CS4T01 2009 v1 - M.Sc. Project

Network Attached Storage (NAS) and multimedia learning.

Benjamin Goupil (07209525)

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First Project Supervisor: **Gaylor Boobyer**

Second Project Supervisor: **Dave Farthing**

Declaration

Faculty of Advanced Technology, **statement of originality**

This is to certify that, except where specific reference is made, the work described in this project is the result of the investigation carried out by the student, and that neither this project nor any part of it has been presented, or is currently being submitted in candidature for any award other than in part for the M.Sc. award, Faculty of Advanced Technology from the University of Glamorgan.

Student signature

Abstract

Computing at home is democratized now and young people, who use a lot Information Technology (IT) at work, at home or in a scholar environment discover new usage. At the beginning, external mass storage were used by advanced users (typically geeks) to save data, now, the needs to save data is vast to the home, which is composed of a multitude of intelligent machine in network. The new trends since 2007 is to access a storage through the network, it's a specialized element called "Network Attached Storage" (NAS). This type of product is popular but complicated to understand so the goal of this project is to teach 2 categories of people the use of a NAS.

The project is built around a website, which is a learning support. The objective of this website is to teach concepts using multimedia elements at well as possible to serve learning theories adapted to learning styles. Learners can test their knowledge using a Multiple Choice Question (MCQ), the goal is to be public, so less formal than a university test, but effective.

Learners are categorized in 2 parts: beginners and advanced learners. For both, there is a MCQ. Results of these tests were from 62% up to 87% of good response. Also, interviews have been conducted to determine the effectiveness of the website. They all have responded some main concepts use in the NAS world.

Learning theories are not mathematics. The only way to make an efficient course is to give a view on the subject under different angle using adapted tools.

Acknowledgments

I would like to thanks my supervisors, **Gaylor Boobyer** and **Dave Farthing**. Gaylor Boobyer advices were welcome for helping me understand all the aspect of this project.

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Then, I express my gratitude to my **learners** with whom I could see and evaluate the limits of my project.

Introduction

What a Network Attached Storage is? A NAS is a hard drive disk into an enclosure, like external hard drive, but with networking capabilities. It's an autonomous files sharing server. At the beginning, a NAS was only made to solve two main problems: sharing files on a network and make a secure copy of files. It's securer to save data in another place than only in the computer internal hard drive.

With the democratisation of NAS since 2007 (apparition of products and actors like Synology or Qnap in Europe), aware people have change their habits and wanted more possibilities. They wanted to download file with the Bittorent protocol, listen to music and watch movies in streaming, and improve the general performance of NAS.

The core domain of a NAS is always sharing data and make them secure with RAID technology. But now, it's not only the main argument, with performances, to buy or build a NAS. Various services are available, and people have bought a NAS only for use them. For example, a NAS include now a Web server, so some people have a Web server hosted at home, with their Web site.

In a modern NAS, services mainly are:

- **File sharing (local)**, using various protocols such as Common Internet File System (CIFS), for Microsoft operating system based computer, Network File System (NFS), for Linux operating system based computer and Apple Filing Protocol for Macintosh operating system based computer. Often, NAS software associated (to install on computer) offer a backup solution.
- **File sharing (over Internet)** with File Transfer Protocol (FTP) which also is a multi-platform protocol. In general, FTP protocol is encapsulated in Secure Shell (SSH) protocol to use it safer.
- **Web server**, to publish your Web site at home on Internet.
- Dynamic Domain Name Server (DynDNS), to convert Internet Protocol (IP) address, for example 193.63.150.45, in Universal Resource Locator (URL), http://www.glam.ac.uk/. Because your Internet connection at home cannot have a fixed address depending on your Internet Service Provider (ISP).
- **Print server**, to share a printer over the network, and make it accessible for everyone.
- Other services (for individual) such as **Close Circuit Television (CCTV) server**, **multimedia server**, using Digital Living Network Alliance (DLNA) or Universal Plug and Play (UPnP) protocol. You can stream music and video on compatible devices like game consoles, smartphones and computers. Also, an **iTunes server**, for doing the same as previously but with Apple products. **USB copy**, you plug a USB key, and the content is copied on the NAS.
- Other services (for professional/firm) which allow network administrator to integrate a NAS into an existing network and interface it with other server and services.

A NAS is more than a simple NAS now. Perhaps, it have to change is name by "home server". In general, they have some features interesting too like the possibility to **encrypt hard drive**, which can be useful in firm, **Wake Up On Lan** (WoL) to wake up the NAS remotely (This functionality is associated with hard drive disk hibernation or can be done with a Power On/Off scheduler), **Redundant Array Of Inexpensive Disks** (RAID) for data integrity (and NAS networking performance) and **RAID expansion**, to increase the volume of storage available easily.

The sophistication of NAS operating system as well in the core domain as the provision of various services, takes the decision to choose a NAS difficult. Plus, they can have physical advantages like the noise level of fan or the number of bay (to put more hard drive) or more or less features according to the manufacturer.

And others related topic are useful to know. Hard drive has evolved and it's possible to choose specific hard drives for NAS (5400 tours by minutes instead of 7200, what consumes less electricity and warms less, big capacity...) or to give a second life to an old. Also, home network is becoming strategic. All the data can be centralised, usage are not, like when computer where to expensive, reserved to one computer. Also, a NAS needs to be physically protected with an Uninterruptible Power Supply (UPS) because a RAID array can be corrupted in case of electrical failure.

The **objective of this project** is to help people understand what the interest of a NAS at home is. The scope of this project is limited to NAS, hard drive, and (a little) network, just the necessary to help people setting up a NAS. Also, some general project's objectives:

- Define the content trough a learning methodology associated to multimedia.
- The project should follow the project plan established in the proposal.
- The project needs to be finalized one week before the deadline due to personal obligation to send the report from France.
- Deliverables will be: The project report including logbook (as paper). A CD containing the multimedia part of the project, the Powerpoint file and the digital version of the project report.
- Depending on learning research outcome, a paper document about NAS can be provided for helping people.

The website developed for this project is available here:

http://students.comp.glam.ac.uk/07209525/CS4T01_2009_V1_MsC_Project_NAS/index.html

Summary

1 - Multimedia & learning

1.1 - Bloom's taxonomy

Benjamin Bloom has published taxonomy about the three domains of learning: Cognitive, psychomotor and affective. Then taxonomy has been revised by Lorin W. Anderson and David R. Krathwohl. In the cognitive domain, the pyramid looks like the figure below (a complete version is available in the appendix, with verbs and matching assessment types):

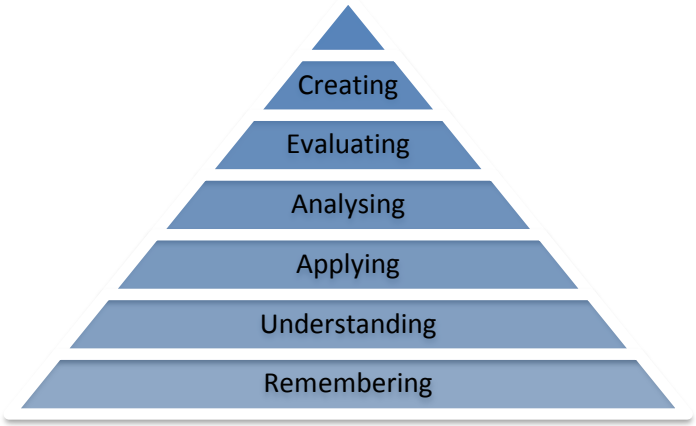

Figure 1: The Bloom's Taxonomy revision.

Each level from the base becomes more and more difficult. Each parent level includes his child levels.

The base of the pyramid is the lowest level, the summit is the highest. Typically, during scholarship, the level has to go from the base to the summit.

This tool has been designed to help teachers to create their notes and assessments.

This project is designed for 2 targets. First, **novice people**, who use computer for basic usage like going on Internet, chatting with friends, making office type document… but don't have any basic knowledge on network devices. Second, **advance users** in computing, people, geek like, who already know what a NAS is but don't feel comfortable to make their own from well-chosen normal computer hardware parts. Those 2 targets have to reach 2 different levels in the Bloom's taxonomy.

Remembering helps the learners in memorising key elements to reinforce knowledge in a particular domain. Here, learners are able to make links between subjects. The more learners know the vocabulary, the more they will be able to understand the subject.

Understanding allows learners to explore new concepts, to feel comfortable with new concepts, to visualize complex phenomenon. That can be done by using conceptual map resuming argumentation, main theories and concepts. It can use comparisons of solutions like schemas and diagrams. The learner can analyse use cases, expand the "lecture" (a paper presentation is more appropriate here than hypermedia stuff) by looking for stuff on Internet (Update or other opinion). Also, a debate is interesting because some solutions, in the NAS case, can be very similar for same purpose or very different, in term of cost for example. So, it can be complex to choose a NAS adapted to needs.

Applying allows the learner to see in detail how something works. See if the theory has disadvantages in practice (or not), evaluate if the process is the better to use, see if secondary usage (like services in the case of NAS devices: FTP, Dynamic DNS, Web Server, File sharing…) are interesting or not, and increase their skills in this domain.

Analyzing and **evaluating** can be put at the same level, depending on how we interpret the Bloom's taxonomy. Those levels are not required in the project. However, learners will "generate" their

opinion by analysing and evaluate things concerning NAS at remembering, understanding and applying level to choose efficiently a NAS. Needs are personal, linked to specific usages, so levels can't be up more than applying in the teaching process. The goal is to help people to understand in what a NAS can be useful for them, but even presented like that, they have to think a little about their needs, so, in fact, analyze their case and evaluate if it's a good choice. But, opposite to the Bloom's taxonomy spirit, the project doesn't have to evaluate the effectiveness of their choice. It's not the role of the project to evaluate each case study, just give materials for people for doing that. That gives the scope of the project. The learner own analyze is the only one person who know that if the result of his choice is the better.

Others types of taxonomy, not in the cognitive domain, like psychomotor and affective domains do not appear to be appropriate here. For the **affective** domain, the project needs learners be **responding** to the presentation. Participating to the NAS presentation through animation is probably the best way of achieving it. Thus helps learners to learn and is more effective than just **receiving**. If a learner is interested in the subject, he can evolve at the **valuing** level (in the affective domain) by applying (in the cognitive domain). In the most of the cases, receiving will be the level we shall meet.

This project, let assume us that novice people need to be at the second level "Understanding", to help them to understand advantages of a NAS in a home network. Advance users need to match the "Applying" level as they will use the tool to configure both the hardware and the software part of their NAS. So, two methods need to be set up, with the second objective view as the next step of the first (Not a parallel method).

1.2 - Instructional design model

Education is a process. Instructional design is an amount of tested theories and practices to achieve the effectiveness and efficiency of learning experience. The goal of instructional design is to conceive an adapted and optimized pedagogical support for learners.

"The process by which instruction is improved through the analysis of learning needs and systematic development of learning materials. Instructional designers often use technology and multimedia as tools to enhance instruction." (Richard Culatta, 2010, instructional design definition taken from http://www.instructionaldesign.org/index.html)

That is concerning all the area of study, conception, realization and adaptation of a pedagogical project based on expert's works. The project must also consider technical, economic, social and costs… It includes too, all the methods and tools to allow learning, adapted to a certain target with educational objectives clearly defined. Sometimes, tools need to be created or adapted to fit the objectives.

There are various instructional design models to available. They are based on a basic model called ADDIE (Analyse, Design, Develop, Implement and Evaluate.). Another model, more evolve, is called rapid prototyping.

Both have their equivalent in software development. We can compare the ADDIE model with the V-model. And rapid prototyping to… rapid prototyping! So, conceptual differences between them look similar in the learning development. Rapid prototyping needs to cut the project in parts and use many user evaluations to improve the project quality via feedbacks.

The model chosen will probably be a mix between both, a classic ADDIE model but with feedback and improvements at the evaluation phase. This plan is envisaged due to the difficulty to have feedback at each step in the project. Also, it's not possible to use an instructional design model as delivered in theory. Some parts can be done only using teams, and some others are too complicated for a small project like this. For example, the analyse part can be really important for teaching conceptual things to learn using adequate multimedia content.

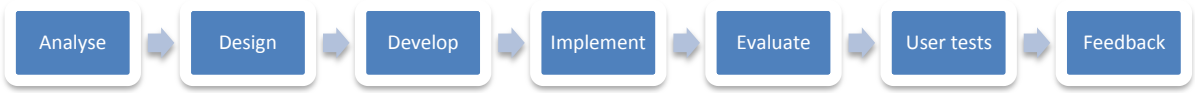

Figure 2: Project's process example

Review of steps in the ADDIE model:

1.2.1 - Analyse

Objectives: Define the problem, identify the source of the problem and determine possible solutions.

Tasks: Needs analysis, job analysis, tasks analysis.

Outputs: Instructional goals, a list of tasks to be instructed.

From Wikipedia:

- Who are the learners and what are their characteristics?
- What is the new behavioral outcome?
- What types of learning constraints exist?
- What are the delivery options?
- What are the online pedagogical considerations?
- What are the Adult Learning Theory considerations?
- What is the timeline for project completion?

In this project, the analyze part is done and adapted to the scale of resources and scope of the subject. **Objectives** need to be setup, it's obvious, and ways to achieve it are discovered all along the project analyze. There is real (big) problem talking about NAS except the skills of the learner in computing. But it's also an objective of the project to talk about it to vary people. That is solve by the analyze of possible learners with some existing and well documented methodologies like use personas, multimedia,… with the good tone and the good level.

Solutions to solve the skill level problem of learner here is the presentation itself, it's a goal of the presentation, and are technically made by using as well as possible possibilities in multimedia computing. That is job analysis. Tasks analysis cut the project in part mainly, to allow the learner to understanding things step by step. It's explained in other parts of this paper. In many ways this project can be conducted, so it is managed not only by following a model (like ADDIE), but by analyzing the opportunity or not to follow a model. So the project is based on literature review and modifications of the ADDIE process. This analyze of the ADDIE process is necessary to evaluate if all ADDIE model aspects have to be studied for the success of the project.

It's hard to establish a **need analysis** when we want to make something available for the widest public possible. Here, personas are a good strategic choice, but need to correspond too to real users. So, personas will be established by thinking to classic use cases (A chief executive officer, a geek, a family,…) and by adding real individual as use case (a real geek can have other needs than the "classic" geek). This method is used to see what are the most interesting secondary aspects, the specials features which can make the difference (because NAS are close now in functionalities), what are the problems most often met. For example, a quick look into specialized forum let see that problems are most often met in services configuration than RAID. Also, an important problem come back regularly: how is it possible to keep data on a hard drive disk which is not view into a certain operating system and connected in Universal Serial Bus (USB)? It exist some main needs, like save file with security, and some secondary needs, like download using Bittorent or accessing file trough Internet.

Some questions in the analyze part must have a response, like **who are the learners**? Or what types of **learning constraints** exists? These points will be analyzed in specific chapters.

Delivery options is a good point to study, even if the project is a multimedia project, a paper version of the project can be useful for learning, as support for more information or support when advance users would like to configure their own NAS.

Online pedagogical considerations and **adult learning theories** considerations will be analyze or integrated in specific chapters.

The **timeline** for the project is basically doing all the analyse part before august, if possible, to begin the design par a little before the end of July to start testing with real testers earlier as possible in august, and then, have some results to make modifications and improvements before September. In September, the project paper will be at the evaluation steps and be completed one week before the deadline, fixed to the last Thursday of September. The one week marge is needed because papers will be sent by postal way to the University of Glamorgan.

1.2.2 - Design

Objectives corresponding to chapters establish previously in the project proposal. Chapters have been established to explain in a simple way a lot's of information. Basically, these information are essential to understand how to set up and how a NAS is working. Those have a certain incidence on the navigation. For more information, see the chapter "Design consideration" in the design part of this paper. Objectives here are close to the subject, it's not a general topic. General statement: Outline how to reach the instructional goals, expand the instructional foundation.

Tasks: Writing a target population description, conducting a learning analysis, writing objectives and test item and selecting a delivery system.

The method which will be used will be as experienced previously in web design, animation with Director and product design. So, the process is basically doing some mock up, let test mock up by beta testers, work on the mock up designed by beta testers as the best (reasons must be justified) and implement it in the technology chosen. Then, redo tests with users to improve some weak parts of the implementation. Traditionally, a storyboard is useful for creating the navigation in the same time as design, and allows the developer to think about functionalities he can add. It can replace a structure chart if the navigation is simple to understand/establish by the developer. Elements of methodology: structure charts / flowcharts / wireframes / storyboards /…

1.2.3 - Develop

Objectives: Develop the instruction and develop media that will be used and develop the documentation. That will done at the same time as the implementation, the lecture itself about NAS will be establish as well as tests using interactivity, multimedia,…

1.2.4 - Implement

Objectives: Promote the students' understanding of material, support the students' mastery of objectives and ensure the transfer of knowledge from the instructional setting to je job. That will be the technical part of this project, for example: Director document, HTML+CSS…

1.2.5 - Evaluate

The evaluation part will **evaluate the effectiveness** of the project on learners, test if the goal is achieved and how is it possible to improve the "lecture". That will be a specific part of this paper, including objectives, effectiveness testing and future improvements. Definition of summative and formative evaluation (Sherri Braxton, 1995):

"**Formative Evaluation** is ongoing during and between phases. The purpose of this type of evaluation is to improve the instruction before the final version is implemented.

Summative Evaluation usually occurs after the final version of instruction is implemented. This type of evaluation assesses the overall effectiveness of the instruction. Data from the Summative Evaluation is often used to make a decision about the instruction (such as whether to purchase an instructional package or continue/discontinue instruction)."

1.3 - Learning styles

There exists many ways to learn. Some people have classified learners via types of learning, but it's not fixed, types of learning can be viewed from different angles too. One learning style theory has been described by Alan Mumford and McCarty (from Geneen Stubbs's lectures). See diagram below:

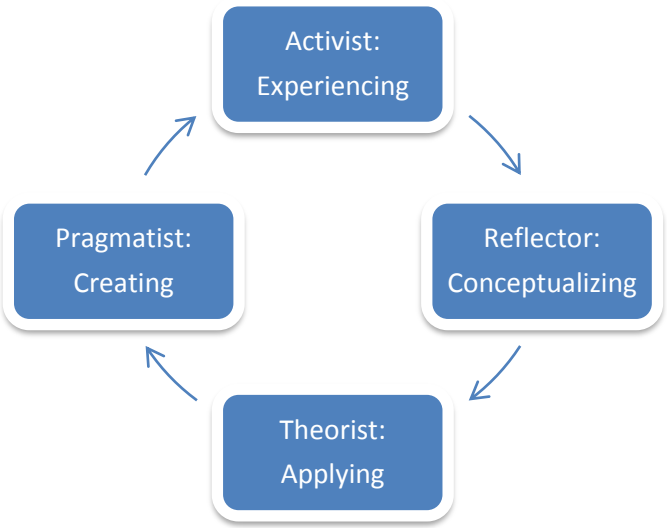

Figure 3: A mix between Alan Mumford and McCarty's learning cycle. Concepts are similar.

The activist: Having an experience. Innovative learners. Making connections. Why?

The reflector: Reviewing the experience. Analytic learners. Formulating ideas. What?

The theorist: Conclude from the experience. Common sense learners. Applying ideas. How?

The pragmatist: Planning the next step. Dynamic learners. Creating original adaptations. If?

These questions and points of view from learners allow the creation of specific questions to which the project needs to respond. A learner is waiting for responses which will be responded through the presentation at different levels

to allow each type of learner to find it. A pre-establish list of areas and subject than the presentation about NAS need to cover allow to think about the way it can be respond, plus the manner, visually, with sounds, using video or diagrams, and more.

In parallel, other theories have been established, in peculiar by Richard M. Felder and Barbara A. Soloman who is talking about **active/reflective** learners, **sensing/intuitive** learners, **visual/verbal** learners and **sequential/global** learners. Each learner is a combination of learning types with a preference for a precise parameter, for example, you can be more active than reflective, plus more intuitive than sensing, etc…

This study has been approved by Susan M. Montgomery:

Results of the survey of student learning styles. They are very similar to those of Felder, whose preliminary observations apply:

- *67% of the students learn best actively, yet lectures are typically passive;*
- *57% of the students are sensors, yet we teach them intuitively;*
- *69% of the students are visual, yet lectures are primarily verbal;*
- *28% of the students are global, yet we seldom focus on the ``big picture.''*

1.4 - Multimedia

Those specify that a multimedia project, by using picture and animation, is completely adapted for learning. It appears the more a multimedia project uses animation, the more it can be considered as active learning. For example, a quiz will oblige learners to use their brain a little and see if concepts are understood, according to the required level. So, it's not passive. The global view of the project will be done via the summary. The global view allows the project to be cutting in parts. *"People learn better when a multimedia message is presented in user-paced segments rather than a continuous unit"* (Richard E. Mayer, 2009).

But Richard E. Mayer suggests too, to use sounds and/or text to reinforce the visual aspect. Graphics are much more efficient when associated with text, and video associated with sounds (voice over explanations). Also, multimedia has strong effects on individuals with low-level knowledge of a subject. It's great, because the target is novice thus can also be useful for more advanced learners. They try solutions by testing (active learners) but don't always understand all the specifications on a subject. For example, NAS and especially the various services available appears to be explained, even for advance users (geeks). A video tutorial made by a Alexis Madrzejewski, on FreeNAS (a specialized Operating System (OS) for transforming a traditional Personal Computer (PC) into a NAS let see that. He doesn't know what a dynamic Domain Name System (DNS) is for example, which is trivial for a more experienced user. The tutorial is available at this address: http://www.tutoriels-video.fr/installation-et-configuration-dun-serveur-freenas/.

1.5 - Technologies

Computer-based authoring software allows a developer to create sophisticated instructional programs. With the popularity of Internet and especially the World Wide Web, the instructional aspect has been hidden for the benefit of HTML, which is just presenting information. And multimedia technologies, mainly supported by Flash and Director, have evolved in the same

direction. But HTML has evolved too and can be used with interactivity by using JavaScript. Also, it's possible to include animation in Flash or Director and some other multimedia content with embedded video or sounds. Even if the powerfulness and sophistication of instructional program is interesting, simple HTML can done a good job and have the advantage to be multiplatform and standard. So, the project will use Web technologies instead of more evolved high programming language like C++ or Java.

Director: A powerful way to create animations. Simple, it allows the developer to produce complex effects in a short time. A Director file can be used as well on the Web as on CD/DVD and interactive terminal for a rich user experience. Aside the graphical way for programming, it's possible to add powerful functionalities through the Lingo scripting language. It can embed vector or bitmap graphics. Animations based on vector graphics are light and can be downloaded quickly from the Internet. For this project, presenting photography of hardware computer will be necessary according to learning styles (Visual here) and be less conceptual for learners, so Director can be a good choice for this specific target. A license is needed for the developer and a plugin for the web browser of the learner. Director is less popular than flash, so the plugin is not installed by default on many computers. But the installation is easy and fast. It runs on Windows and on Apple Mac computers.

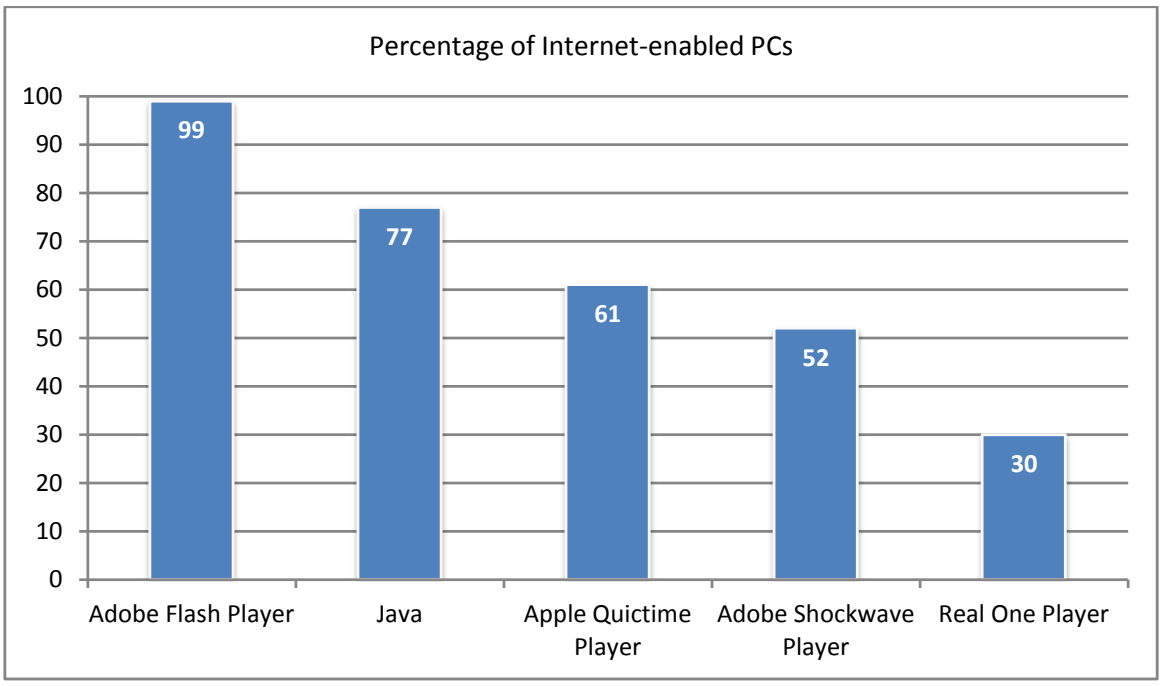

Figure 4: Source: *http://www.adobe.com/products/player_census/shockwaveplayer/*

Flash: A powerful way to create animations too, but limited to vector graphics. It's now a file format more popular than Director for creating animation and interactivity. Like Director, we can embed audio and video. Even if there are technical differences, the most important is the presence of the plugin on computer near 100%.

Video (Alone): A presentation in a video is interesting, but only for some parts in the project. Software for making good video presentations is available on Mac OS X and Windows, but doing modifications is not trivial if the presentation is complex. It needs a powerful computer for the developer. Also, there are some issues: A video is big in size, perhaps the simpler way for sharing it is to upload it on Youtube (or equivalent). There is no interactivity except chapter which can be added. The sound associated to the video must be clear and really adapted to the context, video is just for

show. By comparison to just a picture, video add information about how really people do things (between steps of 2 pictures). For example, if you present how to put a microprocessor into his socket, a video is more helpful than a picture, because it's possible to feel exactly what the narrator feel, and allow the learner to redo the same process without stress.

HTML (Hypertext Markup Language): HTML is the base of Internet. The Web is popular and web browsers have to be compatible to the World Wide Web Consortium (W3C) recommendations. A modern web browser tends to interpret website like other modern web browsers. Doing a website, using HTML is trivial. By default, HTML is poor in interactivity. It can be corrected by adding JavaScript (and, in general, AJAX technologies) or by using third-party piece of software like you can do with Director or Flash. HTML is linked closer to other features like Cascading Style Sheet (CSS). HTML is the content, CSS describe how the content is presented. CSS is useful to made cross-platform website by using a different CSS file by type of output. It can be a computer monitor, a smartphone screen, a printer,… Also, it improves the accessibility of web sites by using semantics which allow the Internet user to have more control on content (Some things need to be put in the HTML file too).

HTML allows thinking differently the project than if the presentation is realize in a single Director file. Some constraints appear when a Director animation is created like realize a title page, integrate the navigation, few buttons and so on. By using KISS (Keep It Simple, Stupid) philosophy, those elements can be integrated in the HTML design and facilitate maintenance and development.

Powerpoint: Powerpoint is not really an online delivery technology. Some people use it to share opinion, graph and so on, in firm mainly, and can be used with success through website like Slideshare.com to communicate to a large public. But there is no complex animation and interactivity. Plus, the file format is proprietary and need a software to be read by the learner. And the developer needs to think to compatibility problem, that signify, for example, that fonts are reduce to fonts available on the targets computer, so, he can't use specific fonts (Like on the Web, but on the web, you can use font family, not in Powerpoint). Also, file size increase easily when graphics are integrated to the presentation, and sounds can't be integrated if they are not in the WAV (WAVEform audio format) or must be hacked from MP3 (MPEG-1/2 Audio Layer 3) as WAV files.

2 - Design

2.1 - Objectives

According to the ADDIE, aims and objectives must be described first. It will influence decisions later, all along the project. Plus, in relation to instructional design, keeping in mind aims and objectives limit derivatives on the method.

Aim of the project: Explaining "What is the interest of Network Attached Storage (NAS) in a personal network?" for people non aware (novices) about technologies in computing and networks. The second aim is to explain to advance user how to set up a NAS.

Objectives:

- Made the NAS a clear device which can perform various services.
- Explaining what they can obtain from a NAS on the market with what performances.
- Explaining advantages/disadvantages, special features,…
- For advance users, how to set-up a NAS, hardware and software configuration included.
- The realisation of the project must be done using multimedia capabilities. That suggest the use of technologies we have seen in lectures (Director, HTML+CSS, Powerpoint…). The better solution will be defined by analyzing the outcome of the project.

It's not possible to avoid jargon. But it must be explained. For example, RAID is the acronym of Redundant Array of Inexpensive Disks, but, even as written in plain text, it can be obscure, plus, it contains not one, but many theories in one, one for each RAID level.

2.2 - Multimedia

Some elements can be presented as an animation to allow people to learn with efficiency. First, how differents RAID levels are working. The interest of the animation here, is to present pieces of data running from the controller card, which can be a hardware RAID or not, to the hard drive. Data can be stripped or mirrored, plus, the animation can represent the parity. All main RAID level in close relation to NAS "world" will be presented: RAID 0, 1, 5, JBOD.

Secondly, charts can be presented and commented with underlined elements only when the narrator speaks about certain elements on the chart. It can be useful to explain difference of cost between homemade NAS and commercial NAS. That is interesting to give facts to the learner for helping him to choose a NAS with accuracy.

Then, a network schema is needed at the beginning of the presentation to explain what the place of a NAS is, and what these functionalities are. Here, it can be explained too by demonstrating interaction between network devices. That can explain how services works, and what are the benefits for the user. Main services will be explained, because they are basics and necessary for the normal functioning of a NAS. From internal services, like Dynamic Host Configuration Protocol (DHCP) or Dynamic Domain Name Service (DynDNS) to Universal Plug and Play (UPnP) or basically, File Transfer Protocol (FTP). It's closed to the learning strategies.

Less technical, schemas can be great to explain what strategies we can setup with a NAS are, in a network, which are considering as a main factor when people want to buy a NAS: save files. Animation can explain step by step how it is possible to doing that. Also, for the advanced users, explaining step by step how a NAS is configured as the hardware than the software part.

2.3 - Learning styles

In order to help learners, it's possible to establish a list on how information will be presented: For the **activist** for example, it can be interesting to add in an animation where there is the possibility to drag and drop elements in two separated boxes which represents "files" as they can be viewed by the RAID controller on hard drives. For **reflector**, the same things can be done by just showing the animation on how the controller adapts a file on a certain type of RAID. The **theorist** here, will probably prefer a condensed version where every RAID types are represented and can be easily compared. The **pragmatic** will anticipate by choosing the solution he needs in regards of main characteristics of each RAID type.

Then, we can help learners with regards to their natural capabilities. For **active learners**, problem-solving activities can be done by showing problems users can meet using RAID 1 versus RAID 5, and try to guide them in some documentation about extending a RAID or doing a migration as safely as possible. More simply, for a novice, it can be about the facts that data doesn't have the same level of importance and can be weighed to figure on a highly secure saving system (with RAID 1) or not, or by made comparison with an internal hard drive synchronized to an external one versus a RAID 1,… Then, active learners will want to solve real world problems such as what can they do in case of a hard drive failure. All responses can't be done through a presentation for a novice, but only main features can be indicated, as well as issues. Explaining RAID levels and how it works is simple, understanding problems in case of issues is an interesting point which can be something for advanced learners.

Reflective users will perhaps think more about the future of a RAID 1 or 5 systems and how it can evolve. Are my data are secured with a long time view?

In both cases, the presentation needs to provide information which can be a start point for some research over the Internet or magazine to see if a NAS is the better solution for their problems.

For **sensing learners**, the presentation can talk about statistics, in general. For example, if you have 2 hard drives in RAID 0, your data saving factor is 0, in case of one hard drive failure, you lost all data. In RAID 1, the factor is 1, it rest 1 hard drive with all data, in RAID 5, factor is 1 plus 1 divided by the number of disks in the array, in JBOD it 1 divided by the number of disks in the array, etc…

Information can be represented as statistic, pie chart, diagram, table,… and help understanding the better way to do things by comparison to each other's. Plus methods to explain how is it possible to choose a solution (with many details and possibilities), to survive to an issue, etc… are interesting aspects that can demonstrate curiosity.

For **intuitive learners**, a real test, with a virtual machine for example, can be more efficient for them. They can try settings (for services for example) and guess how it works and what the best settings are. They just need to understand that it's necessary to be sure about how a NAS works before putting important data on it. So here, be careful, Intuitive learners must verify their results after the experience.

Visual learners are an interesting target for a multimedia presentation. The research before have presented that multimedia increase knowledge easily when novices begin a subject. So here, by using pictures, diagrams, flow charts, etc… the lecture will be enhanced easily and efficiently. Diagram for example, can be used to see the place of a NAS in a network, logically, with IP address for each important device. A flow chart can be used to see interaction on the NAS web interfaces to achieve important settings like set up the RAID array or establishing the file sharing. Also, it can be used to see interaction between devices on a network when people use the NAS. A little film can be interesting to demonstrate how to build a homemade NAS step by step, according to the paper version of the presentation, it's reassuring.

Verbal learners are associated to visual learners. In the case of a homemade NAS building, it's important to say what we did and why. For example, be careful with the microprocessor when you put it in this socket. *"In many instances in video presentation in multimedia programs, the sound track alone is the important part, and the visuals are just for show"* (Stephen M. Alessi and Stanley R. Trollip, 2001).

Sequential learners need linear steps to learn efficiently. The reverse is **global learners** who need the global idea and then, get into the subject step by step. In the first case, connections between concepts are made all along the presentation and, at the end, the global idea appears. In the second case, there is a need to understand this global idea before making links between concepts.

This two opposite learning style can be implemented in the same way. It's obvious, the summary will help global learners to make links and have an idea of their progression in the presentation. So they also can cut subjects to learn as the project can cut parts to do it in chapters. If the introduction of the subject, here NAS, is too "virtual" or "conceptual", sequential learners can directly learn chapter by chapter. The conclusion will be, for them, the introduction for global learners, but the more both will read chapters, and the more making connections will take sense and be less conceptual.

In this project, it will probably hard to respond to each types of learner for learning something, the better way to learn, for example, how RAID works, will be chosen, and some other parameters must be integrated, like file size, technology,…

2.4 - Personas

To be complete, the project must be view with different needs. Some people are interested in a NAS just to save content with a high reliability. However, the powerfulness of functionalities provided by a NAS change the first reason of why a NAS is bough. For example, some others like to easily share massive files for family, like photography, using the FTP server.

Targets are novices and slightly more advanced users. They can be interested in using NAS in some points, so different profiles can be imagined.

- **Bob:** He needs to save important files like personal photos, videos, office type documents (word processing, spreadsheets, presentation),… The amount of files is not important, he is more concerned with the security aspect. He is interested in a NAS by the security aspect more than sharing files.
- **Kevin:** He needs to share massive files over the Internet, as Rapidshare or Megaupload can do, but while keeping respect of his privacy by using a FTP with restricted access. Plus, he

likes to download torrent files without let a computer power on all the night. He is interested in a NAS by various services available for sharing files.

- **Alice:** She likes to watch movies and listen to music on her computer. She is interested in those services that enable multimedia functionality.
- **Eve:** She uses different computers at different places and needs to have an access to her files over the Internet. She is interested in those services that enable an easy file sharing over the Internet and also keeping her information secure.
- **Ben:** He likes to share photography on Internet because files are too big for a simple memory card.

We can imagine many more personas, but it's necessary to limit them to an acceptable number linked to usage. Personas are a powerful way to allow the learners to be in position to associate a personas behavior to himself. It's possible for the learner to identify needs which correspond to their needs too, and so, by comparison, to choose a NAS solution.

2.5 - Alternative to personas

On the other hand, the most obvious principle is to compare technically solutions and then, allow the learner to have sufficient knowledge to do the comparison between his needs and technical possibilities.

- **USB NAS:** Low prices, low performances, good for FTP and external hard drive second life.
- **Classic 3.5 inches SATA NAS:** Medium prices (regarding hard drive number and extension possibilities), medium-high performances, good for saving file and any other purpose. 1 or 2 hard drives maximum.
- **Performance 3.5 inches SATA NAS:** High prices, high performance, good for saving files and any other purpose. Advanced user management and multimedia functionalities. More than 2 hard drives.
- **Second hand 3.5 inches SATA NAS:** Low prices, low performance, good performance / price ratio.
- **Handmade NAS:** Cheaper regarding functionalities and possibilities. Need skills to configure.

For a beginner, personas is the easier way in which to understand what a NAS mean for each person. In the case of estimating hardware possibilities, the understanding and the choice can be more accurate, to fit well with the needs, with a precise idea of what can be done, at the better price.

So, there is two ways to understand how a NAS is works and is useful, **personas**, and **technical analyse** (by the learner). These two ways will be treated not at the same time, this would near two presentations, but it will be useful when it's the most obvious. For example, it's possible to present how a NAS is working for a novice by presenting some technical elements, but it's not so helpful when it's time to choose a NAS on the market. So, a presentation as conclusion of what is interesting regarding usage, like personas, is a good way to make a decision. It adds non-conceptual information. It can be helpful to understand concepts if their application on product is not easy to understand. For example, RAID 1 is not possible in a 1-bay NAS, that has importance on the usage of the NAS itself.

Hardware possibilities allow (or not) usage and/or usage have consequences on the NAS chosen. Learner can view the problem in two directions.

The personas introduce the view “I compare my needs with other’s needs”. At the beginning, and without thinking about learning styles, it appears more natural to explain technically in what a NAS can be interesting, but it’s not as complete and helpful as with personas especially for novices.

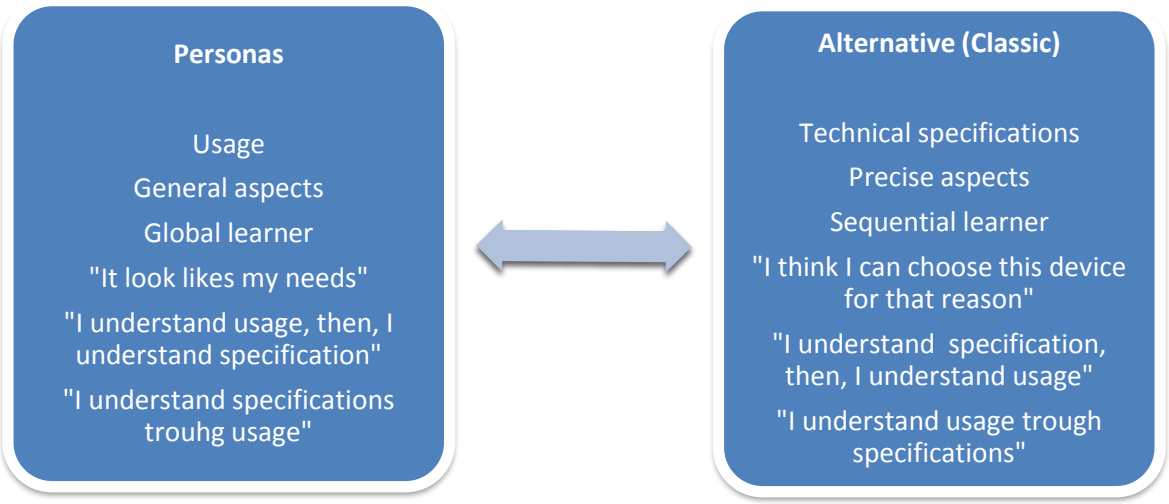

Figure 5: A 2 ways learning.

A sequential learner takes a global view all along the presentation and vice-versa, a global learner takes details. It’s a process.

2.6 - Design considerations

The development part of this project has to be established on the better medium as possible to ensure the effectiveness of the instruction. For starting, a quick list of specifications has been made, based on users and developer needs (Richard E. Mayer, 2009):

- Need chapters: to navigate easily and allow a better learning experience with the segmenting strategy principle.
- Need to be updated easily: for integrating missing chapter mainly, correction about the learning experience, new quiz, products update, improvements…
- Need to be accessible: to be available for everyone, the first target of the project.
- Use illustrations and animations: low-knowledge increase their knowledge and become high-knowledge faster.

Some multimedia technologies have been considered:

- A Director animation (one file for the entire project): Plugin issue. License issue (for the developer). Hard to maintain, cost of the license.
- A Powerpoint presentation (not suitable for the M. Sc. Multimedia Computing): Software, file format and fonts issues.
- A Portable Document Format (PDF)(one file as presentation and support): Can be correct (regarding a Powerpoint presentation) but there is a big lack of interactivity.
- Video (alone, one file for the entire project): Chapters, update and interactivity issues.
- HTML+CSS: Appears to be correct, standard, allow pictures and video. Can provide multimedia and is complete from the functionalities point of view. Is really accessible.

Powerpoint or a PDF files are not appropriate in the case of a multimedia learning project. Due to a lack in interactivity, but can serve as support for lecture in other circumstances.

2.6.1 - Choice of a technology

Research from the literature review (Mayer, 2009) demonstrate that a pure animation absolutely need, to start, a title page, a direction page if needed (complex animation), few buttons for the navigation and be consistent, as well for graphics (the user need to be in the same "world" all along the animation) as for the text, with the good tone, adapted to novice, with no jargon, etc…

More, it's advised to set up the navigation and anticipate place of buttons, titles, content at the beginning of the project. For sure, it's done with a basic storyboard for place key elements, and with a flowchart for the navigation. But it's possible to think about the problem differently.

If there is one multimedia (Director) file for the project, those things need to be set up in Director. If the development is web oriented, those things will be simpler to implement, because all those "administrative" things can be implemented in the HTML file, as well as the navigation. So if a Director animation is produced, it can be centred only on the content and on the control of what is demonstrated. For example, a demonstration about RAID 1 will provide an animation on how the data are going to be treated by the RAID controller and written on the hard drive, control can be only repeating the animation, doing it step by step, etc… without controls for the navigation added. That allows the animation to be simpler but the reverse is the need to create as many animations as necessary. So, keep the same idea of how graphics and texts will be presented to keep in mind the consistency link of each animation between them. Plus, a static explanation picture can be extracted easily from the animation to serve as support for a paper version of the project. Then a saving of space is welcome and allows the learner to read the beginning of the presentation (if done in HTML) before charging and watching animation. So, it's less frustrating.

2.6.2 - Content structure

Divided the presentation in multiple files allow them to be easily modified later, improve the efficiency of the maintenance and to divide the presentation in logical chapters. Regarding a primary brainstorming about how to it can be done and important subjects to know, the project can be divided like that:

For novice:

- Introduction (backup strategy, software for saving file, overview of usage, capacity)
- NAS definition (advantages and disadvantages, operating systems)
- RAID (Hard drive, RAID 1, RAID 5, JBOD, Capacity review)
- Pre-assembled NAS (Actors of the market, for individuals, for firm, interest compared to homemade NAS)
- Homemade NAS (RAID options (Spare disk and cache memory), Software RAID with Windows or Linux, Hardware RAID (Integrated RAID trough motherboard chipset, controller card, associated hardware (UPS))
- Services (File sharing, FTP, Web server, UPnP,…)
- Costs & performances (Network types, usage)
- The second hand market.

For advance users (geek for example):

- Hardware consideration (ATX, Mini ITX, electric consumption, existing hardware, how to choose)
- Tutorial using FreeNAS, a cost efficient, simple, BSD based NAS distribution.
- Tutorial using Ubuntu, a powerful multi-purpose operating system.
- Tutorial using NASLite, CryptoNAS, OpenFiler?

Divided the project in two parts considering targets, allow to differentiate them using a different environment. For example, graphically, by not using the same background color but always with the same consistency about places of elements, graphics, texts and so on.

It helps the instruction by placing tests at strategic places. For example, 1 easy quiz at the end of the novice presentation, and one other at the end of the advance user presentation. It's also possible to increase tests granularity by testing in each main topic in a presentation, with attention to tests with "consistency" too, where information is essential. For example, testing the difference between RAID 1 and RAID 5 is consistent, not on testing costs, because it changes over the time.

After this first draft, it's possible to consider the consistency of what need to be learned considering the instructional design. And homemade NAS is probably a chapter which needs to move from novice to advance user presentation. Plus, a chapter about operating system for advance users can extend the same chapter for novices. In this case, most operating systems can be analysed and reviewed to offer as wide a panel of solutions possible. For example, new proprietary file systems like unRAID and Drobo FS can be compared to standard solutions based on Linux and Windows.

If the subject for novice can be presented as an online website (HTML+CSS and more…), the subject for advanced users perhaps need to be printed to serve as support during the tutorial. Because it's easier to handled and ensure the effectiveness of the presentation in this circumstance. This possibility can be implement using 2 technical solutions, by allowing the user to print the page "as is" if the page background is white for example or with a special CSS file dedicated to print.

A little survey has been established to see if a **printed document** is necessary. People interviewed where 4 novices and 4 advanced users (However, advance users are not all hardware and especially NAS fan, more developers). They said: "Yes, do it". But, for novices, it appears that on screen information is sufficient. They will no print for read later, they read when it's available on the Web, like news, like e-mail, like their navigation on a social networking website, it's a "live" discovery. Plus, if a PDF is available, advance users will read it on screen! The finality of a printed document is to be printed, not to be read on screen, so, even if it can be interesting as another possibility to learn, the printed document will not be a specific document thinking to be on paper (Explanations are differently provided on paper than on screen, when using graphics (Alessi and Trollip, 2001)), but a possible webpage print. That adds a constraint to use light background and dark font's colors. It's possible to have an issue when animations are printed, with missed information or deformed content.

2.6.3 - Navigation, learning requirements

The content structure commands the navigation. So, the navigation, including one "big" test at the end of each category, can be overview like the figure below:

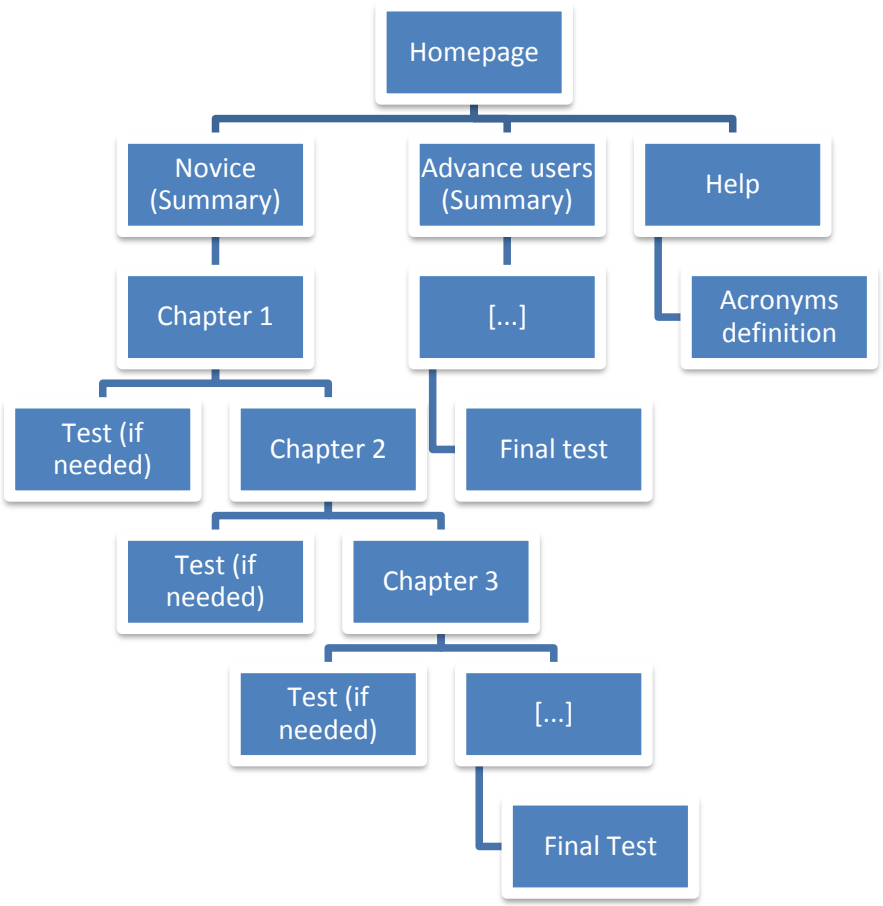

Figure 6: General navigation organization

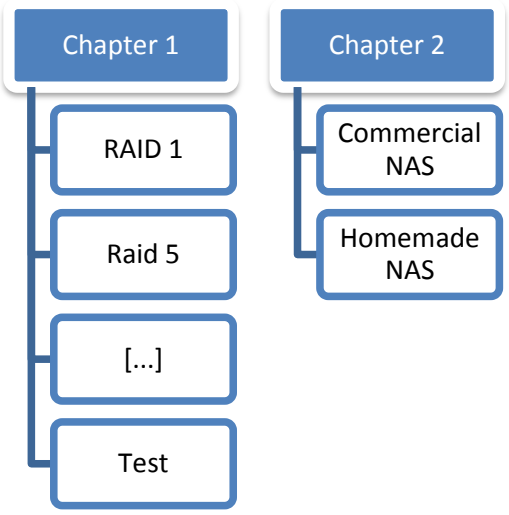

Figure 7: Chapters organization. There are much more chapters! A chapter is a webpage with a list of titles.

From the **menu**, it's possible to go on two major direction, novices and advance users. Chapters will be presented by a summary. Tests can be directly accessible from a summary page. Tests are according to the level established in the Bloom's taxonomy analyze part of this project, but some little tests can be included in chapters.

Tests in chapters can presents some basic problems, such as "What is the space available in RAID 1 with two disks of 1 TB?". Those basic tests will be at the level "remembering of the Bloom's taxonomy. They can be presented just after (or in) the "capacity table" review page. It's possible for learners to skip those tests.

Tests after chapters need much more to think about technical aspects depending to the situation, such as "What is better: Two 1 TB hard drive in RAID 1 or five 250GB hard drive in RAID 5?". Tests after chapters need more reflections by the leaners about consequences, strakes, etc…

The **tone** for those tests will be different in tone than in a scholarly environment. In this project, learners are invited to discover a part of Information Technology (IT). It's not a problem if they don't have an understanding of all the chapters. Some chapters are important and some others not.

A chapter is a webpage with content in the same semantic area. For example, the page about NAS will have many chapters: RAID 0, RAID 1, RAID 5,… Eventually, if the page is too long, a chapter can be cut in two (or more) parts. People are afraid of too long page.

Important chapters will be covered by little tests integrated in chapters. For example, a little test about RAID level is important because it's a main feature in a NAS. A chopping advice is secondary and can change over the time, so it's not important to retain what model is best suitable for particular purpose. In this second case, advice for chopping it, is great to have an overview of the market and possibilities, but the learner does not have to know every reference on hardware that exists, it's not pertinent. Tests tone can be like a Q.C.M. in a magazine.

The **general structure** of the website is simple, with two main areas. These two main areas will not communicate, because the content is absolutely different. So, it needs, for the leaner, to return on the homepage if he wants to go from the novice part to the advance user part of the presentation.

The **specific structure** of each category, novices or advance users, is mainly, a continuation of chapters. But, each test is an independent page. Otherwise, people have just to scroll up to see elements of response! Chapters can be skip if the learner want to return easily where he have left, or if he have already skill on subject, or just because he want to have precise information at one time.

A summary is present at the beginning of each category and list all chapters, and add a description (if needed). So it's also possible to skip a large part of chapter, and not skip chapters one by one if you are interested by the last one!

There is no, for both learners, general conclusion. An **overview of possibilities** will be presented for novices, for what is really important to think about NAS, their interest. For advance user, if the tutorial runs well, the conclusion will be general, for example, think to maintenance, bug, ask help here,… than a conceptual conclusion like the previous.

Technically, the nature of the presentation is HTML+CSS, so divided navigation like the previous schema is easy. Animation, charts and graphics can be made to explain RAID, costs,… Otherwise, about **languages**, the website will be in French, tested with French users and evaluate as French. However, according to the project needs, an English version will be set up, the only issue is tone. It's not possible for the developer to be sure that the English language will be adequately used (tone). Flags corresponding to languages will be displayed on the homepage, but not more deeply in the website structure.

2.6.4 - Navigation, users requirements

A little survey has been conducted to know how people see a website which talks about computing, in general. In fact, they know what they don't want to see! A website with dark background, many links on many pages on the home page, flashy component (advertisements, prices, offers,…), pixel type typography. However, they know what they want, in general, for a technology centred website. They like light background, a simple layout with a clear navigation, a modern blue typography, light gradient effects and familiar graphics (handmade graphics for example, like in the Google Wave presentation video available here: http://www.youtube.com/watch?v=rDu2A3WzQpo). Also, they prefer a website which is fast loaded if there are animations.

Results and explanations in pictures:

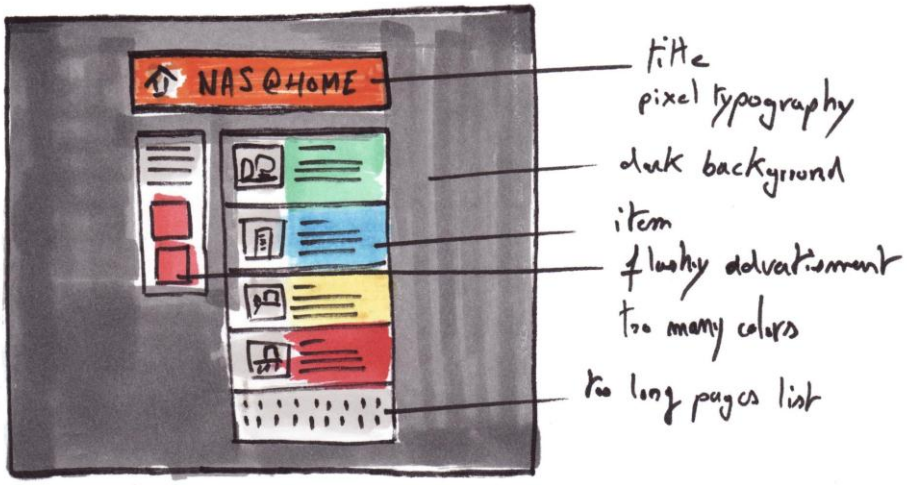

Figure 8: What they don't like!

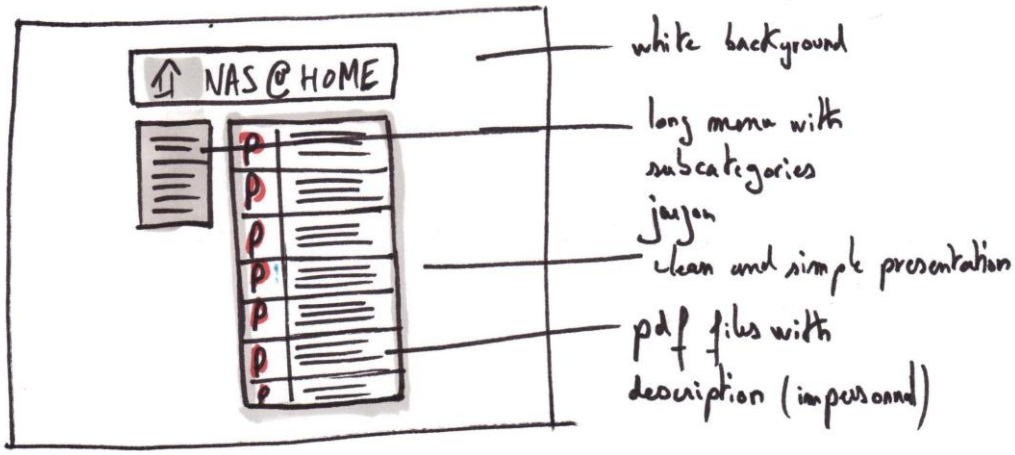

Figure 9: Better but impersonal.

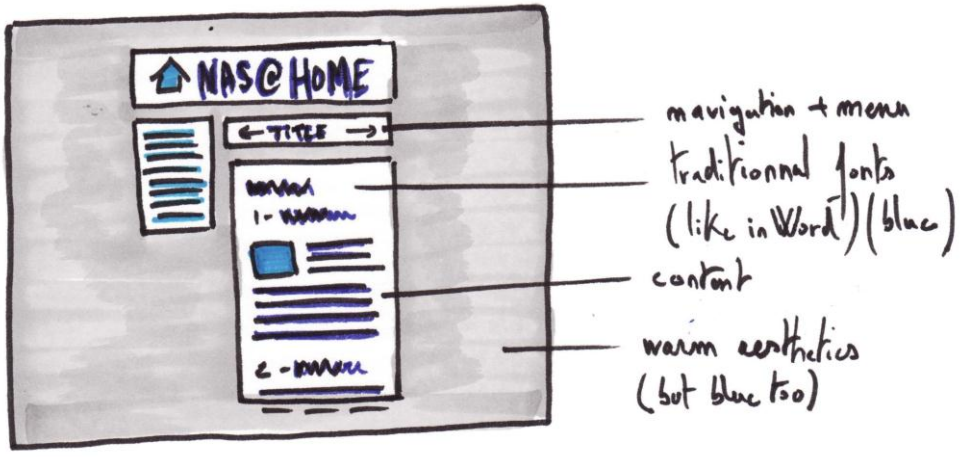

Figure 10: They like blue and warm feeling for a website.

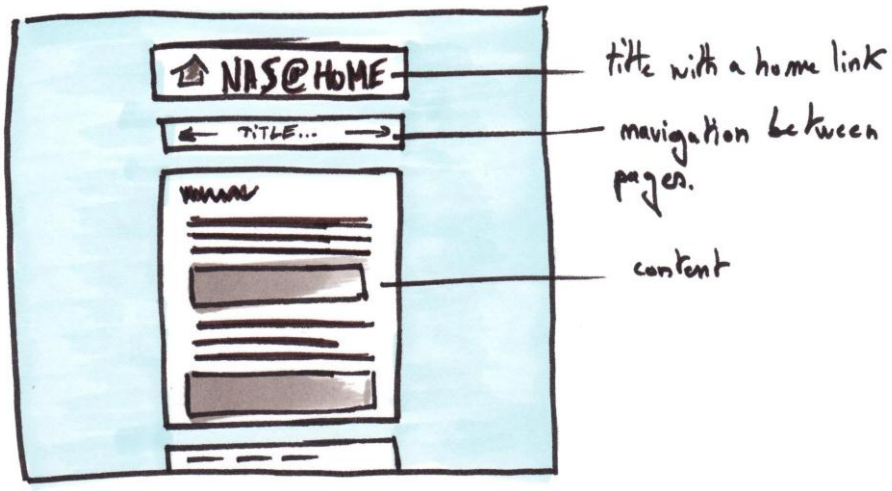

Figure 11: Warm inside, cool outside (blue background).

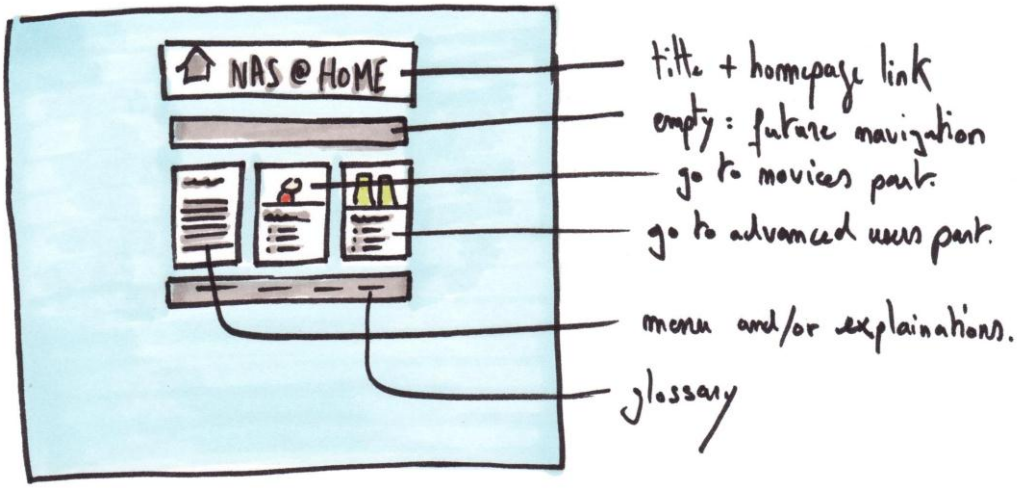

Figure 12: Main menu with the same elements.

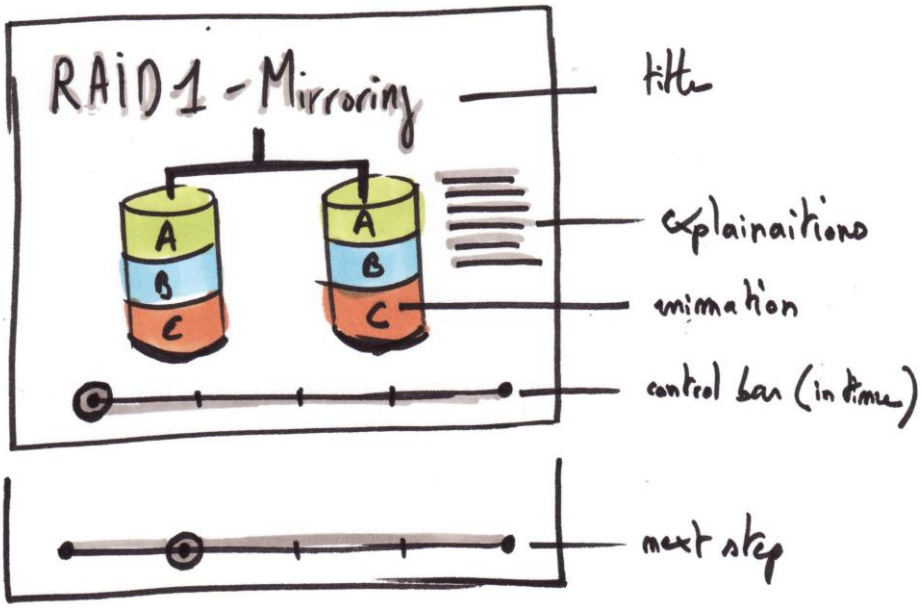

Figure 13: Animation design, simple to maintain and translate. Background is transparent.

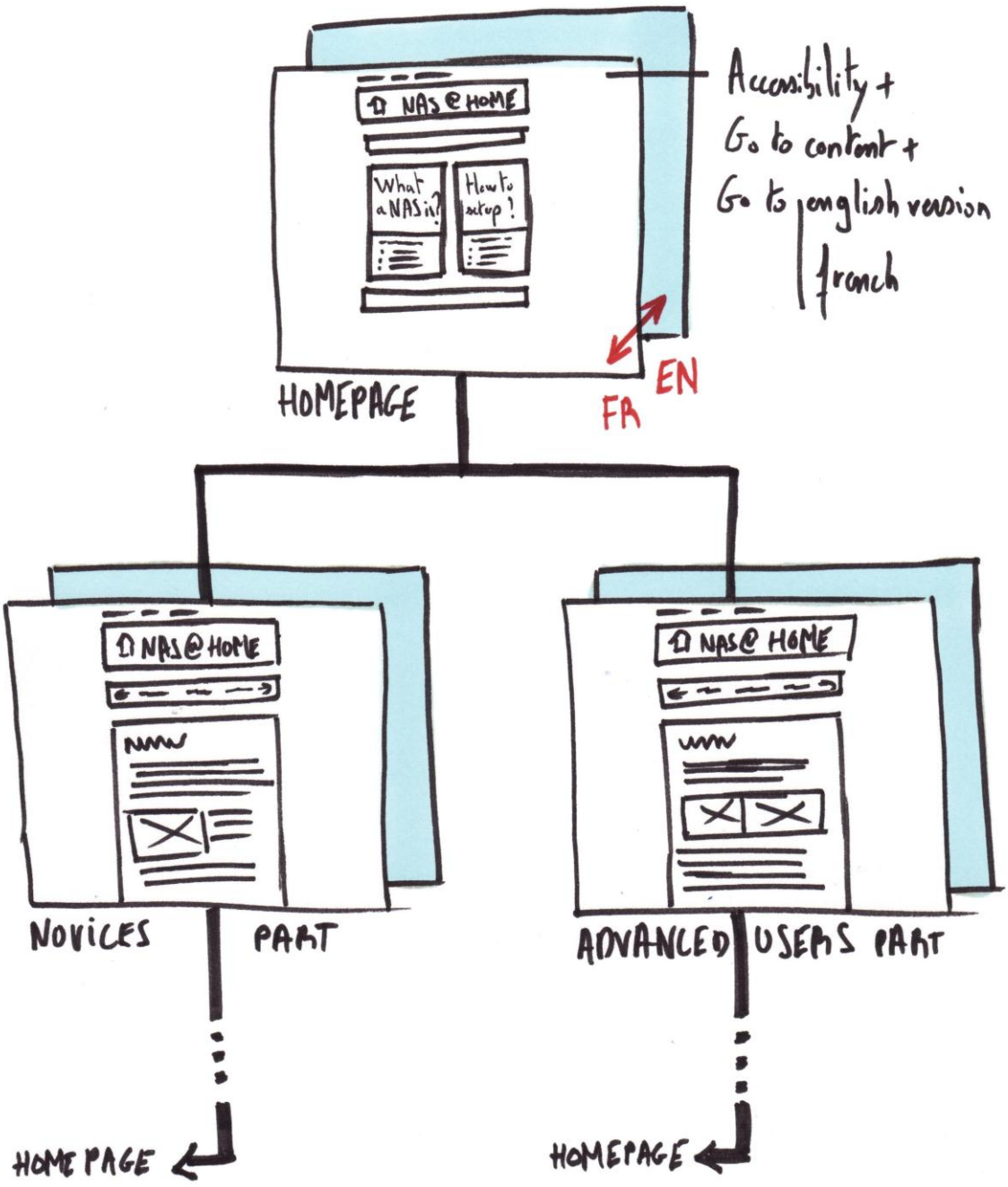

Figure 14: General vision with cross links between French and English version.

2.6.5 - Multimedia elements

It appears that attention guiding techniques used for facilitate learning using a multimedia document have moderate effects (Jamet, 2007). But **salience effect** (highlighting text with red color for example) and **sequential presentation**, which have strong effects alone in certain cases, have stronger effect associated together. Also, to be efficient, the quantity of information displayed should be the less as possible, and must keep simple.

They are *"positive effects of attention guidance on the remembering of multimedia documents as well as on students' perception of processing difficulty" said researchers. Also "The salience effect can be explained in terms of the guiding of attention. By automatically capturing attention, the change of color circumvents the controlled visual search phase during the selection process. Consequently, it*

both shortens processing time and frees up resources for other cognitive processes required for the organization and integration of the material phases (Mayer, 2001; Schnotz, 2005), and permits the contiguous processing of the visual and auditory information in working memory. The effect of sequential presentation can, to some extent, be interpreted in the same way but, because of the additive effects [observed in this study], it is plausible that the reduction in the quantity of information presented on-screen also helped."

In the multimedia elements of this project, we can assume that explanations will be done using these two recommendations. Plus, let the user control what he want to see. That affects the salience effect but help people to learn and memorize things. Quiz will also be interesting to help learner to be active in front of this computer and avoid the absence of attention. That will also make the difference between the remembering and learning of a text. Some questions in the quiz need the user make sense of what he have learned, the response can be textual, obvious (Dan Meyer, 2010).

That have consequences on how animation will be make. That adds constraints: simplicity, timeline with control, few interaction zone (buttons) for special features (if needed), simple graphics… Graphics elements such as arrows need to be use or elements have to move during the animation to make sense as well as temporal principle. If not, the coherence principle in learning will not be well applied and that can have consequences on learners (Mayer, 2009). Identifying quickly elements in an animation is a key for success in the knowledge transfer.

Textual information needs to be used as minimum as possible too, but depending on the situation, some subtitles will be provided to enhance the voice (if the voice is used).

The **segmenting principle**, which consists to cut in parts a big element, like RAID levels, into multiple another, like RAID 0, 1, 5… already exists through the navigation. But jargon can be an obstacle for the testing step, so the **pre-training principle**, which consists to put in evidence key terms, can be applied. *"The pre-training principle is based on the idea that information about the key terms, such as names, definitions, location, and characteristics, should be known to the learners before they receive the multimedia lesson"* (Mayer, 2009). That can be implemented as a special web page for acronym or a quick "slide" on main subjects the learner have to retain after a chapter. For example, a table resuming RAID levels can be useful. Plus, the **modality principle** suggests that "Students who receive a multimedia lesson will perform better on a problem-solving test when the words are presented as spoken text rather than as printed text." In this project, the outcome is not to evaluate students in a scholarship environment but people who are novice or advanced users in a public environment. They can assist the lesson if they want, this project don't have to be aggressive. So, in order to facilitate a little the big amount of data that the NAS world represents, test will be linked in the learners mind to lesson using the same text, as well as spoken than written (Spoken and written text will be identical). Eventually, jargon can be avoided but that don't have too many consequences. For example, "RAID 1" should be inverted with "mirroring" without problems. Learners have to make the link on this type of subject. Also, those have a positive effect of not producing a cognitive overhead on people.

Photography can be used for presenting real elements such as hard drive disk, controller card, Serial ATA and Parallel ATA slot for hard drive… The background of each pictures needs to be neutral, white for example, and do not provides some extra information not relative to the subject. But others elements like a coin of one Pounds can be useful to compare size, or two hard drive can be compare such as 2,5 inches hard drive versus 3,5 inches.

General advices are provided by Mayer under the **principles for fostering generative processing in multimedia learning**:

- Multimedia: Present words and pictures rather than words alone.
- Personalization: Present speech in conversational style rather than formal style.
- Voice: Present speech with human voice rather than machine voice
- Image: present speaker's image on the screen during learning [not supported].

About personalization: that reinforces the wide public characteristic of the project (as not in a scholarship environment). Other aspect have been previously define or will be interpreted not as part of the animation but as part of a web page. So the structure is a little different, but rhythm will be maintained in the text tone (for example), to keep learners attention.

There is one **limitation** here: the project need to be done both in English and French. French because it's the native language of testers for the first version, English, due to University constraint. Because the project developer is French, the conversational style can be mastered and evaluate in French but with uncertain level in English.

2.6.6 - Testing the learners

For the moment, only quiz systems have been envisaged to verify the effectiveness of the presentation on learners. It appears to be a good system to evaluate knowledge in the circumstance of a website, quick, adapted and efficient.

Flowchart for questions: This project will not use a specific flowchart for question due to the public nature of the subject and resources available (One person). It's not a scholarship assessment.

Testing content: The content will be established using elements previously viewed in the lecture.

Testing implementation: the implementation will probably be done in HTML. It's simple and help can be provided easier than if the test if embedded in a Director file for example. However collected data will be treated anonymously and will not be saved. Test is just for show, needed for the learner to verify if he understanding well but that not will deliver any diploma! Here an example of website using multiple choice questions: http://www.siteduzero.com/tutoriel-3-14668-concevez-votre-site-web-avec-php-et-mysql.html. This website use humorous language and at any response, even if it's right, an explanation is given to the learner. Also, if you give a wrong response, your wrong response *and* the right response are displayed. And the final notation is given but not highlighted, it's a secondary element. The leaner will have not limit in time for responding. They can cheat too, but it's not their interest. Because it's not a scholarship assessment, responses will probably be honest, there is no need to prove whatever, just the possibility to learn more!

There is no need to skip the test, but it will be a possibility. It's possible just for allowing users to go faster on the next chapter and because tests are not obligatory.

Testing levels: The project is divided in two parts: novices and advanced users. For each, there is a test at the Bloom's taxonomy expectation level at the end. So two "big" test at comprehension and application level. Plus, a collection of knowledge level test in each key chapter needed to understand or applying well. The score will be established as a percentage of success. For example, if you have responded correctly to 4 questions on 5, you have 80%.

Quality of tests: The quality of each assessment as to be verified to see if it corresponds to the situation. After the evaluation process, some question can be changed or modified to fit the level expected.

Quality methods: Questions will be generated randomly (brainstorming) and then, evaluate by the developer and a little group of advance (users) testers.

Testing content: For novices, it's possible to evaluate if they can make the difference between NAS world elements such as services, RAID level,… This type of exercise will be done during tests included in chapters (remembering level). Distracters for example, cannot be in the same area as the question. For the overall understanding test, the learner needs to be tested on their opinion about what type of NAS is adapted to what situation. The issue is that a need can be satisfied by many manners. So, without be obvious, the possible response(s) has to be thought and intelligent. Distracters will be in the same area as the question and two responses can appears to be right. For novices, the goal is to help them to choose a NAS, but it's impossible to verify, so the better as we can evaluate is their accuracy when choosing a NAS regarding needs.

For advance users, it's the same scenario, it's not possible to evaluate if they have successfully set up a NAS. But advices on the hardware can provided much more than for novices, for example, choosing the best adapted hard drive in a selection. So, the evaluation has to go in the same way as for novice, by evaluate their accuracy on a particular subject. Advanced users part have to be complete, semi-professional and less a tutorial part than expected. To be complete, this part have to speak a lot about services, definition and usage, and the tutorial part have to talk about setting up a simple NAS built for saving files, the main usage of a product like this.

Assuming that test built in the website can include some mistake, a **real life face to face test** needs to evaluate:

- If tests in the website is "good" or need to be modified.
- If the lesson have been well understanding in the case of novices people and well applying in the case of advanced users.
- Is the granularity of the content is adapted or too precise.
- Is the response of the problem is well done using multimedia.
- Is a multimedia website is the better solution for explaining that?

Also, is useful for:

- Making a comparison between test needs and users' needs.
- Having feedbacks from learners.
- Testing the effectiveness of the project on learners.

Because NAS subject will be expanded during the implementation phase of this project, questions asked will be created later.

People who will test the website as learner will be novices and advanced users at different levels. The difference will be established by their interest in the NAS domain and computing in general. Some behaviors are expected:

- A **novice really novice** in computing, who really have zero knowledge in computing. This type of person is a problem for the project, because it's not easy to determine at what level the

lesson can start. Doe's the vocabulary has to be explained more? What is the level or knowledge necessary to understand the lesson? Is the tone is not too specialized? Doe's a pre-test have to be established before beginning the first lesson (introduction)? Doe's people need to read the glossary before starting?... Examples: Doe's the "server" word has to be explained? Doe's a leaner understand the principle of services over a network? Consequences: The name of the website cannot be "NAS@Home" or just "NAS" but more "How to share files on your personal network?" which is the main reason of NAS existence but also a not complete reason. The place of a NAS needs to be explained and linked areas need to be covered by an introduction, like network, client-server, public and private IP address... First tests with learners will adjust the scope of the project. Also, we let us assume that they are motivated to learn and know in what a NAS is useful. He has a moderate interest in the subject.

- A **novice who use computers** and know a little what can be the future usage of a NAS. Even if this type of person doesn't know how to configure a router for example, they know a little what is used for. He has connected his laptop to the modem-router trough the Wi-Fi. Vocabulary can be confused but sounds familiar. He has a moderate and strong interest in a NAS because he is interesting by one of the aspect (Personas).
- An **advance user** in computing but not in hardware. A person which have knowledge about computing, network and who know what is a NAS but needs information about hardware to choose well a NAS. He already knows his needs and how he can respond to it by verifying characteristics of NAS. He can discover possibilities he don't have imagine with new products. He would like to know how to configure them.
- An **advance user** who have moderate knowledge in all the area of the subject and want more information to be comfortable for setting up a NAS. He is absolutely not afraid by setting up a NAS.

Each behavior expected have consequences that will be taking in account during the implementation phase. Each user type have problems the project needs to respond, the most difficult is the really novice user. He will probably be the center of test and evaluation before the others because it's the most sensitive part of the presentation.

3 - Implementation

Website address:
http://students.comp.glam.ac.uk/07209525/CS4T01_2009_V1_MsC_Project_NAS/index.html

3.1 - Modifications

The implementation phase has started in august. The original website design, from the design part has changed. Chapters are a collection of single HTML pages and the homepage is just for show the 2 sides of the project: beginners and advanced users. But during the implementation phase, the need to just present both sides on the homepage, which link to a beginner or advanced user menu page appears to be useless. So homepage and menu pages are 2 in 1 page now. Plus the reading way is from left to right, not from top to bottom, so learners can judge at the first sight the structure of the website. If it was from top to bottom, they can think that the "top" information is much important than at the bottom, and always begin by the beginners' part. The "Other" menu is less important than the others, so it's not a problem for it to not be place at the same level. Each element of lists is a chapter which is directly accessible.

Also, there is no need to really create chapters with regards to the content volume. So basically, one page is one concept to learn. Each chapter don't normally have a direct access to the homepage (regarding the design part, you have to do a "tour" in beginners or advanced users part) but the menu is design for an intuitive navigation like if don't have this possibility. The previous and newt chapter are indicated with arrows, so, you know where you are and what the next concept is.

3.2 - Features

Figure 15: 2 in 1 picture for the logo.

The website has been implemented using modern techniques like **image sprite and CSS rollover**. The first technique is the use of a single image file which contains all the pictures used as decoration on the website. The aim is to reduce the global file size of picture used because one large file is lighter than multiple files. Secondly, the loading time is reduced because there is only one HTTP request to the server. The server has one request instead of the number of picture. The project use only 18 pictures in 3 files, one file as logo and for the logo rollover (the logo is a link to the homepage), one file for the favicon (The picture to identify the tab in the browser) the last file for the pictures used as decoration. Logo's pictures have been treated as one. There are no other pictures because it's not necessary and there is a need to maintain the loading time as less as possible due to the possible weight of the content, in particular, the weight of animations. It's also possible to maintain easily each file, for example, adding one icon doesn't have consequence on the logo.

HTML principles has been respected: **unique title** for each page, language declaration with "**xml:lang="fr" lang="fr"**", which is different if you are on a page in French or English, the **correct charset** for French page (UTF8) in order to avoid accent problem. The "**lang="en"**" is used when English words are used in French page. It's available for software name or protocol name for example. "**em**" and "**strong**" tags are used instead of "**i**" (italic) and "**b**" (bold) to add the semantic of

“important” and “very important” for the content. The tactic used is to put the “em” tag for each special vocabulary, which can correspond to a single glossary entry and the “strong” tag to highlight important concepts (salience effect).

There is no text which is no between tags. For example . So it’s possible to control the appearance of all the content, visible or invisible, by using CSS attributes in a separated sheet. The website use 3 CSS sheets: one as reset (From Meyer: http://meyerweb.com/eric/tools/css/reset/), one for screen usage, with the ambiance designed at the design stage, the last for **print**, which keep only the content. For this reason, the “fastaccess” “div” tag has been created. It adds nothing but just the ability to hide the text on the top of the page when you want to print. The print CSS use a special tip to display real links (the “href” attribute) instead of the text of the link. For example “http://www.website/link.html” instead of “click here”.

You can navigate through the website using "**Skip to content**" and "**back to top**" button, plus, you can press the "**tab**" key to go on each links in a page. The tab key provides the same result as if the mouse cursor focuses on a link. Each link and title have a title information in the tag to help the accessibility. 5 access keys have been defined too to go on specific page like the homepage or the sitemap. Some links like the glossary link on the homepage is open in a new tab. That’s better to don’t lose the learner from his “active” page.

The hand-writing generated picture has been abandoned because the result was absolutely ugly and consuming. For a better result in this way, more time is needed (and a real artistic sense for doing something simple and beautiful!).

The last update date has been added on the homepage because there is price information in the cost and performance chapter. Description, keywords and author meta tag exists like a real website even if those tags are obsolete for Google. Yahoo! Use those like Bing but it’s not as important as the beginning of the Web for Search Engine Optimization (SEO). The outdated robots meta tag is not used, just “personal” meta tag. The natural referencing and the sitemap are ideal, plus, the website goal doesn’t have to appear first on Google but much more to serve as lecture support.

3.3 - Learning elements

To reach the website goal, learning what a NAS is, some elements have been developed.

- Each Web page can be print, and the printed document is a **paper version of the article**, without the header, the navigation bar and the footer. Only what is important is printed.
- The **tone** of each article, and the scope of each concept reach the learner level in front of computing. For example, a specific word is explained in the text, if not, there is the glossary. The text has been written with an accessibility of the content strategy for everyone, without going too much on the glossary. Also, the text tries to be confident to the learner, like a blog approach. The text looks less formal and can be integrate much easier by learners. Also, the more you read, the less jargon words are explained, because it consumes lots of space in the page without adding elements for the learner.
- In order to explain all the different types of RAID levels, **Director animations** have been created. A typical summary of an animation is, first, by explaining how the controller works, then, how a file is copied on the RAID array. After, what is the problem when there is a hard drive crash and how is it possible to solve the problem. A quiz is provided to see what his

specific RAID level implies, for example, a maximum number of hard drives, in general, something directly linked to a NAS choice. If you click on the bulb, you will have a little text about what is important to remember. Animations have the same presentation to not disturbing the learner.

- For the moment, only one **test** is presented to the learner at the end of a module (beginners or advanced users), but, in the future, the goal is to provide a list of tests, one general (like now) and one for each chapter, with a link between the chapter and the test. The advantage here is to give a global view of concepts which needs to be learned. And that is easy to maintain too! Tests are made using the freeware **Hotpotatoes**. It allows a gain in time for the developer and the teacher, the software can be configure and personalized in many way, here, questions and responses can change their position to avoid the use of the learner memory instead of reflexion.
- Learners need support, so a **chat** is implemented. The motor of the chat is an open source product, **phpFreeChat**.
- In general, **text and pictures** must be choosing with accuracy, according to the learners capabilities to understand (decode) it. The right amount of text needs to explain a major part of the subject, deleted (or not present) text explain details which are not good for the best learning experience.

3.4 - Problems (not technical)

During the implementation phase, two main problems have been discovered:

First, **prerequisites**: Even if the website has a beginner's part, it's difficult to have the right tone. Each jargon word can be something to explain. So the glossary is big, and the subject speech is hard to introduce. This will be a strategic point during the next phase, evaluation. That type of problem has consequences: for example, does a hard drive need to be defined as well as his functioning?

The second is the **quality and relevance** of testing advanced users. How is it possible to really judge the effectiveness of the website? The nature of the subject imply that the effectiveness is to judge if advanced users have taken the better option as possible suited for their needs. It's highly difficult and can be a source of subjectivity. And it probably can't be done online, by a technologic tool, but perhaps only in face to face. The only one reason of a test here is to measure the advanced users' level (Applying in the Bloom's taxonomy!). That point has been missed during the design phase due to a focus on the beginners' part.

Then, the implementation duration is more than planned due to a too ambitious project. There are 2 parts, in 2 languages and a well tough content to generate using multiples technologies! There is a delay of approximately 2,5 weeks on the planning.

3.5 - Screenshots

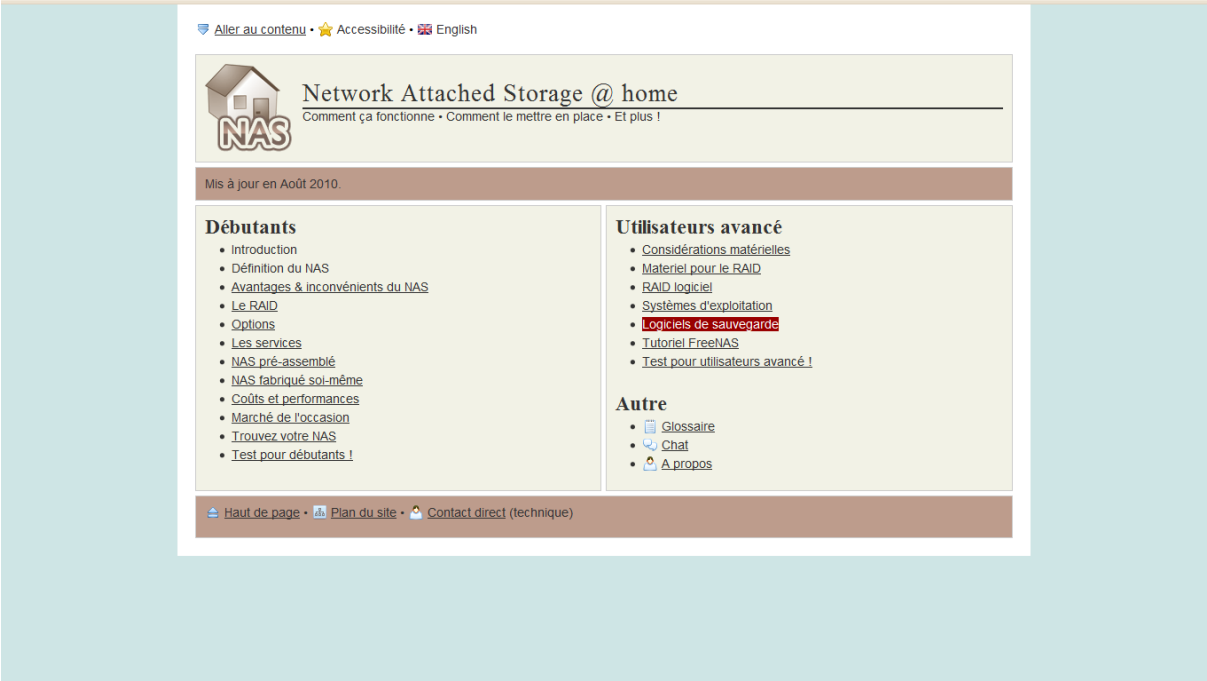

Figure 16: The homepage in French with a link highlighted using the tab key. The content area is warm and the outside is cool. The general style is clean and sober.

Figure 17: A page like it can be viewed on screen.

Les logiciels de sauvegarde

Si mettre des disques en RAID est un bon moyen de sauvegarder ses données et suffisant dans un boitier NAS, il est préférable d'utiliser un complément au système RAID. En effet, les grappes RAID peuvent quand même tomber en panne, les causes sont aléatoire, en général, il s'agit d'une mauvaise reconstruction suite au crash d'un disque ou de l'OS, ou encore d'une surtension sur l'ordinateur contenant la grappe. Les données sont essentielles, il est donc recommandé de faire des sauvegardes régulières au cas où la grappe RAID tomberait en panne. Le moyen le plus simple reste la synchronisation entre la grappe RAID et un disque dur externe par le biais d'un logiciel, intégré, ou pas, au NAS.

Les avantages du logiciel de sauvegarde:

- Sauvegarde incrémentielle.
- Souplesse d'utilisation.
- Portabilité des sauvegardes sur un autre ordinateur.
- Planification des sauvegardes (gestion des versions).
- Simple à mettre en œuvre.
- Sauvegarde sur FTP.
- Pas de machine dédiée.

Les inconvénients:

- Sauvegarde incrémentielle, la sauvegarde ne contient pas les derniers documents ajouté, modifié ou supprimé.
- Risque plus grand de bug critique.
- Limité à un système d'exploitation le plus souvent.
- Confiance aveugle sur le fonctionnement interne du logiciel.
- Nescésite de l'espace disque en plus, équivalent à ce qui doit être sauvegardé.

Les logiciels:

Il existe un logiciel intégré à Windows XP: *NTbackup* qui se révèle simple et efficace. Ce logiciel est présent également sur la version home de Windows XP mais n'est pas installé sur le disque dur, il faut aller le chercher sur le CD d'installation de Windows pour pouvoir l'utiliser. L'équivalent Windows Vista se nomme *WinBackup* quand à Windows 7, plus récent, propose un outil de sauvegarde intitulé "Sauvegarder et Restaurer" dans le panneau de configuration.

Des logiciels gratuit et/ou open source existent. Les plus renommé sont ***Cobian Backup*** (http://www.educ.umu.se/~cobian/cobianbackup.htm) et ***Backup PC*** (http://backuppc.sourceforge.net/). Un tutorial est disponible **chez Malekal** (http://www.malekal.com/tutorial_CobianBackup.php) pour *Cobian Backup* et sur **Ubuntu-fr** (http://doc.ubuntu-fr.org/backuppc) pour *Backup PC*. Ces 2 logiciels sont très performants et souples. Il est possible de créer plusieurs profils de sauvegarde, sur différent systèmes d'exploitations, en réseau et à travers Internet !

Un logiciel plus léger comme ***FullSync*** (http://fullsync.sourceforge.net/) peut également suffire, c'est un un logiciel libre, multiplateforme et simple d'emploi.

Du même genre que FullSync, il existe ***SyncBack Freeware*** (http://www.2brightsparks.com/downloads.html#freeware), qui peux donc synchroniser des fichiers entre ordinateurs, stockage externe (clé USB ou disque dur), lecteur réseau et serveur FTP. La synchronisation peut être uni ou bidirectionnelle, manuelle ou planifiée... Il est plus complet que FullSync et gratuit, mais il n'est disponible que sous Windows.

Astase développe les logiciels payant, *Ultrabackup* et *Ultrabackup Netstation*. Plus utile dans les environements professionels

"Plusieurs postes à sauvegarder dans un réseau local ou Internet? *UltraBackup NetStation* centralise le stockage des données tout en permettant aux clients de gérer librement leur stratégie de sauvegarde. Installez le serveur sur un ordinateur auquel est attaché des périphériques de stockage fiables (serveur de fichiers, système RAID...) et déployez le client: le réseau de sauvegarde est créé."

Figure 18: The same page like it can be printed. For making this screenshot, the print CSS has been used as the screen CSS. A A4 printed page look like that but at the A4 format, with a content adapted to page margins (Float and not fixed) and typical information as the page number, title and URL.

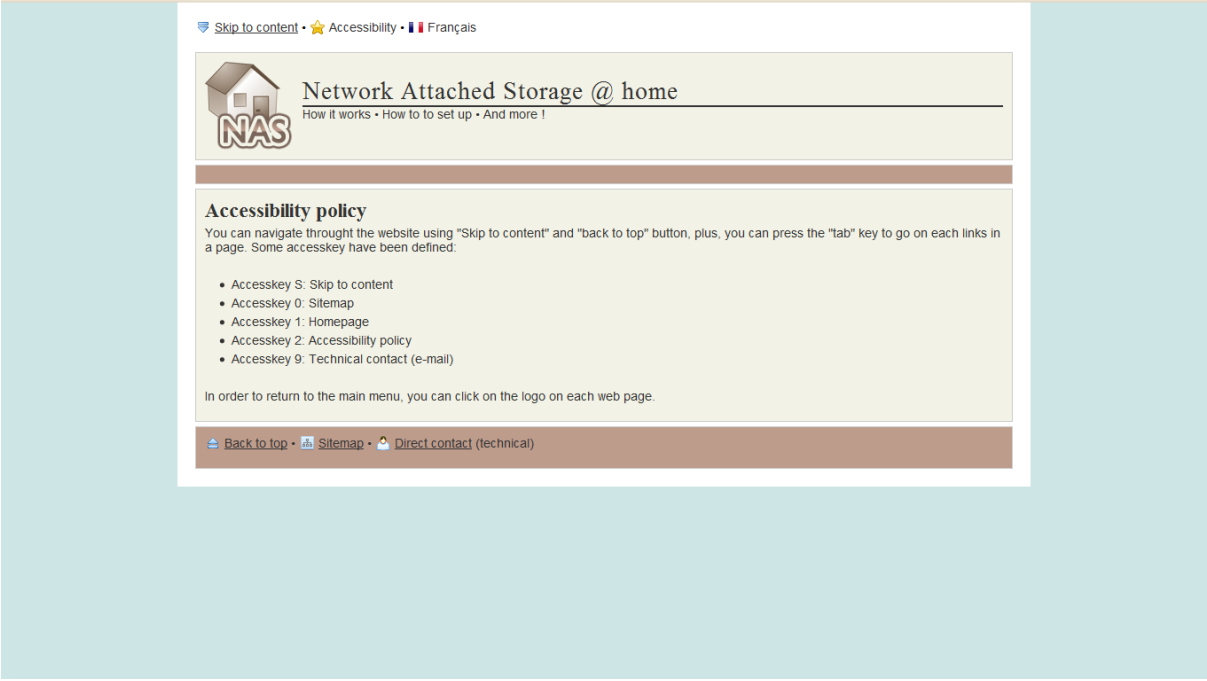

Figure 19: The accessibility page in English. The menu bar is empty and exists to separate the header from the content.

4 - Evaluation

The evaluation parts have to evaluate the effectiveness of the tool, so here, a website, on learners. The method that will be used in this part is:

- A **theoretical analyse** of the implementation with regards to the theory explained in the first chapter of this paper.
- A **learner test** based on the previous analyse (like an interview, after learners use the website).
- **Results and comparison** between analyse and users tests.
- **Conclusion**: A list of points to improve for a better effectiveness.

The conclusion will evaluate if the course if efficiently given or not too.

4.1 - Theoretical analyse

4.1.1 - Bloom's taxonomy and instructional design model.

The implementation phase has identified 2 problems. The first is the **prerequisites** problem. It's close to the analyse of who learners are and what characteristics they have. That implies to start by a basic definition of NAS but also by an environment discovery (Here, why is it important to save on multiple supports). The second is the **quality and relevance** of testing advanced users. In the bloom's taxonomy wheel available on Wikipedia (available in the appendices chapter), they are key words like: organize, generalize, produce, choose, solve, draw, apply… for the applying level. But the most obvious way to know if it's the case or not is to give materials to an advanced user and saying to him to build a NAS. Quiz, both for beginners and advanced users are designed to evolve and be much more relevant with the time. But a **practical test**, which is a basic at school, can't be envisaged for a website which is as for learning as informational. So perhaps, users' needs live face to face help. It's possible to suggest more interactive elements to test users in other way because a quiz is limited and correspond to a single way to learn. Also, the applying level needs to make the difference between **theory and practice**. And for the moment, there is no feedback on the website, no feedback can be read by learners, and no system is present to put feedback on it. This system can be a forum for example. Chat is interesting but can only be used to ask a question without be classified and review by others. To help in the remembering phase, some content have been highlight using "em" and "strong" tag, the effectiveness on learners needs to be evaluate.

4.1.2 - Learning styles

The website is not plenty of pictures due to the size that big amount can have when loading a page. And content pictures are limited to 200 pixels height (with exceptions) that is no sufficient to give details for visual learners. A slideshow in Flash of FreeNAS Screenshot was provided to help understanding how it works with more details, but in order to rest clear, the slideshow is a 1366 x 768 animation for a little more than 3MB, which was accessible only for broadband usage. The idea has been abandoned because the resolution is too high for a normal page, screenshots are now delivered as pictures (PNG) in a compressed file (ZIP).

The **activist** will probably try FreeNAS, even if it's a beginner, because he needs to try to understand. Explanations on the tutorial page can be completed with online materials. And he will do that with

no doubt because FreeNAS, which is based on FreeBSD, have a poor support of drivers and have graphically change. The next NAS distribution made by the same guy as FreeNAS is Linux based (Debian). So it's seems that support, to discuss about real problem have to be implemented. A forum appears to correspond with potential needs.

Also, **lectures are typically** passive (Susan M. Montgomery), so the website is made for enthusiasts' people, because there is a lot of text, and the appearance of too much text is boring. A good solution is perhaps to add video, to make text a **podcast** or to provide Powerpoint with sounds, many pictures and less text.

We can see in others types of learning linked to multimedia and learning, a lack in every positive aspect, putting in evidence (they learn best actively, lectures are passive, they are sensors, teaching is intuitive, they are visual but lectures are verbal). The only one negative aspect is that students are less global than we can think and teaching is focus on the "big picture"! All the aspects in modern teaching appear to be the contrary of student's needs. So it's difficult to say if the "**big picture**" represented by the menu is useful or not. Perhaps advanced users will no choose the "advanced users" section first, but will begin by the "beginners" section.

Plus, the website is **static**, a first page with news in the NAS world can be interesting. The website, with this approach, is less formal even if static page are here as learning support. Or the website is an offline course (but there is PHP on it).

4.1.3 - Personas and alternatives

The website tries to indicate a NAS solution by using personas. A fictitious person who has needs which corresponding to a particular choice. The number of personas is limited but try to reflect all the different possibilities of solutions (the NAS solutions are limited, not the needs). Examples given on the website are the same as given in this paper at the design stage. The goal of the evaluation is to see if personas have added information and are well choose, or, on the contrary, need to evaluate (more personas, more needs cases). **Sensing beginners learners** are the perfect target for this type of evaluation. They don't really know what a NAS is, so they feel it, and they don't really know how it works, so they will compare easier using personas. Also, **reflective learners** will have more elements to deal with when they want to choose a NAS because they have a better global view of the possibilities, of the market, on the needs.

4.1.4 - Multimedia

The principal element of a NAS is its capacity to maintain the data integrity. It's done by using different RAID type. Over 6 RAID types presented, 3 have an animation, and 2 are not recommended for a data integrity fault. The others are explained with pictures, and in general on the website, there is only pictures and text. The website is ambitious, the aim is to explain what a NAS is and the really end goal is to help people choose their solution and have knowledge in Information Technology (IT) in general. Making multimedia elements for this project is too ambitious with the according time, but the way is open to improvements. For example, if a podcast is interesting, a **videocast** can be interesting too. Universities in United States of America (USA) have given Ipod (portable music player) to their students, it's possible to assist MIT or College de France lectures online. The benefit of those solutions needs to be proposed and evaluated to learners.

4.1.5 - Technologies

The worst aspect of this website is the use of **proprietary technologies**, Flash, for the FreeNAS slideshow and Shockwave for RAID types animations. The problem to evaluate is the animation accessibility, is Shockwave refrain learners? There is not too many possibilities to do animations. The goal was to include picture that learners can base their reflexion on but if animation is rebuilt (using Flash for example), the use of modern vector graphics can participate to a better immersion in the subject, with a consistent graphics NAS set for example.

The use of Javascript and **Web 2.0 techniques** can add interactivity but there is not a lot of element which can be modified. The most obvious is the pictures treatment. They are small, by clicking on it, it's possible to have a nice effect of zooming (a big picture appear) on a dark background.

4.2 - Learners tests

The learner test will be done in 3 times for each category of learners. The first time is an observation of learners using the website, the second is a questions list they respond. The previous analyse has identify possible ways for making improvements, the next step is to give the maximum of improvement subjects to the learner. The last one is a live face to face meeting (it's optional for the second step, and the first step can be done with a limited number of learners because of the study limited resources.

This test is designed to measure the effectiveness of the website as well as the observation, which is complementary as the MCQ include in the website for each learner types.

The previous part (4.1) let us a list of questions to ask itself based on the first chapter of this paper. (AB) before questions corresponding to questions asked for beginners and advanced users, (A) concerns advanced users only.

(AB) Are you interested by a NAS ?

(AB) Do you think you have understood what the NAS environment is ?

(AB) Can you remember some important concepts ? Can you give an example (or more) ?

(AB) Do you think graphics document has helped you ?

(AB) Do you think that chapters have a good quality ?

(AB) Have you a precise idea of what a NAS is ?

(AB) Do you think you need more advise to choose a NAS ?

(AB) Do you feel comfortable with the amount of information ?

(AB) Do you think a forum would be appreciated ?

(AB) Do you think you will enjoy a podcast or a videocast for each chapter of this website ? Do you need more (video, Powerpoint presentation) to download ?

(AB) Are you interested by news about NAS world ?

(AB) Do you think this website is modern? Have you suggestions to improve it ?

(A) Have you started directly from the advanced users menu ?

(A) Do you think you can make your NAS yourself using explanations found on the website ? Do you need more ?

(A) Do you think you need face to face help or do you feel comfortable doing that alone ?

(A) Do you think you need more details ?

(A) Will you try to see on another's websites information about how to build a NAS ?

4.3 - Results

4.3.1 - General

Some questions where generals, but sometimes, details have been added **orally** to give argument ways to the learner but always depending on previous argument given. There is no argument creation. For example, at the question "*Do you think this website is modern? Have you suggestions to improve it?*" a person have added details about website's background color, and ask a suggestion. When others asked for question details, the response was: "*in terms of graphics, pictures and colors, in terms of content, too much text or not for example*". Text was also an argument pointed.

Results let assume us a certain **consistency** and real difference between beginners and advanced users. Arguments look similar between people in the beginners group. The same effect is observed in the advanced users group. There is no communication between people during interviews. For two beginners' persons at least, there are more than just responses to questions but also suggestions on the website, about their experience, which give precise details on their view on subject. For example, one of them don't have seen a hard drive before and have confused hard drive and magnetic tape drive. Also, she doesn't have seen an opened hard drive and this is what the source of the mistake was. She has seen external hard drive previously so she has identified the magnetic tape drive as it because it looks similar.

This experience is really great because precise points have been identified as **source of errors**. So, before questions, a general feedback was demanded, it was optional. This feedback is as well written (on real paper) as well as orally (voice or instant messaging for people far). Approximately the half of the learners have given their opinion with precise points, others have. Feedbacks have been much more complete and precise by beginners than advanced users. The main reason is that advanced users have really less problem in computing and are accustomed to self-help (using Google in case of jargon).

After feedbacks and questionnaire, modifications have been made only on **spelling**, and mainly for French pages. Suggestions have been noted but not applied.

Pages have been viewed, test too. It appears that each **Multiple Choice Question** (MCQ) was interesting for people, they enjoy test their knowledge and see responses. That part is a success, the test was not aggressive and that is a key aspect and much better, it was an **element of comparison** between students with funny anecdotes. They have just seen a link to the general test on the test page and one people have asked the question why just one. The response, which is because there will be a list of tests in the future on chapters topic was accepted and validated (asked during feedbacks).

At the end of learners test, one missing point has been identified. Because the original objective was to make a website in French for French learners, the English version was just an **administrative** version done to be understood by supervisors and university's examiners. The objective doesn't have change, mainly because there is a lack of English learners in the project environment. But points need to be revise and/or taking into account: the content is the same as in French so if the text is, in general, understood and correct for French people, we can assume that there is no reasons for what the content is not adapted for English users. Only few elements can be a problem: pictures for the FreeNAS tutorial are in French, links for help too (the targets are French websites) and prices are in Euro. These elements can be disturbing but are normal for French people who have a lot's of help with links on English content.

Another missing element is the chat, which just has not been used by learners and they don't have talk about it. We assume that this type of tool is used and efficient when there is a large audience.

Another point is the **learner panel**, it's mainly young people, a large part is from 25 to 30 years old. It's concentrate. Only 2 persons between 45 and 50 years old have been tested. These persons were considered as beginners but it seems that even the beginner's part is too advanced for one of them. We assume there is an age limit to understand this course. And it's not really a problem of prerequisites but more a cultural problem in computing. Young people are now called "digital native", it seems that is an advantage. The age limit doesn't affect people aged over 30 years if they are in contact with technology at their work.

An announce was send by mail to learners with the link of the website on the Glamorgan's web students server. Then, each interview takes between **20 and 30 minutes**. All people interviewed were interested by a NAS after the presentation. Some beginners have been enthusiasts about their possibilities.

4.3.2 - Beginners

Negative aspects: In general, lacks are about the use of **jargons** which is difficult to explain, which is too conceptual, virtual. The glossary is an advantage to respond to that but need to be more accessible, integrated. A technical solution can be a **tooltip**. The integration of that feature was planned but the result was not perfect, not in term of graphics but in term of usability.

Also, chapters are well done and clear but the use of jargon in technical chapter, like RAID 5, refrain learners. This chapter seems to be particularly **complicated**, they need to read it twice to understand. Plus, the link between RAID concept and NAS definition is not clear for one learner. But it's explained in the text. Highlighted elements have to change here, RAID is "in" the NAS, they can think the reverse… Orally, the comparison with an external hard drive seems to be clear, because they have one at home, it gives an idea of the size, the consumption,...

The RAID chapter use animations which not working without a plugin, this plugin was installed on all computers except one running **Linux**. The Ubuntu 10.04 workstation (a popular Linux distribution) doesn't provide compatible software though the "software center" to watch Director's animation, only flash. The RAID page is a little long to load too, the page comes with a black background during 5 to 8 seconds approximately before displaying the page. Animations are not loaded so it's probably the plugin which have a time to load.

Another negative aspect is the **concept concentration**. There are 3 domains: usages, services, security. The "usages" domain is general, it's about behavior linked to NAS type (Personas). Services

are the technical response to usages, and the use defined jargons is done as well as possible but there are lacks in definitions. Jargon definitions appears disconnected to the subject.

The last negative aspect was the **spelling**. There is always errors, this this the only one thing which have been fix during learners tests. They can read a text with too many mistakes without be disturbed.

Positive aspects: It seems beginners have **understood** what a NAS and the NAS environment (software, hardware, this network position) are but need probably help to configure and use it. They don't feel comfortable choose one but have an idea of what NAS type they want and for what price. Personas examples and NAS type was successful. A major part of beginners have **2 views** of the NAS world, one **virtual**, which concern possibilities, and one **visual**, which concern the physical aspect. The difference between them is understood (software versus hardware). All beginners have returned a correct and very complete definition of what a NAS is. So, that there is security and services and that why a UPS is recommended. But all definitions returned where **general** too, without technical aspect like RAID.

The volume of text is correct, information's are well organized, and chapters introduce a great way to learn. The **navigation bar** has been used correctly as well as the logo as homepage link. There is no navigation problem. Simplicity is an asset.

Animations made with Director have been read by learners' panel running Windows (Vista and Seven). The **JBOD RAID level** is a little difficult to understand but RAID 1 and 5 have been appreciated. The ending MCQ was less popular than "global" MCQ because there is only one question and because there is no results to compare with others! Animations are light.

The chat was not used but videocasts (similar as podcast but using video) and a **forum** will probably be appreciated. A forum, it's in case of technical problem and to share opinion about was suits the best to needs, as complementary source of information for the website. **Videocast** is also interesting to see products, how to configure services, how to assemble components… Podcast are not useful for them, they said that to read is more efficient. Another tools have been discuss, around news and **website update**. A blog can be great as first page, with the possibility to subscribe to the RSS feed. More classical, a newsletter can be established.

Observation: Responses are consistent. 3 people have made the suggestion to use **funny elements**, or a funny way to explain complex concepts. One of them says: "*Like the TV show "C'est pas Sorcier"*.", a French TV program which explain scientific subjects to children. Also, if the website is simple, the first appearance is described savorless, without elements that attract attention, a little boring.

4.3.3 - Advanced users

Negative aspects: For one learner, the layout is too large. Also, he prefer to have the content in the animations displayed in HTML, not because of the animation format but because he likes to read from the top to bottom. He don't like the blue background, his suggestion is to change it into **white**. He sees blue as a background color by default. This suggestion has been proposed to others learners, both beginners and advanced users. They have approved it. It's not a big change but the website return lighter to see. It allows information to be printed too. For another one the FreeNAS tutorial is too long but it's acceptable due to pictures.

One has **started directly** by the advanced users menu. He takes a look to each chapter one by one and then do the advanced users test. He has finished by doing the beginners test “for fun”. He was confused on how a NAS can be chosen. A lack has been identified in the content. Advanced users are considered as people who will make a NAS homemade. But alternatives are explained in the beginners’ part. So the usage/price/performance ratio is not clear because pre-assembled NAS can be a solution in front of a homemade. And depending on budget, they can be a better choice.

Figure 20: Test with a white background.

Positive aspects: All the content, navigation and information are understood. There is no problem with jargon and the glossary seems to be efficient. They think the subject is **well thought** and the security aspect is global, with hardware and software solutions (and user behaviour) reviewed. They know what the environment of a NAS is and the project has added details. One of them said it’s not possible to be a bible on a subject, it’s not compatible with the learning goal. They like the fact that the website is **sober**, without flashing elements, gif-advertisement, 2 columns. Without these disturbing elements, learners are **concentrated** on the content.

4.4 - Evaluation conclusion

The overall vision of NAS environment is clear, the course is complete. Animations and test are successful but the website needs **more attractive elements**.

For beginners, the website can be improved to be more accessible, with **less jargon** and a **prerequisites** part. For advanced users, there is just the need to be update with more hardware opinion for a homemade NAS.

For both, a forum will be appreciated, that can be interesting in order to keep a formal (but with funny parts) website oriented learning with commercial aspect in the forum. A “problems encountered” page can be made with **generic solutions**. For specific problems (linked to a precise commercial NAS, hardware component, operating system or service configuration), the forum is

perfect. The chat will probably be abandoned if it’s not used at large scale, or integrated to the forum.

The menu is a turned as a "**big picture**" and the effect is working well.

The original navigation has been changed a little and there is absolutely no negative feedback about it. It's a success, people can navigate easily and have understood the concept that chapters need to be viewed one after one.

People have discovered devices features orally, like on TV. They just don't use multimedia and network capabilities of modern televisions. Also, one said: "It's fantastic, there is a USB plug in my modem-router i don't need a NAS to share pictures over the Internet!"

People are activist for this type of subject, and it's the better way to learn. A simulation can't be as complex as the reality and a local network show us the result.

Personas are a key concept for success too. Beginners are really sensitive to it. Personas are confident to the learners, this is why it works on beginners. Reflective learners have a better global view of the market.

All MCQ tests were **over 60%**, with a minimum at 62 and a maximum at 87. MCQ are really great and nobody says they are basic, just the result is interesting. Questions responded are complete, full of details.

After a **certain age**, the subject is obscure. A beginner doesn’t learn too much, he has to go back on the document when needed, the subject appears too theoretical. They don't remember even the product type name days after! There is no official feedback, the observation was just made orally, each page has been read by the learner and re-explained orally.

5 - Conclusion

Learning is a complicated process. There is no one way to learn. A course has to be designed to respond to a maximum of learning styles. To be complete, it also needs different views on the subject.

This project has put in evidence that the important part is the content over the presentation, but the presentation has to not disturb the learner. A learning project has to be well written and this task is consuming. For this project, 2 weeks of pure text writing is just necessary to cover the subject but without details.

A website can be effective for people who have to be at the “remember” and “understanding” level on the Bloom’s taxonomy. The effectiveness of the “applying” level can be done using animation for “virtual” concept, like mathematics for example. Here, it’s not the case, a homemade NAS is a physical machine, and we assume a complex animation, which emulates a NAS interface, can do a great job. But the realization of this type of animation is consuming and can be totally deprecated in a short time. FreeNAS for example, is changing his web interface and a new operating system realize by one of the FreeNAS contributor based on Debian (Linux) is promising. If this new operating system become popular, the FreeNAS animation is less interesting. Also, a perfect animation has to emulate errors and multiple configurations. A real simulation is better, FreeNAS can be tested on old computer or by the intermediate of a virtual machine. But the aim of this project is not to explain how a virtual machine works, and it’s not simple to explain this concept added to the NAS concept without be confused. In fact, for testing the applying level, the only method available is to have a face with a teacher during a tutorial, like at the university. An online exercise is not adapted.

An observation phase is needed to understand where problems are. During the interview just after, it’s advised to takes their first impression. A fixed problem (comprehension) allows a better efficiency of the evaluation itself.

For my part, I think this project is too ambitious for the accorded time so it was impossible to optimize all the learning aspects as expected. There are 2 parts, in 2 languages. The most important thing to remember for me is that there is no one way to learn and it’s difficult to respond to each aspect of learning theories and learning styles. The most obvious thing is that the more there is way to learn, the better is it, but the most difficult is it too. People have to learn a subject with different regards on it, in different way to appreciate all the subtleties and thought, experiment, try new things. It’s consuming to try to respond to each side alone, a team can do a better job.

Technically, the work is to maintain an accessible course, and course is not only a website, at the university, a course is the content of a lecture plus a practice, which is hard to give to my target. Learners don’t have to feel they learn.

And, about learning, it’s really hard to maintain a consistency in the writings, there is a good job done here but hard to evaluate. The conclusion here is that the most I write with learning objectives in my head, the most writings have a good quality.

Personally, I was expecting results, now, I have a better idea on how learning works and the amount of work needed.

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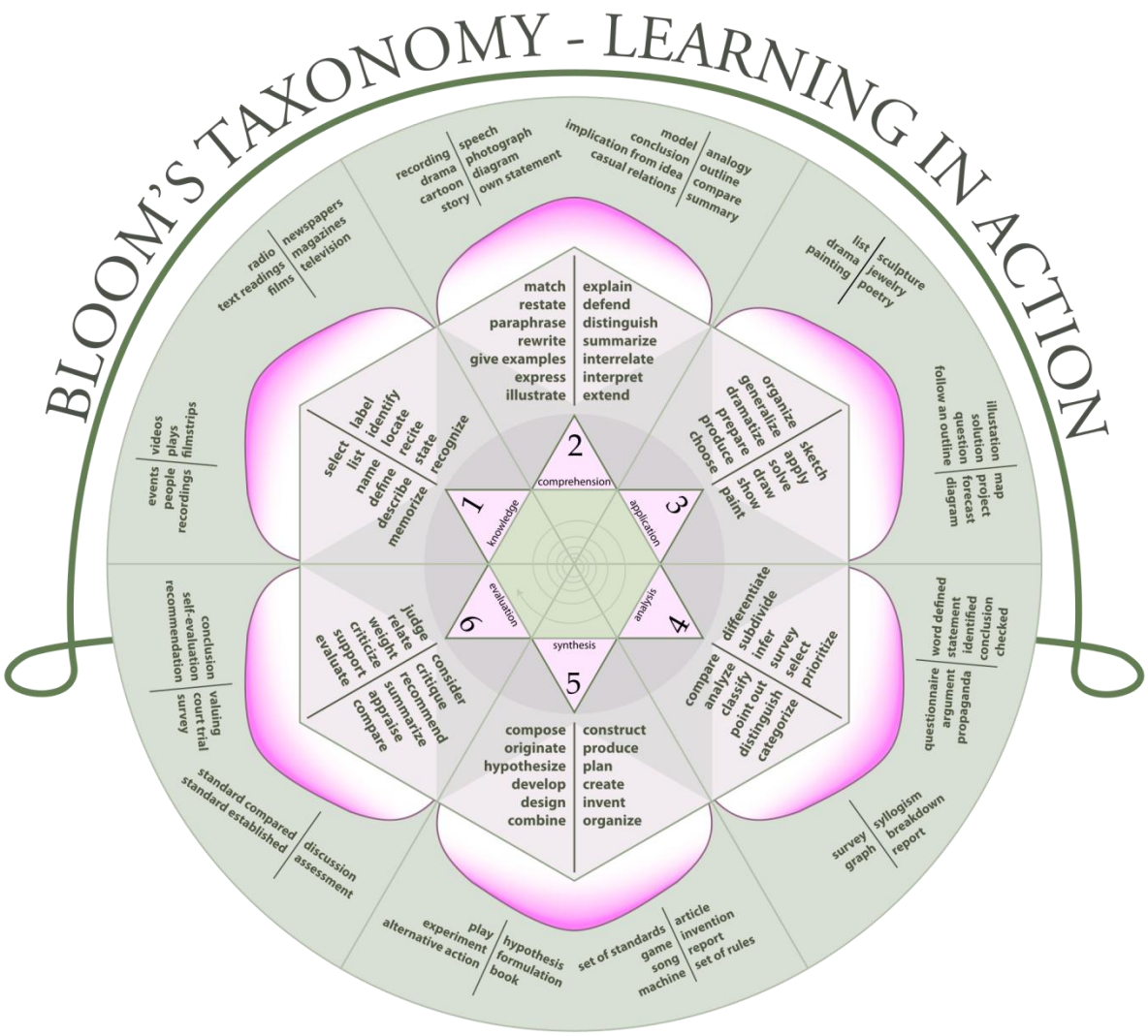
7 - Appendices

7.1 - Materials

7.1.1 - The Bloom's taxonomy

The Bloom's Wheel, according to the Bloom's verbs and matching assessment types. The verbs are intended to be feasible and measurable.

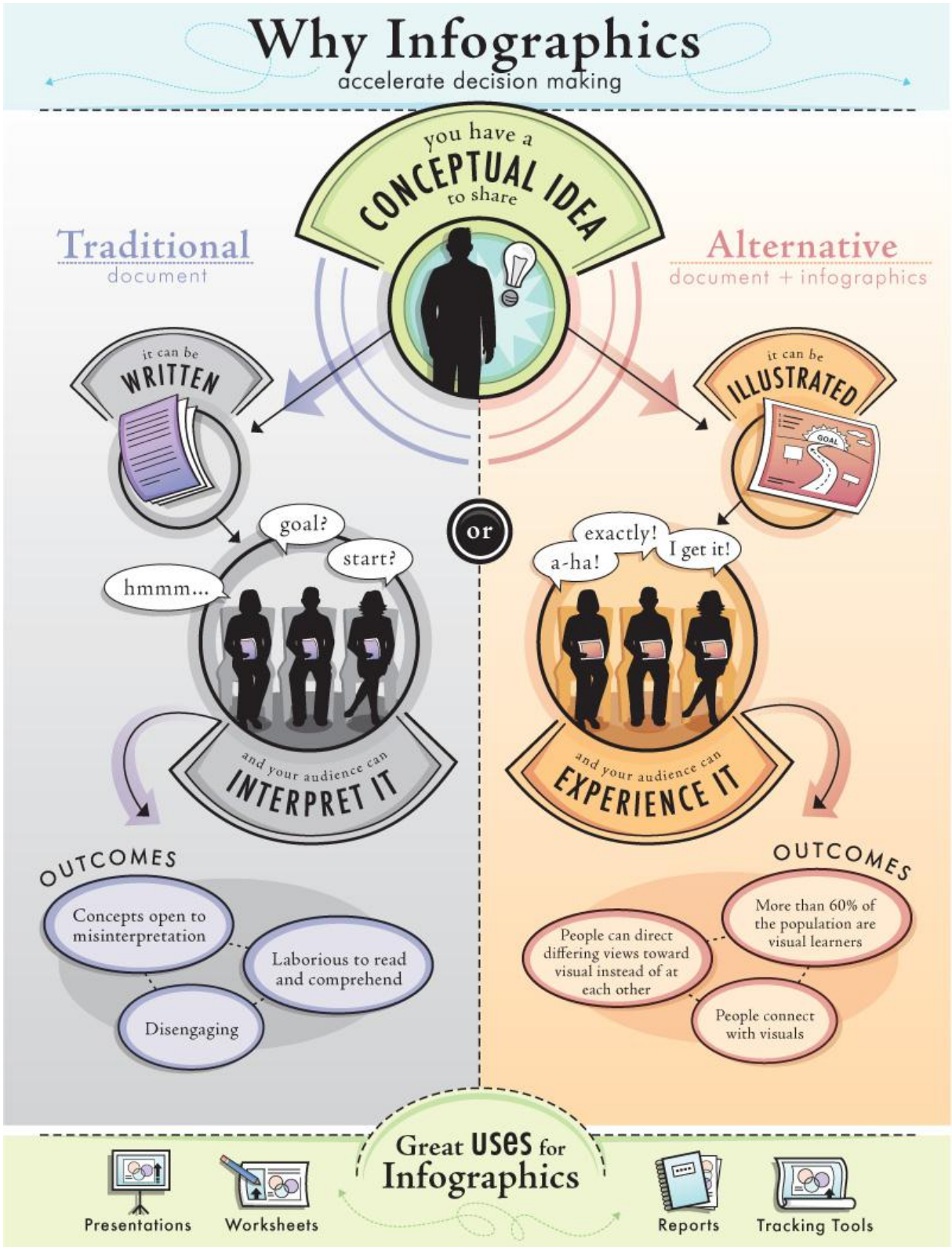


Text and picture taken from: http://en.wikipedia.org/wiki/Taxonomy_of_Educational_Objectives

This material is helpful for creating stuff during the implementation part of the project. Especially words associated to Bloom's taxonomy levels. It's an inspiration source when you want to create multimedia stuff.

7.1.2 - An infographic on the use of infographics

By Rick Mans, source: http://rickmans.posterous.com/an-infographic-on-the-use-of-infographics



7.1.3 - Questionnaire in English

(AB) are questions for beginners, (A) are questions for advanced users only.

(AB) Are you interested by a NAS ?

(AB) Do you think you have understood what the NAS environment is ?

(AB) Can you remember some important concepts ? Can you give an example (or more) ?

(AB) Do you think graphics document has helped you ?

(AB) Do you think that chapters have a good quality ?

(AB) Have you a precise idea of what a NAS is ?

(AB) Do you think you need more advise to choose a NAS ?

(AB) Do you feel comfortable with the amount of information ?

(AB) Do you think a forum would be appreciated ?

(AB) Do you think you will enjoy a podcast or a videocast for each chapter of this website ? Do you need more (video, Powerpoint presentation) to download ?

(AB) Are you interested by news about NAS world ?

(AB) Do you think this website is modern? Have you suggestions to improve it ?

(A) Have you started directly from the advanced users menu ?

(A) Do you think you can make your NAS yourself using explanations found on the website ? Do you need more ?

(A) Do you think you need face to face help or do you feel comfortable doing that alone ?

(A) Do you think you need more details ?

(A) Will you try to see on another's websites information about how to build a NAS ?

7.1.4 - Questionnaire in French

(AB) sont les questions destinées aux débutants, (A) sont seulement destinés aux utilisateurs avancés.

(AB) Etes-vous intéressé par les NAS ?

(AB) Pensez-vous avoir compris ce qu'était l'environnement d'un NAS ?

(AB) Pouvez-vous vous souvenir de concepts importants ? Pouvez-vous donnez un exemple (ou plus) ?

(AB) Pensez-vous que les graphiques (images) vous ont aidés ?

(AB) Pensez-vous que les chapitres soient de bonnes qualités ?

(AB) Avez-vous une idée précise de ce qu'est un NAS ?

(AB) Pensez-vous avoir besoin de plus de conseils pour choisir un NAS ?

(AB) Etes-vous à l'aise avec le volume d'information présenté ?

(AB) Pensez-vous qu'un forum serait apprécié ? (Ajout sur le site)

(AB) Pensez-vous que vous apprécieriez un podcast ou un videocast pour chaque chapitre du site Web ? Avez-vous besoin de plus (vidéo, présentation Powerpoint) à télécharger ?

(AB) Etes-vous intéressé par des actualités à propos des NAS ? (Flux RSS, newsletter, blog,… ou pas lié au site)

(AB) Pensez-vous que le site Web est modern ? Avez-vous des suggestions pour l'améliorer ?

(A) Avez-vous directement démarré depuis le menu utilisateurs avancés ?

(A) Pensez-vous pouvoir fabriquer votre NAS vous-même avec les explications du site Web ? Avez-vous besoin de plus ?

(A) Pensez-vous avoir besoin d'aide (face à face avec une vrai personne) ou vous sentez-vous à l'aise pour le faire tout seul ?

(A) Pensez-vous avoir besoin de plus de détails ?

(A) Allez-vous essayer de regarder sur d'autre site Internet des informations sur comment construire un NAS ?

7.1.5 - CSS code for screen media (complete)

The complete Cascading Style Sheet (CSS) code for the screen media (screen.css) :

```
@charset "utf-8";

* {
margin:0;
padding:0;
}

html {
font-size:86%;
}

body {
font-family:arial, helvetica, sans-serif;
font-size:1em;
line-height:normal;
background:#cee5e5;
}

#wrapper {
width:922px;
background-color:#fff;
margin:0 auto;
padding:20px;
}

#header {
color:#333;
width:900px;
float:left;
border:1px solid #ccc;
height:100px;
background:#f2f2e6;
margin:10px 0 5px;
padding:10px;
}

#logo {
position:absolute;
display:block;
width:100px;
height:100px;
background:url(images/logo.png) 0 0 no-repeat;
}

#logo:hover,#logo:active,#logo:focus {
background-position:0 -110px !important;
}

#logo span {
display:none;
}
```

```
p.subtitle {
margin-left:110px px;
left:110px;
position:relative;
}

#navigation {
float:left;
width:900px;
color:#333;
border:1px solid #ccc;
background:#bd9c8c;
margin:0 0 5px;
padding:10px;
}

#leftcolumn {
color:#333;
border:1px solid #ccc;
background:#f2f2e6;
width:436px;
float:left;
height:300px;
margin:0 5px 5px 0;
padding:10px;
}

#rightcolumn {
float:right;
color:#333;
border:1px solid #ccc;
background:#f2f2e6;
width:437px;
display:inline;
height:300px;
margin:0 0 5px;
padding:10px;
}

#content {
float:right;
width:900px;
color:#333;
border:1px solid #ccc;
background:#f2f2e6;
margin:0 0 5px;
padding:10px;
text-align:justify;
}

#content img {
display: block;
margin:15px auto;
}

#footer {
```

```
width:900px;
clear:both;
color:#333;
border:1px solid #ccc;
background:#bd9c8c;
padding:10px;
}

a:link {
color:#333;
}

a:focus,a:active,a:hover {
background:#900;
color:#fff !important;
text-decoration:none;
outline:none;
border-color:#900 !important;
}

a:visited {
text-decoration:none;
color:#333;
}

img {
border:none;
}

#menu {
list-style:none;
}

#menu li {
display:inline;
margin-right:1px;
color:#fff;
}

#menu li a {
text-align:center;
text-decoration:none;
padding:4px;
}

#menu li a:hover,#navigation li a:focus,#navigation li a:active {
background:#900;
}

p {
margin-bottom:10px;
}

p ul li {
font-size:medium;
}
```

```
h1 {
border-bottom:2px solid;
display:block;
font:2em "times new roman", times, serif, georgia;
letter-spacing:1px;
margin-bottom:0;
margin-left:110px;
margin-top:15px;
text-align:left;
padding:0 5px 0 0;
}

h2 {
font-size:1.7em;
font-family:"times new roman", times, serif, georgia;
margin-bottom:5px;
}

h3 {
font-size:1.4em;
font-family:"times new roman", times, serif, georgia;
border-bottom:2px solid #ddd;
border-left:10px solid #ddd;
margin-top:30px;
margin-bottom:10px;
padding-left:5px;
}

h4 {
font-size:1em;
margin-top:15px;
margin-bottom:5px;
}

#leftcolumn ul {
margin-bottom:10px;
}

#rightcolumn ul {
margin-bottom:10px;
}

#content ul {
margin-bottom:10px;
}

ul li {
list-style-type:disc;
margin-bottom:5px;
margin-left:30px;
}

ul li:hover {
list-style-type:circle;
margin-bottom:5px;
```

```
margin-left:30px;
}

ul ul {
margin-left:30px;
}

ol p {
margin-bottom:10px;
}

ol {
list-style:decimal;
margin-bottom:10px;
}

ol li {
margin-left:30px;
padding-left:0px;
}

table {
border-collapse:collapse;
margin:0 auto;
}

thead {
background-color:#ccc;
}

th,td {
border:1px solid #000;
}

td {
text-align:center;
padding:5px;
}

caption {
caption-side:top;
}

strong {
font-weight:bold;
}

em {
font-style:italic;
}

span {
text-indent:-5000px;
overflow:hidden;
}
```

```
dfn {
font-weight:bold;
}

#icons {
background: url(images/icons.png) no-repeat top left;
margin-right:1px;
margin-left:1px;
padding-right:8px;
padding-left:8px;
}

#icons.FR { background-position: 0 0; width: 22px; height: 16px; }
#icons.UK { background-position: 0 -32px; width: 22px; height: 16px; }
#icons.accessibility { background-position: 0 -64px; width: 16px; height:
16px; }
#icons.chat { background-position: 0 -96px; width: 16px; height: 16px; }
#icons.down { background-position: 0 -128px; width: 16px; height: 16px; }
#icons.home { background-position: 0 -160px; width: 16px; height: 16px; }
#icons.left { background-position: 0 -192px; width: 16px; height: 16px; }
#icons.list { background-position: 0 -224px; width: 16px; height: 16px; }
#icons.mail { background-position: 0 -256px; width: 16px; height: 16px; }
#icons.notes { background-position: 0 -288px; width: 16px; height: 16px; }
#icons.print { background-position: 0 -320px; width: 16px; height: 16px; }
#icons.right { background-position: 0 -352px; width: 16px; height: 16px; }
#icons.sitemap { background-position: 0 -384px; width: 16px; height: 16px;
}
#icons.up { background-position: 0 -416px; width: 16px; height: 16px; }
#icons.user { background-position: 0 -448px; width: 16px; height: 16px; }
#icons.user2 { background-position: 0 -480px; width: 16px; height: 16px; }

q {
font-weight:bold;
color:#900;
font-style:italic;
}
```

7.1.6 - CSS code for print media (extract)

The partially Cascading Style Sheet (CSS) code for the print media (print.css) :

```
body {
font-family:arial, helvetica, sans-serif;
font-size:1em;
line-height:normal;
background:#fff;
}

#wrapper, #content {
background:#fff;
width: auto;
border: 0;
margin: 0 0%;
padding: 0;
float: none !important;
text-align:justify;
}

#fastaccess {
display:none;
}

#header {
display:none;
}

p.subtitle {
margin-left:110px px;
left:110px;
position:relative;
}

#navigation {
display:none;
}

#footer {
display:none;
}

a:link, a:visited {
color: #900;
background: transparent;
font-weight: bold;
text-decoration: underline;
}

a:link:after, a:visited:after {
content: " (" attr(href) ")";
font-size: 90%;
}
```

7.1.7 - HTML code, backup software page in English (complete)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xml:lang="en" xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<meta name="description" content="CS4T01 2009 v1 - M.Sc. Project">
<meta name="keywords" content="Network Attached Storage, NAS, FreeNAS,
RAID">
<meta name="author" content="Benjamin Goupil - 07209525">
<link rel="shortcut icon" href="images/favicon.png">
<link rel="stylesheet" type="text/css" href="reset.css" />
<link rel="stylesheet" type="text/css" media="screen" href="screen.css" />
<link rel="stylesheet" type="text/css" media="print" href="print.css" />
<title>Network Attached Storage @ home - Backup software (EN)</title>
<script type="text/javascript"
src="lightbox2.04/js/prototype.js"></script>
<script type="text/javascript"
src="lightbox2.04/js/scriptaculous.js?load=effects,builder"></script>
<script type="text/javascript" src="lightbox2.04/js/lightbox.js"></script>
<link rel="stylesheet" type="text/css"
href="lightbox2.04/css/lightbox.css"/>
</head>
<body>
<div id="wrapper">
<div id="fastaccess">
  <p><span id="icons" class="down"> </span><a href="#content"
title="Skip to content" accesskey="S">Skip to content</a> • <span
id="icons" class="accessibility"> </span><a accesskey="2"
href="accessibility_en.html" title="Accessibility
policy">Accessibility</a> • <span id="icons" class="FR"> </span><a
href="backup_software_fr.html" title="En Français">Français</a></p>
</div>
<div id="header"><a id="logo" href="index.html" accesskey="1"
title="Return to the home page"><span>Homepage</span></a>
  <h1>Network Attached Storage @ home</h1>
  <p class="subtitle">How it works • How to to set up • And more !</p>
</div>
<div id="navigation">
  <ul id="menu">
    <li><a href="operating_systems_en.html" title="Operating
systems"><span id="icons" class="left"> </span> Operating
systems</a></li>
    <li><a href="backup_software_en.html" title="Backup software">Backup
software</a></li>
    <li><a href="FreeNAS_en.html" title="FreeNAS tutorial">FreeNAS
tutorial <span id="icons" class="right"> </span></a></li>
  </ul>
</div>
<div id="content">
  <h2 title="Backup software">Backup software</h2>
  <p>If placing hard drives in RAID configuration is a good way to save
data and sufficient inside a NAS  box, it is better to use <strong>a
complement to the RAID system.</strong> Indeed, RAID clusters can
breakdown. Causes are random, but in general, it is due to a bad
```

```
reconstruction following a disk or OS crash, or  a power surge on the
computer containing the cluster. Data is essential, therefore it is
recommended <strong>to make regular backups</strong> in the case of RAID
cluster would breakdown. The easiest way is <strong>the
synchronisation</strong> between the RAID cluster and an external hard
drive by using a software, integrated or not, to the NAS.</p>
    <p><strong>The advantages</strong> of backup software:</p>
    <ul>
      <li>Incremental backup.</li>
      <li>Versatility.</li>
      <li>Backups portability on another computer.</li>
      <li>Scheduling Backups (version management).</li>
      <li>Simple to set up.</li>
      <li>Backup to FTP.</li>
      <li>No dedicated machine.</li>
    </ul>
    <p><strong>Drawbacks</strong>:</p>
    <ul>
      <li>Incremental backup. The backup does not contain the latest
documents added, changed or deleted.</li>
      <li>Bigger risk of critical bug.</li>
      <li>More often limited to one operating system.</li>
      <li>Confidence blind to the inner workings of the software.</li>
      <li>Requires the most disk space, equivalent to what must be
saved.</li>
    </ul>
    <h3 title="Softwares">Softwares:</h3>
    <p>There is software built into <em>Windows XP</em>:
<strong><em>NTbackup</em></strong> which appears simple and effective.
This software is present on the home version of <em>Windows XP</em> but is
not installed on the hard disk. We must go and look on the installation CD
of <em>Windows</em> to use it. The <em>Windows Vista</em> equivalent is
called <strong><em>WinBackup</em>.</strong> As for <em>Windows 7</em>,
more recently, it has a backup tool called <strong>"<em>Save and
Restore</em>"</strong> in the Control Panel.</p>
    <p>Free software and/or open source exist. The most famous are
<strong><a href="http://www.educ.umu.se/~cobian/cobianbackup.htm"
target="_blank"><em>Cobian Backup</em></a></strong> and <strong><a
href="http://backuppc.sourceforge.net/" target="_blank"><em>Backup
PC</em></a>.</strong> A tutorial is available <a
href="http://www.malekal.com/tutorial_CobianBackup.php" target="_blank">at
Malekal</a> for <em>Cobian Backup</em> and <a href="http://doc.ubuntu-
fr.org/backuppc" target="_blank">Ubuntu-fr</a> for <em>Backup PC</em>.
These 2 programs are very powerful and flexible. You can create multiple
backup profiles on different operating systems, network and through
Internet !</p>
    <p>Software lighter as <strong><a
href="http://fullsync.sourceforge.net/"
target="_blank"><em>FullSync</em></a></strong> may also suffice. This is a
multiplatform and easy to use Free software.</p>
    <p>Like <em>Fullsync</em>, it exist <strong><a
href="http://www.2brightsparks.com/downloads.html#freeware"
target="_blank"><em>SyncBack Freeware</em></a>,</strong> which can just
synchronize files between computers, external storage (USB drive or hard
drive), network drives and FTP servers. Synchronization can be
unidirectional or bidirectional, manual or scheduled ... It's more
```

```
complete than <em>FullSync</em> and free, but it is only available on
<em>Windows</em>.</p>
    <p><em>Astase</em> develops commercial software,
<strong><em>Ultrabackup</em></strong> and <strong><em>Ultrabackup
Netstation</em>.</strong> More useful in professional environments.</p>
    <p>"<em>Several computers to save in a local network or Internet ?
<span>UltraBackup NetStation</span> centralized data storage while
allowing customers to freely manage their backup strategy. Install the
server on a computer that is attached peripherals reliable storage (file
server , RAID ...) and deploy the client: network backup is
created.</em>"</p>
      <a href="images/cobian_big.png" rel="lightbox" title="Cobian Backup
8."><img src="images/cobian.png" alt="Cobian Backup 8." /></a>
</div>
<div id="footer">
  <p><span id="icons" class="up"> </span><a href="#wrapper"
title="Back to top">Back to top</a> • <span id="icons"
class="sitemap"> </span><a accesskey="0"
href="sitemap_en.html">Sitemap</a> • <span id="icons"
class="user"> </span><a accesskey="9"
href="mailto:07209525@glam.ac.uk">Direct contact</a> (technical)</p>
</div>
</div>
</body>
</html>
```

7.1.8 - HTML code, backup software page in French (complete)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html lang="fr" xml:lang="fr" xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<meta name="description" content="CS4T01 2009 v1 - M.Sc. Project">
<meta name="keywords" content="Network Attached Storage, NAS, FreeNAS,
RAID">
<meta name="author" content="Benjamin Goupil - 07209525">
<link rel="shortcut icon" href="images/favicon.png">
<link rel="stylesheet" type="text/css" href="reset.css" />
<link rel="stylesheet" type="text/css" media="screen" href="screen.css" />
<link rel="stylesheet" type="text/css" media="print" href="print.css" />
<title>Network Attached Storage @ home - Logiciels de sauvegarde
(FR)</title>
<script type="text/javascript"
src="lightbox2.04/js/prototype.js"></script>
<script type="text/javascript"
src="lightbox2.04/js/scriptaculous.js?load=effects,builder"></script>
<script type="text/javascript" src="lightbox2.04/js/lightbox.js"></script>
<link rel="stylesheet" type="text/css"
href="lightbox2.04/css/lightbox.css"/>
</head>
<body>
<div id="wrapper">
  <div id="fastaccess">
    <p><span id="icons" class="down"> </span><a href="#content"
title="Aller au contenu" accesskey="S">Aller au contenu</a> • <span
id="icons" class="accessibility"> </span><a accesskey="2"
href="accessibility_fr.html" title="Accessibilité">Accessibilité</a> •
<span id="icons" class="UK"> </span><a href="backup_software_en.html"
title="In English">English</a></p>
  </div>
  <div id="header"><a id="logo" href="index_fr.html" accesskey="1"
title="Retourner à l'accueil"><span>Accueil</span></a>
    <h1>Network Attached Storage @ home</h1>
    <p class="subtitle">Comment ça fonctionne • Comment le mettre en place
• Et plus !</p>
  </div>
  <div id="navigation">
    <ul id="menu">
      <li><a href="operating_systems_fr.html" title="Systèmes
d'exploitation"><span id="icons" class="left"> </span> Systèmes
d'exploitation</a></li>
      <li><a href="backup_software_fr.html" title="Logiciels de
sauvegarde">Logiciels de sauvegarde</a></li>
      <li><a href="FreeNAS_fr.html" title="Tutoriel FreeNAS">Tutoriel
FreeNAS <span id="icons" class="right"> </span></a></li>
    </ul>
  </div>
  <div id="content">
    <h2 title="Les logiciels de sauvegarde">Les logiciels de
sauvegarde</h2>
```

```
    <p>Si mettre des disques durs en RAID est un bon moyen de sauvegarder
ses données et suffisant dans un boîtier NAS, il est préférable d'utiliser
<strong>un complément au système RAID.</strong> En effet, les grappes RAID
peuvent quand même tomber en panne, les causes sont aléatoires. En
général, il s'agit d'une mauvaise reconstruction suite au crash d'un
disque ou du système d'exploitation, ou encore d'une surtension sur
l'ordinateur contenant la grappe. Les données sont essentielles, il est
donc recommandé de <strong>faire des sauvegardes régulières</strong> au
cas où la grappe RAID tomberait en panne. Le moyen le plus simple reste
<strong>la synchronisation</strong> entre la grappe RAID et un disque dur
externe par le biais d'un logiciel, intégré, ou pas, au NAS.</p>
    <p><strong>Les avantages</strong> du logiciel de sauvegarde:</p>
    <ul>
      <li>Sauvegarde incrémentielle.</li>
      <li>Souplesse d'utilisation.</li>
      <li>Portabilité des sauvegardes sur un autre ordinateur.</li>
      <li>Planification des sauvegardes (gestion des versions).</li>
      <li>Simple à mettre en œuvre.</li>
      <li>Sauvegarde sur FTP.</li>
      <li>Pas de machine dédiée.</li>
    </ul>
    <p><strong>Les inconvénients</strong>:</p>
    <ul>
      <li>Sauvegarde incrémentielle. La sauvegarde ne contient pas les
derniers documents ajoutés, modifiés ou supprimés.</li>
      <li>Risque plus grand de bug critique.</li>
      <li>Limité à un seul système d'exploitation le plus souvent.</li>
      <li>Confiance aveugle sur le fonctionnement interne du
logiciel.</li>
      <li>Nécessite de l'espace disque en plus, équivalent à ce qui doit
être sauvegardé.</li>
    </ul>
    <h3 title="Les logiciels">Les logiciels:</h3>
    <p>Il existe un logiciel intégré à <em>Windows XP</em>: <strong><em
lang="en">NTbackup</em></strong> qui se révèle simple et efficace. Ce
logiciel est présent également sur la version familiale de <em>Windows
XP</em> mais n'est pas installé sur le disque dur. Il faut aller le
chercher sur le CD d'installation de <em>Windows</em> pour pouvoir
l'utiliser. L'équivalent <em>Windows Vista</em> se nomme <strong><em
lang="en">WinBackup</em>.</strong> Quant à <em>Windows 7</em>, plus
récent, il propose un outil de sauvegarde intitulé
<strong>"<em>Sauvegarder et Restaurer</em>"</strong> dans le panneau de
configuration.</p>
    <p>Des logiciels gratuits et/ou open source existent. Les plus
renommés sont <strong><a
href="http://www.educ.umu.se/~cobian/cobianbackup.htm" target="_blank"><em
lang="en">Cobian Backup</em></a></strong> et <strong><a
href="http://backuppc.sourceforge.net/" target="_blank"><em
lang="en">Backup PC</em></a>.</strong> Un tutorial est disponible chez <a
href="http://www.malekal.com/tutorial_CobianBackup.php"
target="_blank"><em>Malekal</em></a> pour <em lang="en">Cobian Backup</em>
et sur <a href="http://doc.ubuntu-fr.org/backuppc"
target="_blank"><em>Ubuntu-fr</em></a> pour <em lang="en">Backup PC</em>.
Ces 2 logiciels sont très performants et souples. Il est possible de créer
plusieurs profils de sauvegarde, sur différents systèmes d'exploitation,
en réseau et à travers Internet !</p>
```

```
    <p>Un logiciel plus léger comme <strong><a
href="http://fullsync.sourceforge.net/" target="_blank"><em
lang="en">FullSync</em></a></strong> peut également suffire. C'est un un
logiciel libre, multiplateforme et simple d’emploi.</p>
    <p>Du même genre que <em lang="en">FullSync</em>, il existe <strong><a
href="http://www.2brightsparks.com/downloads.html#freeware"
target="_blank"><em lang="en">SyncBack Freeware</em></a>,</strong> qui
peut donc synchroniser des fichiers entre ordinateurs, stockage externe
(clé USB ou disque dur), lecteurs réseaux et serveurs FTP. La
synchronisation peut être unidirectionnelle ou bidirectionnelle, manuelle
ou planifiée... Il est plus complet que <em lang="en">FullSync</em> et
gratuit, mais il n'est disponible que sous <em>Windows</em>.</p>
    <p><em>Astase</em> développe les logiciels payants, <strong><em
lang="en">Ultrabackup</em></strong> et <strong><em lang="en">Ultrabackup
Netstation</em></strong>. Plus utile dans les environnements
professionnels</p>
    <p>"<em>Plusieurs postes à sauvegarder dans un réseau local ou
Internet? <span lang="en">UltraBackup NetStation</span> centralise le
stockage des données tout en permettant aux clients de gérer librement
leurs stratégies de sauvegarde. Installez le serveur sur un ordinateur
auquel est attaché des périphériques de stockage fiables (serveur de
fichiers, système RAID...) et déployez le client: le réseau de sauvegarde
est créé.</em>"</p>
      <a href="images/cobian_big.png" rel="lightbox" title="Cobian Backup
8."><img src="images/cobian.png" alt="Cobian Backup 8." /></a>
  </div>
  <div id="footer">
    <p><span id="icons" class="up"> </span><a href="#wrapper"
title="Haut de page">Haut de page</a> • <span id="icons"
class="sitemap"> </span><a accesskey="0" href="sitemap_fr.html">Plan
du site</a> • <span id="icons" class="user"> </span><a accesskey="9"
href="mailto:07209525@glam.ac.uk">Contact direct</a> (technique)</p>
  </div>
</div>
</body>
</html>
```

7.2 - Logbook

Week 1: From the 18th to the 24th of June 2010.

Research in the area of "multimedia for learning". That's have helped me to establish the hierarchy of subjects I need to look into in order to find what is the better way to achieve with effectiveness and efficiency the "NAS lecture". Researches were wide and have started to look into the ADDIE model and a first step on the content. The meeting with my supervisor has been helpful to focus the project on who are my learners. Plus, the need to write things from my previous research like how I see the project's development part and why. Face to face meeting with my supervisor Gaylor Boobyer the 24th of June 2010.

Week 2: From the 24th to the 30th of June 2010.

Learning styles were too general. Learning styles linked to multimedia approach have been suggested by my supervisor. I have found another clear document about effects by learning trough multimedia content. After some general consideration, precise considerations on my target are established. Design consideration need to be write on paper after the first research week.

Note: The meeting with the supervisor has been delayed of 1 day. Face to face meeting with my supervisor Gaylor Boobyer the 1th of July 2010.

Week 3: from the 1th to the 6th of July 2010.

Design consideration need to be finished (the navigation). Some precision about learners need to appears trough personas and use cases. A new learning style way can be set up. Instructional design model is going to be justified and analyzed considering resources allowed for this project. Face to face meeting with my supervisor Gaylor Boobyer the 6th of July 2010.

Week 4: from the 6th to the 13th of July 2010.

The paper need to be reorganized, in 2 parts for the moment: Analyze and Design. Some analyze stuff appears to be to light and not justified. Some works are done for these weak points. The document itself is graphically arranged to be closer to the final version. Face to face meeting with my supervisor Gaylor Boobyer the 13th of July 2010.

Week 5: from the 13th to the 22th of July 2010.

Grammar needs to be revised. Some parts need more explanations too and citations. The implementation part of the project is started, some mockup are drawing on paper. The introduction chapter will talk about NAS for helping supervisor (and other people) to better understand this project. The design consideration chapter is divided into little chapters, easier to read. Face to face meeting with my supervisor Gaylor Boobyer the 22th of July 2010.

Week 6: from the 22th of July to the 9th of August 2010.

Methods of evaluations are described. I need to evaluate the effectiveness of the website on learner. Also, the website itself will be evaluated by users to see if it can be improved. The content of the final website is reviewed, analyse and cut in two parts, one for novice and one for advance users. Users requirements are designated to please to the maximum of person as possible, a little survey is conducted. Drawing mockups. Elements for testing the learners are described.

Week 6: from the 9th to the 31th of August 2010.

Implementation phase. Including multimedia, bilingual and accessibility aspects.

Week 7: from the 31th of August to the 12th of September 2010.

Delays due to a too ambitious project perhaps. The project goal is to finish as well as possible multimedia elements and complete the text. In parallel, evaluation points are setting as well as an answer sheet for interviews with my panel of learners. The difficult point is to stop the improvements on the website. Plus, they will be obvious after tests. The English part will be finished the last week after send the paper version to the university.

Week 8: from the 12th to the 19th of September 2010.

Evaluation methodology is done. The evaluation sheet is send to supervisor the 13th and face to face' have started the same day. This week is also dedicated to the finalization of this paper, evaluation, conclusion, abstract and acknowledgments.

Week 9: from the 20th to the 26th of September 2010.

The Monday is reserved for a general review and correction of this document, and then printed. CD must be burned. On CD will appears this paper as PDF file, the complete website and source files for Director animations (DIR).

Tuesday is reserved for binding and sending by mail.

Wednesday and Thursday are time reserved in case of problem (printing and binding).

Next days are reserved to make the Powerpoint presentation for the viva.

7.3 - Project management

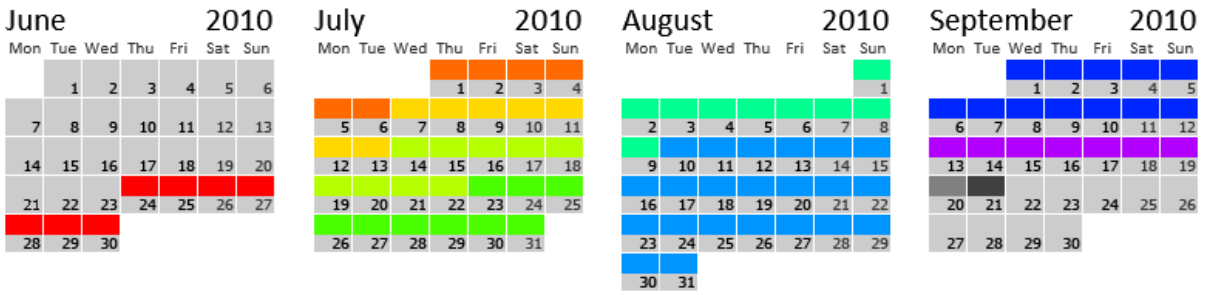


Figure 21: Real project's calendar

The minimal amount of words is 20000 and the project started in June. It's 5000 words by month, 1250 words by week. I was validating late, mid-**June**, with a first meeting with my first supervisor the 24th. The 30th of June, I had 3000 words and many ideas in many ways.

July was a great month with 12500 words, the analyse and design part finished and a great help from my supervisor to organize all my ideas. The project scope and goal were clearer.

For personal reason, I was obliged to go back to France. The first week of **August** is complicated (family…), I just have the time to write French text which will by use. The text is translated partially. From the 9th to the 15th, some pictures handmade were used to serve as base for animations. But the final result is not great, colors are ugly. I decided to take picture from Wikipedia to explain how RAID works. The next week is dedicated to the website itself in HTML + CSS and partially completed with textual content. Since the 23, animations are made using Director and translated, the content is improved, the first English translation doesn't correspond to the new content. Also, I fix bug and run FreeNAS on a testing machine. I have to learn how FreeNAS works too but I have a little previous experience. One of the hard drives crash, the RAID 1 is working well!

The original plan was to finish the website around the 22th of August and make arrangements on the website plus a first step in the evaluation plan during one week to the end of the month. But the objectives are a little too optimistic (and the website too ambitious), so a delay of 2,5 weeks (including the last week of august) is noticed. The evaluation road map is officially the last week before sending the paper to the university but things have been though since the end of August.

At the beginning of **September**, I decide to improve the website structure and add pictures. CSS sprites are used, the content is improved, pictures are chosen and the implementation part is explained in this paper. The second week is dedicated on evaluation part and website last updates. The third week is for learners testing in face to face, the end of the evaluation part but also the project paper finalization. I had approximately 17000 words the 12th of September.

7.4 - Returned questionnaires

7.4.1 - Beginner 1

(AB) Etes-vous intéressé par les NAS ?

Oui, mais plus tard chez moi.

(AB) Pensez-vous avoir compris ce qu'était l'environnement d'un NAS ?

A peu près sauf quand c'est trop technique. Appel à quelqu'un qui s'y connaît.

(AB) Pouvez-vous vous souvenir de concepts importants ? Pouvez-vous donnez un exemple (ou plus) ?

Oui, serveur qui permet de stocker des données en masse en réseau local. NAS avec ou sans disque, pré-assemblé ou fait maison (avec un vieux PC...). La réponse est complète.

(AB) Pensez-vous que les graphiques (images) vous ont aidés ?

Oui, pour le RAID mais le sujet reste compliqué (n'a pas vu les animations). Les photos aident à mieux comprendre.

(AB) Pensez-vous que les chapitres soient de bonne qualité ?

Présentation, ça va mais pas trop de texte. Pas assez attractif. Il faut avoir besoin. Cela apprend des choses. Possibilité de perdre le fil conducteur à cause d'un problème de vocabulaire. Assez technique.

(AB) Avez-vous une idée précise de ce qu'est un NAS ?

Notion virtuelle (possibilité), plus que visuelle (photos).

(AB) Pensez-vous avoir besoin de plus de conseils pour choisir un NAS ?

Il y a déjà pas mal de conseils. Plutôt pour le mettre en place (pas forcément pour décider quel type de NAS conviendrait).

(AB) Etes-vous à l'aise avec le volume d'information présenté ?

Les informations sont très concentrées. Trop d'informations en même temps.

(AB) Pensez-vous qu'un forum serait apprécié ? (Ajout sur le site)

Oui, en cas de problème technique. Discuter avec des pairs, des techniciens, des professionnels.

(AB) Pensez-vous que vous apprécieriez un podcast ou un videocast pour chaque chapitre du site Web ? Avez-vous besoin de plus (vidéo, présentation Powerpoint) à télécharger ?

Oui, mais de la vidéo. Il y a l'image et cela aide. Besoin de plus de liens pour aller chercher l'information.

(AB) Etes-vous intéressé par des actualités à propos des NAS ? (Flux RSS, newsletter, blog,… ou pas lié au site)

Genre newsletter. En cas de NAS chez moi, oui. Sinon, non.

(AB) Pensez-vous que le site Web est moderne ? Avez-vous des suggestions pour l'améliorer ?

Relativement moderne mais pas assez de choses pour le rendre attractif. Il faudrait plus de choses humoristiques par exemple.

7.4.2 - Beginner 2

(AB) Etes-vous intéressé par les NAS ?

Oui. Prix, utilisation, sécurité, abordable.

(AB) Pensez-vous avoir compris ce qu'était l'environnement d'un NAS ?

A peu près. (Ok but not clear). Pense au futur.

(AB) Pouvez-vous vous souvenir de concepts importants ? Pouvez-vous donnez un exemple (ou plus) ?

Moyen. Onduleur. RAID compliqué. NAS 1 ou 2 baies.

(AB) Pensez-vous que les graphiques (images) vous ont aidés ?

Oui, bon support. Permet de s'interroger. Sinon, impossible à lire. Se fixer sur quelque chose de concret.

(AB) Pensez-vous que les chapitres soient de bonne qualité ?

NAS → RAID : lien difficile à suivre. Intro → définition.

(AB) Avez-vous une idée précise de ce qu'est un NAS ?

Moyen. Virtuellement. Comme l'espace photos SFR. Physiquement : moyen.

(AB) Pensez-vous avoir besoin de plus de conseils pour choisir un NAS ?

Yes. A Benjamin pour l'achat et à François pour l'utiliser.

(AB) Etes-vous à l'aise avec le volume d'information présenté ?

Un peu trop de texte, de vocabulaire. Un peu trop de jargon. Benjamin a fait des efforts pour expliquer. Plan clair mais modification à faire dans les chapitres. Exception pour le RAID. Doit mettre « Chapitre » pour comprendre la suite logique.

(AB) Pensez-vous qu'un forum serait apprécié ? (Ajout sur le site)

Pourquoi pas, oui, il faut qu'il y ait un échange. Plus de liens ou de conseils. Tout est utile surtout s'il n'y a personne qui s'y connaît dans ta famille.

(AB) Pensez-vous que vous apprécieriez un podcast ou un videocast pour chaque chapitre du site Web ? Avez-vous besoin de plus (vidéo, présentation Powerpoint) à télécharger ?

Non, pas plus d'images ou des images avec du son. Son appuyé par des images. Image du présentation (vidéo + que du son).

(AB) Etes-vous intéressé par des actualités à propos des NAS ? (Flux RSS, newsletter, blog,… ou pas lié au site)

Oui, genre flux RSS.

(AB) Pensez-vous que le site Web est moderne ? Avez-vous des suggestions pour l'améliorer ?

Moderne, facile d'utilisation mais mise en page à revoir. Plus aérée. Vocabulaire plus simple. Impression de lire un manuel. Pas comme un blog pour la crédibilité.

7.4.3 - Advanced user 1

(AB) Etes-vous intéressé par les NAS ?

Oui, mais moins par la sauvegarde que par l'accessibilité des données et la protection (logiciel et matériel).

(AB) Pensez-vous avoir compris ce qu'était l'environnement d'un NAS ?

Oui.

(AB) Pouvez-vous vous souvenir de concepts importants ? Pouvez-vous donnez un exemple (ou plus) ?

Oui, de tout.

(AB) Pensez-vous que les graphiques (images) vous ont aidés ?

Oui, un petit schéma vaut mieux qu'un long discours. Les animations sont difficilement identifiables. Défaut ergonomique. Préfère mettre le contenu dans la page html. Les animations doivent être simples. Explication RAID 5.

(AB) Pensez-vous que les chapitres soient de bonne qualité ?

Problème de présentation. Mise en page trop large. Effort visuel. Diminuer la largeur du texte pour éviter la fatigue oculaire.

(AB) Avez-vous une idée précise de ce qu'est un NAS ?

Oui, grâce au bilan de tout ce qui est un NAS. C'est une étude avec avantages et inconvénients. C'est complet. Utilisateur qui a une réflexion sur son environnement numérique. L'utilisation d'un NAS est déconnectée de la réalité quotidienne pour l'utilisateur Lambda. Pas de problème à résoudre pour un vrai débutant.

(AB) Pensez-vous avoir besoin de plus de conseils pour choisir un NAS ?

Oui et non. Non, dans le sens où le site explique vraiment comment trouver son NAS par rapport à ses besoins mais de l'autre, il serait intéressant de consulter des magazines spécialisés (contre-expertise).

(AB) Etes-vous à l'aise avec le volume d'information présenté ?

Oui, certaines pages sont inévitablement chargées en informations. Tout est indexé, chapitré.

On peut faire l'impasse sur des informations (surtout si on est débutant car le volume est moindre).

(AB) Pensez-vous qu'un forum serait apprécié ? (Ajout sur le site)

Non. Il faut tout le temps être dessus. Cela implique des contraintes et une lourdeur car il faut le gérer. C'est une responsabilité : gestion et surveillance. Or, ce temps et cette présence ne sont pas forcément utiles. Ce serait un énième petit forum puisque cela existe déjà. Trop petit en terme d'audience. Ce n'est pas un forum Wikipedia.

(AB) Pensez-vous que vous apprécieriez un podcast ou un videocast pour chaque chapitre du site Web ? Avez-vous besoin de plus (vidéo, présentation Powerpoint) à télécharger ?

Podcast : oui. Videocast : non ou peut-être. Le podcast permet à tout un public de profiter du contenu du site. C'est appréciable. De l'autre, une vidéo pour quelques lignes ? Peur de double emploi. 2 structures pédagogiques. Premier réflexe : lire la vidéo sans faire d'efforts. Bazarder le texte. Plus efficace pour la pédagogie. Indexation pour pouvoir revenir dessus.

Avantage de la vidéo : voir l'enchaînement des actions → déjà fait animation.

(AB) Etes-vous intéressé par des actualités à propos des NAS ? (Flux RSS, newsletter, blog,… ou pas lié au site)

Bonne manière de montrer un site à jour. Indicateur de bonne santé d'un site. Date de mise à jour trop en avant. Possible de nuancer vu que ce n'est pas sur toutes les pages, ce n'est pas un problème qu'elle soit mise en avant.

Mettre entre parenthèses la date des prix (MM/AAAA).

(AB) Pensez-vous que le site Web est moderne ? Avez-vous des suggestions pour l'améliorer ?

Moderne, c'est bien, lisible partout, c'est mieux. Exemple : pas de flash. La modernité est un faux problème. Visuellement oui. Attention au choix des couleurs. Penser au daltonisme.

Bleu ciel : 77B5FE.

Bleu ciel clair : DFF2FF.

→ Plus sobre : c'est bien pour de l'explicatif. Psychologiquement, le bleu ciel aère.

Light Bleu : ADD8E6

RVB : 169, 180, 252.

Pourquoi pas que du blanc en fond ? Se concentrer au centre, moins de gêne. Parfait en blanc, c'est logique.

(A) Avez-vous directement démarré depuis le menu utilisateurs avancés ?

Non, « faut pas mettre la charrue avant les bœufs ». Pas de A avant B.

(A) Pensez-vous pouvoir fabriquer votre NAS vous-même avec les explications du site Web ? Avez-vous besoin de plus ?

Oui, dans le principe général, mais besoin de plus d'informations. C'est impossible d'être la bible complète sur tout → inévitable. Bon point de départ. Start up. Général → Technique.

(A) Pensez-vous avoir besoin d'aide (face à face avec une vrai personne) ou vous sentez-vous à l'aise pour le faire tout seul ?

Cela dépend de chacun. Ici non, je ne me sens pas à l'aise de le faire seul car je n'aime pas toucher au matériel. Risque de faire des manipulations dangereuses ou hasardeuses. Ce n'est pas forcément l'idéal de le faire tout seul surtout si on n'a pas l'habitude.

(A) Pensez-vous avoir besoin de plus de détails ?

Non, cela peut être sans fin. Quel est le but du site ? NAS et sa description complète ou Bible ? Non, puisque support éducatif. Information par rapport à un cas précis, plus que des connaissances de base.

(A) Allez-vous essayer de regarder sur d'autres sites Internet des informations sur comment construire un NAS ?

Oui, pour d'autres avis. Pas à cause d'une lacune du site.

7.4.4 - Beginner 3 (half advanced user too)

(AB) Etes-vous intéressé par les NAS ?

Avant de connaître le site, non. Maintenant, oui. Je n'avais pas entendu beaucoup parlé des NAS auparavant. Je ne cherche pas non plus à connaître les nouveaux produits.

(AB) Pensez-vous avoir compris ce qu'était l'environnement d'un NAS ?

Oui, en gros. J'ai compris à quoi cela sert, comment on en fait un, les différentes options, les prix.

(AB) Pouvez-vous vous souvenir de concepts importants ? Pouvez-vous donnez un exemple (ou plus) ?

Possibilité de recycler pour faire un NAS, web transfert, stockage.

(AB) Pensez-vous que les graphiques (images) vous ont aidés ?

Oui, ils permettent d'avoir une vision réelle par rapport au texte. Il manque quelques images.

(AB) Pensez-vous que les chapitres soient de bonne qualité ?

Il y a un aspect cohérent. Parfois, il y a trop de texte. Les paragraphes sont corrects. Bonne police, bonne lisibilité. La mise en gras se révèle utile. Le site reste simple, sans problème, propre. Le menu

est à revoir. Le format est correct : pas d'encombrement de toute la page. Cependant, de manière générale, il manque de la couleur. Le site doit être plus gai. De plus, il manque de la couleur dans les textes pour différencier les titres.

(AB) Avez-vous une idée précise de ce qu'est un NAS ?

Oui, c'est une unité de stockage centralisée et sécurisée.

(AB) Pensez-vous avoir besoin de plus de conseils pour choisir un NAS ?

Oui et non. NAS pré-assemblé : suivant notre instinct. Sinon guide de montage ou des composants. Besoin d'un manuel ludique. Plus de pas à pas.

(AB) Etes-vous à l'aise avec le volume d'information présenté ?

Moyennement. L'information est répartie dans tous les chapitres mais correctement organisée. Tout dépend si on recherche rapidement ou pas.

(AB) Pensez-vous qu'un forum serait apprécié ? (Ajout sur le site)

Oui, cela aide toujours. Aide sympathique. Les forums ne font pas peur, dans le même esprit.

(AB) Pensez-vous que vous apprécieriez un podcast ou un videocast pour chaque chapitre du site Web ? Avez-vous besoin de plus (vidéo, présentation Powerpoint) à télécharger ?

Oui, mais plus un videocast. Il faudrait montrer réellement l'objet, la taille. Une audio, non.

(AB) Etes-vous intéressé par des actualités à propos des NAS ? (Flux RSS, newsletter, blog,… ou pas lié au site)

Oui, dans le site et réexpliquer. Plus de sources. Oui, genre un blog officiel. Différence de prix suivant le temps. Taxe... Il faudrait une actualité claire, légère, simple, succincte.

(AB) Pensez-vous que le site Web est moderne ? Avez-vous des suggestions pour l'améliorer ?

Moderne : pas vraiment. Il manque des animations. Manque de dynamisme mais c'est lié au sujet qui ne porte pas à ça. Il faudrait un dégradé, que ce ne soit pas carré. Peut-être des boutons animés. Sinon, la simplicité est un atout. Besoin de choses qui attirent l'œil.

(A) Avez-vous directement démarré depuis le menu utilisateurs avancés ?

Non, j'ai commencé par l'intro, la définition. Intro pour A et B. Page de présentation. Mettre des questions à la place des titres. Genre FAQ.

(A) Pensez-vous pouvoir fabriquer votre NAS vous-même avec les explications du site Web ? Avez-vous besoin de plus ?

Oui, je pense pouvoir le fabriquer seul. Cela n'a pas l'air compliqué. Il y a juste besoin de bien identifier les composants du NAS.

(A) Pensez-vous avoir besoin d'aide (face à face avec une vrai personne) ou vous sentez-vous à l'aise pour le faire tout seul ?

J'aurai besoin de plus d'explications sur le site, sur les composants (mais pas compliqué).

(A) Pensez-vous avoir besoin de plus de détails ?

Oui, au niveau du glossaire. Je suis partisan des choses logiques et humoristiques. J'aime le ludique. (Il faudrait accentuer cet aspect).

(A) Allez-vous essayer de regarder sur d'autres sites Internet des informations sur comment construire un NAS ?

Oui, d'ailleurs, c'est déjà fait pour certains termes (Google).

7.4.5 - Advanced user 2

(AB) Etes-vous intéressé par les NAS ?

Modérément.

(AB) Pensez-vous avoir compris ce qu'était l'environnement d'un NAS ?

Oui, comment en faire un, comment l'assembler (comme un PC normal).

(AB) Pouvez-vous vous souvenir de concepts importants ? Pouvez-vous donnez un exemple (ou plus) ?

L'onduleur, le processeur (sécurité). Le RAID 1 suffit largement pour le particulier.

(AB) Pensez-vous que les graphiques (images) vous ont aidés ?

Non (mais n'a pas trop regardé).

(AB) Pensez-vous que les chapitres soient de bonne qualité ?

Oui, bien structurés. Bon contenu. Le site fait bien le tour du sujet.

(AB) Avez-vous une idée précise de ce qu'est un NAS ?

Oui. Système de sauvegarde, duplication pour éviter les pertes et aussi le partage.

(AB) Pensez-vous avoir besoin de plus de conseils pour choisir un NAS ?

Oui. Détails d'une configuration pour un particulier comme complément.

(AB) Etes-vous à l'aise avec le volume d'information présenté ?

Oui, pas trop long. A part les informations concernant le FreeNAS, ça va, mais il y a des images.

(AB) Pensez-vous qu'un forum serait apprécié ? (Ajout sur le site)

Il rejoint les conseils d'achat. Il permettrait de voir ce que les autres utilisent.

(AB) Pensez-vous que vous apprécieriez un podcast ou un videocast pour chaque chapitre du site Web ? Avez-vous besoin de plus (vidéo, présentation Powerpoint) à télécharger ?

Par rapport aux montages, utilité des videocasts. Pour les podcasts, moyen. Rapide à lire.

(AB) Etes-vous intéressé par des actualités à propos des NAS ? (Flux RSS, newsletter, blog,… ou pas lié au site)

Oui, encore pour le matos : conseil actualité en fonction de ce qui sort.

(AB) Pensez-vous que le site Web est moderne ? Avez-vous des suggestions pour l'améliorer ?

Il est pas mal sobre. C'est un site d'informations. Il est bien.

(A) Avez-vous directement démarré depuis le menu utilisateurs avancés ?

Oui. D'abord, le menu pour les utilisateurs avancés, puis le test "avancé" et enfin le test pour débutants.

(A) Pensez-vous pouvoir fabriquer votre NAS vous-même avec les explications du site Web ? Avez-vous besoin de plus ?

Oui, si expérience pour monter un PC. Sinon quelques détails pour brancher un composant sur une carte mère. A priori, on s'y connaît déjà un petit peu.

(A) Pensez-vous avoir besoin d'aide (face à face avec une vrai personne) ou vous sentez-vous à l'aise pour le faire tout seul ?

Tout seul.

(A) Pensez-vous avoir besoin de plus de détails ?

Oui, sur des techniques d'assemblage pour certains sinon, lui non, ça va.

(A) Allez-vous essayer de regarder sur d'autres sites Internet des informations sur comment construire un NAS ?

Oui, si celui-ci est le premier, pour vérifier rapidement (par habitude).

7.4.6 - Beginner 4

(AB) Are you interested by a NAS?

Yes, from now I am very interesting by a NAS, I am sure I am going to have a look in more details in the following months.

(AB) Do you think you have understood what the NAS environment is?

I think I have understood in general the environment of the NAS.

(AB) Can you remember some important concepts? Can you give an example (or more)?

I remember 3 things:

Publishing, Sharing, storage! Everything's within security; able to respect and to recover my personal data's.

I keep also in mind the idea of restoring a old desktop computer and transforming it into a NAS

(AB) Do you think graphics document has helped you?

Yes for sure, the RAID seems to be quite complex "concept" and very technical especially for beginner like me. I appreciated the small animation that helped me to understand better the concept

(AB) Do you think that chapters have a good quality?

All the chapters have a good quality in term of content, all the abbreviations are explained which helped a lot, they are technical but using a common language. A good proof of this I think is my score at the test after reading which is 75% even if there are only 8 questions. I liked this test.

(AB) Have you a precise idea of what a NAS is?

I have a precise idea of what is now a NAS in a large direction of course

(AB) Do you think you need more advise to choose a NAS?

I do not think I need more advise to choose a NAS, because I am not a professional. I will maybe contact a professional in this area and will explain him my needs. Thanks to the website that I read today, I will understand his language and what he is talking about. I will be more confident in a future potential purchase act.

(AB) Do you feel comfortable with the amount of information?

Yes

(AB) Do you think a forum would be appreciated?

I do not know… I am not an "aficionados" of the forum. In all the case if there is one, I will not visit it for sure.

(AB) Do you think you will enjoy a podcast or a videocast for each chapter of this website? Do you need more (video, Powerpoint presentation) to download?

I will enjoy a fun comic or cartoon; I always remember complex and technicals things in a funny way. I liked a lot the animation in RAID chapter for their simplicity and it remind me a famous show "C'est pas sorcier" I imagined Jamy presenting and explain it…

(AB) Are you interested by news about NAS world?

No, I do not think to be right target for it.

(AB) Do you think this website is modern? Have you suggestions to improve it?

This website is simple, I would like pictures and maybe less text in a technical area (the beginning), I was really interesting by the benefits of a NAS. Now, I know it exists and will remember for future own company.

I liked the Home made NAS chapter, and maybe a small comic proposed with a pack containing the rights "ingredients" would be a motivation for me to build tomorrow a NAS.

7.4.7 - Advanced user 3

(AB) Are you interested by a NAS?

Yes it would be a useful device to save data across my home network.

(AB) Do you think you have understood what the NAS environment is?

Yes.

(AB) Can you remember some important concepts? Can you give an example (or more)?

Different types of raid, in backup software you could add synctoy, a Microsoft tool which works well for me.

(AB) Do you think graphics document has helped you?

It's always better to have a graphic, a plus would have been screenshots in English and not only in French like in the FreeNAS tutorial.

(AB) Do you think that chapters have a good quality?

Yes, I like that some important words are in bold.

(AB) Have you a precise idea of what a NAS is?

Yes before to read the website.

(AB) Do you think you need more advise to choose a NAS?

In find your nas, you could put the current popular nas on the market for raid 0, raid 1 … raid 5. So people could buy it directly, for the moment in this chapter I just know the good brands but then I have to search elsewhere for a list of concrete product available.

(AB) Do you feel comfortable with the amount of information?

Yes, I don't like lengthy document, and in this website the pages are not too long.

(AB) Do you think a forum would be appreciated?

A forum where users could share their configurations and ideas would be good. For this kind of topic, a community is always appreciated.

(AB) Do you think you will enjoy a podcast or a videocast for each chapter of this website? Do you need more (video, Powerpoint presentation) to download?

I would not say no to a videocast to see how to build a nas.

(AB) Are you interested by news about NAS world?

If I need to buy one.

(AB) Do you think this website is modern? Have you suggestions to improve it?

The colors are fade for me. The website is easy to use, and the separation between beginners and advances users is good.

(A) Have you started directly from the advanced users menu?

Yes

(A) Do you think you can make your NAS yourself using explanations found on the website? Do you need more?

I look at several websites before doing something like this.

(A) Do you think you need face to face help or do you feel comfortable doing that alone?

I can do it alone.

(A) Do you think you need more details?

There is enough details, then what I need is to practice to see if the information where helpful enough to help me build a NAS.

(A) Will you try to see on another's websites information about how to build a NAS?

I always look on several websites to have a good understanding and view of a specific subject.

Note: It would be good to put the url of the website in the questionnaire.