The Designers' Outpost: A Tangible Interface for Collaborative Web Site. Klemmer, et al. UIST. 2001.

What are the core research questions addressed by the work?

- Supporting the practice of collaborative affinity diagramming in web design

What motivates the work?

- From previous studies, identified that paper, pen, walls, and tables were used for explaining, developing, and communicating ideas during early phases of web design
- There is a need to supplement the practice by combining the affordances of paper and large physical workspaces

How does the work understand the usage, capabilities, and limitations of paper?

- Paper and walls make information, any kind of information, tangible, easy to manipulate, and easy to organize
- Collaboration aided both by the persistence of the design artifact, which supports asynchronous collaboration and constant awareness of the state of the project, as well as by the greater-than-human-size space allowing multiple people to simultaneously view, discuss, and modify the artifact
- Drawbacks to traditional paper-centric representation:
    - Information exists in the relationships between information chunks
        - Because structure must be maintained manually, marks that designers make about the data, such as links or annotations, often fall out of sync with notes as they are shifted around
    - Versioning not feasible in paper-only representation
    - Few opportunities for remote participants: No way to update, access

What is the target application domain of the work?

- Design

What are some proposed extensions to paper proposed by the work?

- Same functional capabilities maintained, but enables paper to be used as an input device for the electronic world
- Display of electronic information on the surface of the physical world
- Transitioning between physical and digital representations
- Framing as an informal capture tool: Documentation of physical for purposes of later recall and export to other tools

What design constraints or objectives guided the work's implementation of the proposed extensions?

- Support for following interaction techniques: Adding notes, creating notes, removing notes, moving notes, context menus (menu to enable manipulation of electronic properties embodied by physical elements),
- Physical tools for manipulating electronic content: Freeform ink, move tool, physical eraser

How are the proposed extensions implemented?

- SMART board with a 1280x1024 projection
- Use of vision for sensing

What findings have been obtained from either the implementation process or an evaluation of the proposed system?

- Groups using prototype went through three phases of design:
    - Brainstorming: Get everything on Post-it notes
        - Adamant on not wanting any system feedback
    - Creating a top-level information architecture
        - Migrating from a loose federation of notes on the board to a high level information architecture by clustering related information into groups, pruning unnecessary concepts, linking notes together
    - Drilling down - Adding information with ink
        - Sketching design details, adding annotations or properties with freeform ink
    - Two styles:
        - Facilitator style: One person stands at the board, entire group discusses the site, but as discussion progresses, facilitator creates notes that synthesize the discussion content
        - Open board: No central figure, all participants have agency to create notes and directly express their ideas in the artifact
- Design implications
    - Smart yet silent
        - In this setting, it is preferred that the system actions do not take place automatically - regarded as a distraction
            - Should be available but should not interrupt the design process
    - Sweet spot on the tangible/virtual spectrum
        - There exists a sweet spot in the tangible/virtual spectrum
        - Information appliances should be as easy to learn as physical appliances
    - Extending the existing design process
        - Allowing migrating the design artifact to other tools for further refinement
        - Support for asynchronous participation
- Technical limitations
    - Missed actions
    - False positives
    - Location and orientation misreporting