browse a database's tables, views, and stored procedures. Quickly test any SQL statement to ensure you're getting the desired results.
 - **Customisable Live Data:** Test different page settings with the Live Data Preview. From within the design environment you can see how various access restrictions affect pages.
- **Microsoft SQL Server® :** used for creating, editing and manipulating database of users' information:
SQL Server provides extensive database programming capabilities built on Web standards. Internet standard support gives the ability to store and retrieve data in XML format easily with built-in stored procedures. It can also provide XML to insert, update and delete data easily.

With it, it is simple to use HTTP to send queries to the database, perform full-text search on documents stored in database, and run queries over the Web with natural language. The access to data through the web becomes very easy. Moreover, SQL Server Analysis Services capabilities are extended to the Internet. It is also possible to access and manipulate cube data by means of a Web browser.

In light of the sensitive and vulnerable nature of Web-based e-commerce applications, Microsoft SQL Server introduces significant new security enhancements, not only offering the highest level of security available in the industry, but also making it much easier to achieve that level. To start with, this package installs with a much higher level of default security, taking advantage of the integrated security of Windows® 2000 right out of the box. This makes server lock down in production environments easier and faster.

SQL Server introduces a collection of sophisticated new security features: powerful and flexible role-based security for server, database, and application profiles; integrated tools for security auditing, tracking 18 different security events and additional sub-events; support for sophisticated file and network encryption, including Secure Socket Layer (SSL), Kerberos, and delegation. This package has been certified under the U.S. government's C2-level security certification—the highest level of security available in the industry.

- **Microsoft IIS®** web server allows the translation of the dynamic pages (ASP) and the publishing the web sites over Internet.

5.1.3 Graphic Design

All graphics have been developed under Adobe PhotoShop 6®. Original graphics come from real PDAs that I have redesigned to reach the result wanted. A lot of techniques are involved in their modifications. The original graphic elements are the following:



Figure 7: The Casio CASSIOPEIA®



Figure 8: The Compaq PocketPC®

The design of the new interfaces developed with *Adobe PhotoShop 6®* are below:



Figure 7 bis: The Casio CASSIOPEIA® redesigned under Adobe PhotoShop 6®



Figure 8 bis: The Compaq PocketPC® redesigned under Adobe PhotoShop 6®

The concept of the design is to give the impression to the users that they are using a PDA or a remote device like these above. The buttons are working for the blue interface to go directly to the help page, the map of the site and to the login page to access or create an account. The second interface does not have these functionalities, but they will be implemented in the

commercial version of this application. A logo has been developed to personalise the application. This logo is:



Figure 9: Logo of the Collaborative and Co-operative Electronic Calendar project.

This logo is designed around a big “C” for the “*Collaborative*”, “*Co-operative*” and “*Calendar*” words. Inside, we can read the title of the application. An graphic element has been added to the big “C” to promote the Internet orientation of the project. Finally, a picture of a shell, which follows the “C” shape, has been placed in background to give a better esthetical aspect. This logo is kept on each page of the prototype in the background (at a fixed place²⁸) to intuitively remind users that they are in a Collaborative and Co-operative Electronic Calendar environment.

5.1.4 Storyboard

The storyboard is explained in the interactivity section.

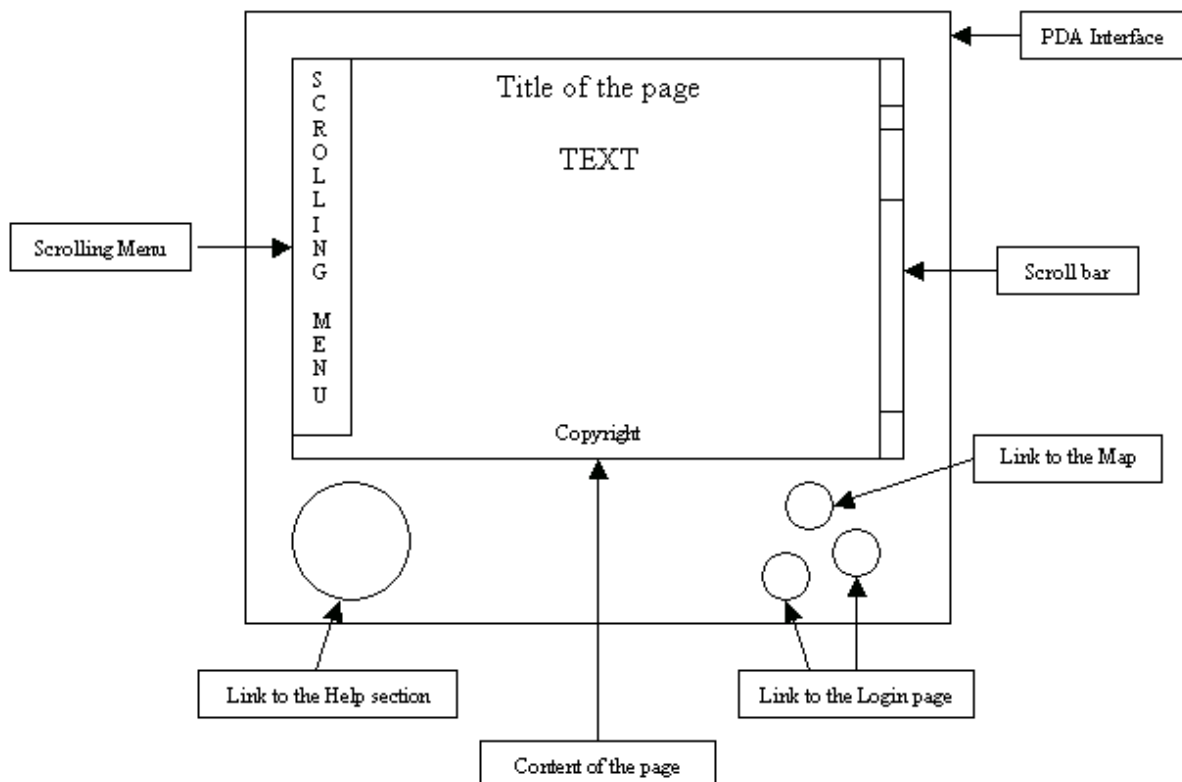


Figure 10: Storyboard of the application

²⁸ This code fixes the background in the <BODY> tag: “BGPROPERTIES=“fixed””

5.1.5 Navigation map

The navigation of the application needs to be simple to use and intuitive to let users interact with it without any constrains. The navigation of the application is the following:

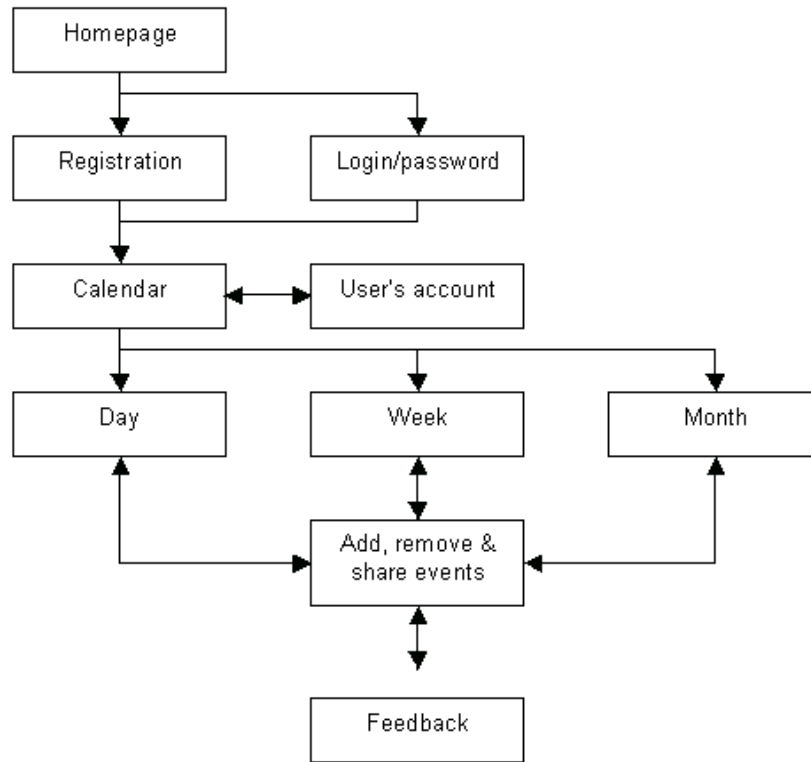


Figure 11: Navigation of the Electronic Calendar

The prototype is a demonstration of the aims, concepts and technologies used during the development of the application. It gives a very good approach for the final design. The navigation map for this demonstration is different to allow users to learn more about the project and the technology involved:

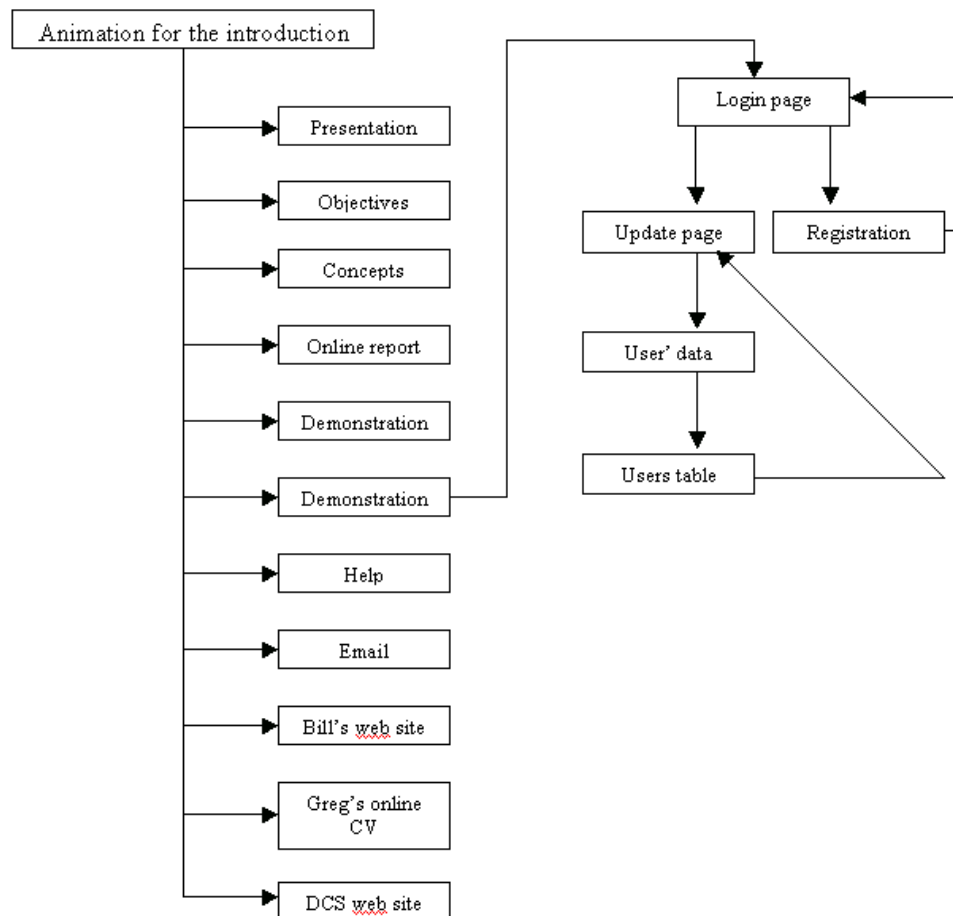


Figure 12: Navigation map of the prototype

5.1.6 Usability

Usability addresses the relationship between a tool and its user. In order for a tool to be effective, it must allow the intended users to accomplish their tasks in the best way possible. The same principle applies to computers, web sites and other software. In order for these systems to work, their users must be able to employ them effectively.

From the user's perspective, usability is important because it can make the difference between performing a task accurately and completely or not, and enjoying the process of being frustrated. From the developer's perspective, usability is important because it can mean the difference between the success or the failure of a system. From a management point of view, software with poor usability can reduce the productivity of the workforce to a level of performance worse than without the system. In all cases, lack of usability can cost time and effort, and can greatly determine success or failure of a system. Given a choice, people will tend to use systems that are more user-friendly.

The key principle of maximising usability is to employ iterative design, which progressively refines the design through evaluation from the early stages of design. The evaluation steps enable the designers and developers to incorporate user and client feedback until the system reaches an acceptable level of usability.

The preferred method for ensuring usability is to test actual users on a working system. Achieving a high level of usability requires focusing design efforts on the intended end-users of the system. There are many ways to determine who the primary users are, how they work and what tasks they must accomplish. Some alternative methods include user testing on system prototypes, a usability inspection conducted by experts, and cognitive modelling.

5.1.7 Interactivity

Multimedia²⁹ –the combination of text, graphic and audio elements into a single collection or presentation – becomes interactive multimedia when designers give the user some control over what information is viewed and when it is viewed. Interactive multimedia becomes hypermedia when its designer provides a structure of linked elements through which a user can navigate and interact.

Interactivity is a major issue in web design. If there is no interactive elements, users start to get bored in a few minutes. Interactivity is present all over the site. Buttons on the interface are active, and allow users to navigate very easily. Moreover, a “Scrolling Menu” has been implemented to give a real PDA approach. This menu is represented as a vertical orange bar on the left side of the screen. As soon as the mouse rolls over it, the menu scrolls out and displays the different sections. This menu has been developed in JavaScript, using layers technology. It is so powerful that, even if the user scrolls down the scrollbar, the menu will move with the page. This part of interactivity is appreciable in a HCI approach, and it allows users to use the application without any constrains.

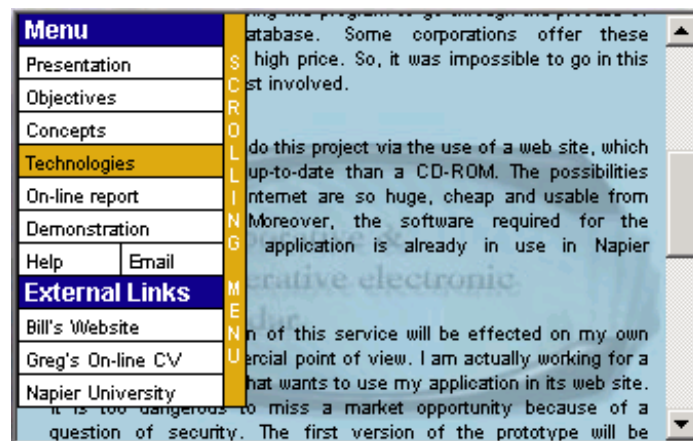


Figure 13: The scrolling menu scrolled out in the middle of a page.

5.1.8 Web development

²⁹ From Multimedia Making It Work (fourth edition) by Tay Vaughan, Multimedia Pioneer and President of Timestream, Osborne edition.

The full development of the prototype has been completed with *Macromedia* Dreamweaver UltraDev 4®. This software is a great tool in web implementation because of its simplicity and its resources. After developing the interface under Adobe PhotoShop 6®, the interface has been cut under *Macromedia* Fireworks 4® and exported as a HTML file under *Macromedia* Dreamweaver UltraDev 4®.

The border of the PDA interface was been kept in a table, and the screen image was erased. The table is centred in the page to give a better visual aspect. The main idea of the design is to keep the PDA interface through the navigation. The main problem was to create the window inside this interface. By using the <FRAME> tag³⁰, this task would be very difficult to implement due of the poor scalability of this function. The solution was find with the <IFRAME>³¹ tag which allows the loading of a page directly inside another page. This function was very helpful to create the PDA interface without using traditional frames. Links inside the *iframe* are directly displayed in the same place on the screen. If a link needs to use the full page, the *target* object will contain the “_parent” information.

Another issue of this design was to use buttons of the PDA interface. In a first step, it was necessary to define buttons as links with the use of mappings on the different pictures. These mapping are circular just like buttons. After implementing this, it is important to specify the target of the loaded page. In this case, we want to display the page in the *iframe* area. Its target name is *miniwindow*. Finally, buttons have been implemented properly and they works in the way they were designed.

The project allows users to customise the interface. In the main page called *presentation* in the prototype, users can select an interface between two models. These refer to two pages, each for an interface. These pages contain the design presented above with the *iframe* linked to the *presentation* section. This solution is not optimise because users needs to go back to this page to change the interface and this information is not keep in the database. It will be improved in the commercial version. Anyway, the interface will stay displayed on the screen during all the users’ navigation because only the *iframe* is refreshed with news pages.

The navigation goes through the use of the scrolling menu developed in JavaScript and DHTML. This menu contains all sections of the demonstration and a part of it is reversed for the users’ personal links. This feature gives another interactive elements because users can customise with their own dynamic information. This functionality has not been developed in the prototype which stays static on this point because the menu is not linked to the database. This will be done very easily by combining JavaScript and ASP technologies in the commercial version of this project.

Still in this area, it is very helpful to use CSS files to keep the design easy to update. If it is necessary to change the font or the size of the text, it could be done by editing the CSS file and changing variables for these fields. With this technique, the entire site will be updated on the fly. Another similar technique is very interesting in the implementation of a web site. This technique is call *Template*. It allows designers to develop a model which will be used in the development of all pages. If they need to change the design, they just have to update the *Template* and the entire site will follow these changes.

³⁰ Frames are hard to manage properly on screen.

³¹ Unfortunately, the <IFRAME> tag works only with *Microsoft* Internet Explorer.

5.2 Implementation of the Database

5.2.1 The *users* table

This table contains all the information about the user. In the first version of the application, this table will only have a few pieces of data, but in a future version this table will contain more information to customise the interface and the display of the data on the screen with the user's wishes. For the non-commercial version, the information needed is the following:

- ***num_user***: this field is required to describe the user with a unique integer. This is the only way to keep a record of a user because different users could have the same login (but not the same password). The *num_user* record is an integer automatically created by the SQL Server by incrementing the last record. In general, this field is called *user_id*.
- ***name_user***: this field contains the user's name more known as login. The information will be recorded as a string of characters strictly inferior at twenty characters. This field is very important because it will allow the user to enter his identification in the login process before entering the personal collaborative and co-operative electronic calendar.
- ***password***: this field contains the user's password to keep a certain level of security for the management of the information that is not shared in the calendar. The password will be recorded in the database as a string of characters (superior at four characters and inferior at twenty). In the first version of this application, this field is not encrypted. For the future commercial version, this field will be encrypted to have a high level of security. The encryption is not treated in this report.
- ***mail_user***: this field contains the user's email. This is very important because of the notion of collaborative and co-operative work as a synchronous or asynchronous process. The real-time function will be very hard to implement in a web site because of the asynchronous way to receive and send the information. Moreover, the email will be used to send feedback about a shared event in a community or a group of users. This information is recorded as a string of characters (inferior at thirty characters).
- ***group_user***: this field contains the user's group and indirectly the user's community. This field is very important in the notion of CSCW (Computer Supported Co-operative Work), by linking people with a common interest or working on a same project. As soon as the users select a group, they are automatically registered in a community of users. For example, the group could be *Multimedia Systems* and the community would be the *DCS*.

5.2.2 The *groups* table

Each user is registered in a group to keep the idea of collaborative and co-operative work. This notion is more and more important and presents a lot of advantages in the industry. The *GroupWare* is almost present in every corporation because it allows them to work properly and efficiently by increasing the communication between workers in the same or a remote location with a synchronous or asynchronous process (the notion of time/space matrix).

In the first version of the electronic calendar, users are not allowed to create a group of users. Only the administrator can create a group or a community of users. In the commercial version of this application, the notion of level of responsibility will be managed to give rights to some

users like the representative of each community to create groups. The design of the *groups* table is outlined below:

- ***num_group***: this field is auto-generated by the SQL Server and is recorded as a unique integer like the *num_user* field in the *users* table.
- ***name_group***: this field is used to record the name of the group and is used dynamically for the registration process. Like this, if a new group is implemented, the list is updated automatically. This field is recorded as a string of characters (strictly inferior at twenty).
- ***desc_group***: this field contains the description of the group to help the user to choose the right one. The information is stocked as a string of characters (strictly inferior at one hundred and fifty).
- ***com_group***: this field is the direct link to the community table to fix the notion of branching between the communities and the groups. This information is registered as an integer relative to the community from which the group belongs to.

5.2.3 The *community* table

The community can be assimilated as the father and the group as the children to explain simply this notion. Only the main administrator will be allowed to create a new community before giving rights to its representative. The different fields into the *community* table are:

- ***num_com***: this field is auto-generated by the SQL Server and is recorded as a unique integer like the *num_group* field in the *groups* table.
- ***name_com***: this field is used to record the name of the group and is used dynamically for the registration process. Like this, if a new community is implemented, the list is updated automatically. This field is recorded as a string of characters (strictly inferior at twenty).
- ***desc_com***: this field contains the description of the community to help the representative to create rights groups. The information is stocked as a string of characters (strictly inferior at one hundred and fifty).

5.2.4 The *info* table

This table is the most important in the database because it will contain all of the users' events. This point must be taken very seriously to provide the best services. The first interesting feature is the option to set the sharing of the events through a group or a community of users. Users will set this level of sharing when they create a new event.

The second feature is the level of importance of the events. For example, a meeting with the Director of the corporation will have the highest level of importance. Think about phoning a friend will have the lowest level of importance. In fact, this application will manage three levels of importance and will be interpreted with a code of colours when the information will be displayed on the screen.

Generally, a title and a day in the calendar will present an event. This title will be set at the colour in correspondence with the level of importance. In the commercial version of this application, the level of importance will be also presented with a specific icon. In the current version, the description and the exact time will be displayed to the user by clicking on the title of the event. The design of the *info* table is the following:

- ***num_info***: this field is a unique identification of the event and it is saved as an integer. This is the only way to keep a record of an event. The *num_info* record is an integer automatically created by the SQL Server by incrementing the last record.
- ***owner_info***: this field is used to identify the owner of an event. This functionality is very important to allow users to give feedback about an event. In fact, the *user_num* will be recorded directly in this field to allow an easy access via a request to the *users* table.
- ***title_info***: this field will contain the title of the event. The record will be saved as a string of characters (limited to thirty characters).
- ***content_info***: this field will contain the description of the event, that's why it is important to allocate enough space in the table. This field is set to record a string of characters (limited to one hundred and fifty characters).
- ***date_info***: this field is very important because it will keep a record of the day/month/year of the event in creation.
- ***hour_info***: this field will be used to set the hour of the event. In this version, this field will be simply implemented by letting users enter the hour, for example, if they have a meeting at 14h15, they will type 14. Like this, there is no management of am/pm. This field will be recorded as a regular and standard date into the table on the SQL Server.
- ***creation_date***: this field will be used to display the events onto the shared calendar as a shared information. It will be recorded as the *hour_info*.
- ***creation_hour***: like the *hour_info*, this field will serve to record the hour of creation. This is not very important, but it could be interpreted as a relevant information in this tri-dimensional forum (time/space/events).
- ***Importance***: this field is the marker of the level of importance of an event. In the database, this function will be represented as an integer with three different values 1, 2 and 3. The first value will be used to present an information with a low level of importance and the last one as the highest.
- ***Sharability***: this field will dynamically record the value of the group/community that the user wants to share the event with. It will be represented as an integer. If an event was personal, the *sharability* field would not be set and would therefore stay empty.

5.2.5 The *opinion* table

This table will stock the “opinion” of users about a certain event. The functionality is the main interest of this application, because it allows users to share opinions and feedback on certain events like a meeting or a reception. All the information is kept into the database, so users could come back to have a look over a special event. The design of the *opinion* table is the following:

- ***num_opinion***: this field is a unique identification of the opinion and it is saved as an integer. This is the only way to keep a record of an event. The *num_opinion* record is an integer that is automatically created by the SQL Server by incrementing the last record.
- ***num_info***: this field refers directly to the event that the user wants to discuss. It will be recorded as the *num_info* of the *info* table.
- ***owner_opinion***: this field refers directly to the user identification *num_user*, to set the ownership of the opinion. This will be used to display the name of the user who gives feedback about an event.

- ***content_opinion***: this field will stock the opinion of the user about an event. The table will keep this record as a string of characters (inferior at one hundred and fifty characters).
- ***creation_date***: this field will record the date of creation of the opinion of the user. This feature is very important to keep a level of time architecture through the application and gives the highest facility to understand the data. This field is set as the *info_date*.
- ***creation_hour***: this field is also used to keep a time record of the opinion. It is set like the *info_hour*.
- ***importance***: this option allows the user to set the importance of the opinion to an event not depending on the event's importance. This field is set as the *importance* in the *info* table.
- ***sharability***: this field is used to set if the feedback will be shared with other users/uses or just used as a personal note. It means that this field will keep the identification of the group or the community that the information is shared with, or will be set as an empty field if it is considered as a personal note, it means not shared.

5.2.6 Relations in the database

Description of a primary key and a foreign key

A *primary key* is a column or set of columns that uniquely identifies the rest of the data in any given row. For example, in the *users* table, the *num_user* column uniquely identifies that row. This means two things:

- no two rows can have the same *num_user*, and, even if two users have the same information,
- the *num_user* column ensures that the two users will not be confused with each other, because the unique *num_user* column will be used throughout the database to track the owners, rather than the names.

A *foreign key* is a column in a table where that column is a primary key of another table, which means that any data in a foreign key column must have corresponding data in the other table where that column is the primary key.

For example, in the *info* table, the *owner_info* is a foreign key of the primary key of the *users* table (*num_user*), as, in both tables. The identification rows are used to identify the users and information, and that the *num_user* is the primary key of the *users* table. In other words, all of this "ID" data is used to refer to the users and information of users, themselves, without having to use the actual names.

Primary keys and foreign keys

For each table the primary keys are:

- ***users*** table: *num_user*
- ***groups*** table: *num_group*
- ***community*** table: *num_com*
- ***info*** table: *num_info*
- ***opinion*** table: *num_opinion*

The foreign keys are:

- **users** table: *group_user* is the foreign key of the *num_group* in the *groups* table.
- **groups** table: *com_group* is the foreign key of the *num_com* in the *community* table.
- **Info** table: *owner_info* is the foreign key of the *num_user* in the *users* table.
- **opinion** table:
 - *num_info* is the foreign key of the *num_info* in the *info* table.
 - *owner_opinion* is the foreign key of the *num_user* in the *users* table.

Relations:

A user belongs to a unique group, indirectly he/she belongs to a unique community of users. It means that a user has a unique group and community. Inversely, a group has several users (as a community). With the same idea, a group belongs to a community (notion of parent and children). A community is composed of several groups, and a group belongs to a unique community.

A user creates an event (an information), and it belongs to the user. But a user can create several events in his/her calendar. So, an event belongs to a unique user which could have several events recorded. An opinion is created by a user to reply to an event. This opinion belongs to a unique user (its creator) and corresponds to a unique event (the information). So an event could have several opinions from a single user or several users.

Relations between tables

Diagram of the relation between tables:

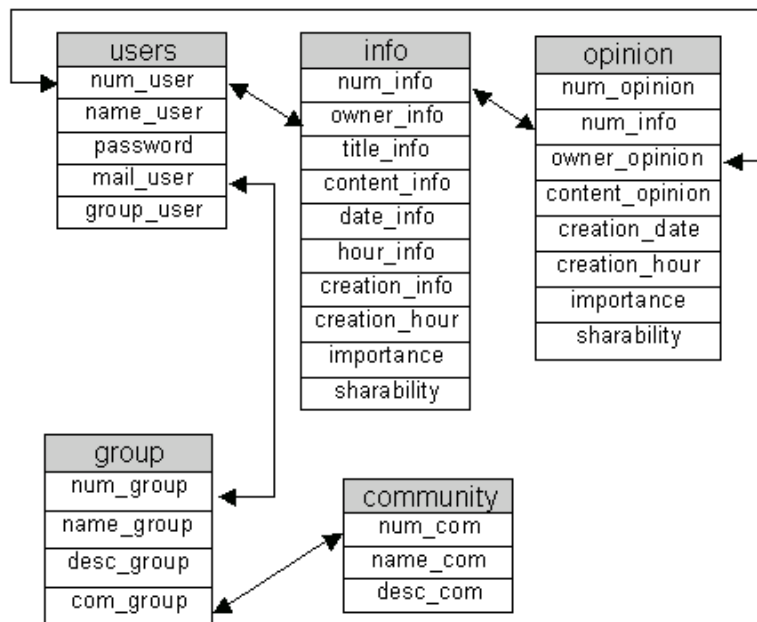


Figure 14: Relations between tables

5.2.7 Dynamic Pages in ASP

To create dynamic pages, first of all the configuration of an ODBC³² is required (see Figure 15 below). To manage it, an interface can be found in the following menu: Start/Settings/Control Panel. As soon as the system recognises the database, it is possible to manage the implementation of dynamic pages under *Macromedia* Dreamweaver UltraDev 4®. This software directly writes ASP code on these pages, therefore it is very easy to display information from the database in a page.

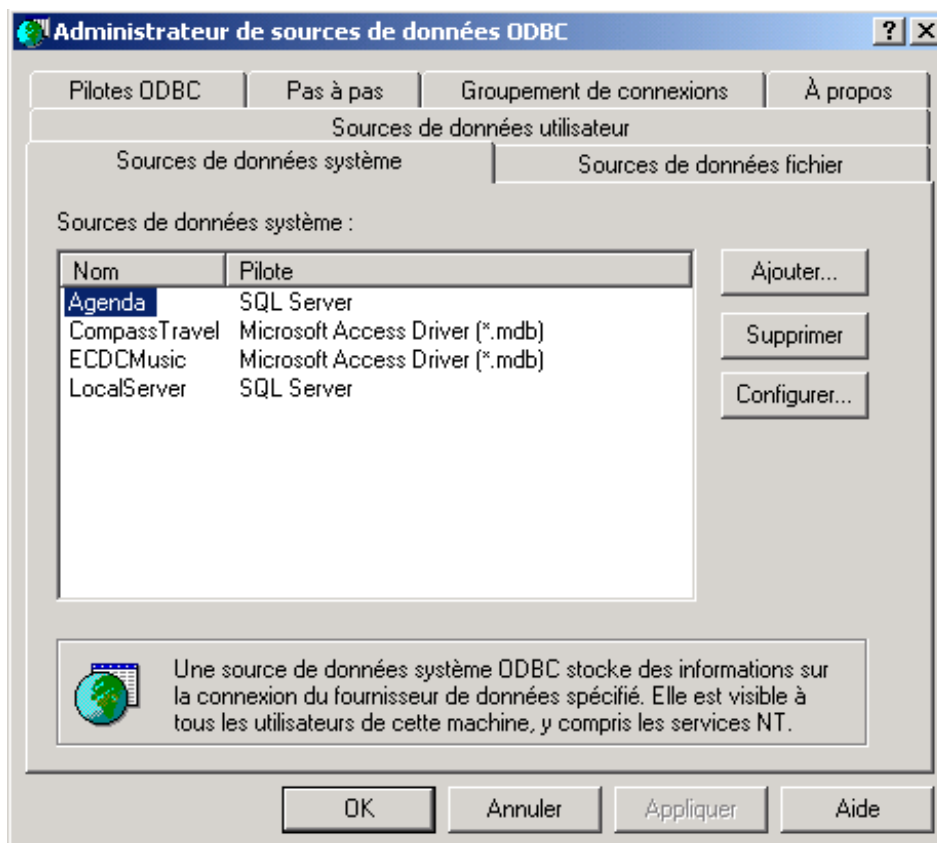
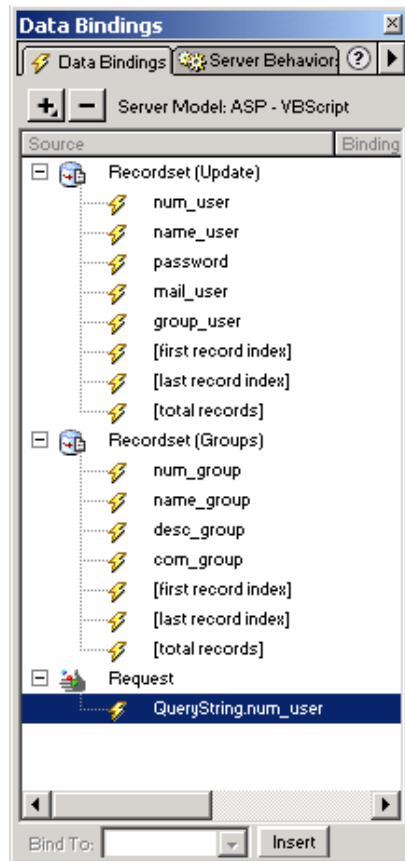


Figure 15: Screenshot of the ODBC window
(French version of *Microsoft* Windows 2000®)

³² *Open Database Connectivity*



The creation of the connection to the database is the first step for the implementation of ASP pages. A lot of behaviours exist and allow developers to create on the fly dynamic pages (cf. Figure 16). The prototype includes these pages in the demonstration section.

The figure 16 presents different elements in the “users” and the “groups” tables. The information is recorded in two *Recordsets* called *Update* and *Groups*. The children elements are the fields of each table. By dragging and dropping these elements, the page will display dynamic elements.

At the bottom of figure 16, there is a *Request* element which is used to receive data from the previous page. The *Session* object is very important as well, because it keeps some information about the user during all the navigation. This functionality is very useful because it allows the server to have a continuous reference to the user, for instance when he/she will enter a personal page as the calendar or the profile page.

Figure 16: Data Bindings window

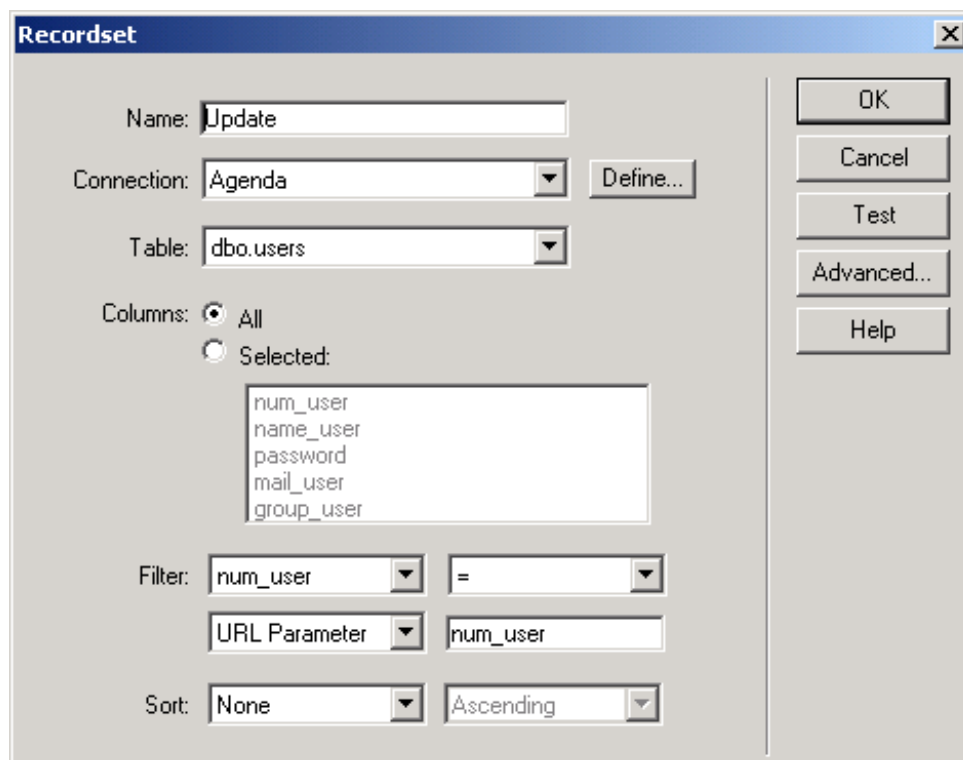


Figure 17: Creation of a Recordset called *Update*

The creation of dynamic elements is one of the main part of the implementation to create a automated tool. Behaviours registered in *Macromedia Dreamweaver UltraDev 4®* are great

and very easy to use. For the development of the login process, the tools provided by this software caused a lot of problems, so I used other techniques to reach the goal. These techniques are linked to the *Session* object which set a variable in the server environment. This function does not force the developers to send users' information for each request. Linking the web site to the *Microsoft IIS Server*[®] is easy to manage with the use of the IIS panel:

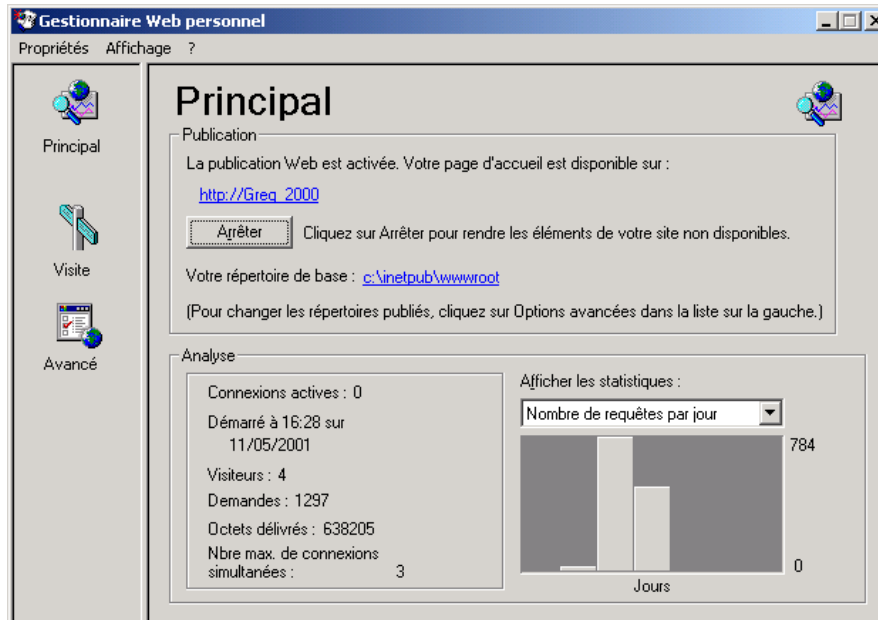


Figure 18: This window presents the *Microsoft IIS Server*[®]

This panel presents all the information about requests, users, etc, in the “*Analyse*” and “*Statistics*” windows. It also displays the local address of the server “*http://Greg_2000*” and the referencing folder containing all the files “*c:\inetpub\wwwroot*”. During the process of implementation, it is primordial to assess all functions as soon as they are added. After copying files from the main folder to the IIS folder, designers can evaluate their work by typing the URL of the local/remote server.

The site is displayed as it will be for the commercial version with all constrains³³ linked to the web. This is an important process over the implementation and it is called the *evaluation process*. Passing through the IIS server, dynamic pages are interpreted by the server which will send the result of the interpretation to the client computer. This is the main solution to assess the functioning of the system.

³³ Bandwith is the main constrain over the Internet relative to Dr William Buchanan's site: <http://www.dcs.napier.ac.uk/~bill/tenthings.html> visited on the 22/04/2001

6. Commercial Version

The commercial version of this project will include much more functionalities to give more information to the user. The main idea will stay the same: Provide a system which connects people with a same interest and allow them to work in a GroupWare framework. The main improvement will reside in the implementation of a vortal linked to the database and to the users' interests. Moreover, the commercial version will allow users to connect to the system via several kinds of platforms like PDA, Pocket PC, WAP phones, Handheld PC, etc.

6.1 Information Portal

6.1.1 Enterprise Information Portal

The enterprise information portal (EIP) is a concept for a Web site that serves as a single gateway to a company's information and knowledge base for employees and possibly for customers, business partners, and the general public as well. In one model, an EIP is made up of these elements: access/search, categorisation, collaboration, personalisation, expertise and profiling, application integration, and security.

- **Access/search:** it allows a user to get all the information needed (but no more) in the desired context. For example, a loan officer does not need marketing information to approve a loan. An EIP makes sure the loan officer gets only the information needed.
- **Categorisation:** An EIP categorises all information so that it is delivered to the user within the context needed (think of the subject structure on Yahoo)
- **Collaboration:** An EIP allows individuals to collaborate regardless of geographical location.
- **Personalisation:** The information provided to individuals using an EIP is personalised to that person's role, preferences, and habits.
- **Expertise and profiling:** Expertise and profiling is essential for the collaboration element of an EIP. Individuals within an enterprise are profiled according to their experience and competencies. If an individual needs to collaborate with others, he can choose those that are qualified for the project.
- **Application integration:** This allows individuals to deliver, access, and share information regardless of applications used.
- **Security:** This provides information to users based on security clearance. The user logs on and is given access only to information that the user is authorised to access.

6.1.2 Vortal (vertical industry portal)

On the Web, a vortal³⁴ is a Web site that provides a gateway or portal to information related to a particular industry, such as health care, insurance, automobiles, or food manufacturing. A vertical industry is one that is focused on a relatively narrow range of goods and services, whereas a horizontal industry is one that aims to produce a wide range of goods and services. Because most industry tends to specialise, most industry tends to be vertical. A term that might also be used is *interest community web site* since any vertical industry brings together people sharing an interest in buying, selling, or exchanging information about that particular industry.

³⁴ Vortal is also short for voice portal.

Vortals are also seen as likely business-to-business communities - for example, small business people with home offices might be attracted to a comprehensive vortal that provided ideas and product information related to setting up and maintaining the home office. By whatever name, Web sites that promise to give the user a single place to communicate with and about a single industry are predicted to become big businesses themselves. The Gartner Group estimates that 300 such sites already exist and predicts as many as 10,000 within the next several years³⁵.

6.1.3 Linking the Electronic Calendar with a Vortal

Vortals are real resources of updated information. They are a real success all around the world because of their ability to provide a lot of services and especially on focused areas. This technology is exactly the kind of engine that needs this project to be viable and to bring users and money.

For instance, a group of users is interested in Graphic Design. The vortal will dynamically take information on this topic and record them in the database for the benefits of the users. Users of this group will have updated information in their screen as soon as they log in the system. Simultaneously, it will be possible to record events directly in users' database. For example, this group of users will find in their calendar the date of the new release of Adobe PhotoShop® and the new patch for Kinetix 3D Studio Max V.3®.

6.2 Portable technologies

The principal aim of the commercial version of this project is to scale it to mobile devices as WAP phone, PDA, Palm Pilot, Pocket PC and HandheldPC as Psion. These devices allow users to access and control information from remote location.

*The Next Generation of Active Server Pages is here and it's called ASP.NET (formerly ASP+). Rebuilt from the ground up, ASP.NET is a key foundation of Microsoft's new .NET platform. What does ASP.NET mean? An order of magnitude increase in usability and scalability, object oriented development, compiled code, development in VB, C++, C#, or JScript, automatic state management, VB-like event model, cleaner, faster code, XCopy installation, content caching, and lots more.*³⁶

During the last two years, developers using ASP technology have discovered problems regarding its scalability and its potential to be more usable and powerful than the PHP and JSP technologies. It is my opinion that ASP.NET is the most powerful tool to develop real dynamic Web sites scalable to all existing platforms.

6.2.1 What is ASP.NET?

ASP.NET is a programming framework built on the Common Language Runtime (CLR) that can be used on a server to build powerful Web Applications. ASP.NET offers several important advantages over previous Web development models:

³⁵ An early leader is publicly-traded VerticalNet, a company that uses the same content format and design for a number of vortal sites.

³⁶ From the ASP Connection web site: <http://www.asp-connections.com> visited on the 12/02/2001

- **Enhanced Performance.** ASP.NET is compiled Common Language Runtime code running on the server. Unlike its interpreted predecessors, ASP.NET can take advantage of early binding, just-in-time compilation, native optimisation, and caching services, right out-of-the-box. For developers, this amounts to dramatically better performance before you ever write a line of code.
- **World-class Tool Support.** The ASP.NET framework is complimented by a rich toolbox and designer in the Visual Studio integrated development environment. WYSIWYG editing, drag-and-drop server controls, and automatic deployment are just a handful of features this powerful tool provides.
- **Power and Flexibility.** Because ASP.NET is based on the Common Language Runtime, the power and flexibility of that entire platform is made available to Web application developers. The Common Language Runtime's Base Class libraries, Messaging, and Data Access solutions are all seamlessly accessible from the Web. ASP.NET is also language-independent, so you can choose a language that best applies to your application, or partition your application across many languages. Further, Common Language Runtime interoperability guarantees that existing investment in COM-based development is preserved when migrating to ASP.NET.
- **Simplicity.** ASP.NET makes it easy to perform common tasks, from simple form submission and client authentication to deployment and site configuration. For example, the ASP.NET Page Framework allows you to build user interfaces that cleanly separate application logic from presentation code, and Handheld events in a simple, VB-like forms processing model. Additionally, the Common Language Runtime simplifies development with managed code services like automatic reference counting and garbage collection.
- **Manageability.** ASP.NET employs a text-based, hierarchical configuration system, which simplifies applying settings to your server environment and Web applications. Because configuration information is stored as plain-text, new settings may be applied without the aid of local administration tools. This "zero local administration" philosophy extends to deploying ASP.NET applications as well. An ASP.NET application is deployed to a server simply by copying the necessary files to the server. No server restart is required, even to deploy or replace running compiled code.
- **Scalability and Availability.** ASP.NET has been designed with scalability in mind, with features specifically tailored to improve performance in clustered and multi-processor environments. Further, processes are closely monitored and managed by the ASP.NET runtime, so that if one misbehaves (leaks, deadlocks), a new process can be created in its place, which helps keep your application constantly available to Handheld requests.
- **Customisability and Extensibility.** ASP.NET delivers a well-factored architecture that allows developers to "plug-in" their code at the appropriate level. In fact, it is possible to extend or replace any sub-component of the ASP.NET runtime with your own custom-written component. Implementing custom authentication or state services has never been easier.

- **Suitability for mobile devices:** One of the most important aspect of the ASP.NET model, compatible with almost all kind of existing to portable devices.
- **Introducing Mobile Web Forms:** Over the past few years, the world has seen an explosion of new devices like Web phones and personal digital assistants that promise to be the next generation of clients for the software you create today. To help you prepare for these new applications, Microsoft has created server-side mobile controls that enable you to create a single user interface viewable on any of a number of devices.

The Mobile Web Forms Designer, which enables developers to graphically create Mobile Web Forms, will be included as part of Microsoft Visual Studio.NET Beta 2. Mobile server controls extend the power of ASP.NET and the .NET Framework to help developers build mobile Web applications for cell phones and Pocket PCs. These controls, along with Mobile Web Forms, can generate Wireless Markup Language (WML) version 1.1, Hypertext Markup Language (HTML) version 3.2, and intelligently formatted content for different devices from a single ASP.NET page.

6.2.2 .NET Mobile Web SDK

Microsoft .NET Mobile Web SDK Beta 1 is built on the .NET Framework and brings all the advantages of the ASP.NET Web development model to the world of mobile Web applications. In addition, .NET Mobile Web SDK Beta 1 offers:

- **Support for a Variety of Devices.** Use ASP.NET to target a large variety of mobile devices from WML-based mobile phones to the HTML-based Pocket PC.
- **Write-once Web Pages.** With the SDK's set of adaptive components, you can author a Web application once and have it work on any supported mobile device. You can write complex applications using a set of mobile server controls, with no required knowledge of WML or other mark-up languages. This Handhelds of many of the implementation differences in browsers, devices, and gateways.
- **Customisability and Extensibility.** Take advantage of the same customisation and extensibility features available with ASP.NET. In addition, the extensibility model will enable other devices to be supported in the future. This ensures that the mobile Web applications you write today will support new generations of devices in the future.

6.2.3 The following features will be available soon:

- **World-class Tool Support:** .NET Mobile Web SDK Beta 1 will provide full support for the Visual Studio integrated development environment, with its rich toolbox and designer, drag-and-drop server controls, automatic deployment, and a host of other features.
- **Unique Mobility Scenarios:** .NET Mobile Web SDK Beta 1 will enable new mobility scenarios for your Web applications, such as the ability to push content to supported devices.

- **Mobile Web Forms:** A Mobile Web Form page is a specialised ASP.NET Web Form page. Like any other Web Form, a Mobile Web Form is a text file with the .aspx extension. It contains a set of mobile controls-ASP.NET server controls that can adaptively render to supported mobile devices.



Figure 19 : Pocket PC



Figure 20 : Microsoft Mobile Explorer
Phone Emulator

As a developer, it is possible to program to the mobile page and controls using device-independent properties, methods, and events. When a supported device requests a Mobile Web Form page, the page and controls automatically produce a rendering suitable for the device. These features included in the ASP.NET are relevant to the purpose of this co-operative and collaborative electronic calendar to allow users to access this application from anywhere.

6.3 Portable devices

Palm Pushes Into Smart Phone Space With Web Clipping³⁷

February 3, 2000 -- Palm Computing says it is moving more strongly into the world of GSM wireless data communications.

At the GSM World Congress this week in Cannes, France, Palm said it will work with several European telecom companies to demonstrate connectivity between Palm-based handhelds and GSM phones. GSM is the most widely-accepted standard for wireless phones in Europe.

In conjunction with Motorola, Alcatel and Sagem, Palm will demonstrate how its Web clipping technology accesses online content via smart phones. Web clipping has so far been used primarily with the Palm VII wireless handheld. Palm has actively been pushing its platform into the smart phone space.

³⁷ Taken from <http://devices.internet.com/news/9910/991013palm2/991013palm2.html> visited on the 20/02/2001

6.3.1 Online capabilities:

Sending and receiving e-mail via your PDA or Handheld PC is easy and almost a standard feature on palm devices. Most palm device manufacturers can install communications software if your device does not come with it and there are many software companies producing compatible communications software. Infrared ports, designed to be used with a PC, access e-mail at home or the office. If users want to be able to send and receive e-mail on the go they may have to install a modem. If they are using your office e-mail they will probably have to have additional software installed to make their palm device compatible with the office's system.

This could start to eat up ROM and RAM quickly because they may also have to install software to access AOL, Hotmail, Yahoo, or other internet mail services. If you get a palm device and are thinking about using e-mail check to be sure that there is enough memory to run the manufacturers software and any additional programs that might be necessary.

Modems are standard features on HPCs but are less common on PDAs. While users can get an internal modem for your PDA it is probably more cost effective to get either a clip-on or an in-cradle external modem. They are less convenient if you are on the road but the cost difference should make up for it.

Since staying in touch where ever they are is the name of the game these days users may want to consider a wireless modem. Most metropolitan areas are set up to Handheld wireless modems in palm devices. Wireless modem speeds are slower than landlines almost by half, but you are not sending or receiving even close to the same amount of data.

Web surfing capability is still a few years away. With the larger Handheld PCs users can browse the Web almost as if they were on a desktop, albeit with a much smaller screen and slower speeds. Most services have side stepped the technical problems by offering stripped versions of web access. 3Com does this by cutting out the graphics and providing just text; another way is partially scrollable screens. Because the screens are so small Handheld PC and PDA manufacturers provide software that accesses only certain web pages and download specific information such as stock prices, sports scores, and weather on standardised templates. Wireless access by non-PC devices is growing in demand and providers are working to have a usable and affordable system for easy access in the next few years.

6.3.2 PDA vs. HPC

Palm devices are usually referred to as either PDAs or HPCs. The two are very different and have been designed and marketed for different uses. Depending on what you are going to be using yours for will help you decide on which one to get.

HPC:

Handheld personal computer, also called business organisers, look very different from the PDAs. For starters they have a keyboard, albeit very small, and fold closed like a laptop. The progression of the HPC goes something like this, the home computer begat the laptop and in turn, the laptop begat the HPC. Each successive generation gives up function for mobility. Colour screens are pretty much the standard on HPCs as well as voice recorders, internal microphones, PC/Flash Card slots for added storage, infrared transceivers, internal modems, and rechargeable batteries. Some of the newer HPCs have been injected with steroids and are

being marketed as HPC Professional Models or Jupiter Devices. HPCs can run slimmed down versions of spreadsheet, word processing and presentation software programs. In general HPCs are used in place of a laptop or desktop when the situation demands mobility.

PDA:

Personal data assistant are geared less towards supplementing office work and more toward personal organisation. Most PDAs come with limited software programs that are expandable with 3rd party software options, essentially though they are glorified rolodexes. PDAs have a stylus and notepad with handwriting recognition software, or if you want to tap in your text entries some offer on-screen keyboards. Like HPCs PDAs are designed to support your PC, though in a more limited fashion, and can either connect to them via a cradle or infrared port. The biggest internal difference between HPCs and PDAs is memory. Most PDAs run on 4-8 MB of RAM and 4-8 MB of ROM while HPCs usually start at 8 MB of RAM and ROM and go as high as 16. The larger amount of memory allows HPCs to run more complicated programs but at the same time runs the batteries down quicker. Battery life in HPCs and PDAs is more than just a nuisance, many of the devices lose stored info when you change the batteries and some can crash completely if the batteries die in use.

7. Conclusion

The honours project was a real source of inspiration and creativity to find its topic. This project has to be accomplished as a professional project, which is justify be the investigation and the implementation made during its development.

The main aspect of this project is that a corporation is already interested by its particularity and its high level of inter and intro communication between groups and community of people. This notion is one of the most important research for the new IT orientation to share information and task through GroupWare. The corporation will use the system linked to its users database go give them the maximum of information in relation with their interests. This is another aspect of the vortal, because of the user's interests involvement to the web site.

The honours project was also the possibility to focus on unknown technologies to create an application. I am deeply attracted to the web development, and I felt that I have not a lot of knowledge in dynamic web sites, particularly in practice. This involves me to learn a lot of principles and languages before starting the implementation of the application. For instance, theoretically I heard about SQL and ASP without having developed anything with these technologies. It was so a great opportunity for me to learn and practice them. At the same time I had to decide the technological orientation of the project. Indeed, there are several kinds of dynamic languages on the web, as CGI, PHP or JSP. An investigation was necessary to make the right choice. At the same time, I needed to check that the technology was compatible with the corporation in which I will develop the commercial version of the system.

I also focused on the database technology to give the best result to users and to the corporation. The choice is very important because of the rapidity of trading requests. The Microsoft Access 2000® is a great tool, but unfortunately if I used this software, the application's database would not been scalable for the needs of industry. These needs are huge and must be taken very carefully to reach a high level of usability. Microsoft SQL Server® is one of the leader database Server with Oracle. In the case of this project, the corporation already has a Microsoft SQL Server®, so the migration of the system from my personal computer to the server will be easy to manage.

Moreover, it took me more time than planned to acquire all the knowledge I needed to investigate books and techniques for the full development of the application. This justifies that the application contains only the users' account management. I will develop the rest of the project over the summer to submit it to the corporation before re-implementing some features and installing in their system. The honour project is not a finality but an introduction to the industry.

The commercial version will involve the development of other components, like a vortal and the remote control through mobile devices. These areas are particularly interesting and they take more and more part of web development and techniques. The honours project is a great introduction to the industrial world and it will allow me to learn and practice other techniques relevant to the Internet.

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