

PROJECT
CONSUMENTENPRODUCTEN

KAL

LIX

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KALIX
AN IKEA PROJECT

KALIX

Innovating showering

This report is intended for the managers of Ikea and the professors of the University of Twente and was designed for five weeks by students of the study programmes: Industrial Engineering and Management, Industrial Design and Mechanical Engineering.

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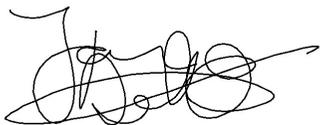
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PREFACE

Motive

The motive for this project is an assignment from IKEA for the students of the University of Twente. IKEA wants to broaden their range of bathroom articles by launching a partition. This partition would be placed between the wet and dry section of the bathroom. This enables the customers to buy a more complete bathroom at IKEA. Of course IKEA wants the new products to fit the design of the already existing products. The product should also be innovative within its market. The development and the entire designing process of this product is described within this report.

Target group

This report is written for IKEA and the professors of the University of Twente. It is focussed on presenting the product, which is designed by the projectgroup IDEA, to IKEA. The users are the customers of IKEA. The target group, also known as the consumer, will be investigated in the market analysis.

Structure of the report

First the final product is presented; how it looks, how it works, et cetera. Thereafter the market research will be explained, which will be used to determine the target group and which will be used as inspiration for the brainstorm. This is followed by the list of requirements, which is compared to the final product. Now the concept choice is explained, our considerations for the choice of this concept are explained. This is the main part of the report, which also contains the designing process. The second to final section of this report is production and transport. IKEA has set up requirements for transporting the final product, it must meet some conditions on size and weight for example. The report ends with a conclusion and some recommendations. The recommendations are the promised sections for the final interactive report that still need some working out. There is also an appendix that contains explaining pieces of text, charts, etc.

Expression of gratitude

This project has been made by the projectgroup 32 (IDEA) and with support of the professors of the University of Twente, IKEA Netherlands and IKEA of Sweden. We would like to give our special thanks to ms. W. Dankers and mr. J. Havinga for supporting the designing process.

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PRODUCT DESCRIPTION

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figure 1.1 L-Shape Kalix

KALIX

The Kalix is a partition made up from either two walls to create a L-shape, or three walls to create an U-shape. Each wall is build up from panels that are placed at an angle. This way the water will flow back into the showering space, preventing it from reaching the dry part of the bathroom. Because of the angle there is still some space between the panels, allowing air to flow through. This way steam can leave the shower space and fresh air can enter, allowing the user to breath better.

The panels of the Kalix are secured in a rail. Wheels are placed between the panels and the rail, so the panels can slide up and down the rails. The rail is fixed on the wall by means of piercing or an adhesive strip. When one is not showering, the partition can be easily pulled up. This is done by releasing the lowest panel from a "click system" which holds on to the lowest panel. Because of a torsion spring the partition nicely folds up by itself. Because it is folded when it is not used, it takes very little space.

The lowest panel is slightly bigger than the other panels. If the partition is pulled up, only the lowest panel is visible and the others are hidden behind it. The lowest panel is made from laminate, making it seem like wood. The lowest panel also has a little rubber strip on the bottom. This way, water is not able to flow underneath the partition and enter the rest of the bathroom.

When the user wants to take a shower, he or she can just pull the partition down and fix it with the click system. Once finished showering, it is really easy to dry off the partition, because of the smooth surface. But if one does not always want to dry it off, that is no problem too. The polymer which is used does not mold easily, so it is not needed to dry it off every time one takes a shower.

Why the product fits with the style of IKEA

Right now IKEA is selling multiple bathroom products. They sell bathroom furniture and accessories that fit with this furniture.

After launching the Kalix, IKEA will have a broader range of product types for bathrooms. Alongside the furniture IKEA can also provide the customer a bathroom partition. The Kalix follows the IKEA ideology. The Kalix is innovative in its market as it is different from all the other partitions that are sold around the world right now. The Kalix is also of a low price, this is because the materials are cheap and the transport costs are low because of IKEA's way of compact packaging. It is also relatively easy to build, as it has the usual IKEA-guide. The product is flexible for many different sized bathrooms. This is because the customer can choose between the L- and U-shaped Kalix. The Kalix is a perfect product for the target group of IKEA, people with small bathrooms.

The Kalix fits into the existing IKEA style. The use of transparent panels is a recurring aspect in the IKEA cabinets and tables. Transparent panels are used in the IKEA-styles Hemnes and Godmorgen. The panels at the bottom have wood profiles and are made of polymers, to ensure that the product does not decay too fast. These wood profiles are especially used in the style Godmorgen. The new partition between the wet and dry parts of the bathroom can be combined with all Godmorgen style products. It also has many similarities with the Hemnes style, so the product can be combined with many Hemnes style products too.



figure 1.2 U-Shape Kalix

MARKET ANALYSIS

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Before starting the designing process, a market analysis was done. To find out in which market IKEA operates, the following was researched: products, materials, showering habits, target group, IKEA's style and partitions in rooms other than the bathroom. To further investigate showering habits, a survey was created and analysed. This survey was mainly for dutch people. This part contains conclusions of an extensive market research. For more information, facts, figures and graphs the entire research can be consulted, which is written down in appendix 2.

Target group

To analyse the target group, three scenarios and three personas were made. These scenarios can be found in appendix 2.1. These scenarios and personas were created to figure out the different types of people that could buy the product, and see what kinds of problems they could run into using the product. Out of the three scenarios and personas it can be concluded that the product will never fit all the scenarios and personas perfectly. Especially because it also has to fit IKEA's requirements. For example: it has to be able to fit into the transportation boxes of IKEA, but it also has to be able to assemble. These scenarios and personas give insight in problems different target groups may encounter.

The conclusion from the scenarios and personas is that the product must be ideal for people who do not want an entire shower cabin but also do not have a lot of money to spend. They still want something that is not too cheap and does not mold too easily, like a shower curtain. It has to be easy to move. It does not need to be ridiculously easy to build up, but everyone should still be able to build it with the guide at hand.

IKEA's style

A big thing about IKEA is that the customer is able to combine products from different lines to create his or her own style. To get a good understanding of the overall style of IKEA, three product styles were worked out. These styles are: Godmorgon, Hemnes and Trä och Järn. There have been made collages of these styles, which are placed in appendix 2.2.

Godmorgon

Godmorgon uses many different styles of wood and colours (coated parts), of which black and white are the most common. Wood ensures a more playful and less clinical atmosphere in the room.

Hemnes

A Scandinavian white design which is very easy to combine with white products from other product styles.

Trä Och Järn

The industrial style of the product line gets accomplished with dark wood, iron, and copper as materials.

From this analysis it can be concluded that IKEA has a very broad style, but a product always easily fits within the style of almost every house. Because of this the shower partition that is being designed should either be really basic and plain or it should be customizable to fit any style.

On the next page style collages are shown.

Product

There are some alternatives to the bathroom partition. A shower curtain is the cheapest option for creating a partition between wet and dry. Shower curtains at the IKEA cost between € 2,- and € 14,-. Because of this, the bathroom partition should either fit within this price range or when the bathroom partition exceeds this price range, it should have a significant better quality. Showering accessories from IKEA are mostly fastened with suction cups and sometimes fastened with screws. So to give customers of IKEA the opportunity to be still able to use these accessories it would be wise to design the bathroom partition in such a way that these accessories can be attached. The accessories can either be attached to the partition itself or to the bathroom wall. This means that the partition should be designed in a way that allows these accessories to be semi-permanently attached or it should be designed in a way that leaves a bathroom wall clear for the accessories to be attached.

It was also examined whether or not it could be beneficial to incorporate a small closet or some cabinets to the partition. Because IKEA does not have any bathroom closets or cabinets, a whole closet or cabinet would have to be designed. Attaching or incorporating a closet or cabinets would make the partition a lot bigger than it needs to be. This would exclude people with a small bathroom from the possible customers. Because of these reasons it was decided that there will not be a closet or cabinet incorporated in the design.



GODMORGON

HEMNES





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TRÄ OCH JÄRN



Partitions in rooms other than the bathroom

A partition in a room is almost always made using a closet. Walls are also a widely used partitioning option. These walls are often decorated with colourful patterns and designs, and can often be combined with small cabinets. The walls are, in most cases, semi-transparent. This is probably because transparent partitions make the room appear bigger than non-transparent partitions. The way partitions are created in other rooms can be a source of inspiration for partitions in the bathroom.

Material

There are four possible material categories: metals, polymers, ceramics, and composites. Composites are way too expensive to use for a shower partition. Ceramics, with an exception for glass, are too brittle and therefore unusable. Metals are a considerable material, provided that they contain a minimum of 10.5% chromium content by mass, otherwise a proper coating is needed. Still, you would have the problem of the weight that metals have. The metals that are relatively light, e.g. aluminium, have to be coated to prevent corrosion.

Polymers are also a great option. Because polymers can be modified in many different ways they create flexibility within the designing process. Polymers are also very cheap.

Showering habits around the world

Generally speaking, North American bathrooms are bigger than European bathrooms. Because of this difference it is important to design a product that either fits in many different sized bathrooms or is adaptable in size. Likewise, it has to be made sure that the product fits the design of a North American, European and also an Asian bathroom. The average size of a bathroom in North America equals 25 m², in Europe the average equals 5 m² and for Asia is not found appropriate information. Another thing that has to be taken into account is that the water pressure in North America is higher than in Europe.

Survey

From the survey the following things can be concluded. The bathroom partition should have the possibility to hang up enough storage trays in the shower space to store around 7 showering products, including a wiper. It is desirable that there is enough space in the shower space itself for the customer to dry themselves of. The bathroom partition should not resemble a shower curtain. It should also not be a necessity to always dry the partition, people do not seem to do that often at all.

LIST OF REQUIREMENTS

In order to develop a firm partition between the 'wet' and 'dry' sections of the bathroom, a list of requirements has been compiled. These requirements are divided into several categories, such as price, durability, etc. The complete list has been stated in figure 3.1 Some of the requirements are trivial, others are stated by the client, IKEA. The final design of the firm partition should meet these requirements and will be reflected.

One important requirement of the product is that it should conform to IKEA's standards. This means that it should fit the general IKEA design and IKEA's target audience, while not being too expensive. This also means that it should be easy to set up. The product should fit on the standard pallet size, europallets. Other requirements, not related to IKEA, are product specific. In this case a shower partition should be water resistant, permeable to steam and firm enough to withstand shocks. Since the product should be able to be sold worldwide, it should have a big market which means that it should be possible to mass produce the product with ease. This also means that the shower partition should conform to all the countries' safety restrictions.

The market research clearly showed that functionality is one of the most important qualities for the bathroom partition. Especially the requirement of being easy to clean or not having to be cleaned at all after using the shower is important because most people do not want to spend time drying off the shower after using it.

The same goes for preparing the shower separation before using it, they want something that is easy to operate, because when they want to take a shower, they only want to take a shower and do not want to build an entire cabin first.

Another functional aspect is installing the shower partition. To fit in with the rest of IKEA, the separation should be easy to build and have a clear manual on how to build it. Since some users are not allowed to drill any holes in the bathroom, it is important to give the option that the model is set up using for example adhesive strips.

Requirement	Value
1. Price	Maximal € 150,-
2. Durability	
a. Lifespan	At least 5 years
b. Firm	Should withstand shocks (normal use)
c. Water resistancy	Only water resistant materials (should last at least 5 years)
3. Mass Producibility	Able to produce fast
4. Safety	Conform the Global Safety Standards
5. Functionality	
a. Cleaning	Easy to clean (smooth surface)
b. Operation	Easy to operate (maximal three handlings)
c. Complexibility	Easy to build (no technical background needed)
d. Airy	There should be space for the steam to escape

6. Attractiveness	
a. Target audience	Should be attractive to every age range and every culture
b. Style	Should fit in with the IKEA style, scandinavian design
7. Dimensions	
a. Packed	Maximal 1200 mm x 2200 mm x 800 mm (l x w x h), Euro-pallet dimensions
b. Unpacked	Compatible in different bathrooms (different heights and widths)
8. Weight	Maximal 15 kg per box

figure 3.1 List of Requirements

CONCEPT CHOICE

During a brainstorm session a lot of different concepts were thrown around. From these concepts the best three concepts were chosen. Examples of ideas of the brainstorm session are shown in figure 4.1, where every concept will be explained. Eventually we chose our final three concepts based on common sense and the market analysis. While not every concept got worked out well, many concepts were at least sketched out and/or used as inspiration for the final concept.

1. The first concept is the concept on the left of the page. It is a showerwall which can be pulled in and out of the wall. So it is quite flexible and useful in small bathrooms.
2. The second idea, named Snabel (current name is the KALIX), got chosen as one of the top three concepts and will be further explained in the section 'concept explanation' that is located later on in this report.
3. This is a hemispherical showerwall which can rotate 360 degrees. A disadvantage of this concept is that it is not only a shower partition but a whole shower cabin.
4. The fourth concept is based on the idea of a spiderweb. The structure of a spiderweb somehow has the tendency to be moisture resistant. The idea here was to make something that works the same way for in the bathroom.
5. This one is a little weird and not very well thought out. The idea was to do something with a folding and clicking system.
6. The sixth concept is a plastic dome which can be pulled in and out.
7. This concept is a shower enclosure which works with a magnetic field. It would work in a similar way that water gets deflected by a static balloon. There are many risks with this design though. Like the problem of probable electrocution because of the combination of an energy field and water. Besides this big problem it would also be extremely expensive to make. These reasons made this concept not be in the top three.
8. The next concept is an air-curtain. It would be multifunctional, because besides being a partition it would also dry the consumers off. This concept would cost a lot of energy and money, just like concept 7.
9. The ninth concept is based on a sushi mat, which is a flexible mat of wood or bamboo sticks. One could for example roll it in when done showering.
10. The tenth idea is one of the top three concepts and is called the Fönster, it will also be explained in the concept explanation.

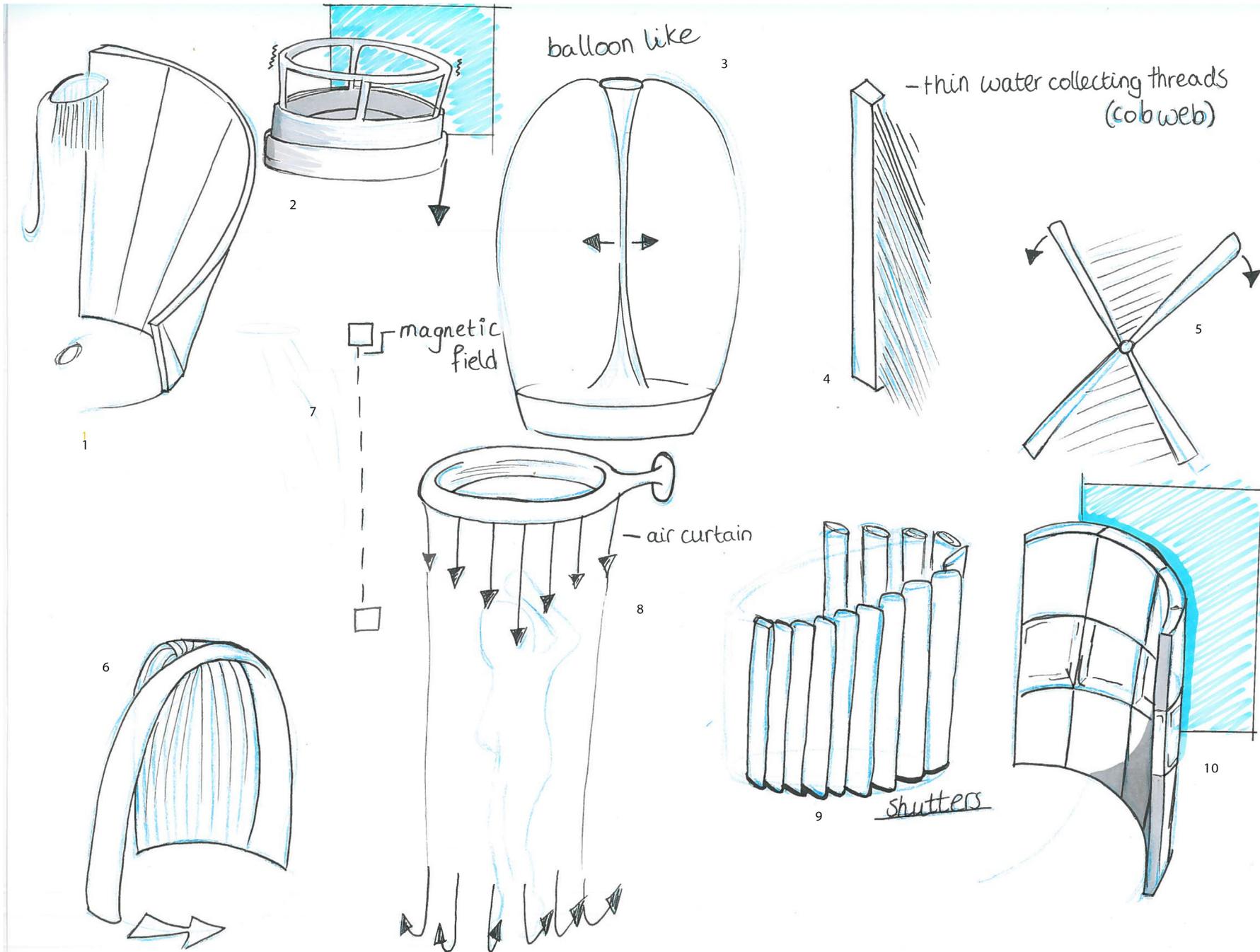


figure 4.1 Brainstorm concepts



Beside these concepts we had more ideas, but those were all possible add-ons for the concepts.

- A plastic that changes colour when the temperature changes. This way one can roughly see how long one has been showering.
- Make the partition work like one of those magnetic drawing boards. This way when one is done showering one gets to erase the drawings and dry the partition at the same time with a magnetic swiper.
- Apply a clock in the enclosure.
- Apply a footrest in the enclosure where one can rest a foot when shaving.
- A stool for older people.
- A one-way mirror. This is a mirror where one can look through when showering and which is a mirror when one is not standing in the cabin.

CONCEPT JUSTIFICATION

Evaluation table

In order to reflect on the final design, an evaluation table has been compiled. This evaluation table is stated in figure 4.2. A weight factor has been assigned to each (sub)requirement in order to reflect on the chosen design. Requirement number 5 has a relative high weight, because of its importance as stated above. It is necessary that the concept meets this requirement.

Requirement	Total value	Subvalue
1. Price	20	20
2. Durability	18	
a. Lifespan		2
b. Firm		8
c. Water resistancy		8
3. Mass Producibility	10	10
4. Safety	10	10

figure 4.2 Evaluation table

5. Functionality	52	
a. Cleaning		10
b. Operation		15
c. Complexibility		25
d. Airy		2
6. Attractiveness	20	
a. Target audience		10
b. Style		10
7. Dimensions	30	
a. Packed		18
b. Unpacked		12
8. Weight	20	20
Total	180	180

Chosen concepts

After brainstorming some concepts three concepts are chosen, the Snabel, the Fönster and the Gångjärn. These concepts will be examined with the weights mentioned above.

Snabel

This concept is of a circular tube. This tube can be folded and lifted towards the ceiling when finished showering. In this way the tube does not take any space in the bathroom when it is not being used. While someone is showering, the separate rings have slid along each other to make sure no water escapes from the shower.

The construction of the tube is attached to the ceiling by a metallic framework where the steam is able to escape. The tube is not completely closed because that is impossible with the shower rod. So this means that the circle is flattened against the wall.

The possible materials are ABS plastics, aluminium and wood with a special water resistant coating.

SNABEL

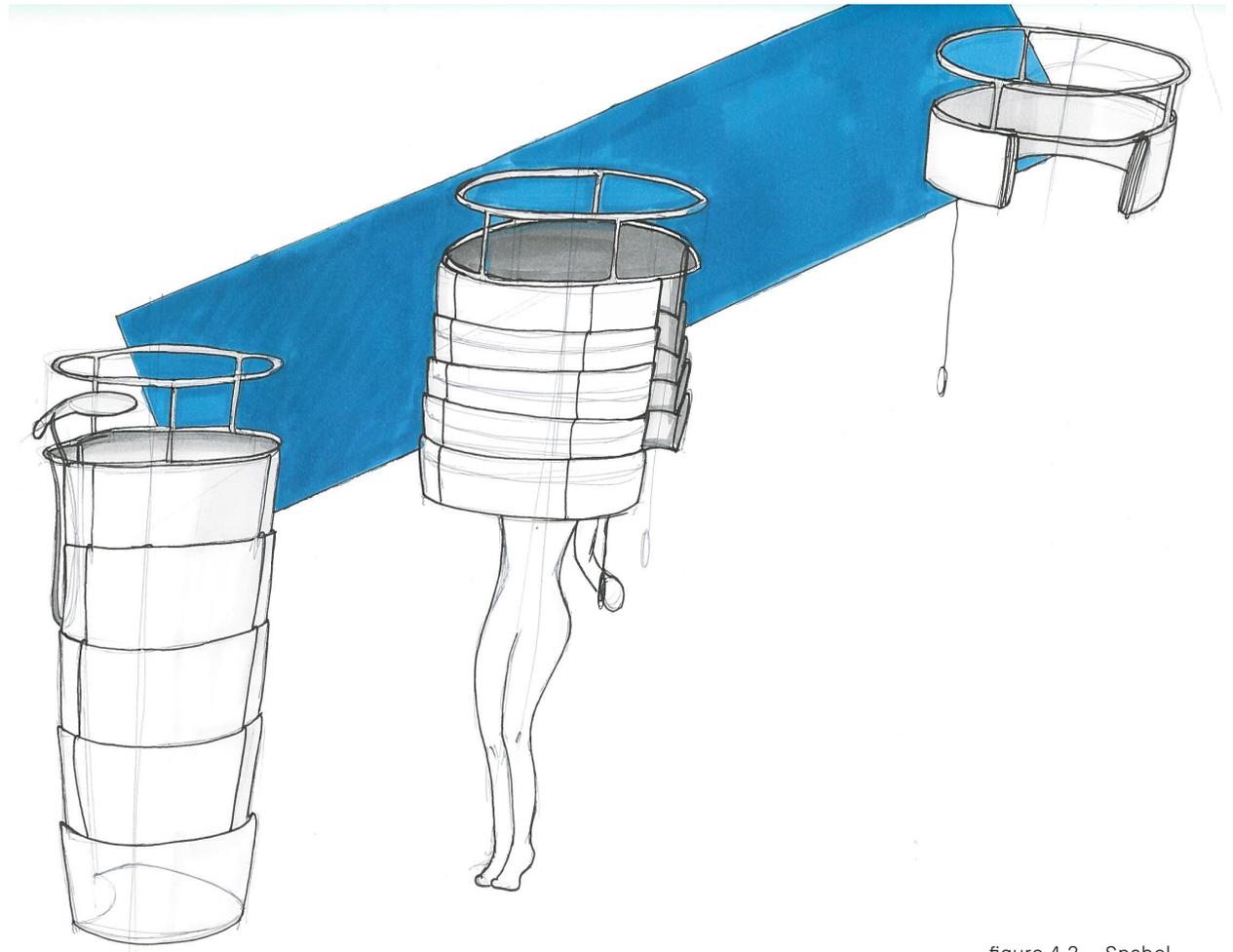


figure 4.3 Snabel

FÖNSTER

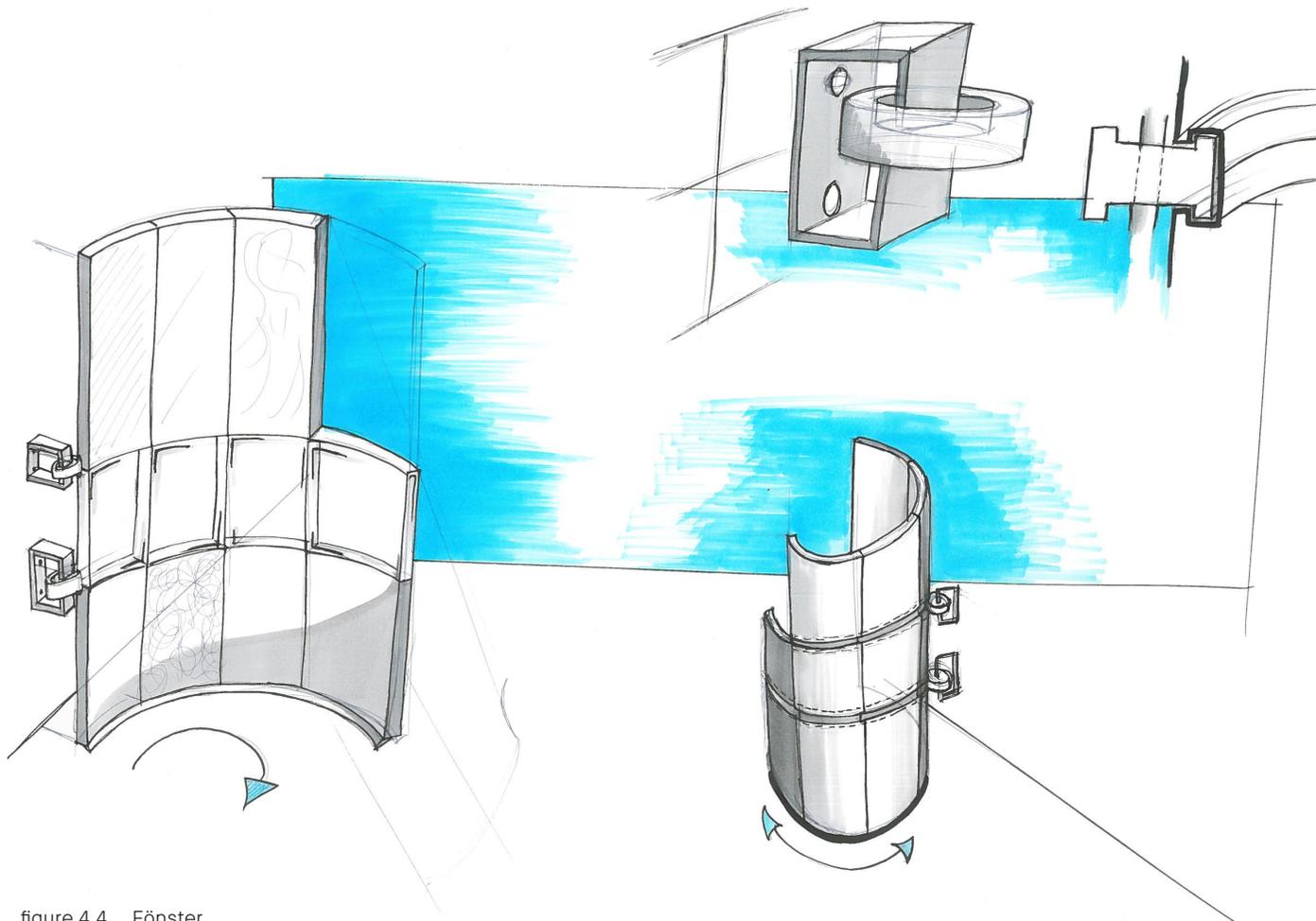


figure 4.4 Fönster

Fönster

In this concept we created a curved wall that can be rotated away against the wall of the bathroom. There is some space left between the showerwall and the wall of the bathroom to prevent the curved wall from hitting the shower itself. The wall is build up out of different blocks. These blocks can be adapted to the consumers preferences by making different prints, colors and materials available. On the back of the curved wall there are two rails that contain a wheel. Those wheels are attached to the wall and make the rotating movement possible.

The possible materials to use for this construction are: metal, polymers and some variable blocks of for example glas.

GÁNGJÄRN

Gångjärn

The idea behind this concept are hinged plates. The two plates are made out of horizontal plates so they can easily be transferred by the customers and can be adapted to their preferred way. The plates are connected to each other with hinges and one side of the plate is connected to the wall, also with a hinge. At the bottom there are some small wheels to make it easy to move. There is also rubber to prevent the water from getting to the rest of the bathroom. After taking a shower the partition can be folded against the wall and takes up almost no space. The magnets on the other side of the wall provide a good separation between the wall and the product.

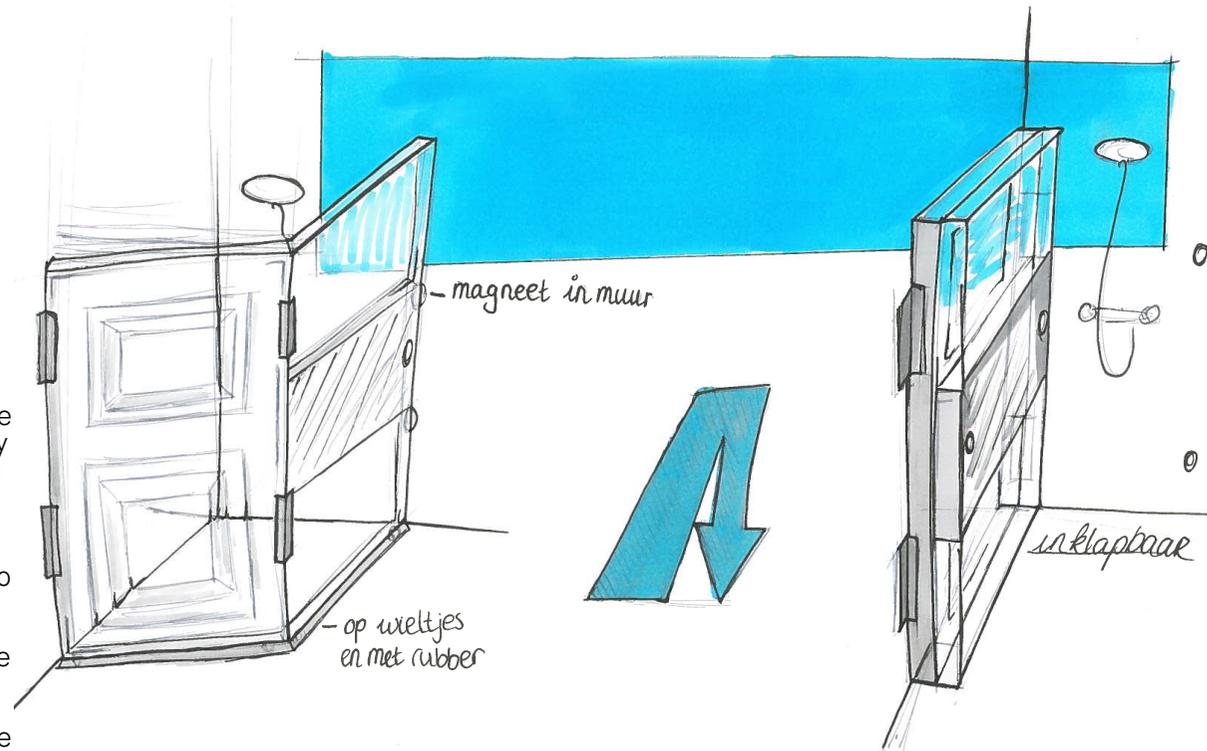


figure 4.5 Gångjärn

Concept justification

General advantages and disadvantages of the concepts are stated in figure 4.6 below. These (dis)advantages partly determine the values in the evaluation table.

Concept	Snabel	Fönster	Gångjärn
Advantage	Takes little space	Easy to handle	Adjustable in height
	Closed area	Easy to clean	Takes little space when folded
	Easy to operate	Colours can be chosen by consumer	Easy producible
	Adjustable in height	Adjustable in height	Colours can be chosen by consumer
	Useable in every bathroom		Easy to clean
Disadvantage	Not easy to clean	Needs space to install	Risk of mold (in the hinges for example)
	Complex mechanism to produce	Technical knowledge required to assemble	Technical knowledge required to assemble
		Not easy applicable in corner showers	Not easy applicable when 1 side has to be covered

figure 4.6 General (dis)advantages

To compare the concepts, each concept will be reflected to the list of requirements by the evaluation table. Every requirement is assigned a number from 1 to 5, which is multiplied by the weight factor. These values summed up, delivers the value of the concept. The concept with the highest value is therefore the best. The filled in table can be found in figure 4.7.

Requirement	Subvalue	Max	Snabel	Total	Fönster	Total	Gångjärn	Total
1. Price	20	100	3	60	1	20	4	80
2. Durability								
a. Lifespan	2	10	4	8	3	6	4	8
b. Firm	8	40	4	32	3	24	3	24
c. Water resistancy	8	40	3	24	4	32	4	32
3. Mass Producibility	10	50	4	40	3	30	4	40
4. Safety	10	50	4	40	4	40	4	40
5. Functionality								
a. Cleaning	10	50	2	20	4	40	4	40
b. Operation	15	75	4	60	4	60	4	60
c. Complexibility	25	125	3	75	3	75	4	100
d. Airy	2	10	5	10	4	8	4	8
6. Attractiveness								
a. Target audience	10	50	4	40	2	20	3	30
b. Style	10	50	4	40	4	40	3	30
7. Dimensions								
a. Packed	18	90	4	72	3	54	4	72
b. Unpacked	12	60	4	48	3	36	4	48
8. Weight	20	100	4	80	3	60	3	60
Total	180	900		649		545		672

figure 4.7 Filled in evaluation table

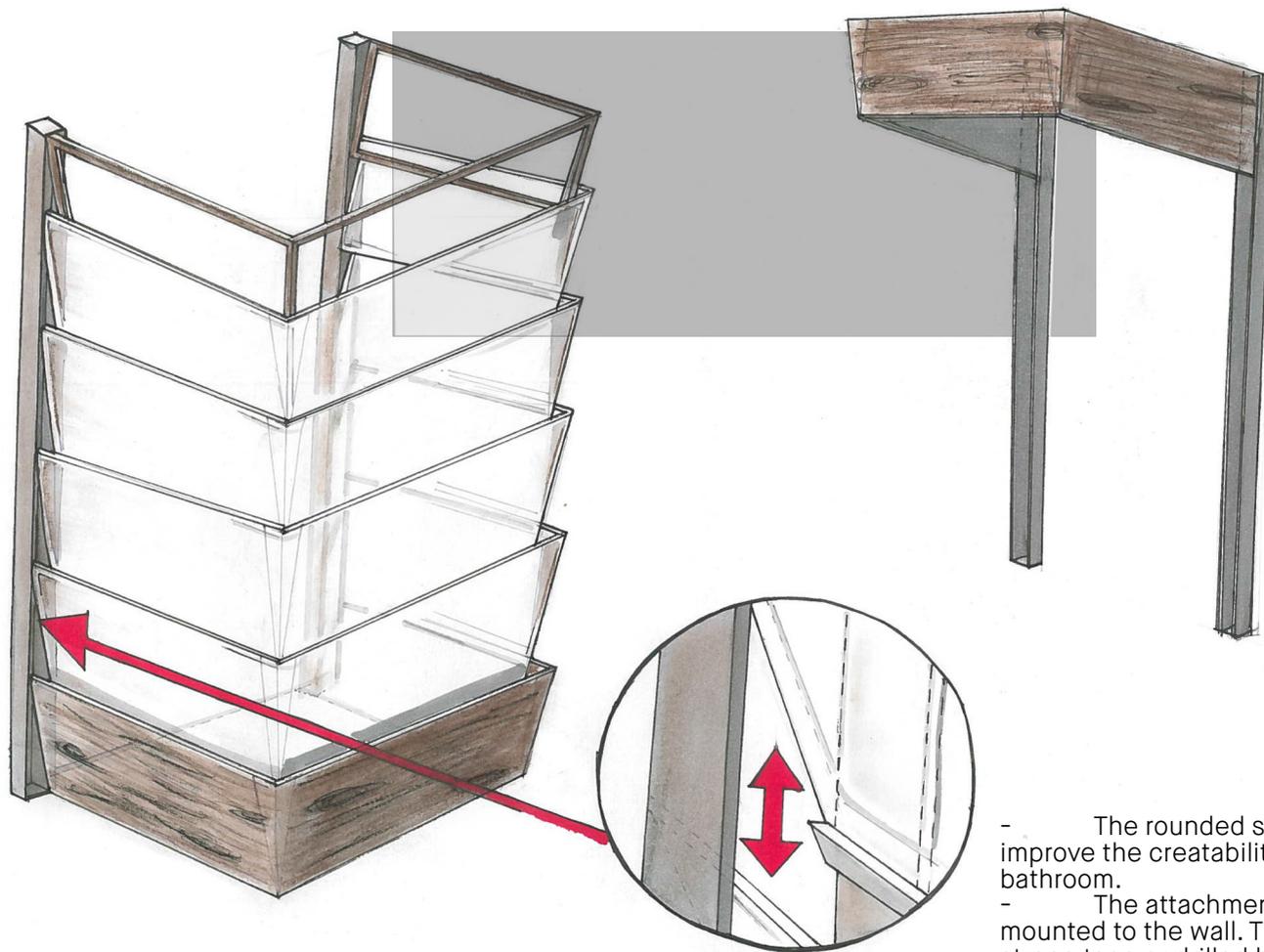


figure 4.8 Final concept

As can be seen, concept 3 scores the best. Disadvantage of this concept is the fact that the competitor probably will have almost the same design. Therefore, the second best concept, concept 1, is chosen. This concept can be improved, which is done to create the final design. Generally, the following improvements are made to optimize the concept:

- The rounded shape is exchanged for an U- or L-shape to improve the creatability and to make sure it fits in every bathroom.
- The attachment to the ceiling has been replaced by a rail mounted to the wall. This rail can be mounted using a strong tape or drilled holes, which can be chosen by the consumer.
- The panels are made transparent in order to decrease the possible claustrophobic feeling when showering. To make an original and good-looking design, the lowest panel looks like it is made out of wood.

When these improvements are taken into account, it is clear that this improved concept is the best. Because an original and progressive design is desired, the first concept is improved instead of the third one.

FINAL DESIGN

Shape

Due to the disadvantages of the original concept, the shape needed to be revised. At first, the round shape changed. The original circular shape would be a big disadvantage, because of the bad applicability in common bathrooms and the way higher production and packaging costs. So it was decided to change it to a rectangular shape. Designing it this way would enable the user to choose between two different shapes, the L-shape (with two walls) or the U-shape (with three walls).

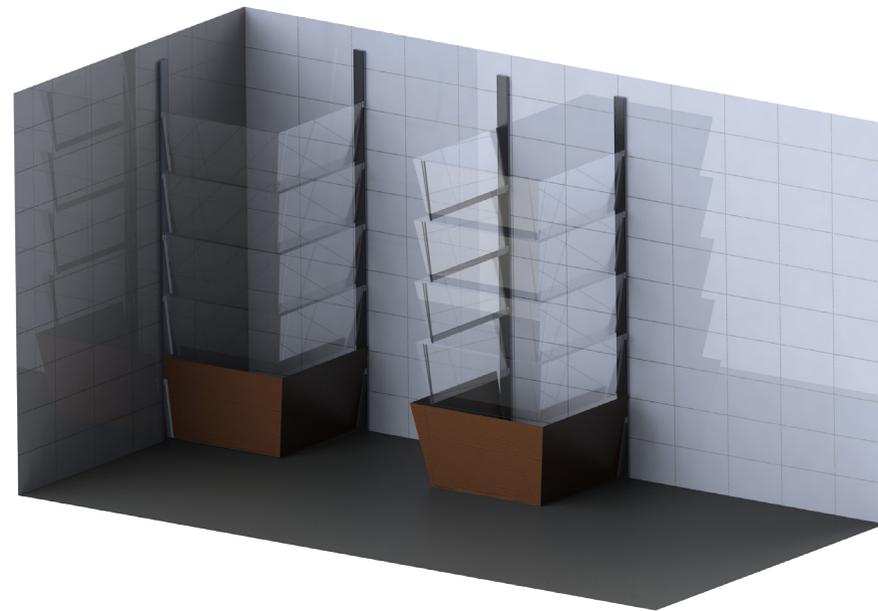


figure 5.1 L-shaped Kalix (left) and U-shaped Kalix (right)

Panels

The concept will consist of 5 panels. These panels can be pushed up, they will fold and be out of the way. Before showering the panels can be pulled down to close the area. The panels will be slightly angled so they can easily slide past each other. This way 4 of the 5 panels can be the same size. The upper four panels will be transparent, to get rid of any potential claustrophobic feeling. The lower panel will be made of laminate, which looks like wood. This panel will be slightly bigger than the others to make sure it will cover the other 4 panels when it is in the pulled up position. (see figure 5.2 and 5.3)

The four panels will be 400 by 800 millimeters big. These dimensions are chosen with the Euro-pallet measurements in mind. These Euro-pallets are 1200 millimeter by 800 millimeter so with the chosen panel sizes it is possible to place three panels next to each other on one Euro-pallet.

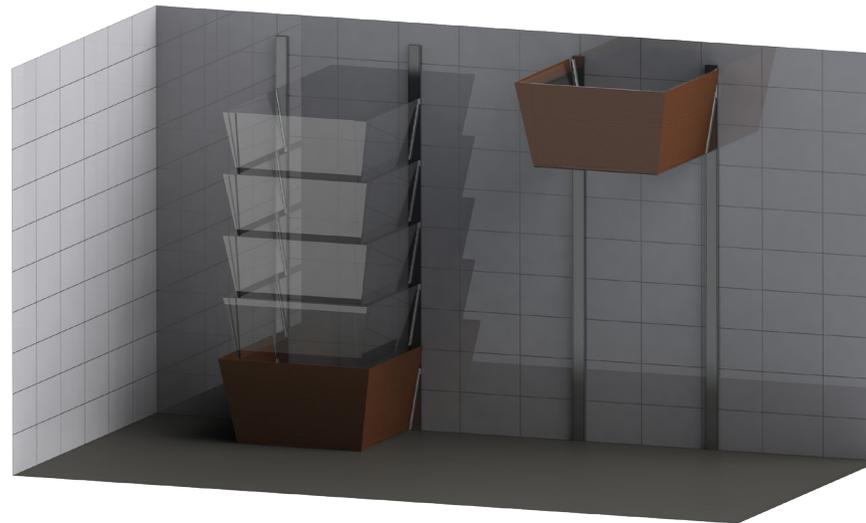


figure 5.3 Kalix in use position (left) and non-use position (right)

The original circular concept included an open frame just below the ceiling, to allow good ventilation. In the new design there will be some space between the upper panel and the ceiling to allow ventilation.

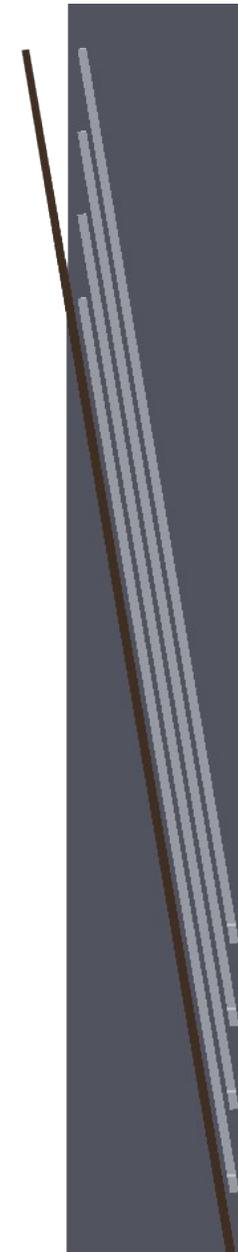


figure 5.2 Schematic view of the panels in non-use position

Rails

The panels will slide up and down over two rails that are mounted to the wall. The panels are connected to sliders with little rollers that will roll smoothly along the rails. Inside the rail, a rebound system will be applied to make sure the panels can be held up. The height of the rail will be 2.20 meters with a possible extension part to make it 2.40 meters. (figure 5.4) These heights were determined by looking at standard bathroom heights. This height for new houses is 2.40 meters and for houses, build 100 years ago till recent, 2.20 meters.



figure 5.4 Preview of the sliding system, including the rail (upper grey part), sliders (lower grey part) and the rollers (four white parts)

Rubber edge

To make sure no water will spill out over the bathroom floor, a rubber edge is added to the lower part of the lower panel. This will keep the water inside the showering area (figure 5.5).



figure 5.5 Rubber edge

Rebound system

When the product is not in use it is at the top of the rail, at the ceiling. This means that the construction must be held high up the entire time that it is not in use. To achieve this a rebound system was designed. This system uses a torsion spring to keep the panels up. The spring is attached to the lowest panel so it takes the other panels with it when being lifted. When the user has finished showering the spring will pull up the panels instantly so that the user does not need to lift the construction him/herself.

Clicking system

When the product is pulled down the lowest panel can get clicked in at the bottom of the rail, where it fixes itself in a socket in the rail. This keeps the panels from going up when the shower is in use.

The clicking system is similar to the system used for a ballpoint pen. When low enough the panels are fixed and after showering one will release the panel from the socket, with for example a push on a button, and the rebound system takes over.

Attenuation

To prevent the construction from moving up to the ceiling too fast, there is a damping system. This results in the panels having a smoother movement instead of slamming themselves into the endpoint of the railing. At first a gas spring was considered. A spring has the disadvantage that the elongation of the spring is not equal. This means that the gas spring is not capable of handling the same force with a different elongation. A steering stabilizer was chosen as a better option. This is almost the same principle as the gas spring but uses friction instead of a spring. The friction will provide the constant attenuation for an equal force because of the constant friction.

Connection between the panels

The panels have to be connected in a way so they can be lowered and pulled up. Different ideas and approaches were looked at like hooks, elastics and the use of gravity. But the final solution has not yet come up. This will be worked out in more detail and with a working system later on in the project.

MECHANISM

Global explanation

By using a cord with a winding system the panels can be lifted up and down. The panels are attached to a rail. This attachment is realised by different slots whereby the sliding part, the connection between the panels and the rail, slides. There are six different slots per rail. By adding four stops in the four middle slots the upper panels can not be lowered till the ground and in this way a tube is formed. The stops will be placed on predefined heights so the tube will be well formed.

Winding mechanics

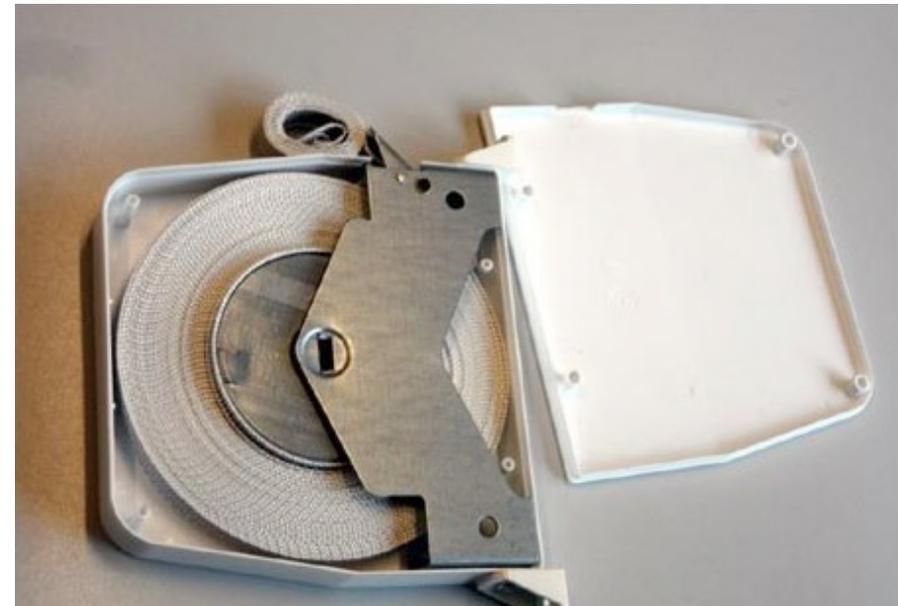
The mechanics are derived from the working principle of a not electrical rolling shutter. In addition, a cord winding system is used with a built-in stop. This means that when the cord is released it lingers at the same height. Which concludes that the customer can lift the panels in any desired height.

To lower the panels, the cord is pulled slightly toward the user so it drops below a certain angle. In this situation the cord is no longer under the influence of the stopping mechanic.

Still below the certain angle the cord can be pulled up and the panels will be slowly lowered down. The panels are not able to shoot down because when the cord is released, the angle becomes smaller and the stopping system takes over.

Connection left and right

In order to counteract the tilting, the panels are lifted at the same time from the left and the right rail. This is realised by adding a rolling pipe that is coupled to the winding mechanism. Around the rolling pipe winds



a cord which is coupled to the lowest panel. When the cord of the winding mechanism is being pulled the pipe starts rolling around its axis. The cord attached to the panel will roll up around the pipe and lift the panels.

When the cord of the winding system unrolls, under the certain angle, the pressure over the cord will drop. Which causes that the gravity working on the panels can take over. The rope attached to the panel will unroll from the pipe and the cord of the winding system will roll around the pipe. Which causes that the panels will come down.

For the L-shape Kalix the rolling pipe needs to have an angle. So it will be parallel to the wall. In this case we used two bevel gears to ensure both of the sides are supporting the panels when moving upward.

Rail and sliding part

The rail consists out of six slots. The outermost ones have a T-form and the middle ones are a more simple square shape. The connection piece between the rail and the panels consists of two standard sliding blocks, that fit in the T-form, and four possible positions to add a stop block. This stop block ensures that the panels can not slide further down than a certain height. This heights are predefined and realised by adding a bolt in the rail that prevents the stop block and the panel to go further down. The stop blocks are attached to the sliding part by a screw that goes through the sliding part and screws fixed in the stop block. Per sliding part one stop block is attached. So one panel only stops at one particular height. With every height set the panels will form a tube that will be watertight. The sliding part can be retracted at the top of the rail and the panels can easily be attached to the sliding parts by M/F bolt. The corner panels are also attached with M/F bolt.

MATERIALS

In order to select decent materials for the various parts of the Kalix, the program CES was used. Because every part of the the product has different specifications, the product has to be divided in different parts and for every part a material has to be selected. For all parts, some general restrictions are stated, for example the price, melting point and water durability. These restrictions are applied to all parts. Also, more specific requirements are stated for every single part. (appendix 1)

At first, the material for the panels was analysed. In addition, the panels need to be transparent. After these restrictions were applied, the best material was determined by optimizing for the best price and the best durability. It appeared that Clarified Propylene would be the best material for the panels. (for further information, see appendix 1)

The rail, however, will need a higher strength because of the panels mounted to it. For this reason a polymer won't be a proper option and a material selection has been made from the metal universe. It was found that aluminum would be the best option, aluminum is also commonly used by IKEA. (for further information, see appendix 1)



DISTRIBUTION

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Production

It is difficult to determine the best method for production. A higher production speed results in higher costs (for complex moulds et cetera). It is unknown what is desirable, therefore there are more options given at some parts.

Rails

The rails will be extruded from aluminum. After the extrusion, holes will be drilled to attach the rail to the wall and to secure the stopping blocks.

Corners

The corners are slightly changed. The conical design had been changed to a parallel design. In this way, the profiles can be extruded from Clarified PE and cut to the desired length.

Panels

Premanufactured plates will be cut into the desired shape. Because of the non-trivial shape obtained by the change in design, extrusion is a less likely option. Another option is to manufacture the panels by injection moulding, but this option is more expensive.

Sliding Part

The sliding part will be made using injection moulding. In order to create a proper mould, the sliding part had been optimized. Thoughts of this optimisation can be found in the appendix.

Stopping bridge

The stopping bridge, the part between the sliding part and the stopping blocks, will be made using a simple mould.

Stopping blocks

The stopping blocks in the rail are made by cutting a five by five millimeter aluminum rod into the desired length. When these rods aren't available, one can make the parts using a simple mould.

Production and packaging are two very important factors that determine the price of the product. When you talk about production, you first have to choose a material which you are going to use. You have to bring all those materials to one place where they will be fabricated. After that the products will be packaged and transported to a distribution center. This will be the shop of IKEA in this case. After this process the customer will buy the KALIX and when the product is old and used it is going to be thrown away or recycled. One also needs to take into account that, at every stage, storage space is needed.

Production has big influence on the price and transportation of the product. High costs can be made when a production method is used, that is not optimal. Also, good production can reduce the impact on the environment. Therefore, it is important to make the right decisions when considering production. Here IKEA will be given some options for maximizing production efficiency and sustainability.

The parts of the Kalix are made by means of different production methods. To reduce the costs for transportation and to reduce the CO2-emission, it would be good to produce the parts at the same place. We don't know the location of IKEA's production plants, so we cannot make a recommendation on the exact location where the parts should be produced. Since we also don't know if all parts can be produced at the same place, we recommend to produce the parts as close to each other as possible. After that, the parts can be brought to one place for packaging. Then the whole package can be brought to the different shops of IKEA.

TRANSPORT

This chapter will give an example for the packaging and transportation of the Kalix. First the dimensions of the packaging boxes will be calculated. Some products will be combined in one box, these are the corner pieces, the panels and the mechanism with fixer parts like screws. After the determination of the dimensions, the boxes will be modelled in solidworks and ordered in a logical way on euro-pallets, to give an example of efficient pac. The euro-pallet has a length of 1200

mm, a width of 800 mm and a height of 2200 mm. The first calculation will be the dimensions of the boxes. For transport, there are two calculations of the dimensions, one for the L-shaped Kalix and one for the U-shaped Kalix. The next table gives the amounts for each box, including its dimensions and weight. The thickness of the box material is 3 mm. Because this thickness is very small, it will be neglected.

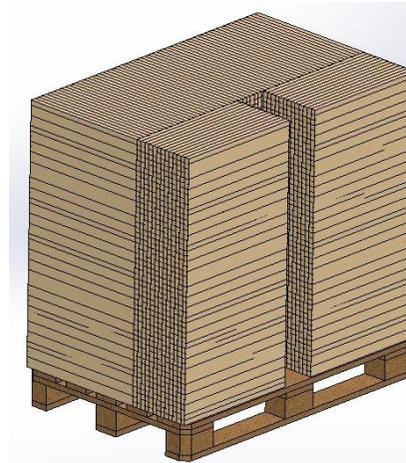
L shape							
Part	Box number	Parts need	Material	Weight	Weight combined product	Dimensions one product	Dimensions of parts need
Rubber for KALIX in L-shape	1L	2	Rubber	0.3564	0.7128	532x20x20	532x40x20
Transparant panel corner	2L	4	Polypropylene (clarified/nucleated)	0.34	1.36	394x90x10	specified at box 2L
Transparant panel	3L	8	Polypropylene (clarified/nucleated)	1.21	9.68	400x800x2	400x800x16
Panel cornerwoodlook	2L	1	Polypropylene (clarified/nucleated)	0.58	0.58	532x115x10	specified at box 2L
Panel woodlook	3L	2	Polypropylene (clarified/nucleated)	1.63	3.26	540x800x2	540x800x4
wall rail	4	4	Aluminum	1.368	5.472	1200 x 80 x 20	1200x80x80
Mechanim	5	1	Aluminum	0.4	0.4	200x200x50	200x200x50
Mechanim shaft	6L	1	Aluminum	0.594	0.594	550x20x20	550x20x20
Total	6				22.0588		

U shape							
Part	Box number	Parts need	Material	Weight	Weight combined product	Dimensions one product	Dimensions of parts need
Rubber for KALIX in L-shape	1U	3	Rubber	0.3564	1.0692	532x20x20	532x60x20
Transparant panel corner	2U	8	Polypropylene (clarified/nucleated)	0.34	2.72	394x90x90	specified at box 2U
Transparant panel	3U	12	Polypropylene (clarified/nucleated)	1.21	14.52	400x800x2	800x400x24
Panel cornerwoodlook	2U	2	Polypropylene (clarified/nucleated)	0.58	1.16	532x115x115	specified at box 2U
Panel woodlook	3U	3	Polypropylene (clarified/nucleated)	1.63	4.89	540x800x2	540x800x6
wall rail	4	4	Aluminum	1.368	5.472	1200 x 80 x 20	1200x80x80
Mechanim	5	1	Aluminum	0.4	0.4	200x200x50	200x200x50
Mechanim shaft	6U	1	Aluminum	0.594	0.594	550x20x20	550x20x20
Total	6				30.2312		

After the different products are combined in a proper box, the new dimensions for the boxes are calculated. The weight is also calculated, because an euro pallet can have the maximum weight of 1200 kg. The first three boxes and the last box are different for the U-shaped and the L-shaped. Box four and five are the same.

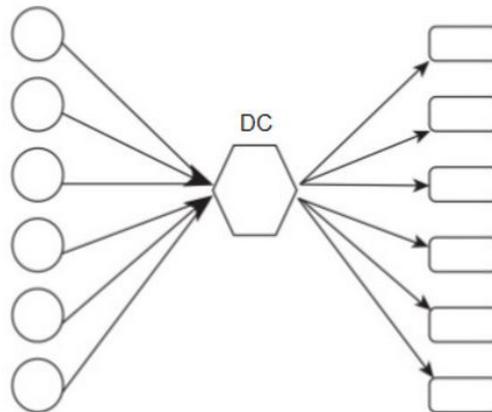
U-shaped		
Box number	Dimensions	weight
1U	532x60x20	0.3564
2U	532x525x115	0.92
3U	540x800x30	2.84
4	1200x80x80	1.368
5	200x200x50	0.4
6U	550x20x20	0.594

L-shaped		
Box number	Dimensions	weight
1L	532x40x20	0.3564
2L	532x340x115	0.92
3L	540x800x20	2.84
4	1200x80x80	1.368
5	200x200x50	0.4
6L	550x20x20	0.594

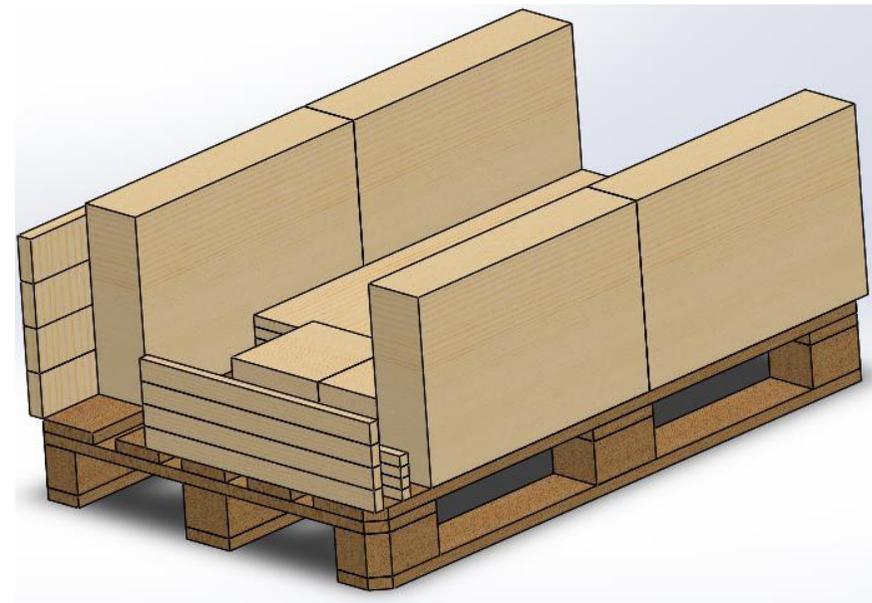


Now the boxes can be placed on pallets. The products will be produced in different factories in the world. The assumption is that products made from the same materials, are produced in the same factories. The distribution type used will be intermediate transit point with cross decking. From the factory, pallets are transported to the distribution centre. In the cross decking distribution depot, different parts from different pallets will be combined with on other pallets. After this cross decking the entire product is placed on one pallet.

Next a possible combination of boxes on pallets will be given. First the grouping of boxes on the pallets during the transport to the intermediate transit point is discussed. To give an example the pallet of the rubber factory is combined, with 1L boxes. This pallet goes to the intermediate transit point. Each product is approximately like this way, to a height of 2200 mm. This pallet has a total amount of 3300 1L boxes and has the weight of 1176 kg.



The next pallet shows how all products on the pallet are packed during transportation from the distribution centre to the IKEA stores. This is an optional distribution of the products and not necessarily the optimal distribution. This grouping is for four Kalix partitions. This pallet can be sent to the IKEA stores (if the distribution is optimised).



MARKETING PLAN

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Segmentation

For the segmentation part of the marketing plan, the market is divided by a couple of demographic variables. Demographic variables are very suitable to distinguish between the wants and needs of the people in the market. The market did not get divided by geographic, psychographic or behavioral variables because these variables do not seem to influence the purchasing behaviour of IKEA customers as much as the demographic variables.

The first variable used is life stage. The life stage of a person describes their major concerns. Examples of life stages are going through a divorce or having a child. These life stages can indicate what kind of products people need.

The second variable is bathroom size. People with a bigger bathroom have other needs than people with a smaller bathroom. Smaller bathrooms only have room for products that are small and foldable, so they do not take too much space. In bigger bathrooms, size is less important because there is more room available. In these bigger bathrooms, people will attach more value to products which have a nice design, respectable price, good quality, etc.

Another variable which is analysed is income. Income influences how much a person is willing and able to spend on a specific product. People with a low income, will not be able to spend high amounts of money on something. When someone has a high income, he or she is willing to pay more for a certain product.

The last variable is level of education. How someone has been educated indicates whether that person is capable of assembling a complicated product. People that have had a very low level of education might not be capable of understanding the manual required for assembling the product. At the other end of the spectrum, people with a very high level of theoretical education might not be practical enough to figure out a manual either. The manual should be understandable for as many people as possible.

Targeting

For IKEA, it will be determined which segments should be targeted with its partition. The best targeting strategy would be product specialization. When selling a product with specific characteristics, IKEA could meet the needs of multiple segments. In this way, IKEA is able to target multiple segments with the same product. When determining the segments that will be targeted with product specialization, it is important that the needs of the segments have significant similarities. The segments that are chosen, are the following:

Students

The life stage of this segment is studying. Students live mostly with other students in a student resident. These student residents generally have a small bathroom that often is shared between multiple students. The income of a student is low. They mostly get money from their parents, they borrow money from the government, or they work for it with minimum wage jobs. Their education is not very high yet. Once they are done studying, they will have a college degree, so students are capable of getting a high income. Taking this all into account, a couple of needs can be identified for students when they purchase a bathroom partition. First, because of the small bathroom, the separation should not take up much space. The partition should not be expensive, because in general students do not have much money. The design of the shower enclosure is not very important for students, they are more focussed on price and if the product works well. It is also not very important if the product is hard to assemble, because students are capable of getting a high education. Therefore, in general they should be capable of assembling a complex separation as well.

Young adults

The segment of young adults contains people who just moved in for the first time with their significant other. Their bathroom is generally not very big, but just big enough for two people. They do work, but their income is not high yet, because they just started with their career. Young adults have completed their education, which varies from low to high. When purchasing a bathroom partition, young adults need a product that is not very big, because of the size of their bathroom. They also want a product that has a price that is not too high. Furthermore, the product should not be too hard to assemble, because the education of this segment varies a lot.

Young families

This segment has a life stage that concerns raising children. Young families mostly have a bathroom that is slightly bigger than the one of the segment of young adults. Also, their income is generally a bit higher than that of young adults. The reason for this is that they already have been working on their careers far longer. Their education varies from low to high and they have finished their education. An implication of this for purchasing a bathroom partition is that is not very important that the separation is compact. The price of the partition should not be too high. Although the income of young families is higher, they have to pay for a lot of things, for example things for their children. Finally, their education varies from low to high, so the product should be not too hard to assemble.

Targeting

When determining the different market segments, it is important to look at two factors: the segment's overall attractiveness and the company's objectives and resources.

It is thought that all three segments are attractive to IKEA, because these segments score good on the five forces that are determined by Michael Porter. The first force, threat of intense segment rivalry, is not high. IKEA does have competitors in all the segments determined above, but they are not aggressive. The threat of new entrants is low, because the entry barriers are high and there are high fixed costs for making a bathroom partition. The exit barrier for new entrants is low, they can quit very easily. The combination of these two makes the three chosen segments attractive. The threat of substitute products is also low. There are some substitute products, but these have some big disadvantages, for example that it sticks to one's body (shower curtains), or that it is expensive (shower cabins). The KALIX does have a lot less of these disadvantages, therefore the threat of substitute products is not significant high. The bargaining power of the buyers is moderate. On one hand, the switching costs are very low for the customers and the customers are price-sensitive. On the other hand, the customers buy the product in low volumes, mostly just one at the time. The threat of the bargaining power of the suppliers is low. IKEA is a major customer to its suppliers, so its suppliers do not have more bargaining power.

Moreover IKEA's objectives and resources are in line with the needs of the segments that are chosen. All the chosen segments, ask for products which have a low price and take as less space as possible. This is something that IKEA already tries to accomplish with all its products and they are good at it. Also, a number of the people need a shower separation that is easy to assemble, which is something that IKEA is very good at as well. Therefore, the three segments chosen fit very well to the objectives and resources of IKEA.



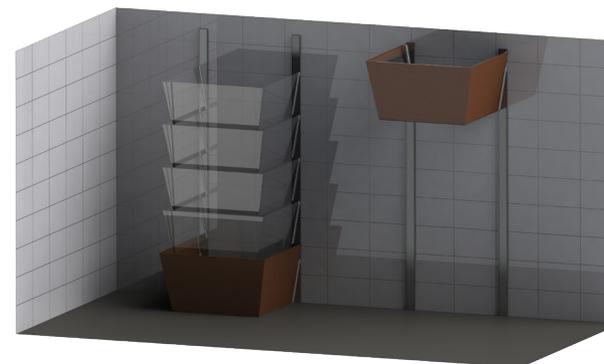
CONCLUSION

The KALIX is a firm bathroom partition that can be folded up towards the ceiling when it is not in use, and it can be pulled down to the floor when the user wants to take a shower. Because of its design and overall look it fits well with the rest of IKEA's products and IKEA's target group. This target group is very broad, but mostly focused on people with not a lot of money to spend and a small bathroom. Because of its innovative design it does not need to be the cheapest bathroom partition on the market. Later on this page there will be a short description of the three main decisions concerning the KALIX.

The materials for the KALIX were selected using CES. All restrictions were taken into account to filter most materials. Of the materials remaining, the cheapest and lightest material were considered and checked if the remaining mechanical properties would suffice. For the panels this meant that clarified PP was the most optimal material since this is transparent, cheap and light. For the rails aluminum is the best material since it is stiff, strong and relatively cheap and light compared to other metals. Aluminum is also commonly used by IKEA and in bathrooms.

Concerning packaging it is decided to transport all the product parts in europallets with sizes 800 x 1200 x 2200 mm. The panels already conform to these dimensions.

Concerning the marketing plan, four variables were chosen to segment the market. The variables chosen are life stage, income, education and bathroom size. Those are all demographic variables. After that, there has been decided which segments IKEA should focus on with its shower partition. Those segments are students, young families and young adults.





RESOURCES

2 Market analysis

2.1 Analysis of the target group

www.berenschot.nl/publish/pages/267/casus_ikea.pdf

<http://cultureleografie.tripod.com/ikea/id2.html>

2.3 Market analysis at IKEA

<http://www.ikea.com/be/nl/catalog/categories/departments/bathroom/18908/>

<http://www.ikea.com/be/nl/catalog/products/43014610/>

<http://www.ikea.com/be/nl/catalog/categories/departments/bathroom/series/15288/?sorting=newest>

http://www.bathstore.com/products/showers/shower-enclosures#price_range=m0&sort=price+ASC&page=1

<http://www.sanitairwinkel.nl/douche/douchecabines/novellini/>

2.5 Material analysis

<http://bit.ly/1Yr5LUw>

<http://abt.cm/1Npgddz>

<http://bit.ly/1R2OezX>

2.6 Showering habits

2.6.1 North America

http://www.ehow.com/info_10002724_big-average-bathroom.html

http://www.rempros.com/dimensions/bathroom_sizes.html <http://www.jennaburger.com/2012/03/sensational-standard-sized-bathrooms/>

Europe

<http://www.environ.ie/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownload,1655,en.pdf>

<http://www.dispenser.com/blog/organizedbath/european-vs-american-bathrooms/>

Asia

<http://www.houzz.com/ideabooks/39512313/list/20-ways-to-design-an-asian-style-bathroom>

3 List of requirements

<http://bit.ly/1CUl28p>

<http://bit.ly/1NyXLtC>

4 Product analysis

Materials

CES - Cambridge Engineering Selector

6 Marketing plan

boek: http://socioline.ru/files/5/283/kotler_keller_-_marketing_management_14th_edition.pdf

