



The Wheel of Design – Usability Driven Improvements to the GeoVITe User Interface

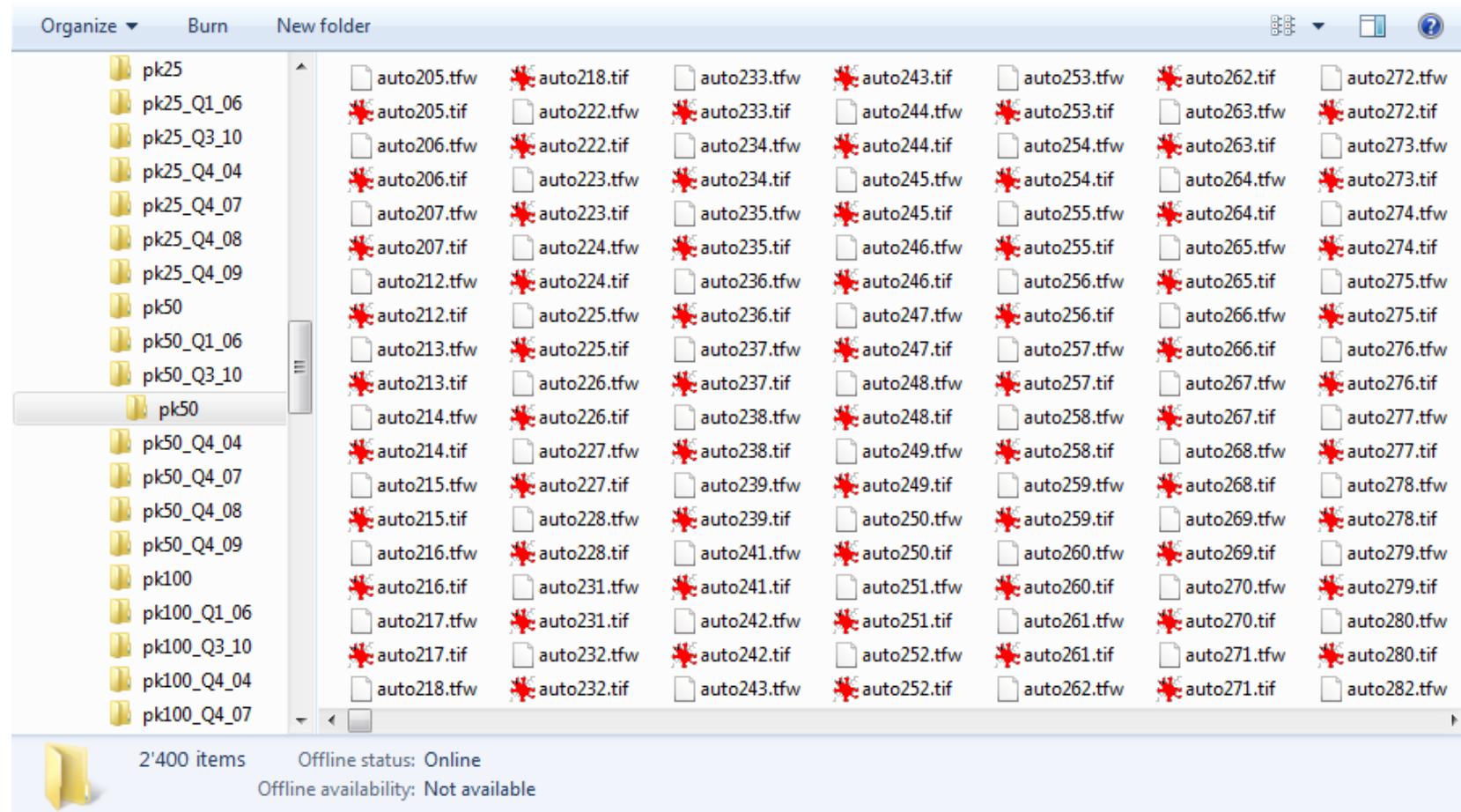
1st ICA European Symposium on Cartography,
10-12 November, Vienna, Austria

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ICA European Symposium on
CARTOGRAPHY
VIENNA, 10–12 NOVEMBER 2015

ETH Zürich, Switzerland

Geodata Access: The Conventional Way



GeoVITe

- **Geodata Visualization and Interactive Training Environment**
- Spatial Data Infrastructure (SDI) for ETH Zurich
- ETH-wide beta version launched in 2010
- Based on custom SVG technology (carto.net framework)

- Geo-portal functionalities: after Resch & Zimmer 2013
 - *discover* geo-datasets
 - *portray* data on map
 - *retrieve* data for further usage

Navigation



Name Search

Selection Area and Download

Set Dataframe to Tile Grid:

none

Current Area (sqm):

210'000'000

Max. Area (sqm):

90'000'000'000

Dataframe

Set

Hide

Zoom to

X: 691072

Y: 196052

X: 708572

Y: 184052


[Geodata Browser](#) [Download Cart](#) [Info](#) [Help](#)

Geodataset

Map Category: Topographic Vector Maps

Map Product: Vector200

Description of Vector200:

VECTOR200 is a digital landscape model of Switzerland based on the Swiss Topographic Maps at the scale 1:200'000. It represents natural and artificial objects of the landscape in a flexible vector format with a high generalisation grade.

>> More info

Layers for Download

-  Primary Surfaces, Landcover
-  Administrative Boundaries
-  Hydrology - Flowing Water
-  Hydrology - Lakes
-  Buildings
-  Road Network
-  Railway Network
-  Points of Interest
-  Geodetic Points

Select / Visualize in >>3D

Background Layers



GeoVITe Usage Workflow

- Select product

Geodataset

Map Category: Airborne Orthoimages ▼

Map Product: Swissimage 50 ▼

Description of Swissimage 50:
The orthophoto mosaic SWISSIMAGE is a composition of digital color aerial photographs.
Ground resolution: 0.5m.

[>> More info](#)

GeoVITe Usage Workflow

- Select product
- Select extent



Selection Area and Download

Set Dataframe to Tile Grid:

none

Current Area (sqm):
210'000'000

X: 691072
Y: 196052

Hide

Zoom to

Dataframe

Max. Area (sqm):
12'000'000

X: 708572
Y: 184052

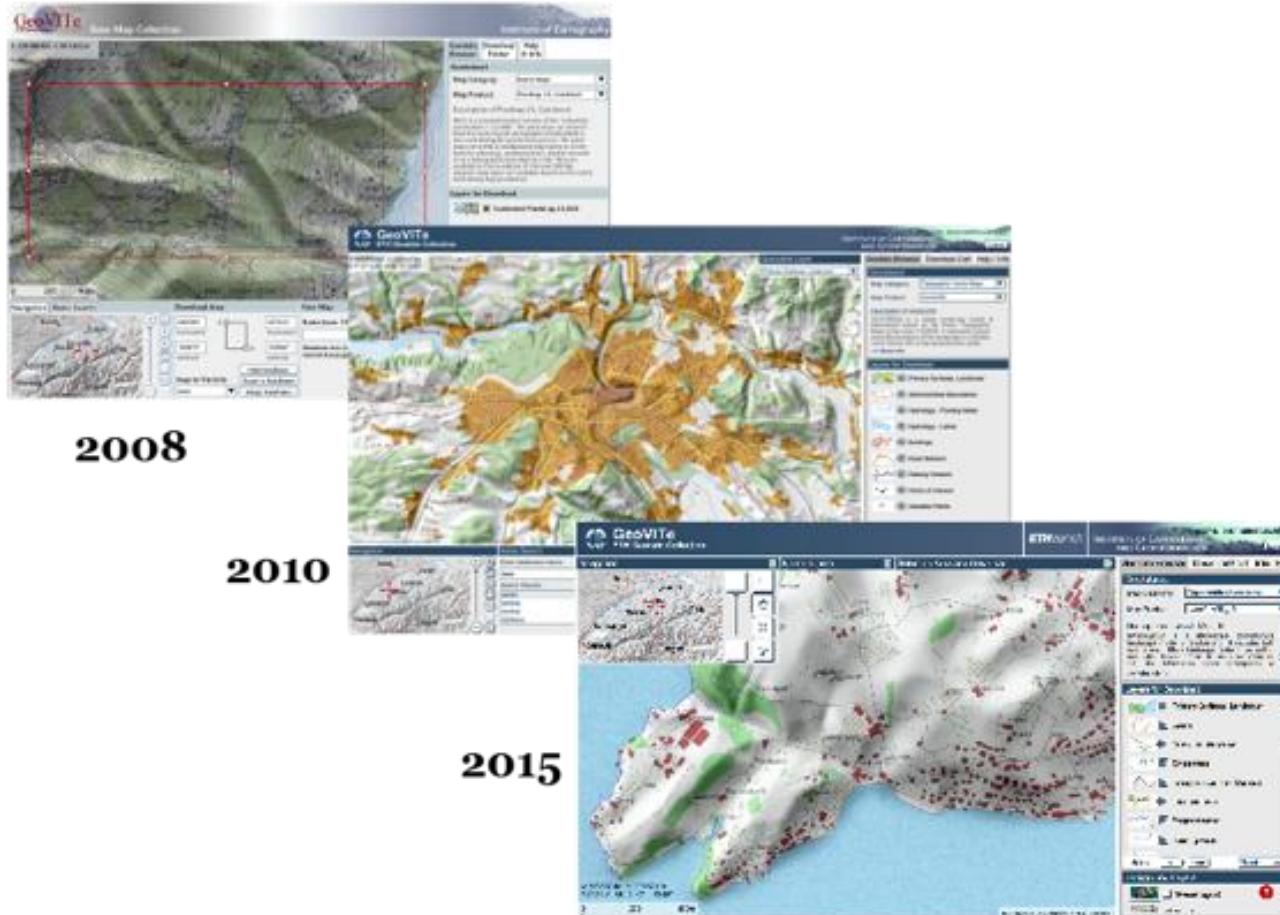
Add selected Layers to Download Cart

GeoVITe Usage Workflow

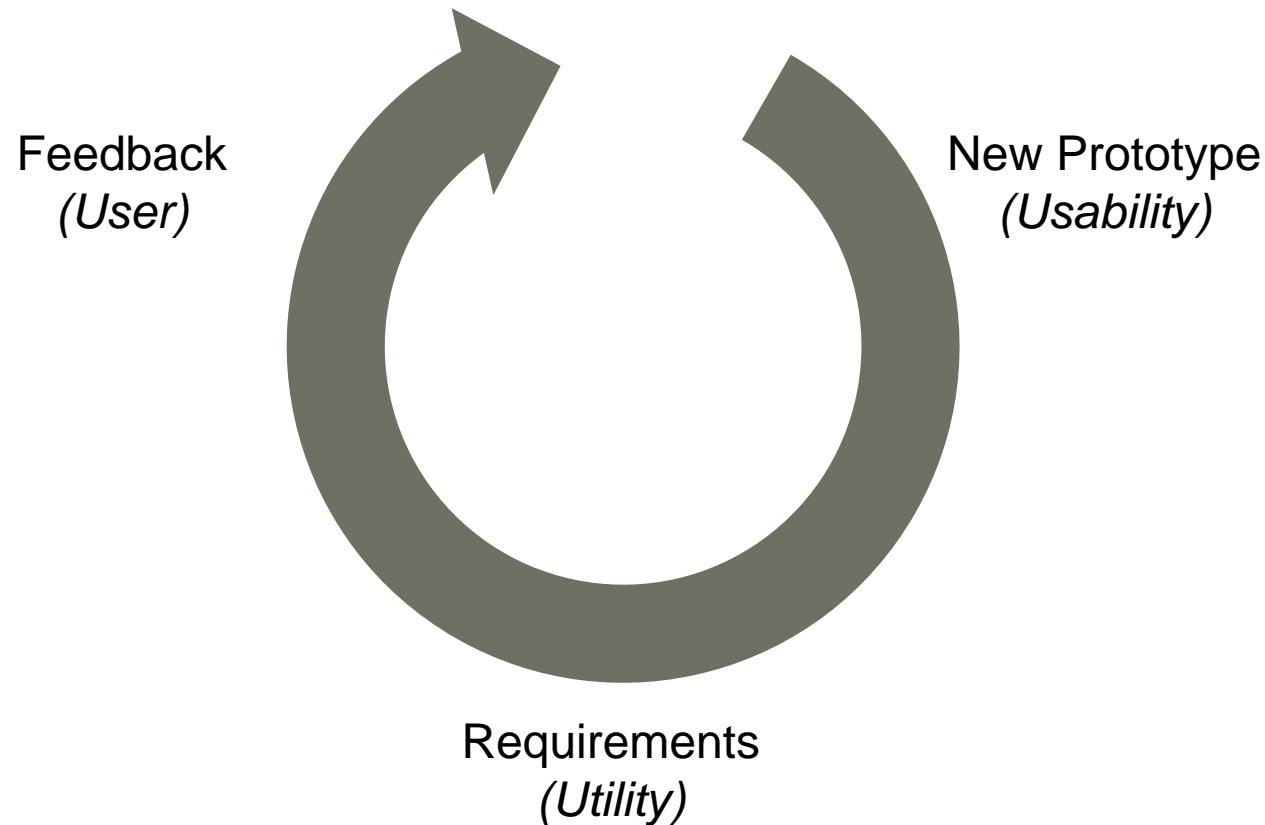
- Select product
- Select extent
- Add to cart and download

| Source Product | Extent (CH1903/LV03) | Download Format / Projection | Action | Status / Download |
|--|---|---|---------------|---|
| Latest (1999), w/ relief (PK1000_krel_1999) | hor.: 691073, 708573 vert.: 184052, 196052 | Format: GeoTIFF .tif Projection: CH1903 / LV03 ▾ | Generate File | Click here to download result |
| Swissimage 50 (1999-2009) (si50) | hor.: 704620, 706033 vert.: 184052, 188009 | Format: GeoTIFF .tif Projection: CH1903 / LV03 ▾ | Generate File | Extracting Data... Please wait |
| swissALTI3D (2011) (SwissAlti11) | hor.: 653819, 661074 vert.: 209707, 218151 | Format: GeoTIFF .tif ▾ Projection: CH1903 / LV03 ▾ | Generate File | |

The Wheel of Design: GeoVITe Evolution



The Wheel of Design

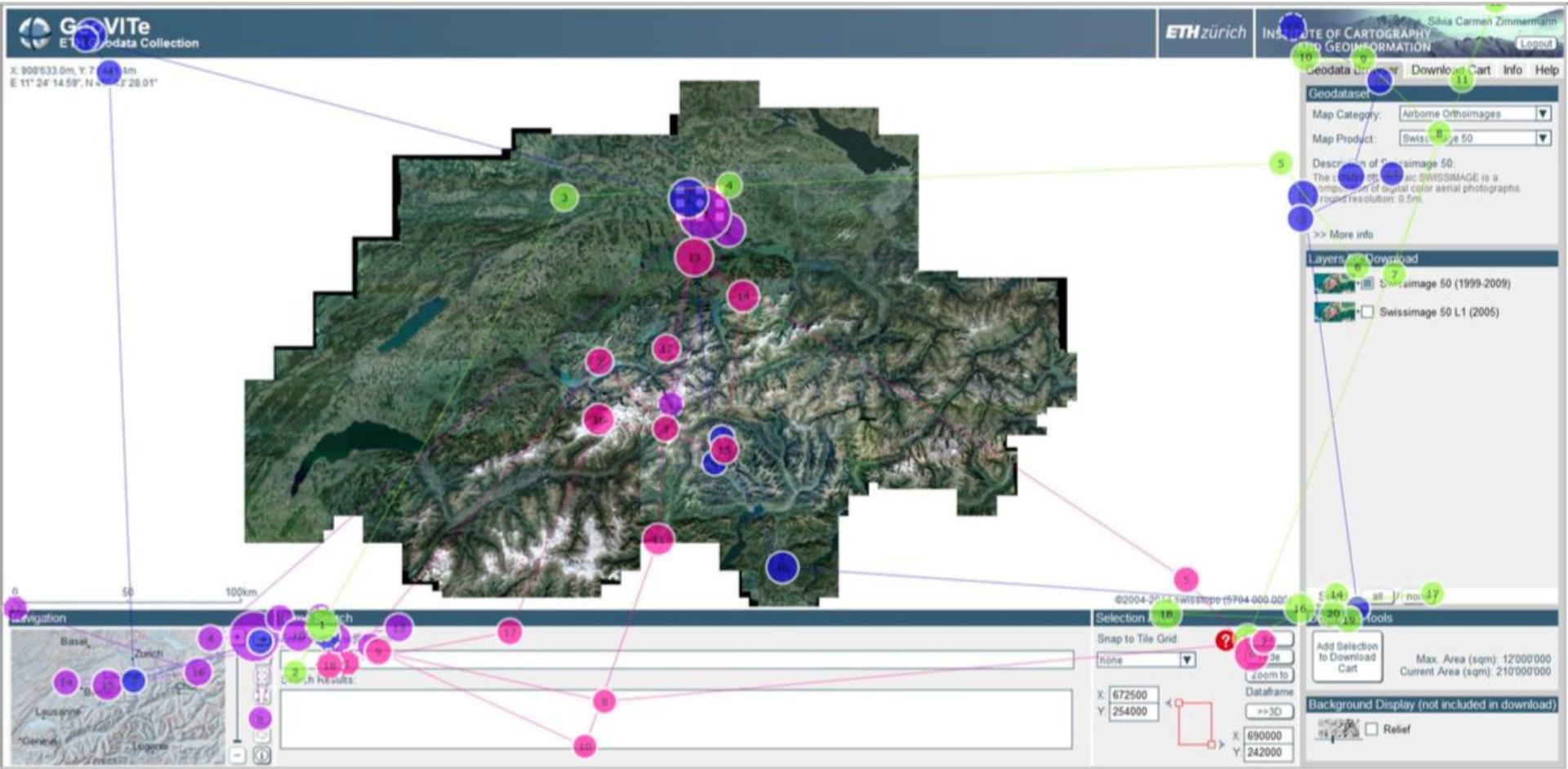


after Roth et al. 2015

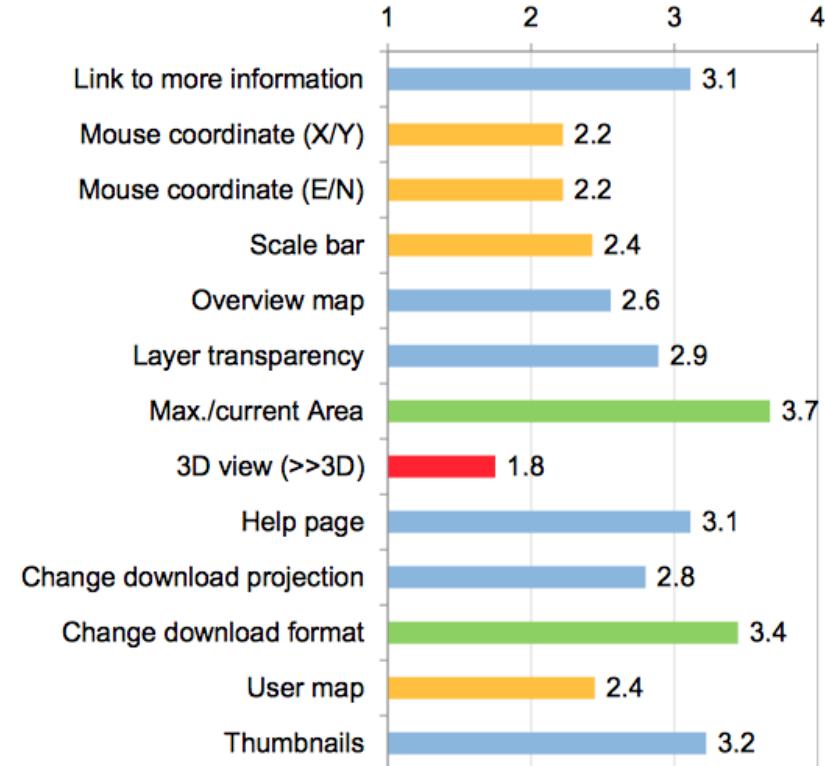
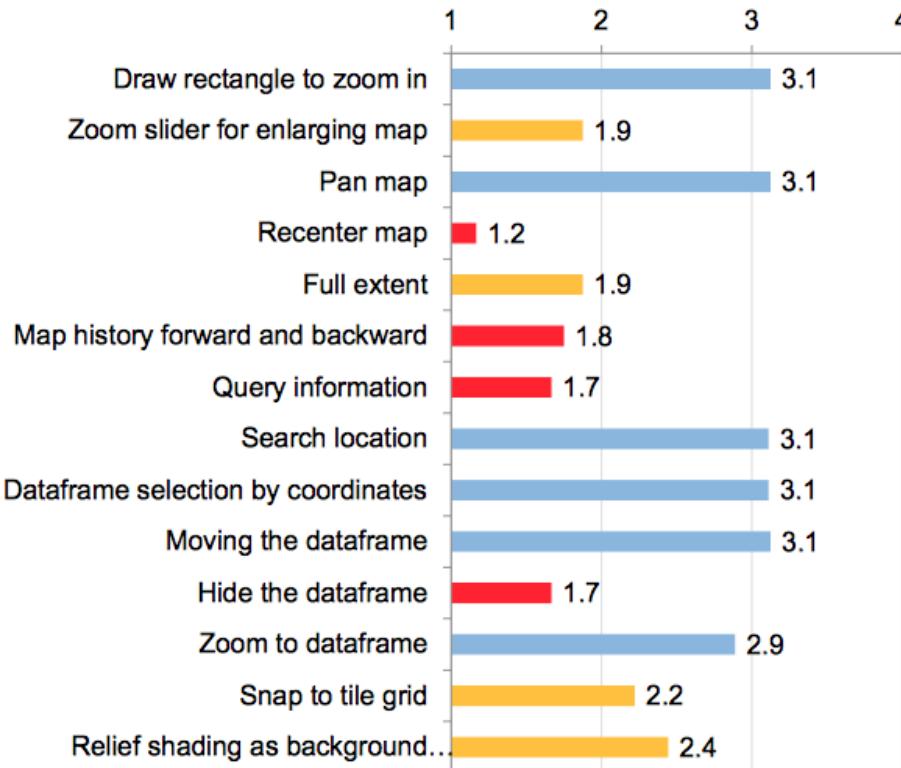
Usability Evaluation – Background

- **User Centered Design (UCD)** Tsou 2013
- **3 Components** Roth et al. 2015
 - Usability
 - Utility
 - User
- **Methodologies:**
 - Questionnaires
 - Interviews
 - Eye-tracking

Results: Eye-tracking



Results: Necessity of Functionality



The Next Design Step: Geodata4SwissEDU

The screenshot displays the Geodata4SwissEDU web application interface. The main area shows a topographic map of Switzerland with major cities labeled: Basel, Winterthur, St.Gallen, Zürich, Biel/Bienne, Neuchâtel, Bern, Fribourg, Yverdon-les-Bains, Thun, Luzern, Chur, Lausanne, Sion, and Genève. A green rectangular box highlights a specific area in the eastern part of the country. The right side of the screen contains a sidebar with several sections:

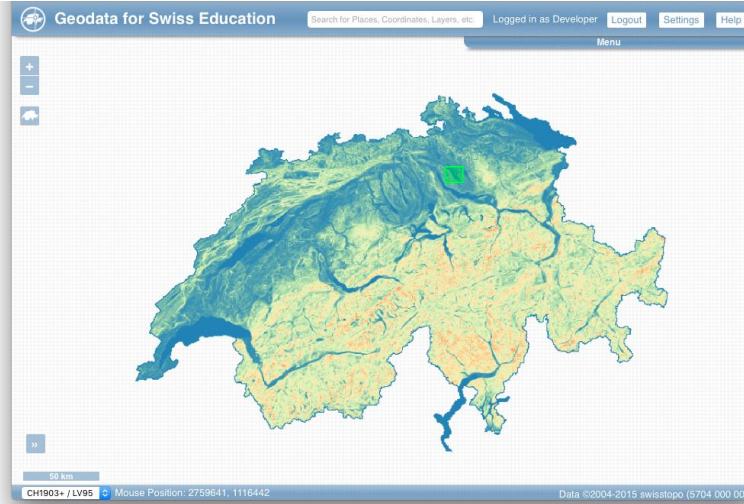
- Extent**, **Layers**, **Download**, **Tools** buttons
- SELECT DATASETS** section:
 - Topographic Raster Maps
 - Topographic Vector Maps
 - Digital Elevation Models
 - Orthoimages**:
 - Landsat (25m)
 - Spot
 - Swissimage 50
 - Swissimage 25
 - Thematic Maps
 - Historic Maps
- ACTIVE LAYERS** section:
 - Settlements (checked, red X)
 - Administrative Boundaries (checked, red X)
 - Hydrology - Lakes (checked, red X)
 - Relief 1000 (checked, red X)
 - Show/hide all (checkbox), Get all, Remove all buttons

At the bottom of the sidebar, there is a "Menu" button.

Map controls include zoom (+/-), pan (mouse icon), and a scale bar (50 km). A status bar at the bottom shows "CH1903+ / LV95" and "Mouse Position". The copyright notice "Data ©2004-2015 swisstopo (5704 000 000)" is also present.

Usability-Driven Recommendations

- Use a **Full Screen Map**
 - Overlay controls in collapsible & customizable menus
- Implement “**Standard**” **Navigation Controls**
 - Click and drag to pan, scroll to zoom, click to query, etc.



Usability-Driven Recommendations

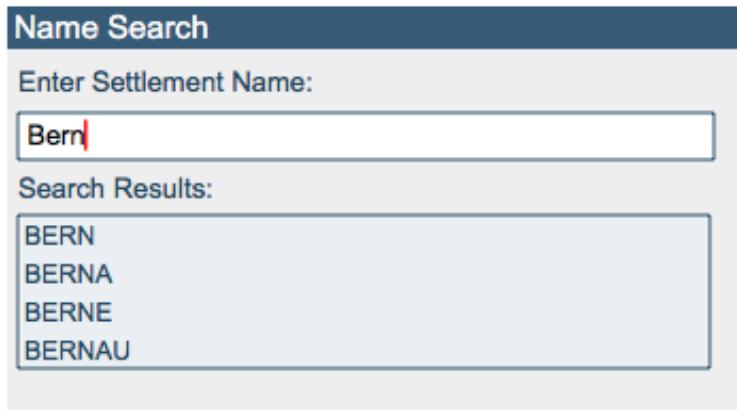
- Offer a **Multi-Purpose Search Function**
 - Search for places, coordinates, datasets, etc.
 - Allow imprecise search terms
 - Rank search terms according to relevance

GeoVITe:

Name Search

Enter Settlement Name:
Bern

Search Results:
BERN
BERNA
BERNE
BERNAU

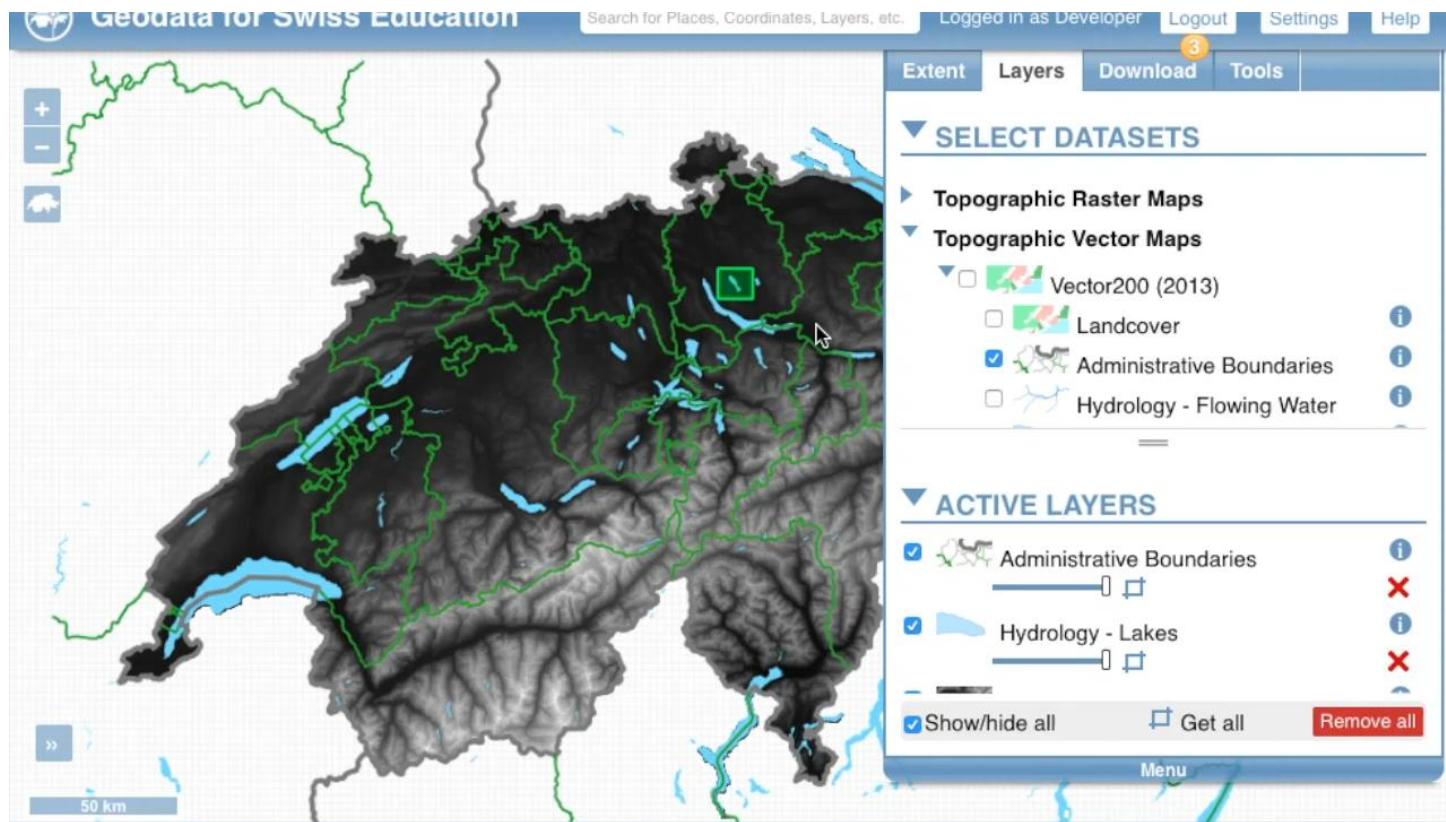


Geodata4SwissEDU:



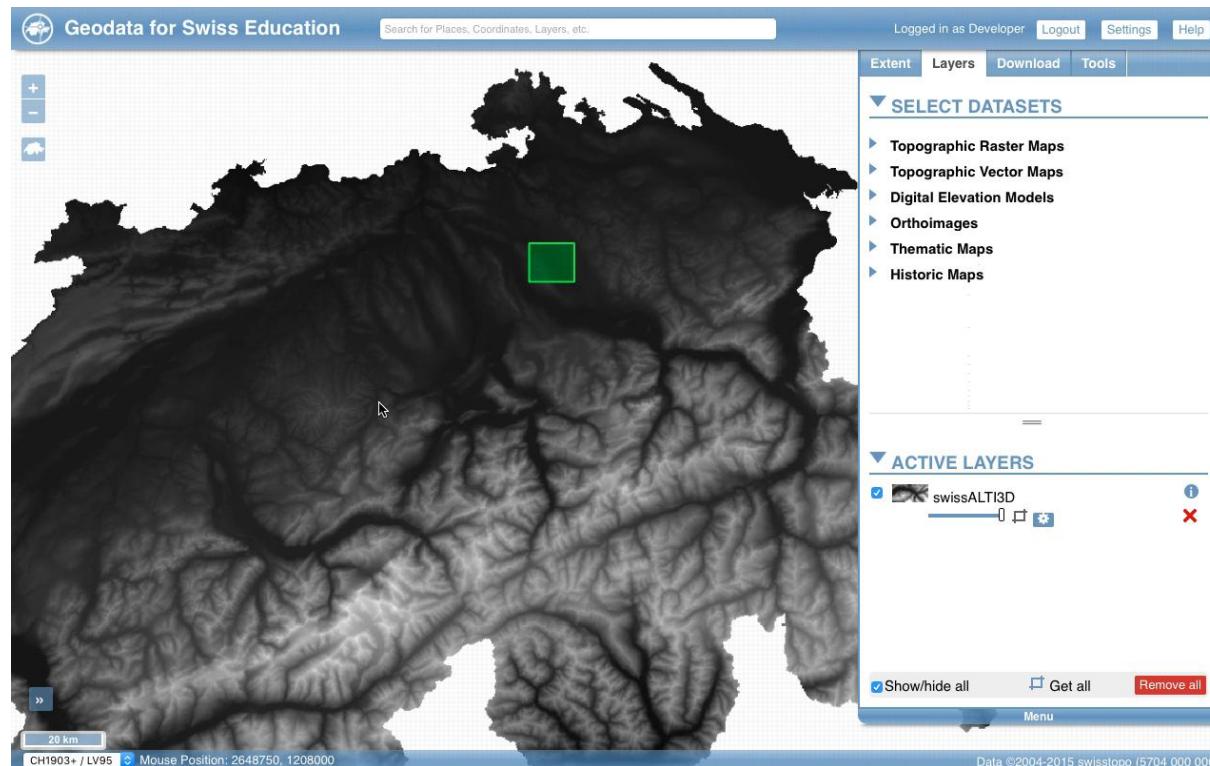
Usability-Driven Recommendations

- Allow **User Customization**
 - Collapsible panels, adjustable menus



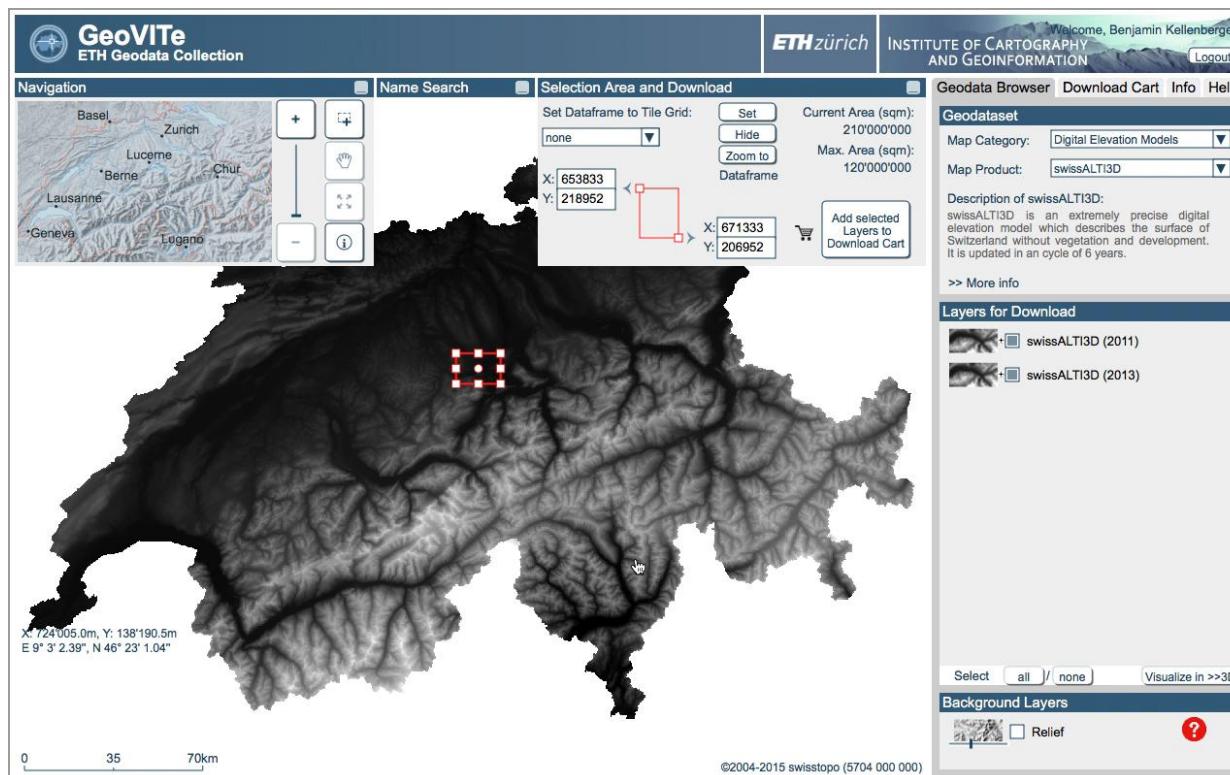
Usability-Driven Recommendations

- Allow Map Mashups
 - Content not limited to one topic, but layers arbitrarily combinable



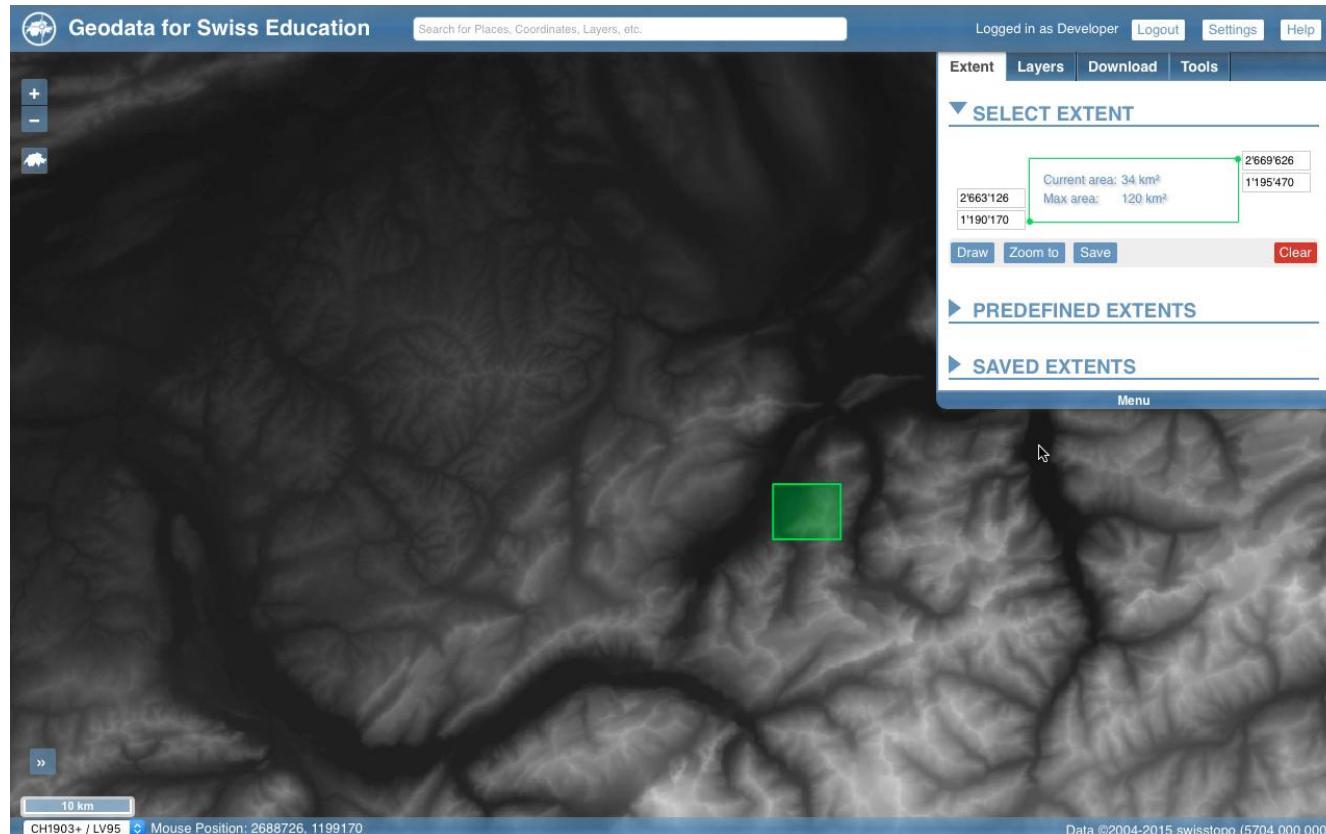
Usability-Driven Recommendations

- Provide Instant User Feedback for errors
- Before usability study in GeoVITE:



Usability-Driven Recommendations

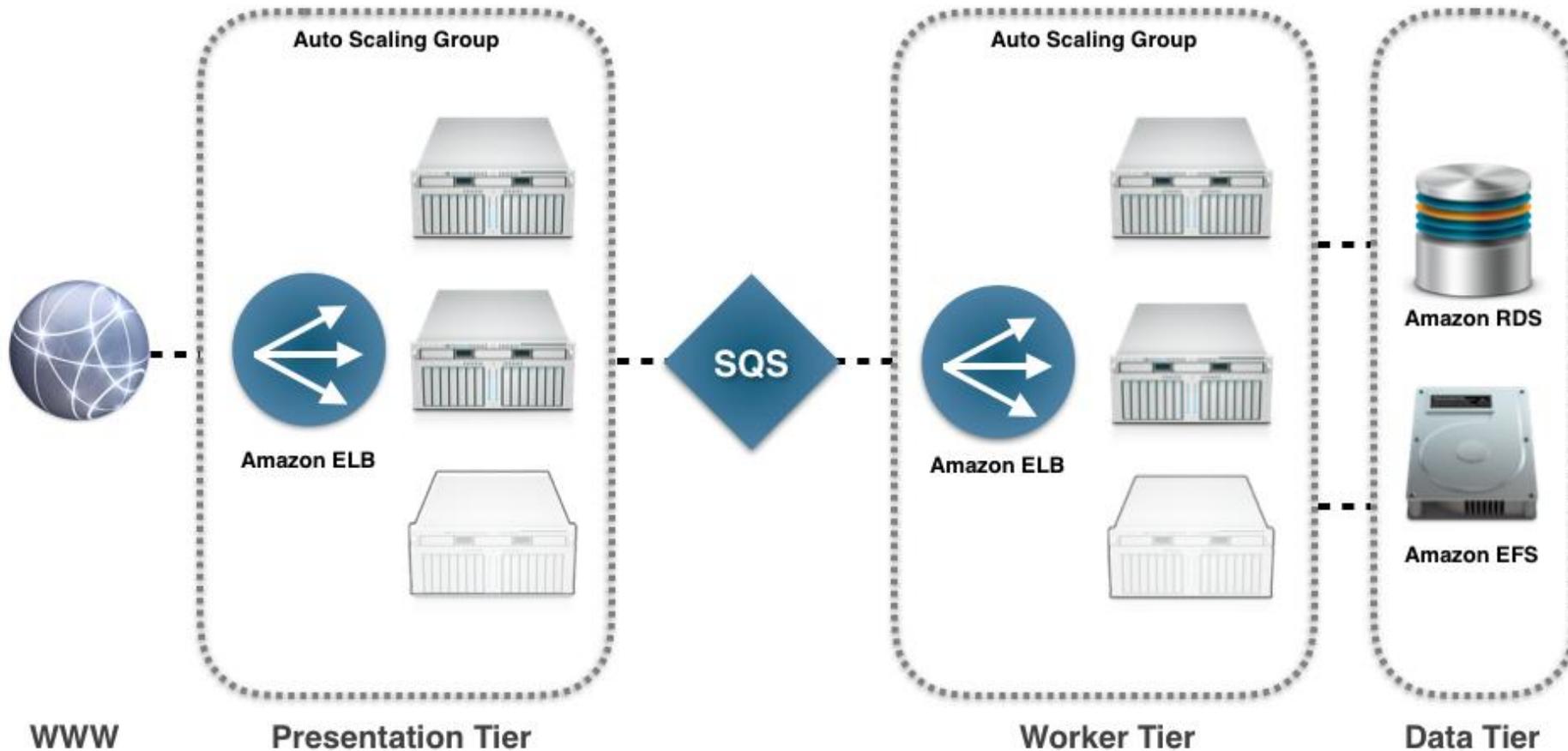
- After usability study in Geodata4SwissEDU



Outlook

- GeoVITe: more than just a User Interface
 - Expansion to national level (*Geodata4SwissEDU* project)
 - Goal: Swiss academic SDI
- Restructuring *under the hood*
 - New hard- & software for thousands of simultaneous users required
 - Intended solution: **Amazon Web Services (AWS) Cloud**

Outlook: Towards an AWS Cloud Solution



Thank you for your attention!



Literature

- Resch B, Zimmer B (2013): *User Experience Design in Professional Map-Based Geo-Portals*. ISPRS International Journal of Geo-Information 2(4), 1015-1037.
- Roth RE, Ross KS, MacEachren AM (2015): *User-Centered Design for Interactive Maps: A Case Study in Crime Analysis*. ISPRS International Journal of Geo-Information 4(1), 262-301.
- Tsou M (2013): *Revisiting Web Cartography in the United States: the Rise of User-Centered Design*. Cartography and Geographic Information Science 38(3), 250-257.

GeoVITe Roadmap

- Current technical limitations in GeoVITe:
 - Limited to small user groups (max. 20 simultaneous users)
 - Custom SVG-based GUI hard to maintain
- Upcoming: the *Geodata4SwissEDU* project:
 - Upscaling of GeoVITe to national level (in Switzerland)
 - Joint-collaboration between ETH Library, IKG/ETH Zurich & Hochschule für Technik Rapperswil (HSR)
 - Funded by swissuniversities.ch



Perfect time for a usability evaluation!

GeoVITe: Usability Evaluation

- 11 users (9 with previous GeoVITe experience)
- Predefined workflow:
 1. Pre-test interview: user behaviour, experience, etc.
 2. Eye-tracking on GeoVITe portal page
 3. Questionnaire: clearness of GUI elements, necessity of functionality
 4. Post-test survey: feedback on GeoVITe GUI quality

Usability Recommendations

- Use a **Full Screen Map**
 - Overlay controls in collapsible & customizable menus
- Implement “**Standard**” **Navigation Controls**
 - Click and drag to pan, scroll to zoom, click to query, etc.
- Be **Consistent** in the styling of **Controls**
 - Button symbols only if meaning salient, no automatic tab changes, etc.
- Offer a **Multi-Purpose Search Function**
 - Search for places, coordinates, datasets, etc.
 - Allow imprecise search terms
 - Rank search terms according to relevance

Usability Recommendations

- Allow **User Customization**
 - Collapsible panels, adjustable menus
- Allow **Map Mashups**
 - Content not limited to one topic, but layers arbitrarily combinable
- Provide **Instant User Feedback** for errors



The **GeoVITe-Geodata4SwissEDU** Portal

- Built from scratch with open source technology (OpenLayers 3, QGIS Server) → easier to maintain
- Based on usability evaluation feedback
- Omission of unused functionality
- Improved and new interoperability tools
- Much more customizability