Development of a Tablet as Input Device for Respondents in a Collaborative Approach to CAPI Interviewing

Chris Schlapper

University of Wisconsin Survey Center
May 19, 2014

© 2014. Materials may not be reproduced without permission of the author.
Chicago Maps Project

• CAPI pilot study

• Measure respondent experiences in, knowledge of, and perceptions about a large number of communities across the Chicago metropolitan area
Trial PAPI Study

- Conducted by the client
- Paper maps of the Chicago area
  - Custom-designed by the client
    - Show only selected features including major roads, neighborhood and township boundaries
  - Two separate maps
    - Chicago neighborhoods
    - Greater Chicago area
- Respondents indicated their answers on the maps
- Used different-colored pens to respond to each question
Trial PAPI Study: Findings

- Paper maps large and unwieldy
- As interview progressed, maps became increasingly difficult to read
- Responses were difficult to modify
- Challenges in gathering and quantifying responses

Conclusion
- Explore using an electronic version of the maps
- Develop Dynamic Tablet Screen Maps (DTSM)
DTSM: Required Functionality

- Electronic mapping tool to replace paper maps
- Respondents submit answers to geospatial survey questions
- Runs on a tablet device
- Wi fi connection to the interviewer laptop
- Interact with a CAPI survey instrument
  - Bi-directional data flow
    - Gather and import data from respondent into the survey instrument
    - Display data from the survey instrument
DTSM: Development Goals

- Iterative, exploratory development process
- Independent of specific survey instrument
  - Generically-defined interface
  - Set of communication protocols
  - Able to connect with any survey instrument
- Perform feasibility testing
- Continue refinement
Tablet Device Implementation

• Similar to the Viewer in WiscMoms CAPI study
  • Web application on a tablet device
  • Wi fi connection to CAPI survey instrument
  • Dynamically populated data grids with survey data as they were collected by an interviewer
  • Tablet data read-only
  • Respondents review and confirm the data

• DTSM New Functionality
  • Respondents indicate their answers on the tablet device
  • Answers load directly into the survey instrument
Laptop

- Used by the interviewer
- CAPI survey instrument
  - CASES 5.5
- Wi fi hotspot
  - Connectify program
  - Encrypted, password protected
  - Internet access restricted
- IIS Web Server
- Custom web application
- MySQL database
- Map server

Tablet - DTSM

- Used by the respondent
- Wi fi connection to laptop
- Web browser
- Display maps as web pages
- Accept respondent input
- IPad
- Safari web browser
DTSM – Map Functionality

• Display map
  • Set initial zoom level, focus point, and previously given answers

• Interactive with respondent
  • Navigate and change zoom levels
  • Select and remove geographic points (pin)
  • Select pre-defined regions (highlight)
  • Display region name on selection
  • Submit responses to survey instrument
Components: DTSM – Additional Functionality

- Indicate a geographic region outside the defined area
- Review summary of prior questions and answers

- Watch for and respond to commands from the survey instrument

- Send data and commands to the survey instrument
  - Import answers into its native data structure
  - Display answers to interviewer
    - Confirm and conduct probes
Implementing DTSM: Option 1

• Web application
• Electronic Version of the paper maps
  • Map rendered as an HTML image
  • Define sub-regions respondent can tap to select
    • HTML hotspot objects
      • Circles, rectangles, or polygons
  • Build a data structure to store those region definitions
Review

Where you currently live

Where you previously lived
Belmont Cragin
Hermosa
Logan Square
Montclare

Information sent.
Implementing DTSM: Option 1 - Findings

Established
- Proof-of-concept
- Core functionality was sound
- Intuitive interface

Challenges
- Time calculating the regional boundaries
- Uncertain boundary lines
- Independent from geospatial coordinates
- Considerable set-up effort to expand to other metropolitan areas
  - Creating new base maps
Implementing DTSM: Option 2

- Online mapping technology
  - Google Maps API
  - Bing Map API
  - Map Box Streets
  - Open Streets Map
- Cartographic boundary files
  - Neighborhoods, cities, county
  - Replace manually-defined regions
  - Free to use
- Geospatial coordinates
- Less effort to expand into other metropolitan areas
Implementing DTSM: Option 2

• Additional developer
  • Implement online mapping
• Utilize existing web application codebase
  • Expand to work with new mapping technology
- Non-map functions
- Bi-directional communication protocols
- Reusable codebase for future projects

- Display maps
- Interact with respondent
- Submit data
Implementing Map Application

- Programmed using
  - Javascript and HTML
  - PHP
- GeoJSON as a communication standard

- Map Box Streets
  - Preferred look and feel
  - Offline version of mapping tiles
    - Eliminate the need for an active internet connection during the interview
Implementing Web Application

- Programmed using
  - Javascript and HTML
  - PHP
- GeoJSON as a communication standard
- Communication processes
  - Text files
    - Initiate actions
    - Between survey instrument and web application
  - Data exchange layouts
    - Transfer data and map behavior settings
    - Between web application and the map application
Interviewer initiates CAPI Instrument
Create text file command
100031|3a

Listen and retrieve text file changes
Query database
  • Related geographic data points
  • Map behavior settings
Create data exchange command
Web Application Data Exchange Structure

• Define data flow from Web Application to Map Application

• Layout
  • Map Settings
    • Initial focus and zoom level
  • Display associated geographic data
    • Non-editable reference points/regions
    • Editable answers to current question
Web Application Data Exchange Structure

• Layout (cont.)
  • Map Behavior Settings
    • Configured by question
      • Disable navigation
      • Disable zoom
    • Select either points or regions
    • Single or multi-select points/regions
Web Application Data Exchange Structure

• Design Decisions for Map Behavior Settings
  • Question matrix
  • Programmed behaviors not questions
  • Abstracted all possible behaviors
    • Document behaviors by question
    • MySQL database table
  • Flexibility during feasibility testing
    • Add or remove questions
    • Modify behaviors
3a|Residential History|{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}}]}|6|0|{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}}]}||point|1|1|1|0
Interviewer triggers survey instrument
Perl script
Query database
Load response
Display data in the instrument

Update database
Create text file command
100031|3a

Respondent taps Submit icon
Create data exchange command
Map Application Data Exchange Structure

• Define data flow from Map Application to Web Application

• Layout
  • Question variable
  • Respondent-selected points/regions in GeoJSON format
  • Timestamps when each point/region was selected
  • Zoom levels when each point/region was selected
  • Center point of the map when each point/region was selected
Map Application Data Exchange Example

```
1|{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}]}]|1280296860145|6||{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}]}]|1280296860145|6||{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}]}]
```
Implementing DTSM: Option 2 - Findings

Challenges

• Split functionality increases software complexity
• Coordinate software development effort
• Establish data communication protocols
• Boundary Layer File customization
  • Regional names more visible
• Off-line map server

Benefits

• Experienced map developer
• Standard look and feel to the maps
• Expandable to new regions
• Geospatial data results
• Adaptable to future projects
Chicago Maps: Summary

- Continue developing use of tablet device within CAPI studies
- Receive and import data from the respondent

Future Steps
- Complete integration between the DTSM components
- Implement the offline map tiles
- Finalize and program survey instrument
- Perform feasibility testing and adapt the software tools
Acknowledgements

• Dr. Michael Bader
• Steve Bochte
• Dr. Kyle Crowder
• Brendan Day
• Kerryann DiLoreto
• Dr. Matthew Dunbar
• Dr. Jen Dykema
• Kelly Elver
• Andrea Fischer
• Dr. Maria Krysan
• Dr. Nora Cate Schaeffer

• John Stevenson
• Eric White
Thank you!

For copies of this presentation or more information, please contact me at cschlapper@ssc.wisc.edu

Please visit us at www.uwsc.wisc.edu

© 2014. Materials may not be reproduced without permission of the author.