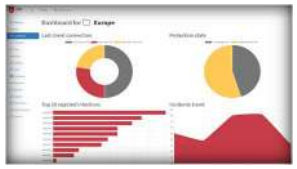
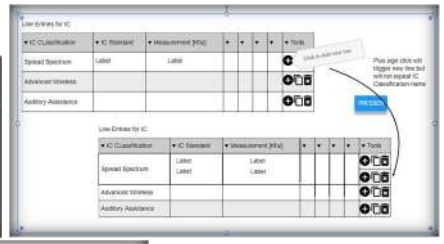
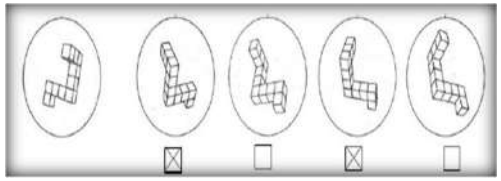
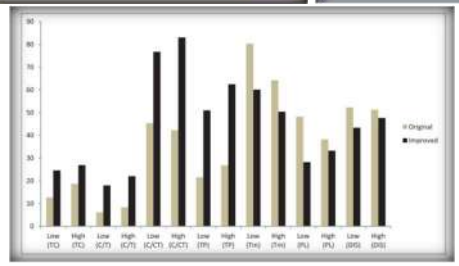
# Raza Habib – UX Design Portfolio

**Specialties:** Design Thinking, B2B and B2C Product Design, User Experience, User Stories, WorkFlows, Sketches, Prototypes, Mac – Linux – Windows Application Design, Web, Tablet and Mobile Innovative Designs, UX Software Development, Statistical Data Analysis, Problem Solving, End to End Product Design, Interaction Design, Design Strategy, Visual Interface Design, User Testing & Analysis, Conducting UX workshops







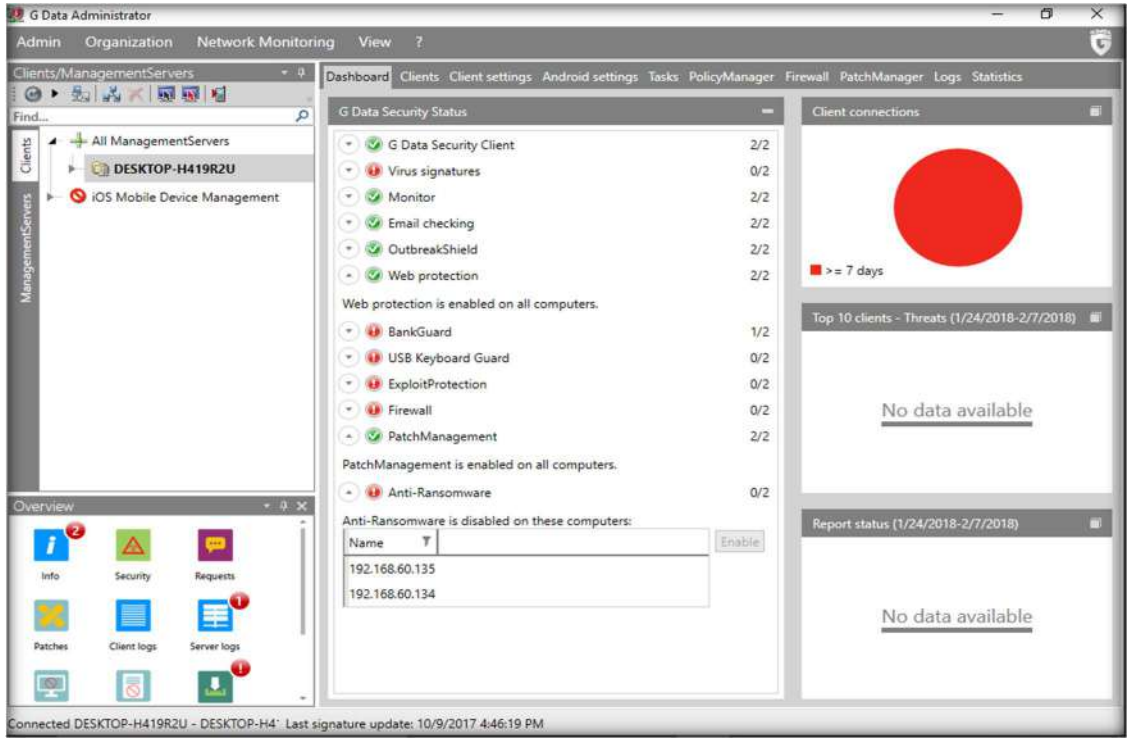




# Contents

# Case Study 1: Redesigning the B2B MMS Administrator

## The Existing Design



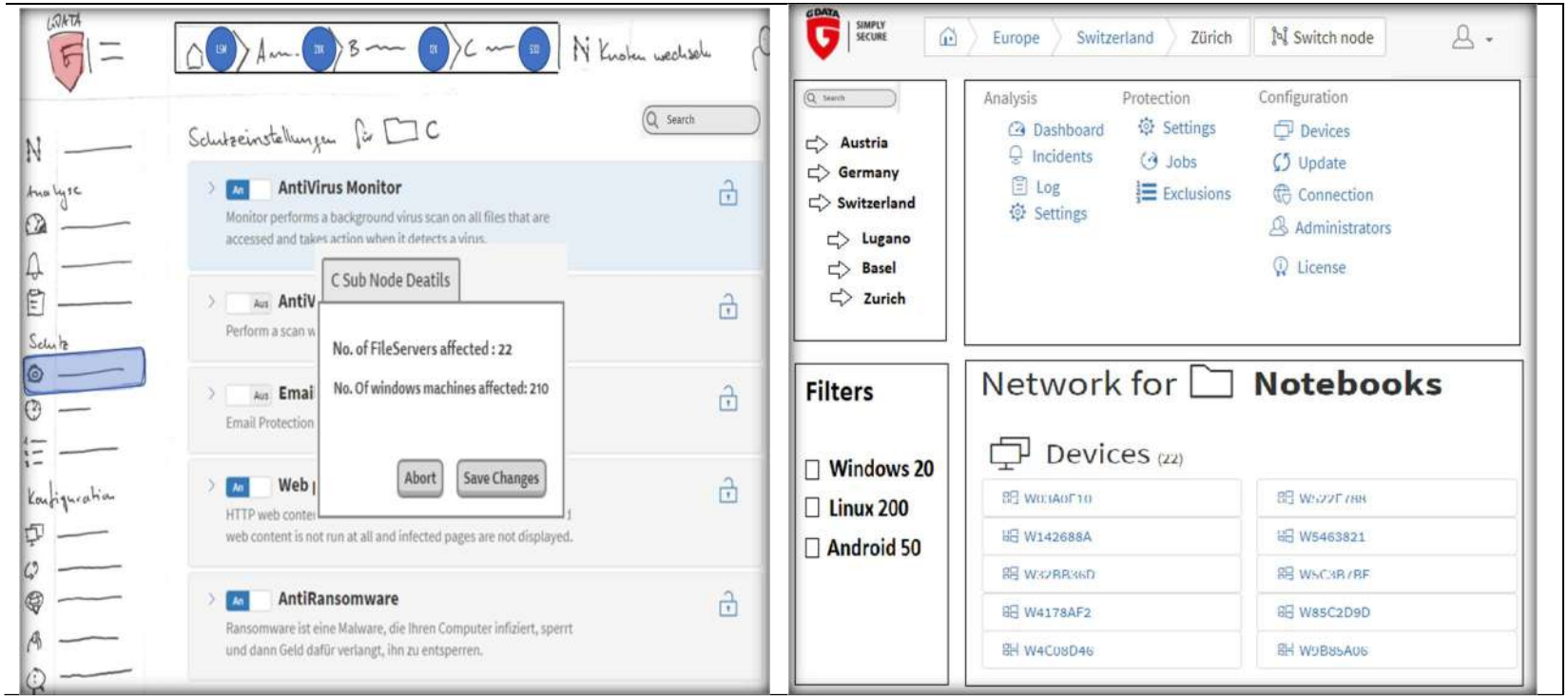

## UX Design Goals

1. Redesign the existing B2B MMS Administrator to control network security remotely.
2. Create a web based product with predictable, simple and beautiful interaction
3. Reveal complexity progressively
4. Make it scalable and cloud based

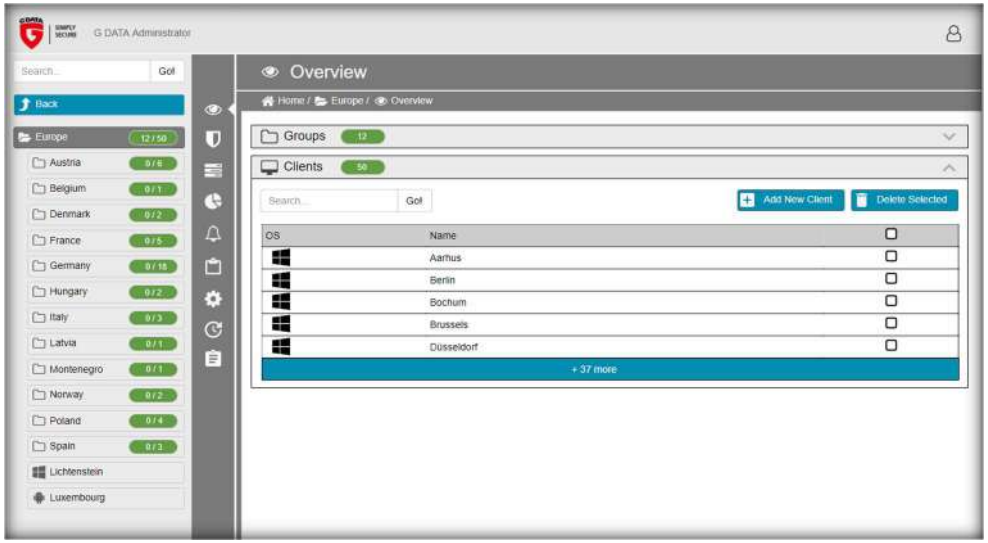
## UX Design Process

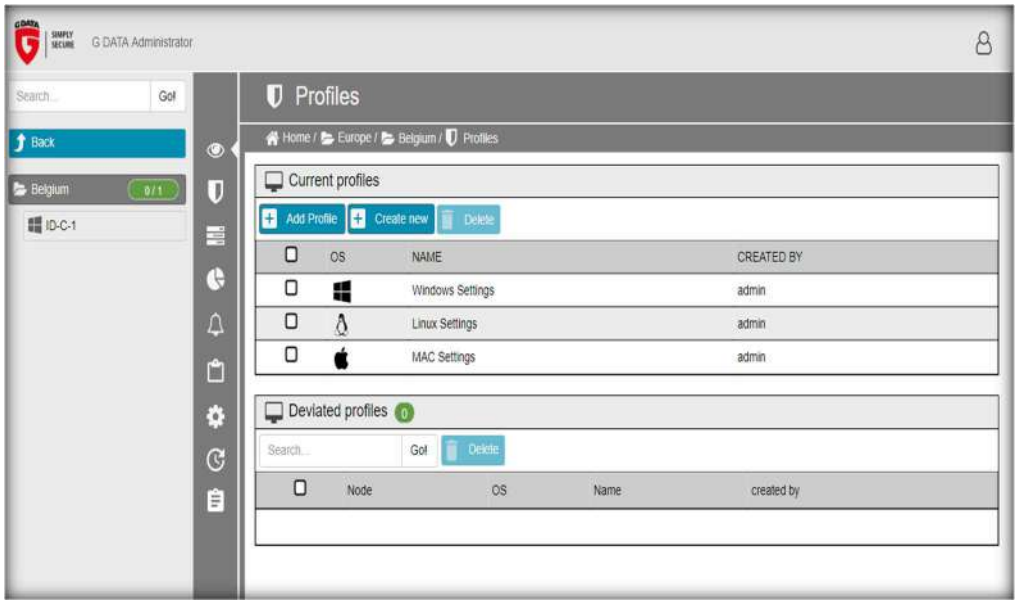
1. Conceptualization of web based product
2. Initial Sketches
3. Creating Wireframes
4. Prototype for Mobile Android and web
5. User testing by conducting UX Workshops
6. Data Analysis and reporting

## Sketches

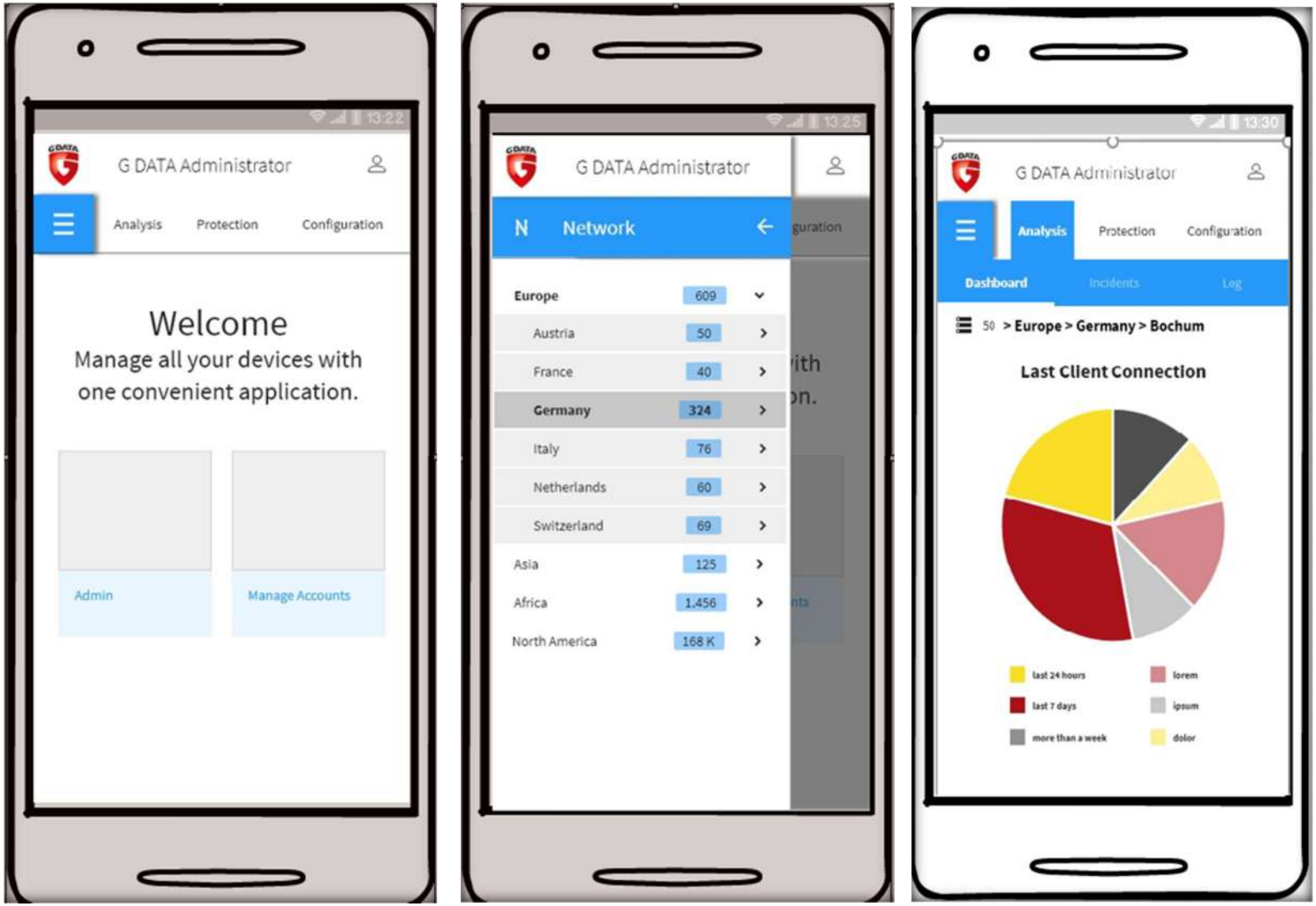

Schutzeinstellungen für C
AntiVirus Monitor
Monitor performs a background virus scan on all files that are accessed and takes action when it detects a virus.
C Sub Node Deatils
No. of FileServers affected : 22
No. Of windows machines affected: 210
Abort
Save Changes
AntiRansomware
Ransomware ist eine Malware, die Ihren Computer infiziert, sperrt und dann Geld dafür verlangt, ihn zu entsperren.
Europe
Switzerland
Zürich
Switch node
Austria
Germany
Switzerland
Lugano
Basel
Zurich
Analysis
Dashboard
Incidents
Log
Settings
Protection
Settings
Jobs
Exclusions
Configuration
Devices
Update
Connection
Administrators
License
Filters
Windows 20
Linux 200
Android 50
Network for Notebooks
Devices (22)
W142688A
W5463821
W4178AF2
W85C2D9D
W4C08D46

## Wireframes

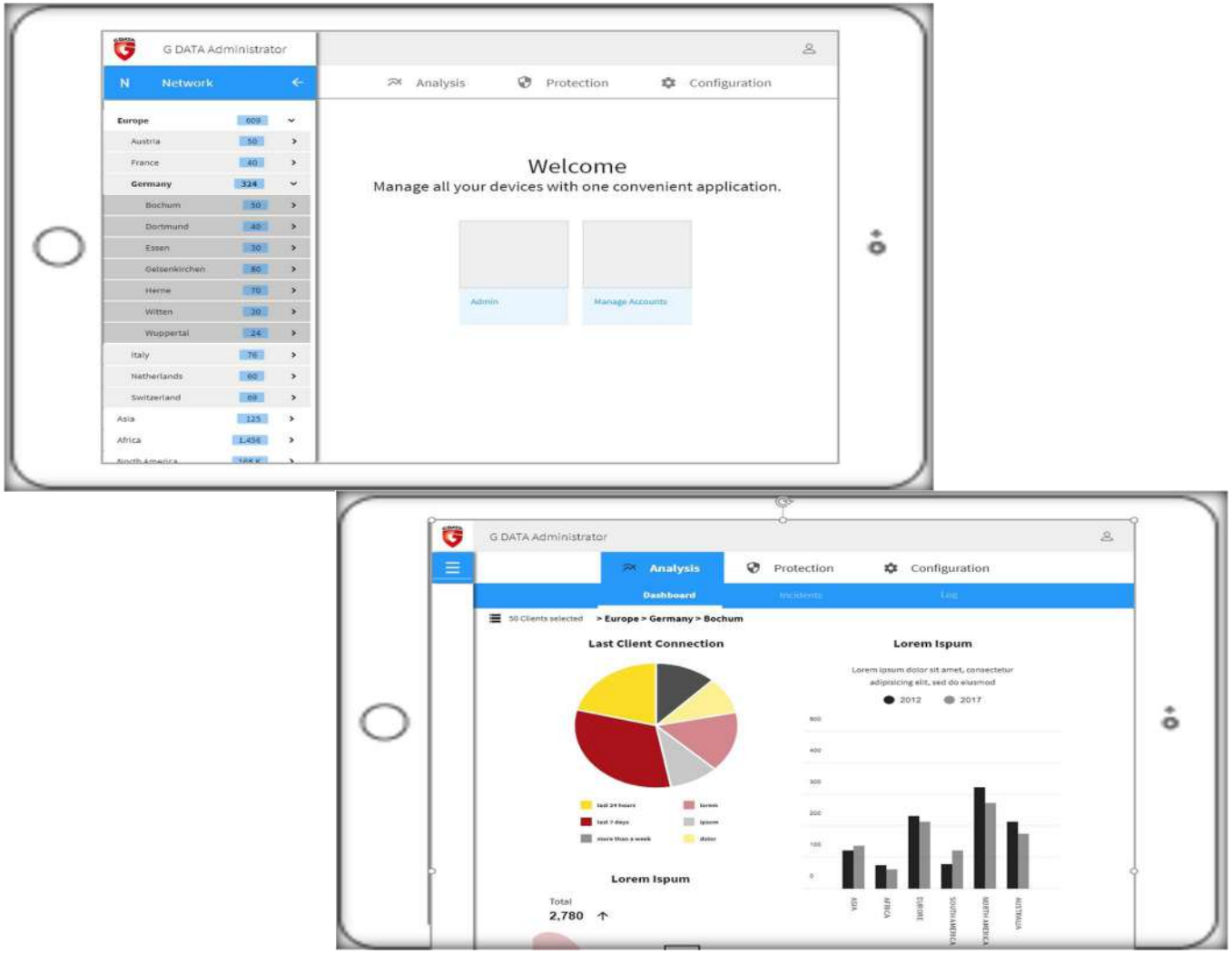

G DATA Administrator
Search...
Go!
Back
Europe 12 / 50
Austria 0 / 6
Belgium 0 / 1
Denmark 0 / 2
France 0 / 5
Germany 0 / 18
Hungary 0 / 2
Italy 0 / 3
Latvia 0 / 1
Montenegro 0 / 1
Norway 0 / 2
Poland 0 / 4
Spain 0 / 3
Lichtenstein
Luxembourg
Overview
Home / Europe / Overview
Groups 12
Clients 50
Search...
Go!
Add New Client
Delete Selected
OS
Name
Aarhus
Berlin
Bochum
Brussels
Düsseldorf
+ 37 more


G DATA Administrator
Search...
Go!
Back
Belgium 0 / 1
ID-C-1
Profiles
Home / Europe / Belgium / Profiles
Current profiles
Add Profile
Create new
Delete
OS
NAME
CREATED BY
Windows Settings
admin
Linux Settings
admin
MAC Settings
admin
Deviated profiles 0
Search...
Go!
Delete
Node
OS
Name
created by

## Prototypes for Mobile



## Prototypes for Tablet



User Testing

## Data Analysis

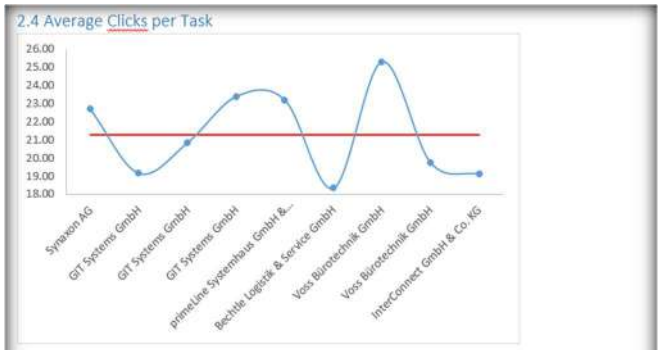



Figure 4: Average clicks per task for nine participants

**Interpretation:**

- The combined average score of number of clicks per task for nine participants is 21.30 clicks.
- The result from this metric shows poor performance.
- Twenty-one clicks per task is very high and certainly does not follow Three (plus 7)-Click Rule.

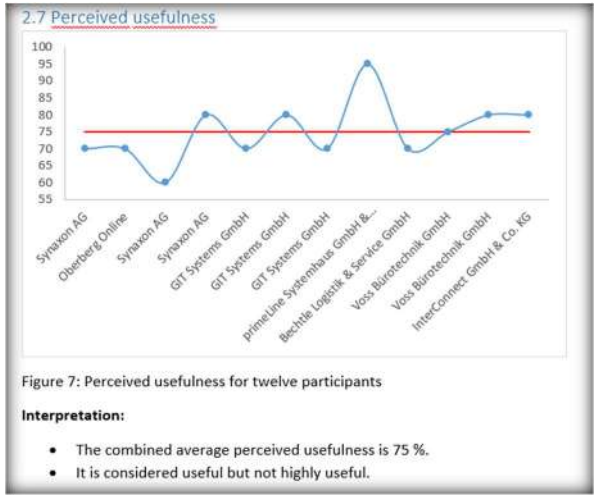



Figure 7: Perceived usefulness for twelve participants

**Interpretation:**

- The combined average perceived usefulness is 75 %.
- It is considered useful but not highly useful.

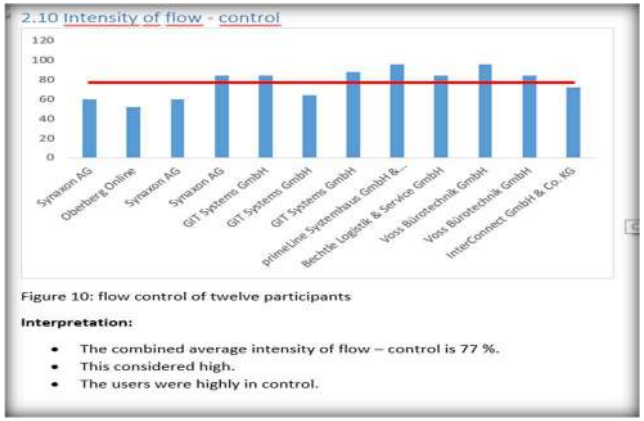
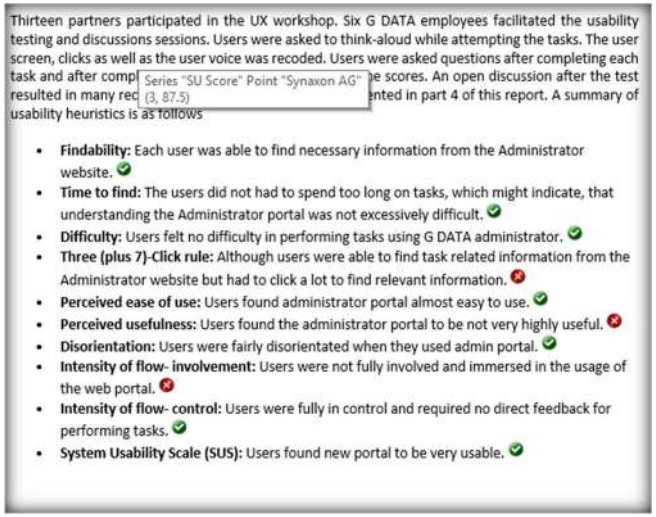



Figure 10: flow control of twelve participants

**Interpretation:**

- The combined average intensity of flow – control is 77 %.
- This considered high.
- The users were highly in control.

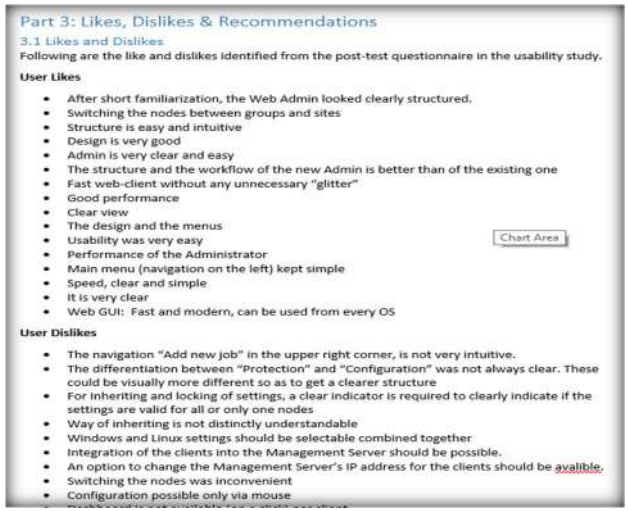
## Reporting



Thirteen partners participated in the UX workshop. Six G DATA employees facilitated the usability testing and discussions sessions. Users were asked to think-aloud while attempting the tasks. The user screen, clicks as well as the user voice was recoded. Users were asked questions after completing each task and after compl e scores. An open discussion after the test resulted in many rec nted in part 4 of this report. A summary of usability heuristics is as follows

Series "SU Score" Point "Synaxon AG" (3, 87.5)

- **Findability:** Each user was able to find necessary information from the Administrator website.
- **Time to find:** The users did not had to spend too long on tasks, which might indicate, that understanding the Administrator portal was not excessively difficult.
- **Difficulty:** Users felt no difficulty in performing tasks using G DATA administrator.
- **Three (plus 7)-Click rule:** Although users were able to find task related information from the Administrator website but had to click a lot to find relevant information.
- **Perceived ease of use:** Users found administrator portal almost easy to use.
- **Perceived usefulness:** Users found the administrator portal to be not very highly useful.
- **Disorientation:** Users were fairly disorientated when they used admin portal.
- **Intensity of flow- involvement:** Users were not fully involved and immersed in the usage of the web portal.
- **Intensity of flow- control:** Users were fully in control and required no direct feedback for performing tasks.
- **System Usability Scale (SUS):** Users found new portal to be very usable.



### Part 3: Likes, Dislikes & Recommendations

#### 3.1 Likes and Dislikes

Following are the like and dislikes identified from the post-test questionnaire in the usability study.

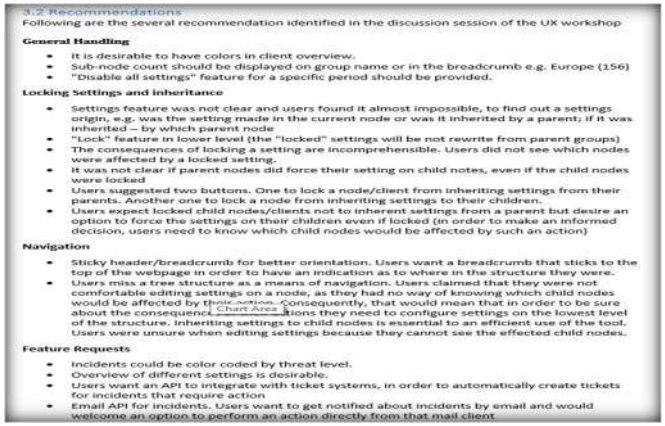
**User Likes**

- After short familiarization, the Web Admin looked clearly structured.
- Switching the nodes between groups and sites
- Structure is easy and intuitive
- Design is very good
- Admin is very clear and easy
- The structure and the workflow of the new Admin is better than of the existing one
- Fast web-client without any unnecessary "glitter"
- Good performance
- Clear view
- The design and the menus
- Usability was very easy
- Performance of the Administrator
- Main menu (navigation on the left) kept simple
- Speed, clear and simple
- It is very clear
- Web GUI: Fast and modern, can be used from every OS

Chart Area

**User Dislikes**

- The navigation "Add new job" in the upper right corner, is not very intuitive.
- The differentiation between "Protection" and "Configuration" was not always clear. These could be visually more different so as to get a clearer structure
- For Inheriting and locking of settings, a clear indicator is required to clearly indicate if the settings are valid for all or only one nodes
- Way of inheriting is not distinctly understandable
- Windows and Linux settings should be selectable combined together
- Integration of the clients into the Management Server should be possible.
- An option to change the Management Server's IP address for the clients should be avalible.
- Switching the nodes was inconvenient
- Configuration possible only via mouse



#### 3.2 Recommendations

Following are the several recommendation identified in the discussion session of the UX workshop

**General Handling**

- It is desirable to have colors in client overview.
- Sub-node count should be displayed on group name or in the breadcrumb e.g. Europe (156)
- "Disable all settings" feature for a specific period should be provided.

**Locking Settings and inheritance**

- Settings feature was not clear and users found it almost impossible, to find out a settings origin, e.g. was the setting made in the current node or was it inherited by a parent; if it was inherited – by which parent node
- "Lock" feature in lower level (the "locked" settings will be not rewrite from parent groups)
- The consequences of locking a setting are incomprehensible. Users did not see which nodes were affected by a locked setting.
- It was not clear if parent nodes did force their setting on child notes, even if the child nodes were locked
- Users suggested two buttons. One to lock a node/client from inheriting settings from their parents. Another one to lock a node from inheriting settings to their children.
- Users expect locked child nodes/clients not to inherent settings from a parent but desire an option to force the settings on their children even if locked (in order to make an informed decision, users need to know which child nodes would be affected by such an action)

**Navigation**

- Sticky header/breadcrumb for better orientation. Users want a breadcrumb that sticks to the top of the webpage in order to have an indication as to where in the structure they were.
- Users miss a tree structure as a means of navigation. Users claimed that they were not comfortable editing settings on a node, as they had no way of knowing which child nodes would be affected by their action. Consequently, that would mean that in order to be sure about the consequenc tions they need to configure settings on the lowest level of the structure. Inheriting settings to child nodes is essential to an efficient use of the tool. Users were unsure when editing settings because they cannot see the effected child nodes.

Chart Area

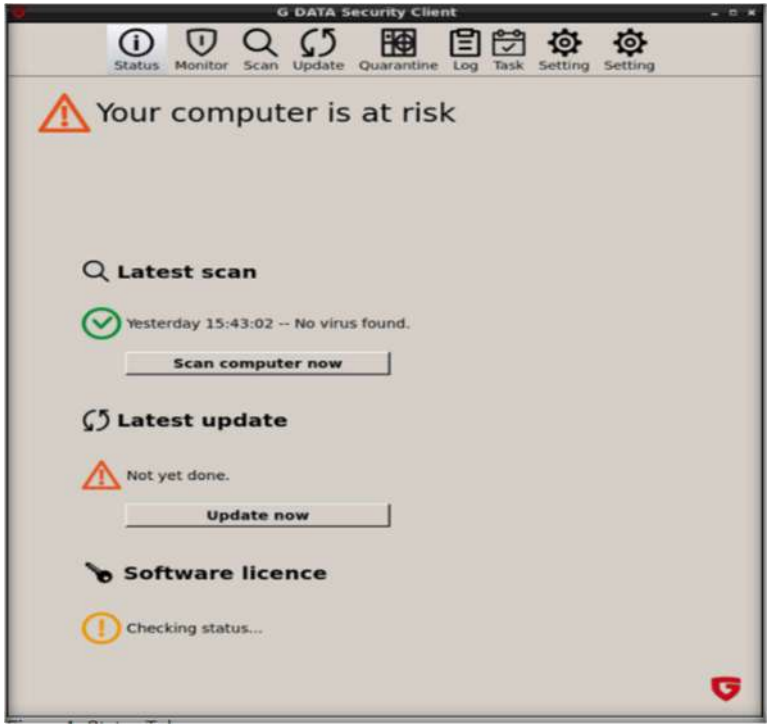
**Feature Requests**

- Incidents could be color coded by threat level.
- Overview of different settings is desirable.
- Users want an API to integrate with ticket systems, in order to automatically create tickets for incidents that require action
- Email API for incidents. Users want to get notified about incidents by email and would welcome an option to perform an action directly from that mail client

## The Final Product

# Case Study 2: Mac & Linux B2B and B2C Security Client Redesign

## The Existing Design



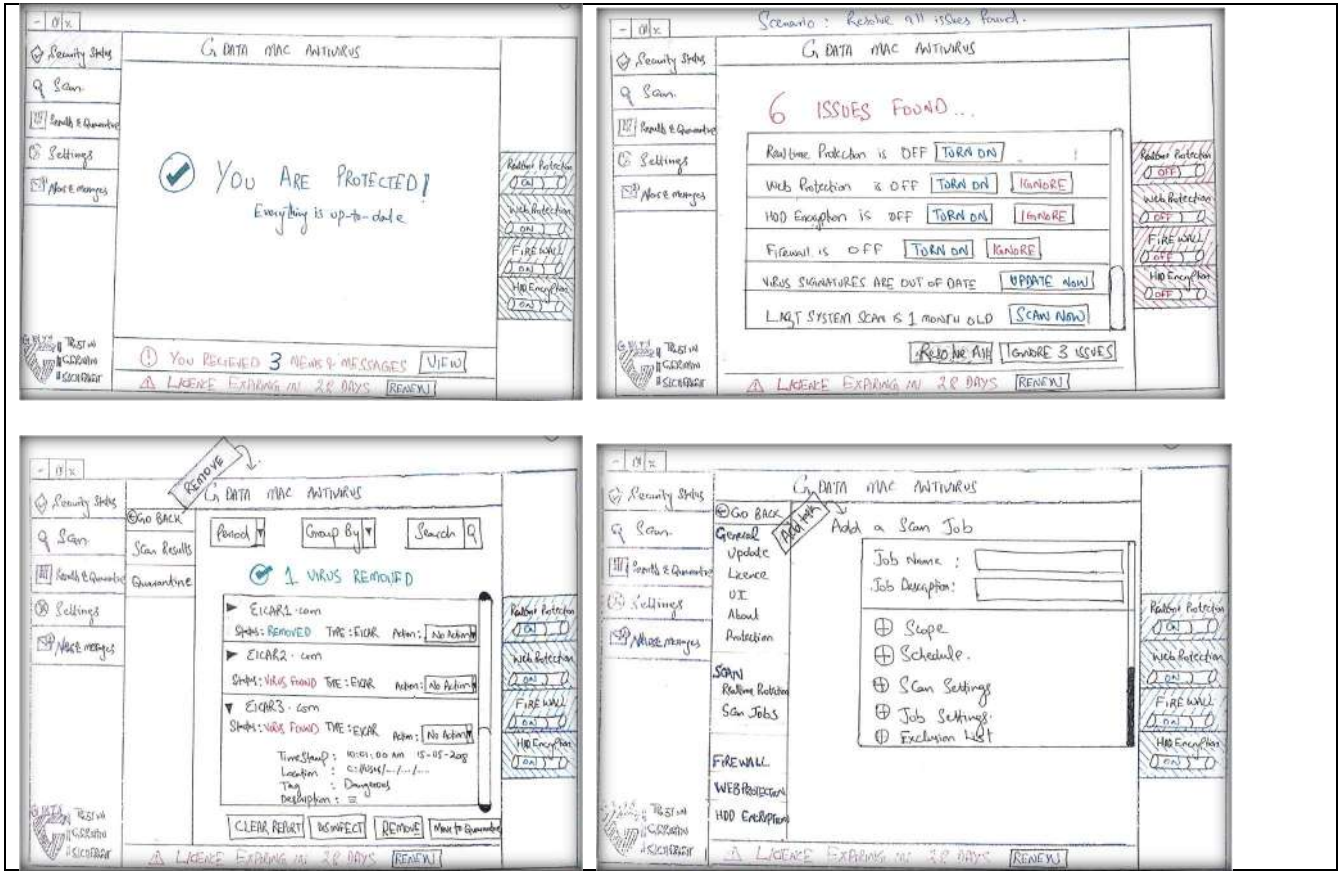

## UX Design Goals

1. Redesign the existing Mac B2B product
2. The design should produce a homogenous look and feel across B2B and B2C security clients i.e. the MAC UI should be designed for both business endpoints and consumer endpoints
3. Perform a Competitive Analysis for Mac / Linux products e.g. Avg , Avira, MacAfee and Kaspersky
4. The design should be based on MAC UI guidelines.
5. Graphics and Visual effects should be enhanced
6. Existing UI is mono colored and not consistent with corporate color scheme
7. Apply Golden Ratio to outer layout width, height and to inner objects such as buttons
8. Get rid of Traybar icon menu.
9. Scan results and reports should be resizable

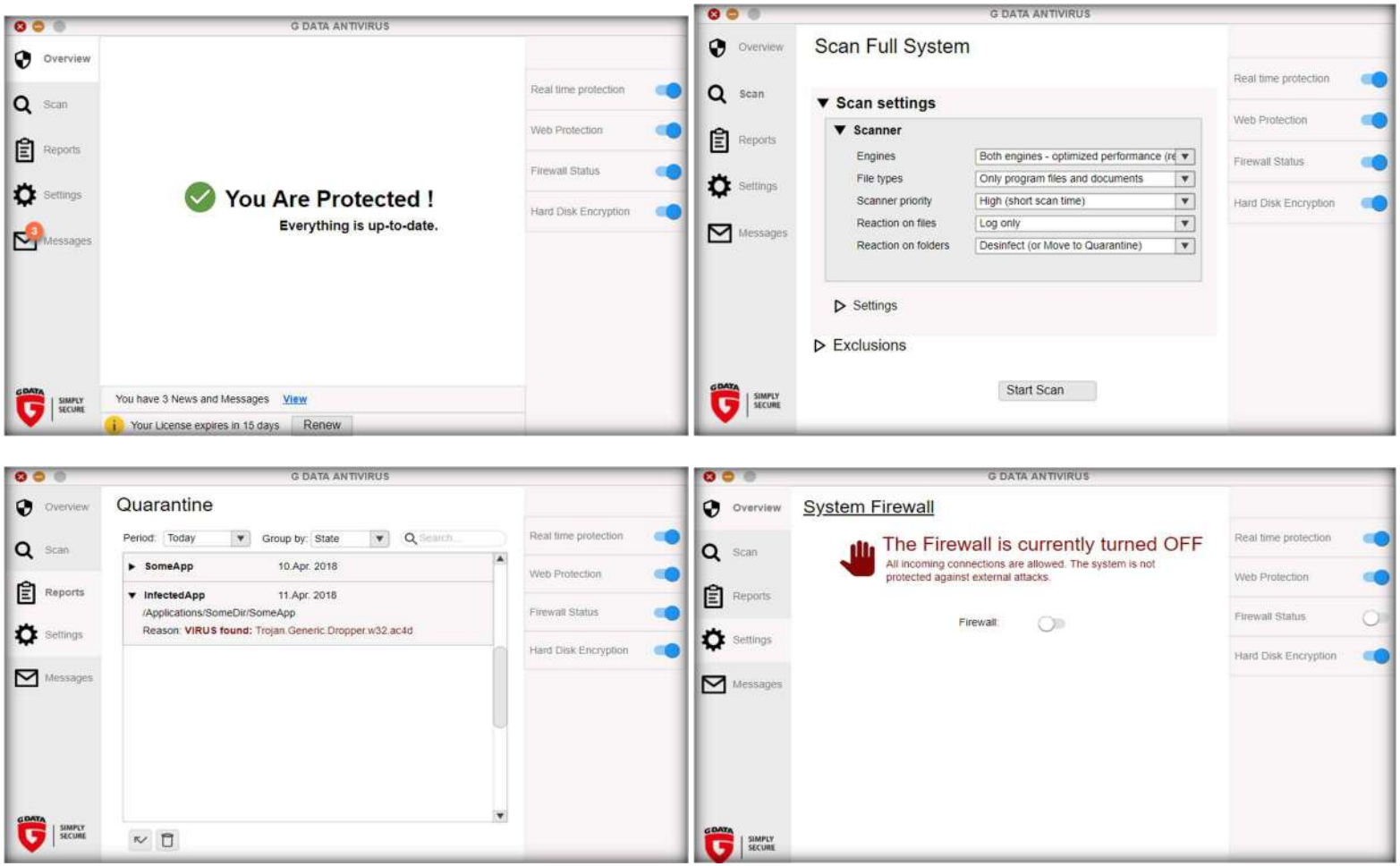
## UX Design Process

1. Initial Sketches & Wireframes
2. Use case diagram
3. Activity diagrams
4. Multiple Design iterations

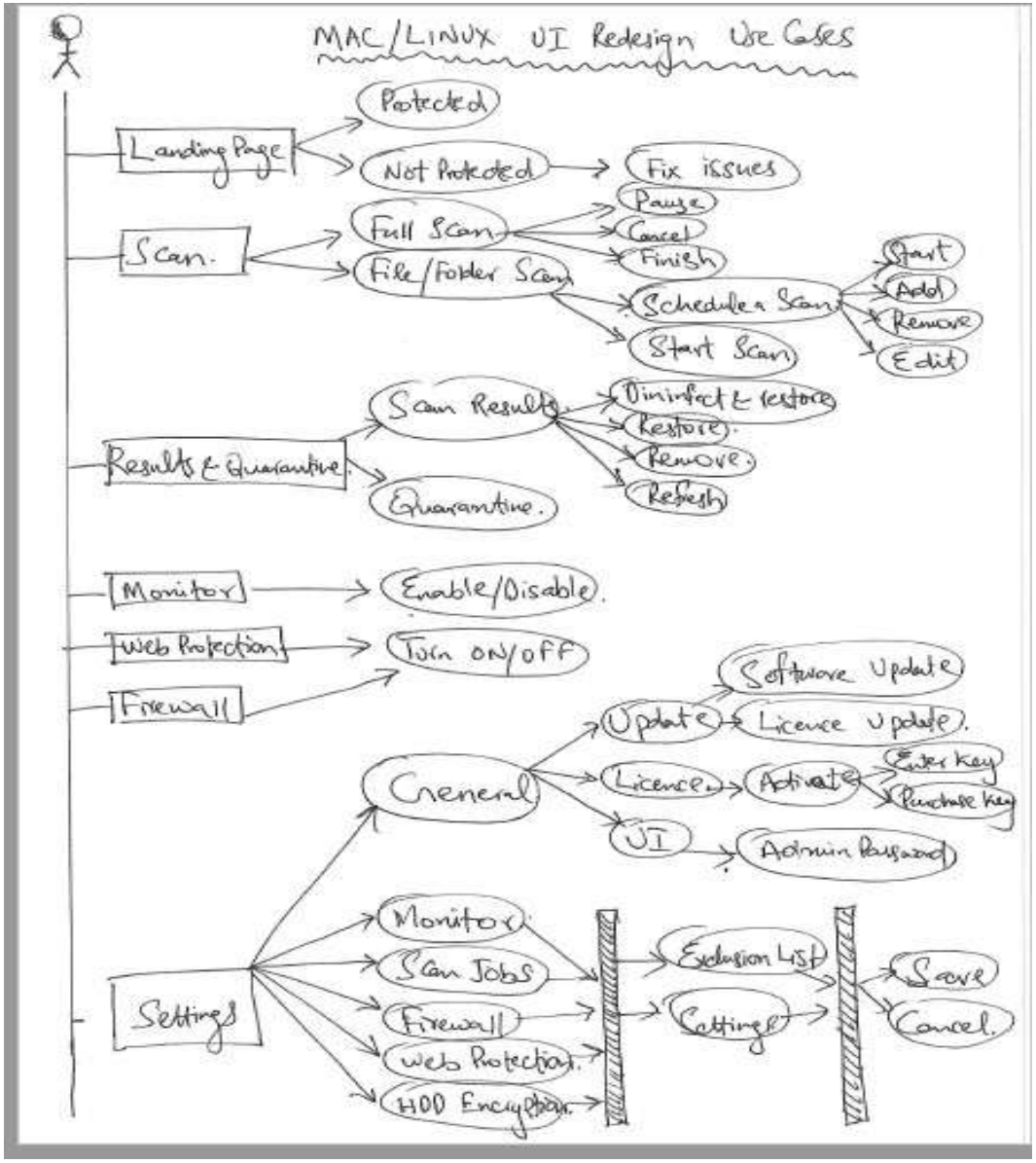
## Sketches


G DATA MAC ANTIVIRUS
You Are Protected!
Everything is up-to-date
You received 3 news & messages
View
Licence expiring in 28 days
Renew
Scenario : Resolve all issues found.
6 ISSUES FOUND...
Real time Protection is OFF
Turn on
Web Protection is OFF
Turn on
Ignore
HDD Encryption is OFF
Turn on
Ignore
Firewall is OFF
Turn on
Ignore
Virus signatures are out of date
Update now
Last system scan is 1 month old
Scan now
Resolve All
Ignore 3 issues
Remove
1 virus removed
Clear report
Disinfect
Remove
Move to Quarantine
Add new
Add a Scan Job
Job Name :
Job Description :
Scope
Schedule
Scan Settings
Job Settings
Exclusion List

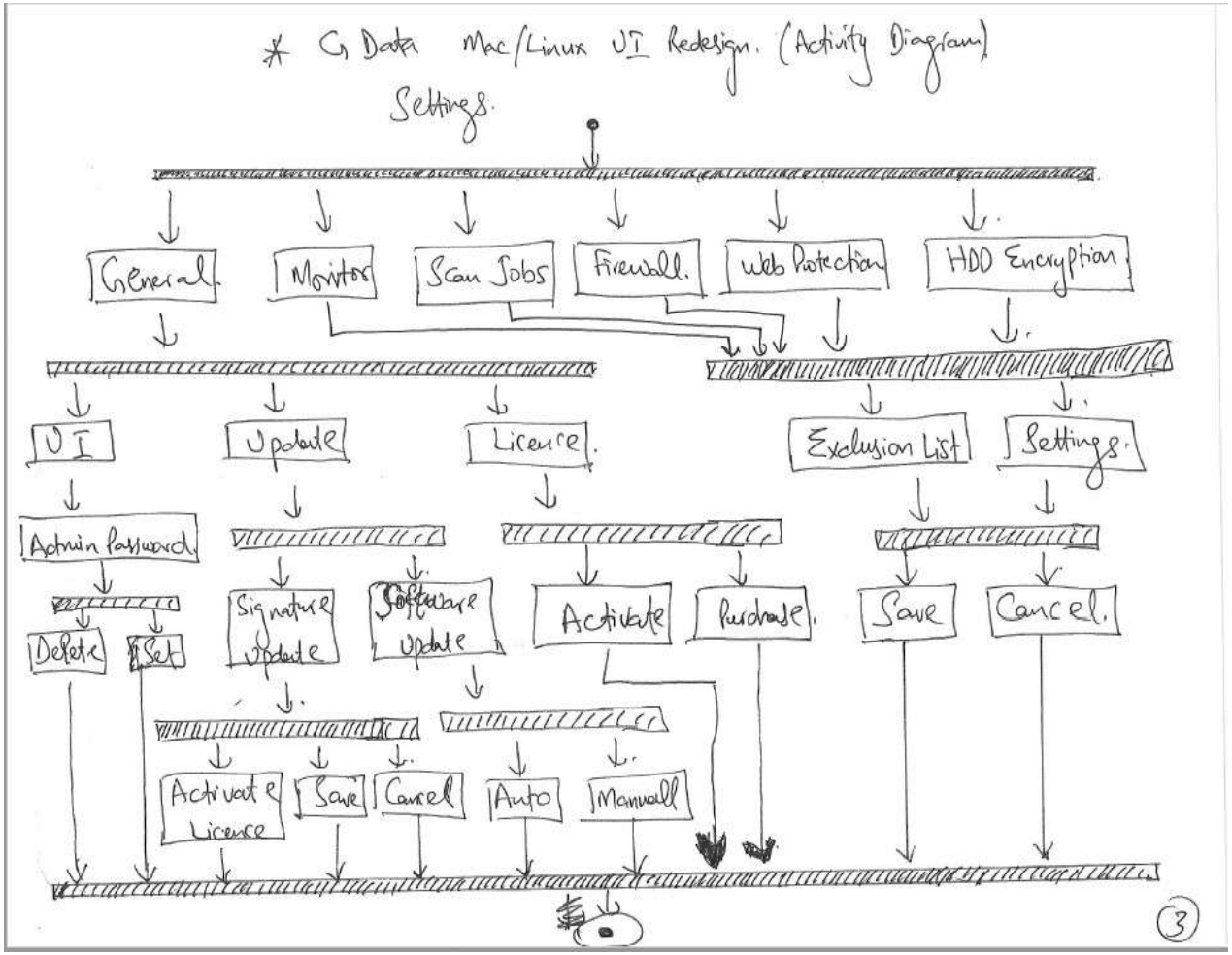
## Wireframes

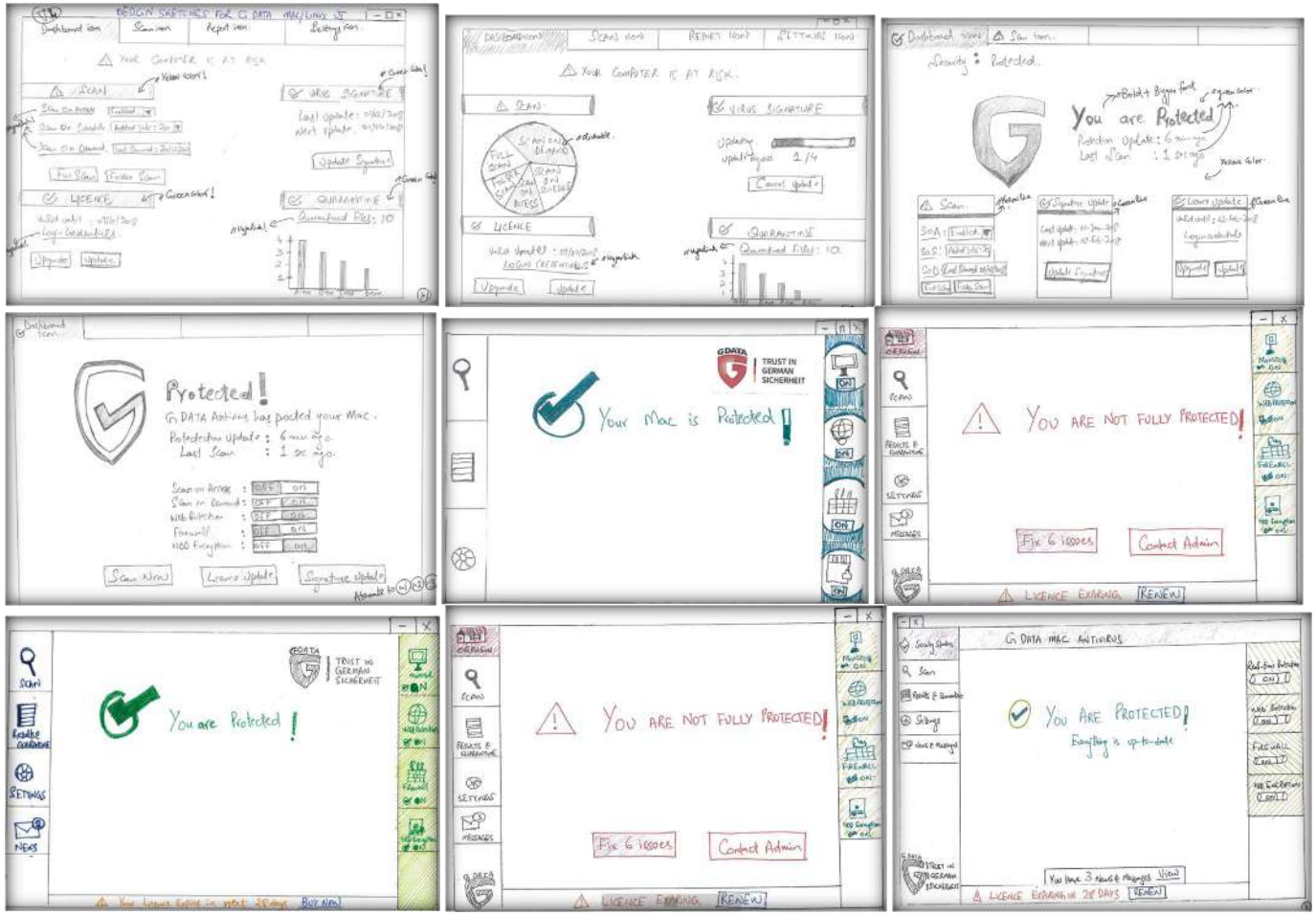

G DATA ANTIVIRUS
Overview
Scan
Reports
Settings
Messages
Real time protection
Web Protection
Firewall Status
Hard Disk Encryption
You Are Protected !
Everything is up-to-date.
You have 3 News and Messages View
Your License expires in 15 days
Renew
Scan Full System
Scan settings
Scanner
Engines
File types
Only program files and documents
Scanner priority
High (short scan time)
Reaction on files
Log only
Reaction on folders
Desinfect (or Move to Quarantine)
Settings
Exclusions
Start Scan
Quarantine
Period: Today
Group by: State
SomeApp 10.Apr. 2018
InfectedApp 11.Apr. 2018
/Applications/SomeDir/SomeApp
Reason: VIRUS found: Trojan.Generic.Dropper.w32.ac4d
System Firewall
The Firewall is currently turned OFF
All incoming connections are allowed. The system is not protected against external attacks.
Firewall:

Use Case Diagram



## Interaction Diagram



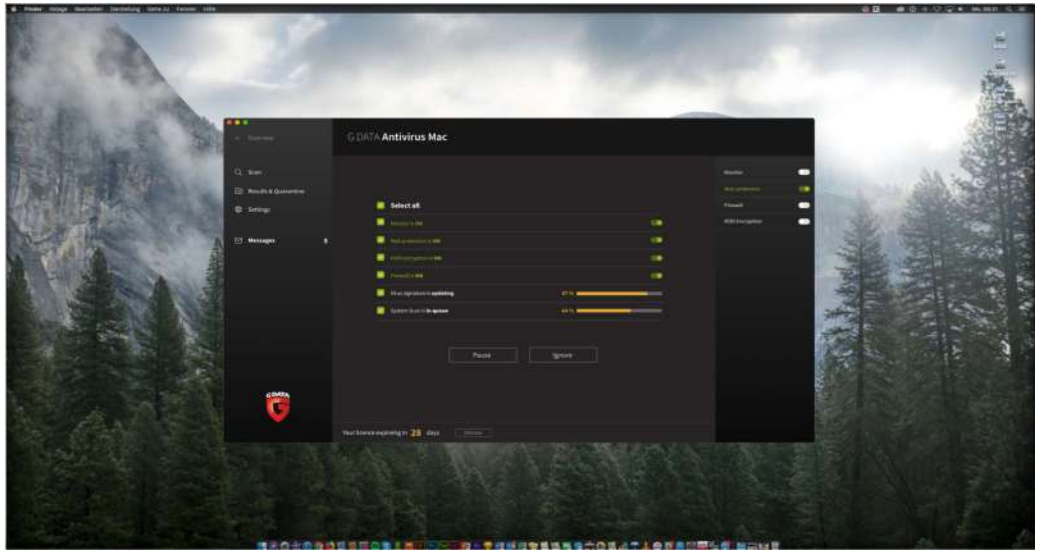



## Design Iterations

**Key points:**

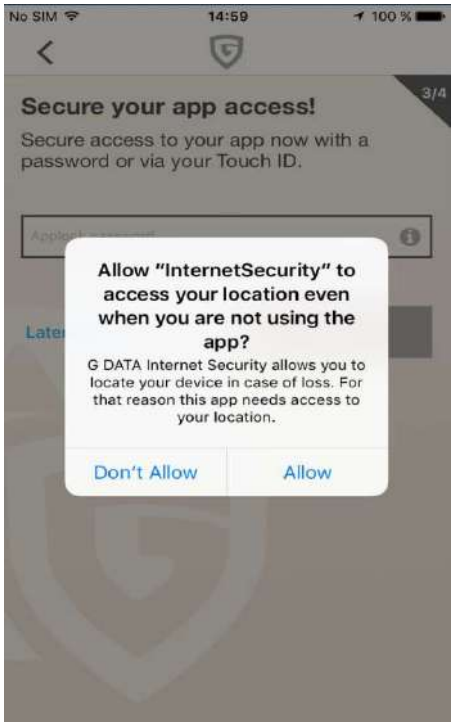
1. Entire application design went through 12 iterations
2. There are 70 UI screens in total.
3. Each UI is represented as separate screen.

## The Final Product

# Case Study 3: Workflow Enhancement of Android & iOS App

## The Existing Design



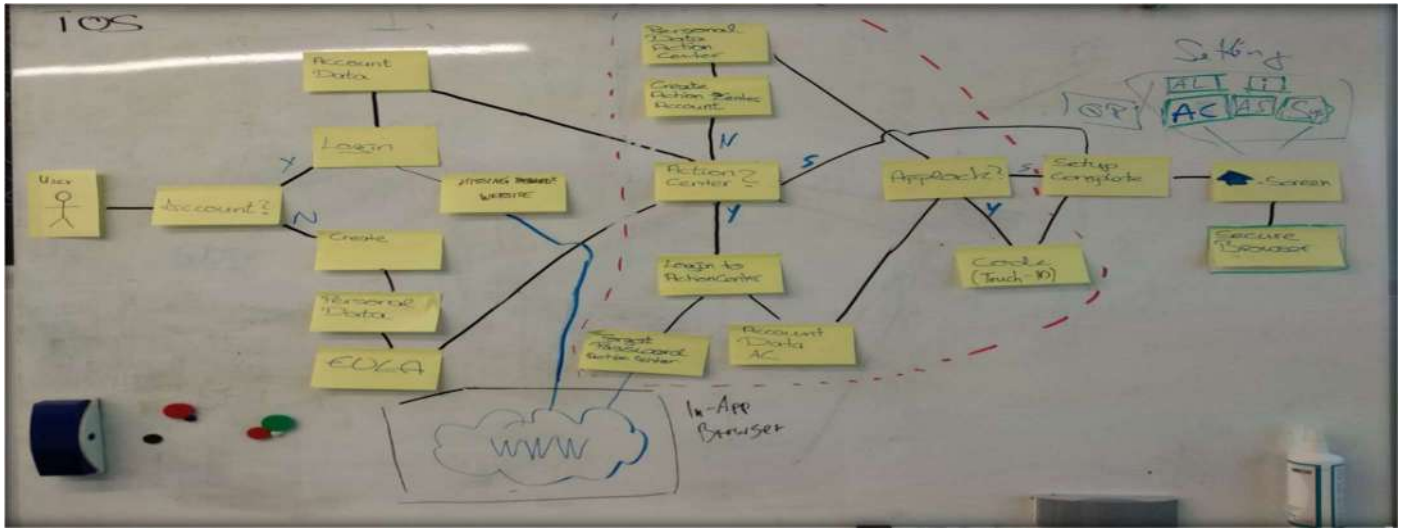

## UX Design Goals

1. Overall workflow should be simplified.
2. Graphics and visual effects should be enhanced.
3. Software Installation steps should be simplified and improved.
4. Propose different translated version of GUI
5. Descriptive error popup/message/notification dialogs should appear.
6. System status should be visible in case scan in already running

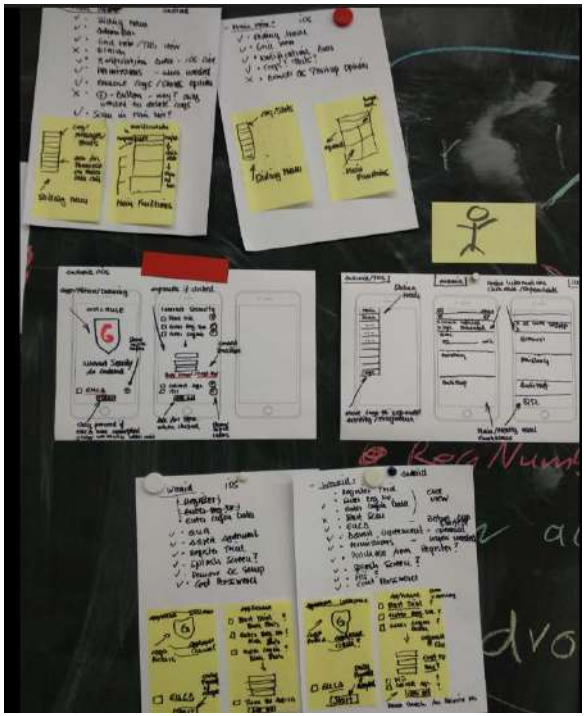
## UX Design Process

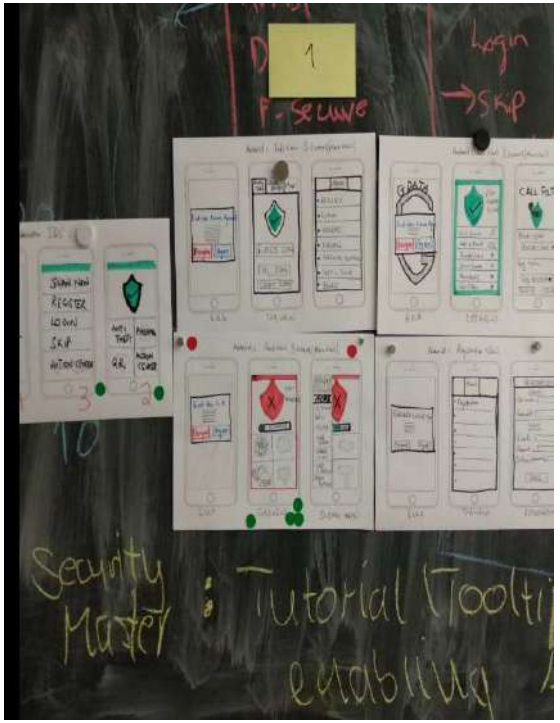
1. Conceptualization & Sketches
2. Prototype development
3. Data Analysis
4. Reporting

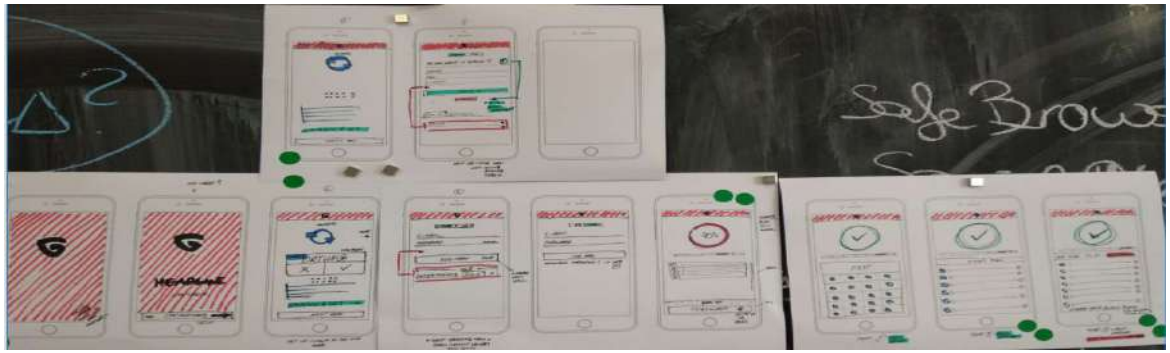
## Conceptualization

## Sketching





Prototype


Internet Security
EULA
Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim. Donec pede justo, fringilla vel, aliquet nec, vulputate eget, arcu. In enim justo, rhoncus ut, imperdiet a, venenatis vitae, justo. Nullam dictum felis eu pede mollis pretium.
DISAGREE
AGREE
Internet Security
Registration
Login
Passwort
******
Mii Agreement
LOGIN

## Data Analysis

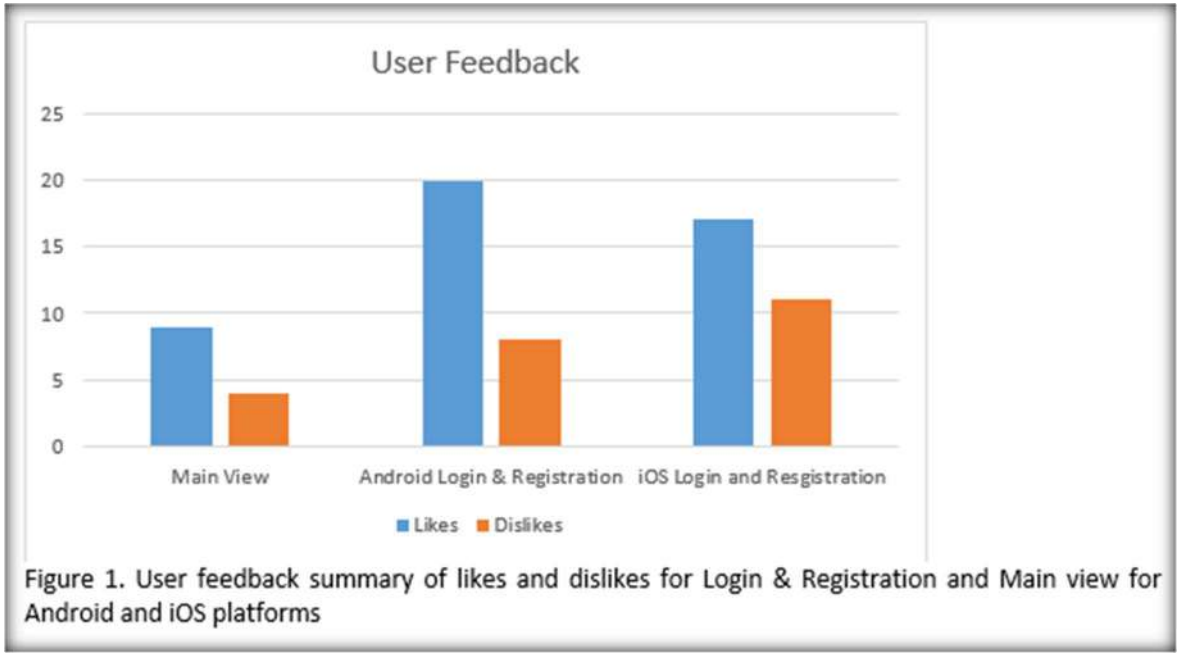
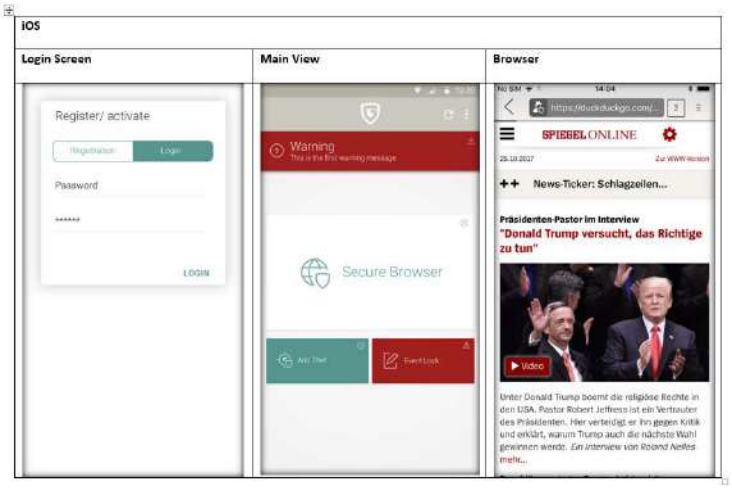



Figure 1. User feedback summary of likes and dislikes for Login & Registration and Main view for Android and iOS platforms

## Improved Redesign




## Reporting

### Top Finding

- Overall, each user expressed contentment with the improved UI on both platforms.
- All participants of the user testing session unanimously admired the simplified workflow for all scenarios for both iOS and Android platforms.
- Although participants were satisfied with the improvement made in iOS, they appeared to have provided more improvement feedback as compared to Android screen (See Fig. 1)

### Likes, Dislikes and Recommendations

Overall, it was observed that each participant provided positive feedback. Especially for Android prototype, users were very satisfied with the simplistic, modern and elegant UI for Login and registration scenarios. However, a high negative feedback was observed for iOS since users found that the new UI might not provide the real "Apple experience".

### Part 2: User Feedback

#### 2.1 Feedback on Single Usefulness Question

The question asked was "Which version you liked the most". All participant expressed satisfaction with prototype version. Following is the feedback

| Participant | Android | | | | iOS | | | |
|---|---|---|---|---|---|---|---|---|
| | Login Scenario | | Registration Scenario | | Login Scenario | | Registration Scenario | |
| | Existing version | Prototype version | Existing version | Prototype version | Existing version | Prototype version | Existing version | Prototype version |
| 1 | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ |
| 2 | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ |
| 3 | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ |
| 4 | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ |

Table 3. Single Usefulness Question feedback

#### 2.2 Feedback on Main View

Following is the feedback on main view based on scenarios from all participants for the user testing session

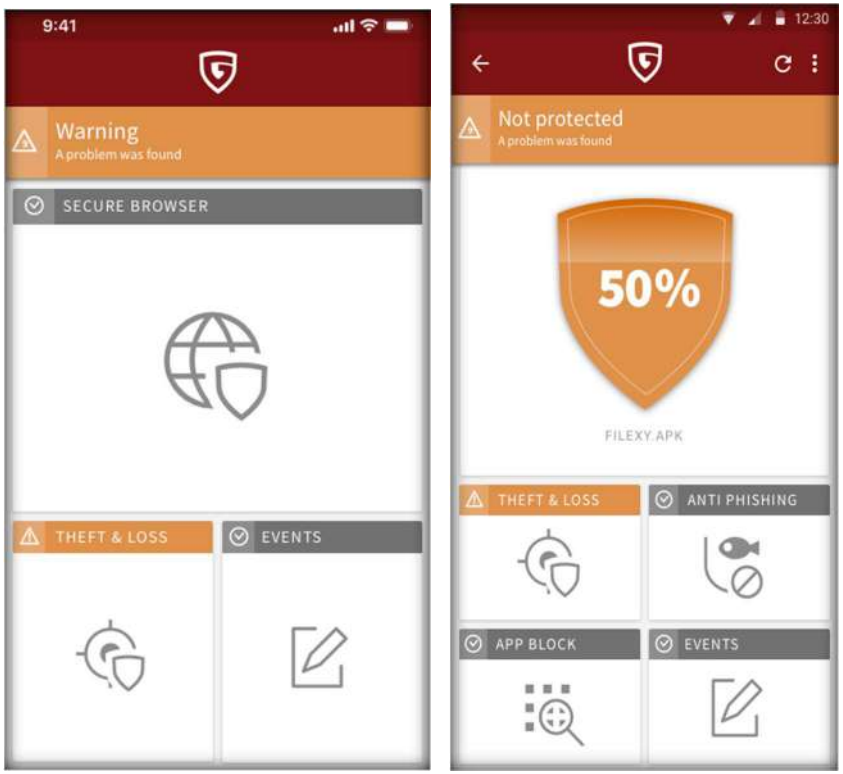
| Main View | |
|---|---|
| **Positive aspects** ✓ | **Negative aspects** ✗ |
| • Looks familiar with other Antivirus solutions<br>• Main view starts without going through menu<br>• Steps of scan no longer included<br>• Clearer UI<br>• Fewer options<br>• Grid layout provides quick overview<br>• Options are easily accessible<br>• Big screen buttons<br>• UI looks more familiar | • Title for scan missing<br>• Grey implies disabled<br>• Green checkmark missing<br>• Make scan start/stop more obvious |

Table 4. User feedback on Main view

| Wizard, Login and Registration view | |
|---|---|
| **Android version** | |
| **Positive aspects (Frequency)** ✓ | **Negative aspects** ✗ |
| • License / Mii agreement<br>• Simple to use (2)<br>• Fewer screens<br>• Clearer UI (3)<br>• Less options (2)<br>• Buttons instead of menu<br>• Most important information on the first view<br>• Self-speaking forms<br>• Less text (2)<br>• Modern design<br>• Better structured (2)<br>• EULA handling (2)<br>• Registration number handling | • Permissions should be explained better<br>• Orange shield too saturated<br>• Colors not appealing<br>• Not enough explanation<br>• Clickable elements should be more obvious<br>• Mii should be renamed<br>• License expiry not obvious<br>• Advertisement agreement not understandable |

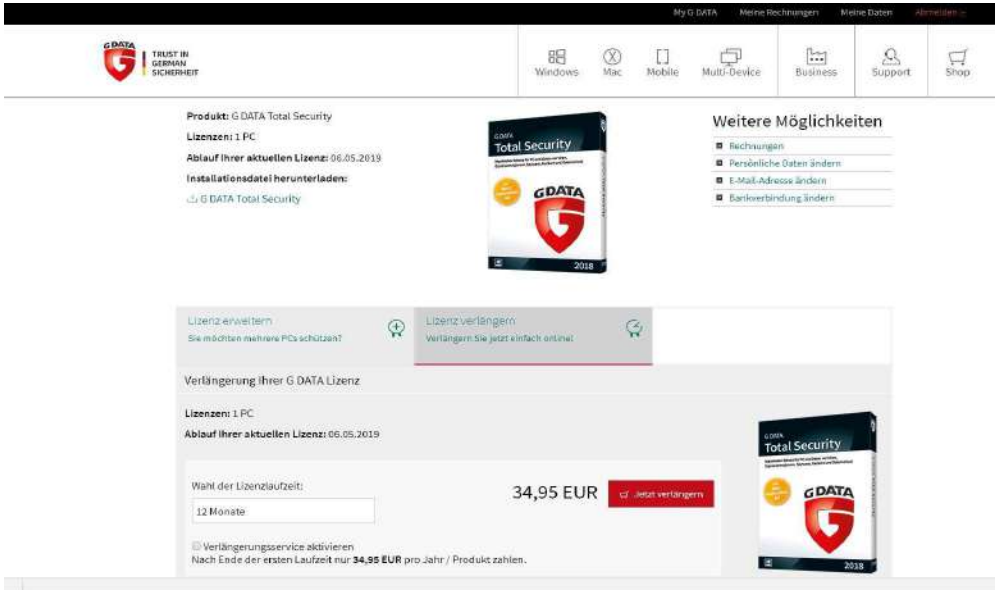
Table 5. Android Wizard user feedback

## The Final Product



# Case Study 4: Redesigning the Customer Upgrade Center

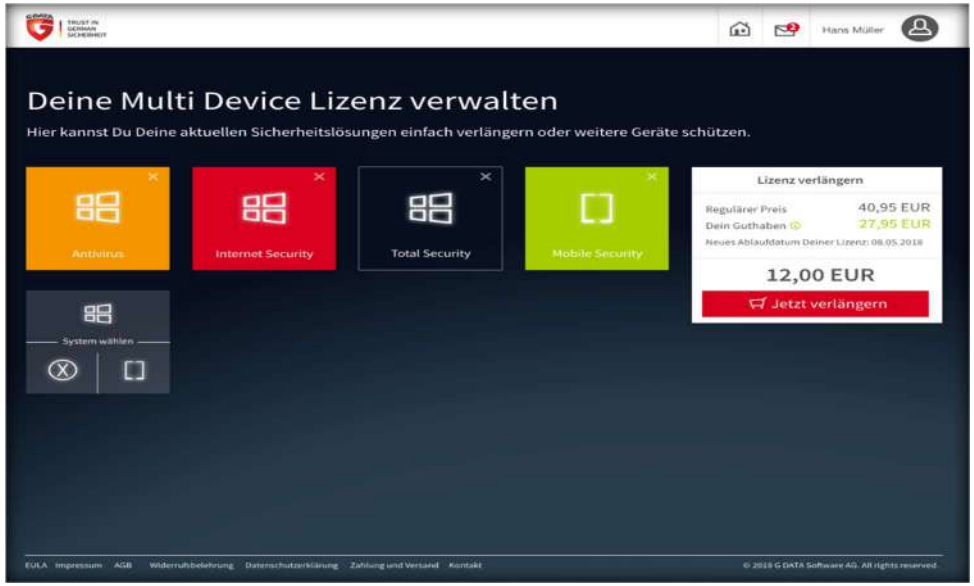
## The Existing Design

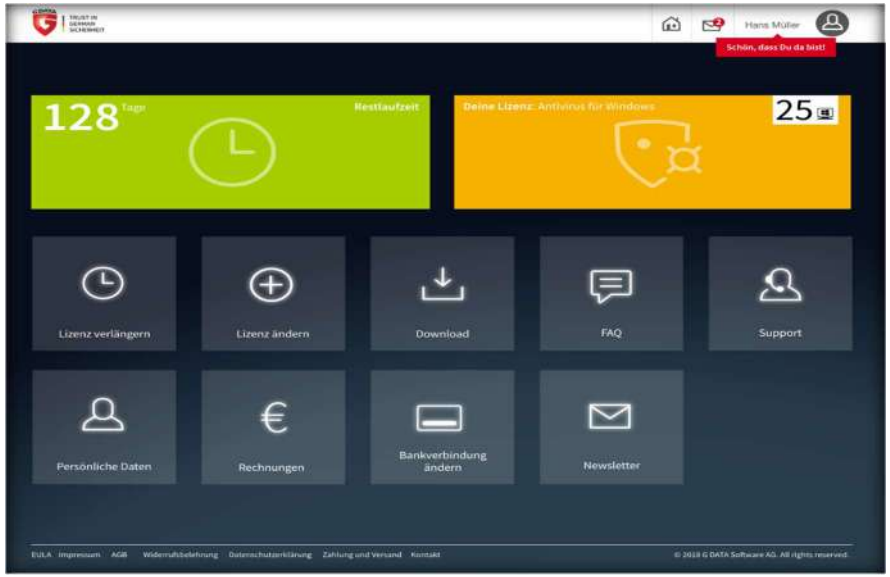



## UX Design Goals

1. Enhanced web experience for website visitors.
2. Help in rebranding.
3. Improved usability.
4. Better website performance.
5. Improve online communication, information and education to the users.
6. Responsive interface.
7. Provide smooth transition in both direction from the consumer / business software to portal and vice versa.
8. A/B usability testing should be performed
9. Unfamiliar and low scent elements should be improved

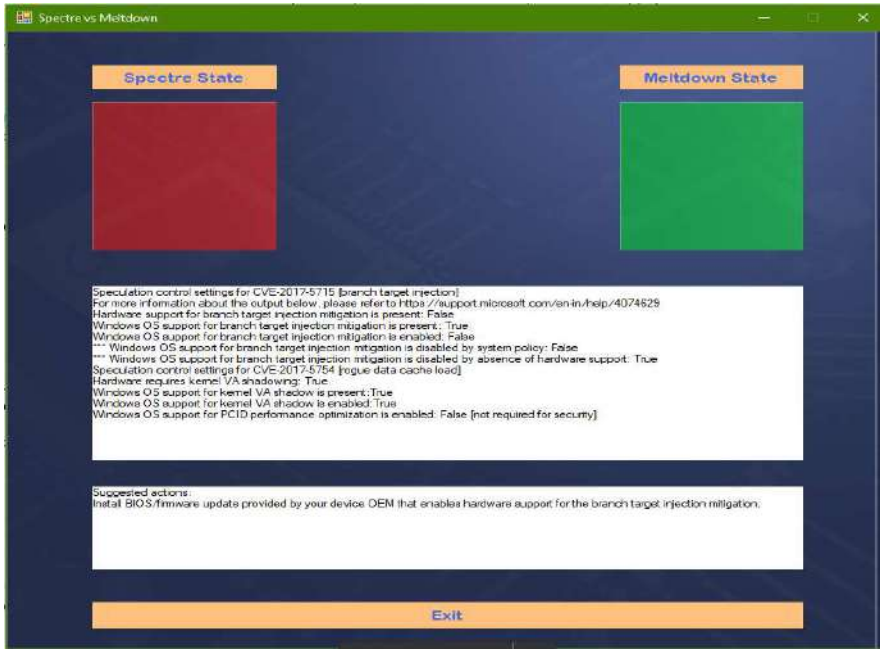
## The Final Product



# Case Study 5: Redesigning the Meltdown & Scanner App

## The Existing Design



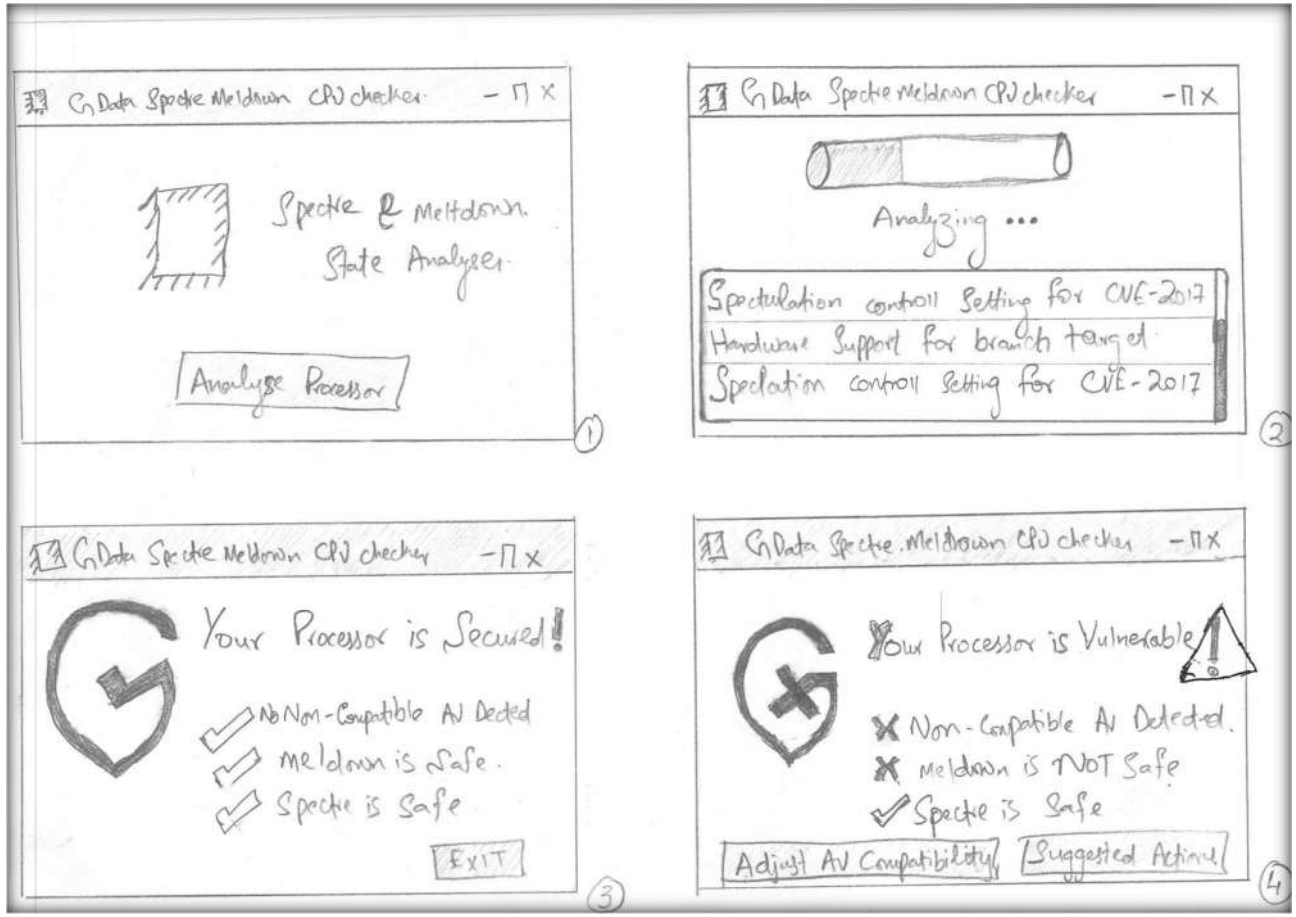

## UX Design Goals

1. Title of the application should be improved
2. The icon of the application besides the title should be customized
3. The buttons should indicate the system status by using Red or Green color
4. The landing UI should be a smaller 400 * 500 pixels frame
5. ‘Reanalyze’ button is missing.
6. Too much technical information in the textbox.
7. Overall protection status is missing.
8. The background image should be better hig quality microprocessor image
9. In case of vulnerability, a big ‘Your processor is Vulnerable’ should be shown

## UX Design Process

1. Conceptualization
2. Wireframes

## Wireframes


Data Spectre Meltdown CPU checker
Spectre & Meltdown
State Analyzer
Analyse Processor
1
Data Spectre Meltdown CPU checker
Analyzing ...
Speculation controll Setting for CVE-2017
Hardware Support for branch target
Speculation controll Setting for CVE-2017
2
Data Spectre Meltdown CPU checker
Your Processor is Secured!
No Non-Compatible AV Dected
meldown is safe.
Spectre is Safe
EXIT
3
Data Spectre Meltdown CPU checker
Your Processor is Vulnerable
Non-Capatible AV Detected.
Meldown is NOT Safe
Spectre is Safe
Adjust AV Compatibility
Suggested Actions
4

## The Final Product

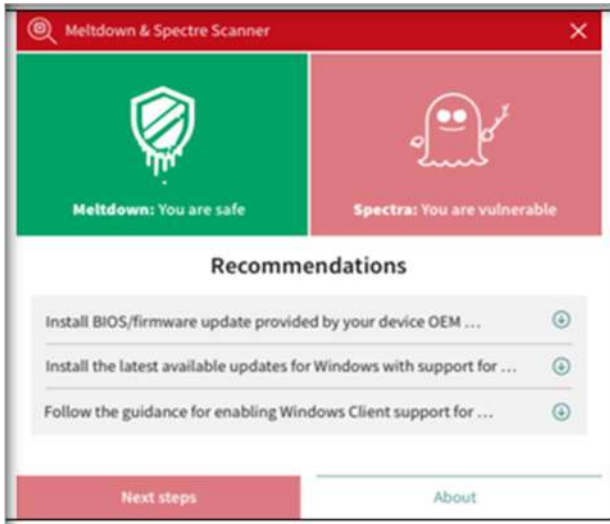


Figure 3: Vulnerable state recommendations

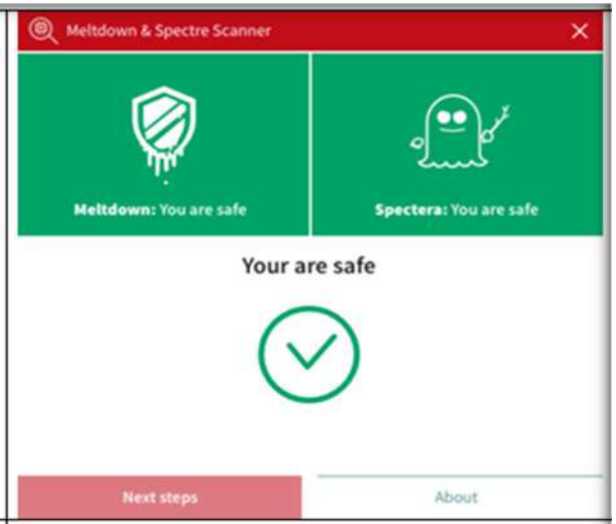


Figure 4: Safe state

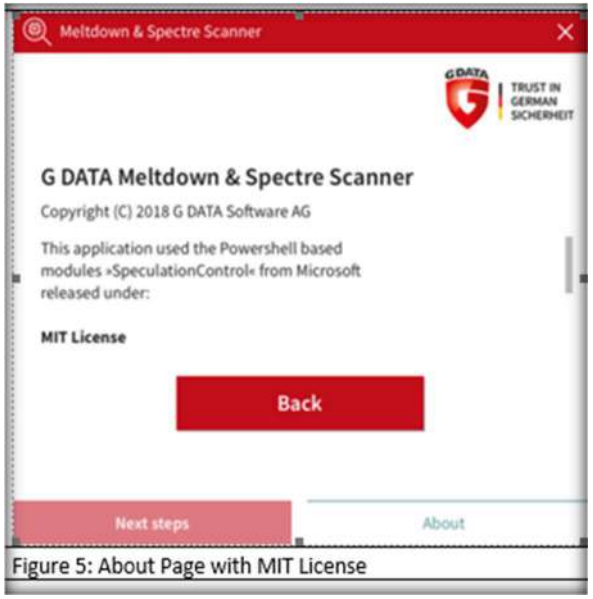
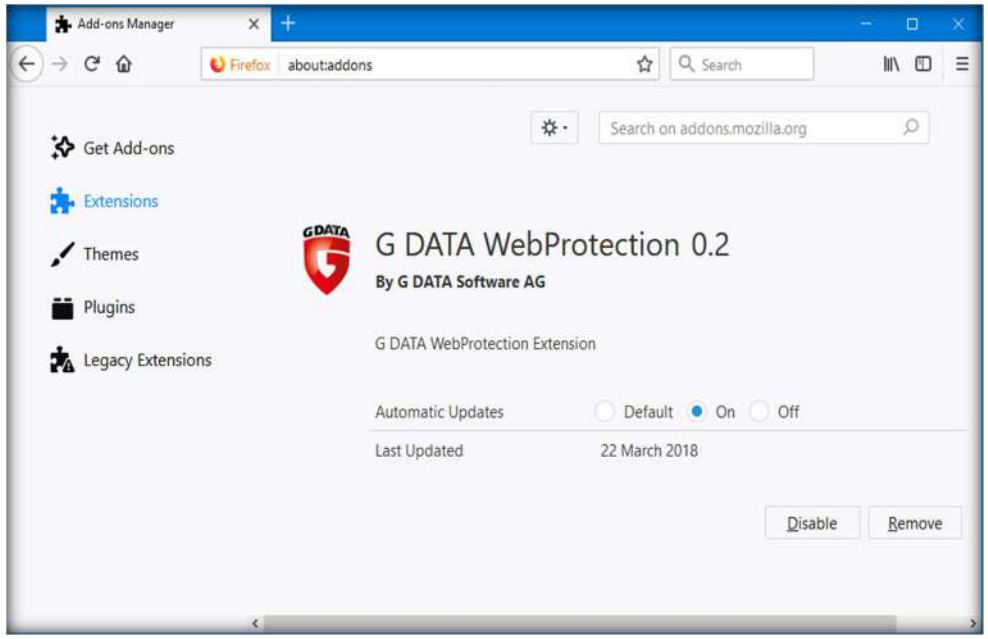


Figure 5: About Page with MIT License

# Case Study 6: Designing the Browser ext UI & Block Page

## The New Browser Plugin



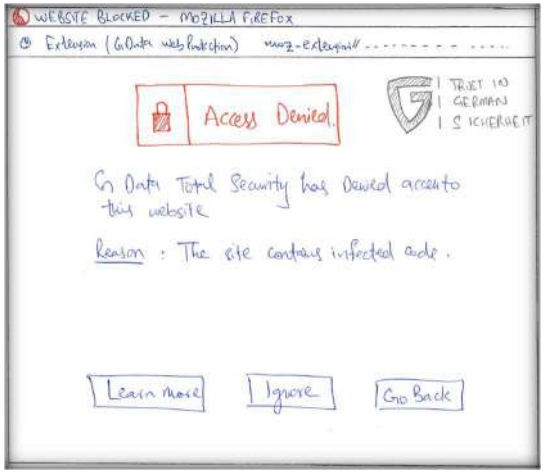

## UX Design Goals

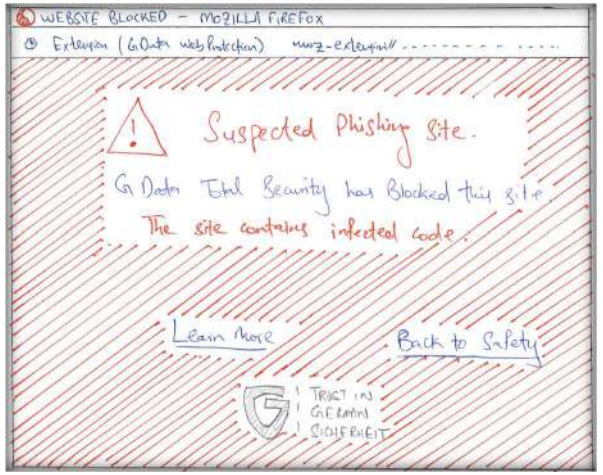
1. A new browser plugin should be designed
2. A new block page should be designed
3. Learn more, Ignore & Go Back functionality should be included in the block page

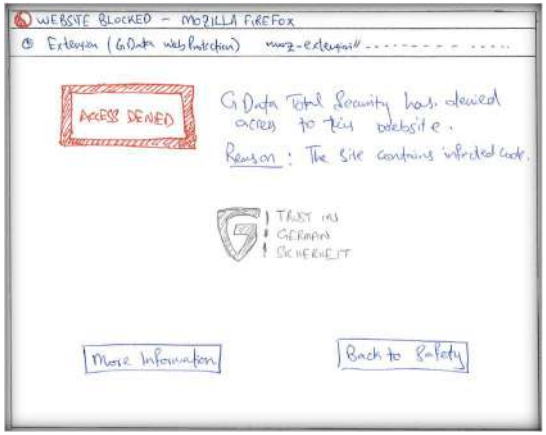
## UX Design Process

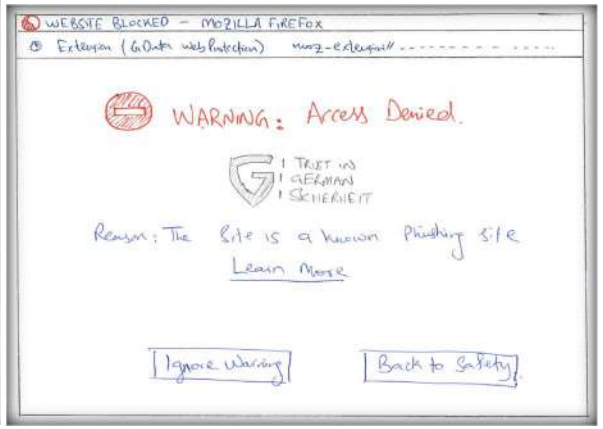
1. Conceptualization
2. Sketches

## Sketches


WEBSITE BLOCKED – MOZILLA FIREFOX
Extension (G Data web protection)
Access Denied.
TRUST IN GERMAN SICHERHEIT
G Data Total Security has denied access to this website
Reason : The site contains infected code.
Learn more
Ignore
Go Back


WEBSITE BLOCKED – MOZILLA FIREFOX
Extension (G Data web protection)
Suspected Phishing Site.
G Data Total Security has blocked this site.
The site contains infected code.
Learn more
Back to Safety
TRUST IN GERMAN SICHERHEIT


WEBSITE BLOCKED – MOZILLA FIREFOX
Extension (G Data web protection)
ACCESS DENIED
G Data Total Security has denied access to this website.
Reason : The site contains infected code.
TRUST IN GERMAN SICHERHEIT
More Information
Back to Safety


WEBSITE BLOCKED – MOZILLA FIREFOX
Extension (G Data web protection)
WARNING: Access Denied.
TRUST IN GERMAN SICHERHEIT
Reason: The site is a known Phishing site
Learn More
Ignore Warning
Back to Safety

## The Final Product

# Case Study 7: Improving Information Architecture: Goal-specific automating computational cognitive modelling techniques

## The Old vs Improved Information Architecture

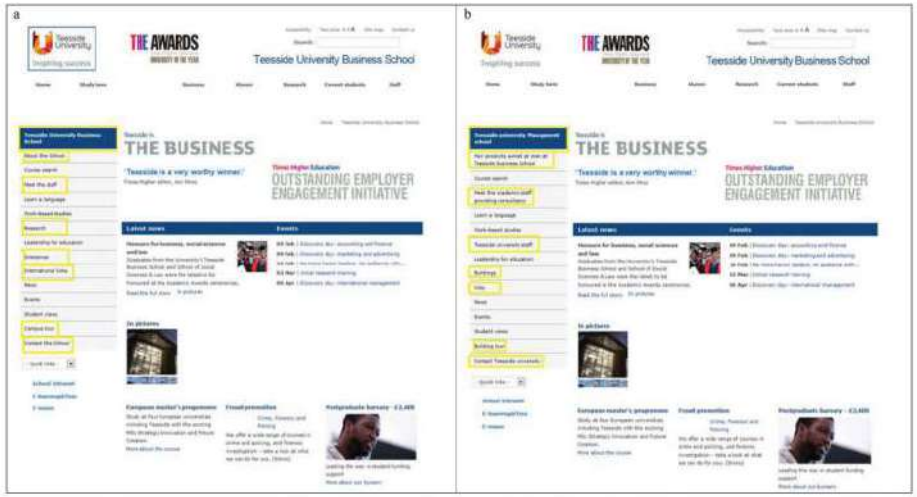



Fig. 1. Web pages, Study 1 (a, c original; b, d improved).

## UX Design Goals

1. Improve the overall information architecture of large websites
2. Perform a goal specific analysis to improve the information scent

## UX Design Process

1. Developed Information Architecture Analysis Structure)
2. Implemented web parsers for large websites.
3. Propose, automate, simulate and validated human cognitive model for web navigation named “improved CoLiDeS/+” based on using Latent Semantic Analysis
4. Proposing / testing Hypothesis for by
5. A / B testing

## Comparison of improved CoLiDeS model with existing cognitive models

Table 9.4. *Comparison of improved CoLiDeS model with existing cognitive models*

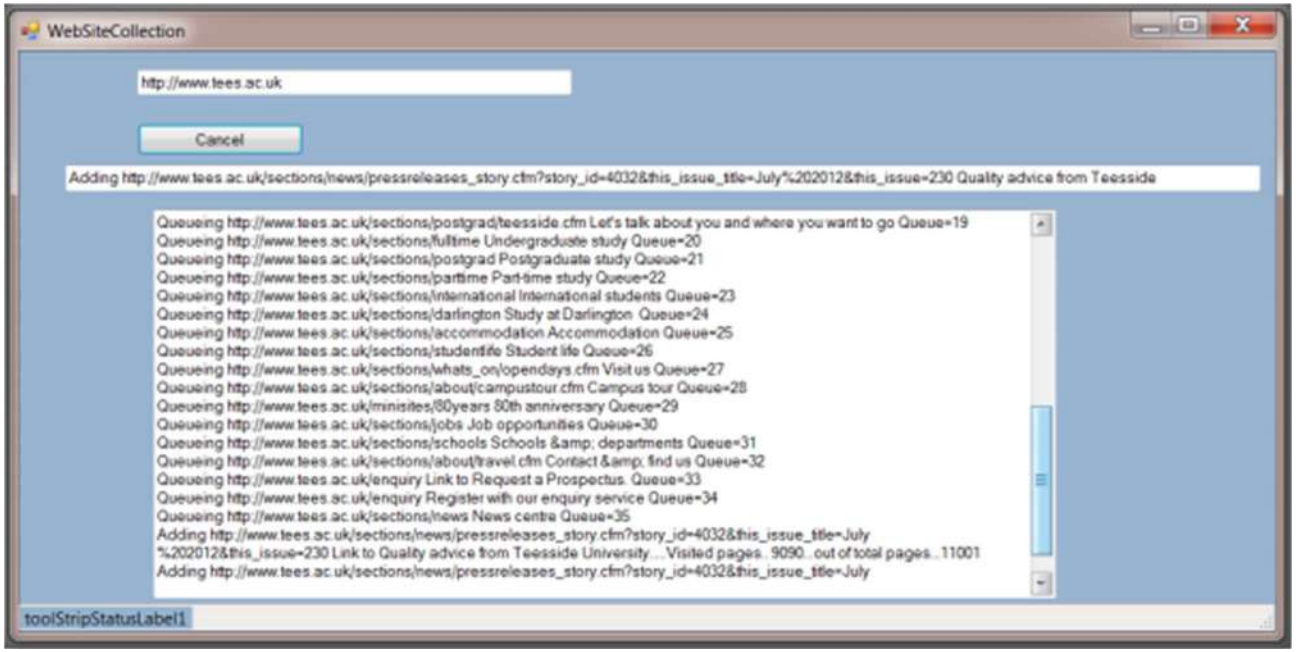
| Criteria | MESA | CogTool-Explorer | SNIF-ACT | ScentTrails | Bloodhound | ISETool | ACWW | CoLiDeS | CoLiDeS+ | Improved CoLiDeS+ |
|---|---|---|---|---|---|---|---|---|---|---|
| Based on Cognitive architecture | MESA | SNIF-ACT (2.0) | ACT-R architecture | Search and Navigation | SNIF-ACT (1.0) | CWW | CWW, CoLiDeS | Construction-Integration architecture | CoLiDeS+ | CoLiDeS and CoLiDeS+ |
| Underlying knowledge corpus | None | TASA | Online text corpora-Entire Web | Analysed website | Analysed website | TASA | TASA | TASA | TASA | TASA |
| Semantic model for calculating information scent | Human ratings | LSA | Spreading activation using PMI-IR | Spreading activation using scent vectors | Information Scent Absorption Rate (ISAR) | LSA | LSA | LSA | LSA | LSA |
| Automated simulation | No | Yes- using a tool | Yes- using Web User Flow by Information Scent (WUFIS) | Yes - ScentTrails algorithm similar to WUFIS | Yes- but semi-automated | Yes- but Semi-automated | No | No | No | Yes –fully automated |
| Involves user input in simulation | Yes | Yes | Yes | Yes | Yes- | Yes- | Yes | Yes | Yes | No- Fully automated simulation |
| Approach to repair | None | None | None | None- only highlights links based on information | None | None | None | Manual | Manual | Improving text of best path identified by depth software |

| | | | | scent | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Considers web elements other than links under heading | No | No | No | No | No | No | No | No | No | Yes- Considers Heading, LinksWithoutHeading and templateOflinks along with link relevance |
| Considers position of elements | No | Yes | Yes – uses BSM (Fu, in press; Fu & Gray, 2006) | No | No | No | No | No | No | No |
| Automated prediction and walkthrough of user's path | No | Yes | Yes | No | Yes | Yes | No | No | No | Yes –presents the scent trails followed |
| Automated goal text identification | No | No | No | No – uses keywords | No | No | No | No | No | Yes - paragraphs of length 100 to 200 words were used goal text |
| Comparison of simulated path with best path | No | No | No | No | No | No | No | No | No | Yes |
| Database representation of analysed website | No | No | No | No | No | No | No | No | No | Yes |
| Decay propagation | No | Yes | No | Yes | Yes | No | No | No | No | No |

Table 9.2. *Comparison of improved CoLiDeS/+ model with CoLiDeS and CoLiDeS+*

| Criteria | Improved CoLiDeS/+ | CoLiDeS | CoLiDeS+ |
|---|---|---|---|
| **Forward search** | | | |
| Considers Heading, *LinksWithoutHeading* and *TemplateOfLinks* along with link relevance | Yes | No | No |
| Use heading text to elaborate link text is forward search | Yes | No | No |
| Possibility of 'forward search only' mode | Yes | Yes | No |
| Increasing similarity in forward search | Yes | No | Yes |
| Backtracking (impasse) in 'forward search only' mode | Yes – when path adequacy module is not in use (e.g. Chapter 5 simulation) | No | No – when forward search fails, path adequacy is checked, and if that fails, it then backtracks |
| **Path adequacy** | | | |
| Backtracking (impasse) in path adequacy | Yes | No | Yes |
| Use heading text to elaborate link text in path adequacy | Yes | No | No |
| Increase in similarity in path adequacy | Yes | No | No |
| Checking that link cosine higher than heading cosine | Yes | No | No |
| **Simulation results** | | | |
| Automated and simulated | Yes | No | No |
| Predicts correct path | Yes | No | No |
| Automated goal text identification | Yes - uses paragraphs (of length 100 – 200 words) | No | No |
| Simulated path vs. correct (best) path analysis | Yes – Compared the simulated path with best path calculated by depth software | No | No |
| Outputs all paths and backtrackings performed to reach target web page | Yes | No | No |

## Automated parsing and saving data in database




```
LinkWithHeadingSubSite li = LinkWithHeadingSubSite.SingleOrDefault(x =>
x.LinkId == 22);

An example of updating a heading of the table Heading using the Save

methodology


      Heading h = Common.AllHeading.SingleOrDefault(x => x.WebPageId ==
webpageId && x.HeadingText == data);
        if (h == null) {
            h = new Heading();
            h.WebPageId = webpageId;
            h.HeadingText = data;
            h.VectorTermLength = "";
            h.Save();
          }
```

| Column Name | Data type |
|---|---|
| WebPageId | Int |
| WebSiteId | Int |
| Title | nvarchar(MAX) |
| Url | nvarchar(MAX) |
| Visited | Bit |
| Source | nvarchar(MAX) |

Proposing improved CoLiDeS/+ model for performing automated cognitive simulation

## 5.4 Improvement to CoLiDeS/+ model and implementation

A recursive algorithm which selects web elements on the basis of highest cosine match against the goal was developed (see Appendix 5.4) based on CoLiDeS (Kitajima et al, 2000; Blackmon et al, 2002, 2003 and 2005) and CoLiDeS+ (Juvina & van Oostendorp, 2006, 2008). This algorithm was then converted to pseudocode (see Appendix 5.5) and then to Visual C# code for .NET (available on CD).

### 5.4.1 Cosine value passed on in 'forward-search only' mode

In a forward-search recursive routine in improved CoLiDeS/+, a cosine value from one page is passed (piggybacked) onto the next page. The reason for the decision to pass a cosine value to the next page is that the scent should be increasing as users get closer to the target page. In contrast, the CoLiDeS model only considers the highest cosine on the new page, even if this new cosine is lower than the last chosen cosine value from the previous page (Kitajima et al., 2000, 2007; Blackmon et al, 2002, 2003, 2005; Juvina & van Oostendorp, 2006; Katsanos et al., 2006; Karanam et al., 2011)

Improved CoLiDeS/+ takes into consideration the cosine value from the previous page and sets it as a cut-off value for the information scent of heading text (highest cosine value) on the following page. As an example, let's assume on Page A the highest link has a cosine value of 0.23. The simulated user then clicks on this link and moves on to Page B. Given that improved CoLiDeS/+ considers heading scent along with the links, assume the cosine of the highest heading text with its goal is 0.20. While CoLiDeS model selects the best link on page B, CoLiDeS+ does not. The highest cosine on page B is lower than the previous highest cosine (0.20 < 0.23). Therefore, in a simulation of in the improved CoLiDeS/+ the forward search fails and the backtrackable forward-search functionality comes into effect as described below.

### 5.4.2 Backtrackable 'forward-search only' mode

Although Blackmon et al. (2002, p. 467) mention that forward search could fail; they provide no solution to this problem in CoLiDeS model; "Another problem area is backing out of a failed search. The CWW aims for a site in which users will usually be guided forward successfully, but failures will occur". Therefore, another essential feature of the improved CoLiDeS/+ model is that it includes backtracking in forward search.

During web navigation, backtracking behaviour is quite frequent (Cockburn & McKenzie, 2001), in case the forward search fails. In other words, if the link or the heading cosine on subsequent pages is not equal to or higher than the piggybacked cosine, navigation goes back and second-highest cosine phrase may be selected.

### 5.4.3 Automated reporting of entire path traversed

Improved CoLiDeS/+ reports the entire path followed to reach the target page after any backtrackings when the simulation terminates matching a particular user-goal with the web page content. Moreover, this traversed navigated path is compared with the best path with least number of page visits to reach the target page, as calculated by the depth software.

### 5.4.4 Considering links not under heading

The CoLiDeS/CoLiDeS+ model consider only those links that appear under a heading. The improved CoLiDeS/+ implementation considers links without heading and template of links as well. The simulated model can also easily accommodate images.

### 5.4.5 Highest amongst higher cosines

In the CoLiDeS/CoLiDeS+ model, functioning on a single web page screen object is regarded as the outcome of a multi-step process algorithm that divides any given page in four processes (Kitajima et al., 2000). "The four cognitive processes most central to the CoLiDeS model are parsing, focusing on, comprehension, and selection" (p. 3). The problem with this model is that it takes into consideration only the headings and links under heading.

In the improved CoLiDeS/+ model, parsing is achieved by dividing the page into sections under headings and a heading-less section. The identified areas are links under heading, paragraphs under heading, and images under heading. Other areas are links without heading, images without heading and template of links. The template of links contains all links from the top bar, the side bar and the bottom bar.

The improved CoLiDeS/+ implementation first selects the link having the highest cosine with the goal (say x) from all links without heading section on a particular web page. Then, it selects the link with the highest cosine with the goal (say y) in link under heading section of the same web page. The algorithm then chooses the highest value among both sections i.e. highest cosine among x and y. The

## Developing software programs for information architecture improvements

| Tool name | Description | Input | Output | Requirements |
|---|---|---|---|---|
| IACollector-1 | Collects and downloads entire website | Manually enter a URL of the homepage. | A database table *WebPage* holding all the title, URL and pages in the website. | A website whose HTML follows W3C guidelines |
| IACollector-2 | Parses and extracts the web elements from entire website | *WebPage* table from database | Multiple tables holding specific information related to web elements on a web page | Use only after IACollector-1 has finished collection |
| | | Non-goal specific analysis | | |
| Cosine Analysis (nine software programs) | Finds cosine similarity among different web elements | Tables from *IACollector-2* holding parsed web page information | Cosine values in the corresponding tables | Use only after IACollector-2 has finished collection |
| Term vector length analysis (five software programs) | Finds TVL values of different web elements | Tables from *IACollector-2* holding parsed web page information | TVL values in the corresponding tables | Use only after IACollector-2 has finished collection |
| | | Goal-Specific Analysis | | |
| CoLiDeS | Implements CoLiDeS and CoLiDeS+ models of user-behaviour. | *HeadingSubSite*, *LinkWithHeadingSubsite*, *LinkWithoutHeadingSubsite* | Status of goal (found/ unfound) and simulated path of user-behaviour in web navigation | Use only after IACollector-2 has finished collection |
| FindingTop-ofTree | Calculates the depth of all the pages from the homepage for all the pages. | *LinkWithheadingSubSite*, *LinkWithoutHeadingSubSite*, *TemplateOfLinks* tables | Best route to top and count to top values in *WebPageSubSite* table | Uses parsed information from IACollector-2 |
| AfterRepairing-Running CoLiDeSAgain | Running CoLiDeS simulation again on improved IA | *HeadingModified*, *LinkWithHeadingSubSiteModified*, *LinkWithoutHeadingSubSiteModified* | Status of goal (found/ unfound) and simulated path of user-behaviour in web navigation | This program is to be used after the modified tables have been created |
| CoLiDeS+On-ModifiedTables | Running improved CoLiDeS+ on failed goals | Paragraph Id's of failed goals | Status of goal (found/ unfound) and simulated path of user-behaviour in web navigation | This program is to be used on failed goals after running *AfterRepairingRunni-ngCoLiDeSAgain* |
| | | User-experiment | | |
| WebpageHref-Transformation | Transforms images and links references | Downloaded website | Navigable copy of the downloaded website | Downloaded website |
| ChangingMenu-ofAllFiles | Changes the menu of all files to mirror rewording on homepage menu. | Sub-site files | Changed menu of all files | |
| ChangingCSS-PathforAllFiles | Change the CSS of all files to structure the content | Sub-site files | Changed CSS of all files | |
| WordandPDFto-HTMLConverter | Converts binary files to HTML | Reads all the files in newpages subfolder. Reads *.pdf, .doc and .docx* | Converts these files to .html files | |
| RemovingPage-NotFound | Removes all web pages saving | | | Unnecessary files are created due to |

## Analysis depth of webpage & Goal status before after simulation

| WebPageId | LwhORLwoh | BestRouteToTop | CountToTop |
|---|---|---|---|
| 179427 | Lwh | 178473 | 1 |
| 179428 | Lwh | 178473 | 1 |
| 179429 | Lwh | 178473 | 1 |
| 179430 | Lwh | 178473 | 1 |
| 179431 | Lwh | 178473 | 1 |
| 179619 | lwoh | 179397 | 2 |
| 179621 | lwoh | 179399 | 2 |
| 179631 | lwoh | 179397 | 2 |
| 179632 | lwoh | 179397 | 2 |
| 185825 | Lwh | 182213 | 3 |
| 185826 | Lwh | 182213 | 3 |
| 185827 | Lwh | 182213 | 3 |
| 185829 | lwoh | 182219 | 3 |
| 185831 | lwoh | 182223 | 3 |
| 185854 | lwoh | 182229 | 3 |
| 185855 | lwoh | 182231 | 3 |

| | Original sub-site | Modified sub-site |
|---|---|---|
| Not Found | 22 | 5 |
| Found | 19 | 36 |
| Total | 41 | 41 |

| Goal number | Goal ParaId | Webpage Id | Initial simulation (original sub-site) | After rewording and running simulation (modified sub-site) |
|---|---|---|---|---|
| 1 | 464081 | 179419 | Found | Found |
| 2 | 464067 | 179416 | Found | Found |
| 3 | 503099 | 185817 | Not found | Found |
| 4 | 503158 | 185825 | Not found | Found |
| 5 | 503147 | 185823 | Not found | *Not found* |
| 6 | 503130 | 185820 | Not found | *Not found* |
| 7 | 503123 | 185821 | Not found | Found |
| 8 | 490661 | 182745 | Not found | *Not found* |
| 9 | 465677 | 179621 | Not found | Found |
| 10 | 489630 | 182636 | Not found | Found |
| 11 | 489628 | 182636 | Not found | *Not found* |
| 12 | 489574 | 182631 | Not found | Found |
| 13 | 464045 | 179409 | Not found | Found |
| 14 | 464036 | 179411 | Not found | Found |
| 15 | 489629 | 182636 | Not found | *Not found* |
| 16 | 488299 | 182218 | Not found | Found |
| 17 | 503207 | 185829 | Not found | Found |
| 18 | 488355 | 182222 | Not found | Found |
| 19 | 489645 | 182637 | Not found | Found |
| 20 | 503172 | 185826 | Not found | Found |
| 21 | 489536 | 182630 | Not found | Found |
| 22 | 488282 | 179419 | Not found | Found |
| 23 | 465682 | 179621 | Found | Found |
| 24 | 489644 | 182637 | Not found | Found |
| 26 | 464059 | 179415 | Found | Found |
| 27 | 464005 | 179407 | Found | Found |
| 28 | 503228 | 185831 | Found | Found |
| 29 | 503227 | 185831 | Found | Found |

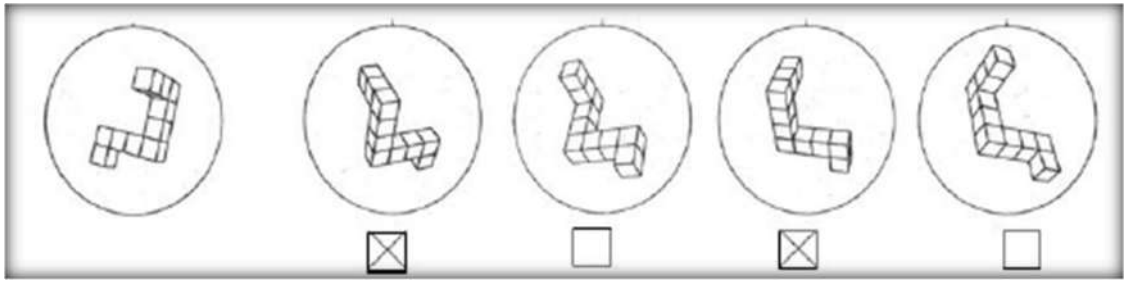
## Limitation & problems in repairing labels: goal-specific Analysis

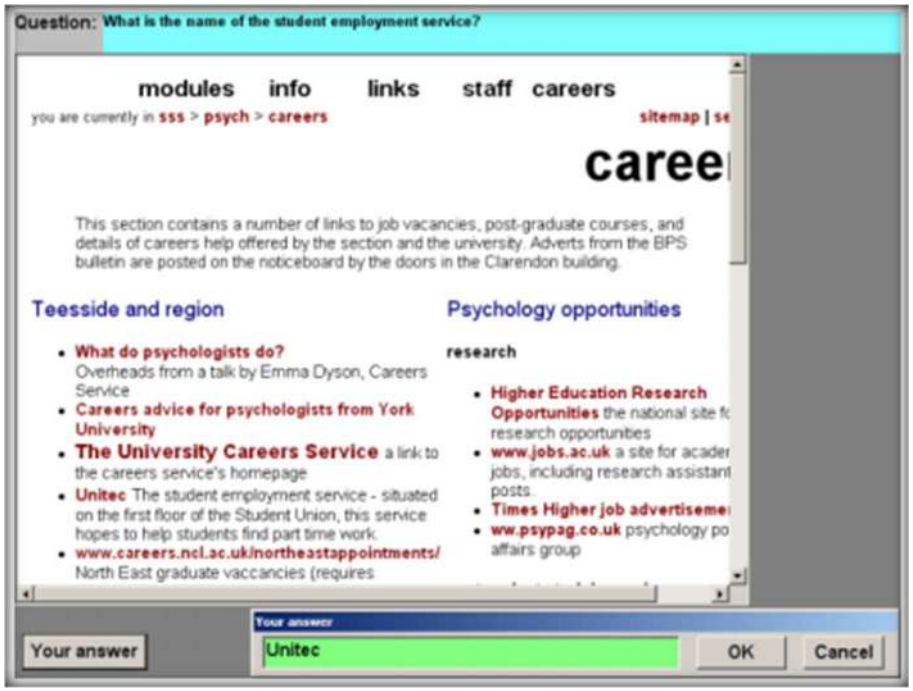
### 9.5.5 Limitation in repairing labels: goal-specific analysis

Rewordings were heavily based on the best (shortest) path proposed by the depth software. After rewordings were mapped onto the database tables, it was unlikely that the improved CoLiDeS/+ simulation would always encounter a solution to the target web page using the best predicted path (i.e. would only follow the modified path). Certainly, this is not possible in many cases. Assume a situation where the path from pages A to D, A to E, A to F all go through an intermediate path from A to B to C then to D and then finally the last page D,E or F. This situation occurred in both the studies. Various target pages followed the same path to the target page. When such a path is reworded, the simulation using one goal text may fail

| Case | Text of Heading | Text of Link 1 | Cosine Value(Heading, Link 1) | Modified Text of link (Link 2) | Cosine value(Heading, Link 2) | Comment |
|---|---|---|---|---|---|---|
| A | Welcome to Educational Partnerships | click here | 0.026 | Click here to access Educational Partnerships | 0.71 | The new link is elaborate enough and requires no further improvement to increase the new cosine value to minimum threshold of 0.80. |
| B | HE in FE Conference 2006 | HE in FE Conference 2007 | 1.00 | - | - | Keep Link2Text. No solution in this case |
| C | Graduate Research School | Graduate Research School | 1.00 | - | - | Remove Link2Text |
| D | Development of New Programmes | 449 | 0.38 | Early initial discussions and planning cycle for development of new programmes in college and schools will be put in place if demand with schools is established. | 0.80 | |
| E | Enrolment and Induction | 1014 | -0.05 | Enrolment into University Student Information Technology System is a responsibility of the College Programme Leader. | 0.80 | Cosine value of the paragraph with the original heading text was negative which implies no relevance of heading for paragraph text. |
| F | Graduation | 1031 | 0.50 | Graduation of students completing a University programme and submission of nominations for school prize by staff | 0.80 | |

## User testing





## A / B testing results

Table 8.1. *Descriptive statistics*

| | Original (n = 32) | | Modified (n = 32) | | |
|---|---|---|---|---|---|
| | Mean | *SD* | Mean | *SD* | *d* |
| Spatial ability | 2.53 | 1.68 | 4.56 | 2.68 | -0.93 |
| Percentage of tasks completed | 36.72 | 25.78 | 58.98 | 18.30 | -1.01 |
| Percentage of correctly answered tasks out of total | 3.52 | 6.53 | 37.11 | 19.18 | -2.61 |
| Percentage of correctly answered tasks out of completed | 8.70 | 16.66 | 61.62 | 26.11 | -2.47 |
| Perceived disorientation | 4.33 | 1.36 | 3.68 | 1.59 | 0.44 |
| Average time-on-task | 186.41 | 79.94 | 121.43 | 66.57 | 0.89 |
| Average number of page loads | 32.94 | 27.38 | 26.91 | 17.08 | 0.27 |

*Note.* Original: original information architecture. Modified: modified information architecture

Table 8.2. *Correlation Matrix between measured constructs and information architecture*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1 Information Architecture | | | | | | | | |
| 2 Spatial ability | ***0.42 | | | | | | | |
| 3 Percentage of tasks completed | ***0.45 | *0.31 | | | | | | |
| 4 Percentage of correctly answered tasks out of total | ***0.77 | ***0.56 | ***0.56 | | | | | |
| 5 Percentage of correctly answered tasks out of completed | ***0.78 | ***0.47 | ***0.41 | ***0.93 | | | | |
| 6 Perceived disorientation | -0.22 | -0.10 | -0.13 | *-0.30 | *-0.30 | | | |
| 7 Average time-on-task (correct answers) | *-0.36 | -0.09 | -0.28 | -0.70 | 0.11 | -0.21 | | |
| 8 Average number of page loads | -0.13 | -0.03 | ***-0.52 | -0.29 | -0.23 | -0.03 | 0.14 | |

*p < 0.05. **p < 0.01. ***p ≤ 0.001.

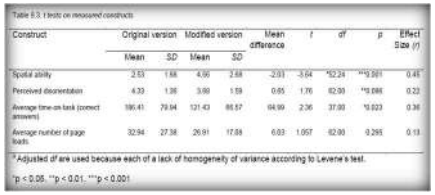


Table 8.3. *t tests on measured constructs*

| Construct | Original version | | Modified version | | Mean difference | *t* | *df* | *p* | Effect Size (*r*) |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | *SD* | Mean | *SD* | | | | | |
| Spatial ability | 2.53 | 1.68 | 4.56 | 2.68 | -2.03 | -3.64 | *52.24 | ***0.001 | 0.45 |
| Perceived disorientation | 4.33 | 1.36 | 3.68 | 1.59 | 0.65 | 1.76 | 62.00 | **0.086 | 0.22 |
| Average time-on-task (correct answers) | 186.41 | 79.94 | 121.43 | 66.57 | 64.99 | 2.36 | 37.00 | *0.023 | 0.36 |
| Average number of page loads | 32.94 | 27.38 | 26.91 | 17.08 | 6.03 | 1.057 | 62.00 | 0.295 | 0.13 |

* Adjusted *df* are used because each of a lack of homogeneity of variance according to Levene's test.

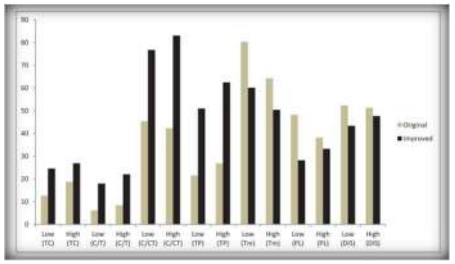
*p < 0.05. **p < 0.01. ***p < 0.001

Table 8.4. *Descriptive as a function of information architecture and spatial ability*

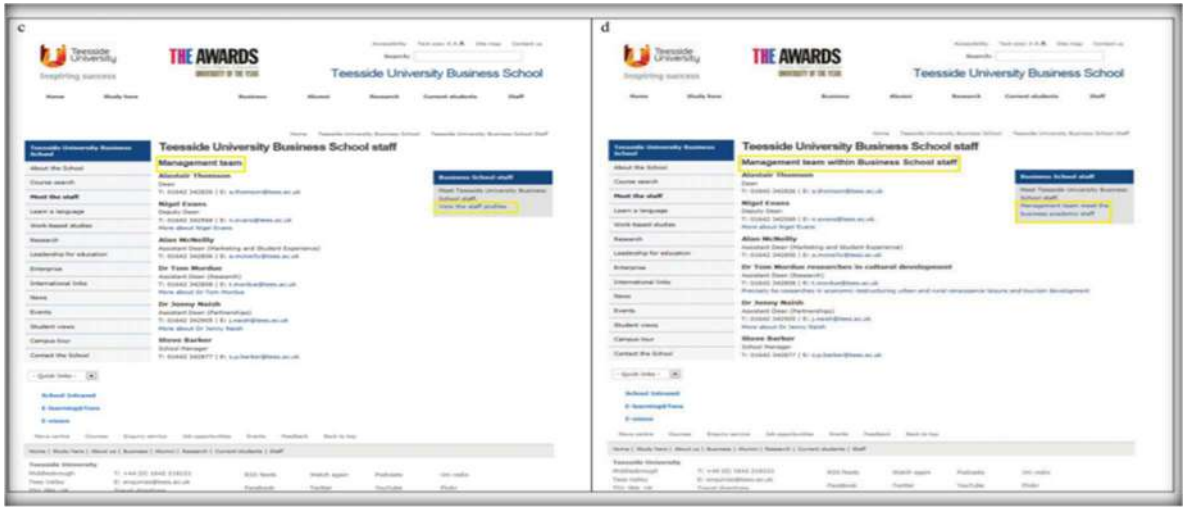
| | Percentage of tasks completed | | | | percentage of correctly answered tasks out of total | | | | percentage of correctly answered tasks out of completed | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Information architecture | Original version | | Modified version | | Original version | | Modified version | | Original version | | Modified version | |
| Spatial Ability | Mean | *SD* | Mean | *SD* | Mean | *SD* | Mean | *SD* | Mean | *SD* | Mean | *SD* |
| Low | 35.33 | 24.03 | 51.04 | 22.90 | 4.35 | 7.16 | 26.04 | 17.24 | 11.01 | 18.60 | 50.26 | 29.03 |
| High | 40.28 | 31.11 | 63.75 | 13.40 | 1.39 | 4.17 | 43.75 | 17.44 | 2.78 | 8.33 | 68.44 | 22.22 |

Table 8.5. *Frequency of positive and negative comments for both versions of the website*

| Comments | Frequency | | | |
|---|---|---|---|---|
| | Version 1 | | Version 2 | |
| | Negative | Positive | Negative | Positive |
| Information architecture | 24 | 6 | 12 | 25 |
| Layout and other aspects | 13 | 19 | 21 | 7 |

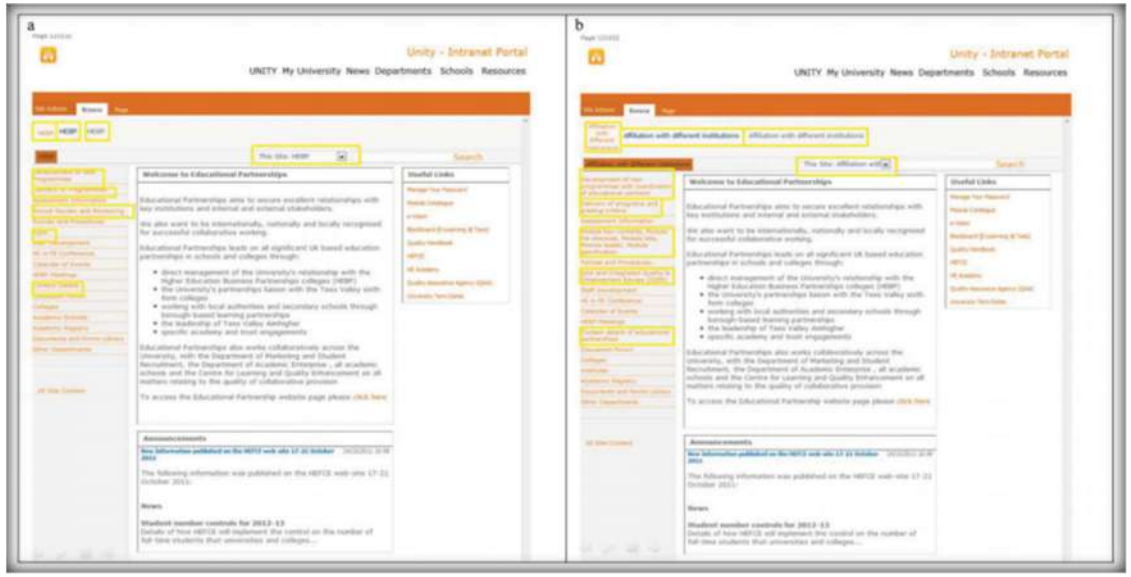


The Improved Information Architecture



# Case Study 8: Improving Information Architecture: Non-goal specific automated computational analysis

## The Non-goal specific analysis tools




## UX Design Goals

1. Improve the overall information architecture of the website
2. Non-goal specific analysis of confusable, low-scent and unfamiliar elements on a web page in a website

## UX Design Process

1. Perform in-depth theoretical and practical analysis on non-goal specific analysis of Teesside University's website and its TUBS sub-site
2. Propose analysis and repairs on unfamiliar and confusable elements

## Defining the confusable and unfamiliar elements

| Category | Subcategory | Comparison | Problem identification criterion | Reference | Solution |
|---|---|---|---|---|---|
| Image | Image under heading | An Image with its heading | Identify low-scent image: If correct image does not have a high cosine with its heading and value ≤ 0.80 | | (1) Improve wording of image alt text<br>(2) Reword to reduce cosine of non-correct (conflicting) images with heading |
| | Images under heading | Image with all images under same heading | Identify confusable images: image-with-image cosine ≥ 0.6 | No support from literature[a] | Revise and regroup:<br>1 Reduce cosine(s) of competing images by reworking image alt text nested under headings<br>2 Regroup or give new heading labels to images until each image alt text on a page is more similar to the heading under which it is nested than to any other heading on the page |
| Image (Continued) | More than two Images without headings | Image with all images on same page | Identify confusable images: image-with-image cosine ≥ 0.6 | | Revise alt text of images |
| | Image | TVL of image's 'alternate' text | Identify unfamiliar image: TVL < 0.8 | | Reword to elaborate text |

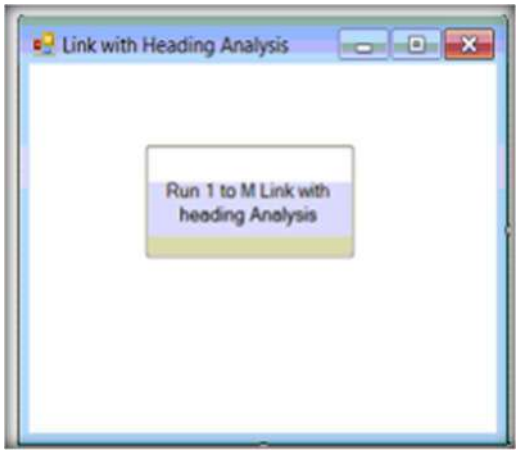
| | | | | | |
|---|---|---|---|---|---|
| Link | Link under heading | Link with its heading | Identify low scent link: correct link with its heading cosine ≤ 0.80 | Blackmon *et al.* (2003) | Improve wording of link text |
| | Links under same heading | Link with all links under heading | Identify confusable link: link-with-link cosine ≥ 0.60 | Blackmon *et al.*, (2003) | 1. Reduce cosine(s) of competing links by reworking link labels under headings<br>2 Regroup or give new heading labels to links until each link on a page is more similar to the heading under which it is nested than to any other heading on the page |
| | Links without heading | | Identify unfamiliar text: TVL < 0.8 | No support from literature | Reword to elaborate text |
| Link (Continued) | All links without any heading | Link with all link not under a heading | Identify confusable links, link-with-link cosine ≥ 0.60 | No support from literature | Revise label of either link. If cosine value remains too high between links merge the content pages under these links |
| | Template of links without heading[b] | Link with all links identified as being part of a template | Identify confusable template link: link-with-link cosine ≥ 0.6 | No support from literature | Revise and regroup |
| | Link | | Identify unfamiliar links: TVL < 0.8 | Blackmon *et al.*, (2002, 2003) | Reword to elaborate link text |

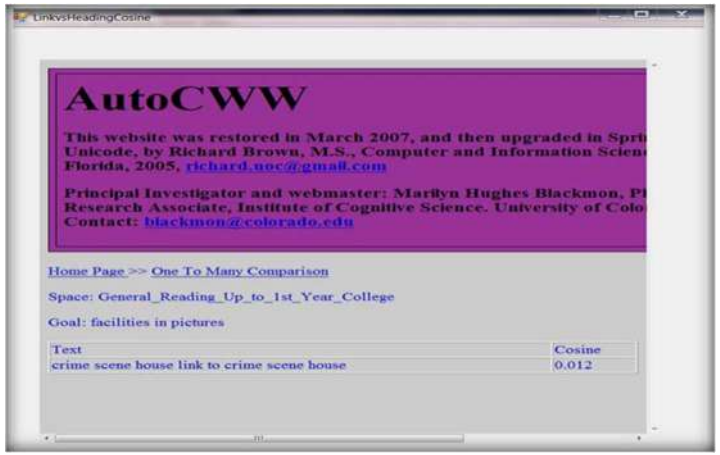
| | | | | | |
|---|---|---|---|---|---|
| Heading | Headings on same page | Heading with all headings on same page | Identify confusable headings: heading-with-heading cosine ≥ 0.60 | Blackmon et al. (2003) | Reduce cosine(s) of competing links by reworking link labels nested under headings |
| | Heading | | TVL < 0.8 | *Blackmon et al.*, (2002, 2003) | Reword to elaborate text |
| Paragraphs | Paragraph under heading | Paragraph with its heading | Identify low scent paragraphs: cosine of paragraph with its heading ≤ 0.80 | No support from literature | Reword the heading containing the paragraph to improve cosine or move the paragraph under a different heading with high cosine value between heading and paragraph |

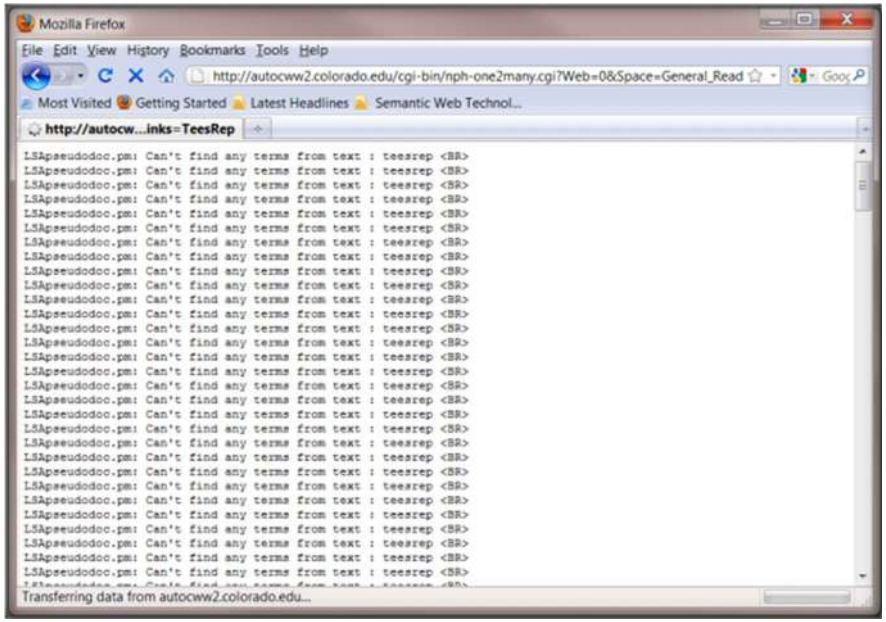
a. Karanam et al. (2011) have published work related to CoLiDeS + Pic, but their work lacks non-goal-specific analysis of images.

b. Template of links contains those links which are not under a heading and exist on the top bar, side bar and bottom bar of the web page.

Element computing the cosines

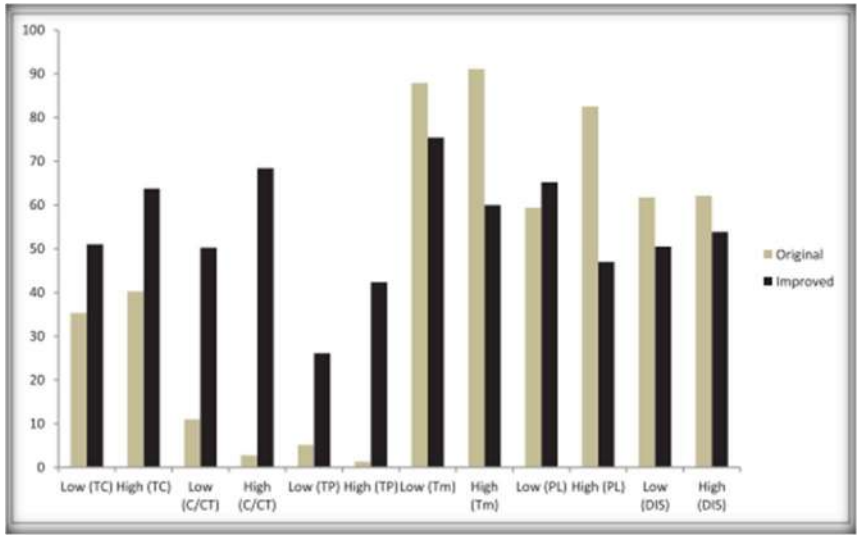


## Data Store & Analysis

| Analysis type | Cosine value saved in table named |
|---|---|
| Link with heading (cosine) | *LinkWithHeadingTUBS* |
| Link with link under heading (cosine) | *CosineLinkLinkunderHeadingTUBS* |
| Paragraphs under Heading (cosine) | *ParagraphsTUBS* |
| Heading with heading on same page(Cosine) | *HeadingvsHeadingUnderSamePage TUBS* |
| Links (TVL) | *LinkWithHeadingTUBS* |
| Heading (TVL) | HeadingTUBSTVL |



## Limitation in repairing labels: non-goal-specific Analysis

### 9.5.4 Limitation in repairing labels: non-goal-specific analysis

A label is said to be unfamiliar, if a particular user does not understand the meaning of element label. Elements with low LSA term-vector length are likely to be unfamiliar. Similarly, elements with low LSA cosine values are likely to be confusable. A comprehensive framework for the non-goal-specific analysis of unfamiliar elements is presented in Chapter 4.

Various problems in the repair of labels were observed in Chapters 4 and 7. Some of the repairs (solutions) seem rather artificial as when improving link text 'click here' under heading 'Welcome to Educational Partnerships' with cosine value of 0.026 to repaired link text 'Click here to access Educational Partnerships' yielding cosine value of 0.71 (see Case A in Table 9.6). Another unusual instance of rewording can be observed in Cases B and C, where link text is kept or removed.

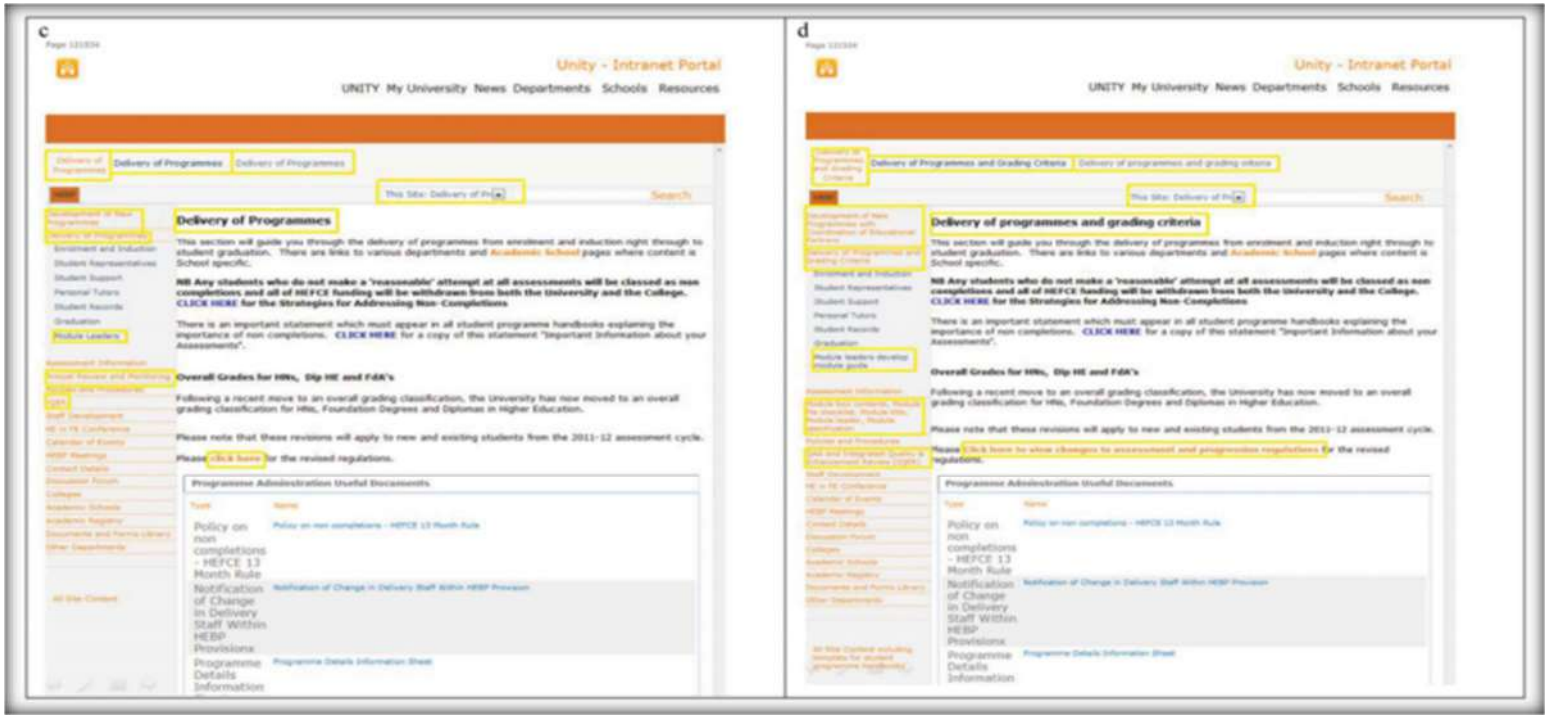
In Cases D, E and F extensively long rewordings had to be done to reach the threshold values. The question remains, are these long rewordings credible?

Furthermore, there is no practical method for automated elimination of names only from the text before submitting it for the analysis at the AutoCWW server. For example, a goal phrase "Finding a good home for homeless cats is an issue" produces a lower cosine of 0.359 with the link text "Alex is a stray cat", while the text when the name is removed "is a stray cat", producing a cosine value of 0.372. In Chapter 4, unfamiliarity analysis on proper names revealed similar issues of low TVL. Although a solution was proposed, it was to temporarily enhance the text scent. Pragmatically, developing a semantic space for any corpus, in any language will have the issue with proper names, until and unless all the possible names are included while developing the semantic space, which would still produce meaningless results.

## Computational cognitive tools for Web navigation analysis

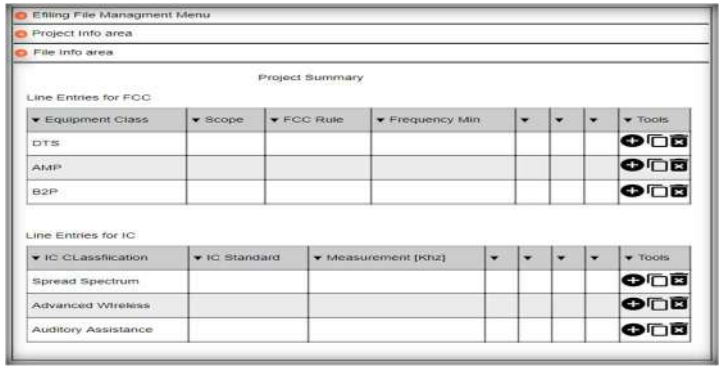
| Tool (Reference) | Related HCI model | Algorithms or techniques used | Input | Output |
|---|---|---|---|---|
| BloodHound (Chi et al., 2003) | • SNIF-ACT v1.0 | • Information Scent<br>• Absorption Rate (ISAR) | • Goal statement<br>• Starting page URL<br>• End page URL | • Usability metrics indicating overall rating, % success per task, high-traffic pages and number of wrong pages reached |
| MESA (Miller & Remington,2004) | • MESA | • Threshold-based strategy (selecting first link that exceeds predefined scent value)<br>• Opportunistic strategy (lower of threshold in case no link exceeds original threshold) | • Breadth × depth structure of website<br>• Information scent of links with user goal<br>• Target web page | • Simulated cognitive user processes<br>• Prediction of mean navigation time by simulations |
| ACWW (Blackmon et al.; Brown, 2005) | • CoLiDeS<br>• Cognitive walkthrough | • LSA | • Goal (detailed description)<br>• Sub-regions of web page<br>• List of headings/links<br>• Correct heading/link | • Predicted mean number of clicks<br>• Navigation problems: weak scent, competing, headings and links, unfamiliar headings and links |
| ISETool (Katsanos et al., 2006) | • SNIF-ACT v1.0 | • Parsing algorithm<br>• LSA | • Goal (free text or persona)<br>• Starting page URL | • Simulated user's navigation path<br>• Interactive tabular report |
| CoLiDeS+ (Juvina, 2006 a) | • CoLiDeS+ | • LSA<br>• backtracking | • Goal (text Description)<br>• Sub regions of web page<br>• List of headings/links | • Simulated link-selection<br>• actions |
| CogTool-Explorer (Teo & John, 2008) | • SNIF-ACT v2.0 | • Web crawler<br>• LSA<br>• Visual Search | • Goal (free text)<br>• Website design prototype | • Predicted time-on-task<br>• Simulated cognitive, visual-perception, and motor actions |
| AutoCardSorter (Katsanos at al.,1998) | • Card sorting | • Hierarchical clustering<br>• LSA<br>• Eigenvalue analysis | • Text description of content items | • Interactive dendrogram<br>• Best-fit number of categories |
| ScentTrails (Olston & Chi, 2003) | • ScentTrails | • WUFIS algorithm<br>• Starts with search and then navigation search results | • Keyword related to goal | • Potential links to destination pages<br>• Highlighted links |
| Semantic Fields model (Stone & Dennis, 2011) | • Semantic Fields | • LSA | • relative positions of a web page's textual elements | • Heat map of goal-oriented visual salience<br>• Estimates of likelihood that users' will focus their visual attention on various positions on a Web page |

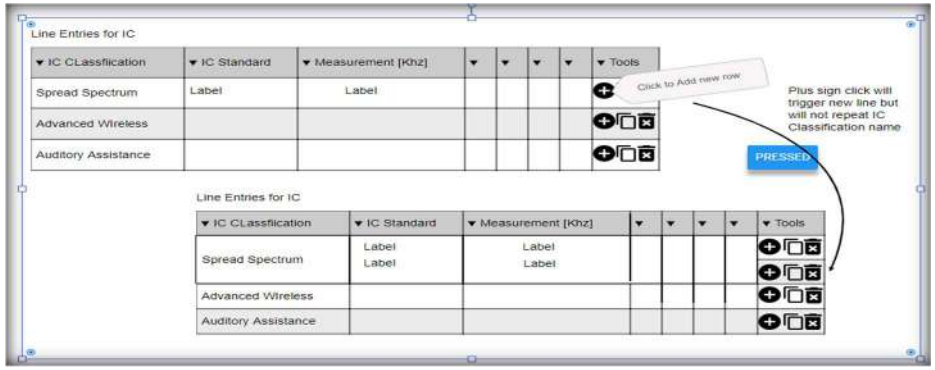
The improved Information Architecture



# Development FCC & ISED Efiling application

## Wireframes




## UX Design Goals

1. Develop a new application to facilitate filing online certification application
2. The certification for USA approval be based on FCC requirements
3. The certification for Canada approval should be based on ISED requirements
4. The application should automatically upload the documents to USA and Canada approval websites

## UX Design Process

1. Requirement gathering from Stakeholder
2. Conceptualization
3. Initial Design
4. Wireframes
5. Programming the application in ColdFusion

# SWOT analysis for growth strategy

## SWOT ANALYSIS

### Strengths

- We are world oldest security software provider.
- We care about customer privacy "Meine Daten bleiben in Deutschland"
- Security software "Made in Germany"
- Continuous product improvement and development
- Large existing B2B and B2C customer & partner base
- Available on Mobile (iOS & Android).

### Weaknesses

- Major customer only in DACH region
- High maintenance cost for localized versions of software
- Slowness of scans
- Difficulty in completely eliminating false positives

### Opportunities

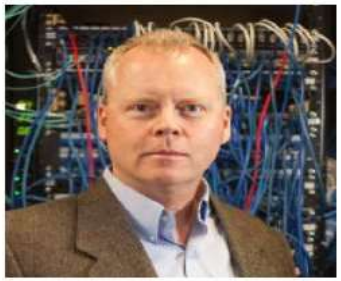
- Increase sales by partnering in Rest of the world
- Pay google AdWords to maintain top slots
- Use Best-Cost provider strategy
- Use *Frontal Assault tactic on Antivirus competitors by* going head-to-head with the competitor

### Threats

- New market entrants providing AI based cyber security solutions
- Major new malware threats which can go undetected
- Product development in current competitors in the market
- Newly emerging competition
- EU Data Protection law related challenges

# Personas

## System Administrator



*"What antivirus should i use ?"*

**Age:** 53
**Work:** IT Head
**Family:** Married
**Location:** Germany
**Character:** Type

### Personality

| | |
|---|---|
| Introvert | Extrovert |
| Thinking | Feeling |
| Sensing | Intuition |
| Judging | Perceiving |

Technical | Computer Equipment | Network Architecture

### Goals

- Keep company network up and running 365 days a year
- Network should remain malware free at all times
- Replace existing security solution
- Business Security solution capable of handling 1000 clients
- Wants an Endpoint security with Mobile device management

### Frustrations

- Increased new malcicus program types
- Existing security software not shielding the network properly.
- Installed Endpoint security solution is not Web based.

### Bio

Mr. Klaus in his current role is working as IT Head. He is leading a team of senior and junior network administrators and is responsible for the computer infrastructures of his Stuttgart based company. He is responsible for on-site servers, software-network interactions as well as network resilience. He has been working in the field of IT since 17 years. Five years ago, his company decided to purchase our competitor software based on good reviews in AV-Test and AV-Comparatives. Frustrated by the low malware detection and high false positives, he is now looking for alternative endpoint security solution.

### Motivation

Incentive
Fear
Growth
Power
Social

### Brands & Influencers

KASPERSKY

### Preferred Channels

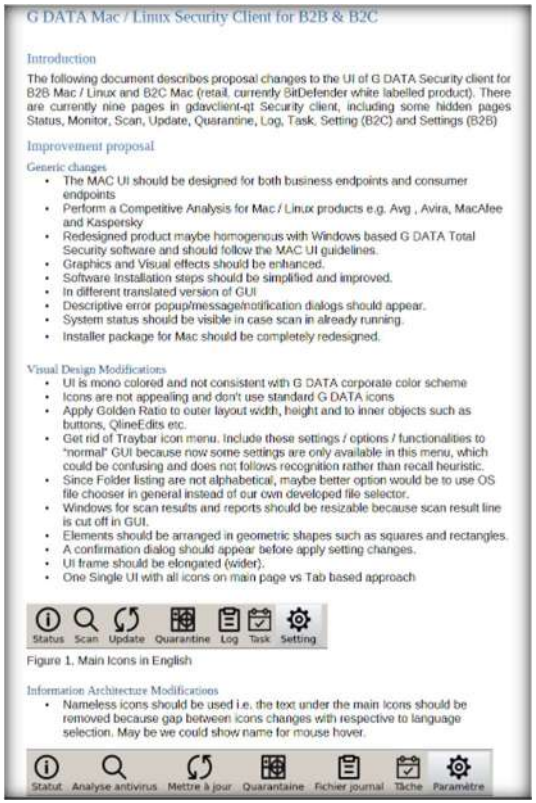
Malware News magzine
Online & Social Media
Referral
Guerrilla Efforts & PR

# Development of Usability tool: Website Analyser

| Usability evaluation tool | Aim | Input scope | Output | Provides database model | Element- element relatedness measure (e.g. link-link) | Individual-element familiarity | Supports automation |
|---|---|---|---|---|---|---|---|
| Heuristic evaluation (Nielsen, 1993) | Finds the problems in the interface in early stages of development. Jakob Nielsen's heuristics are probably the most-used usability heuristics for user interface design | Specialists judge the user interface benchmarking it to established guidelines | Good ideas for improving the interface. Identification of interface related problems such an s use of colours, lay-out and information structuring, consistency of the terminology, consistency of the interaction mechanisms. | No | No | No | No |
| Usabilla (www.usabilla.com) | Tracks where users click, which enables both click-tracking information to be captured | Feedback about a web page or image from users | Data results as visual reports of heat-maps or scatterplots of clicks. | No | No | No | Yes |
| Web Usability Probe (Carta et al., | Remote evaluation usability testing using an explicit | User-goals and website | Logged data available in form of timeliness | No | No | No | Yes |

| Category | Purpose | Type | *Website Analyser* |
|---|---|---|---|
| Location | How the tool is used | web-based vs. off-line | off-line |
| Type of service | What service does the tool provide to analysts | Failure identifiers, fault analysers, analysis and repair tools | Analysis and repair tools (assist the developer also in fixing faults) |
| Information source | The underlying information source used by the tool for automatic usability analysis | Sources, webserver logs, user testing data | This tool uses database tables to be analysed to represent a website. |
| Scope | The set of attributes that are considered during automatic analysis | HTML validators, HTML/graphic optimizers, link checkers, usability tools | Usability tools (detect and sometimes help to fix usability faults) |

# Defining UX enhancement requirements



G DATA Mac / Linux Security Client for B2B & B2C

Introduction

The following document describes proposal changes to the UI of G DATA Security client for B2B Mac / Linux and B2C Mac (retail, currently BitDefender white labelled product). There are currently nine pages in gdavclient-qt Security client, including some hidden pages Status, Monitor, Scan, Update, Quarantine, Log, Task, Setting (B2C) and Settings (B2B)

Improvement proposal

Generic changes

- The MAC UI should be designed for both business endpoints and consumer endpoints
- Perform a Competitive Analysis for Mac / Linux products e.g. Avg , Avira, MacAfee and Kaspersky
- Redesigned product maybe homogenous with Windows based G DATA Total Security software and should follow the MAC UI guidelines.
- Graphics and Visual effects should be enhanced.
- Software Installation steps should be simplified and improved.
- In different translated version of GUI
- Descriptive error popup/message/notification dialogs should appear.
- System status should be visible in case scan in already running.
- Installer package for Mac should be completely redesigned.

Visual Design Modifications

- UI is mono colored and not consistent with G DATA corporate color scheme
- Icons are not appealing and don't use standard G DATA icons
- Apply Golden Ratio to outer layout width, height and to inner objects such as buttons, QlineEdits etc.
- Get rid of Traybar icon menu. Include these settings / options / functionalities to "normal" GUI because now some settings are only available in this menu, which could be confusing and does not follows recognition rather than recall heuristic.
- Since Folder listing are not alphabetical, maybe better option would be to use OS file chooser in general instead of our own developed file selector.
- Windows for scan results and reports should be resizable because scan result line is cut off in GUI.
- Elements should be arranged in geometric shapes such as squares and rectangles.
- A confirmation dialog should appear before apply setting changes.
- UI frame should be elongated (wider).
- One Single UI with all icons on main page vs Tab based approach

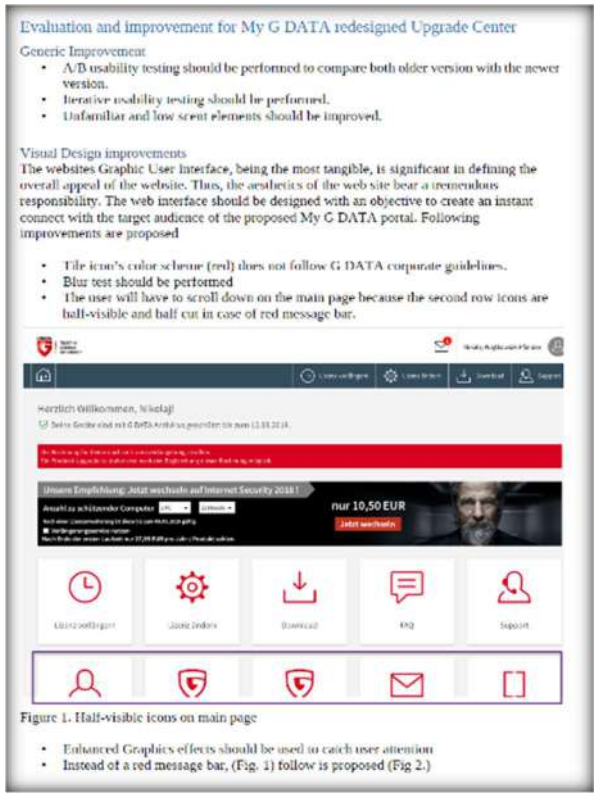
Status Scan Update Quarantine Log Task Setting

Figure 1. Main Icons in English

Information Architecture Modifications

- Nameless icons should be used i.e. the text under the main Icons should be removed because gap between icons changes with respective to language selection. May be we could show name for mouse hover.

Statut Analyse antivirus Mettre à jour Quarantaine Fichier journal Tâche Paramètre



Evaluation and improvement for My G DATA redesigned Upgrade Center

Generic Improvement

- A/B usability testing should be performed to compare both older version with the newer version.
- Iterative usability testing should be performed.
- Unfamiliar and low scent elements should be improved.

Visual Design improvements

The websites Graphic User Interface, being the most tangible, is significant in defining the overall appeal of the website. Thus, the aesthetics of the web site bear a tremendous responsibility. The web interface should be designed with an objective to create an instant connect with the target audience of the proposed My G DATA portal. Following improvements are proposed

- Tile icon's color scheme (red) does not follow G DATA corporate guidelines.
- Blur test should be performed
- The user will have to scroll down on the main page because the second row icons are half-visible and half cut in case of red message bar.

Figure 1. Half-visible icons on main page

- Enhanced Graphics effects should be used to catch user attention
- Instead of a red message bar, (Fig. 1) follow is proposed (Fig 2.)

Redesigned Spectre & Meltdown UI

Introduction

There is currently a high awareness and much medial attention regarding Spectre & Meltdown vulnerability. In our company, we have an employee who is highly involved in this matter and we already have some good publications, it would perfectly fit to release a tool like this to catch even more attention. We could also directly get some new customers with a special offer in case no compatible AV solution is found on the system. Our target group for this tool is Consumers. We wish to release a free product to detect Spectre & Meltdown vulnerability.

Exisitng UI

Spectre State

Meltdown State

Exit

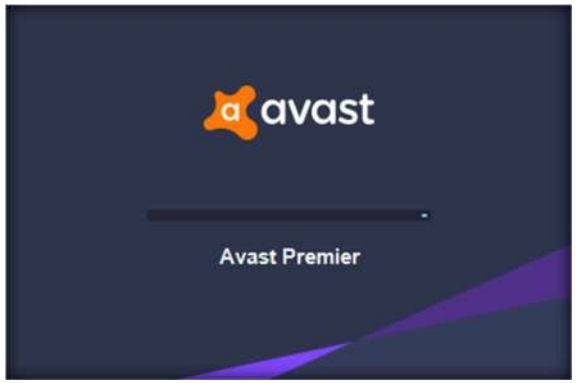
# Comprehensive Usability Evaluation Framework

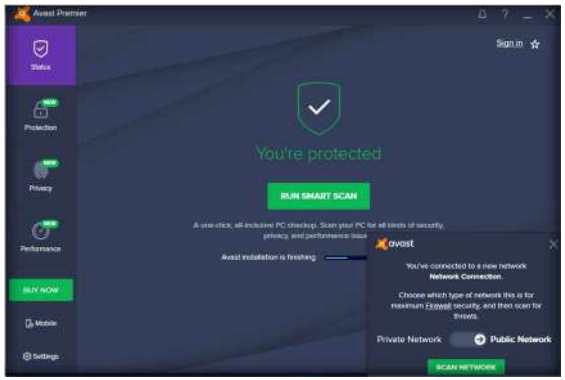
| Analysis type | Category | Sub-Category | Evaluation methods | Quantitative metrics | Qualitative metrics | Result analysis methods |
|---|---|---|---|---|---|---|
| **Goal Specific Analysis** | Findability | | • Task based Analysis<br>• A / B comparative testing<br>• User screen and voice recording<br>• Clickstream Analysis<br>• Think aloud<br>• Eye tracking<br>• Heat maps analysis | • No. of Clicks per task<br>• No. of Tasks completed<br>• No. of task correctly / successfully completed out of completed tasks<br>• Time on task<br>• Critical Errors | • Demographics<br>• Spatial Ability<br>• SEQ<br>• Ease of use<br>• Perceived Usefulness<br>• Perceived Disorientation<br>• Intensity of Flow<br>• System Usability Scale<br>• Likes, Dislikes and Recommendations | • ANOVA<br>• ANCOVA<br>• Student's t-test<br>• Median<br>• Pearson's Correlation Coefficient (composite scores)<br>• Mean<br>• Standard Deviation |
| **Non - Goal Specific Analysis** | IA - Labeling | Confusable Elements | Does a pair of headings or links having a cosine > 80% ? | • Cosine of heading with all headings on the same page<br>• Cosine of link anchor text with all links under same heading<br>• Cosine of link anchor text with all links without heading on same page | | Repairs should alter the text of elements |
| | | Low scent elements | Is scent between a link / para and its heading > 0.80 ? | • Cosine of link anchor text with its heading<br>• Cosine of paragraph text with its respective heading | | |
| | | Unfamiliar Elements | Is TVL < 0.80 for the two most meaningful words ? | • Term Vector Length of link text<br>• Term Vector Length of heading text<br>• Term Vector Length of links without heading | | |
| | IA - organisation | Sorting content | Card Sorting | | | Are the topics and content arranged into categories ? |
| | Visual Design | Readability | • Can users easily recognize information ?<br>• Is the Font large enough ? | | | small, medium and large text sizes |
| | | Color & Contrast | • Coblis - Color Blindness Simulator<br>• Blur test | | | |
| | | Shapes | Are elements arranged in geometric shapes such as in squares and rectangles ? | | | |
| **Generic Usability Analysis** | | | • Heuristics evaluation<br>• Concept testing<br>• Diary / Camera studies<br>• Focus groups<br>• Contextual interviews<br>• Surveys (Intercept, Email)<br>• Personas<br>• Prototyping<br>• Competitive analysis<br>• Social media monitoring<br>• Forum post Analysis<br>• Feedback review<br>• SEO Analysis | | | |

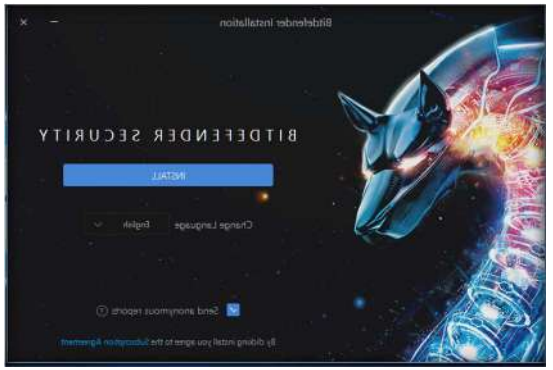
# Products Overlap with UX Design & Evaluation

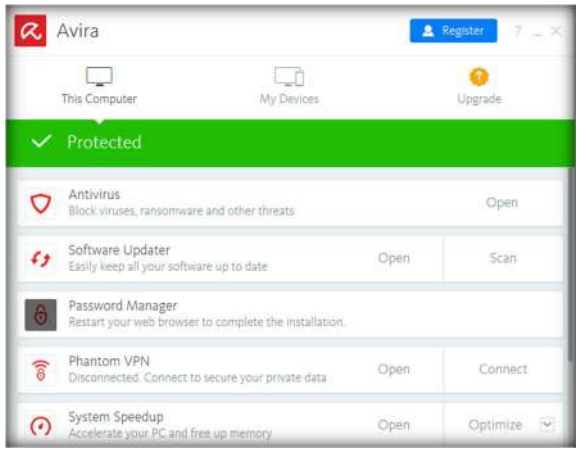
| | Product | | | UxD Task |
|---|---|---|---|---|
| | **B2B Client (Antivirus Business, Client Security Business, Endpoint protection Business, Managed Endpoint Security)** | **B2C Client** | **BootCD** | |
| **Network** | • Mail Security for Exchange*<br>• Network monitoring | • Action Center | | |
| **Windows** | Windows Security Client | • Antivirus<br>• Internet Security<br>• Total Security | In-house developed | |
| **Linux** | • Linux Security Client<br>• Postfix*<br>• SAMBA (File Server Security)*<br>• Squid (Proxy server, Web Security gateway)*<br>• Mail Gateway security<br>• LightAgent for Virtual Environment | N /A | | |
| **MacOS** | Mac Security Client (inhouse) | • AV (currently from Bit Defender<br>• Mac Security Client (to be developed inhouse) | | Homogeneous UI for both Security Clients |
| **Android** | Android Security Client | • Internet Security<br>• Internet Secuirty Light | | Homogeneous UI for both Clients |
| **iOS** | N/A | • Internet Security | | |
| **Web based** | G DATA web Administrator | N / A | | UX evaluation |

# Competitor Security Software User Interface





# Unmoderated usability testing tool comparison

| Usability testing tool | Price | Pre / Post Test questions | | | | Reporting | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Demographics | own tasks | Own testers | Audio & Video | Card sorting | Tree test | surveys | Click stream | Completion / successRate | Task Level Satisfaction (SEQ) | Test Level Satisfaction (SUS etc) |
| Validately | $199/m | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ |
| UserZoom | $1,000 per month. | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Userlytics | $49/pp | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Loop11 | $158 pm or $350 per project. | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Usabilla | $49/m to $199/m | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| UserTesting | $49/pp per test. | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| OpenHallway | $49 - $199/month | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| UserFeel | | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ovo Logger | $3,000 + | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Chalkmark | $109/month | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Morae | $1995 | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Solidify | $49/month | ✗ | ✓ | ✗ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| TryMyUI | | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ovo Solo | | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Silverback | | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ | ✓ |