AEIOU
AFFINITY DIAGRAMMING
ARTIFACT ANALYSIS
AUTOMATED REMOTE RESEARCH
BEHAVIORAL MAPPING
BODYSTORMING
BRAINSTORM GRAPHIC ORGANIZERS
BUSINESS ORIGAMI
CARD SORTING
CASE STUDIES
COGNITIVE MAPPING
COGNITIVE WALKTHROUGH
COLLAGE
COMPETITIVE TESTING
CONCEPT MAPPING
CONTENT ANALYSIS
CONTENT INVENTORY & AUDIT
CONTEXTUAL DESIGN
CONTEXTUAL INQUIRY
CREATIVE TOOLKITS
CRITICAL INCIDENT TECHNIQUE
CROWDSOURCING
CULTURAL PROBES
CUSTOMER EXPERIENCE AUDIT
DESIGN CHARETTE
DESIGN ETHNOGRAPHY
DESIGN WORKSHOPS
DESIRABILITY TESTING
DIARY STUDIES
DIRECTED STORYTELLING
ELITO METHOD
ERGONOMIC ANALYSIS
EVALUATIVE RESEARCH
EVIDENCE-BASED DESIGN
EXPERIENCE PROTOTYPING
EXPERIENCE SAMPLING METHOD
EXPERIMENTS
EXPLORATORY RESEARCH
EYETRACKING
FLEXIBLE MODELING
FLY-ON-THE-WALL OBSERVATION
FOCUS GROUPS
GENERATIVE RESEARCH
GRAFFITI WALLS
HEURISTIC EVALUATION
IMAGE BOARDS
INTERVIEWS
KJ TECHNIQUE
KANO ANALYSIS
KEY PERFORMANCE INDICATORS
LADDERING
LITERATURE REVIEWS
THE LOVE LETTER & THE BREAKUP LETTER
MENTAL MODEL DIAGRAMS
MIND MAPPING
OBSERVATION
PARALLEL PROTOTYPING
PARTICIPANT OBSERVATION
PARTICIPATORY ACTION RESEARCH
PARTICIPATORY DESIGN
PERSONAL INVENTORIES
PERSONAS
PHOTO STUDIES
PICTURE CARDS
PROTOTYPING
QUESTIONNAIRES

Universal Methods of Design

Bella Martin
Bruce Hanington

ROCKPORT

100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions

11 Case Studies

The case study is a research strategy involving in-depth investigation of single events or instances in context, using multiple sources of research evidence.[1]

Case studies have a long history in social science research, and in the teaching practices of law and business.[2] More recently, it has been proposed that this method has value for design practice and education, in both the *use* of case studies for design research and teaching, and in the *writing* of case studies by designers.[3] Case studies are useful in exploratory research for understanding existing phenomena for comparison, information, or inspiration, but can also be used to study the effects of change, new programs, or innovations.

The case study method focuses on gaining detailed, intensive knowledge about a single instance or a set of related instances. These instances, or cases, may be of individuals, organizations, entire communities, events, or processes. The details of cases emerge during data collection and analysis, which typically include the following features:[4]

- Selection of a case or small set of cases for a situation or area of concern
- Study of the case in context, in its social and physical setting
- Collection of information using multiple, triangulated methods such as interviews, observations, unobtrusive trace measures, and document analysis

Case studies are inclusive, assuming that consideration of the whole, covering interrelationships, is more advantageous than a reductionist study of parts, and that this depth compensates for any shortcomings in breadth and the ability to generalize. Furthermore, the case study method does not look for representative instances, but welcomes extraordinary cases and outliers. However, descriptions from a single researcher should be cross verified to enhance the reliability of participant accounts, while still recognizing that each individual point of view may be valid. While single cases are not enough to support or reject hypotheses, they may shed light on theory.[5]

Case studies have been proposed as useful for designers, bearing some resemblance to the design process. Case studies require the researcher to determine a problem, make initial hypotheses, conduct research through interviews, observations, and other forms of information gathering, revise hypotheses and theory, and tell a story.[6] The telling of case studies should in fact be designed, and when well composed, can result in compelling human narratives, meaningful for research yet enjoyable to read, with vivid details that make the case more memorable.[7] Furthermore, the documenting of design process has the potential to contribute to a repository of design case studies.

1. Yin, Robert K. *Case Study Research: Design and Methods*, 3rd ed. Thousand Oaks, CA: Sage Publications, 2002.

2. Harvard Law School introduced the concept of case study beginning in the late 1870s, taking advantage of existing cases natural to the practice of law, and in reaction to traditional teaching methods requiring memorization and recall. By the 1920s, the Harvard Business School followed, with the added challenge of writing its own cases. Harvard Medical School introduced the use of case studies in the 1980s. The adoption of case studies as an educational approach fostered in-depth reading of cases, analysis, and the dialectic of classroom discussion. In professional programs, case studies proved to be a needed bridge between the scholarship of theories, and connections to real-life experience to inform decision making. See:
Breslin, Maggie, and Richard Buchanan. "On the Case Study Method of Research and Teaching in Design." *Design Issues* 24, no. 1 (Winter 2008): 36–40.

3. Breslin, Maggie, and Richard Buchanan. "On the Case Study Method of Research and Teaching in Design." *Design Issues* 24, no. 1 (Winter 2008): 36–40.

4. Robson, Colin. *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*, 2nd ed. Oxford: Blackwell Publishers, 2002.

5. Sommer, Robert, and Barbara Sommer. *A Practical Guide to Behavioral Research: Tools and Techniques*. New York: Oxford University Press, 2002.

6. See note 3 above.

7. See note 5 above.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

78,79
80
48
47
49
42
43

16 Concept Mapping

Concept mapping is a visual framework that allows designers to absorb new concepts into an existing understanding of a domain so that new meaning can be made.[1]

A concept map is a sense-making tool that connects a large number of ideas, objects, and events as they relate to a certain domain. It provides a scaffolding that can help designers visualize the complexities of a system, and assists them as they make and break connections, study existing connections, and expand on what is already understood but possibly taken for granted within a particular system.

Concept maps consist of individual *concepts* (a well-understood idea, object, or event; usually a noun or noun cluster) connected by *linking words* (usually a verb). When linking words connect two or more concepts, a *proposition* is formed that creates a meaningful statement. As propositions emerge, some relationships may reflect knowledge that is already understood, but others will represent new knowledge.[2] The power of the concept map is that it brings new connections into focus within the context of already understood information. As new insights are formed, designers can study relationships between old and new concepts, revealing new meaning as it relates to the domain.

To construct a concept map, it is important to have a good understanding of the domain. If one's understanding of the concepts is limited, it will be difficult to make meaningful interconnections with linking words.[3] Also, articulating the correct focus question is a key step that will provide context and structure to the map. "How do people share pictures" and "How do people want to share pictures" should lead to different maps: the former providing a listing of options, the latter, a more exploratory audit suggesting a range of opportunities.

After a focus question is generated, a list of fifteen to twenty-five concepts should be identified and ranked from general to very specific, as they relate to the focus question. Successful concept maps are organized hierarchically based on this ranking, even if it is just a loose organization at first. Once all of the concepts are ranked, the next step is to initiate the construction of a preliminary map using either paper-based or computer-based tools that make it easy to move concepts around. Ideally, the concepts can be moved around by trial and error until the best hierarchy is reached.

Once a strong map is in place, cross-links identify relationships between subdomains in the map, and linking words articulate individual concepts. This can be the most difficult step for the mapmaker.[4] Finally, revise, reposition, and rewrite until a final map emerges that adequately answers the focus questions. Maps that meet the above criteria should help design teams gain new knowledge, and find new meanings in an information space.

1. While researching how children learn new concepts and information, David Ausubel determined that learning is more meaningful when new information is assimilated into existing frameworks that children already grasp. While seeking a better way to represent the learning process, what emerged was the idea of visually representing children's knowledge in the form of a concept map. See:

Ausubel, David P. *The Psychology of Meaningful Verbal Learning*. New York and London: Grune and Stratton, 1963.

2. Ausubel, David, Joseph D. Novak, and H. Hanesian. *Educational Psychology: A Cognitive View*, 2nd ed. New York: Holt, Rinehart & Winston, 1978.

3. See note 2 above.

4. See note 2 above

5. Novak, J. D., and A. J. Cañas. "The Theory Underlying Concept Maps and How to Construct and Use Them" in *Technical Report IHMC CmapTools 2006-01 Rev. 01-2008*, Florida Institute for Human and Machine Cognition, 2008, http://cmap.ihmc.us/Publications/ResearchPapers/TheoryUnderlyingConceptMaps.pdf

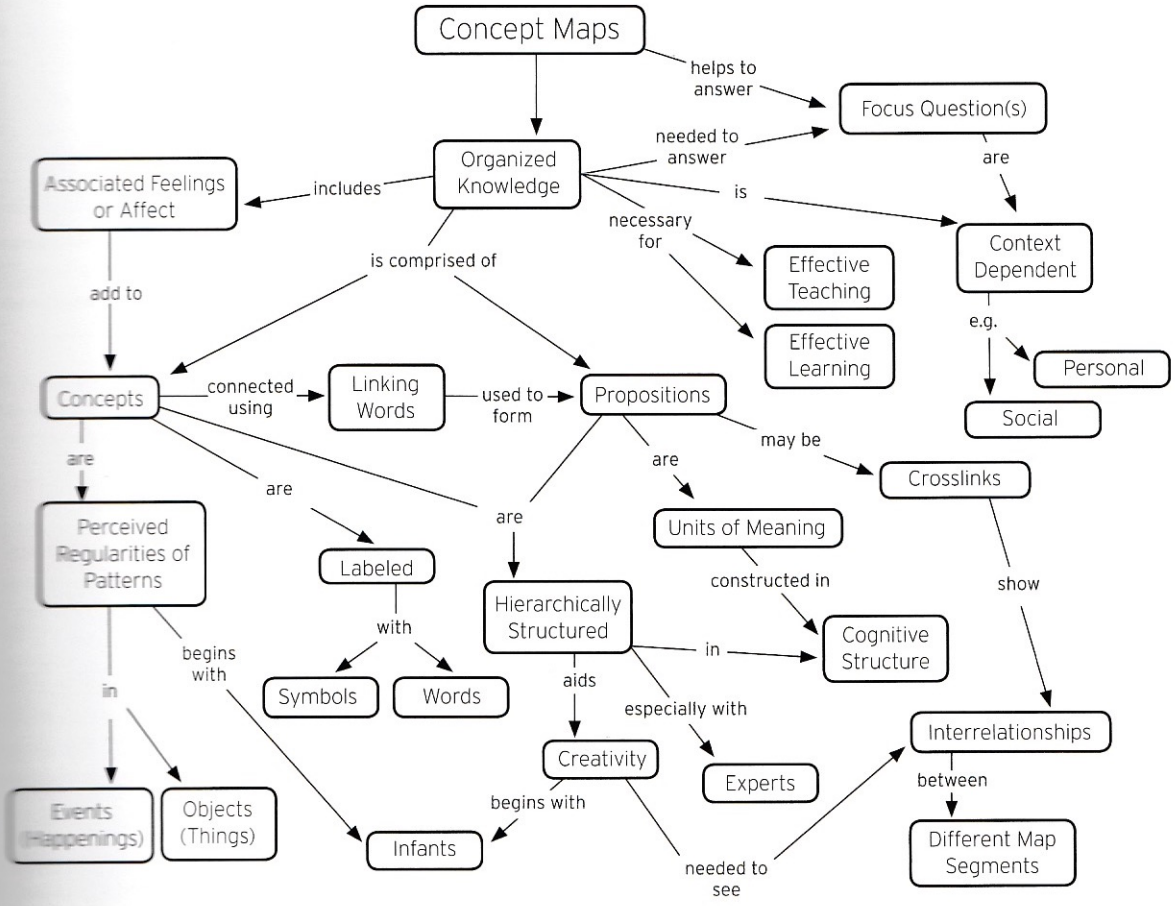
CmapTools, a knowledge modeling kit that is designed to construct concept maps, is available online at cmap.ihmc.us.

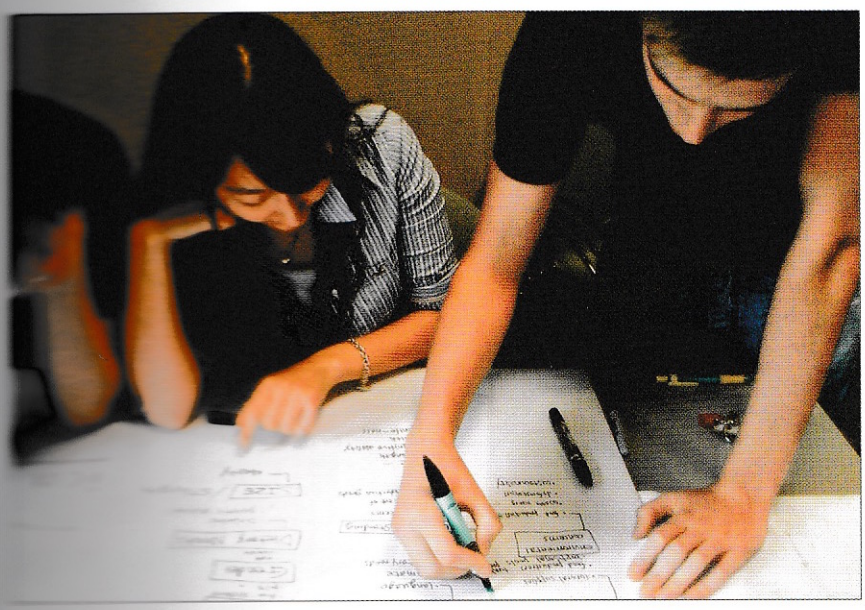
Further Reading

Novak, Joseph D,. and D. Bob Gowin. *Learning How to Learn*. Cambridge: Cambridge University Press, 1984.

Preszler, R. W. "Cooperative Concept Mapping Improves Performance in Biology." *Journal of College Science Teaching* 33 (2004): 30–35.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process





Concept maps are organized in a downward hierarchy, with the focus question at the top of the map and the most general concepts below it.

Concepts are well-understood ideas, objects, or events, connected by *linking words*. When linking words connect two or more concepts, a *proposition* is formed that potentially challenges existing thinking or creates new meaning.[5]

Courtesy of Joseph D. Novak and Alberto J. Cañas, http://cmap.ihmc.us

24 Cultural Probes

Cultural probes are provocative instruments given to participants to inspire new forms of self-understanding and communication about their lives, environments, thoughts, and interactions.[1]

Cultural probes consist of any number of materials designed to inspire people to thoughtfully consider personal context and circumstance, and respond to the design team in unique, creative ways facilitated by the provocations. Cultural probe studies have used postcards, maps, journals, cameras, recording devices, and various pieces of text and imagery to guide personal responses. Cultural probes use several such artifacts, packaged together for participants. The materials, much like the method itself, are intentionally flexible and open-ended. The creators of cultural probes place the method in the artist-designer realm, with an emphasis on being openly subjective, collecting inspirational data to stimulate design imagination.[2]

In a study of interaction techniques to increase the presence of the elderly in three European communities, Bill Gaver et al. created cultural probe kits to gain impressionistic views of participant cultures, preferences, beliefs, and desires.[3] Postcards contained obscure images and were preaddressed for return to the design team, posing open questions about the cultural environment, life, and technology. Several maps printed on various papers asked the elderly to mark zones for meeting others, being alone, dreaming, and going somewhere they could not. Disposable cameras were provided to take images of both assigned and self-selected things, and to use these in telling a story in a small album included in the kit. Finally, a media diary asked about technology interactions and communication.

As an exploratory research method, cultural probes are not intended to be formally analyzed, but rather to serve as inspirational pieces identifying key patterns and themes that might emerge from a participant group or culture. They serve to begin a conversation about possibilities that might exist by design, in tandem with other informative research methods such as observations, site visits, interviews, and secondary sources. In the Gaver et al. study, the results of the returned kits were used as one element to inspire proposals for future possibilities and design conversations, based on the character of each local culture.[4]

Cultural probes are specifically casual and informal, yet thoughtful in their aesthetic craft, message, and delivery, created to inspire delight and respect, response and return. The materials created for probe kits should be varied and imaginative, designed to elicit responses that are relevant to the particular design inquiry. When done well, cultural probes will gain respectable response rates comparable to or exceeding traditional methods, with investment in the exercise by enthusiastic participants, and rich information to inspire great design.

1. The seminal research on cultural probes is by Gaver et al., created for the "Presence Project," examining technology and the increased presence of the elderly in their local communities in Norway, the Netherlands, and Italy. See "Cultural Probes" by Bill Gaver, Tony Dunne and Elena Pacenti, in *Interactions*, January-February 1999, pp. 21-29.

2. See note 1 above.

3. See note 1 above.

4. See note 1 above.

Further Reading

W. Gaver, A. Boucher, S. Pennington, and B. Walker. "Cultural Probes and the Value of Uncertainty" in *Interactions*, Vol. XI.5 (2004): 53-56.

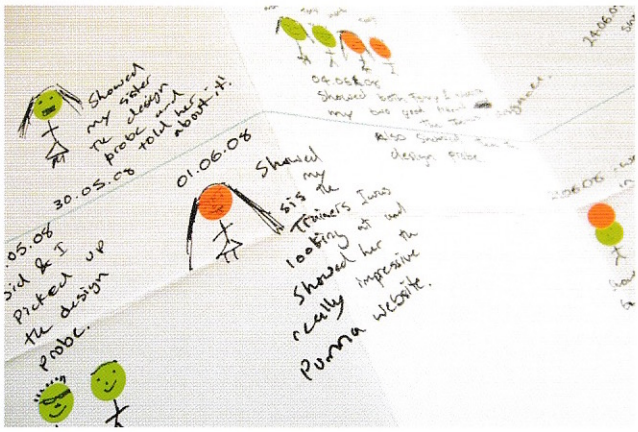
Herd, Kate, A. Bardill, and M. Karamanoglu. "The Co-design Experience: Conceptual Models and Design Tools for Mass Customization" in *Handbook of Research in Mass Customization and Personalization*, vol 1. Singapore: World Scientific Press, 2010.

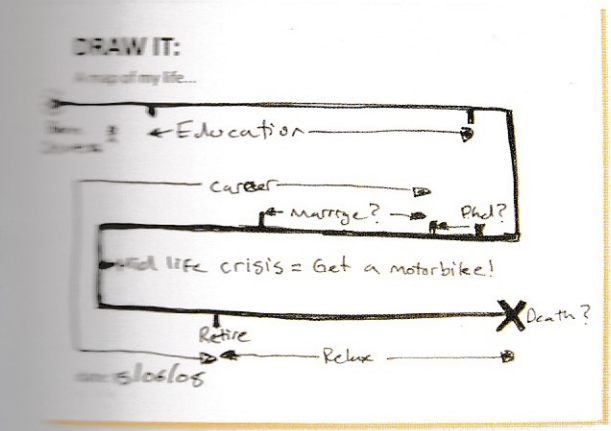
Herd, Kate, A. Bardill, and M. Karamanoglu. "X-ray Specs, Stickers and Colouring In: Seeing Beyond the Configurator using Design Probes." *Proceedings of 2009 World Conference on Mass Customization & Personalization*, 2009.

Herd, Kate, A. Bardill, and M. Karamanoglu. "Development of a Design Probe to Reveal Customer Touch Points in the Sale of Mass Customised Products." *Design Principles and Practice* 3, no. 3 (2009): 193-208.

Mattelmäki, Tuuli. *Design Probes*. Publication Series of the University of Art and Design Helsinki, 2006, http://www.uiah.fi/publications

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process





A cultural probe kit for tracking the experience of customers as they move from being consumer to co-designer using mass customizable products. Design probes support empathic understanding through information gathering over a prolonged period, where the researcher cannot be present. The probe kits in this study collected user reflections on experiences through their personal stories, told using digital voice recorders, cameras, postcards, diaries, and stickers.

Courtesy of Kate Herd

30. Diary Studies • 37. Experience Sampling Method • 64. Photo Studies

26 Design Charette

When superior design features and characteristics inspire subsequent rounds of ideas, the end result is more likely to be an optimized design solution.[1]

Design teams flourish when they have a creative environment to explore and share ideas freely, and are expected to leverage and build off each other's best ideas. A design charette is a workshop-style technique that provides a collaborative space that allows for this creation and cross-pollination of design ideas to occur. Designers and non-designers—including project stakeholders, engineers, and users—can participate in a design charette. It can be used to explore ideas about opportunities of a large-scale design challenge, or generate possibilities regarding a very specific interface (where it is more commonly referred to as *parallel prototyping*).[2]

The method is inspired by the process of biological natural selection and genetic algorithms,[3] which seeks to test and select the strongest qualities as the basis for the next generation. This process, when applied over several generations, results in a population (or in the case of a design charette, a design solution) that is optimized for success, given its various requirements.

When planning a design charette, select a physical space that will inspire creativity and the flow of ideas. There should be a public space for participants to come together and discuss the range of ideas, and work spaces for individuals or groups to generate design ideas. At each work space, provide tools to spur creativity: paper templates, pencils, erasers, color markers. The sessions should be decidedly low tech, and a moderator can help to keep things moving, take pictures, and make sure that each group has what they need. Design session outcomes can either be presented, or simply displayed in an area large enough for all participants to congregate and talk about the spectrum of ideas. It should be clearly communicated that each round of designs build off the preferred components identified in the prior cycle.

Oftentimes, more clarity can be achieved not by championing any one particular idea, but through the active comparison and contrast of many ideas.[4] Use design charettes when you want to thoroughly explore a problem space and quickly generate a wide range of ideas. A charette can quickly produce dozens of concepts, but due to the speed of the technique it should be understood that the resulting concepts are rough drafts, or at best, low-fidelity prototypes. The iterative design process can further improve upon the superior design ideas, as can usability testing and other evaluative methods.[5]

1. The National Charrette Institute suggests that the term "charrette" originates from the École des Beaux-Arts in Paris. In the nineteenth century, it was not unusual for student architects to continue working furiously on the illustrations for their design presentations, even while riding in the school cart (*en charrette*) through the streets of Paris en route to submit the projects to their professors. Hence, the term was adapted into the current design-related usage to reflect its rapid pace.

2. McGrew, John F. "Shortening the Human Computer Interface Design Cycle: A Parallel Design Process Based on the Genetic Algorithm." *Proceedings of the Human Factors and Ergonomics Society 45th Annual Meeting*, 2001: 603–606.

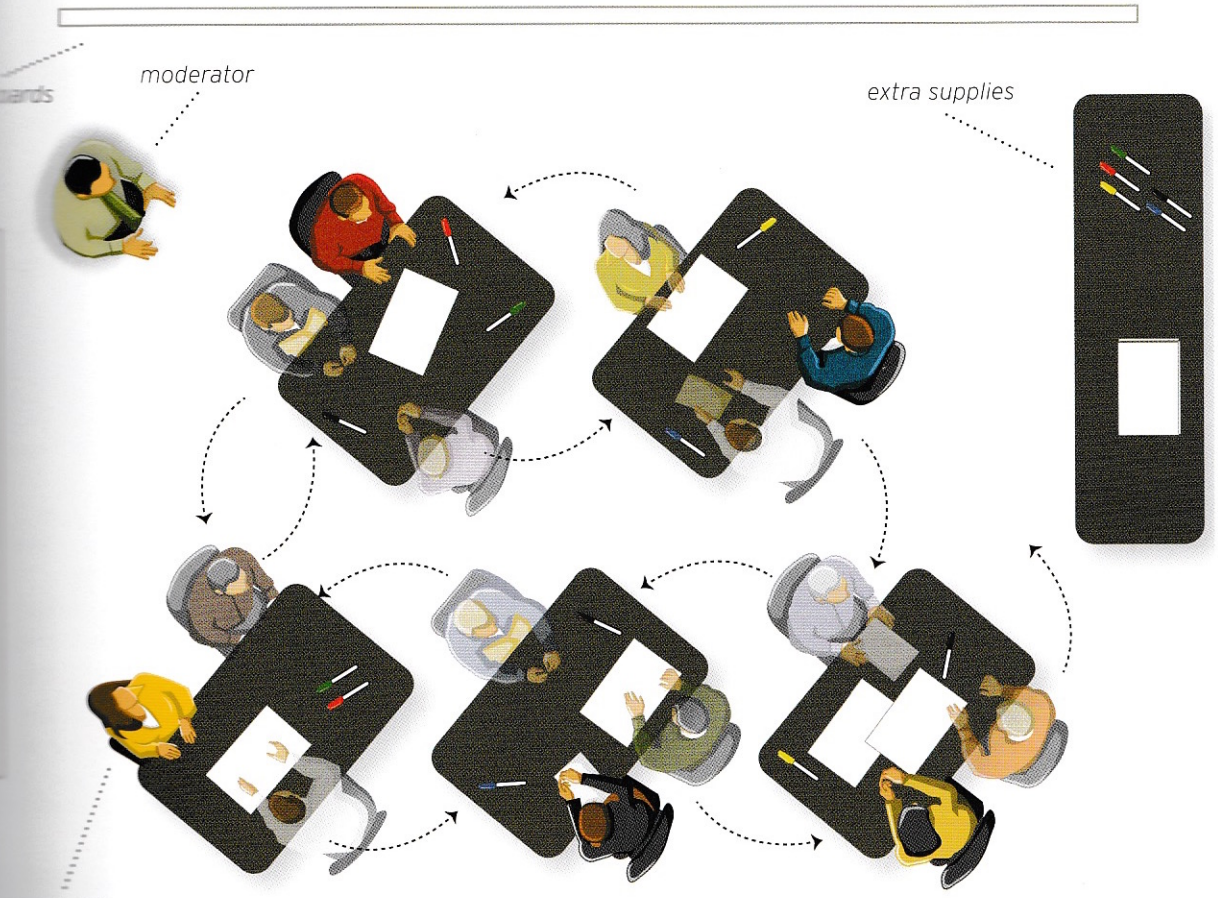
Nielsen, Jakob, and Jan Maurits Faber. "Improving System Usability Through Parallel Design." *IEEE Computer* 29, no. 2 (1996): 29–35. Also available online at useit.com.

3. See note 2 (McGrew) above.

4. Tohidi, M., B. Buxton, R. Baecker, A. Sellen. "User Sketches: A Quick, Inexpensive, and Effective Way to Elicit More User Feedback." *Proceedings of NordCHI 2006*, 2006.

5. Nielsen, Jakob, and Heather Dusurvire. "Comparative Design Review: An Exercise in Parallel Design." *ACM INTERCHI'93 Conference Proceedings*, 1993: 414–417.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process



HOW A DESIGN CHARETTE WORKS

A creative space is provided for a multidisciplinary group that may consist of designers, stakeholders, and developers to come together and generate potential ideas for a project. Here, small groups of people collaborate at separate tables, and each group is given 10 minutes to sketch. After 10 minutes, the moderator asks two people from the table to move to different tables, while the third person remains at the table.

Each person brings forward the best ideas from each group, and the cross-pollination of the best ideas begins to emerge and inform superior design concepts. A benefit of the design charette is that the evaluation and synthesis of ideas happens concurrently over the course of several sessions, and can help everyone involved feel like they are contributing to the final concept.

See also 28. Design Workshops • 58. Parallel Prototyping • 61. Participatory Design

27 Design Ethnography

Design ethnography approximates the immersion methods of traditional ethnography, to deeply experience and understand the user's world for design empathy and insight.[1]

The intent of exploratory user research in design is clearly exemplified in this definition of ethnography: "The study of people in their natural settings; a descriptive account of social life and culture in a defined social system, based on qualitative methods (e.g., detailed observations, unstructured interviews, analysis of documents)."[2]

While every aspect of the above definition holds true for the motivations of design research, ethnography as practiced by professional ethnographers or anthropologists must be distinguished from design ethnography. While true ethnographers may immerse themselves in a culture or specific population for months or years at a time,[3] designers are more typically seeking sufficient information from time-sampled observations of behaviors. For example, designers conducting immersive ethnographic research may "sample" real experiences of participants through the experience sampling method, diary and photo studies, cultural probes, contextual inquiry, and various forms of observation, including modified versions of participant observation.

Design ethnography is therefore a broad approach encompassing several research methods, focused on a comprehensive and empathic understanding of the users, their lives, their language, and the context of their artifacts and behaviors. The methods of design ethnography are largely qualitative, yet designers can borrow a lesson from the rigor of true ethnographers, as suggested by this description:

"The ethnographer enters the field with an open mind, not an empty head. Before asking the first question in the field, the ethnographer begins with a problem, a theory or model, a research design, specific collection techniques, tools for analysis, and a specific writing style."[4]

Analyses of design ethnography depend on the specific methods used, but are generally focused on a comprehensive view of the users and design territory under investigation, built from deciphering patterns and themes emerging from research materials, and articulated in a set of design implications or guidelines in preparation for generative research and concept development.

1. Seminal work in ethnography derives from social anthropology, and in particular the work of Malinowski. See:

Malinowski, B. *Argonauts of the Western Pacific*. London: Routledge and Kegan Paul, 1922.

Precedent works in design and ethnography include:

"Anthropology: A Research Resource." *Innovation*, special issue. Industrial Designers Society of America, Summer 1996.

Salvador, Tony, Genevieve Bell, and Ken Anderson. "Design Ethnography." *Design Management Journal* (Fall 1999): 35–41.

Sanders, Elizabeth. "Ethnography in NPD Research: How 'Applied Ethnography' can Improve your NPD Research Process." *PDMA Visions Magazine* XXVI, no. 2 (April/May 2002): 8–12.

An extensive ethnography and design bibliography compiled from "Ethnography and Design: Resources for Teaching and Research" by Bruce M. Tharp (ed.), March 2006, is available at designresearch.wikispaces.com/file/view/compiled_ethno_biblio.pdf.

2. Bowling, Ann. *Research Methods in Health: Investigating Health and Health Services*. Buckingham: Open University Press, 1997.

3. LeCompte, Margaret D., and Jean J. Schensul. *Designing and Conducting Ethnographic Research, Ethnographer's Toolkit, Vol. 1*. Walnut Creek, CA: Altamira Press, 1999.

4. Fetterman, David M. *Ethnography Step by Step*, 2nd ed. Thousand Oaks, CA: Sage Publications, 1998.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

DESIGN FOR LEARNING IN EVERYDAY CONTEXTS

Design ethnography of the mechanic's garage, from a study of understanding how technical knowledge and preventative car care might be supported through the design of services and artifacts.

Courtesy of Gretchen Mendoza. Photos by Ivette Spradlin.

See also *24. Cultural Probes • 39. Exploratory Research • 59. Participant Observation*

31 Directed Storytelling

Directed storytelling allows designers to easily gather rich stories of lived experiences from participants, using thoughtful prompts and guiding and framing questions in conversation.[1]

Directed storytelling is rooted in the social science method of narrative inquiry, whereby researchers understand people and document their experiences from the personal stories they tell.[2] As a method of design ethnography, directed storytelling is a shorthand means of collecting compelling stories from participants when time or other factors prevent direct observation or longer forms of research inquiry.

Directed storytelling sessions are started with a prompt by the researcher to the storyteller such as "Tell me a story about the last time you..." Guidance from the research leader continues throughout the storytelling session, to keep the storyteller comfortable in flowing narrative. Additional guiding questions are posed in terms of who, what, when, where, and how. For example, if the topic of design inquiry was focused on the last time they were admitted to a hospital, guiding questions for the storyteller might include: With whom did you interact? What means of communication were involved? When did this take place, and how long did the process take? Where did the interaction occur? Were there aspects of the environment that affected your experience? How did you feel about the interactions and experience? While the research leader directs the story, ideally another person on the research team documents the session.

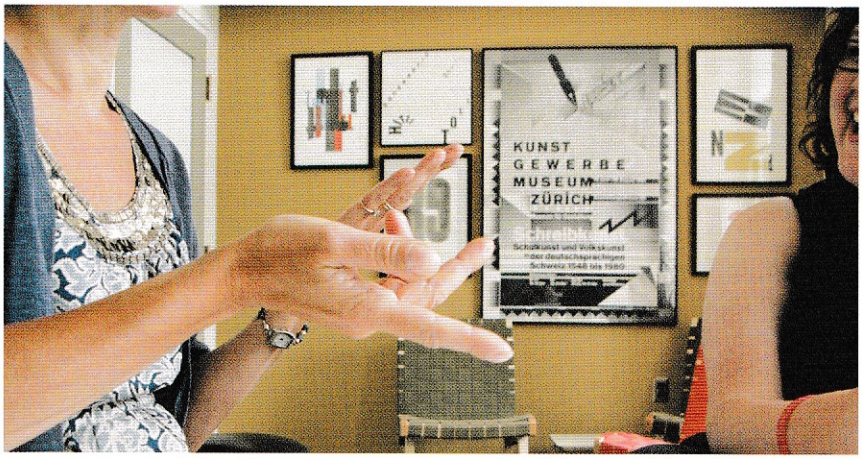
To interpret directed storytelling sessions the documentation is critical. The central ideas of the story need to be identified through the storyteller's own emphasis and interpretation by the documenter. The ideas that emerge from stories can then be clustered using common methods such as affinity diagramming, looking for consistent patterns within and across experiences. Once clusters are formed and named, the themes that characterize experiences can be modeled into a tangible framework, with maps or diagrams serving as a reference artifact for what is most significant about participant experiences. This visible knowledge serves as a critical tool in communication, and in affecting design decisions about the content, hierarchy, and form of information or interactions.

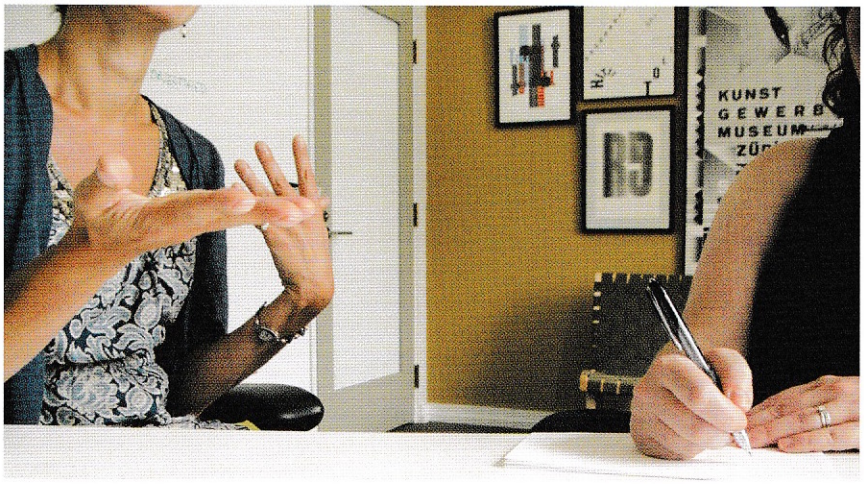
As an exploratory research tool, directed storytelling is most powerful in expressing the essence of experiences for design teams, without a large investment of time or resources. Ideally the results of directed storytelling contribute directly to design decisions. However, the method may provide a more subtle reinforcement and validation of existing design directions, or identify the need for additional research.

1. Evenson, Shelley. "Directed Storytelling: Interpreting Experience for Design" in *Design Studies: Theory and Research in Graphic Design, A Reader*. New York: Princeton Architectural Press, 2006.

2. Clandinin, Jean, and Michael Connelly. *Narrative Inquiry: Experience and Story in Qualitative Research*. San Francisco, CA: Jossey-Bass, 2000.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process





See also 48. Interviews • 22. Critical Incident Technique • 65. Picture Cards

34 Evaluative Research

Evaluative research involves the testing of prototypes, products, or interfaces by real potential users of a system in design development.

Evaluative or evaluation research attempts to gauge human expectations against the designed artifact in question, determining whether something is useful, usable, and desirable. This is the most established form of research in design, stemming from a long history of product and interface testing in human factors, commonly known as "user testing." To avoid connotations that the participants themselves are being tested, the term "product testing" is preferred. Furthermore, whereas testing in the past focused primarily on *performance* measures to gauge variables such as speed and accuracy in task completion, the emphasis in design evaluation is now more comprehensive, collecting feedback on *preference* measures as well, including the aesthetic and emotional response from users. Evaluation research therefore encompasses methods that gauge human factors and ergonomics, usability, aesthetic response, and emotional resonance.

Evaluation research is ideally iterative, based on feedback from potential users in cyclical rounds of concept and prototype development to refine product and interface details. Evaluation should never be reserved only for final product release, when design changes are potentially complicated and expensive. However, evaluation research of existing products may be useful in early stage design research, to inform new product development, for competing products or variations, or for complementary products within a system.

The methodology of evaluation research may be tightly controlled, employing a scientific, experimental model typical in lab testing. The advantage of this model is the control over extraneous variables, but this may come at the expense of realism. Depending on the fidelity of prototypes, testing can also be conducted using flexible evaluations by people using products or prototypes in context or approximate conditions of real-world use. The value of this approach is realism, but it may come at the expense of control over other influencing variables.

New crowdsourcing opportunities afford online testing by volunteers to assess pages, navigation, and how users are engaging with prototype interface designs and wireframes, complete with summarized data analysis and visualizations presented in graphs and heat maps.[1] While evaluation research should always encompass testing with potential users, other methods use expert evaluators to assess products and interfaces, such as cognitive walkthrough and heuristic evaluation.

When evaluation research is conducted following thorough exploratory and generative research, it often needs only to serve a verification purpose, to assess how well designers have responded to input from users as they iterate and refine their designs.

1. See for example:

Kittur, Aniket, Ed H. Chi, and Bongwon Suh. "Crowdsourcing for Usability: Using Micro-Task Markets for Rapid, Remote, and Low-Cost User Measurements." *Proceedings of CHI*, 2008.

See also:

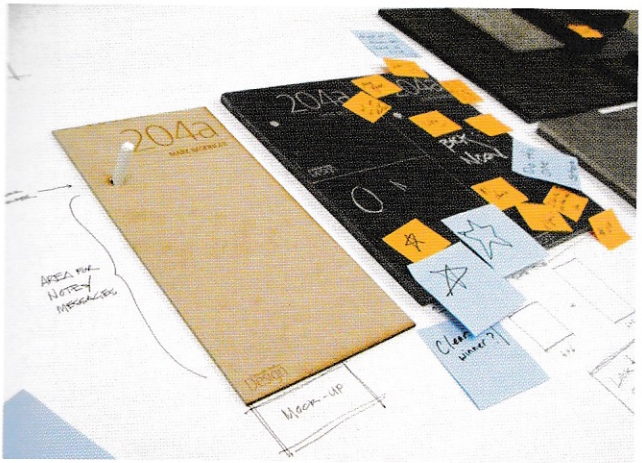
Amazon Mechanical Turk: www.mturk.com
fivesecondtest: www.fivesecondtest.com
navflow: www.navflow.com
clicktest: www.theclicktest.com

Further Reading

Barnum, Carol. *Usability Testing Essentials: Ready, Set . . . Test!* San Francisco, CA: Morgan Kaufmann, 2010.

Hackos, JoAnn, and Janice Redish. *User and Task Analysis for Interface Design*. New York: Wiley, 1998.

Tullis, Thomas, and William Albert. *Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics*. San Francisco, CA: Morgan Kaufmann, 2008.



Evaluation research can be conducted through a range of formal and informal means. Here stakeholder evaluations were informally invited through a public display of prototypes for a proposed new signage program in the School of Design at Carnegie Mellon University.

See also ***01. A/B Testing • 46. Heuristic Evaluation • 87. Think-aloud Protocol***

39 Exploratory Research

Exploratory research is defined by user and product studies, intended to forge an empathic knowledge base, particularly when designers may be working in unfamiliar territory.

Exploratory research is typically conducted in the earliest stages of the design process, set by the planning, scoping, and definition phase, and leading to generative concept design. Activities are focused on gaining a solid knowledge base of the design territory and existing artifacts, and forging an empathic sense of the people targeted by the design work.

Exploratory research should be an immersive experience for the designer, inspiring creative momentum and empathy through intense exposure to people and products relevant to the investigation, utilizing a broad variety of diverse yet complementary methods.

Depending on the area of design inquiry, research activities should focus on understanding the nature of the users' world, their daily life routines, challenges, needs, desires, interactions, product preferences, and environmental context and use patterns. Methods should also build a comprehensive knowledge of existing, complementary, and competitive products, systems, and spaces.

Exploratory research encompasses traditional, ethnographic, and other design methods, including:

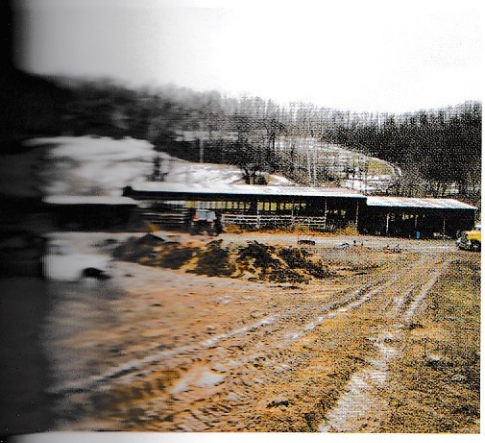
- Surveys and Questionnaires
- Design Ethnography
- Observation
- Participant Observation
- Experience Sampling
- Touchstone Tours
- Diary Studies
- Cultural Probes
- Contextual Inquiry
- Artifact Analysis
- Personal Inventories
- Unobtrusive Measures

As an exploration, research is purposefully flexible, meaning divergences from planned protocols and the collection of information from spontaneous interactions and observations are encouraged. Synthesis is critical, but targeted toward inspiration rather than the formal analysis of concrete data. Exploratory research culminates in a comprehensive understanding of the people and the area under investigation, and ideally results in a set of tangible design implications or guiding criteria, preparing the groundwork for generative research and concept development.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

Exploratory research for a service design project on how we decide what meat to buy included an extensive survey, site visits to two farms, interviews with three farmers, and observations and conversations at meat counters with workers, butchers, and consumers.

Courtesy of Kelly Nash.



See also 24. Cultural Probes • 27. Design Ethnography • 57. Observation

42 Fly-on-the-Wall Observation

Fly-on-the-wall observation allows the researcher to unobtrusively gather information by looking and listening without direct participation or interference with the people or behaviors being observed.

Fly-on-the-wall is differentiated from other types of observation, such as participant observation, because it intentionally removes the researcher from direct involvement with the activities or people under research. Fly-on-the-wall attempts to minimize potential bias or behavioral influences that might result from engagement with users. However, it may also reduce the researcher's ability to connect empathically with people and probe further into motivations behind participant behaviors.

As with other forms of observation, various degrees of structure may be put into place, although generally fly-on-the-wall observation is conducted flexibly, without predetermined criteria to specifically categorize or code observations. However, worksheets or other guiding frameworks may still usefully inform fly-on-the-wall observation (see Observation and AEIOU).

John Zeisel discusses observations from the vantage point of the observer, and suggests two forms that are relevant to fly-on-the-wall.[1] *Secret outsiders* are distant observers, with a vantage point that removes them from participants, minimizing any influence the presence of the researcher or recording equipment may have on behaviors. This form of observation may be limited in capturing individual nuances of interaction and personal depth.

Recognized outsiders have the nature of their research and role as observer made known to the participants being observed, although like a fly-on-the-wall, they position themselves in a natural and unobtrusive way within the environment under study. Despite best efforts to remain distant and unobtrusive when observing, a disadvantage of this method may still be the tendency for people to change their behaviors when they know they are being studied or observed, also known as the "Hawthorne Effect," stemming from a landmark study where this influence was first identified.[2] Another caution is perceived partisanship, if the researcher is associated with particular factions (such as management) within the environment or organization being observed.

When choosing observational methods, let appropriateness for the situation and the research question at hand guide you. For example, fly-on-the-wall might be appropriate when you are observing public places and activities, or when you are studying work processes that may be unduly influenced if interrupted or inconvenienced. Any time you believe that people may edit their speech and actions if observations are intrusive, or the observer's presence will change behaviors, fly-on-the-wall may be a good choice of methods.

1. Zeisel, John. *Inquiry by Design: Environment/Behavior/Neuroscience in Architecture, Interiors, Landscape, and Planning*. New York: Norton, 2006.

2. The Hawthorne Effect is the recognized influence on the behaviors of people because they are under observation or study. The term originates from a study of worker productivity in response to manipulations of lighting levels in the Hawthorne Works of the Western Electric Company in Chicago, in the 1920s and 1930s. Productivity was seen to increase regardless of degree of lighting manipulation and other workplace changes, and drop when studies were concluded, leading to the belief that the intervention itself, or the interest being shown in workers, was responsible for short-term increases in productivity. See, for example:

Landsberger, Henry A. *Hawthorne Revisited*. Ithaca, NY: Cornell University, 1958.

Behavioral	Quantitative	Innovative	**Exploratory**	Participatory
Attitudinal	**Qualitative**	Adapted	Generative	**Observational**
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

See also 57. Observation • 76. Shadowing • 92. Unobtrusive Measures

47 Image Boards

A collage of collected pictures, illustrations, or brand imagery can be used to visually communicate an essential description of targeted aesthetics, style, audience, context, or other aspects of design intent.

Image boards, or mood boards, are a long-standing tradition used by a variety of design professions for a range of reasons, built from inspiration and serving to inspire and sell. The image board is typically created once the designer or team has decided on a general focus for design aesthetics, style, context, or audience. Images are then collected that are representative of that defined aesthetic, context, or user group, and these images are edited and collaged. The image board bears some resemblance to sample boards used by interior designers, whereby color, material, and sometimes hardware and product swatches are presented together to communicate a proposed design system.

For example, to create an image board to visually define the meaning of a chosen design aesthetic verbally described as "urban chic," images that convey the particular styles, colors, products, brands, and environments associated with the designer's interpretation of that aesthetic would be collected, edited, and collaged. For more specific design purposes, image boards can be created to describe targeted users or environmental context. For a user-based image board, the visuals might portray types of people that define an audience target, profiling their age demographics and tastes and preferences as conveyed through clothing, products, preferred brands, environments, activities, transportation, and social interests. An environment-based image board might visually define the typical surroundings for which a product design is appropriately intended, showing sample interiors, furniture, lighting, fixtures, and conveying color palettes and atmospheric tone.

As an internal tool, image boards can serve as a tangible focus for the designer, a visual reminder of the aesthetic context or audience for inspiring their design efforts. Image boards can also serve well as a consensus artifact for design teams, visually representing an agreed-upon version of a design aesthetic or context. To this end, the act of creating the image board can itself be an important tool, managed through team contributions so that all members take ownership of the decided-upon visual definition for design focus. Externally, image boards are powerful tools for effectively communicating design intent to clients, visually clarifying an aesthetic direction or targeted audience.[1]

1. Most image boards are created by hand as physical artifacts, but software tools can also be used, and online services for the digital creation of mood boards are available. See, for example, http://www.sampleboard.com and http://www.moodshare.co

2. Hughes, Kristin. "Design to Promote Agency and Self-efficacy through Educational Games" in *Beyond Barbie and Mortal Kombat: New Perspectives on Girls and Games*. Cambridge, MA: MIT Press, 2008: 231–246.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

Left: These image boards were produced to help the design team better understand the pop culture, likes, and dislikes of teenage girls. Collage was a great method to use, helping capture the DIY spirit of teenage girls. The boards helped to inform the visual brand/identity and verbal language for a large scale, city-wide, role playing game.[2]

Image boards created by Rebecca Bortman and Michael Sui, courtesy of Kristin Hughes

Below: This image board was created to capture the styling and design intent for a series of wooden vessels. It is used as a reflection piece to show previous typologies of vessel forms in this series and to help inform future design iterations.

Courtesy of Mark Baskinger © 2011

See also 56. Mind Mapping • 80. Stakeholder Maps • 85. Territory Maps

48 Interviews

Interviews are a fundamental research method for direct contact with participants, to collect firsthand personal accounts of experience, opinions, attitudes, and perceptions.

Interviews are one of two methods of survey research, the other being questionnaires. Interviews are best conducted in person so that nuances of personal expression and body language are recognized in conversation, but they may be conducted remotely by phone or using social media.

Interviews may be structured and follow a script of questions, or relatively unstructured, allowing for flexible detours in a conversational format. However, even in unstructured interviews, the researcher typically has a guiding set of topics that he or she hopes to address in the session. Unstructured interviews have the advantage of being conversational and more comfortable for participants, but rely on the researcher to guide the session and collect the necessary information within an allotted time. Structured interviews may be perceived as formal and impersonal, but are easier to control in terms of questions and timekeeping, and are easier to analyze.

Questions asked during interviews will vary depending on the nature of the design inquiry. If the research is designed for exploratory purposes, then the unstructured format and flexible diversions are fine. However, if designed for more rigorous purposes where consistency across sessions is required, questions should be read exactly as scripted by each interviewer, to avoid the introduction of subtle bias or altered interpretations by the researcher or respondent. In all forms of interviews, the researcher needs to be personally sensitive and adaptable, yet organized and responsible in adhering to the protocol of the session.

Targeted audience is another way to distinguish types of interviews. For example, stakeholder interviews focus on information from specific roles or people who may have a vested interest in the particular inquiry. Key informant interviews concentrate on people who have specialized or expert knowledge to contribute. Interviews may also be conducted individually, with couples, or with strategic groups. Paired or group interviews are efficient and often provide more natural conversation, with participants reminding or challenging each other about details and history. However, the researcher must also be aware of the undue influence that one person can have over another, and find ways to moderate the risk of dominated interviews or conversations.

Interviews are often one component of a research strategy utilizing complementary methods such as questionnaires or observations, to verify and humanize data collected using other means. Interviews can be made more productive when based around artifacts, the inspiration behind integrated methods such as touchstone tours, personal inventories, and picture cards.

Further Reading

Kuniavsky, Mike. *Observing the User Experience: A Practitioner's Guide to User Research*. San Francisco, CA: Morgan Kaufmann, 2003.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

See also 20. Contextual Inquiry • 67. Questionnaires • 83. Surveys

49 KJ Technique

When the traditional meeting format fails to achieve group consensus, the KJ Technique can be used to help teams work through a problem space and prioritize what should be focused on first.[1]

The KJ Technique is a consensus-building exercise that helps teams organize a complicated range of ideas and information. When used as a format for a team meeting, the KJ Technique is an effective way to externalize all of the information that is in everyone's heads, and then organize and prioritize the data in a way that builds group consensus.

In traditional meetings, there is rarely enough time for a problem space to be described, let alone be better understood. This is not a symptom of team dysfunction; rather, it is a limitation of the traditional meeting format. The KJ Technique is designed to succeed in ways that typical meetings fail because it focuses the team on one focus question, and then sets everyone to work on the same task at the same time. Other key strengths of the KJ Technique include:

The KJ Technique is silent. Everyone in the group is provided with blank sticky notes and markers, and then asked to write as many problems, insights, data, or opinions as they can think of—in silence. This way, everyone is provided with an equal opportunity to express his or her points of view, and has the assurance that their issues are being represented and shared.

The KJ Technique makes effective use of time. In traditional meetings, only one person can speak or draw on the white board at a time. With the KJ Technique, all of the sticky notes are posted simultaneously, opening up the opportunity for a holistic assessment of the problem space. This process helps everyone to understand that it is not about "my opinions" versus "your opinions," but rather "how do my opinions relate to yours, and how do our concerns paint a broader picture of our challenge?"

Group pressure won't affect outcomes. The KJ Technique promises equal representation, regardless of the politics and personalities involved. It doesn't matter who has the most power or who can most eloquently argue their point of view. By providing a framework where everyone silently works together as a team, decisions are made democratically, with little or no opportunities for coercion.[2]

Within one to two hours, a team can organize their notes into an *affinity diagram*, which is a relational visual representation of a team's observations, knowledge, concerns, and ideas. Although results of the KJ Technique are subjective and qualitative, it is a powerful way for teams to come together, solve problems, and prioritize next steps.

1. Jiro Kawakita, a Japanese anthropologist, created the KJ Technique in the 1960s. It is one of the seven management and planning tools used in Total Quality Control. See: Kawakita, Jiro. *The Original KJ Method*. Tokyo: Kawakita Research Institute, 1982.

2. Spool, Jared. "The KJ-Technique: A Group Process for Establishing Priorities," 2004, http://www.uie.com

Further Reading

Kuniavsky, Michael. *Observing the User Experience*. San Francisco, CA: Morgan Kaufmann, 2003.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	**Qualitative**	Adapted	**Generative**	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

Meetings that use the KJ Technique are completed in silence. Team members independently identify their respective concerns and project requirements on sticky notes, and then silently cluster similar concerns and challenges. It is effective in helping teams reach consensus and externalizes the range of issues that teams need to work together to solve.

See also 03. *Affinity Diagramming* • 96. *Value Opportunity Analysis* • 98. *Weighted Matrix*

53 Literature Reviews

Literature reviews are an integral part of academic papers, but are also a useful component of any design project, to collect and synthesize research on a given topic.

Literature reviews are a familiar method of secondary research to any student who has written a term paper or report, yet they can also be critical to design projects in both research and practice. The literature review is intended to distill information from published sources, capturing the essence of previous research or projects as they might inform the current project. The review need not summarize everything from each source, but should begin to converge the information in a synthetic way, such that connections are drawn between references, while maintaining relevant focus on the design project. Literature reviews may be freestanding, but are more typically one component of a larger research paper or project.

Internet resources have expedited literature searches significantly, allowing the researcher to access libraries from around the world using online tools, digital journals, email, and interlibrary loans. However, the good researcher is still discerning in the choice of references for the review, ensuring that the research and literature selected for inclusion are not only relevant, but from credible sources. Particular caution should be exercised if including website or blog resources, often not vetted or peer-reviewed for credibility. Nonetheless, literature reviews for design may include a diverse range of references, including, but not limited to, books, chapters, journal and magazine articles, theses and dissertations, corporate and academic websites and blogs, and documented design projects.

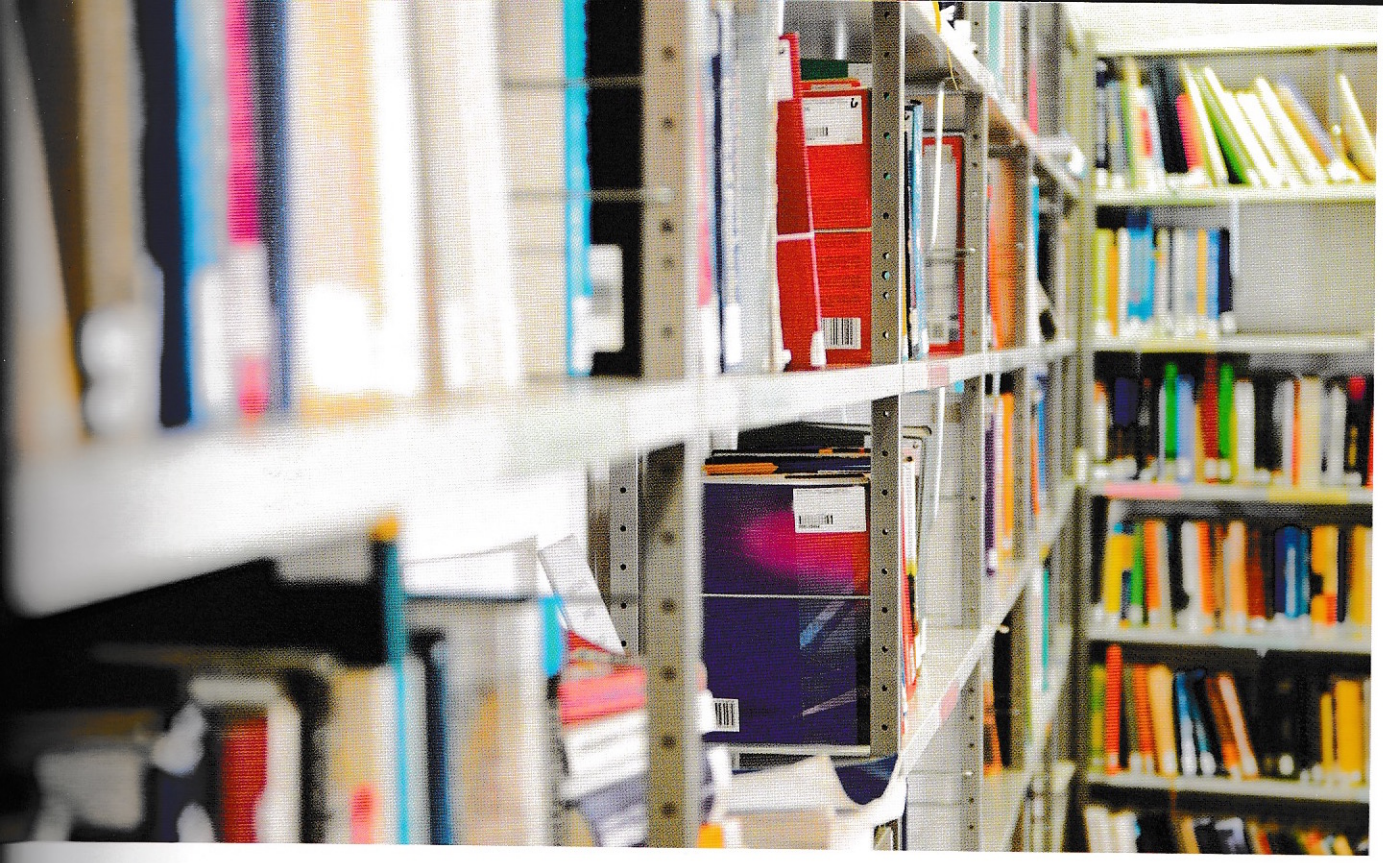
It is often useful in literature reviews to organize the material by research categories. For example, if the focus of the design project is a new digital application for teenagers, the literature could be sectioned into topics related to technology, generational trends, and game design. Other organizational strategies include chronological, thematic, or methodological.

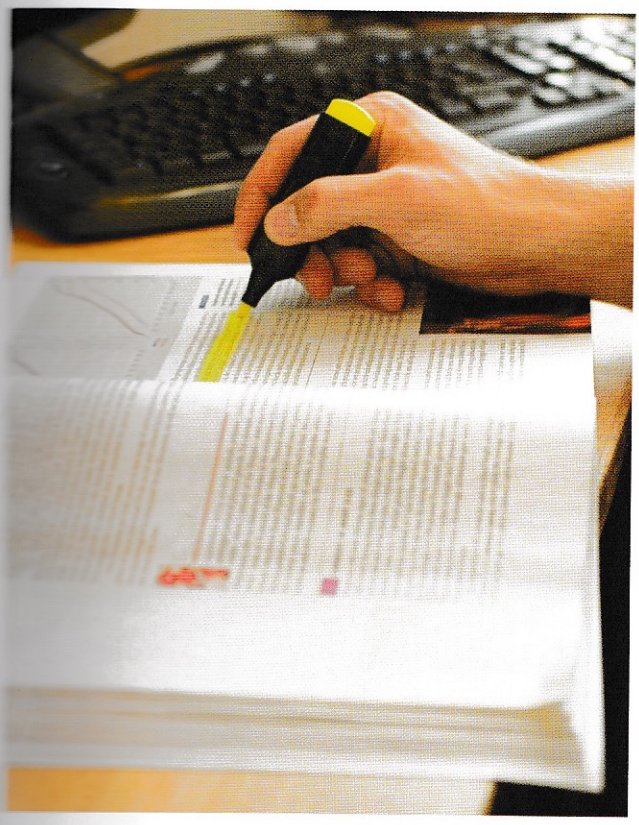
The guiding factor in selecting literature for the review should be relevance to the project, clearly suggesting *how* it informed or informs the design investigation. In rare cases in design, literature reviews attempt to be completely exhaustive, or "systematic reviews," even using statistical techniques or scoring systems to establish the eligibility of study inclusion in the review (see evidence-based design). In all cases, literature reviews should be accurately referenced using consistent footnoting or endnoting, and bibliographic style, although there is no single agreed-upon system for design.

Further Reading

Booth, Wayne C., Gregory G. Colomb, and Joseph M. Williams. *The Craft of Research*, 3rd ed. Chicago, IL: The University of Chicago Press, 2008.

A number of good resources in standard research and writing textbooks can help guide the literature review process. Additionally, many colleges and universities publish online guides, for example, the Writing Center at the University of North Carolina at Chapel Hill: http://www.unc.edu/depts/wcweb/handouts/literature_review.html





Extracting salient information from precedent research and projects through comprehensive literature reviews is a critical step in laying the foundation and contextualizing the design inquiry.

See also 35. *Evidence-based Design* • 74. *Secondary Research* • 92. *Unobtrusive Measures*

56 Mind Mapping

When a topic or a problem has many moving parts, mind mapping provides a method of visually organizing a problem space in order to better understand it.

Mind mapping is a visual thinking tool that can help generate ideas and develop concepts when the relationships among many pieces of related information are unclear. It provides a nonlinear means of externalizing the information in our heads so that we can consolidate, interpret, communicate, store, and retrieve information. Because of its visual, diagrammatic nature, it is a powerful mnemonic device, and can be used to promote understanding and enhance recall of a problem space.

Because the way people think is rarely linear, and complicated problems do not follow a neat pattern of steps that can be isolated from one another, mind maps reflect how we think through complexities of a given problem. As the map takes shape, it allows us to summarize and test assumptions, make and break connections, and consider alternatives while we shape the data into meaningful themes and patterns.

By limiting mind maps to one side of one sheet of paper, the process of freely mapping associations should not feel overwhelming. To draw a mind map, follow the steps below:[1]

1. Identify a focus question to serve as the central theme and keep the mapping process from straying off topic. Draw the subject in the center of a sheet of paper, and circle it.
2. Start drawing extensions outward from the center of the map, and label them with simple verb-noun pairs or noun clusters. The closer a word or image is to the center, the more importance it takes on in your map. These are your primary connections.
3. As the spokes of primary connections are identified, each will reveal deeper, more granular levels of secondary information. Connect primary and secondary connections with lines. It is the connections of concepts that create meaning.
4. Continue this process of making free associations until all relevant pieces of information are represented. As new information comes up, add it to the map.
5. Before declaring the map complete, stay with it for a while. The idea is to strengthen concepts and their interconnections with hopes of creating new knowledge and understanding.

By providing people a means to visually represent their unique thinking patterns in a nonlinear, visual way, researchers can better understand different ways that people prioritize and organize information. After the map is complete, have the user explain the pieces of the map, and its meanings. When mind mapping is used in this manner, it would fall under a "self-reporting" method, and should be further vetted with additional observation-based research. Nonetheless, it can be used to reveal basic, idiosyncratic patterns of thinking.[2]

1. Hyerle, David. *Visual Tools for Constructing Knowledge*. Alexandria, VA: ASCD, 1996.

2. See note 1 above.

3. See note 1 above.

Further Reading

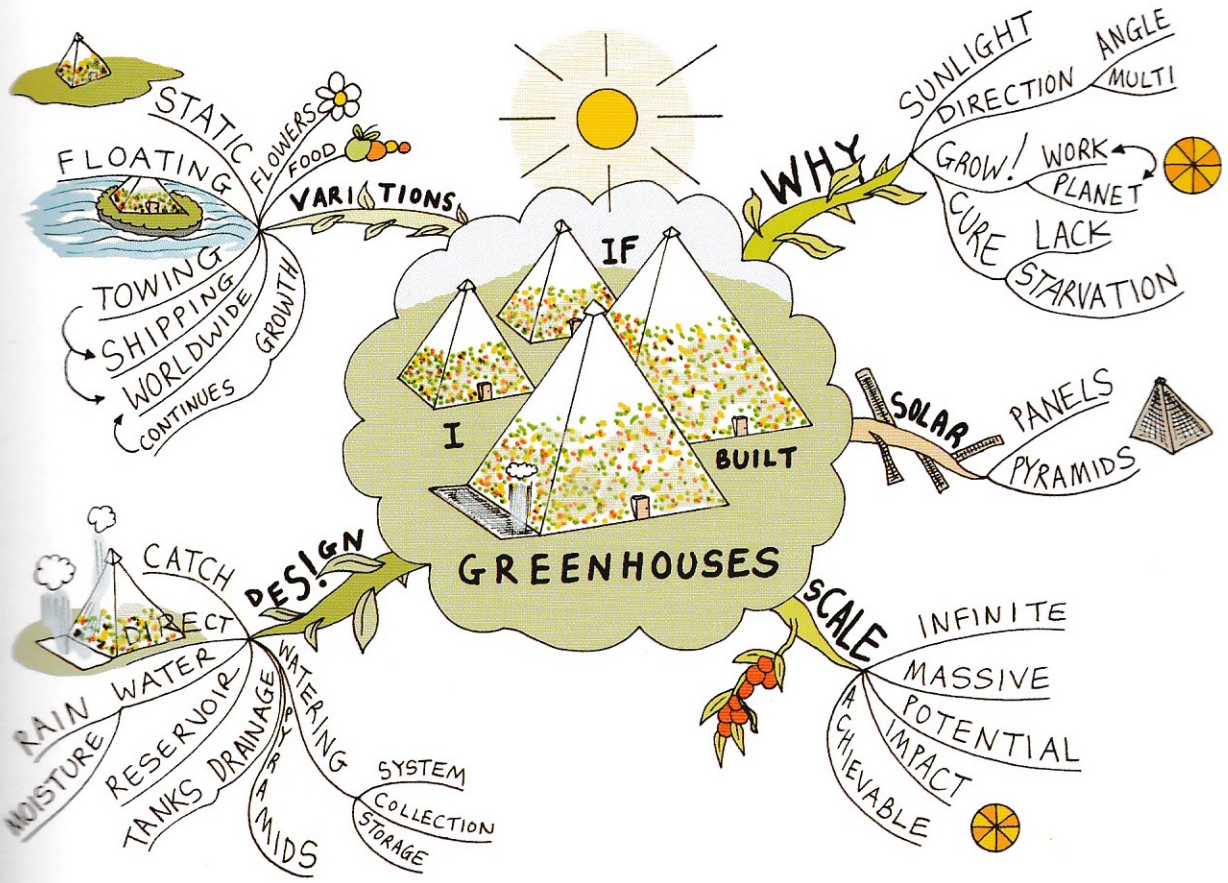
Buzan, Tony. *The Mind Map Book*. New York: Plume, 1996.

Buzan, Tony. *Use Both Sides of Your Brain*, 3rd ed. New York: Plume, 1991.

Wycoff, Joyce. *Mindmapping: Your Personal Guide to Exploring Creativity and Problem-Solving*. New York: Berkley Books, 1991.

See www.mindmapinspiration.com.

Behavioral	Quantitative	**Innovative**	**Exploratory**	Participatory
Attitudinal	**Qualitative**	Adapted	Generative	Observational
		Traditional	Evaluative	**Self reporting**
				Expert review
				Design process



© Paul Foreman http://www.mindmapinspiration.com

When used as a method of analysis and sense-making, mind mapping allows us to simultaneously identify the subject of the map, relationships between the components, and understand the relative importance of the information that is represented. The ability to understand the boundaries, and at the same time understand the interconnecting parts within the system, reflects our human capacity for systems thinking at work.[3]

Use single words or simple noun clusters, common symbols, hand-drawn images, and group-related information with starbursts or clouds. These visual cues serve to transform the map to a mnemonic device that can more readily trigger recall of the information space.

See also 08. Brainstorm Graphic Organizers • 14. Collage • 16. Concept Mapping

58 Parallel Prototyping

Simultaneously exploring multiple design opportunities can help teams keep from fixating on a design direction too early, improve the nature of design critiques, and lead to more effective design results.[1]

Parallel prototyping is the process of considering a range of potential design ideas simultaneously before selecting and refining one specific design approach. When applied before iterative design, parallel prototyping enables teams to more fully experiment with and investigate a wide range of opportunities in a design space. It can also help designers to avoid becoming fixated on a design, and avoid "hill climbing" toward a less superior result, which has been a long-standing criticism of the iterative design methodology.[2]

Parallel prototyping asks that designers quickly and independently create a range of low-fidelity prototypes, and then submit designs to testing by end users, or to heuristic evaluation by experts. The intention of these design evaluations is not to pick the "best" or "most preferred" design. Rather, the evaluations should help the designers to thoughtfully reflect and consider how people react to individual elements of the design, and which accomplish the intended goals of the project. The best qualities of all preceding designs can then be refined and merged to inform a superior, optimized design. Parallel prototyping affords other advantages when exploring potential solutions to a problem space. Parallel prototyping:

- **Encourages divergent explorations.**[3] Because a goal of parallel prototyping is to create multiple design options, the method frees designers to explore and get feedback on a wide range of options, as opposed to locking in on and refining only their first idea.
- **Shifts focus from the designer onto the design.**[4] Parallel prototyping provides a safe backdrop for giving and receiving constructive criticism. When multiple designs are being considered side by side, it is harder for the designer to feel defensive about any one particular design. When practiced repeatedly, it can help sensitive or novice designers learn to view their designs as separate from themselves.
- **Promotes team collaboration and builds rapport.**[5] Designers collaborating on parallel designs will often merge and refine others' concepts into their subsequent designs. This sort of idea sharing on a team goes a long way toward team building, and also minimizes internal competition among team members.

Use parallel prototyping when working with teams that have a tendency to "get stuck" on one design approach in the early exploration and concept generation phases. The method can be used to make design critiques more engaging and less stressful: design managers and educators will find that parallel prototyping helps critiques become more effective and designers less apprehensive, promoting a safe environment where divergent design ideas can be explored and discussed.

1. Dow, Steven P., Alana Glassco, Jonathan Kass, Melissa Schwarz, Daniel L. Schwartz, and Scott R. Klemmer. "Parallel Prototyping Leads to Better Design Results, More Divergence, and Increased Self-Efficacy." *ACM Transactions on Computer-Human Interaction* 17, no. 4 (2010).

2. Nielsen, Jakob. "Parallel & Iterative Design + Competitive Testing = High Usability," 2011, http://www.useit.com.

3. See note 1 above.

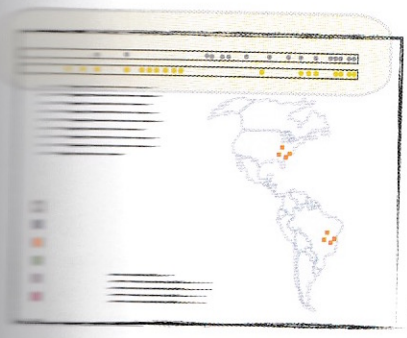
4. Dow, Steven P., Julie Fortuna, Dan Schwartz, Beth Altringer, Daniel L. Schwartz, and Scott R. Klemmer. "Prototyping Dynamics: Sharing Multiple Designs Improves Exploration, Group Rapport, and Results." *CHI 2011 Conference Proceedings*, 2011.

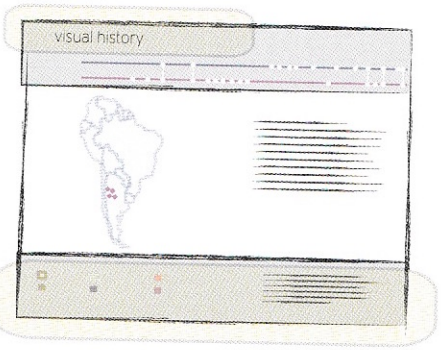
5. See note 3 above.

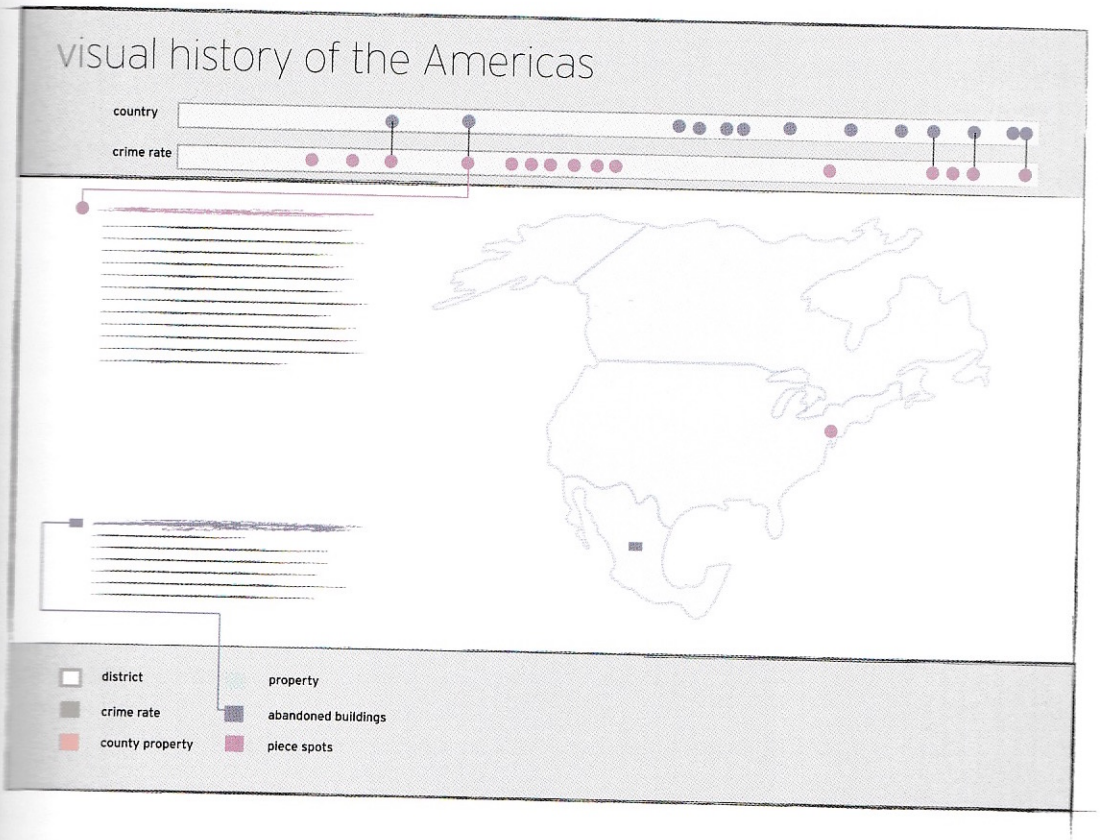
Further Reading

Dow, Steven P., Kate Heddleston, and Scott R. Klemmer. "The Efficacy of Prototyping Under Time Constraints." *Proceedings of ACM Conference on Creativity and Cognition*, 2009: 165–174.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process







By simultaneously designing and testing multiple design approaches and delaying the selection of any one specific direction, there is a better chance that the final design will represent the best qualities of all the design options. Above, the parallel prototypes at the top of the page show yellow highlights that tested best with participants. Each informs the design decisions made in the final interactive map.

See also 26. Design Charette • 66. Prototyping • 70. Research Through Design

60 Participatory Action Research (PAR)

PAR is a cyclical, collaborative research process that seeks to intentionally change the community or other aspects that are the focus of the inquiry.[1]

Participatory Action Research (PAR) is differentiated from many "objective" methods of research inquiry that seek only to describe, understand, and explain, in its explicit mission to actually change the community, parties, or policies under study. With an overtone of empowerment, emancipation, and activism, the approach has been popular in arenas such as education, feminist research, and social justice. PAR is also appropriate where involving practitioners directly in social research serves the purpose of bringing skills and experience to facilitate change, advocating for the creation of practitioner researchers in areas such as nursing and social work.[2]

The process of PAR is dynamic and cyclical in its sequence of planning, taking action, observing, evaluating (including self-evaluation), and critical reflection prior to planning the next cycle.[3] Robson outlines common stages of PAR as follows:[4]

1. Define the inquiry.
2. Describe the situation.
3. Collect evaluative data and analyze it.
4. Review the data and look for contradictions.
5. Tackle a contradiction by introducing change.
6. Monitor the change.
7. Analyze evaluative data about the change.
8. Review the change and decide what to do next.

PAR is defined by the collaborative relationship between researchers and those being researched. Specific research methods utilized within the approach are variable, but tend to be flexible, qualitative, and ethnographic, including traditional observations, participant observation, and interviews. While there is little evidence to date of PAR being formally employed in design research, the connections with participatory design and new movements in social impact by design suggest a natural affiliation and opportunities for an expanded relationship. For example, contextual, immersive, and collaborative methods of design including *contextual inquiry*, *design ethnography*, *participatory design*, *design workshops*, and *creative tool kits* would be powerful when aligned with PAR, corresponding naturally to an approach designed to address issues identified by the community at hand and inspiring action applied directly to problems.

PAR has been criticized for its weaknesses, most notably for its inherently political nature, the potential lack of systematic methods employed, and the shared power over research design and data collection that is necessary in the collaborative relationship. Caution must therefore be exercised when using PAR, in designing and conducting the inquiry, assumptions, and in communicating the project. However, the powerful change that can result from the PAR approach makes it worthy of serious evaluation and consideration by design.

1. First usage of the term "action research" is credited to Kurt Lewin in "Action Research and Minority Problems," which appeared in the *Journal of Social Issues* 2 (1946): 34-46.

2. Robson, Colin. *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*, 2nd ed. Oxford: Blackwell Publishers, 2002.

3. McNiff, Jean. *Action Research for Professional Development*, 2002, http://www.jeanmcniff.com/ar-booklet.asp

4. See note 2 above.

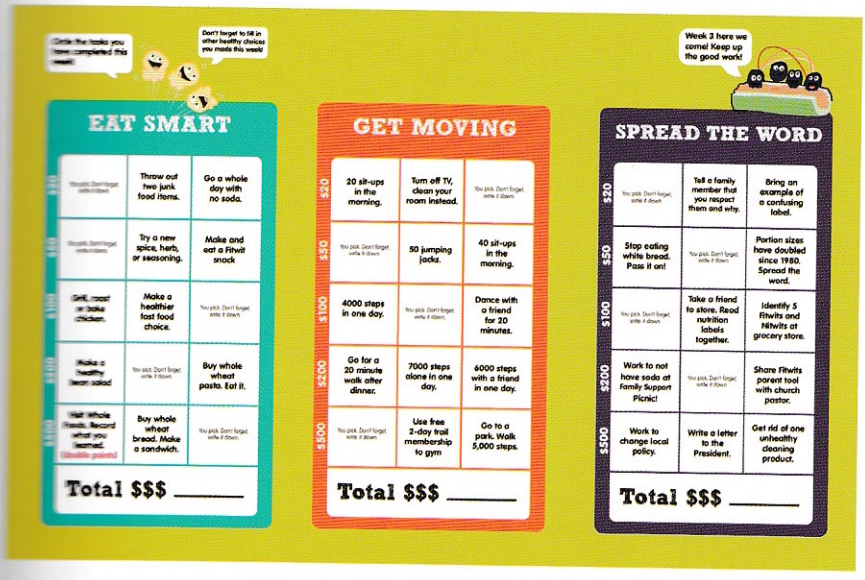
Further Reading

Sommer, Robert, and Barbara Sommer. *A Practical Guide to Behavioral Research: Tools and Techniques*. New York: Oxford University Press, 2002.

A professional journal, manifesto, and blog is dedicated to (Participatory) Action Research at http://arj-journal.blogspot.com and http://arj.sagepub.com

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

GET FIT WITH THE FITWITS: CO-DESIGNING A COMMUNITY-WIDE OBESITY PREVENTION GAME



The challenge for this project required connecting with a local community to design an appropriate health literacy game.

Engaged players described three positive behavior changes: (a) a positive self-image through the game by succeeding in healthy behavior game challenges; (b) better physical and psychological well-being and continued healthy activities; and (c) positive reinforcement from friends and family. Participants took the message well beyond the original game, promoting Fitwits through new activities in other communities, at work and in summer camps, and raising funds for their own appropriated version. The design research team was in turn inspired to expand the program and run it in a school, where materials are now being integrated into teaching units on health.

Courtesy of Kristin Hughes

See also 11. Case Studies • 61. Participatory Design

61 Participatory Design

Participatory design is a human-centered approach advocating active user and stakeholder engagement throughout all phases of the research and design process, including co-design activities.

The origin of participatory design is generally credited to Scandinavian initiatives in the 1970s, first in Norway, where computer professionals worked closely with ironworker and metalworker union leaders and members on the integration of new technologies into the workplace.[1] Several subsequent projects in Scandinavia involved interdisciplinary research teams from computer science, sociology, economics, and engineering, collaborating with union leaders and members in repair shops, factories, and a department store, again on issues surrounding computer integration and its effect on workplace production and processes. The UTOPIA project of the late 1980s, involving graphics workers in the newspaper industry, sparked the introduction of innovative, experience-based methods such as role-playing scenarios using low-fidelity prototypes.[2]

Participatory design has since expanded in scope and methods, gaining widespread acceptance as an approach to practice in research and application across industrial design, architecture, urban design, interaction design, and communication design. Participatory design encompasses several methods, with the unifying philosophy that they all involve active consultation with users, clients, and other stakeholders in the design process, ideally through face-to-face contact in activity-based co-design engagements. Methods include cultural probes, diary studies, photo studies, collage, flexible modeling, and creative tool kits and design workshops. Participatory design respects the creative insight of participants to inspire and help guide the design process, and to respond to design outcomes. However, participant input is paired with design expertise, supporting the creative authority of designers to translate collaborations into design criteria, services, and artifacts.

Sanders, Brandt, and Binder have proposed a useful framework for organizing the various approaches, tools, techniques, and methods of current-day participatory design, consolidating several years of research in the area.[3] The framework is based on the *form* of participatory action that describes the method or technique (making, telling, enacting), and *purpose*, or why the tools and techniques are being used. Four dimensions of purpose are described as *probing* participants for self-discovery and reporting, *priming* participants for further participatory engagement, *understanding* current experience, and *generation* of future scenarios and concepts. *Context* further describes how and where participatory design might occur, based on group size and composition, face-to-face or online, venue, and stakeholder relationships between the designer-researchers and participants.

1. Kuhn, Sara, and Terry Winograd. "Participatory Design" in *Bringing Design to Software*, New York: Addison-Wesley, 1996.

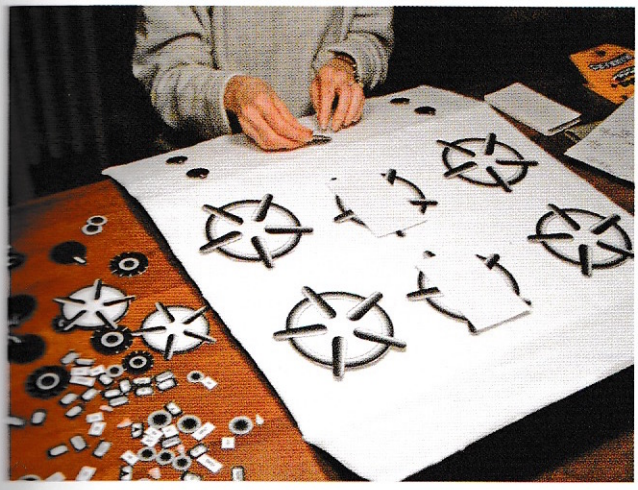
2. Ehn, Pelle. "Scandinavian Design: On Participation and Skill" in *Usability: Turning Technologies into Tools*, New York: Oxford University Press (1992): 96–132.

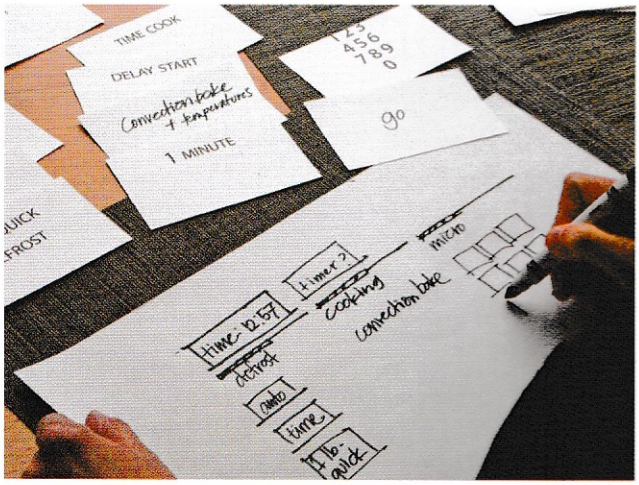
3. Sanders, Elizabeth B.-N., Eva Brandt, and Thomas Binder. "A Framework for Organizing the Tools and Techniques of Participatory Design." *Participatory Design Conference (PDC) Proceedings*, 2010.

4. Baskinger, Mark, and Bruce Hanington. "Sustaining Autonomous Living for Older People Through Inclusive Strategies for Home Appliance Design" in *Designing Inclusive Futures*. London: Springer, 2008.

Baskinger, Mark. "Autonomy + the Aging Population: Designing Empowerment into Home Appliances." *Proceedings of Design and Semantics of Form and Movement* (DeSForM) (2007): 133–146.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process





Participatory design engages users in a wide range of activities throughout the exploratory, generative, and evaluative cycles of research and design. Here participants use creative toolkits for design input, and offer feedback on prototypes, for a project on appliance design for the aging population.[4]

See also *21. Creative Toolkits • 28. Design Workshops*

62 Personal Inventories

Personal inventories allow the designer to see and understand the relevance of objects in a user's life from the participant's point of view, to inspire design themes and insight.[1]

By understanding the role that objects play in users' lives, design teams can be appropriately inspired to create responsive products and systems based on true needs and values.

Personal inventories are representative collections of artifacts selected by the participant for the designer-researcher, most commonly solicited through paired methods such as guided tours, contextual interviews, and photo and diary studies. Although the method can be used to understand the relationships people have with artifacts in the workplace, because of the personal nature of the inventory, studies are more typically conducted in the home. Smaller inventories may also be taken of backpacks, purses, or briefcases, or items carried during travel.

As an integral component of touchstone tours, participants are asked to talk about the things they own as they walk the researcher through their home or other environment, engaged in conversation. As an element of photo studies, participants document the objects of meaning to them, often with companion notations entered into a diary. Contextual interviews during tours or instructions for diary entries probe for the meaning of objects, through such questions as the role or specific purpose objects play in the participant's life; the history of their acquisition and ownership; aspects of their operation and use; their placement for storage, display, or transport; and how they might feel if the object were lost, discarded, or damaged.

The focus of personal inventories may be specifically targeted toward certain types of objects or products, but is more commonly driven by the participant, who is encouraged to identify any and all items of personal significance. In this way, the inventory is generally informative, but relies on the designer to extract insight about the user and their context relevant to the design inquiry. For example, in a study of sustainability and interaction design, personal inventories were used to understand the difference between objects that were cherished and those that were discarded.[2] Additional methods may be used to draw out meaning from participants. For example, in one study participants were asked to think aloud while card sorting their photographed objects along semantic differential scales indicating levels of attachment, perceptions of new versus old, emotional versus functional value, etc.[3]

1. The seminal work in documenting the personal meaning of artifacts in the home, often cited by designers, is:

Csíkszentmihályi, Mihaly, and Eugene Rochberg-Halton. *The Meaning of Things: Domestic Symbols and the Self*. Cambridge: Cambridge University Press, 1981.

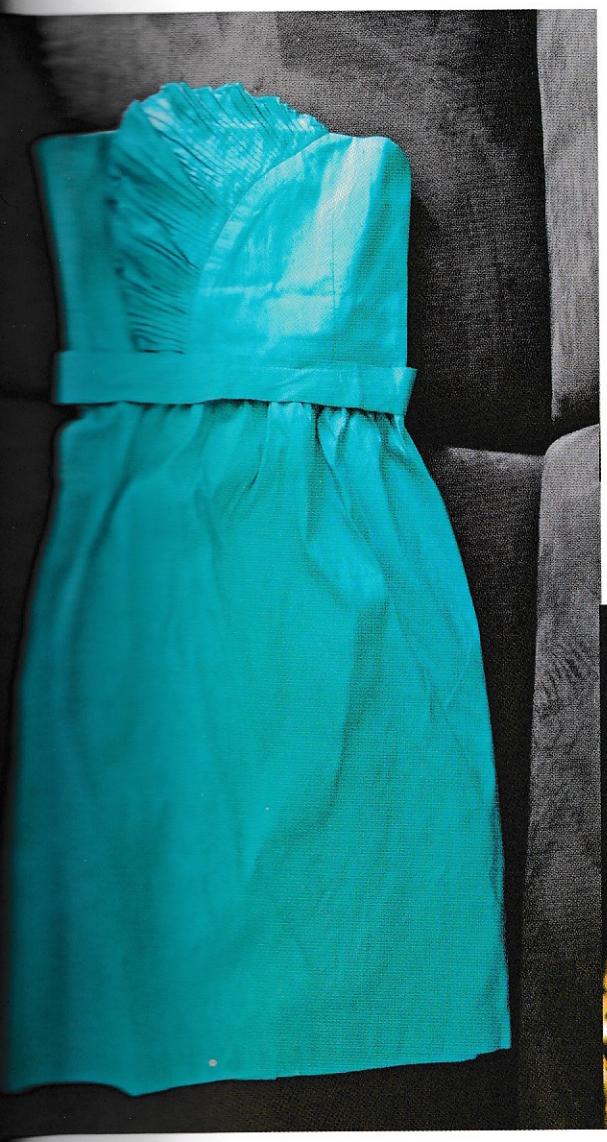
The seminal work in design and origin of the term "personal inventories" is documented in:

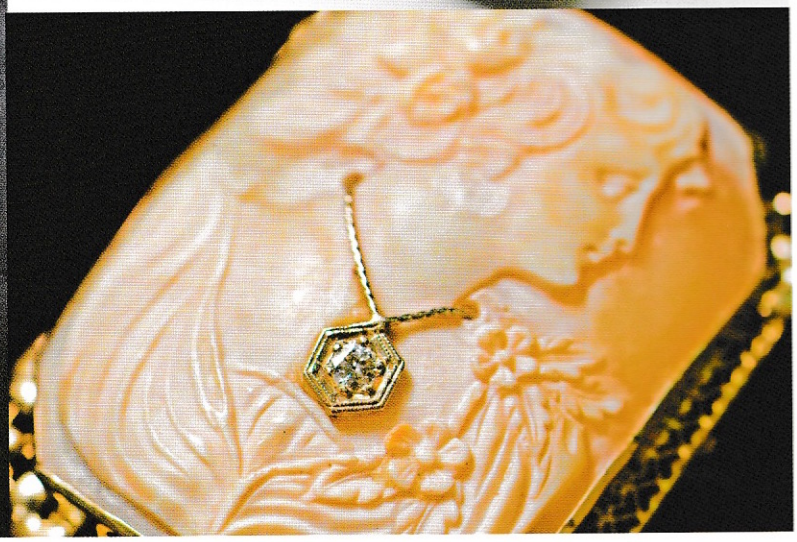
Blevis, Eli, and Erik Stolterman. "Ensoulment and Sustainable Interaction Design" in *Proceedings of International Association of Design Research Societies Conference IASDR* 2007. Hong Kong: HKPT, 2007.

2. Odom, William, Eli Blevis, and Erik Stolterman. "Personal Inventories in the Context of Sustainability and Interaction Design." *Interactions* XV, no. 5 (September-October 2008): 17–20.

3. Odom, William, and James Pierce. "Improving with Age: Designing Enduring Interactive Products." *Proceedings of CHI*, ACM, 2009.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process





Collected objects from personal inventories reveal much about the significance of participant-owned objects, but may rely on the designer to extract insight about the user and their context relevant to the particular design inquiry.

Courtesy of Will Odom

See also 04. Artifact Analysis • 30. Diary Studies • 89. Touchstone Tours

64 Photo Studies

Photo studies invite the participant to photo-document aspects of his or her life and interactions, providing the designer with visual, self-reported insights into user behaviors and priorities.

Photo studies are an ideal way to have participants highlight details of their personal lives directly, providing visual samples of the important things in their world to inform and inspire design. Photo studies are common in exploratory research as a method for understanding the world of users, particularly when engaging in territory unfamiliar to the designer.

To initiate a photo study, participants are provided with a camera, or instructed how their own cameras are to be used for the purposes of the research. Participants are given general instructions on what to document through images, for example, to take pictures of each technology interaction during the day, or objects of significance, or items associated with scheduling appointments and meetings. They may also be instructed to take images of their surroundings when they are feeling a particular way (energized, sad, overwhelmed), or, in rare circumstances, of human interactions. When documenting human interactions, caution needs to be exercised in requesting photos of uncomfortable situations such as work encounters, or photographing the personal details of others.

Photo studies are most often used as a complementary component of other methods. For example, diary studies may include a photographic requirement, whereby pictures are taken by participants to supplement journal entries about behaviors or encounters during a specified time period. Diaries or journals may in turn be a significant part of the experience sampling method.

Like many creative methods, participants are more likely to enthusiastically engage in requests to complete a photo study of their personal lives than they are to traditional means of behavior survey. Furthermore, photo studies provide visual collateral for designers to work with, and particularly when contextualized with journals or other written material, can lead to unique discoveries about users, their behaviors, and priorities.

To synthesize findings from photo studies, the designer may rely solely on the photographs and simple notes provided by the participant. However, it is more common, and recommended, to have the participant explain his or her photos in follow-up interviews, possibly to include sorting or collage of the images or detailing them along a time line or other axis, such as positive-negative interactions. Because the output of photo studies is primarily used for exploratory purposes, the research is summarized as visual support for understanding and inspiration, not for specific meaning through formal analysis. However, patterns and themes might emerge across an inventory of several photos from multiple participants, providing insight for design implications.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

Collected photos from a crowdsourced photo study on energy use reveal a diverse range of interpretations on the subject matter for design consideration.

Courtesy of frog, frogmob.frogdesign.com

See also *24. Cultural Probes • 30. Diary Studies • 37. Experience Sampling Method*

82 Storyboards

Storyboards provide a visual narrative that generates empathy and communicates the context in which a technology or form factor will be used.

Storyboarding can help visually capture the important social, environmental, and technical factors that shape the context of how, where, and why people engage with products. By illustrating contextually rich narratives, storyboards can be used to build empathy for end users, reframe multichannel touch points, and consider design alternatives in the early phases of the design process.

Experts approach storyboards by harnessing five design practices common to visual storytelling.[1]

1. *Degree of artistic or photo-realistic detail:* A misconception is that storyboards should be left to designers with artistic capabilities. However, simple, abstract drawings of stick figures are oftentimes more effective at focusing the attention of the storyboard audience on a specific detail or message.[2] Refine drawings so that they show enough context, but not so much that details begin to distract from the purpose that the storyboard is designed to communicate.
2. *Text-based narration or explanations:* Use text to supplement the visuals in a storyboard when it would otherwise take too much effort to illustrate a concept or idea. Text is usually added to storyboards as word or thought balloons, captions, or background signs.
3. *Emphasis on people, products, or both:* To elicit an emotional impact from the storyboard audience, illustrate characters in emotionally charged situations. If on the other hand the goal is to elicit technical or evaluative feedback regarding the concept, leaving characters out of the panels can focus attention on the details of the design.
4. *The right number of storyboard panels:* Storyboarding experts tend to use between three to six panels to communicate an idea. Each storyboard should be focused on one salient concept or idea; if more than one concept needs to be communicated, consider creating multiple storyboards that each focus on a different factor.
5. *Depicting the passage of time:* Time as a design element should be used to show large time lapses in a scene. Clocks, calendars, zoom-ins of wristwatches, or the movement of the sun in the background can be added to explicitly show the passage of time.

Construct the story and the storyboard panels depending on what information will resonate with the target audience. For instance, when designing for stakeholders, illustrate the range of potential design opportunities. For developers and programmers, illustrate a scene and a context in which the product or form factor will be most likely used. For visual designers, draw close-up details of the interface, and for users, show empathic scenes to determine if the situation is realistic and meaningful.[3]

1. Truong, Khai N., Gillian R. Hayes, and Gregory D. Abowd. "Storyboarding: An Empirical Determination of Best Practices and Effective Guidelines." *Proceedings of DIS 2006*, 2006.

2. McLoud, Scott. *Understanding Comics: The Invisible Art*. New York: Harper Paperbacks, 1994.

3. Vertelney, Laurie, and Gayle Curtis. "Storyboards and Sketch Prototypes for Rapid Interface Visualization." *CHI Tutorial*, ACM Press, 1990.

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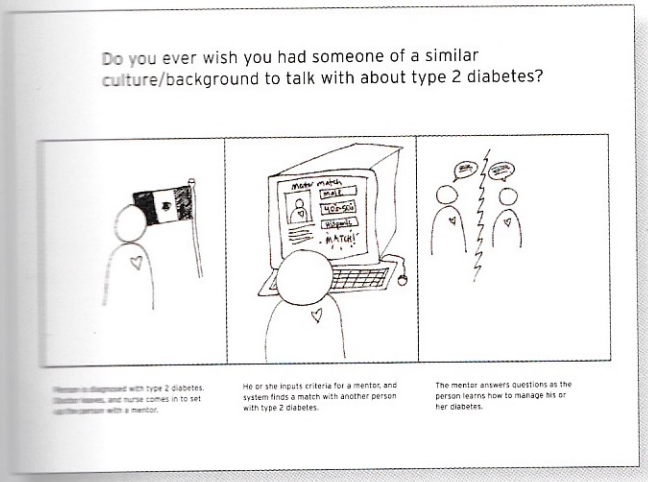
Cooper, Alan, Robert Reimann, and David Cronin. *About Face 3: The Essentials of Interaction Design*. Indianapolis, IN: Wiley & Sons, 2007.

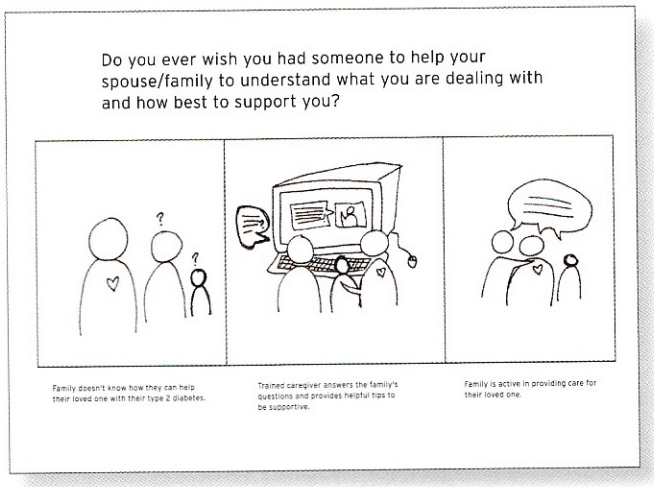
Goodwin, Kim. *Designing for the Digital Age: How to Create Human-Centered Products and Services*. Indianapolis, IN: Wiley & Sons, 2009.

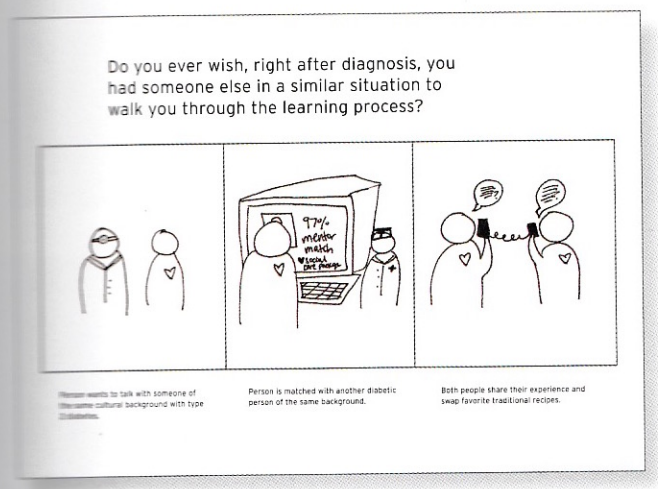
Landay, James A., and Brad A. Myers. "Sketching Storyboards to Illustrate Interface Behavior." *Conference Companion of ACM Conference on Human Factors in Computing Systems*, 1996.

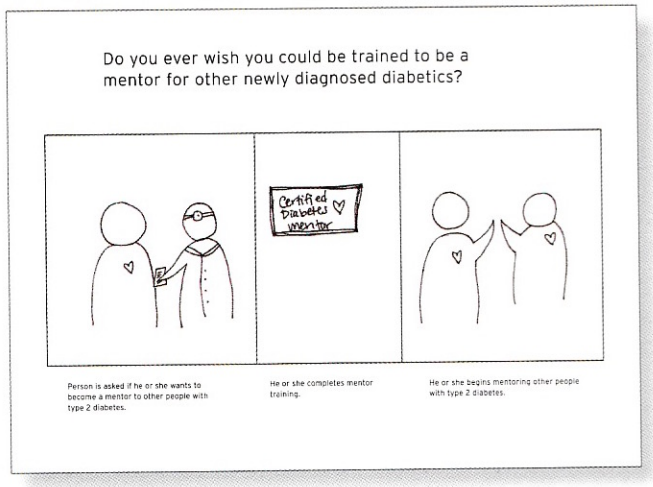
Storyboards have been used by film and television preproduction for many decades, and their best practices are well understood and documented. See *The Art of the Storyboard, Second Edition: A Filmmaker's Introduction* by John Hart, Oxford: Focal Press, 2007.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process









Storyboards shape social, environmental, and temporal factors into a compelling narrative and help design teams to more carefully consider how products and services could improve people's lives. The storyboards shown here explore the idea of a peer mentoring service designed to help people who have been recently diagnosed with type 2 diabetes.

Courtesy of Lauren Chapman

See also *63. Personas • 71. Role-playing • 79. Speed Dating*

83 Surveys

Surveys are a method of collecting self-reported information from people about their characteristics, thoughts, feelings, perceptions, behaviors, or attitudes.

Surveys are a common method for collecting information from people, typically from large samples of respondents. They are an efficient tool for collecting a lot of data in a short time frame, typically with little cost, and are versatile in the type of information that can be collected. With large enough samples, results can be analyzed statistically.

While the term describes a broad approach, there are two dominant techniques for survey data collection within the method–*questionnaires*, either self-completed or read to participants and completed by the researcher; and structured *interviews*, conducted in person, by phone, or through various communication technologies.

Like any self-report instrument, surveys may not be an accurate reflection of true thoughts, feelings, perceptions, or even behaviors. This argues for the careful design and administration of surveys, and the use of complementary observations or other methods. For example, it is common to survey a wide base of constituents using questionnaires to gain a lot of information, and pair this with a smaller set of in-depth observations, contextual inquiries, or participatory design sessions.

There are various types of survey questions for interviews or questionnaires:[1]

- Closed–forced choice, structured with limited response options
- Open–broad with no set response to encourage discussion or longer answers
- General–focused on big picture, broad spectrum issues
- Specific–focused on details particular to the situation
- Factual–with responses that can be verified by observation or supporting information
- Hypothetical–asks participant to speculate about behaviors or actions
- Judgmental–asks participant for his or her opinion, what he or she thinks about things
- Comparative–asks for a judgment on two or more alternatives
- Neutral–no value words used, remains objective
- Leading–to be avoided, suggests a correct or expected answer
- Blaming–to be avoided, suggests participant is wrong or at fault
- Request for suggestions–invites participant to suggest new ideas, opinions
- Request for questions–invites participant to suggest questions you have overlooked

The form of questions should be based on the inquiry, time constraints, and preferred response format.

1. Hackos, JoAnn T., and Janice C. Redish. *User and Task Analysis for Interface Design*. New York: Wiley, 1998.

Behavioral	Quantitative	Innovative	Exploratory	Participatory
Attitudinal	Qualitative	Adapted	Generative	Observational
		Traditional	Evaluative	Self reporting
				Expert review
				Design process

The "Produce Proposal Wall" provides a method of survey that allows customers to communicate what fresh fruits and vegetables they want available in the store, while fostering dialogue between grocery store owners and shoppers, and building a community around the topic.

Courtesy of Sarah Calandro © 2011

See also 48. Interviews • 67. Questionnaires