

KEEPING PACE with EMERGING web mapping technologies

Richard Donohue (@rgdonohue)

Timothy Wallace (@wallacetim)

Carl Sack (@northlandiguana)

Robert Roth (@RobertERoth)

Tanya Buckingham (@tanmabuck)

University of Wisconsin-Madison

D3 satellite projection by @mbostock

introduction

we *research*
design
develop
and **teach**
web
maps

introduction

farewell sweet Flash...

Winner of
2012 NACIS

Dynamic Map
Competition!



DEPARTMENT OF
GEOGRAPHY
University of Wisconsin-Madison 

Department | People | Graduate | Undergraduate | GIS Certificate | Courses | Science Hall Resources Search

 **Geography 575 — Spring 2012**

Interactive Cartography & Geovisualization

Geography 575 provides a comprehensive overview of topics related to dynamic mapping, topics typically considered under the cartographic research thrusts of Interactive Cartography and Geovisualization.

Final Maps:

Wetland Gems Viewer
authors: **Chris Long, Madeline Emde, Danielle Lee** | video: [Wetland Gems Viewer](#)
Geoportals leverage the connection between vision and cognition to improve the understanding and access to diverse types of data. Applying intuitive well-theorized browsing methods to a rich collection of pictures, texts and maps. The Wetland Gems Mapper (WGM) facilitates an efficient user-friendly browsing experience of these documents.

Weevil Viewer
authors: **Julia Janicki, Max Conway, Chao He Guo** | video: [Weevil Viewer](#)
This map explores systematic entomology and is build around a state-wide survey of Wisconsin's four families of primitive weevils (Nemionychidae, Anthribidae, Attelabidae, Brentidae).

problem statement

The collage illustrates several technologies used for creating maps and visualizations:

- Leaflet**: An Open-Source JavaScript Library for Mobile-Friendly Interactive Maps by CloudMade. It features a navigation bar with Overview, Features, Tutorials, Download, Plugins, Blog, GitHub, and Twitter.
- Data-Driven Documents**: A page showing examples of D3.js visualizations, including a sunburst chart, a network graph, and a treemap.
- OpenLayers: Free Maps for the Web**: A page for the OpenLayers library, which allows putting dynamic maps in web pages. It includes sections for Get OpenLayers Now!, About, Supporting OpenLayers, and For Developers!
- Google Maps API**: A page for the Google Maps API, which enables adding maps functionality to websites. It features a sidebar with links like Overview, Location-Based Apps, Mobile Apps, Visualize, Customize, License, Showcase, Documentation, and Videos.
- Adobe Flash Professional CS5**: A screenshot of the Adobe Flash Professional interface, showing the 'Create from Template' and 'Create New' panels. The 'Create New' panel lists options like ActionScript 3.0, ActionScript 2.0, Adobe AIR 2, iPhone OS, Flash Lite 4, ActionScript File, and Flash JavaScript File.

A large blue question mark is overlaid on the center of the images, indicating a problem or lack of integration between these technologies.

4 guiding questions

Q#1

which technologies or tool(s)
should we use for web mapping?

4 guiding questions

Q#2

what are web maps
and **what is web mapping?**

Q#1

development?

4 guiding questions



how do we
teach these tools?

Q#3

Q#2

Q#1

design?
development?

4 guiding questions

Q#4

can
we cope
with **change**?

Q#3

teaching?

Q#2

design?

Q#1

development?

4 guiding questions

Q#4

process?

Q#3

teaching?

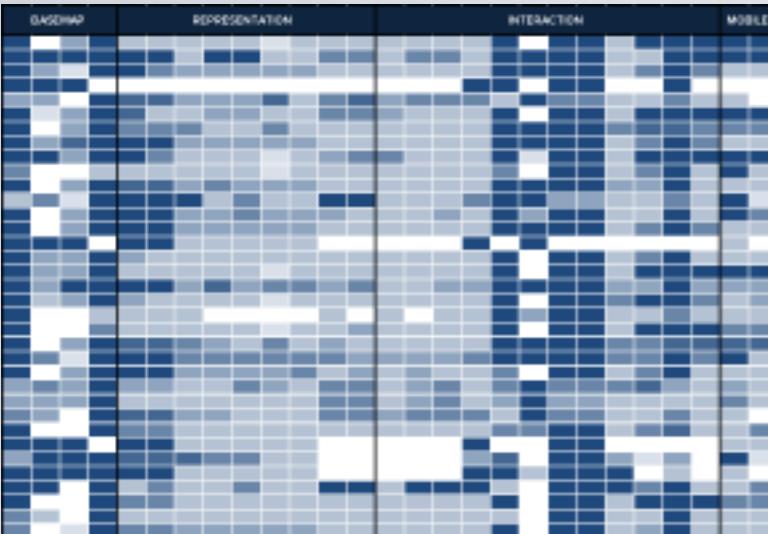
Q#2

design?

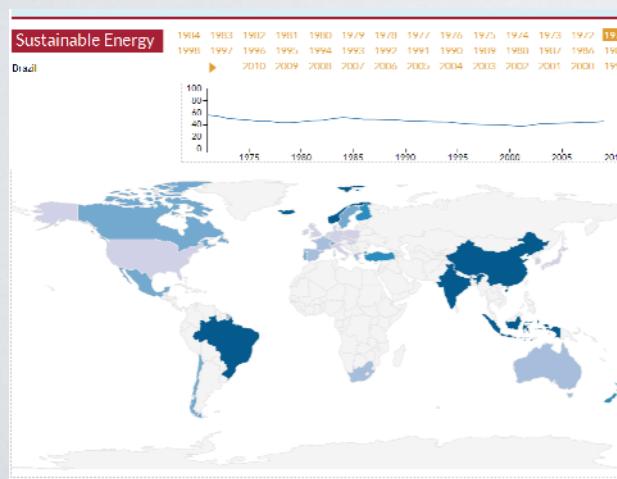
Q#1

development?

overview of our process



part I. competitive analysis study



part III. diary study

part II. needs assessment survey

 WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

1. Please provide 4-6 keywords (multiple word phrases are OK) that describe your current work responsibilities.

Please mark the category that best describes your affiliation with the UW System:

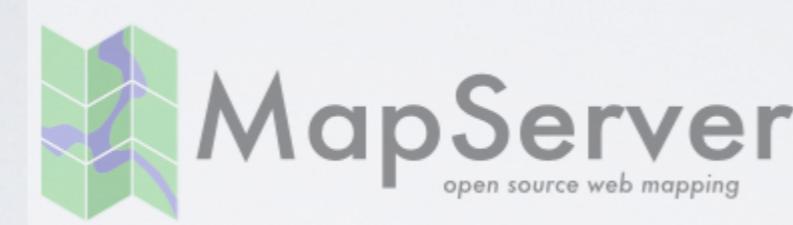
Undergraduate Student
 Graduate Student
 Staff
 Faculty
 Not Affiliated
 Other:

How frequently do you assemble and/or manipulate geographic information in your own daily work?

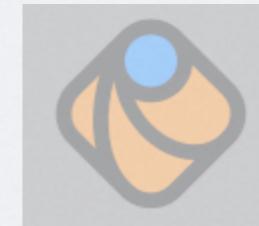
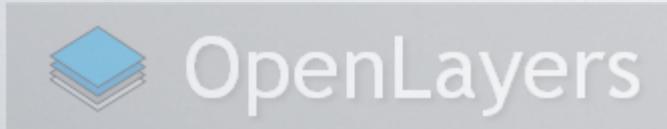
daily
 weekly
 monthly
 yearly
 never
 I supervise this activity, but do not regularly complete it myself

part I. competitive analysis study

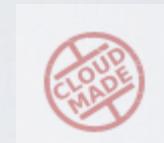
How did we do it?



Polymaps



jump



MAPSTRACTION

Javascript mapping abstraction library

Bing Maps API
CartoDB
CartoWeb
Cloudmade
d3
deCarta
GeoEXT
GeoMoose
G Maps API
Jump
Ka-Map
Kartograph
Leaflet
MapBender
Mapnik
MapQuery
MapQuest API
MapServer
Mapstraction
Modest Maps
Nokia
OpenLayers
OpenScales
Polymaps
Processing
Processing.js
Raphaël
ReadyMap
Tiledrawer
TileMill
Tilestache
TimeMap
ViaMichelin
Wax
WorldKit

Web mapping
options go here!



BASEMAP**REPRESENTATION****INTERACTION****MOBILE**

Bing Maps API			
CartoDB			
CartoWeb			
Cloudmade			
d3			
deCarta			
GeoEXT			
GeoMoose			
G Maps API			
Jump			
Ka-Map			
Kartograph			
Leaflet			
MapBender			
Mapnik			
MapQuery			
MapQuest API			
MapServer			
Mapstraction			
Modest Maps			
Nokia			
OpenLayers			
OpenScales			
Polymaps			
Processing			
Processing.js			
Raphaël			
ReadyMap			
Tiledrawer			
TileMill			
Tilestache			
TimeMap			
ViaMichelin			
Wax			
WorldKit			

Categories up here.

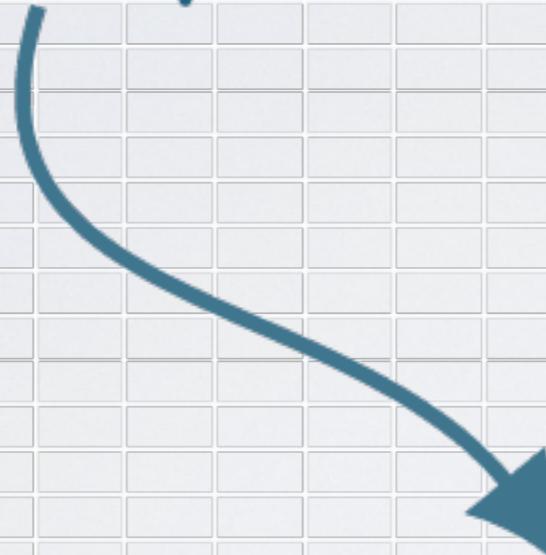


BASEMAP**REPRESENTATION****INTERACTION****MOBILE**

Bing Maps API
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Polymaps
Processing
Processing.js
Raphaël
ReadyMap
Tiledrawer
TileMill
Tiltestache
TimeMap
ViaMichelin
Wax
WorldKit

Toggle Map Types
Map Styling
Custom Tiling
Custom Vectors
Choropleth
Proportional Symbol
Dot Density
Isoline/Surface
Flow
Cartogram
Bivariate/Multivariate
Animation
Graphics/Charts
Reexpress
Arrange/Linked Views
Sequence
Resymbolize
Overlay/Toggle
Reproject
Pan
Zoom
Filter
Search
Retrieve
Calculate
Mobile Support
Location Aware

Specific feature
requirements go here.



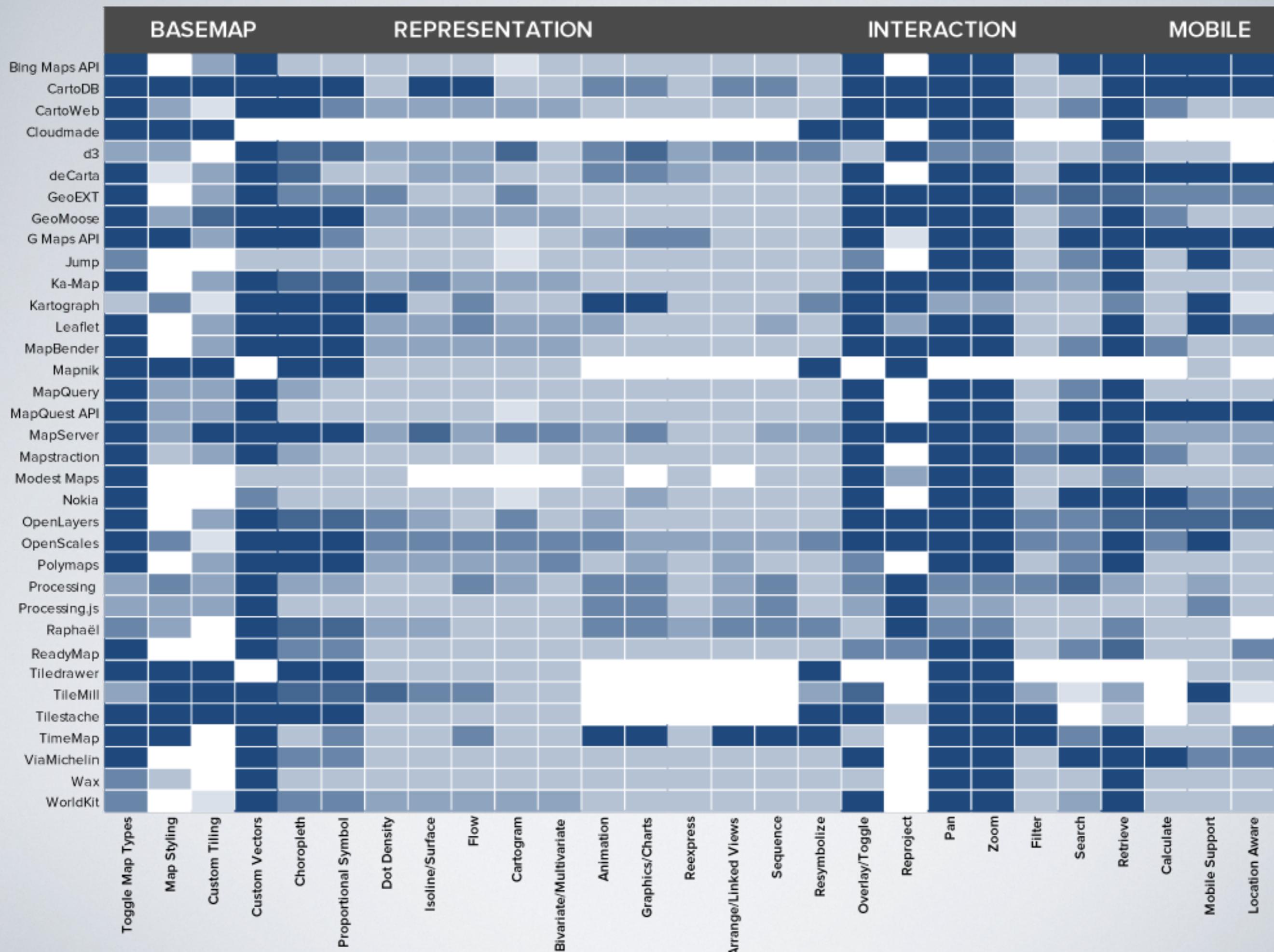
How did we code these options for feature support?

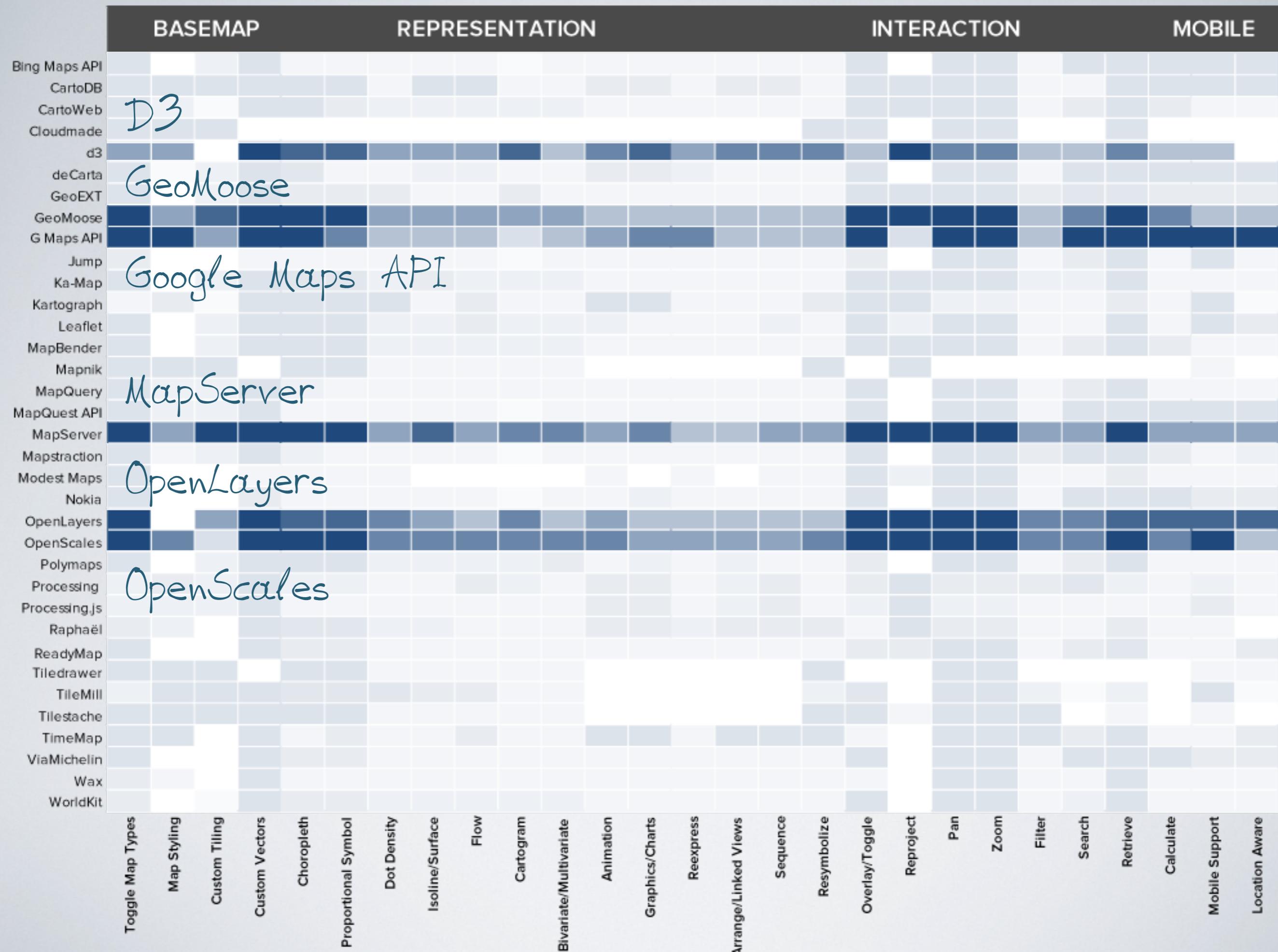
1: supported natively out-of-the-box

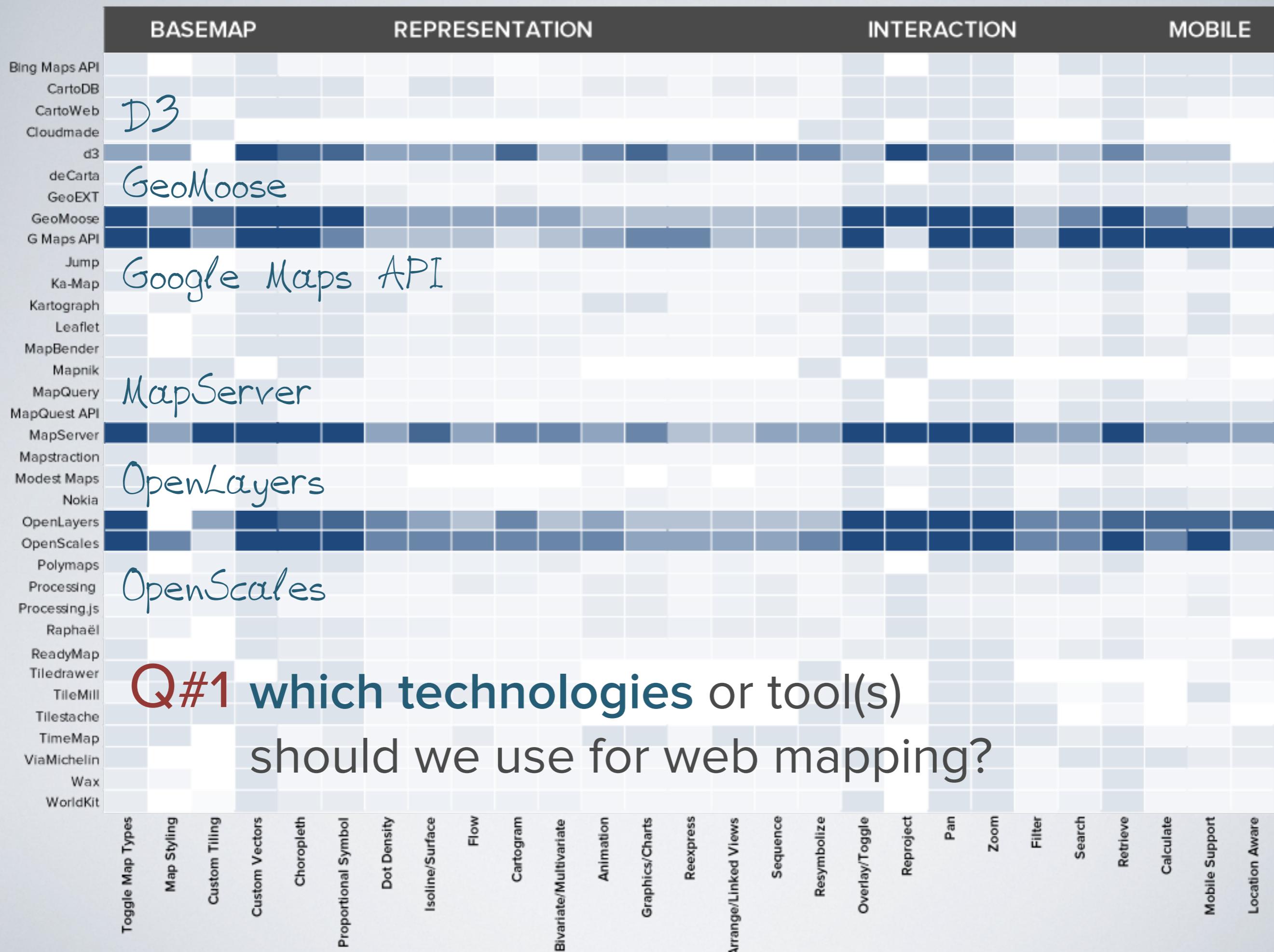
2: knowing existing work-around

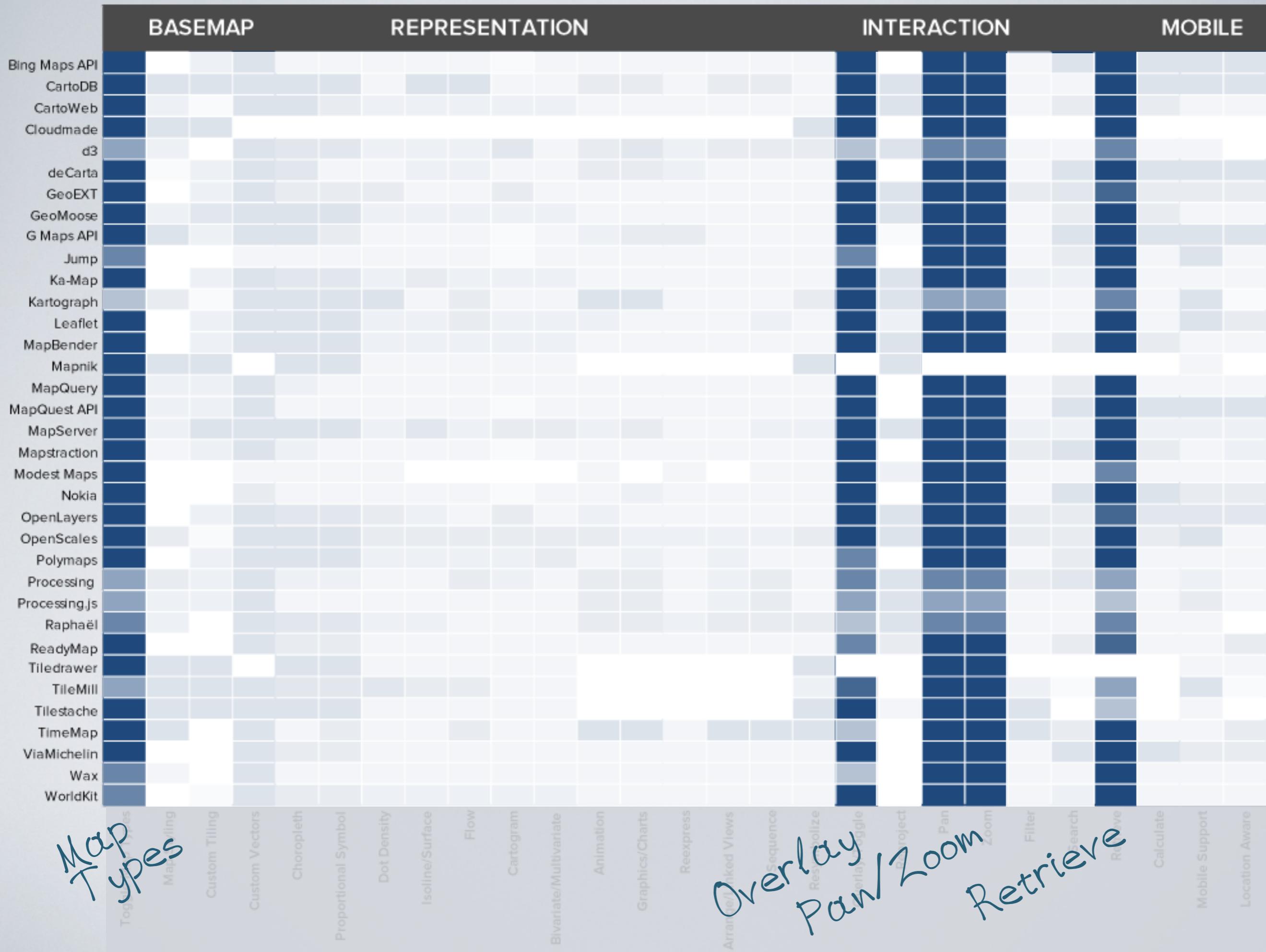
3: appears to require a hack

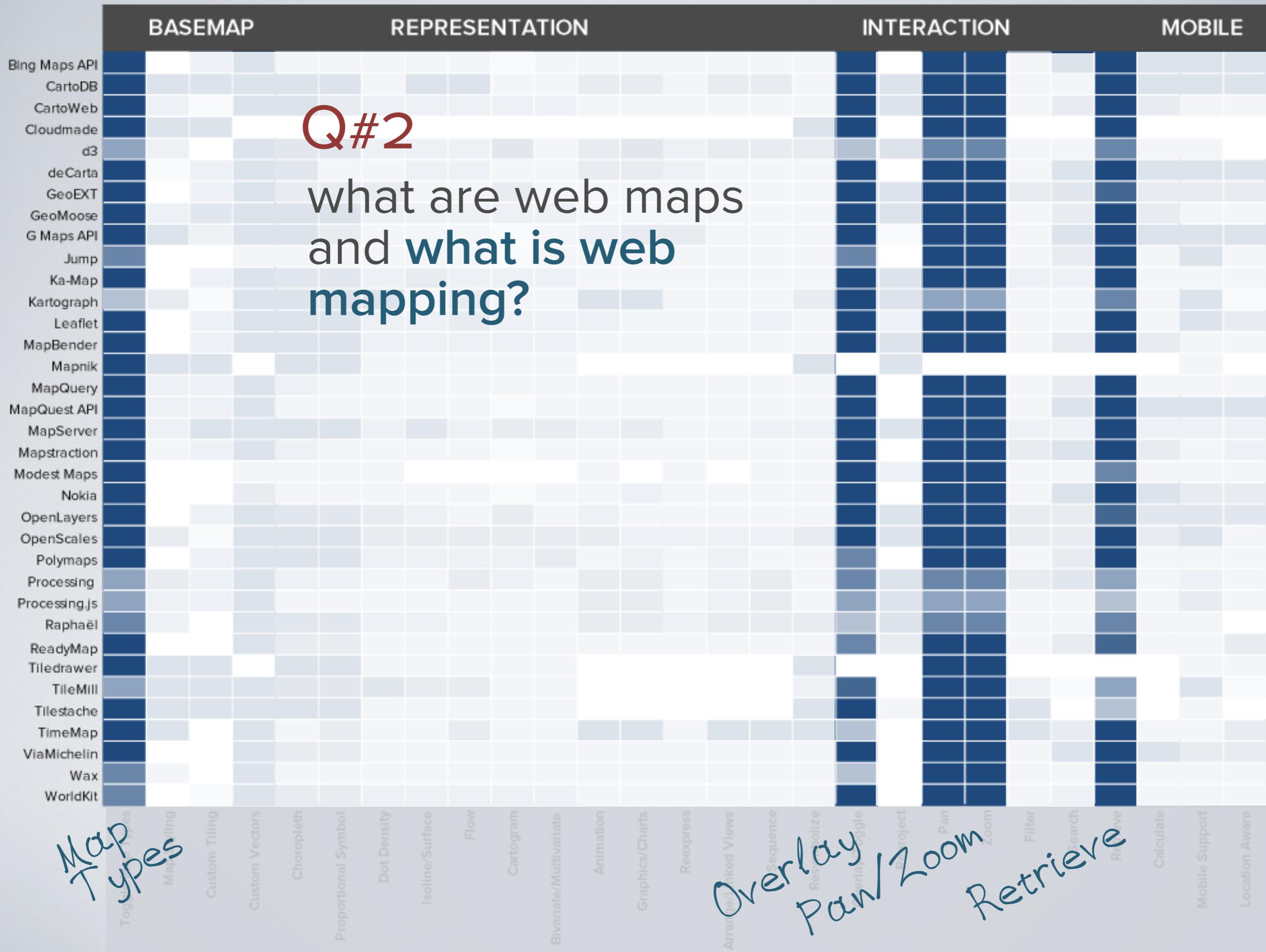
4: not possible

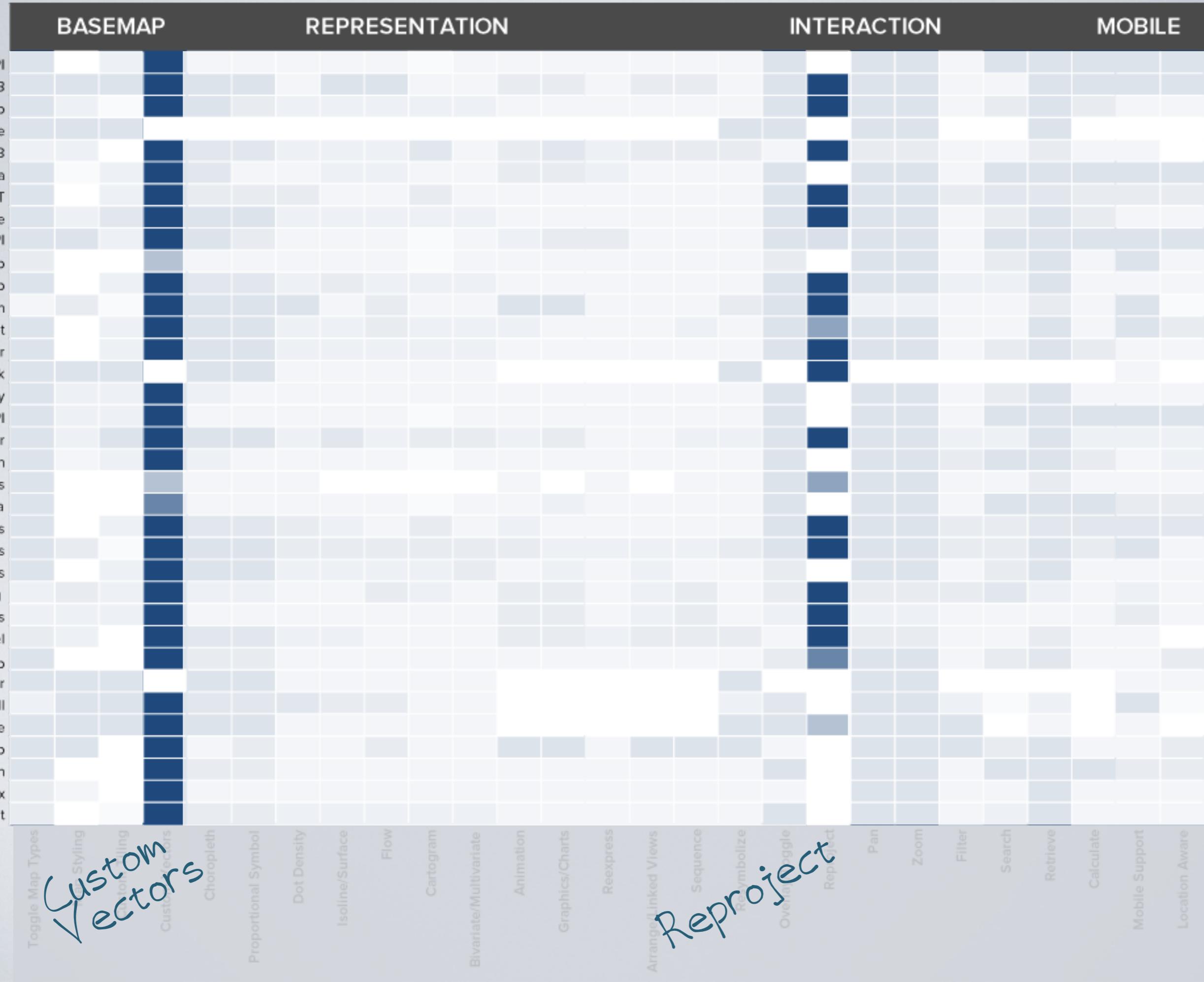


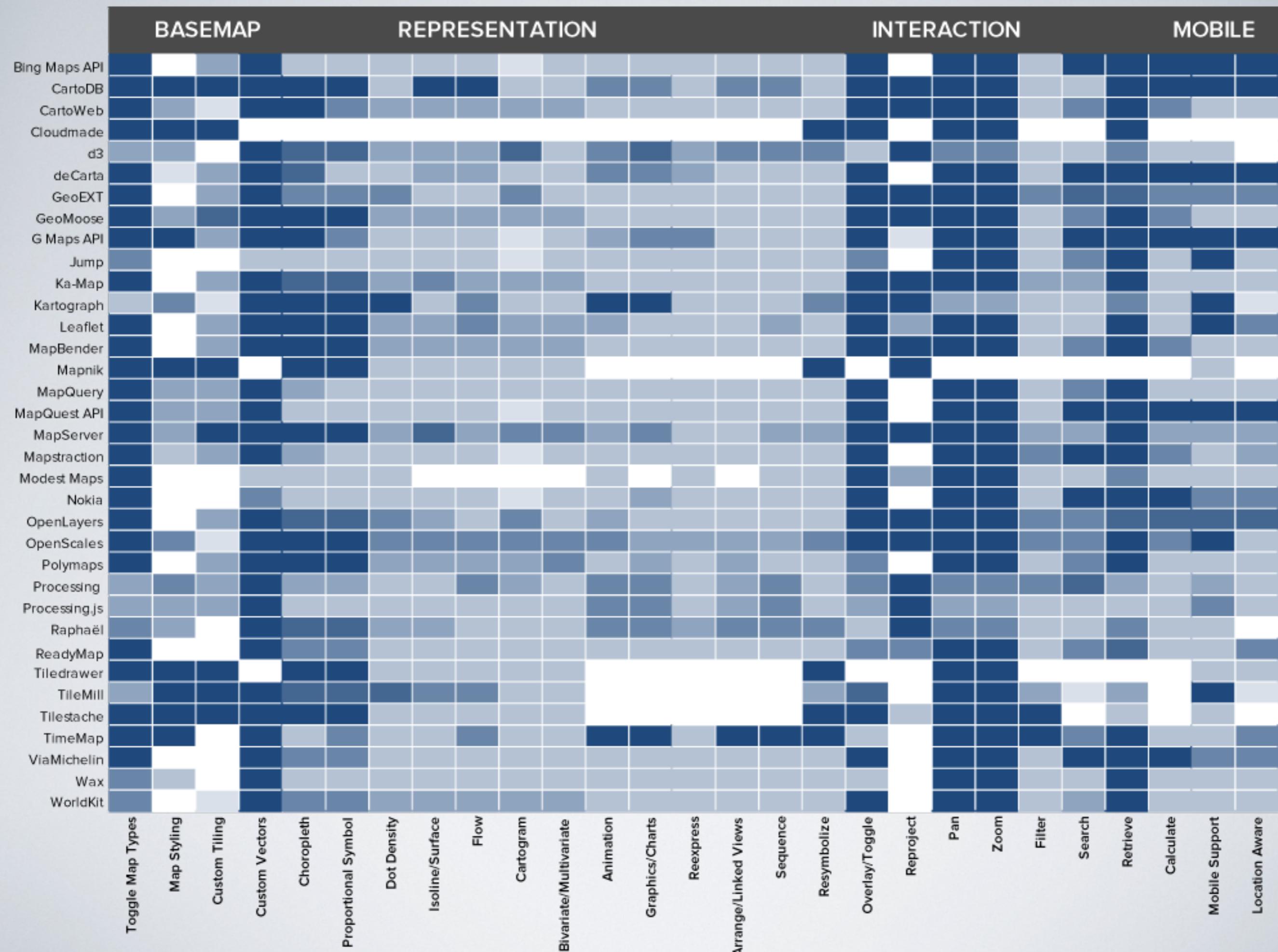










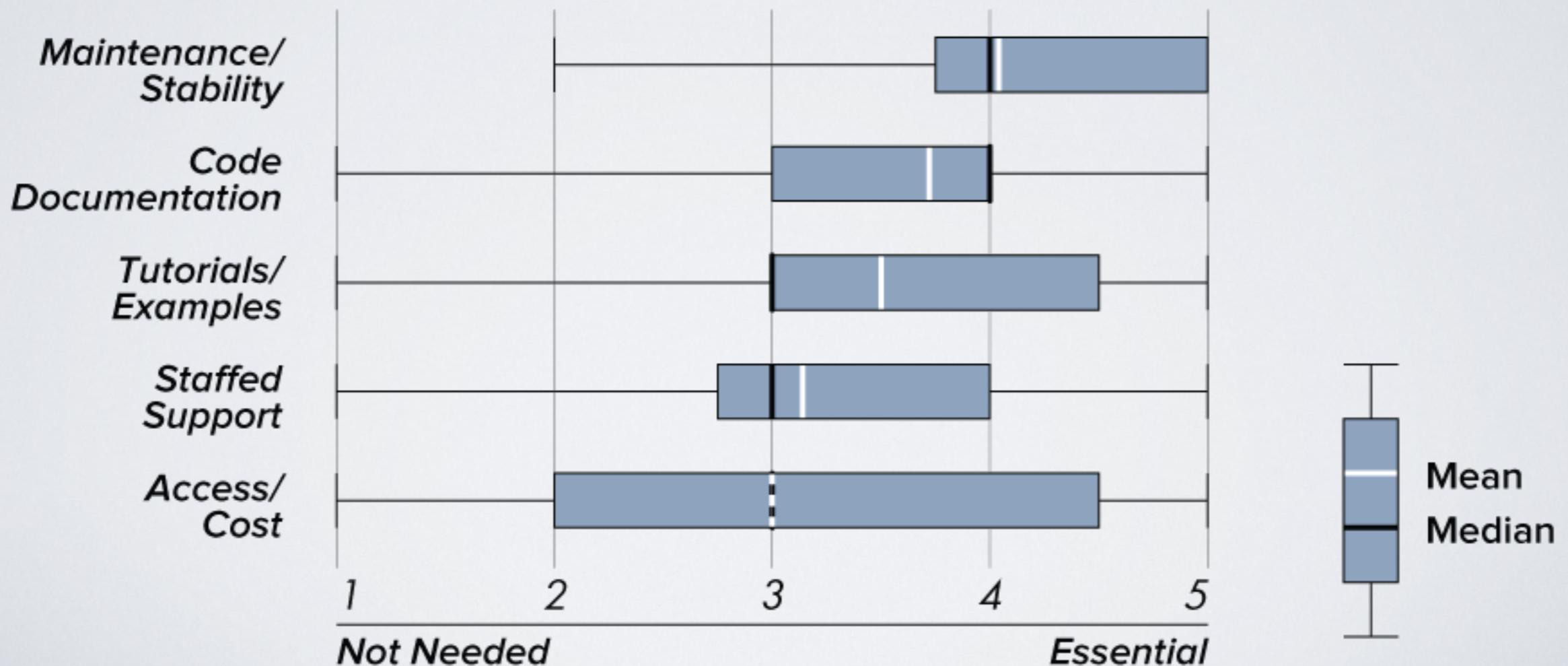


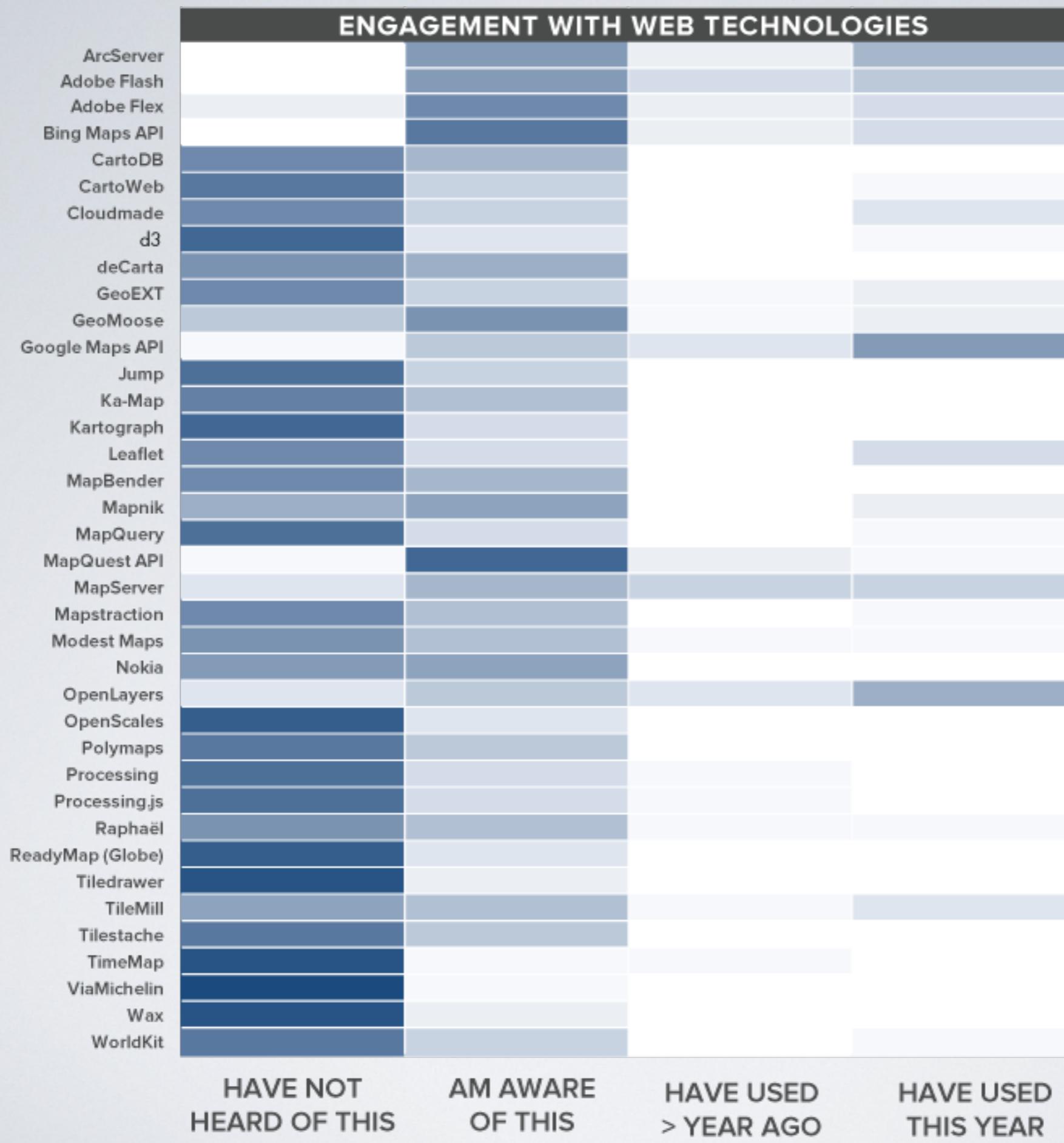
part II. needs assessment survey

How did
we do it?

what did we **LEARN?**

Please rate the importance of the following practical considerations:





n=21 █ High
 n=0 █ Low

HAVE NOT
HEARD OF THIS

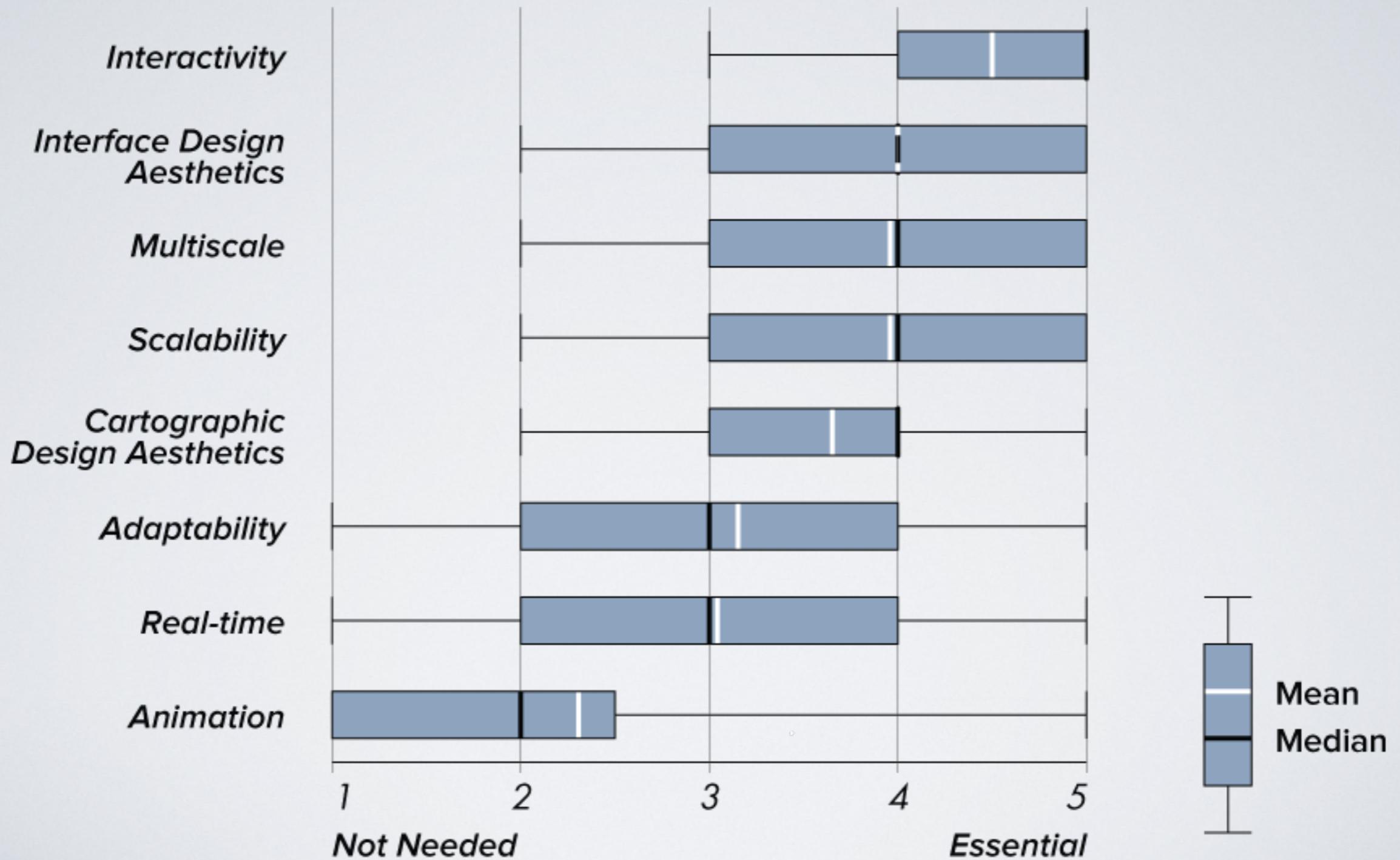
AM AWARE
OF THIS

HAVE USED
> YEAR AGO

HAVE USED
THIS YEAR

part II. needs assessment survey

Please rate importance of the following characteristics of web maps:



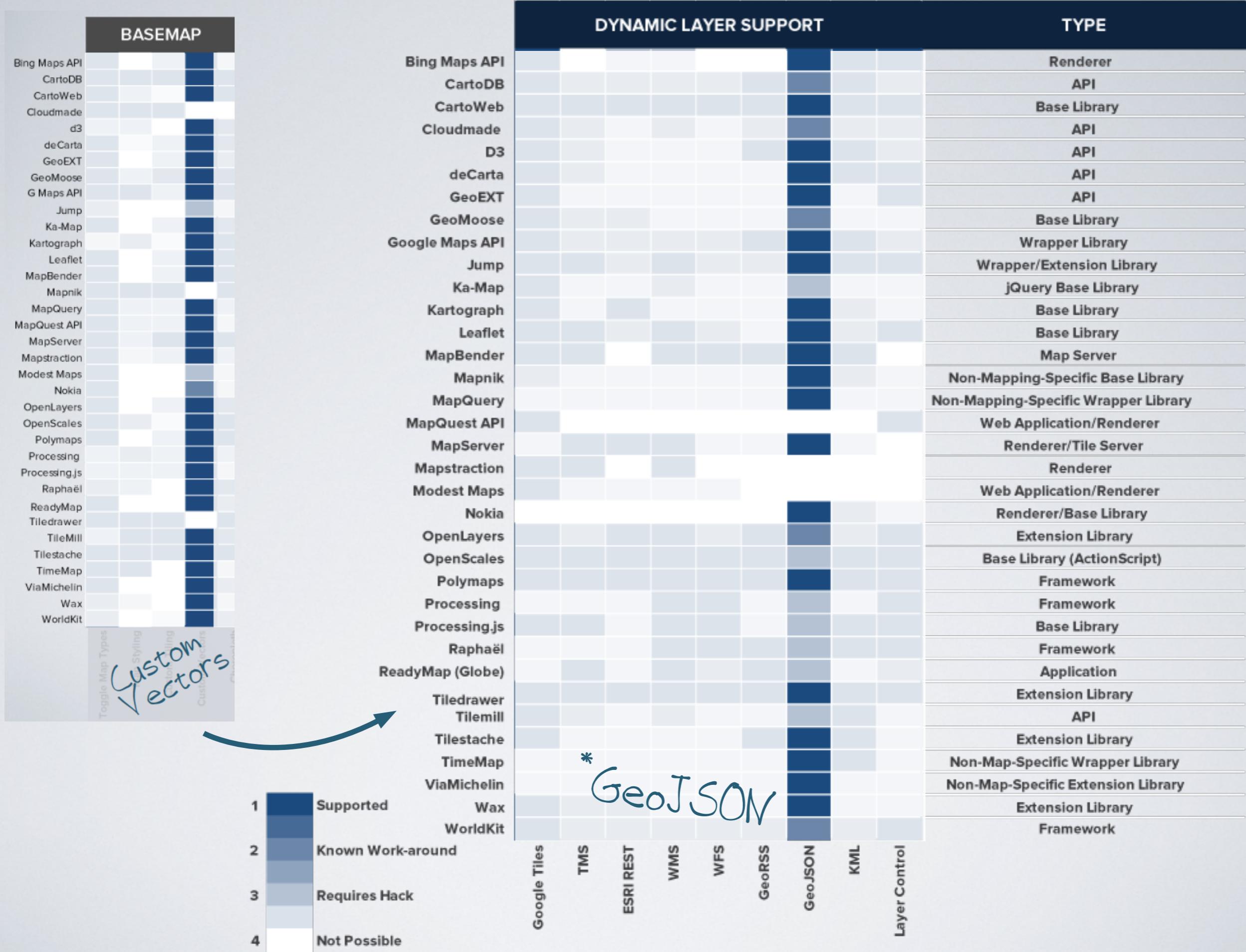
part II. needs assessment survey

* engagement with web mapping technologies

“In testing technologies for next generation web apps, we’re quickly moving primarily toward **JavaScript**-based frameworks. Current frameworks under consideration include **OpenLayers**, **Leaflet**, and **GeoEXT**. This is primarily for interface development.

Web service and **tile authoring, storage and delivery** are fairly independent of this.”

- anonymous survey participant



part III. diary study

Leaflet

The screenshot shows the official Leaflet website. At the top, there's a navigation bar with links for Overview, Features, Tutorials, API, Download, Plugins, Blog, GitHub, Twitter, and Forum. Below the navigation is a banner announcing "July 30, 2012 — Leaflet 0.4 Released with Lots of Exciting Improvements! — Read More in the Blog". The main content area contains text about Leaflet being a modern open-source JavaScript library for mobile-friendly interactive maps, developed by Vladimir Agafonkin of CloudMade. It highlights its use on various platforms like iOS and Android, and its focus on usability and performance. A small map of London is shown at the bottom.

D3

The screenshot shows the official D3.js website. At the top, there are links for Overview, Examples, Documentation, and Source. The main title is "Data-Driven Documents". Below the title are several examples of data visualizations: a sunburst chart of Spain and Portugal, a network graph of flight routes, a bubble chart of protein interactions, a treemap visualization of data, a chart showing time of day, arrival delay, and distance, and a scatter plot of nutritional data for various foods.

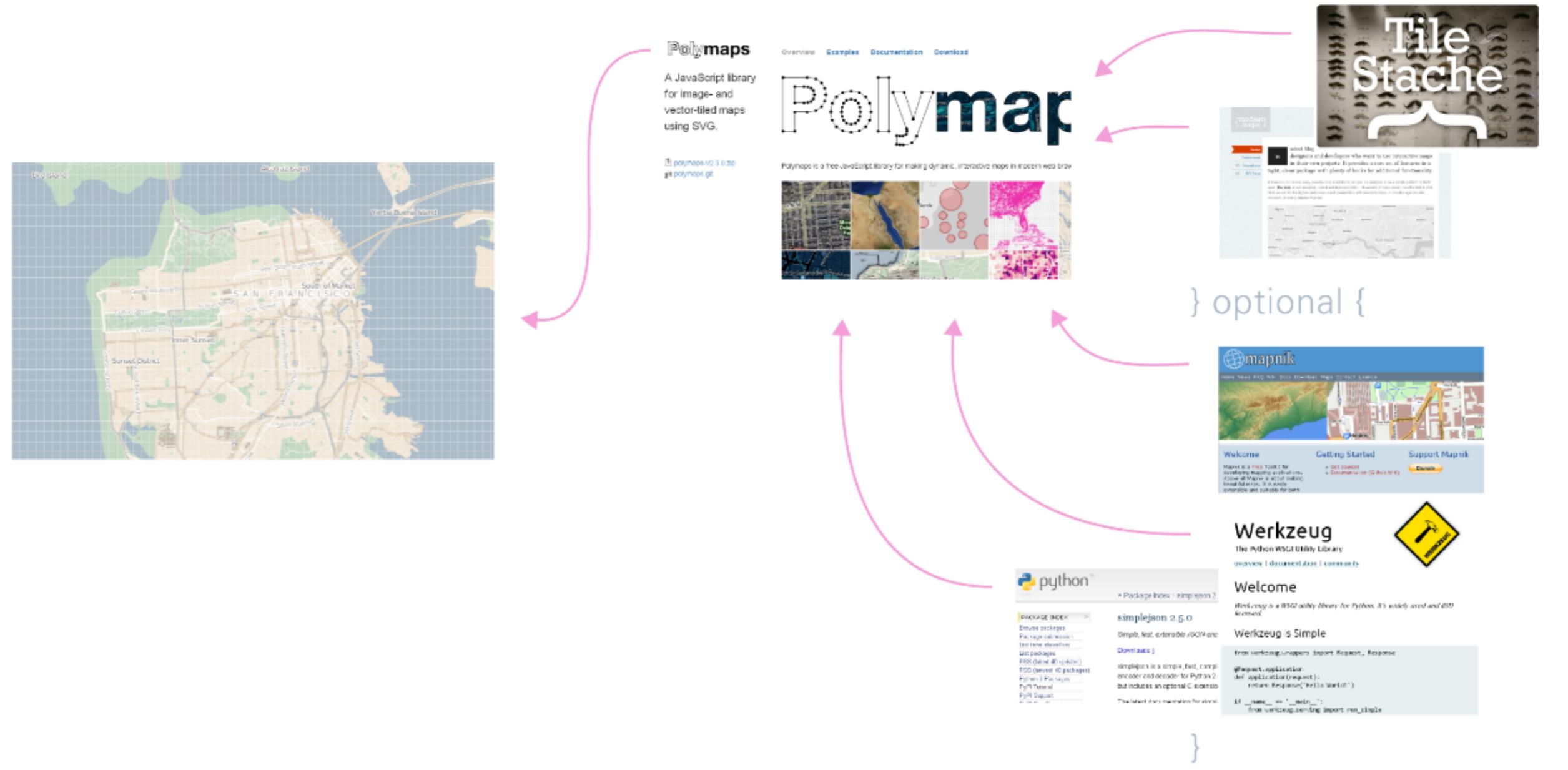
OpenLayers

The screenshot shows the official OpenLayers website. At the top, there are links for Sponsorship and Documentation. The main content area includes a section titled "OpenLayers: Free Maps for the Web" with a "Get OpenLayers Now!" link to version 2.12. It also features a world map with zoom controls and a "Put an open map wi" button. Other sections include "About...", "Supporting OpenLayers", and "For Developers!". The "About..." section provides a brief overview of what OpenLayers is and how it can be used. The "Supporting OpenLayers" section discusses the community and sponsorship. The "For Developers!" section explains the library's nature as a pure JavaScript library.

Google Maps API

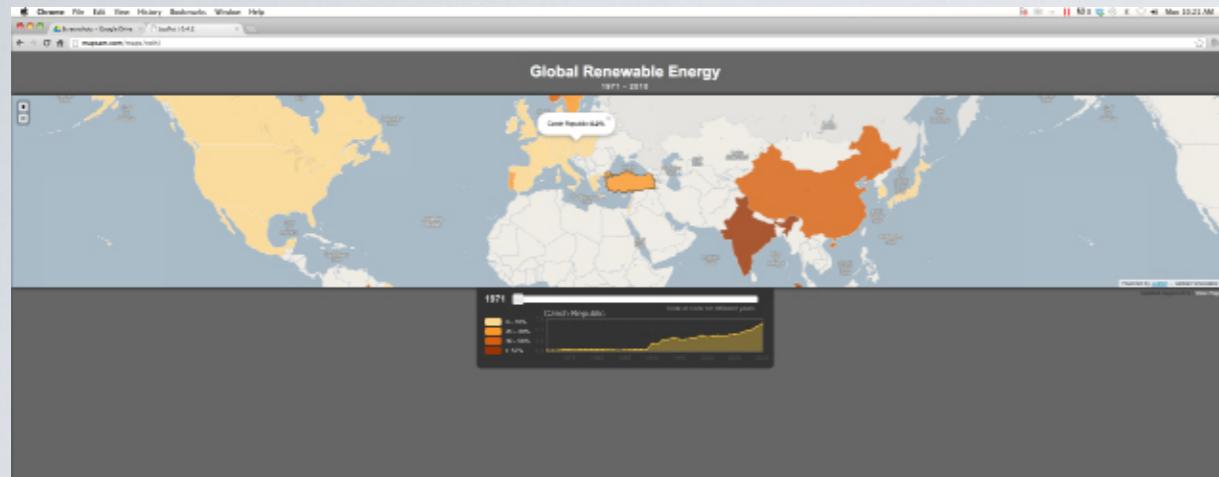
The screenshot shows the official Google Maps API website. At the top, there are links for Overview, Location-Based Apps, Mobile Apps, Visualize, Customize, Licensing, Showcase, Documentation, and Videos. The main content area features a large image of a map of Tokyo with the Colosseum overlaid, with the text "More Than a Map" and "Explore features for your apps.". Below this, there's a smaller image of a map of San Francisco with the text "Easily add maps functionality to your site in three steps."

Tools and workflow of making a Polymap

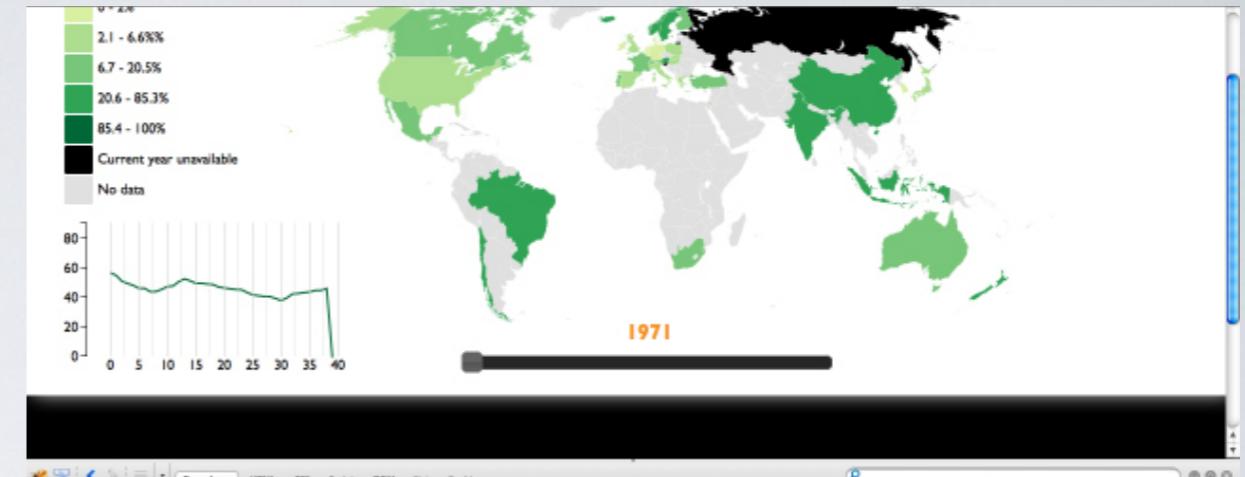


part III. diary study

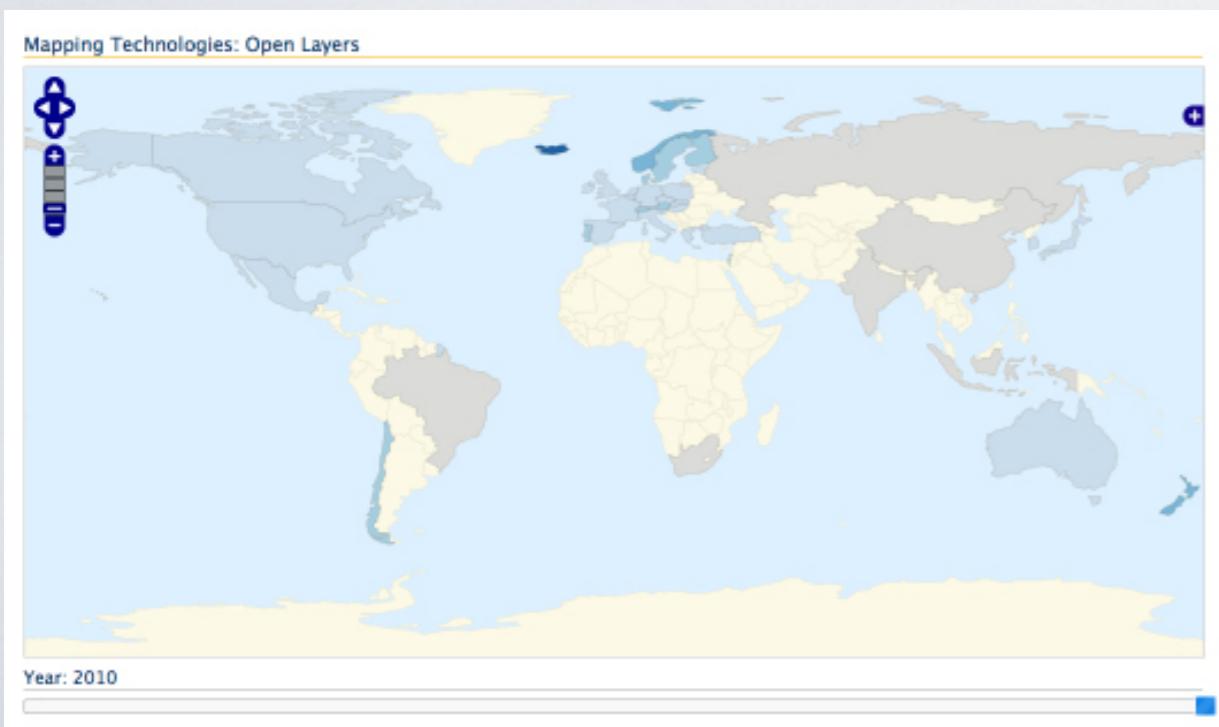
Leaflet



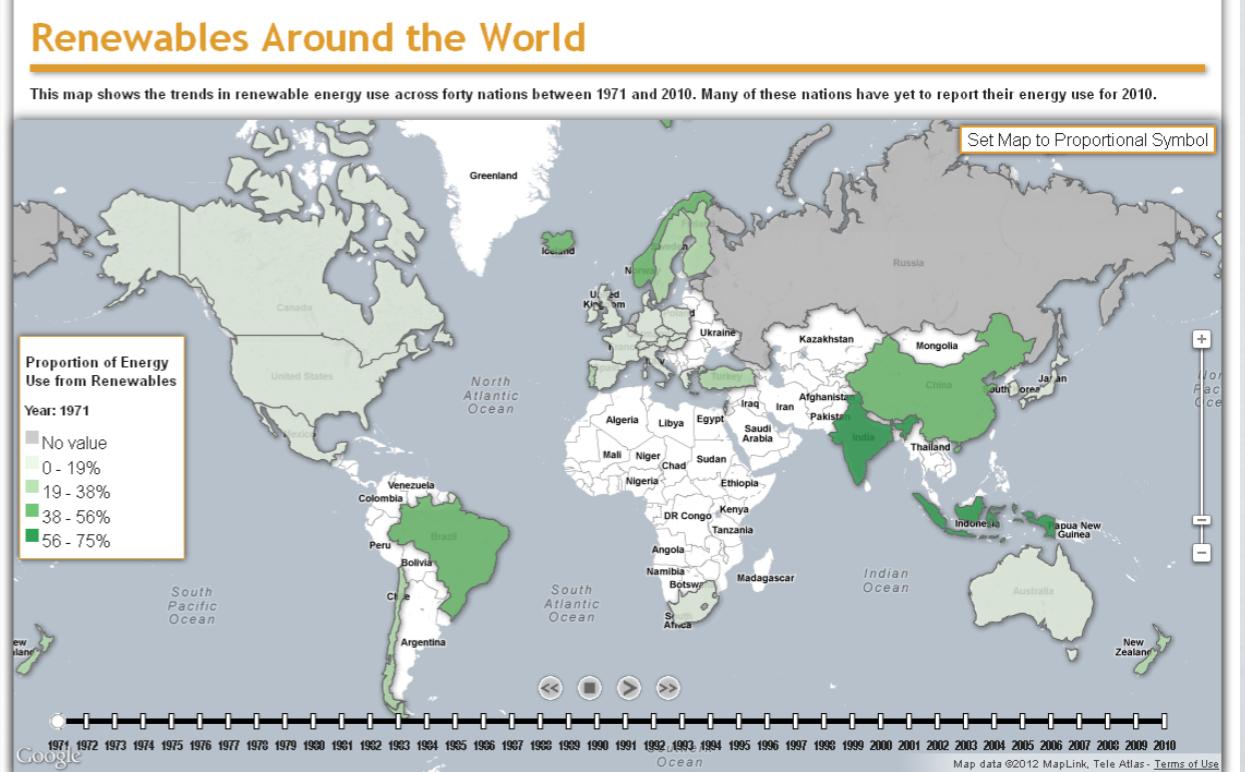
D3



OpenLayers



Google Maps API



part III. diary study

REPRESENTATION



map types: support each of the following map types; follow all associated conventions

classed choropleth (visual variable = color hue+value)

graduated symbol (visual variable = size)

animation: animate the map over the included time periods

typography: label map features following typographic conventions; labels may be suppressed at the global zoom level

classification: use an equal interval classification scheme for both the choropleth and graduated symbol map

legend: dynamically (re)draw the map legend to match the displayed map type

highlighting: include a highlighted variant of each map feature to indicate selection

information graphic: include a line graph showing the signature of a selected country in comparison to the United States and the median value for the year

visual hierarchy: style the basemap to produce a strong visual hierarchy

storytelling: provide a title and supplementary text to introduce the subject/purpose

cartographic design aesthetics: customize the look and feel of the map

part III. diary study

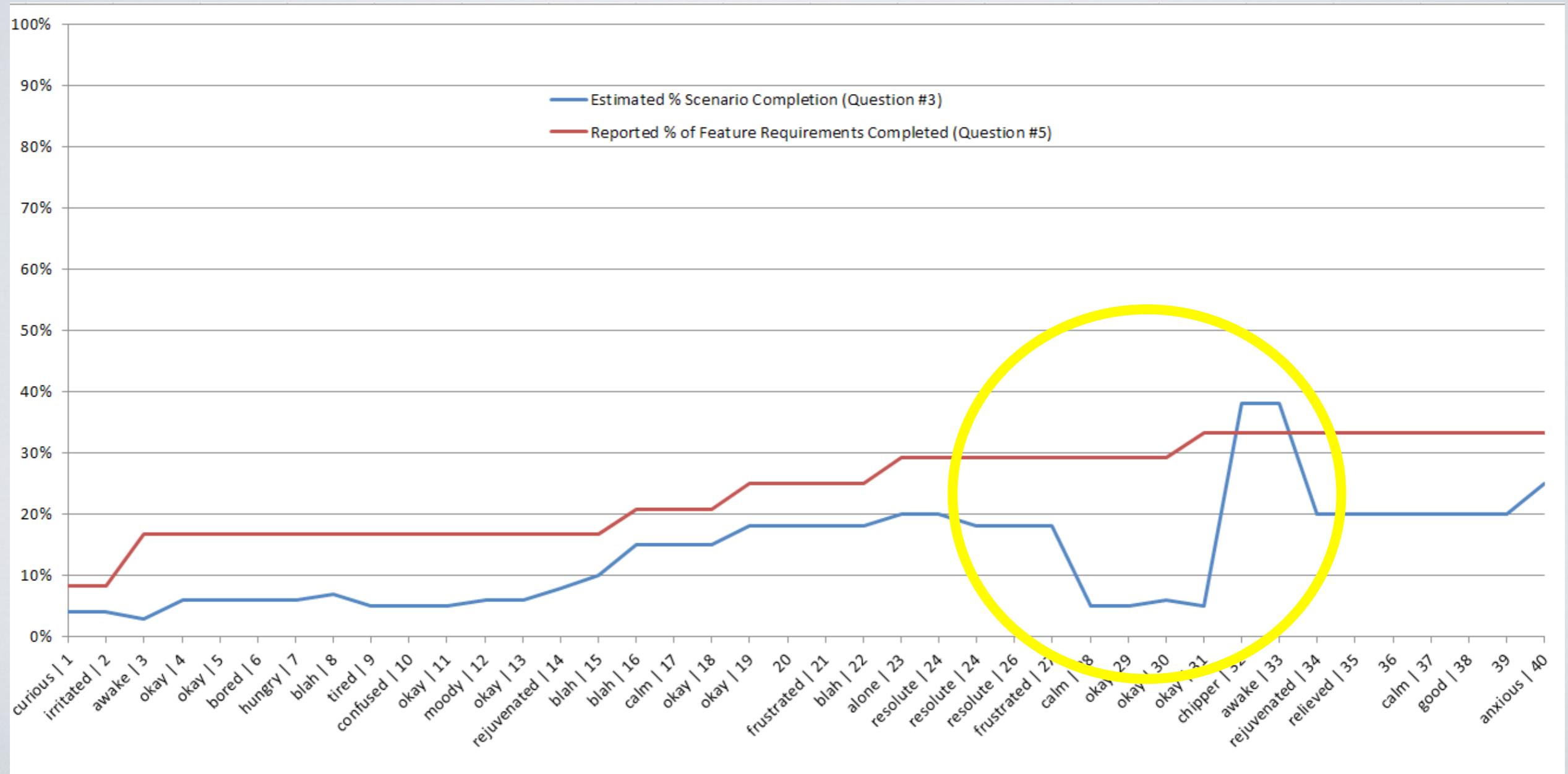
Z
O
N
E
I
N
T
R
A
C
T
I
V
E
I
N
T



- reexpress:** change the displayed map type between choropleth and graduated symbol
- sequence:** include standard VCR controls (play, stop, step, back) to control the animation
- resymbolize:** change the number of classes used for the choropleth or graduated symbol map; allow the user to range from 3 to 20
- overlay:** toggle between a vector map and aerial image basemap
- reproject:** set the map projection to an equal area
- pan:** change the geographic center of the map
- zoom:** change the scale and resolution (of labels) of the map
- filter:** filter the map according to the attribute range using a two-thumb slider; matching map features should become highlighted
- search:** allow the user to search for a specific country; matching map features should become highlighted
- retrieve:** highlight a probed map feature and activate an associated information window with details about the feature
- calculate:** dynamically calculate deviation of a map feature from median (i.e., percentile) and include in the information window upon retrieve
- link:** coordinate retrieve with the line graph to show the selected map feature in context with the United States and the median
- interface design aesthetics:** customize the look and feel of the interface

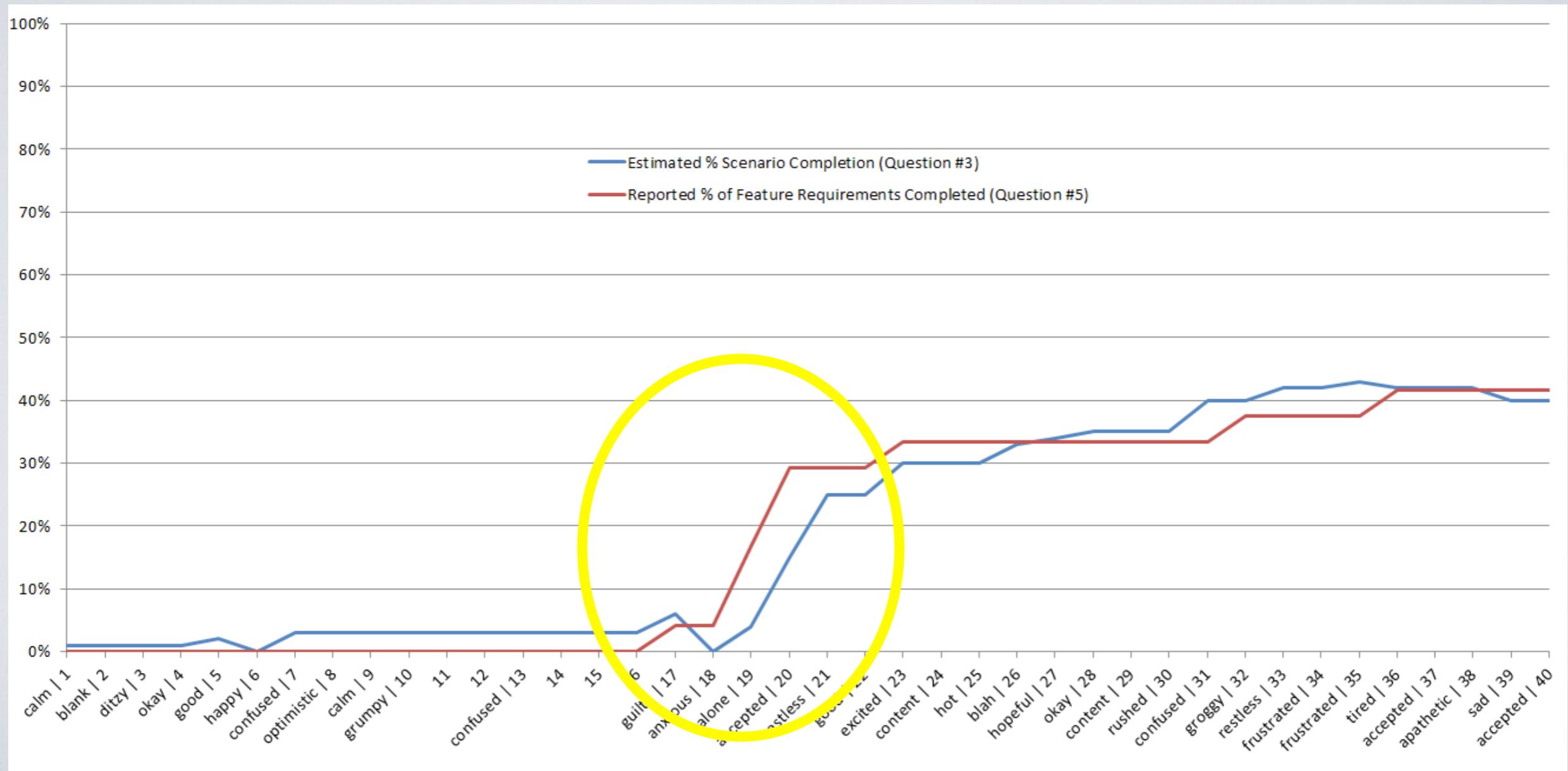
part III. diary study

* refactoring the Google Maps API



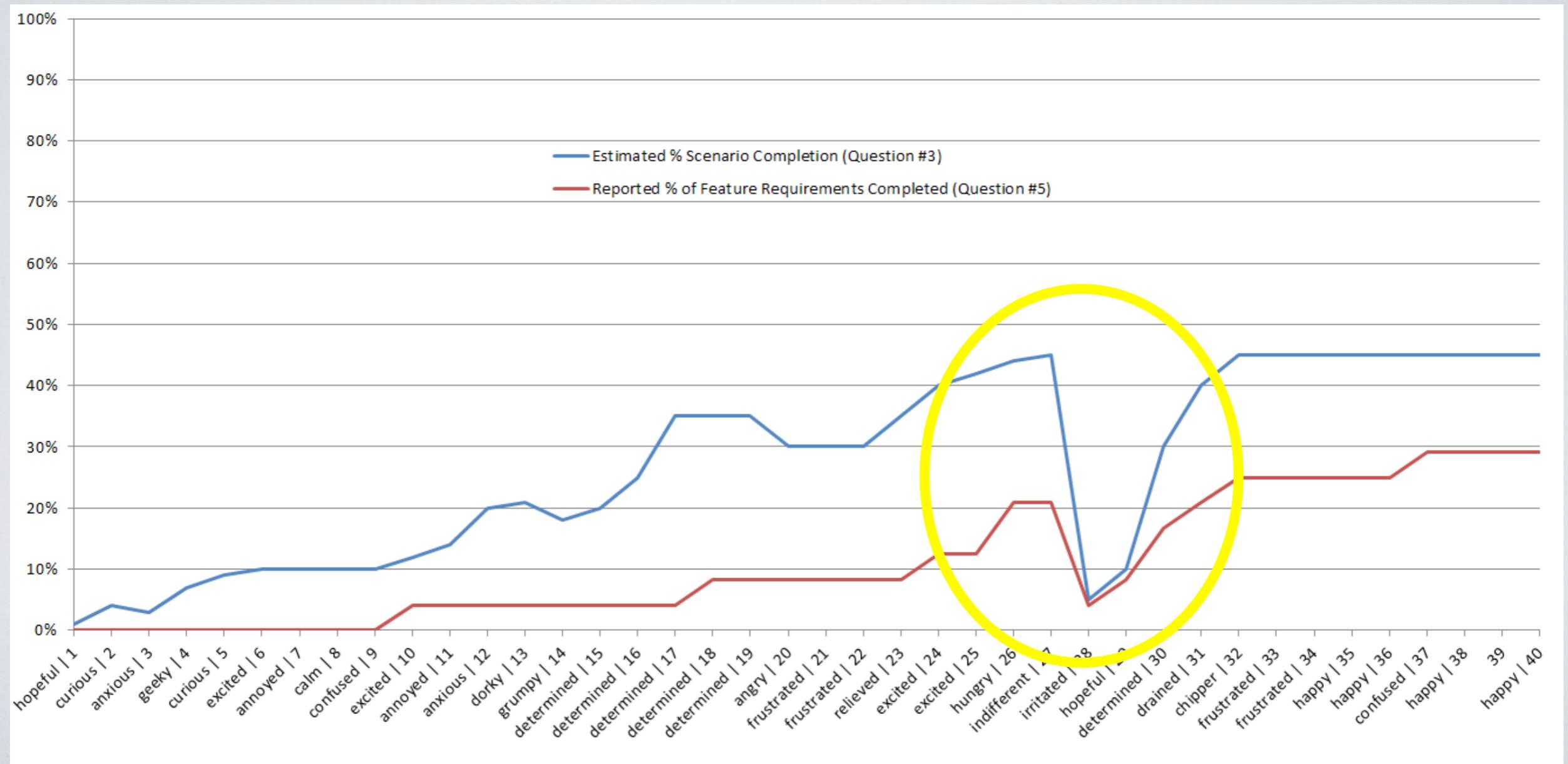
part III. diary study

* quick progress with OpenLayers Symbology
but then a steady plateau



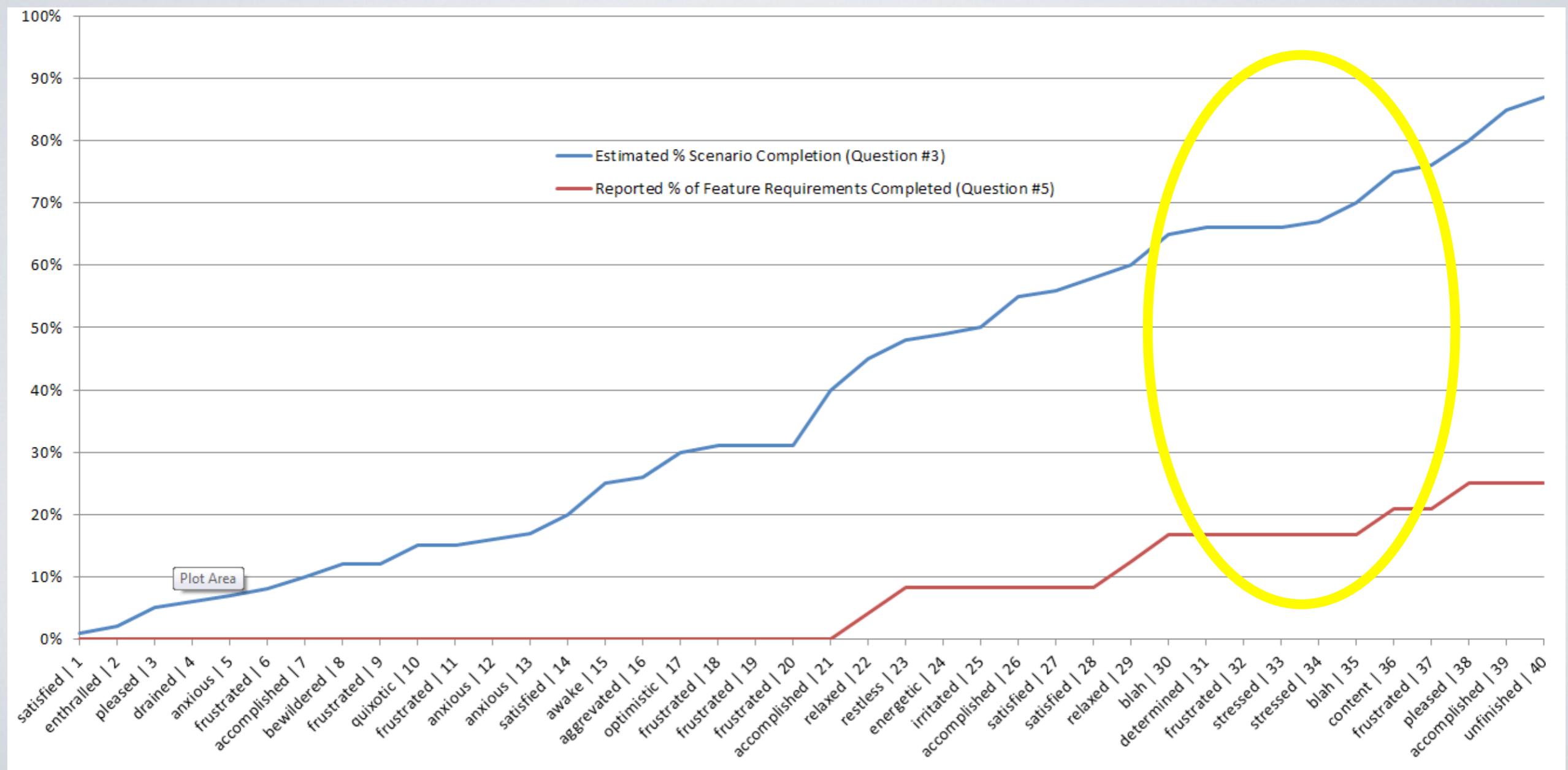
part III. diary study

* a new release of Leaflet version 0.4!



part III. diary study

* drastic discrepancies between estimated and reported feature requirements completed



part III. diary study

Leaflet

OpenLayers

A large, bold word cloud centered on the page. The most prominent word is "frustrated", which is repeated several times in different sizes. Other large words include "confused", "anxious", "blah", and "rushed". The words are rendered in black, with some smaller words appearing in gray. The font size of each word varies, creating a dynamic visual effect where the most frequent or intense emotions are the largest.

relieved
crappy
awake
gloomy
irritated
determined
pessimistic
thankful
hopeful
groggy
bewildered
annoyed
good
refreshed
hot
dizzy
exhausted
cynical
bittersweet
relaxed
surprised
crushed
refreshed
disappointed
rushed
complacent
confident
sleepy
angry
grumpy
accomplished
depressed
melancholy
okay
aggravated
curious
weird
cold
mischievous
chipper
thirsty
ashamed
indifferent
morose
sick
envious
alone
frustrated
guilty
bored
apathetic
cranky
amused
optimistic
tired
blank
anxious
hungry
calm
jealous
discontent
cheerful
excited
drained
restless
blah
bouncy
accepted
content

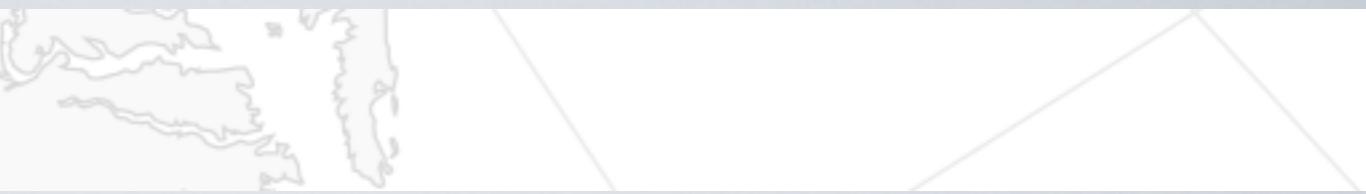
D3

tired **happy**
rushed **motivated** **good** **angry**
accepted **elated** **ashamed**
full **mellow** **ditsy**
carries **annoyed**
lazy **energetic**
cynical
confused **content** **anxious**
sleepy
optimistic
caffinated
sick
thirsty
confident
lethargic
chipper
amused
relieved
overwhelmed
nervy
bered
frustrated **groggy**
nervous
dirty
hungry **impressed** **relaxed**
calm **excited** **hopeful**
okay

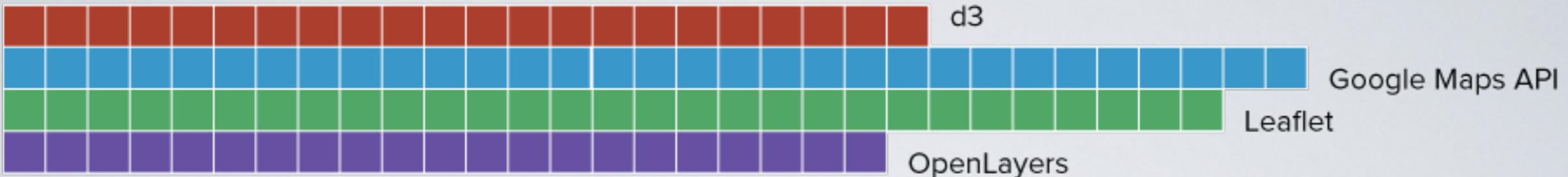
Google Maps API

frustrated
accomplished **indifferent** **determined** **optimistic**
enthralled **restless** **chipper** **energetic** **moody**
content **quixotic** **unfinished** **pleased**
numb **irritated** **anxious** **cynical** **relieved**
alone **excited** **blah** **rushed** **bored**
relaxed **hungry** **satisfied** **awake**
okay **thirsty** **stressed** **calm** **confused**
tired **curious** **rejuvenated** **resolute**
good

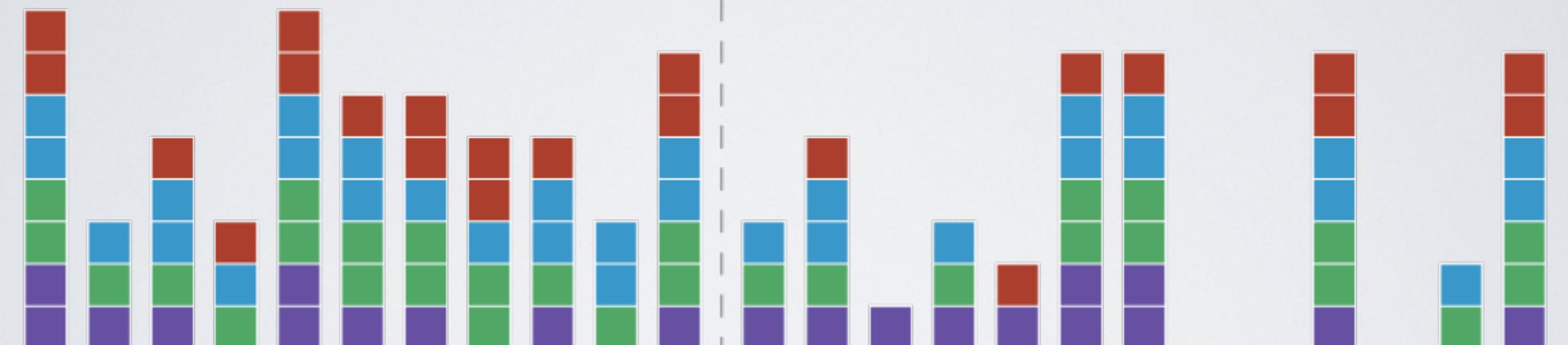
part III. diary study



REQUIREMENTS



REPRESENTATION



INTERACTION

conclusions and reflections

Q#4

can
we cope
with **change?**

Q#3

how do we
teach these tools?

Q#2

what are web maps
and **what is web mapping?**

Q#1

which technologies or tool(s)
should we use for web mapping?

conclusions and reflections

Q#4

Q#3

Q#2

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and **what is web mapping?**

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should we use for web mapping?

Q#1



thank you

Richard Donohue (@rgdonohue)

Timothy Wallace (@wallacetim)

Carl Sack (@northlandiguana)

Robert Roth (@RobertERoth)

Tanya Buckingham (@tanmabuck)

University of Wisconsin-Madison

D3 satellite projection by @mbostock