

Hi, this is a web page screenshot.
You can visit the page and the interactive prototype via the link:
<https://www.yuuliu.com/master-thesis>

Design Guidelines That Improve The Online Retail Experience Of Smart Lighting Products

Master project collaborated with Philips Hue
M.S. Design for Interaction
Yu Liu

Delft University of Technology
Faculty of Industrial Design Engineering

Supervised by
Maarten Wijnjes(Chair)
Christina Schneegeass(Mentor)
Marisol Velasco Montañez(Company Mentor)

Contact
Yu Liu

© Yu Liu, 2023
All rights reserved. No part of this report may be reproduced or transmitted in any form or by any means without permission of the author

Why Research On The Online Retailing Page?

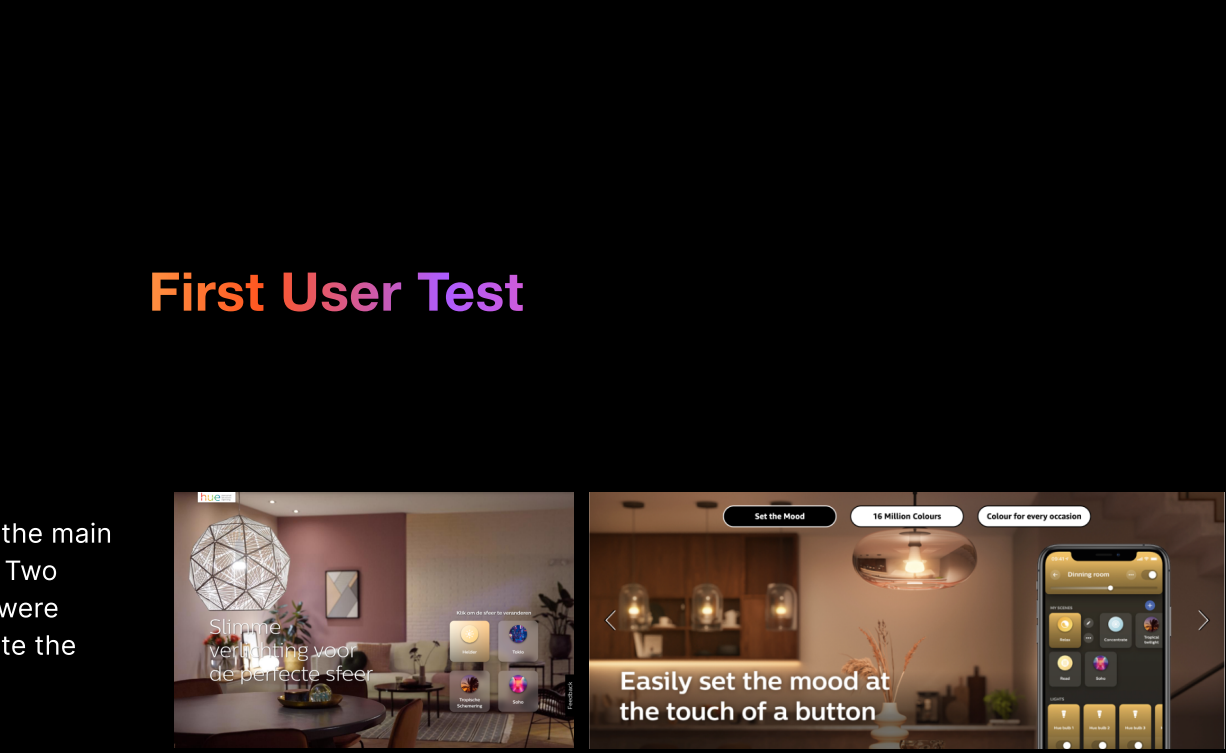
Increasing popularity of e-commerce
The Internet plays a vital role in revolutionizing the commercial world, people get used to gathering information and making purchases on the Internet.

The Challenge Of Presenting Lighting Products Online

- Less range of colors**
In reality, human eyes can adapt to different lighting conditions, allowing us to perceive details in both bright and dark areas of a scene. However, pictures on the Internet, especially those displayed on screens, have **limitations in reproducing the full dynamic range of the original scene.**
- loses the perception of space**
Also, since it is a two-dimensional space, the user **loses the perception of space.**
- Low color accuracy**
The pictures on the internet can be influenced by various factors, including the display device, image resolutions, and rendering techniques.

Project Approach

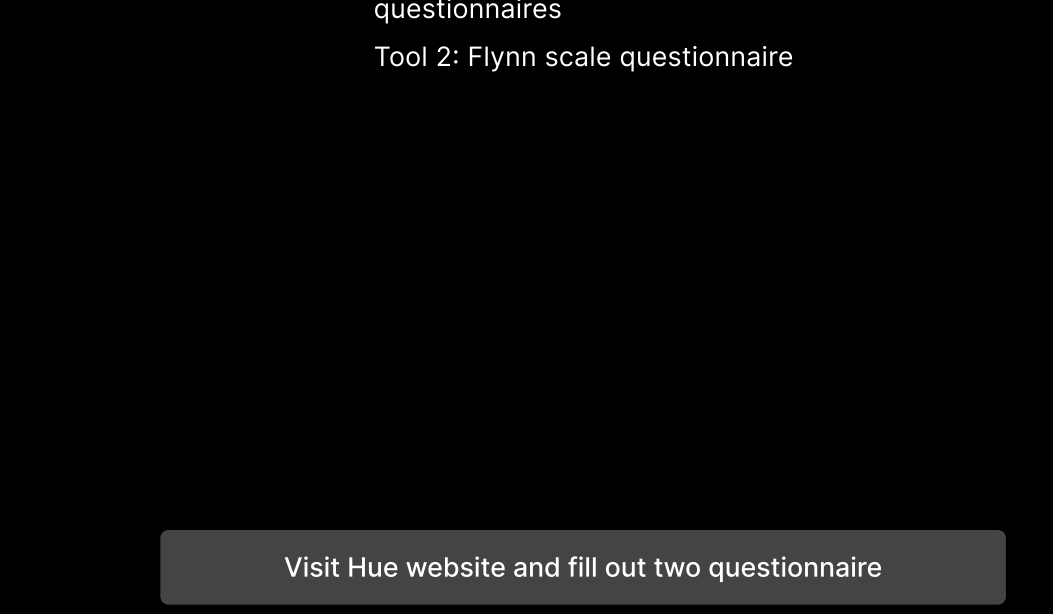
This project followed the design development process proposed by Elizabeth & Pieter Jan Stappers(2016). The first part of the report is about conducting user research and testing to gain insights in the fuzzy front end. This involves techniques such as interviews, questionnaires, user observations, and usability testing. Based on the preferences, motivations, and pain points related to online shopping, guidelines will be suggested and used for designing the demo in the later traditional design development process.



First User Test

Research Objects

The official website and Amazon store are the main entrance for Philips Hue online purchasers Two design elements from these two websites were chosen for the study, and they communicate the same message with different lighting and interactions: users can switch the lighting atmosphere on their own.



Research Questions

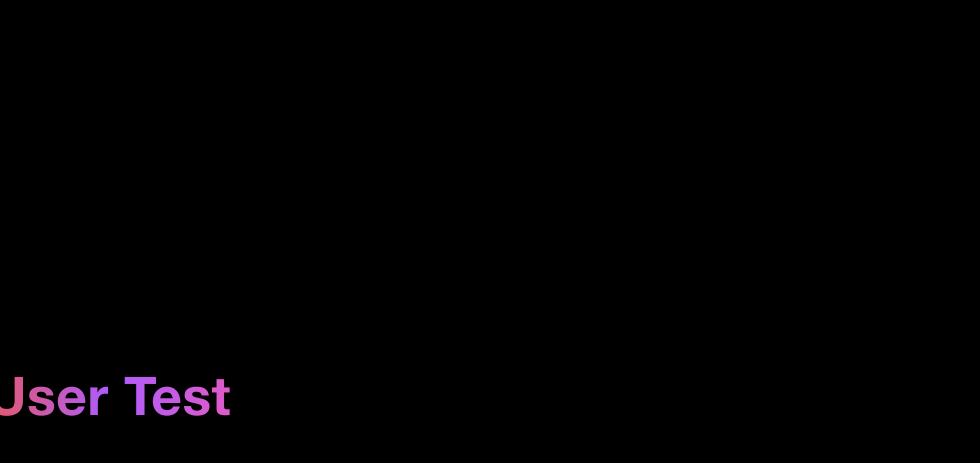
- How does the experience with the hue online representation differ from the real-world experience (regarding lighting and overall user experience)?
- Which aspects affect the user's perception of online and offline experience? Images' style, quality, interaction way or other aspects?

Tools

- The user test focuses on two aspects: The user experience aspect and the Light aspect. And each aspect are measured in the test by using different tools.
- Tool 1: Open questions and statements questionnaires
- Tool 2: Flynn scale questionnaire

Test Process

10 participants were invited to do the user tests. Test was conducted in a 12 m² room and two Philips Hue bulbs were equipped in the room. And the whole test process was divided into 3 parts, and the overview of the test process is shown in figure 13. After giving consent to participate, demographic data, photos and videos are collected.



Result

- How does the experience with the hue online representation differ from the real-world experience (regarding lighting and overall user experience)?
- Offline light experiences are perceived by users to offer more vibrant and layered colors. Users learn more information of the usage senario(light location, numbers of lights and etc.)and they feel more sense of control when they experience app.

- Which aspects affect the user's perception of online and offline experience? Images' style, quality, interaction way or other aspects?
- For the content of image side, offering Home-feeling, trustable, storytelling and efficient visual presentations are important. For the interaction side, user prefer the intuitive, efficient, free interaction way. For the light side, participants appreciate that they can see more layers, light environment and location of light. Besides, they also want the light follow their personal taste.

Second User Test

Hypotheses

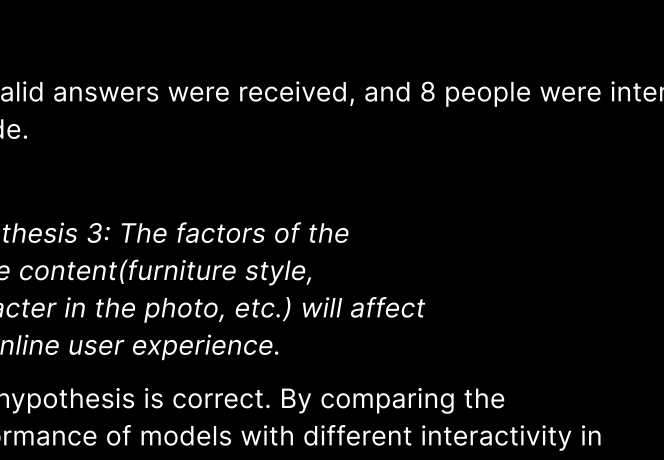
From first user test, the researcher concluded four hypotheses:

- Hypothesis 1: The level of interaction will affect the online user experience. More interaction, better user experience.
- Hypothesis 2: The level of interaction will affect the user's judgment of the light. With more interaction, users rate the light experience higher.
- Hypothesis 3: The factors of the image content(furniture style, character in the photo, etc.) will affect the online user experience.
- Hypothesis 4: The factors of image content(furniture style, character in the photo, etc.) will affect the user's judgment of the light.

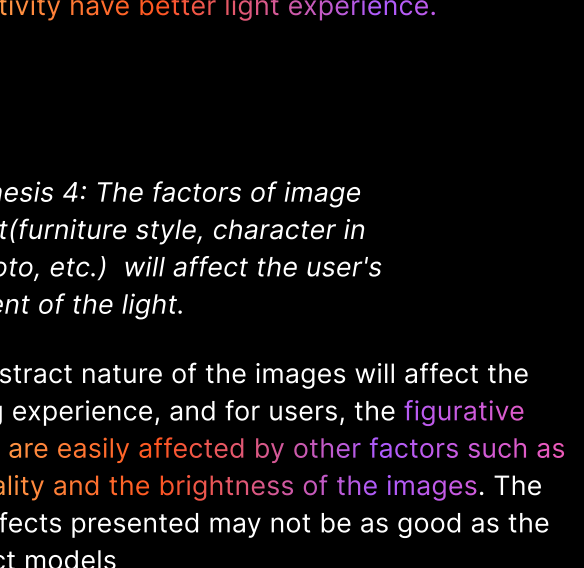
In the later phase, experiments are made to test those

Prototypes For Testing

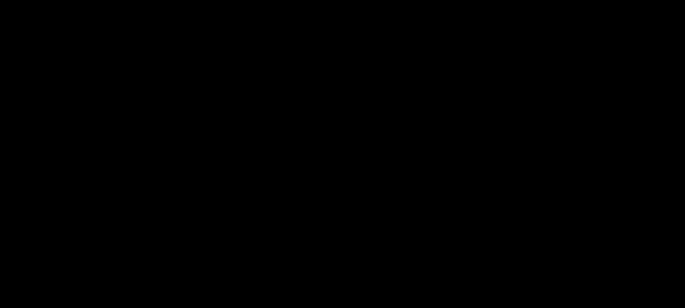
- After experiments, three different prototypes were chosen to be tested.
- Model 1: A low-interaction abstract prototype
Before entering the model, a scenario-guided pop-up is added, and participants are guided to an online shopping site scenario. In this model, the user only sees lighting changes and can rotate the model but cannot change the lighting color or position.



- Model 2: High-interaction abstract prototype
After entering model, hints such as "drag me!" will also appear for the guidance of interactive components. The scene with model one remains the same, the user can change the light color by their own operation and move the position of the lamps by mouse, rotate the model and watch different perspectives.



- Model 3: Highly interactive realistic prototype
The real use of the scene, the user can change the color of the light and move the position of the lamp through the operation of the mouse.



Result

Following the same tools used in first user test, In the second user test, 20 valid answers were received, and 8 people were interviewed. Results are analysed from both user experience side and light experience side.

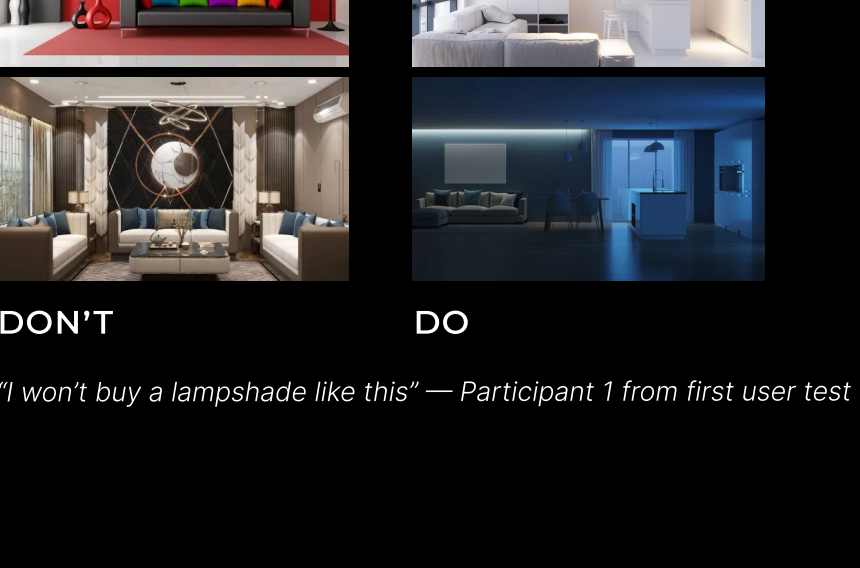
- Hypothesis 1: The level of interaction will affect the online user experience. More interaction, better user experience.
- This hypothesis is correct. By comparing the performance of models with different interactivity in the UX questionnaire, the models with high interactivity have better user experience.
- Hypothesis 2: The level of interaction will affect the user's judgment of the light. With more interaction, users rate the light experience higher.
- The abstraction of the image will affect the user experience. For users, a model with high abstraction will stimulate their imagination and associate them with more usage scenarios.

- Hypothesis 3: The factors of the image content(furniture style, character in the photo, etc.) will affect the online user experience.
- This hypothesis is correct. By comparing the performance of models with different interactivity in the light questionnaire, the models with high interactivity have better light experience.
- Hypothesis 4: The factors of image content(furniture style, character in the photo, etc.) will affect the user's judgment of the light.
- The abstract nature of the images will affect the lighting experience, and for users, the figurative scenes are easily affected by other factors such as the quality and the brightness of the images. The light effects presented may not be as good as the abstract models

Design Guidelines

Home-Like Feeling

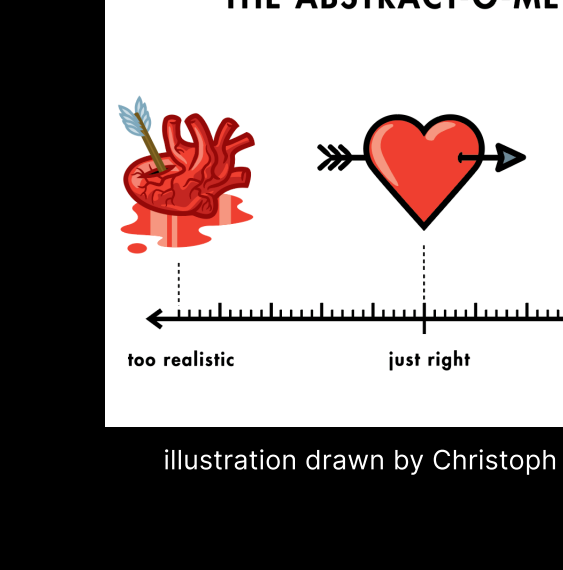
- The feeling of being at home can be affected by Psychological aspects, social aspects, the built environment(Rijnjaard et al., 2016), following qualities of a home-like feeling picture can be conducted:
1. A sense of authenticity and not overly polished(Psychological aspects)
 2. Add characters and storylines to images to create emotional links with views(Social aspects)
 3. Add seasonal, holiday and other elements(Social aspects)
 4. Avoid choosing overly stylized images when dealing with global markets(The built environment)



"I like those images, there are people involved in and I have more emotion connection with them" — Participant 5 from first user test

Trustable

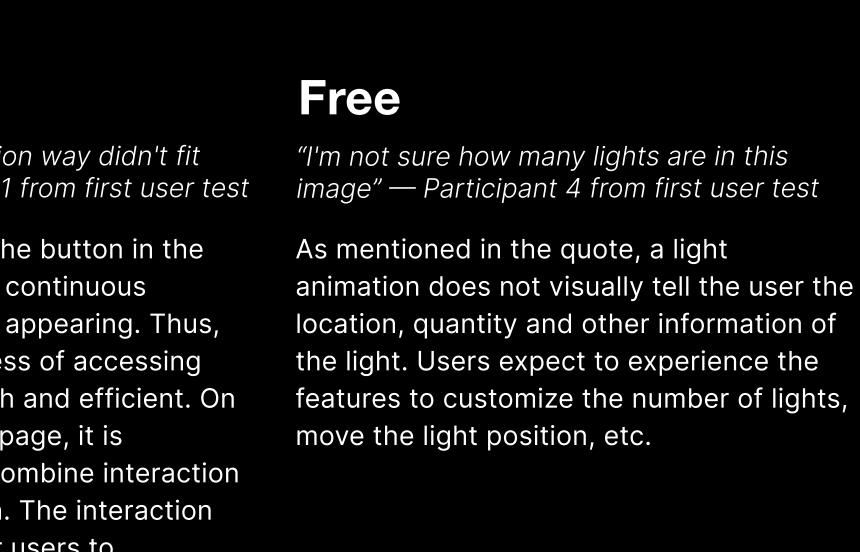
- The feeling of being at home can be affected by Psychological aspects, social aspects, the built environment(Rijnjaard et al., 2016), following qualities of a home-like feeling picture can be conducted:
1. A sense of authenticity and not overly polished(Psychological aspects)
 2. Add characters and storylines to images to create emotional links with views(Social aspects)
 3. Add seasonal, holiday and other elements(Social aspects)
 4. Avoid choosing overly stylized images when dealing with global markets(The built environment)



"The pictures look unreal, like photoshopped photos" — Participant 7 from first user test

Visual Abstraction

- Key point is reducing image noise and emphasizing the product.
- Based on Zitnick and Parkh's research (2013), there are various sets of features affect semantic importance:
- Occurrence:** objects such as the bear, dog, girl or boy are more semantically meaningful than background objects such as tree.
- Person attributes:** human expression and action are important attributes, with expression being more crucial.
- Co-occurrence of the objects, Relative spatial location Depth ordering:** other useful features for contextual reasoning about scenes.

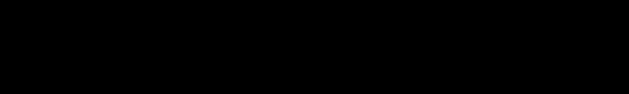


"I won't buy a lampshade like this" — Participant 1 from first user test

Semantic Importance

Based on Zitnick and Parkh's research (2013), there are various sets of features affect semantic importance:

THE ABSTRACT-O-METER



Intuitive

- Users are unconsciously click the app interface - participant 1,5,6
- As observed, participants unconsciously clicked on the app components in the images during the test, and users were satisfied with the features that they can press the button to switch different color scenes in the hue website, as this interaction met their expectations after seeing the images. Therefore, creating an intuitive interaction can increase user satisfaction.

Efficient

- "Information and interaction way didn't fit quite well" — Participant 1 from first user test
- After the user pressing the button in the Amazon page, there is a continuous repetition of information appearing. Thus, users feel that the process of accessing information is not smooth and efficient. On the product information page, it is intuitively important to combine interaction with product information. The interaction should make it easier for users to understand the product usage scenarios, features and other specific information.

Free

- "I'm not sure how many lights are in this image" — Participant 4 from first user test
- As mentioned in the quote, a light animation does not visually tell the user the location, quantity and other information of the light. Users expect to experience the features to customize the number of lights, move the light position, etc.