



USE PACT
New Interaction Styles Lighting Control
in the Home Environment
By Team 2

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Introduction

Introduction

When it comes to lighting a living room, it seems very easy. But when looking closer to how lights and controls are organized in a modern livingroom, it tends to become fairly complex. A normal livingroom has multiple user, who all have multiple light preferences for the different activities performed in a livingroom.

The challenge is to control the lights in a living room in a different way. Now everything is controlled manual, we want to create a hybrid system using the addition of autonomous control. The autonomous control will consist of multiple sensors and a smart processor to improve to daily lighting experience.

In this report we will focus on implementing the design into students' dormitories. The goal is to create a better living environment for the students and at the same time help the proprietor to save energy costs while also contribute to a healthy environment..

Goals

The main goal of this analysis is to see whether or not students have the hidden need for a more intelligent and advanced lighting system. We separated our main goal into a few sub-goals.

- Would an intelligent lighting system save energy within a student living room
- Do students desire an advanced lighting system
- How complicated are lighting settings needed for the different activities within a student living room
- Are students willing to spend money on improving their lighting system

Approach

Seeing we ourself are still students the first step for our approach is to look at our own situations. Besides this we will also use the knowledge we gained from our research in the previous assignment from the Use secret life of light course. Being the targetgroup gives us the ability to determine many aspects of the people, activities and context part of the analysis without involving external people. It's important for us consider all the aspects of the PACT-analysis and in the end draw a picture of our user's ideal lighting setup intended for the living room.

Introduction

PACT method

PACT analysis is used to get a more detailed design brief before you actually start designing. It's all about gathering information related to our scenario. PACT stands for; people, activities, context and technology. We will examine our designing problem from these four different angles and strive to get a more clear view on the problem. Examine the people related to our designing problem will give us better insight about the characteristics of our target group. In the activities part of the PACT-analysis we will examine what activities are carried out by our target group in a by us determined environment. The context analysis is meant to examine the environmental influence on our designing problem. Which is strongly related to the activities taking place in our environment. Technologie is about what tools are used in our current environment and what improvements can be applied to these tools.

People

Our users are students living in dormitories with a shared livingroom. These people can have any background. From lower to higher education, from teenagers to young adults. Dormitories have a variety of people who can almost all get along with each other.

Most of the time, students do not have a lot of money. This is due the fact that they do not have a lot time to work, but do have to pay their own bills and necessities, like food. Furthermore, a lot of money is spent on educational materials and beer. They pay a fixed rent for their use of electricity and water each month. Sometimes, this causes irresponsible usage of the energy. Examples are keeping the lights on when no one is in the room and not closing the tap. The dormitories mostly have poor lights because they are old houses. Most landlords are not interested in investing in these dormitories because investing as little as possible is cheaper for them.

In a house of people with different education or work, people have different sleeping rhythm due to their differences in schedules. Due to this the students often perform different activities in the living room at the same time. These different activities are not only done by the students living at the dormitories. Most students have lots of guests coming over. They use the livingroom a lot, because their room is often too small to live in. Due to this there is a lot of dynamics in the livingroom. However, there are also students who prefer to be by themselves.

Stakeholders are the landlord, guests of students and housing companies like Vestide. Previously is mentioned that most of the landlord are not interested in spending a lot of money into the dormitory. This is not exactly the same with housing companies like Vestide. These have reputations to maintain.

The living room of dormitories contain a variety of types of user. Most of the users are novice and experienced users if we introduce a new system. The experienced users are the students who live in the dormitory and could also be the landlords. The novice users are the guests and students who live in the dormitory but are not frequently at home, not that smart or don't use the light system that often.

Students are young and most of the time have good developed senses. They are curious and experience using technology more enjoyable. Most of the time they learn fast and this makes new technology more usable. However, these senses do not function well when the students are drunk. An average student is drunk at least once a week according to some studies.

To conclude, in dormitories you have a variety of students. This causes a lot of dynamic in the living room.

Activities

Activities

Within this chapter of the PACT analysis the activities will be described. These activities will all be described in detail with the different needs and desires for these activities.

As described in the previous chapter the target group of this PACT analysis are students. What's so special about this target group is the amount of activities they perform within their livingroom.

Most common activities within this living room are:

- Relaxing
 - Watching Tv
 - Watching Movies
- Dining
 - Small groups
 - Large groups (multiple friends over)
- Studying
 - With multiple people
- Small party
 - 10- people
- Games
 - Console games
 - Board games

A less common activity is:

- Large party
 - 10+ people

Activities

Relaxing

One of the most common activities if not the most common activity is relaxing, usually when students get home from college the first thing they do is relax. Just sit down and get some rest after a long day of listening to boring lectures, creating prototypes or other study related activities. Because of this the overall purpose of this activity is to get some rest and re-energize for other activities.

The length of this activity is often related to the amount of plans the student has the rest of the day, because of this there is no real time limit. There can for example be cases where the student is relaxing in the living room from the moment they get home till the moment they go to bed.

Quite often during this relaxing activity there are multiple students in the room participating in the same activity, also this activity is often but not always combined with some of the other activities done within this room. Because of the multiple people participating in the activity there has to be compromises in regard to the light setting, studies show that for relaxing often a warm and not too bright light setting is chosen. This probably main due to the bright and cold light often used during work times within universities and other work environments.



Relaxing is a regular activity, which often starts around the same time. It is a routine within the students everyday living, often they will come home simply drop their stuff and lie down for as long as they can. The time pressure whether or not they can continue this activity really depends on a case to case scenario, but they usually set a amount of time they can relax for themselves.

Overall this is an very calm daily activity often done within groups, for a variating time span, without any safety issues and which depends on a case to case scenario for how tired the students are.

Overall design

Dining

Within most student houses there is no dedicated dining room, because of this students often dine on the couches and chairs in the living room. This activity can also be split upon two versions dining in small groups, with only roommates or alone, and dining in large groups when friends are over. In both of the cases the overall purpose of the activity is to consume food.

The most regular of the two versions of this activity is the dining in small groups, which is done on a daily basis. Dining in larger groups is often done on a weekly basis, some groups of friends have a weekly day on which they all come together to dine.



Usually students won't eat multiple courses, because of this the time consumed during this activity is quite minimal. However this activity is usually combined or followed up by the activity relaxing. Although during this activity more light is needed in regard to safety issues, seeing if you aren't able to see your hot food there might be a chance that you harm yourself.

Overall this is a daily activity, that isn't that time consuming, done in a group, with some safety issues and without any real complexity.

Studying

For students studying is also a daily activity, which is often done in their own sleeping room. However when the task is that important or when their sleeping room is very small they often perform this activity in the living room. The overall purpose of this activity is to gather information or perform study related tasks. For which often reading is required to which sufficient light is needed.

However when other people are performing different activities in the room at the same time there might be a conflict in regard to light settings. Because of this a certain type of cooperation or agreements will be needed, this can create more complex light settings. For example part of the room with enough light to study but others with a more relaxing light setting. Whether or not this is a routine and the size of the time span is different for every student,

Activities



this because of the different courses they follow but also how easily someone can gather and contain information. However for most cases students don't want a busy or noisy place when they are studying because of this a conflict can be caused when others are relaxing while watching tv in the same room.

Overall this is a for most students a daily activity, which can cause conflict with other activities, sometimes require complex light settings, sometimes frustrating, can contain time pressure and fluctuating time span.

Small party



This activity can require lots of different settings, because the activity itself can be different each time. Sometimes a small party is simply drinking a few drinks other times people want to dance or play drinking games. For students this is often a weekly activity, therefore it shouldn't be too difficult for them to change the light settings in regard to this activity.

The overall purpose of this activity is to have fun and perhaps to socialize with your room-mates. Even though reducing the brightness could create a more cosy feeling it could create dangerous situation, seeing when there is alcohol involved there is often the chance that a glass falls down. When this happens it would be safer if there was sufficient lighting to see the broken glass.

During this activity the need for lighting often changes because, because of this it can create a higher complexity with regard to the light system. Seeing it is still a common activity which could become a routine for certain students, they won't want to adjust the light system in detail to a certain light setting each party.

Overall this is a complex activity, that can require differences in light setting each time around, might cause some safety issues, is in some cases a routine and is mostly aimed at having fun.

Activities

Gaming

A common activity that is also related to relaxing is gaming. Most student livingrooms have at least one gaming console, if not one of the newer versions it's often an old one they took from their parents house. This activity can vary from being extremely active, for example the wii, kinect and playstation move, to a more relaxing way of gaming. However gaming is not only linked to gaming on consoles some students also often play board games with their roommates. Although light settings for this are quite different than light settings for console gaming.

During this gaming activity there are also usually multiple people participating in other activities within the same room. Because of this there needs to be an agreement or cooperation in regard to light settings. This can create complex situations.

As stated before there are physically active type of gaming in these cases there might be concerns towards safety if people won't be able to see everything clear because of the light setting. Just imagine you waving your arms around in darkness, there could be a big chance that you hit something.

Overall this is a usually daily activity, with a varying time span, multiple people participating and not participating, some safety issues, varying between physically active and not physically active, varying between console and board games and with the overall purpose of fun.



Activities

Large party

In some student homes large parties are given on a semi regular basis. The overall purpose of this activity is to have fun and to socialize. During these parties they often move all furniture out of the living room to create more space for more people. So these parties are often quite active, sometimes even with loud music and dancing. Because of this it there would probably be a wish for a more active light setting, for example that changes with the music.



Although because there are so many people together in a room you don't want everyone to be able to control the light settings. Also these parties are often no routine and require some planning up front, so it involves new tasks every time.

Overall this is an activity, that is not done on a regular basis, with varying time span, multiple active people, in a party setting, with complex light settings and aimed to have fun.

Common grounds

These activities have some common grounds which are:

- Concerning multiple people
- Which sometimes perform different activities at the same time
- Might all require multiple light settings throughout the activity
- Activities among each other can create conflicts in amount of light needed

Context

There are 3 types of context which are distinguishable:

- Physical environment
- Social context
- Organizational context

Physical environment



Our users live in dormitories or student houses. These environments are often not nicely maintained buildings. On the inside everything looks decayed and ready for replacement. The living room is filled with old chairs, tables and couches. The white wallpaper came loose from the wall and became yellow. The main reason why the homes of students don't have that great interior is, because the small amount of money they have to spend each month. The living room is filled with old stuff and looks not really cosy.

Often the ceilings are low and the spaces not really big. Rooms have a small amount of windows. This way few sunlight is able to enter the room. The rooms and buildings are bad ventilated. The position of the house regarding the environment. Student houses and dormitories are often places in the center of a city. These places can be very noisy.

Social context

This context is about the the reason why people gather in this space or room. The social context is strongly related to the activities which happen in the spaces. Some examples of activities in the living room which we elaborated more in the activities part are; relaxing, dining, gaming, studying and small parties. We explained that each social context needs its own adaptation of the environment. There is for example a difference between watching a movie and studying. While you watch a movie you'll probably want the light to be dimmed or even off. While studying you need more light so you will be able to read your books. This could possibly give a conflict in this context setting. Most dormitories and student houses are inhabited by more than one student. This means that you have to take your roommates in account when you are using the living room. It is not possible to set three different lighting moods at the same time so that you comfort all your roommate's needs. This social context means that you have to make an agreement with each other to maximise all three students their needs. The organizational context is not really applicate in this case.

Technology

The final part of this PACT-analysis is technology. Technology is of course the main driver of everything because it forms the physical system. The technology to control the light has to be autonomous, so no simple wall-switches anymore. But in order to value the light setting more, a manual input is also desired. When a system is fully autonomous the end user tends to value the light less, because it feels that the control over the lighting setting is lost [stated in assignment].

As a fully autonomous system is not wanted and a fully manual system is also not wanted, some sort of hybrid between these two has to be created. But as this system has to be implemented in student dormitories, it has to be attractive to students, but also for the proprietor of the dormitory as he is the one paying for the lighting system. The system is attractive for students living in the dormitory because lighting conditions are poor in most cases, and the system is attractive to the proprietor because energy costs can be saved when lights turn off automatically for instance.

The system in context, a hybrid system, will consist of multiple current existing components. The most important component will be the actuator, in this case the light source. As a hybrid system is wanted the light is not only controlled by a manual input panel but also by a sensor network. And of course everything is connected to a main processor. These four components form the main technology.

Light sources

Modern light sources like LED's could be used. LED's are very energy efficient and come in various colors. A main white light source can be used for some activities. The addition of colored light sources can set the mood for a small party for instance.

As different activities require different light settings and even different light sources, LEDs are an ideal solution.



Technology

Sensors

To control the lights in an autonomous way, sensors are a good solution. Different sensor can be used in this case, assuming the living room has windows where natural light comes in. Useful sensors could be a motion sensor, students tend to forget turning of the light, a motion sensor can save energy in this case. Also a lighting sensor can be very helpful, when for instance the sun is shining outside, the inner lighting does not have to emit at full power, again saving energy. Another 'sensor' input could be to determine if the television is on, when the television is on some light can be dimmed or even completely turned off. These sensors are just some examples and form the autonomous part of the system.

Manual inputs

For the manual control of the system a manual input is required. A manual input could be an old fashioned light switch or a dimmer. But as there will be many light sources, multiple light switches/dimmers would be required, making it hard to repeat a lighting condition multiple times. A central controller in the room would be a solution, like a touchscreen. With this touchscreen, multiple predefined light settings could be recalled. A preset could also be stored using the main controller. But this would mean that in order to change to a different light setting, the user has to walk to the control panel. As every student in the dormitory is connected to the wifi network through their smartphones, a smartphone could also be used to control the overall light setting, or even the personal light setting.

Main processor

Everything is connected to the main processor, which converts sensor inputs and manual inputs to a light setting and eventually to commands for the different light sources. The main processor stores all the personal lighting preferences and could also make lighting suggestions making the system more autonomous. The algorithms can be as complex as it is required for a students' living room.

When using some of the existing technologies for the lighting application of students' living rooms everything is possible. The system can be very autonomous, but should also have some manual inputs as mentioned earlier.

One other important matter is safety. Considering a very autonomous system, what would happen when control over the system is lost? And what happens when there is a fire or a power outage? These are questions that need to be considered when designing this system.

Conclusion, Vision & Scenario

The conclusion that can be formed from this analysis is that a hybrid type of controlling the light would be best suitable for this type of user. Seeing students are often quite busy, have a lot on their mind or are under influence of alcohol it is easy for them to forget things, for example to turn off the light. Because of this it might be very useful for students if there was an option in the lighting system that would turn off the lights when there are no sounds or movement within the living room for a certain period of time. This could create a drop in energy usage as well, which would be desirable for the landlord.

This is also an advantage for students who come home late from for a party. If they are intoxicated and try to find the light button, controller or any way to turn on the light, they could create a mess because they knock things over. However if the light would turn on in a low brightness setting when someone would enter the room, it could prevent dangerous situations and make it easier for the student to find the controls.

The hybrid lighting setup can be used as a social bridge between users in the living room. In this scenario it has a more playful application. In a different setting it could be used to improve your study attitude. This could especially be used when small amounts of sunlight are able to enter the living room. Turning the light setting into a blue/white light will slow down the melatonin production. This will keep you more alert and awake.

But besides the examples given above, there are quite often multiple students participating in different activities in this room. Due to this there could be the desire to be able to set different light settings for different parts of the room. The reason for this is so all people can have the desired light setting for their activity. But adding this to a lighting system would mean a more complicated lighting interaction or a lighting system that would be able to track a person and with this follow them with their own light setting. Perhaps even combining two light settings when two students are close together. Two options for this are:

- A more advanced lighting control (for example a panel) that could create a diverse and complicated light setting within the room.
- A light system where each person has its own controller which they can set to a certain light mood/setting. The light system is able to track this person and make sure that wherever they are in the room the light setting follows them. This way the system could create very complicated light settings without any effort of the user what so ever.

Added this together would create a system that:

- Turn on when people enter the room
- Turn off when there are no people in the room
- Able to create different light settings/moods for different activities in the same room

Conclusion, Vision & Scenario

However a very advanced lighting system would probably still be too expensive. Due to the fact that most students have little money, the money has to come from somewhere else. When tested, the landlord can be informed how much money the new lighting system will save. Most landlords own multiple dormitories for years. If there will be a return of the investment made in the new lighting system, the landlord will probably be interested.

Otherwise, a balance between a complex and an affordable system must be made or the light system must convince the students that it is a valuable investment. One aspect students probably find really interesting is that they can turn their normal light system into a party light system. Normally, investments are made into hiring a special light system when organizing a party. With the new light system those costs will be saved.

To conclude, our vision is that the livingrooms in dormitories are an interesting home environment to design for. Although they have little money, the dynamics and the profits of the landlords are a challenge. They have special needs which are not yet fulfilled with the lighting systems of nowadays. These are needs like; making the light system easier for intoxicated students who come home, having a party light system ready at all times and having different illuminations in one room. Furthermore, a special aspect of dormitories is that they are owned by landlords who are interested in any kind of profit.

Scenario

Susan is leaning against the door of her dormitory. She has problems unlocking the door, while she is drunk and cannot find the keyhole. When she finally managed to open the door, she stumbles the hallway in. Dimmed light slowly goes on. Much better than the bright lights in the snack bar which almost blinded her and caused a huge headache. She slowly tries to climb the stairs towards the living room. The dimmed light makes it able for Susan to find the corner of the couch. She crashes on the corner of the couch and immediately falls asleep. After a while the lights automatically turn off.

One hour later another roommate, Tom, comes home with all his friends. He is still in the party mood. While walking into the living room he does not notice that Susan is sleeping in the corner on the couch. He immediately grabs the party lights remote control and shows his friends how cool their light system is. This makes Susan restless in her sleep and causes her to move. The light system notices this and automatically makes sure that the part of the room where Susan sleeps is not illuminated. Susan is able to sleep further and Tom and his friends continue to drink another beer. They lived happily ever after..