



P1 Timetable Analysis

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Goal

| WP 1: Timetable analysis | P1 (6 ECTS) |
|--|-------------|
| Time recordings from timetable is available with descriptions of activities. The goal is to analyze and visualize this data to extract common patterns as main findings. | |
| Input: Timetables from different projects | |
| Output: Common patterns in the timetables | |
| Deliverable: Visual dashboard showing the patterns found in the data | |



Goals (example case)

Input - Annual Work time recordings CSV of a scientist is received, which needs to be optimised based on the Austrian Working Times Act.

Output - Visualise legal and illegal days/time recordings from the data, recognise which recordings (illegal ones) do not comply with the Working Times Act.



Goals (generalised)

Make the tool useful to people like freelancers, self employed, working students etc.

Rules should not be specific to one law (Working Times Act) so that more types of users can use the tool.

In order to do that, make Rules customisable for user needs.



Rules

Based on the stated generalised requirements. The following rules were selected to mark a time recording as illegal:

1. No work on holidays. (Customisable holidays)
2. No work on weekends.
3. No work before an AM time, eg. 8AM. (Customisable time)
4. No work after a PM time, eg. 8PM. (Customisable time)
5. No work more than 10 hours a day. (Customisable limit)

With such set of rules the tool could fit a variety of users based on their requirements.



Rules

If a time recording data complies with the selected Rules then it is **legal**.

Otherwise it is **illegal**.

Visualise Legal and illegal recordings discovered on a dashboard.

Input Data

timetable_data.csv

```
Version,TimeEntryID,StartDate,StartTime,StartTimeOffset,EndDate,EndTime,EndTimeOffset,Duration,ActivityID,Activity,SpaceId,Space,Username,Note,Mentions,Tags
"4","14210489","2020-01-04","20:55:19","+0100","2020-01-04","21:30:00","+0100","00:34:41","716031","Administration","69558","CompanyZ","xy@z.at","Stundenauf:",
"4","14210492","2020-01-04","21:30:00","+0100","2020-01-05","02:00:00","+0100","04:30:00","606995","Funding","10863","Projects","xy@z.at","1000-Ideen #fwf",
"4","14213100","2020-01-05","10:11:46","+0100","2020-01-05","13:36:10","+0100","03:24:24","606995","Funding","10863","Projects","xy@z.at","1000-Ideen #fwf",
"4","14218828","2020-01-05","19:39:46","+0100","2020-01-05","23:00:46","+0100","03:21:00","606996","Coding","10863","Projects","xy@z.at","#enexsa","","#enex:
"4","14391131","2020-01-07","08:30:00","+0100","2020-01-07","10:00:00","+0100","01:30:00","716050","Business Development (Akquise)","10863","Projects","xy@z
"4","14391057","2020-01-07","10:00:00","+0100","2020-01-07","10:30:00","+0100","00:30:00","716070","Student Supervision","69561","Teaching","xy@z.at","","",
"4","14391046","2020-01-07","10:30:00","+0100","2020-01-07","11:30:00","+0100","01:00:00","606995","Funding","10863","Projects","xy@z.at","COPEX #eu","","#e
```

holidays.csv

holiday,name

"2020-01-01", "New Year's Day"

"2020-01-06", "Epiphany"

"2020-04-13", "Easter Monday"

"2020-05-01", "Labour Day"

"2020-05-21", "Ascension Day"

"2020-06-01", "Whit Monday"

Timetable_data.csv - Interesting Columns



| | | |
|----|-----------|--------------|
| 1. | StartDate | "2020-01-04" |
| 2. | StartTime | "20:55:19" |
| 3. | EndDate | "2020-01-04" |
| 4. | EndTime | "21:30:00" |
| 5. | Duration | "00:34:41" |
| 6. | Activity | "Coding" |

Tasks - What questions should be answered?



1. Find illegal slots on a given date. Eg. 31st March 2020.
2. Find how many illegal days do I have in a month, eg. October 2020.
3. What is the most common reason for illegal days in 2020.
4. Did I work on 25th December 2020?
5. How many hours did I work on 29th March 2020?
6. Was 29th March 2020 a normal working day?
7. What did I work on 5th May 2020?
8. How many hours did I work in November 2020?
9. What time recordings are illegal on 30th November 2020?
10. Why was 03rd June 2020 illegal?
11. How many total late evening hours, after 10pm did I work in 2020?
12. What was the most common reason of illegal hours in 2020?

etc...

Design Principle followed -



Schneidermann's Mantra

Overview First, Zoom & Filter, Details on Demand.

Design Drafts - Overview

Home

Catalog 2021

← 2020 → 2022

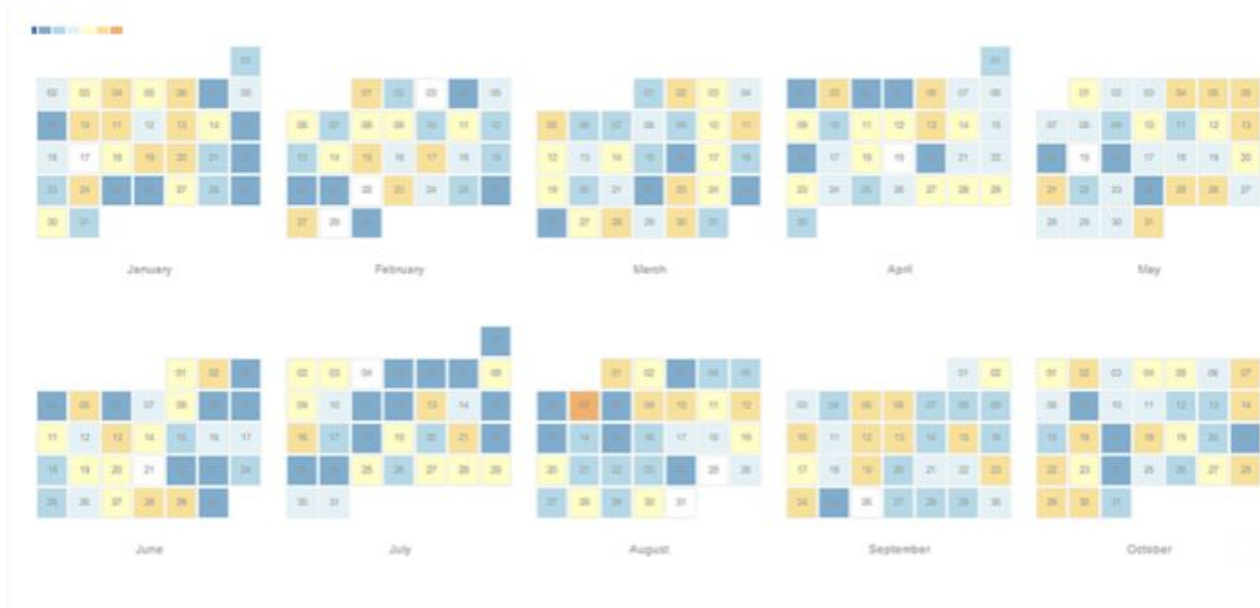
| | | | |
|-----|-----|-----|-----|
| Jan | Feb | Mar | Apr |
| May | Jun | Jul | Aug |
| Sep | Oct | Nov | Dec |

Hours as per legal requirements
Hours need adjustment
Future months

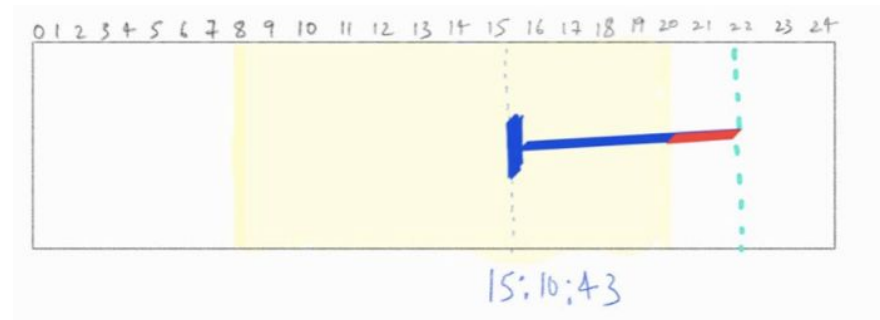
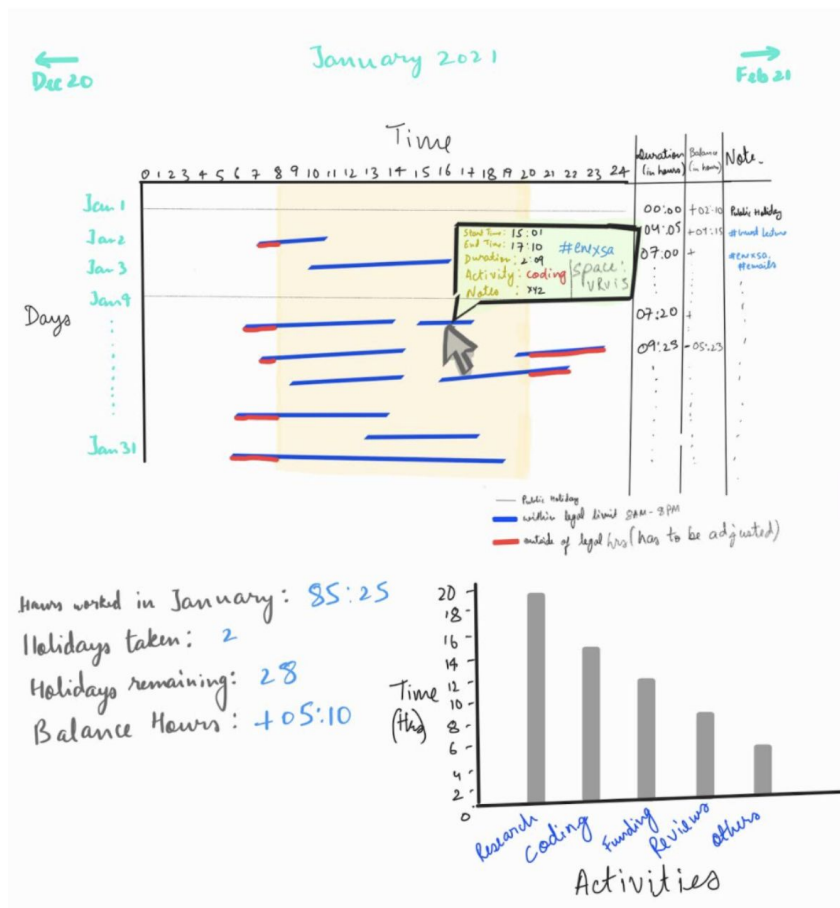
The image shows a hand-drawn calendar grid for the year 2021. The grid is a 3x4 table with months from Jan to Dec. The months are color-coded: Jan, Mar, Jun, and Sep are highlighted in red, while Feb, Apr, May, Jul, Aug, Oct, Nov, and Dec are highlighted in yellow. Above the grid, the word 'Catalog' is written in a large, cursive font, with '2021' written below it. To the left of '2021' is a green arrow pointing left with '2020' written below it, and to the right is a green arrow pointing right with '2022' written below it. In the top left corner, there is a small box labeled 'Home'. Below the grid, there is a legend with three colored squares: a yellow square, a red square, and a white square. To the right of these squares are three lines of text: 'Hours as per legal requirements' (corresponding to the yellow square), 'Hours need adjustment' (corresponding to the red square), and 'Future months' (corresponding to the white square).

Overview + Zoom & filter

Feedback - modify to something rather like this:

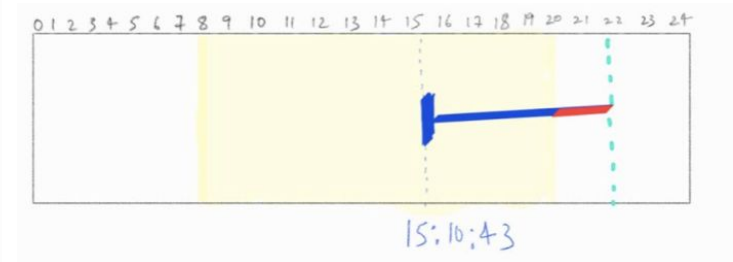
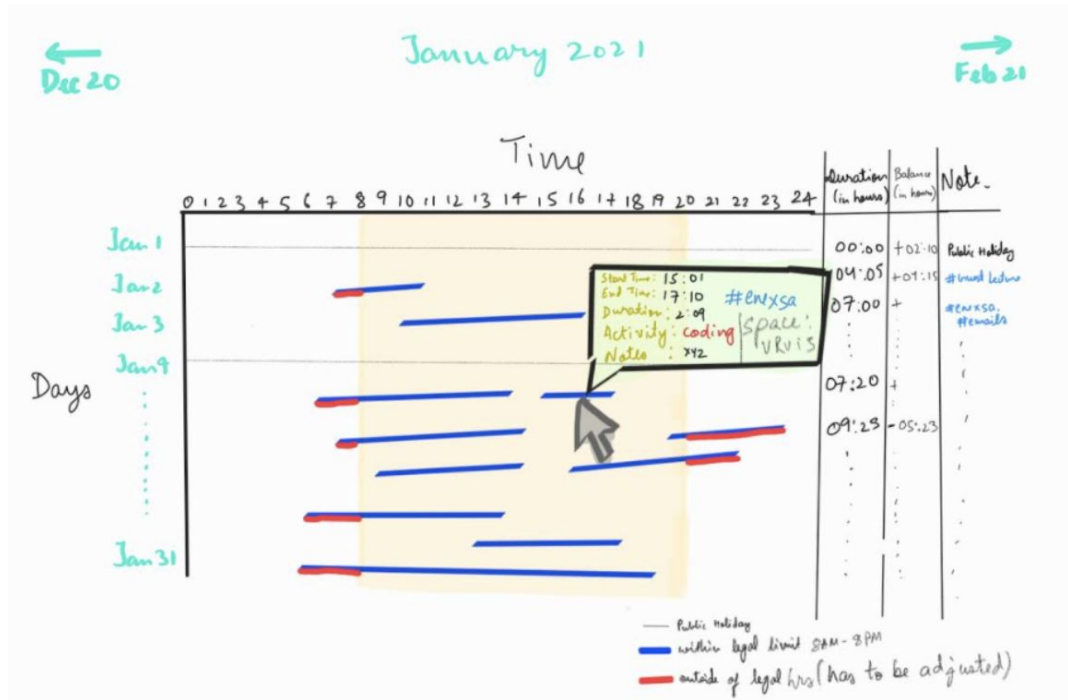


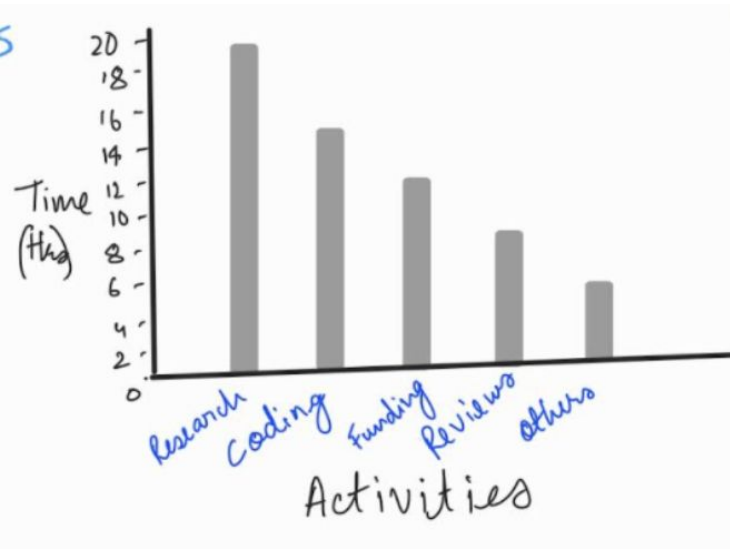
Zoom & Filter + Details on Demand



Zoom & Filter

Feedback - good





Feedback - not so interesting to the user plus not relevant for the tasks. Instead replace with a stacked barchart showing the summary of reasons of illegalities over the entire dataset. Something like the following.



Implementation Phase

D3 application in Vue.js using Javascript

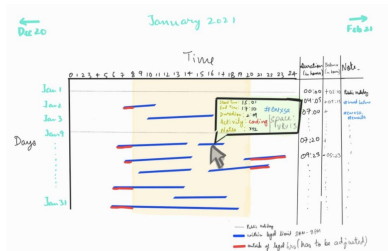


Components -

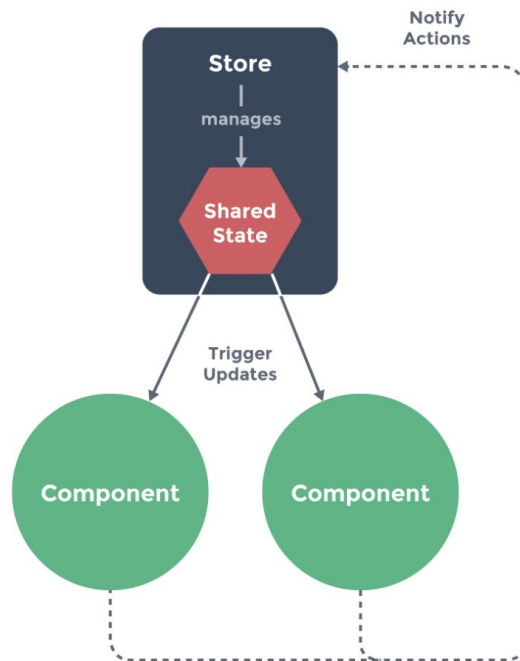
1. Calendar.vue
(Overview)



2. DayView.vue
(Details on Demand)



3. Rules.vue (Filter)
- Filter rule selection by the user



Source: <https://v1.vuejs.org/guide/application.html>

Store - (Shared State)

1. All Data

- CSV data stored as array of objects

```
Version,TimeEntryID,StartDate,StartTime,StartTimeOffset,EndDate,EndTime,EndTimeOffset,Duration,ActivityID,Activity,SpaceId,Space,Username,Note,Mentions,Tags
"4","14210489","2020-01-04","20:55:19","+0100","2020-01-04","21:30:00","+0100","00:34:41","716031","Administration","69558","Company2","xy@z.at","Stundenauf:
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"4","14213100","2020-01-05","10:11:46","+0100","2020-01-05","13:36:10","+0100","03:24:24","606995","Funding","10863","Projects","xy@z.at","1000-Ideen #fwf",
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"4","14391046","2020-01-07","10:30:00","+0100","2020-01-07","11:30:00","+0100","01:00:00","606995","Funding","10863","Projects","xy@z.at","COPEX #eu","",#e
```

2. **Selected Rules** - Array of selected rules by the user for filtering.
3. **Selected Date** - String of selected Date/Month by the user.
4. **All Recordings** - using **All Data & Selected Rules** make an array of objects with all time slots from all dates with derived properties used for presenting the Detailed Views. Splitting of slots at AM and PM times. (used for DayView.vue component)
5. **Day Recordings** - using **All Recordings** array, make an array of objects with each object having each Date's data - aggregate all recordings of a date into one date recording. This is used to present the Overview visualisation. (used for Calendar.vue component)

Components

Rules.vue



User can filter and customise the rules using this component.

Also, serves the purpose of legend with colour markings for the tool.

Components

Calendar.vue

10 h daily limit: 340.34 hrs
Total: 1872.12 hrs

Legal

☒ All Rules

☒ Holidays

☒ Weekends

☒ Limit 10hrs

☒ before 8

☒ after 20

Creates an annual calendar for the user data and marks each date with a colour coding representing Legal or a type of illegality found in the recordings of that date.

The Summary visualisation on top summarizes the distribution of hours worked with respect to legalities. A tooltip to display exact details is presented on hover.

Select a date or a month

Components

DayView.vue (View 1)



January

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|-----|-----|-----|-----|-----|-----|-----|
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

February

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| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |

March

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| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | | | | |

April

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May

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June

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July

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August

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| 30 | 31 | | | | | |

September

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October

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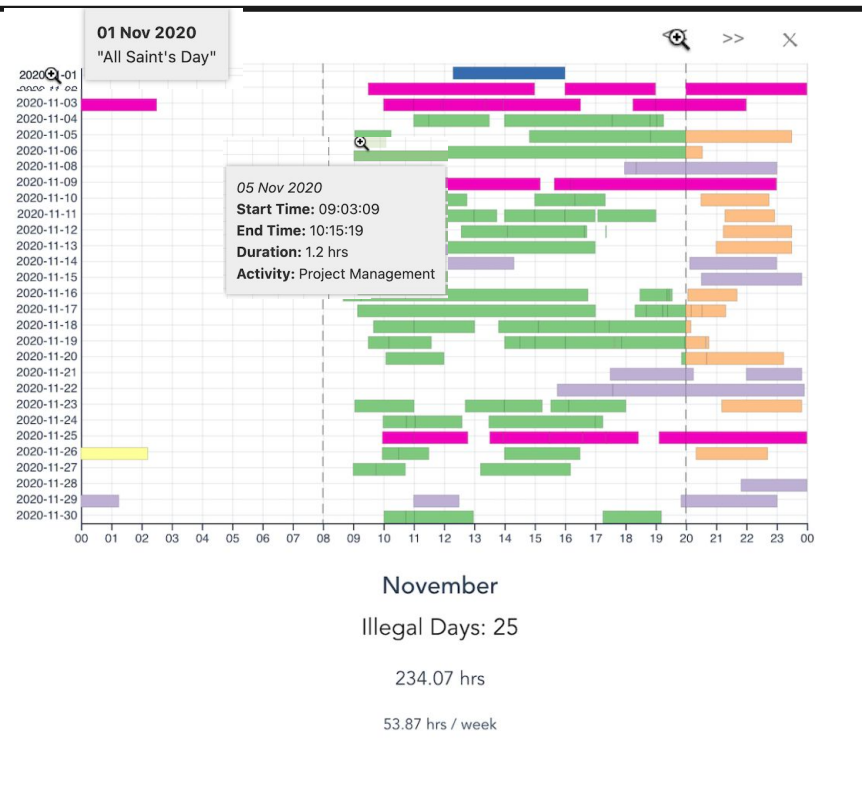
November

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| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | | | | | |

December

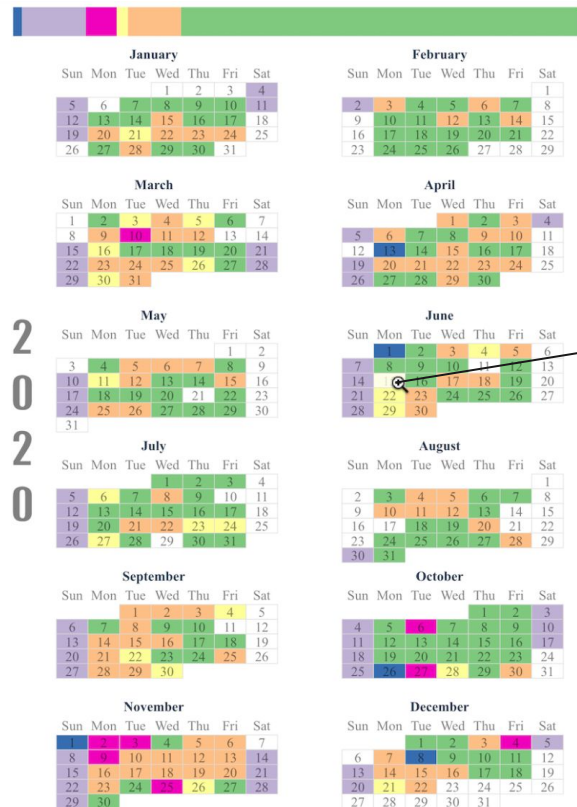
| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
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| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

Legal ☒ All Rules ☒ Holidays ☒ Weekends ☒ Limit 12hrs ☐ before 8 ☐ after 20



Components

DayView.vue (View 2)



Legal

☒ All Rules

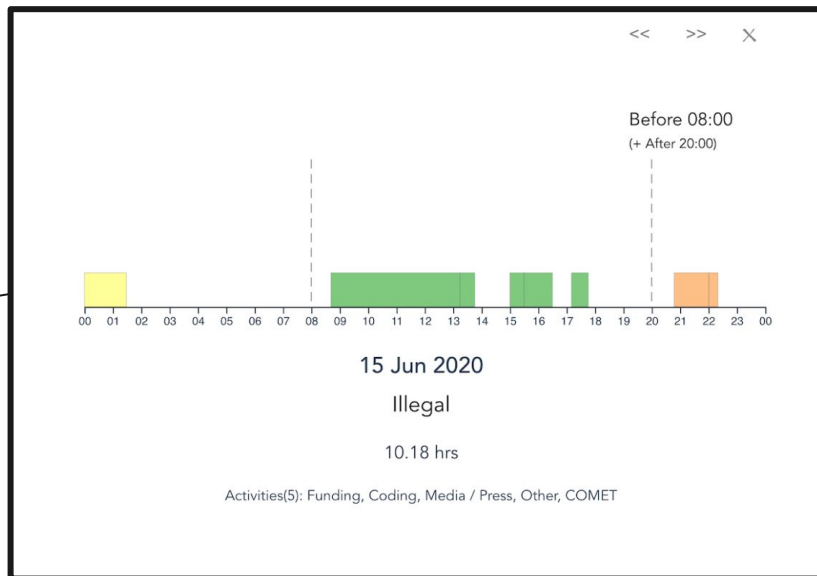
☒ Holidays

☒ Weekends

☒ Limit 12hrs

☒ before 8

☒ after 20



DayView.vue (View 3)



Legal

☒ All Rules

☒ Holidays

☒ Weekends

☒ Limit 12hrs

☒ before 8

☒ after 20

×

January

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| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

February

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| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |

March

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| 29 | 30 | 31 | | | | |

April

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May

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June

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| 28 | 29 | 30 | | | | |

July

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| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

August

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September

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October

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| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

November

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
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December

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|-----|-----|-----|-----|-----|-----|-----|
| | | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

08 Aug 2020

no time recordings found for this date.

Why all components in one screen view?



Eyes over memory principle

Less number of clicks for navigation between dates/months.



Now to the application in the browser...

Possible next points of improvements:



import CSV into the application directly from UI -

- maybe a collapsable sidebar with setup & instructions menu

Performance - make the Rule adjustments take less time (more responsive)

Calendar UI

- Keyboard support, scrolling through visible dates/months

Maybe more rules if the users requests any new rules

Different screen sizes support for UI - if users want to use different devices than laptops

etc...