Customer flow data visualization for retail analytics

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Customer flow data visualization for IKEA analytics

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Abstract

This master thesis collaborates with Axis Communications, which is a Swedish video camera company. The mission for the thesis was to take advantage of Axis developed or developing technology to explore the data value in the retail industry and design a data visualization interface.

Shopping via online shopping platforms, customers will leave their shopping journey data and the data can be recorded step by step. By analyzing the conversion rate between different web pages, retailers could narrow down problem areas and even locate problems efficiently. Compared with online shopping platforms, traditional retail stores have limitations on data-collecting and data-integrating. Without analyzing sales numbers, it is difficult for retailers to discover any existing problems during a shopping journey and satisfy their customers by optimizing the shopping journey. Thus, I selected IKEA as my thesis's use study after my comprehensive analysis of camera data-collecting advantages and retailer's concentrated shopping journey data. With a series of user research, I selected to visualize customer flow data, which is an important data reference for making sales plans and designing layout by analyzing the relationship between a customers' path and a product location. Finally, based on existing data collection process and data analysis procedure, I define product function, test design prototype and finalize my customer flow data visualization interface combined with Axis brand indentation.

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Chapter 1

Introduction

1.1 Background

1.1.1 Who is Axis Communications?

Axis Communications is a market leader in network video. By offering the intelligent data analytic solutions, Axis Communications could create more in-store sales opportunities and enhance customers' experience by improving store layouts, staff planning and target marketing.

1.1.2 Overall mission offered by Axis Communications

According to the retail industry's needs, Axis Communications released four data analytics products on the market, which are **traffic, occupancy, demographics** and **queue management**. With the technology development of hardware and image identification, Axis's camera can collect and analyze more data and provide more powerful data analytics tool for retailers. However, facing the differences between the nature of retail business and data needs based on employee position, there is a gap between the data analytics service and the real needs of retailers. Therefore, offered by Axis Communication, my overall mission of this masters thesis is to explore retailers' needs and design a data visualization interface based on Axis's developed or developing technology.

Figure 1.1.1 Axis Communications Product Family

People counter Occupancy Queue Management Demographic

Figure 1.1.2 Axis Communications data analytics product family

1.1 Background

1.1.3 Research background

There are a lot of reasons why a customer makes a buying decision. With the powerful support of data collection and analytics, online stores could identify problems by analyzing the variations of conversion rates during a customer's shopping journey, and optimizing the customer shopping journey by solving problems efficiently and accurately.

However, compared with online stores, traditional physical stores still lack efficient data support, from the standpoints of both **data-collection** and **data-integration**, to identify problems and optimize them to offer a better shopping experience to their customers. Therefore, the starting point of my masters thesis is from shopping journey data research.

During a customer shopping journey, there are many steps before a final buying result. Without an interaction between a customer and a product, there will not be a buying result. Based on this existing fact, in all kinds of shopping journey data, my focus is located on **the area of customer-product interaction data**.

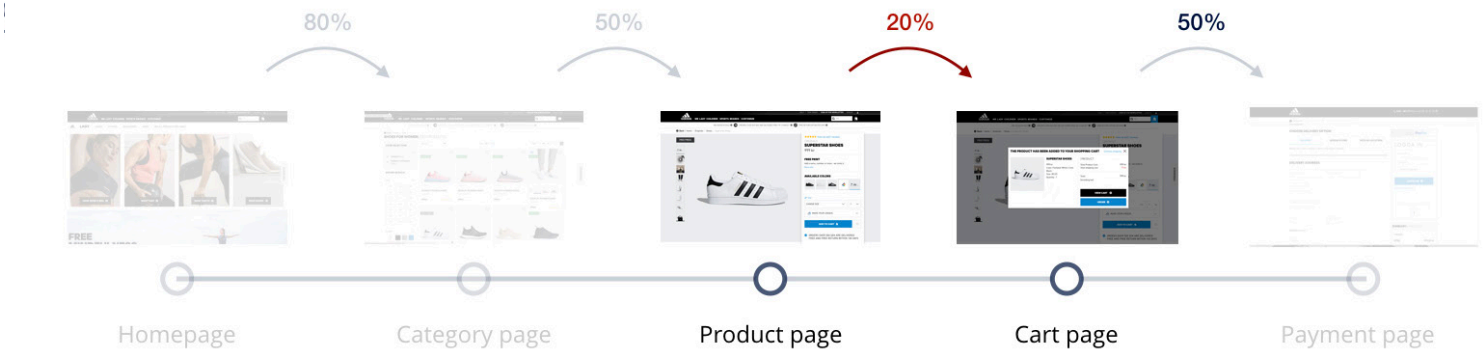


Figure 1.1.3.1 Online store conversion rate analysis

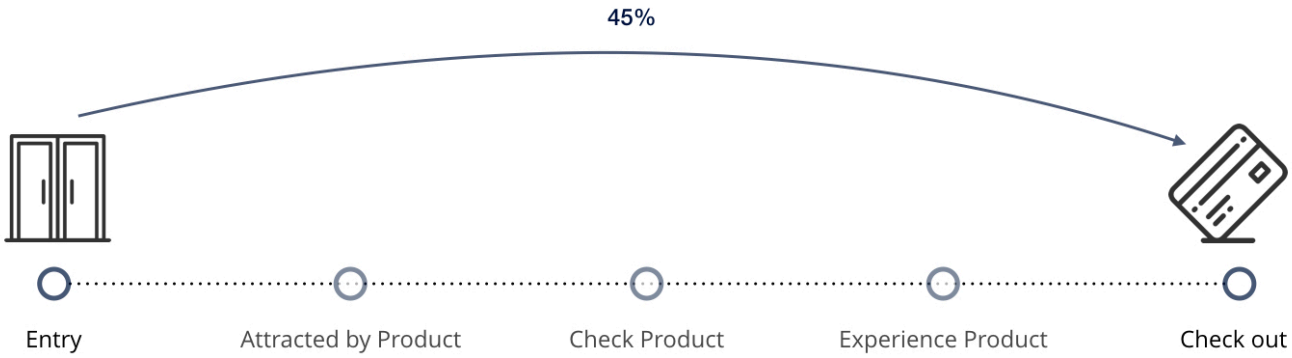


Figure 1.1.3.2 Physical store conversion rate analysis

1.2 Research questions

1. What kind of retailers would like to analyze shopping journey data?
2. What data do they care about and what is the relationship between different data categories?
3. What goals do retailers want to achieve by analyzing shopping journey data?

1.3 Implication

Limited by data resource, even though retailers try to identify problems during a shopping journey and solve them, they still take the traditional methods that are mainly about sales number analytics, which do not have a direct relationship about the customer shopping journey. There are some traditional methods or conducting research about the customer shopping journey like questionnaires and collecting customer feedback, which are inefficient and time-delaying. By analyzing data from the customer shopping journey, retailers could understand customers' needs even better and satisfy their customers' needs accurately and immediately. By identifying problems immediately and narrowing down the possible reasons with the integrated data analytics system, retailers could optimize services in the constantly changing market.

1.4 Initial brief

Selecting a potential retailer that has a strong need of shopping journey data and conducting a series of user research to explore user data need. Combining with Axis's developed or developing technology, design a data visualization interface to analyze shopping journey data efficiently.

1.5 Demarcation

There are different and diverse data in different scenarios during shopping journey. Collaborating with Axis Communications, I will select a use case based on their product advantages, which means it is a use case that cameras are able to collect data and their end-user has a strong need to analyze shopping journey data. In this case, the product functions will be universal to some degree because they are developed from the camera's data collection capabilities. However, some functions of my design could be applied only in some specific scenarios since it is based on a specific use case. Therefore, this project is focusing on the whole design process that includes locate a research direction and explore user's data need and transfer user's requirements into a product function based on a specific use case.

1.6 Ethical research

In this project, I will keep an objective attitude to collect and use my interviewee's data, and present them according to their wishes. Besides, talking about user data collection and analytics, they have been a sensitive topic area for many years. According to The General Data Protection Regulation (GDPR) that is going to come into force 25 May 2018, I will conduct my project within the law. Below, I will list sensitive data and specific cases that allow analysis for explaining my concerns about analyzing data in the retail industry.

Some sensitive data are abandoned with regard to the collection and analysis except some specific case.

- Personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs;
- Trade–union membership;
- Genetic data, biometric data processed solely to identify a human being;
- Health–related data;
- Data concerning a person’s sex life or sexual orientation.

Some specific cases that allow the collection and analysis of and analyze the sensitive data.

- The explicit consent of the individual was obtained (a law may rule out this option in certain cases);
- An EU or national law or a collective agreement, requires your company/organisation to process the data to comply with its obligations and rights, and those of the individuals, in the fields of employment, social security and social protection law;

1.6 Ethical research

• The vital interests of the person, or of a person physically or legally incapable of giving consent, are at stake;

• You are a foundation, association or other not–for–profit body with a political, philosophical, religious or trade union aim, processing data about its members or about people in regular contact with the organisation;

• The personal data was manifestly made public by the individual;

• The data is required for the establishment, exercise or defence of legal claims;

• The data is processed for reasons of substantial public interest on the basis of EU or national law;

• The data is processed for the purposes of preventive or occupational medicine, assessment of the working capacity of the employee, medical diagnosis, the provision of health or social care or treatment, or the management of health or social care systems and services on the basis of EU or national law, or on the basis of a contract as a health professional;

• The data is processed for reasons of public interest in the field of public health on the basis of EU or national law;

• The data is processed for archiving, scientific or historical research purposes or statistical purposes on the basis of EU or national law.

In GDPR accessible online, there are some decriptions about some legal cases but more detailed requirements need to be analyzed in different use cases. Since data analytics applied in retail industry varies differently under different situation, I will not use any sensitive data mentioned above in my project.

Chapter 2

Research

2.1 Case study selection

2.1.1 Market research

For building an intelligent store, there are many sensors developed from our mature technologies to record customers' shopping behaviors during their shopping journey. Not limited between cameras' brands, I chose Axis Communications's competitors from data recording hardware in the market. With the development of technology, there are three mature technologies that are used to collect data in physical stores, camera, RFID label and WIFI detector. With their own features, they are used in different scenarios. To select a case study, I started by analyzing the data-collection theories among those three technologies. To select a case study that is suitable for a camera, I need to first understand which data cameras are good at collecting.

Based on materials of existing application cases and theories behind each technology, I drew a conclusion that the RFID labeling is widely used on small products for recording the interaction between customers and products. For example, if a customer takes a bag from a shelf, this interaction could be recorded. By analyzing this data, retailers can know which bag is more popular. On another side, cameras and WIFI detectors tend to be used for recording the relationship between customers and their location in store.

This finding combined with my data interest, which is the interaction between customers and products, built my basis for a case selection.

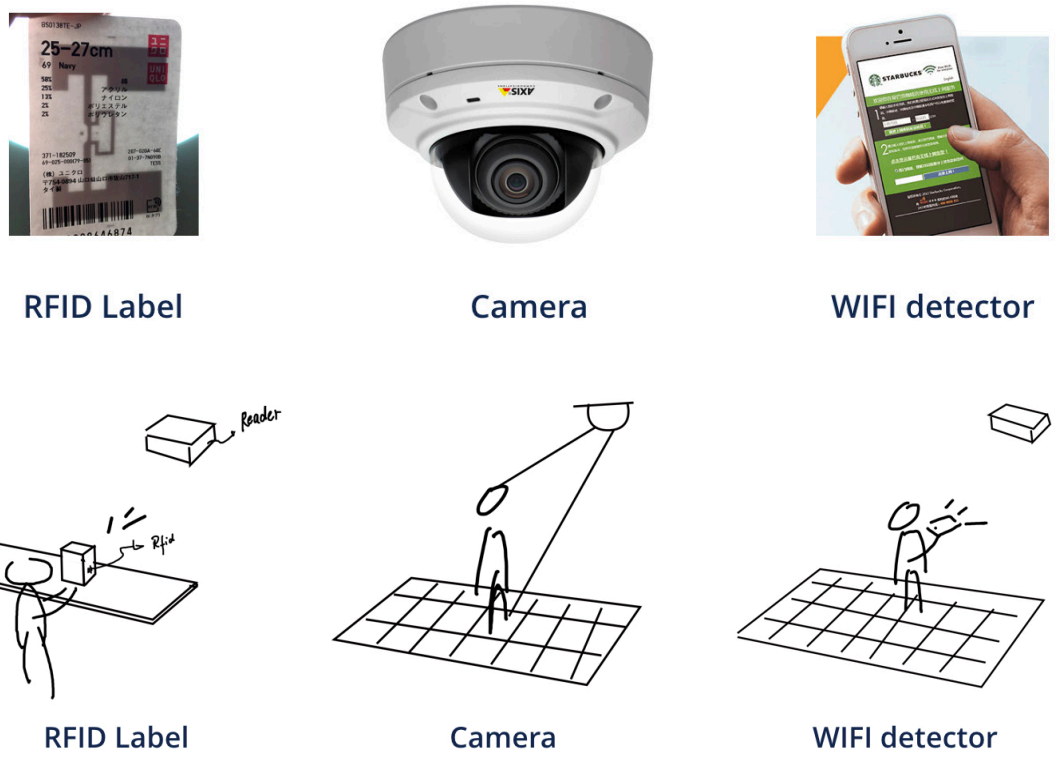


Figure 2.2.1 Analysis for competitive products

2.1 Case study selection

2.1.2 Refinement of research focus

During the whole shopping journey, the interaction between customers and products is an essential touch point. Whether selecting a product directly or taking some time for experiencing a product, these interactions are all pre-steps for making a buying decision. And how customers move in store and how to place products in store are two aspects that help to create more chances in achieving this interaction.

According to my previous competitor analysis, since Axis's data is collected by camera, it is a data recording between customer and their location in store. In another words, it is not about the interaction between customers and products, which is the initial research focus of my thesis.

To achieve my initial research goal, I was thinking of how to make the relationship between the customer to products and the customer to space.

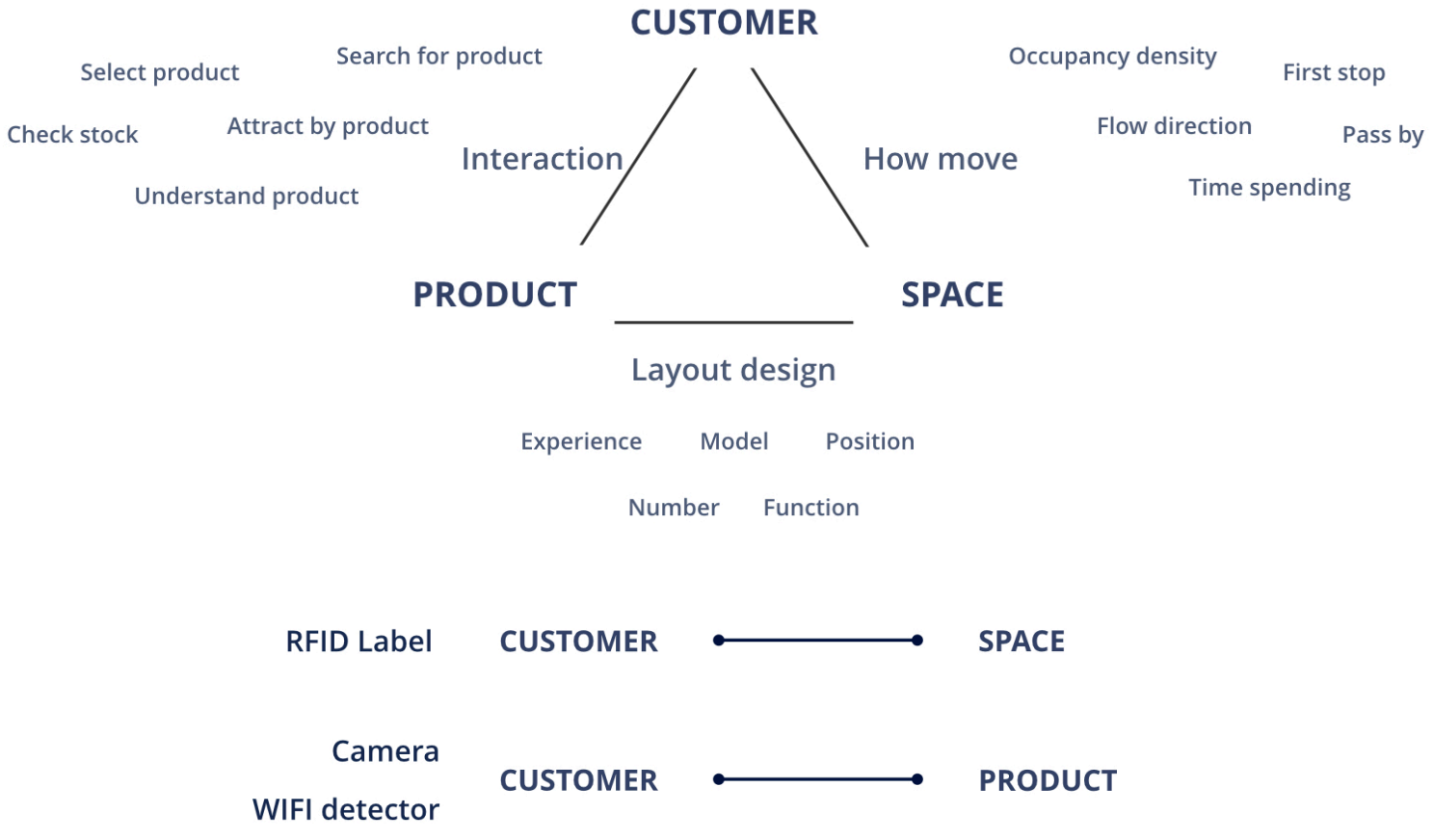


Figure 2.1.2 Research focus refinement process

2.1 Case study selection

2.1.3 Technical feasibility

During my research, I had been communicating with Axis engineers to understand their data collection technologies of their products all the time. After I got the idea that a product is equal to a space, I realized that there is one technology I could take advantage of and it is their real–time queue monitor.

The Axis queue monitor can detect live people or moving objects from a still background, and count the number of customers by the number of grids that are covered. The grid system can be changed by adjusting the size and density.

Therefore, I had two options to achieve this equation. My first option is that the product should be big (not as small as a bag), which means when a customer is experiencing a product, this interaction is able to being detected in their grid system. Another option is that a specific kind of space has the same tag, like a table full of jewelry that is designed by the same designer.

Therefore, based on these two directions, I evaluated many potential case studies later and made my final decision that is combined with my available time and resource.

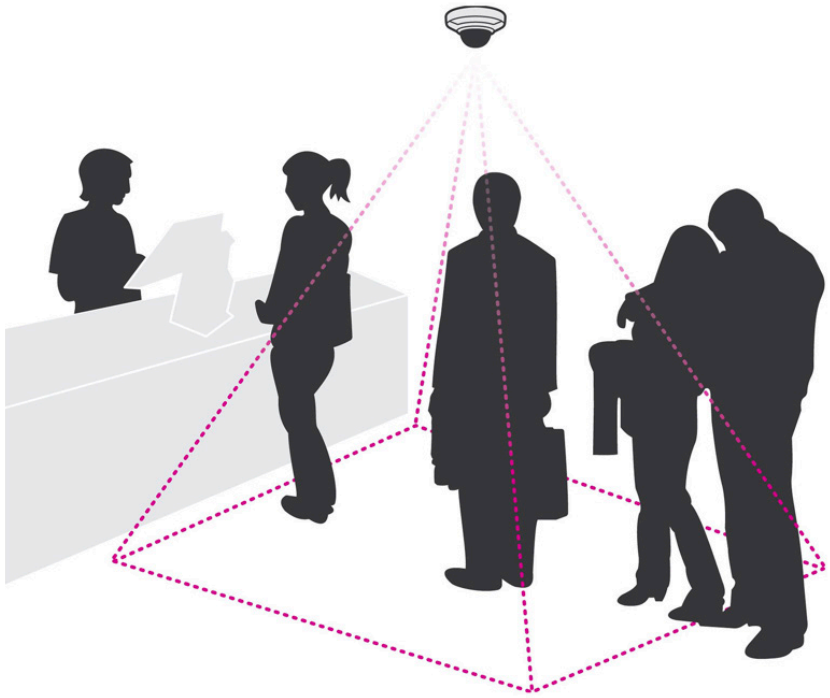


Figure 2.1.3.1 Axis Queue Monitor illustration

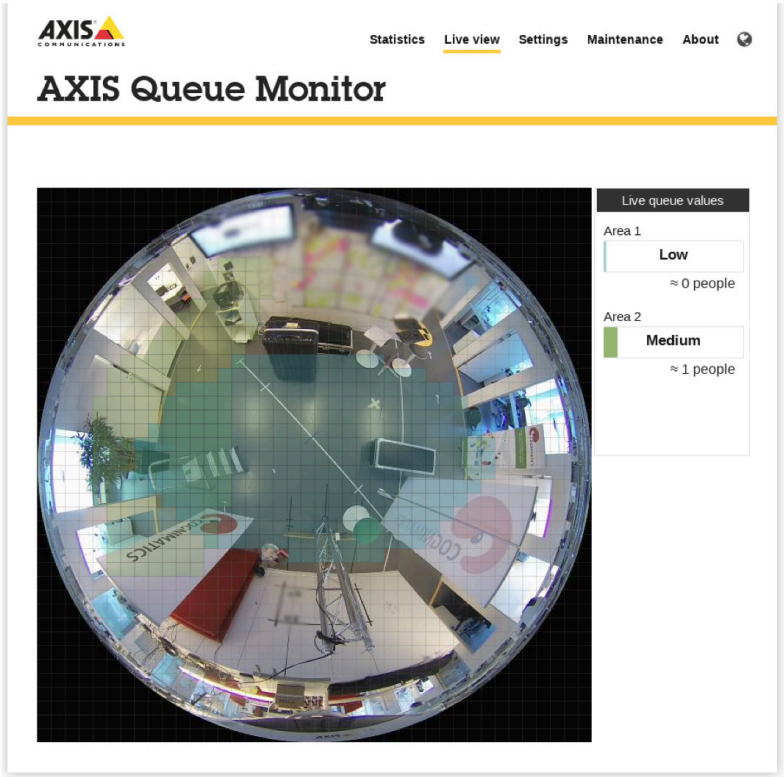


Figure 2.1.3.2 Axis Queue Monitor interface

2.1 Case study selection

2.1.4 Final decision

After my analysis of technology implementation and marketing situations, and combined with my available time and resources, I selected the IKEA living room department as my starting point. There are two reasons for selecting IKEA as my case study:

1. Data during shopping journey is valuable for furniture retailers.

For now, a physical store is still an important touch point for achieving a buying conversion, especially for the large furniture. The shopping experience strongly influences sales conversion.

2. Availability of technology.

Axis cameras can detect moving objects and identify their real-time location. Sofas take more space as compared to small objects. When a customer is trying a large item, cameras can detect moving people and locate their position immediately. This data is related to three key factors in my retail data analytics circle.

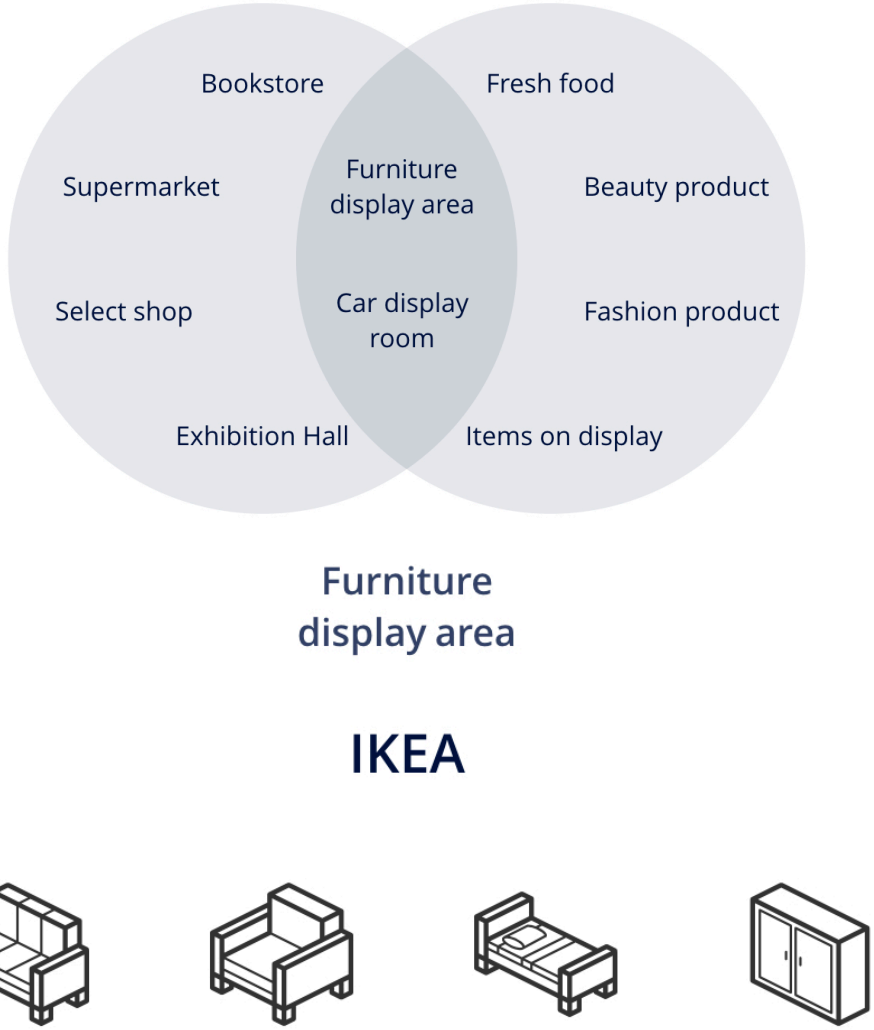


Figure 2.1.4 Use case final decision

2.2 User research process

Following the starting point of the project, the main focus of my user research is about data collection and analytics of the customers' shopping journey, which is especially focusing on recording the interaction between customers and products by customers' location, like path map in store. Therefore, my research outline and process are all about exploration in this direction.

I started to research by talking with sales assistants in-store and hoped to get a chance to talk with my real end-users like sales leader or sales manager, who make decisions based on data analytics results. Although I was only able to speak to sales assistants at the beginning, I was still able to collect important information on how IKEA conducts customer research by following customers in-store and reduce many flow maps into one that provides important customer research input for both sales and design teams. Luckily, after four interviews with sales assistants, I got a chance to talk with a sales leader of IKEA's living room department and figured out the customer flow data collection process which shares the same theory as my plan. Besides asking questions, I also did a quick card sorting with her due to the complicated data relationship. Based on the information she gave me, I have a clear picture about how she takes data to make decisions. To achieve a good experience, I also built a persona based on my interview results.

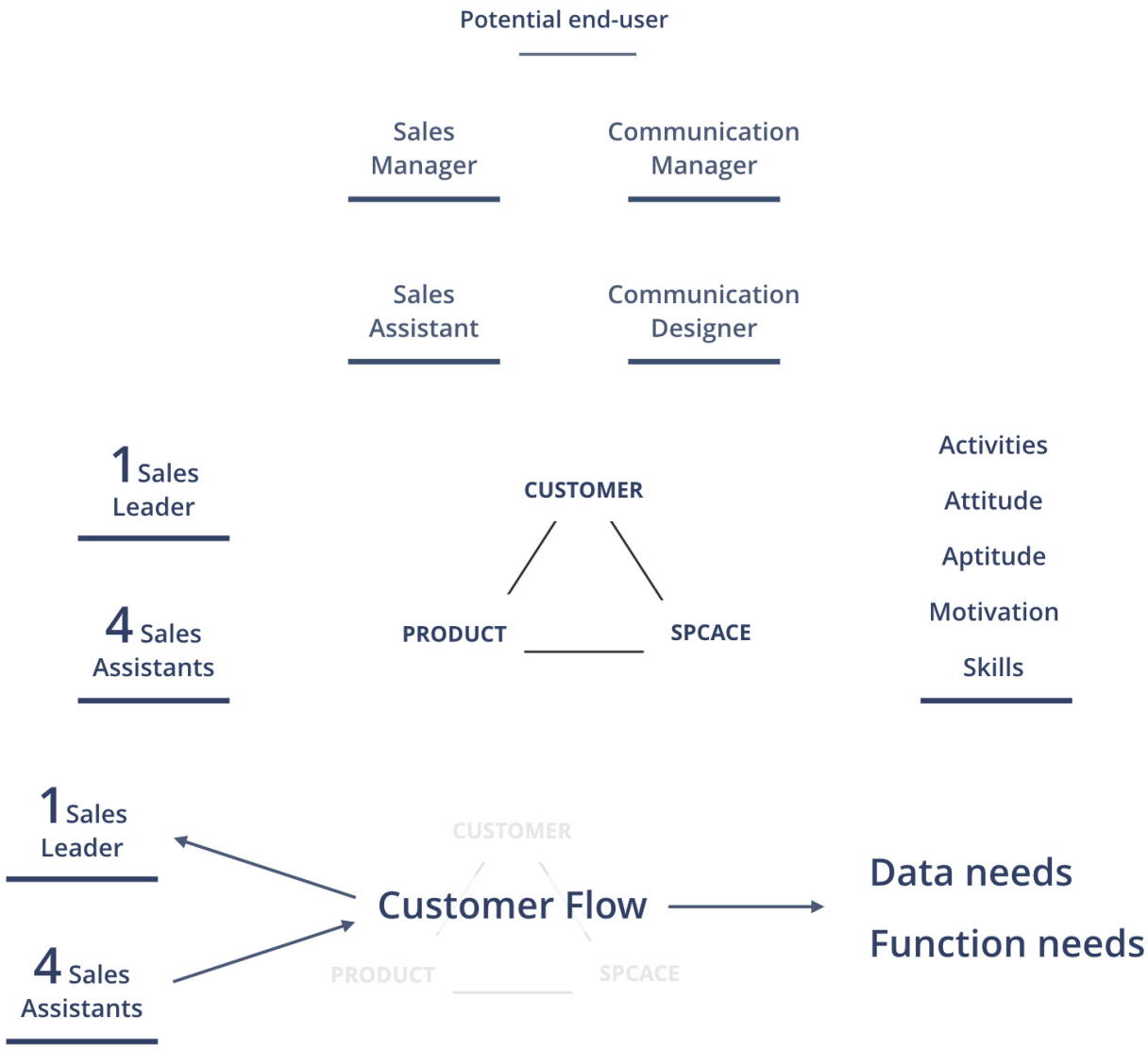


Figure 2.2 User research process

2.3 User research method

2.3.1 Card Sorting

Method introduction

"It is important to make sure that your interviewee and you are understanding everything in the same way. Therefore, making everything visible is important when you do your interview."

––FRANCESCA DESMARAIS

Popularized by information architects, card sorting is a technique to understand how users organize information and concepts. While there are a number of variations on the technique, it is typically performed by asking users to sort a deck of cards, each containing a piece of functionality or information related to the product or website. One technique of this method is to invite a subject who has refined organizational skills, and observe the way of sorting a group of abstract topics will correlate to the way they will end up wanting to use your product. It will require properly conducted open–ended interviews which involves asking the right questions and paying close attention to how a subject explains his activities in different scenarios.

To understand how my end–user analyzes data and to takes some actions based on analyzing results, I wrote down all data names she mentioned previously on cards and encouraged her to share some stories behind each of them with me.

Figure 2.3.1 Card sorting material

2.4 Research finding

2.4.1 Persona

Sofia is a sales leader of the IKEA's living room department and her goal is to achieve her sales plan efficiently with team members from both her department and other departments, like the communications department.

Since the display space is limited, especially the size of hot areas, she needs to make sure that she puts right products on the right places for achieving her sales goal. To make a full use of the hot area, she needs to understand the distribution of hot and cold areas in her department. Sofia and her team members need to follow 1,000 customers for generating a customer flow map three times every year.

Besides the spacial position, it is also important to create a good experience to try their furniture. Compared with the communications team, which is mainly in charge of spacial design, the sales team is working on-site, which is more familiar with the customer shopping experience, and has more information about customer feedback. Therefore, there is a close collaboration between the sales and the communications team. For preparing and conducting a better sales plan, Sofia needs the design magic from the communications team. When communications is searching for input before designing, Sofia will support them by combining customer data and sales data together.

Comprehensive data analyzing ability

Sales background, good understanding of data resource and meaning. Want to see integrated data instead of one data each time. Be able to customize data dashboard on her own and analyze it.

Changeable working site

Multi-working situations. Different devices needed.

Computer nerd

Good analysing skills but bad software skills.
Simple interface and one-button operation wish.

Efficiency

Data should be prioritized based on her needs.

Holistic view and teamwork

Receive data and share data with different teams.

Data is not the only one for decision

Analyze data, but hear from customers' feedback also.

2.4 Research finding

2.4.2 Customer flow

In the first interview, the sales leader told me that IKEA has their PCD(product change dates) and that they change their whole layout four times a year. To be able to collect customers' feedback of the changes, they need to follow 1,000 customers in between each of these changes. In addition, they also do some small adjustments, like changing sofa covers, changing product positions or doing some family discounts, based on marketing performance or the stock situation of a selected product.

1. Which data is included in the customer flow?

- First stop – A spot that a customer stops first.
- All stop – All spots that a customer shops.
- How to pass through the living room department – Connect all stops by a line with arrows.
- Time spending in the department–How long a customer goes through the whole shopping area.

2. How to make a customer flow map?

Follow customers with maps when they enter the living room department. Mark a spot with a circle for the customer's first stop. For rest stops, mark them with crosses. After they leave the living room department, clock the whole shopping journey duration. After following 1,000 customers, put all marked maps together for generating a density map with red color and blue color. The red color means density of the area is high and the blue color means density of the area is low.

3. What is the problems with their current customer flow map?

1. Consuming human resource .
2. Timeliness of data.
3. Unable to save data for re–using.

Whole department layout change

IKEA has **4 PCDs**(Product change dates) a year for new products or seasonal theme.

Customer flow

3 customer researches that follow **1,000** customers each time between the 4 PCDs.

Figure 2.4.2.1 Customer flow illustration

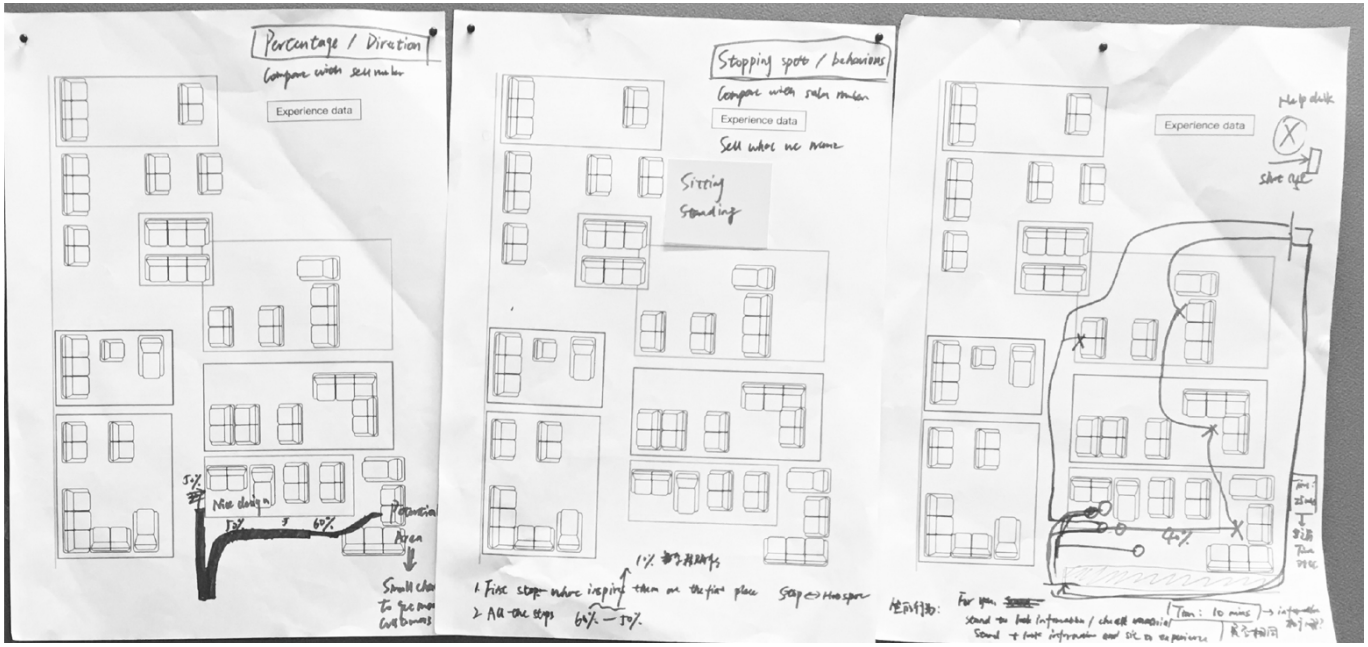


Figure 2.4.2.2 An illustration of collecting customer flow data by IKEA

2.4 Research finding–Card Sorting

2.4.3 Card sorting process

Data name: All stops, first stop, product spots, flow density, path map, sales number, spending time.

During the card sorting I did with the IKEA sales leader, there were two parts. In the first part, she was asked to select one card each time. In this way, she could tell me how she understands the data and how she uses the data. During the first round, she kept mentioning that she compared the same data at different time points. Therefore, compared with a single data, she is more inclined to analyze the comprehensive data resources to achieve her goal.

In the second round, she was asked to select two cards as she wants. She can select two cards that she already used in her current daily work. She also can select two cards that she hopes to analyze according to her existing needs.

2.4.4 Card sorting results

In the first round, she used flow density and all stops to estimate the performance of a spot or an area. Talking about first stop, she wanted to know whether the spots to which she intended to attract customers got customers' attention or not. For product spots, she hopes to see conversion rates from a trying behavior to a buying result. And for the path map, she is more interested in main crossing, which is about how many customers notice the shortcut and choose it for leaving their department.

In the second round, we categorized all combinations into three groups. Firstly, she wanted to know the relationship between a product performance and its location. Secondly, she wanted to know the product's conversion rate, which needs an external data resource. Finally, she hoped to compare all stops, first stops and path maps at different time points.

Figure 2.4.4 Card sorting results

2.5 Research conclusion

2.5.1 User requirements

Based on the interview results and card sorting results, it is obvious to see that the sales team and communications team cannot check the correlation between the popularity of a location in the store and the conversion rate of a product. They also are unable to evaluate a layout change result. Considering of data safety and storage, for conversion rates, users can export data into other software to calculate a conversion rate instead of importing sales data into the Axis system. Thus, I summarized two key requirements for my end–user, which are correlation and comparison.

1. Correlation

The relationship between customer, product and space, being able to measure a product performance, prioritize locations' value and take advantage of those different locations are important parts for a retail operation.

2. Comparison

As a fast–furniture brand, an IKEA store's layout–change is more frequent than any other furniture brand. To bring a refreshing feeling to their customers, IKEA also does some small adjustments frequently. At the same time, it is still a furniture brand which means it takes time to change their layouts compared with other stores. Therefore, to be able to record and compare what is good and what is bad could improve working efficiency and reduce chances to make mistakes.

2.5 Research conclusion–Project Brief 2.0

2.5.2 Project Brief 2.0

Main requirements of product design

Based on customer flow data needs of IKEA, I will design a data visualization product that is focusing on correlation and comparison. With this product, the sales team and communications team can analyze the relationship between products and their locations and evaluate layout changing results. Thus, the sales team and communications team can conduct a better sales plan and also do evaluations of their work.

Other requirements for product design

1. It is important to make a distinction between essential and less essential data.
2. The interface should be easy to learn and to use.

Chapter 3

Function

3.1 Function definition

3.1.1 Process 1 – Brainstorming

Based on two interview results, I brainstormed exercise to refine every data meaning, data category and relationship between different data.

3.1.2 Process 2 – Data classification

According to two user requirement keywords, correlation and comparison, after my brainstorming exercise, I refined product functions by categorizing them with four dimensions that are function keywords, map–supporting needs, comparison dimension and other data–supporting needs. With this process, I sorted the complicated data into three main categories.

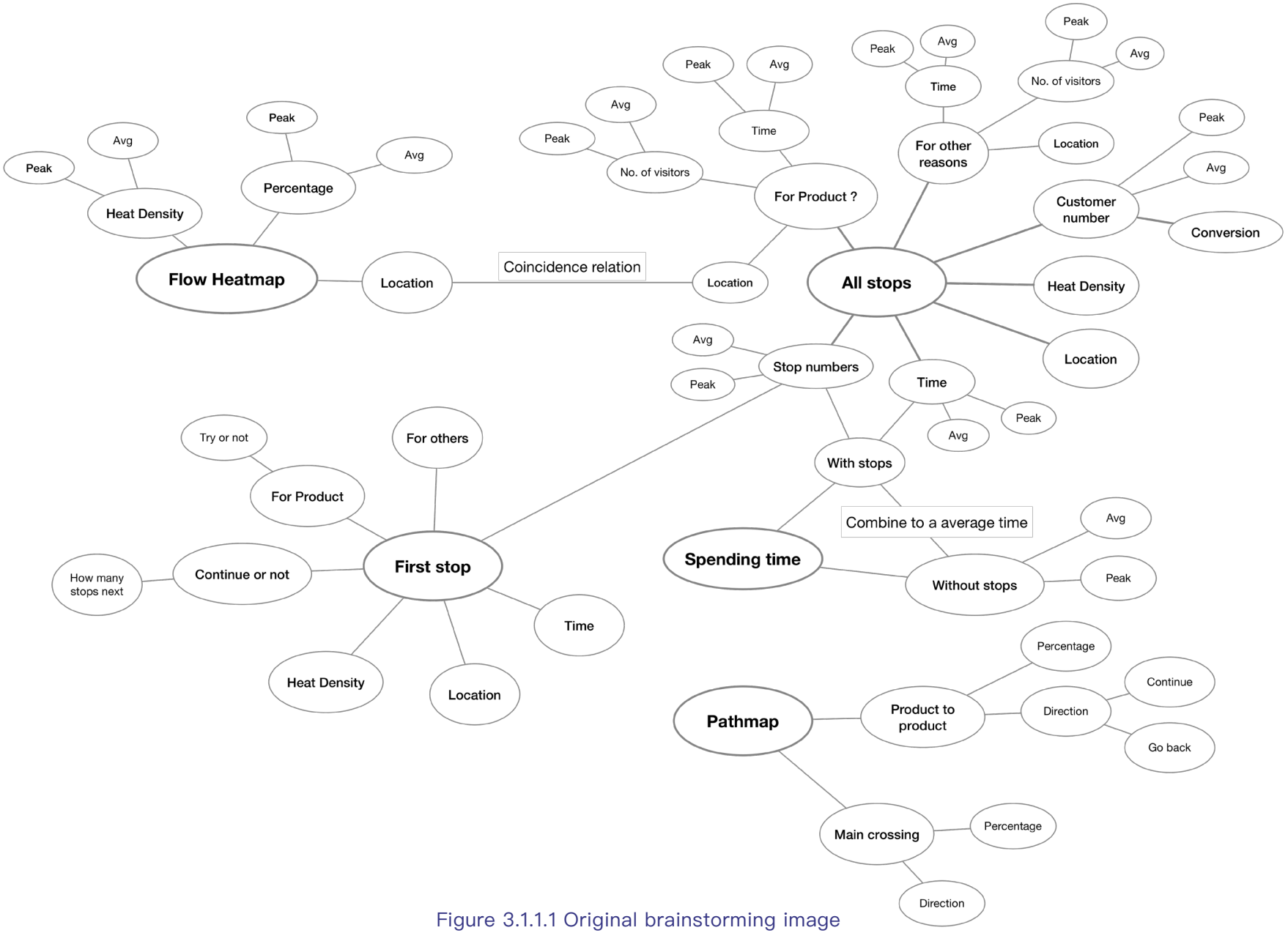


Figure 3.1.1.1 Original brainstorming image

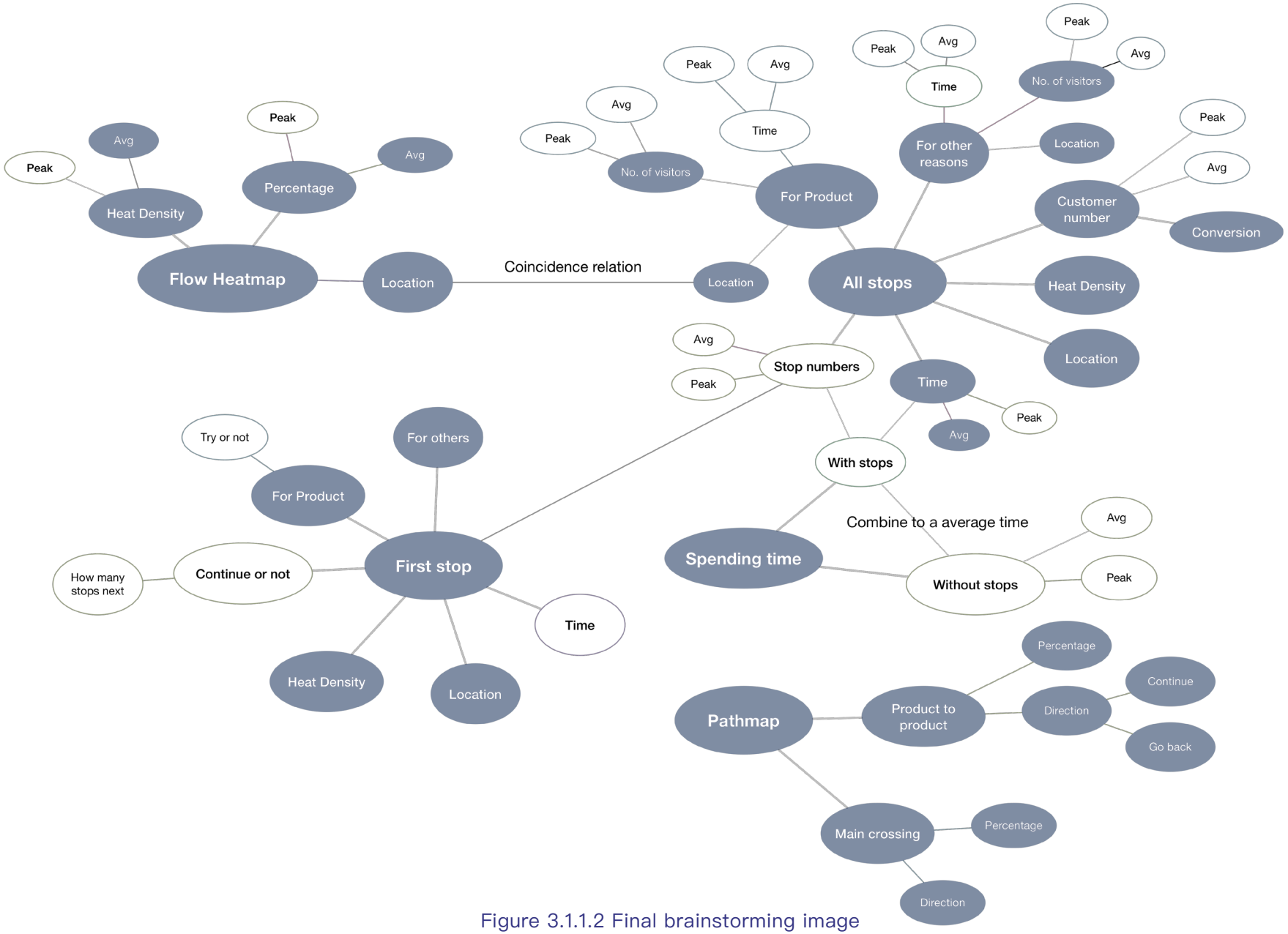


Figure 3.1.1.2 Final brainstorming image

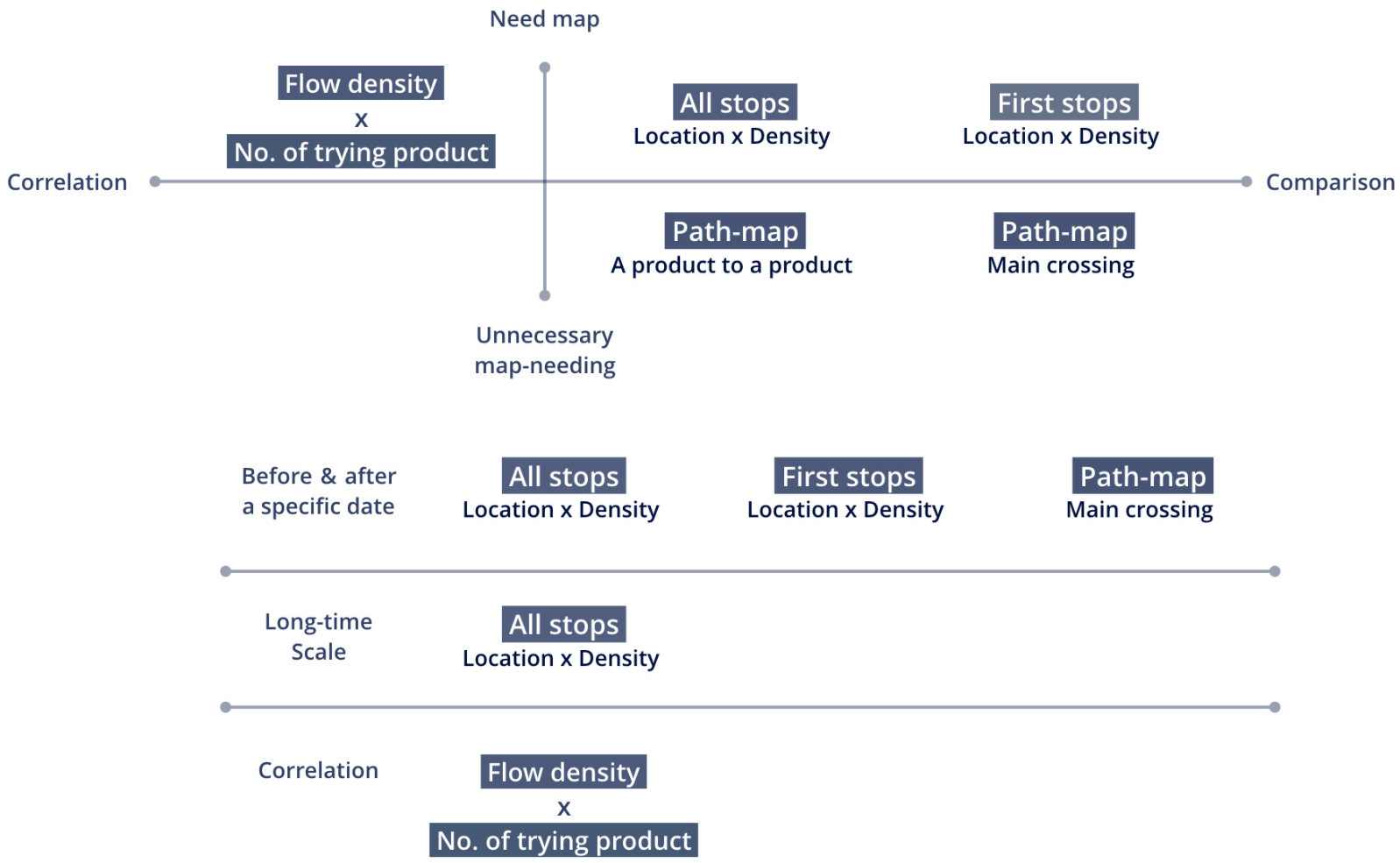


Figure 3.1.1.3 Product function definition process

3.1 Function definition

3.1.3 Function definition results

Based on the process, three main functions of my product are generated, which are Overview, All Play, and Comparison.

In Overview, there are two keywords to define its functions, daily-checking and correlation-checking. If users need to analyze data from a more detailed perspective, they could make use of the remaining functions.

For the Comparison, there is an obvious question that arises. For a normal chart, they could put data at different time points together. But, a data-based map is already an image and it is an image based on collected information from a set period of time. My focus is on how to visualize a desk of images within a chart.

Even though those two functions, which are All Play and Comparison, are both designed for comparing data, there is still a difference between them. On a long-term scale, users are more likely to trouble shooting. Small change is a normal thing for them. So, for the All Play function, as the name shows, it will compare different images at different time points by a gif. Each image stays there for some seconds and changes into the next one. Small change won't be caught by our eyes, but only the big changes. In the Comparison function, users are expected to compare the changing effects by evaluating customer behaviors after they change their layout. In this case, a more detailed comparison needs to be done. Therefore, I will put two images with other data supplements side by side for end-users to check.

Therefore, the logic between these three functions is like this. After identifying unusual numbers by the Overview function or the All Play function, users can try comparison for possible reasons. They could also combine with other Axis products for more data input.

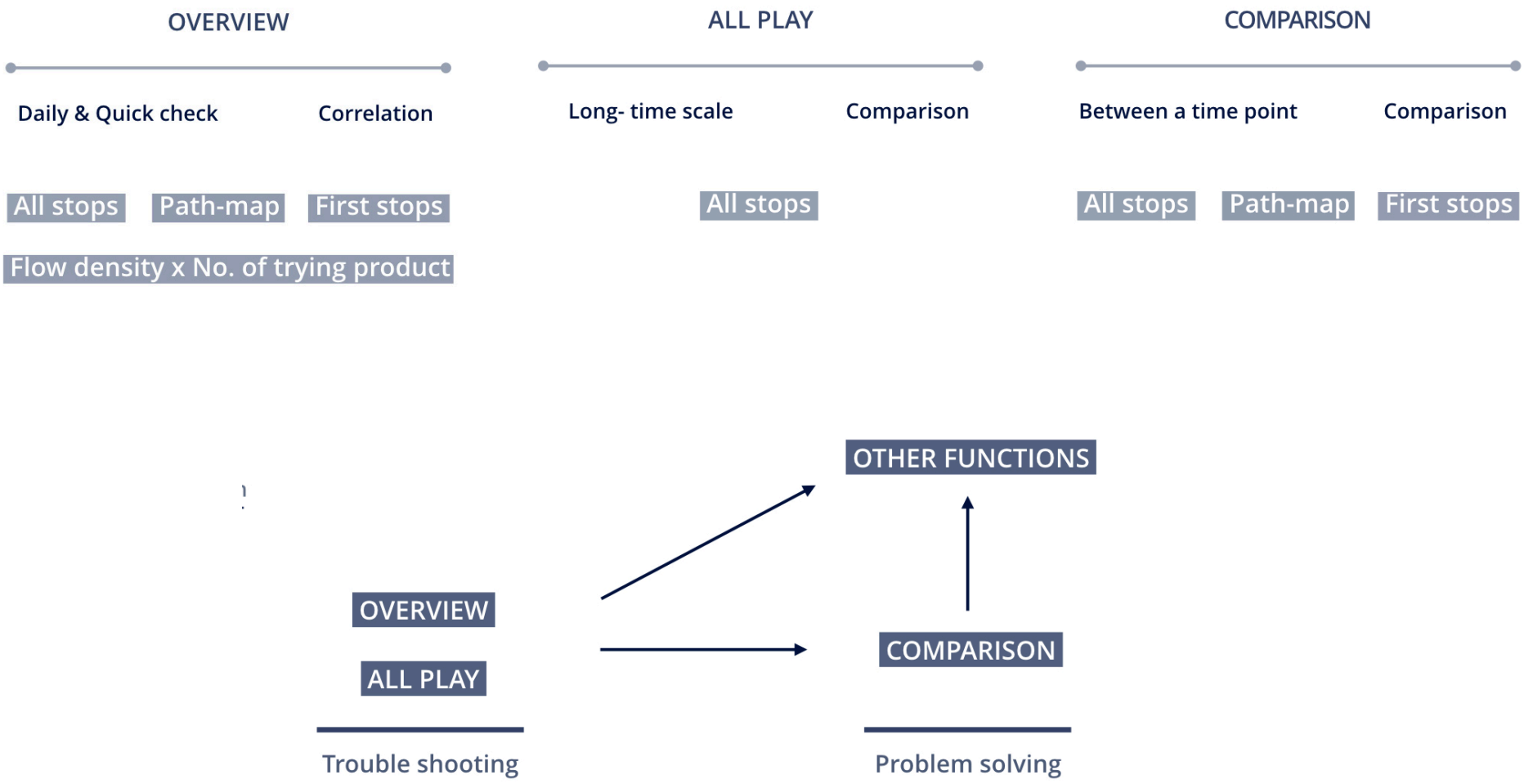


Figure 3.1.3 Product function illustration

3.2 Prototype testing

Based on user needs and initial function definition, I made a functional prototype for a product functions test. Generally, I would like to know whether my function definitions meet user's requirements or not, and what other functions my end-user needs in some specific scenarios.

In this case, my function test was divided into two parts.

1. Let the sales leader play with my prototype on her own without any instructions for 3 minutes.

2. Finish my pre-set tasks with support from my prototype.

Testing tasks:

a. Make a new sales plan for the team;

b. Discuss a new layout design with the communications team;

c. Collect layout design feedback;

d. Estimate market performance of several of the recent products;

e. Presentation-preparing and report-writing in the middle of the whole year.

Limited by my interviewee's time schedule on that day, I didn't finish all the questions and tasks. Collected information is re-organized for writing my user's key path scenario.

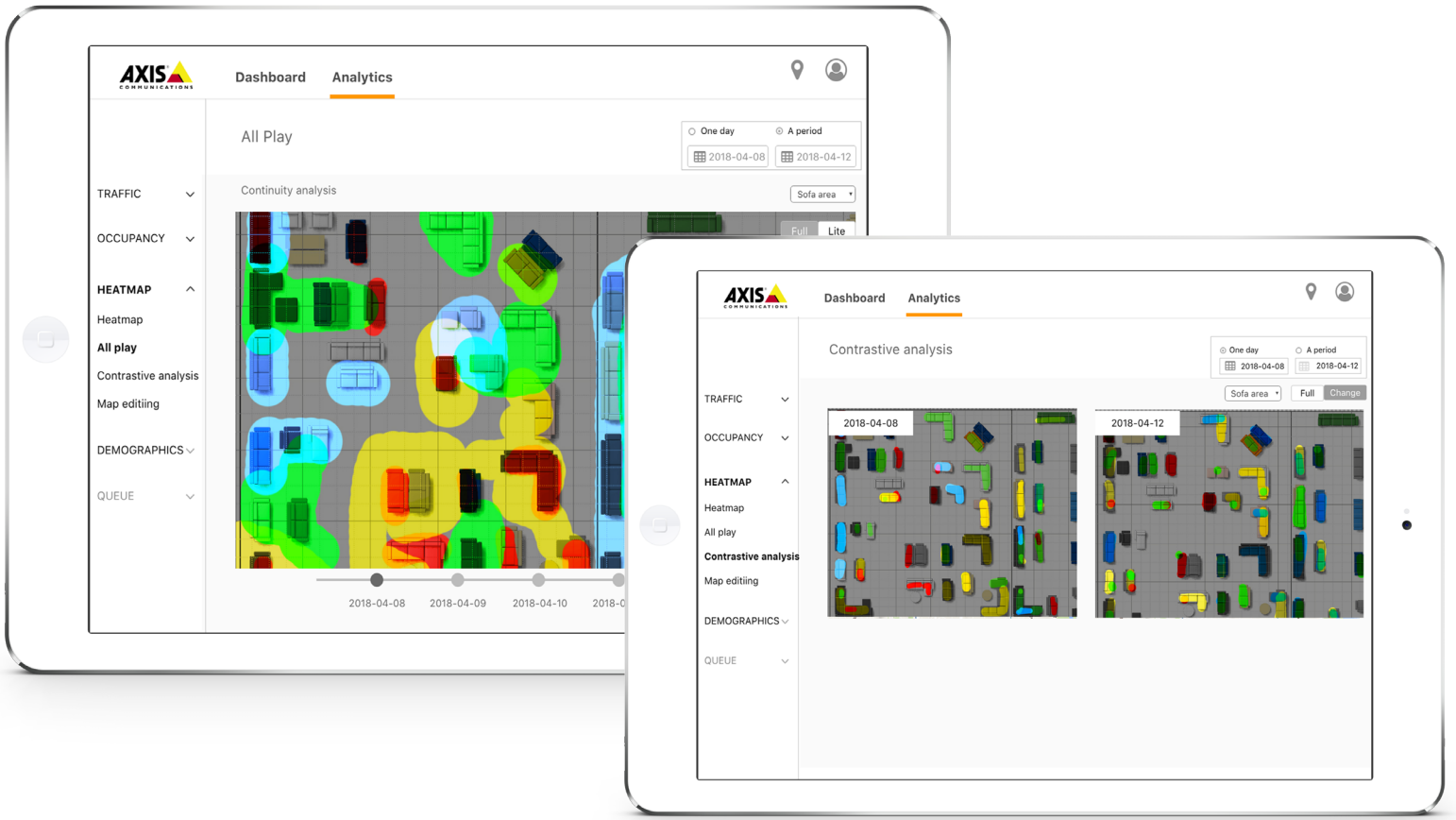


Figure 3.2 Some interfaces of testing functional prototype

3.3 Key path scenario

A key path scenario describes how the persona interacts with a product, using the vocabulary of the interaction framework. These scenarios depict the primary pathways through the interface that the persona takes with the greatest frequency, often on a daily basis. Their focus is at the task level.

These scenarios typically evolve from the context scenarios, but here we specifically describe the persona's interaction with the various functional and data elements that make up the interaction framework. As we add more and more detail to the interaction framework, we iterate the key path scenarios to reflect this detail in greater specificity around user actions and product responses.

Sofia wants to check the market performance of the Tom Dixon collection that was put into the store two weeks ago. The sales numbers are much lower than her expectations and she wants to know whether customers noticed the change or not?

So, she clicks the heatmap button and selects "all stop" page. By a heatmap, she can see that there are fewer people stopping by the Tom Dixon collection. In case there might be any other reasons behind this, she checked visitor numbers and the percentage of hot areas also, and those two were stable.

She compared data from last week with data from two weeks ago and came to a conclusion that this collection had been in the cold status during these two weeks.

Not sure whether it is because fewer people selected that path, she wants to compare the flow map together with a corresponding product experience colormap together. By selecting the hot area but less experienced products, she could see that there were still many people passing by this area with other products around it being tried a lot. During her research, she also found that there is another collection that has the same problem.

Since there are many marketing activities to promote this collection, and it is a profitable collection, Sofia thinks she needs to do some changes together with the communications team. She marked these two collections on a map and sent it to her colleagues for ideas.

In the afternoon, she was asked by her sales manager to send her a past 6-month report. Sofia needs to prepare an explanation for some off the extreme parameters resulting from layout changes or marketing activities.

Not sure of the exact period, Sofia starts from a big time scale and checks the most dramatic change percentage in the hot area covered and narrow down the time scale by decreasing it.

Since the smallest time unit of adjustment is a week, Sofia locates a time period and plays this period between different weeks to see the variations quickly.

Once she is sure that these are the pictures that she wanted, she saved it as a gif version for checking variations quickly. At the same time, she saved each of them as a png for explanation one by one.

3.4 Function structure map

According to the functional prototype testing results and a key path scenario, I refined my product function structure map. Based on this, I later structured and designed my wireframe.

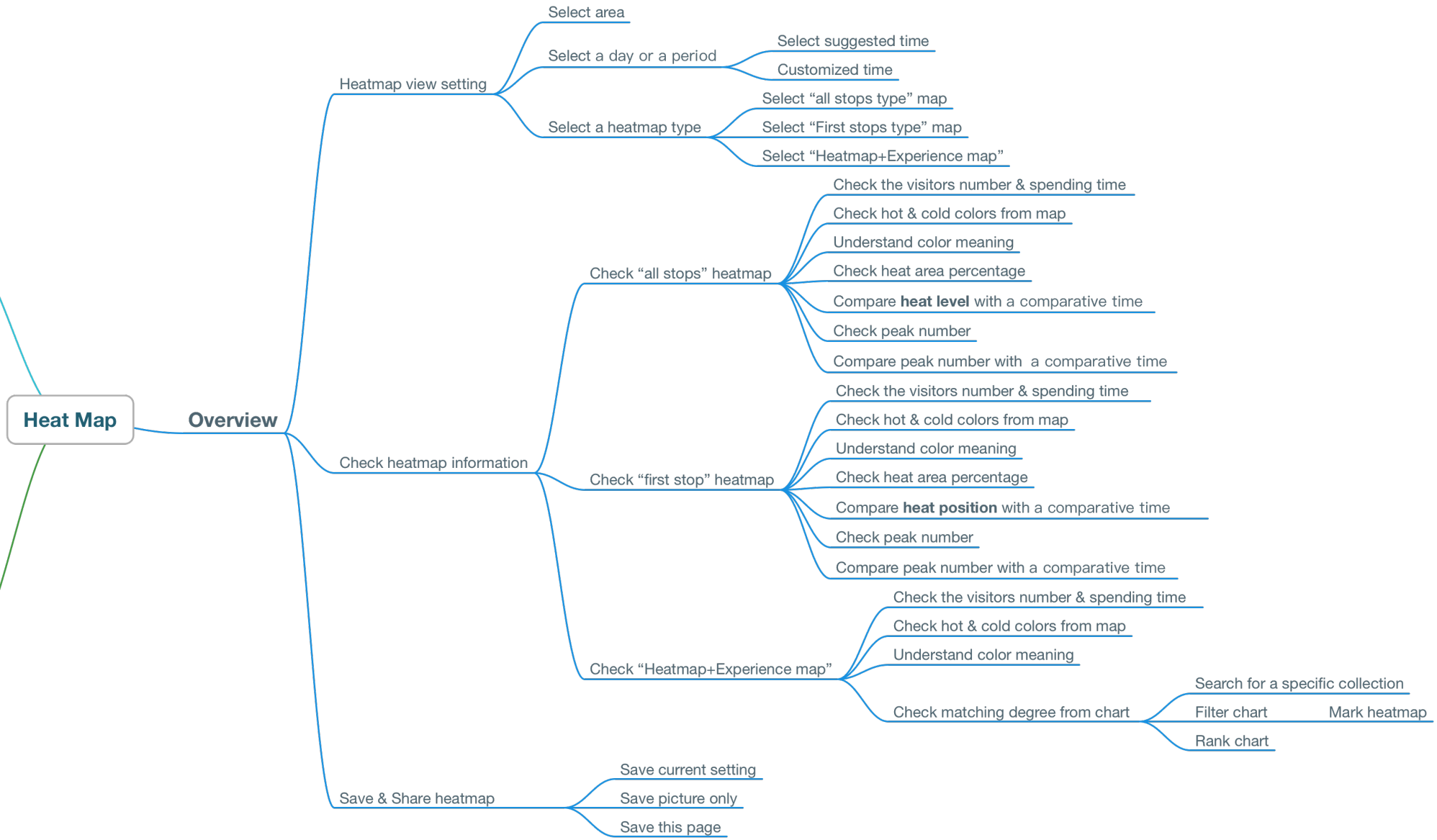


Figure 3.4 Product function structure

Chapter 4

Design

4.1 Wireframe design

4.2 Usibility design

4.3 UI style guide

4.1 Wireframe design

4.1.1 Current product analysis

There are two main functions of the current Axis retail analytics product – dashboard and analytics. They are designed for different needs in various scenarios.

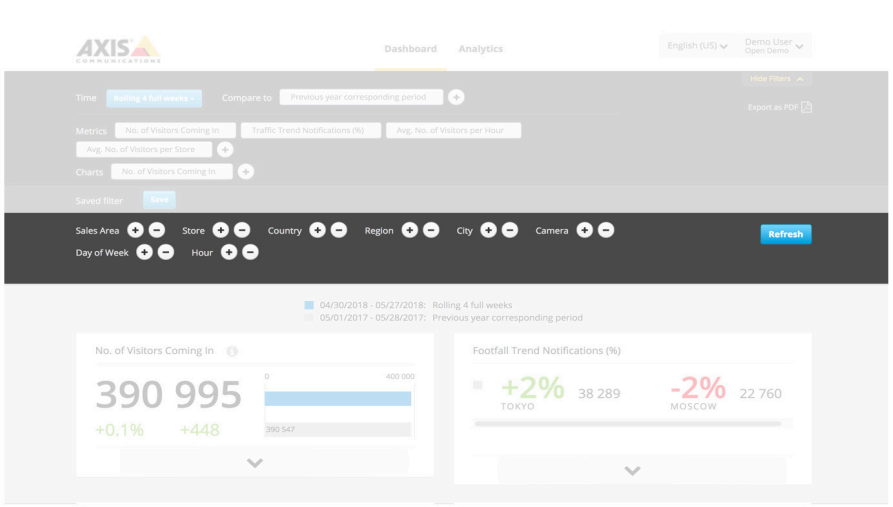
The Axis dashboard can present multi–dimensional data with the same time & comparative setting. Therefore, it is a design that is made for users to conduct a problem–locating and a potential possibility–analysis.

Entering the interface of analytics, users can analyze one specific type of data with a lot of flexible adjustments and presentation styles. Thus, it is a design that is made for users to dig into data for analysis and save data charts for further use.

4.1.2 Combined heatmap with current product

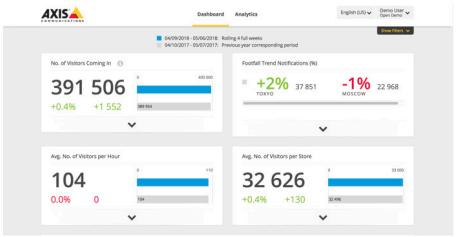
My project will end up with a product in the Axis retail analytics product family. This is because location is not a practical comparative parameter for a heatmap, but the dashboard takes location as a main comparative parameter. And a heatmap is a still picture and it is impossible to compare a heatmap easily. Thus, I will put my product under the analytics category but not dashboard.

Because of the real–time data values of heatmap and occupancy, I added another main function next to dashboard and analytics called real–time to check a real–time heatmap.



Dashboard

Comprehensive data
Fixed setting
Unadjustable chart



Analytics

One specific data
Adjustable setting
Diverse data chart

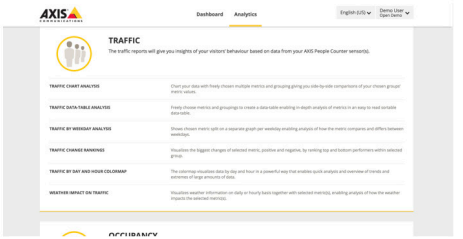


Figure 4.1.1 Analysis of Axis current product

4.1 Wireframe design – Layout

4.1.3 Responsive web design & Card-based interface

A changeable working desk is usual for a sales leader of IKEA and she mainly chooses an ipad and a desktop as her information resource. Consideration the different end-devices' adaptation, responsive web design is necessary for this project.

Responsive web design

Responsive web design (RWD) is an approach to web design which makes web pages render well on a variety of devices and window or screen sizes.

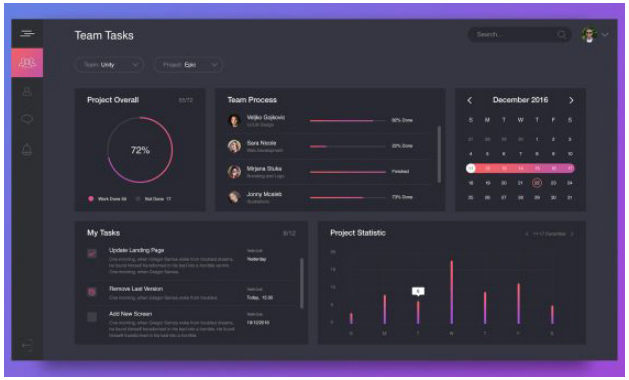
Mainly, there are three different layouts used for a responsive web design.

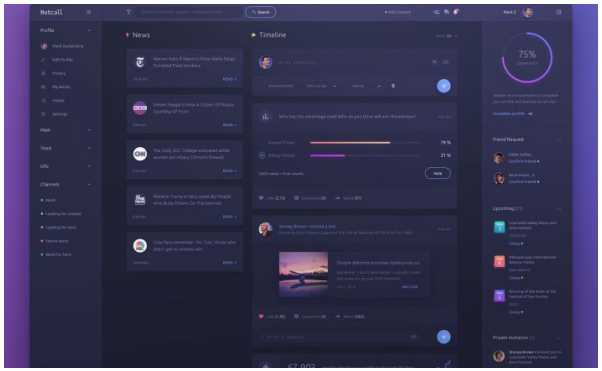
1. Same height of each row, where every part is the same height.

2. Same width of each column, where every part is the same width.

3. Grid system, where every part can be setted into a different sizes.

For the data visualization effect, I need enough space on my interface to visualize a heatmap. Thus, I selected a grid system and card-based interface according to the guideline of Google material design.





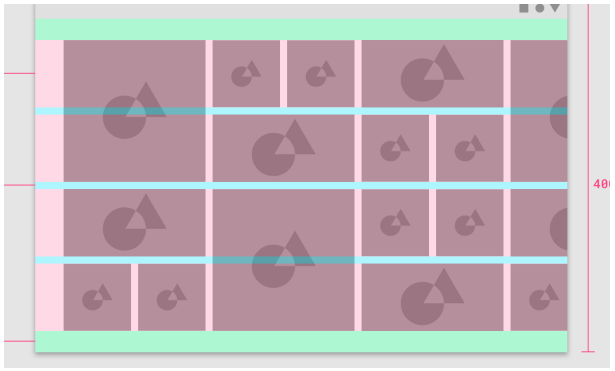


Figure 4.1.3 Three kinds of layout design

4.1 Wireframe design – Navigation

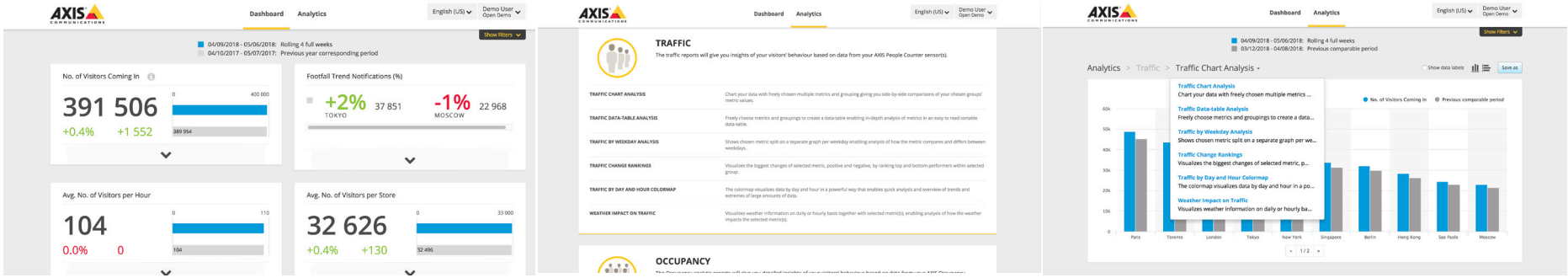
4.1.4 Navigation

A heatmap cannot be analyzed with other data in the dashboard of Axis. In addition to the necessary and important data presented in the heatmap page, it is important to enable users to switch between the different products efficiently and accurately if they need more data input.

With the development of the Axis products, it is important for users to be able to locate and switch quickly and flexibly. Therefore, at the beginning of the product's navigation design, I focused on efficient design of function–location and function–switching.

There are five key factors for me to decide the product's dashboard navigation:

1. Switch between the third navigation easily.
2. The length of the product name.
3. The amount of the product name.
4. The size of the data visualization area.
5. The indication of the current page name.



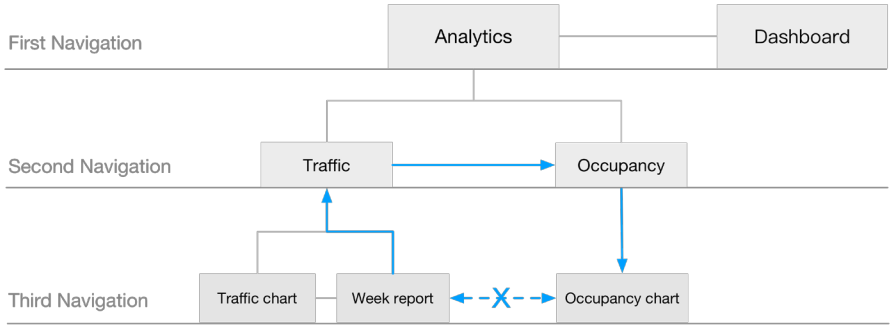
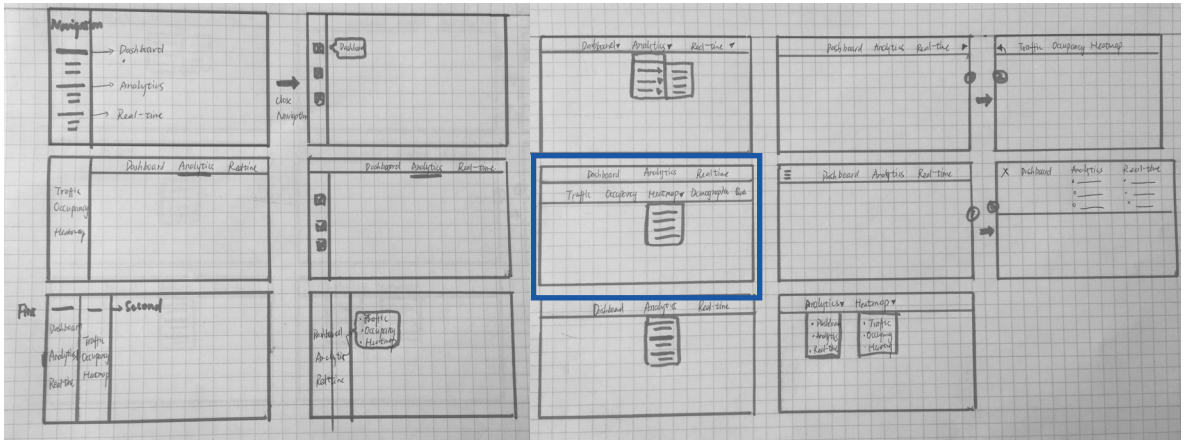


Figure 4.1.4 An illustration of current navigation relationship

4.1 Wireframe design

4.1.5 Navigation sketch



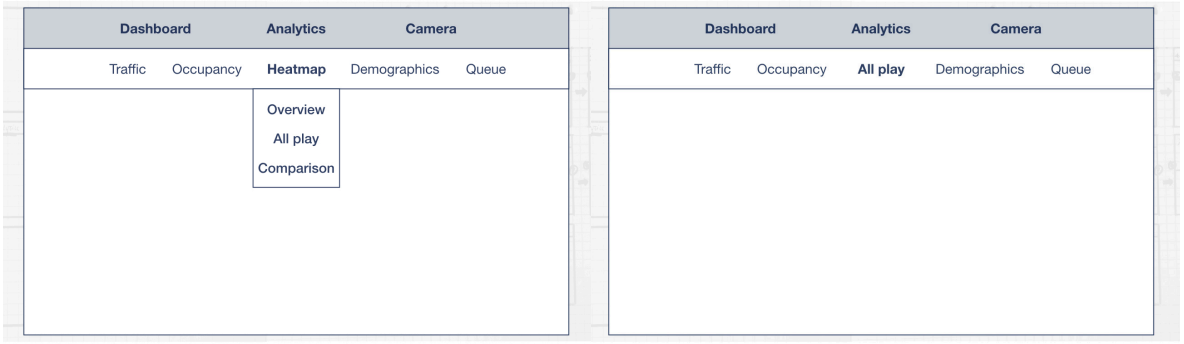


Figure 4.1.5 Sketches and final design illustration

4.1 Wireframe design

4.1.6 Data visualization

There are many different data visualization methods that help users to capture the key meaning of their data. In my project, because the two main functions of my heatmap are corresponding relation and comparison, I took advantage of these two keywords and my product function structure, and define six key design keywords for my data visualization interface.

Design guideline keywords:

- Corresponding
- Compare
- Trend
- Proportion
- Continuous & Discontinuous
- Ranking
- Path.

According to these six design keywords, I mainly took the charts from figure 4.1.6.2 for my interface design.

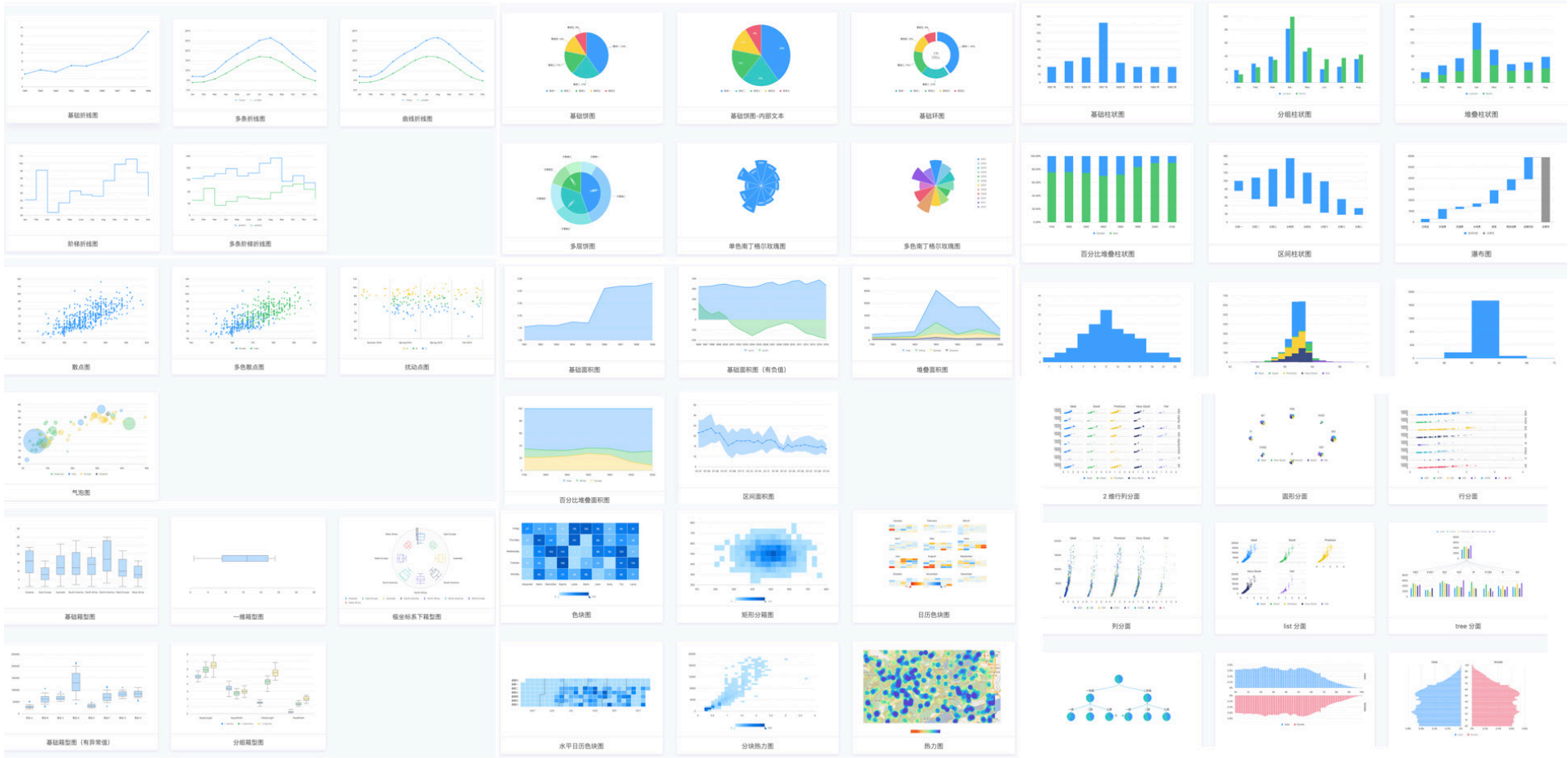


Figure 4.1.6.1 Data visualization inspiration collection

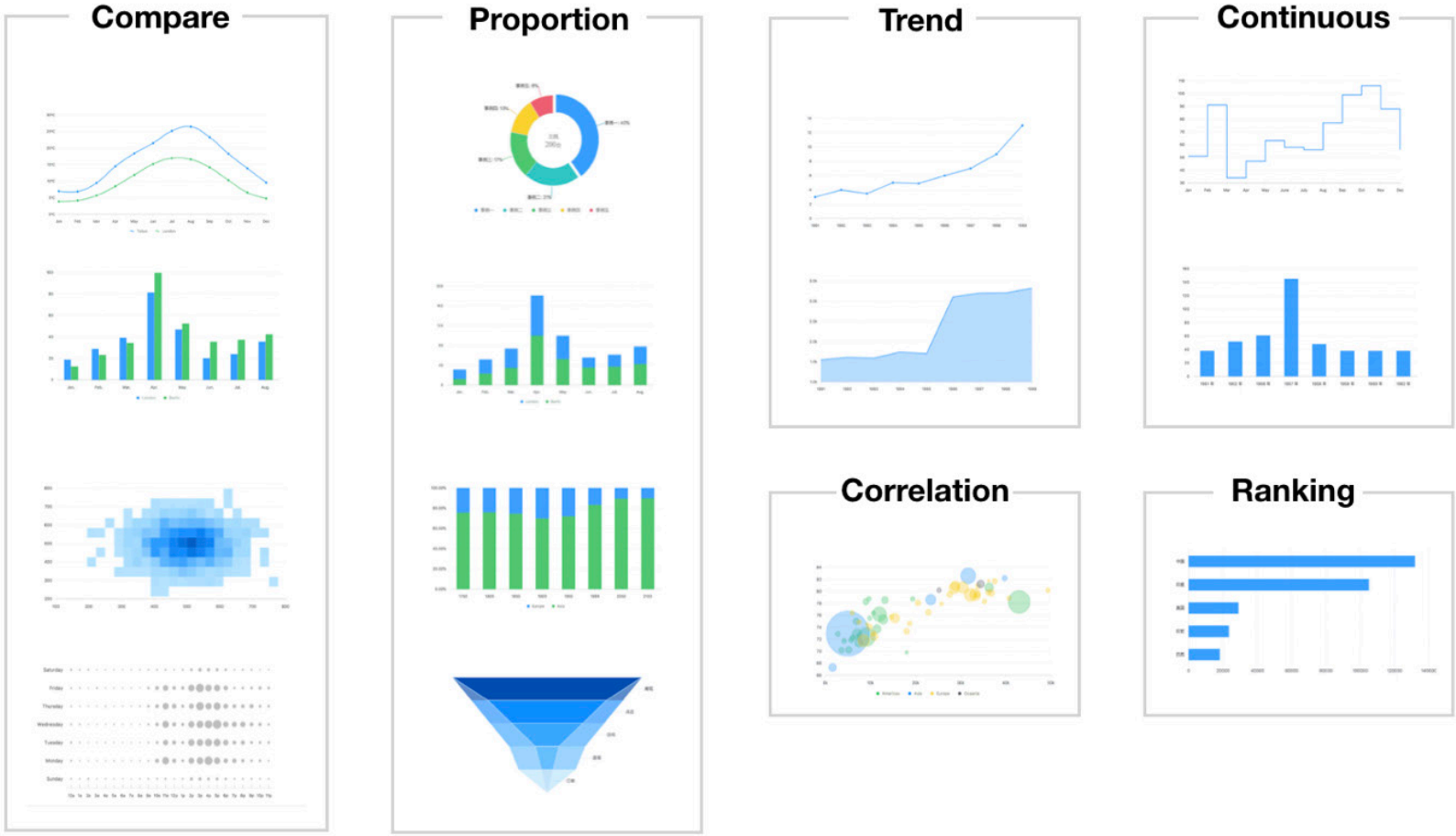


Figure 4.1.6.2 Data visualization selection

4.1 Wireframe design – Data visualization

4.1.7 Flow density x Product spots

For one heatmap that needs to show correlation between flow density and product visiting numbers, I took some time to try a better way to design it since it needs to put two layers of density map above a layout map. The left one of figure 4.1.7.1 gives me a lot of inspiration.

Besides the spots' location that is indicated by the X & Y axis, this chart could convey more than 5 data information by layer–overlapping, shape's size and shape's color.

Therefore, for the flow density & product spots heatmap design, I selected this way to visualize my data. After collecting some data onsite, I made a series of heatmaps of flow density X product spot, shown as figure 4.1.7.3.

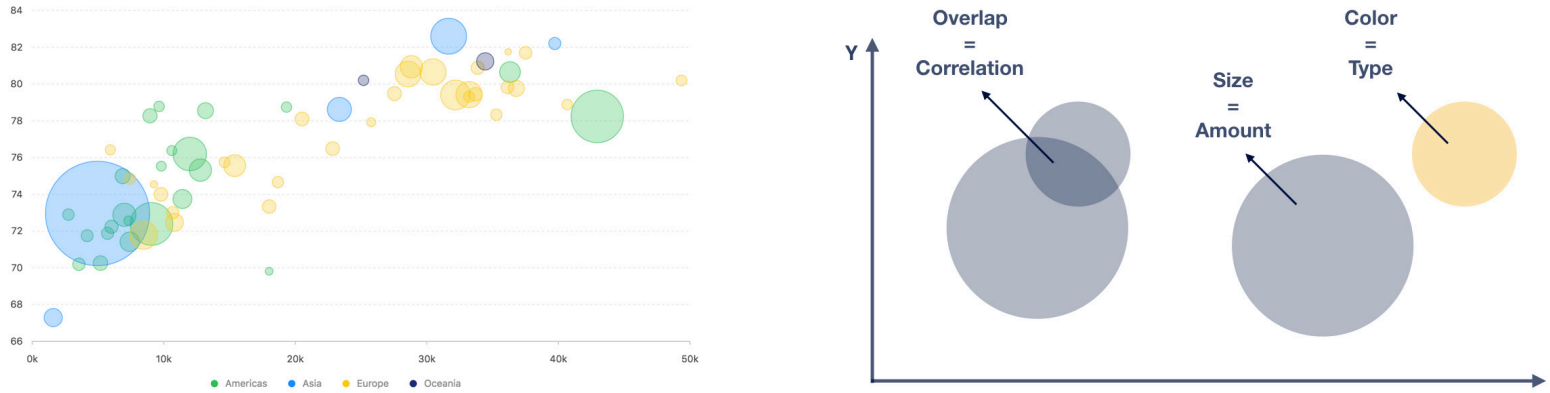


Figure 4.1.7.1 Flow DensityXProduct spot inspiration

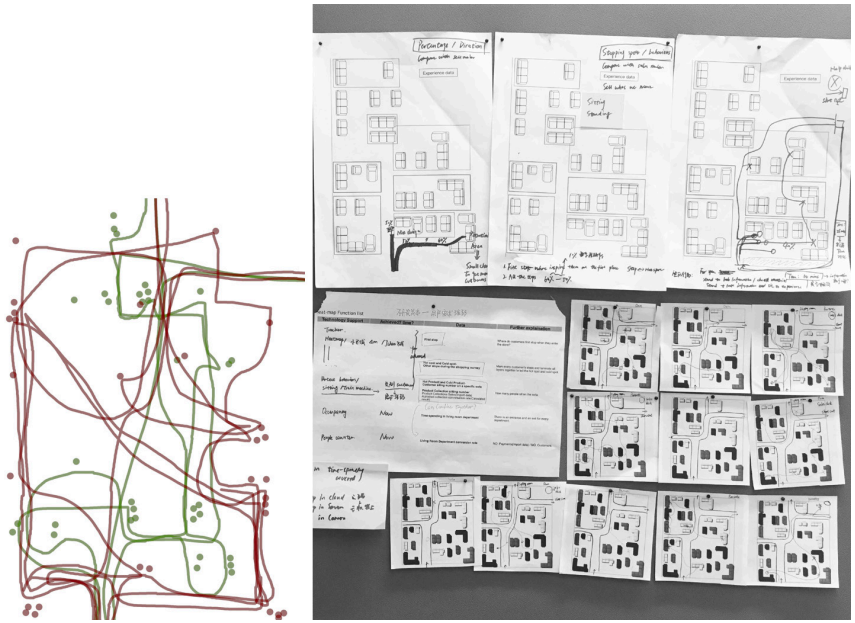


Figure 4.1.7.2 Data collection process & result

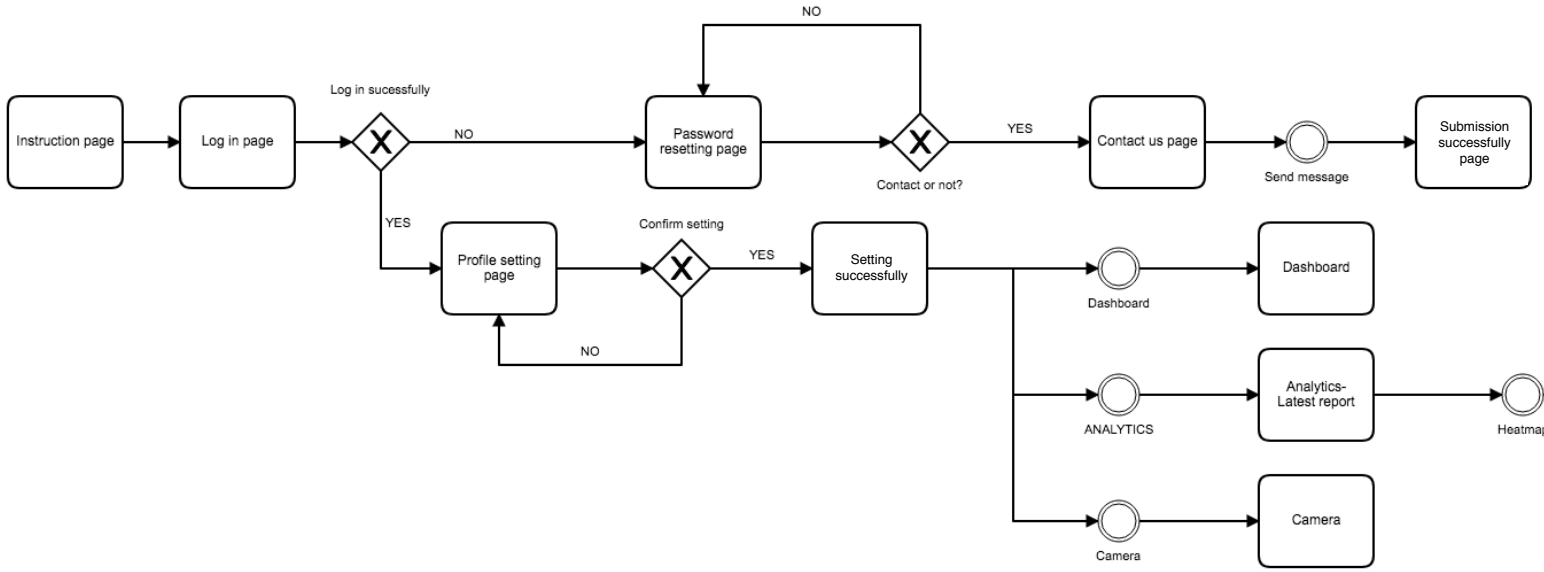
Figure 4.1.7.3 Final flow density X product spot heatmap

4.1 Wireframe design – Page flow

4.1.8 Product page flow

Page flow diagram includes pages' names, content and logic, like a bone of our body.

During my design process, I adjusted the page flow map several times when I changed pages' content, added product functions, etc. My page flow is growing with my final wireframe at the same time. After I finalized my page flow, shown as figure 4.1.8, the number and content of my wireframe are also decided.



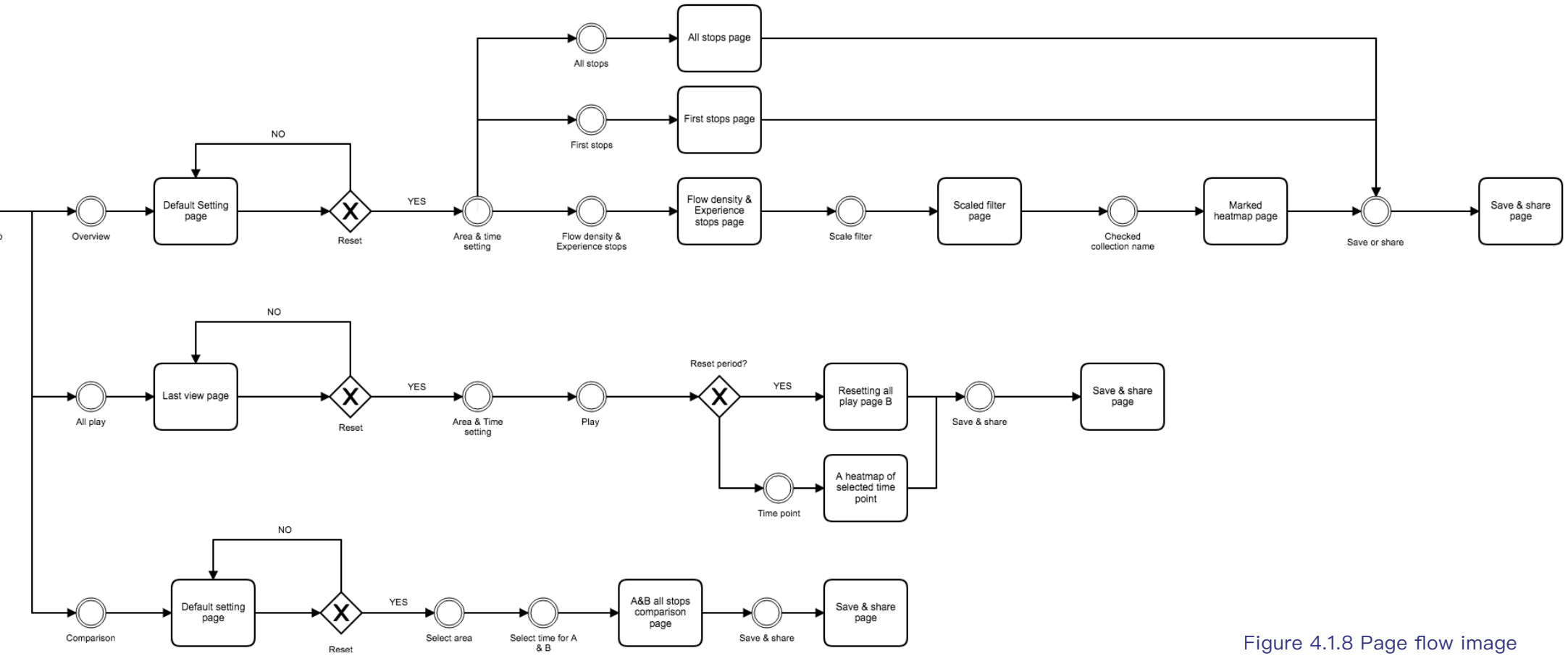
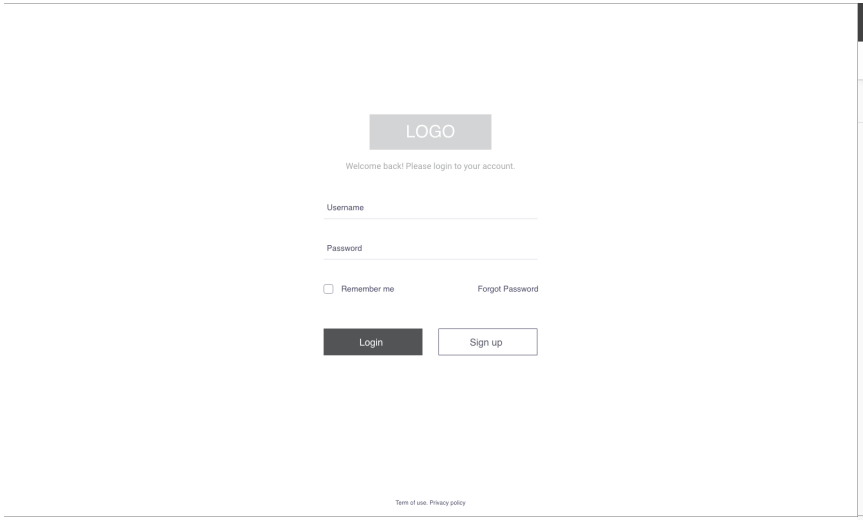
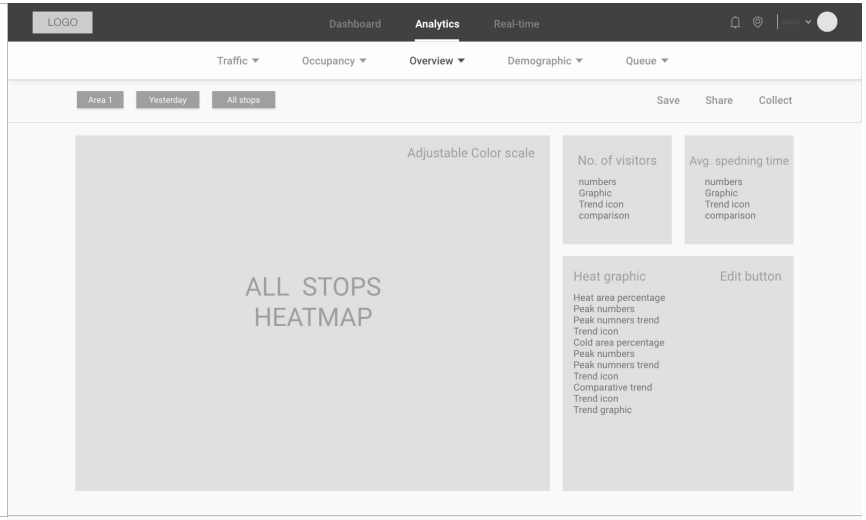


Figure 4.1.8 Page flow image

4.1 Wireframe design–Presentation

4.1.9 Wireframe Presentation





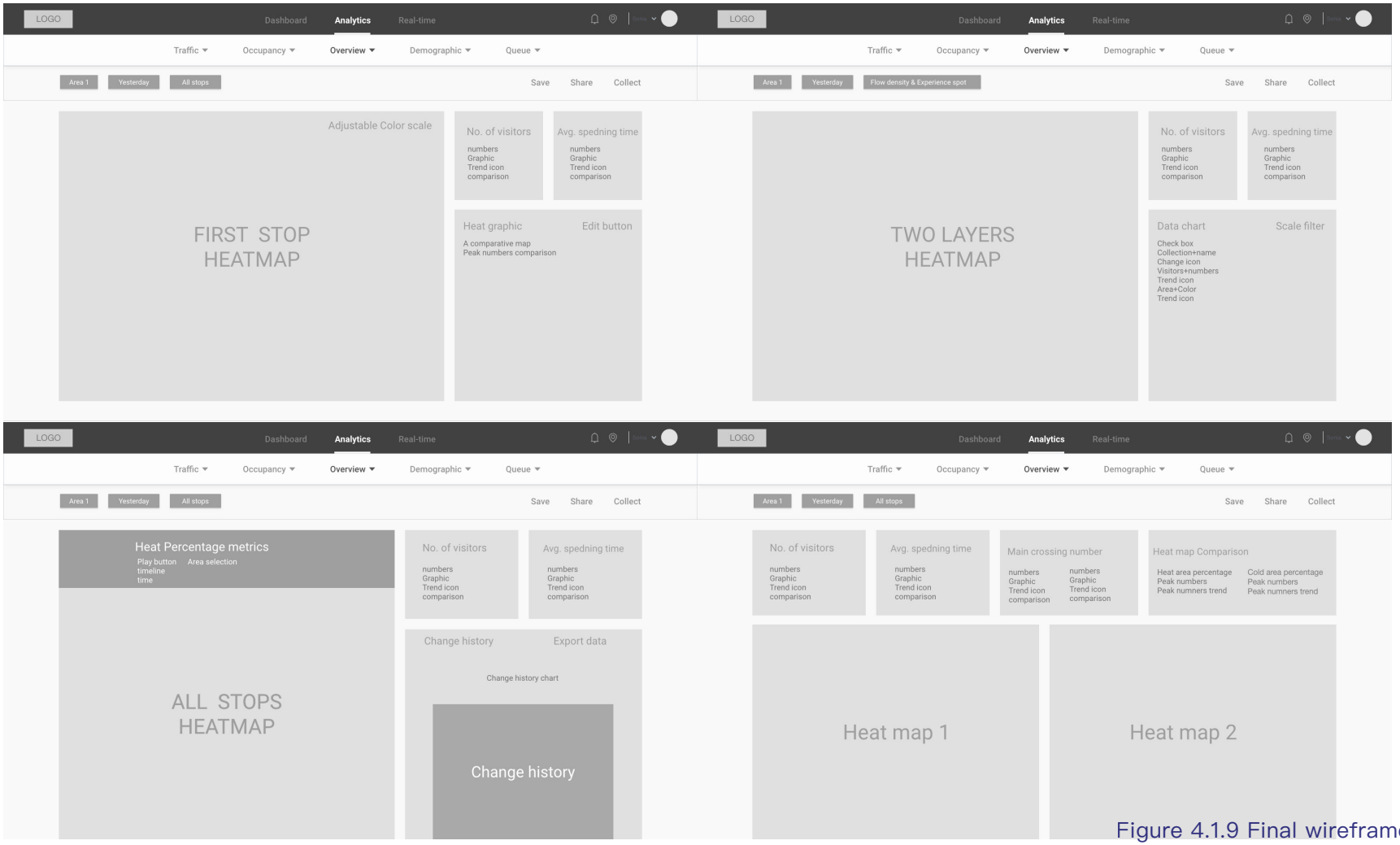


Figure 4.1.9 Final wireframe design

4.2 Usability design

4.2.1 Usability design focus

During the design process, I mainly changed my interface to improve product usability four times. When using a data visualization product, there are two frequent interactions between users and interfaces, which are condition-setting and data-checking. Therefore, I spent a lot of time to improve my product usability of time picker and data readability.

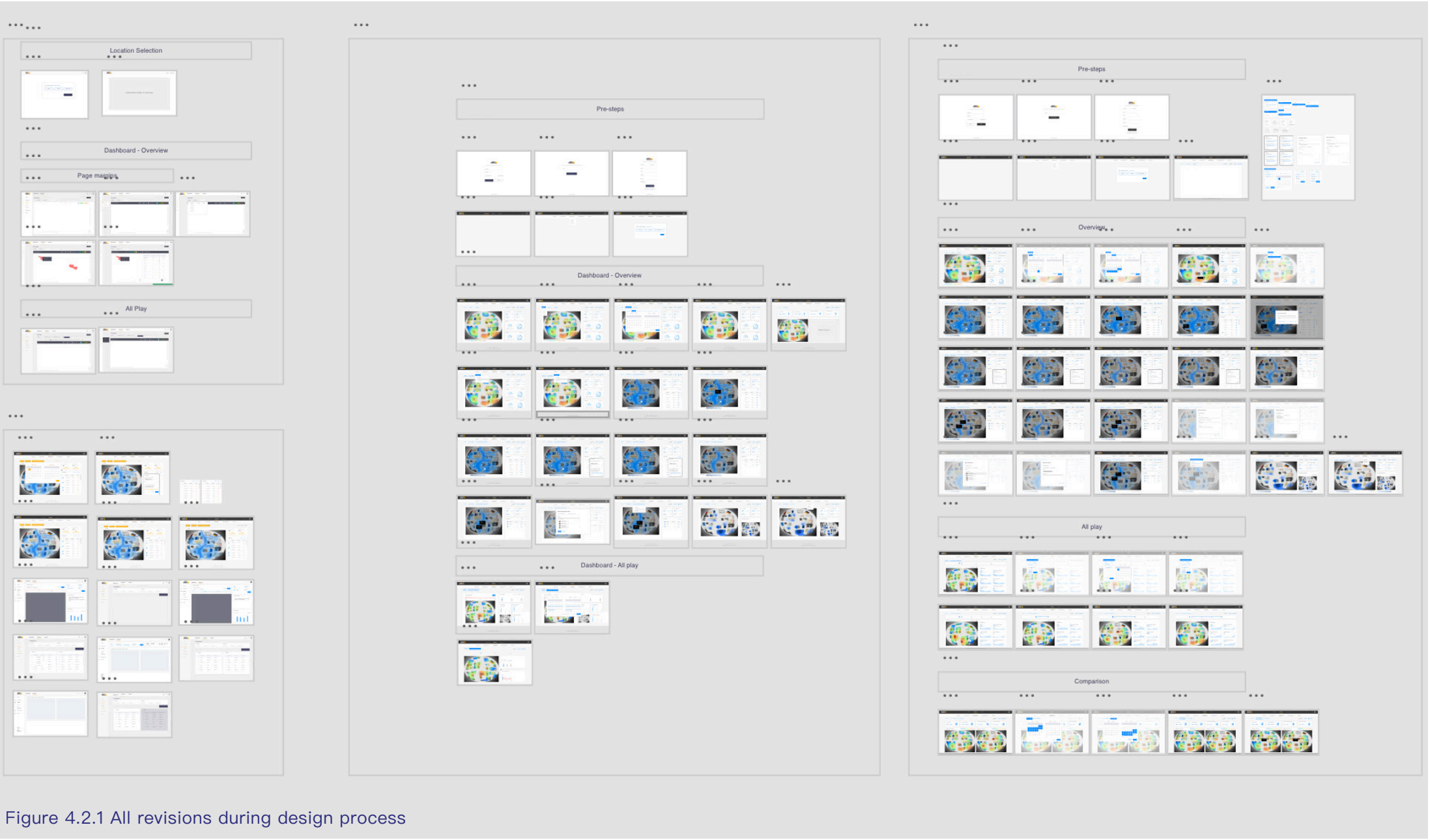


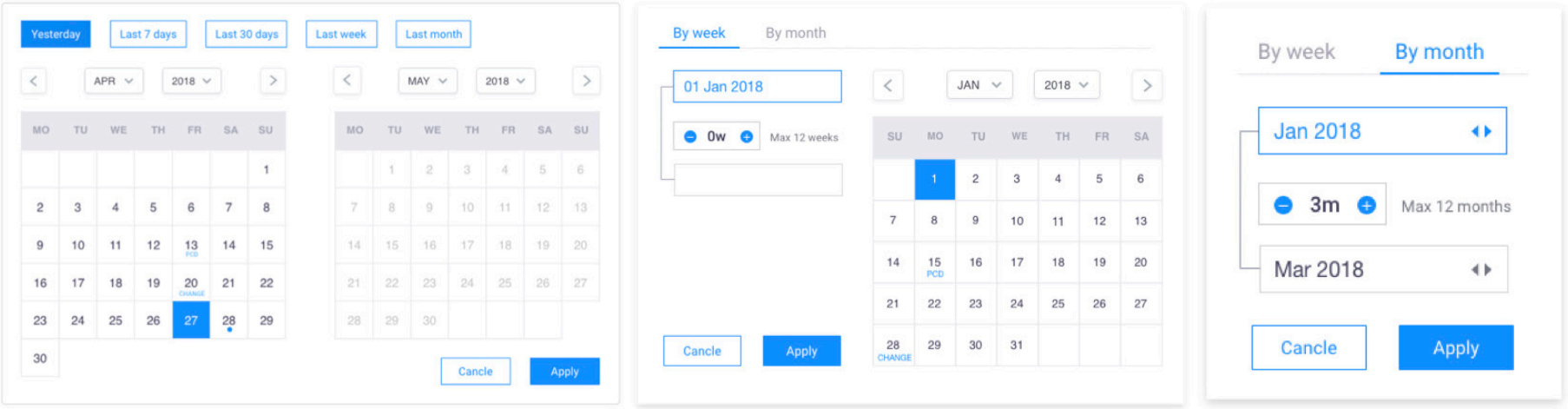
Figure 4.2.1 All revisions during design process

4.2 Usability design

4.2.2 Condition-setting：Time picker design

For the “Overview” function, since users have fixed daily checking routine, there are some shortcut-buttons for users efficiently to get into the results they want to see, like yesterday, last 7 days, last week, last 30 days and last month.

For the “All Play” function, however, it will be different when a user wants to select a long-time scale. What our end-users care about is not a specific date. They are more likely to know how many months or weeks they select and the value of this period. Therefore, I added an amount-added button and the ending time will be automatically shown to them for understanding the length of their selected period.



Overview

All Play

All Play

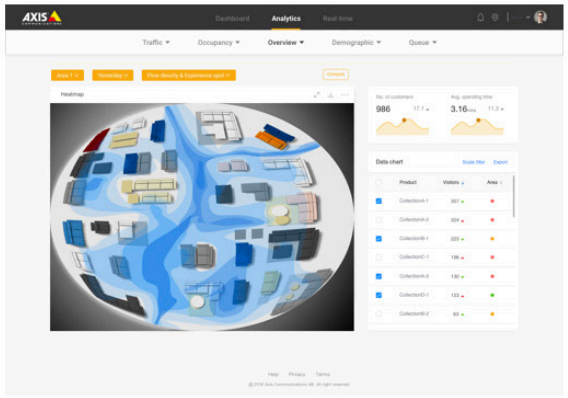
Figure 4.2.2 Final time picker design

4.2 Usability design

4.2.3 Flow & Product spot colormap data visualization design

“Flow & Product spot colormap" is an important product feature of my design. In the beginning, I designed two ranking buttons next to the visitor number and area density level for users to rank for quick information sorting. This works in some way. But, I want to let users see the most unmatching relationship, and I designed a scale filter to check these two layers individually.

By the adjusting scale, users can customize different sections separately and check the overlapping status on this colormap in a more direct way.



Data chart Export

	Product	Visitors	Area
	CollectionA-1	357 ▼	
	CollectionA-2	324 ▲	
	CollectionA-3	130 ▼	
	CollectionC-1	196 ▲	
	CollectionB-1	223 ▼	
	CollectionB-2	63 ▼	
	CollectionD-1	123 ▲	

Data chart Export

	Product	Visitors	Area
	CollectionA-1	357 ▼	
	CollectionA-2	324 ▲	
	CollectionA-3	130 ▼	
	CollectionC-1	196 ▲	
	CollectionB-1	223 ▼	
	CollectionB-2	63 ▼	
	CollectionD-1	123 ▲	

Scale filter

Customer flow density

1 — 732

Coveed Percentage: 32.5%

Experiencing product visitors

0 — 357

No. of Products: 23

Cancle Apply

Scale filter

Customer flow density

201 — 732

Coveed Percentage: 25.4%

Experiencing product visitors

0 — 357

No. of Products: 23

Cancle Apply

Scale filter

Customer flow density

401 — 732

Coveed Percentage: 16.2%

Experiencing product visitors

0 — 357

No. of Products: 23

Cancle Apply

Scale filter

Customer flow density

401 — 732

Coveed Percentage: 16.2%

Experiencing product visitors

0 — 27

No. of Products: 2

Cancle Apply

Figure 4.2.3 Final Scale filter design

4.3 UI Style guide

4.3.1 Overview

As products from the same brand, it is natural and necessary that they speak the same visual language and that is the reason that I analyzed and built a style guide. According to the theory of Atom Design, a whole structure of a design system includes three parts.

Building Blocks
Color palettes, typographic scales, grid definitions, icons & assets.

UI Patterns
Templates, Modules, Components, Elements.

Rules
Design principles, implementation guidelines, editorial guidelines.

In this project, as a conceptual product, I mainly focused on the first two parts, which are building blocks and UI patterns.

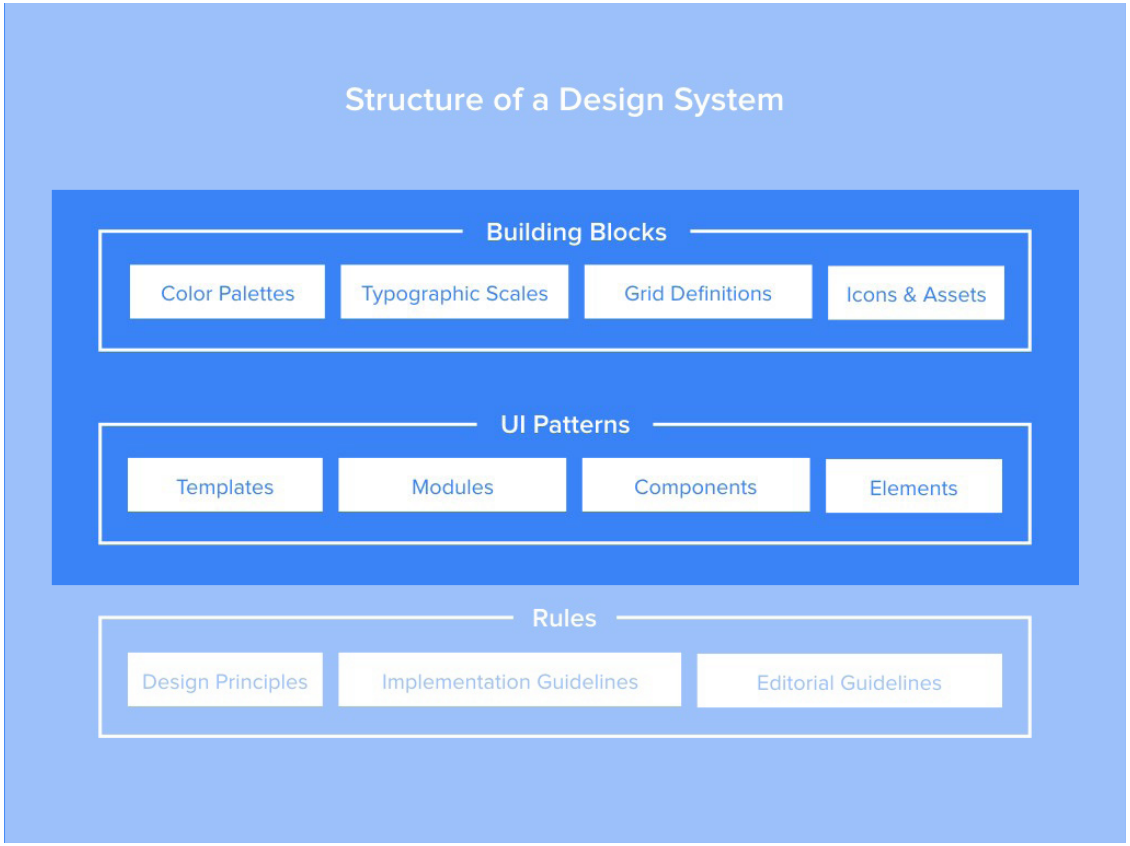


Figure 4.3.1 UI design system

4.3 UI Style guide

4.3.2 Brand identity analysis

For visual language definition, which is connected with many design aspects, it is important to keep the same path with the Axis brand identity that they are using now.

To analyze the Axis brand identity, I collected information and materials mainly from three aspects–Axis official websites, Axis graphic design manual, and Axis digital style guide manual. By the description of Axis history, brand value and brand responsibility, I concluded three keywords to describe the Axis brand identity, which are industry front–runner, intelligence, and safety. These keywords are the foundation of the Axis's brand identity. Based on these keywords, I extended some sub–keywords to depict the Axis's brand image. Combined with internal materials I got from Axis, I selected some specific colors and typography, which are two essential elements of my visual language.

According to the Axis brand identity analysis I did and the visual language that they are using now, it is obvious to see that they take outstanding color, bold and sharp typography to present their brand as an industry leader, a safe and technological solution supplier. Therefore, designing for Axis, I will continue to take yellow and gray as two symbols of leadership and stability. In addition, I will take daybreak blue as a theme color to show a brand with human–centered technology. For character style, I selected Roboto, a font that Google mainly used, as my main typography. On the other hand, for data visualization, I will present them with color–blocks for a steady visual effect.

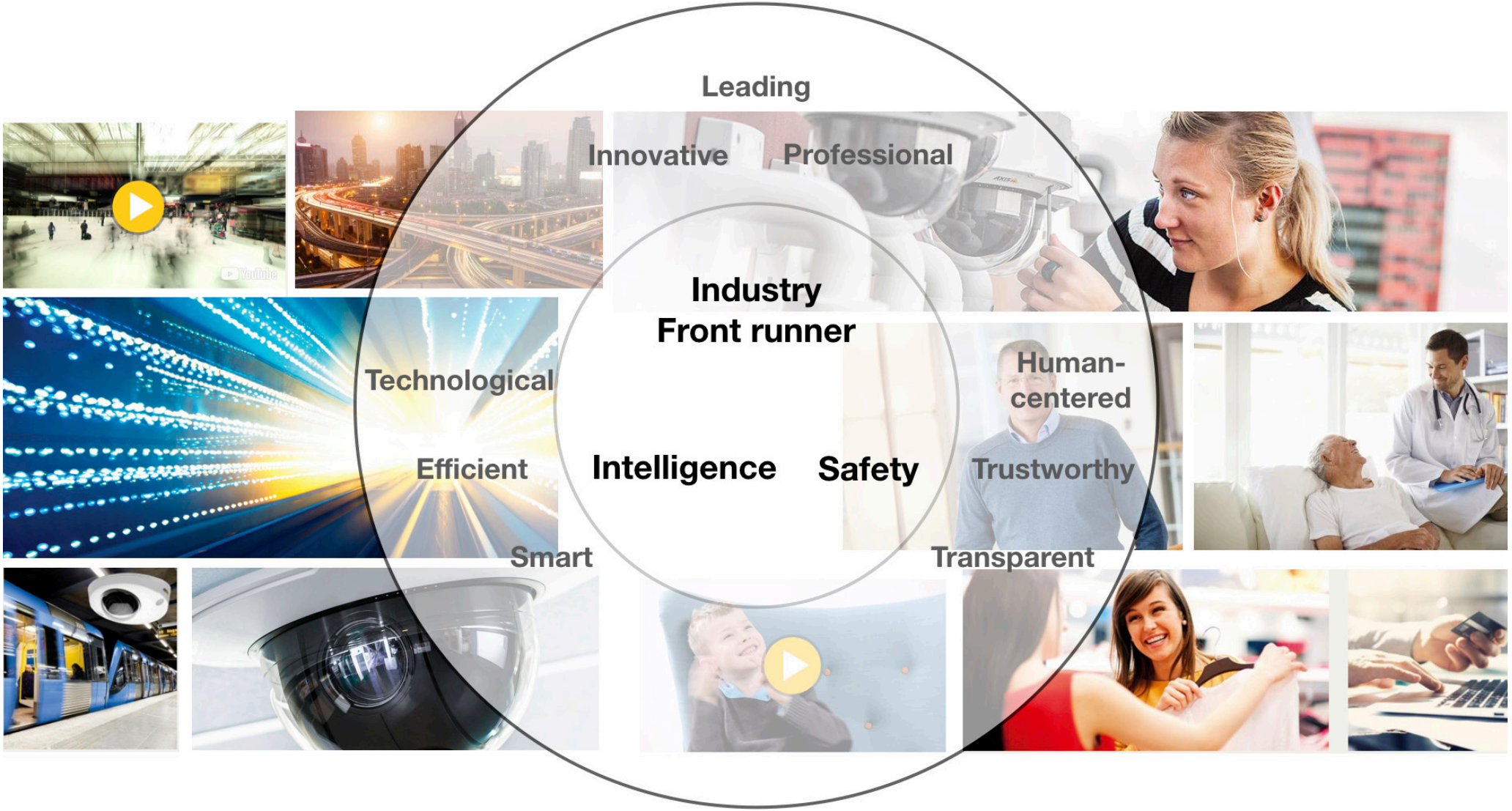


Figure 4.3.2 Axis brand identity analysis

4.3 UI Style guide

Color Palette

Daybreak Blue
Inclusive / Technological / Beneficial

Gray
Safe / Stable

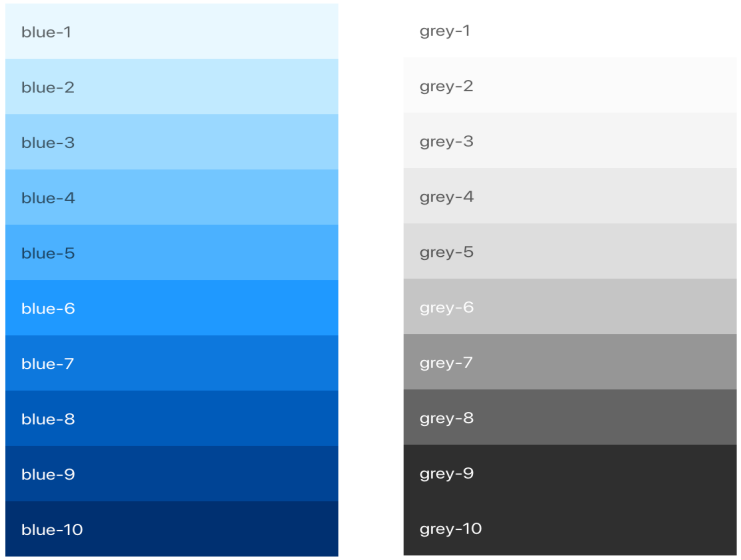


Figure 4.3.3.1 Final color palette

Typography

Character style 1
Roboto

Character style 2
Helvetica

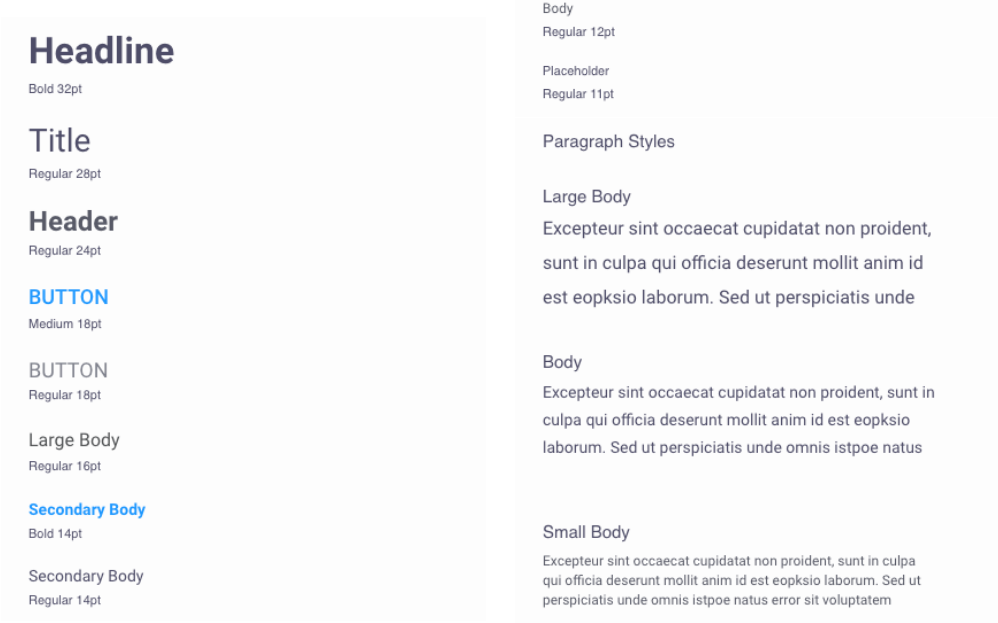


Figure 4.3.3.2 Final typography

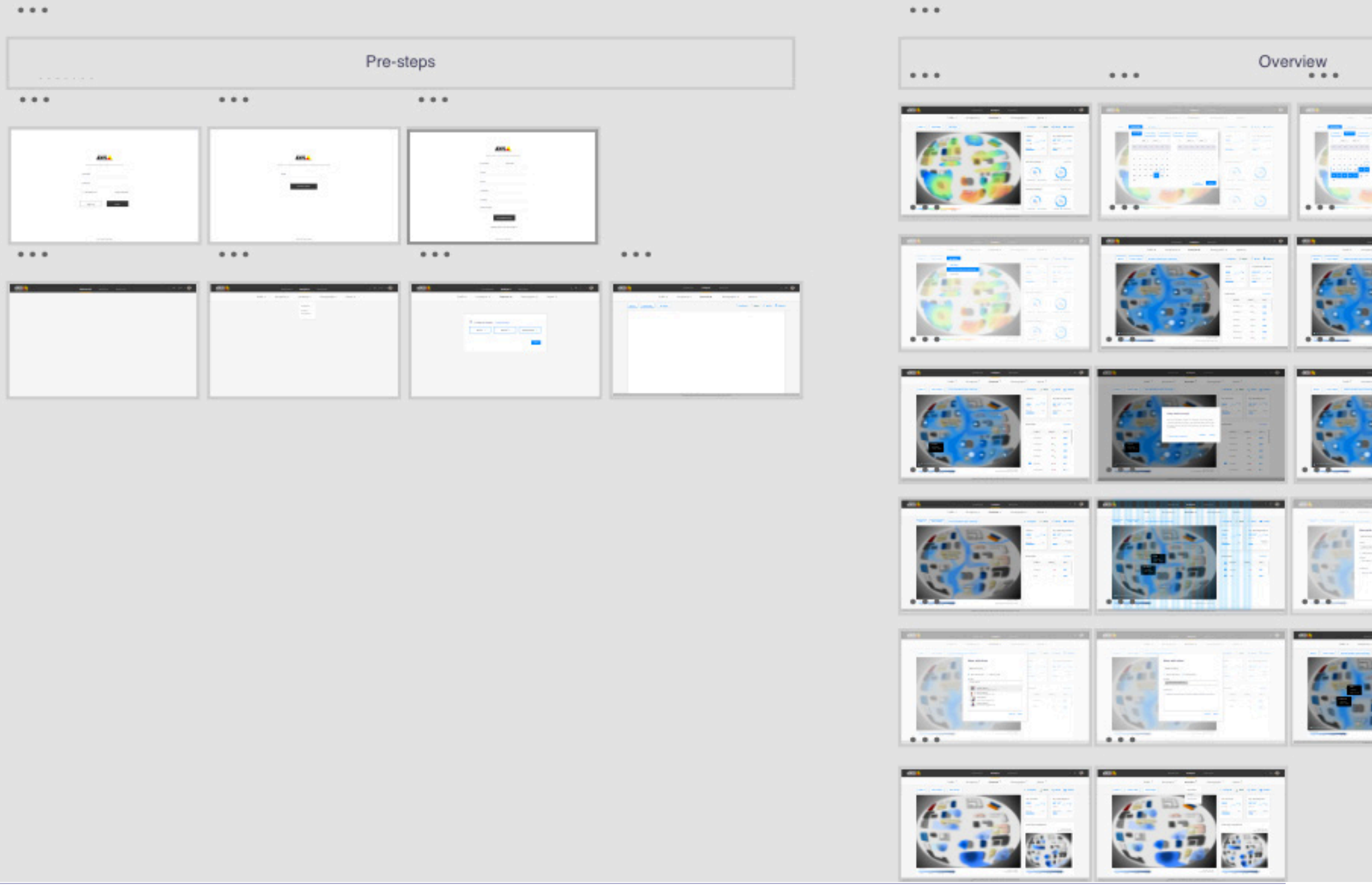
Chapter 5

Final work

5.1 Overview interface

5.2 All play interface

5.3 Comparison interface


Pre-steps
Overview

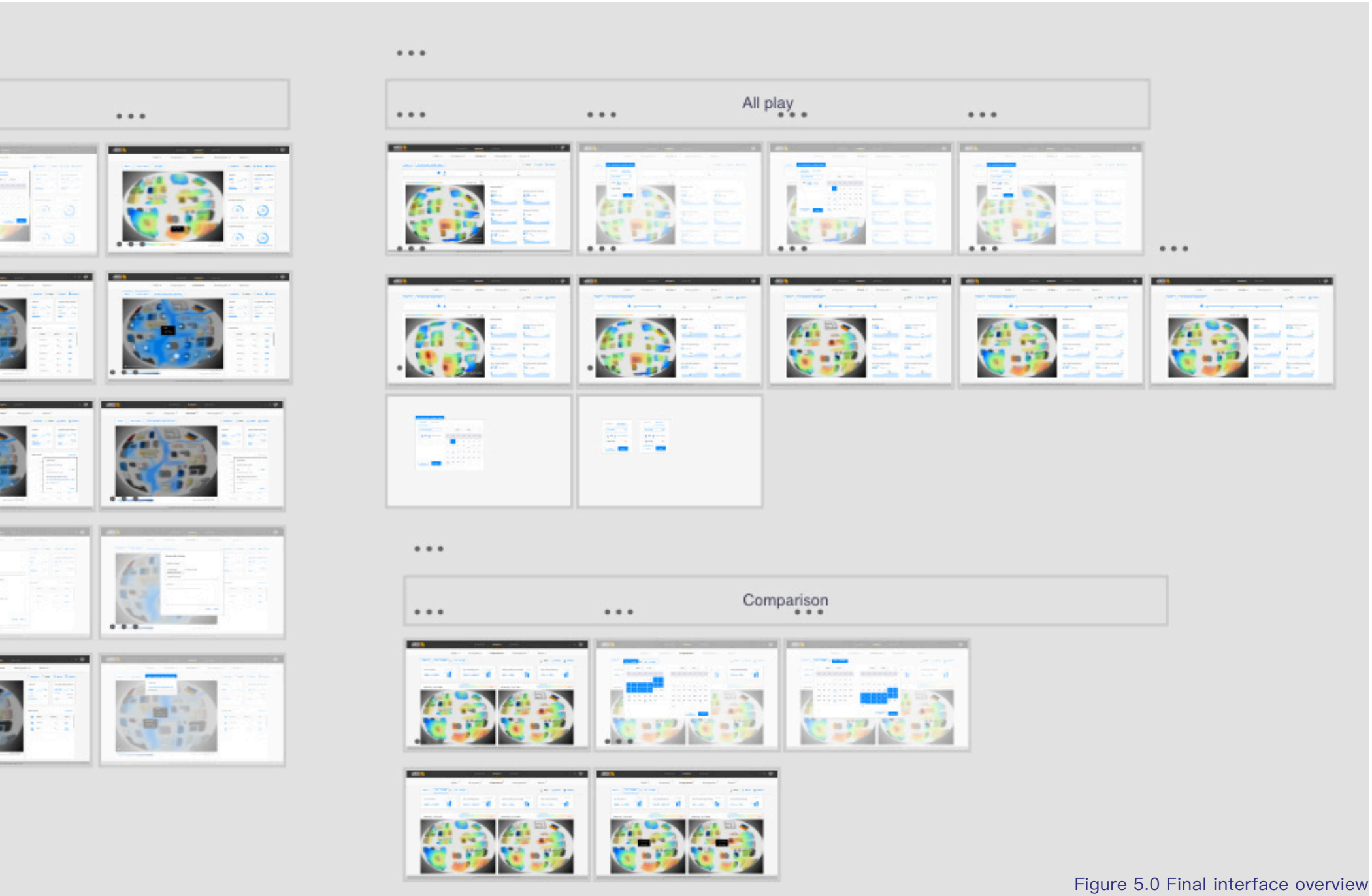


Figure 5.0 Final interface overview

5.1 Overview page

Under the function of "Overview", users can do a quick check of "All stops", "First stops", and "Flow and Product spot colormap". Combined with other data shown at the same time, users can get a quick view of their selected time period.

Seen from figure 5.1, a colormap takes a lot space for users to see which area is hot and how hot it is. For users to understand the heat level and trends in a better way, there is a hot area coverage percentage number. With an accurate number explanation, users can understand a heatmap not just from visual effect, but also from a comparable perspective. In addition, I also set other data resources, like visitor numbers, how many of them take a shortcut, and how long they spend in this department. With these related data, users can understand their store performance from a comprehensive perspective.

The "Flow & Product spot colormap" is an important product feature. By overlapping a shape and a heat layer, users can understand the correlation between a product and it's location. There is a chart next to the colormap for users to see overall performance. You can rank visitor numbers and busy areal. And users can also use the scale filter to customize the section that they are interested in.

For first stop, users are not interested in numbers. What they want to see is the first stop location. They hope to see whether it is an area that is close to the entrance or an area they are anticipating to attract customers' attention. Therefore, numbers are not needed for this interface, instead a heatmap is prefered.

For detailed information of button term and data functions, please check appendix 4.

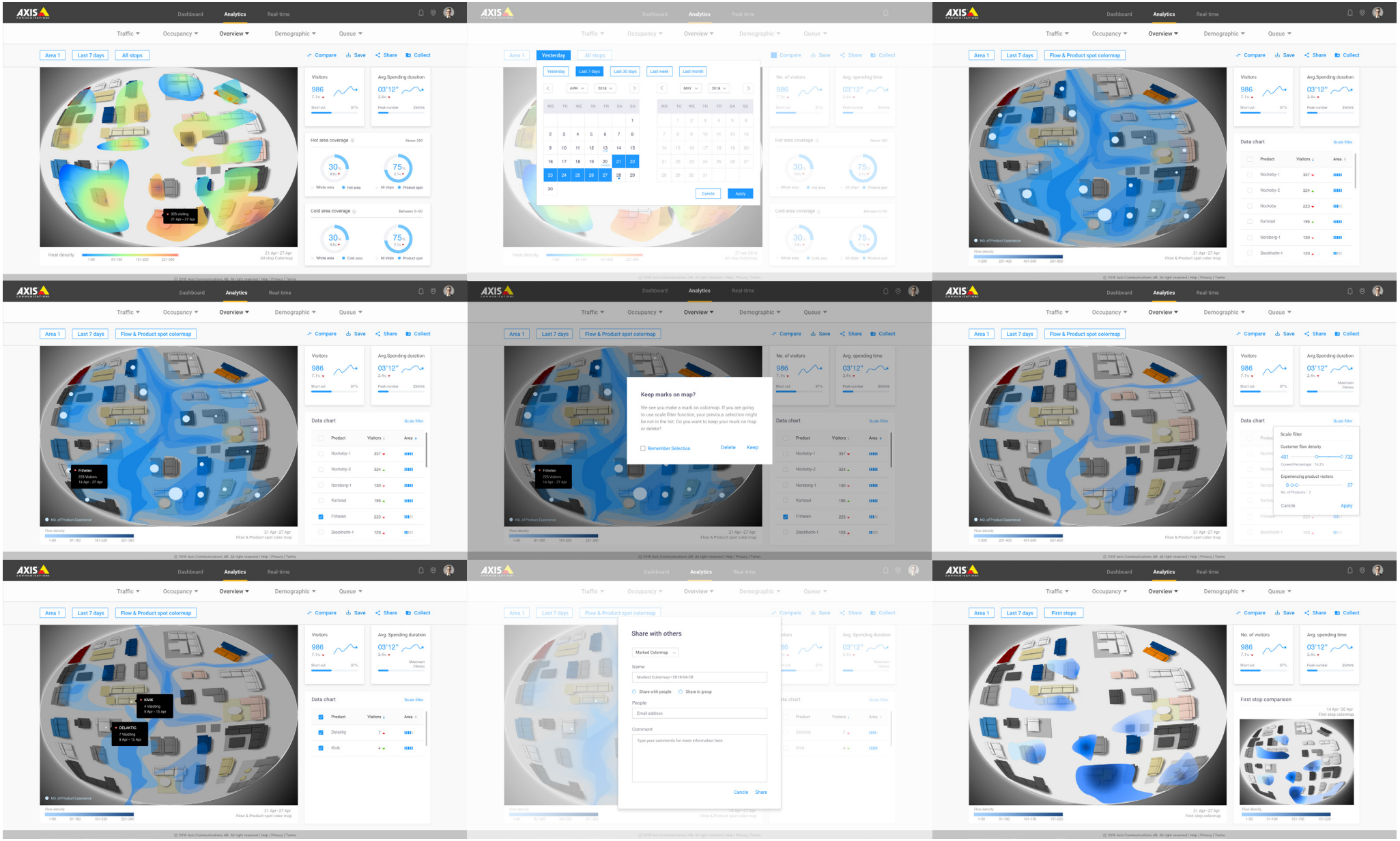


Figure 5.1 Overview interface

5.2 All Play page

Based on the analysis in the previous chapter, there is a user requirement to see an area's performance during a long-time period and zoom in for more detailed information, like a smaller time scale. Since the heatmap is different from other charts, it is impossible to compare different images at different time points in an image. Therefore, to compare some heatmaps, I designed two ways to compare them in both long-time scale and short-time scale.

Under the function of a "All Play", the user can see an average performance during a long-time period and zoom in detailed information by changing to a smaller time unit. As users started to play different images as a video, other data shown at the specific time point will be changed in parallel. Thus, for the design of other charts, I selected numbers and trending data for users to acquire information quickly.

Users can stop anytime if they think the data is valuable. If the time unit is a month at the beginning and they then think it is valuable to explore the data further, they could adjust the time unit to a week and see more detailed and accurate data.

For detailed information of button terms and data functions, please check appendix 4.

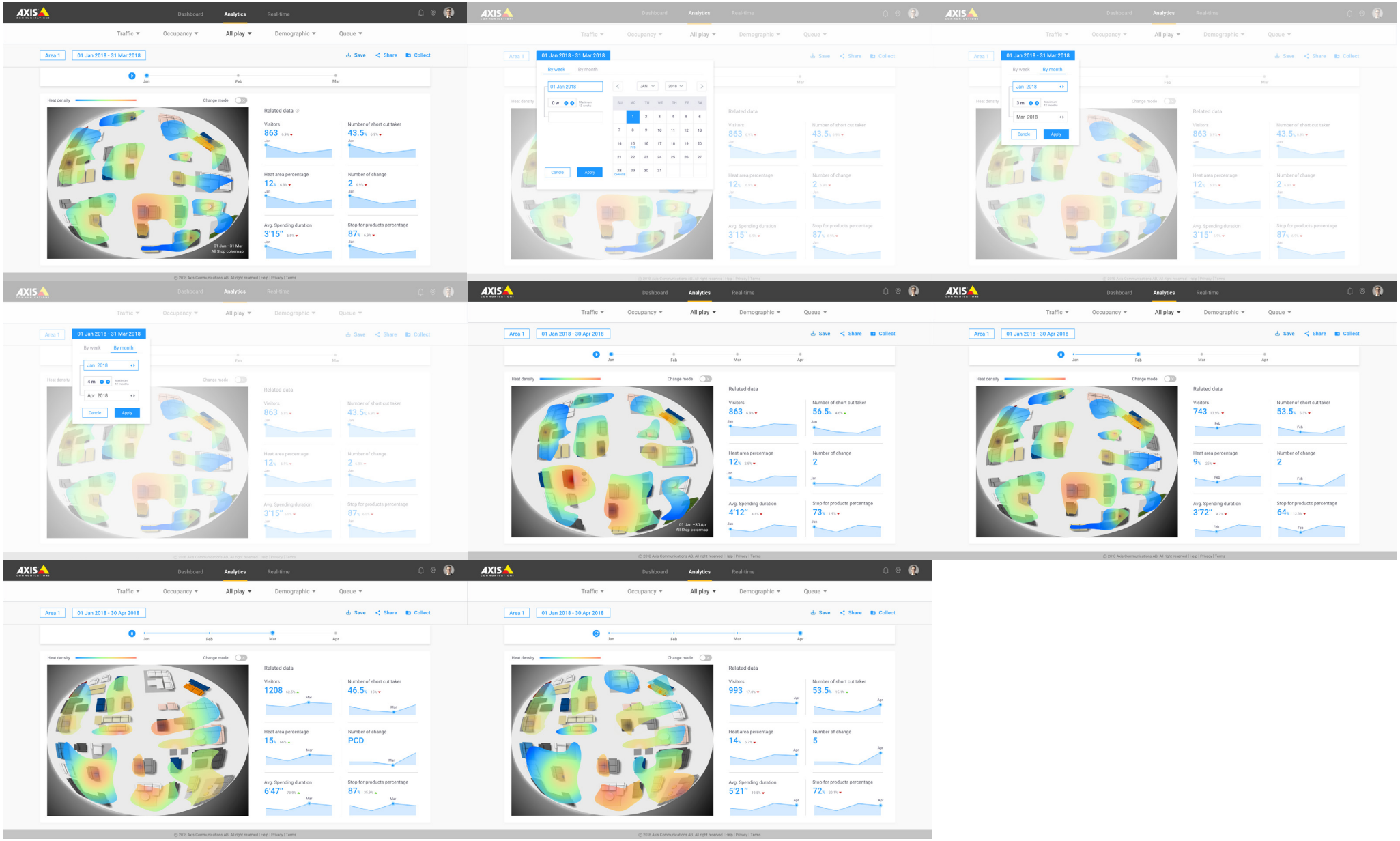


Figure 5.2 All Play interface

5.3 Comparison page

After a layout change that usually takes two days to be completed, the sales team and communications team need to evaluate the result of their layout change. A comparison surrounding a specific date shows up. Under a user requirement described earlier, users need to stay with these two heatmaps and compare them from many aspects.

Thus, for direct understanding, I added a mode to show changing location, which helps users to build a better understanding between layout changes and final results.

On the other hand, as we discussed before, time picker is an important element to be designed on this page. To be able to offer users a tip about changing dates is a key design point for the comparison function.

For detailed information of button terms and data functions, please check appendix 4.

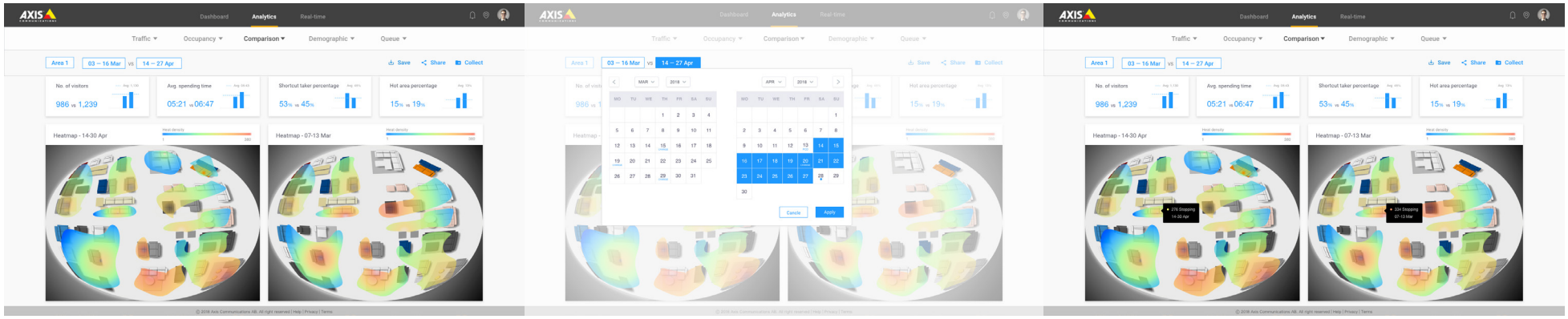


Figure 5.3 Comparsion interface

Chapter 6

Discussion

6.1 Discussion

6.1.1 Conclusion

Back to my mission offered by Axis, based on developed and developing technologies of Axis Communication, research of user data needs and to design of a user–friendly data visualization product, has been explored.

When I was doing my research, I selected my case study by a combination of camera technology and data value in the retail industry. With a limited resource to get close to my real end–users, from the perspective of both time and candidates, I selected suitable research methods and also adjusted some methods based on my case. This process allowed me to apply my theoretical knowledge into real practice.

When I started to design my product, I did an analysis of the Axis's current product with consideration that a heatmap is a part of the whole Axis product family. Having agreed with the Axis product strategy, I summarized the problems of their product and optimize them. At the same time, I merged my functions together with the optimized product.

6.1.2 Limitations

More and more products will join the Axis product family and it is not just me, but also Axis needs to think about optimizing their product with an integrated functions net and a reasonable relevance. For UI design, I developed my UI principle by analyzing their brand identity and current product interface. Limited by time, there are more visual language components needed to be developed.

6.1 Discussion

6.1.3 Ethical discussion

For building a trustworthy society, the foundation is about information transparency. Service suppliers, like Facebook and Amazon, are stronger than customers and this situation is changing slightly. With the development of laws and regulations, customers need to know what kind of information their service supplier takes and how much they takes. In Sweden or Denmark, there will be some signs to inform customers if there are cameras inside. But, it is not clear for customers to know how these cameras are working. As a video camera industry leader, Axis is trying to take advantage of technologies to help people looking for a safe and secure life. Therefore, I had an inspiration and also a discussion with my friends about data transparency.

When a retailer buys an Axis camera, they will get a notice sign to inform of the surveillance status for free. On the sign, there will be different icons for customers to see what kind of data that the store is taking. And if they want, they also can go to the Axis website for more information. With information transparency, trust will be built and it is beneficial for both the retail brand and the Axis brand.

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Figure

Fig 4.1.4–1: AXIS Store Reporter Demo, available on 20 May 2018. https://asr–demo.axis.com/dashboard

Fig 4.1.4–2: AXIS Store Reporter Demo, available on 20 May 2018. https://asr–demo.axis.com/analytics

Fig 4.1.4–3: AXIS Store Reporter Demo, available on 20 May 2018. https://asr–demo.axis.com/analytics/report/people_counting_adhoc

Figure 4.1.6–1&2 G2 基础图表类库 – AntV, available 20 May 2018. https://antv.alipay.com/zh–cn/g2/3.x/index.html

Fig 4.3.1: Design Systems Sprint 1: The Interface Inventory — Marcin Treder — Medium, available on 20 May 2018. https://medium.com/@marcintreder/design–systems–sprint–1–the–interface–inventory–1f78d376e49a

Figure 4.3.2–1&10&11 Privacy vs security | Axis Communications, available 20 May 2018. https://www.axis.com/about–axis/a–smarter–safer–world/privacy–vs–security

Figure 4.3.2–2 The security market | Axis Communications, available 20 May 2018. https://www.axis.com/about–axis/the–security–market

Figure 4.3.2–3&4&8 Innovations | Axis Communications, available 20 May 2018. https://www.axis.com/about–axis/innovations

Figure 4.3.2–6 Healthcare | Axis Communications, available 20 May 2018. https://www.axis.com/solutions–by–industry/healthcare

Figure 4.3.2–7 Celebrating 10 years of onboard network cameras – Secure Insights, available 20 May 2018. https://www.axis.com/blog/secure–insights/mobile–cameras/

Figure 4.3.2–9 Overview | Axis Communications, available 20 May 2018. https://www.axis.com/about–axis/a–smarter–safer–world

Appendix 1 – Sonia 1st Interview Questions & Results

Interviewer

Jin Liu, student of Industrial design, Lund University.

Interviewee

Sonia Bassi, sales leader of IKEA living room department

Duration

60 mins

(Comments: Organized again after finishing and some information has been deleted.)

Q = Question;

A = Answer

Q– How often do you change your department layout?

A– We have four product change days in a whole year and they happen in February, April, August and October. During this time, we have a lot of news in and some stock is necessary to be cleared. And we make a quite big change for both open display area and our sample display room.

Q– Who will design the layout?

A– For the display area, sales manager, sales leader and communication designer usually work together.

Q– Could you tell me more about customer flow?

A– We conduct 2–3 customer flow researches a year at least. The hot spot is the spots that the customers always stop and the cold spots are the spots that they don't stop. And we need to make changes according to that. If they stopped by a sofa, then we will make a mark for that. We also record how long do they spend in this area.

Q– What do you mean to stop?

A– It is different. Sometimes, they just stop and look. They check the price tag on their interesting product. They sit on the sofa for 45mins and that is a positive thing for us. We cannot follow if they actually buy it or not cause we cannot follow them to the cashier.

Q– Do you think spending time for a product means something to you?

A– Some customers just relax on it. But, we have some coaches called memory foam and it could be shaped by your body and it takes a while, then it stays. But, the sofa is hard to sit on at the beginning, and we always recommend them to sit longer and feel it. Usually, the customer who try longer buy them.

Q– Besides customer flow, do you conduct other customer research also?

A– We have forms to ask questions. Whether your product is in stock? Is it clean? Do you need to wait for a long time? These forms include much very valuable information. What are we good at? Whether we are better this year compared with last year? We use Ipad to do the questionnaire. People always say that they cannot find the products they are aimed at. But, most time, we do have in stock. This kind of feedback means that some popular products are not easy to see and find. We value this information a lot.

Q– Can you describe sales assistant daily job?

A– For all of us, the customer is the first always. Besides answering questions and helping customers, they also need check product condition. We do small change once a week like changing sofa covers for a commercial reason.

Q– How does sales team work with Communication team?

We have some meetings a few times a week. Normally, it is held in the morning. Normally, sales team presents customer flow to them and they do the layout design. We present sales figure to them and let them know what did actually increase the sales. Before changing, we talk with communication team first. We will explain this is what we need, this is what we can see from our customer behaviors.

Q– Can you give me an example that you improve sales by analyzing customer's shopping behaviors?

A– Malmo has modern customers and we still need to sell our tradition. So, we make the whole display room modern just because our customers prefer. Modern and transition. They start to ask about the same one. Suddenly, all of them started asking about it. The commercial color is gray, but you don't want to all the colors to be gray. Sometimes, you need to put on a crazy color just to make the customers see the products. Usually, they buy the gray anyway. They noticed the products, they try the products and they asked what kind of colors can I can get from here.

Q– What is your daily working routine?

A– I have too much. I would like to do something efficient and simple. Too many programs need to open at the same time. Sometimes, I need to go into twenty different things on my computer for analyzing my department sales of this week. It would be good to have something gathered. Prioritise what important and what is not important is necessary.

Q– Do you think shopping behaviors are changing as the development of your online store?

A– Online shopping behavior is different. The online customers usually have a direct goal to achieve. For our customers, they usually come here with more payments.

Other valuable information from our interview.

We do a lot of changes with our layout and analyze how to place our products, take the right fabric. I need my communication designers to help me if I want to do some changes to the current layout.

If the sofa doesn't sell, why should I take 20% of the area for this sofa? We need to ask reasons and see the results all the time.

How many people visited it? Why is this sofa getting their attention and why is not this sofa? What do the customers think of our displayed products?

For the products that are always in our store, maybe we need to collaborate with the second floor and other departments of our third floor to show the right products. For example, we sell a lot of cushion covers and blankets. But, maybe they don't buy our sofa downstairs.

Appendix 2 – Sonia card sorting questions & results

Interviewer

Jin Liu, student of Industrial design, Lund University.

Interviewee

Sonia Bassi, sales leader of IKEA living room department

Duration

25 mins

(Comments: Organized again after finishing and some information has been deleted.)

Introduction to Sonia

Thanks for your time last time and I am glad that you could share your time for a quick card sorting with me again. Card sorting is an interesting tool for us to structure information. I think by doing this, it might give you some insights to use data. So, basically, you need to select one card or two cards and say why you selected them? I might add some extra questions after your answers. For card selection, you could select some data you are using now and also can say something you hope to use based on your needs.

Question1

Can you select one card and tell me why you want it and how you use it?

Answer

1. Flow density & All Stop: I want to know which area is more crowded. For instance, the place next to our main road is always a good place, cause it is easy for people to try products. So, people passing by could increase product exposure rate. Stops are important and that is why we pin it always. That is why we want to compare them but cannot.

2. First stop: The first stop is something attracts customers at the beginning. Sometimes they stop because I put my popular products next to entrance and they see it and try it. Sometimes, they see our offers and go there to check quality. Many reasons, but a good way to see whether our plan works or not. I don't focus on details, important thing is whether it is moved as I hope.

3. Product spot: We don't mark sitting spot separately. But, we want to know. We know many people try our products, and they buy online. It is not our KPI but online department's. We hope to let customers buy from us.

4. Pathmap: We was thinking more customers take shortcut cause our service desk is there and we saw customers a lot. But, after we finish our map, we saw less customers find shortcut. If we see the number changes, we could make the shortcut less visible. 60% customers try this product and only half of them go on and try that one, I want to see this and also why. Why don't they continue. If I change the sofa cover, could this help?

5. Spending time: I would like to know how long do my customers stay in my department? Maybe this season is interesting and we get a lot trying and takes longer time. Not for products. There is less difference between trying product A and product B. We do have a sofa that is made with memory foam. That would need to see how long customers sitting on it. Usually, if they try longer, they buy it.

Question 2

Can you select two cards and tell me why you want them and how you use them?

Answer

1. Flow Density & Product spot: In our department, we have news-in every month and these are our space. When new products come in, I should know where I should put it? How many I should put it? Should I move some products and put my new one? In Malmo, we have more single people, there is a balance between family model and single model. Always make sure I put the right product at the right place.

2. Product spot & Sales number: It is the same as product spot I said before. The Stockholm collection was sitting a lot when it came here. It is modern and the red color really stands out from our gray-ish environment. But, Malmo people have the smallest wallet in Sweden, and Stockholm is the most expensive here. After sometime, we still move them to the cold corner.

3. First stops & First stops: We do big changes quite often compared with before. To evaluate the whole layout results, this is a quick way. It is important to compare with before. We have some spots that we want to customers to see and we can test it if we have our customer flow map. But, it cost too much time and we don't do it often.

4. All stops & All stops: It can be used anytime. Especially after our changes.

5. Path map & Pathmap: Like I said before, how many people take a shortcut? Why don't they continue anymore?

Appendix 3 – Prototype Testing questions & results

Testing process

1. Experience products by her own. (5 mins)

2. Finish these pre-setting tasks with my product. (25mins)

a. Plan for a new sales strategy in your sales team.

b. Discuss a new layout design strategy with communication team.

c. Evaluate customer feedback of a new layout change.

d. Writing a report of a new product.

e. Making an interim presentation.

3. Ask prepared questions. (10 mins)

Questions preparation

– Overview Function

1. Time selection shortcut: Do you have some fixed time selections? In what kind of situation? Ranking of them?

2. Picture-saving: Do you want to or need to save this heatmap? What will it be used for?

3. Is the background picture is clear enough for you? Do you want to customize it and color theme?

– All play Function

1. Time selection: What kind of time period and time unit do you want to analyze?

2. Do you want to compare with other IKEA living room department?

– Comparison Function

1. Do you think 2 pictures are enough? Do you hope to see more picture on this screen?

2. If you could compare 2 images together, what kind of data information do you want to compare most?

Overview All play Comparison

Interviewer

Jin Liu, student of Industrial design, Lund University.

Interviewee

Sonia Bassi, sales leader of IKEA living room department

Duration

25 mins

(Comments: Organized again after finishing and some information has been deleted.)

Introduction to Sonia

Thanks for your time last time and I am glad that you could share your time for a prototype testing with me again. This is a functional prototype I made and you could have a try for 3 mins. After that, I have five prepared tasks for you. You could try to finish it by analyzing the data you can get from this product.

Request from Sonia

I have a meeting in 20 mins today. I am not sure how long will it take to finish all tasks. I should let you know in case you won't finish it on time.

Plan adjustment

1. Get familiar with prototype for 3 mins.

2. Testing tasks 1–4 in 12 mins

3. Choose the questions that have not been covered during our testing. 4. All stops & All stops: It can be used anytime. Especially after our changes.

Sales strategy: Identity the hot spot. I know that the freedom collection sells bad and I want to improve the sells. I need to move it the hot spot. So, when it is the hot spot. Then, I will change the sales and to see whether the changes matching what I made.

Discuss with Communication team: Where do the customers go? Do they go the place as the designed arrows. Whether they take the shortcut or not all the time. If many people take the shortcut, maybe I should make it less visible. And this is the data I could take use of.

Layout change testing: That area has move potential than we thought. We do changes but we sometimes can be bad at making sure that is a good change. Now, we did it and it is done and we just dropped it. I want to compare it, that is the meaning of change. We want to them to go as we planed and to see everything. If they take the shortcut, they won't see the armchair and they won't see the leather sofa. And we want them to be seen. Go back signal is important and valuable for them.

Pictures for report: And the direction. How many customers visit during weekends and weekdays. We need to hand over the data one by one and calculate them.

Other comments from Sonia:

If we can always check data immediately, we could see our products performance in a better way. If I have a family offer, many times, I just want to check the two–week period to evauate my family offer.

If I can see which area is more crowded now, I could be better at how to use my people.

All the small changes, usually, we don't record them and for some big changes, we always can look back.

Customers flow, if the store size is very different, maybe we don't need to see it. But, we definitely want to compare it with the similar stores to see if their products selling better in some circumstance.

Appendix 4 – Term explanation

Term on product's interface	Explanation
Terms of button	
First stop	Customer first stop spot after entering.
All stops	Customer all stop spots after entering.
Flow Colormap & Product spot	Two more layers for this heatmap besides layout map: 1. Flow density： How many customers passed by a area. 2. Product spot: How many times a product have been tried.
Overview	Check heatmap under selected time period of all stops, first stop, flow colormap & product spot.
All play	Present several heatmaps of all stops under selected time period.
Comparison	Compare two all stops heatmaps from same area but different time period. The time duration must be the same, which will be limited by system.
Area	Limited by height of building, dividing living-room department into three areas according to product category.
Scale filter	Adjust flow colormap data range and product spot data range separately.
Shared with people	Shared to a colleague or some colleagues by email.
Shared in group	Shared in one group or several groups that is/are pre-created or existed internally.
All play - By week/By month	Time units between two time points.
Play button	Based on user's selection, each heatmap will be showed for several secs and be changed to next one.
Change mode	Show historical changes instead heatmaps of all stops.

Term on product's interface	Explanation
Terms of button	
Visitors	Number of visitors under selected time period.
Avg. Spending duration	Average number of customers' spending time under selected area and time period.
Hot area coverage	Percentage of hot area that is above 260.
Cold area coverage	Percentage of hot area that is below 50.
Data chart	A chart with product name, product experienced number and density of product's location.
Current page	A screenshot of current web page.
Marked colormap	A colormap after user's customized setting. When users don't change anything, marked colormap will be the same as original colormap.
Original colormap	A colormap before user's customized setting. When users don't change anything, original colormap will be the same as marked colormap.
Comments	Add a comment for further explanation/requirements about shared selection. No minimum length for the comment; Can share selection without a comment.