

TRIP TRAP

BY SKAGERAK

PROCESS REPORT

MSc4-ID7

HILLSIDE DESK

MAY, 2014

JESPER THEIL JAKOBSEN

Summary

Hillside desk is a product designed for the international design company named TRIP TRAP DENMARK A/S. Through a systematic project scoping, it has been developed out from specific design criteria and user needs. The result is a home office desk that besides emphasising personal design values accommodates teleworking from home. This product is therefore a new product that tries to combine the everyday life with the professional life through its ergonomics and features.

The desk consists of a storage box, a lamp and a cable holder. The storage box is designed for documents, and other home office accessories such as pen and paper. The lamp and the cable holder have been integrated into a combined solution that is easily replaceable.

Furthermore, the desk is an attempt to attract TRIP TRAP's young customers aged +30 by using design elements inspired by the company's GEORGE and OCEAN product series. Through here, **Hillside desk** creates a coherent connection between the home office desks' design with existing TRIP TRAP products, attempting to attract other customers through existing design values.

TITLE SHEET

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Appendix:	CD

Jesper Theil Jakobsen

Introduction

This short master thesis project revolves around the Danish international design company named TRIP TRAP DENMARK A/S. The company is interested in expanding into the home office market while trying to attract its young customer base. In this connection, the undersigned has taken the opportunity to design and develop one or more product proposals within home offices that aim to accommodate new as well as current customers for the company.

Since the company hasn't expanded to the home office market yet, the product proposal seeks to give TRIP TRAP a starting point, while focusing on new technical aspects to help differentiating itself within this market sector. In addition, the product design is an attempt to bring innovative design to TRIP TRAP without devaluing its existing design DNA, thus possibly creating a design value connection to its existing products.

Based on previous internship held at TRIP TRAP, the undersigned has constructed a project structure which reflects a design process that is the combination of the Stage-gate model, and TRIP TRAP's product development process.

In this way, the project has generated a structured approach to better design and develop realistic products that fulfil the design DNA and criteria of TRIP TRAP. The process also contains meetings with TRIP TRAP that has had the goal of ensuring that the project follows a rightful direction which satisfies both the company and the project.

Reading guide

In this process report, there are illustrations displaying project focuses, research subjects, and decision making. The project has changed its project scoping several times, which is reflected in these decision making boxes. Here, the choices made are described along with the reasoning behind.

An example of the decision making box layout can be seen. The intention behind the use of these boxes has been to be transparent in the project process, showing the undersigned's capability of scoping the project accordingly to research, design and experiences.

In addition, as the product development comes along in the process report, there are illustrations highlighting the different development process steps, creating short overviews for the reader to better follow through. An example of these process steps illustrations can be seen on the right.

Decision-making

Decision:

Here, the decision will be described in overall details.

Why:

Here, the reasoning behind the particular decision made will be described to enlighten the viewer of the process behind.

Illustration 1

Process steps

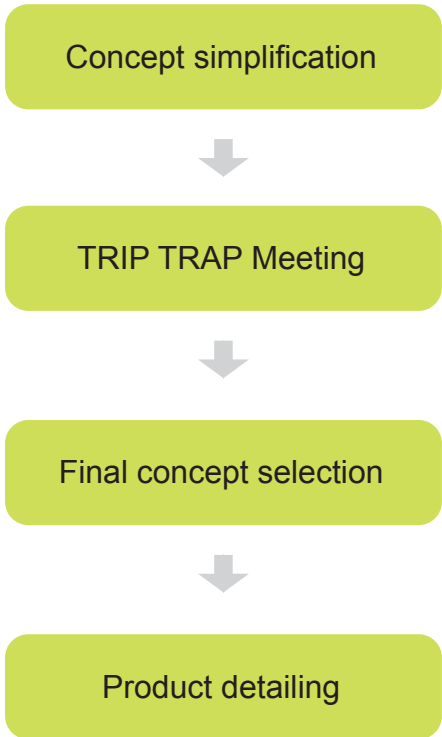


Illustration 2

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TRIP TRAP INTRODUCTION

What is TRIP TRAP?

TRIP TRAP DENMARK A/S is an international design company that designs, develops, and markets outdoor and interior furniture, and gift items to customers with a sense of quality. It is famous for its use of different wood species, and its dedicated craftsmanship, which are reflected in its selection of products that emphasise sublime quality, functionality and aesthetics.

The company consists of departments within marketing, stores, product development, product management, and warehouses, containing project leaders and managers, product managers, quality managers, sales managers and etc. All of each has an important position and responsibility when it comes to preparing TRIP TRAP's annually released assortments.

Through its product developments, the company holds weekly status meetings between its departments to ensure everything goes according to plan, and to consistently evaluate and assess its future assortments of products.

The company also puts great efforts into ensuring that its production and the products follow correct guidelines in regards to environmental impact. It does so, too, by using FSC certified wood species in respect to sustainability. Here, TRIP TRAP emphasises the use of the "use and preserve" mentality to accommodate today's great desire of a more environmental-friendly world.

Moreover, TRIP TRAP is an open design company that allows external consultancy, where new as well as collaborating designers can propose design concepts to the company's upcoming assortments. Among interesting design proposals to TRIP TRAP, the company will then select and further develop the design proposals in collaboration with the respective designers. When the designs are

completed and readied for production, TRIP TRAP then ensures the production and marketing of the products while the designers gain royalty of the sales through TRIP TRAP.

TRIP TRAP originally started as a company which sold floorings and staircases in 1976. Through its years on the markets, the company slowly but steadily transformed itself into what it is today by using its practical knowledge and experiences from its consistent use of wood species.

This has enabled the company to produce beautiful designs in sublime quality, which in combination with its collaborative designers has brought along its product icons over the years.

Now, however, the company is undergoing a name change from TRIP TRAP to SKAGERAK in connection to its great desire of expanding more and more internationally.

TRIP TRAP's departments

The company consists of departments within marketing, stores, product development, product management, and warehouses, containing project leaders and managers, product managers, quality managers, sales managers and etc. All of each has an important position and responsibility when it comes to preparing TRIP TRAP's annually released assortments.

TRIP TRAP

BY SKAGERAK

Selected overview of TRIP TRAP product branches



Outdoor furniture



Indoor furniture



Gift items

TRIP TRAP design DNA

Like other design companies, TRIP TRAP has its own particular style in design. This style defines and separates TRIP TRAP among other brandings on the markets and the design strives to create recognisable designs that appeal to both new and old customers. Its idea of simplicity is products that consist of no superficial parts and design elements, cutting everything to the bone.

However, it is not only about simplicity, it's also about achieving products in which the respective design values melt together in the right way and thereby become sublime. As TRIP TRAP sees it, products do not exist just for the cause of existing, but instead exist to serve meaningful purposes.



Illustration 4

Targeted group of customers

TRIP TRAP's targeted customers can be divided into two main groups, describing people from the age of 30 to 50 and from the age of 50 to 75. The latter is described as people with economic profit, whom also have known of TRIP TRAP for years, which therefore makes this the primary group of customers. The younger group, people aged 30 to 50, has become more and more interested in TRIP TRAP by the later years, and as a result, the company is now trying to attract and accommodate these people through its various product designs and collaborating designers. Through the latter, TRIP TRAP has come to better express classic and present-day design than before which the younger customers seemingly are attracted to.

As a primary thumb of rule, TRIP TRAP wants to sell its various product designs to customers with a sense of quality. A second rule of thumb, TRIP TRAP aims to attract customers whom have established economic profit and whom have settled in homes where they plan to stay for longer periods of time.

TRIP TRAP sells its products through retailers. It is seemingly crucial that the company focus on creating relations to the retailers through the products, while ensuring that the products reflect TRIP TRAP DNA or at least create recognitions in relation to the TRIP TRAP brand.

Group 1: Aged 30-50

- Defined as the young customers
- Have a sense of quality
- About to establish a home (around +30's)
- Have a steady income
- Have settled down
- Not planning to move any-time soon.

Illustration 5

Group 2: Aged 50-75

- Defined as the old customers
- "Old gold"
- Have a sense of quality
- Steady income
- Settled down
- Not planning to move.

Illustration 6

TRIP TRAP

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DESIGN ASSIGNMENT

Home office products

For this particular design assignment, TRIP TRAP has listed its initial wishes as expressed through design brief (Appendix 1), and meeting sessions.

These wishes have been mixed with the company's design criteria to form a mind-set for a product development process.

This mind-set is meant to help narrowing down the product solution spectrum as the project progresses.

TRIP TRAP's initial wishes

Stand-alone products to be sold separately through different distributors.

Wishes to see something new (based on design brief).

Wishes to accommodate its young customers more through new products.

Illustration 7

TRIP TRAP DESIGN CRITERIA

The design proposal must:

- Be built on one or more substantial ideas that serve a purpose
- Offer the opportunity to replace damaged and/or worn out components
- Offer an appropriate design solution, which pursuits the HOME OFFICE market
- Offer an appropriate design solution, which pursuits younger customers*
- Offer one or more design values which accommodates user needs
- Offer one or more unique selling points
- Have a TRIP TRAP by SKAGERAK logo placed in a visible spot
- Reflect thoughts on how it will be sold
- Reflect transportation considerations (i.e. use minimal space under the entire delivery process)

WISHES

- Shall consist of minimalistic design
- Shall have a simple construction
- Shall provide substantial functionality
- Shall accommodate customers with a sense of quality
- Shall be a design solution, which creates a connection to the values which TRIP TRAP's current customer base are attracted to (i.e. quality, design, simplicity, use of materials)

*: According to TRIP TRAP, young customers are defined as aged 30-50, whereof the closer to the age of 30, the younger the customer.

OFFICE WORLD

Functionality mind map

What functions are needed to make this a successful office table?



Raise/lower engine will increase

much more will it cost compared solution in which on the same functionality?

vs Automatically

THE OFFICE WORLD



Product Requirements Requirements specification

20-2-2014

Private office
Company office



'How is it going to look in stores?'
PTAP Store vs Regular Store
Which stores are we aiming at?

General needs - Office furniture



Preface introduction

This section will describe the project's first phase of trying to establish a coherent foundation out from research, meetings with TRIP TRAP, and decision making.

This phase consists of three rounds of research before the project reached the first midterm status session. Notably, various of things were looked through during the research periods in attempt to form a substantial foundation for this project to be built on. Especially, the focus has been on the ability to create one or more products designed on the basis of valid reasoning and confirmation through actual problems and needs. This, however, proved to be quite difficult when it comes to designing furniture in connection to an industrial design master thesis through Aalborg University.

Usually, a MS.c project revolves around a located niche market, where it's possible to find specific users and user needs. From there, the project will focus on what kinds of problems there can be found in connection to the users if not directly explained by the users themselves. This helps forming a substantial basis in which a problem-solving concept development can emerge. Throughout such project, the focus will be locked on very specific issues as found by research, where the business model will rely on blue ocean strategies. Most often, the projects will have found markets in which few competitors to none exist, enabling the students to focus on various aspects at the same time to solve the explicit issues through their designed products.

This project, however, faced what is known as the red ocean while collaborating with a design company that targets a considerably wide group of common customers of TRIP TRAP products and home office products, which have made it rather difficult to base a project on. This is so as TRIP TRAP has a strict set of design criteria requesting almost

the simplest among the simplest design, leaving a very restricted space for innovation, technical features, and so on. Nevertheless, this has been taken as a challenge rather than an impossibility while seeking for new knowledge and experiences to create a sublime quality product for TRIP TRAP.

On the following pages, the process of the preface will be outlined while displaying which decisions there have been made in the process.

Preface project framing

At the very beginning of this project, before the very first meeting with TRIP TRAP regarding the master thesis, the approach was to be open minded to ensure that as many appropriate considerations could be made. As an initial choice, it was decided that the design proposal for this master thesis should consist of an office desk and an office chair. This decision was based on the fact that TRIP TRAP lacks what was considered the absolute most essential parts of a traditional home office, and it was, too, based on the desire of designing one or more products with substantial product complexity to better fulfil the requirements set forth by the master's program of Industrial Design at Aalborg University.

After the first meeting with TRIP TRAP, many new arguments came to the table. Although there were no decisions made at the meeting, different aspects were discussed to outline what direction that would suit TRIP TRAP

and their initial wishes. Here, it came to attention that TRIP TRAP values the branding aspect of how its products are displayed in stores. Hence emphasising what experiences the customers have before buying, when buying, unpacking, and using the products. In the end, three project directions were discussed as displayed in illustration 8.

Based on the feedback given at the meeting, it was later decided that it would be appropriate to design an home office desk with appertaining home office accessories. This was so, as TRIP TRAP values greatly the opportunity to have different product series that help selling each other when being displayed in stores together.



Illustration 8

Decision-making step 1

Which:
A decision was made to go from designing an office desk and office chair to designing an office desk with office accessories.

Why:
This was made to meet the design criteria of TRIP TRAP better, and to better incorporate the business aspect of TRIP TRAP, as they value how their products are displayed in stores together.

Illustration 9

Preface research

Research round 1 and 2

Out from the initial decision making, an initial problem statement and initial vision was created to outline the project framing. Through the first two rounds of following research, countless attempts were made to find specific problematics for a solid perspective in which to build problem-solving design.

As a start, various subjects were looked through to help forming a basis of understanding of the assignment.

One of the main concerns were to find out who the customers were, and what TRIP TRAP essentially defines as young customers. In that respect, a starting point for this project was to look into where the boundary goes for TRIP TRAP's young customers, to see if it could be any younger than originally stated by TRIP TRAP and if that would make out a new market for the company to pursuit.

By the initial SWOT analysis of TRIP TRAP, it became clear that the company doesn't rely on ergonomics to build its designs on, as it primarily manufactures prototypes and then tests them to see if the designs are appropriate and that they fit the human body.

Therefore, to meet a higher technical level, it was assessed as a suitable project direction to focus on measurable ergonomics in connection to the home office desk, and let these ergonomic requirements help structuring a solid product design.



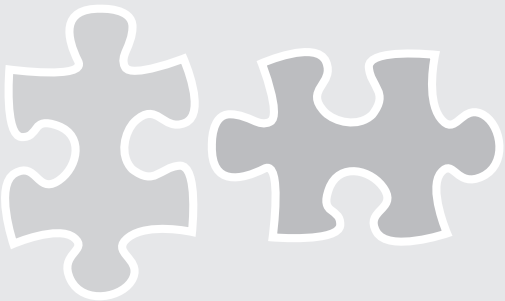
- TRIP TRAP SWOT analysis
- TRIP TRAP customers
- Young customers (aged +25)
- Market potential
- Ergonomics
- Competitors
- The office world
- Home office accessories
- Home office product categories
- Home office user needs
- Office desk inspiration

Illustration 10



- Product categories
- Requirements specification
- Office furniture
- Office accessories
- User needs - office desks
- Office desk functionality
- Raise and lower function

Illustration 11



Initial problem statement

How can a combination of office furniture and accessories help TRIP TRAP DENMARK A/S to gain / attract younger customers while maintaining its current customer base?

Initial vision

How can office furniture help TRIP TRAP to become a B2B company as well, which provides high quality solutions to quality sensed companies?

Illustration 12


STRENGTHS	WEAKNESSES
<div>Sublime designs.</div> <div>Top/High product quality.</div> <div>Strong image on the market - represents high quality and use of wood species</div> <div>Strong in providing both furniture and home articles.</div> <div>Professional/Skilled usage of different wood species.</div> <div>Knowledge of wood species based on nearly 40 years of experience.</div> <div>Dedicated craftsmanship.</div> <div>Good connection to production line + suppliers.</div>	<div>Have poor determination towards competing against others unless they are the leading company first.</div> <div>Maintains only a few positions on the furniture market (i.e. outdoor furniture, and a few interior designs).</div> <div>High product prices / expensive prices which accommodate customers who have settled down with a family, and with steady income.</div> <div>Has no standard procedures to ensure rightful ergonomics.</div>
OPPORTUNITIES	THREATS
<div>Expansion to other furniture categories (i.e. for living room, office, etc.).</div> <div>Incorporating rightful ergonomics</div> <div>Designing cheaper products</div> <div>Include younger customers, below the age of 30.</div>	<div>Cheaper furniture with high quality</div> <div>Other high quality products made of wood species</div> <div>Low pricing</div> <div>Competitors that already are on the market of other furniture categories.</div>

Illustration 13

Research round 3

As a part of getting to understand what elements there are connected to this project, a broad research was made about the office world, including home offices as well as company offices. This research lead to the outlining of the office world context as shown in illustration 15. Through the research, it was easier to outline what kind of users there are involved.

However, it was later assessed that the found information was inadequate of locating specific user needs, because it only briefly described what common kind of people that are involved with offices. It also gave a deeper understanding of how the involved product categories are dominated by subjective design values when it comes to the private home office, and that these values are difficult to locate out from a broad perspective.



Home office VS company office

User context

User needs

Market potential

Requirements specification

Targeted group of customers

Ergonomics

Office desk usage diagram

Illustration 14

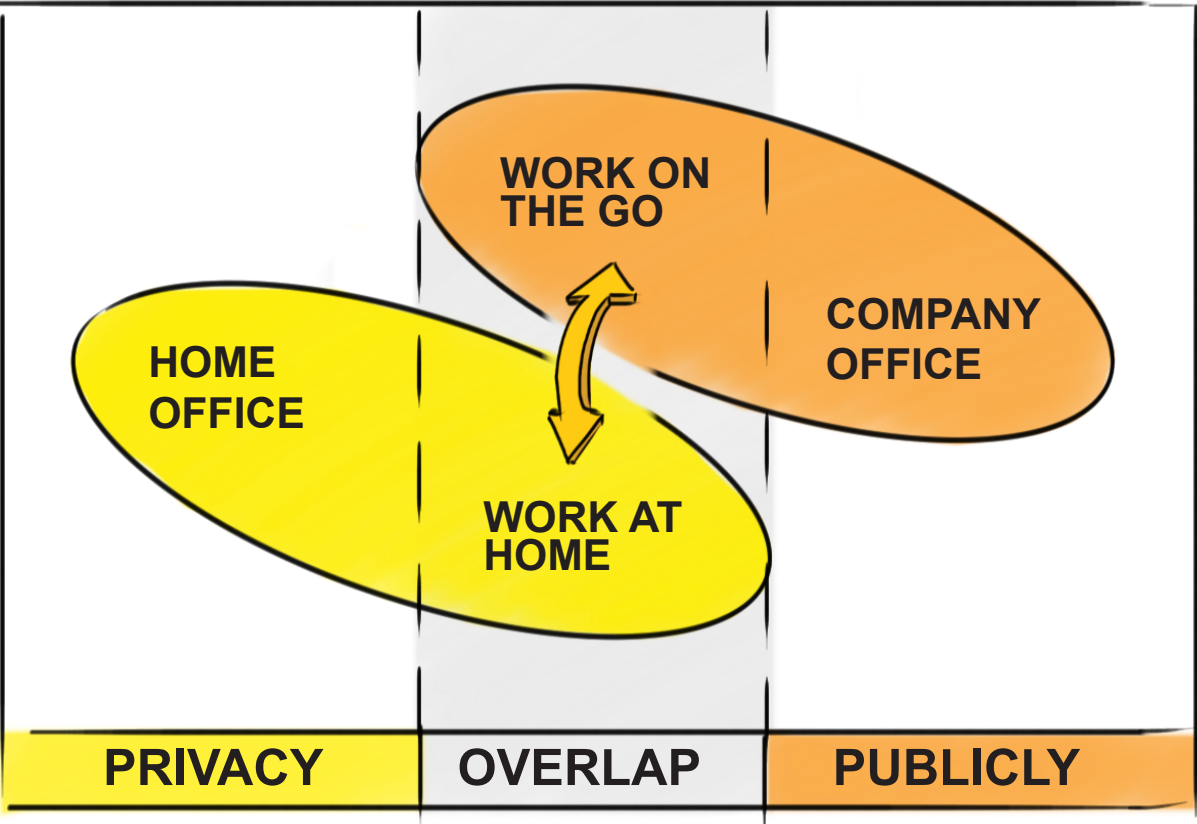


Illustration 15

Although, by defining the office world, it became clear where the circumstances of the office world change when going from private spaces to public spaces. In the transition of going from privacy to publicly, it was discovered that requirements apply differently. As shown in illustration 16, in area 1, there are no specific requirements set forth by the Danish law system. Here, one only finds subjective design requirements, which varies from one person to another, while there are no requirements in terms of ergonomics by the Danish law system.

In area 2 and 3, a different circumstance apply. Here, the Danish law system requires certain ergonomics to be met in connection to working from a home office (known as teleworking), and working on the go. Here, the employer has the responsibility for his/

her worker to perform the assigned job under completely safe and health friendly working conditions. On the other side, there are also working situations that involve driving, which requires specific requirements in terms of equipment instalment and usage when working on the go.

In area 4 of the office world map, one finds the very strict and specific requirements when it comes to the furniture involved with sedentary office work. Several requirements under the categories of environment setup, lighting, and movability have to be met in order for a company to become completely safe and health friendly.

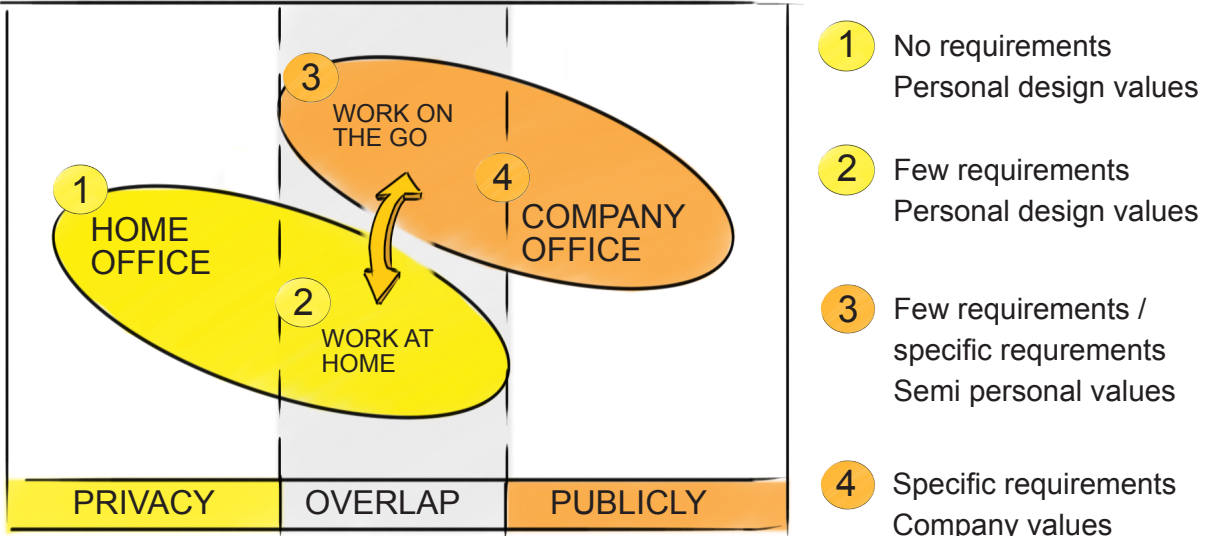


Illustration 16

Market potential

Out from the mapping and researching about the office market, the next thing was to look at where TRIP TRAP wants to position itself in the office world to help specifying the project and where to position the project accordingly.

By default, TRIP TRAP wants to provide home office products that meet its customers' demands of sublime quality and minimalistic design for their private homes. Based on the mapping of the office world, a potential market came to attention: The market area 2 of teleworking from home.

When including a project perspective of accommodating teleworkers at home, the environment will still be the same as it's set in the user's private home. In this way, the project could include the ergonomic requirements in regards to teleworking to help constructing a coherent and valid product out from specific measure necessities and problematics.

From this data, it was decided that it will be appropriate to push TRIP TRAP onto pursuing the market between home offices assigned to everyday life and home offices assigned to workdays. In this way, it will be possible to challenge TRIP TRAP in terms of ergonomics and technical requirements to accommodate this new potential market.

TRIP TRAP positioning

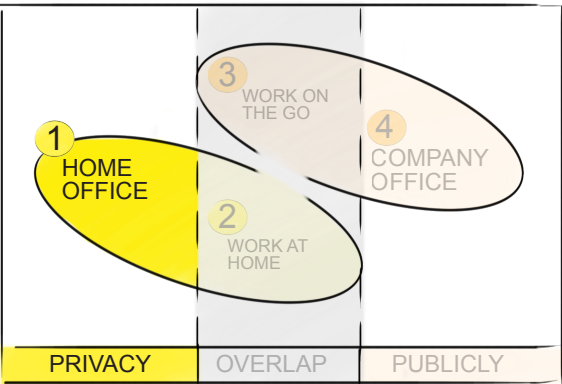


illustration 17

Market potential

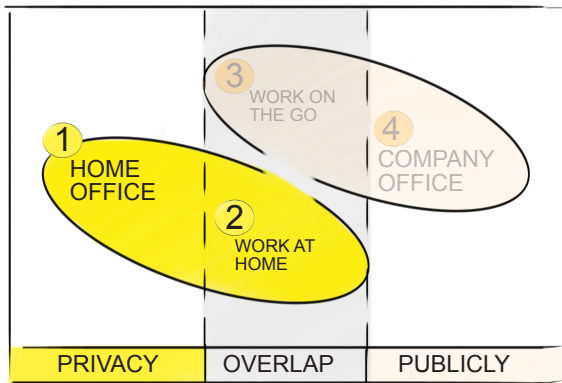


illustration 18

Actual market aim

Targeting 594.000 people whom telework from home is a quite massive number, which is impossible to assess whether or not a product will reach through sales. Therefore, when considering that TRIP TRAP is expanding to a new product market, it assessed as being appropriate to start out small, and from there look at possible expansion. For instance, instead of targeting the 594 thousand people, targeting around 2 % of those would make out a comparably safer business model.

This is so as this includes less risk taking, which means less money lost if the final product should turn out to be inadequate of being sold in enough numbers. Although, when aiming at such small numbers, the cost, and price may also vary depending on production issues and what kind of processing the chosen materials need.

The decision to focus on 2 % of the initial targeted customers was made to be more realistic, and to build up a considerably safe foundation for TRIP TRAP to invest in. Since the red ocean of the home office market is marked by endless product designs, it is practically impossible to foretell how well a product will do on its targeted market. Starting out small will therefore be much more appropriate for TRIP TRAP, to test if it's capable of managing a successful market within the home office market.

Later market potential

As a later vision, it would be interesting for this project to look into the possibility of expanding TRIP TRAP's product market to including office furniture for company offices. If not ergonomically correct products, it should still be relevant for TRIP TRAP to embrace such market, as there are already other office products on the market which accommodates higher demands of design quality opposed to static ergonomically correct products.

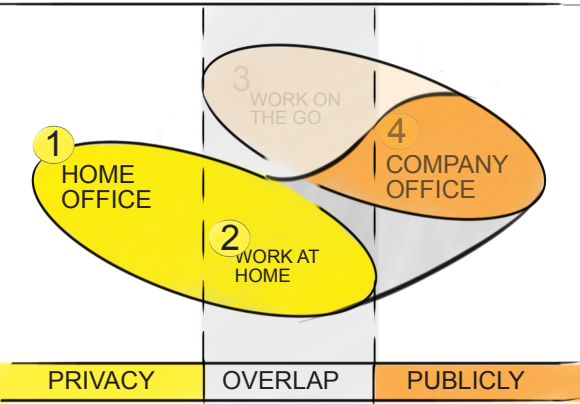


Illustration 21



Illustration 20

- 1 No requirements
Personal design values
- 2 Few requirements
Personal design values
- 4 Specific requirements
Company values

In Denmark (2013):

www.dst.dk

■ 756.000 out of 2.614.000 people telework.

>1 time per 4 weeks

■ Initial new potential customers for TRIP TRAP:

Aged 25-54: 594.000 people

Illustration 19

First midterm status

Despite locating a potential market with targeted customers, there were still no actual user needs that could be found and used for the product development process. This was also discussed at the first midterm status, where critical issues came to attention. As a result, the first midterm status turned out to be a crucial point for the project, as the project direction and focus was later changed through the decisions made upon the feedback gained. Due to the project's focus, a big concern was about how it is impossible to find any usable user needs through the project's scoping. It was also established that since the project concerns a considerably large red ocean, the project scope needed to be changed in order to find valid user needs and or user needs to work out from.

Illustration 22 shows the new focus points along with new project perspective.

In addition, due to the large amount of time used to locate a valid project basis, a decision about what to design for the project was changed from an office desk with office accessories to designing an office desk. Based on the remaining time framing, it was assessed that there wouldn't be enough time to find out what additional product categories that should be included as accessories let along designing them. The project aim was therefore to design a fully detailed office desk that accommodates rightful user needs.

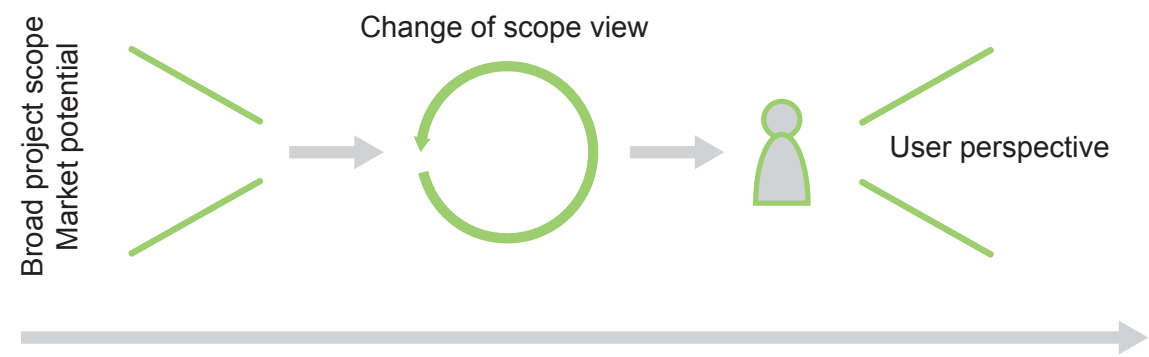


Illustration 22

Decision-making step 2

Which:
A decision was made to go from designing an office desk and office accessories to only designing an office desk.

Why:
This decision was based on the project framing and feedback given at the first midterm status, to be able to complete a home office desk without additional accessories / products in time.

Illustration 23

Klausurperifikation

15-03-2014

Nej, ikke inden for de sidste fire uger 2013
 Alder i år
 15-24 år
 25-34 år
 35-44 år
 45-54 år
 55-64 år

CONCEPT DEVELOPMENT
 Design requirements specifications v2

The following requirements are based on research, previously listed criteria, and initial decision making. It is made to ensure a common thread in the design process of the product development. The requirements are listed with the purpose of narrowing down the end-solutions spectrum, which enables a systematic approach in the design process, too. In addition, the requirements list's objective is to give clear a direction in respect to the product development process by listing precise requirements that enable the designer to assess various product concepts accordingly.

TELEWORKING REQUIREMENTS
 The design proposal must accommodate work that last at least 2 hours per day, or 1 day per week, by the homes serving as home office item, which accommodates teleworking.

- Must be a desk consisting of at least one table top and supporting legs that is meant to be placed in the homes serving as home office item, which accommodates teleworking.
- Must have a manual height adjustable function.
 - Although there are no direct requirements of the working desks for video display terminal usage to be adjustable in height. However, this will make the best solution if there are to be any requirements concerning variations of work positions according to the policies of companies.
 - When designing a manual height adjustment mechanism in the desk, the mechanism should be placed in such way that avoids strain on the user's back when being used.
- Must have a manual height adjustable handle that is designed for the use of hands.
 - Based on TRIP TRAP DESIGN DNA
- Must have a surface with minimal reflections, so that the user will not be blinded and thereby distracted when using the desk.
- Must accommodate work in connection to use of video display terminals.
- Must have enough desk depth (the distance from the user's front to the other side of the desk) to accommodate additional equipment/accessories requirements set forth by the respective company in connection to teleworking arrangements, such as laptop PCs for work at home and at work. (Based on <http://www.computerworld.dk/art/56337/vi-vil-have-huse-med-plads-til-hjemmekontor>)

Hereunder ergonomic requirements¹, the design proposal must accommodate:

Seated work situations with:

- A minimum height for thighs of 68 cm
- A minimum depth for knees of 43 cm
- A minimum width for thighs of 50 cm
- A minimum depth at foot level of 60 cm

Standing work situations with:

- A minimum standing height for desks (- desk thickness) ranging from 56 to 116 cm

In general:

- Must not contain any components that will intersect with the space required under the desk for the user's legs and feet, according to the ergonomic measurements, whether it is at seating level or standing level.

¹ Has been specified from BIFMA guidelines: <http://www.bifmaoffice.com/BIFMA%20Documents%20and%20Forms/BIFMA%20Ergonomic%20Requirements%20for%20Office%20Furniture.pdf>

15-04-2014
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Market 1
 Market 2 & 3
 Market 4
 Public
 Home office
 WORK ON THE GO
 Public Office
 WORK AT HOME
 Private
 Semi

③: Hotels, etc., during business trips, or the like. Netcafés.

③: Semi public people
 Public places
 ④: Public people
 Public places

features of the different market

are required here, but will be met automatically through this requirement.

29-03-2014
 Dansternes.dk

Sp. Hvor meget var dine samlede udgifter ca. i 2013 for at stifte dit eget selskab?

Base: (n=1176)

Udgiftsinterval (kr.)	Procent
0-9.999 kr.	25%
10.000-14.999 kr.	25%
15.000-24.999 kr.	13%
25.000-39.999 kr.	12%
40.000 kr. eller derover	24%

Sp. Hvor meget tjener du ca. om året for skat?

Base: (n=1176)

Indkomstinterval (kr.)	Procent
0-10.000	23%
10.000-20.000	12%
20.000-30.000	20%
30.000-40.000	19%
40.000-50.000	16%
50.000-60.000	10%

al why?
 if way

PHASE 1 Research & Requirements

Research 4

As previously described in the last part of the preface chapter, new issues had to be considered before moving on with the project and how to successfully create a valid product. Therefore, a new round of research was initiated, focusing on users of home office desks, young customers aged +25, wife acceptance factor (WAF), and user needs. However, as time progressed, it became more and more clear that there were no specific users to target and thereby design out from, while still wanting to fulfil the design criteria of TRIP TRAP.

As much as there can be said about the customers of TRIP TRAP, the customers fit essentially everyone who can afford buying their products, which renders the known information about them as being superficial, and incapable of bringing direct design requirements to meet their needs. Therefore, as shown in illustration 25, this was considered another critical point of the project, which lead to another approach of creating online questionnaires to achieve relevant, valid and usable information.

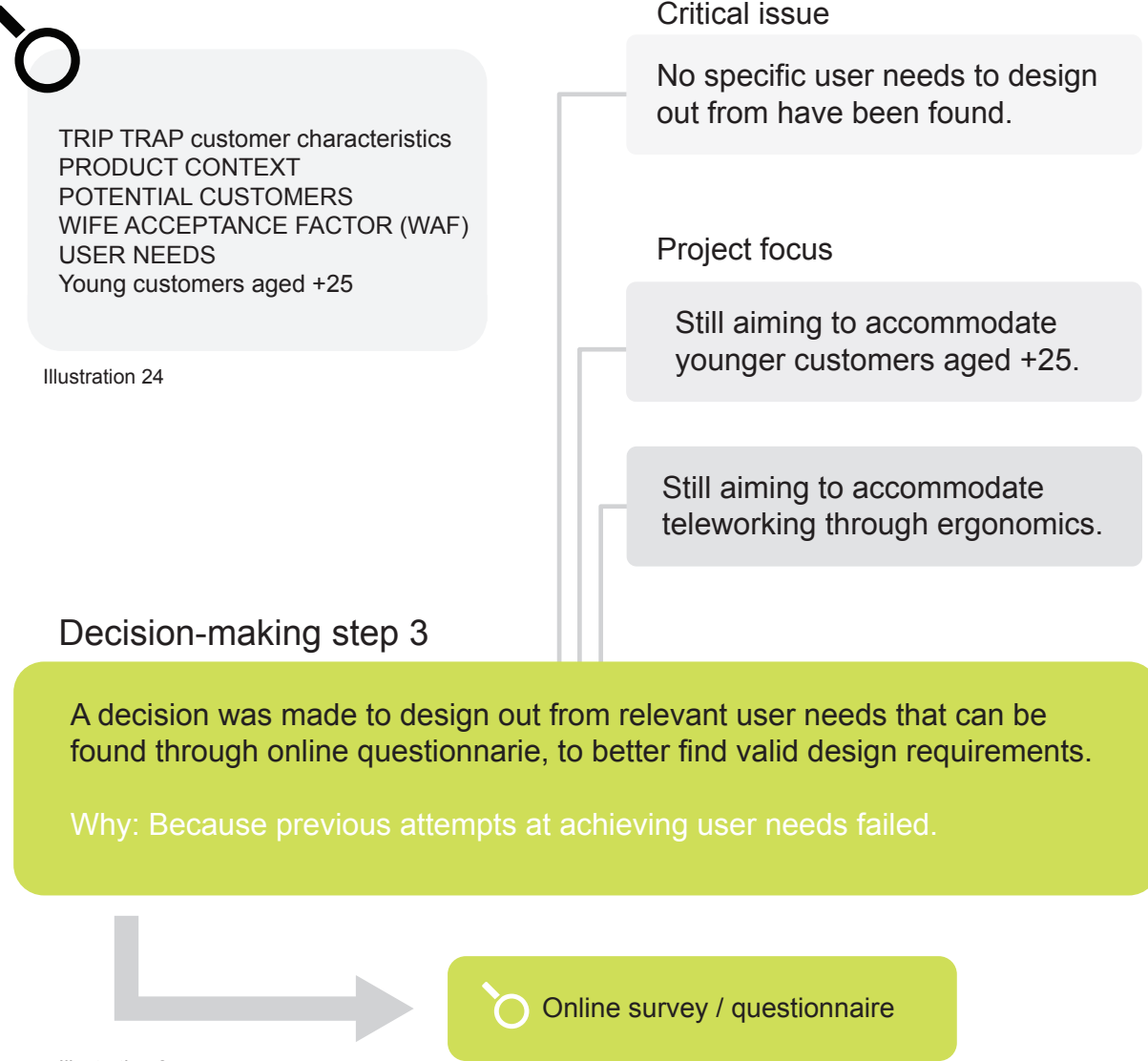


Illustration 24

Illustration 25

Online survey

In attempts to quickly find a relevant product context and relevant customers to question, an online questionnaire was initiated on the site called SurveyMonkey. The attempt was rather successful as it gained a total number of 74 replies. The questionnaire was built on the outset of achieving information in regards to the respondents' sex, age, type of housing, if they have a home office and what kind of home office, and where it's located in their homes.

In addition, the purpose of the questionnaire was to also see who and how many of the respondents are connected to teleworking, and how that potentially affects the users' replies. Here, the focus was getting to know how much they use their offices per day, and what sort of activities they use it for, i.e. spare time activities, part-time jobs, studying, and paid jobs.

While it was thought to be difficult to achieve direct user needs through an online questionnaire, an effort was made to encourage the respondents to come up with their needs. This was done by making the respondents rate various initial listed office product requirements to initiate a thought process in which they consider what they use, what they need and how they value it.

The results (Appendix 2) coming back was remarkably good, where roughly 20 % of the respondents had written down additional user needs in respect to home offices.

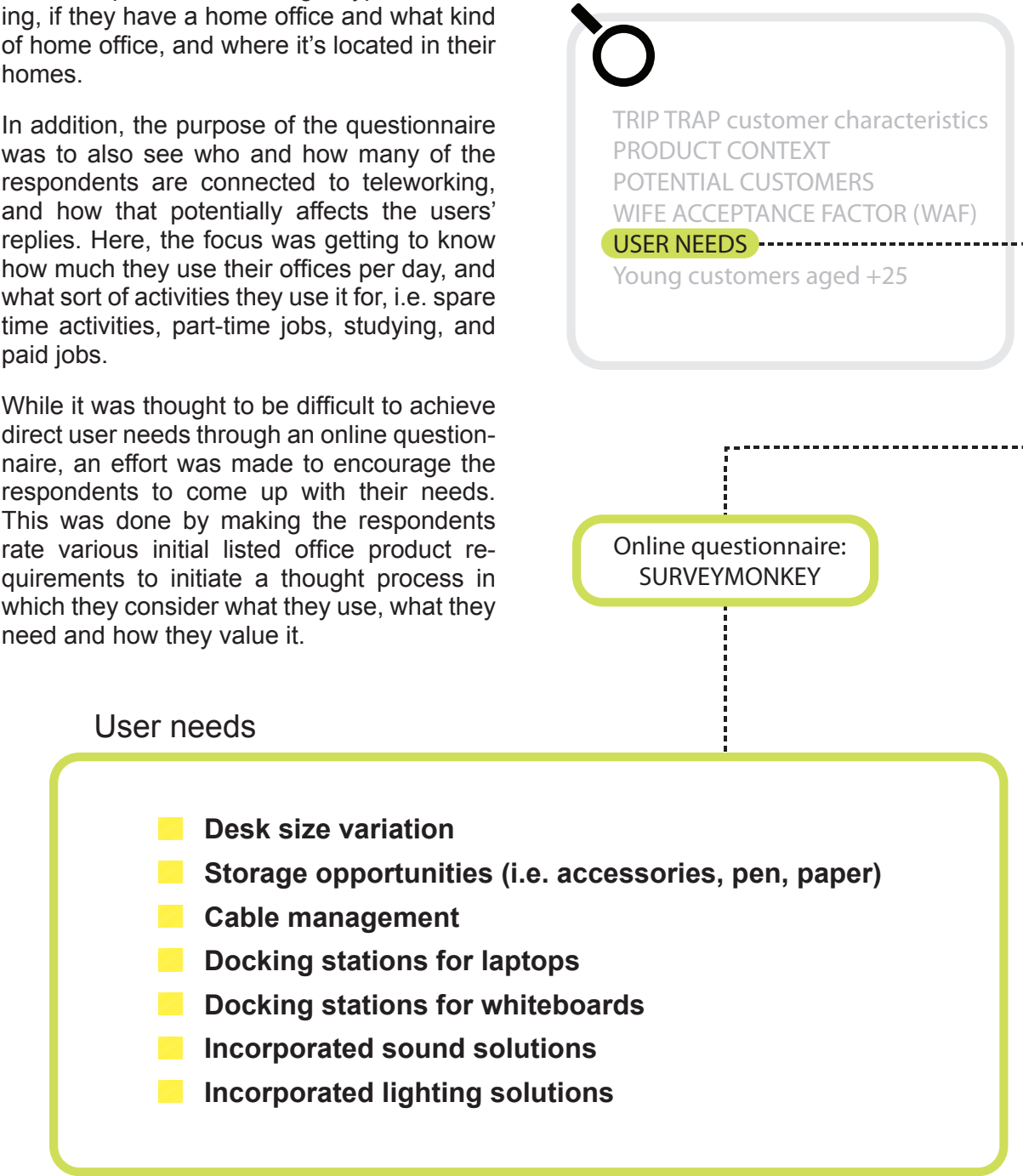


Illustration 26

The context

Besides establishing actual user needs through the online survey, additional significant information surfaced as well. The 56 % of the respondents were in the age group of 21-30 years old, and make up most of the 20% whom answered with direct user needs. As the project aims to accommodate young customers in the age around the 30'ies, this validates the user needs and the significance hereof even further.

This does, however, not exclude all the other replies by the differently aged people. In fact, the interesting point is that the all respondents have mixed replies when it comes to what context they have placed their home office in. Although, the top three contexts were a dedicated office room, the bedroom, and the living room.

As a result, this has led to the following decision.

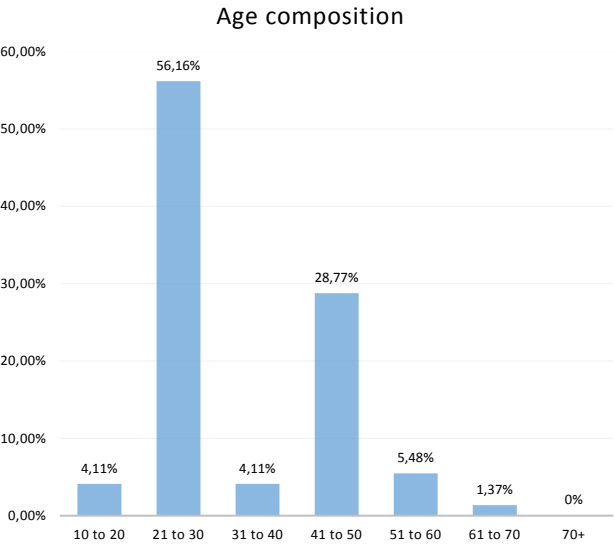
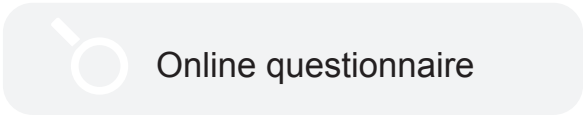


Illustration 28

Decision-making step 4

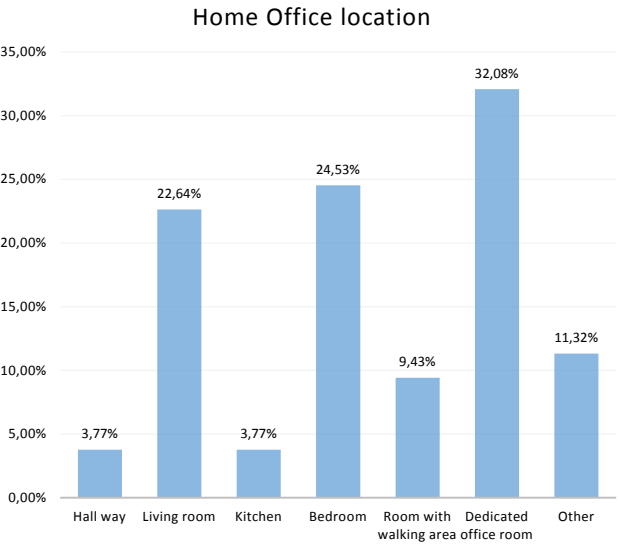
Decision:

To only focus on the actual user needs and not the context in which it will be placed, to develop a substantial requirements specification.

Why:

Despite locating the most used contexts in connection to the respondents, it was assessed that no usable requirements could be withdrawn, as there were no problematics that could be found. Moreover, TRIP TRAP's design DNA doesn't allow radical solutions that accommodate special needs, if any, in terms of context integration, and thereby special solutions. For instance, TRIP TRAP doesn't focus on special user needs in connection to handicap, as it goes against its design criteria of minimalistic design and simple construction.

Illustration 27



Chosen user needs and project goal

After finding several user needs through the online questionnaire, it was time to decide which of these user requirements the product development should initially focus on. Based on the design DNA of TRIP TRAP, and the company's design criteria, three user needs were deselected. The reason as to why these three user needs and thereby requirements were deselected is due to the lack of relevance and coherence to TRIP TRAP.

It was assessed that docking stations for laptops and white boards would be too complicated in terms of design for TRIP TRAP, while incorporated sound solutions were considered too advanced in terms of technology.

On the other hand, the company has begun to experience with lighting solutions and is currently fully developing a lamp for its future assortments. In that connection, it has been evaluated as being highly relevant for this project to focus on lighting requirements in the design process. This is also because of the project goal of trying to push of TRIP TRAP into a more modern and idealistic direction to better accommodate younger customers as it wishes.



Illustration 29 - TRIP TRAP 'PIND'

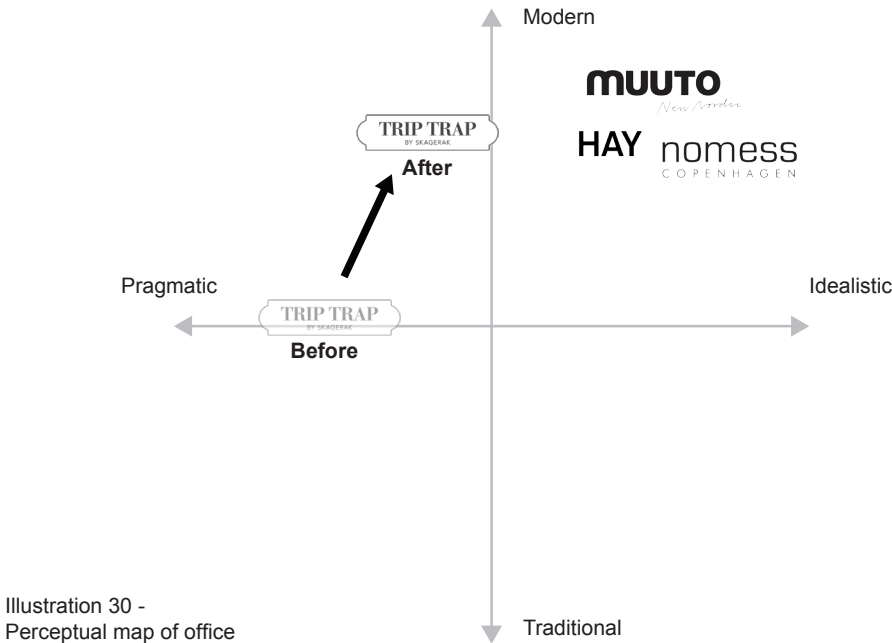


Illustration 30 - Perceptual map of office market with initial competitors

Ergonomics and teleworking

In this section, ergonomics and how it is used in this project will be described. In connection to teleworkers, ergonomics is an essential part of accommodating needed workspace conditions. According to the international ergonomics association, ergonomics can be split up into three categories that involve physical ergonomics, cognitive ergonomics, and organizational ergonomics. The relevant category for this project is the physical ergonomics, as it revolves around a product and its physicality.

Opposed to cognitive ergonomics, physical ergonomics are tangible measureable aspects that can be used directly for product development. The needed ergonomics for this project is therefore the measurements that ensure the right dimensioning of the home office desk for the average human being. It is assessed as being a standard procedure to dimension products after the average human being to target a wider group of customers.

According to Arbejdstilsynet, Arbejdsmiljøviden, and Danske forsikringsfunktionærers landsforening, there are some requirements that apply in regards to teleworking in home offices. For instance, screen terminal work spaces are to be designed and applied with inventories, so that work can be done in a complete safe and healthy way. However, the rules state that the requirements only apply when a worker is teleworking at least 2 hours per day, or what is equivalent to 1 day per week. Though, this condition does not apply to the use of laptops that are not placed in fixed workstations.

Since it is rather difficult to assess who exactly will buy and use this product for teleworking and how long they will work per day, the outset is to design a product that is ergonomically correct to enhance the product's quality and thereby usability.

The relevant teleworking and ergonomic requirements have been selected and incorporated in the following requirements specification to ensure a rightful concept development.

Requirements specification

After locating central user needs, ergonomics and teleworking requirements, the design process reached to the step of composing a reliable requirements specification, which is designed to structure the design process of the project and help evaluating the final product concept at the end of the design process.

It is important to note that TRIP TRAP doesn't have any specific requirements for the design proposal, but its design criteria have been a mind set for the concept development. However, in connection to its considerably strict design DNA and criteria, an exception has been to focus on broadening the concept development phase at first to generate as many relevant design solutions as possible.

The following pages show the first requirements specification version used for the following concept development phase. All requirements have been specified to be as specific as possible, to ensure a more comprehensible concept development process. In addition, please note that specific technical requirements have not been a part of the first design process to avoid big unnecessary concept limitations.

Process steps

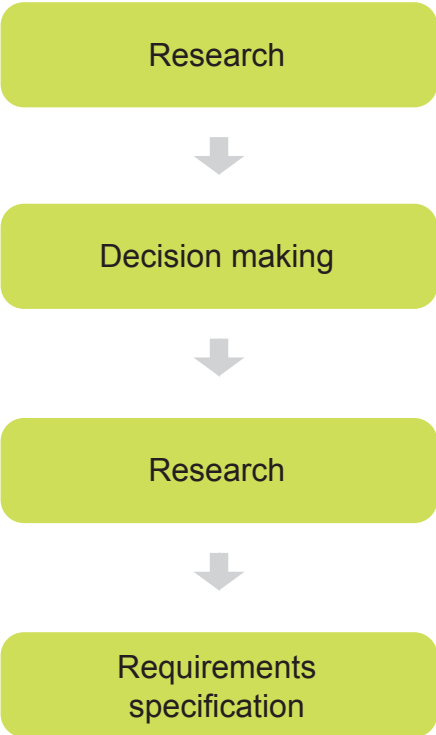


Illustration 34

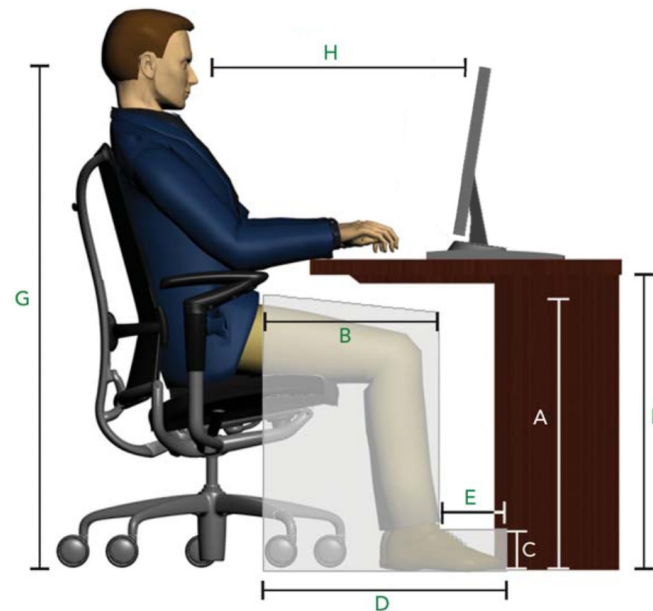


Illustration 32
BIFMA outline of measurements to consider



Illustration 33
Bounding box for minimum BIFMA clearances

The following requirements are based on research, previously listed criteria, and initial decision making. It is made to ensure a common thread in the design process of the product development. The requirements are listed with the purpose of narrowing down the end-solutions spectrum, which enables a systematic approach in the design process, too. In addition, the requirements list's objective is to give clear a direction in respect to the product development process by listing precise requirements that enable the designer to assess various product concepts accordingly.

TELEWORKING REQUIREMENTS

The design proposal must accommodate TRIP TRAP's requirement of no electrical powered engines, while accommodating teleworking that last at least 2 hours per day, or 1 day per week, by the following requirements:

- Must be a desk consisting of at least one table top and supporting legs that is meant to be placed in homes serving as a home office item, which accommodates teleworking.
- Must have a manual non electrical powered desk height adjustable function.
 - Although there are no direct requirements of the working desks for video display terminal usage to be adjustable in height. However, this will make the best solution if there are to be any requirements concerning variations of work positions according to the policies of companies.
 - When designing a manual height adjustment mechanism in the desk, the mechanism should be placed in such way that avoids strain on the user's back when being used.
- Must have a manual height adjustable function triggered by a handle that is designed for the use of hands.
- Must have a surface with minimal reflections, so that the user will not be blinded and thereby distracted when using the desk.
- Must accommodate work in connection to use of video display terminals.
- Must have enough desk depth (the distance from the user's front to the other side of the desk) to accommodate a viewing depth of no less than 40 cm from the user's eyes to the video display terminal.
- Must accommodate additional equipment/accessories requirements set forth by the respective company in connection to teleworking arrangements, such as laptop PCs for work at home and at work.

Hereunder ergonomic requirements, the design proposal must accommodate:

Seated work situations with:

- A minimum height for thighs of 68 cm
- A minimum depth for knees of 43 cm
- A minimum width for thighs of 50 cm
- A minimum depth at foot level of 60 cm

Standing work situations with:

- A minimum standing height for desks (- desk thickness) ranging from 56 to 116 cm

In general:

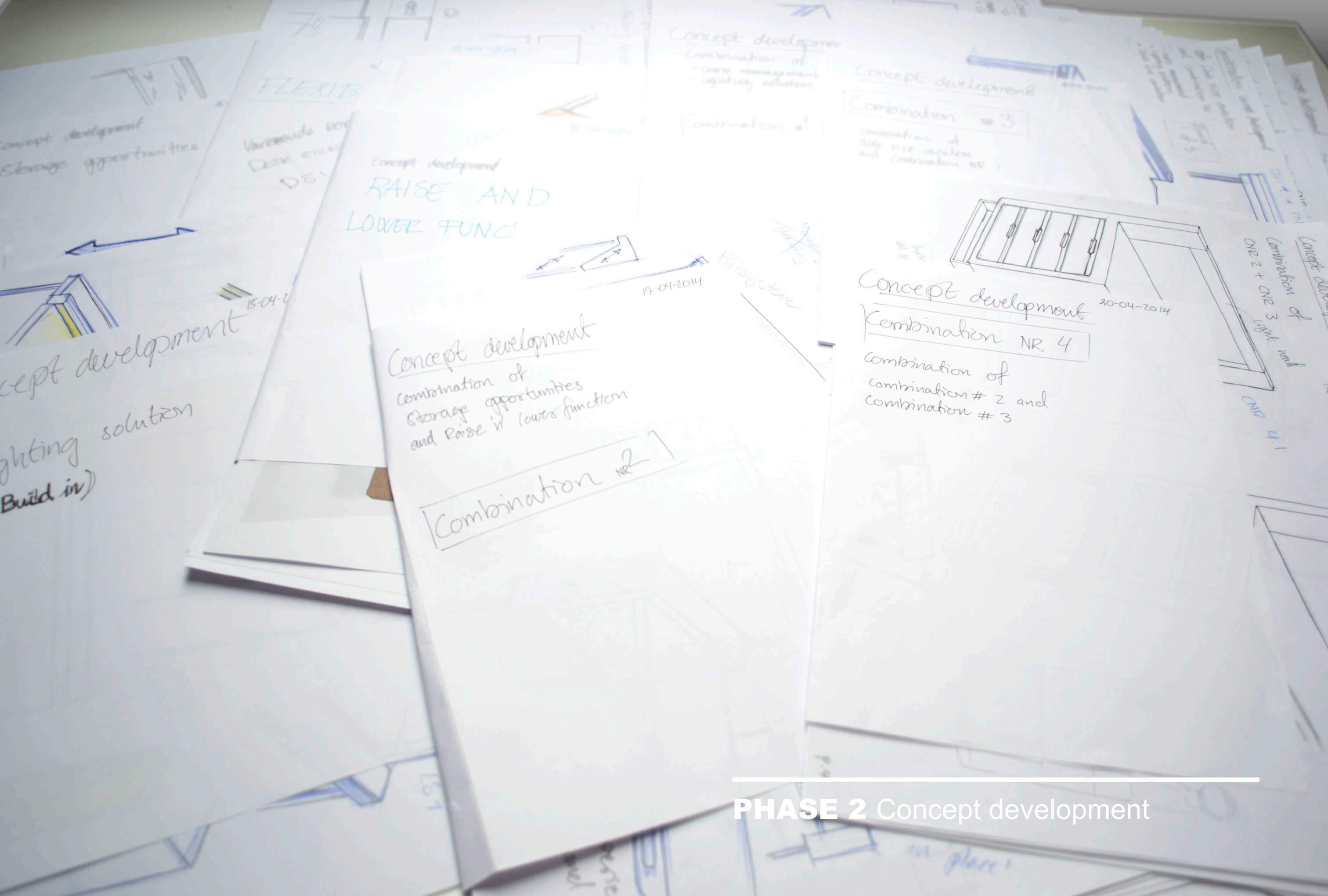
- Must not contain any components that will intersect with the space required under the desk for the user's legs and feet, according to the ergonomic measurements, whether it is at seating level or standing level. A minimum requirement of feet height, width and depth are required here, although this will be met automatically through the fulfilment of this requirement.

USER NEEDS REQUIREMENTS

The following requirements are based of the answered gained by the questionnaire created on surveymonkey.com

The design proposal must accommodate user needs by the following requirements:

- Must offer the opportunity to vary and thereby change the size of the desk's work surface to accommodate the need for different sized work surfaces.
- Must accommodate electric cables management in such way that cables aren't directed directly over the active work surface of the user.
- Must offer storage opportunities for documents, printers, and home office accessories such as pen and paper. (Quantity unknown at this point)
- Must offer an adjustable height function, which keeps any mechanical noises to a minimum, so that it doesn't distract or annoy the user when being used.
- Must offer a build in lighting solution that helps lighting up the active work surfaces for the user to see.
- Must be able to stand up on its own feet, without any help from a wall or other objects, hence being capable of standing up out in open space on a flat flooring.



concept development
Storage opportunities

FLEXIB

Variable box
Desk area
DS

concept development
RAISE AND
LOWER FUNC

concept development
lighting solution
(Build in)

concept development
Combination of
Storage opportunities
and Raise in lower function

Combination #2

Concept development
- Combination of
- Color management
- lighting solution

Combination #1

Concept development

Combination #3

Combination of
desk size variation
and Combination #1

Concept development

Combination NR. 4

Combination of
Combination #2 and
Combination #3

PHASE 2 Concept development

Systematic sketching

After establishing actual user needs, the next step was to concept develop based on the requirements specifications. Here, a clear line of systematics has been used through the process of sketching. The first step of this systematic sketching process has been to concept develop out from one requirement first, and then one at a time. After having generated several concepts for each requirement separately, the next step was to start combining two requirements into one concept based on the previously designed concepts.

While focusing on combining the concepts and requirements in this concept development phase, another focus was also to further develop the combined concepts instead of only merging them as such to broaden out the product solving spectrum and to make them more integrated. Naturally, this lead to additional yet enhanced concepts that started to mix the product requirements better.

The last steps of the systematic sketching process ensured that the product development narrowed down the process to concepts that fulfil all the requirements at the same time. The following pages showcase the shortened version of systematic sketching process where only the chosen concepts are highlighted.

In the illustration 35, an overlook of the concept combination rounds is displayed.

On page 63, a fully detailed overview of the systematic sketching process can be seen.

Reading guide

The following pages show a shortened version of the systematic sketching process. Every design requirement has been given two pages to display the selected developed concepts.

More specifically, the concepts that have been selected for further development have been highlighted and marked with different letters followed with different numbers.

The letters represent the category they come from, for instance: “CM 1” means the first concept coming from the cable management requirement, whereas “CNR 2.1” means the first concept from the second combination round.

The selection process has focused on the concepts that were assessed as being adequate solutions to the different requirements, and later as being most appropriate to combine in the following concept combination rounds.

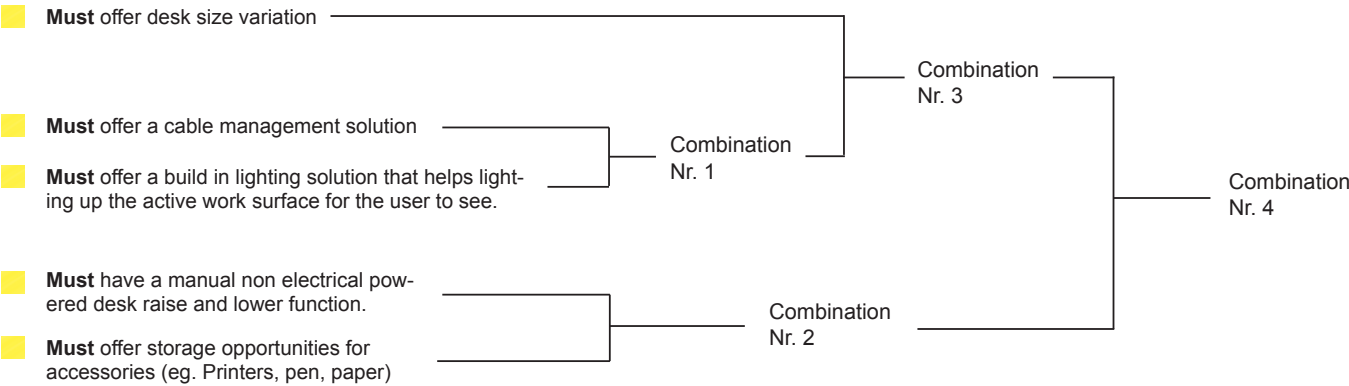

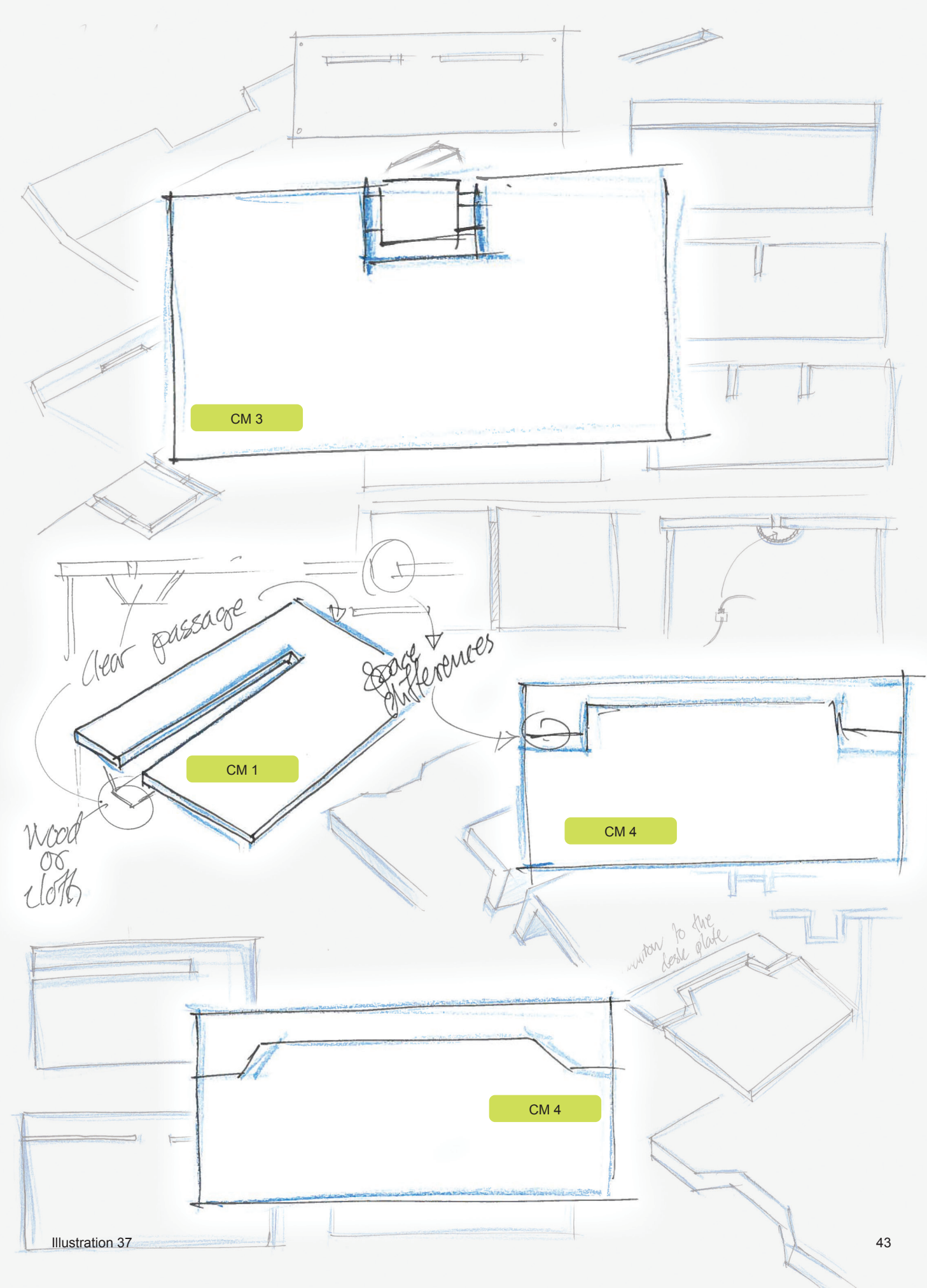
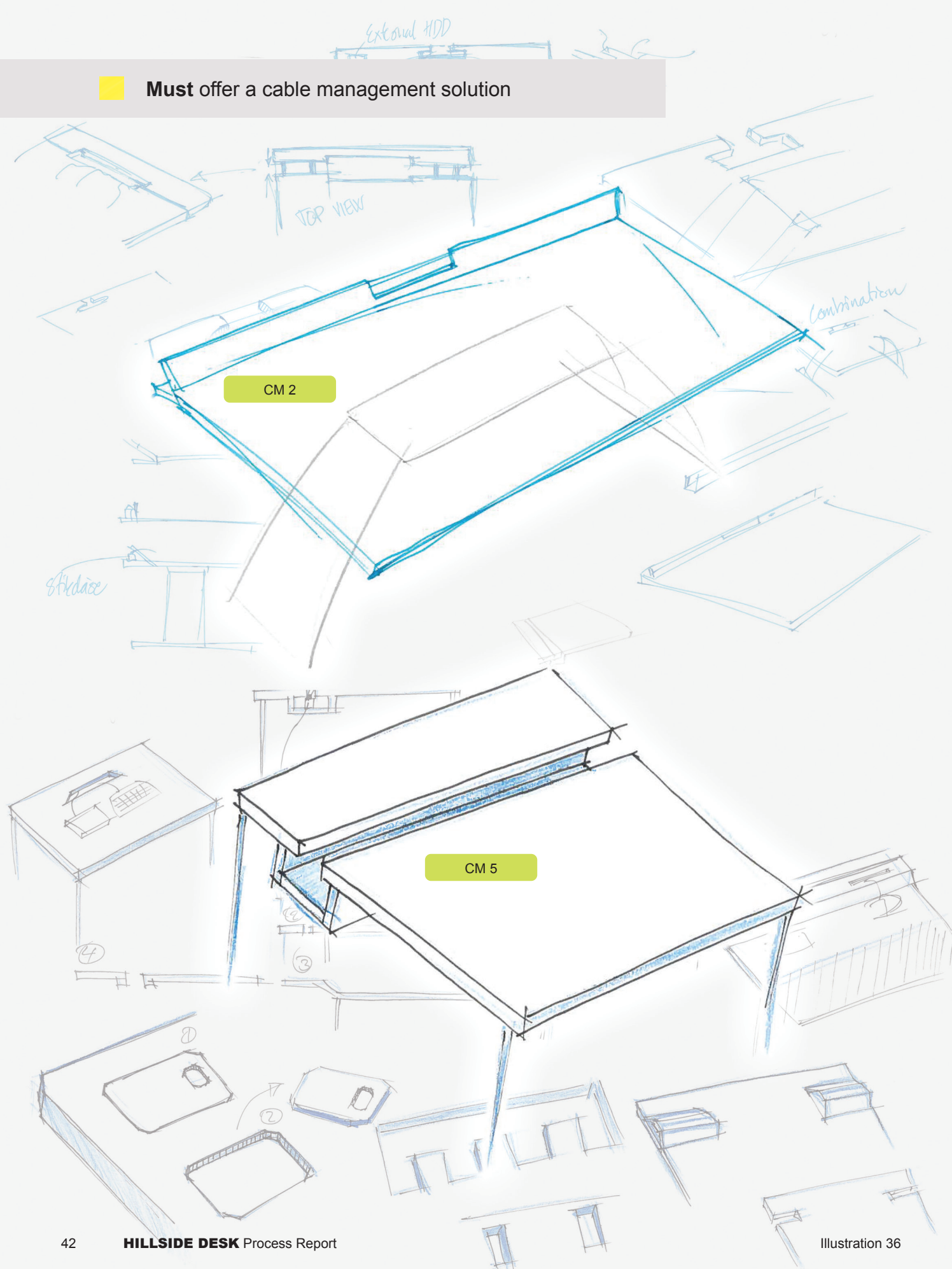


Illustration 35 - Systematic sketching process

 **Must** offer a cable management solution



Must offer a build in lighting solution that helps lighting up the active work surface for the user to see.

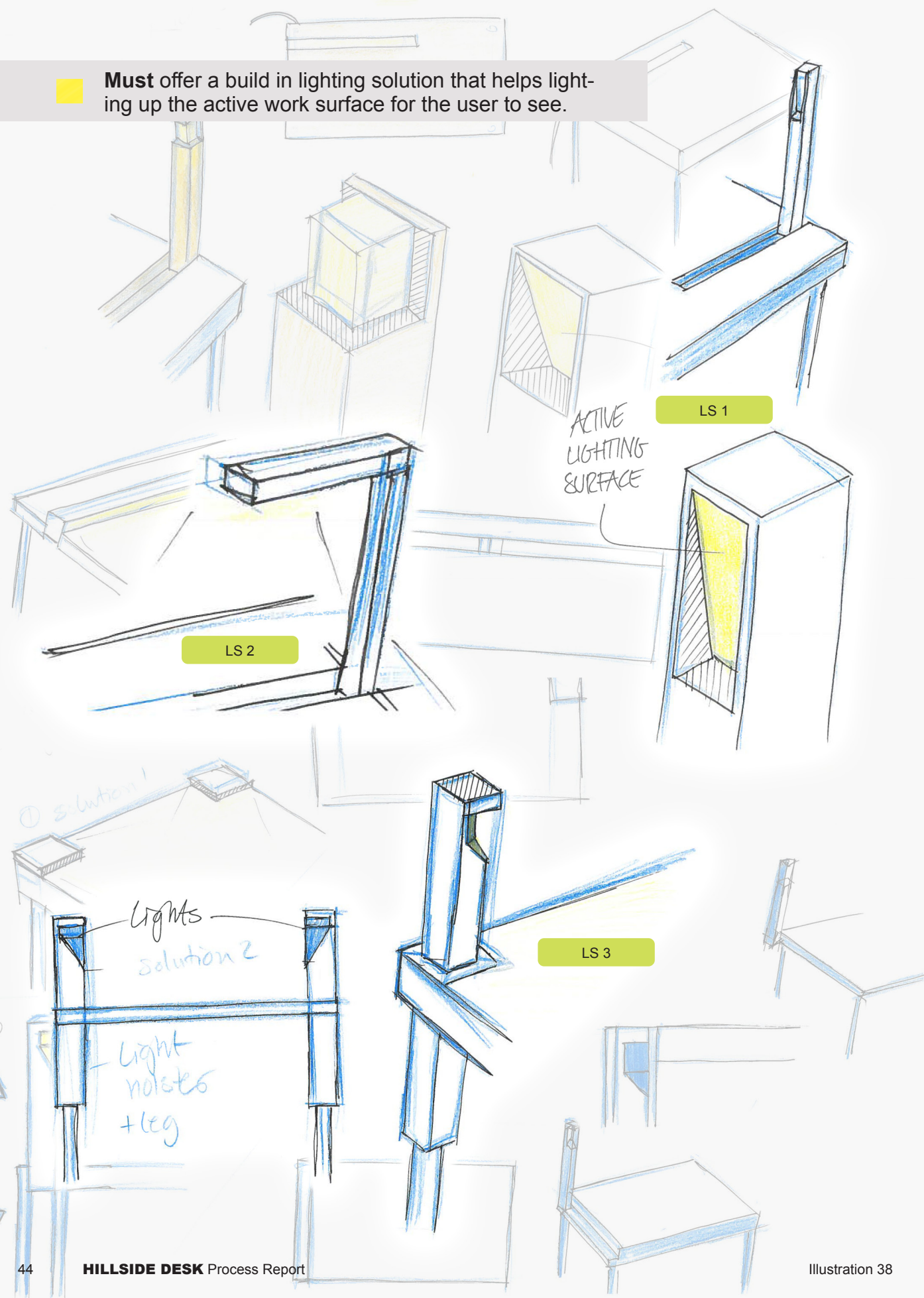


Illustration 38

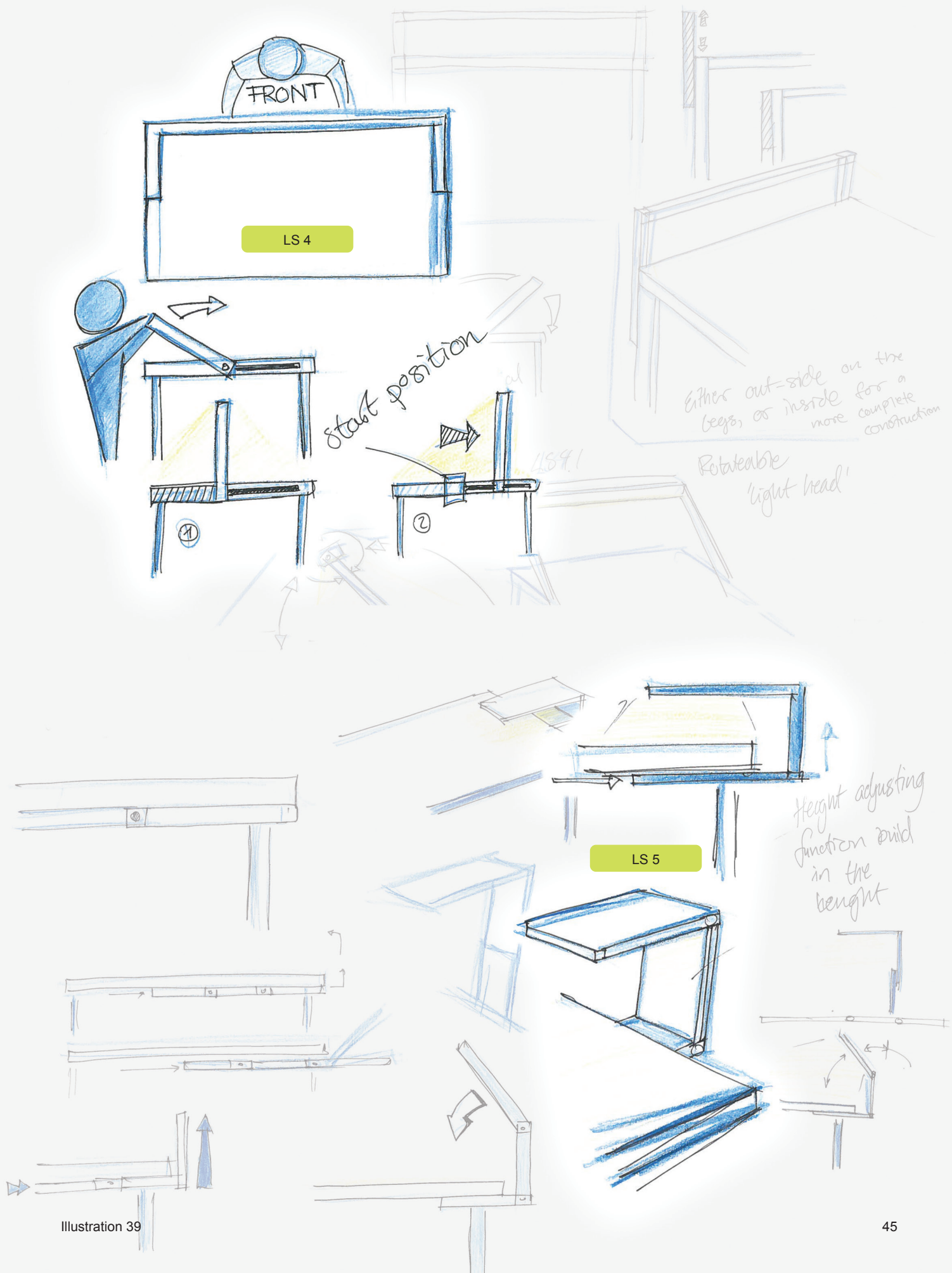


Illustration 39

Must have a manual non electrical powered desk raise and lower function.

RLF 1

RLF 3

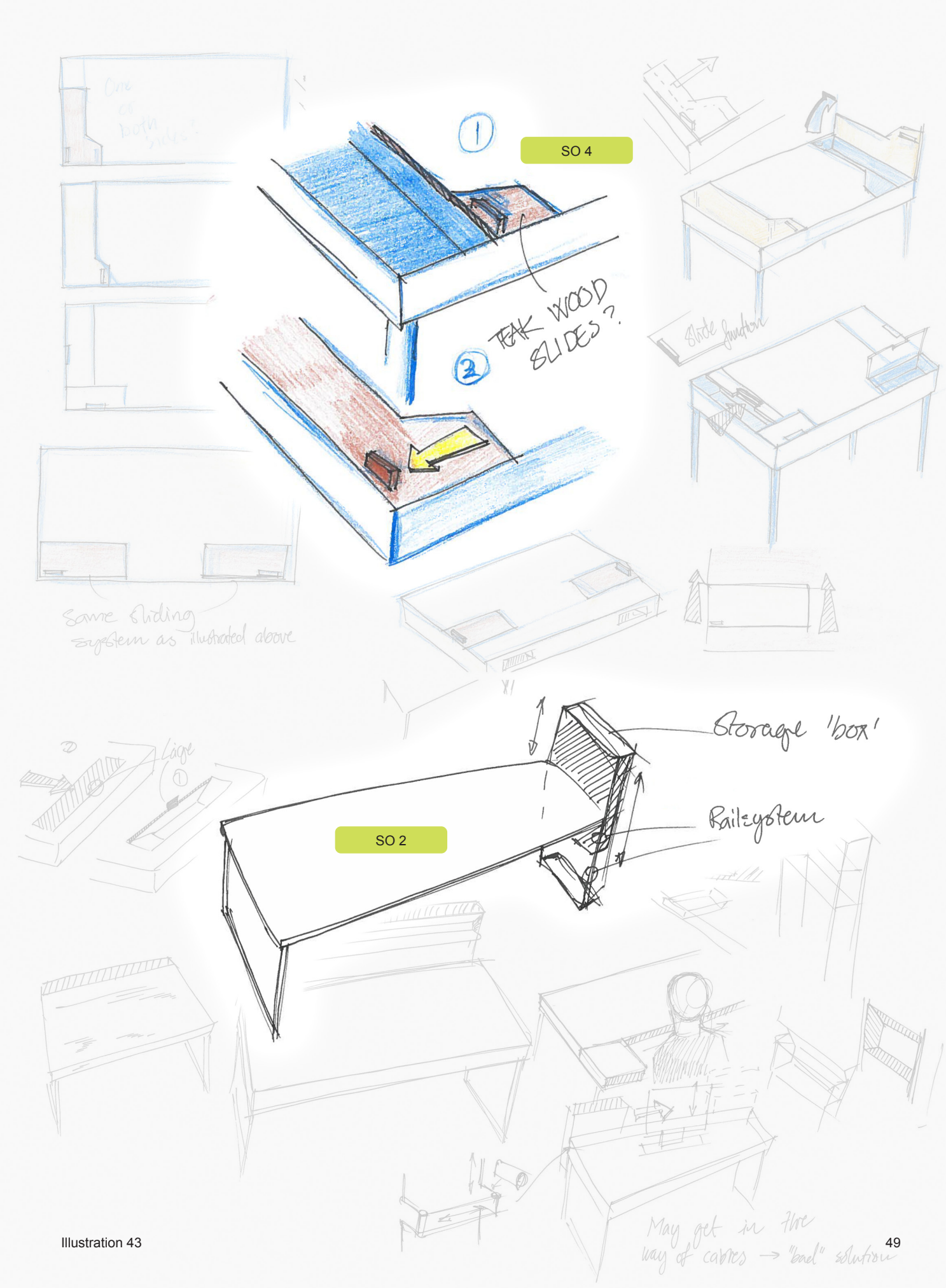
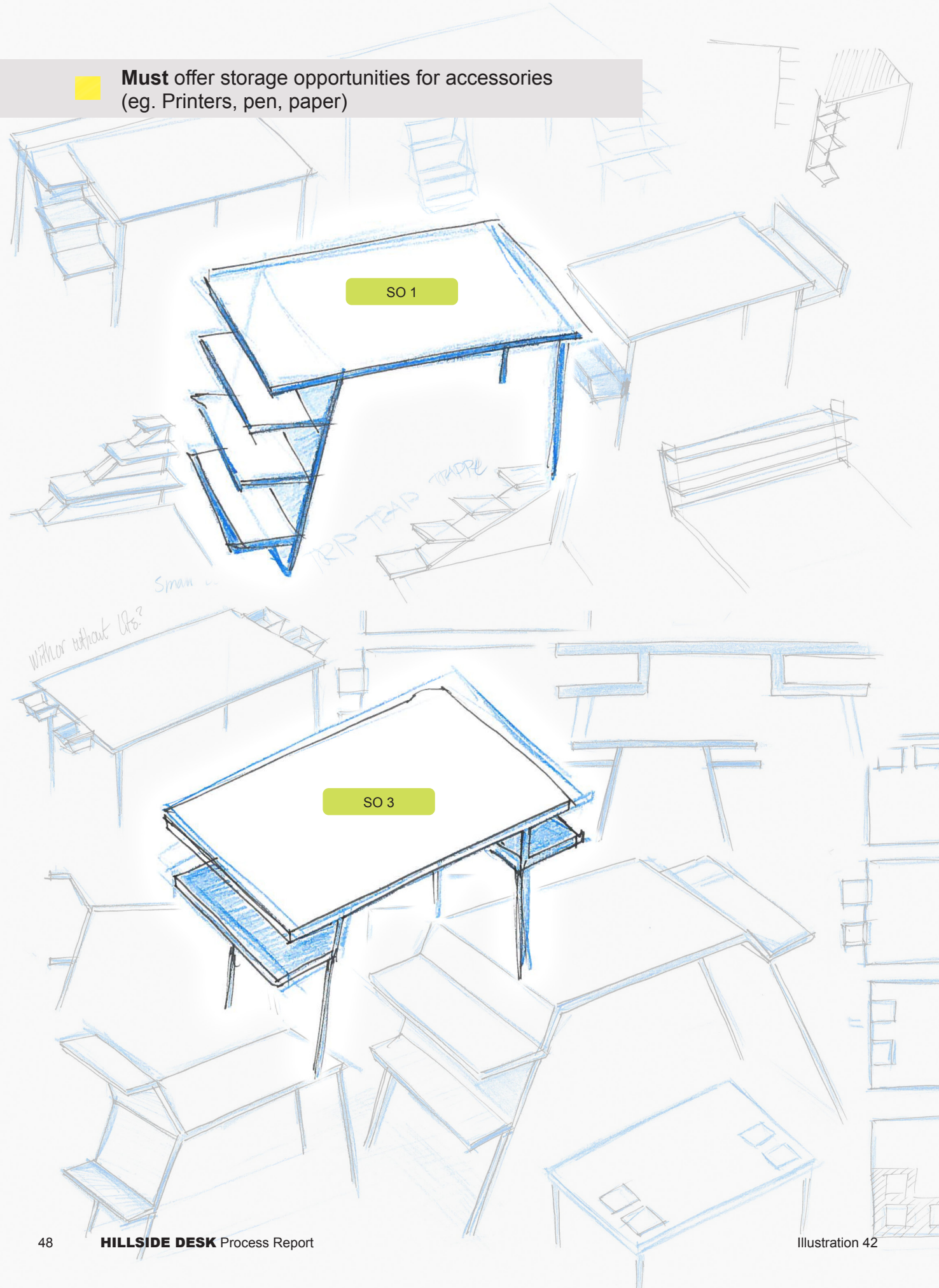
Illustration 40

RLF 4

RLF 2

Illustration 41

Must offer storage opportunities for accessories
(eg. Printers, pen, paper)



Must offer desk size variation

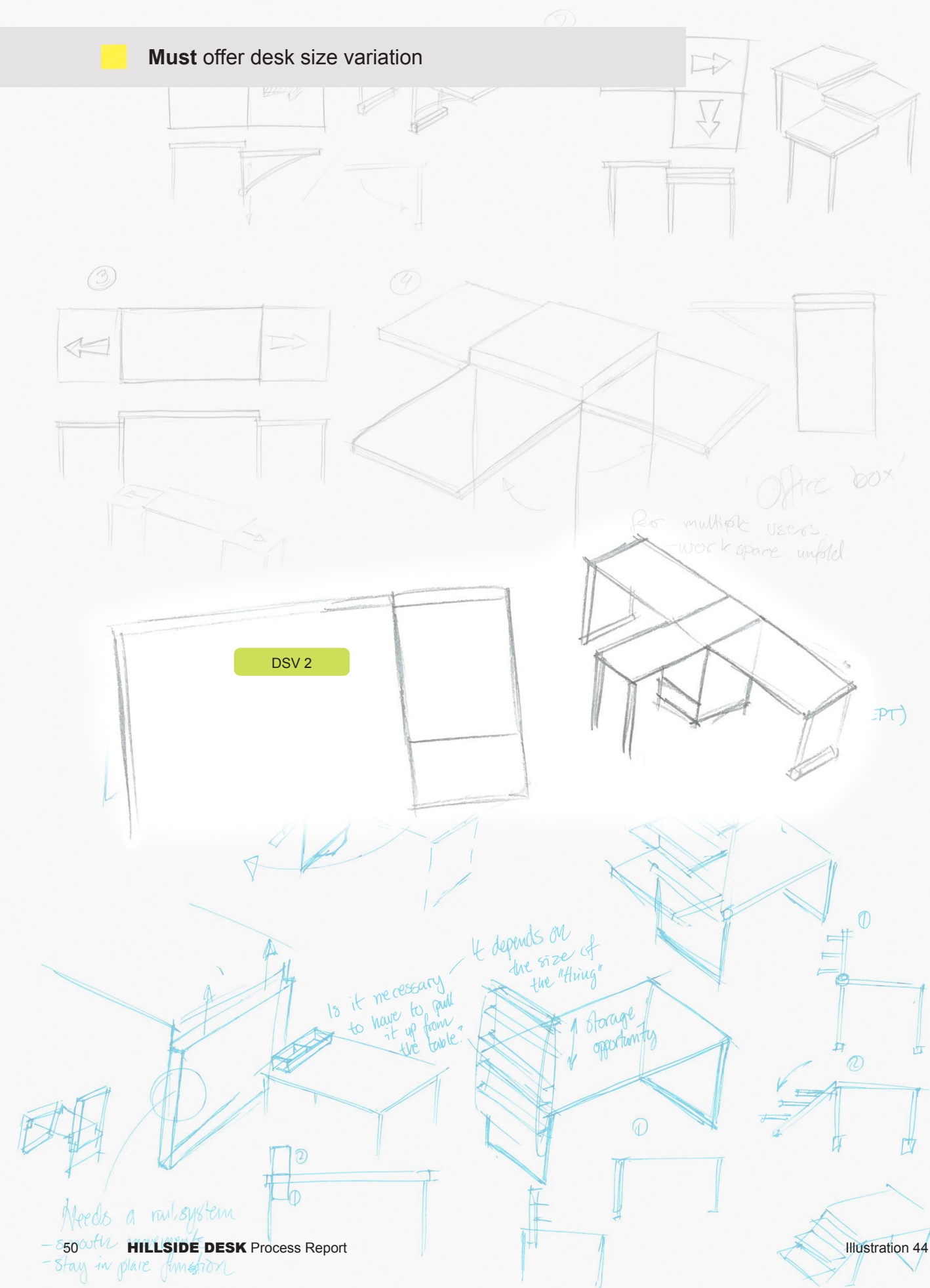


Illustration 44

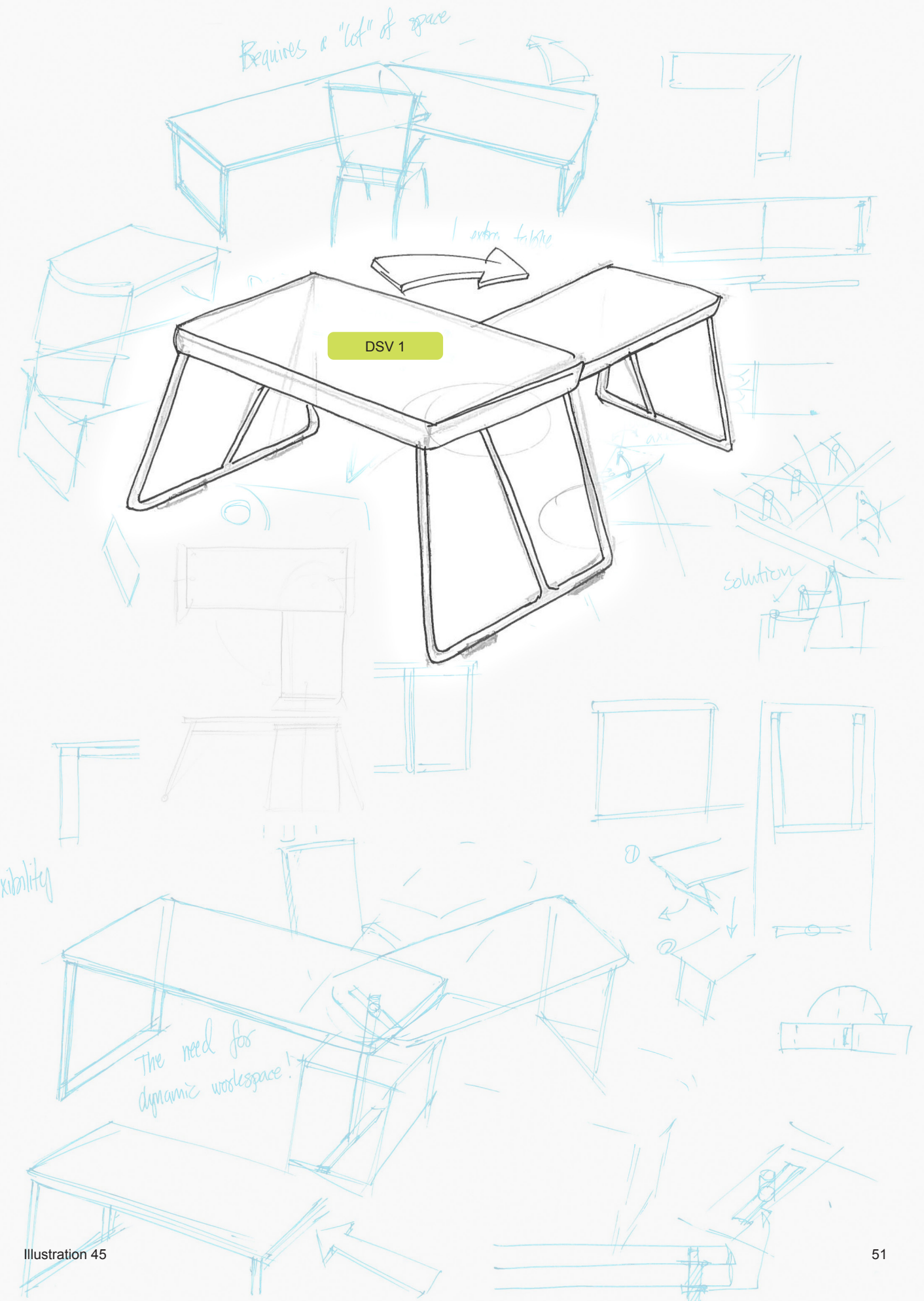
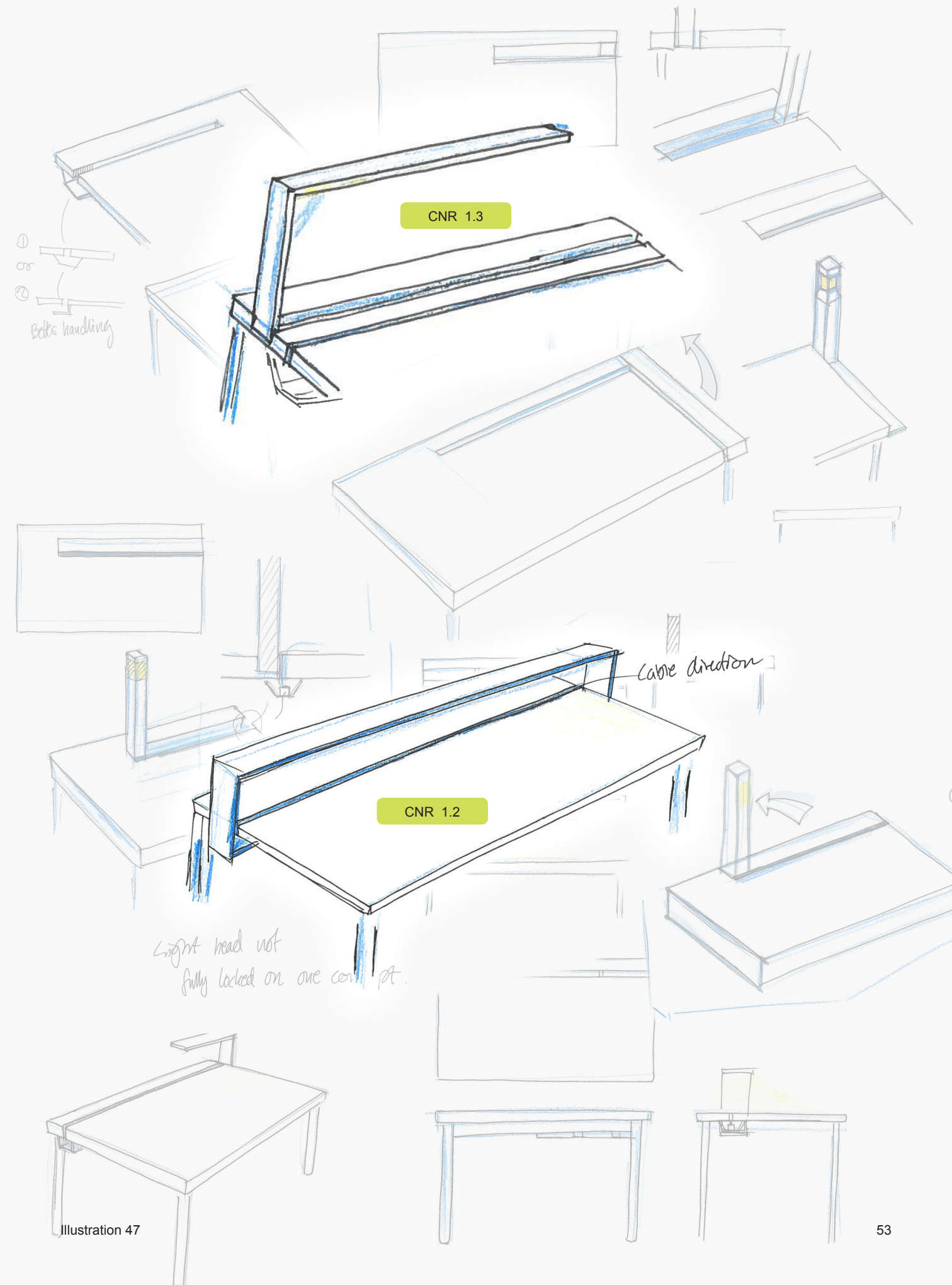
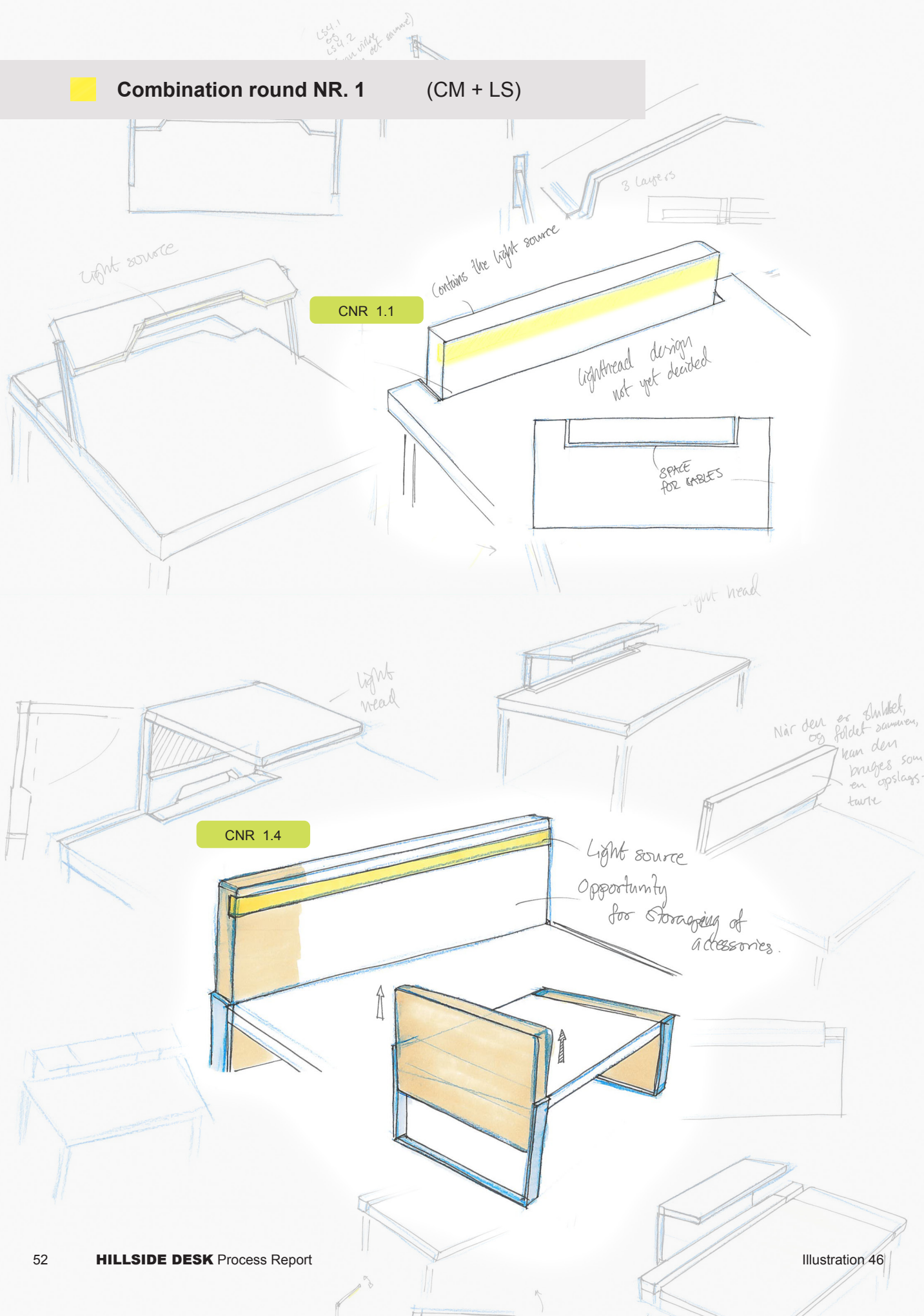
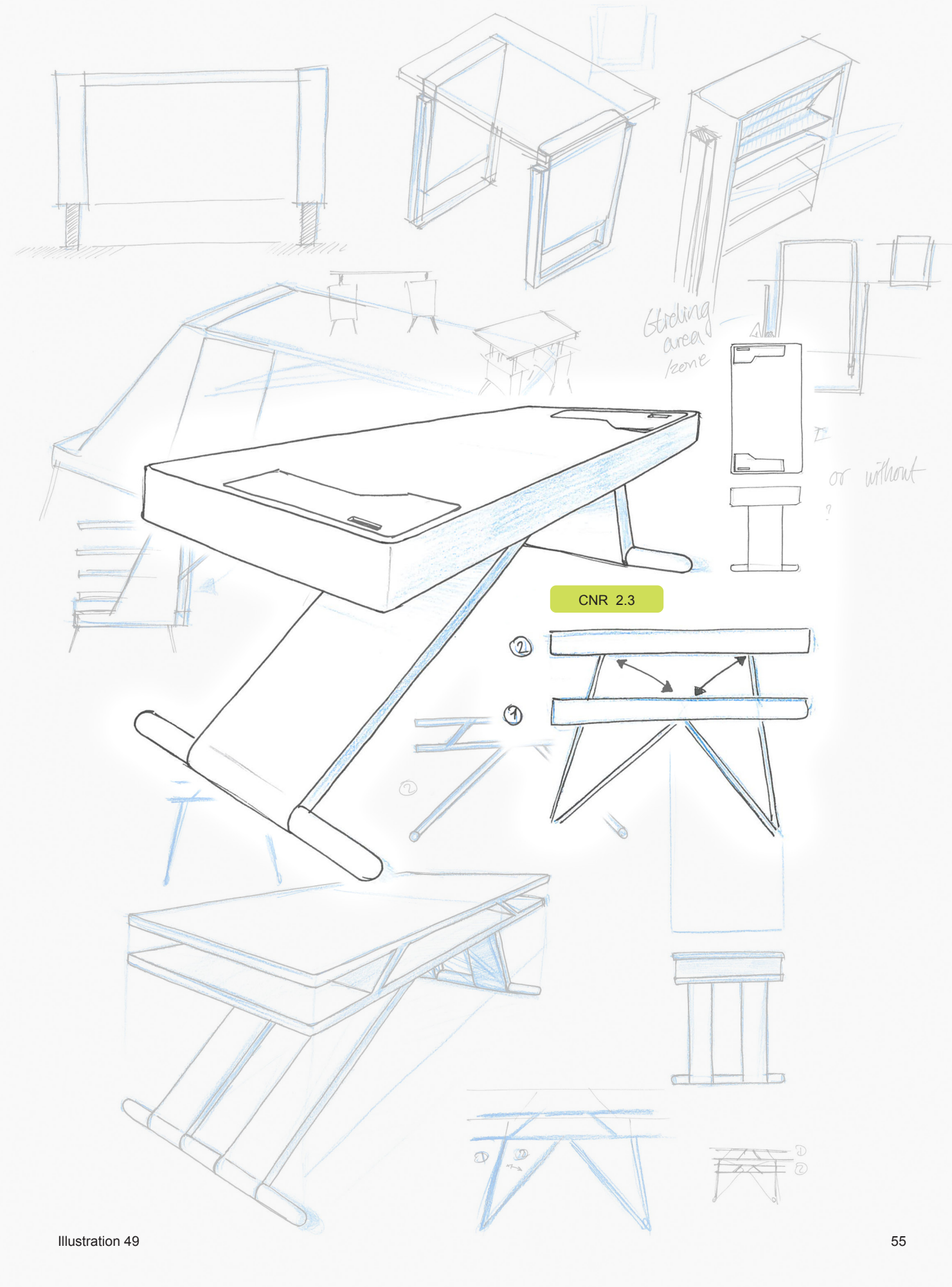
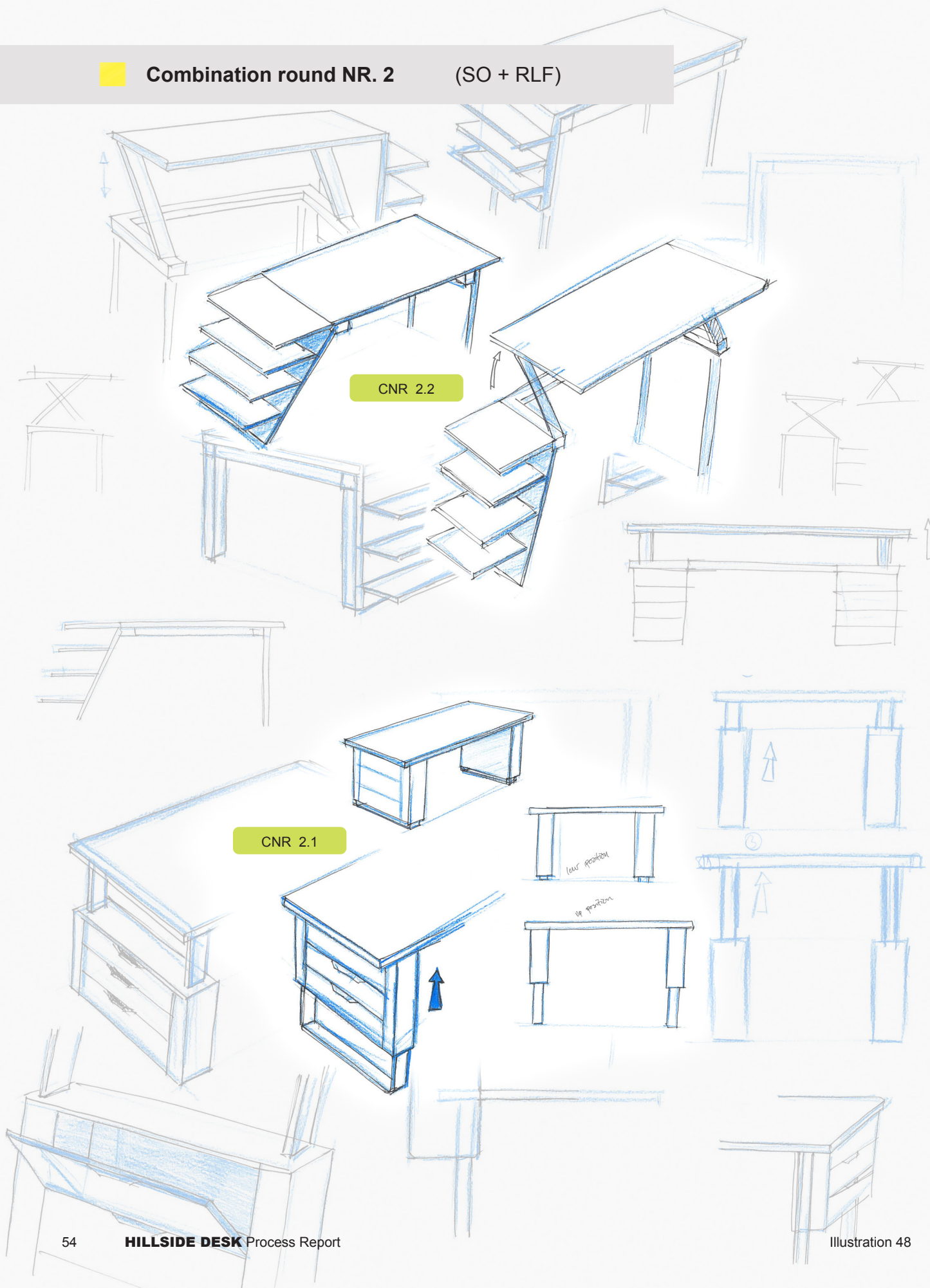
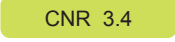
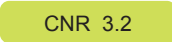


Illustration 45



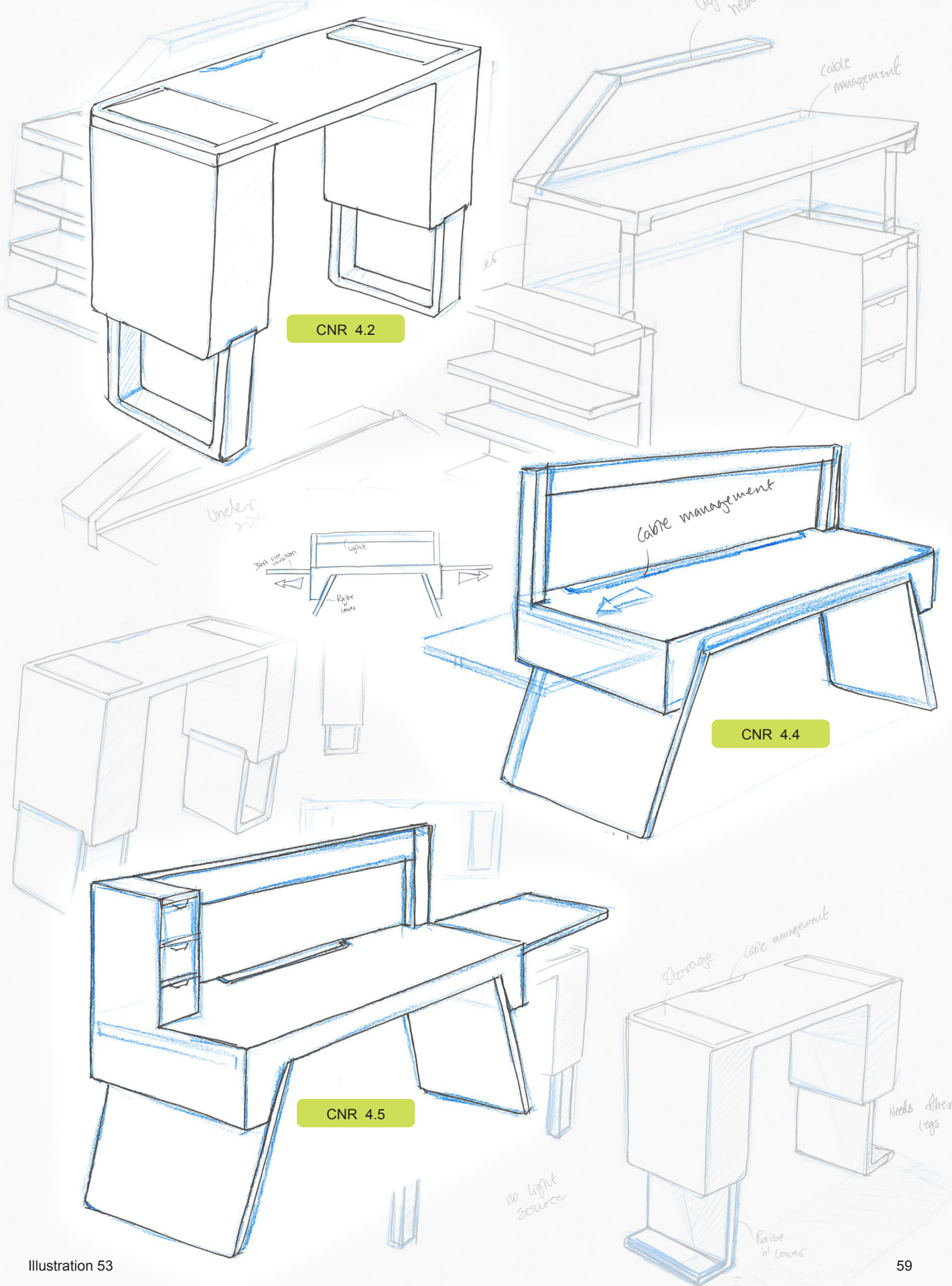
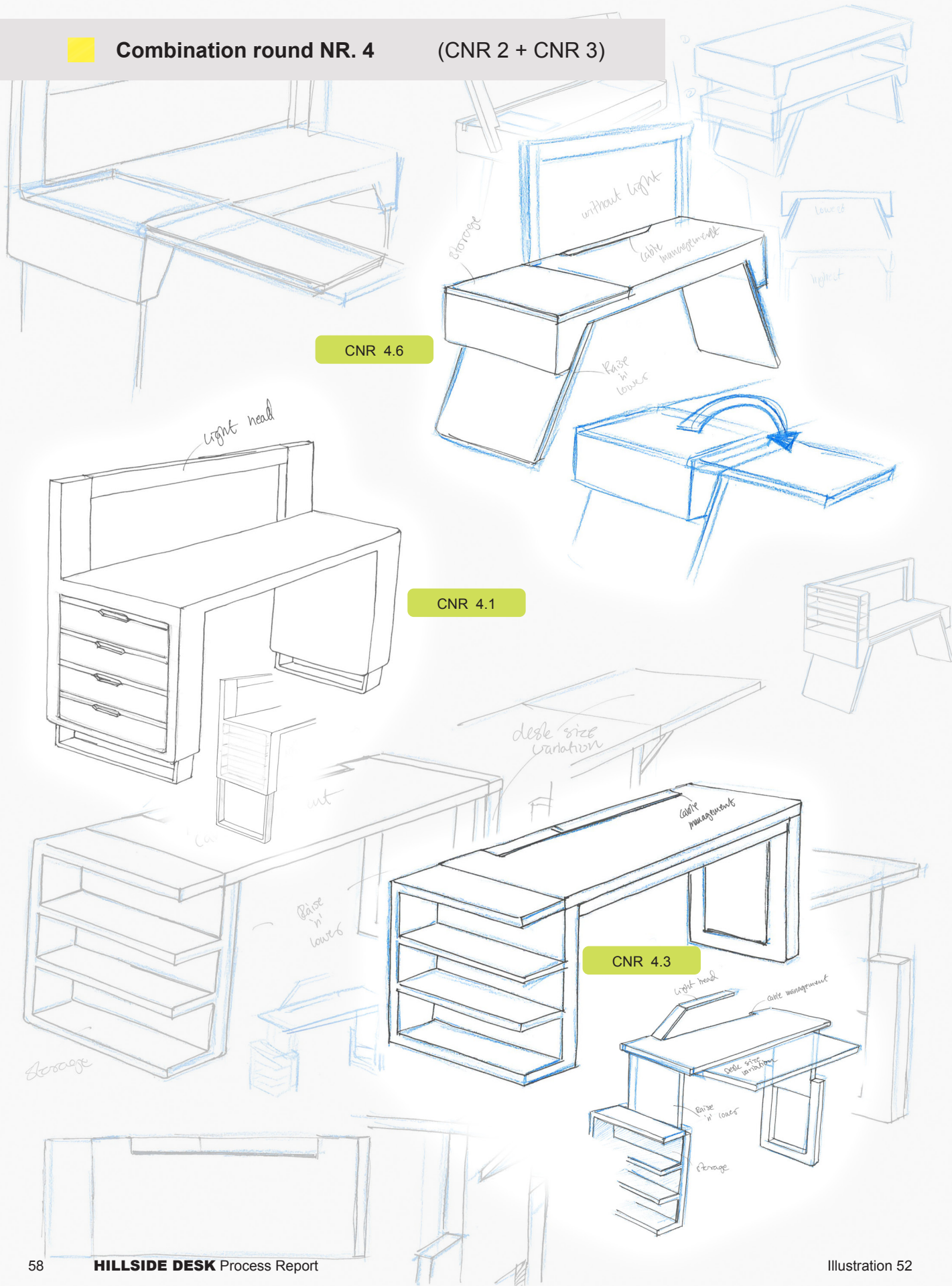






Combination round NR. 4

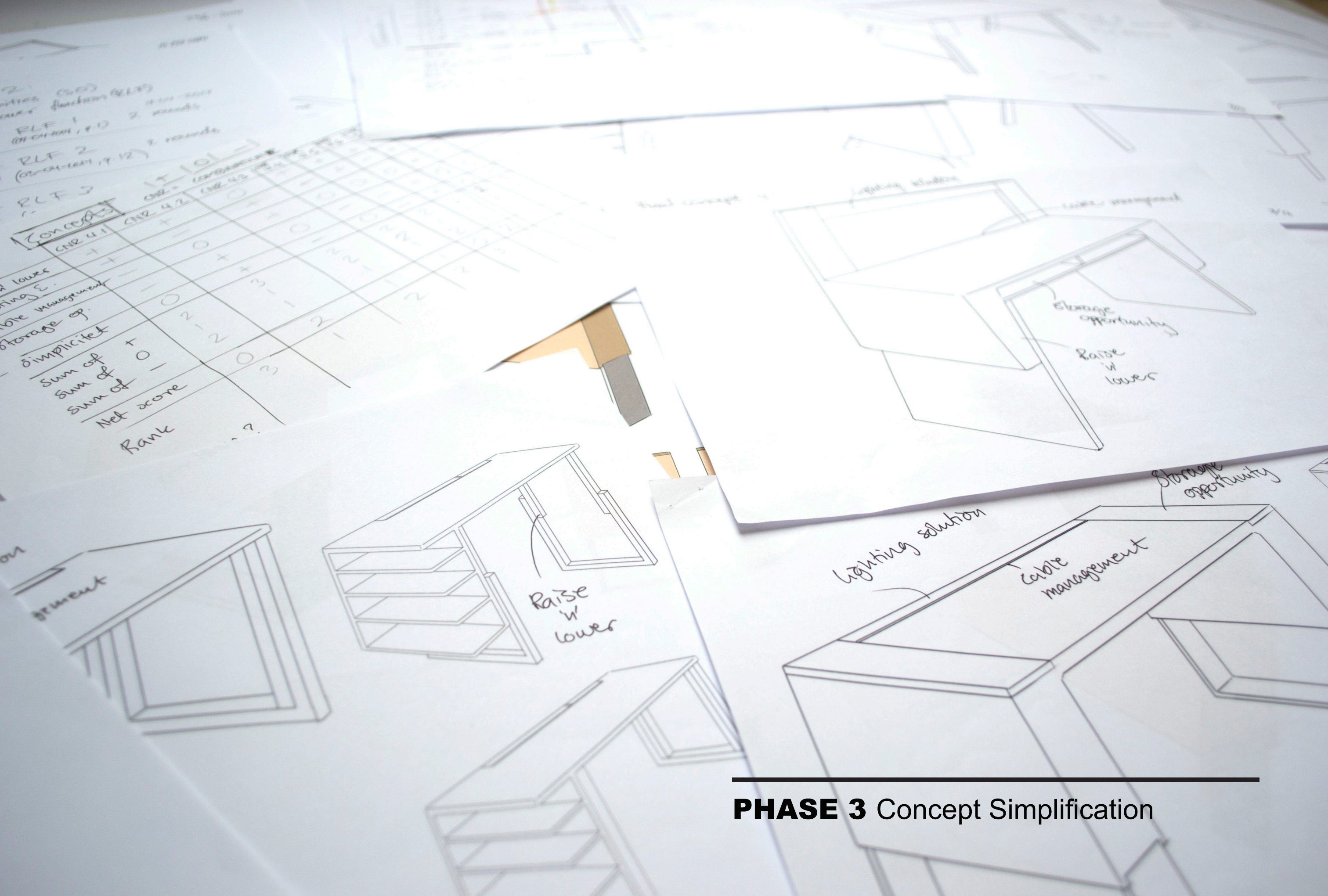
(CNR 2 + CNR 3)



2:
 size (50)
 over function (100)
 RLF 1 (01-04-1001, 1-10) 2 rounds
 RLF 2 (05-08-1001, 1-12) 2 rounds
 RLF 3 (09-12-1001, 1-12) 2 rounds

Concepts

	CR2 4.1	CR2 4.2	CR2 4.3	CR2 4.4	CR2 4.5	CR2 4.6	CR2 4.7	CR2 4.8	CR2 4.9	CR2 4.10	CR2 4.11	CR2 4.12
lower	+	+	+	+	+	+	+	+	+	+	+	+
ing E.	+	+	+	+	+	+	+	+	+	+	+	+
ble management	-	-	-	-	-	-	-	-	-	-	-	-
Storage op.	0	2	2	2	2	2	2	2	2	2	2	2
simplicitet	+	+	+	+	+	+	+	+	+	+	+	+
Sum of	0	0	0	0	0	0	0	0	0	0	0	0
Sum of	-	-	-	-	-	-	-	-	-	-	-	-
Sum of	0	0	0	0	0	0	0	0	0	0	0	0
Net score	0	0	0	0	0	0	0	0	0	0	0	0
Rank	1	2	3	4	5	6	7	8	9	10	11	12



PHASE 3 Concept Simplification

Concept development summary

This section will summarise the process of the concept development. As described in the previous phase, the design DNA and criteria of TRIP TRAP has worked as an underlying mind set for the concept development process, which has helped selecting the various concepts during the combination rounds. As such, there was no specific measure which was used to select the concepts besides assessing the level of complexity and feasibility out from a TRIP TRAP perspective.

As seen in illustration 54, the entire process has been successfully built on a systematic approach. Notably, the concepts generated out from the different design requirements were combined step by step, starting with the first combination round of cable management (CM) and lighting solution requirements (LS).

The following round (Nr. 2) of combination contains the storage (SO) opportunity and raise and lower function requirements (RLF). In these two combination rounds, it was possible to generate several integrated and better concepts. Although, as illustrated with X's, there were in fact rounds where no concepts were selected for further development.

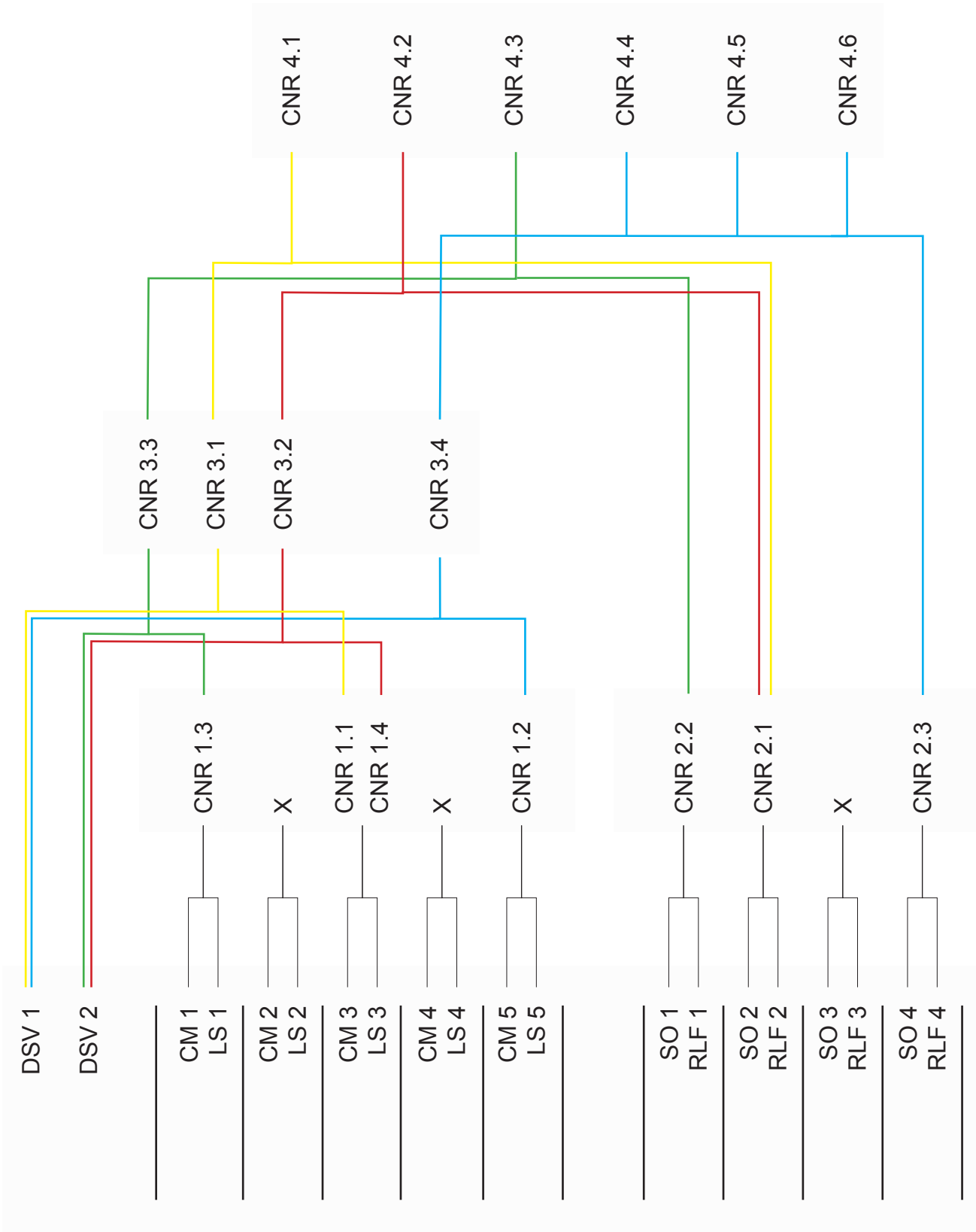
Later on, the desk size variation (DSV) requirement was integrated through combination round Nr. 3. Ideally, the concepts from the latter requirement could have been combined with the concepts of combination round nr. 2, but due to the fact that the systematic sketching process was to combine all of the requirements simultaneously it was assessed as being unimportant.

When the process reached its end, the process of combining the concepts became more and more difficult, which ultimately rendered it harder to be careful to include everything without leaving anything out of the concept designs. This, and the fact that the concepts reached a level of complexity where the various requirement solutions began to conflict with each other.

The overall goal with this concept development process was to generate many concepts as a starting point to ensure higher chances of coming up with appropriate concept designs. Fortunately, the process turned out to be effective and gave various interesting designs.

Essentially, the process could have kept going, trying to combine the various concepts in another and perhaps more random order opposed to this process. However, as time progressed, the need for closing in on the absolute relevant concept designs became more and more significant. Therefore, the process stopped after having successfully combined concepts in combination round Nr. 4.

On the following pages, the process of choosing the final concepts will be described.



Concept selection matrix

Before preparing the concept selection process, it was assessed that it was vital to use the design criteria of TRIP TRAP more, and thereby start to narrow down the design process from that point. When the concepts of combination round 4 were held up against the absolute criteria of TRIP TRAP, it quickly became clear that the complexity of the products were too high and that the some requirements were more necessary than others.

As a result, a decision was made to discard the desk size variation requirement in the concepts when preparing the selection process. This basically meant that the concepts were meant to be looked at without their concepts of fulfilling desk size variation needs.

When it finally came to selecting appropriate concept designs to proceed with, the start was to select final concepts for a concept selection matrix. As seen in illustration 57, the concepts chosen for evaluation does not originate only from the 4th combination round. In fact, the decision to focus more on the criteria of TRIP TRAP, the boundary for which concepts to choose was shifted, and led to spotting the potential of other concepts for the further development.

As a result, two previous concepts, concept 3 from combination round 3, and concept 3 from combination round 2, showed potential and were assessed as being adequate of becoming fulfilling designs if chosen.

The concept selection matrix is set up with the requirements needed to be fulfilled at this stage, along with an additional criteria in connection to the TRIP TRAP mind set called simplicity. The simpler the concepts combined the requirements the better.

In the end, after having evaluated and scored the selected concepts, the idea was to have around 4-5 concepts to show to TRIP TRAP before finally choosing a final concept direction. Fortunately, the selection process turned out well and gave 5, the top 5, concepts worth proceeding with.

Decision-making step 5

Decision:

It was decided to deselect the desk size variation requirement before initiating the concept selection matrix.

Why:

Because it made the concepts too complicated, and it interfered with the raise and lower function greatly, which at this point was assessed being a vital part of the final product design.

Illustration 55

Decision-making step 6

Decision:

It was decided to include simplicity as a design criteria in the concept selection matrix.

Why:

It was to better turn the concept development direction towards becoming TRIP TRAP products. The reason as to why simplicity is the only criteria involved at this stage is due to a wish of starting out small, slowly but steadily narrowing down the concept development selection process.

Illustration 56

Concepts

Requirements	CNR 4.1	CNR 4.2	CNR 4.3	CNR 4.4	CNR 4.5	CNR 4.6	CNR 3.3	CNR 2.3
	Raise and lower function	+	+	0	+	+	-	+
	Lighting solution	+	-	+	+	-	+	-
	Cable management	-	0	+	0	0	+	-
	Storage opportunity	-	+	0	-	+	0	0
Design criteria								
Simplicity	0	+	-	0	-	+	0	+
Sum of plusses	2	3	2	2	2	3	2	2
Sum of O's	1	1	2	2	1	1	2	0
Sum of minusses	2	1	1	1	2	1	1	2
Net score	0	2	1	1	0	2	1	0
Rank	3	1	2	2	3	1	2	3

Continue?	No	Yes	Yes	No	Yes	No
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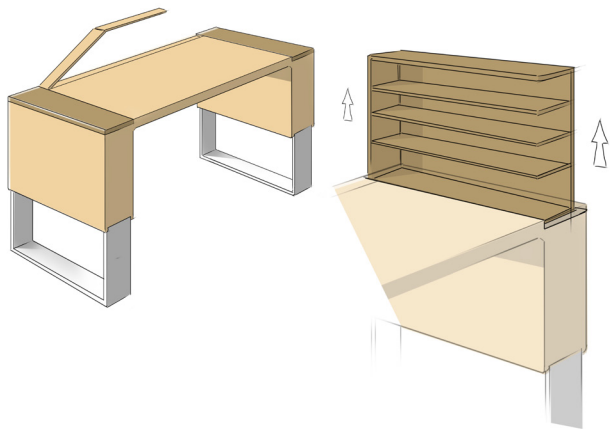
Concept refinement

The phase of refining the concepts is a simple process of redrawing the selected concepts to include the needed concept solutions. This step was also to prepare for the second mid-term status, by having presentable concepts meant for feedback. Here, it's important to note that the concepts had no direct technical explanations as to how the technical features worked or what existing solutions to compare with because they were attempts on being innovative in terms of new design.

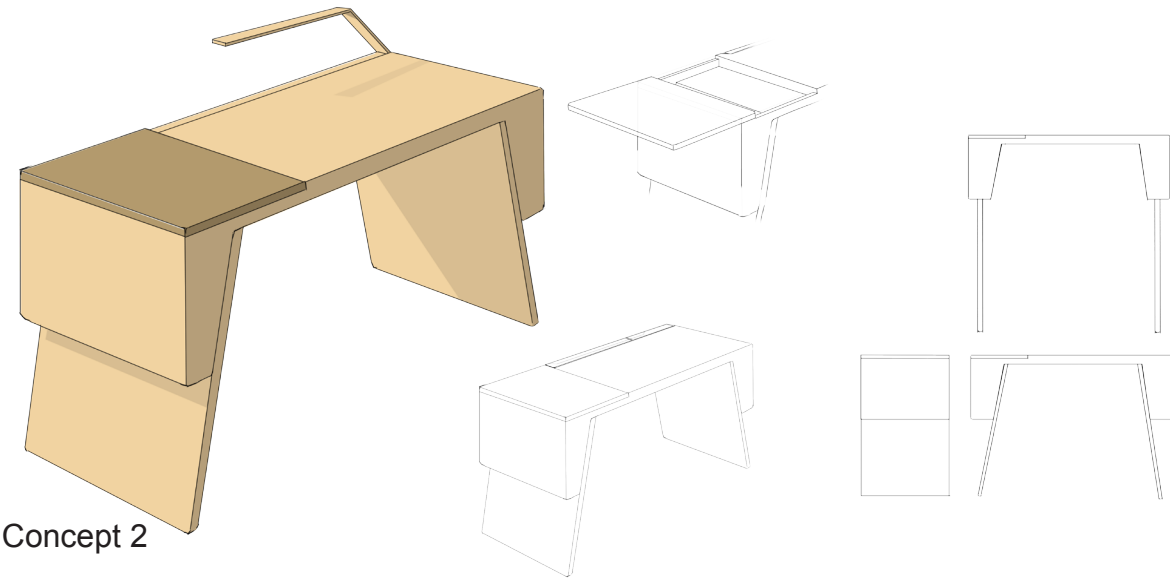
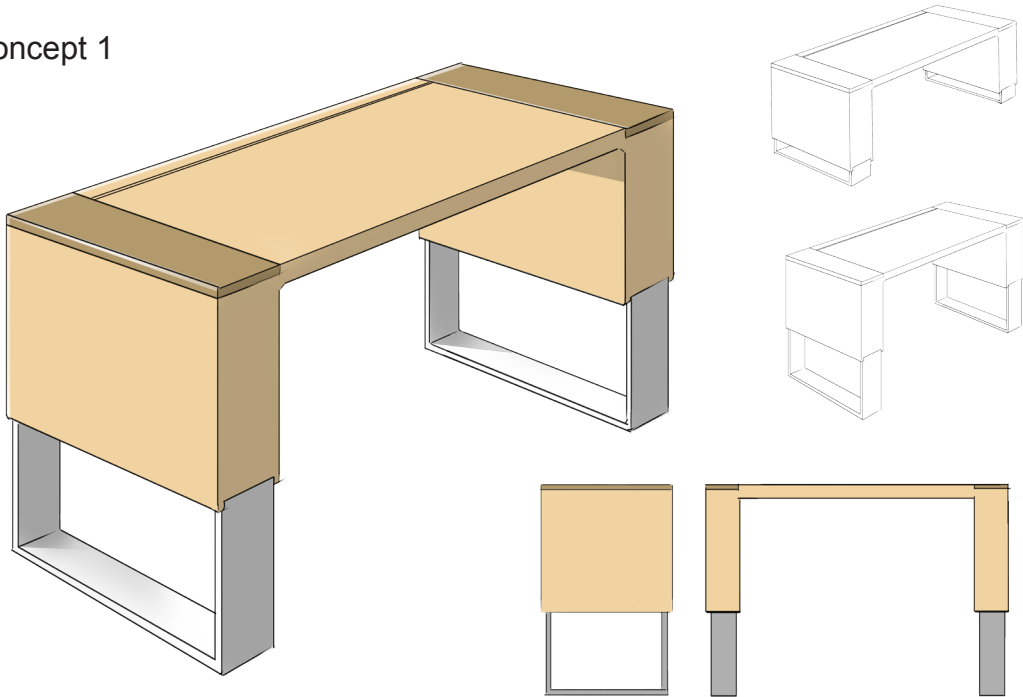
This, and the fact that time framing was limited, leaving little time to finish the concepts in a presentable way let along checking the practicality of the concepts.

The technical feature most in question was the raise and lower function, as there was a high level of uncertainty regarding how it's supposed to work precisely, its requirements of technical components and how that would affect the design. It was assessed that the concepts displayed a 'dream-state', which basically meant that the end result most likely would vary greatly in terms of design and complexity.

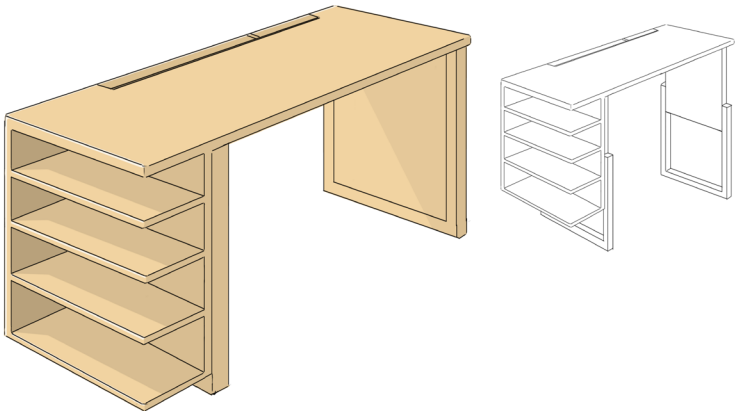
The use of materials in the concepts was not decided upon, while the colouring of the concepts were meant to simulate wood texture as a start. Notably, in concept 1 one sees the use of what looks like metal for its legs. At this point it was a minor detail in connection to diversity, while it was early considerations of how the raise and lower function should work precisely.



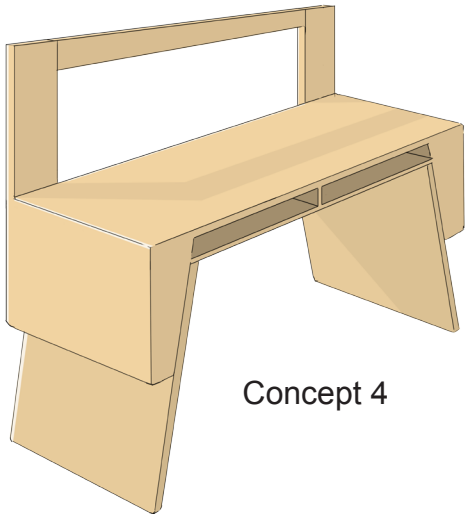
Concept 1



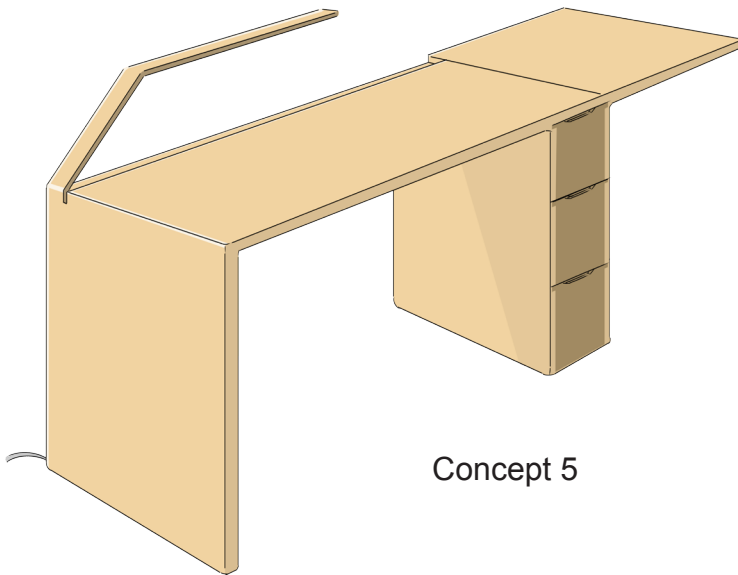
Concept 2



Concept 3



Concept 4



Concept 5

Last midterm status

During the second and last midterm status, many new things were discussed. Ultimately, this led to new decisions that concern both the design process and the project direction, which will be highlighted in this section.

After showcasing the 5 concept designs, the feedback revolved around the need for this project to focus more on simplifying the concepts to make them more TRIP TRAP alike. Here, the design DNA of TRIP TRAP was discussed, stating that the design criteria aren't tangible requirements that can be used specifically to design, and that the appropriate approach would be to include other similar TRIP TRAP products in the design process to create a style connection between the upcoming end-product to the company's products.

At this point in time, the targeted price setting for the end-product surfaced as well, as it was time to consider what price that ideally would fit the end-product according to TRIP TRAP. The desired price setting was set in the price range of 10-12.000 DKK, which seemed well suitable for the company compared to its existing products and price ranges.

The most vital issue discussed at the last status, however, was the project direction and which customers age group to focus on. Up until this point, it was impossible to document an actual effect on the young customer base aged +25 and how a price range of 10-12.000 DKK would be suitable. As a result, a decision was made to shift the focus from the age group +25 to TRIP TRAP's existing customer base of +30, and from there study the initiative which the company has taken to better accommodate that age group.

Out from the last status, the scoping of the design process was also narrowed down accordingly to better incorporate TRIP TRAP design DNA. A decision was therefore made, stating that the raise and lower function requirement should be discarded in favour of the end results and to avoid unnecessary product complexity. This decision was based on the requirements specification and the appertaining research regarding ergonomics. Firstly, there are no direct requirements stating that any desk used for teleworking must contain a raise and lower function. It is, however, highly encouraged to use a desk with such functionality.

Secondly, due to the complexity involved when incorporating a raise and lower function, it was assessed that the needed manual raise and lower function would require too many components, whilst complicating the use of the function. It was, too, assessed that without an electrical engine the function would basically require much muscle power to work, hence putting unnecessary higher physical pressure on the user's body depending on the total weight of the end-product.

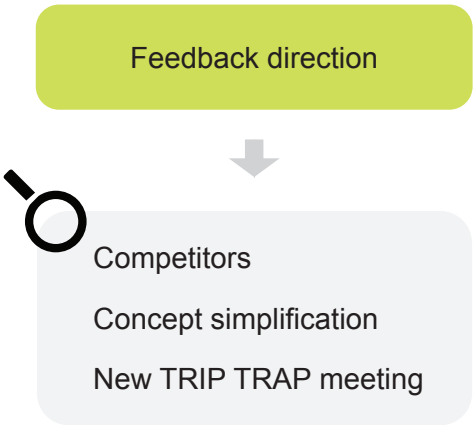


Illustration 58

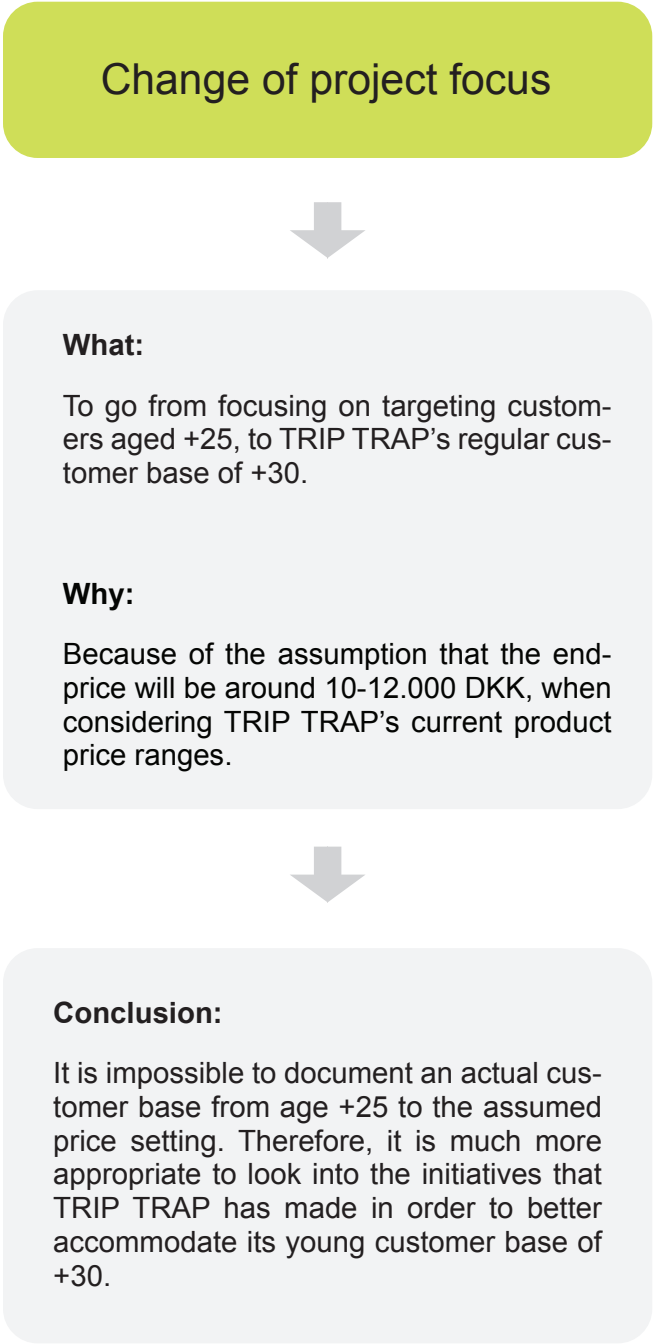


Illustration 59

Decision-making step 7

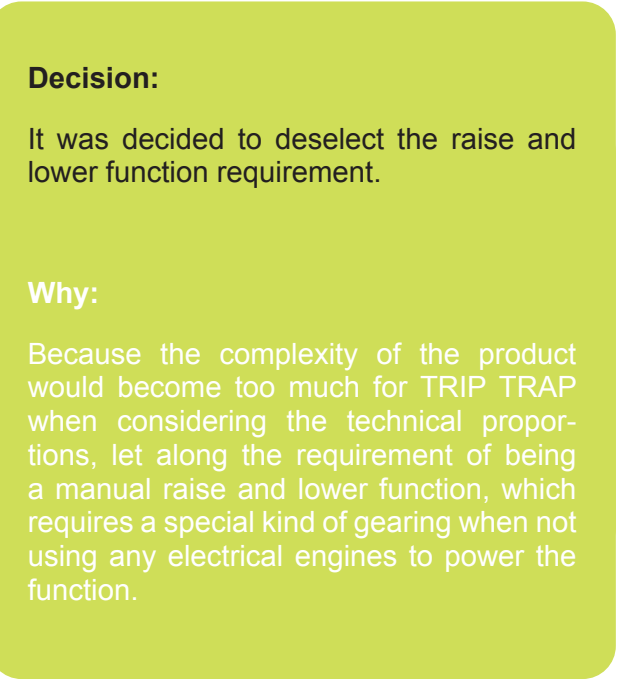


Illustration 60

Competitors

Based on the assumed price setting and the feedback gained at the second status meeting, a competitor sum-up research was initiated. The initial competitors of this project were found as HAY, MUUTO, and NOMESS at the early beginning of this project. These companies are the most known competitors to TRIP TRAP, as they also focus on wood materials in their product designs along with various colour and material mixes.

When looking at these as well as other competitors in and near the price range of 10-12.000 DKK, the characteristics among the desks are that very few of them feature additional user needs other than being ‘traditional’ flat desks with legs. As it seems, the competitors rely heavily on the Nordic design principle of “less is more”, where the designs focus more on the use of materials, material combinations, and how these two factors melt together with the overall design of the individual products.

When considering the markets circumstances, and while considering illustration 68, one quickly sees that many modern desks have high prices despite not having any extra features as such. The desk from TREKU consists of a storage opportunity concept in a minimalistic way. Yet, it also seemingly increase the price significantly.

Basically, most competitors are only competing in prices and not product features which gives an advantage on the market for TRIP TRAP if designed well. Although, despite including extra features in a product it does not automatically mean that the product becomes better. This research tells that having very limited features and minimalistic design still counts as a market entry, and that the pricing can follow depending on the product’s quality and design.

Notably, this research was initiated to learn more about the competition on the home office market, what product features and price ranges one can compete within, and to help inspire the design process additionally at the stage in which it’s narrowing down to concrete solutions. Moreover, this is not to say that competitors haven’t been in focus up until at this point in the project, rather, this is the sum-up research on what likely competitors TRIP TRAP will be competing against.

In addition, this research was also to find more design inspiration for how a home office desk can look like, and what design aspects the individual design firms focus on.

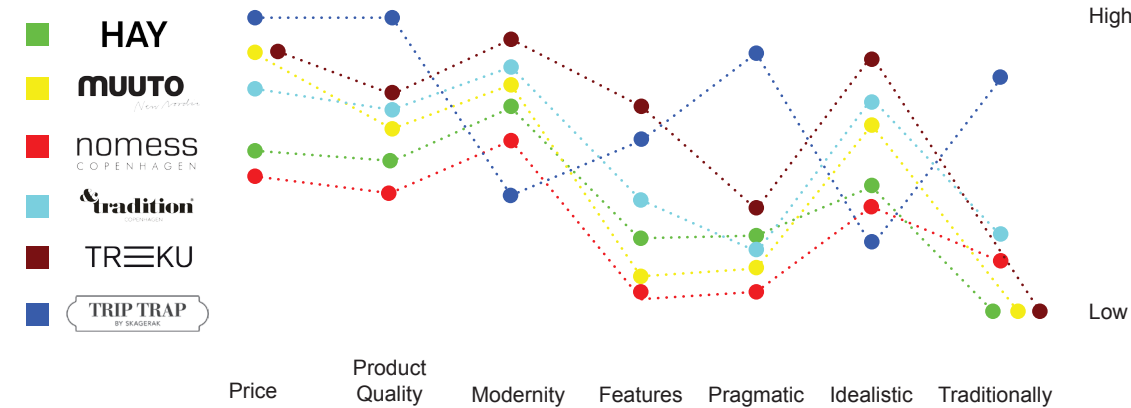


Illustration 67

&tradition
COPENHAGEN



Raft Table NA2 black
9.995,00 DKK



Raft Table NA2 smoked Oak
14.995,00 DKK

muuto
New Nordic



70/70 Table - Small
8.700,00 DKK



70/70 Table - Large
9.900,00 DKK

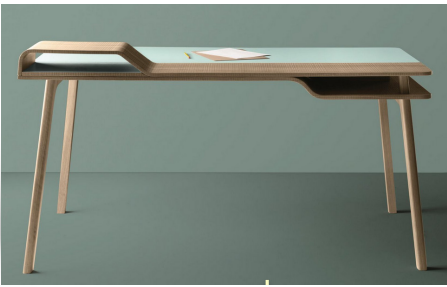
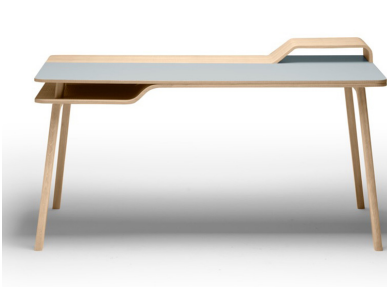


Split table
14.950,00 DKK



Keep Table
24.900,00 DKK

TREKU



Belharra desk - 14.350,00 DKK

nomess
COPENHAGEN



4-dots desk
7.900,00 DKK

HAY



Copenhagen desk - CPH190
6.999,00 DKK



Copenhagen desk - CPH30
10.999,00 DKK

Concept simplification

As a result of summing up a competitor re- search, a decision was made to choose one of the 5 final concepts and further develop that given concept to generate more concrete design concepts that are more wood-desk alike, hence more TRIP TRAP alike. Before this point, the requirement of the raise and lower function was deselected, leaving behind three requirements of storage opportunity, lighting solution, and cable management.

This was considered when picking a concept direction among the final 5 concepts. The chosen concept was concept Nr. 1 from the concept refinement process. A criterion for the selection was to choose the concept with the biggest potential of becoming a TRIP TRAP product while mentally visualising the concepts becoming yet more simple and less massive in their designs.

Ideally, this was to make a fast design-call, as time progressed fast and the project needed to go into its product detail phase as soon as it was possible.

The chosen concept became the template for a simplification process where the design was cut more directly to the bone, all while maintaining the three product requirements. Ultimately, this led to 9 very similar concepts as a final broadened scope of concept development. The intention was to decide which product direction to go with upon receiving feedback from a TRIP TRAP meeting.

Decision-making step 8

Decision:

It was decided to make a designer's call and choose a concept which showed the most potential in terms of design and further development.

Why:

Because the previous semi-final 5 concepts were assessed as being too massive and complicated in terms of design according to TRIP TRAP's design criteria and design DNA.

Illustration 69

Process steps

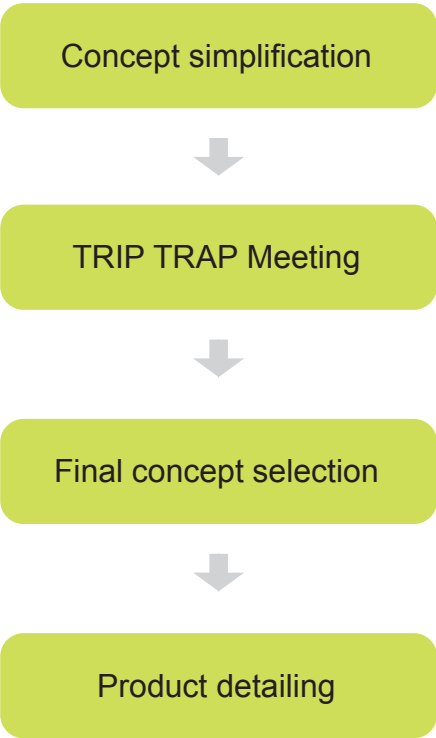
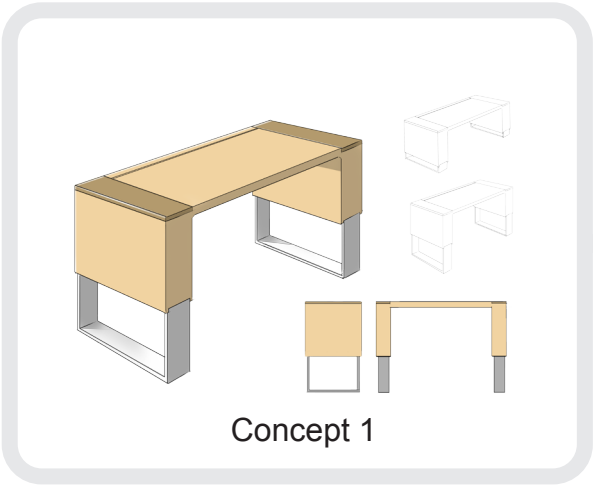


Illustration 70



Final product concepts

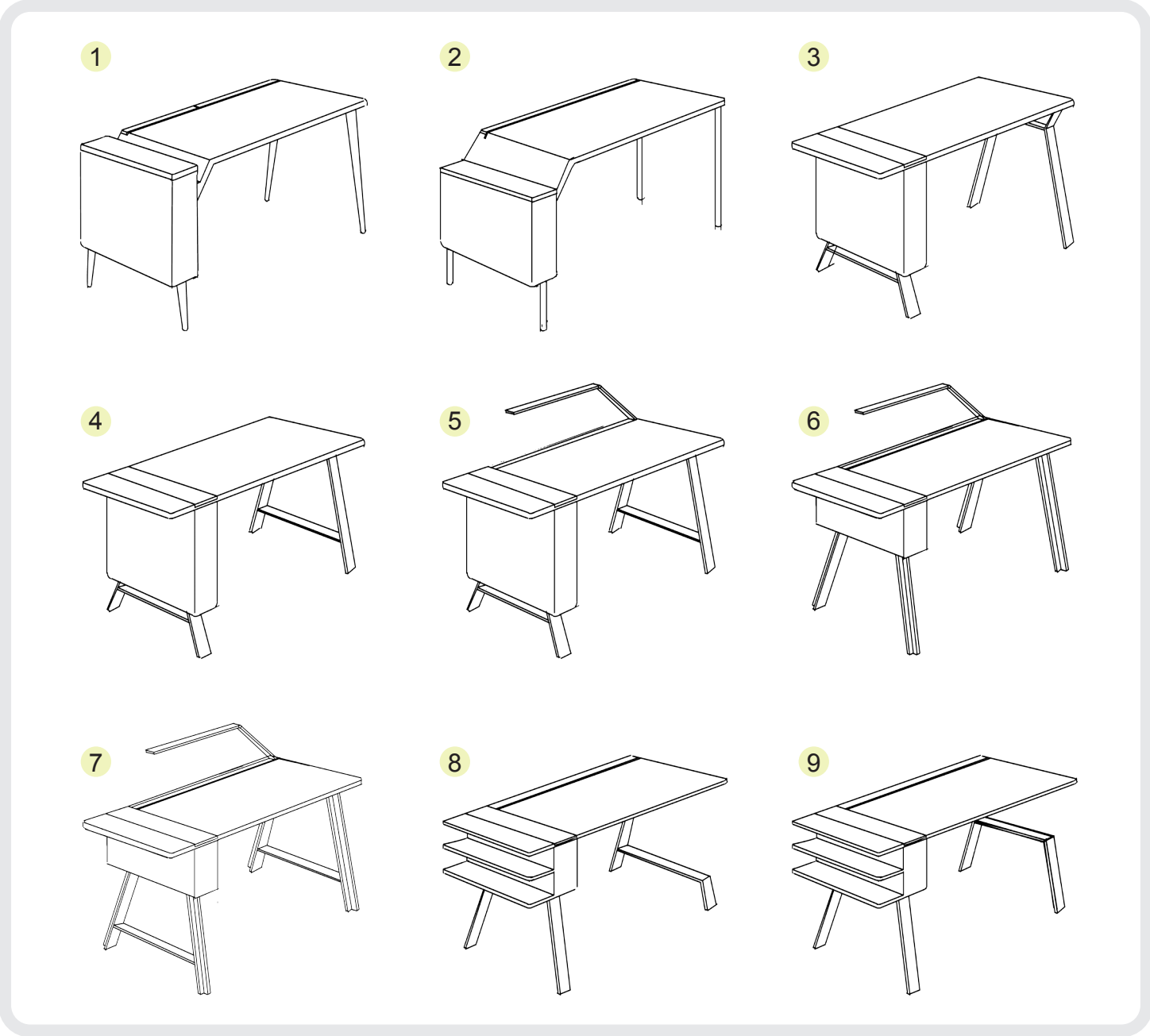


Illustration 71 - Achieved concepts through the simplification process

TRIP TRAP presentation

This section will describe the following TRIP TRAP meeting where the new final concepts, project direction, and a selection of final concept were discussed. Previously, the concept simplification process was to ensure more specified design concepts out from a TRIP TRAP perspective. Fortunately, this turned out to be an appropriate and needed step towards designing a TRIP TRAP home office desk. TRIP TRAP also assessed that the concepts from the concept refinement process were massive and quite complicated in terms of design and features.

Therefore, TRIP TRAP approved the process step of concept simplification, and was seemingly satisfied with the project direction. From there, the discussion went on what kind joints and assemblies the product should have to enhance the quality while emphasise it being a TRIP TRAP product.

In that connection it was mentioned that a design analysis of selected TRIP TRAP products was about to be initiated and certain design elements and material usage would be withdrawn from that to help designing the final product. This, and the connection to accommodating the company's younger customers aged +30.

Before the meeting, and based on a short revision of the TRIP TRAP assortment for 2014, it came to attention that the GEORGE product series aims at the company's young customers and that it in fact was quite popular considering that one of its products won the REDDOT design award for 2014.

It was therefore considered highly appropriate to analyse these two product series and to use relevant design elements in a final product design. Inevitably, this was also discussed at the meeting, where it was assessed as being highly appropriate by TRIP TRAP, too. In addition, while discussing design elements, use of materials and thereby material combinations were expressed as a new interesting perspective to the company and it would like to experiment with the latter to become more modern in terms of design.

At the end of the meeting, TRIP TRAP was asked to select one of the final concepts in which it saw potential. The chosen concept was in fact not far off from the project's choice of final concept, which therefore was considered straight forward to combine the two into an integrated solution.

Decision-making step 9

Decision:

It was decided to combine the two selected concepts to ensure a combination of both the project's as well as TRIP TRAP's design requirements.

Why:

Since this project is about designing a product for TRIP TRAP, it's also important to consider and use the feedback given from the company to ensure the right conditions for a realistic end-product.

Illustration 72

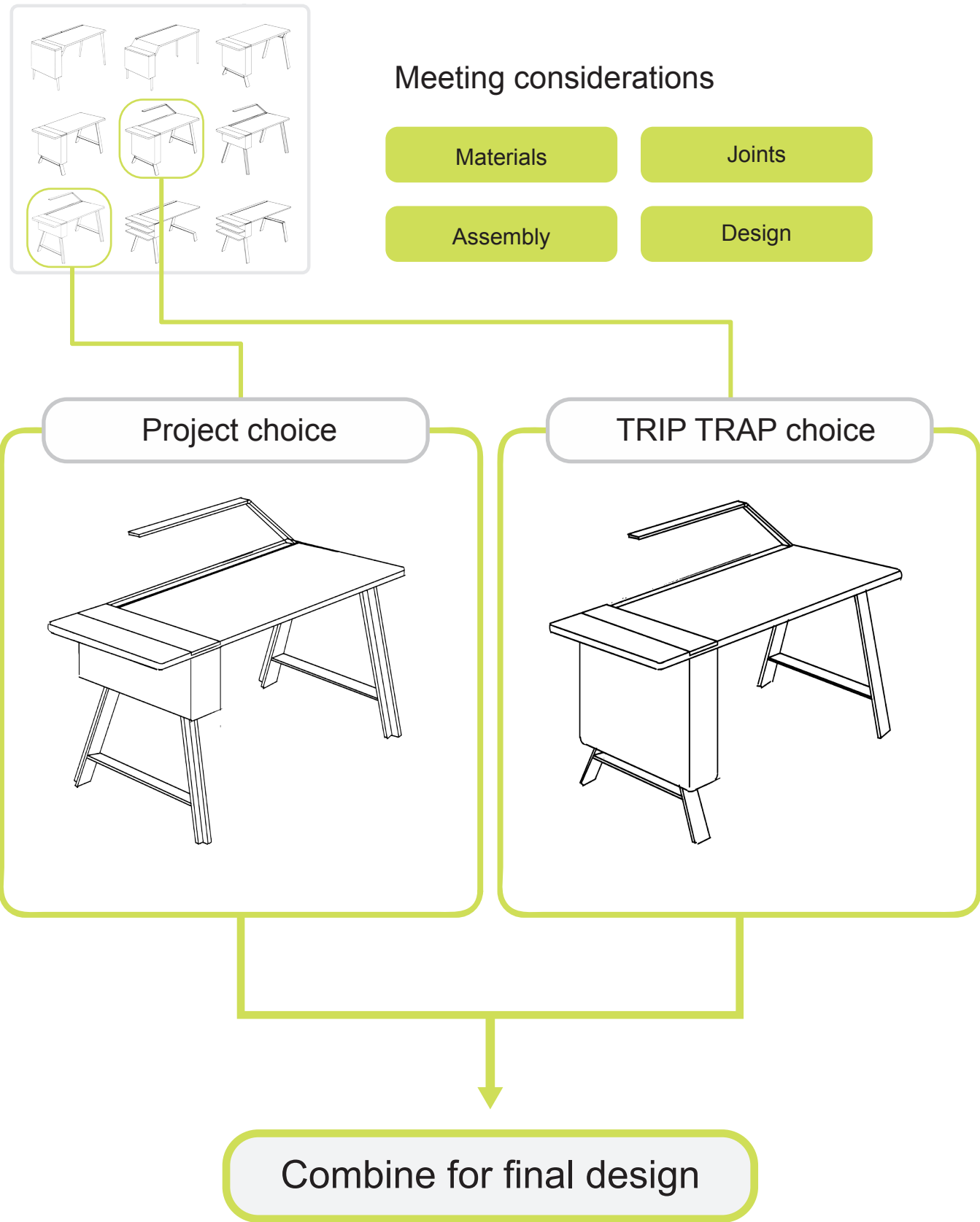


Illustration 73



PHASE 4 Product detailing

George design analysis

Based on previous decision making and the TRIP TRAP presentation meeting, a research about the TRIP TRAP GEORGE product series was made. From this particular research, new design elements were taken out to inspire and help designing the final product of this project to better accommodate TRIP TRAP's young customer base of +30. A form for validation can be seen through the series' Red dot 2014 award-winning stool for its innovative design.

Chosen design elements

- Special chamfered underside edge
- Simple joint and assembly in legs
- Large smooth roundings around edges and legs
- Use of material: FSC Oak

Illustration 74

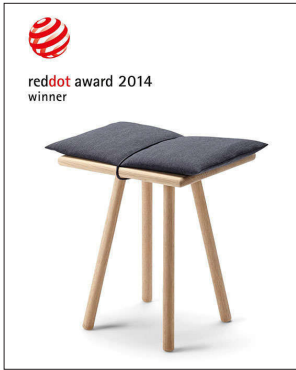


Illustration 75



Illustration 76

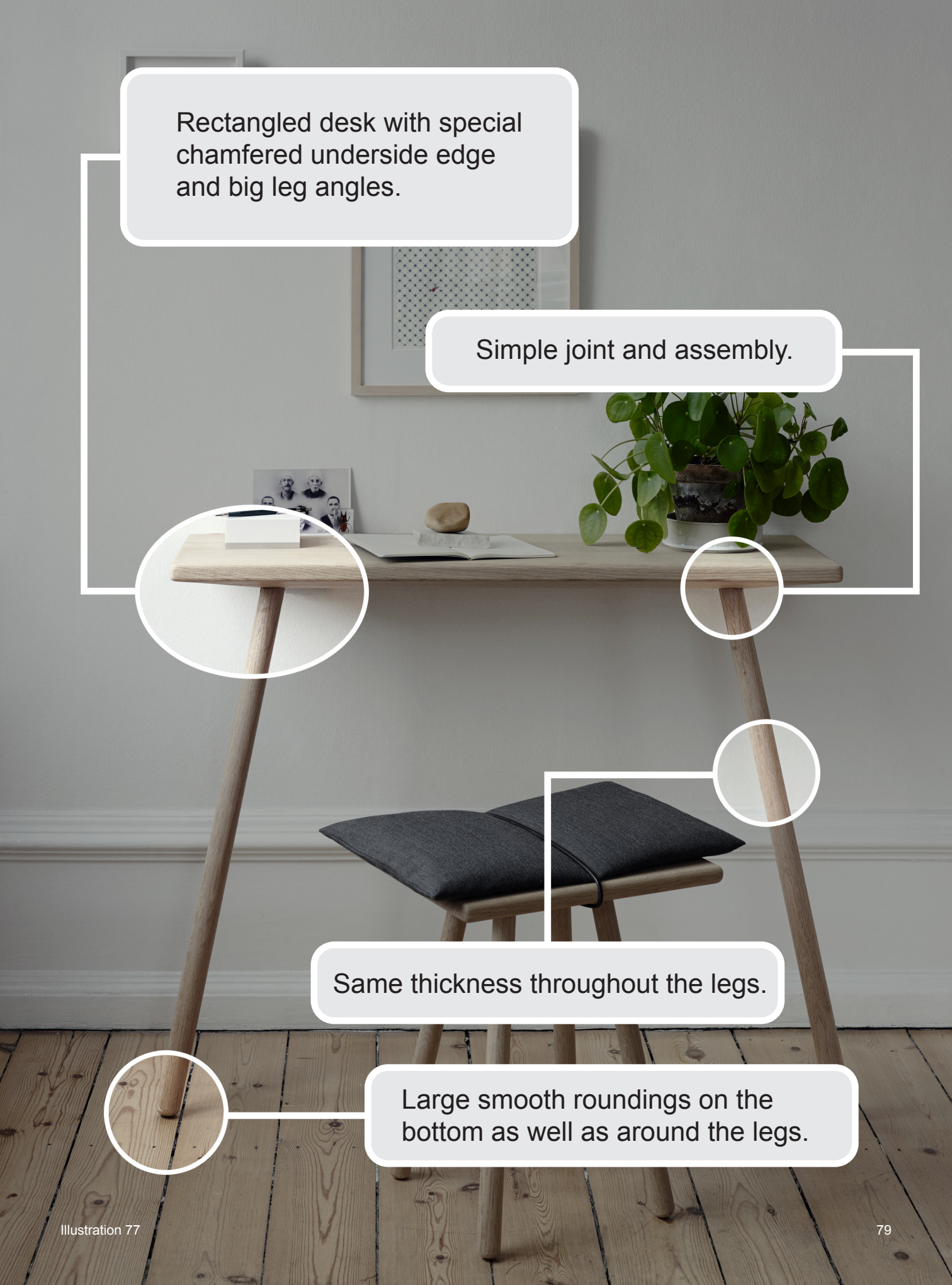


Illustration 77

Ocean design analysis

As a response to TRIP TRAP’s new desire of having new material combinations in their designs, a research was made about the company uses of materials, and which of these that could be interesting to combine in the final product design.

The ocean series first appeared on the market in 2005, where it tried to shift the image of the company at the time. TRIP TRAP was widely known for its use of wood species called teak in its products, which was quite a contrast to the new use of materials in the ocean series. The series focuses heavily on the use of stainless steel, plastic (ASA), while featuring other few materials in different versions of the ocean table top.

The interesting aspects of the Ocean product series for this project are not limited to the use of materials. The use of colours can also be considered an influential factor when designing a product, and the ocean series seem to display different modern colour combinations.

Chosen design elements

- Use of stainless steel with matt surfaces
- Material combinations
- Colour combinations, heavily inspired to incorporate a white colouring

Illustration 78



Illustration 79

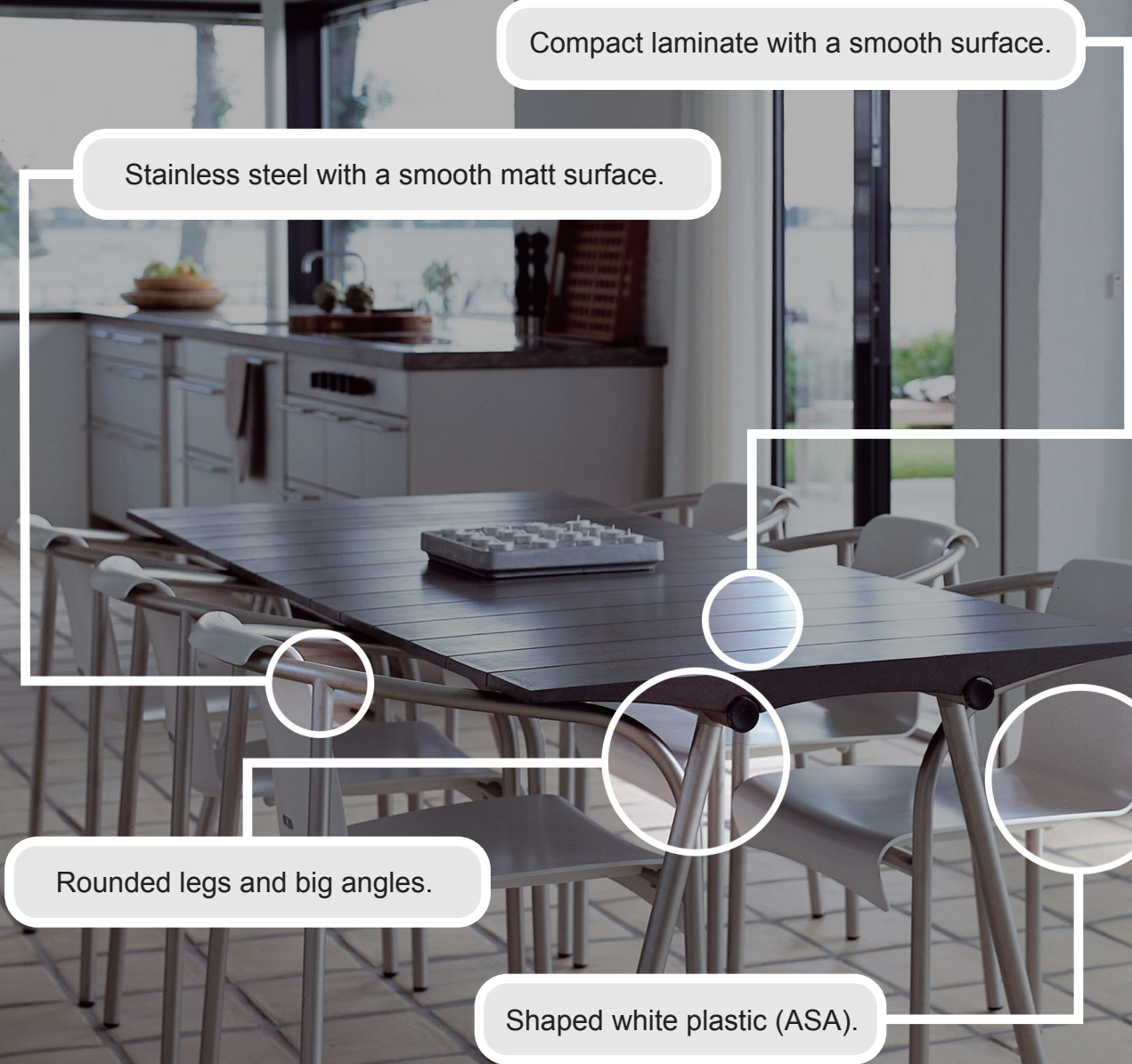
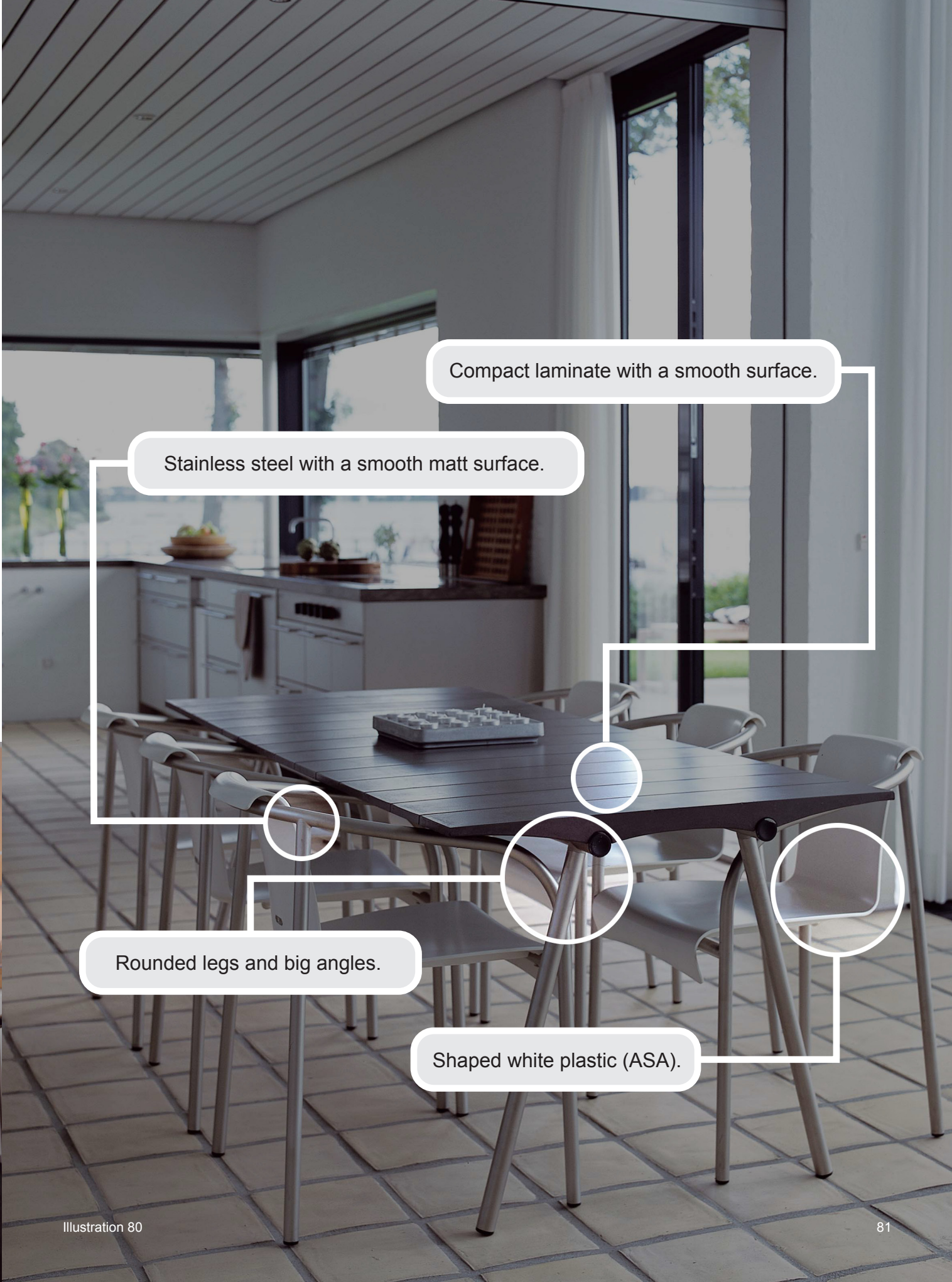


Illustration 80

Product detailing

This section and the following pages will describe the overall process of the product detailing phase. After having withdrawn the previously listed design elements from the two product series of TRIP TRAP, the detailing process was initiated.

Through this process, the three remaining requirements, cable management, storage opportunity, and lighting solution, went through additional iterations to become more complete and realistic. Moreover, a final TRIP TRAP presentation was set up to discuss final product aspects and issues to better detail the final product design.

The final presentation took place midway the detailing process, and gave useful details and considerations, which helped accommodating the needs of the company. In addition, based on the 3D renders and prototype modelling, the overall design of the desk was established as TRIP TRAP found the design quite satisfying. More specifically, the legs shape and design were assessed as being beautiful and highly usable for the final product design. On the next page, the legs which the company found interesting are highlighted.

However, there were uncertainties when it came to the technical details of the lamp and the storage box in the design. Ultimately, this led to additional decision making in the last part of the detailing phase to adjust the functionality of the product properly according to the project direction and design criteria.

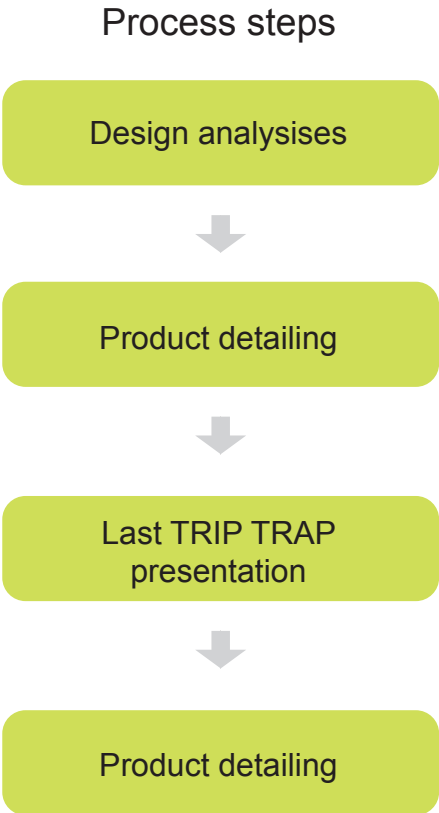


Illustration 81

Decision-making step 10

Decision:

A final design was chosen, which only affects the desk's overall design, and not the technical functionality of the lamp nor of the storage box.

Why:

The final design was chosen based on feedback gained at the last TRIP TRAP presentation, which fit the project direction better.

Illustration 82

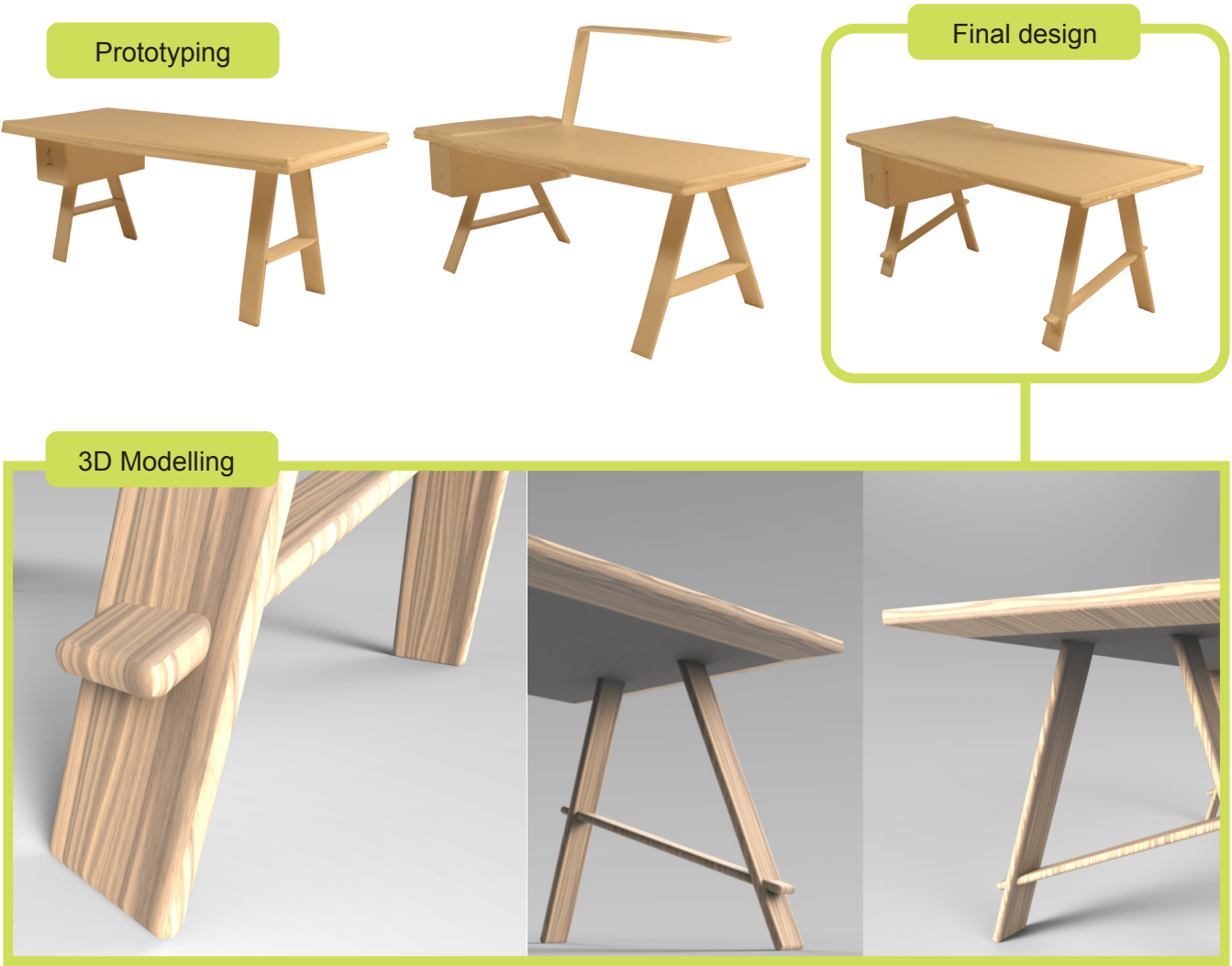
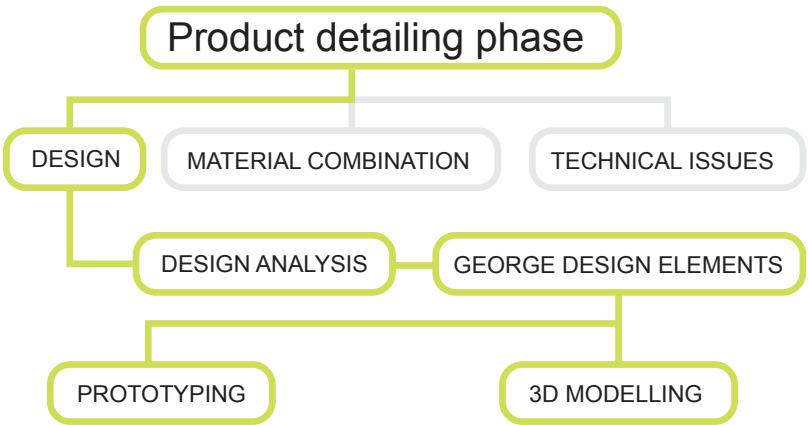
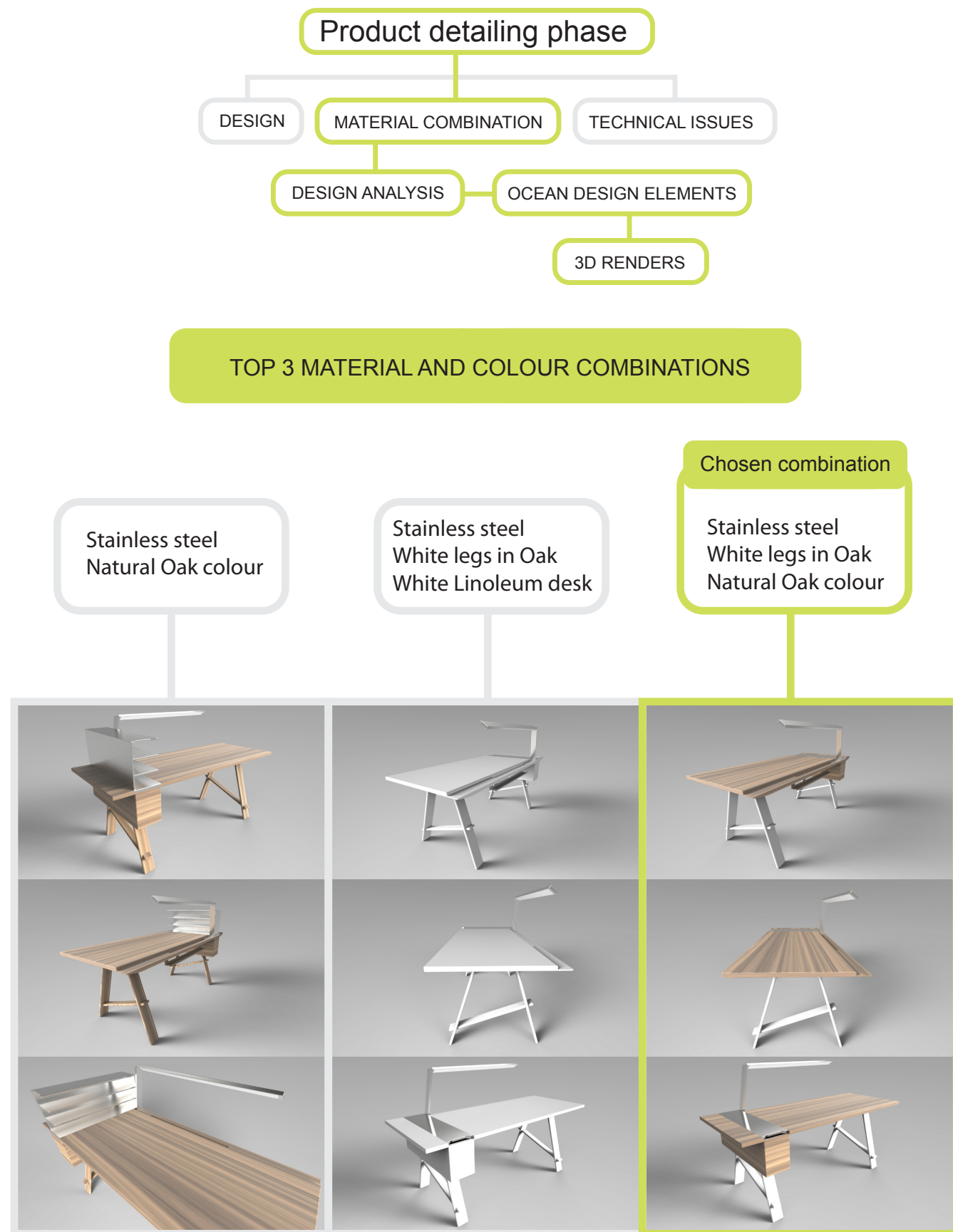


Illustration 83



The storage box

The original idea behind the storage box was an elevated system with shelves, giving a new and refreshing experience when it comes to desk designs. It was an attempt to create a more modern design, and to help the product and thereby company differentiate itself on the market.

However, in the technical design process, it became more and more clear that functionality had a large underlying complication due to its desired design. This led to research about what technical components which could help ensuring a rightful functionality of the product.

In the meantime, a requirements specification list was made to help evaluating the technical components and how well they would fulfil these requirements. It was required that the elevating shelf could lift its own weight along with additional weight of around 5 Kg.

The shelf was meant to carry regular home office accessories such as pen and paper. The functionality was thought as a pop-up system, in which the user pressed the shelf's top and it would bump itself up a notch, where the user could lift it to its max height. Of course, the idea was that the elevated system featured a servo mechanism helping the user lifting it.

Based on the latter, 4 mechanisms were found and assessed according to the functionality. These mechanisms were a turning wheel, a counter weight system, a spring system, and gas cylinders.

On the following pages the selection process will be highlighted and described.

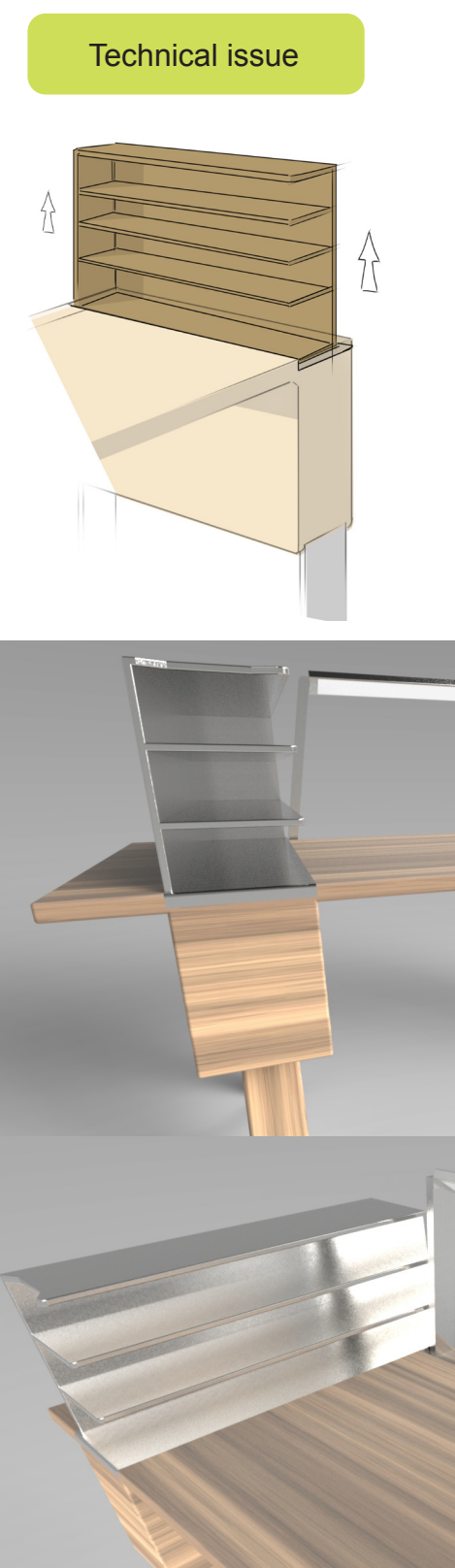
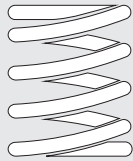


Illustration 85

Technical solution

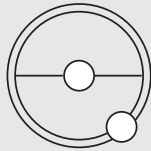
Underside springs



Pros and Cons

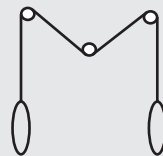
- + Can lift up the shelves with additional weight
- Requires much power to be put back into place
- Requires a locking mechanism to hold down the shelf system
- Requires a railsystem to control the speed of the up-movement

Turning wheel



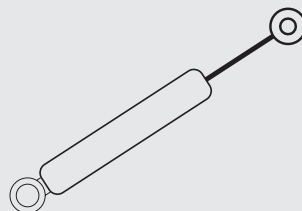
- + Can lift up the shelves with additional weight
- Requires inside railsystem which may enlarge the design
- Does not fit with the design DNA of TRIP TRAP

Counterweight system

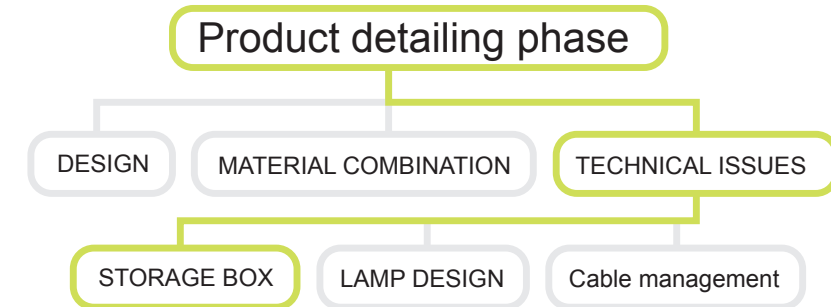


- + Can lift up the shelves with additional weight
- Requires inside railsystem which may enlarge the design
- The product will become extremely heavy and thereby not fit the criteria of TRIP TRAP

Gas cylinder



- + Can lift up the shelves with additional weight
- Requires either little space, to lay horizontally, but cannot go into an upward direction by itself
- Or requires much more space to stand vertically to actually work and thereby enlarge the storage box unnecessarily



As a result of evaluating the conditions for incorporating the listed technical solutions, a big concern emerged towards the wanted functionality of the storage box. Although it was seen as a new interesting feature, it would in the end either make the final design too big or the functionality would not have a servo mechanism.

The technical solution which showed most potential was the gas cylinder. This kind of product is used in many different products including furniture and car doors for baggage. The functionality in it is smooth and has two positions in which it can maintain while carrying weight without difficulties. All of this whilst being easily moveable by the user.

Unfortunately, the downside to the gas cylinder is that it has to be put in an upwards position to enable the servo mechanism, helping the user lifting the shelf system. While an idea was to position the gas cylinders in an horizontal line whilst making them capable of turning upwards, a need would then be for the user to lift the shelf system the first stretch. This, however, was considered inappropriate as it would put unnecessary strain on the user's muscles and back.

In the end, after assessing the found technical solutions, a decision was made to deselect the wanted elevating functionality of the storage box. Instead, the design was turned over to a simple lid covering the storage box.

Decision-making step 11

Decision:

The functionality of the storage box was deselected and turned into a simple storage box with a covering lid.

Why:

Because the assessed technical solutions turned out be inadequate of providing the wanted functionality without over-complicating the final design of the desk and storage box.

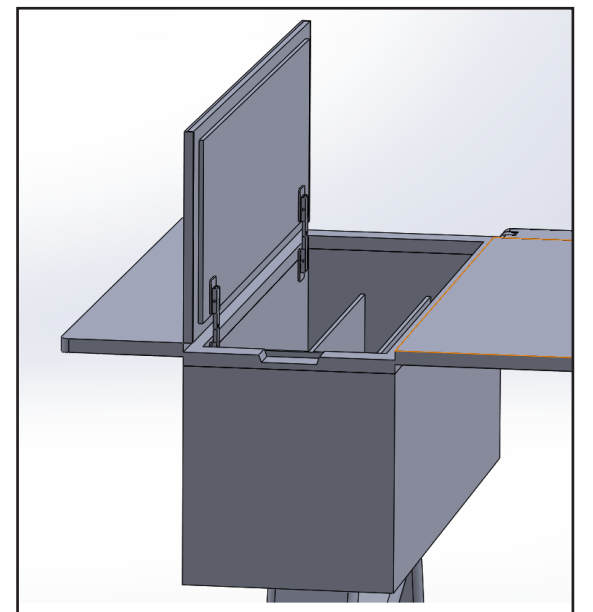


Illustration 87

Cable holder and the lamp

As previously mentioned in the product detailing introduction, there was a concern in connection to the functionality and technicality of the lamp design. The first version of the lamp was considerably long (around over 1000 mm long in its top part), which later was assessed as being too massive and therefore led to a decision to make it shorter and lighter.

Its use of material was set to solid stainless steel as an initial choice, but this was changed to oak covered with 1 mm stainless steel to still get the nice line of metal along the desk side and to basically make it lighter as well.

In addition, the cable management solution concept received little feedback from the last TRIP TRAP presentation, stating that the cable holder would be much easier and perhaps better to create out from stainless steel. This was so, as it was assessed that the price for the needed wood and processing of the cable holder design would be much higher when comparing to the latter, and that the construction wasn't appropriate.

With all of this in mind, while considering the technicality of the lamp, new design iterations were initiated to figure out how the final lamp design should be like.

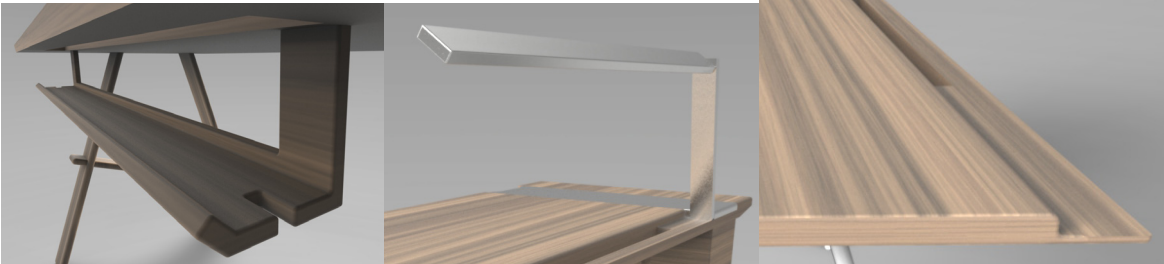


Illustration 89

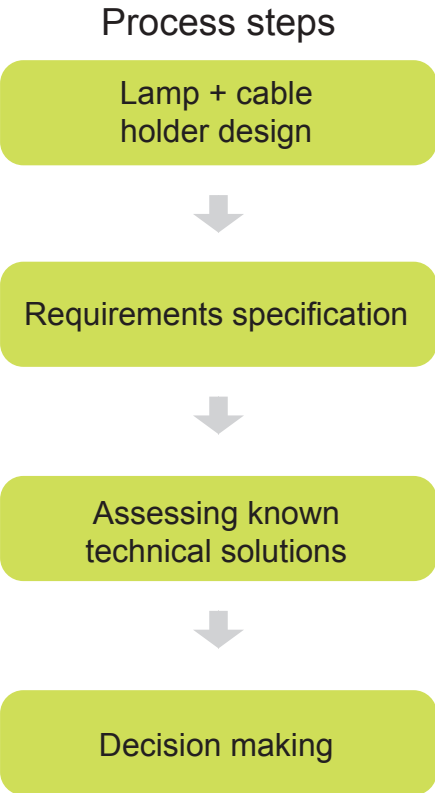
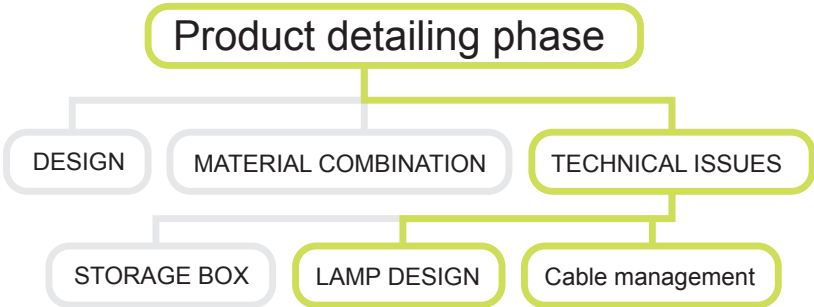


Illustration 88



As a result of further iteration and decision making, the final version of the lamp and cable holder design was merged into an integrated solution that is to be mounted behind the desk.

Through the merged design, it became clearer how the functionality and the final design could be obtained in the lamp. Based on previous assessment of the technical solutions, it was assessed that the gas cylinder would make an excellent fit to make the raise and lower function work in the lamp design while taking advantage of the cable holder.

Through here, it was possible to use the design to create an angle for the gas cylinder to ensure a upwards lift direction. In this way, the user won't have to lift all the weight of the lamp him/her-self. In addition, through research, it was clarified that a gas cylinder can be considerably small while still being packed with enough lifting power to lift several Kg.

The choice of the gas cylinder size is determined on the weight calculations shown in appendix 3.

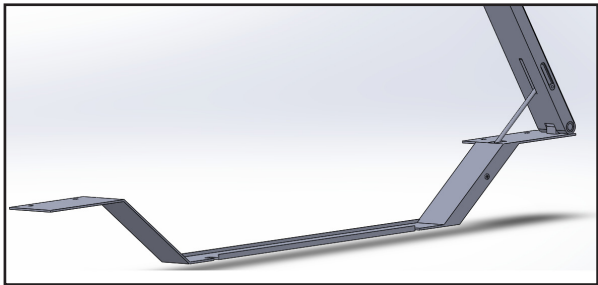


Illustration 90

Decision-making step 12

Decision:

A decision was made to include the gas cylinder in the lamp design to gain the wanted raise and lower function.

Why:

The functionality of the lamp was considered very important, while the gas cylinder was considered an appropriate solution for the raise and lower function in the lamp design.

Illustration 91

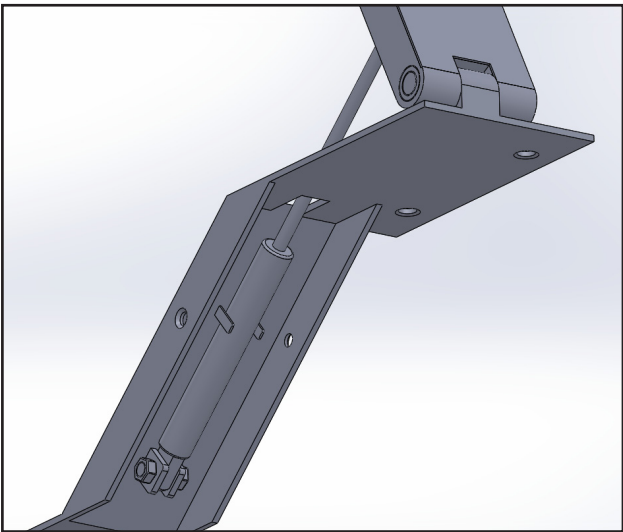


Illustration 92

Technical detailing of the lamp

Another design issue in connection to the lamp’s design was the upper part construction. The initial wanted functionality was a rotatable lamp head, which could be adjusted to point in the direction of the user. It was considered a neat and useful feature to include in the design, and it was thought to help lighting up the surface of the desk.

This particular design, however, was hard to ensure without overusing additional technical solutions, which most likely in the end would contradict the design criteria and DNA of TRIP TRAP. It was quickly realized that the rotatable function would be impossible and inappropriate in a final design as it would require too much complexity before working. Therefore, it was deselected as it was assessed that the wanted functionality was superficial and that the lamp would be capable of lighting the work desk in a sufficient way.

Consequently, this led to new design iterations constantly trying to make the upper part of the lamp self-supporting to better accommodate the criteria of TRIP TRAP. The result came out as a considerably elegant solution with inside surfaces that restrict the movement of the upper part to a such degree that it’s horizontal when the lamp stands up.

Decision-making step 13

Decision:

A decision was made to deselect the side-way rotatable function in the upper part of the lamp.

Why:

It was assessed as being superficial, while over complicating the final design to a degree that contradicts the design criteria of TRIP TRAP.

Illustration 93

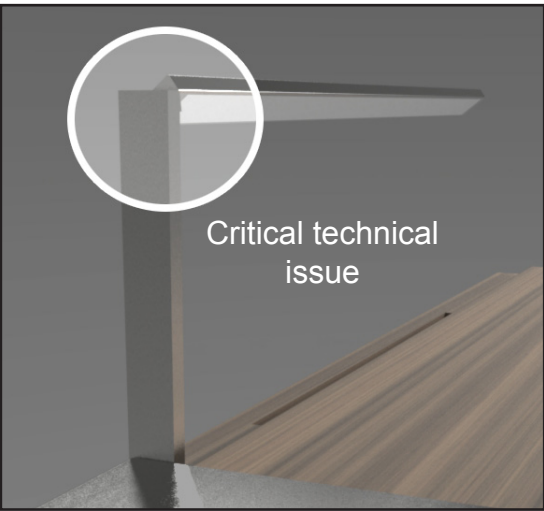


Illustration 94

Process steps

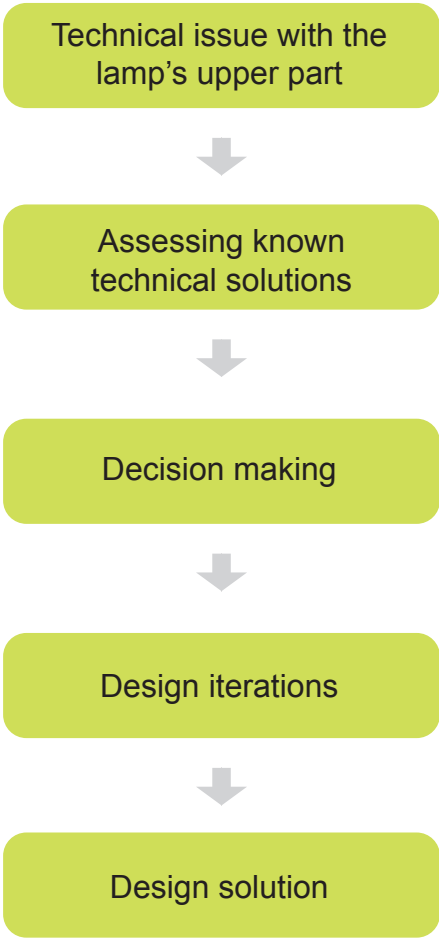


Illustration 95

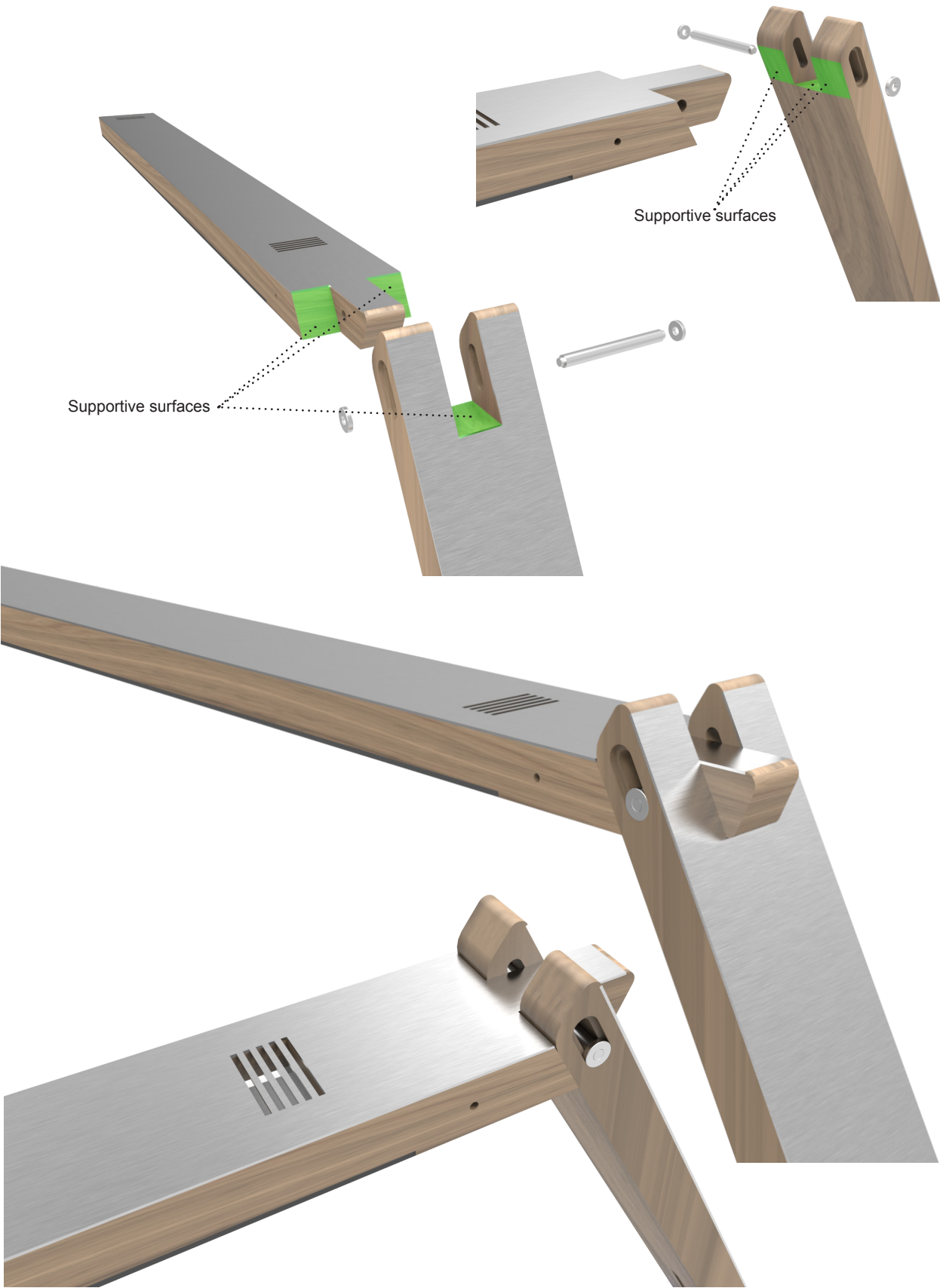


Illustration 96 - Upper part of the lamp

The electrical components of the lamp consists of 2 LED stripes with 6 small LED lights each. These stripes have a thin heating plate installed on their bottom side (facing upwards), which directs the heat to the two vents of the lamp design. Through research it has come to attention that it is advised to have light equal to 500 lux when working at a desk, which one LED stripe alone isn't enough to generate.

However, it's possible to achieve the desired 500 lux with two combined LED stripes, which also splits the needed electricity over more LED lights. This will make the LED lights generate less heat each hence creating more optimal conditions for cooling because of the heat being divided over additional areas.

A simple matt plastic surface is designed to enclose the underside of the lamp and to ensure that no sharp light can bother the user. Here, a focus has been to make the construction in such way that light come out from the inside edge of the lamp to better reach the work desk surface.

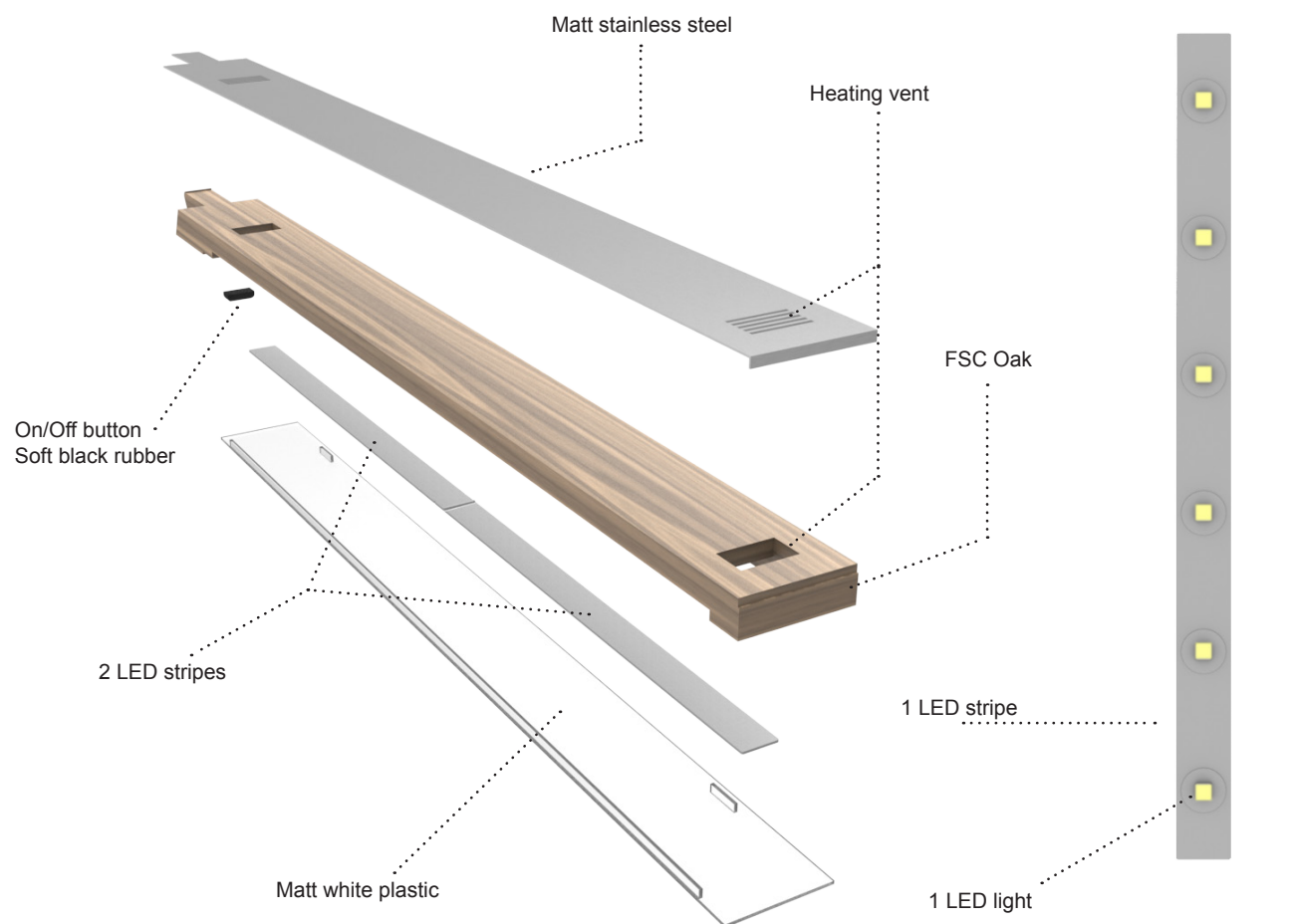


Illustration 97

Final design foundation

This section will showcase the final version of the requirements specifications for the final design, and the final version of the problem statement. These are displayed to sum up the final standing point for this project.

Through the design process and product development, several requirements have been removed from the initial specifications list. This is caused by decisions made throughout of the project process, assessing the necessity of the individual requirements and technical feasibility.

Combined with the final version of the problem statement, these criteria are to help evaluating the final product design based on how well the product fulfil these criteria.

Process steps

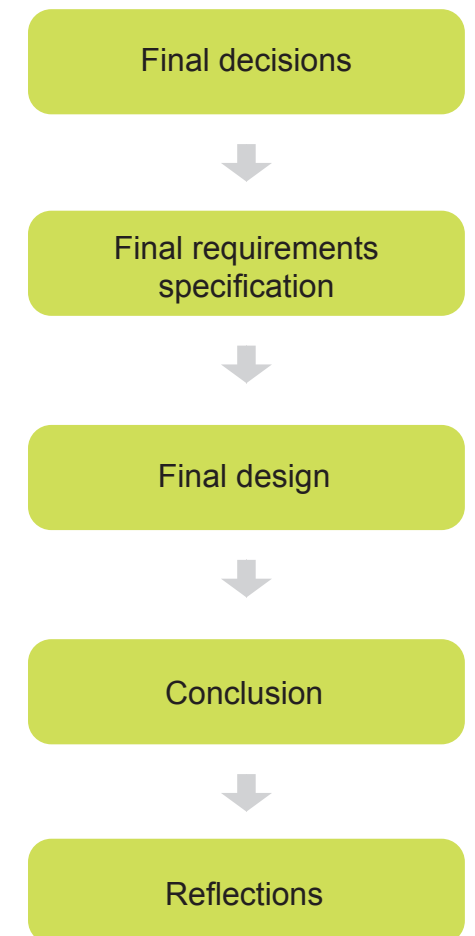


Illustration 99

Problem statement

How can a TRIP TRAP home office desk design; that accommodates teleworking, maintains a connection to the company's current designs and thereby customer base, uses inspiring design elements from the GEORGE and OCEAN product series to better accommodate young customers aged +30, while featuring a storage box, lamp, and cable holder, help TRIP TRAP DENMARK A/S with expanding into the office furniture market?

Illustration 98

Final requirements specification

TELEWORKING REQUIREMENTS

Must accommodate teleworking that last at least 2 hours per day, or 1 day per week, by the following requirements:

- Must be a desk consisting of at least one table top and supporting legs that is meant to be placed in homes serving as a home office item, which accommodates teleworking.
- Must have a surface with minimal reflections, so that the user will not be blinded and thereby distracted when using the desk.
- Must accommodate work in connection to use of video display terminals, by having enough desk depth (the distance from the user’s front to the other side of the desk) to accommodate a viewing depth of no less than 40 cm from the user’s eyes to the video display terminal.

Hereunder ergonomic requirements, the design proposal must accommodate:

Seated work situations with:

- A minimum height for thighs of 68 cm
- A minimum depth for knees of 43 cm
- A minimum width for thighs of 50 cm
- A minimum depth at foot level of 60 cm

The desk must have a minimum height of 72 cm

USER NEEDS REQUIREMENTS

The following requirements are based of the answered gained by the questionnaire created on surveymonkey.com

The design proposal must accommodate user needs by the following requirements:

- Must accommodate electric cables management in such way that cables aren’t directed directly over the active work surface of the user.
- Must offer storage opportunities for documents, and other home office accessories such as pen and paper.
- Must offer a build in lighting solution that helps lighting up the active work surfaces for the user to see.
- Must offer a lighting solution capable of producing 500 lux.
- Must be able to stand up on its own feet, without any help from a wall or other objects, hence being capable of standing up out in open space on a flat flooring.

Final product design



Illustration 100

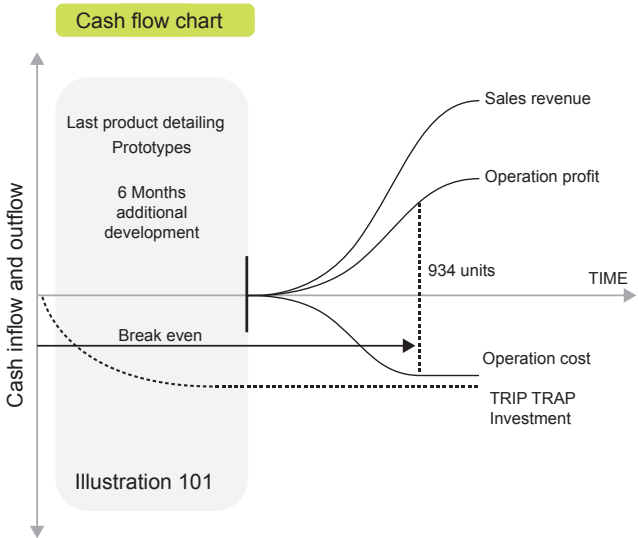
Pricing of the product

TRIP TRAP does not wish to reveal its confidential information in regards to its production, materials and supplier. It has, however, provided an indicative price based on the final product design and material use.

The pricing of the final product depends on the production cost, materials price, processing, work hours, location of production, and operation profit. TRIP TRAP has its own production line in Thailand, where materials and the like are being delivered by itself as well as other nearby countries in East Asia to be assembled.

In order to set an example of what could be the business case of this product, assumptions have been made about how much TRIP TRAP is going to spend in terms of operation cost and what it will gain in operation profit. Fortunately, it has been informed that TRIP TRAP invests in its own productions, which therefore eliminates an uncertainty regarding the initiative of the production.

The estimation of operation cost for the production has been set to 40 %, where the operation profit is set to 57 % to cover the expenses of cost operation, and a reasonable profit of 17%. Moreover, a fixed royalty rate at 3% has been set to pay off this project's work, which has been assessed as being a fair price.

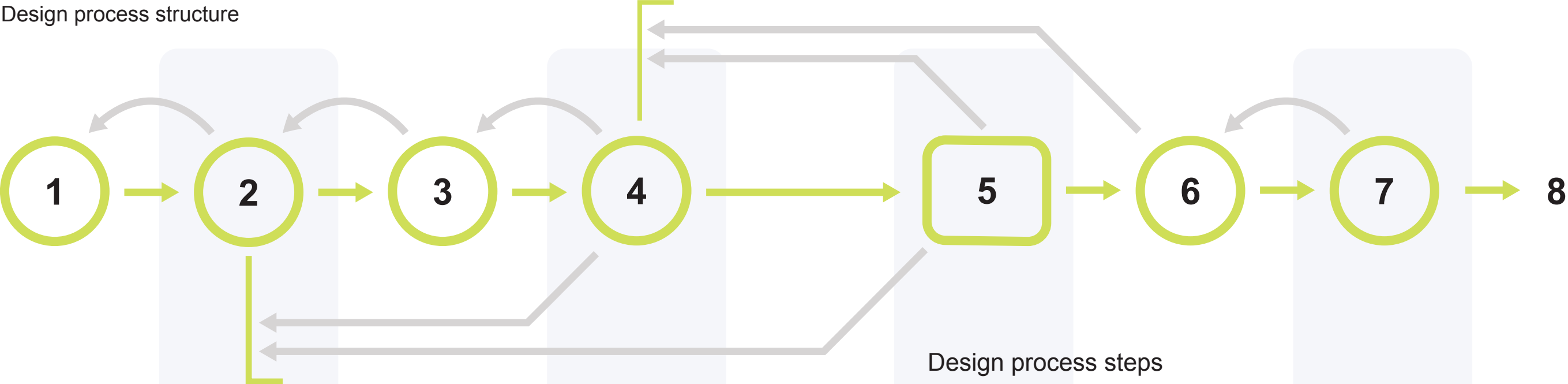


Per unit		
Indicative price	16.000	DKK
Before VAT (-20%)	12.800	DKK
Estimated cost operations (40%)	5.120	DKK
Estimated operation profit (57%)	7.296	DKK
3% Royalty (designer)	384	DKK

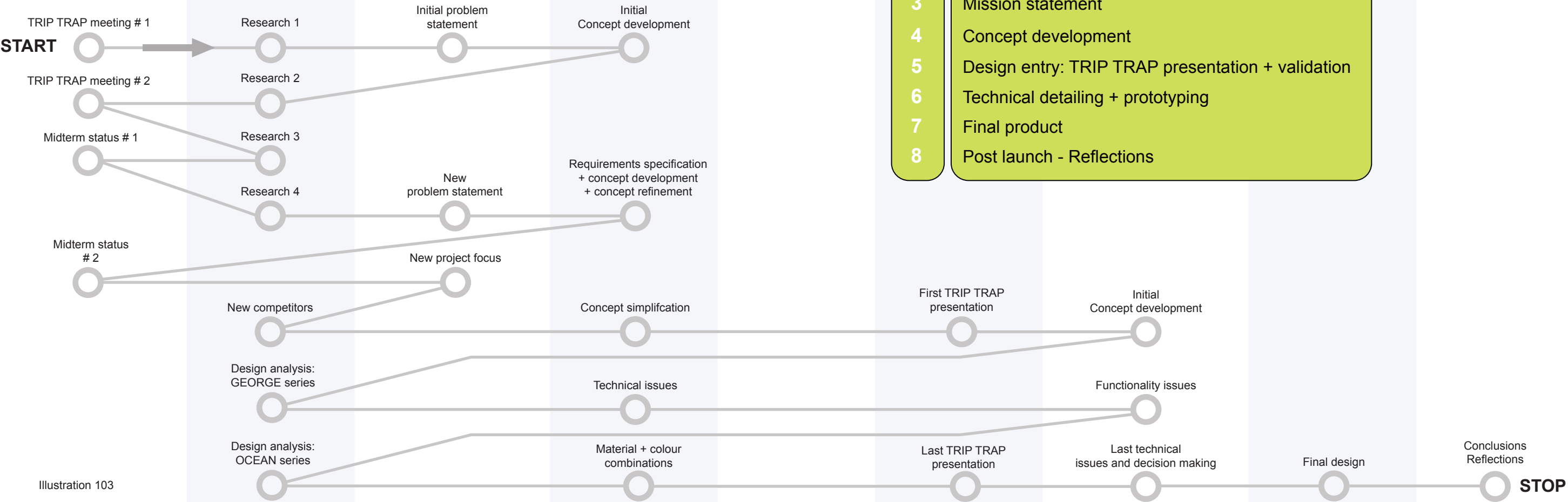
Targeted market potential 1186 units		
Total sales revenue (Before VAT)	15.180.800	DKK
Total estimated operation cost	6.072.320	DKK
Total estimated operation profit	8.349.440	DKK
Total company profit	2.580.736	DKK
Total designer profit	455.424	DKK

Illustration 102

Design process structure



Design process tracing



Design process steps

- | | |
|---|---|
| 1 | Alignment |
| 2 | Research |
| 3 | Mission statement |
| 4 | Concept development |
| 5 | Design entry: TRIP TRAP presentation + validation |
| 6 | Technical detailing + prototyping |
| 7 | Final product |
| 8 | Post launch - Reflections |

Conclusion

Out from systematic approaches in terms of concept development, concept selection, design evaluation, technical evaluation, and requirements specification, it is possible to conclude that this project has undergone a successful product development process.

Through structured assessments, various decisions have been made appropriately according to the design process, enabling an adequate narrowing process of the project scope while ensuring rightful tools to help designing the end-product. The process of this project has had TRIP TRAP's design criteria as a mind-set through the entire process, focusing on creating a realistic end-result out from both the project's as well as the company's expectations.

Furthermore, the process of the project has been using the status sessions and TRIP TRAP meetings throughout the project appropriately to help re-evaluating the project and design direction. Through the feedback gained, important decisions were properly made thus contributing to a more structured design approach.

It is possible to conclude that an appropriate design solution for TRIP TRAP has been designed, which contains useful features that fulfil the acquired user needs while helping to differentiate itself on the home office market. The product is a home office desk which accommodates teleworking by fulfilling required ergonomics, ensuring proper use-conditions for the users. In addition, the desk offers personal design values inspired by TRIP TRAP's two product series called GEROGE and OCEAN.

Through these elements, it has been assessed that the end-product will be better equipped to accommodate the company's young customers aged +30, while offering additional sublime design and functionality in quality by TRIP TRAP standards. Moreover, the design elements ensure a connection to the company's existing products hence creating a connection to its existing customer bases of both young as well as old customers.

Out from a business perspective, it has been assessed that the made assumptions lie within reasonable boundaries when considering only indicative prices have been provided by TRIP TRAP due to its wish of maintaining its confidential information regarding production. When comparing the pricing of the product to the found competitors, it is possible to conclude that the product lies within a reasonable price range while featuring additional functionalities.

Reflections

Despite undergoing a clearly systematic approach to the project, the very foundation of creating this home office desk for TRIP TRAP has been exceedingly critical, especially at the very beginning of the project. This is to state that the acquisition of verifiable user needs and market potential has been an enormous challenge while trying to make it fit a project worthy of the Industrial Design master's thesis program.

This is due to the fact that this project faced an extremely red ocean with very little tangible details to base a project out from. On top of that, collaborating with a company such as TRIP TRAP puts up very strict limitations as to how much one can innovate when trying to be realistic due to its design DNA and criteria, but also due to its very, very wide customer base that can describe nearly everyone.

Trying to locate a niche market for TRIP TRAP is practically impossible as the company does not desire to accommodate what it considers special needs (such as handicap considerations, etc.). This is so as it considers simplicity a core value, and that it has a brand value that stands for expensive but sublime quality, giving the buyers a sort of exclusive feeling.

The good thing was that the process came to a point of successfully gaining usable user needs for systematic concept and product development. The questionable circumstances, however, are that the questionnaire received unspecific user needs, which then were turned into reasonable demands to help designing.

For instance, when considering the lighting solution requirement, the original answer was simple replies of "light", as they require in connection to a home office. Therefore, the solution didn't have to be incorporated into the desk, but be an external factor which the

users take care of themselves. This is not to devalue the end-design, but to highlight the challenging boundaries when it comes to such a subjective based design assignment as it is when designing such furniture.

In this respect, it becomes a task of designing **to** and not **for** the users. When designing for a user or a customer, it's a process of closely studying the circumstances which the user/customer resides within and to see additional aspects that are not else explained by the user/customer. In this way, new and perhaps more tangible needs can be discovered that ultimately lead to much more specific and user friendly products.

In hindsight, a good perspective would have been to establish user tests to evaluate how users use a desk when there are different obstacles, forcing the users to rethink and readjusting their movements. Perhaps, this could have led to interesting problematics which TRIP TRAP could accommodate in a simple yet powerful way.

Another approach could have been to design various object volumes out from the acquired answers to simulate various concept solutions, and to have these concepts combined in different ways and tested by users to see how the concepts relate in terms of the pros and cons.

However, when considering the following design approach after the acquisition of the user needs, the project slowly but steadily formed a valid design foundation. By using a consistent approach of systematics, it ultimately led to a coherent product design which reflects TRIP TRAP's design DNA and efficient decision making throughout the design process.

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Illustrations

All illustrations are made by the undersigned, with the exceptions of:

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The following illustrations and pictures are either made out from or used directly from TRIP TRAP’s picture archive at http://www.triptrap.dk/om-os/presse/billedarkiv:

2 full pages picture, page 8 - 9
Illustration 3-4, 76-77, 79-80,