Universidad Zaragoza

1542

Trabajo fin de grado

EPS Project: Green Technology

Tipo B

Autor/es

Andrea Cuella Martin
Emily Rebecca Burroughs
Hermine Cooreman
Victor Rodriguez

Director/es

Ignacio López Fornies
Ole Schultz

EUITIZ/ Ingeniørhøjskolen i København
2012

Ingeniería de Diseño Industrial y Desarrollo de Producto
Proyecto desarrollado en el marco Europeo de movilidad

EPS Project: Green Technology

Within contemporary society, armed with knowledge by the media and government, all of us have become more aware of the environmental problems that the consumption if resources causes. Subsequently, we have all become 'eco-warriors' of a perfect world where we have increasing respect for our planet and act accordingly. However we do not live a perfect world and these ideals have become increasingly neglected in favour of ignorance fuelled by confusion and a significant lack of motivation.

IHK is already working to reduce its excessive consumption of resources such as water, electricity and gas. However, we strive to stride one step further. The main priority, other than reducing the waste of resources by using new technologies and techniques, is to effectively communicate with students, teachers and employees. Thus, they can be informed how to alter their personal behaviour, and subsequently their habits, in order to reach the global objective of a healthier planet. Although more efficient technology and engineering is necessary to reach this goal effectively, the

alteration and improvement of user habit is the main objective. Thus, one of the main aims of the project is to Communicate with users in a way that motivates them to not only want to change, but to prolong their interest and therefore the succeed in reaching long-term levels of improvement in sustainability. Sustain interest in sustainable behaviour.

Subsequently, in order to implement this form of education and alteration, we are developing an information system that online, with a web-page opened in any browser, that users can monitor the resource consumption (water and energy) and learn the most efficient ways to minimise usage and waste whilst in the university itself. Henceforth, allowing users to experience the same university environment and do the same activities in it, but using the minimum amount of resources necessary.

Abstract

Ingeniørhøjskolen i København - EPS - Spring Semester 2012 - Group 3 - Supervisor: OLe Schultz

Group 3. Emily Rebecca Burroughs, Hermine Cooreman, Andrea Cuella, Victor Rodriguez

Summary

CHAPTER 0 INTRODUCTION **04**

- Introduction 04
- Team work presentation 05
- Project Proposal 06
- Objectives 07
- Framework 07
- Reach of the project 09

CHAPTER 1 FIRST APROACH **11**

- Introduction 11
- Overview Research 11
- Problem Definition 12

CHAPTER 2 METHODOLOGY/STRUCTURE OF THE PROJECT **14**

- Metodology and Structure 14
- Work Breakdown Structure 15
- Responsability Matrix 17

CHAPTER 3 BACKGROUND AND RESEARCH **18**

- Introduction 18
- Design for sustainable behaviour 18
- Specific Research 19
  - >> Environment 19
  - >> Technologies for the website 37
  - >> Users 38
- Conclusion: Mind Map 56

Summary

CHAPTER 4 THE WEBPAGE **59**

- Introduction 59
- Naming 59
- The webpage development.. 62
  - >> Sketches 63
  - >> Alternatives 64
  - >> Selection and evolution 67
  - >> Review 74
  - >> Creating the webpage 78
  - >> Users test 86
  - >> Final development 98
  - >> Contents 100
  - >> Measurements points
- Technical items 103
- The result: THE WEBPAGE 110

CHAPTER 5 THE INITIATIVE DESIGN **111**

- Introduction 111
- The posters design 112
- Stand alone display design 115
- Conclusion- Result 122

CHAPTER 6 CONCLUSIONS **123**

CHAPTER 7 REFERENCES **126**

CHAPTER 8 APPENDIX **131**

CHAPTER 0

Introduction

• Introduction

Before going through to the main part of the project, we are going to introduce some parts such as team work, the university and some other interesting information

• Team Work Presentation

In order to be an effective team we have to establish the basis and the rules for our group work this semester.

Co-operation is one of the most important things that real team work requires. To be more efficient we should know our strengths and weaknesses. In this way we know the role each member should play.

Communication is one of the main points in a team, throughout our project we are going to share our knowledge, our inquiries, as well as the work folders. That's why we created a shared Google Docs folder to put all our research and documents.

Everyone perceives team work differently so it's important to discuss our views of the project and try to find a common attitude for the team respecting our respective opinions.

Thereby, knowing that the results of group work depends to a great extend on how the team develops and collaborates we find it necessary to explain the bases of our team work:

The group obtains the best result if each team member is given a specific role (leader, secretary..etc..)

Decisions should be unanimous and accepted by all. Minority or majority decisions should not be allowed.

It´s better to accept compromises than to discuss disagreements.

CHAPTER 0

Introduction

• Team Work Presentation

Our team is well balanced because our training covers all areas:

Hermine: Web designer and developer. specialization in user interfaces, web application development, mobile applications and programming.

Victor: Software designer and implementer. Specialization in Software management.

Andrea: User oriented designer and graphic designer , specialization in, Interfaces design, Ergonomics,Product Management, Bionics, Creativity and Photography

Emily: Product designer, engineer and researcher. Specialising in user sociology and design and engineering history, methodology, management and material science.

Hermine and Victor provide the team with a more technical vision while Andrea and Emily provide the team with a more creative and user focused perspective.

The task of each member of the group:

The group should always work together, especially in the first phase and second phase in order to find the problem to be solved and different creative ways to solve it.

However, in the development phase all of us are going to do a specific task according to our skills:

Hermine and Victor are going to focus on the web programming part and contents.

Emily and Andrea are going focus on the user interface design .

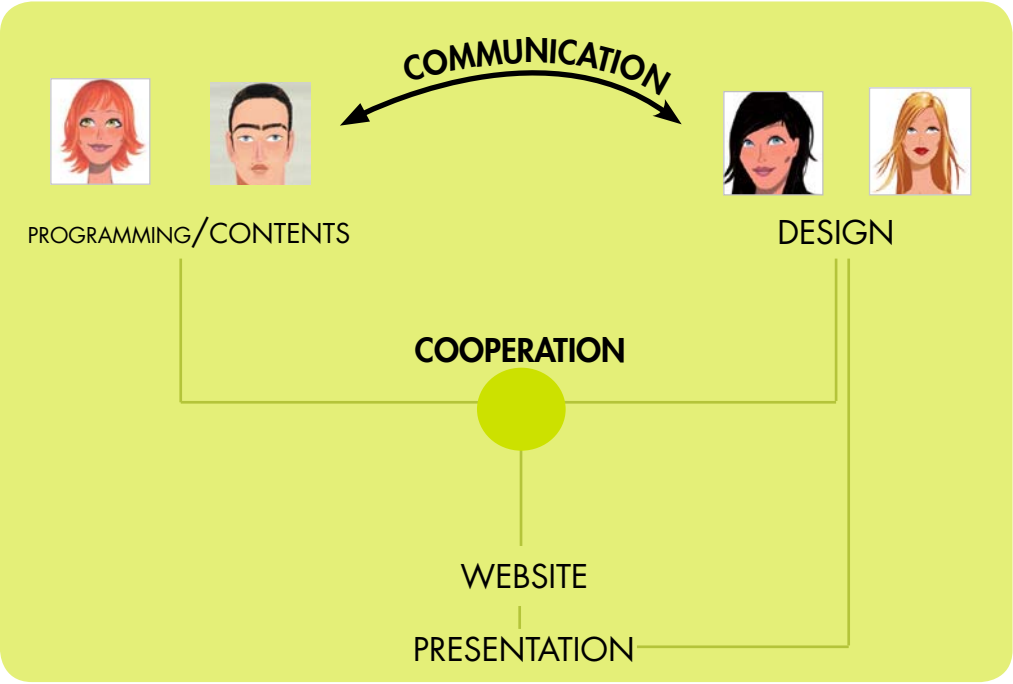
>> At this point we should work together as a team to make decisions because some of the design decisions can collide with the web programming .

CHAPTER 0

Introduction

• Team Work Presentation

As user oriented designers, they should make an effort in communicating. Subsequently, they´ll design a display to present the service/product in the university, and create some promotion for it.



• Project proposal

The irresponsible consumption of resources is a big problem. Burning fossil fuels to obtain electricity causes pollution problems. It can cause the habitat of animals and plants to become uninhabitable, also for humans. Our population is continually growing and water is becoming sparse. We have to start using it in a more sustainable way because we need water to survive. The Earth doesn't belong to us, it's just where we live. We have to start taking care of it because we don't have any other place to live.

IHK wants to reduce its energy and water consumption. Our main goal is to find out how the building of IHK is designed, focusing on lighting, heating, ventilation and water installations and from that, research about how we can improve the efficiency in two ways. On the one hand, we want to know if there are possible structural changes that can reduce consumption without losing benefits, and on the other hand, and most importantly, we want to modify the users' behavior to make them interested in reducing the waste of resources.

CHAPTER 0

Introduction

• Objectives

The **MAIN OBJECTIVE** is to **monitor the resources consumption in a building,** in our case we will apply it in IHK, in order to decrease the consumption of resources.

To reach this objective we have to accomplish two **SECONDARY OBJECTIVES**

>> Modify people's behaviour in order to make them more efficient in resources consumption. Also we need to keep the interested and motivated along the time.

>> Inform about the consumption of the building and show some tips to reduce it.

• Framework

For choosing the framework where our application will run, we discussed about three possibilities that allow us to create something useful and innovative: A physical device, a web application or just an application. Now, let's see the differences between them and how the different frameworks will affect our final product.

Physical device:

This possibility is useful because it's going to be designed only for this purpose, so for sure it will be optimized for it. For people who is not used to computers or just don't have, it's very useful. Although it could be nice to design something optimized for our application, having a device that only works for a specific purpose is not so useful, having a device that only works for a specific purpose is not so useful and also, it will cause costs to increase, so final product will be more expensive. Furthermore, the energy used to produce the device it's greater than if we develop some kind of application.

Application:

This possibility is also interesting, because nowadays almost everybody has a computer, so many people will be able to use it. Maybe the costs of creation are higher,

CHAPTER 0

Introduction

• Framework

Application:

but once developed, the only extra-cost will be the maintenance and up to date the application. So finally, it may be cheaper than creating some kind of hardware. On the other hand, nowadays the tendency is to use applications on the "cloud", so applications are just executed online because of the possibility of executing your apps independently from hardware.

Web application:

This is similar to the application, but if we can execute our application on the Internet, we only need a web browser, no more. It does not occupy memory on your PC and the data processing is being done, not on our computer, but in the server. Also, it allows us, to have a device, if we want, dedicated to our application. Just imagine a tablet PC with a web browser and the application running, here we have our device with no extra costs.

Finally, we decided to choose the web application, because it's the simplest and also the most portable option. Also, because nowadays the tendency is to use applications online instead of installing it on your computer. Devices and mobile phones are also growing up as common devices, and it's storage capacity is limited, so we don't have to restrict the use of this application for users, we have to be adapted to new times and tendencies.

• Reach of the project

Competitive feature online to keep people interested in using it.

CONCEPT

In order to gain the interest of users and inspire them to continually use the website and increase their energy efficiency a feature that allows them to 'compete' with other users either within the same household or in another comparable location would be beneficial. It would compare the related energy consumption data and create a comparison that will fulfil the human desire to compete.

CHAPTER 0

Introduction

• Reach of the project

Competitive feature online to keep people interested in using it.

Justification

Research suggests that humans enjoy competition and thrive with it. Thus, it is logical to believe that making something competitive will increase the popularity of it and desire to succeed, in this instance, in reducing their energy waste and general consumption. It would also provide the new website with a unique feature that sets it apart from past, existing and rival examples of this type of software and may increase the chances of prolonged improvement.

In order to combat the problems of past types of software with similar purposes to ours, we have to create something that is capable of gaining and keeping the interest of users. Many past examples have failed due to reduced usage.

Stand alone display within university for ease of use and accessibility through interactive features

CONCEPT

In order to market, advertise and create a 'buzz' regarding this product, a standalone display will provide ample opportunity for (if it were placed within the university) students to interact with the website and learn how to use it as well as adding to the statistics by inputting their own personal usage. It would be a freestanding display featuring an interactive screen (computer) that allows access to the website easily and demonstrates how to use it effectively.

CHAPTER 1

Introduction

- **Reach of the project**

Justification

As with many consumer products, the idea of 'try before you buy' is based around gaining user interest in the hope that they will continue to use the product within their own life. Thus, if people can interact with the website and learn how it can help them, they may be inspired to explore it more in their own time and for their own home. Thus, combating the continuing problem of people losing interest in this type of product and them being shutdown.

CHAPTER1

First aproach

•Introduction

Before starting the main part of the project, we should know which are the fields and the main ideas we need in order to investigate properly in the correct fields. We did the initial research and used it to define the problem and to fix the limits and the boundaries that we want to explore. It is ass important to know what we want to do as what we don't want to do.

•Overview Research

We started the information research focused in these main parts:

>> **MARKET**
Patents -interfaces- products with a similar functionality.

>> USERS
(Psychological studies) about the preferences of the users: interfaces, apps, website... and how we can influence sustainable behavior.

>> ENVIRONMENT :
The parameters we have to consider, the meaning of the place where we're going to use the product or service...

MAIN CONCLUSIONS :

>> People are different

>> Lack information

>> Only showing information is not useful

>> Too much information is boring and confusing

>> People don´t know how to be energy efficient

>> There are many failed similar products

(This conclusions are based on part of the information available in the overview research)

These conclusions are reflected in the Mind Map p57

CHAPTER1

First aproach

• Problem definition

In general, people are wasting too many resources such as energy and water. This is one of the contributing factors to global warming. It is of utmost important to decrease this wasting of resources. One of the problems is that people don't know how to reduce their energy and water usage. Even if they do know how to reduce it, they are often not willing to change their behaviors in a beneficial way. We want to make a product that informs people about ways to be more energy and water efficient, and makes them react by implementing our tips and reducing their usage. Some of the main issues faced in this area are as follows:

>> **Wastage of water** - this can cause issues such as the sourcing of water. It can be combated by changes in habits and behaviour.

>> **Over-use and waste of light energy (electricity)**- this is a problem in all societies, particularly building such as schools and universities where the bill payers are not the priority users. This too require a significant change in habits of user as well as the implementation of more sustainable technology.

>> **Waste of heat energy-** there are many methods of saving heat energy in order to reduce the necessity to have heating as high as it currently is. This would reduce costs and negative impact on the environment if user habits were to be altered.

>> **Electrical wastage**- the use of electricity that is also neglected by many consciences and require a change of habit in turning items off properly when leaving a room etc. However, this also requires changes to more sustainable sourcing of power.

CHAPTER1

First aproach

• Problem definition

Subsequently, it would appear that the main problem faced is altering people's behaviour and habits. Our secondary issue is encouraging the implementation of greener technology to maximise the benefits of altering user mind-sets and habits.

"We don´t design for a sustainable building, we design for a sustainable behavior"

CHAPTER 3

Metodology / structure of the project

• Metodology and structure

In order to achieve our design goals a work methodology was designed.

From the project proposal overview research was done. This allowed us to redefine the project and set goals. With the objectives fixed, we studied the framework and we decided the reach of the project . We defined the problem to solve in this project and with this we made a mental map collecting all the questions, ideas and search results. This marks a milestone in our project, as it is the basis for a further development.

After drawing conclusions, the realization of creative techniques shall be done , as well as design proposals to select one that we will eventually develop.

During the final development , we'll do users test, we´ll design a display , some posters and the presentation of the product in its environment.

>> Project Proposal

>> Overview research

-Conclusions

>> Objectives

>> Planification

>> PHASE 1

- Framework + Reach of the project
- Problem definition
- MIND MAP
- Conclusions

>> PHASE 2: Concept definition

-Environment study
-User study
-Creative techniques
-Solutions proposal - sketches
-Proposal selection and justification

CHAPTER 2

Metodology / structure of the project

• Metodology and structure

>> PHASE 3: Solution development

-Wire frame development
-Designing the website
-Contents
-User testings

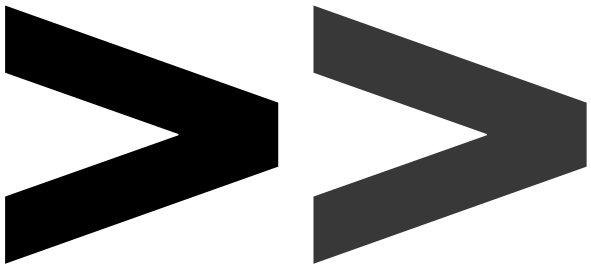
>> PHASE 4: Final development

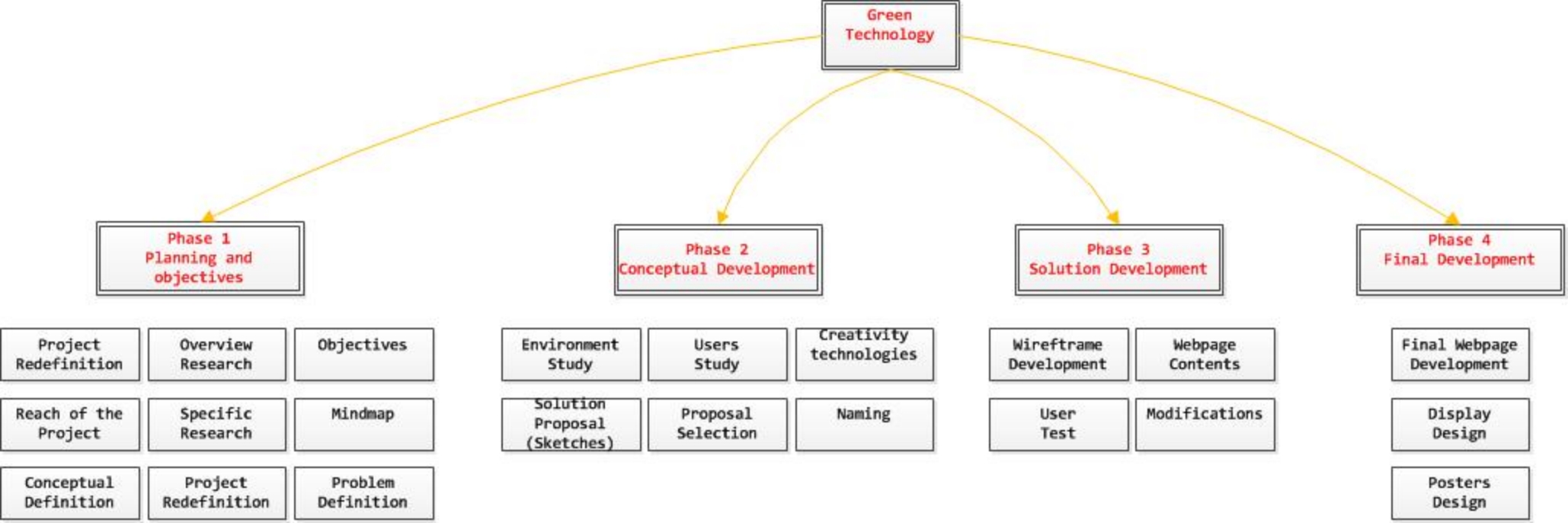
-Website final development
-Display design
-Posters design
-Presentation

>> For more detail : Gannt Chart - *Apendix p131-p02*

• Work Breackdown Structure

Note: Both in the WBS and in the OBS we have made some changes due to events arising during the project development. Comparing with the schemes already delivered in the interim report you can see the differences.




Green Technology
Phase 1 Planning and objectives
Phase 2 Conceptual Development
Phase 3 Solution Development
Phase 4 Final Development
Project Redefinition
Overview Research
Objectives
Reach of the Project
Specific Research
Mindmap
Conceptual Definition
Project Redefinition
Problem Definition
Environment Study
Users Study
Creativity technologies
Solution Proposal (Sketches)
Proposal Selection
Naming
Wireframe Development
Webpage Contents
User Test
Modifications
Final Webpage Development
Display Design
Posters Design

CHAPTER 2

Metodology / structure of the project

- **Responsibility Matrix**

S: Supporting R: Responsible

OBS / WBS	Andrea	Victor	Emily	Hermine	Comments
Research					
Technical research		R			
User research		S	R	S	
Market research	R				
Research Analysis					
Definition of the objectives	S	S	R	S	
Definition of the framework	S	R	S	S	
Reach of the project	S	S	R	S	
Mind Map	R	S	S	S	
Problem Definition	S	S	S	R	
Concept Development					
Solution proposals	R	S	S	S	
Proposal selection and justification	R	S	S	S	
Solution Development					
Wireframe development	S	S	S	R	
Designing the website	R	S		R	
Contents		R			
User-testing	R	S	S		
Modifying the design	S			R	
Final Development					
Final Website development				R	
Fixing issues		S		R	
Extra					
Designing a display	R				
Designing posters			R		

CHAPTER 3

Background and research

•Introduction

Once we know which are the topics we have to investigate, we did it and afterwards we tried to obtain some conclusions that help us to decide a solution. This part is quite influent, because depending the point of view we use, the result could be extremely different. Now, it's when we have to understand how to obtain the best solution but always justifying the reason of it. After this chapter, all information will be summarised and organized in a mindmap that will help us to clarify all the ideas.

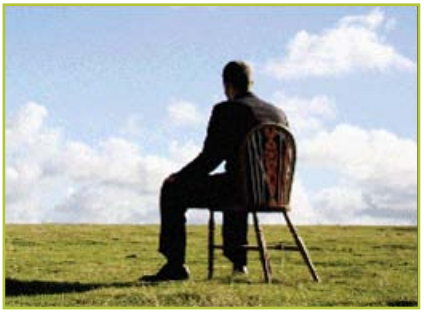
• Design For Sustainable Behaviour

An ever-present issue within the majority of developed societies worldwide, there are many arguments, not only for and against the concepts of 'global warming' and 'the greenhouse effect', but also for the most effective methods of decreasing our negative impact on the environment of the planet on which we exist.

Subsequently, there is an increasingly wide variety of programs, incentives, research projects and media focused on reducing our energy consumption and using more sustainable resources to reduce our negative impact on the environment.

However, every concept for reducing our increasingly negative influence on the planet is accompanied by one or more arguments as to how it will fail and why individuals and societies will not respond effectively and positively. These arguments range from the selfish, lazy and greedy nature of humans that are heavily documented within hundreds of years of psychological and sociological studies and the inability for pure knowledge and information having an impact strong enough to influence the waste and usage that is responsible for these issues.

The majority of products and projects in recent history have been built around the concept of 'green technology', 'sustainable products' or 'sustainable design and engineering'. Perhaps we should now be more focused on design for sustainable behaviour?



One of the main problems with designing more energy efficient and sustainable sourced products is that the effect is temporary, i.e. it only lasts until the inevitable decline in popularity or planned obsolescence comes into effect or when the original target market are no longer the primary consumers in this area. However, designing something that aims to, and succeeds in, altering the way people behave and fostering more energy efficient and less wasteful habits in the way they interact with their environments on a day-to-day basis we are promoting concepts and consumer and behavioural habits that will be passed down through generations and will continue to improve our impact on the planet over longer periods of time. The only way to

CHAPTER 3

Background and research

• Design For Sustainable Behaviour

continue to improve our impact on the planet over longer periods of time. The only way to guarantee an improvement is to guarantee continuously 'greener' behaviour. Many respected sociologists(ref) have conclusively researched the way we are socialised and it is accepted that imitation of our close family and peers is responsible for many elements of our own habits. Therefore, we must design to encourage the implementation of changes in behaviour in order to maximise change in energy consumption and sustainable living.

•Specific Research

From the overview research, we narrow the project so now its necessary to do some specific research in order to answer to the new problems encountered. The research is focused on factors that influence the users and on the parameters that we want to address.

THE ENVIRONMENT

1• How's our environment?

Continent: Europe (Scandinavia)
Country: Denmark
City: Copenhagen (Ballerup)

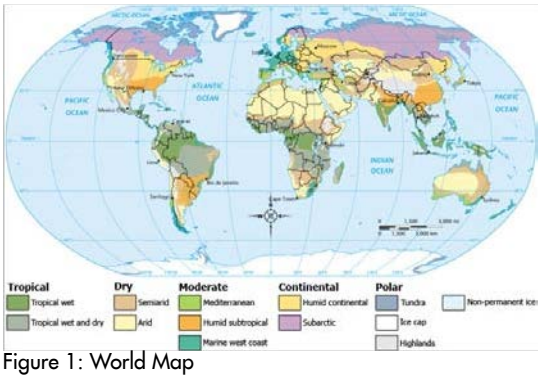


Figure 1: World Map


Figure 2: View of Denmark


Figure 3: View of Copenhagen and Ballerup

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

1• How's our environment?

Primary Purpose: University
Type of building: Large, on campus.
Number of users: Approximately 2000 students, plus academic staff.

Figure 4: IHK view

•Denmark:

Made warmer mostly by the surrounding seas and western winds the Danish climate is temperate and Denmark's weather is relatively mild. Although very apparent, the winters in this country are not subject to extreme cold and the summers are not especially hot but remain mild.

Unlike some countries, Denmark does not suffer significant fluctuation from day and night temperatures. It is, however, subject to gusty winds which are prone to quick directional changes and cause temperatures ad weather conditions to alternate at any point during a day.

The coldest and warmest mean temperatures that Danes experience are in February and July and are 0 degrees celcius and 17 degrees celcius. Rainfall in Denmark is apparent year-round, thus, there are no defined 'dry' periods. Average, annual Danish rainfall is 61cm of precipitation.

Typically for Scandinavia, due to its location in Northern Europe, the length of time with sunlight each day varies significantly in Denmark. During the winter days can be as short as just over seven hours, yet in the summer this period of daylight can be as long as over eighteen hours.

	Average high	Average low	Warmest ever	Coldest ever
Jan	37	30	51	0
Feb	36	28	54	3
Mar	41	32	60	7
Apr	49	36	77	23
May	60	45	77	30
Jun	66	52	84	37
Jul	69	55	86	43
Aug	69	54	88	42
Sep	61	50	79	32
Oct	53	44	70	27
Nov	44	37	68	18
Dec	39	32	54	9

Figure 5: Temperature in Denmark

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

1• How's our environment?

•Copenhagen:

Copenhagen is the capital city of Denmark and is made of a series of islands, as is Denmark as a whole. The city itself is bordering on a humid continental climate in the oceanic climate zone. Throughout all four seasons Copenhagen experiences unpredictable and unstable weather change and patterns. The cause of this is the location of the city which is in the path of Atlantic low-pressure systems.

Copenhagen is also subject to the warmth of the Atlantic gulf-stream, moving warm water from the Gulf Coast area towards Europe. Additionally, low pressure-systems follow with the oceanic stream. Subsequently, it experiences temperatures, on average, five degrees celcius higher than the average temperatures for its latitude of fifty-five degrees north.

With a relatively small peak from June to August, precipitation throughout the year in Copenhagen is moderate. Not lasting long, snowfall occurs mainly between december and march. Importantly, when considering energy consumption, average temperatures for this period of time are around freezing.

With an average of 170 rainy days a year, Copenhagen is subject to frequent precipitation. However, the greatest come between September and November.

Winter weather in Copenhagen can be difficult to predict due to the variation caused by route which the Atlantic low pressure centre takes. A stable high-pressure around the Alps means that the low-pressure moving up through Scandinavia causes above freezing temperature day and night. However, when a stable high-pressure system sits over Denmark or some neighbouring countries such as Finland and Russia, milder Atlantic winds are blocked and polar winds are free to cover the area and temperature can regularly drop below freezing both day and night (rarely below -5 degrees celcius during the day, but down to -12 degrees celcius at night).

Climate data for Copenhagen (1961–1990) [hide]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	1.9 (35.4)	2.0 (35.6)	4.8 (40.6)	9.5 (49.1)	15.0 (59.0)	19.2 (66.6)	20.4 (68.7)	20.3 (68.5)	16.7 (62.1)	12.1 (53.8)	7.1 (44.8)	3.7 (38.7)	11.1 (52.0)
Average low °C (°F)	−2 (28.4)	−2.4 (27.7)	−0.6 (30.9)	2.3 (36.1)	7.2 (45.0)	11.3 (52.3)	12.9 (55.2)	12.6 (54.7)	9.8 (49.6)	6.7 (44.1)	2.7 (36.9)	−0.5 (31.1)	5.0 (41.0)
Precipitation mm (inches)	46 (1.81)	30 (1.18)	39 (1.54)	39 (1.54)	42 (1.65)	52 (2.05)	68 (2.68)	64 (2.52)	60 (2.36)	56 (2.2)	61 (2.4)	56 (2.2)	613 (24.13)
Avg. rainy days	17	13	14	13	13	11	13	13	14	14	17	16	168
Sunshine hours	45	67	110	168	217	218	202	193	133	90	55	42	1,539
Source no. 1: Danmarks Meteorologiske Institut													
Source no. 2: World Weather Information Service[37]													

Figure 6: Climate data for Copenhagen (1961-1990)

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

1• How's our environment?

Although comparable to continental Europe, spring in Copenhagen often arrives around one week later than on the continent due to the cold of the surrounding waters. However, due to the same characteristic of the islands, but reversed, the city is kept milder for longer on Autumn.

With mixture of southwestern mild, windy and rainy low-pressure systems, summers in Copenhagen are also subjects to periods of stable high-pressure. These types of weather systems boast, usually, sunny and reasonably warm weather. However, these milder periods last up to only ten days and can appear anytime between late April and mid September.

•Ballerup:

Ballerup is a town within the Copenhagen area and is therefore subject to almost identical weather to the city itself. As with the rest of Denmark the coldest month in Ballerup in February and the warmest is July. These are the relevant statistics for these months:

	February	July
Average High	2ºC	20ºC
Average Low	-3ºC	12ºC
Average mean	0ºC	16ºC
Average wind-speed	22km/h	20km/h
Days with precipitation	20	19
Days with snow	12	0
Days with fog	19	21
Days with temperature below 0ºC	20	0
Days with temperature above 32ºC	0	13

Figure 7: Climate data for Ballerup (February and July)

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

1• How's our environment?

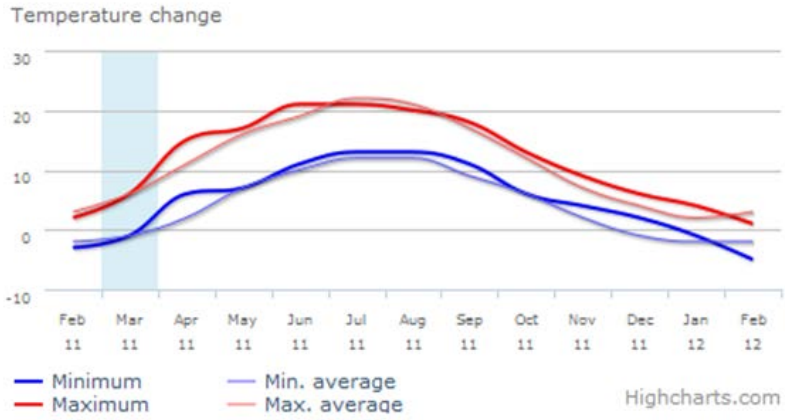


Figure 8: Temperature change in Ballerup

•Conclusion

Considering the average high and low temperatures and the precipitation, wind-speeds etc it is fair to conclude that Denmark as a country, and the Ballerup area of Copenhagen, is subject to less extreme weather conditions than many countries. It has mild, but not excessively hot, summers and typical Scandinavian winters that, although rarely above freezing point, are not subject to extreme lows in temperature.

However, due to the surrounding waters and variation between low and high pressure streams from the Gulf Coat and the Arctic, the weather types can fluctuate quickly and significantly in any season.

How will weather influence our product?

In order to maximise the potential for energy efficiency and waste reduction of the interface we must ensure that we take into consideration the influence of the local climate on the energy usage of the university building.

By tailoring advice, incentives and changes in behaviour to the climate that the building is subject to, it will be more realistic and plausible, and possibly easier to implement. Subsequently, the chance of success of the product will be significantly increased and research shows that one of the main problems with 'green' suggestions for behaviour and consumer habits is that they are often unrealistic and are subject to circumstantial influence and therefore are often ignored or fail to show any benefit to the user or the environment.

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

In any existing building, whether it is a homes, office or university, you need to consume resources to provide its users with electricity, water, and heating. The consumption of these resources should be done responsibly and efficiently, as they are limited and some of them pollute our planet, making it uninhabitable and altering the habitat of hundreds of species of animals and plants. It is our responsibility to use these resources efficiently with small gestures that can lead to great results.

Broadly we can classify the resources into 2 groups, energy resources (electricity and heating) and water. Energy resources are used for lighting, heating, water heating and other electrical devices (fridge, oven, computers, washing machine...). A large amount of this electricity is generated from burning fossil fuels that release a large amount of harmful gases into the atmosphere, but increasingly attempts to change it for the so-called "renewable energy", attempting to exploit natural resources to obtain energy in a sustainable way. Water is an indispensable resource for life, so our view is of highest priority to minimize their waste.

This study will try to find out the main sources of resource consumption in a building, concretely IHK, and how users can behave to reduce the waste of it. It is worth that technological advances are very useful in helping us to reduce our consumption, but is much more useful to try to accustom people to behave efficiently and responsibly. That's why we'll develop an information system to monitor and control the resources consumption, but majorly is focused on teach people how to behave.

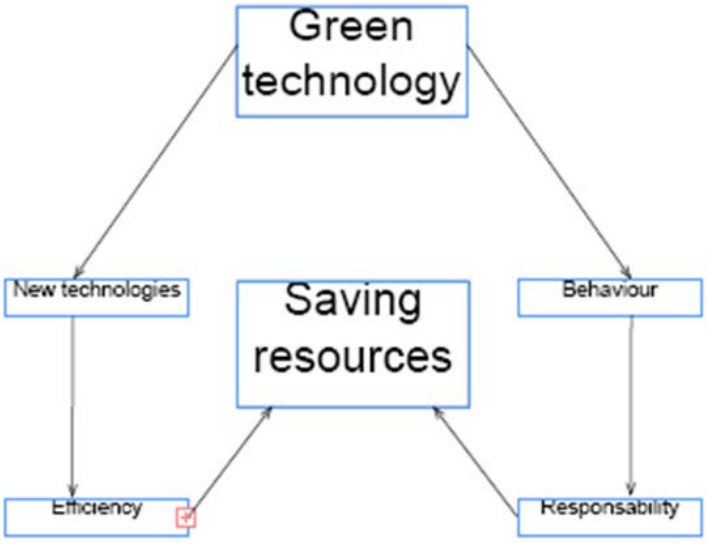


Figure 9: Scheme of the technical research metodology

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Lighting

Nothing is more easy to understand than that the best way to save energy is not spend it. Unnecessarily illuminating a room does not make any kind of sense, so it would be interesting, for example, to install motion sensors to turn lights off automatically if no one is in the room. New technologies can help us to reduce our impact on the environment, but without proper behavior, all aid becomes useless.

Depending on the type of building we want light we opt for a different type of lighting, since each type of bulb has different properties. Each impact on the environment according to the material they are made, as some may contain mercury or other components of difficult recycling. Another parameter to consider is the type of light we need to develop the activity to which is meant the building or room, since the idea is to get the same benefits using the minimum possible energy.

Consider now a comparison about some of the different types of bulbs available today in the market.

Incandescent:

These are the most inefficient light bulbs, since theywork by heating a metal filament until it is 'white' hot. The initial cost is the lowest since the bulbs are cheaper than others we can find, although the long-term spending is greater because they consume a lot of energy because of its poor performance (only 10% - 15% of the energy used is converted into light, the rest is lost as heat) and

their short life expectancy, which is around 1000-2000 hours. These bulbs reach performance of about 15 lm / W (lumens per watt).

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Lighting

Fluorescent Tube:

This type of bulb is more efficient than incandescent bulbs, and that use 30% - 50% of the energy consumed to generate light. It's life expectancy is approximately 6000 - 8000 hours, depending on its use, since turning these bulbs on and off reduces the life. They are ideal for places

that need to be illuminated continuously such as a park or a crowded hallway. Their light is cold and is not constant, since it operates at a frequency equal to that of electric current, approximately 50 Hz, which can feel a sense of flicker. Current models achieve a frequency of about 20 kHz and have a start instant. Its light output ranges from 50 to 60 lm / W.

Compact energy saving lamp (CFL):

They use the same principle as fluorescent tubes, but in a smaller size. Have an energy yield of 75%, a factor which is quite high and allows us to amortize the high cost of these bulbs in a very short period of time. Have against the light is quite cold and need to take temperature to provide its full potential, which can be annoying in some location. These bulbs have a light output of between

50 to 70 lm / W and have an average lifespan of about 6000 - 8000 hours of life.

Halogen bulb:

They are very similar to incandescent lamps, except that the tungsten filament is inside containing a mixture of gases (inert and halogen) that extends the life of the filament and increases efficiency. Also, the housing is not formed by glass, but quartz, which better stand the temperature.

Its light output can vary from 18 to 22 lm / W and have a lifespan of 2000 to 4000 hours.

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Lighting

>> Conclusion

According to these characteristics, we must strike a balance between energy efficiency and the properties that we offer to ensure adequate lighting without wasting energy. Let's see now, according to the type of accommodation and activities, how much light (lumens) are recommended. To understand the table below, we introduce some concepts:

Maintained luminance (em): The flow of light per unit area minimum (lumens / m ^ 2) necessary to develop an activity.

Index unified glare (UGR): Used to determine glare caused by light anywhere. The index varies between 10 and 31.

Colour rendering (RA): It is used to quantify the ability of light to reproduce all the colours of the chromatic scale. Its value ranges between 0 and 100.

	em	UGR	RA
Classrooms	300	19	80
Night Classrooms	500	19	80
Reading room	500	19	80
Blackboard	500	19	80
Workbench	500	19	80
Art classroom	500	19	90
Technical drawing classroon	750	16	80
IT rooms	300	19	80
Corridors	100	25	80
Meeting rooms	200	22	80

Figure 10: Lighting Requirements in IHK

IHK is doing some investments in order to reduce the consumption of electricity in lighting. Room N 2.06 is an example of it. There are new type of lamps and bulbs wich save energy, and there's no loss of lighting quality. In the figure in the appendix (p131-p011), there's explained how was the old installation, and other alternatives that are more efficient, in terms of costs and energy consumption.

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Heating

Energy invested in heating is tipically a big source of consumption, even more in Denmark, were our product will be applied. It's important to mantain a kind thermal sensation in order to keep users comfortable, but also users can behave in order to reduce the consumption of energy. The first step we should think about, is wich type of heating system fit better in the building depending on the environment, the purpose and the needs. But not only is possible to reduce consummption installing the most efficient boilers and systems, human behavior affects more then we think.

First of all, let's see the most interesting heating systems and it's characteristics, and afterwards let's discuss how different behaviours will help us to reduce the energy consumption invested in heating up the building.

Accumulators:

This type of heating, using electricity to store heat, usually in ceramic pieces by peeling resistance and go slowly. Generally, the night is used to accumulate heat as heating demand is lower, and during the day it downloads. This system is recommended for second homes or rooms and small rooms. This system does not use any fluid, just heat the air and force it to re-circulate through the room.

Heat pump:

This system is used for both heating and cooling of buildings in temperate climates where it requires a rather constant temperature without excessive work demands. Their operation is governed by the law of thermodynamics; summarized quickly, carry heat from one place to another by the principle that the temperature goes from a hot to a cold source.

District Heating:

This kind of heating, takes profit from the thermal waste that factories produce. The heat that the facilites of industries produce is used to warm water wich flows into pipes to provide houses, wich should be almost near, with thermal energy. The pipes should be well insulated, because if not the warmth will be transferred to the ground and to the environment, with the consequently loss of efficiency. Even, the efficiency here is not quite important, because all the energy used to heat up is the energy waste of other industries, so we can say that we are "recycling" the waste of energy from factories.

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Heating

Solar water heating:

This technology is using a renewable energy, wich is the sun. It uses the sunbeams in order to heat the water wich is flowing inside the collector, and this water will flow into a heat exchanger in order to warm up a water tank. After, this heated water flows through pipes untill heater exchangers to heat up rooms. It's recomended only in locations wich are sunny.

So here we can see systems to heat up water, but afterwards, how this water is used to heat up buildings? It's necessary a device to exchange the thermal energy wich hot water have with the environment. Those devices are named heat exchangers, and there's 2 systems that works quite different. Let's compare them.

Radial floor:

It works by installing a series of pipes on the floor of the building where circulates hot water, so the heat is radiating from the floor of the building. Often used in places where the climate is quite extreme, since it serves to use both heating and cooling. The water could be heaten by a boiler, a thermosolar plates, gas, heat pump... Here we can see how heat is being moved all along rooms.

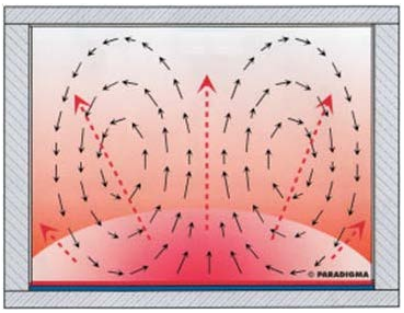


Figure 11: Scheme of radial floor action

Radiator:

It´s the most common heat exchangers in rooms. Normally it's installed below a window, and the technology wich uses is almost simply. Normally, some fluid flows into the radiator in order to exchange energy with the environement in order to heat or cool.

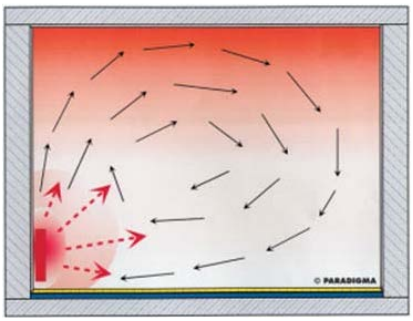


Figure 12: Scheme of radiator action

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

- **Heating**

We can see that radial floor heating is better than radiators because of the widespread of the heating and the low temperature they supply, so it has a big efficiency. If the building will be build now, I'll decide to use this system but not now, but may be take in account if someday it's necessary to expand the university or make any important restructuration.

- Adjust the temperature to your needs:

This premise is as simple as logic, there is no sense in winter to wear short sleeves at home, you better make the effort to go a little warmer and not (mis) spend energy unnecessarily. The proper daytime temperature ranges from 19 ° - 21 ° Celsius, while night temperatures can drop to 17 ° - 18 ° Celsius.

- Investing in isolation:

It is not possible to heat or cool efficiently any building if this temperature radiates out of this, so it is very important to invest in insulation. It is an important investment, but it's returned just by reducing the electricity bill. Elements such as double glazed windows and insulated walls can increase the performance of our climating system significantly.

- To adapt our behavior:

A few tricks can help us save energy with small gestures that, ultimately, will make significantly reduce our power consumption. Here are a few:

- Use efficient boilers and review periodically, as a mal function can lower its performance significantly.
- Install awnings to avoid overheating in summer seasons.
- Turn off air conditioning when ventilating the buil ding.
- Close the doors of the rooms air conditioned, but you lose the heat (or cold).
- Install programmable thermostats, while more ex pensive are depreciated using the electricity bil

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Ventilation

In order to guarantee the quality of the air we need to exchange the air of a closed habitat. The circulation of air inside a system is called transfer air. we are going to list some reasons to understand why it's important to take care about ventilation in any building:

- Save energy
- Lower heating bills
- Less noise from outside
- Hygiene
- Riddance of dust
- Reduce odours
- Minimization of carbon oxide
- Demanded by Danish Building Regulation

The ventilation could be done by two different techiques: Natural ventilation and Mechanical ventilation. Let's see the characteristics of the systems and how we can combine them in order to maximize the efficiency of any ventilation system.

Natural ventilation:

This type of ventilation don't use any kind of machine but difference of pressure and temperature. This means that warm air, wich is lighter than cold, could be moved by taking profit of "stack effect" just by opening a window or a door. The biggest problem of this method is that the quality of the air inside the building can't be controlled. I'ts a cheap alternative, because this method is not using energy, but temperature, humidity and other factors could'nt be controlled.

Mechanical ventilation:

This is the most common technique used in big buildings, such as IHK. This method use some machines in order to exchange the closed air with fresh air and also control the wetnes of the air, temperature... Nowadays, new technologies make us able to adapt this machines to the type of room or time in order to save energy. In contrast with natural ventilation, this method use energy, but we can control all parameters we want.

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Ventilation

Hybrid ventilation:

This technique is the most efficient one, because it uses the difference of pressure to exchange the air but also some faciliteies that allow us to control different paramaters such as wetness, temperature or filtering. Also, this system could take profit from the energy spent on heating, because this ventilating system* is able to extract energy from the environment to heat up the clean air.

Air handler units (AHU)

It's a facility to process closed air in buildings, but this appliances just can heat the fresh air in order to help the heating.

Air handler unit tools:

Fan

It's the mechanical element that generates the air flow with the fresh air. It should provide some pressure to the conducts in order to the air reaches all the part of the conducts after going through the filters.

Filters:

It's the part that clean the air, it means that the dust will keep there in order to increase the quality of the air. there are different types of filters, depending on its density and material. It's not the same the air quality that we need for an hospital, for a office or for a home, so different filters are available to use. Also it's possible to use some filters in order to kill microbiotics and to reduce odours.

Heating and cooling:

Normally, the system that AHU uses is a coil where water (hot or cold, depending if we want to cool or warm) flows and heat or cool the air flow that generates the fan. Nowadays, in order to improve the energetic efficiency nowadays the water is heated in heat pumps or in solar thermal plates.

Conducts:

Is the element that guides the air through the building, it's recomended to build it the

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Ventilation

more straight it's possible, because the more curves, the less efficiency. That's because if if there are a lot of curves, the engine that generates the air flow has to increase the pressure.

>> Conclusion

The best option in our opinion, it's the hybrid ventilation system using an air handler system, wich is the one that IHK has implemented, because it can help with the heating and it's sure that the ventilation will be done correctly. Also, the efficiency is quite higher than others, because environmental energy is used. So, nowadays university is highly efficient in using energy for ventilation.

• Water

It's important to know how this resource is used in order to design an efficient plan for saving it. We can organize the consumption in three categories:

Residual consumption: It's the consumption for different aplications but it's not recoverd on the sewage. For example, the water used on the cooling systems, the water used for water the gardens, the water used to make ice cubes...

Useful consumption: This kind of consumption is when once used, is recovered on the sewage and treated in order to reuse it for othera pplications. The water we use to clean, in taps, toilettes...

Losses: Is water that is not used for any service and is not recovered in the sewage. Leaks on pipes, deposits, valves, the

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Water

It's important to identify the type of use for all devices or places where water is used in order to make a precise description of the usage of this resource. Some importants points that we have to describe are:

1. Main purpose of the usage: If it's used for toilets, cooking, labs, workshops, cooling systems...

2. Category of use: residual consumption, useful consumption or losses

3. Frequency of use: The schedule when the system is using water. For example, in IHK the normal consumption of toilettes are from 8:00 untill 16:00.

4. Ocassional consumptions: These are little or big consumption wich are caused occassio naly and can supose peaks of consumption somewhere in the time.

>> Consumption tests

In order to know the impact of the measures taken, we have to measure the consumption before applying it and after. In order to do it we have to revise and adequate the measuring systems of the building

[the measuring system in a building is the set of meters,
accessories and activities to obtain, process, analyse and disseminate
data on volumes of water consumed or used]

- Identify the volume of water provided to the building

- Identify the amount of water consumed wether in ordinary or extraordinary schedule

- Identify the amount of storaged water such as tanks, boilers, cooling systems...

- Also, we have some standard consumption for most of common uses. >>

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

• Water

>> Consumption tests

	average consumption
Bathroom faucet	2 – 6 l/min
tub	18 l/min
toilete	16 -20 l/min
urinal	2 – 4 l/min
washing machine	225 liters per wash
garden taps	6 – 12 l/min

Figure 13: Water Consumption

>> Saving measures

Normally, when we think about saving water, into our mind comes ideas such as different devices for reduce the flow of water, the waste of it, and of course it exist, but also to adapt our behaviour is important to reduce it.

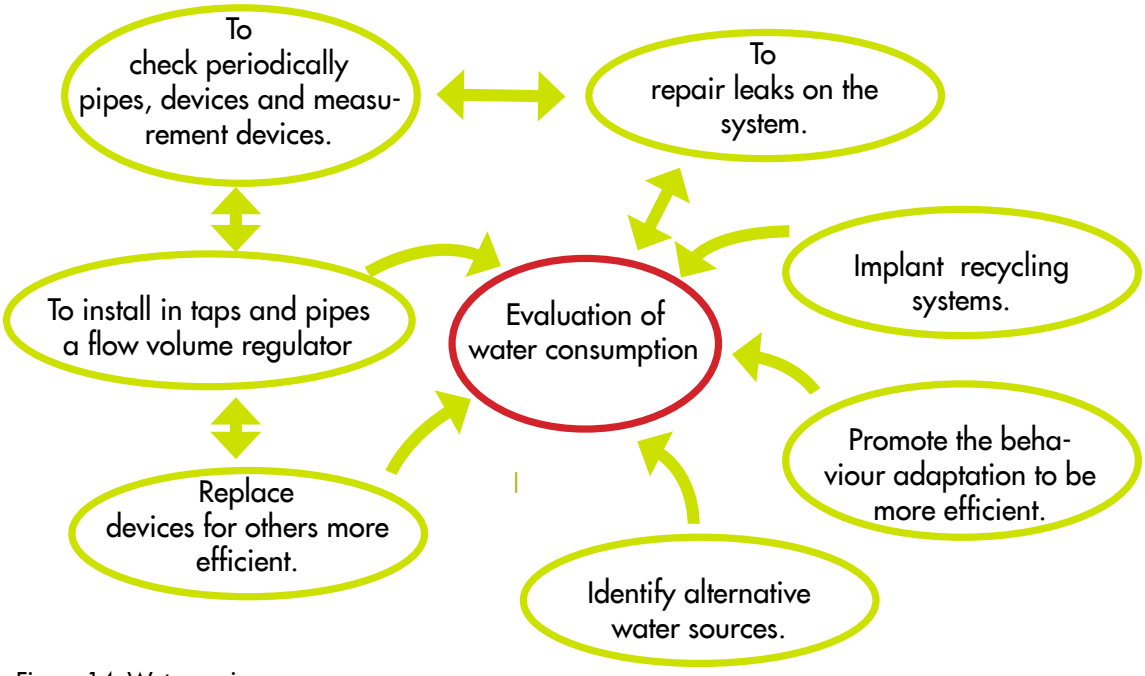


Figure 14: Water saving measures

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

- **Water**

Detecting leaks

In order to avoid losses by leaks, it could be interesting to have a periodic revision of all the installations which provide water in the building. Also users should inform if some pipe, tap or toilette have any problem.

Recycling systems

This systems are used to collect water wich has been used but it has the minimum quality for being used for another aplication. This systems also includes treated water even if it's not potable.

Alternative sources of water

If some uses, such as toilets or heating and cooling systems, doesn't need portable water, we can take some water from the rain or lakes.

Behaviour changes

Report leaks, if exist in taps, toilets...
Use the minimum amount of water that is necessary for every case
Don't let taps or valves opened for a long time
Not throw cigarettes or bin inside the toilets
Be sure about what we throw by the toilet, it could be harmful for nature.

>> Conclusion

The main goal is to incorporate saving measures that fit the building using the active participation of users. During the last years, there was a lot of new techniques which appeared because of the studies along the years and the experience. Our objective is to impact on the collective wich use the building and to find solutions wich offers us benefits. In these benefits, we can include the life quality that we can reach if our environment is healthy and clean because of the less pollution.

CHAPTER 3

Background and research

•Specific Research

THE ENVIRONMENT

2 • University- Technical research

Technical changes that we apply, always have to be joined with changes in usage of water and the behaviour that we have when using it. This mean to take efficient habits that help us to reduce our consumption and also helps to reduce the contamination of water. But not only teach people how to act is necessary but also help users to communicate between them in order to share experiences and make a collective behaviour.

TECHNOLOGIES FOR THE WEBSITE

The website will be running on an Apache server. During the development process, we'll use programs as LAMP (on Windows) or MAMP (on Mac) to run a virtual server on our own computers. Once the website is finished, we'll deploy it to an Apache server that's accessible everywhere over the Internet.

The resources consumption data is available to us in Excel documents and via goenergi.dk. This data will be put in a MySQL database. There are several tools available to convert the Excel Documents to MySQL databases. We will use PHP to access this database and to program the website, which will be in HTML and CSS with some jQuery (a JavaScript library) to make sure the users will have the best experience possible.

•Energy use in the university

The energy use in the university is measured at different locations. This data is accessible via the website goenergi.dk. It can be accessed by using javascripts. There is data available for the total energy consumption (id=3525, niveau=1), data for the foundation class and production light in rooms A, B and E (id=5026, id=3), data for the civil engineering department and machine department in rooms N, P, Q, R and S (id=5024, niveau=3) and data for the center for IT and Electronics and Sustainable Energy in rooms H, K, M, T, U, V and X (id=5027, niveau=3).

There is an excel document with the total energy consumption by month and by year from 1998 to 2011 (EL Forbrug 1998-2012.xls). There is also an excel document with the heating consumption by month and by year from 2001 to 2011 (Varmeforbrug 2001-2011.xls).

CHAPTER 3

Background and research

•Specific Research

TECHNOLOGIES FOR THE WEBSITE

•Energy use in the university

The heating system is a Honeywell EBI R410.2 system which can be controlled over the internet. It controls heat in the radiators and the ventilation. There are temperature sensors in different locations to control this system. The system also controls the blinds in the canteen area, and it can open windows automatically when it's 20°C outside.

• Water use in the university

The water usage of the university is measured in one central unit. This data is available in an excel spreadsheet, where the yearly consumption is shown. Data available for 2002 - 2011 (Vandforbrug 2002-2012.xls).

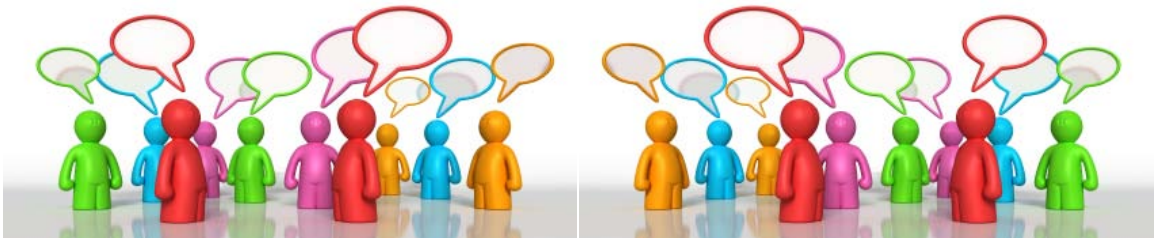
There is no real-time data available, this might be a challenge to us.

USERS

• Psychological Studies and Theory:

Marketing is one of the main priorities that should be addressed when designing and producing any product whether it is a service and physical object or web-based. Thus, consumer behaviour is one of the younger, yet heavily explored, disciplines within contemporary psychological study.

Psychological Contributions to Consumer Behaviour



Learning—Two important learning theo-ries are classical conditioning (Pavlov) and instrumental conditioning (Skinner). Classical conditioning focuses on contiguity (association) and repetition. Through significant trials and testing Pavlov encouraged a dog to link food (meat) with the sounds of a bell. Henceforth, eventually upon hearing the ringing of the bell the dog would involuntarily salivate without the presence of food. Advertising encourages an association between a soft drink and having a good time. In order to do this they demonstrate a group

CHAPTER 3

Background and research

•Specific Research

USERS

of people having fun whilst drinking the promoted product. In an instance where a company wishes to make you believe that a new tissue product is soft its advertisements might show the tissues with clouds, cotton, babies etc. Thus, if you associate a product with a positive aspect of it or experience then it will encourage a feeling a want when the user is faced with the product in a real life situation.

Subsequently, in order to interest users we must encourage them to associate our interface with something appealing. We must link energy efficiency to some feeling of social well-being or the opportunity to save money and spend it on something pleasant.

Instrumental conditioning focuses on reinforcement. In order for an action or type of behaviour to be repeated it must be rewarded. This is demonstrated in animal training; when a seal catches a ball it is given a fish, it will the do it again assuming it will receive a fish. One of the best reinforcing aspects is a good quality, working product. However, sometimes more reinforcement is required as the positive impact of a product (particularly in our project) may not be immediately obvious or directly affect the user. This can be in the form of financial reward. Obviously it would be impossible to just give away money to users, however by addressing the needs of our target market we would encourage repeated use by offering discounts or similar incentives based around services and products used regularly by students. Alternatively, the problem with always rewarding a behavior is that you get used to the reward. However, in this situation where repeated usage is essential for the success of the product and it's desired function the incentives may be necessary. Although, they could be reduced over time as the user forms a habit of using the product.

Image: Product image is an essential aspect for consideration in the development of a product. Brand image is very often the most influential factor, however in our case there is no brand and it the way that the product affects the user's self-image that is more relevant in promoting the product.

People have a self-image. You may see yourself as being very smart and it may not be true. IQ tests attempt to measure the real self; self-image is the way you see yourself. People tend to buy products that fit their self-image. If you think of yourself as a sexy woman, what brand of perfume will you wear? If you see yourself as a sexy, flashy, kind of guy, what kind of car will you drive? If, on the other hand, you see yourself as thrifty, simple, and frugal, what kind of car do you drive? **Self-image**

CHAPTER 3

Background and research

•Specific Research

USERS

• User Incentive and Motivation:

Considering existing products (a wide range of both successful and failed examples) it is clear that one of the key issues regarding a product that has its main aim as a reduction of energy waste and an increased efficiency within a given environment through extensive user usage is the factors that make the project appeal to users and promote repetitive use. We have drawn a selection of conclusions relating to this issue. This is one of the main areas of development and is ongoing throughout the design and concept development process.

- 'Advertising generally works to reinforce consumer trends rather than to initiate them.'- Michael Schudson.

- The main conclusion from initial research is that no product of this type (ie. a website or user based interface) can gain popularity without incentives to motivate consumers to use the product.

- Furthermore, even if the user is initially drawn to the product, continued usage is increased by the utilisation of continuing incentives that benefit the user.

- Users are most likely to respond to financial incentive as humans are motivated by gain and consumption.

- Although the social conscious of the majority of society will initially encourage them to respond to motivation based on feelings of guilt and wanting to change that are provoked by information on the deterioration of our planet, Boredom and a lac of interest will eventual lead them to forget about the product and use will not continue.

- Consumers are also often motivated by competitive incentives and people enjoy 'winning' and proving that they can be 'better' than others. Comparison is a powerful marketing tool.

CHAPTER 3

Background and research

•Specific Research

USERS

Based of these conclusions, some initial ideas have been discussed are still in an early stage of development:

>> 'Competition is not only the basis of protection to the consumer, but is the incentive to progress.'-Herbert Hoover.

>> Allowing users to compete with other users in terms of their energy consumption, usage and waste may increase the likelihood of them using the website continually and will increase the effectiveness of the product in reducing waste.

>> Financial gain to users is a powerful motivator. Considering that our product will be based within the university and will be aimed at students, it is logical to suggest that this particular target market is highly financial motivated and will respond particularly well to this type of incentive. Thus, if there is a way of measuring usage, consumption and waste, continued reduction of this may be rewarded by providing discounts on items at the university such as food, drink and stationary as well as travel outside of the university. Subsequently, increasing the benefits of the product to the user and potentially prolonging heir interest in it.

• User Mentality and Consumer Habit

>> How society reacts to environmental issues?

In contemporary society consumers are continually exposed to the increasing media attention that is focused on the negative impact we as product users have on our local, national and global climates, both economic and environmental. Furthermore, government and commercial incentives to reduce our impact on the planet through alterations in our day to day behaviour are now commonplace on everyday life from more obvious mediums such as energy consumption reduction in household appliances and travel methods, to less obvious means such as buying products that are manufactured in a more 'eco-friendly' way or are created using more sustainable resources.

CHAPTER 3

Background and research

•Specific Research

USERS

- **User Mentality and Consumer Habit**

Buying products that are manufactured in a more 'eco-friendly' way or are created using more sustainable resources.

In theory, these incentives should guarantee a change in consumer behaviour and therefore an improvement in our impact on the environment. However society is built up of a wide variety of people that fit into several social categorisations, each with different behavioural patterns and attitudes and subsequently, different reactions to this type of pressure. Here we made the comparison between the different user profiles:

Families (with young children)

Considering the contemporary economic climate it is safe to assume that most working families with children are budgeting strictly in order to remain financially stable. Therefore, they will want to adhere to the 'social responsibility' that is promoted in order to encourage people to change how they live, however they will be more inclined to purchase the best value option in any commercial situation. However, in the region of household energy consumption, these types of household will be interested in reducing theirs as it will also decrease their outgoings for power.

Thus, focussing on combining green options with cost-efficiency is the most effective way to connect with families (particularly those with young children).

Working households (without children)

Working people, specifically couples, in modern society are usually very aware of social issues and are therefore relatively interested in improvement of the planets maintenance. However, younger working households tend to focus on what they prefer and what they can afford, therefore a significant quantity of effort is required to convince them that they should change their consumer behaviour. As with families, they would also need to be able to recognise the benefits to them of altering their behaviour.

Additionally, sociological studies have found that if a couple is already compromising with each other they are unlikely to want to compromise other aspects of their behaviour as they want to keep control and stay happy. Thus, they may not be interested in focussing on alterin

their attitudes outside of their relationship.

Single person households

Studies have found that single person households are often the most malleable in changing their behaviour. It is appropriate to assume that this is because they are only one person in one household, therefore they do not have to take into consideration the needs, wants and requirements of another person living with them. Thus, if a change is proposed it only needs their approval and is significantly more likely to be implemented.

However, single people living alone, specifically if they are young, are often heavily restricted by their income. Therefore, it is safe to assume that they would be more likely to make a change to their consumer habits if it boasted financial and economical improvement or benefits for the individual user.

CHAPTER 3

Background and research

•Specific Research

USERS

• User Mentality and Consumer Habit

Students:

Stereotypes of students often suggest that they are all 'hippy' environmentalists that would be heavily focussed on decreasing our impact on the global and local climate. However, in modern reality, studies suggest that many students lack interest in environmental issues as they have become used to constantly being bombarded with information and media hysteria and are almost immune to being shocked. Furthermore, students generally live in rented homes where the way that energy is consumed is not their responsibility. Additionally, the financial strain of studying does not allow for young people to easily alter their consumer behaviour purely for selfless reasons.

However, young people such as students are becoming increasingly socially aware and knowledgeable on issues that affect local and global society due to increasing usage of media outputs such as the internet. Thus, they may be more interested in altering their behaviour than initially assumed. Furthermore, they usually have not lived independently of their parents long enough to form solid consumer and household habits and are therefore still easier to influence than couples and families.

OAP's:

OAP's are often the most difficult people to influence in relation to behaviour and habits, particularly consumerism as they have spent a lifetime building their own habits and routines that they are used to and are heavily reluctant to change. Furthermore, retirees are often living off a limited budget and will focus on value for money options rather than what might be best for their 'carbon footprint'

Subsequently, it is best to promote cost-efficiency to this group. However, many retirees live in state provided accommodation and are therefore in residences that can be altered to be more energy efficient by the government and local authorities rather than being left to their own motivation

>> How people are best motivated to change?

I would argue that people are often motivated to change due to the pressure of social responsibility however the most effective motivation is usually financial; this is the only aspect that is commonly appreciated by the majority of society, not just selected groups.

However, it would be logical to suggest that any personal benefit to a consumer will persuade them change their habits, thus this should be focused on when creating more efficient option in any area of everyday life.

>>How people best receive quantitative and qualitative information.

Statistics are an easy and time-efficient way to present, read and understand information.

CHAPTER 3

Background and research

•Specific Research

USERS

- **Tools to Motivate Sustainable Behavior**

Most programs to decrease energy and water consumption are based on information. But, these campaigns usually fail to change behavior. Studies have shown that education alone has almost no effect on sustainable behavior. This is because there are more barriers than just lack of knowledge for sustainable behavior. There are a lot more things that influence human behavior. To develop a successful product, it's important that we identify these barriers and that we also look into the tools that social science research has identified to be effective in changing behavior.

>> Commitment (From Intention to Action)

If you make people commit to something, they are much more likely to act in a way that is consistent with their commitment. Consistency is an important character trait. People who behave inconsistently are viewed as untrustworthy and unreliable. Individuals whose deeds match their words are viewed as being honest and having integrity. That's why public commitments are much more effective than private commitments. Commitments should be sought only if the people are already interested in the activity. Research suggests that it will not work if the person feels pressured to commit.

>> Prompts (Remembering to Act)

A prompt is a visual or auditory aid which reminds us to carry out an activity that we might otherwise forget. A prompt should be delivered close to the target behavior. For example, a sign to turn of lights should be beside the light switch by the exit. Prompts can be effective for encouraging sustainable behavior.

>> Norms (Building Community Support)

Programs to promote sustainable behavior should attempt to communicate what acceptable behaviors are. To be effective, the norm must also be visible. People need to view the norm as how they should behave.

>> Communication (Effective Messages)

The transition to a sustainable future will require that the vast majority of people be persuaded to adopt different lifestyles. It's impossible to persuade people without their attention. An effective way to ensure attention is to present vivid, concrete and personalized information.

CHAPTER 3

Background and research

•Specific Research

USERS

- **User Mentality and Consumer Habit**

>> Incentives (Enhancing Motivation)

Incentives can be particularly useful when motivation to engage in sustainable behavior is low. They are most effective if they are presented at the time the behavior is to occur. Incentives to reward positive behavior are much more effective than disincentives which are often less predictable because it does not encourage a positive alternative. If you are using incentives, you must make sure they are visible because it will have little or no impact if people are unaware of its existence. Many individuals engage in sustainable activities because they feel like they are making a positive contribution. The danger with incentives is that when you use them, they replace this internal motivation. Once you take the incentive away, individuals may lose all motivation to continue the activity. It's really important think carefully about introducing incentives, especially if you believe the incentive may be removed at a later time. Incentives don't have to be financial. For example, public recognition of actions which foster sustainability can be an important source of motivation.

>> Convenience (Making it Easy to Act)

Find out what the external barriers are and address them.

A checklist is available in the appendix. p131
(McKenzie-Mohr, 1999)

CHAPTER 3

Background and research

•Specific Research

USERS

• Questionnaire

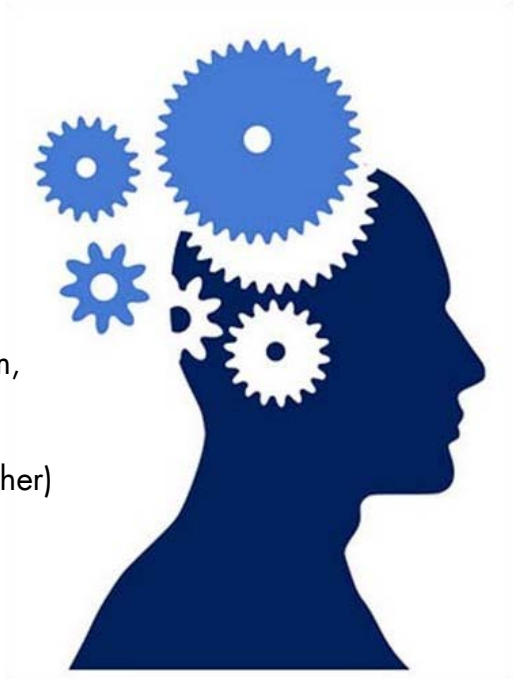
>> The objectives

To discover the barriers of why the students at the university aren't more energy efficient, we developed a questionnaire. With this questionnaire, we want to find out if our users are interested in our problem and their knowledge about it.

To be sure we're going to get the right answers, we already tested our questions with a small group of people, and made some modifications to our questions to make them more clear following their feedback.

>> The respondents

- Gender: 12 Males and 6 Females
- Nationality: 4 French, 5 Spanish, 2 South Korean, 1 UK, 1 Bosnian, 1 Danish, 1 Belgium, 1 Taiwan, 1 Portugal, 1 Ecuador
- Age: 12 (21-24 years old - Students) and 1 (- Teacher)



CHAPTER 3

Background and research

•Specific Research

USERS

• Questionnaire

>> The questions and their answers

• 1. What do you know about the current waste of resources (water and energy) and the consequences of that?

Respondents are aware that we are wasting a lot of natural resources and that these ones are limited. They know that we need to avoid this waste and find good solutions because the problems will come soon, sooner than we expect, the climate change is only a notice.

So users should conscientious of what they consume and the consequences of this consumption.Some of the respondents know a lot about the problem, but others only know a little bit. They're all aware of it.

• 2. Are you interested in this problem?

Almost the respondents are interested in this subject or in this problem , however one of them tells us :

"Yes, but I think we heard a lot of things about this problem and few solutions are implemented. Besides from my point of view** I find it completely stupid to ask people don´t take the car while in the other hand a refinery is rejecting in the atmosphere the equivalent of the annual consumption of France and Germany**."

We think that they are many people that think like this and **this is a hard point to treat and a hard negative barrier for us. We have to take in account this point of view.** A minority isn't interested in the problem because they think it's not happening around them.

• 3. Are you doing something to decrease this waste of resources? If so, what are you doing? If not, why not?

Most people are making some gestures to decrease this waste, for example:

-Turn off the light when I leave a room,
-Turn off the heater if I open a windows.
-Try to control the water use when cleaning the dishes, having a shower, brushing my teeth…
-Recycle and separate trashes.
-Plug off laptop and phone loaders

CHAPTER 3

Background and research

•Specific Research

USERS

• Questionnaire

>> The cuestions and their answers

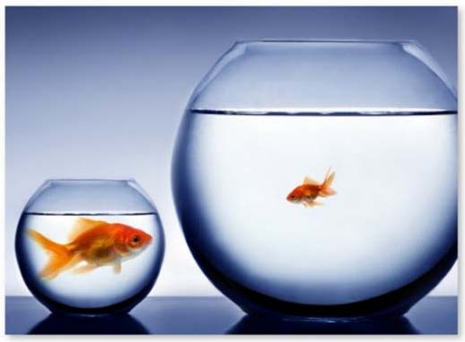
-Take public transports (bus, train, metro) or bike.
-Try to insulate the house as much as possible...

They are various small things that users used to do currently. But one of the respondents recognize that :

"[..] Sometimes I forget to recycle bottles or I take my car for a short distance maybe because I think that industrial enterprises have more environment impact than me."

A small amount of people aren't doing anything:

- it's **easier** to do **nothing**
- they don't think about it they think **small changes** won´t make a **difference**
- **only big consumers like companies can make a real difference**. Without them changing their ways we'll never solve this problem.



• 4. Are you willing to change your behavior if it helps to save resources? Even if you have to give up some of your comfort?

Almost all the respondents are willing to change their behavior even if this is quite annoying if we are talking about comfort. **For some it depends on what comfort they'll be giving up.**

We highlight the answers of two of the respondents that they say:

"I think it's something that you can't change one day to the other."

"Yes, if I can reduce my payment, I would give up some of my comfort."

CHAPTER 3

Background and research

•Specific Research

USERS

• Questionnaire

>> The questions and their answers

• 5. Do you think you can change your behavior in relation to resources consumption? Do you think using a webpage informing you of the energy use at the university is a good idea? Do you have any suggestions?

In general they think that the webpage can be a good idea because it´s easy to access , principally if the solutions or tips must be easy to implement and really efficient. With some easy understanding pictures and color.

The website can be a good reminder to be energy efficient, because a lot of the times they just forget.

A very useful thing that one of the respondents tells us and that we obviously have to take in account is:

"Using a webpage its a good idea, but I also think that people must know the consequences of not being worried about the waste of energy. Showing them how this impact invidually could be a solution (e.g. increase the prices of the main products as water, electricity etc) and also comparing it with the people that barely can use this energy"

Another goods suggestions:

"If you can inform people how much is being wasted and identify concrete ways that people can change their behaviour to reduce the waste and measure the impact of the behaviour (e.g. if everyone used no more than one paper towel every time they dried their hands, this would slow the rate of carbon emissions by xxx), this would slow the rate of carbon emissions by xxx), this would be helpful. Otherwise if it is a university-wide initiative the website could encourage people to, for example, cycle to work for a week to save xxx amount of carbon emissions"

"The website can show you the results of the changes you're implementing, like how much you'll save."

"The website can provide information but in the end there can be a game or a challenge to make it more memorable and fun."

CHAPTER 3

Background and research

•Specific Research

USERS

• Questionnaire

>> The questions and their answers

• 6. Would you be interested in participating in a sustainability project in your university?

All the people are in for participating in this sustainable project so the predisposition is fine! (Some suggest it shouldn't take too much time because they're busy a lot of the time.)

• 7. Do you have an idea on how we can save resources at the university?

The most relevant ideas were:

- Change the automatic doors and put manuals.
- Turn off computers when the day is over. Same with the lights.
- Change the toilet switches with sprinkler system switches
- Change manual taps for time controlled taps.
- Change paper for air dryers in the bathrooms.
- Recycling bins
- Automatic lights

• Users Profile

In order to know our potential users we´re going to study their profiles in a general way : their needs against the product, their influences from a technological point of view and their concerns. In the same way and with the help of the questionnaire we´ll can know our users and make a website aimed at them.

Achieving this we will be closer to getting one of our main objectives:

" Modify people's behaviour in order to make them more efficient in resources consumption."

CHAPTER 3

Background and research

•Specific Research

USERS

• Users Profile

The environment in which we work is the IHK (Copenhagen University College of Engineering), so all our users have one thing in common. However we must make some distinctions that´s why we have divided our targets according to their expectations about the website and their function in the university:

>> Teachers and administration stuff

>> Students (Danish and Internationals)

>> Maintenance-employee (we have to distinguish this user because he will handle the we bsite from a technical point of view, providing the information necessary to the website, about the building, in order to we can provide the best solutions to the other users).

> 1. TEACHERS- PROFESSIONALS

Profile:

International professors
(engineering field)

Age: 30 – 65 years old

Marital status: married with family

Residence: Copenhagen (Denmark)

Languages: Danish / English

In general this users are more aware of the environmental problems. They are easier to deal.

Needs:

- **A WEBSITE that can be used as an educational tool**

- Learn how to reduce the energy waste

- Easy interface and intuitive

Influences :

In the following influence map we capture all the interfaces and websites that can be familiar for this target.

Influence MAP Explanation:

This target usually consult web newspapers, he use a Windows or a MAC interface and principally Microsoft office tools like Power Point or Excel . This users can use specific programs like Solid Works , obviously they use CampusNet to upload documents and to communicate to their students , they also use hotmail or Google mail . Finally as Danish citizens they may be familiar with the DSB automatic ticket interface .

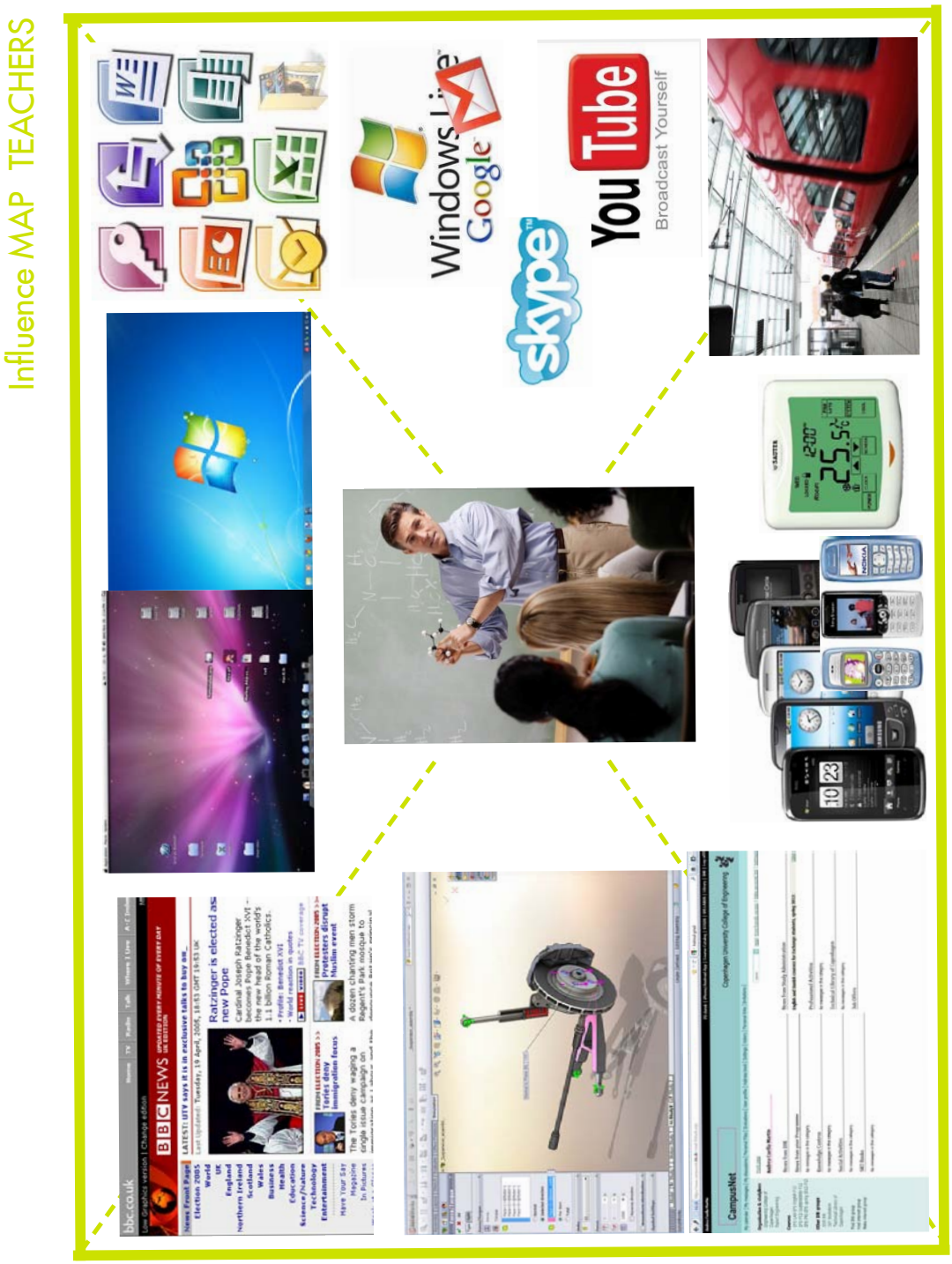
CHAPTER 3

Background and research

•Specific Research

USERS

- **Users Profile**



CHAPTER 3

Background and research

•Specific Research

USERS

• Users Profile

> 2. STUDENTS

Profile:

International students
(engineering field)

Age: 18 – 28 years old

Marital status: single

Residence: Copenhagen (Denmark)

Languages: Danish / English (Others: Spanish, French, German..)

This users are our principal objective, because in many cases their behavior to the environment is not appropriate. In so many cases they aren´t interested about this subject or only are interested when it supposed an economic benefit for them (e.g: recycling cans and bottles)

Needs:

- A dynamic and graphic WEBSITE.
- Useful and simple
- Customizable
- Related to websites like Facebook or Twitter
- Educational too

Influences :

In the following influence map we capture all the interfaces and websites that can be familiar for this target in order to help us to make our own interface.

Influence MAP Explanation:

This target is an expert on social networks like Facebook or Twitter, also he use other media such as Skype or WhatsApp (for the mobile phone). He often use Dropbox or Google Docs for the transfer of documents. In many cases they are users of Smartphones and of their applications. As students of Engineering they usually use specific programs such as Solid Edge and are familiar with Campus Net . Finally as Danish citizens they may be familiar with the DSB automatic ticket interface .

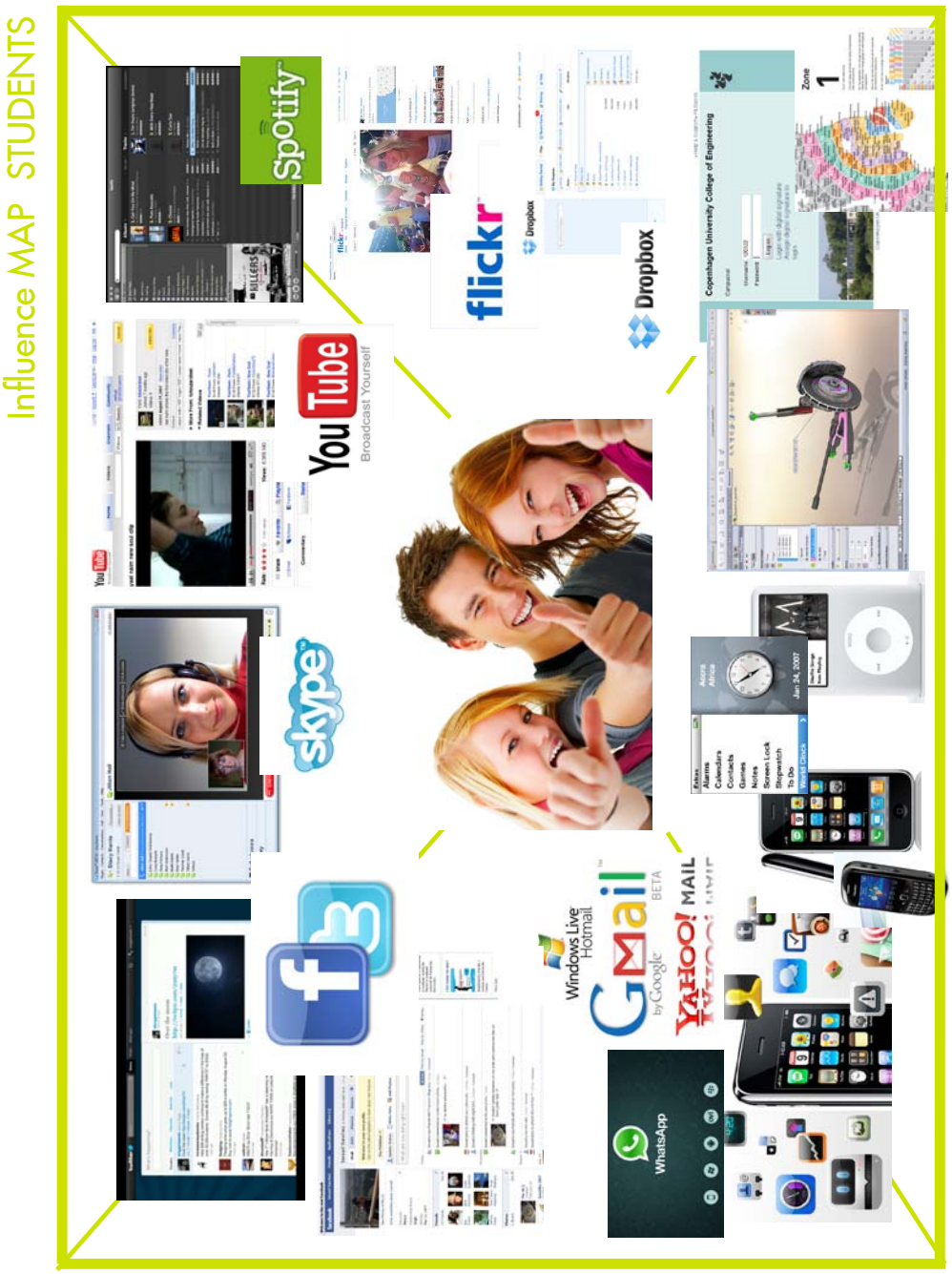
CHAPTER 3

Background and research

•Specific Research

USERS

- Users Profile



Background and research

•Specific Research

USERS

• Users Profile

> 3 MAINTENANCE employee

Profile:

National employee

Age: 30 – 60 years old

Marital status: married with family

Residence: Copenhagen (Denmark)

Languages: Danish / English

This target is as important as the others because he is the responsible of introducing the technical information in the website in order to provide some sustainable solutions . For that reason the technical part of the website should be focused and heavily oriented to this user.

Needs:

The main problem of this target may be the lack of time. In other words, they don´t have enough time to spend in front of a webpage. That´s why this user needs an:

- Easy and intuitive website
- Useful and simple

Influences :

This user may be familiar with other control and maintenance interfaces present in the university.

CHAPTER 3

Background and research

•Mind Map

We've made a mind map to present all our ideas , the research we've done, the main problem, the objectives.... to break down the problem in order to obtain a solution. During two of our team meetings we used the blackboard available to write down everything we were thinking of. We outlined our project this way, and with this overview we can limit what we want to use in our project.

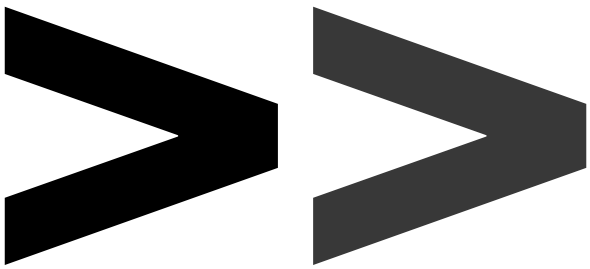
In this map we collect all the overview research and objectives explained in the previous pages and we discussed the conclusions from the specific research in order to finish it and complete it.

What´s a mind map ?

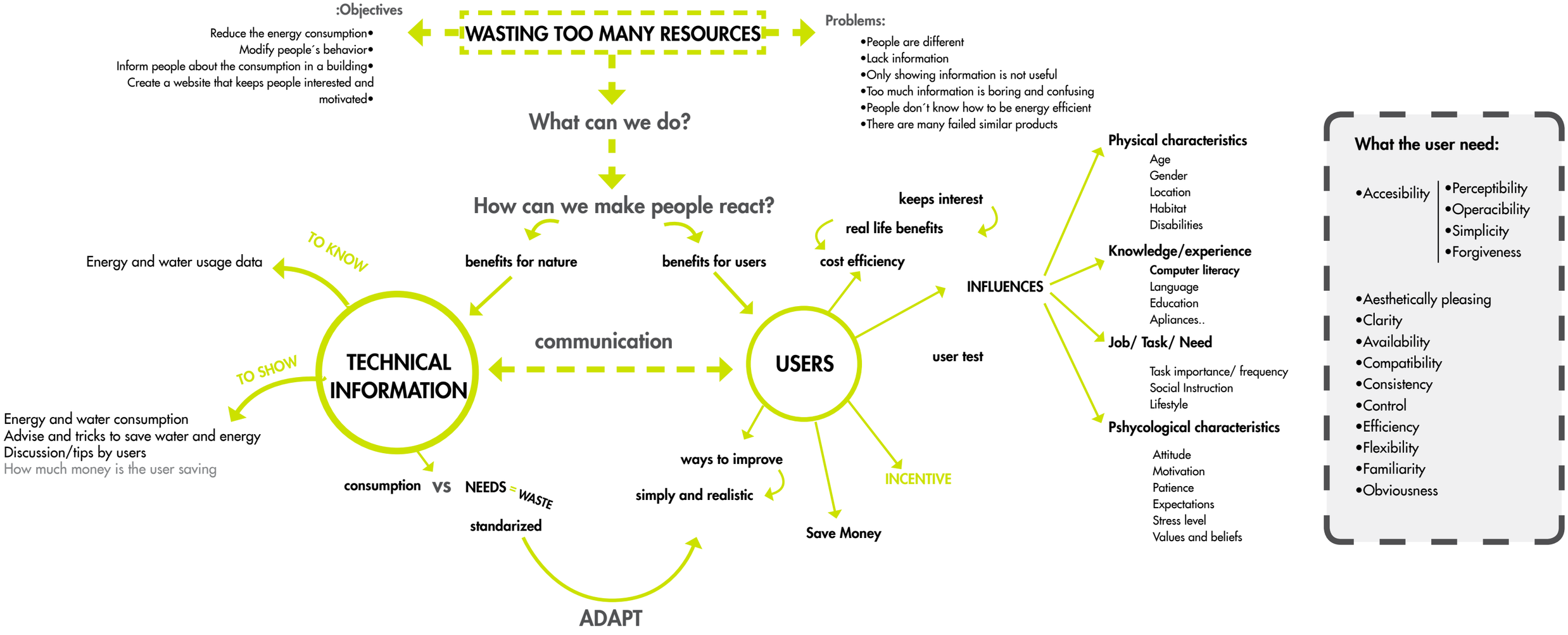
A mind map is a diagram used to represent words, ideas, tasks, or other items linked to and arranged around a central key word or idea.

Mind maps are used to generate, visualize, structure, and classify ideas, and as an aid tostudying and organizing information, solving problems, making decisions, and writing.

The elements of a given mind map are arranged intuitively according to the importance of the concepts,the goal is representing connections between portions of information.



Mind Map.



Copenhagen University College of Engineering - EPS - Spring Semester 2012
Group 3. Emily Rebecca Burroughs, Hermine Cooreman, Andrea Cuella, Victor Rodriguez

CHAPTER 3

Background and research

•Mind Map

CONCLUSIONS

In order to solve the problem at hand the technical information must be taken into consideration in order to formulate solutions to save resources. Presenting the technical information can suggest to users ways to improve their consumption and habits that should trigger a reaction in them as members of an affected society as well as consumers. Also is essential for us to provide users with solutions to improve their energy and water consumption. Therefore: We have this situation, we want to improve it, how?

This is the most difficult and important point to reach our objectives, Users must be able to understand the information, therefore we must present it in an easy and convenient form. Subsequently users will be aware of the situation and will hopefully attempt to focus their attention on the critical points and on the areas that will improve with their reactional behaviour.

And now the most critical part: how to make people react? To know how to make people react we have to know our users profile. In order to helps us solve this challenge we have turned to creative techniques such as influence maps, brainstorming, etc. Subsequently, this is the most in-depth part for us as website developers because it's the most subjective and psychological part. We are going to assert our attention in the graphic design area and in the different ways to motivate people to act against the situation.

CHAPTER 4

The webpage

• Introduction

After have done all the researches we are ready to start with our webpage design , including the choice of the webpage name. In the following pages we are going to show part of the webpage development.

• Naming

THE PROCESS

•What´s the technique about?

In order to find the name of our webpage we can follow the steps below:

•Make a list with the key words that define the product.

From this:

•Use translations in several languages.

• Play with prefixes and suffixes.

• Use dictionaries, definitions and synonyms.

• Consider references real physical objects.

• Communicate with emotion, using feelings

•Key Words:

sustainable/sustainability/behavior/environment/green/resource/save/teach/stingy/learn/improve/aware/action/nature/modify/change..

•Examples of names for the webpage : *(extracted from the words above)*

GREENABILITY (instead of Sustainability) / **BE GREENABLE /´S green** (s of "sustainable") we can play with "he´s green, she´s green and you?" for the slogan/ **ECOSAVE / Be ECO/ECOSTINGY**

CHAPTER 4

The webpage

- **Naming**

  - **THE SELECTION**

ECOSTINGY MOVEMENT

We want to catch the attention of people, and keep them interested in this subject so we have to impress, that´s why we needed to choose a word that emphasised our objective and our purpose.

Stingy >> because we want people fix their attention in the subject.

(Stingy means mean or ungenerous)

eco >> In reference to ecology and sustainability

So ecostingy means someone who´s not very generous with nature with eco-subjects , in other words someone who didn´t leave nature to be damage or fall into the wrong hands.

To reforce this idea we need to add an slogan:

"Wasting is no longer in. Now, become an ecoStingy!"

With this kind of slogan we emphasise the fact that you belong to a group, that you´re joined this philosophy.

  - **THE GRAPHIC IMAGE**

In order to realize the graphic image of the website we focused on the values we wanted to transmit:

Ecology/Sustainability/Originality/Freshness/Usability/Functionality/Youthfulness (according to the environment in which we are designing the webpage)/Diversity

CHAPTER 4

The webpage

• Naming

THE GRAPHIC IMAGE

•Logotype

Note: Finally the logotype is only constitute by the name of the website, in other words the name of the web is the logo of this one and of the movement we are going to promote at IHK.

In the logotype we have used two diferent but similar typographies , in this way we separate in two parts the logotipe: on one hand eco and on the other one stingy. Using two tipographies cause a breack and dynamism in the word .

Typographies:

appleberry - Love Ya Like A Sister

eco - Stingy

As we can see these type of fonts are very originals and informals. We use the combination of this two typographies principally because they are similar with the exception that the second is bigger than the first one (with the same font size), so it´s more stress . This fact allows us to highlight the word Stingy , to cause impact above eco that is important , but not is so impressive for users.

Playing with two diferent colours we reinforce this idea :

ecoStingy

•Logotype + Slogan

ecoStingy

" Wasting is no longer in. Now, become an ecoStingy! "

>> See Appendix : ***Graphic Design Folder*** p131-p05

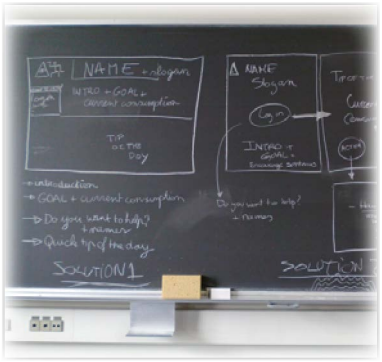
CHAPTER 4

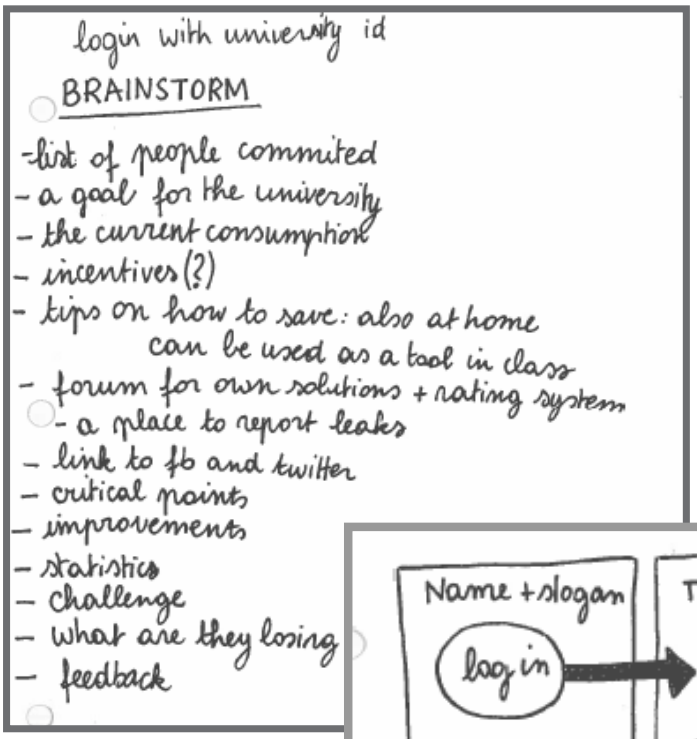
The webpage

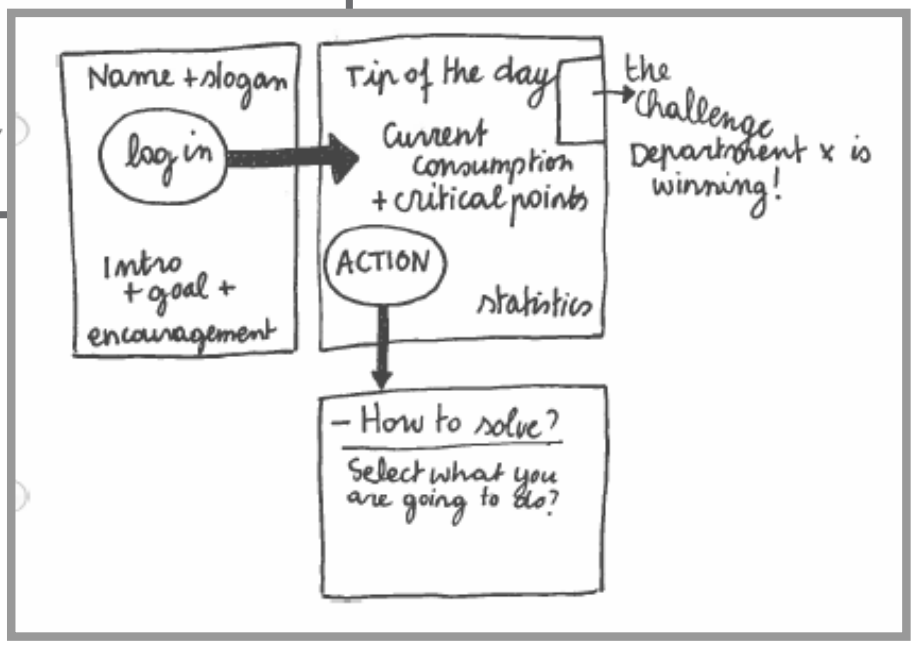
• The webpage development

SKETCHES

Before starting the design of the website is necessary to organize all the information you want to show on it and make some sketches of the structure of the website and the content of each menu etc ... To do this we did a Brainstorming (creative technique) in order to determine the content of our website and then each one propose different alternatives for the structure of the website. Below is a selection of sketches that will be used for the design of our website.





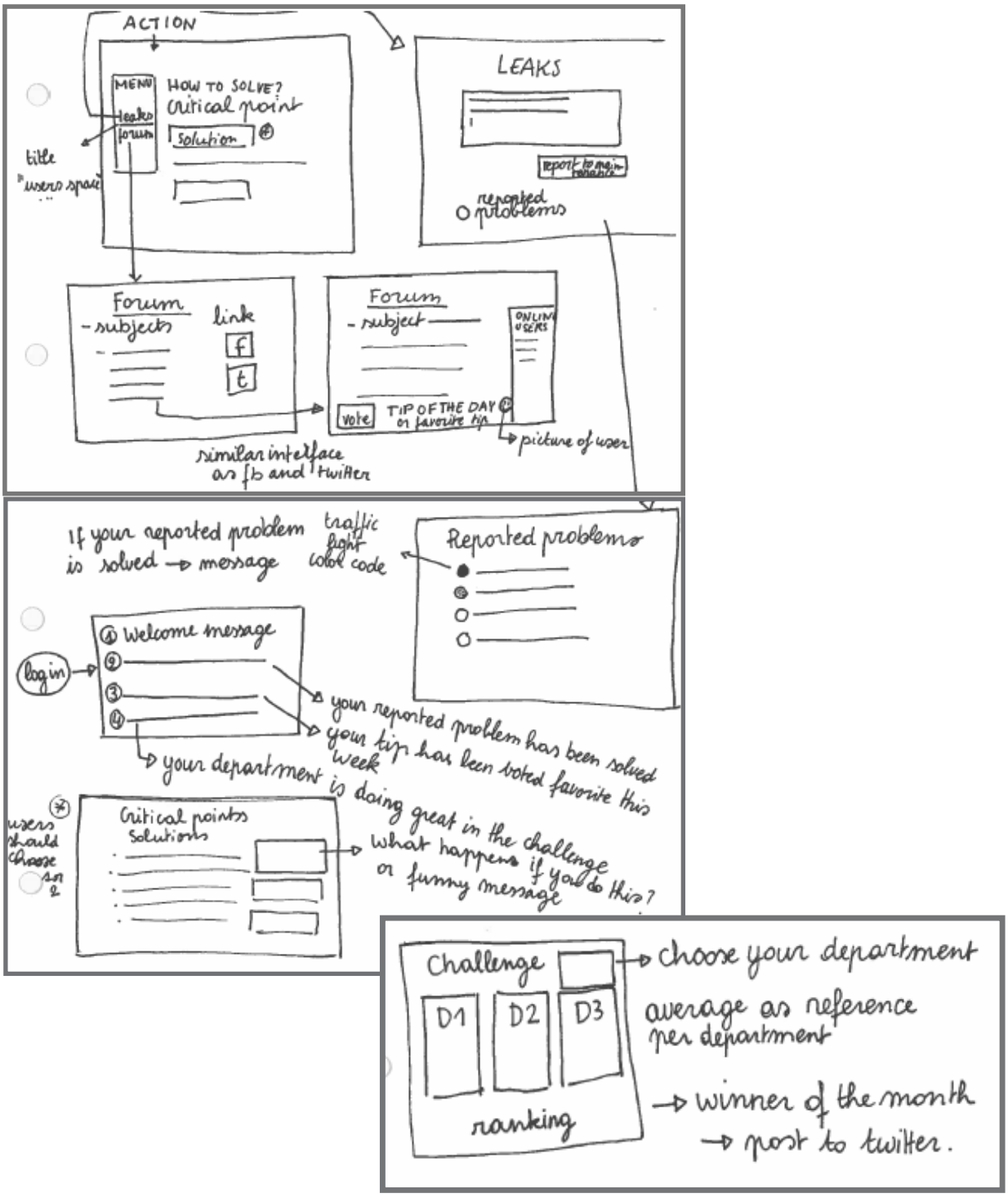


CHAPTER 4

The webpage

• The webpage development

SKETCHES



Figures 15-19: Schetches

CHAPTER 4

The webpage

• The webpage development

FIRST LAYOUTS

>> Requirements

In order the begin the building and development of the webpage we have considered the needs of the users and taken conclusions from our research into user behaviour in order to maximise the ease of use and appeal of the website. By doing this we maximise the likelihood of students within the university using the website effectively and reducing energy consumption and waste, thus, reaching the main objective of the project.

Some of the most influential conclusions from user research and exploration of existing products are as follows:

- The web page must be simple to follow and the instructions for use clear.
- It must convey all relevant informations such as instruction for use, ways to reduce consumption and explanation of the objectives without overloading the user with text. Studies show that readers generally only focus on 10% the quantity of text online as they would if it were printed. Subsequently, if we include too much text on the page the user may lose interest and not complete the process and will not return to use the webpage again.
- It must make it as simple as possible for users to input data and information (both qualitative and quantitative).
- In order to promote repeated use and positive reputation the webpage must present the benefits to the users from using the site.
- However, in order to soothe social conscience the web page must also make the user aware of how they are 'saving the environment'.
- It may require methods of posting the progress of the user in terms of energy consumption on various social networking sites (such as Facebook and Twitter) instantly.

>> Alternative 1

Initially, the user's impression of our product will be the aesthetic and layout of the pages. Furthermore, the layout and design defines the ease of use and simplicity of the web page and aid the user in the understanding of the instructions, purpose and objectives of our product.

Considering our research and the failings and successes of existing websites it is clear that the more simple the concept for the movement through the website and the layout the easier it is for the user to navigate and the more likely they are to return to it again. Also, the majority of contemporary, popular and successful websites utilise incredibly simple colour schemes and aesthetics.

Firstly, by simplifying the imagery and semantics associated with the planet and the majority of 'eco' products I concluded that a circular based design would symbolise the Earth and create a simplistic graphic aesthetic. Furthermore, pastel colours are heavily used in web

CHAPTER 4

The webpage

• The webpage development

FIRST LAYOUTS

design on pale, plain backgrounds. Thus, using pastel shades of blue, green, yellow, pink and will differentiate each section whilst keeping a 'neutral' aesthetic which relates to the theme of 'the environment' which is often represented in pastel shades and using blue, green yellow etc.

Furthermore, circles represent the shape of the earth and are also a clean and aesthetically pleasing way to separate different items on the page. They allow for the page to flow without being confusing and allow the colour to stand out from the background.

Each separate shape could incorporate a single 'tip' on saving energy, one piece of information or a link to another page within the website.

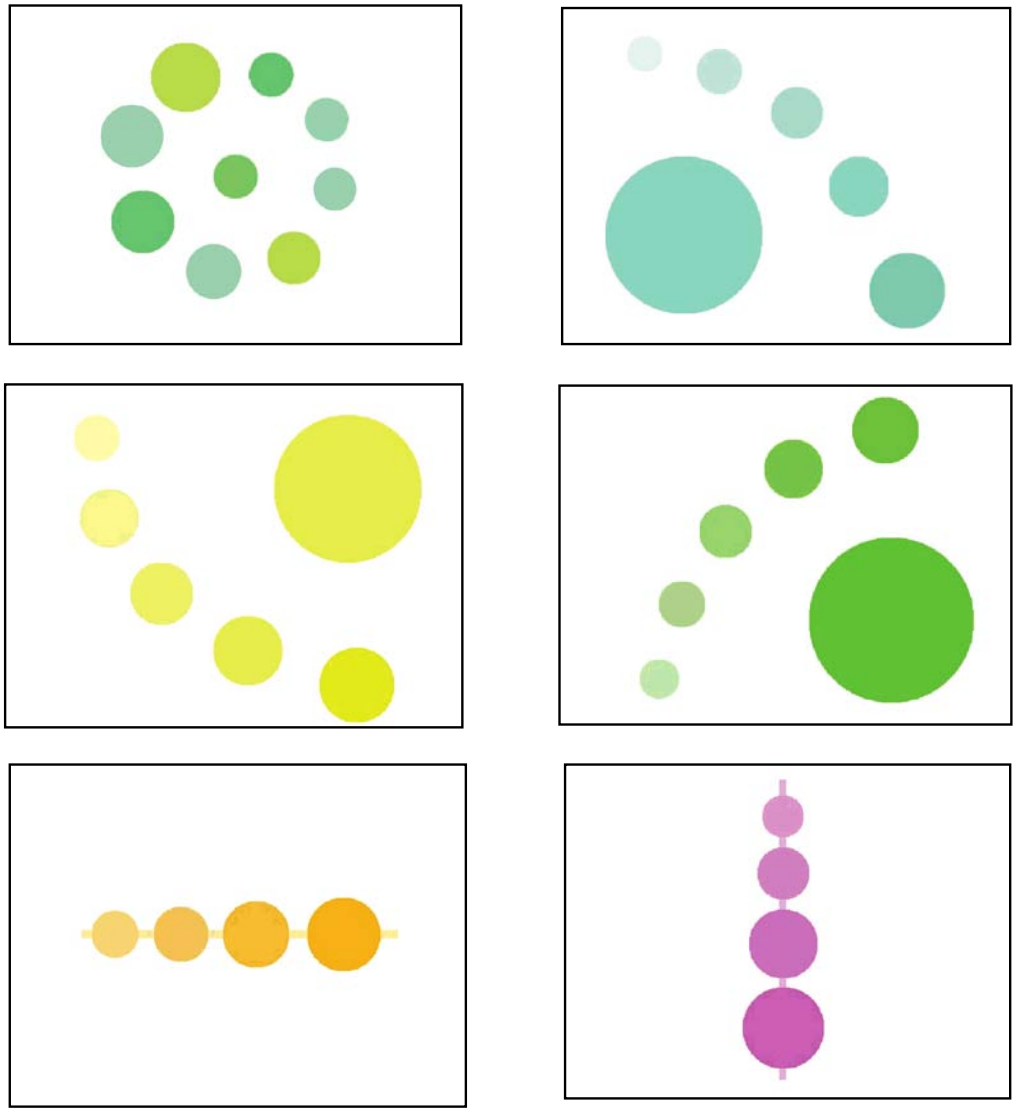


Figure 20: Alternative one-web design

CHAPTER 4

The webpage

• The webpage development

FIRST LAYOUTS

• Alternative 2

With this website layout we want to follow the layout of our presentations and reports. The purpose of the use of this colors and structure is transmitting a simple appearance as simple as the use of the website. The user has to perceive the website as a tool as a help, so the interface should be very clear, homogeneous and attractive.

Using this aesthetic we want to transmit technology and ecology as well as freshness and creativity. So according to this values we use a green and light green in reference to nature and a black and grey Pantone in reference to technology and modernity.

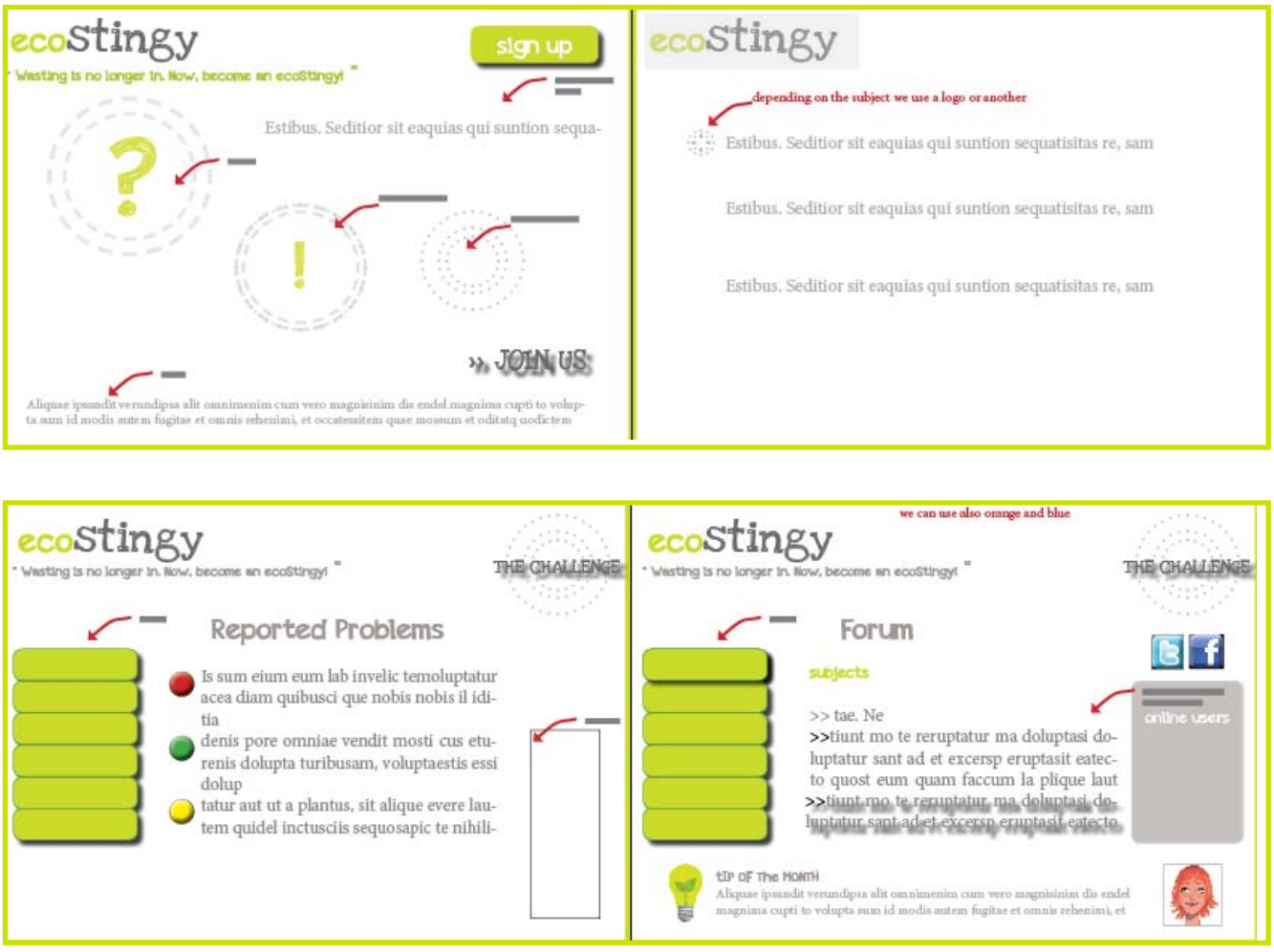


Figure 21: Alternative two-web design

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION

Once the choice of one of the alternatives was done, the designer of this alternative developed it, following the sketches already done. The designer defined the margins, typographies, sizes, colors.. and other aspects that could be modified once the programming has been done.

This is only a first layout that probably is going to be modified during the webpage development, taking in account that a test user test is going to be done as well as some reviews before the final presentation of the webpage.

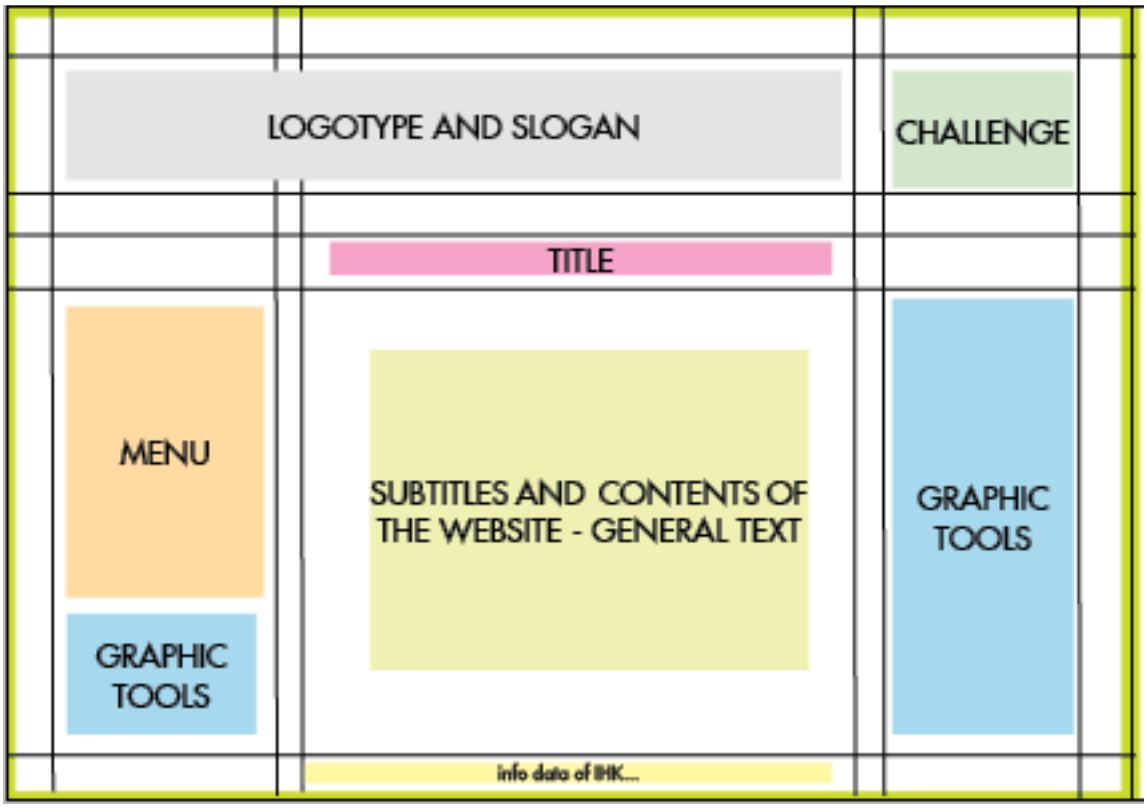


Figure 22: structure of a general page of the site Ecostingy (except Introduction and Challenge page)

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION

•typographies and colors

>> typographies

In order to do a webpage homogeny, logical and continuous we use the same typographies we use on the logotype and slogan of the site. Nevertheless these ones aren´t appropriate for a long continuous text so we use Futura LT typography because is a representation off modernity and simplicity, concepts that we want to transmit to users.

•Titles-Menu-Buttons-
important text-mesages..

Love Ya Like A Sister

•Subtitles

appleberry

•General Text

Futura LT Medium

Futura LT Book

>> sizes

•Name and slogan

42 18

•Titles and subtitles

30 18

•Menu

14

•General text

12

>>colors

•Main colours

204 R 225G 0B

C25 M0 Y91 K12

Pantone Black C

•Secondary colours

Pantone Orange 021 C

Pantone 2925 C

The main colours we use are according with the layouts of our previous presentations, in this case we add other colors like blue or orange to bring more dynamism and freshness at the webpage. (Red is also susceptible to be add).

The green represent the nature, the ecology .. however with this specific tonality we wanted to do a reference to technology and modernity too. Obviously the use of black is justified because is a neutral and modern color.

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION

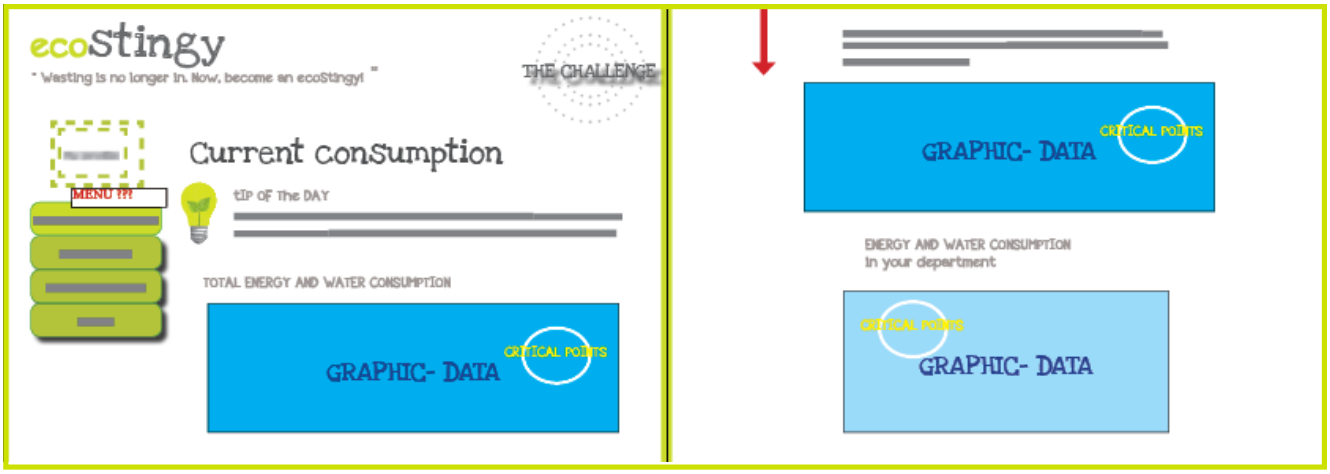
Figures 23-24 Welcome page and "My profile "page

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION



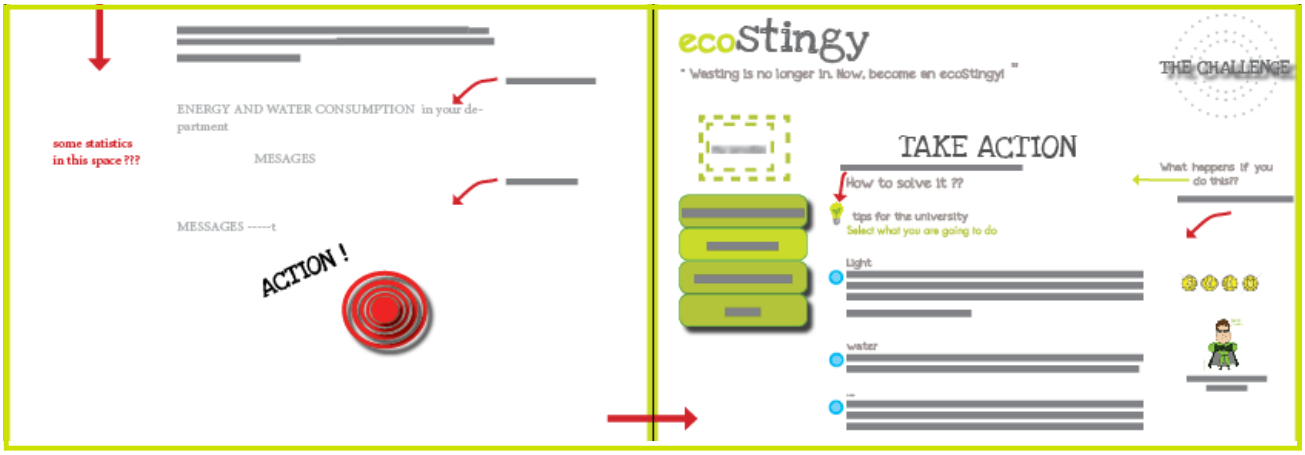
Figures 25-26: "My profile "page-alternative and "Current consuption" page

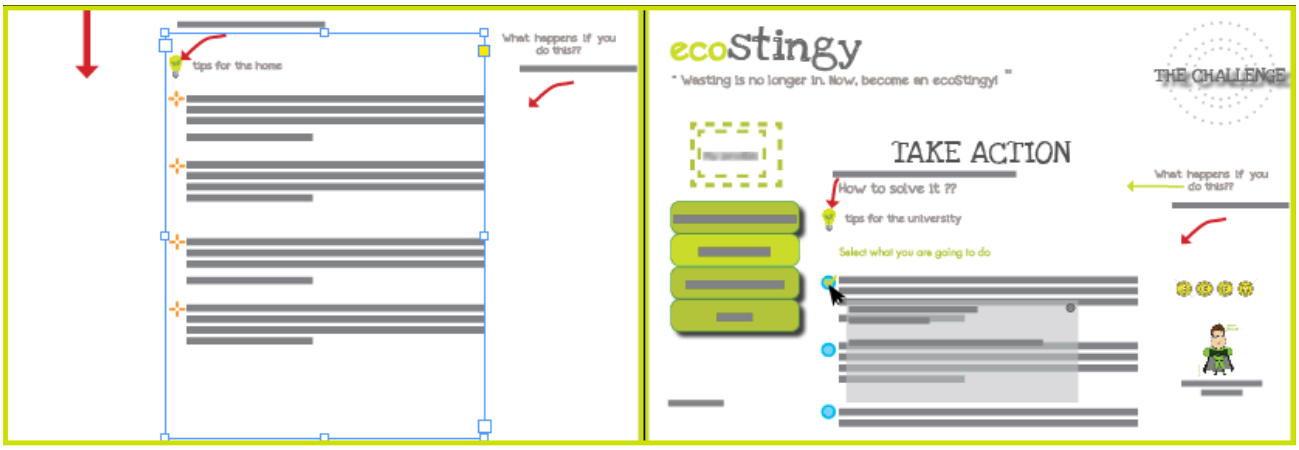
CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION





Figures 27-28: "Current consuption" end of the page and "Take action" page

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION

Figures 29-30: "Take action" end of the page , "Report a problem" page and "Forum" page

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION

Figures 31-32: "Forum" end of the page and "Help" page , "The challenge" page

CHAPTER 4

The webpage

• The webpage development

REVIEW

After the evolution of the alternative 2, the group discussed about some important design concepts (look notes in red color p-) , for example the use of menus or lists instead of a text box where user have to type...

The webpage was designed more specifically, the graphics that are going to be showed to users, and other aspects.The layout following is the result of the discussion between the group members and the supervisor.

(In this part, we only include just he slides that have been modified.)

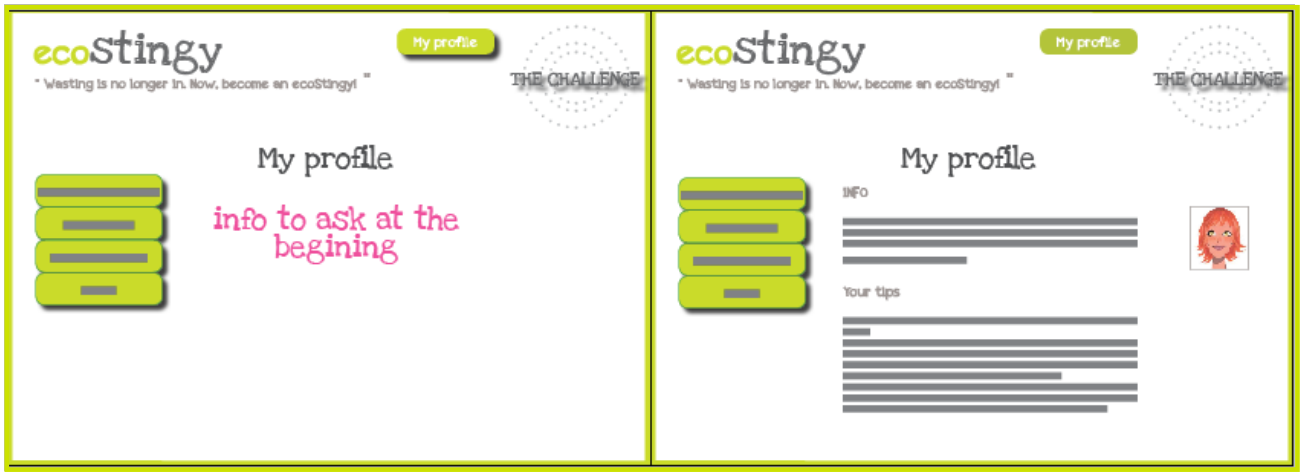


Figure 33

Figure 34

CHAPTER 4

The webpage

- **The webpage development**

  - **REVIEW**

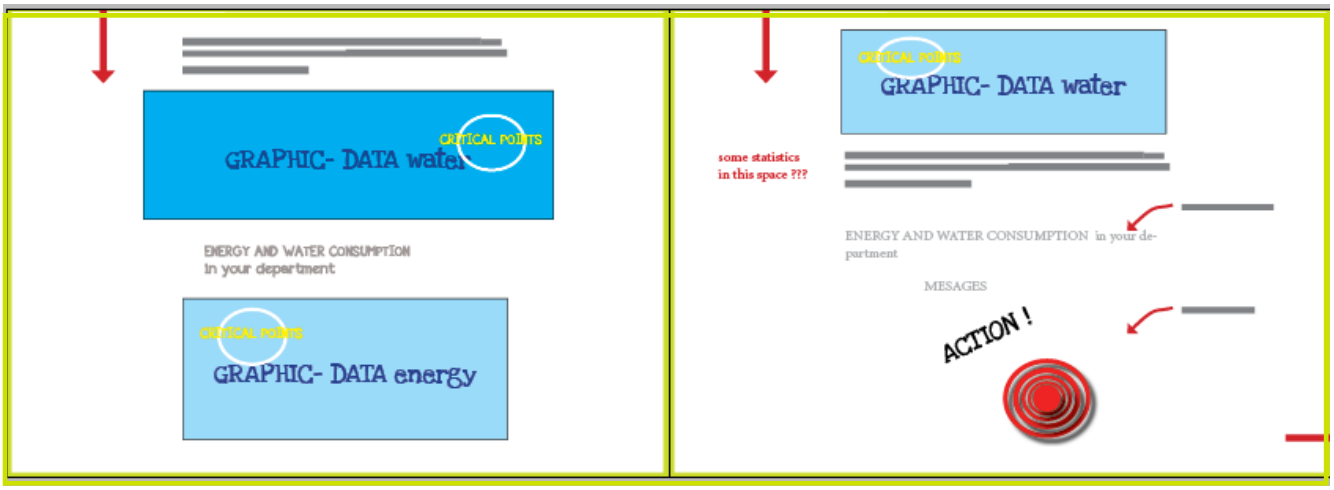


Figure 35

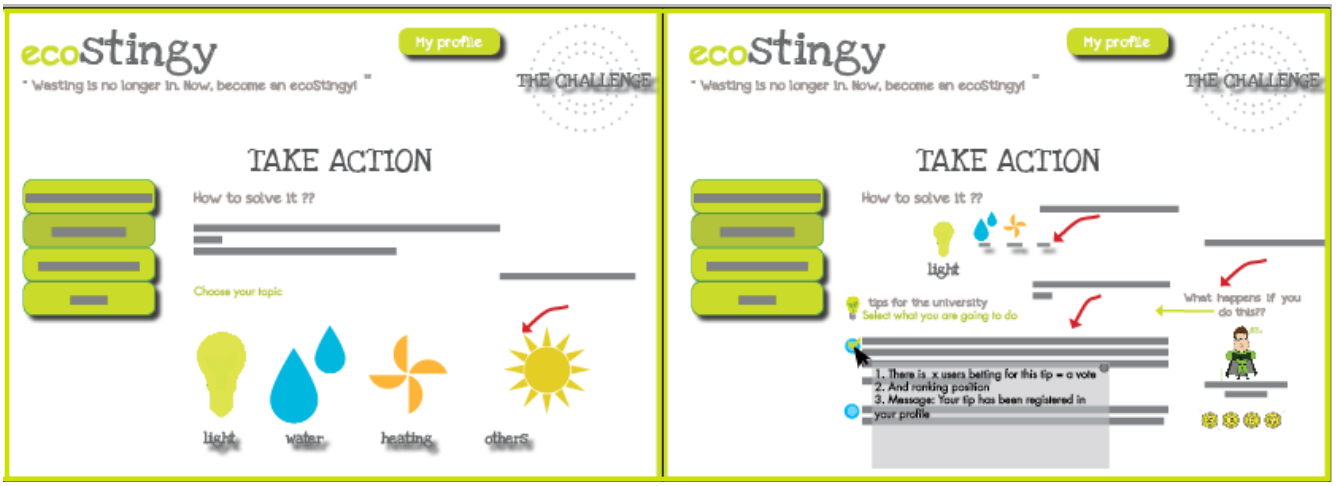


Figure 36

CHAPTER 4

The webpage

• The webpage development

REVIEW

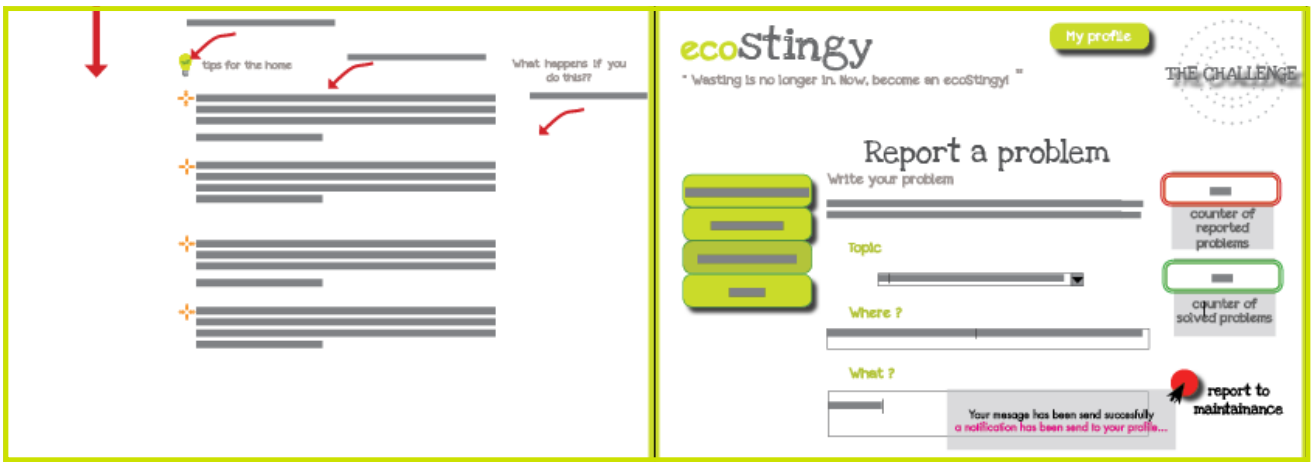


Figure 37

Figure 38

CHAPTER 4

The webpage

- **The webpage development**
  - **REVIEW**

Figure 39

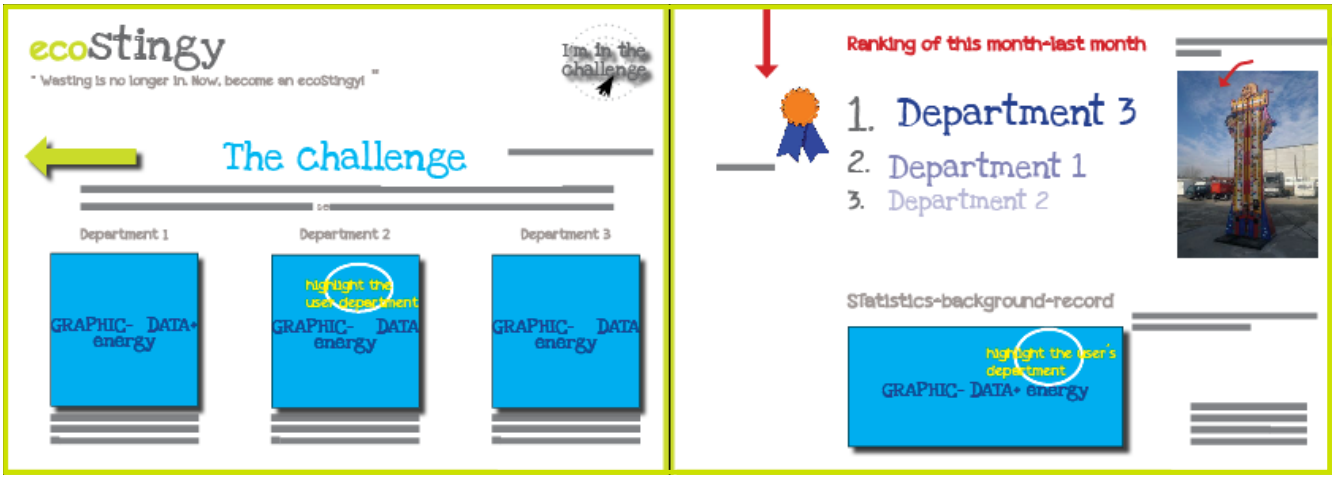


Figure 40

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION

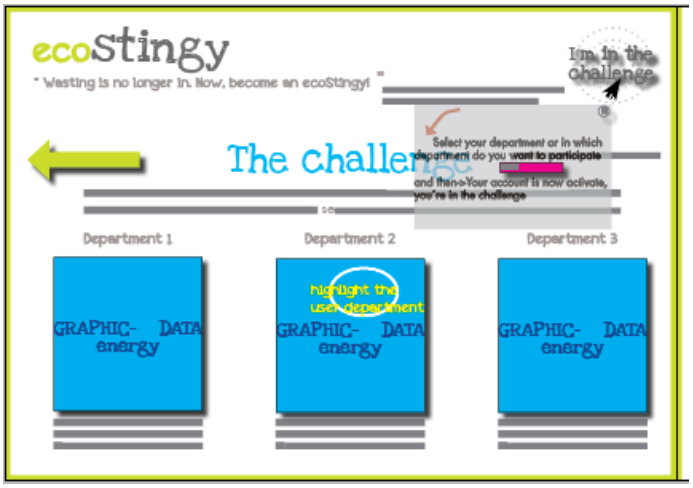


Figure 41

Figures 33-41: Web design after the Review

CREATING THE WEBPAGE

Once we did the design using Indesign , we started creating the webpage, programming in order to obtain a first prototype of the webpage. With this prototype we´ll be able to start testing with users the **ecoSTINGY** page.

These are the first results:

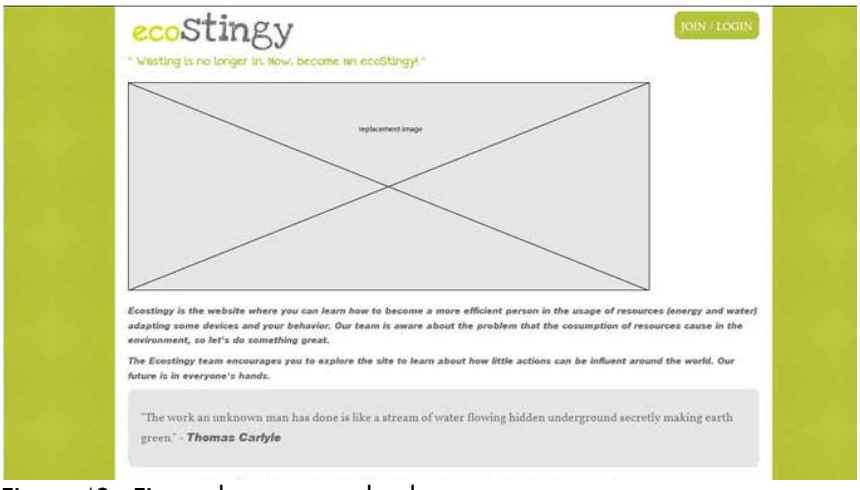


Figure 42 : First welcome page development

CHAPTER 4

The webpage

• The webpage development

CREATING THE WEBPAGE

Figure 43: Screenshot "Welcome page"

Figure 44: Screenshot "Edit your information"

CHAPTER 4

The webpage

• The webpage development

CREATING THE WEBPAGE

Figure 45: Screenshot "My profile"

Figure 46: Screenshot "Take action"

CHAPTER 4

The webpage

• The webpage development

CREATING THE WEBPAGE

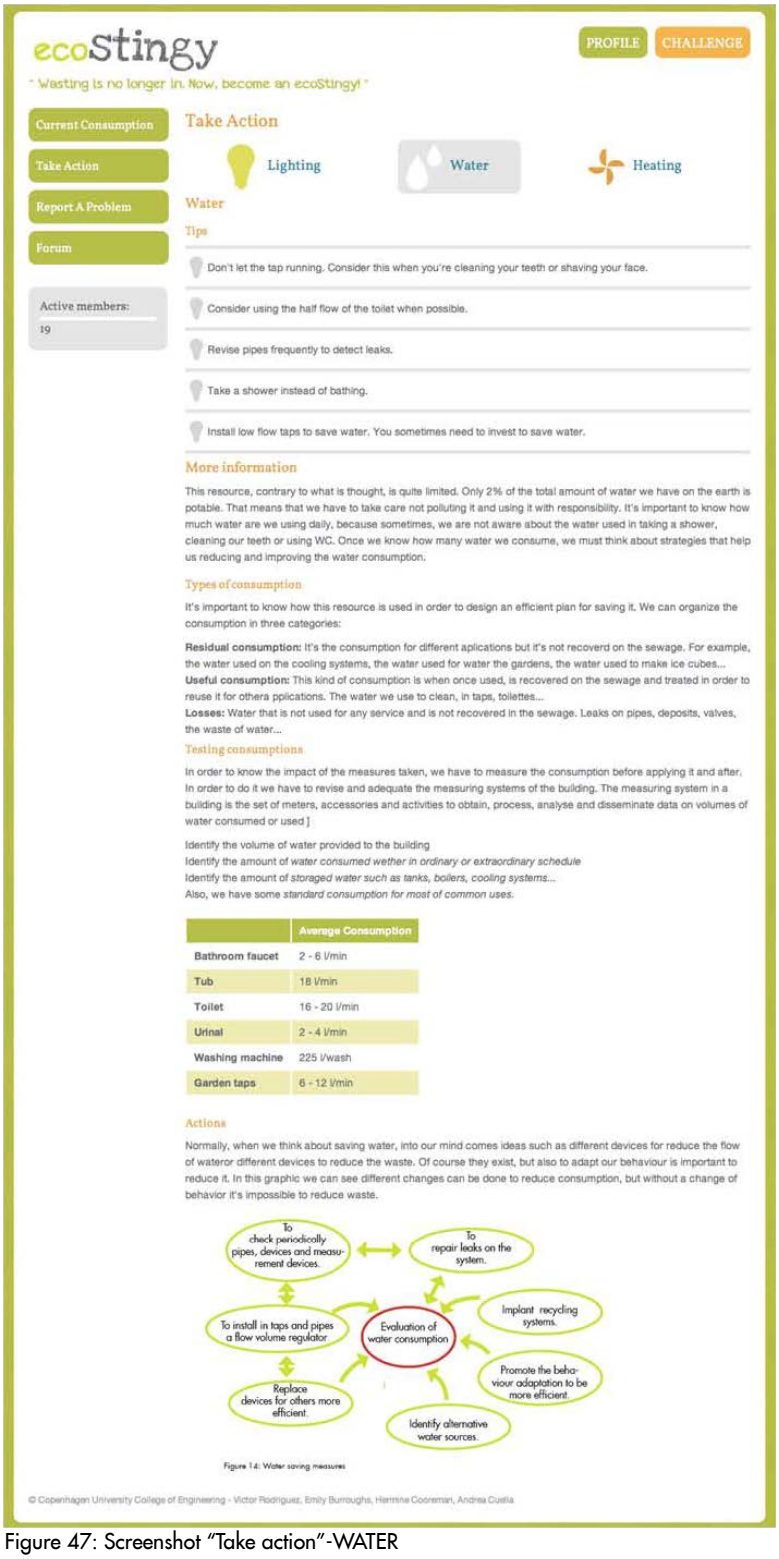


Figure 47: Screenshot "Take action"-WATER

CHAPTER 4

The webpage

• The webpage development

CREATING THE WEBPAGE

Figure 48: Screenshot "Current consumption"

CHAPTER 4

The webpage

• The webpage development

CREATING THE WEBPAGE

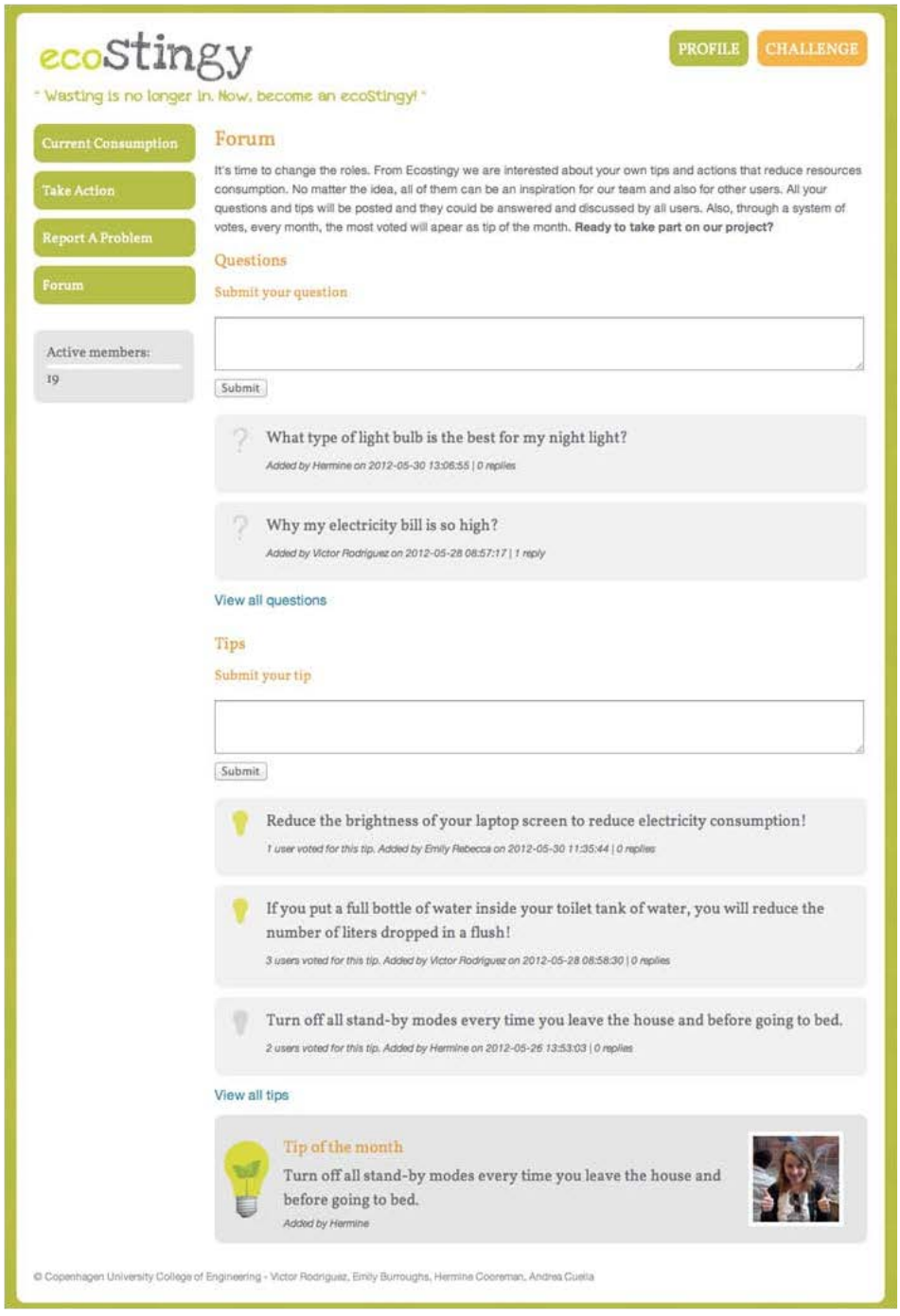


Figure 49: Screenshot "Forum"

CHAPTER 4

The webpage

• The webpage development

CREATING THE WEBPAGE

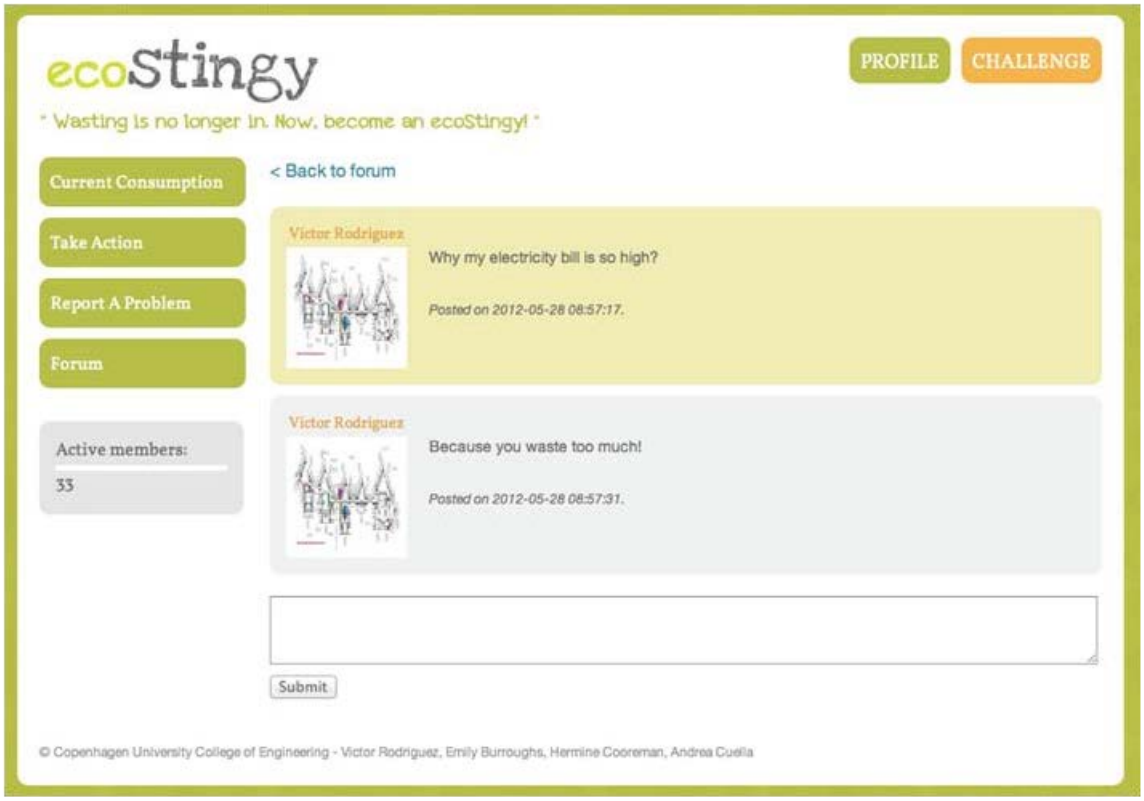


Figure 50: Screenshot -Example of discussion in the Forum

CHAPTER 4

The webpage

• The webpage development

CREATING THE WEBPAGE

Figure 51: Screenshot "Challenge"

CHAPTER 4

The webpage

• The webpage development

SELECTION AND EVOLUTION

Figure 52: Screenshot "Report a problem"

USER TEST

>> The purpose

This questionnaire will be presented to some students from IHK in order to know if they, who will be the final users, understand the webpage, it's contents and the objectives. Also it's important to define if the webpage is well structured and interesting. **The methodology will be showing them the webpage and also the questionaire, so they can answer directly what they found should be changed.*(It´s a writed questionnaire, there is no dialogue)***

>> The respondents

9 Students of IHK (the same profiles of the other questionnaire p46)

>> The respondents introduction to our website

We're creating an innovative product wich is called Ecostingy. It's a webpage where you can get information about the resources consumption of the university and how you can help to reduce it.

CHAPTER 4

The webpage

• The webpage development

USER TEST

>> Their questions and their answers

- **1. After a first glance, do you understand, or it becomes clear what is the purpose of the website?**

For all the respondents the purpose is very clear, we highlight some interesting answers:

"Yes, the green slogan below the logo focused my attention at first, and because of this I was able to undenstand intuinitively what is the sence of the webpage."

"Yes. It's to aware people for the necessity of saving energy and water, specially on the university."

- **2. In your opinion, do you think that the contents and services that are offered in this website are useful?**

In a general way they think that they are useful, principally it´suseful to remind them the problem .

"Yes. It is a special place to show one problem close to us and there is no similar website exist ***. But if there are more picture to show us, it will be better."***

"Yes I like the challenge idea *between different departments to compete for being the most efficient department in energy usage. And all the graph make a good connexion between theory and reality."*

*"**The 'report a problem page' seems like a really good idea,** much easier than emailing or finding the right member of staff to report a problem. I also liked the 'take action page, factual information; bullet pointed which helps give an understanding to someone in a more simple way."*

- **3. Are the texts used in the menu describable enough of what it is offered in the windows you can access through them?**

The users agree that the text and contents are very clear, they also gave us some suggestions:
"The text are clear, and the images help the user to locate itself. ***I would suggest to highlight the section you are in each moment. (Current consumption, take action, report a problem...)"***

CHAPTER 4

The webpage

• The webpage development

USER TEST

"Yes, it's encourage to go deeper inside the page. The quotaion at the bottom is a good idea."

"I like the **menu as it is simple to read.***"*

- **4. Seeing the home page (the page with the menu), Could you see at a glance the most relevant content that it is offered?**

The majority of respondents understand very quickly the most relevant contents.

"Yes, but for me part "Take action" is the meritum of the page and it can be more demonstrated (biger font, slightly different button, etc...) "

- **5. Do you underestand the charts and the indormation related to resources consumption at IHK?**

Users understand the graphics although they don´t like a lot how they look like.

*"**Yes, it's understandable, but it looks not pretty nice** (because of the fact that halfs of charts aro on grren backgtound and other halfs on whilt on (in chrome). The font of numbers is very basic, and I don't like notation "00" on X-axis and there can be "24" to make more obvious that there are presented hours."*

"The charts were pretty easy to read and were interesting."

- **6. Do you find useful the tips about saving energy resources?**

Despite the fact that some of them know this tips before , all users agree that it´s very important to remind them this easy tips to be aware of the problems and solutions that exist.

"Yes. Some seems to be obvious, but people are forgoting about this, so it's definitelly useful.."

"Yes. But most of them i have heard before."

- **7. Do you understand how the challenge works and the objective of it ?**

Users are very motivated with the challenge and they like the idea of competition.

CHAPTER 4

The webpage

• The webpage development

USER TEST

"Yes and I like it, the competition to reduce the consumption is a good idea."

"I would do the challenge but might find it easier with clearer targets"

• 8. Do you actually think that you are going to enter, share opinions in the Forum ?

In reference to the challenge not all the users are motivated to use them, some of them will use it if there is many people who use it.

"I like finding informations in forums. Probably I will use it to find something more for me and if I find something interesting to me, I will join the discussion ;)"

"I will use the forum if it is easy to access."

• 9. Would you use this product at the University or home?

Some users are right now not really sure if they are going to use the webpage also at home, it depends of how it works and of the answer of the rest of users.

"Why not, i don´t know. It s depend if there is a "life" on the website why not."

"Would be useful at the University because of the department challenge!"

"It could be interesting with a real follow-up"

"This would probably be better in the home environment as we would be the ones paying the bills so more thought is taken into being more efficient"

• 10. Comments and suggestions

As designers of this webpage we can conclude that the users answers are in general very useful and positives. Students are motivated to use the website and we hope a succes for the webpage.

"Well done." - "Nothing, good work."-"Good work by the way..."

"If I could use it through my phone or iPad I would like it a lot."

"Nice layout and congratulations for the work content."

>> See Appendix p131-p07

CHAPTER 4

The webpage

• The webpage development

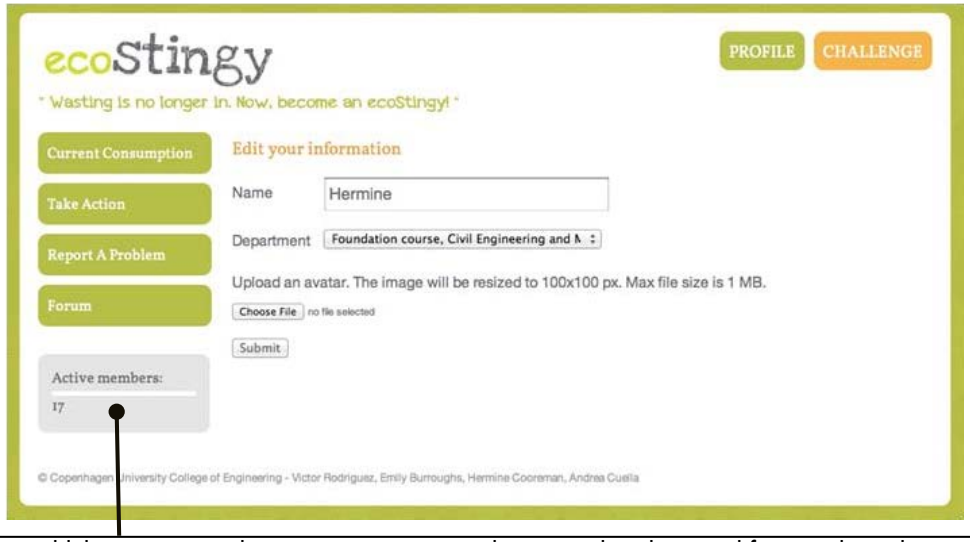
FINAL DEVELOPMENT

Using the conclusions of the user test and tacking in account their suggestions and opinions we do the final development of the website.

NOTE: some elements as the charts are hardly modifiable so we haven´t modified all the things because of some restrictions we found.

We add a text to explain the login with campusnet login, because some users felt a little bit lost at the beginning.

Figure 53



We add the "active members" to encourage people to use teh website and for us to know how succesfull is the **ecostingy** movement .

Figure 54

CHAPTER 4

The webpage

• The webpage development

FINAL DEVELOPMENT

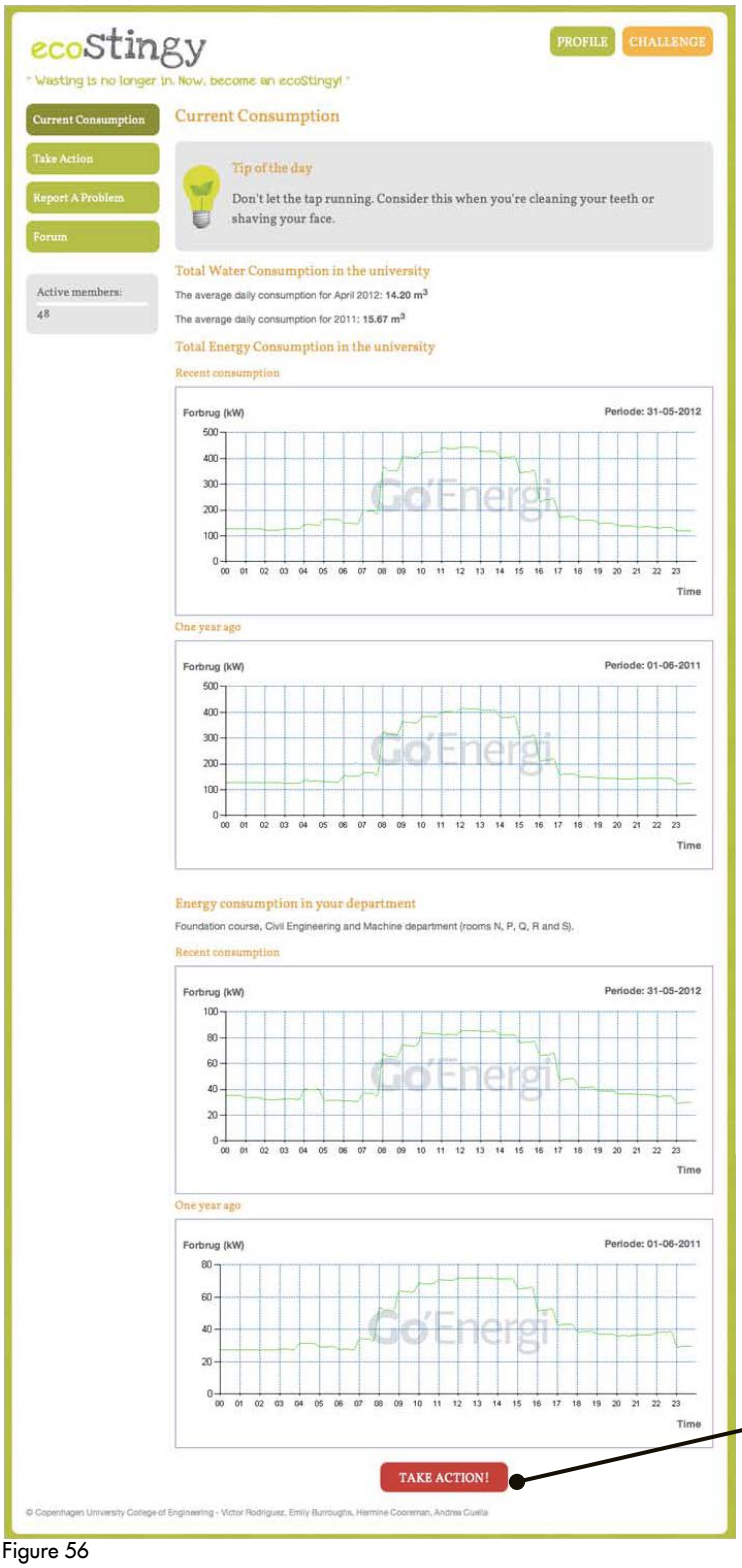
Figure 55

CHAPTER 4

The webpage

• The webpage development

FINAL DEVELOPMENT



We add a **"TAKE ACTION"** button linked to the *"Current consumption"* page.

Figure 56

CHAPTER 4

The webpage

• The webpage development

FINAL DEVELOPMENT

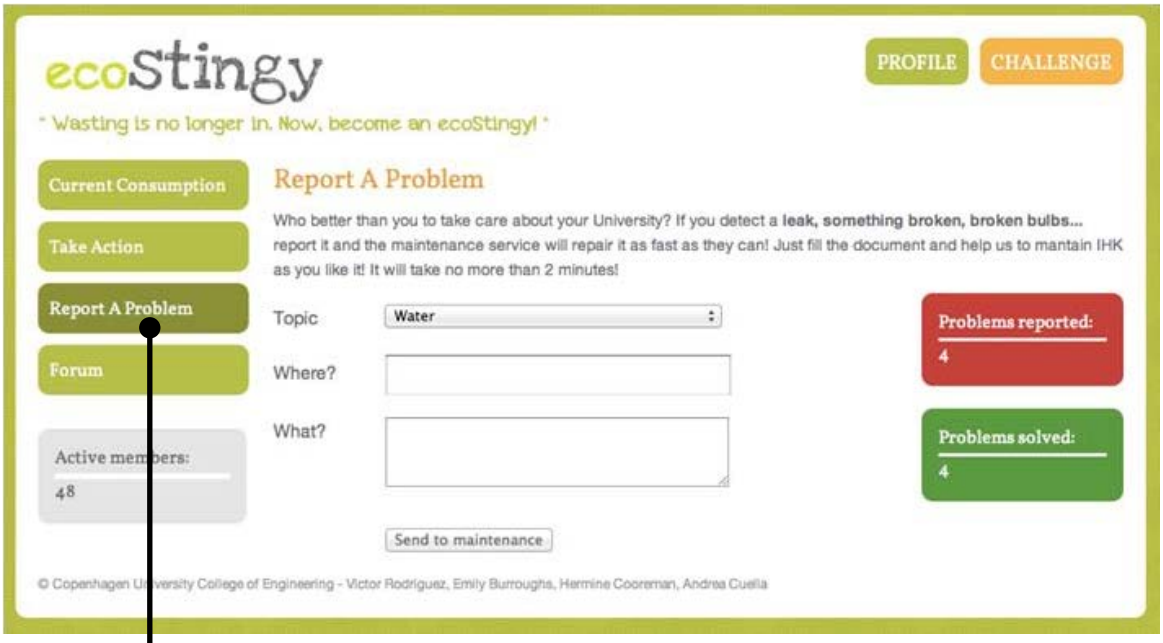


Figure 57

Now selected menu item is in a different color in order to help users to know where they are .

Figure 58

CHAPTER 4

The webpage

• The webpage development

FINAL DEVELOPMENT

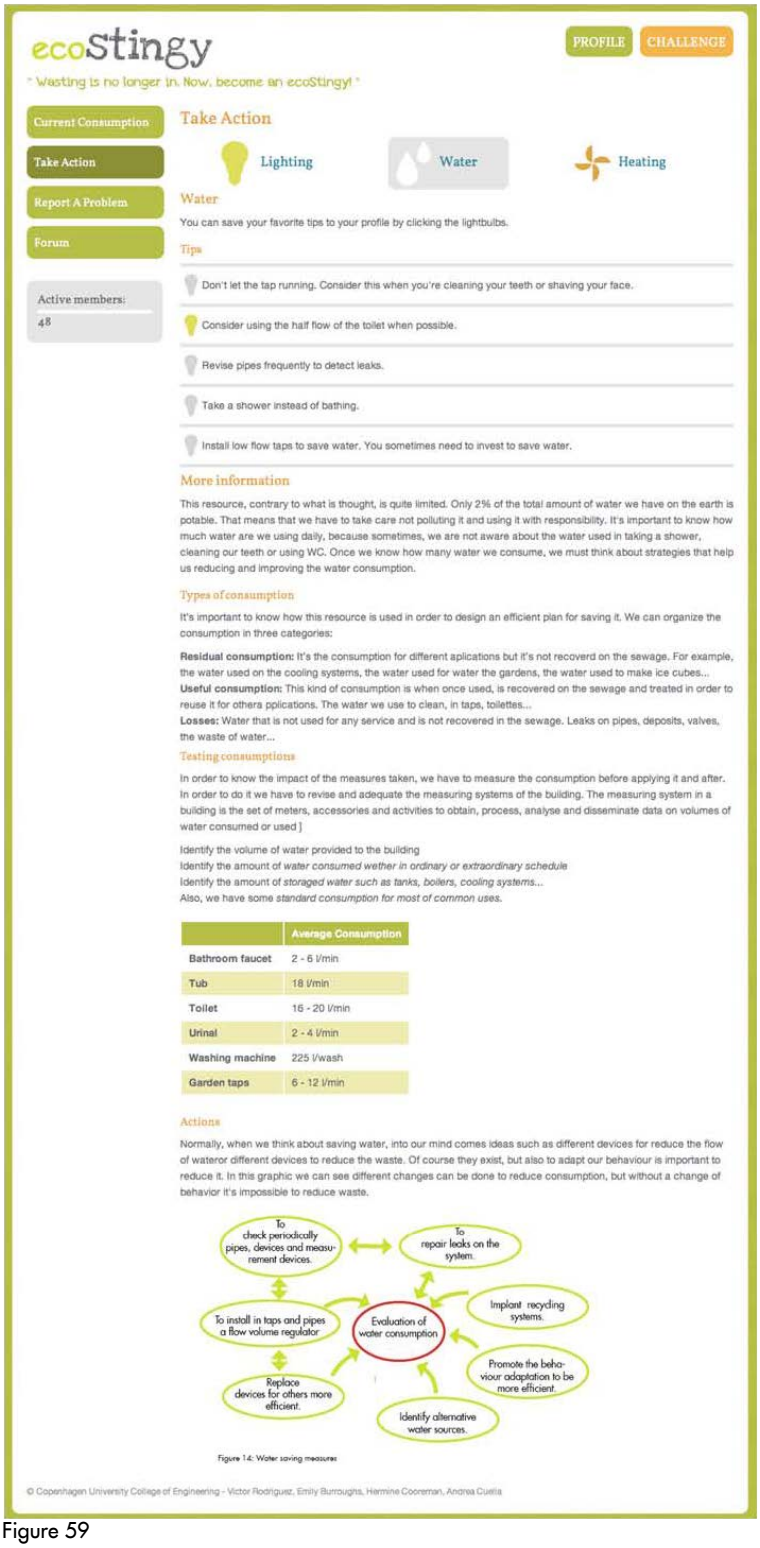
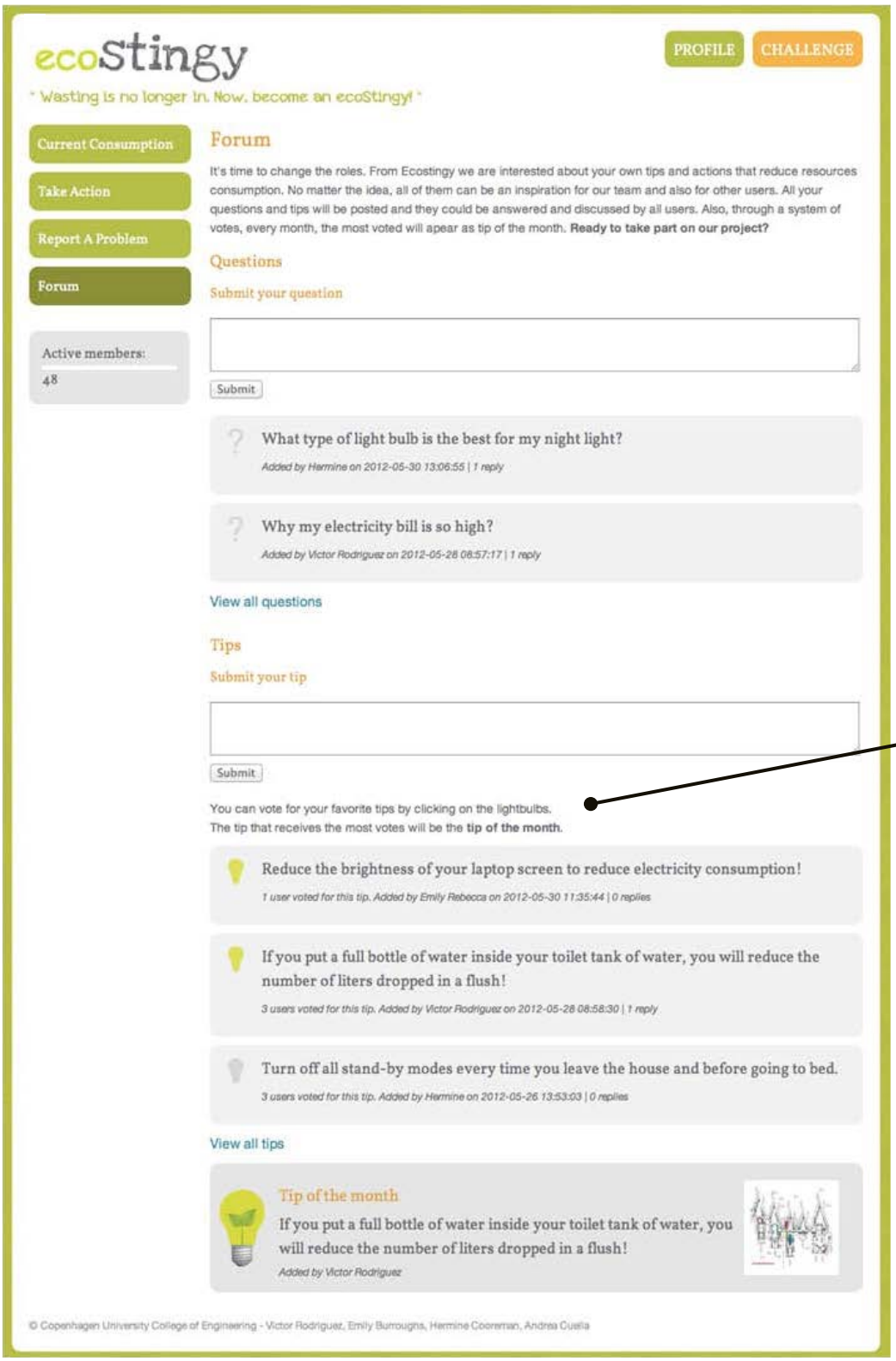


Figure 59

CHAPTER 4

The webpage

- **The webpage development**



We add a text to explain how you can vote for your favorite tip

Figure 60

CHAPTER 4

The webpage

• The webpage development

FINAL DEVELOPMENT

Now in the forum topics there's a title to tell the users where they are.

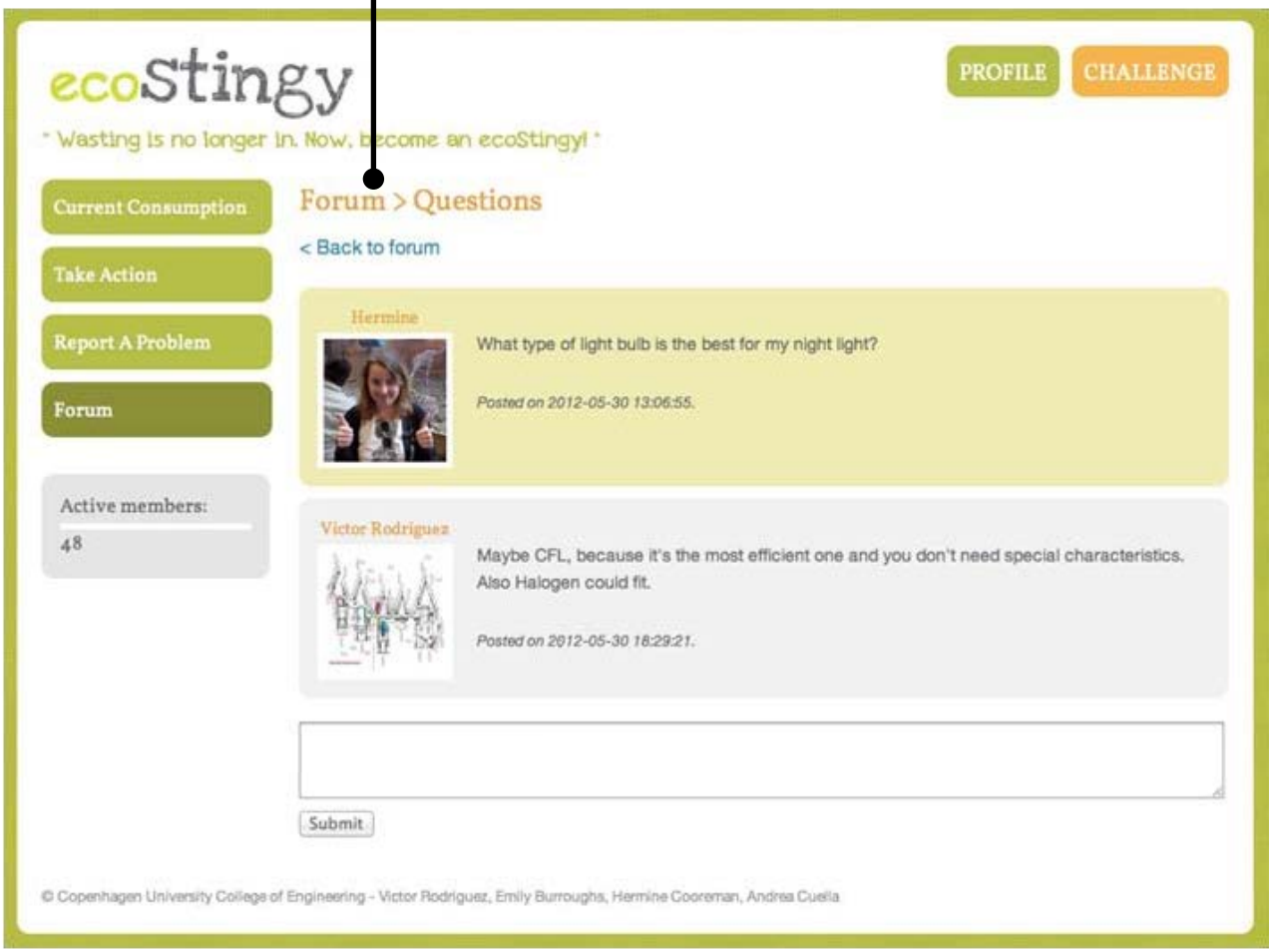


Figure 61

CHAPTER 4

The webpage

• The webpage development

FINAL DEVELOPMENT

Figure 62

Figure 53-62: Screenshots of the final development of the webpage

CHAPTER 4

The webpage

• The webpage development

CONTENTS

The main goal for the webpage is to help users to reduce the resources consumption. This will be reached by informing users about it's consumption and teaching them how to decrease it. It's quite important to motivate all users as possible, because the more people use it the more results will be reached. Our biggest problem will be to make users involved in our project, make them feeling that is its own responsability.

Before having the final product, we've decided wich are the tasks that users should be able to do in order to make them useful to reach the main objective. It's important to remark that the final result will not be positive if students are not involved on it, so it could be said that our product is a tool. By this we can conclude that we have two more objectives: Attract users and provide them with a simple and effective tool.

As far as we know, we don't have all the solutions, so participation and interaction beetween users it's interesting from our point of view. Everybody can contribute with it's own ideas and doubts. Our phylosphy is that working together, fighting for a common objective, we can reach all objectives easily.

>> Information and learning.

Information about consumption could be very useful and it's the reference to create saving measures, but only informing is not effective. Having all the information, users could be aware about its own impact on the environment, but then, what else? This is the point where we have to process this data to teach users how to improve its results. It's important to update information frequently, otherwise people will lose interest once read.

Nowadays, information flows around the world instanly, everything changes day after day. The way we inform people should be dynamic, encouraging people to participate actively and feeling theirselves useful and necessary. As far as we know, the best way to achieve that objective is that users were the principal actors in the webpage informing them about its consumption and trying to involve them in our project by teaching how to improve its behaviour and also learning from them.

CHAPTER 4

The webpage

• The webpage development

CONTENTS

>> Horizontal flow of information.

The point that our product differ with others that hadn´t succeeded is that we don't want to change people's behaviour by imposing some rules or tasks. Our objective is to make them participants in our project by showing them how they use resources and making them able to see its improvements and results. Also, we can't answer questions if are not formulated, so users should be able to ask concrete answers to obtain solutions to it's own situation.

Furthermore, do we know all the answers? That's not possible, but that's why we decided to use a webpage, because common knowledge is more powerful than anything. Users are also allowed (and invited) to answer their mates questions, so everyone is essencial in order to achieve our objectives. Questions make people aware about things that maybe they didn't realised before and answers are solutions for problems that users have. Ecostingy team also will try to answer that questions as far as we are the risponsibles of the project.

>> Motivation and incentives

Reducing resources consumption is the main goal of the project, but this task cannot be done alone. Students should participate actively to ensure a correct function, so how we will do to attract them? As we know, human is competitive, so through a challenge between departments in university we want to accomplish two objectives: Marketing from user-user because it's a team challenge and also make users interested in beat the other departments being more sustainable.

Incentives such as money, discounts or other advantatges were thought, but we concluded that people could get used to this and just participate to get the prize, and the objective is that people become aware and interested by other "prizes" such as a better environment for future generations and keeping our limited resources as much as we can. Futhermore, informing about the saving that some actions can determinate could be a good idea, because it's a colateral effect.

>> Responsibility

Users from university are who detect first things that are broken or just don't work. That's why we want that they are able to inform directly to the maintenance risponsables, because the more fast a problem is reported the more fast it is solved. Risponsability is the base that make this project possible, because is needed users voluntarity to change it's behaviour.

CHAPTER 4

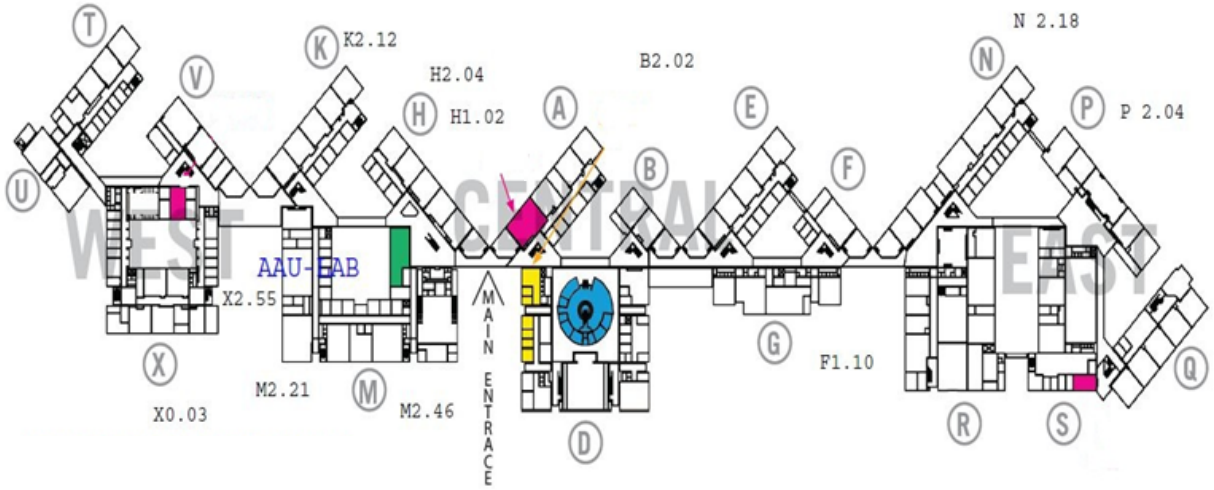
The webpage

• The webpage development

MEASUREMENTS POINTS

In IHK, we have different measurement points of electricity located along the building. This measurement points are composed by 2 different types of measure: Lighting and Other devices (need to know wich are). The info collected by this sensors will be used for us in order to inform users in IHK the consumption of electricity and to plan different strategies of saving.

Nowadays, we have 3 measurement points: One for the CV(Center for continuing education) and wings A, B and E, another for the Civil Engineering department (wings N, P, Q, R and S and Foundation class) and another one for IT and Electronics department (wings H, K, M, T, U, V and X) and the lab for Aalborg University. All of them have some servers included, indicated on the figure below. We will use it for 2 principal objectives wich are showing the total (and partial) consumption of the building and to make a challenge between users to encourage them using our product.



Classroom numbers indicates where servers are

Figure 63: IHK servers location.

>> Possible improvements

We have to be careful when showing info about consumption, because if it's not easy to understand or too complicated, users will not be interested anymore. Simplicity is the key when we have to display complex information, because a lot of numbers and charts would make people confused. Most of users from university, as engineers, will know technical details but they're not interesting, because we only want to inform that resources could be saved. It's time for comparisons.

CHAPTER 4

The webpage

• The webpage development

MEASUREMENTS POINTS

Using comparisons we can see quickly if we are improving the consumption of electricity or not. References are needed to compare our actual consumption with processed data. This means that we will not show only daily data, we want to show at the same time 3 different measures: Actual consumption, day before consumption and last year consumption. A third parameter, that maybe could be useful, is the weather from the day, bacause it's an important factor for electricity (and energy) consumption (with clouds, no natural light and less natural warm...).

Furthermore, the measurement points could be improved, because by now we only can separate consumptions in building in big parts, but with more measurement points, we can rise the accuracy of the strategies for saving. Why? Because every different class has different needs, it's not the same a workshop, where heavy machines are working, and a classroom, where all this resource is invested for lighting and maybe some computers.

The best option, is to have a independent measurement point in each class. With this distribution, we will be able to control where problems are (Classes where sunlight is not useful, bad behaviours, let light's turned on...) to create specific saving strategies for every situation. Obviously, it may be expensive and with lots of different measurements, but is still the best option. If measurement points should be improved, we have to compare the savings that we can obtain and decide if they are enough to payback the investment.

It's also important to know, that maybe we will not have back the money that we invest but the benefits for the environment are also important, maybe more than the economic. The objective of measuring the consumption is to study where we can improve the efficiency of its usage to create saving strategies. The main objective of the project is to save resources, not money.

Also we have 2 more meters, one for the total heating consumption, wich is district heating and other to measure the total consumption of water. The idea is the same, to spread out the meters to have the consumption of heating and water individually for every room that use one of those resources.

>> Taking profit of measurement points: Challenge

Another technique for make people interested is to create a challenge where students from different departments will compete to be the most electricity-saving. All of we know that humans are competitve by nature, so this idea could be interesting for 2 aspects: To promote the website and to inform users about it's average electricity consumption. So those are the objectives we want to obtain with the challenge.

CHAPTER 4

The webpage

• The webpage development

MEASUREMENTS POINTS

>> Taking profit of measurement points: Challenge

We will use tha data that measurement points obtains and divide the total consumption by the number of users of the departments, so logically, the department wich obtain the less average consumption will. All the consumption of the IT and Electronics department is divided by the number of users wich are in this zone, so logically, the department wich obtain the less average consumption will win. To know where the user is studying most of time, they have to inform about it when they register for the challenge, so the students will encourage their classmates to participate on it to reduce the average consumption.

It could be improved if meters in everey classe were available, because the accuracy will increase a lot. Nowadays, also the consuimption of servers and labs are modifiying the measurements, so it will not be very accurate, but it's more to gave an idea to the users than to create a real competition. Also if we include water and heating consumption, it will be more accurate.

CHAPTER 4

The webpage

• Technical items

TECHNOLOGIES

The website is running on an Apache server. Apache is open-source web server software. During the development phase of the website, we used MAMP, which stands for Macintosh, Apache, Mysql and PHP as a virtual server on our computers. An alternative would be Xampp, that runs on different platforms such as Linux and Windows.

We use a Mysql database for the data of the website, and PHP to access this data. We also used Smarty (http://smarty.net), a template engine for PHP that facilitates the separation of presentation (HTML/CSS) from application logic (PHP). We decided to use this to make the code easier to maintain. By using Smarty, you can also separate the front end development and the back end development entirely. For the front-end development we're using HTML/CSS and jQuery (a javascript library).

WEBSITE STRUCTURE

Home: On the home page we introduce our project, encouraging people from the university to participate. This is the only page you can see if you're not logged in. From this page you have the option to join/login, and if you click the link you get redirected to the login page.

Login: All the students and staff at IHK have a personal login (student id) and password that is used for Campusnet, the hotspot, … The university uses a CAS server for this. CAS is a multi-protocol SSO solution, and can be used for authorization. The user will be directed to a page from the university (see figure) to log in, and when the login is successful, redirected back to our website where the website receives the student id from the CAS server.

Because our website is built with PHP, we used a PHP CAS client called phpCAS (https://wiki.jasig.org/display/CASC/phpCAS)

Figure 64: IHK CampusNet

CHAPTER 4

The webpage

• Technical items

WEBSITE STRUCTURE

Profile & edit profile: When the user logs in to the website via CAS, there is a check to see if it's a new or a returning user (checks if there is a user with the user id CAS returns in the database - more information on the database structure later in this chapter). If it's a new user the user gets directed to edit profile where he can edit his information (name, department and avatar). A returning user gets directed to his profile where he can see his information, the tips he's saved from Take Action (our tips) and the tips he's saved from the Forum (other users' tips), the problems he's reported in Report A Problem and their current status (solved or not) and his achievements (for example if his department wins the Challenge or if his tip in the Forum gets awarded "Tip Of The Month").

Current Consumption: Here we display the energy and water consumption in the university. At the top of the page we have a "Tip Of The Day". This is a tip that you can also find at Take Action. There is not a lot of data available for the water consumption, but we have the yearly consumption from the past and the monthly consumption from 2012 so we display the average consumption for last year and the average consumption for the last recorded month.

For the energy consumption we are using charts from goenergi.dk. The university has meters in 3 different locations (we use these 3 locations as 3 departments to make the data more customized to our users). We are displaying the recent consumption charts (data from 3 days ago) in the entire university and comparing it to one year before on the same day of the same week. If the user selected his department in Edit Profile we also display the recent consumption charts and the charts for one year before for his department.

Take Action: On this page you can read an introduction on why it's important to take action and save resources. We divided it in 3 categories, lighting, water and heating. These categories are subpages. On every subpage there are some concrete and easy to understand tips first. The user can save the tips he likes to his profile to easily find them back. The saving of the tips is done with AJAX (jQuery/javascript makes the request to the server) so the page doesn't have to be refreshed. Below the tips we have more information on the topic.

Report A Problem: Here the user can report problems in the university to maintenance. For example, if there is a tap that's leaking. The user needs to select the topic (water, electricity, heating or other), give the location and also write a summary of the problem. Then he can send it to maintenance. The problem he just reported is then added to his Profile so he can stay updated on the status.

CHAPTER 4

The webpage

• Technical items

WEBSITE STRUCTURE

Forum: In the forum users can ask questions and give tips on how to save resources, and discuss them. The forum is divided in two parts: questions and tips. On the main page of the forum you can add new questions and tips, and the five most recent entries of both are displayed. Users can save the tips given in the Forum to their Profile, and this save also counts as a vote to see the popularity/usefulness of the tips. The tip with the most votes each month gets awarded with "Tip Of The Month", also displayed in the Forum.

Challenge: In the challenge, users get encouraged to save resources in their department. If you start using the website, you're not automatically participating in the challenge. The user first has to click on Participate. If a user is participating, he's playing for the department he selected in his Profile.

The challenge shows the consumption during this month so far for each department, and how many users are playing for the different departments. We calculate the winner by dividing the consumption by the number of users, so the more users a department has, the lower the ratio and the higher chance of winning the challenge. This should encourage users to ask their classmates to join the Challenge and our website.

We also display a chart for every department (from goenergi.dk) with the consumption for the last week.

At the bottom of the page we have a ranking for last month, where the total consumption, number of users at the end of the month and the ratio are displayed.

Maintenance website: We made a seperate website for maintenance, where they can see the reported problems and mark them as solved when they are solved. The other function for this page is that they can enter data for the water consumption to put it in the database.

Figure 65: Screenshot Maintenance-page

CHAPTER 4

The webpage

• Technical items

WEBSITE STRUCTURE

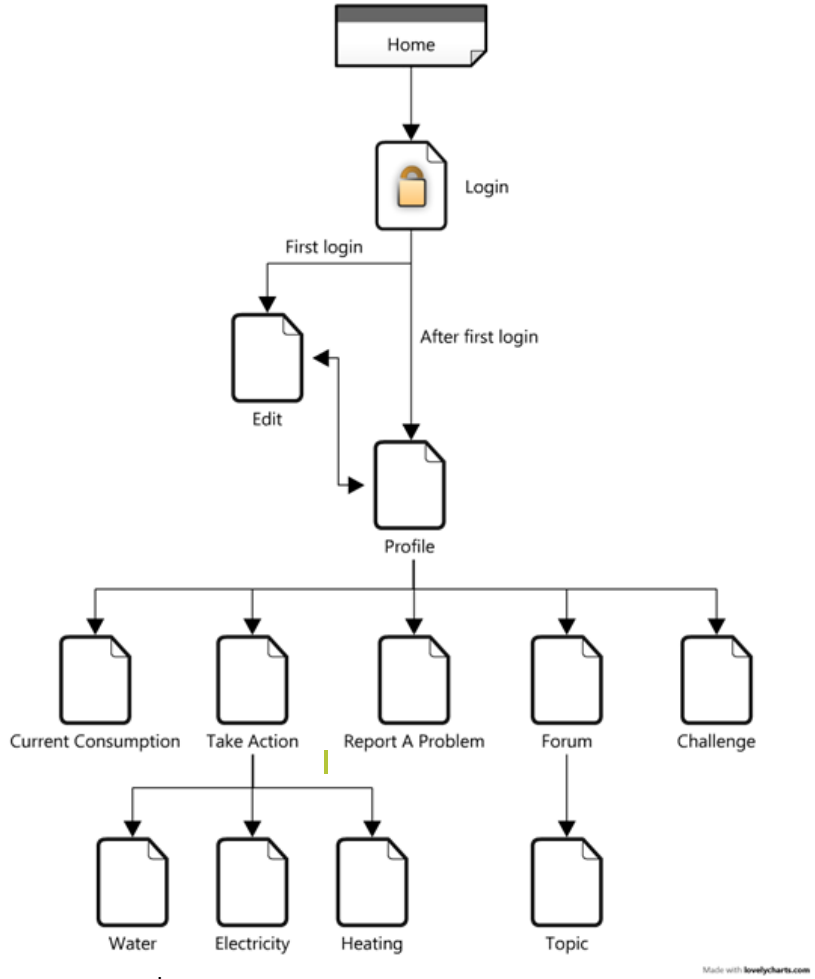


Figure 66: Website structure

DATABASE STRUCTURE

users

Id is the id from CAS login. Registered is a TIMESTAMP from the users' first login.

Department is departments.id. Department, name and image can be changed by the user in Edit Profile. Wherever there's a field called user in other tables, this is users.id.

departments

There are 3 departments. Wherever there's a field called department in other tables, this is the same as departments.id. Goenergi is the meter id that is used in the javascripts from goenergi. Name and rooms are to identify the departments.

CHAPTER 4

The webpage

• Technical items

DATABASE STRUCTURE

reports
Data can be inserted at Report A Problem. Type is a number to identify if it's water, electricity, heating or other. Location and problem is the user input. User is users.id. Solved is 0 for unsolved, 1 for solved. This can be changed in the maintenance website.

tips
This are the tips that we supply and are shown on Take Action. Tip is the text for the tip, type is a number from 1-3 depending on if it's a water, heating or electricity tip.

likes
These are the tips users save on Take Action. The tips are then displayed on their Profile. Tip is tips.id and user is users.id.

topics
This are the questions and tips in the Forum. User is users.id. Topic is the user input for the question or tip. Type is 1 for a question and 2 for a tip. Time is a timestamp for when the topic was added.

replies
This are the replies to the forum topics. Topic is topics.id. User is users.id. Reply is the user input. Time is a timestamp for when the topic was added.

forumlikes
This are the tips from the forum that the users save to their profile. Tip is topics.id and user is users.id.

tipofthemonth
This is the tip that received the most likes in the last month. Month is a date and topic is topics.id.

achievements
This are the achievements that are shown on the users' Profile. Achievement is the text, and user is users.id.

wateryear and water
This is the water usage data for a year and for a month in m3. This is added in the maintenance website.

participating
This are the users that are participating in the Challenge. User is users.id.

CHAPTER 4

The webpage

• Technical items

DATABASE STRUCTURE

energy

This is the daily energy consumption data that we use in the Challenge. This data comes from goenergi.dk where it was exported as XML and then imported in the database. Department is departments.id, date is the date for when the usage is and usage is the consumption in kWh.

challenge

We use this for the monthly ranking of the challenge. Date is the month, department is departments.id, usage is total monthly usage and players is the number of users participating at the end of that month.

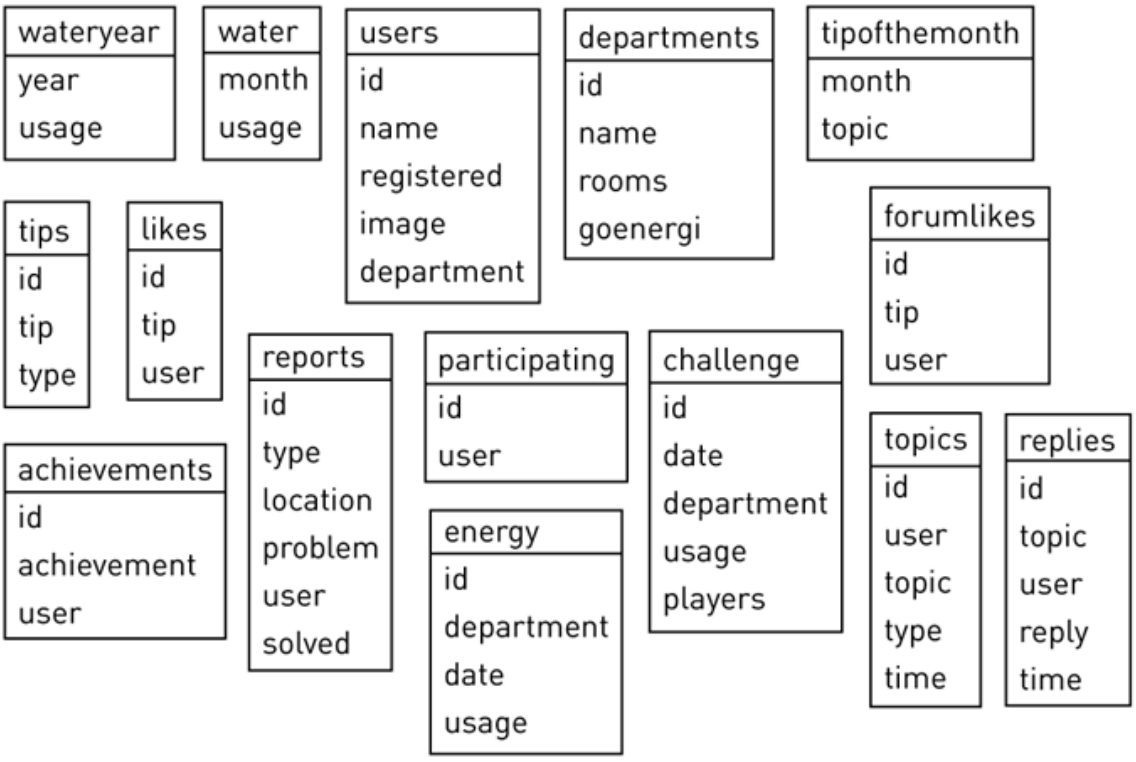


Figure 67: Database structure

CHAPTER 4

The webpage

• Technical items

Filestructure

bold for folder regular for file italics for explanation

- **cas**
  >> config.php | configuration file to access the IHK CAS server
  >> source | phpCAS source

- **images** | images used in the design

- **iindex.php** | main file and front controller for the website.

- **ijs** | javascript files used for liking/saving tips
  >> jquery-1.7.2.min.js | jQuery library
  >> script.js | javascript for likes
  >> toggleForumlike.php | php for saving likes to database
  >> toggleLike.php | php for saving likes to database

- **libs**
  >> ecostingy.lib.php | functionality and database connection for the website
  >> SimpleImage.php | script for uploading/resizing photos

- **screen.css** | CSS file for the website

- **smarty** | smarty source

- **templates** | smarty template files

- **templates_c** | smarty templates cache

- **upload** | folder where users' avatars are uploaded to

CHAPTER 4

The webpage

• The result

After we have done all the user test and modifications we can show the final website, result of all the work submitted in this report.

Link:

http://hermine.me/ecostingy/

Maintenance webpage:

http://hermine.me/maintenance/

CHAPTER 5

The initiative design

• Introduction

In this part of the project we are going to explain how we design the **"ecoSTINGY MOVEMENT" t**o get people involved in sustainability and of course in our webpage. Acording to this purpose we designed some posters to put in the university and a stand alone display for a more easy acces to the webpage.

>> Failure of environmental initiative at IHK.

IHK, along with the majority of large establishments and companies, is constantly striving to reduce the consumption of energy in order to reduce negative environmental impact. Subsequently, they provided us with the brief for this project. However, this is not the first example of them attempting to improve people's behavioural habits within the campus in order to reach their objectives.

Recently the university hosted a week encouraging 'sustainability' and 'green' attitudes and behaviour. However, this struggled to make an impact and we believe there are many reasons for this. It would have been easy to fail to even notice the presence of this initiative as it was not particularly apparent within the campus.

Significant numbers of environmental initiatives have failed in many environments and this is much to do with human behaviour and how we react and are stimulated (see user mentality research).

Subsequently, our initiative focuses on appealling to the competitive side of the human brain in order to inspire activity and participation that will reduce wastage of energy and general consumption.

CHAPTER 5

The initiative design

• Posters design

The Ecostingy webpage offers a communal area for all students to input information on their energy consumption and to measure the impacts alteration in their habits create. However, one of the objectives of this project has been to inspire this change in behaviour and in order to to do this we had to take into account user mentally and employ the conclusions of our research as tools in this aim. Thus, one physical way of creating this change is to create visual stimulus within the university to keep a 'green' mentality fresh in student's minds. Often found in public domains, workplaces, schools and universities materials such as posters and images are used to remind people what they can do to improve their energy consumption and that only they can do this.

Subsequently, it seemed appropriate to create posters to be displayed in a variety of locations throughout the university campus to remind people of the small efforts they need to make in order for us to reach our objective of reducing energy consumption through their behaviour adapting.

Considering research on the way the user mind works I considered different aspects of mentality that a poster could appeal to:

- Appeal to the social conscience of the student.
- Present the benefits of reducing consumption.
- Use statistics and examples to make people of environmental damage.
- Use bright graphics to capture their attention.
- Approach the topic humorously to encourage them to engage.
- Promote an initiative and appeal to the selfish aspect of human nature.

After analysis existing posters and promotion with similar aims and objectives and the ramifications of a variety of perspectives on improving user habit I considered the demographic of the target audience of the posters. As these are mostly young adults in a university environment it seemed appropriate to use humour as a tool. Furthermore, as this is an engineering university it can be legitimately assumed that the majority of students, through their studies and social media, are fully aware of environmental issues and the need to reduce consumption as well as the effects on the environment. Thus, the main problem is motivating them to change their habits.

People are often reluctant to admit that what they do requires improvement, henceforth, when people are presented with criticism of their actions or feel like their actions are being judged then they may react in a way that pushes against what is being suggested to them. However, if you can make someone laugh or consider the situation in good humour they are more likely to appreciate how their single action is essential for a wider improvement.

CHAPTER 5

The initiative design

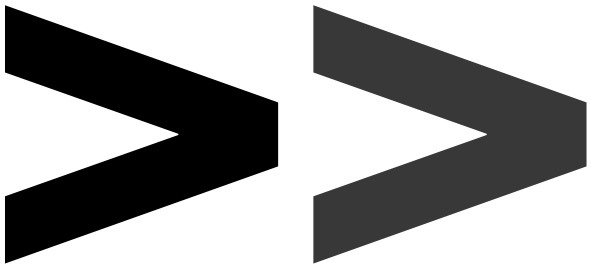
• Posters design

Although I wanted to keep the approach light and humorous, it is still essential that people understand the impact that small changes in their behaviour will have. Thus, it became apparent that using a the humour of the irony of how small the effort is and how little time it takes to make these changes compared to the same aspects of actions we take throughout the day without even thinking that are habits we have adopted and the amount of time it takes to read the poster would amuse and inspire the user. Furthermore, by suggesting to them that this is the easiest way to ease their social conscience on the topic of being environmentally friendly may encourage a change in behaviour. The less aggressive the communication the more effective it should be.

When consulting with two graphic designers it became clear that a poster that should be read quickly and not intrude on quick actions within people's routines should focus on the main points and not be text or graphic heavy in order the focus the user on the specific aim.

Furthermore, colour is important in graphic design as it can set the visual semantic in the reader's mind and helps them visualise the aim of objective of what is suggested without having to waste space and text on the poster explaining it. Commonly found in environmentally focussed media, green, blue and white represent a positive environmental state and the Earth. Additionally, colour blocking is an effective method as it allows for the full subconscious effect of colour to register with the user without compromising the ease of reading and understand of the text and images used.

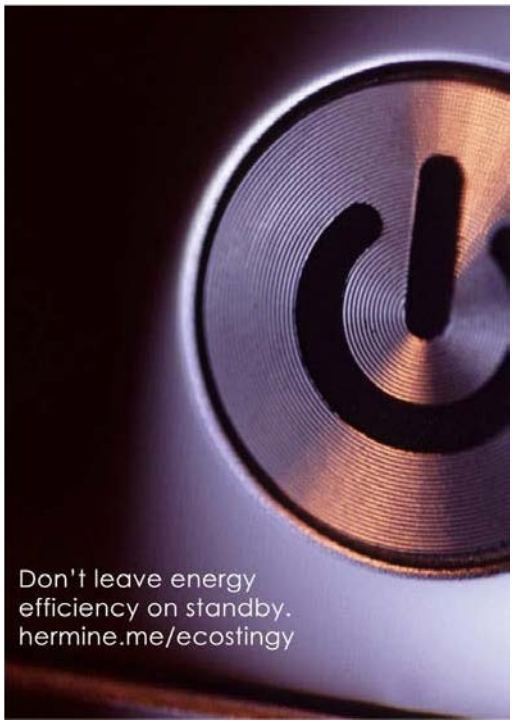
Conclusively, in order to create the most effective and aesthetically pleasing posters that will help us reach our main objective of reducing energy consumption I took into account all aspects of my research into user mentality, graphic design and consumer behaviour.



CHAPTER 5

The initiative design

- **Posters design**



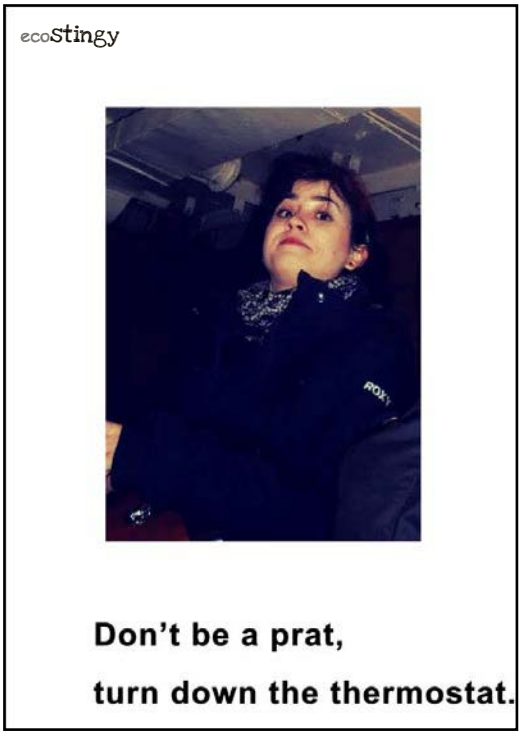


Figure 68:Posters

CHAPTER 5

The initiative design

• Stand alone design

As we announce at the beginning of our project development one of the objectives of our project included the design of a standalone display for the university hall. It´s not only important the fact of designing a good display but also the fact of create a motivating and attractive space for users.

We want to attract users to the stand and once they will be here, invite them to discover the website. So our objective with this product is to market , advertise and create a "buzz" regarding our website.

A standalone display will provide ample opportunity students to interact with the website and learn how to use it as well as adding to the statistics by inputting their own personal usage. It would be a freestanding display featuring an interactive screen (computer) that allows access to the website easily and demonstrates how to use it effectively.

In order to design it in the best way we are going to study the environment in which we are going to place the standalone display as well as all the factors that can influence its design.

ENVIRONMENT (the university)

In order to facilitate the use of the website and according to the challenge developed in the university regarding the website we are going to install one stand alone display in each department, in other words we are going to install 3 standalone displays.

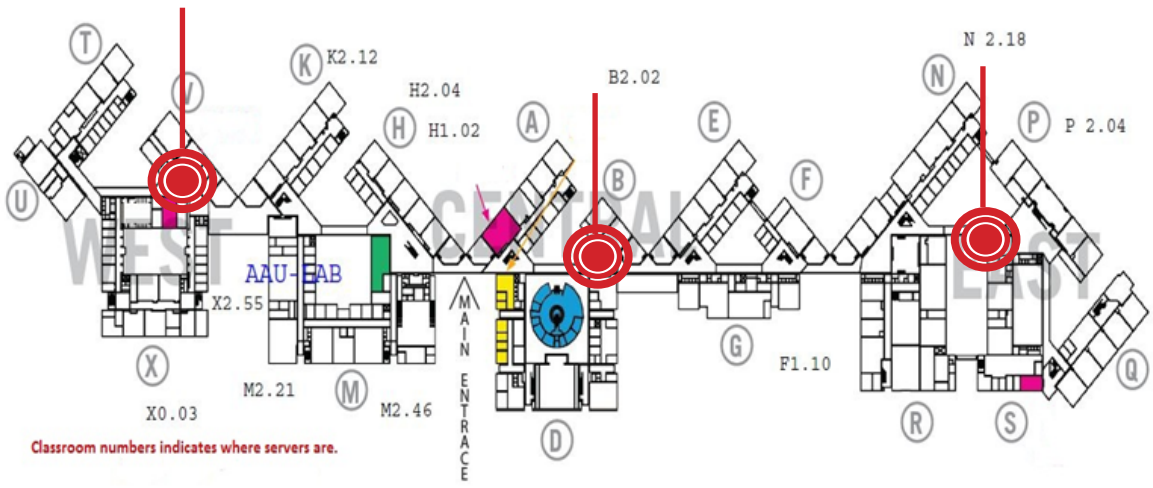


Figure 69: Map of the different departments and distribution at IHK- Displays locations

CHAPTER 5

The initiative design

• Stand alone design

ENVIRONMENT (the university)

:

Figure 70: View of the different areas

University AESTHETIC:

At IHK the areas are design for facilitate the students socialization and mobility, it´s characterized by a great hall and canteen area as well as many squares where people can meet , study and develop their social life. The areas are very spacious, light and functional, with a simple but care aesthetic.

Our product should follow these values:

-Functionality

-Beauty

-Economic

THE INSPIRATION

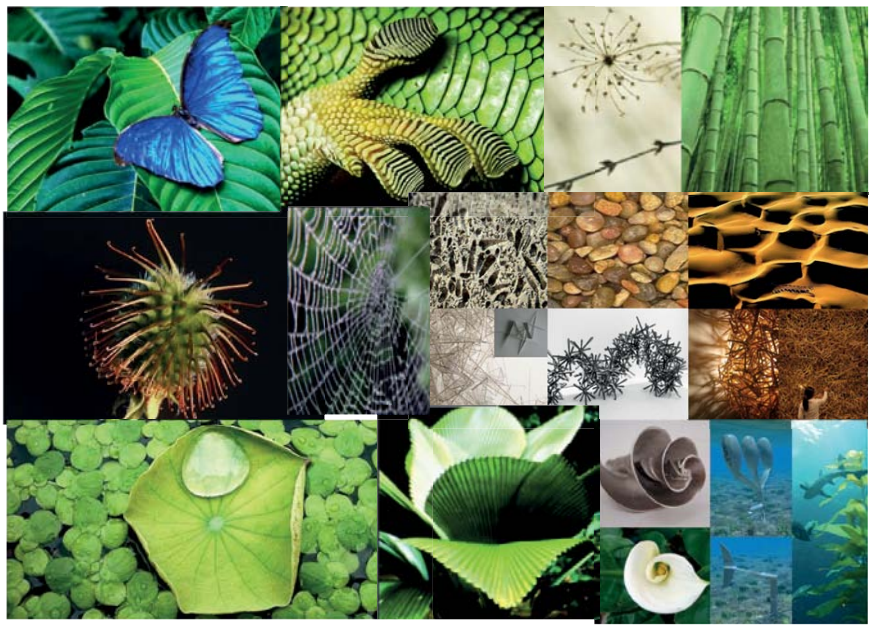
According to the subject involving our website, we can find the inspiration in the nature, in its shapes and colors. As well as in the values and aesthetic that the university and we, as students and ecostingy designers, we want to transmit.

CHAPTER 5

The initiative design

• Stand alone design

THE INSPIRATION

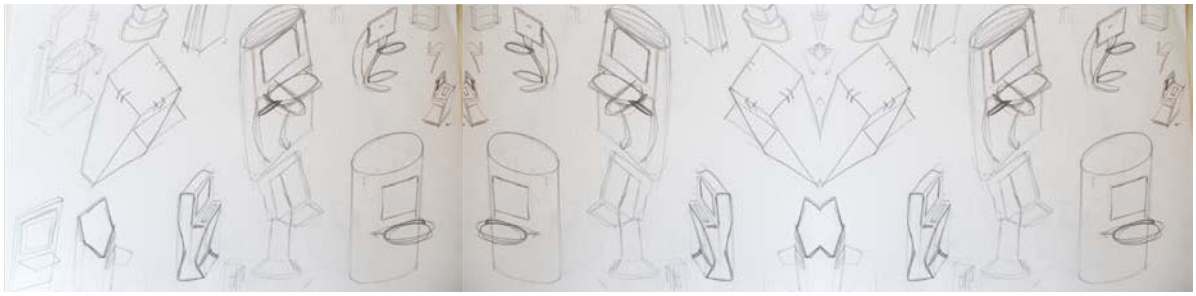


THE CONCEPTS PROPOSAL

We propose 8 concepts all different that combined at the same time simplicity , modernity and functionality. In some of them we use smoothes curves in other geometrical forms according to the environment we are and in others we use nature shapes to bring originality and color.

Below the result of the concept´s design.

(On one hand there are the concepts drawn with soft pencils and on the other hand the different colors and textures possible.)

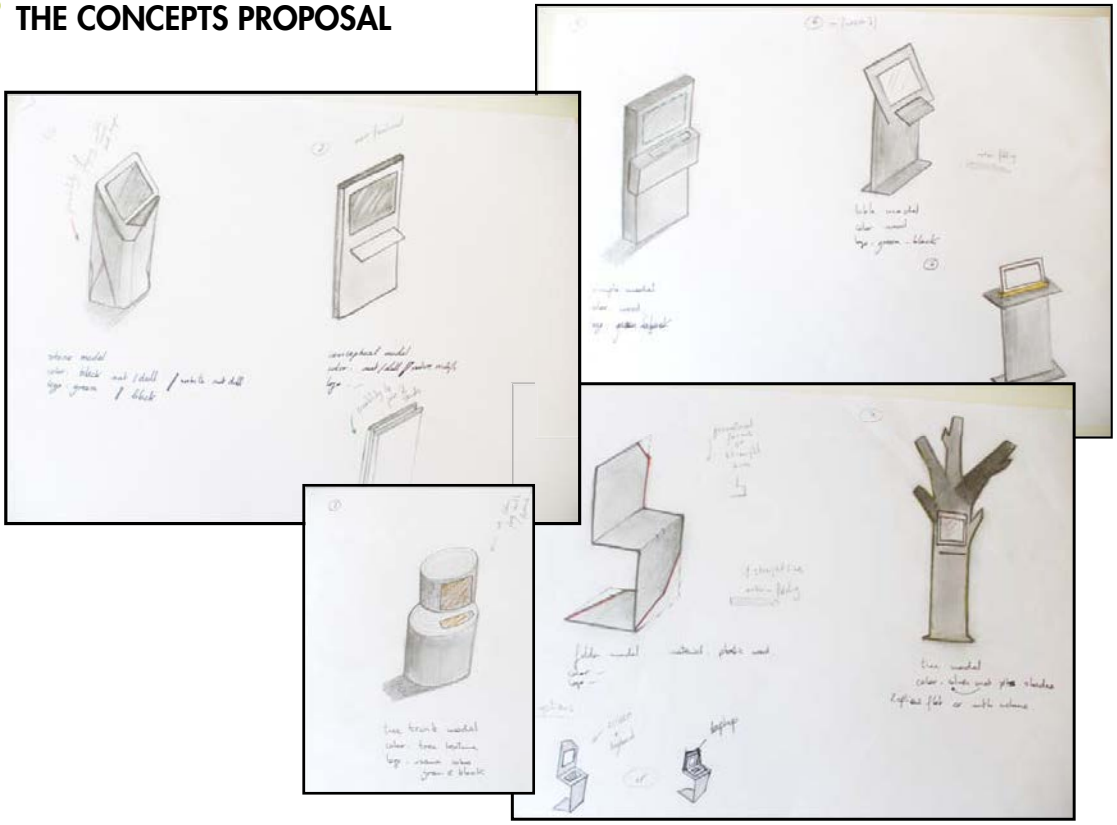


CHAPTER 5

The initiative design

• Stand alone design

THE CONCEPTS PROPOSAL



>> See the Appendix for more detail p131- p06

Textures and colors

The textures and color are according to nature motifs, textures, colors. We propose on one hand the use of greens, browns, blacks and grey in a matt hue and on the other hand we propose forest textures, like the texture of a tree trunk to transmit the idea of the importance of preserve nature and their properties. When students saw the stand we want them to know what is the website and our movement about. In other words we want users could see and breathe nature.

CHAPTER 5

The initiative design

• Stand alone design

THE SELECTION AND 3D DESIGN

2 concepts of the 8 have been selected by the team; the first one is the conceptual model because of its simplicity and functionality and the second one is the folder model because of it original and geometrical shape and its properties.

From this moment we are going to develop the 3d model select one and choice the appropriate texture and esthetic to put in the University.

This is the result of the design production in 3D:

Conceptual model

It's characterized by its engineering shape and simplicity, the use of nature colours and textures provide it an attractive and ecological aspect (in relation with the webpage).

Different combinations of colours can be used:

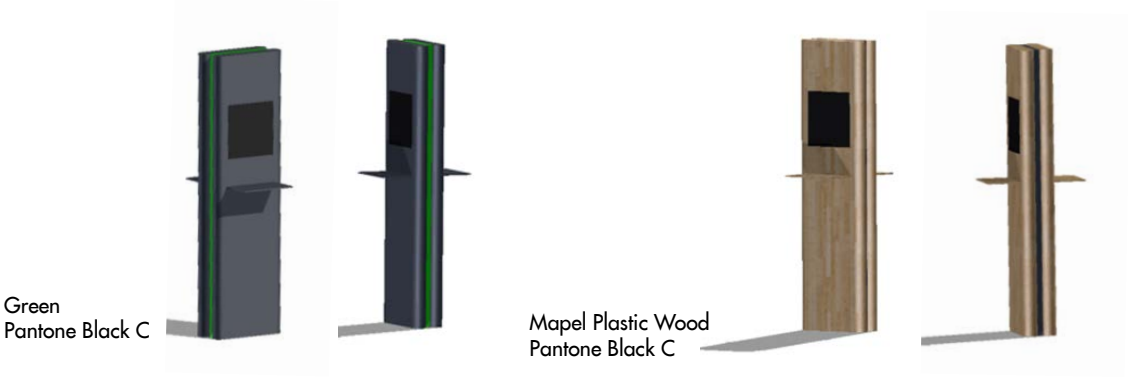


Figure 71: Conceptual model

Folder model

It´s the stand alone display chosen to developed and placed in the University.

What is attractive in it is it´s amazing shape and curves, it´s provocative that´s why it´s perfect to impress the students and to try to attract them to the website.

The colours are all natural as well as the texture, we use plastic wood to produce it in order to be more resistant for use, lasting, cheaper and more esthetic .

There is available two kinds of timber appearance:

Oak timber or old timber

CHAPTER 5

The initiative design

• Stand alone design

THE SELECTION AND 3D DESIGN

Detail

Figure 72: Folder model

THE PRESENTATION

Sizing:

In order to make the best design adapted for everybody we use ergonomic tables to dimension the stand.

Reference: ***Las dimensiones humanas en los espacios interiores*** *Julius Panero, Martin Zelnik*

Result and characteristics of the stand design:

Name: Folder model
General dimensions:
Colour and texture: Oak wood and old wood
Material: plastic wood

Figure 73: Folder model presentation

CHAPTER 5

The initiative design

• Stand alone design

THE PRESENTATION

This design allows us to choose between a laptop or a computer screen to show and promote the webpage in the university.

Figure 74: Folder model presentation-laptop

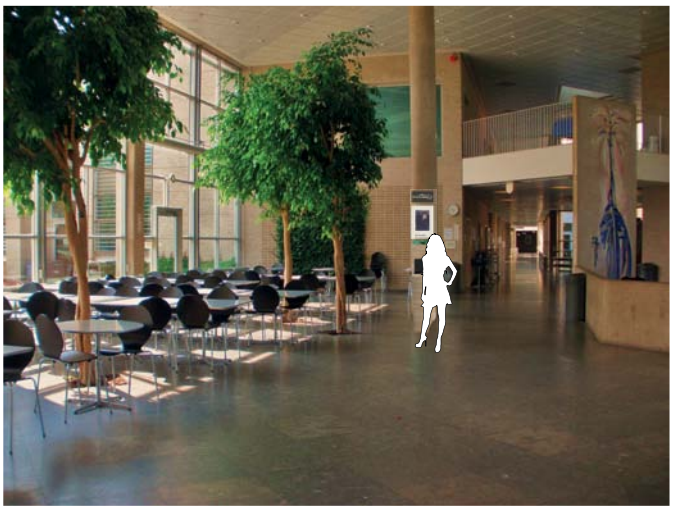
Figure 75: Folder model presentation-screen

CHAPTER 5

The initiative design

•Conclusion - Result

This is part of the result of the iniatiative design , we can see the posters as well as the stand alone display into the university. We show also some suggestions of location inside the building.



Figures 76-78: Initiative design presentation

CHAPTER 6

Conclusions

•General conclusion

Once we finished this project, we get some impressions that are indicatives about the possible success of our product. As far as we know, this result is dependent on the impact this has on final users, because if they're not interested in using it or it is not known, success is not possible. Furthermore, by doing some questionnaires we concluded that most people are interested in changing their mind and using our product to achieve it. This encouraged us to work hard in order to help people, it's our responsibility.

Throughout the project, we've found some problems, because one of our biggest barriers was the lack of knowledge about the main topics we had to explore: psychology and energy efficiency. All the members of our group faced this problem quite positively: no complaints, just more work. Also our supervisor, Ole Schulz, was a good collaborator, he guided us through topics that we didn't know and also his support and his aportations.

Going deeper on the project developement, we conclude that information could be more accurate. This means that if we had more meters in order to have more precise measurements (One meter per wing, One meter per class, One meter per corridor...) users will have a more concrete feedback. This should be taken in account if future adaptations are done in order to maximize the efficiency of the university, because the cost (talking about money) sometimes will not be returned, but maybe we will get a better result: A better world.

CHAPTER 6

Conclusions

•Personal conclusions

Emily

Different to any project I've approached before, the development of this website and surrounding research has broadened my perspective on design. Focussing my efforts on user mentality and the psyche of the consumer in order to alter the behavioural habits of students at IHK has significantly increased the depth of knowledge in this field and through significant analysis of both primary and secondary research we have prioritised and exploited the potential of the product in order to reach our objective in the most effective manner.

Working within a group such as this one, brought together through by a variety of entirely different skills, has been a new experience and one that I have learnt from. The value of combining the knowledge and effort of the group has been infinite and my respect for their skills has grown enormously. It has been both and challenging but incredibly useful to compare our different perspectives and ideas to create the best product possible and this has been a project I have learnt a great deal from.

Hermine

This project was the first project I've ever worked on that's about sustainability, more specifically saving resources. It is such an important and present topic. It's good to see that IHK is making a real effort to reduce their consumption, because all effort in that direction is helping save the world, small steps at a time.

It was really interesting to work together with people of such different backgrounds. Our different backgrounds made sure we had different points of view about the project, and I believe this has been really beneficial for the quality of the final product. It was a pleasure working in this team. We didn't have anyone with an engineering background in our group, but we worked around that by doing a lot of research and working really hard. I've learned a lot from this experience and I'm proud of the product we've developed.

CHAPTER 6

Conclusions

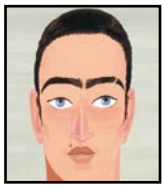
•Personal conclusions

Andrea

This project has been one of the most interesting I have ever done in the last four years. Work in a sustainable project that also involves user's behaviours is not an easy task; however with the effort of the team and a constant work we have achieved a good result. Personally, working in a sustainable project has suppo sed a challenge because I had never worked in something similar before and I had never designed a webpage, although I had already designed some user interfaces. The experience has been very positive and enriching, I have learnt to work in an international team with people with different backgrounds and I have learnt to face some problems that have emerged during the project development. In general I have enjoyed working in the project and taking part of this group.

Finally I want to finish saying that I hope students and professors of IHK will use our website in the future and maybe in some month or years we can see a change in students behaviours and a decrease in water and energy consumption in IHK. This would mean that we have finally reached our purpose and that our work was worth it.

Victor



After all hard work I've done, as my teammates has done, I'm quite proud of the resultant product. I don't know if it will succeed or not, but I can say that it's done after a lot of background work, investigation and reasoned decissions. Another reason is that our fields of study were not very focused on the environment of the project, but with our motivation, curiosity and ambition we worked together to learn the essential to achieve our objectives. I can say that appart from all technical knowledges I get from this study, I learned that working hard and with illusion, all objectives are reachable.

CHAPTER 7

References

Alicante Energia
http://www.alicantenergia.es/es/Consejos-para-el-consumo-eficiente-en-el-hogar.html

Bibdigital
http://bibdigital.epn.edu.ec/bitstream/15000/9964/1/CARACTER%3FSTICAS%20EL%3FCTRICAS%20DE%20LAS%20L%3FMPARAS%20FLUORESCENTES%20COMPACTAS%20(CFL).pdf

Bolivia noticias
http://bolivia.panda.org/sala_redaccion/noticias/?172801/WWF-exhorta-a-la-Unin-Europea-a-prohibir-focos-que-desperdician-energa

Bombillas de bajo consumo
http://www.bombillasbajoconsumo.com/iluminacion_bajoconsumo/lamparas_led/comparativa_led.html

Charles Duhigg
Charles Duhigg, "Please Proceed to Checkout" New York Times Magazine, 2/19/2012, 31-55. academic.brooklyn.cuny.edu

Cnltc
http://www.cnltc.com/admin/pdf/53.pdf

Consumo Responsable
http://www.consumoresponsable.org/actua/energia/energiasahorrarencasa

Decoesfera
http://www.decoesfera.com/electrodomesticos/que-significa-la-etiqueta-energetica-de-los-electrodomesticos

DMI
http://www.dmi.dk/dmi/index/danmark/klimanormaler.htm

Drive
Drive - Daniel H. Pink

Emetec
http://www.emetec.net/ahorro-y-comparativa/

Enciclopediasalud
http://www.enciclopediasalud.com/categorias/hogar/articulos/temperatura-ideal-de-un-hogar-en-los-meses-de-frio/

CHAPTER 7

References

Fenercom
http://www.fenercom.com/pages/pdf/informacion/formacion/Comparativa-de-un-sistema-convencional-de-radiadores-frente-a-climatizacion-invisible-SIMULACIONESYPROYECTOS.pdf

GosScandinavia
http://goscandinavia.about.com/od/denmar1/ss/weatherdenmark.htm

Guia Práctica
http://www.guiapractica.cl/consejos/medio-ambiente/17-consejos-para-ahorrar-agua-en-el-hogar.html

Idae
http://www.idae.es/index.php/mod.pags/mem.detalle/relcategoria.1042/id.57/relmenu.67
http://www.idae.es/ProductosEficientes/AccesoBusqElectrodomesticos.aspx

La flecha
http://www.laflecha.net/canales/blackhats/articulos/ahorro-de-energia-en-iluminacion

Las dimensiones humanas en los espacios interiores Julius Panero, Martin Zelnik

Microsoft Hohm
http://blog.microsoft-hohm.com/Hohm-energy-report-sample.aspx
http://www.microsoft-hohm.com/Recommendation/

McKenzie-Mohr,
McKenzie-Mohr, D., 1999, Fostering Sustainable Behavior: An Introduction to Community Based Social Marketing, inside.bard.edu/berd/documents/FosteringSustainableBehavior.pdf

Notes- Subject: Ergonomics – Degree in Engineering of Industrial Design and Product Development- Rubén Rebollar and Javier Fernández Carrión

The Essential Guide to User Interface Design Wilbert O. Galitz- pdf version

TwEnergy
http://twenergy.com/

Sistemas de calefacción
http://www.sistemascalefaccion.com/tipos/calefaccion-radiante.html

Soitu
http://www.soitu.es/soitu/2009/06/17/medioambiente/1245258514_247739.html

Sun Map
http://www.sunmap.eu/weather/europe/denmark/capital-region/ballerup

CHAPTER 7

References

•Figures

Figure 1: World Map p19 Source: Google IMAGES http://www.google.com/imghp

Figure 2: View of Denmark p19 Source: Google MAPS http://maps.google.com/

Figure 3: View of Copenhagen and Ballerup p19 Source: Google MAPS http://maps.google.com/

Figure 4: IHK view p20 Source: http://int.ihk.dk/

Figure 5: Temperature in Denmark p20 Source: http://goscandinavia.about.com/od/denmar1/ss/weatherdenmark.htm

Figure 6: Climate Data for Copenhagen p21 Source: http://www.dmi.dk/dmi/index/danmark/klimanormaler.htm

Figure 7: Climate Data for Ballerup p22 Source: Source: http://www.sunmap.eu/weather/europe/denmark/capital-region/ballerup

Figure 8: Temperature Change in Ballerup p23 Source: http://www.sunmap.eu/weather/europe/denmark/capital-region/ballerup

Figure 9: Scheme of the technical research metodology p24 Victor

Figure 10: Lighting Requirements in IHK p27 Source: [Document proportionate by Ole Schultz]

Figure 11: Scheme radial floor action p29 Source: *http://www.eks-innova.de/index.php5?datei=wand*

Figure 12: Scheme of radiator action p29 Source: *http://www.eks-innova.de/index.php5?datei=wand*

Figure 13:Water Consumption p35 Source: *Manual para el uso eficiente y Racional del agua* .VictorJ. Bourguett Ortiz ISBN 968-5536-10-4

Figure 14: Water saving measures p 35 Source: *Manual para el uso eficiente y Racional del agua* .VictorJ.Bourguett Ortiz ISBN 968-5536-10-4

Figures 15-19: Sketches p 63

Figure 20: Alternative one -web design p 65 Emily

Figure 21: Alternative two -web design p 66 Andrea

CHAPTER 7

References

- **Figures**

Figure 22: Structure of a general page p67 Andrea

Figures 23-24: "Welcome" page and "My profile page" p69 Andrea

Figures 25-26: "My profile" page alternative and "Current consumption" page p70 Andrea

Figures 27-28: "Current consuption" end of the page and "Take action" page p71 Andrea

Figures 29-30: "Take action" end of the page , "Report a problem" page and "Forum" page p72 Andrea

Figures 31-32: "Forum" end of the page and "Help" page , "The challenge" page p73 Andrea

Figures 33-41: Web design after the Review p74-78 Andrea

Figure 42: First welcome page development p78 Hermine

Figure 43-44: Screenshot "Welcome page" and Screenshot "Edit your information" p79 Hermine

Figure 45-46: Screenshot "My profile" and Screenshot "Take action" p80 Hermine

Figure 47: Screenshot "Take action"-WATER p81 Hermine

Figure 48: Screenshot "Current consumption" p82 Hermine

Figure 49: Screenshot "Forum" p83 Hermine

Figure 50: Screenshot -Example of discussion in the Forum p84 Hermine

Figure 51: Screenshot "Challenge" p85 Hermine

Figure 52: Screenshot "Report a problem" p86 Hermine

Figure 53-62: Screenshots of the final development of the webpage p90-97 Hermine

Figure 63: IHK servers locations p100 Source: *http://www.ihk.dk/*

Figure 64: IHK campusNet p103 Source: *https://auth.ihk.dk/ihk/indexjsp?service=https%3a%2f%2fwww.campusnet.ihk.dk%2fcnnet%2fDefault.aspx*

CHAPTER 7

References

•Figures

Figure 65: Screenshot Maintenance-page p105 Hermine

Figure 66: Website structure p106 Hermine

Figure 67: Database structure p108 Hermine

Figure 68: Posters p114 Emily

Figure 69: Map of the different areas-Displays location p115 Andrea

Figure 70: View of different areas p116 Andrea

Figure 71: Conceptual model p119 Andrea

Figure 72: Folder model p120 Andrea

Figure 73: Folder model presentation-laptop p121 Andrea

Figure 74: Folder model presentation-screen p121 Andrea

Figures 75-77: Initiative design presentation p122 Andrea

>> The rest of pictures have been only used with a graphical purpose
Source:Google Images

CHAPTER 8

Appendix

- **Summary**

- University 01
- Context 01
- The Project Plan 01
- Checklist for sustainable behaviour 03
- The graphic design Folder 05
- Some user test 06
- Lighting investment plan 07
- Ecostingy source 011

CHAPTER 8

Appendix

• University

IHK offers different Bachelor degrees and international studies. European Project Semester is the course our team is attending, and its objective is to learn how to work with a multicultural team to build our project.

The main departments in the school are Civil engineering, Mechanical engineering, Electronics and Computer engineering, Electrical power and IT engineering and Export engineering. The Technical Library of Copenhagen is attached to the University, so all students can use all the material there such as papers, documents, files, books etc.

IHK makes the link between some Danish companies who want to invest in research and investigation and the internationals students. In our case, we are not developing the project for any company but for the university. IHK will both be the client and the partner for our project. Ole Schultz, our supervisor, will guide us in this project by doing regular meetings and helping us if we have problems about working in group and give us useful tips and advice to work in a proper way.

• Context

We are doing this project in the context the European Project Semester. The aims of this program are to train students in teamwork and emphasize realistic and real life situations, to demonstrate the ability to use modern project tools and techniques, to demonstrate the ability to plan and run a team-based project and finally to show the ability to communicate clearly in writing as well as by other means. This will be accomplished by working in cross-cultural and multidisciplinary teams, supervised by an academic supervisor who helps the students to understand the content of their project and ensures they are making progress. The supervisor also makes sure that the advantages of working together in a group are sustained.

• The Project Plan

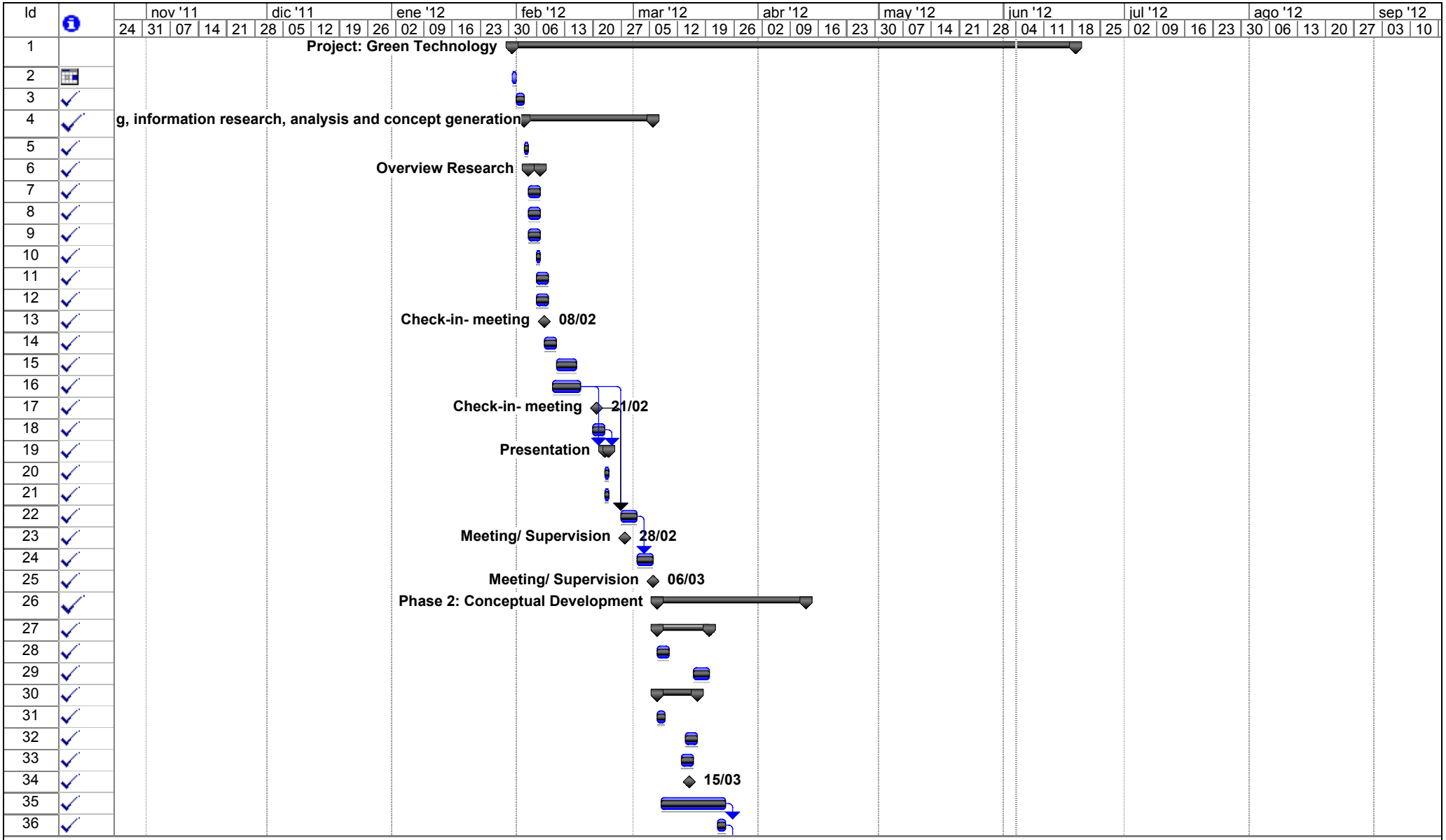
The Gantt chart is a common technique for representing the phases and activities of a project work . It illustrate the start and finish dates of the terminal elements and summary elements of a project. also show the dependency (i.e., precedence network) relationships between activities.

Using this method the project management is assured and the modifications that can occur can be controlled.

>> In the following GANNT chart it´s showed all the work done, including task modifications that we had to do due to the events that occured throughout the final project development.

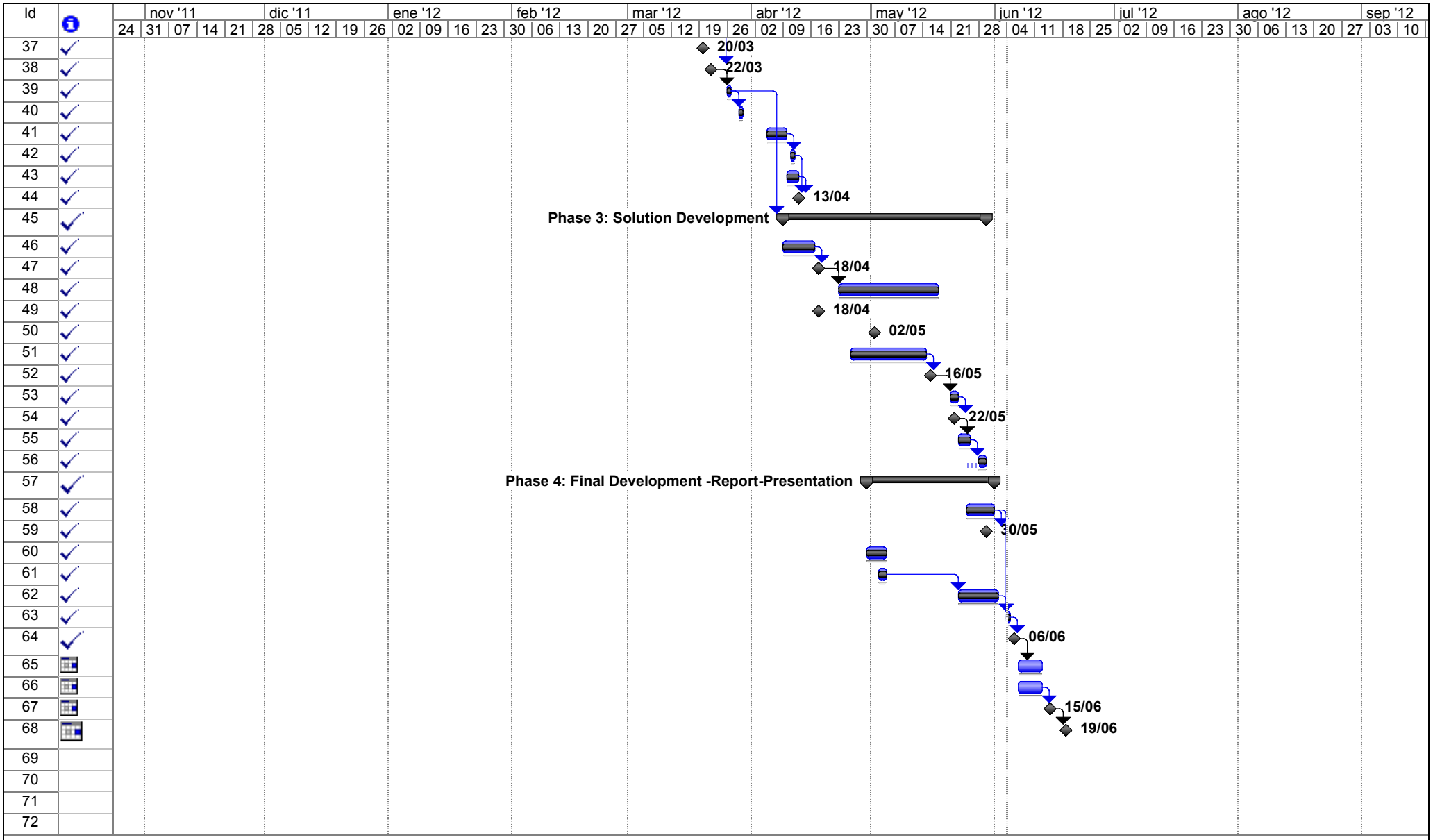
Id	Nombre de tarea	Duración	Comienzo	Fin	Predecesoras	Nombres de los recursos
1	**Project: Green Technology**	**102 días?**	**mar 31/01/12**	**mar 19/06/12**		
2	Meeting with the supervisor	1 día?	mar 31/01/12	mar 31/01/12		Andrea, Emily, Victor
3	Group attitude / Belbin Test	2 días?	mié 01/02/12	jue 02/02/12		Andrea, Emily, Victor
4	**Phase 1: Process planning, information re**	**24 días?**	**vie 03/02/12**	**mar 06/03/12**		
5	Project Redefinition	1 día?	vie 03/02/12	vie 03/02/12		Andrea, Emily, Victor
6	***Overview Research***	***2 días?***	***sáb 04/02/12***	***lun 06/02/12***		
7	Market analysis (Products or Service	2 días?	sáb 04/02/12	lun 06/02/12		Andrea
8	Environment analysis (parameters ev	2 días?	sáb 04/02/12	lun 06/02/12		Victor
9	Users analysis (psychology…)	2 días?	sáb 04/02/12	lun 06/02/12		Emily
10	Conclusions	1 día?	lun 06/02/12	lun 06/02/12		Andrea, Emily, Hermine, Victor
11	Definition of the objectives	3 días?	lun 06/02/12	mié 08/02/12		Emily (after discussion (all the group))
12	Definition of the framework	3 días?	lun 06/02/12	mié 08/02/12		Victor(after discussion (all the group))
13	Check-in- meeting	0 días	mié 08/02/12	mié 08/02/12		Andrea, Emily, Hermine, Victor
14	Reach of the project	3 días?	mié 08/02/12	vie 10/02/12		Emily (after discussion (all the group)
15	Specific Research	4 días?	sáb 11/02/12	mié 15/02/12		Andrea, Emily, Hermine, Victor
16	Mind map	6 días?	vie 10/02/12	jue 16/02/12		Andrea (Andrea, Emily, Hermine, Victor)[83%]
17	Check-in- meeting	0 días	mar 21/02/12	mar 21/02/12		Andrea, Emily, Hermine, Victor
18	Project management class	3 días	lun 20/02/12	mié 22/02/12		Andrea, Emily, Hermine, Victor
19	**Presentation**	**1 día?**	**jue 23/02/12**	**jue 23/02/12**	**18;16**	**Andrea, Emily, Hermine, Victor**
20	Oral Presentation	1 día?	jue 23/02/12	jue 23/02/12		Victor and Andrea
21	Report	1 día?	jue 23/02/12	jue 23/02/12		Hermine
22	Conceptual definition	4 días?	lun 27/02/12	jue 01/03/12	17;16	Andrea, Emily, Hermine, Victor
23	Meeting/ Supervision	0 días	mar 28/02/12	mar 28/02/12		Andrea, Emily, Hermine, Victor
24	Problem definition	2 días?	vie 02/03/12	lun 05/03/12	22	Andrea, Emily, Hermine, Victor
25	Meeting/ Supervision	0 días	mar 06/03/12	mar 06/03/12		Andrea, Emily, Hermine, Victor
26	**Phase 2: Conceptual Development**	**27 días?**	**mié 07/03/12**	**vie 13/04/12**		
27	**Environment study**	**9 días**	**mié 07/03/12**	**lun 19/03/12**		
28	Climate study (Denmark , Copenhagen)	3 días	mié 07/03/12	vie 09/03/12		Andrea and Emily
29	Building study (University- Ihk)	2 días	vie 16/03/12	lun 19/03/12		Hermine and Victor
30	**Users study**	**8 días?**	**mié 07/03/12**	**vie 16/03/12**		
31	Ergonomic Report	2 días	mié 07/03/12	jue 08/03/12		Andrea
32	User´s poll	3 días?	mié 14/03/12	vie 16/03/12		Andrea, Emily, Hermine, Victor
33	Users profile	3 días?	mar 13/03/12	jue 15/03/12		Andrea
34	Meeting/ Supervision	0 días	jue 15/03/12	jue 15/03/12		Andrea, Emily, Hermine, Victor
35	Creativity techniques	12 días?	jue 08/03/12	vie 23/03/12		***Andrea, Hermine, Victor***
36	Solutions proposals-sketches	2 días?	jue 22/03/12	vie 23/03/12	35	***Andrea, Hermine, Victor***
37	Meeting/ Supervision	0 días	mar 20/03/12	mar 20/03/12		Andrea, Emily, Hermine, Victor
38	Interim report submision to supervisors	0 días	jue 22/03/12	jue 22/03/12	36	
39	Proposal Selection and justification	1 día?	lun 26/03/12	lun 26/03/12	38	***Andrea, Hermine, Victor***
40	Meeting/ Supervision	1 día?	jue 29/03/12	jue 29/03/12	39	Andrea, Emily, Hermine, Victor
41	Naming	3 días?	jue 05/04/12	lun 09/04/12		Andrea

Id	Nombre de tarea	Duración	Comienzo	Fin	Predecesoras	Nombres de los recursos
42	***Meeting/ Supervision***	***1 día?***	***mié 11/04/12***	***mié 11/04/12***	***41***	***Emily, Hermine, Victor***
43	Presentation layout	3 días?	mar 10/04/12	jue 12/04/12		Andrea
44	Interim Report presentation	0 días	vie 13/04/12	vie 13/04/12	42;43	Andrea, Emily, Hermine, Victor
45	**Phase 3: Solution Development**	**37 días?**	**lun 09/04/12**	**mar 29/05/12**	**39**	
46	Wireframe development	6 días?	lun 09/04/12	lun 16/04/12		Hermine
47	Meeting/ Supervision	0 días	mié 18/04/12	mié 18/04/12	46	Emily, Hermine, Victor
48	***Designing the website (include the***	***19 días***	***lun 23/04/12***	***jue 17/05/12***	***47***	***Andrea and Hermine***
49	Meeting/ Supervision	0 días	mié 18/04/12	mié 18/04/12		Andrea, Hermine, Victor
50	Meeting/ Supervision	0 días	mié 02/05/12	mié 02/05/12		Andrea, Hermine, Victor
51	***Webpage contents***	***13 días?***	***jue 26/04/12***	***lun 14/05/12***		***Victor***
52	Meeting/ Supervision	0 días	mié 16/05/12	mié 16/05/12	51	Andrea, Hermine, Victor
53	***Preparing user test***	***2 días?***	***lun 21/05/12***	***mar 22/05/12***	***52***	***Andrea***
54	Meeting/ Supervision	0 días	mar 22/05/12	mar 22/05/12	53	Andrea, Emily, Hermine, Victor
55	User-testing	3 días?	mié 23/05/12	vie 25/05/12	54	Andrea, Emily, Victor
56	***Modifying the design-design reviev***	***2 días?***	***vie 25/05/12***	***mar 29/05/12***	***55***	***Andrea and Hermine***
57	**Phase 4: Final Development -Report-Pres**	**24 días?**	**lun 30/04/12**	**jue 31/05/12**		
58	***Final Webpage development***	***5 días?***	***vie 25/05/12***	***jue 31/05/12***		***Hermine***
59	Meeting/ Supervision	0 días	mié 30/05/12	mié 30/05/12	58	Andrea, Emily, Hermine, Victor
60	***Display design***	***5 días?***	***lun 30/04/12***	***vie 04/05/12***		***Andrea***
61	***Posters design***	***2 días?***	***jue 03/05/12***	***vie 04/05/12***		***Emily***
62	Layout	8 días?	mié 23/05/12	vie 01/06/12	61	Andrea
63	Print Report	1 día?	lun 04/06/12	lun 04/06/12	58;62	Andrea and Victor
64	**Final Report Submission (12pm)**	**0 días**	**mié 06/06/12**	**mié 06/06/12**	**63**	**Andrea, Emily, Hermine, Victor**
65	Preparing the presentation	4 días?	jue 07/06/12	mar 12/06/12	64	Andrea, Emily, Hermine, Victor
66	Layout Presentation	4 días?	jue 07/06/12	mar 12/06/12		Andrea
67	Meeting/ Supervision	0 días	vie 15/06/12	vie 15/06/12	66	Andrea, Emily, Hermine, Victor
68	**Presentation**	**0 días**	**mar 19/06/12**	**mar 19/06/12**	**67**	**Andrea, Emily, Hermine, Victor**
69						
70						
71						
72						
73	Legend:	0 días	lun 27/08/12	lun 27/08/12		
74	**MODIFICATIONS**	0 días	lun 30/07/12	lun 30/07/12		



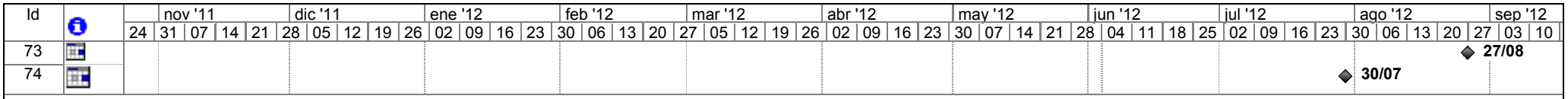
Proyecto: GANNT CHART-Green Tecl
Fecha: lun 04/06/12

Tarea		Hito		Tareas externas	
División		Resumen		Hito externo	
Progreso		Resumen del proyecto		Fecha límite	



Proyecto: GANNT CHART-Green Tecl
Fecha: lun 04/06/12

Tarea		Hito		Tareas externas	
División		Resumen		Hito externo	
Progreso		Resumen del proyecto		Fecha límite	



Proyecto: GANNT CHART-Green Tecl
Fecha: lun 04/06/12

Tarea		Hito		Tareas externas	
División		Resumen		Hito externo	
Progreso		Resumen del proyecto		Fecha límite	

CHAPTER 8

Appendix

• Checklist for fostering sustainable behavior

Commitments

Ask for public commitments
Seek group commitments
Actively involve the person
Help people view themselves as environmentally concerned
Don't use coercion

Prompts

Make the prompt noticeable
The prompt should be self-explanatory
The prompt should be presented as close in time and space as possible to the targeted behavior
Use prompts to encourage people to engage in positive behaviors rather than to avoid environmentally harmful actions

Norms

The norm should be noticeable
As with prompts, the norm should be made explicit at the time the targeted behavior is to occur
As with prompts, when possible use norms to encourage people to engage in positive behaviors rather than to avoid environmentally harmful actions.

Effective communications

Make sure that your message is vivid, personal and concrete
Using techniques described in Chapter 2, explore the attitudes and behavior of your intended audience prior to developing your message.
Have your message delivered by an individual or organization who is credible with the audience you are trying to reach.
Frame your message to indicate what the individual is losing by not acting, rather than what he/she is saving by acting.
If you use a threatening message, make sure that you couple it with **S**pecific suggestions regarding what actions an individual can take.
Use a one-sided or two-sided message depending upon the knowledge of your audience regarding the particular issue.
Make your communication, especially instructions for a desired behavior, clear and specific.

CHAPTER 8

Appendix

• Checklist for fostering sustainable behaviour

Make it easy for people to remember what to do, and how and when to do it.
Integrate personal or community goals into the delivery of your program.
Model the activities you would like people to engage in.
Make sure that your program enhances social diffusion by increasing the likelihood that people will discuss their new activity with others.
Where possible, use personal contact to deliver your message.
Provide feedback at both the individual and community levels about the impact of sustainable behaviors. **(McKenzie-Mohr, 1999)**

GRAPHIC DESIGN Folder

naming •

THE PROCESS

•What general characteristics must have the names of the brands?

Brevity
Simplicity
Ease of reading and pronunciation
Memorization
Euphony
Striking
Association and evocation
Originality
Modernity
Distinction

WHAT´S THIS TECHNIQUE ABOUT?

Naming

In order to find the name of our webpage we can follow the steps below:

•Make a list with the key words that define the product.

From this:

•Use translations in several languages.

• Play with prefixes and suffixes.

• Use dictionaries, definitions and synonyms.

• Consider references real physical objects.

• Communicate with emotion, using feelings

naming •

THE PROCESS

Key words:

-sustainable/sustainability
-behavior
-environment
-ecology
-green
-resource
-save
-teach
-learn
-improve
-aware
-tool
-action
-nature
-modify/change
-improve
-tips
-challenge
-technology
-efficient
-stingy

Examples of names for the webpage :

(extracted from the words on the left column):

-**GREENABILITY** (instead of Sustainability) or **ECOABILITY** (maybe we can use it for the slogan)

-**BE GREENABLE**

- **´S green** (s of "sustainable") we can play with "he´s green, she´s green and you?" for the slogan

-ECOSAVE

-SAVECO

-Be ECO

-ECOSTINGY

The selection

ECOSTINGY MOVEMENT

We want catch the attention of people, and keep them interested in this subject so we have to impress, that´s why we needed to choose a word that emphasized our objective and our purpose.

Stingy >> because we want people fix their attention in the subject.

(Stingy means mean or ungenerous)

eco >> In reference to ecology and sustainability

naming •

THE PROCESS

So ecostingy means someone who´s not very generous with nature with eco-subjects , in other words someone who didn´t leave nature be damage or fall into the wrong hands.

To reforce this idea we need to add an slogan:

“Wasting is no longer in. Now, become a ecoStingy!”,

With this kind of slogan we emphasize the fact that you belong to a group, that you´re joined this philosophy.

THE GRAPHIC IMAGE

In order to realize the graphic image of the website we focused on the values we wanted to transmit:

- Ecology
- Sustainability
- Originality
- Freshness
- Usability
- Functionality
- Youthfulness (according to the environment in which we are designing the webpage)
- Proximity to users
- Diversity

•LOGOTYPE

Note: Finally the logotype is only constitute by the name of the website, in other words the name of the web is the logo of this one and of the movement we are going to promote at IHK.

In the logotype we have used two diferent but similar tipographies , in this way we separate in two parts the logotipe: on one hand eco and on the other one stingy. Using two tipographies cause a breack and dynamism in the word .

naming •

THE GRAPHIC IMAGE

Typographies:

appleberry - Love Ya Like A Sister

eco - Stingy

As we can see these type of fonts are very originals and informals. We use the combination of this two typographies principally because they are similar with the exception that the second is bigger than the first one (with the same font size), so it´s more stress . This fact allows us to highlight the word Stingy , to cause impact above eco that is important , but not is so impressive for users.

Playing with two diferent colours we reinforce this idea :

- MINIMUM SIZE PRINTING

The minimum size printing can´t be very small because the logo is long and has 9 letters .
So the minimum size printing for a correct readability it will be 10 mm high , taking in account that the letters are lower case.

naming •

THE GRAPHIC IMAGE

- TWO COLOURS VERSION

The logo has been designed originally with two different inks . The syllable eco is in one ink and the rest in another one, The rupture has been created to bring more dynamism and stress the main word of the logo. So it´s very important the use and the contrast between this two colours. As we are going to explain later the colours used have an specific meaning that´s why it´s so importance mantenerlos.

There is only one version of the logo according to the two corporate colours. (However depending on the background colour , we could use white instead of black.>> p-)
The corporate colours are explained later in this section.

- ONE COLOUR VERSION

The logotype looks very good with one ink only if we maintain the contrast . We use the same ink that we use for stingy (PANTONE Balck C) for eco with a 60% of tonality and we increased the colour in stingy using a 100% of saturation. As we can see the contrast still being very strong.

naming •

THE GRAPHIC IMAGE

- BACKGROUND ON COLOR VERSION

The logotype looks very good in the first test on a coloured background, the two first samples show the logo on a black background (the same colour as the logotype) and then on a green background (the same colour that the word **eco**). We just have to change one of the corporate colours by a white colour.

Example using on the background a picture :

naming •

THE GRAPHIC IMAGE

- CORPORATE COLOURS

There are two corporate colours : A "green technology" colour, in reference to nature and engineering and a black colour in reference to simplicity and functionality. We use this two colours for the webpage as well as for the project presentations and reports.

In the logotype we use the green with 100% of saturation and the Pantone Black C with a 72%. (*Sometimes we appeal to white depending on the background colour but this , is not going to be taken in account).*

- SLOGAN

We use the same font that in the word **eco** , because is more readable, however we combined it with a black colour (30% of saturation).
Its emplacement will be under the logotype in a small size, the slogan usually appears in the website and in some posters but not in the stand alone display or in a general way.
We´ll use the slogan as a support to transmit our purpose and ideas.

ecoStingy

" Wasting is no longer in. Now, become an ecoStingy! "

Diference between the logotype and the slogan:
Logo: 30
Slogan: 12

CHAPTER 8

Appendix

•Some user test

In this part of the appendix we selected two of the users test we did before the webpage design and two of the most interesting user test we did during the development of website.

First users test:

Name: Hugo Lecourt
Gender: Male
Nationality : French
Age : 21

1.What do you know about the current waste of resources (water and energy) and the consequences of that?
I know that we need a lot of energy to product water and electricity. We need to avoid waste and to reduce the CO2 emissions, for instance the water is a limited resource and it isn´t available in many countries.

2.Are you interested in this problem?
Yes, but I think we heard a lot of things about this problem and few solutions are implemented. Besides from my point of view I find it completely stupid to ask people don´t take the car while in the other hand a refinery is rejecting in the atmosphere the equivalent of the annual consumption of France and Germany.

3.Are you doing something to decrease this waste of resources? If so, what are you doing? If not, why not?
Yes, I turn off the light when I leave a room, I turn off the heater if I open a windows. I recycle my own waste, however sometimes I don´t take care about this because I think the big industrial enterprises can change more than I. Sometimes I forget to recycle bottles or I take my car for a short distance maybe because I think that industrial enterprises have more environment impact than me.

4.Are you willing to change your behavior if it helps to save resources? Even if you have to give up some of your comfort?
No

5.Do you think you can change your behavior in relation to resources consumption? Do you think using a webpage informing you of the energy use at the university is a good idea? Do you have any suggestions?
Yes, for example I don´t buy some products with too many packaging, with much material.
Yes, but the solutions or tips must be easy to implant and really efficient.
If you want to change the world and save the planet, study hard, become a great boss, manage a big firm and implement a strong environmental politic.

6.Would you be interested in participating in a sustainability project in your university?
Yes of course!!

7.Do you have an idea on how we can save resources at the university?
Change the toilet switches with sprinkler system switches

CHAPTER 8

Appendix

•Some user test

Name: Isabelle Hay-Campbell
Gender: Female
Nationality : UK

1.What do you know about the current waste of resources (water and energy) and the consequences of that?
This is a very broad question! I know that waste of resources is a big problem and I am conscious of what I consume, but I am not sure which things waste the most, nor am I sure of the consequences other than a worsening of global warming, etc. In Britain, there is currently a hosepipe ban because of a lack of water.

2.Are you interested in this problem?
Yes.

3.Are you doing something to decrease this waste of resources? If so, what are you doing? If not, why not?
I do various small things. I recycle as much as possible; I bring my own bags to the supermarket/shops to avoid wasting bags; I keep any bags I do get from shops to re-use them; I try to keep lights off if they're not needed; I also do things like only boiling the amount of water I need in the kettle rather than filling it to the top; I do not leave the tap running while I'm brushing my teeth, etc

4.Are you willing to change your behavior if it helps to save resources? Even if you have to give up some of your comfort?
Yes, as long as I know that what I am doing is definitely making a positive impact.

5.Do you think you can change your behavior in relation to resources consumption? Do you think using a webpage informing you of the energy use at the university is a good idea? Do you have any suggestions?
Yes, it's a question of changing habits, like turning the tap off while you're brushing your teeth. Do you think using a webpage informing you of the energy use at the university is a good idea? Yes. Do you have any suggestions? If you can inform people how much is being wasted and identify concrete ways that people can change their behaviour to reduce the waste and measure the impact of the behaviour (e.g. if everyone used no more than one paper towel every time they dried their hands, this would slow the rate of carbon emissions by xxx), this would be helpful. Otherwise if it is a university-wide initiative the website could encourage people to, for example, cycle to work for a week to save xxx amount of carbon emissions

6.Would you be interested in participating in a sustainability project in your university?
Yes, although I only teach there one day a week.

7.Do you have an idea on how we can save resources at the university?
Not other than the obvious things like turning lights off, not wasting paper, paper towels, plastic cutlery, paper plates and recycling what we do use…

CHAPTER 8

Appendix

•Some user test

Web test:

1 After a first glance, do you understand, or it becomes clear what is the purpose of the website?
Not at first initial glance. Once reading the title I got the idea. Maybe an image, some sort of logo?

2 In your opinion, do you think that the contents and services that are offered in this website are useful? Why?
The 'report a problem page' seems like a really good idea, much easier than emailing or finding the right member of staff to report a problem. I also liked the 'take action page, factual information; bullet pointed which helps give an understanding to someone in a more simple way.

3 Are the texts used in the menu clear to understand what's the content of it?
Yes I understood most.

4 Seeing the home page (the page with the menu), Could you see at a glance the most relevant content that it is offered?
Don't fully understand the reasoning for the names of the titles

5 Do you underestand the charts and the information related to resources consumption at IHK?
'Take action' for a page that is there to help and educate, for me I thought that was going to be some sort of signup sheet.

6 Do you find useful the tips about saving energy resources?
I think the charts are showing that in certain time of the day the water consumption increases..?

7 Do you understand how the challenge works and the objective of it ?
Yes bullet point facts are always appreciated, much easier then reading through a lot of text.

8 Do you actually think that you are going to enter, share opinions in the Forum ?
I understand the challenge and yes I would participate however I'm not too sure of the water consumption that is allowed per person.

9 Would you use this product at the University or home?
Yes if this is a real product. Thought it was a made up thing.

10 Comments and suggestions
This would probably be better in the home environment as we would be the ones paying the bills so more thought is taken into being more efficient

CHAPTER 8

Appendix

•Some user test

Web test:

1 After a first glance, do you understand, or it becomes clear what is the purpose of the website?
Yes, the green slogan below the logo focused my attention at first, and because of this I was able to undenstand intuinitively what is the sence of the webpage.

2 In your opinion, do you think that the contents and services that are offered in this website are useful? Why?
Social education is a very important task. Absolutely everyone should be aware of the fact that we need to consume the resources in an economicall way. YES, content of the page is very useful, especially subpage "Take action"

3 Are the texts used in the menu clear to understand what's the content of it?
Yes, it's encourage to go deeper inside the page. The quotaion at the bottom is a good idea.

4 Seeing the home page (the page with the menu), Could you see at a glance the most relevant content that it is offered?
Yes, but for me part "Take action" is the meritum of the page and it can be more demonstrated (biger font, slightly different button, etc.) What's more all the time when a user is in the other part of the wabside there can be some random tips, which links to this sector. (just idea, not everybody have to feel the same ;p)

5 Do you underestand the charts and the information related to resources consumption at IHK?
Yes, it's understandable, but it looks not preety nice (because of the fact that halfs of charts aro on grren backgtound and other halfs on whilt on (in chrome). The font of numbers is very basic, and I don't like notation "00" on X-axis and there can be "24" to make more obviosu that there are presented hours.

6 Do you find useful the tips about saving energy resources?
Yes. Some seems to be obvious, but people are forgoting about this, so it's definitelly useful..

7 Do you understand how the challenge works and the objective of it ?
Mostly yes, but I feel that education/changes should base on constant improvement (on only on sholt challenge).
I feel that many (people, departments, etc.) can implement some dramatic changes just for a time of the challenge to be better "in comparison". For me it's better to promote maybe smaller changes, but PERMANENT.
Idea of competion is good, but we should remember that "We improve ourself just to be better, not to show this to the others." Sometimes we can not obiectively compare two things.

8 Do you actually think that you are going to enter, share opinions in the Forum ?
I like finding informations in forums. Probably I will use it to find something more for me and if I find something interesting to me, I will join the discussion ;)

9 Would you use this product at the University or home?
Maybe. It depends how will it expand.

10 Comments and suggestions
This informations should be easily avaliable for everyone in every age;)

CHAPTER 8

Appendix

•Lighting investment plan

	Old installation	Alternative 1	Alternative 2
number of lamps	14 units	14 units	14 units
bulps per lamp	4 units	2 units	2 units
power per lamp	18 Watt	24 Watt	24 Watt
power loss	31 Watt	5 Watt	5 Watt
total power per lamp	2,74 kW	0,81 kW	0,81 kW
hours of usage per year	1600 timer	1600 timer	1280 timer
life expectance per lamp	20000 timer	20000 timer	20000 timer
price of energy	1,5 kr/kWh	1,5 kr/kWh	1,5 kr/kWh
price per lamp	32,93 kr.	32,93 kr.	32,93 kr.
Total amount of consumption	4390 kWh	1299 kWh	1039 kWh
	6586 kr.	1949 kr.	1559 kr.
Lamps	4,5 units	2,2 units	1,8 units
	148 kr.	74 kr.	59 kr.
total costs	6733 kr.	2023 kr.	1618 kr.
Total savings in kWh per year		3091 kWh	3351 kWh
Total savings in percentage		70,4 %	76,3 %
Total savings in kr. Including lamps		4711 kr.	5115 kr.
Construction Cost for new lighting system		0 kr.	21211 kr.
Total savings		4711 kr.	5115 kr.
Repayment period in years		0 years	4 years

Lamps comparison

It's very significant that, after doing a big investment, in such a short period of time it's amortized, and once the cost is recovered we are saving money. Apart from that, we are also polluting less the environment, and this is very important, because we all know that we have to keep it for future generations and also for other habitants of the Earth.

So, we can say that it's a good idea to invest in this direction, because on the one hand, we are saving money, which can be invested in other stuff, and on the other hand, we're being more energy-efficient means that we're having less impact on the environment.

CHAPTER 8

Appendix

- **Ecostingy source**

(>> CD back page)