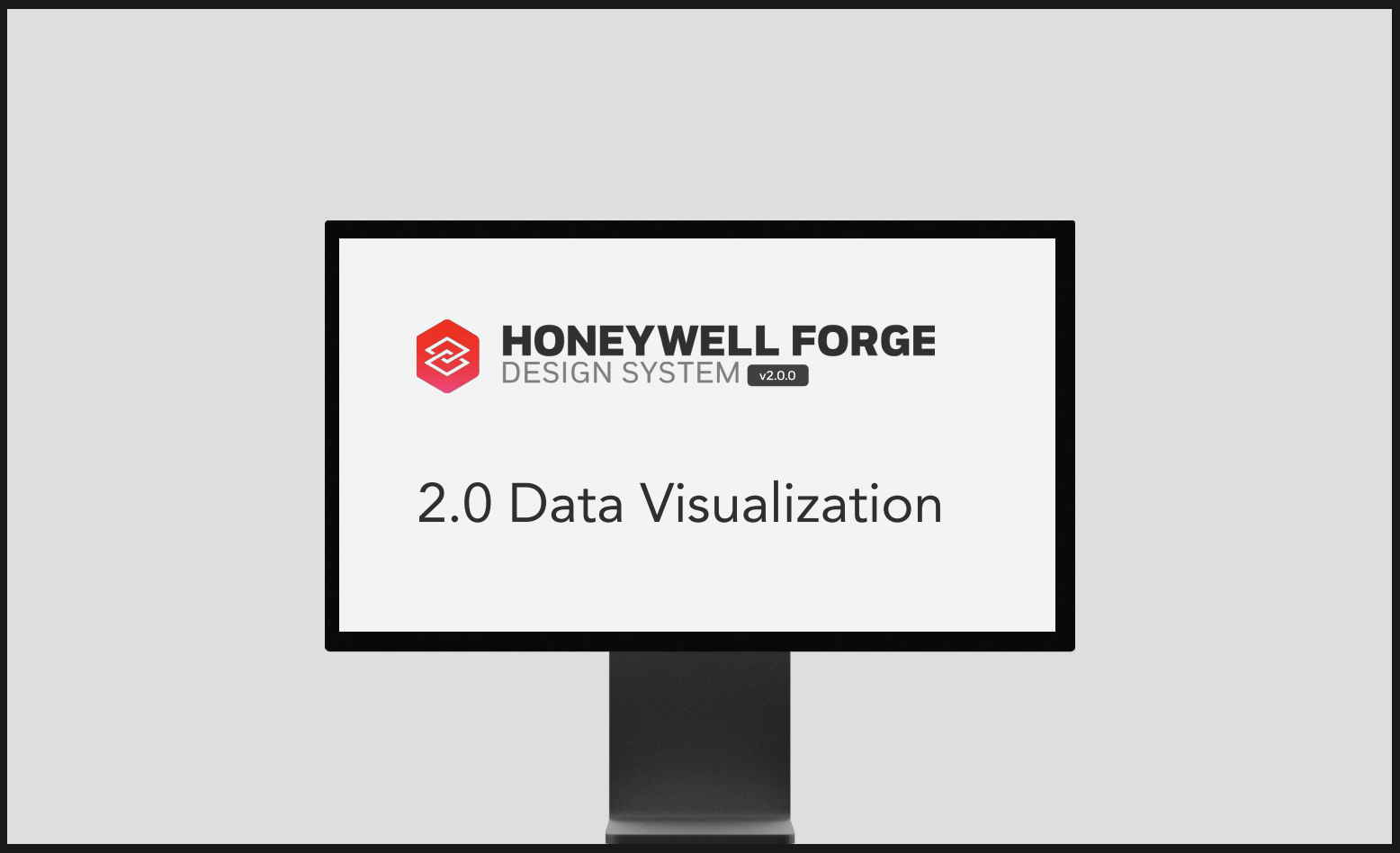
# Accessible Data Visualization library

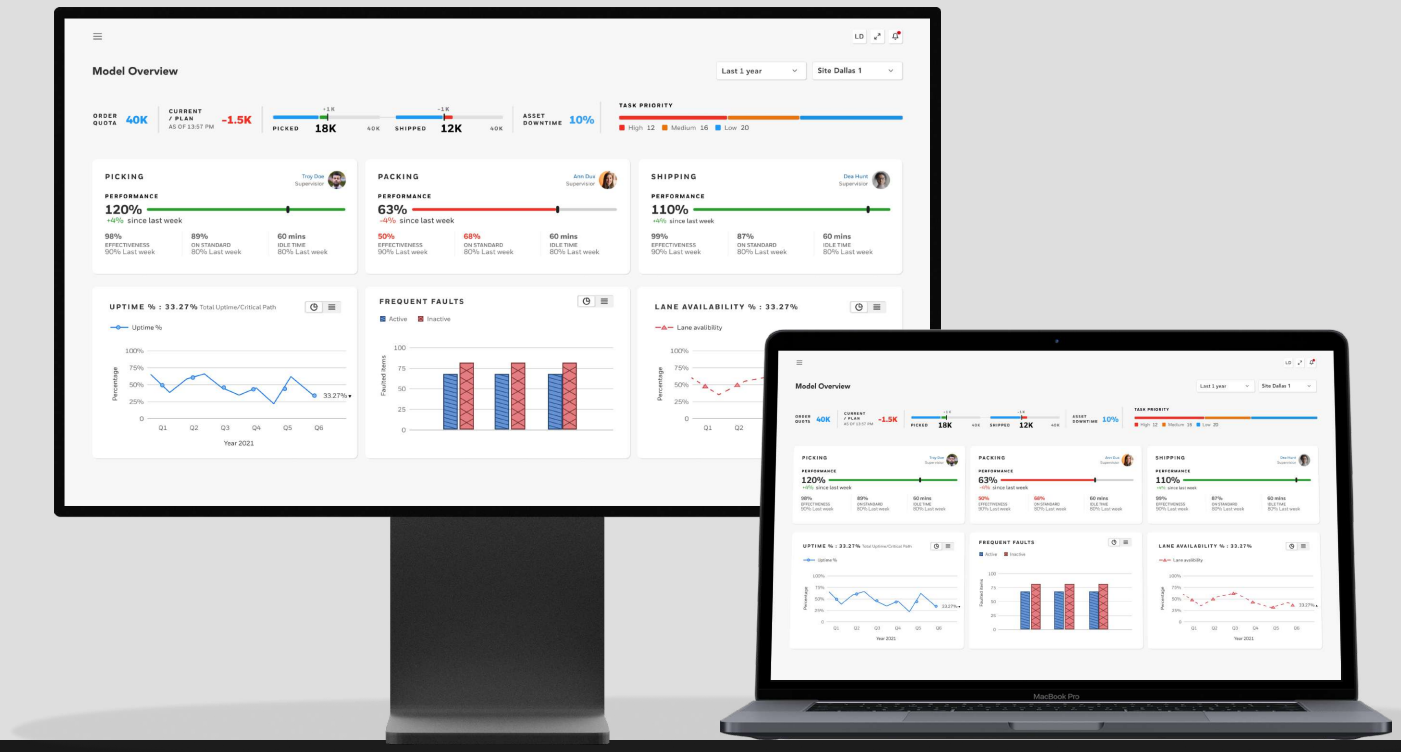
Design Systems Case study




## 1. Overview

Forge UI Design Systems is the Design system adopted by 8+ product teams falling under Honeywell Connected Enterprise.

As a member of the Design system team, I was assigned with the task of giving the outdated Data visualization library a newer look and provide support for design teams using the existing library.




## 2. The Situation

The existing Data visualization library was outdated, and needed a revamp to improve UX and cater to different component requests from different designers from product teams.

The library was not published on Figma and there was a need to reestablish data viz. components which played an important role in the launch of version 2.0 of the Design system.

### Scope of project

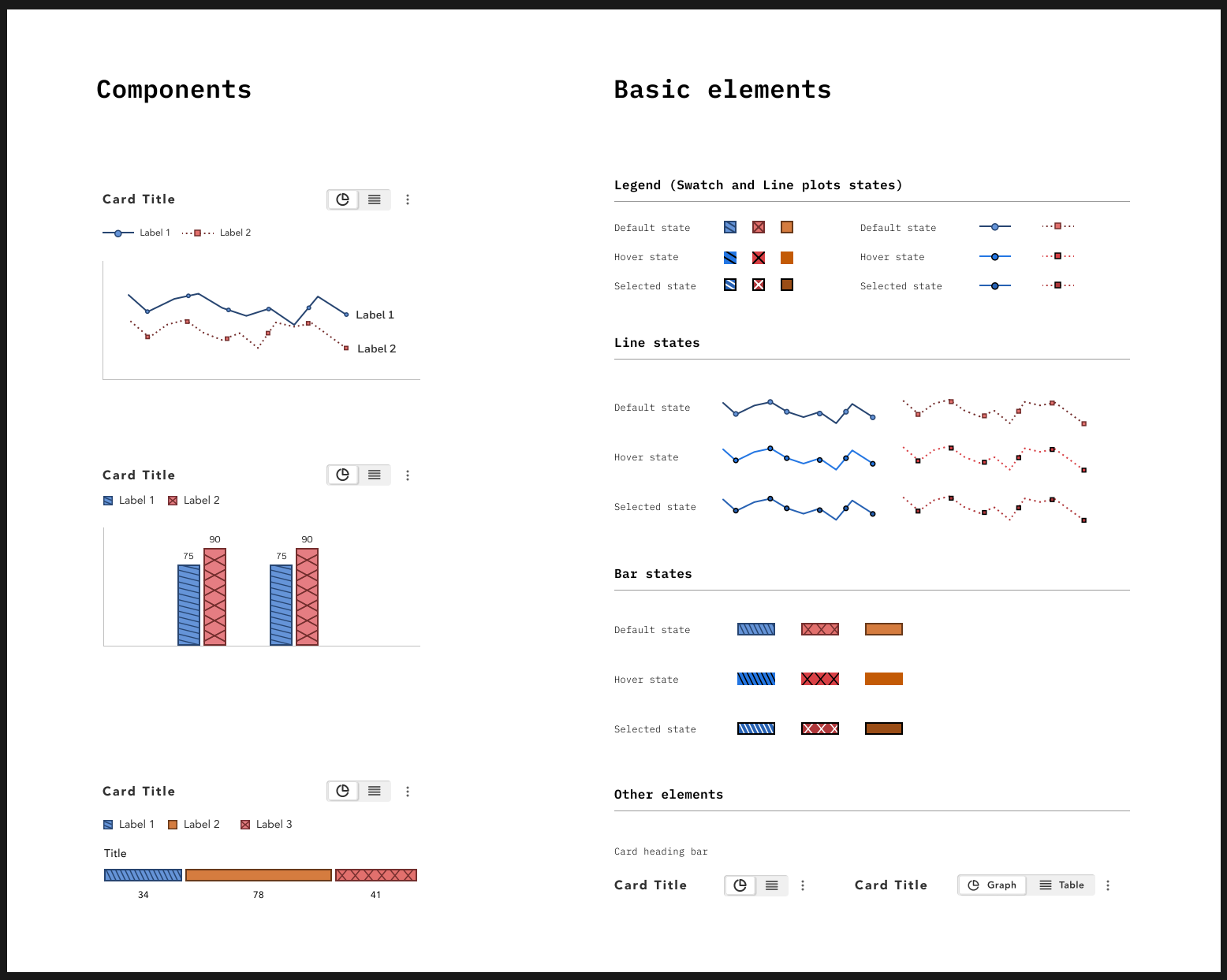
- Outdated Data visualization library
- Make consistent designs for different products
- Make Accessibility compliant designs
- Limited time to meet all business requirements

# 3. Solution

Established new accessible color tokens for light theme and dark theme used in new Data viz. library.

Revamped designs of the chart library for Progress bar, Bar graph, Line graph and Column graph and published 30 nested components and 6 main components.

Increased accessibility of the chart library by creating accessible bar patterns, legends on top, line labels, bar values, line plots, etc.




# 4. The Process

Throughout the process, it involved constant collaboration with the PM's, designers, product teams, engineers and end users (low-vision users).

Data visualization being a very important component for any SaaS products involved many different use-cases and requirements from the teams.

The company aiming towards making platform more accessible, it was also very important to integrate and ensure accessibility at every step during this project.

Discovery

## What was the starting point

### 1.

**Heuristic evaluation & A11y audit of library**

The very first step was to perform Heuristic evaluation of the existing library and product screens.

Followed by an accessibility audit of the library resulted in well listed UX and A11y issues within components.

### 2.

**Understanding different product requirements.**

The library supporting SaaS products in different sectors of industry resulted in varied use-cases of same components.

This also included catering to component modification requests from designers of different product teams.

### 3.

**Synthesize data from UX Research**

Collaborating with UX researchers, I was able to list out various user issues found during testing sessions.

These research findings helped me ensure rectifying previously found issues and enhance overall usability.

Situation

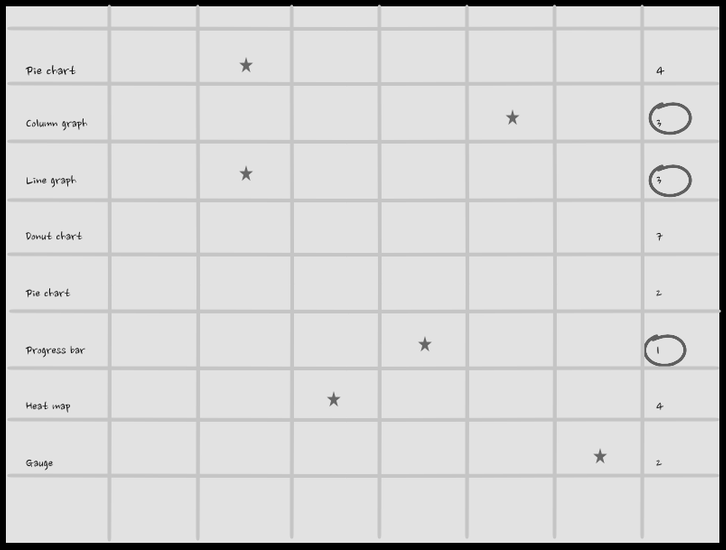
**To meet the business and different product needs, limited time period and to maximize the impact of my work and make scalable components - I had to prioritize components to work on.**

Result

## Prioritization matrix

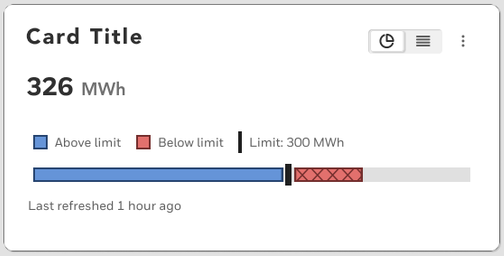
Following Agile sprint methodologies and having close discussions with different Product owners, I created a detailed prioritization matrix with T-shirt sizing of involved work with each component.

The final decision was made based on the number of times the chart is being used in product and identify components which can be more scalable for the Data viz. library.

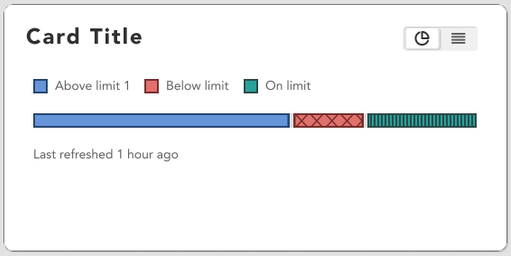



## Through the discovery phase and collaborating with PM's and Engineers, I was able to prioritize components for the revamp of Data viz library.

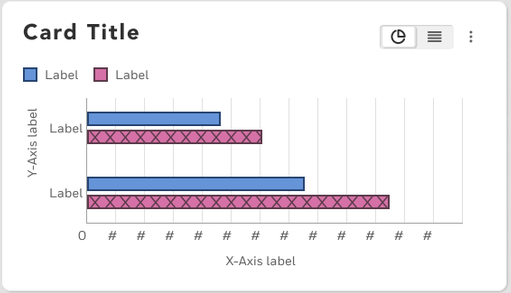
### Progress indicator



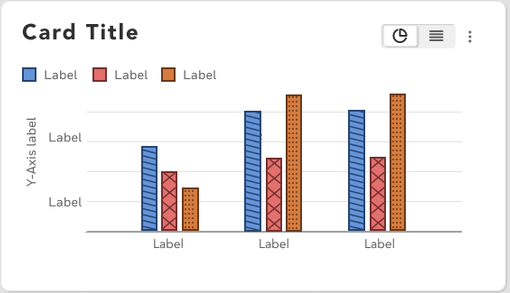

### Single stacked bar graph



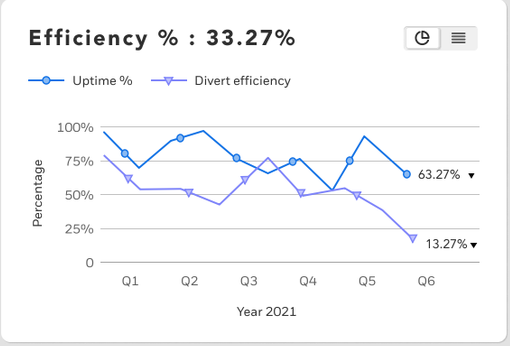

### Bar graph




### Column graph




### Line graph

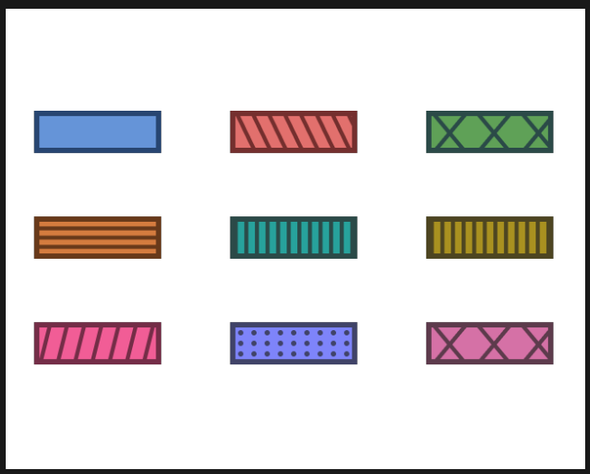



The challenge

## Making data visualization charts accessible

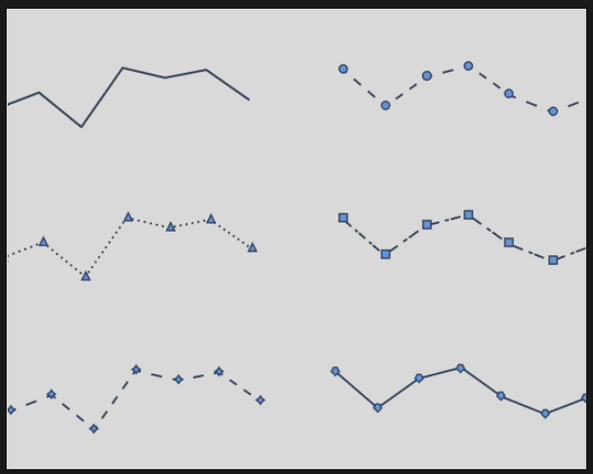
Creating accessible visualization charts was a big challenge. Being familiar with Web Accessibility guidelines (WCAG 2.1&2.2) was not enough. There are no dedicated guidelines in WCAG specific for Data visualization.

Ended up conducting extensive secondary research on Accessibility best practices for Data viz. Exploring and learning from existing Design system libraries like - Visa Chart library, Spectrum DS, GE DS, Lightning DS, etc played a huge role in implementing and ensuring accessibility in final designs.



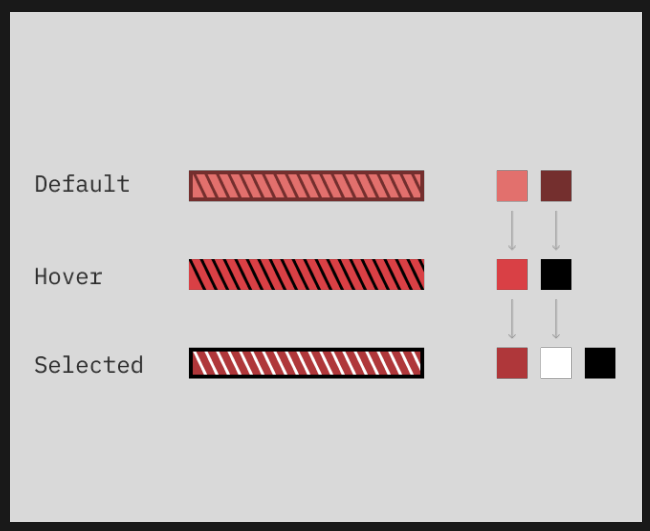
### Patterns for Bar component

Usage of patterns is one of the most common WCAG standard for ensuring accessible experience for low-vision users and color-blind users.
It is very difficult to create completely accessible color scheme as colors are perceived differently by all users.



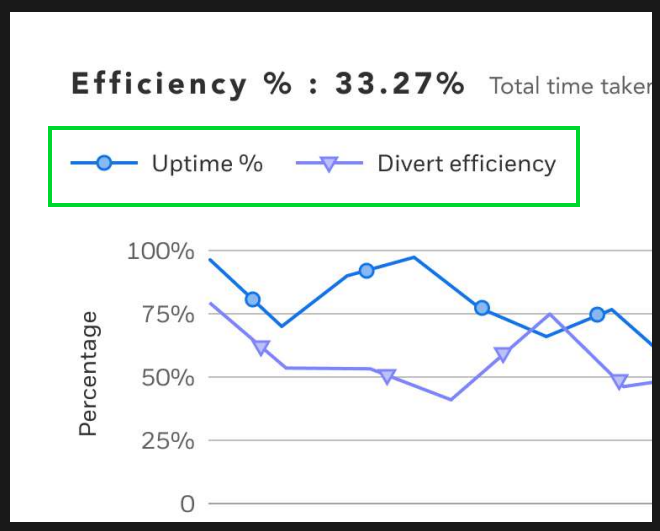
### Plots for Line graph

Similar to the patterns implemented for the the Bar component, in order to make line charts accessible - created different line patterns and plots.
Line types of plots variants are mainly essential when there are multiple parameters to show in line graph.



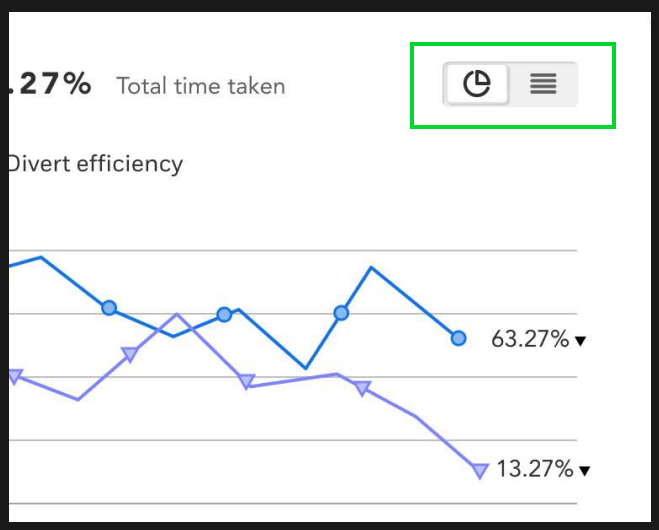

### Different states of components

Following the WCAG AA standard, it is very important to have different states of elements to be visually different from each other.
Ensured that each color used for the component satisfies 3:1 contrast ratio.



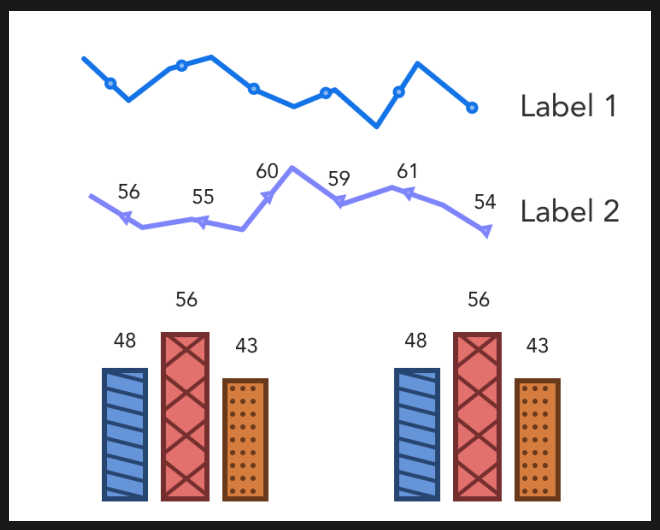

### Have legend on top

Some screen-reader users use desktop at 200% zoom. In that case the scope of view is very small.
Also legend indicates a vital information of the visualization thus applying the F-shaped reading pattern - it is ideal to have legend on top.




### Switch to tabular view

The charts are mainly about data or information. Increasing the ability to view the data in different ways leads to better usability and accessibility.
Some screen-reader users prefer to use excel view of data.




### Values and labels

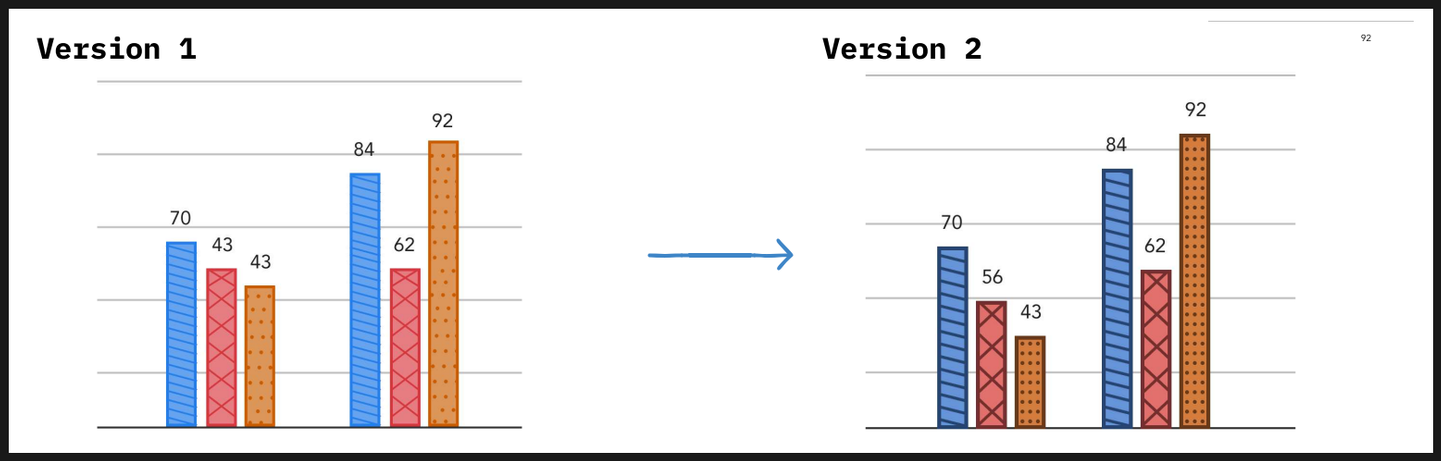
According to WCAG 3.3.2 standard, interactive elements should have labels. Due to few use-cases there was a requirement for interactive bars and lines.
Users with cognitive disability often prefer to have clear labels shown at all times for better experience.

Iterate

## Design modifications and iterations

I firmly practice and believe in keeping all stakeholders in loop throughout the design process. Throughout the project getting feedbacks and recommendations from stakeholders helped me iterate my designs to better address and modify the data viz. components.

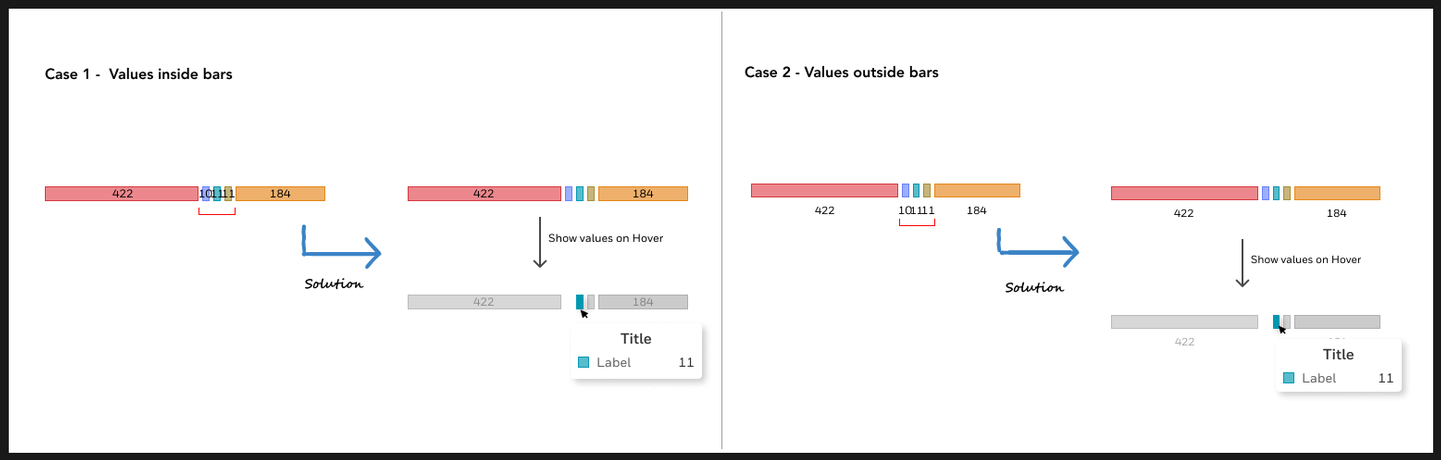
## (a) Modifying color pallet based on User testing




During user testing with the low-vision user even if the color scheme satisfied the 3:1 contrast ratio, the patterns on the bar component were not visible to the user.

This led to complete modification of the color pallet used for data visualization library. The modified color scheme are now more accessible and compliant to WCAG AA standards

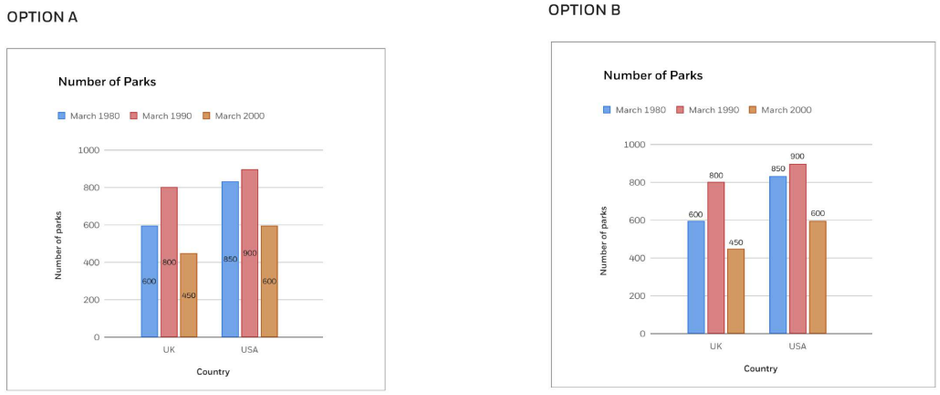
## (b) Exploring edge cases of components with engineers




During design review with engineers, we explored an edge case involved with single stacked bar component with values. In some cases the values of the nearby bar can intersect with each other creating both design and development challanges.

Based on the relative value logic, the engineers suggested to show values of smaller bars only when the user hovers over the component. On hovering the tooltip will showcase the the value and title of the bar.

## (c) Choosing between value above bars and values inside bars




The column graph variant with values had 2 options to showcase the values. One of the option was to place the values inside the bars. The other option was to place it on top of the bars. To reduce complexity for both users and designers - conducted unmoderated user testing to finalize one variant.

All the users preferred the variant with values on top of the bar. Participants found values on top to be more readable and helped them differentiate different bar levels better. This variant also behaved better while truncating bigger values above the bars.

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# 5. Designs

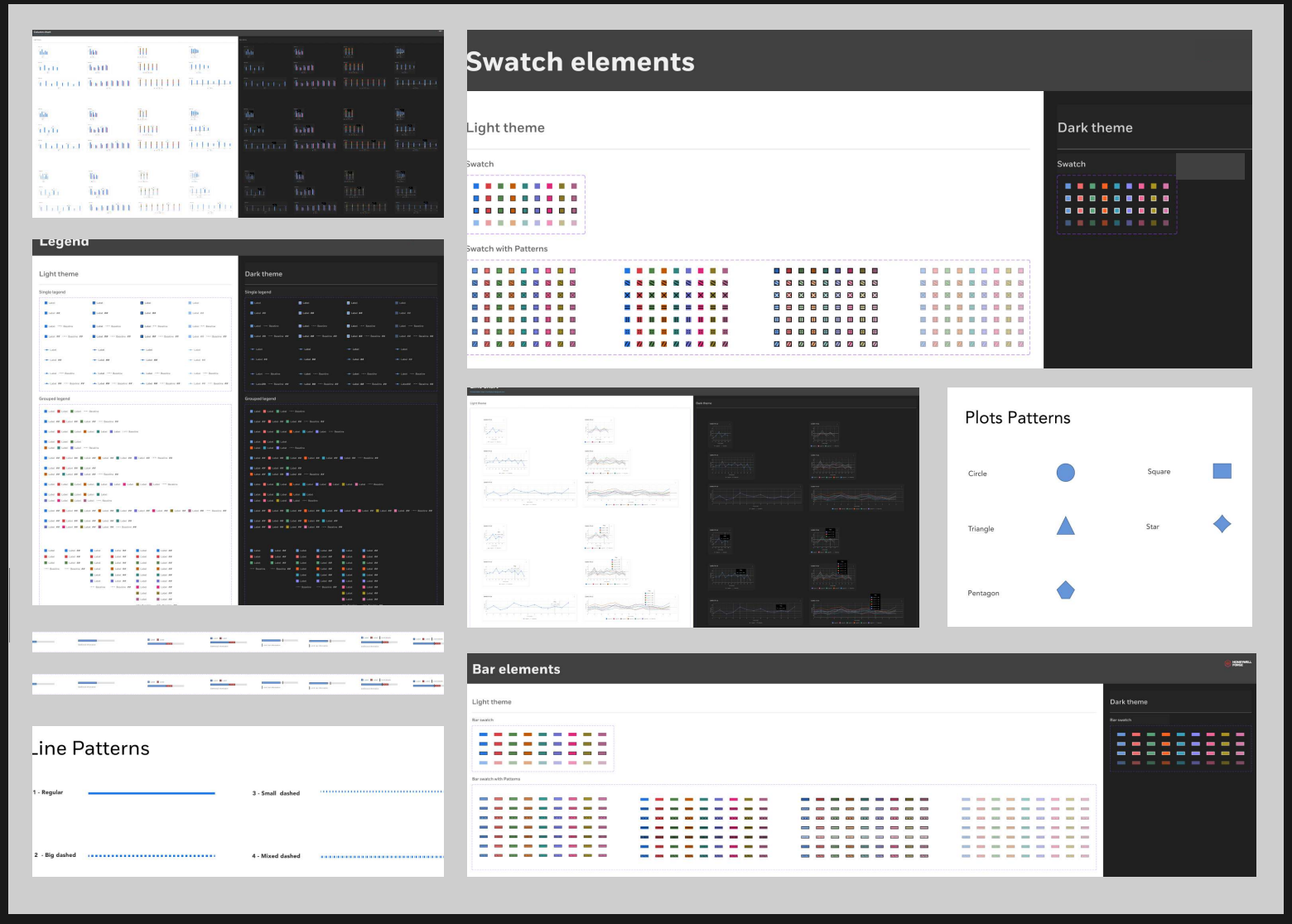
Established new and accessible color scheme for light theme and dark theme used in new Data viz. library.

Increased accessibility of the chart library by creating accessible bar patterns, legends on top, line labels, bar values, line plots, etc.

## Data visualization components

The established components for the new Data visualization library was used as the foundation guidelines for accessible design systems.

The revamped version of the library was more cleaner and more structured variants in Figma for designers from different products.




## Nested components:

Pattern Swatches

**252 variants**

Pattern Legend

**32 variants**

Pattern Bars

**252 variants**

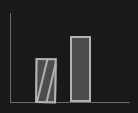
Pattern Line plots

**48 variants**

## Main components:

Single stacked bar

**16 variants**

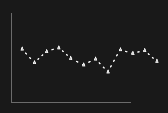


Bar & Column graph

**72 variants**

Progress bar

**16 variants**



Line graph

**24 variants**

## Accessible color pallet

Applying accessibility guidelines and making sure the color pallet was color-blind friendly was one of the most challenging and also very interesting work that I was able to do for this project.

## Situation

When it comes to data visualization, there are a lot of visual representation of data mainly using colors. After multiple iterations and referring to design systems color scheme I learned -

”There is no such thing as a true “color-blind safe” palette as everyone’s ability to perceive color is unique to them (Amazon Cloudscpae DS).

## Result

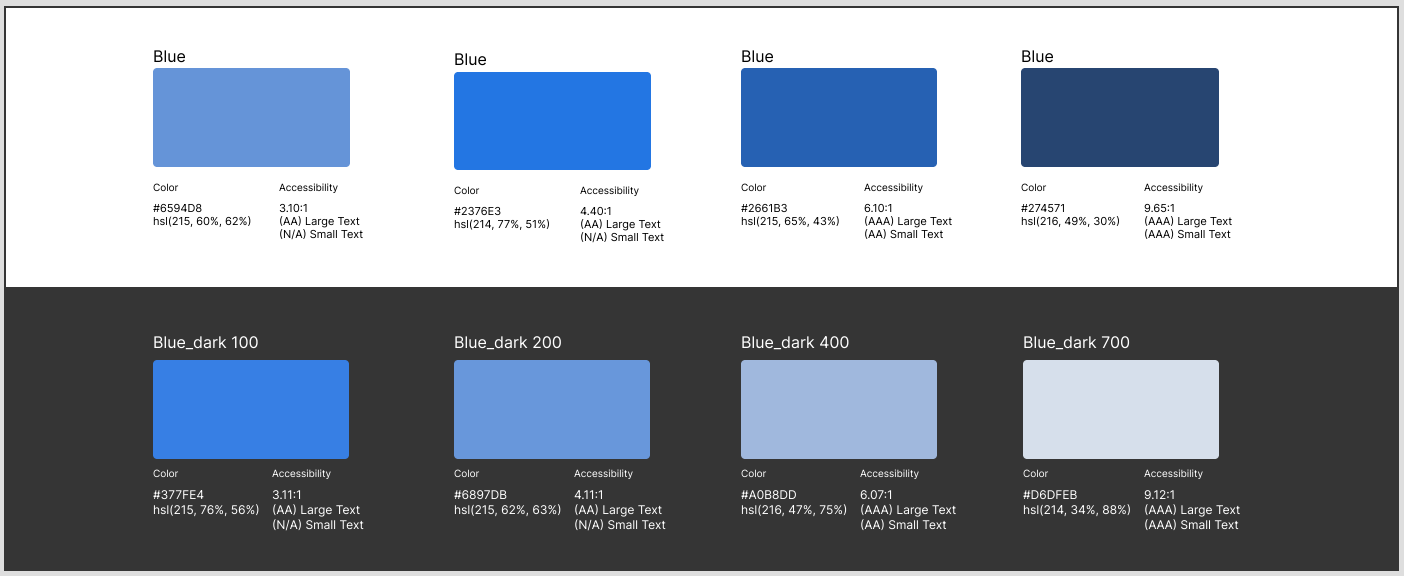
Color should not used as the only method of communicating what the data on a chart represents. Thus, for data visualization usage of of patterns plays a very important role to make sure that the visuals are color-blind friendly and accessible to low-vision users.

In order to come up with a color pallet for patterns to satisfy 3:1 ratio with the background element, creating multiple color schemes of same shade accessible to each other needed multiple iterations. The requirement of different colors for hover and selected states of the chart added on the complexity.

### For documentation

Each color has 8 different shades for light theme and dark theme.

Ensured to satisfy the requirement of different color variants for different states of Data Visualization components  and elements




*(N/A) indicates that it should be used for small text according to the AA compliance

### For designers

The Figma's view of the color component for the designers, each color style has the naming convention that indicated -

- Colors
- Color Variant/Shade Number
- Hex code
- Contrast ratio in the description

Blue_dv1 # 6594D8

(Contrast ratio w/white 3.1:1)