

Appendixes

Macomi Maintenance: A user-centric data-analytic platform for railway maintenance planning optimisation

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Master thesis / Design for Interaction*

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Appendix B. Quotes & insights extracted from Interview at Macomi

- 1hour to Learn the tool at a level that he can demonstrate to the clients, but not at a detail level
- Yesterday show the demo to some people, hard to follow, lots of screen and buttons. He introduces the flow how you should use the tool
- Trained by Menno, knows first start with Project request, then passenger stream, scenarios (went through all the input data, and chose these three, don't want to overwhelm people), show the map and Gantt. Start with the map, explain constraints, show the result.
- 20 people(know a little, don't want to show too many information)(not confused) network, request, hinder of passengers, optimisation result.(flow can be easily follow)
- (10.00) Province (maintenance planners, IT-help implement), 1-2 real user, others planner are higher level(decision making)
- Inspection (day to day), boss of the inspection department (decision makers) are there as well. Planners (users, lower education level).
- Maintenance (more for long-term, a year, few years)
- Highlight elements: now the province has a lot of assets to maintain, bridge, roads..., this tool can help to do the plan better: lower cost, less conflicts.
- Difficult tooling. Macomi talk to higher up people(high education), people who are actually using the tool are people with lower education level. If we can make the tool for lower, easy to use, fit to their current system
- Language: should be in Dutch
- Lots of buttons and things there, hard to graps, OGL
- Outcome, they like this, need more. if they have the plan, they need to connect to their operational system in order to make the plan work (e.g. send task to teams) send to people to execute the plan. (need to notify people, hire people...)
- What are the things they would like to do with our tool (use cases). We provide recipes: for example, if you need to build a terminal, these are the steps that you need to go through. For each case, they may not need all the functions (sometimes you can skip some steps)
- Explain the term by giving examples: events: King's day, not all the terms are universal in the company (they know some background)
- They do inspection, go to the bridge, write report, send to planners, need to do maintenance, schedule. For now this tool might fit into a small part of the whole process (schedule and plan, need to find out how to help in other steps). Need to understand how they work (connect to their system)
- We can provide help but the goal in the end, they should use it independently use the tool.
- Tailored. Discuss with clients to decide what input data should be used and how to use
- Things he likes: somethings here is new.
- Competitor: IBM (Maximo: big tool what you see is what you get. Hard to make changes. Macomi is small and more flexible easy to customise for companies. They like it Want to have control what is in / Ultimo software
- IBM and Ultimo is for factory where you need do maintenance, but not for infrastructure for a province. We are
- The tool should be easy to understand (e.g. language)

Appendix C. Interview questions, Quotes & insights extracted from the Contextual Interview at ProRail

Interview questions

- 1. What's your role and what did you usually do at ProRail?**
- 2. How did you plan the maintenance activities?**
- 3. How do you use PRM currently?**
- 4. What's the first impression on PRM?**

Quotes and insights from Planner A

- Plan maintenance for the whole country
- Now plan it in excel for 1 year a couple of persons, with experience and knowledge, different scenario in their mind 4-6months to make the plan
- 1year and half use this tool, since last jan. now use the tool and see how it can help us
- This now validate their plan
- Use the tool to help us make decision, in parallel, ideally in the future use the tool fully to make decision
- Now plan 2022
- Stakeholders: Now they need people that have knowledge about the rail and maintenance, average ages are high, data people, outcome will present to managers and stakeholders(NS, government, who fund the maintenance), need experienced people to interpret the result (important).
- Easy to find things. most Important is to get result
- Data pipeline from ProRail prepare data and put it into a format that fit the tool, a button"input data from Biline" get all the data
- Input all the data, but I just need data of 2019, manually select data of 2019, first Duplicate the project request, choose 2019 (could be all the data but sometimes want to choose)
- Name the data(analysis), in the future come up with a system of naming help to look back after e.g. half an year what I did

- Choose the duplicated project request, rename the duplicated dataset, sometimes it is not the latest dataset, but a data we duplicated a week ago. Popup of the project change the name
- Mostly plan Jan.1 – Dec.31, plan one year in a time ,in the future maybe plan for more time. Maybe used to plan for summer (now discovering how we can use the tool), when need to plan for small intervention (19.00)
- At the beginning, we chose data of 2019, it is weird that we can choose the analysis time for 2020 (start day and end day)
- Mostly keep the configuration like this, we can use the tool to see if we change it. First may keep the original one and then change the parameters to create scenario
- For new planning, always use optimisation. We use No optimisation to validate the excel planning
- At the end of the day, put some plan, next day get the result
- We most often open the gantt chart
- Gantt chart is the most important thing I would like to improve. For the first view Look at the chart if there are some errors or warning in the request, zoom in and see where should be improved. lots of error warnings, but it is too much so look at the cost only. When found constraint go to constraints, check what can I do.
- If there are two project request constraint each other, We would pin one and run the analysis again and see what we get
- Some constraints are acceptable, discuss different scenarios with stakeholders
- Showing the tool with stakeholders, discuss what scenario NS want to see, (next step want to find out how many scenarios we need maybe 5-10max)
- Use tool, discuss with stakeholders, use it (use it from time to time) check if there are
- make the frontend more user-friendly, if expend this tool need it to be easier
- Always good to have someone to help you(experienced users) that can teach our colleagues
- How new employee work with the tool The guy who work with the tool a lot but doesn't have the their work, tester?)
- Management (rail ,track axis that)

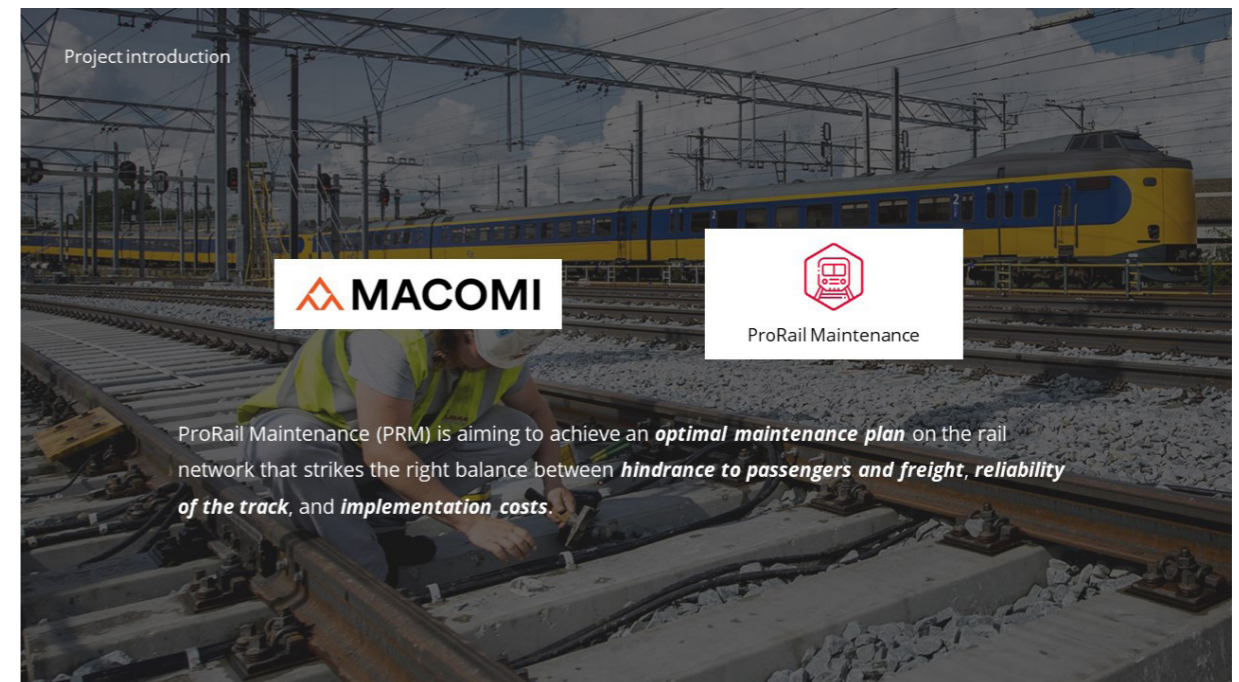
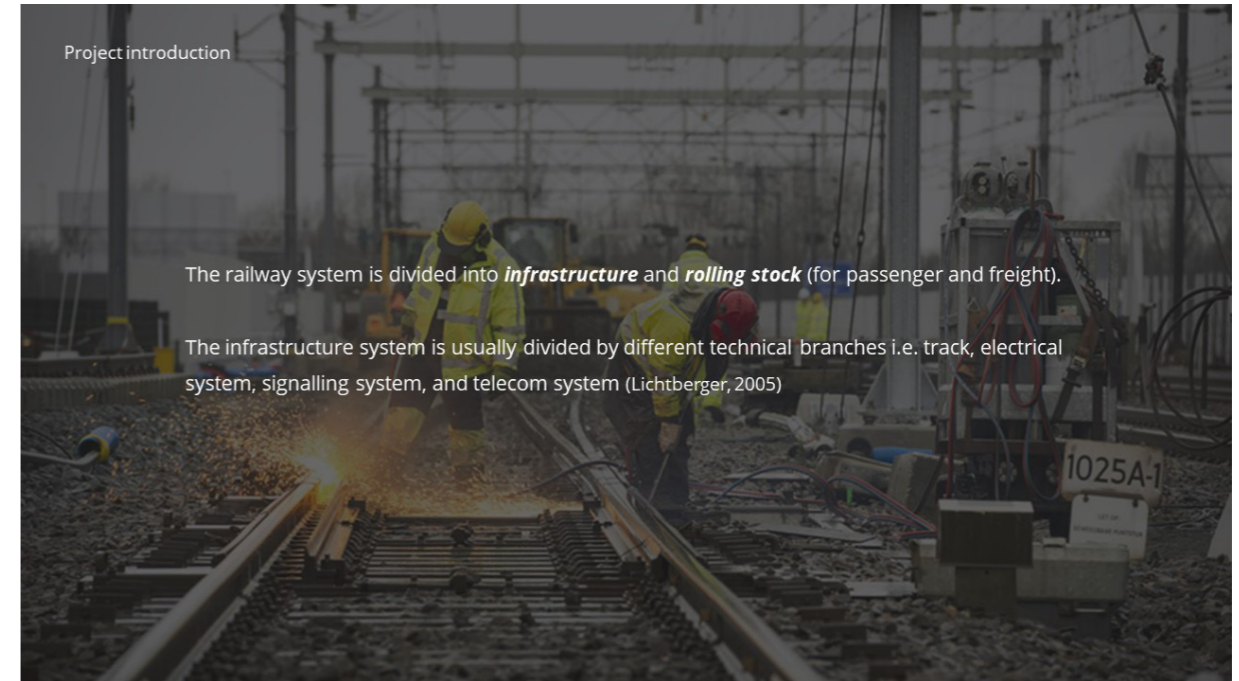
Quotes and insights from Planner B

- 3 years in graduation prorail, planning track in a national context, TVP planner
- 2 years ago, night shift between 1-5am, 4 tracks? For maintenance, for small maintenance and schedule for 4 hours
- TVP planner schedule larger work, bus, train(last week renew)
- Use TVP plan 2022, start in May,
- Plan capacity, we can operating on different tracks sometimes, this is the track we need to do, then we have to plan the time. Most of the work in weekend sat.1am-mon 5am.
- When events happen (Kings day) not suitable to plan on that day
- When we see all events, underlying factors that may impact
- Sometimes it is nice to block a large part of rail, but it cost time to travel (e.g. from
- With macomi sum up cost, decide what is the best, contraction
- Harbour of Rotterdam, Germany.. operating passengers are short time, trade off (manually now, more on availability, but with tvp planning you can also look at the cost, compare different scenario, holistic view of the planning, we can change parameters to see what are their impact)
- Project management team in prorail, transporter(factories, transport the goods?), train operator(e.g. NS, DB Cargo,...53 companies in total), talk to relevant stakeholders, data team in Prorail,(data need to be correct)(15.00) (e.g. date of the events are not correct, need to reschedule the plan. The tool can pin everything else then you can plan it again.
- One time a week, May-Aug., planning time for the whole year, 1 month after the planning, if intrusion happen.
- If operation happen breakdown.. basically plan for long time 6weeks around
- (26.00) Start the plan, see the project requests ("now the projects are not pinned), usually pin large projects
- Sometime open other data at the same time to check
- Always duplicate, so can check what are the differences
- Click the input and choose the new ones (passenger steam quite stable), project request is different always need to check, events
- Configuration, first planning keep the original data and run the analysis, then can change the parameters and compare with the original one. Use the tool to check the manually-made plan (check conflicts, error) Use No optimisation.

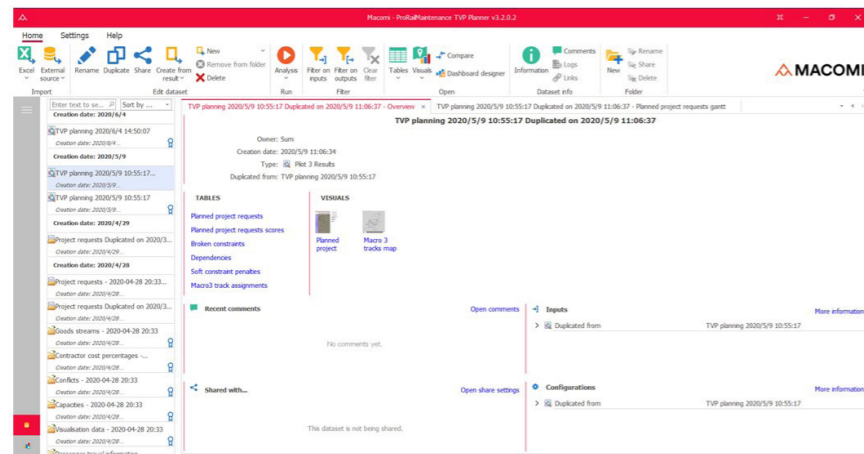
- After double clicking the 'finished' TVP planning, expect to see the result, but seeing this input information here is helpful (because he may forget what are the parameters he chose yesterday) (he run some analysis overnight, and get the result next morning)
- The look and feel is similar to MS Office, similar interaction is helpful
- When watching the result, first look at the the gantt chart
- When scrolling, he expect scroll down the list instead of zooming in(scrolling the time) maybe there could be an option to choose?
- Put the mouse on the block and see the ID of that project, so he can refer to the data
- It is a overview(high level and less detailed), When watching the result, some time what other data. For local level detail, may look at more details from other point of view
- (40.00) When look into the national context, the map is really really helpful and the level of detail is good enough. When I choose a specific date and time, then I see on the map there is red that show maintenance.
- Map and Gantt chart are the most important thing for me to evaluate the plan
- When showing the result to other stakeholders, would show map, gantt chart and maybe something from a calendar view(like the outlook agenda). Per week
- main intercity network, e.g. Amsterdam – Eindhoven corridor, see the Gantt chart in corridor point of view. Would be helpful to see the specific corridor. Then some sub corridor, , smaller part, maybe switches
- Helpful to see the whole view, and also have some corridor highlight in the format of Gantt chart.
- minutes level about traveller, hours level for cargo train
- first impression, lots of button. When seeing these button help me to understand what can I do and match the look and feel of MS office. Now I use right click often
- Haven't used filter,
- You would like to know what you can do
- don't know how to make a plan, you have to see the data , have to fill in the parameters, to understand what are these parameters, things I have to set
- However, when I understand it's easy for me
- People don't want to try. Learning a new tool for some people is very hard. They interesting in the result and the planning(things they know), how to come to result is too much for them

- we Do a first plan> more project manager talk about the planning, understand qualitative of the planning
- For the left part, less used, never use the part to arrange the file
- There is a tool keeping track of the data
- See the corridor, conflicts compare manually

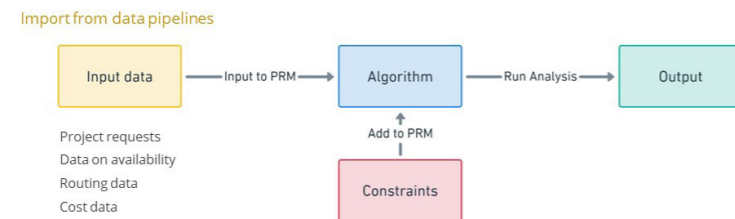
Appendix D. Introduction slides to the context



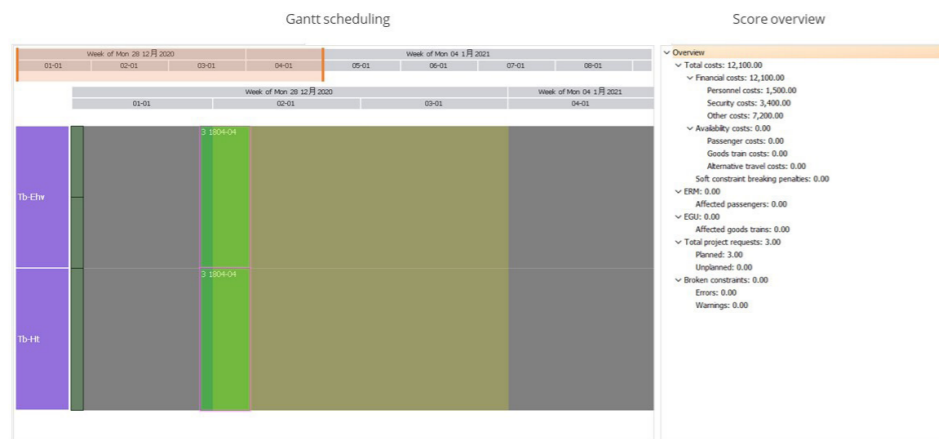
PRM



Basic flow



Outcome

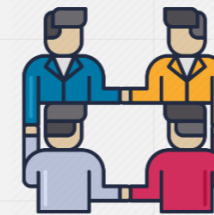


Modify project requests
Compare to get the optimal maintenance planning

Appendix E. Introduction of each round: Co-creation

Feedback from research

- The outcome is really helpful and nice!
- Too much information, looks very professional
- Don't know what I can do with the tool
- How to start the Analysis...



Goal of Co-creation

- Create the ideal situation
- Brainstorm to generate design concepts

Warm-up!

Please think about things you like and things need to improve of the tool.

Things could be but not limited to :
Interaction, flow, functions, features, layout

Examples

Things you like

I like I can share the data with other people

I hope...

I hope there is a special area for managing the result

5 mins

Create your ideal page!

20 mins

Goal:

- Important features you would like to have on the first page
- You understand what you can do with this tool when seeing it
- Forget the current platform and create the things you want (you can even add functions that are not existing)

STEPS:

- Draw down the things you would like to see when you first open the tool. (you don't have to fill up the whole page) 3mins x2 = 6mins
- Take pictures and put it on the board = 3mins
- Explain your ideas and discuss = 11mins

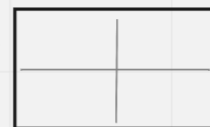
Create your ideal Analysis flow!

Goal:

- Starting point: when you open the tool - End point: see the result (start from inputting data)
- Ideal interaction flow you would like to have (regardless of implementation)
- Try to describe the flow as detailed as possible

STEPS:

- Fold the A4 twice, so that you can get 4 blocks
- Draw down the flow you would like to have (point out touch point) 8mins
- Take pictures and put it on the board = 3mins
- Explain your ideas and discuss = 19mins



30 mins

Appendix F. Ideal scenarios created by product owners at Macomi

Problem

The TVP planner is a hard tool to use. There is lack of overview on both results and on the grouping of datasets. There is lack of a procedure and technical support for dealing with updates in the data. Also, there is a steep learning curve in using the tool, which has led to a smaller group of key users than originally intended.

Vison

The TVP planner is a tool that is easily usable by a first-time user, offers exactly the information needed for stakeholders and managers, and offers complex functionality for the expert user. The TVP planner offers a lot of support with dealing with data versions and updates.

Ideal interactions

Note that interactions that are not supported by current platform functionality are displayed in *italics*.

Dramatis personae

- Alice, a key user
- Bob, a key user
- Charlie, a stakeholder
- Dave, a manager

Single person interactions

- **Modify existing planning in front end by a single user**
 - Alice wants to modify an existing optimised planning
 - Alice views an optimised planning as a Gantt
 - *Alice starts modifying this planning (while the optimised result is also still accessible for her)*
 - Alice searches by project request
 - Alice modifies existing project requests in several ways
 - By drag-and-drop
 - *By modifying the exact date and time*
 - *By aligning the start/end date with an existing request*
 - Alice *directly* sees the impact of her modifications in the score and broken constraints
- **Rerunning optimisation on a modified planning**
 - Alice wants to rerun optimisation on a planning that was optimised before but has been modified since
 - Alice selects which project requests should not be replanned by optimisation
 - In the Gantt
 - In tables
 - Alice *directly* starts an optimisation on the modified planning
 - Alice can *directly* use the previously used inputs/configs, or she can modify these
 - *After the optimisation, Alice looks at the version history (optimisation, edit, edit, edit, optimisation...) of the resulting planning*
- **Merging updated data into input datasets**
 - Alice wants to merge updated data in existing input datasets
 - *The updated data will be either project requests and/or dependencies*
 - Alice merges the new data into the old data
 - *Alice sees some conflicts between the data, which she then can solve*

- **Importing data**
 - Alice wants to import data
 - Alice imports data via the data pipelines
 - Alice selects which data version she wants to import
 - Alice sees a notification the data import has started
 - Alice sees the progress of the data import
 - Alice sees a notification the data import has ended
 - Alice can directly see the newly imported datasets
 - Alice can easily filter based on data version
 - Alice can easily run an optimisation with a specific data version
- **Viewing on a map**
 - Alice wants to view the optimised planning on a map
 - Alice opens the planning as a map
 - Alice looks at a specific time and see which tracks are blocked by maintenance
 - Alice can focus on a specific track and see relevant information on it
 - Alice looks at a specific time and see the detour routes of passengers and goods
 - Alice can focus on a specific weekend and can see relevant information about it
 - Unclear what would be the correct view for a weekend
 - Alice searches by project request and by track
 - Alice projects a satellite or map background on the map

Multiple person interactions

Note that these do not necessarily imply multiple user interactions. The second interaction can be done with a single user / tool instance.

- **Modifying a planning together**
 - Alice and Bob want to modify a planning together (the result)
 - Alice shares her planning with Bob
 - All relevant input data is also made available to Bob
 - Bob sees live updates made by Alice
 - Alice chats with Bob when working together
 - Bob logs off while Alice continues
 - Alice makes comments on the planning that can be later viewed by Bob
 - When Bob logs in later, he can see a list of the changes made by Alice
 - Bob branches from Alice's version and works on his own planning
- **Discussing optimised(/modified) plannings with (external) stakeholders**
 - Alice wants to discuss one or more plannings that she made with external stakeholders. The interests of the stakeholders are conflicting. (Some want lower financial costs, some lower hinder.)
 - Alice easily compares two plannings in Gantt as well as in score, so the stakeholders can better decide between a planning optimised on hinder versus one on financial costs
 - Charlie, a stakeholder, asks what the impact of an individual project request on the planning is
 - Alice can easily show this
 - Charlie then asks if the project request can be replanned
 - Alice then easily shows what the best second option for this project request would be.

- Alice can show the biggest differences between two optimised plannings
 - Unclear how this would look. Top 10 project requests that were 'most different'?
- **Showing results to a manager**
 - Dave, a manager, wants to see the results of Alice's hard work
 - Alice shares results with Dave
 - Alice designs a dashboard for Dave to view
 - Alice easily shares the dashboard with Dave
 - Dave sees results in a simplified view
 - Dave doesn't see too much details, but can open Alice's dashboard on the resulting data
 - Alice shares another result with Dave
 - Alice designs a comparison dashboard for Dave, and shares this dashboard with him
 - Dave then compares the two results in the comparison dashboard

Appendix G. Script: Iteration tests

1. Self-introduction + Introduction of the project

I'm a Design student from TU Delft. I'm working on my graduation project, which is about designing the user-experience of the ProRail Maintenance. Now is the first step of design, and there are 2 low fidelity prototypes that I would like you to test and give feedback.

2. Introduce Test set-up

- Test two prototypes (with some tasks)
- Ask you few small questions after each test
- Wrap-up with a discussion in terms of the whole test

3. Consensus

- For later analysis, is that okay that I do screen record of this session?
- Materials and results of this session (for example information you mentioned, video/audio, screenshots of the session) might be used in my report and presentation
- In terms of video or screenshot, it might include your face, is that okay for you to show your face or you would like to have your face blurred or covered?

Start

1. User self-intro

- First can you introduce yourself in more detail? Demographic information: age, occupation, study background, how technical you are(learn new things)6,timo:
- Briefly introduce your work in ProRail, when did you start work in ProRail, what did you do in your daily work

2. Test intro

- Very first ideas, not the final, rough, bugs, test contents and flow
- Be critical, think-out-loud during the testnt
- Comparable mindset

Tasks:

1. First impression of the prototype

- Describe what you see, what do you think they are used for
- How do you feel about it

2. (Import input data)

3. Make a new Analysis for 2021

- What makes sense for you? Import data first?

4. Check the Analysis Gantt and Score you just made

5. Modify the plan

6. Compare two plans

7. Share with your colleague

8. Fill a questionnaire A

- How confident for you to finish the tasks? Why? 1-7 (1:no confidence at all, 7 very confident)
- Is all the functions and features clear? (you understand what you can do by clicking something) 1-7 (1:unclear 7 very clear)
- Is the flow and interaction logical enough? Why? (1: no logic, 7 very logical for me)
- How easy for you to use it? Why? (1: very hard, 7: very easy)
- what do you like about this? What do you think was not good?
- what features are missing?

9. Compare questionnaire B

- Compare with prototype 1, you can change the rank of prototype 1 as well

10. Discussion ask why!

Appendix H. Consent form

Usability test consent form

Please read and sign this form.

In this usability test:

You will be asked to perform certain tasks on a computer. An interview will be conducted with you regarding the tasks you performed, and all the information in this session will be collected and analysed.

You are voluntarily joining the test to help to improve the ProRail Maintenance software. You can refuse to answer any questions without reasons.

Please select the option on the right of each statement:

- | | Yes | No |
|--|--------------------------|--------------------------|
| • For later analysis, is that okay that I record this session? | <input type="checkbox"/> | <input type="checkbox"/> |
| • Materials and results of this session (for example information you mentioned, video/audio, screenshots of the session) might be used in my report and presentation | <input type="checkbox"/> | <input type="checkbox"/> |
| • In terms of video or screenshot, is that okay for you to show your face? | <input type="checkbox"/> | <input type="checkbox"/> |

Participant:

Signature:

Date:

Researcher: Sum Yuet Leung

Signature:

Date:



Appendix I. Script: Evaluation test

1. Self-introduction + Introduction of the project

I'm a Design student from TU Delft. I'm working on my graduation project, which is about designing the user-experience of the ProRail Maintenance software. Today I would like to invite you to evaluate the concept and give feedback on it.

2. Introduce Test set-up

- This test will take 1-1.5 hours. During this session, you will use a prototype to finish some tasks. It would be helpful if you can think aloud during the whole process.
- After the test, I would ask you some questions to evaluate the experience of the prototype.
- We will wrap-up with a discussion in terms of your whole experience.

Start

1. User self-intro

- First can you introduce yourself in more detail? Demographic information: age, occupation, study background, how technical you are(learn new things)6,timo:
- Briefly introduce your work in ProRail, when did you start work in ProRail, what did you do in your daily work
-

2. Test intro

- This is a prototype made for mimicking the interaction of the design. Please bear in mind that there might be some function could not work due to technical factors.
- The goal is to evaluate the experience flow and find out what can be improved in the future. Please think aloud during the test.

Scenario

- Imagine you have been working in ProRail for half a year, now you are working on planning the maintenance of railway for 2021.
- You've used to plan the maintenance for 2020. Data for 2020 is already there, only few input data have been updated.

Tasks:

1. Import new input data from data Pipelines and make a new Analysis for 2021

(New input data: Project requests 2021, Dependencies 2021, Conflicts 2021)

2. Check the Result of Analysis 2021 Gantt and Score

3. Modify the project request of location B-C and pin it

4. Rerun optimisation based on the modified project request

5. Share 'Analysis 2021-modified' to Alice
6. Compare two plans (Analysis 2021 vs Analysis 2021-modified)
7. 1 minute for you to explore the prototype again
8. Fill a questionnaire A
9. SUS scale ask why!
10. VisAWI-S evaluation

Appendix J. Task list sent to the participants: Evaluation test

Task list of the evaluation test

Scenario

- Imagine you're a maintenance planner who have been working in ProRail for a year. Now you are working on planning the maintenance of railway for 2021.
- Data for 2020 is already there, and now you are going to update some new data in the tool and make a new maintenance planning for 2021(from 1st,Jan to 31th, Dec.).

Tasks:

0. Explore Navigation bar and try to hide the tool bar
1. Import new input data from data Pipelines and make a new Analysis for 2021 (New input data: Project requests 2021, Dependencies 2021, Conflicts 2021)
2. Check the Result of Analysis 2021 □Gantt and Score□
3. Modify the project request of location B-C and pin it
4. Rerun optimisation based on the modified project request
5. Share 'Analysis 2021-modified' to Alice
6. Compare two plans (Analysis 2021 vs Analysis 2021-modified)
7. 1 minute for you to explore the prototype again

**Appendix K. Quantitative evaluation form:
SUS and VisAWI-S**

Evaluation scale

1. I think that I would like to use this system frequently.

Strongly disagree 1 2 3 4 5 Strongly agree

2. I found the system unnecessarily complex.

Strongly disagree 1 2 3 4 5 Strongly agree

3. I thought the system was easy to use.

Strongly disagree 1 2 3 4 5 Strongly agree

4. I think that I would need the support of a technical person to be able to use this system.

Strongly disagree 1 2 3 4 5 Strongly agree

5. I found the various functions in this system were well integrated.

Strongly disagree 1 2 3 4 5 Strongly agree

6. I thought there was too much inconsistency in this system.

Strongly disagree 1 2 3 4 5 Strongly agree

7. I would imagine that most people would learn to use this system very quickly.

Strongly disagree 1 2 3 4 5 Strongly agree

8. I found the system very cumbersome to use.

Strongly disagree 1 2 3 4 5 Strongly agree

9. I felt very confident using the system.

Strongly disagree 1 2 3 4 5 Strongly agree

<https://docs.google.com/forms/d/1jna68xvLrUCsimOILn7cBhQNFAABCMxDdeN9Bhle7hw/edit#response=ACYDBNiprXtZfvYqPRLAKkoPu5U...> 34/36

<https://docs.google.com/forms/d/1jna68xvLrUCsimOILn7cBhQNFAABCMxDdeN9Bhle7hw/edit#response=ACYDBNiprXtZfvYqPRLAKkoPu5U...> 33/36

10. I needed to learn a lot of things before I could get going with this system.

Strongly disagree 1 2 3 4 5 Strongly agree

2.1 Everything goes together on this site.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

2.2 The layout is pleasantly varied.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

2.3 The colour composition is attractive.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

2.4 The layout appears professionally designed.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Participants

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Google 表单

Appendix L. Demographic information of the participants: Evaluation test

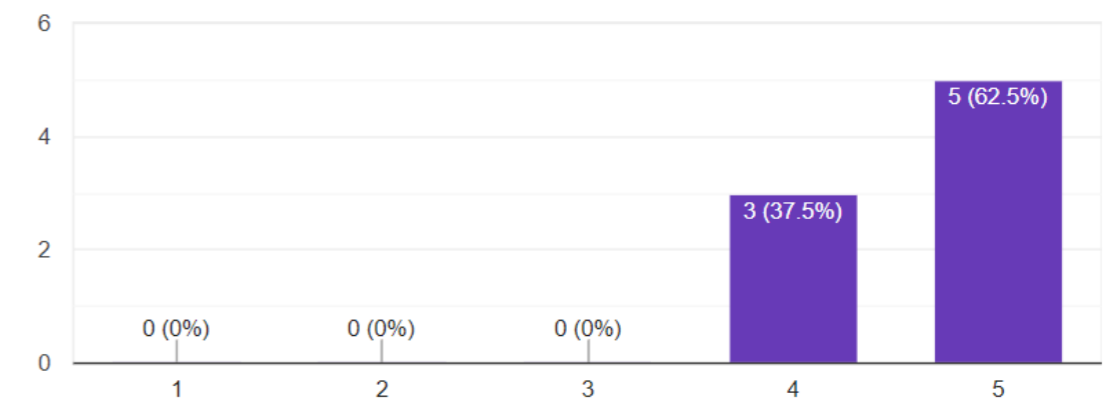
Participant	Occupation	Study background	Age
P1	software engineer	Master computer science	23
P2	Management director	Ph.D. in systems engineering	37
P3	Specialist planner train-free periods of rail infrastructure	Transport Engineering & Management	28
P4	student	Master Design for Interaction	25
P5	Software architect	PhD in Computer Science	38
P6	software engineer	Computer science	37
P7	student	Master Design for Interaction	24
P8	student	bachelor electrical engineering	23

Appendix M. Results of the quantitative evaluation SUS and VisAWI-S

SUS

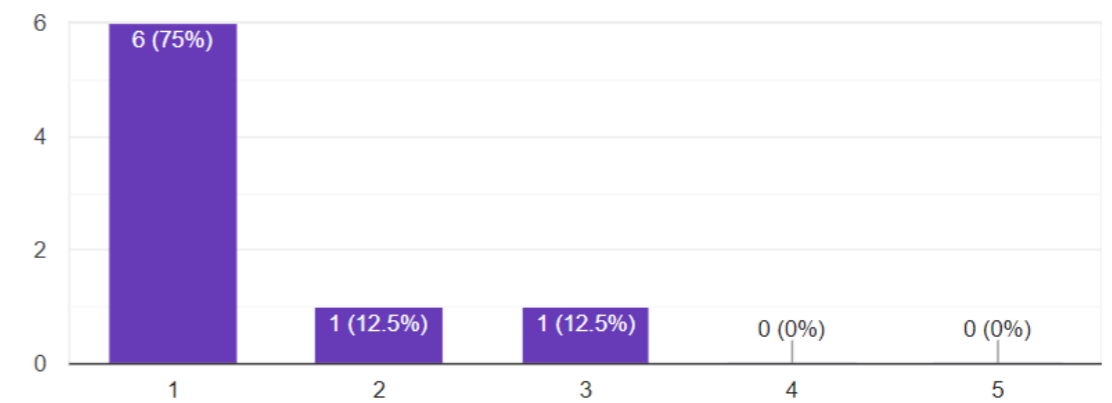
1. I think that I would like to use this system frequently.

(8 条回复)



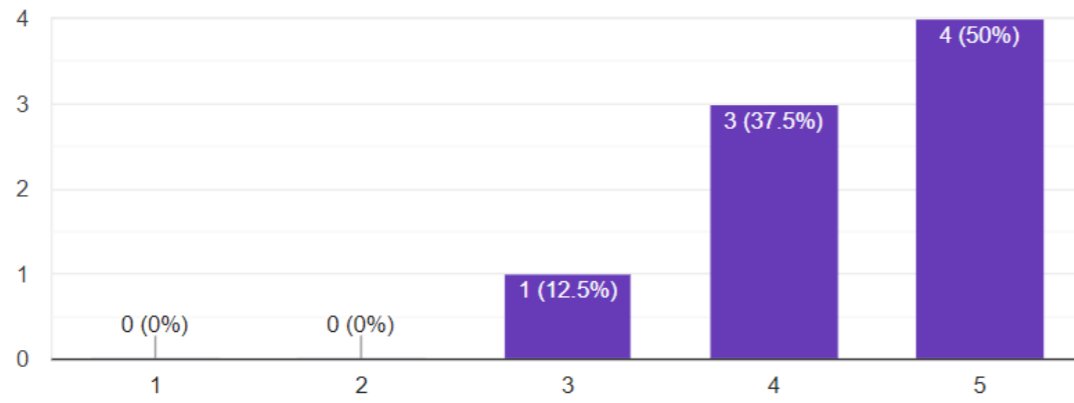
2. I found the system unnecessarily complex.

(8 条回复)



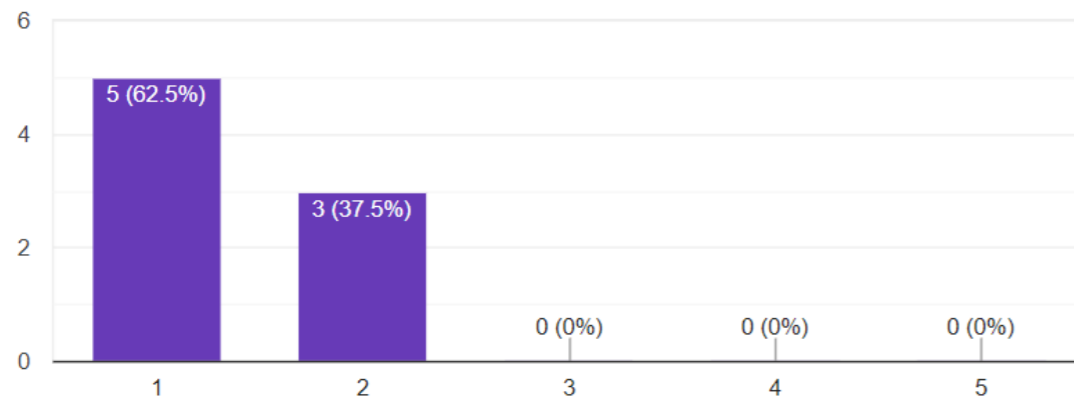
3. I thought the system was easy to use.

(8 条回复)



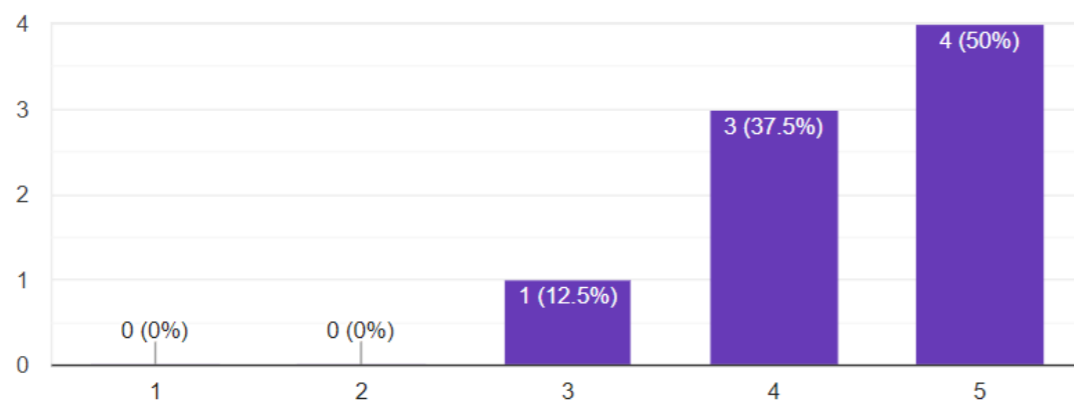
4. I think that I would need the support of a technical person to be able to use this system.

(8 条回复)



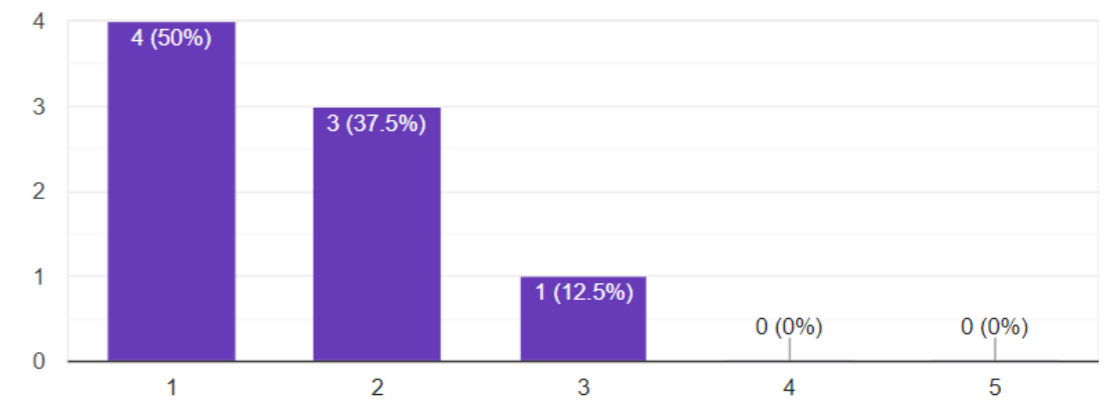
5. I found the various functions in this system were well integrated.

(8 条回复)



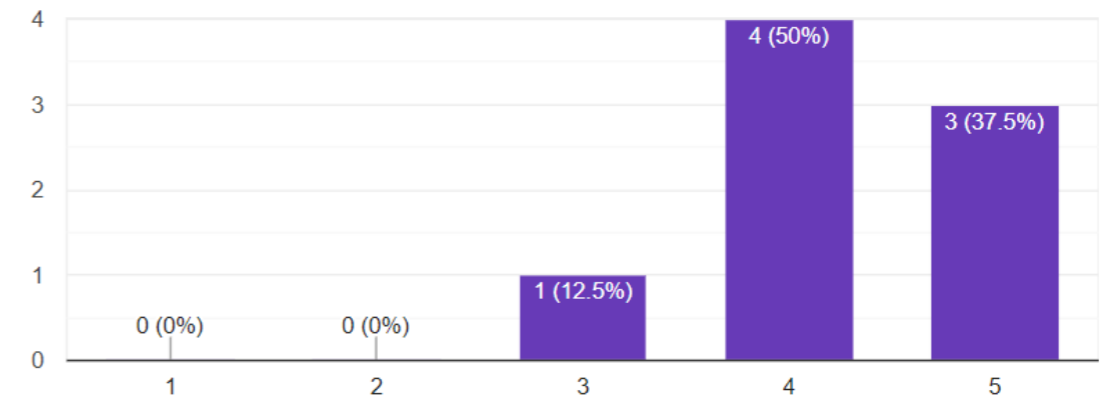
6. I thought there was too much inconsistency in this system.

(8 条回复)



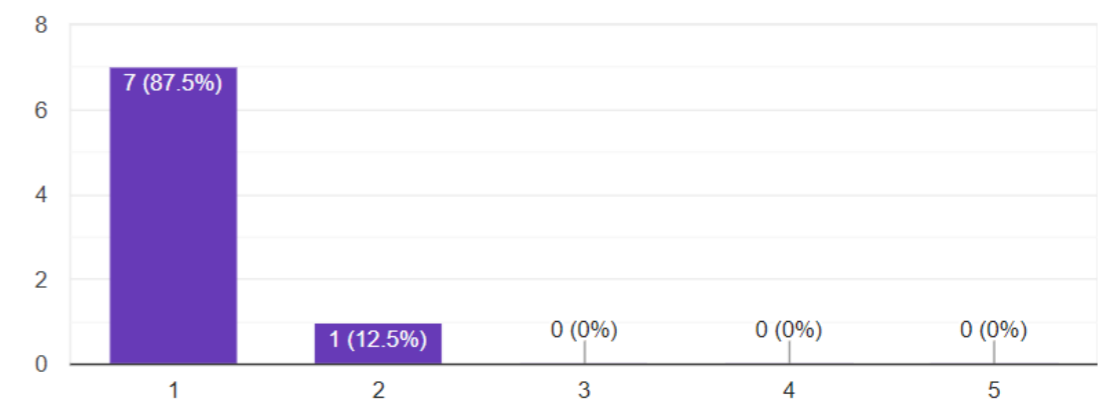
7. I would imagine that most people would learn to use this system very quickly.

(8 条回复)



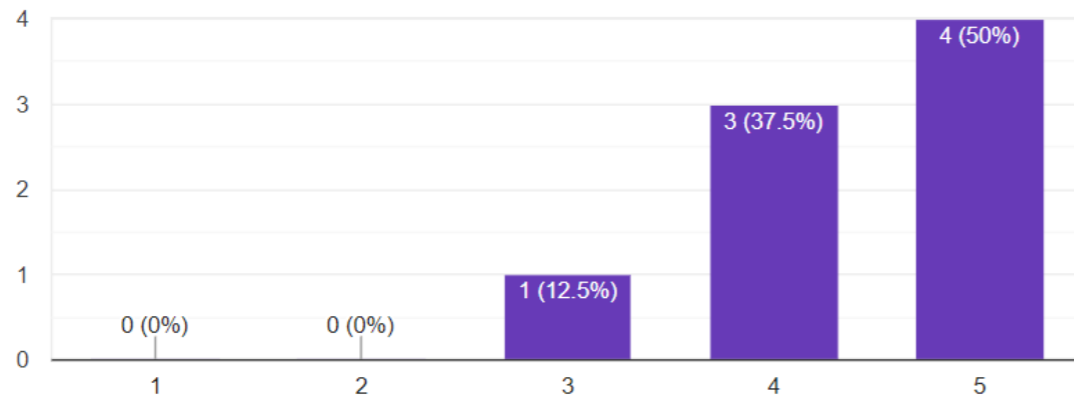
8. I found the system very cumbersome to use.

(8 条回复)



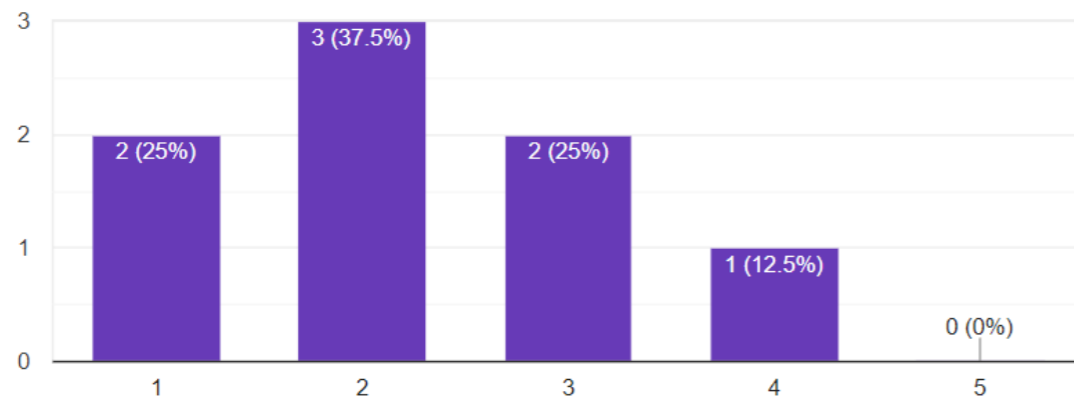
9. I felt very confident using the system.

(8 条回复)



10. I needed to learn a lot of things before I could get going with this system.

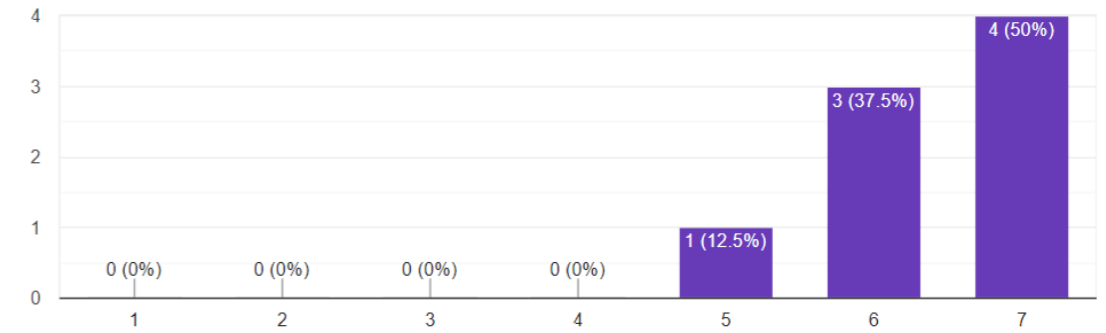
(8 条回复)



VisAWI-S

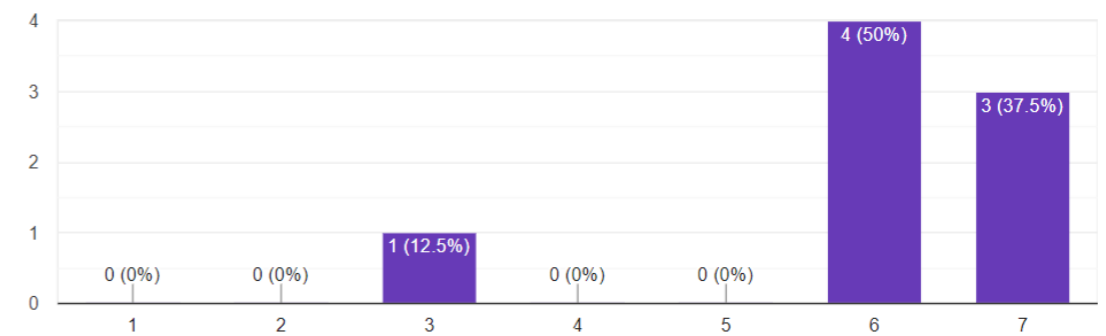
2.1 Everything goes together on this site.

(8 条回复)



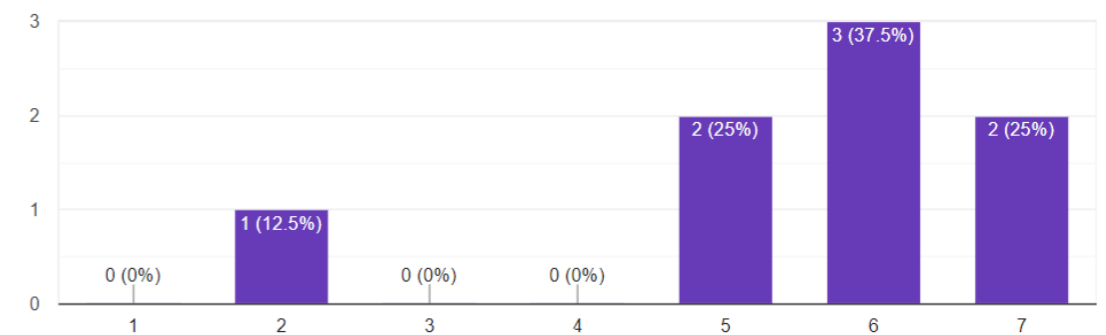
2.2 The layout is pleasantly varied.

(8 条回复)



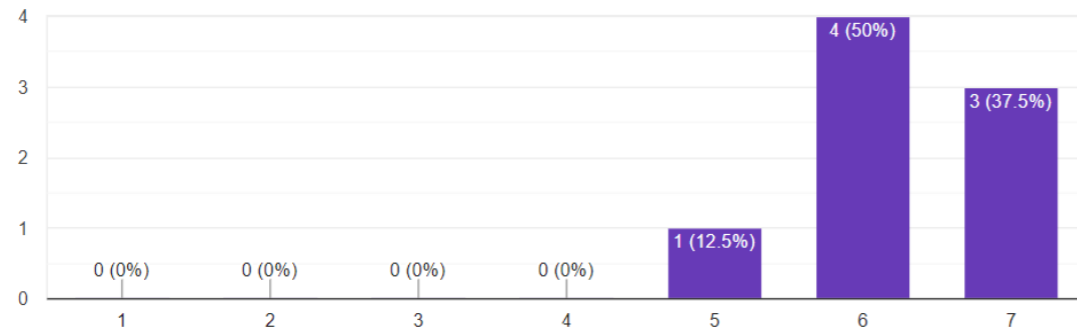
2.3 The colour composition is attractive.

(8 条回复)



2.4 The layout appears professionally designed.

(8 条回复)



Appendix N. Raw qualitative data extracted from the evaluation tests

Participant1

Task	Description/flow	Problems/mistakes	Need hints	Lack of feedback	Positive elements	Expectation
First impression					-1:14:00 the Making analysis and results of analysis are separated from the input now -open the tool with the analysis and progress on the homepage, give the user overview. -the order of the navigation bar show a clear order of the overall flow	-1:19:45 maybe a 'Start a new analysis' button on the home screen. Think about when you open the tool for the first time, there would be nothing(analysis) on the home page
1.Import new input data from data Pipelines	(I guess the folders were automatically created when I import something or I can create myself) 08:35 go to Input>Import from pipelines>select>'Import'>see the import progress and the new automatically created folder(want to rename the folder)>select the folder>add to analysis				10:50 nice that you can select either the whole folder or individual dataset and use them for making analysis	1:14:55 when I open Project requests 2021, it usually contains more than one table, I would also like to check them as well(now just should the project requests)
make a new Analysis for 2021	try to add Scenario>select Year range>select Configuration>Run Analysis> the progress bar shows the analysis is running, on the left I can make a new analysis(usually it should keep everything as it is, remain the setting of the previous setting, e.g. keep the year range, input..., then I just need to change few things)		19:35 not clear there are some pre-filled data. Because the ones I selected are highlighted. If the pre-filled data show the name of the data(e.g. Conflicts 2020), or descriptions saying use the latest data, then it might be more clear	15:35not sure how can I make a new Configuration -16:05 might be confusing that the Optimisation option is separated from the configuration setting, because it might not be changed a lot(might be better to integrate into the configuration setting as well) Year range is something would be changed a lot, so it's nice to separate it		13:00 when I click Scenario to select, I expected to only see the list of Scenarios. 14:05 but I do like now they are not a big long list but shown by types that you can easily find what you need
2.Check the Result of Analysis 2021	either go to the Results through navi bar or click the progress bar> go to the results page>click the card and see the gantt				it's nice to have the gantt as the main view opened -nice that I can see the input and configuration(e.g. if I forgot to give it a good title, then I can tell what did I use for making it)	expect to see the description of the error when I put the mouse on the error icon -1:17:00 might be nice to see the hierachy, where a modified/rerun analysis came from
3.Modify the project request of location B-C and pin it	click 'Modify'>yes>click the block>click 'pin'		30:30 I guess orange means I have moved the block			
4.Rerun optimisation based on the modified project request	click 'Rerun optimisation' >stay here	34:40 not sure if it should say 'Updated' next to the score after rerunning, because it is still the modified plan, not the rerun plan. I might expect only see the 'Updated' when I move the blocks again				might be nice to have an option to change the configuration(ask if I would like to use the same configuration or change it)
5.Share 'Analysis 2021-modified' to Alice	click the Analysis-modified on homepage>click 'share'>select Alice>share>					would like to see who has what permission
6.Compare two plans (Analysis 2021 vs Analysis 2021-modified)	Results page>select two analysis>'compare'				nice to have two results that you know which one is the base	might be nice to give another colour to the blocks that has been moved in the original gantt to show it has been moved(to show which one has been changed and changed to where)

Participant2

Task	Description/flow	Problems/mistakes	Need hints	Lack of feedback	Positive elements	Expectation
First impression					18:55 like that the input, analysis, results are separated ~25:20 I like you have the main focus on the homepage which is the analysis ~26:00 curious to know what would be valuable for ProRail to add dashboard on the homepage, what they would like to see initially (maybe one of the results?) 28:10 maybe some active planning he's working on	
1.Import new input data from data Pipelines	input>(see my input data can't find the ones I need)>click'import from pipelines'>select data>import>see new imported data				21:30 the folder can help to tell the differences between different input data, good idea to have this folder, nice structure, also select data here and add to analysis directly ~22:40 list by type is nice	19:55 maybe a bit over simplified, when there are many project requests, might be difficult for me to quickly ~expect I can collapse/open the contents under a folder ~23:10 only show the name of a input data maybe a bit simple, would like to system to help me to tell what a input data contains
make a new Analysis for 2021	select new input data>'add to analysis'> blue are the ones I filled, and I can select other input by clicking it>select year range>select configuration>check validation>run analysis> left part is back to new, analysis progress means the analysis is running				~24:50, I like you split the making analysis from the results, it's more clear	
2.Check the Result of Analysis 2021	click the bar to the result(it bring me to the page of the results)>click the analysis>check the overview and gantt					I expect to see the gantt result directly instead of going to the page of results
3.Modify the project request of location B-C and pin it	drag the block>yes>see the button'rerun optimisation appears'> click the block>click 'pin'					
4.Rerun optimisation based on the modified project request	click rerun optimisation>stay here(a bit not sure if this is the rerun one)					
5.Share 'Analysis 2021-modified' to Alice	click 'share' button(doesn't work due to bugs)>go to results page>select 'Analysis2021-modified'>click'share'>select Alice>share>see the share icon				nice to see the share icon and to whom I shared	

6.Compare two plans (Analysis 2021 vs Analysis 2021-modified)	select the two analysis>'click 'compare'>only see the changed block			only see the changed block;it seems the modified plan only contains one block	16:35 actually I like it to only see the differences when there are lots of project requests	~maybe instead of calling it 'Analysis2021-modified', calling it the differences ~17:40 I would expect if I switch the results the gantt also switches the base project requests
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Participant3

Task	Description/flow	Problems/mistakes	Need hints	Lack of feedback	Positive elements	Expectation
First impresssion	2:00 navigation bar like a work flow				~ 2:20 it's very clear ~17:10, Navigation bar helpful to get the workflow, from top to buttom, clear for me what I have to do ~19:50 'Add dashboard' could be very helpful. After experiencing I might know what I want to add there	18:34 maybe I can colour the analysis/tasks (colour all analysis of 2020 into red)
1.Import new input data from data Pipelines	go to input, think need to import from pipelines				~04:10, see the day and time and see if this is the right one that I have imported	
make a new Analysis for 2021	04:40click Nav:Analysis-select from input- select input-'add to analysis'-try to click'scenario' to select other data-year range-select config.-07:42 see it's starting and running					
2.Check the Result of Analysis 2021	click the bar to go to analysis					
3.Modify the project request of location B-C and pin it	click'modify'-yes-pin-'rerun					
4.Rerun optimisation based on the modified project request	click'optimisation'-yes					
5.Share 'Analysis 2021-modified' to Alice	12:20share within the results					15:45would prefer tap in to see the gantt and share directly here more likely because I see the result and I can confirm that I am sharing the right one.
6.Compare two plans (Analysis 2021 vs Analysis 2021-modified)	click 'compare'-select Analysis 2021-	14:53 try to find how to go one page back, explore a bit, then click top left to go back			14:00 have two results score is necessary, because sometimes the base situation is different, showing both is helpful to see the differences	

Participant4

Task	Description/flow	Problems/mistakes	Need hints	Lack of feedback	Positive elements	Expectation
First impression		~Hide button next to a search bar is a bit weird and a bit too big ~when clicking other icon on the navi, the navi bar 缩小隐藏, not sure what the other icons mean now, a bit surprised				~ as a complex system, I quite like the navigation bar to switch operation page
1.Import new input data from data Pipelines	16:30 click 'import from pipelines'-select data>import>(notice import progress)	10:12 there are 'Input' and 'Input data' on top left, not sure why there are two titles	11:20 folder in folder? (e.g. Not sure the Project requests 2020 is a file or a folder) ~Naming of the date: culture differences(10/06=10th, Jun or Oct. 6th?)	~why it created a folder automatically and why it was named as this(I didn't give it a name)20:30 expected it ask me if I would like to rename the folder ~'New' next the new imported data should be more obvious		~ after importing data, expect to see the bar near the Import button
make a new Analysis for 2021	21:00, go to 'Analysis' through Navi bar.>select from input>jump to input page>select input data>add to analysis>click 'Scenario'>select 'Year range'> select configuration> run analysis>(notice analysis progress:the analysis is running)	~switch between pages makes me feel not in a same flow, I don't want to leave this page ~the pop-up of Configuration is a bit small ~	13:00 not sure what configuration means ~ need explanation of configuration(e.g. an information icon explaining what does it mean) ~left part turned grey and cleared the input after clicking 'Run analysis'. Expect the input data stay where they were after running	not clear I can rename/edit the name of the new analysis		~expect to see a pop-up after clicking 'Select from input' instead of jumping to the Input page. This makes me feel I'm still in that flow ~expect the numbers in the configuration is left-justified, more readable. I want to see the numbers immediately(now there is a blank area before i catch the number of each row ~ Validation looks like a text box that I need to add something. Expect this part to be collapsed if I don't need it. Expect it to be more like an information bar(like the description on top) Visually distinct 'Validation' from other three parts (other three
2.Check the Result of Analysis 2021	33:00 click progress bar to results>results page>click the Analysis 2021>		~not sure what time means: create time or finish time ~lack of the unit of the cost			~maybe the progress bar under the running Analysis to show its progress instead of an individual Analysis progress in the result page (now the result and the progress are separated) ~the order of showing input data in the result is different from the one i see in the Make analysis page (maybe collapse input data)
3.Modify the project request of location B-C and pin it	move the block>yes>click the block>pin	~pop-up prevent me from editing the gantt	~there is something wrong(what is the problem?) ~not sure what 'pin' means, 'lock' maybe more clear for me			~52:00expect auto save and I can check edit history/milestones (because they are different status of a same file) I can save changes as milestone/mark. If there are a lot of changes, then maybe it's better to save as a new file?
4.Rerun optimisation based on the modified project request	click 'rerun analysis'->yes>stay here			~the pop-up didn't say what I can rename is the folder's name ~1:04:20if I move the block(save as a new file) and then undo, where would it goes?(so in the original result, there's no need to have 'undo' 'redo' 'pin', because if I move the block, it will duplicate anyway) ~'Analysis 2021-rerun is running!' should tell the user where you can find this result		~pop-ups disturb my interaction

5.Share 'Analysis 2021 - modified' to Alice	1:10:35back to result page>select analysis>click share>select Alice>share>see the icon which is clear that I have shared to Alice	1:13:30 title, body, share button fixed on the bottom		-lack of confirmation feedback:you have shared to Alice		-maybe I select the tag then I can directly share the result(e.g. select result1.right click, then share) or after clicking share in the comparison page, a pop-up shows asking if I would like to share the comparison or result1/result2)
6.Compare two plans (Analysis 2021 vs Analysis 2021 - modified)	1:05:20>select analysis> click 'compare>	redo.undo.pin should not be shown here	what's the meaning of the grey tag? Also use the same colour coding (blue:result1, orange:result2) maybe can change the size of the tag to show it is selected?			expect to change the view (list view, board view) if there are many file, I would like to use list view - colour coding indication -do not need to show 'modify' here if I can't modify

Participant5

Task	Description/flow	PROBLEMS/mistake	Need hints	Lack of feedback	Positive elements	Expectation
First impression					55:20 quick overview that are interesting to me on the homepage, and quickly go to the result -like the grouping of the input data -save configuration in the make analysis -the whole compare experience is very nice and clear(if the block can show the connection of the modified one and the original one) -i like that there is a share button in the view of the gantt, at this point i would like to share it immediately, i don't need to go back -the more general data information(name, time people, share:maybe also icons showing what permission) is always visible	the search bar is always there for each page(data grow quickly, there might be a lot of data). I would expect to see the search bar to be visible all the time
1.Import new input data from data Pipelines	go to 'Input'> 'import from pipelines'>select data> import> see the import progress and it's finished, also see the new input folder>				47:20, it's very good when you do import, it results in one group, It's much likely you would use all the new import data together	48:50 50:00 for each type of dataset I just want the latest version. For each import, you might not have the latest types of all the data. Maybe in the page of the make analysis, a button or something saying select latest input. Or a label that you can attach to the latest input data, then you can filter on the label.
make a new Analysis for 2021	select input folder>'add to analysis'>(I guess I have to select other non-blue input data as well)> select year range>select configuration>check validation>run analysis> see progress bar for the new analysis, left part is empty again I can create a new analysis now			34:55 for me it's not clear the input data is already pre-filled because I didn't see the name of the data or something saying it's default. For now it looks like unfilled		

2. Check the Result of Analysis 2021	click the progress bar to the results>go the results page>click the new one>click the card>					~43:10 I click on the progress bar of the analysis, I would expect to go to open the gantt immediately instead of going to the results page. It would feel more integrated if I would just be able to just think of the analysis I was doing
3. Modify the project request of location B-C and pin it	move the block>yes>click the block>click 'pin' (it changes colour so it's pinned>					
4. Rerun optimisation based on the modified project request	rerun optimisation>stay here(want to continue looking at the results)					
5. Share 'Analysis 2021-modified' to Alice	click 'share'>select Alice>share>see the share icon and the name of whom I share with			12:15 to me it's very clear		12:22 I would make the permission more permanent than list by, permission is more important for me. The list is only to help to search the person. Want to make sure I give the right permission, now I might skip looking at the list filter and the permission, i should not skip the permission
6. Compare two plans (Analysis 2021 vs Analysis 2021-modified)	16:10 select the both analysis>'compare'>					18:20 I wonder how it will look if there are two blocks in a row, if I move them and switch the order, how to show the connection between the original and modified one

Participant6

Task	Description/flow	Problems/mistakes	Need hints	Lack of feedback	Positive elements	Expectation
First impression	4:22 yeah				~like I can add dashboard(maybe I want to see the notification then I can add it to the homepage) ~the most highlighted function on the top, and also other function ~navi on the top is useful ~checkbox to select several things and do something ~I can immediately see the gantt and other results in the tap ~clean and simple ~i like that i can have the ribbon on top or hide it. nice for different type of users	
1. Import new input data from data Pipelines	input>import from pipelines>select data>import>				~34:00nice to import in a folder instead of having a long list, it gives it some structure ~I like viewing it by types, nice to have an overview to see them together	
make a new Analysis for 2021	select input data>'add to analysis'>(assume have some default, can change them)>select Year range>try to click 'Run Analysis'>see the bar(the analysis is starting, assume I can make a new one on the left					
2. Check the Result of Analysis 2021	click the progress bar>click the result					expect to see the gantt directly after clicking the progress bar instead of going to Result page
3. Modify the project request of location B-C and pin it	drag the block>click 'yes'> select the block>click 'pin'>			a bit not sure if it duplicated a new one		
4. Rerun optimisation based on the modified project request	click 'Rerun optimisation'>click 'yes'>Go to Home					
5. Share 'Analysis 2021-modified' to Alice	click 'Analysis 2021-modified' on homepage> get the gantt>click share>select Alice>share>see the share icon				I can immediately find the button	

6.Compare two plans (Analysis 2021 vs Analysis 2021-modified)	select two analysis>click'compare'>(on top see I am in a compare page and the name of the analysis'>19:25 understand the results clearly				I have both results and the differences	
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Participant7

Task	Description/flow	Problems/mistakes	Need hints	Lack of feedback	Positive elements	Expectation
First impression	~Recent analysis=google recent file ~Dashboard=shortcut ~clear what they are used for			if there is a arrow next to 'tool', it would be more clear that I can open the tool bar by clicking it		
1.Import new input data from data Pipelines	input'>create folder>click 'Import from Pipelines'>select data>import>see new data>select 'input folder 10/06'>click 'Add to Analysis'	try to find new data right here (didn't realise he needs to import from pipelines)try to create a new folder				
make a new Analysis for 2021	selected data is filled(I can select other data as well)>select Year range>select Configuration>Run Analysis>have upload an analysis and can start a new analysis now				the flow is quite clear	
2.Check the Result of Analysis 2021	click progress bar/click'result' on the navigation bar/click progress bar on homepage>click Analysis 2021>see an exclamation mark (problem happens)					
3.Modify the project request of location B-C and pin it	click 'modify'>yes>17:48(surprised)>drag the block>select the block>pin>		didn't notice I can drag the block(try twice to click and then found it could be dragged)	~click the exclamation mark and want to check what's going wrong(expect a pop-up)		
4.Rerun optimisation based on the modified project request	click'Rerun optimisation'>yes>Homepage>click Analysis 2021-rerun on the homepage					expect to see the result(gantt)directly after clicking 'Analysis 2021 rerun' on homepage instead of going to 'result' page
5.Share 'Analysis 2021-modified' to Alice	select 'Analysis 2021-modified'>click share>see the share icon showing that the result has been shared to Alice					expect a pop-up(feedback)'you've shared to...
6.Compare two plans (Analysis 2021 vs Analysis 2021-modified)	select'Analysis 2021-modified' and 'Analysis 2021'>click 'Compare'	how to go back? There is no 'back' button. It was not very obvious that you can go back by clicking the navi on top(but can get it after first try)			quite clear what do they mean ~No.2 7:35.colour is nice and clear, I know which colour represents which result	would they compare more than 2 results?

Participant8

Task	Description/flow	Problems/mistakes	Need hints	Lack of feedback	Positive elements	Expectation
First impression	green is finished, orange is paused ~not sure what can I add to a new dashboard, maybe create a new analysis ~'Analysis' maybe history of previous analysis		Tool bar occurs on the homepage is a bit weird, undo, duplicate ... should appear when I operate something			
1.Import new input data from data Pipelines	~(thought I need to create a folder for 2021, and then copy paste data in it. explore a while)>import from pipelines>select data> import> have imported data in the folder			lack of 'back' button		
make a new Analysis for 2021	select input data> 'Add to analysis'>(blue are what I have filled in)>year range>configuration>check validation>run analysis>the analysis is running, left part I can make a new analysis		~not clear that I can edit the name of the new analysis ~13:08 if I select e.g. PR in the input and then add to analysis, would it automatically fill in Project requests in the new analysis page? ~can I mix input data?(use project requests2021 and conflicts 2020)			expect to see a pop-up list after clicking project requests. Quicker for selecting data
2.Check the Result of Analysis 2021	click 'result' to check result>click the result>(not sure what modify means)					
3.Modify the project request of location B-C and pin it	click the mark(expect to see what's going wrong)>then drag the block>click 'pin'(fail to pin and not sure if I have pinned it or not)>click the block>click 'pin'		~20:15 surprised to see 'modify the planning and save as...', I haven't modify but it said modify and save. It makes me confused:did I save or not, a bit panic ~not sure if I have pinned	once I try to move the block, the pop-up shows I can't modify ~I thought 'save as' means I have already done something, not clear it is duplicated ~26:20 the pin icon is always grey, I expect it to turn blue after I move the block to show I can use this to pin the block		~expect to enter a page where I can modify instead of seeing 'modify the planning and save as...', after I modify then I can select save as
4.Rerun optimisation based on the modified project request	click 'Rerun optimisation'>yes>go to home>					
5.Share 'Analysis 2021-modified' to Alice	select 'Analysis 2021-modified'>share>select Alice>share					expect a pop-up saying I have successfully shared to Alice
6.Compare two plans (Analysis 2021 vs Analysis 2021-modified)	click 'Analysis'(thought I can see the history of the previous analysis)>click 'result'>select 'Analysis 2021-modified' and 'Analysis 2021-rerun'>click 'compare'		not sure the differences between 'Analysis 2021-modified' and 'Analysis 2021-rerun'			expect the the colour of all the results of an analysis is the same ~redo, undo, pin, should not appear here(I don't need them) ~I would like to output or save the result of this comparison

End