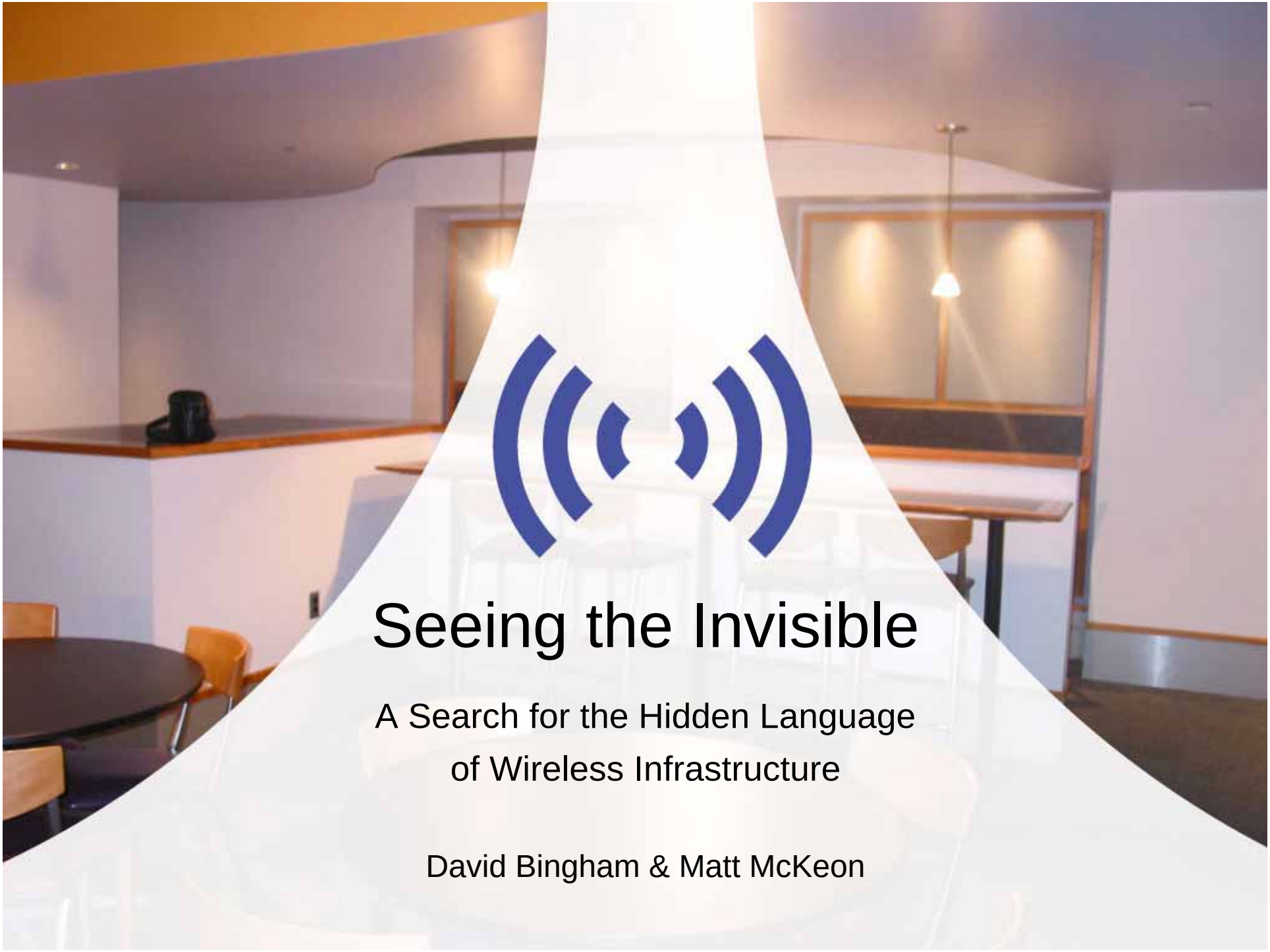


Seeing the Invisible

A Search for the Hidden Language of Wireless Infrastructure

David Bingham & Matt McKeon

The Hidden Language

- Wireless Infrastructure Discrepancy:
  - Not immediately apparent to human senses.
  - People do a good job of finding hotspots.

- How to discover something invisible:
  - Visual: Signs, Symbols, Artifacts
  - Resource: Online, Word-of-mouth, Detectors
  - Experience: (know that it's there in the first place…)

- How do people interpret and value this wifi language?
- How can we make practical use of this knowledge?



What do hotspots look like?



What do hotspots look like?





What do hotspots look like?





What do hotspots look like?





Invisible Infrastructure - Symbol / Service Feedback Loop

We locate infrastructure through symbols and their placements within our environment. We also find such symbols and associate the services they afford.







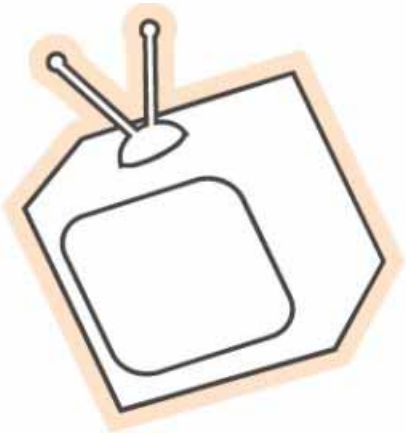




Design decisions are often made based on the existing system of symbols, even if the symbol is outdated or unnecessary.















The Changing Uses of Hotspots

- Value and use of wifi are becoming more complex
  - Not just bandwidth or range!
  - Convenience?
  - Comfort?
  - Security?
  - Numerous others!

- Which ***Values*** associate with which ***Uses***?

- How can we design hotspots accordingly?
  - Grubesic and Murray (2004) found that wifi coverage is “very irregular” even within homogenous (wealth, land use) urban zones.



- How can researchers understand this complex system of values and uses?
  - Master narratives people have adopted (Star 1999)
  - Interwoven, repeating patterns that fit particular uses, desires, and values (Alexander)
  - Reconstruct people's theories of use (Kempton 1986)
  - Let people participate in the analysis of their own conceptual frameworks (Bingham)



- Phenomenology
  - Extracting essence from experience
    - let structure come from things themselves
  - Well-known approach in the social sciences
    - ethnomethodology and design methods

- Design-based research
  - Understanding the messiness of real-world practice, with context being a core part of the story.
  - Development of a profile or theory that characterizes the design in practice.

    (Barab & Squire 2004)



- Participatory Interviews
  - Semi-structured interview with each participant
  - Two phases:
    - Free association and discussion
    - Participatory analysis
  - Selecting participants:
    - Somewhat technically savvy
    - Make regular use of wifi
    - Use mobile computing devices
    - Travel frequently
    - Recently moved to a new area



Methodology

- Free association
  - Generate a wifi-related list:
    - concepts, values, situations, needs, places, artifacts, people, etc
    - e.g. “coffee shops”, “doing work”, “radio antenna”, etc
  - Use open-ended questions or scenarios to further disclosure.
    - *“Recall a situation when you badly needed to find a wifi hotspot.”*
    - *“Draw a sign that a store owner might use to advertise their wifi.”*
    - *“While using wifi, describe what you see looking up from your laptop.”*
    - *“Draw a wifi access point.”*
  - Gradually delve into topics related to:
    - Searching
    - Selection
    - Use



Methodology

- Participatory Analysis
  - Gain an understanding of the values participants place on wifi environments, and how they associate them in different situations.
  - Participant writes Free-Association items on Post-Its:
    - Nouns = Yellow Post-Its
    - Values & Adjectives = Blue Post-Its
  - Work with participant to structure Post-Its in ways that reveal relationships between nouns and values.
    - “Order these places based on whether you prefer to use wifi there.”
    - “Based on how you use wifi, categorize the Post-Its.”
    - “Place the Yellow Post-Its in proximity to the Blue Post-Its as you see them related.”



- What we gain from participatory analysis
  - An understanding, from our own participants, how they prioritize different activities and values in different situations.



- Associated Design Principles
  - Our culture creates codified design principles that are associated with particular values, concepts, or emotions.
    - e.g. Sans-serif typefaces are often associated with modernity
  - We hope to correlate the values and uses we identify through our research into a design matrix for the construction of hotspots:
    - Architects, graphic, interior, industrial, and interaction designers
  - This may lead to another round of interviews, as we discover relationships that are unexplored or design choices that may have unexpected consequences.



- Prototyping and Evaluation
  - Design matrix + professional assistance =
    - Representative photos
    - Creative scenario writing
  - Evaluate participant opinion of photos and scenarios
    - If "isolation" = "wifi", does “cafe with small, individual tables” or “cafe with big, group tables” = “wifi”
    - If “purple” = “unreliable”, then “Help me arrange these wifi logos from your most to least favorite”
  - Iterate based on our findings in this phase



Expected Contributions

- Help designers better support wifi users
  - Not just about the connection!
  - Part of a richer social & environmental tableau.

- Assist people in finding and using wifi in ways that enhance their lives.

- Give hotspot owners a better understanding of how to service their customers.

- Methodological contributions to design research.



Expected Contributions

- Can we generalize to other invisible infrastructure?
  - No, not directly…
    - As wifi spreads our results may no longer be valid for wifi itself!
    - However, the things we identify may be valuable for repeating this process in other situations.



Questions and Comments?

