

# Traffic Software- UI Overhaul

*UX engineering journey for an overhaul of a flagship traffic software application.*

Initial stakeholder engagement set a clear directive for this project. We were to achieve two primary tasks in the UI overhaul. The first, he wanted the ability to glance over a user's shoulder and know they are using the newly overhauled version. Secondly, to optimise the screens' real estate to enable an improved workflow. We were able to achieve both of these goals.

The application at the centre of this project is used by traffic management centres throughout Australia. It is used to change messages on digital roadside signs, digital speed limit signs, real-time traffic light adjustments, and calculate traffic congestion followed by making adjustments to alleviate the congestion, among dozens of other uses.

## Process

Some of the actions taken to achieve the deliverables included the following: Software product introduction, physical tour of the customer sites, ideation of potential concepts, card sorting, mind-maps, sketching wireframes, building mockups, outlining observations & input from users, and presentation to stakeholders.

Each step builds upon the previous. If a step is not performed correctly, the project can easily drift off track. It's acceptable to return to a previous step, in fact this is a common occurrence as an iterative process is implemented.

## Software Product Introduction

As with any project, meeting with stakeholders is paramount in order to understand the scope and deliverables. On this project, COO was leading the charge and set the directive, "I want to be able to look over a user's shoulder and know they are using the new version."

After the initial introduction by the COO, I met the other development team talent. This included everyone from the visual designer to the programmers.

### Visit Customer Sites

A tour of the customer sites allowed me to see the product used in a live situation. The image below is an example of a traffic management centre with the software used within the workstations and on the video wall.



*Example of a traffic management centre.*

### User Engagement

I spent a day interacting with several users, asking questions, taking notes based on user observation and listening to their concerns. Several key issues were identified immediately - some common themes and some based on personal preferences. The issues included limitations on UI, feature requests and frustrations in using the product.

This would prove to be the first of many trips to work with the users. As I started frequenting the sites, I quickly moved to a first name basis with the users. I also started gathering feedback through phone calls and then eMails with screen captures. It was exactly what was needed - user engagement!

### Breakdown of Existing Product

After a product and user introduction, I proceeded to review the existing product to assess the product's gains, pains & pressure points.

Given the product UI had not seen a significant change in the previous six year, it greatly resembled a software running on the older versions of Microsoft OS. The chrome theme consisted of big title bar, status bar, thick borders and menu bar for navigation. Although it had these typical traits, the Aero theme was applied to give it a little life.

Above and beyond the visuals, were the obvious workflow issues the users were going through. Although workflow issues would have been accepted at one time, the spread of software usability awareness, makes it imperative these days to have well designed software and programs.

In addition to understanding the user needs, I needed to grasp the vastness of the software - the features, elements, tools, section, reports, etc. Conceptualization of the new product requires the breakdown of the existing to ensure I cater for all the components.

#### Research Competition

Understanding the competition, includes researching and reviewing the other software vendors making similar products. However, there is a difference and a limitation between software products and websites. Although both are digital products, websites are freely available for research work, while software products are more restricted and I wouldn't have the opportunity to review them completely. Hence, I relied on the product features, videos, images and features as presented on the company websites.

#### Development Team Interaction

Input from development team is key, since they will provide the technological limitations, requirements and other products interactions. I obtained further information on the product platform architecture, built using both WinForms and WPF. We also discussed about the future plans and evolution of technology.

#### Research Ideation Concept

With the information gathered from all the steps above, I proceeded with conceptualising potential solutions. In total, six high-level concepts were offered with varying levels of acceptance. I iterated these concepts with the in-house talent and users. The final result was to incorporate a flat-design with ribbon and backstage, just as Microsoft Office displays.

Not only does the ribbon optimise access to the most commonly used elements in a software product, it also allows scaling for interaction using touch. It is little surprise we need to implement scalable solutions, which includes touch screen interactivity.

### Card Sorting

From my previous work with all the stakeholders and breaking down the existing software, I completed a card sort on the product the way I understood it.

In the image below you can see I did this by creating simple sticky-notes for the primary elements of the software, simulating a ribbon & backstage navigation, using parent to child and sibling to sibling relationships.



*Example of navigation tree providing a visual of the product navigation.*

However, that was just from my perspective. Further user feedback was needed to capture accurate usage of the product and organise the ribbons - most used, least used features, etc. In addition, input from the in-house development team was needed to understand their intent and decisions. The ultimate aim of this is to bridge the gap between the intended usage of

features and how it is actually used. Once I understand this, I will be able to move to the next evolutionary step of outlining the final navigation order.

The method I used to facilitate gathering this information was card sorting. I used Concept Codify (<https://conceptcodify.com/>) to include users, technicians, trainers, designer and development as stakeholders to participate in this session. A total of 45 participants completed this session.

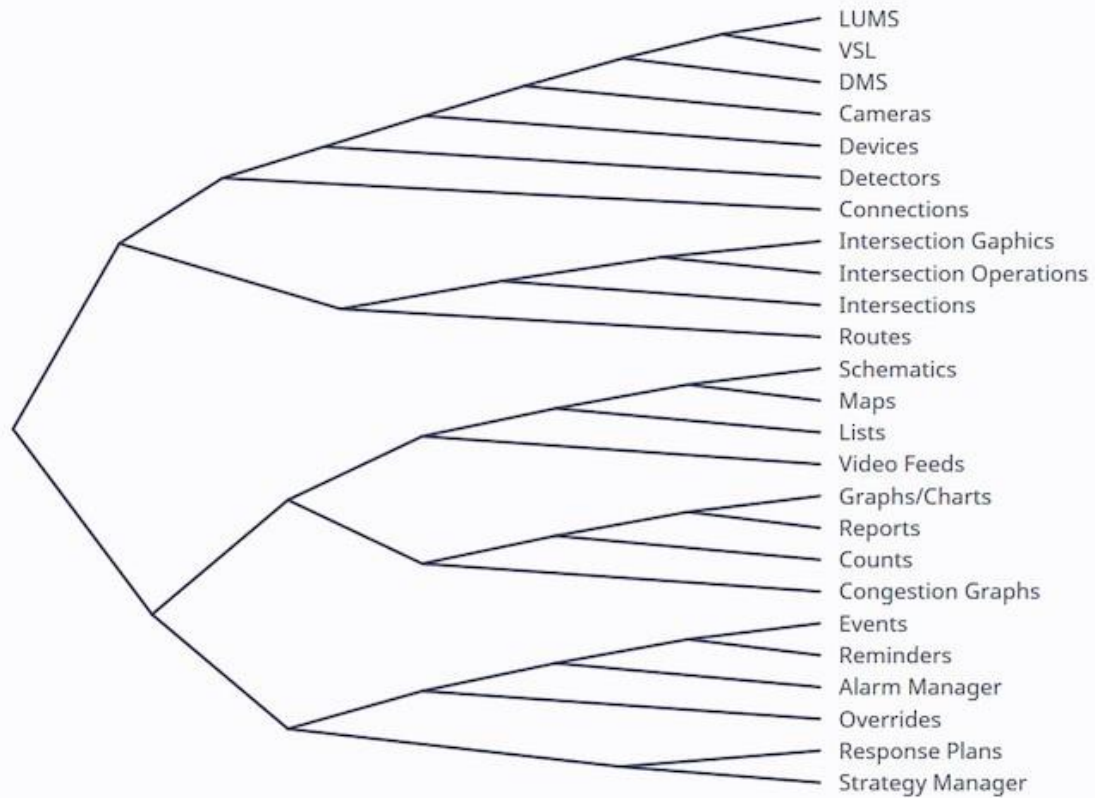
From this campaign I obtained detailed analytics in the form of: Group Name Analysis, Hierarchical Clustering Analysis, Ordering Analysis, Relationship Ranking and Similarity Matrix, as follows.

### Group names analysis

*Limited to top 20*

Count	Word
42	intersections
41	devices
39	tools
35	automation
34	interactive
5	reporting
4	monitoring
3	operations
2	and
2	managed
2	management
2	monitor
2	&
2	system
2	7
2	2,
2	incident
2	traffic
2	freeway
2	historical

## Hierarchical clustering analysis



## Ordering analysis

Rank	Card
1	Maps
2	Intersections
3	Cameras
4	Congestion Graphs
5	Lists
6	Response Plans
7	Alarm Manager
8	Schematics
9	DMS
10	Detectors
11	Connections
12	Routes
13	Video Feeds
14	Strategy Manager
15	Overrides
16	Graphs/Charts
17	Counts
18	Devices
19	Intersection Gaphics
20	Reminders
21	Reports
22	Intersection Operations
23	LUMS
24	VSL
25	Events

## Relationships ranking

Limited to top 20

Similarity	Card	Card
69%	Intersection Gaphics	Intersection Operations
66%	Intersection Operations	Intersections
65%	LUMS	VSL
56%	DMS	VSL
55%	Intersection Gaphics	Intersections
53%	Cameras	DMS
50%	Events	Reminders
49%	Graphs/Charts	Reports
48%	Response Plans	Strategy Manager
47%	Cameras	Devices
46%	Cameras	VSL
43%	DMS	LUMS
41%	Maps	Schematics
41%	DMS	Devices
38%	Detectors	VSL
37%	Cameras	LUMS
36%	Devices	VSL
36%	Alarm Manager	Reminders
35%	Counts	Graphs/Charts
34%	Congestion Graphs	Graphs/Charts

## Similarity matrix

Hover over the numbers to see the two card names.

LUMS		65	43	37	28	32	8	2	1	5	8	5	3	0	2	1	0	3	2	2	2	2	2	6	5
VSL	65		56	46	36	38	9	1	0	5	3	5	1	3	5	2	2	1	1	0	0	2	5	3	2
DMS	43	56		53	41	33	9	1	1	3	3	2	1	6	9	3	6	3	0	1	0	5	6	3	2
Cameras	37	46	53		47	32	9	0	0	3	3	2	6	3	19	4	2	1	2	1	2	2	4	0	0
Devices	28	36	41	47		30	12	0	1	2	4	5	2	8	9	1	5	4	0	0	2	3	2	1	3
Detectors	32	38	33	32	30		6	13	16	23	12	1	1	2	1	0	0	7	3	0	1	2	4	1	0
Connections	8	9	9	9	12	6		1	0	1	7	11	12	18	4	12	17	8	6	16	8	12	4	1	2
Intersection Gaphics	2	1	1	0	0	13	1		69	55	15	7	5	6	3	6	5	9	15	0	0	5	3	1	2
Intersection Operations	1	0	1	0	1	16	0	69		66	19	6	3	6	1	3	3	9	16	0	1	3	7	2	2
Intersections	5	5	3	3	2	23	1	55	66		20	4	3	2	0	0	0	5	10	0	0	1	3	0	1
Routes	8	3	3	3	4	12	7	15	19	20		10	14	8	6	8	2	11	13	8	5	3	8	8	6
Schematics	5	5	2	2	5	1	11	7	6	4	10		41	24	21	14	10	10	17	9	6	16	13	3	8
Maps	3	1	1	6	2	1	12	5	3	3	14	41		28	25	16	8	8	23	9	7	13	12	1	6
Lists	0	3	6	3	8	2	18	6	6	2	8	24	28		17	12	20	9	13	6	11	12	12	1	1
Video Feeds	2	5	9	19	9	1	4	3	1	0	6	21	25	17		18	13	11	15	9	9	13	17	2	5
Graphs/Charts	1	2	3	4	1	0	12	6	3	0	8	14	16	12	18		49	35	34	9	13	20	6	3	9
Reports	0	2	6	2	5	0	17	5	3	0	2	10	8	20	13	49		34	22	16	23	19	7	6	6
Counts	3	1	3	1	4	7	8	9	9	5	11	10	8	9	11	35	34		24	11	17	19	6	5	12
Congestion Graphs	2	1	0	2	0	3	6	15	16	10	13	17	23	13	15	34	22	24		5	10	21	6	2	7
Events	2	0	1	1	0	16	0	0	0	0	8	9	9	6	9	9	16	11	5		50	20	19	20	15
Reminders	2	0	0	2	2	1	8	0	1	0	5	6	7	11	9	13	23	17	10	50		36	22	24	18
Alarm Manager	2	2	5	2	3	2	12	5	3	1	3	16	13	12	13	20	19	19	21	20	36		15	10	16
Overrides	2	5	6	4	2	4	4	3	7	3	8	13	12	12	17	6	7	6	6	19	22	15		18	13
Response Plans	6	3	3	0	1	1	1	1	2	0	8	3	1	1	2	3	6	5	2	20	24	10	18		48
Strategy Manager	5	2	2	0	3	0	2	2	2	1	6	8	6	1	5	9	6	12	7	15	18	16	13	48	

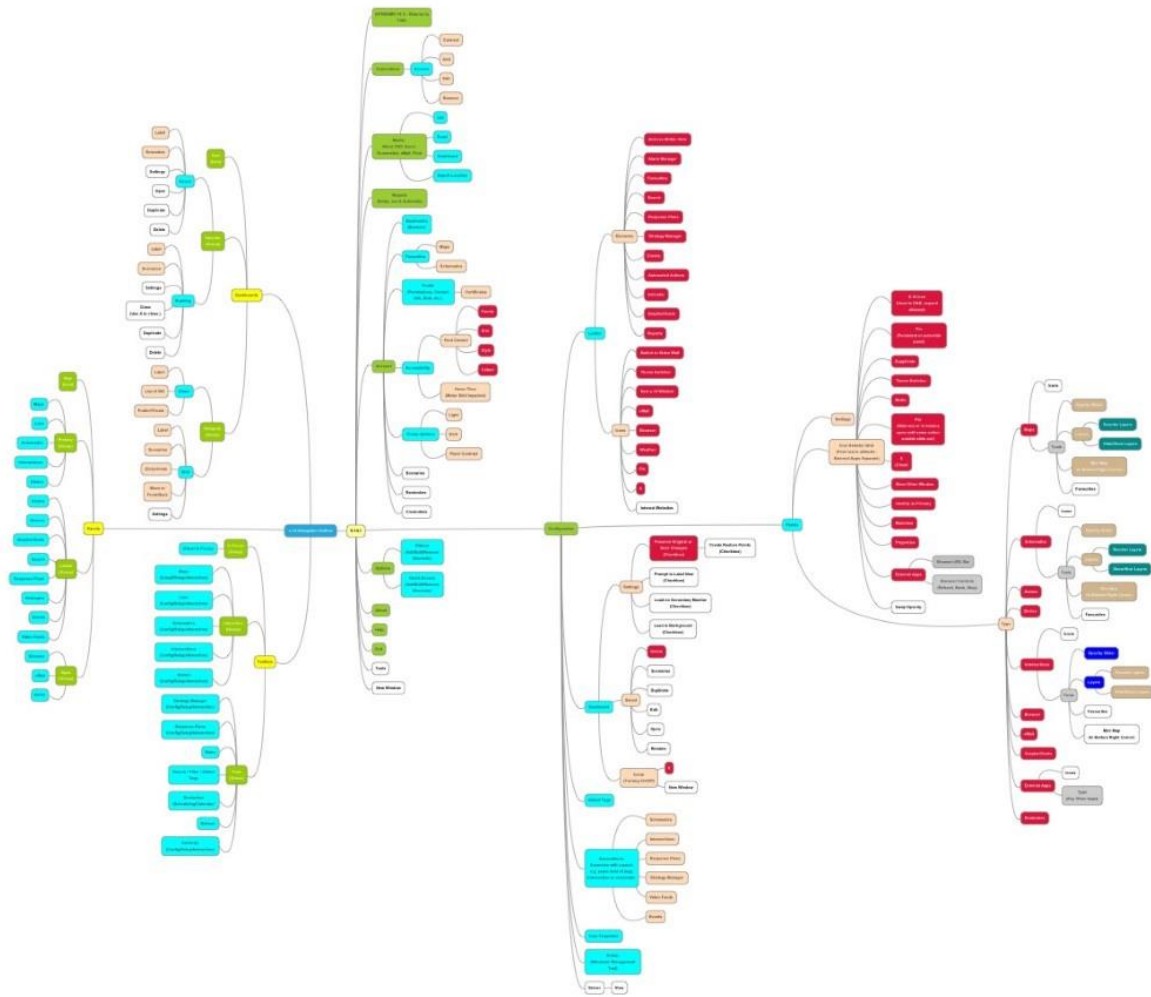
From the analytics I was able to discern there were five well defined groups and hierarchical clusters. On the other hand, within those five groups there would be different organisation, or elimination, of each of the elements from user to user. This organisation was based on the type of job the participant performed using the software or the role of in-house talent who participated, which was of three primary types. Each role used the software significantly different from the next, so much so that one ribbon configuration would not satisfy all three user types.

I communicated my findings, with a suggestion to establish a default ribbon configuration, which can be customised. This provided all users with a basic starting point, further open to custom changes. The solution included significant time savings and quicker learning curve. Partially implemented in Office, users were allowed to add/edit/remove elements within groups as well as create one group of their own. Based on the merits of the solution, this solution was widely accepted.

#### Mind-Mapping Concept

With the card sorting completed, I started conceptualization of the big picture and how the different elements cascade from one to another, using mind-mapping, as in the image below.





## Sketch Wireframes

Sketching wireframes on paper allows me to quickly record concepts as I research, ideate or review my work with others. I can quickly edit or start from scratch with little investment. Mind you, this is very high-level wireframes - black marker on white paper.

Concepts on paper are never fully perceived as intended by all stakeholders. There is always a need for another level of examples to help bring everyone a little closer to understanding the concept. This is where mockups come in.

\*Unfortunately, I do not have any wireframes from this project I can share.

## Interactive Mockup

Once a direction is established, I started building an interactive GUI version using Moqups (<http://moqups.com/>). It allows medium level fidelity renderings which bridged the gap between the high-level paper concepts and visual designer's low-level concepts.

I built an interactive mockup that enabled the user to switch between the ribbons and to peruse the menu of the backstage. I also provided an example of a rich drop-down box that opens. In the following image is a screenshot of a ribbon built on Moqups.



*\* Mockup is not to scale and icons & colour are for example only.*

### [Consult Visual Designer](#)

I worked closely with the in-house visual designer to ensure adherence to the marketing and branding. As well, she was instrumental during ideation and presentations with the stakeholders, who did not come from a design background.

### [Customer Conference Q&A](#)

The annual customer conference is used to present new products in the works to give the users a peek at what we are doing.

After the presentation of the new design, we allowed customers to experience the product and give us feedback. I used this opportunity to obtain feedback with a fresh perspective.

### [Remote User Testing](#)

With the responsibility of demoing the latest build around Australia at various sites, ongoing interaction with the program will provide the best results. However, unlike websites, this software is on a client-server platform. This means the software must be installed on a test workstation with access to a test server running the latest build. The option of sending the build to be installed locally was not viable.

Secondly, my research had requirements that must be met to allow me to perform beneficial user sessions, such as screencasts with audio & video. There were a number of solutions for website remote testing but I didn't find one product that was designed for remote software testing.

While researching a solution, I had to make sure several challenges were overcome to make this work:

- The user at the customer site had to be on a workstation with permission to leave the council's secure network;
- It must provide a method to allow the user access into our secure network;
- We could not install Adobe FLASH;
- We had to be able to allow the user to take control of the test PC inside our network;
- Connection must be dependable and fast enough to be usable.

The solution we selected was TeamViewer. It met all our challenges and provided one additional benefit. The user would receive an eMail link to the session. Using this link, the user could join a session without having to install anything on the council's workstation.

The last bit I needed was webcam and headset at each location. I set up, installed and tested remote access with the webcam & headset using a colleague inside our corporate network as I visited each location. This proved to be a beneficial demo and testing solution.

#### [Roadshow Demo](#)

The Roadshow was conducted over a three month period. I coordinated the schedule with the customer sites to maximise the number of users at the location. The trips ranged from a day to those that required flight and overnight stay.

Each session was organised to accomplish the following: Demo the latest build, allow the user to experience the software, ask the user to perform a few tasks under observation and then Q&A on both systems. In all I met with about 70 users from 10 locations. The entire process was a great success!

The users were impressed with the end results - the redesigned UI was a hit. I received dozens of ideas, suggestions, requests and contingencies to consider. Some complimentary gifts such as thumb drives, pens and the like were also distributed to thank the participants.

#### [Outlined User Observation & Issues](#)

With the input gained from the Roadshow, I authored a brief and shared it among the stakeholders. There were about 170 new issues/ideas/requests which were catalogued into our developer ticketing system. I created a list of

suggested changes for the development team to consider and, last but not the least, plenty of pats-on-the-back for their hard work.

### Keyboard Shortcut

Throughout my time on this project, I kept a spreadsheet of current and potential keyboard interactions, as there was a lack of central repository of shortcuts. It proved beneficial to our customers and the development team as an easy reference. As the team had never been supplied with something like this before, the solution was quite welcome.

### Stakeholder Presentation

At relevant times throughout this project, stakeholder presentations and milestones were completed on time and presented. I received excellent feedback and support from the COO, who received more than he had expected from this project.

### Final Project Submission

Final project submission included project wireframes, interactive mockups, concept mind-map, spreadsheet outlining the correlation between the mockup and the mind-map, Roadshow Demo notes and a Keyboard Shortcut catalogue.

### Supplemental Documents

Supplemental documents available online: <http://1drv.ms/1QOPlzC>

- Card Sorting - Analytics (Five .png files)
- Mockups - Backstage & Ribbon Interactive (One PDF)
- Mind-Map - Project (One PDF)
- Mind-Map - UX Engineering (One PDF)

*Please feel free to contact me for more insight into this project.*