A Systematic Approach to Formulate Design Recommendations for Location-based stories in Augmented Reality

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Outline

- Research problem and motivation
- Objectives and research questions
- Methodology
- Comparative study
- Conceptual design
- Usability evaluation
- Recommendations
- Limitations and future outlook

Research Problem and Motivation

- *Augmented Reality (AR)* – an emerging storytelling tool
- The scope and context of stories spread beyond spatial edges
- New and effective methods of storytelling has become crucial
- Lack of research regarding design techniques in AR

SPIRIT: location-based AR storytelling prototype [4]

Objective

Provide recommendations for designing location-based stories in AR by identifying how stories with spatial information are visualized in different media and what improvements can be made to use AR tools for an enhanced storytelling experience

Sub-objectives and Research Questions

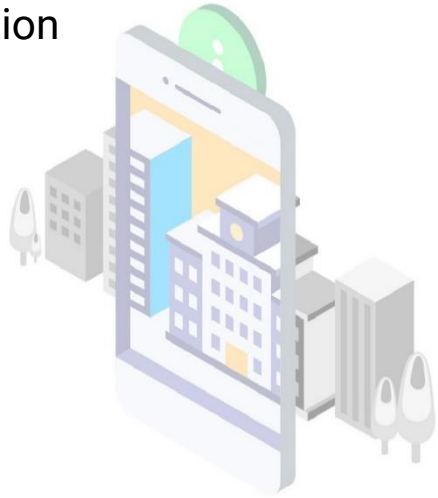
Sub-objective 1: Explore the visualization pattern of location-based stories using different types of visual elements in different media

RQ 1: How are location-based stories for tourists realized in print media, web platforms and in the AR environment?

a. What visual elements have been used to display different types of information in a story or different phases of a story in each media?

b. What visual elements have been used to display route visualization for tourists?

c. What are the similarities and dissimilarities in the patterns of using visual elements among the three different media?



Sub-objectives and Research Questions

Sub-objective 2: Formulate a conceptual design for visualizing different elements of a location-based story for tourists in the AR environment

RQ 2: How can AR technology be used in cartographic storytelling?

a. How can the existing methods or patterns of using visual elements in storytelling be employed or transformed into the AR environment?

b. What visual elements can be used in AR for making a location-based story more engaging and/or informative?

Sub-objectives and Research Questions

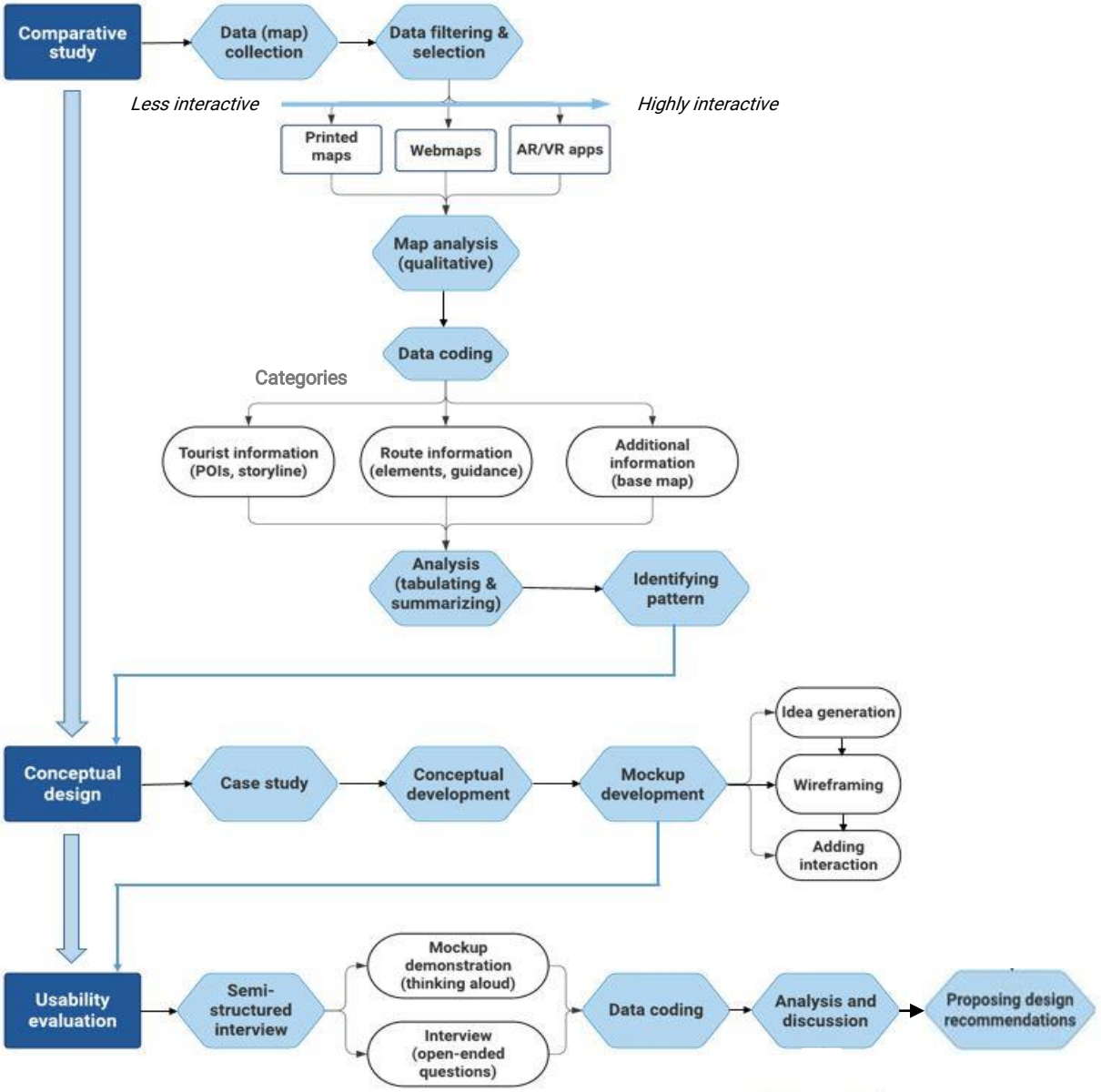
Sub-objective 3: Evaluate the effectiveness of the proposed design and derive further recommendations.

RQ 3: How effective is the proposed design?

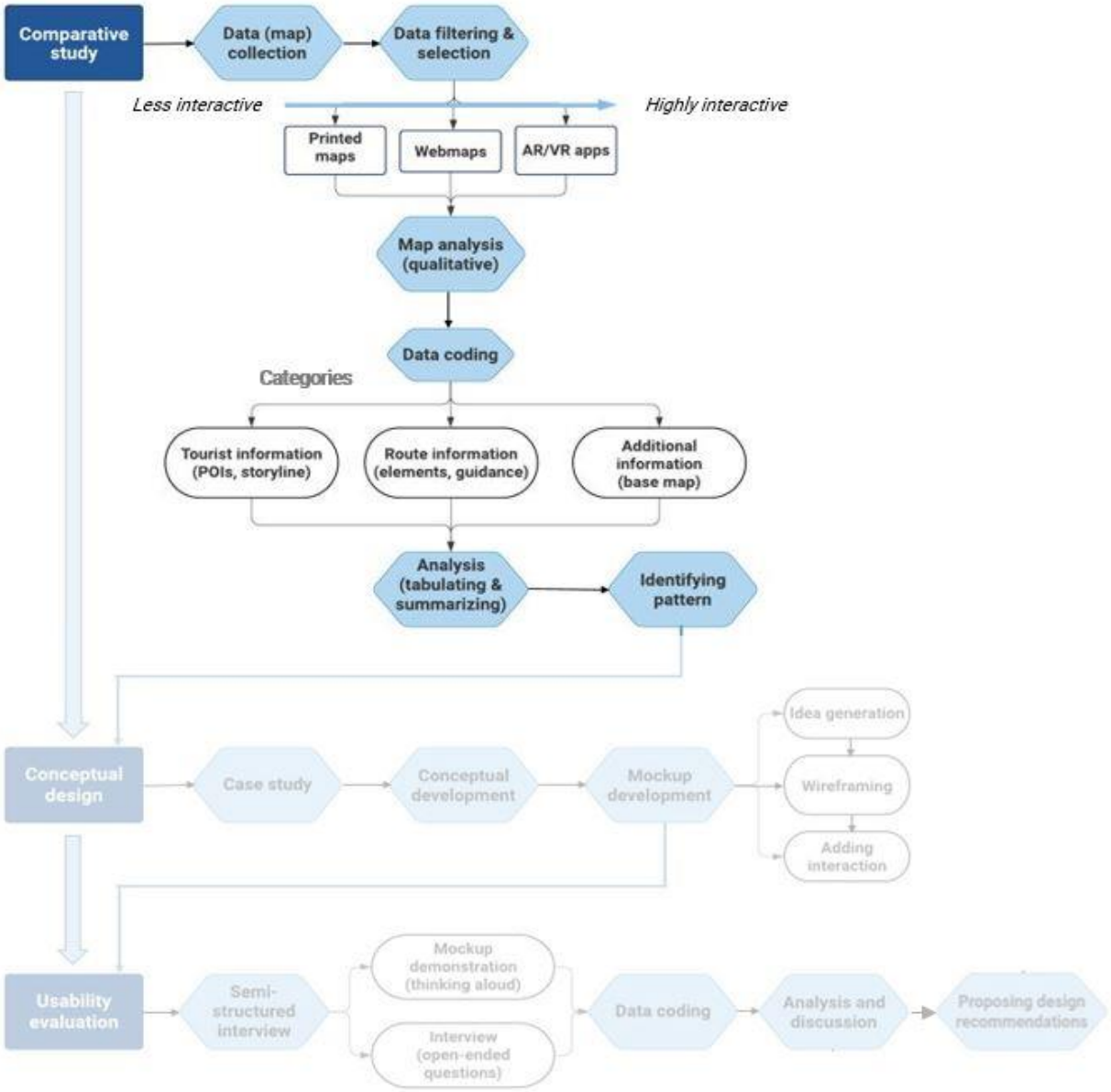
a. How to evaluate the proposed design concept based on user requirements and feedbacks?

b. How effective is the proposed design and what improvements can be made?

Methodology

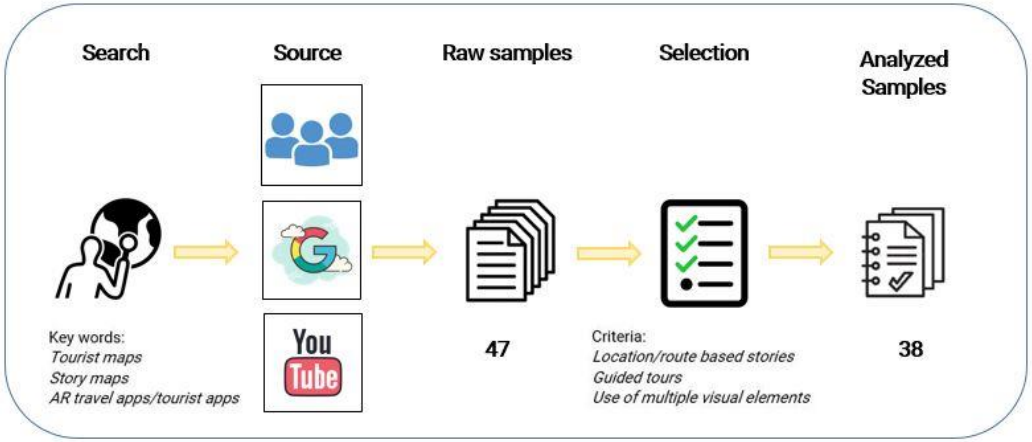


Comparative Study



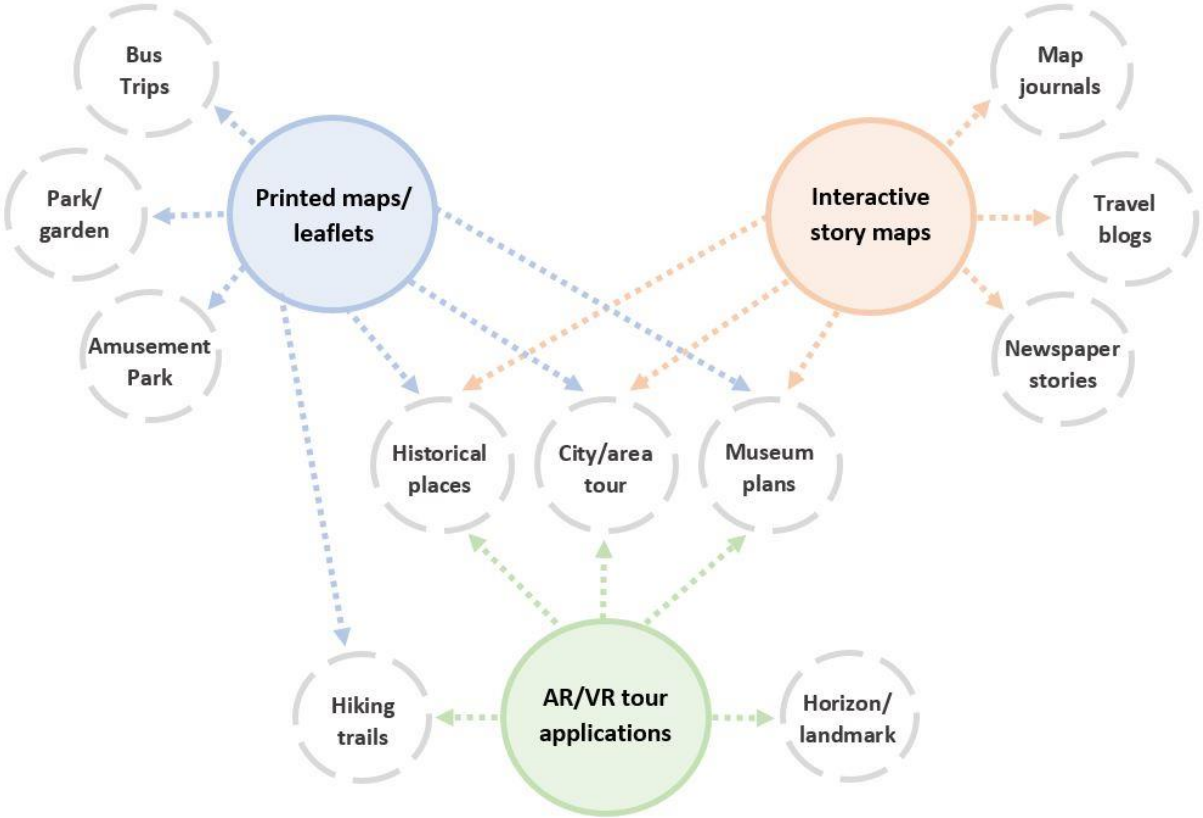
Comparative Study

- Data/sample collection process



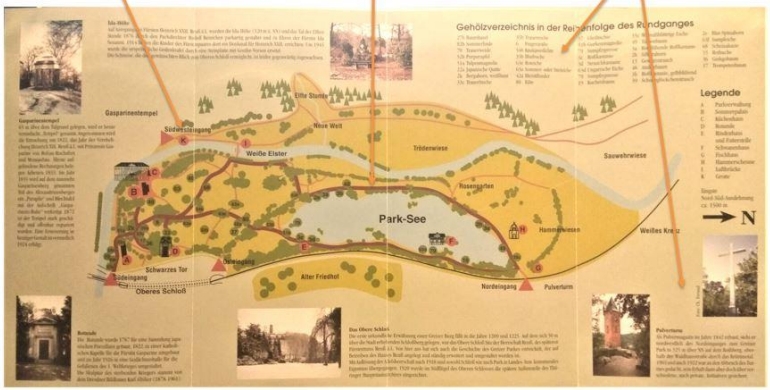
Comparative Study

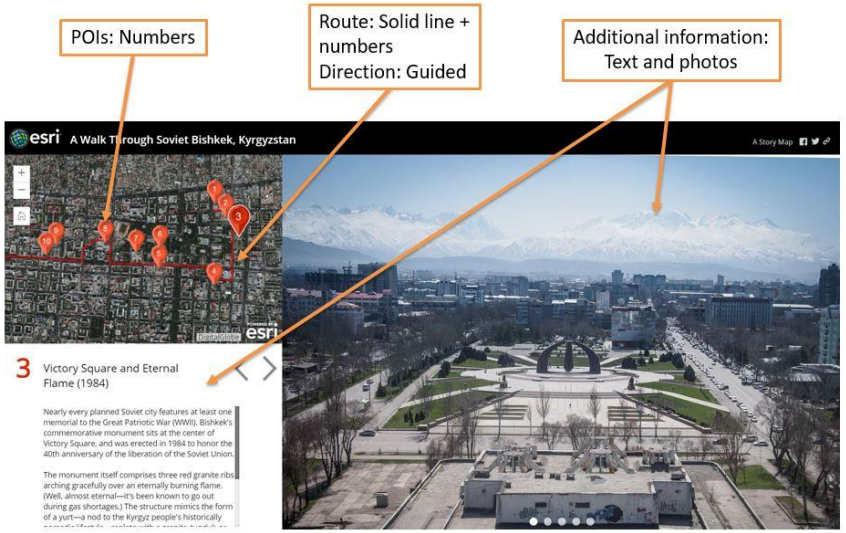
- Data/sample collection process

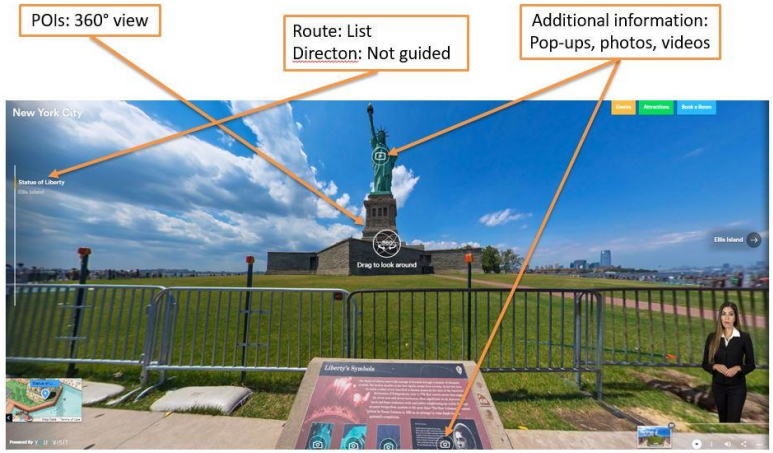


Comparative Study

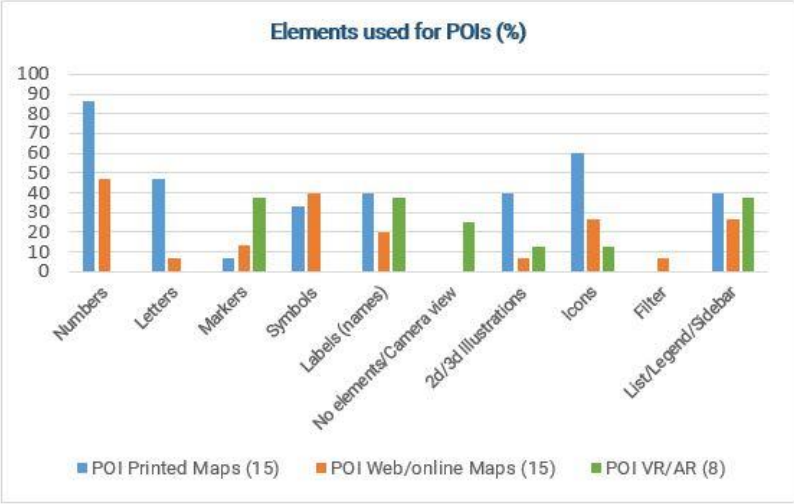
- Information extraction and data coding

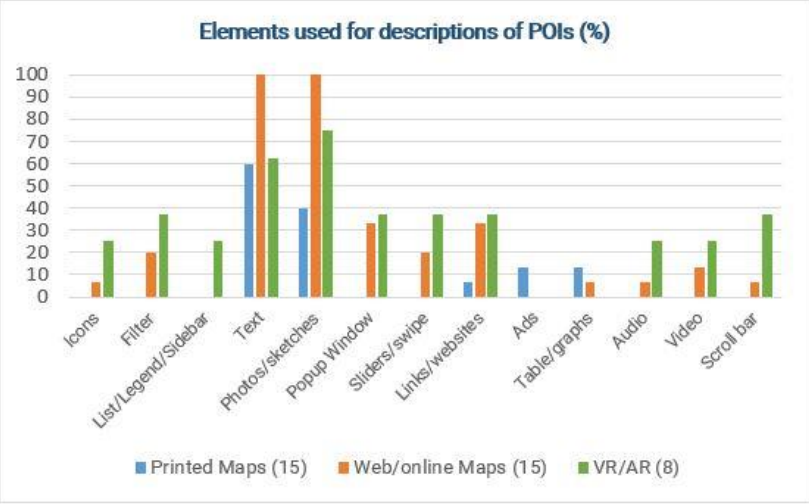


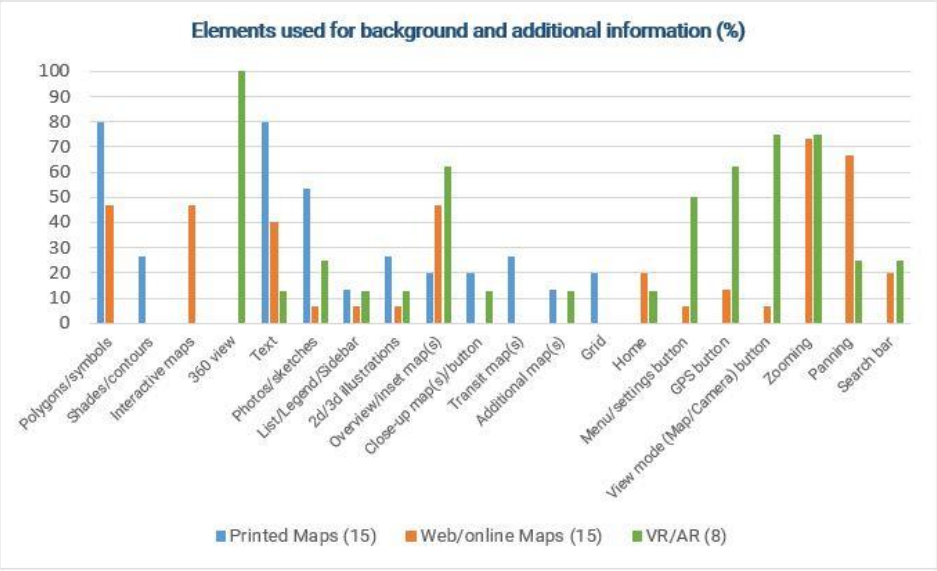




Findings from Comparative Study







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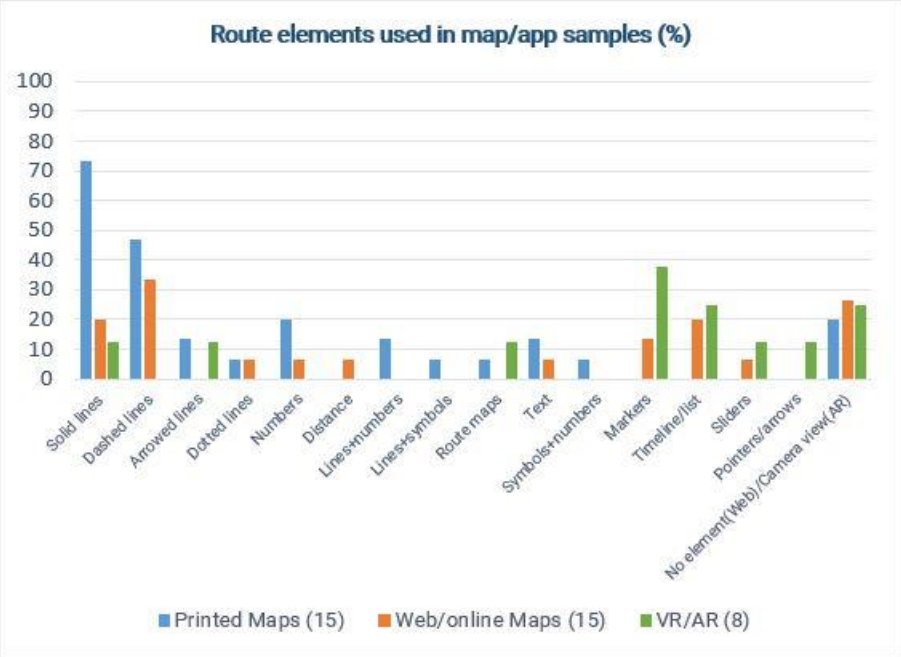

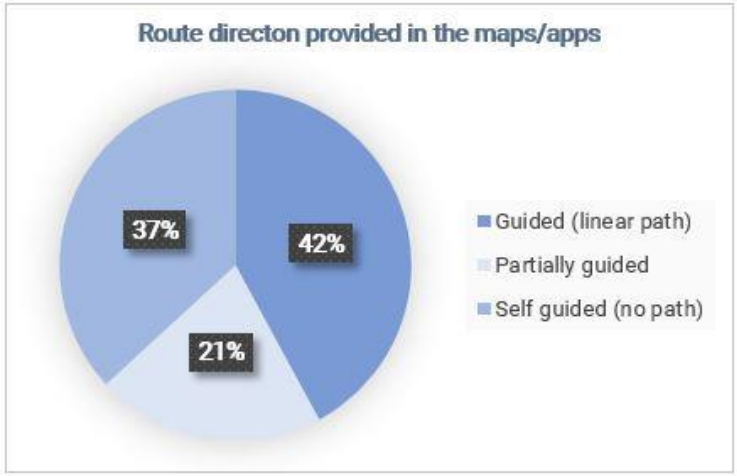

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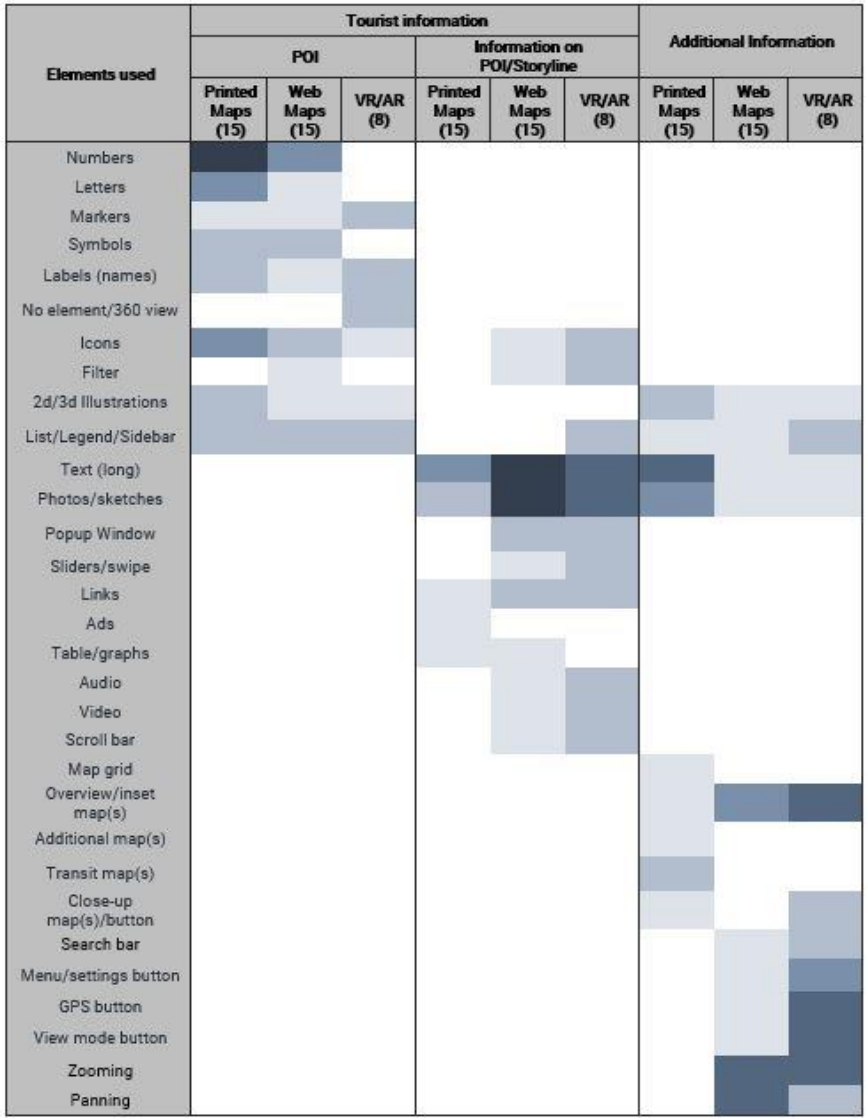
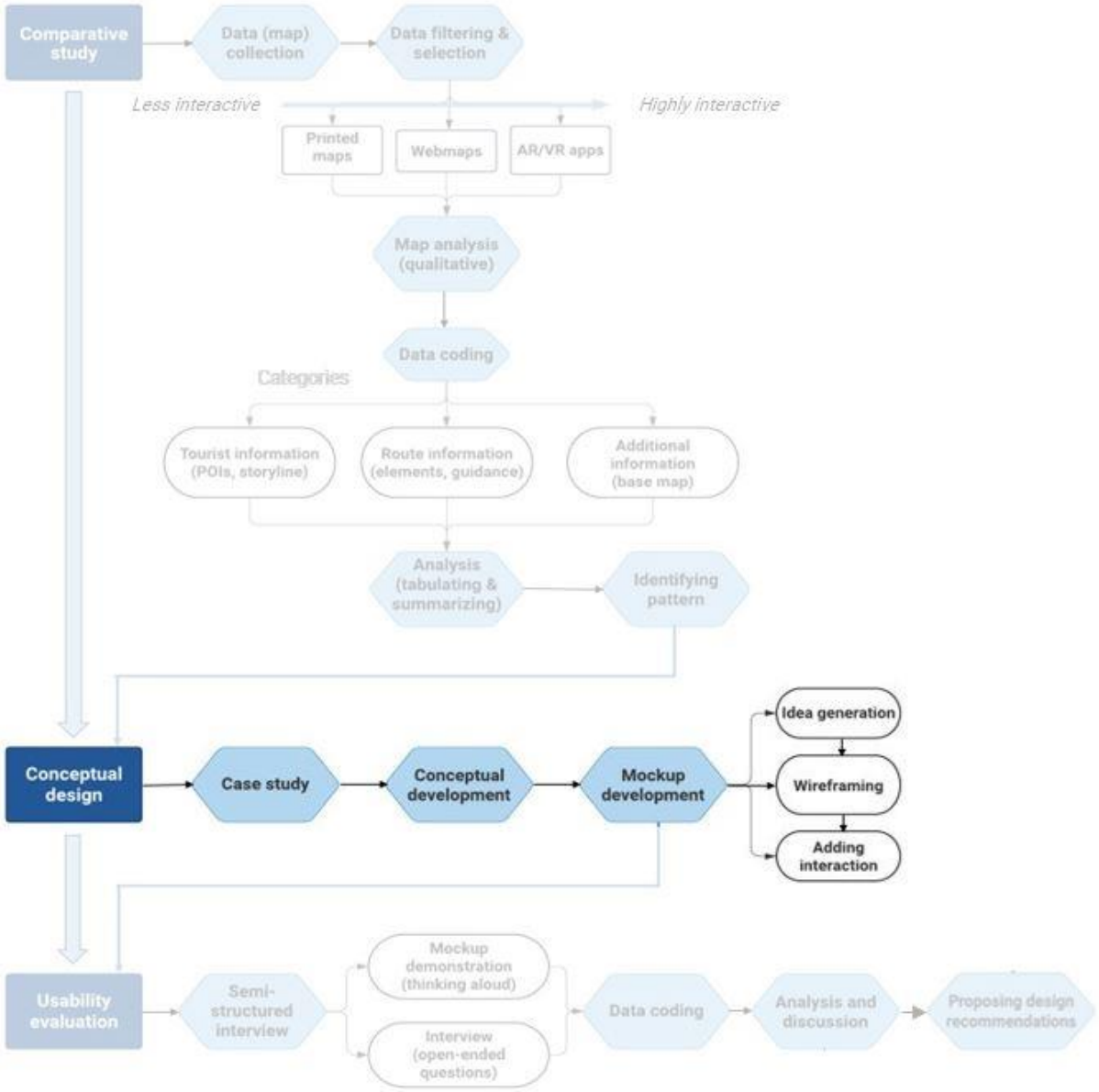
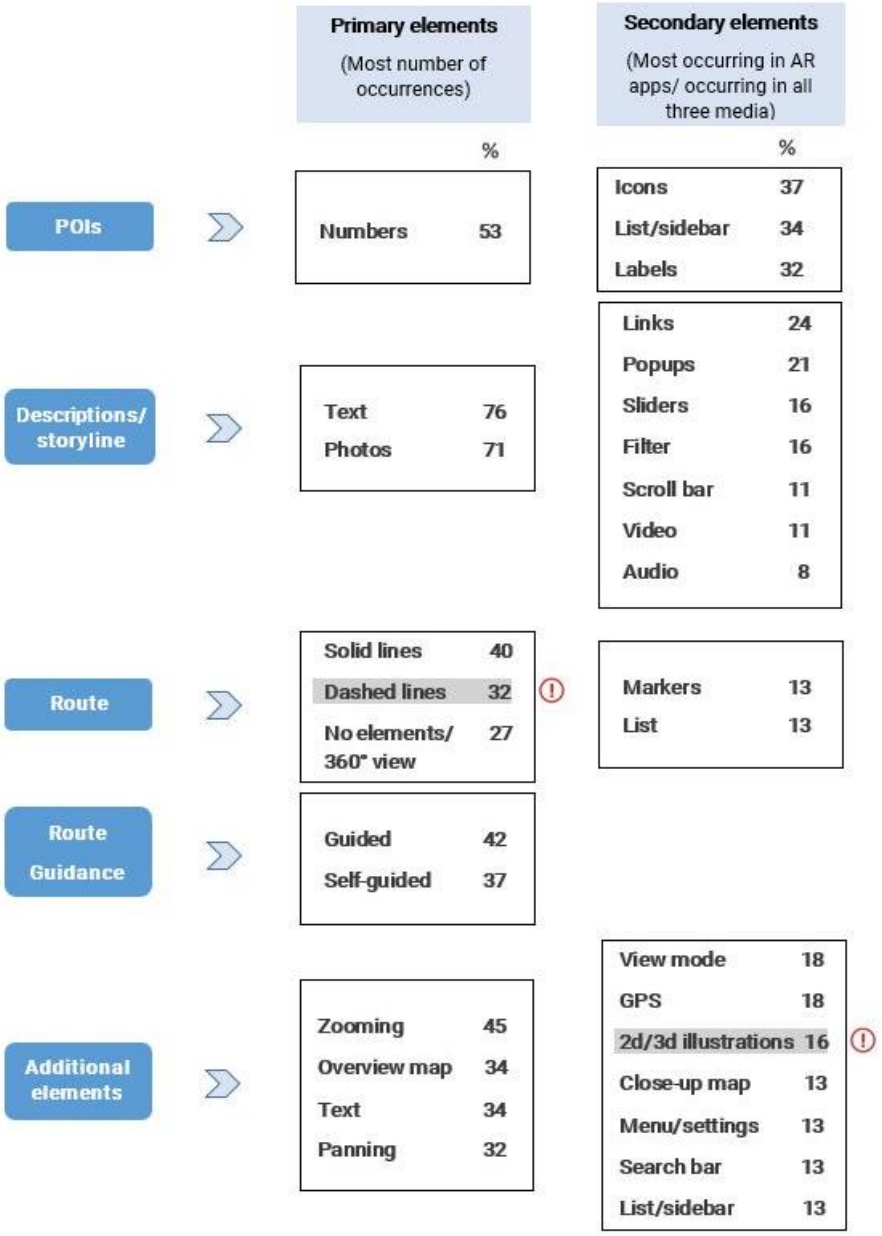


Conceptual Design



Conceptual Design

- Selected elements



Conceptual Design

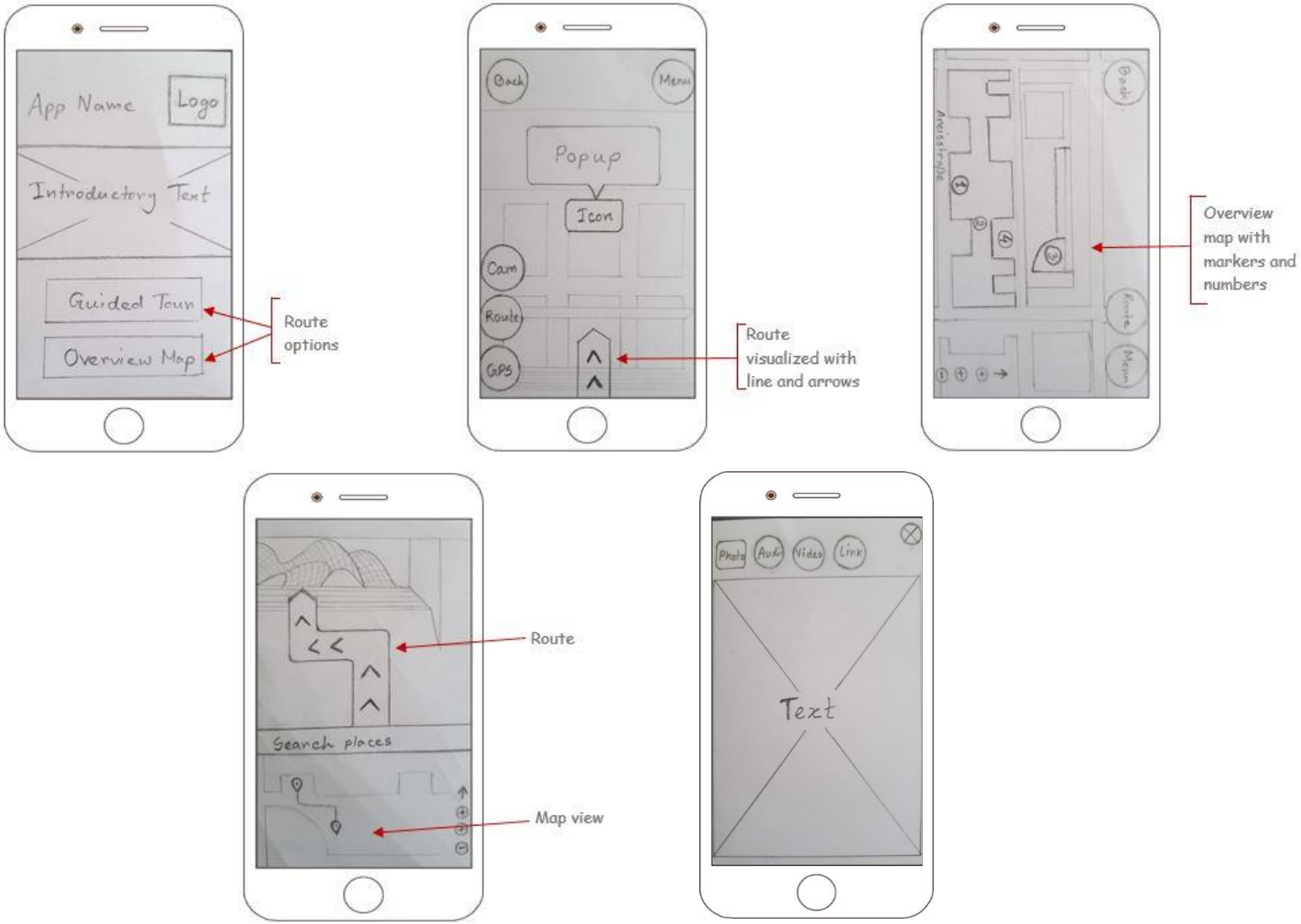
- Case study area

- TU Munich main campus
  - One of the leading universities in Germany
  - Has a history of 150 years

- Target user group
  - New/prospective students
  - Tourists

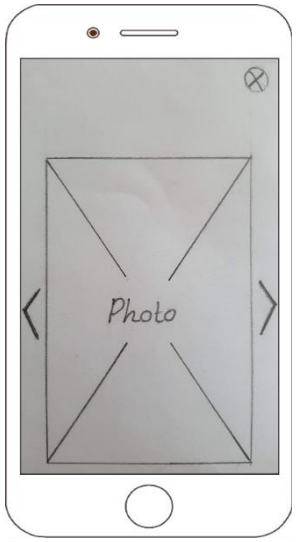
Conceptual Design

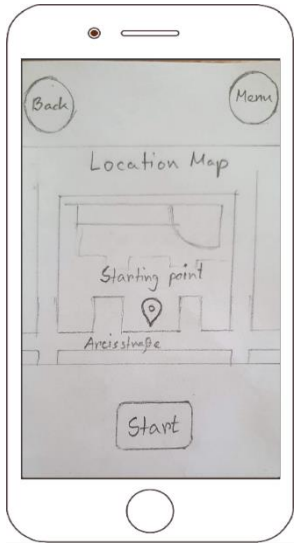
- Wireframing

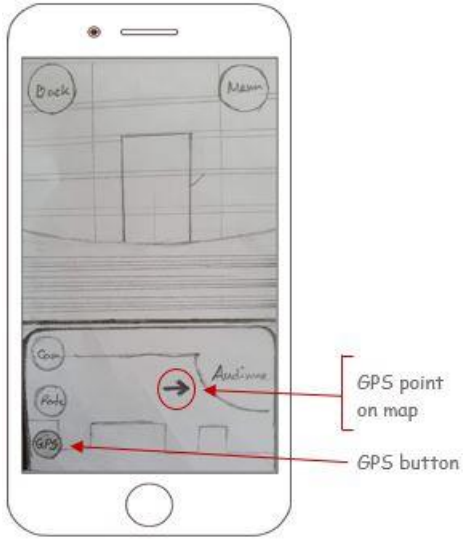


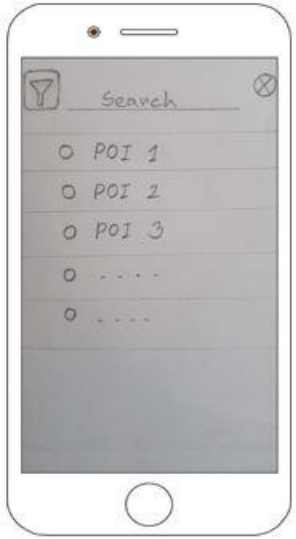
Conceptual Design

- Wireframing









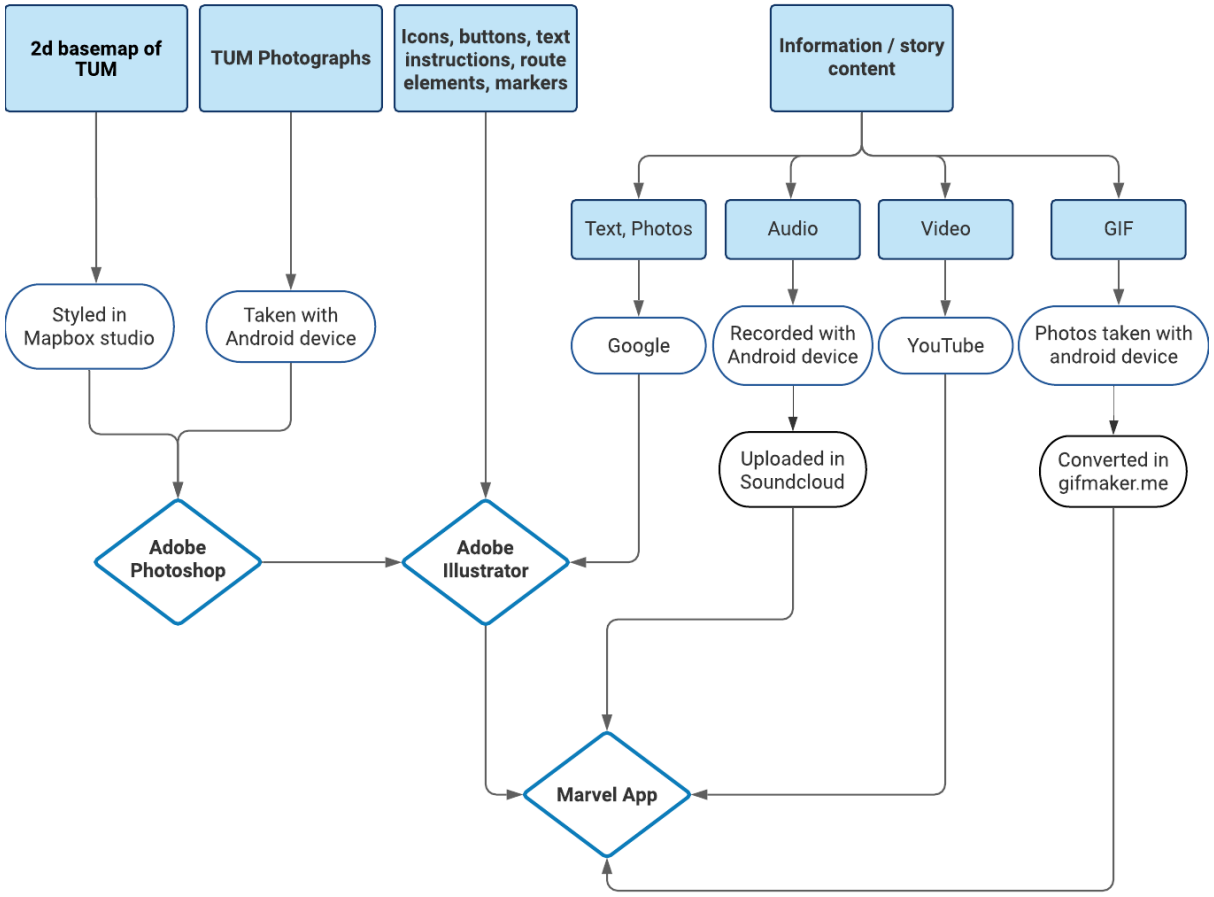
Conceptual Design

- Mockup design – design elements used

Font used		Color used	
Logo/app name	Bradley Hand ITC	App & map background	Blue, white, grey
Headings, Buttons	Papyrus	Icons	Blue, white
Instructions, POIs, story text, menu options, photo captions	Maiandra GD	POI categories	Red, dark blue, purple, green, brown, orange, yellow
Icons used		GPS/location point	Red
Route button 	Photos 	Text (story and instructions)	Black
GPS button 	Audio 	Button text, labels, popup text	Blue in white background
Scan button 	Video 	Route (AR line)	Blue and white
Popup icon 	Links 	Route (map line)	Red
Go back 	Filter 		
Menu 	Marker (map) 		

Case Study - Conceptual Design

- Interactive mockup design – Workflow



Conceptual Design

- Interactive Mockup Design in Marvel

Marvel link: https://marvelapp.com/prototype/5id96e9/screen/75623960

Homepage

Starting tour

AR View

Indicating POIs

Story page

Conceptual Design

- Interactive Mockup Design in Marvel

Photos

Route start

Route end

Overview map

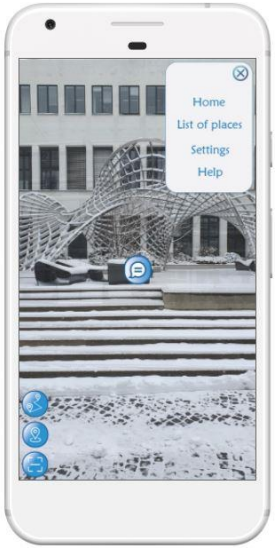
Search location

Conceptual Design

- Interactive Mockup Design in Marvel

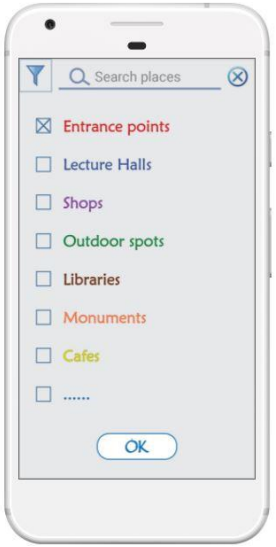
Route map view

GPS



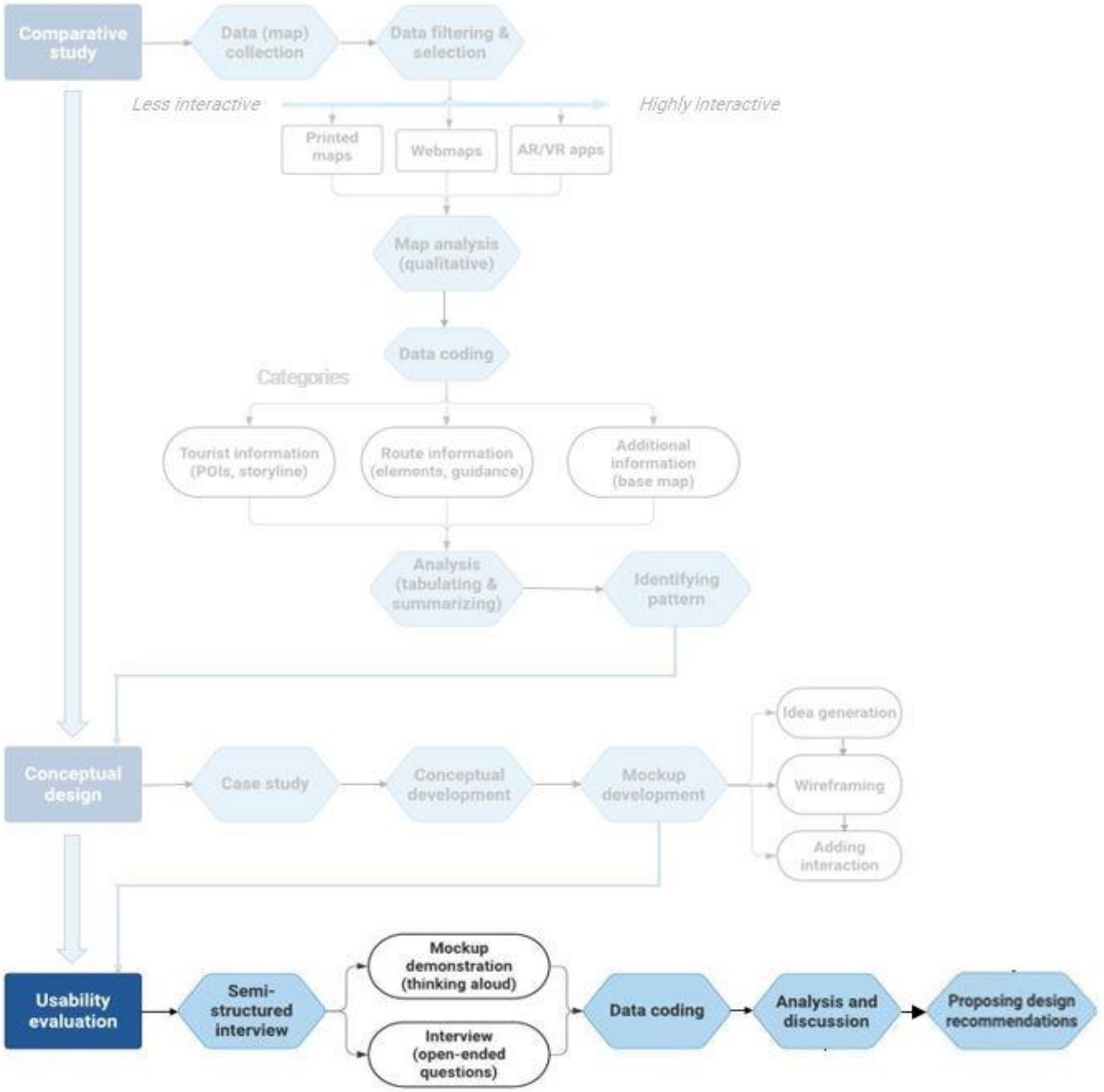
Menu

List of places



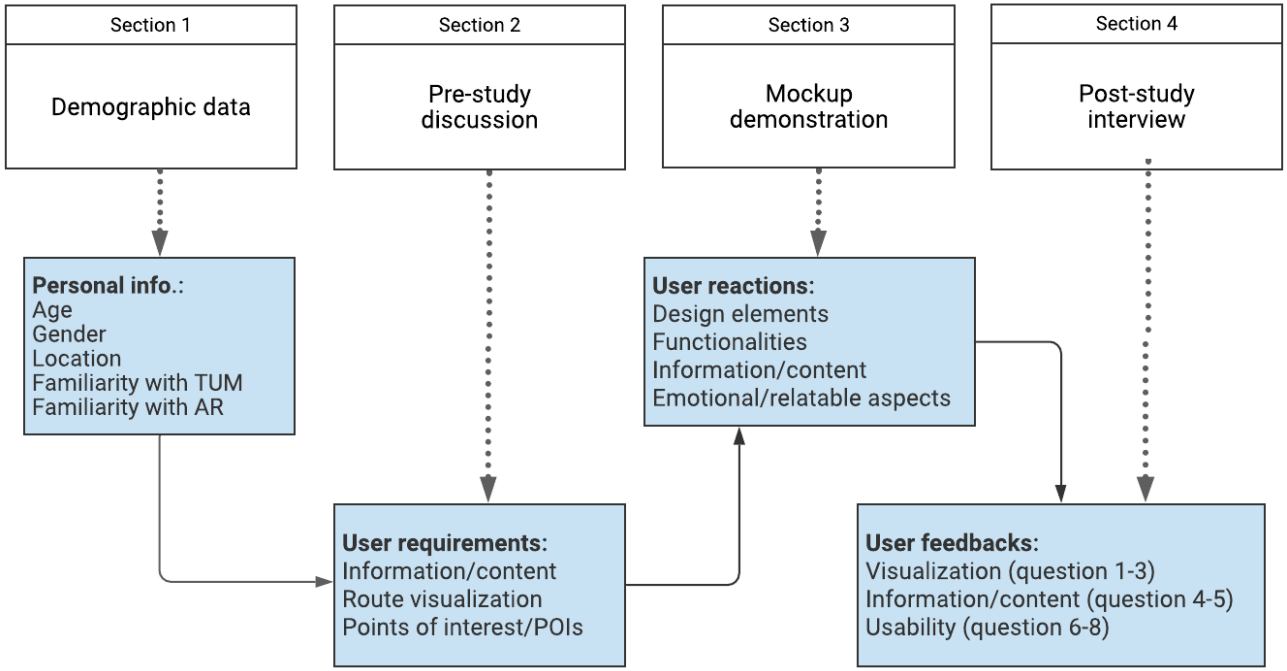
Filter options

Usability Evaluation



Usability Evaluation

- Semi-structured interview



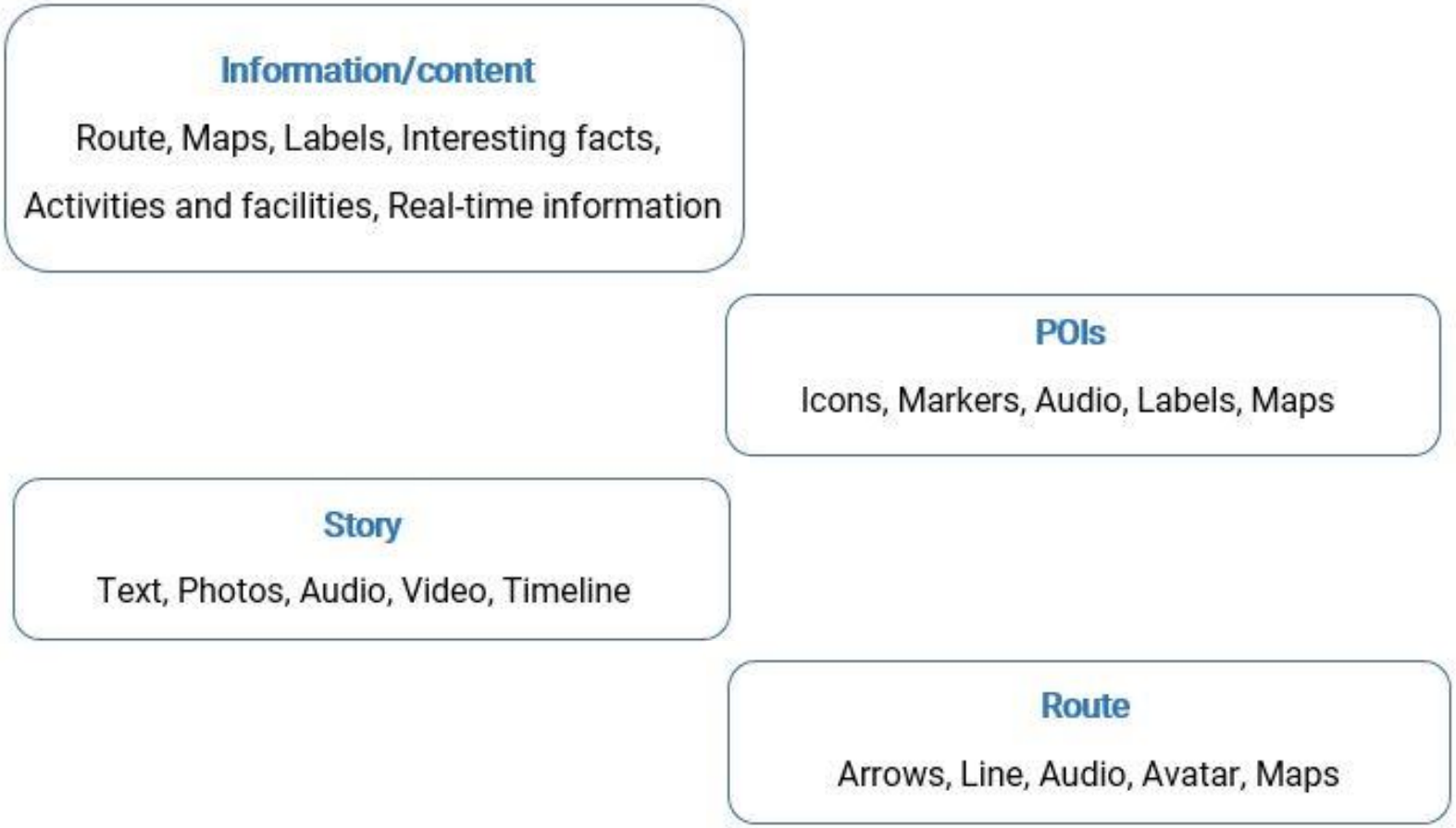
Usability Evaluation

- Demographic data

Information		Percentage
Gender	Male	45%
	Female	55%
Age	<26	0%
	26-30	86.50%
	30-35	9%
	36-40	4.5%
	>40	0%
Familiarity with TUM	Familiar	45%
	Not familiar	55%
Familiarity with AR	Familiar	50%
	Not familiar	50%

Usability Evaluation

- Pre-study discussion – User requirements



Usability Evaluation

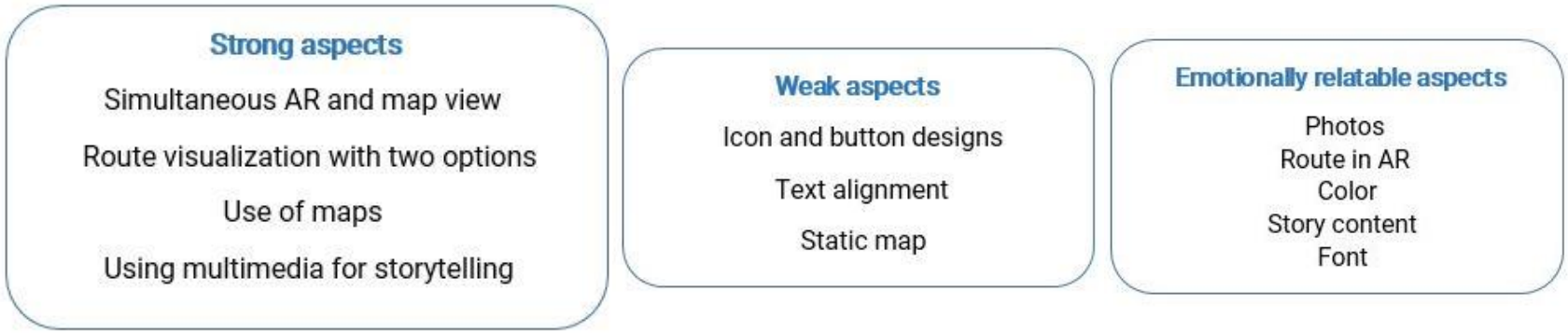
- Mockup demonstration

Task:

Route 1 (guided): from the *main entrance (Arcisstraße)* to TUM shop to *Audimax*
Route 2 (self-guided): from *Audimax* to the *Inside-out pavilion*

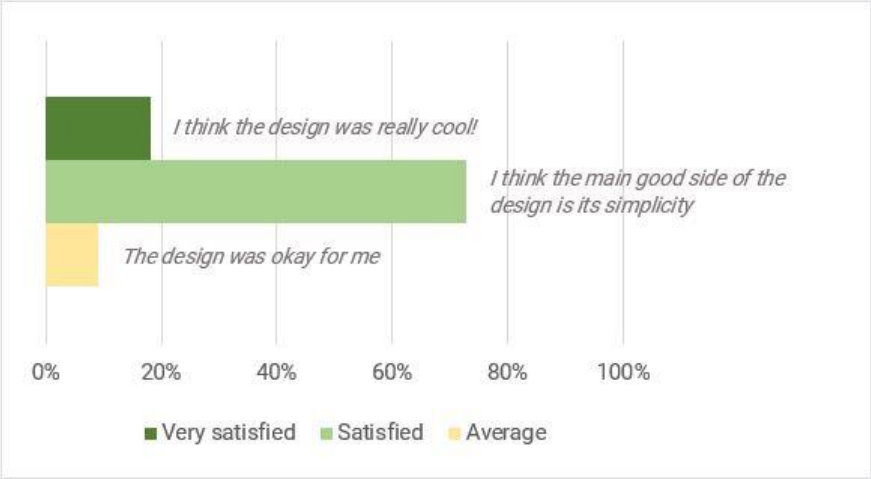
Marvel link: https://marvelapp.com/prototype/5id96e9/screen/75623960

- User reactions



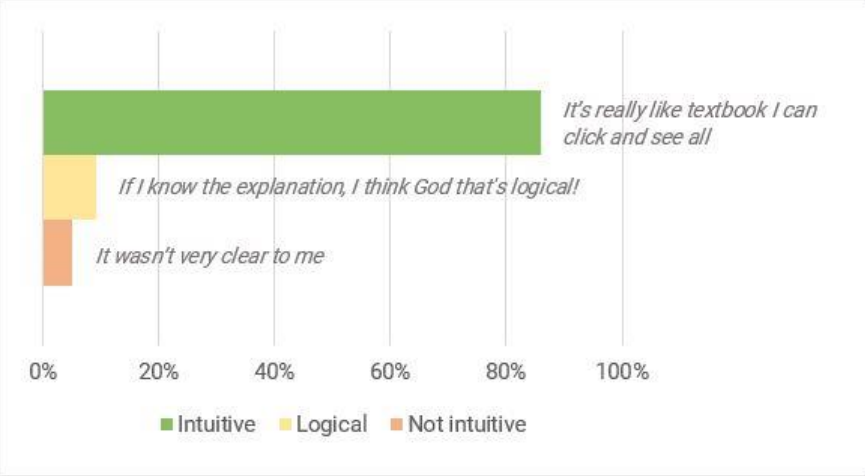
Usability Evaluation

- Post-interview – Overall reactions



User satisfaction level

Intuitiveness level of the app



Usability Evaluation

- Post-interview – reactions on route and story

Route elements

Line - *"It's perfect as it is"*

Map - *"I like the idea more that you have the map below"*

Avatar – *"put like a special character from TUM"*

Story elements

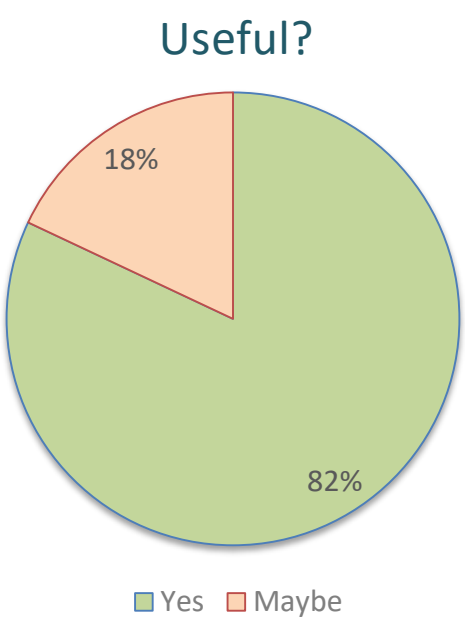
Photos – *"I automatically go to the pictures first"*

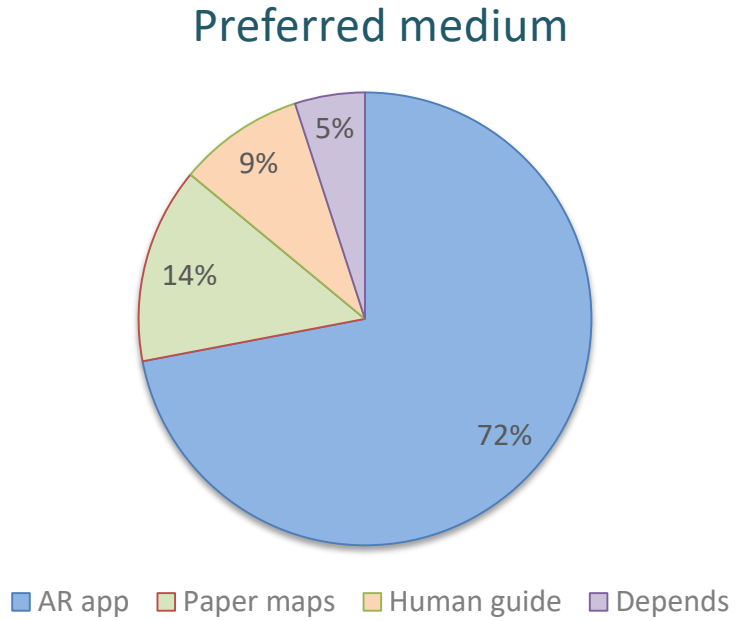
Audio – *"It's always nice to have someone reading it for me"*

Text - *"I like reading and the information was really interesting"*

Usability Evaluation

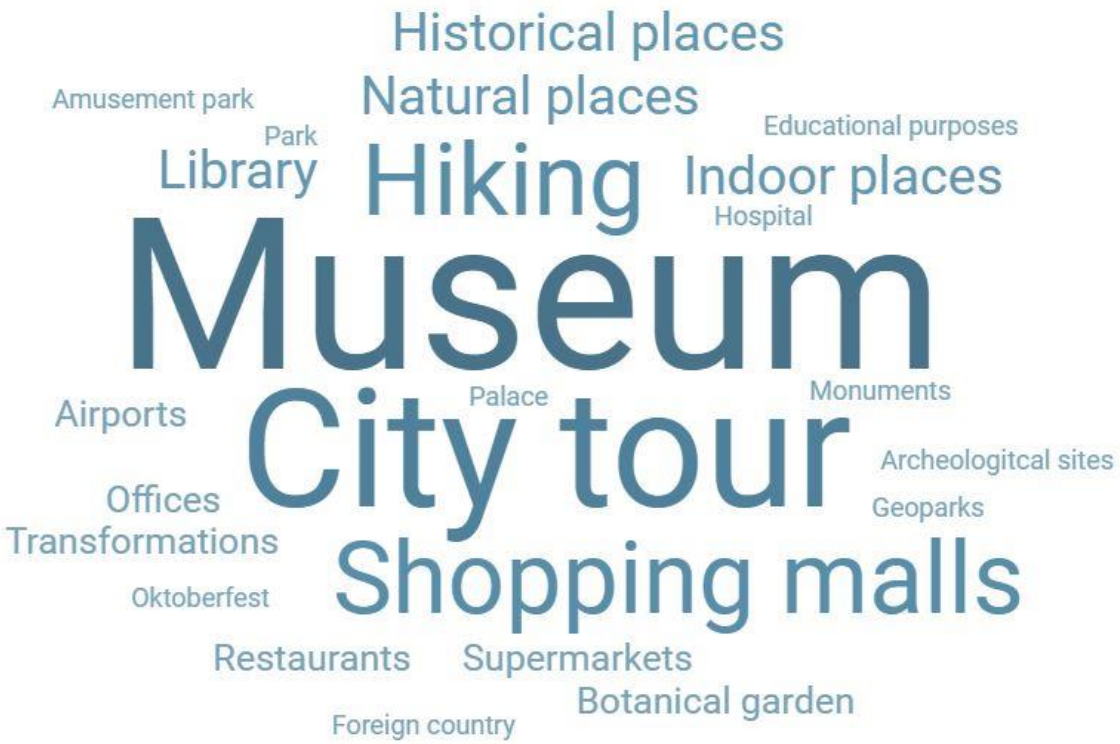
- Post-interview – Usefulness of AR storytelling app





Usability Evaluation

- Post-interview – Use cases



Recommendations

General Recommendation	Tracking
Combine both storytelling and route visualization elements	Use a marker-based tracking method for congested areas
Interface design	**Route Visualization**
Make it simple	Use simple design elements, provide multiple options
Provide clear instructions and tooltips in the beginning	Provide options for turning route on and off
Adopt known, consistent and intuitive designs for buttons and icons	**Use of maps**
Use a soothing and relatable color palette	Use map view with routes, overview maps and GPS
Storytelling	**App functions**
use a mix of author-driven and reader-driven approach	Provide customization options like hiding the buttons, location filtering, turning route on and off, changing map layouts and changing the language
Use short text for the story content, apply meaningful and attractive font; combine text with infographics and photos, and set dividers in the text.	Use pointers to avoid the problem with adjusting camera view and information loss
	Ensure smooth interactions and transitions between frames/screens
Add photos and timelines	**User feedback**
Provide options, such as text and audio to access the story	Include user feedback at every step of the design and development process

Limitations

- Limited number of collected samples for comparative study
- Online usability test with mockups
- Limited number of participants for user study
- Expert opinion not included for designing

Future Outlook

- Further usability test in the field with actual app or prototype and a larger user group
- Experimenting with designs for different purposes and context
- Including gaming experience or a quest
- Combining multiple places, different navigation options and different types of tours in the same app
- Experimenting with responsive designs for different operating systems

References

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3. Pavlik, J.V. and Bridges, F., 2013. The emergence of augmented reality (AR) as a storytelling medium in journalism. *Journalism & Communication Monographs*, 15(1), pp.4-59.
4. Kampa, A. and Spierling, U. (2017). Smart Authoring for Location-based Augmented Reality Storytelling Applications. *Lecture Notes in Informatics (LNI), Gesellschaft für Informatik, Bonn*.


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