Paper Prototyping

User interface (UI) design often involves prototyping: Iteratively creating depictions of what you think the software user interface should look like, and how users should interact with it, based on the software's requirements. Prototyping gives you a way to try out a UI design and find problems early. Changing a drawing (digital or physical) is easier and faster than changing its code implementation.

There are multiple levels—or "fidelities"—of UI design prototypes (low-fidelity, medium-fidelity, and high-fidelity). If you look around, you'll find disagreement on the definitions. Definitions I use:

- **Low-fidelity**: A rough sketch that is often drawn by hand, drawn using an app and stylus, or made using software specifically for creating low-fidelity prototypes. At this fidelity, you can gather feedback on higher-level features and have the flexibility to make large, low-cost changes.

user interface (UI): What a user interacts with to operate a system (e.g., a graphical user interface, a command-line interface, a virtual or augmented reality interface, etc.).

**graphical user interface (GUI)**: A user interface with interactive graphics, in contrast to a text-based user interface.

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low-fidelity prototype: A rough sketch of a user interface design (especially a GUI). Can be hand-drawn or digital.

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medium-fidelity prototype: A careful and detailed illustration of a user interface design (especially a GUI). Can be hand-drawn, but digital is more common.

- **Medium-fidelity**: A detailed illustration often created using a professional drawing or presentation tool (e.g., Visio, PowerPoint, etc.), or perhaps a careful and detailed hand-drawing. At this fidelity, to keep costs low, you can gather feedback on changes to defined and accepted features that you plan to keep but might change the look of.
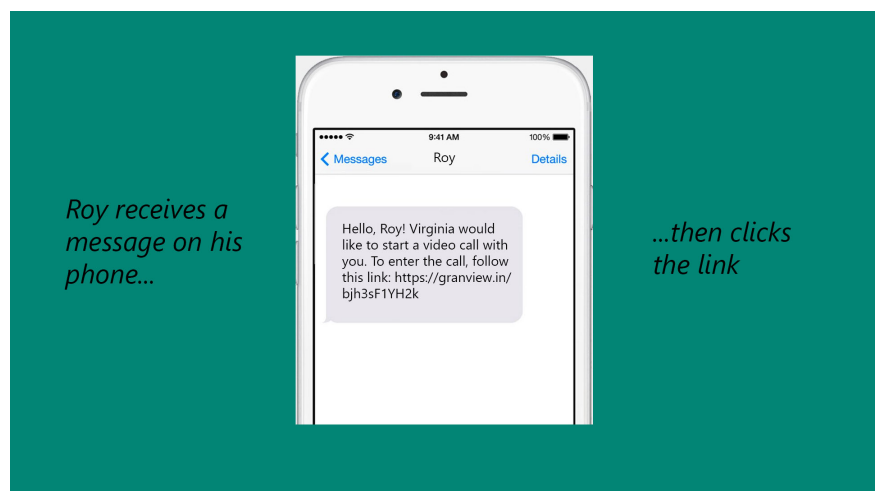
- **High-fidelity**: A polished, detailed illustration that looks like a finished UI. These designs might be created in a full-featured graphics editor (e.g., Photoshop, Illustrator, etc.) or a GUI builder. At this fidelity, to keep costs low, you can gather feedback about detailed tweaks to specific features to make very focused and incremental improvements.

A quick and low-cost way to begin prototyping (and begin getting feedback on your UI design) is to create a low-fidelity **paper prototype**.

A paper prototype is a hand-drawn sketch of a UI design that's based on the software's requirements. It does not need to be pretty or artistic. It can be simple and reduce the UI to only

the most important elements (i.e., it is often low-fidelity).

Showing Interaction

interaction design: An approach to technology design that involves helping users understand what's happening with the technology, what just happened, and what they can do (Norman 2013).

A paper prototype needn't be static or limited to one sheet of paper. With some craftiness and creativity, paper prototypes can communicate elements of **interaction design** by indicating what users can interact with (e.g., a slider), how they can interact (e.g., by dragging), and what happens when they interact (e.g., an overlay appears, showing the elevations of each mountain in the photo). To show interaction design through a paper prototype, you can, for example, cut out small paper shapes you can easily move around (e.g., a small rectangle showing the submenu items that appear when a user clicks), place arrows and annotations on your prototype, and even add strings to show how UI elements may move. I've even seen people use brass brads for spinnable elements. But keep in mind that, if your client doesn't like your design, you might have saved time and communicated your concept just as well with a less elaborate paper prototype.

Showing Your Concept to Others

think-aloud protocol: A method for gathering feedback about the usability of a design that involves a test user speaking their thoughts as they interact with the design (Lewis, Rieman, and Blustein 1993). More information: https://web.archive.org/web/20170318010334/http://grouplab.cpsc.ucalgary.ca/saul/hci_topics/tcsd-book/chap-5_v-1.txt

Once you've constructed a paper prototype, you can use it to harvest feedback. Here's one way: If each of your UI screen designs is on one piece of paper, give a volunteer (e.g., your client, your friend, etc.) the entry screen drawing, then either give them an objective (e.g., submit the data report) or let them explore on their own. Watch as they tap buttons or otherwise interact. Be ready to place other drawings on top of the one they have to indicate what would happen in the real software (e.g., if they tap the gear icon, give them a sketch of the settings screen). If you're fast and brought extra supplies, you can even construct new designs on-the-fly or (if they're interested) let your volunteer participate.

You can ask your volunteer to provide feedback about the design after they're done using it, or as they go, using a think-aloud protocol. With the think-aloud protocol, you can gather rich and detailed feedback by asking your volunteer to talk as they interact, telling you what they're doing, what they're trying to do, what questions they have at that moment, what they don't like, etc.

References

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