the politics of prototyping

Gill Wildman & Nick Durrant

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Contents

why prototype?

This book explores what a prototype is, what it is for, what kinds of prototypes people use and why, what role they play, and how to situate them successfully at the heart of the social process of designing together. For many people the word itself evokes some three-dimensional version of a product concept — it is, after all, a word that comes out of the world of engineering — but as you will see, there are many forms in which people can prototype ideas, things, services, systems, and strategies.

For anyone involved in design, the prototype is the core of the design activity, and focusses attention from all stakeholders.

We use the word prototype in it's broadest sense, to mean any artefact that is produced as a part of the design process, and

this broad definition is intended to be inclusive of many different design disciplines. Different kinds of designers make different kinds of artifacts. But all designers make prototypes to model a variety of aspects to a design problem and solution, as well as to see how problem and solution interact. These different types of model have a common purpose, to 'make it real before it is real', or as we often say, you have to fake it, before you make it.

You can prototype virtually anything. It's a powerful tool for making sense of new alternatives not only with physical tangible products but also services, systems, and strategies.

The key here is to get a sense and understanding of prototyping as an activity — probably the central activity involved in any design process. Prototyping is about trying things out — for learning what the design needs to become and how the design needs to evolve. For the design manager it is perhaps the most important activity to enable and support. Let us put this even more strongly. Without prototyping there is no design.

There are three components of prototyping - the approach , the methods and a culture that values and supports prototyping as a means to understand what 'it' is and what 'it' needs to be.

Why show 10 percent?

"Why are you showing this to me when it's only 10% finished?"

Managers who have not been exposed to design thinking before can react negatively to being shown prototypes or work-in-progress.

Traditionally some disciplines and workplaces never show each other work unless it is finished. For example we don't see bookkeepers displaying their workings for annual business accounts or authors sharing their books when they are incomplete. So for some a design way of working and thinking is not just unfamiliar but even culturally threatening.

The consequence is that when designers ask for feedback as a natural part of their design process, some management cultures routinely misinterpret this as evidence of a lack of confidence in what is being proposed.

Michael Schrage in his article "Cultures of Prototyping" outlines how different organisations have different cultural attitudes towards prototyping, and how these attitudes affect what happens in practise. He draws a contrast between cultures that practise 'specification driven prototypes' versus cultures that practise 'prototype driven specifications'.

You will find that design-thinking methods are more valued in the latter.

As a designer or a design manager you may find yourself in either culture. What works and is obvious in one may not even be recognised or valued in the other.

So you do need to be prepared to champion and articulate the value that design thinking, and the prototyping approach, can bring to the table.

A prototype for a project for mobile services that takes advantage of urban models and maps to explore how future mobile services might work. It was made as a board game and used with a mixed group of people to get them to imaginatively project themselves into playing games in the city, where doing it in real life would have been too difficult. Photo: Flirt, RCA

The traditional logic of project planning is often a linear story — "Phase 1 will deliver x, by date y, using method z". But the logic of design prototyping is iterative — build a little, learn a little. There's a contradiction here.

The difficulty is to do with managing assumptions about the shape of the design process as well as managing expectations about the nature of progress. And this all comes

going in circles?

down to the project planning metaphors used to describe, visualise, and cost design activities over time. For instance: in the past, large-scale software design and development used a very linear metaphor to describe best-practise project planning. It was called 'the waterfall'. Each stage neatly poured into the next one. Each stage was clearly labelled.

It was all very linear and looked very orderly on a Gantt chart. But it also notoriously delivered software that was poor quality, unfit for purpose, and difficult to use. Frequently software systems were late, expensive, full of bugs, and obsolete by the time they shipped. Later, 'spiral development' models gradually replaced the waterfall metaphor. These were better in that at least they allowed for iteration and learning, with the idea that the user's real needs are only revealed over time by using prototypes to garner feedback. Recently, 'agile' methods take the logic of fast iterative code prototyping — 'extreme programming' — to its logical conclusion. The metaphor used is 'the Scrum'. It is still controversial.

If you take the simplest description of the design process that most designers would recognise, it is cyclical — understand, visualise, evaluate — and there are different kinds of activities to be done with the prototypes at different parts of the cycle. But even this is a kind of orderly fiction imposed on the reality of designing. Bill Moggridge in his book 'Designing Interactions', breaks these activities down even further using the analogy of 'the pinball machine'.

Here design activities and attention bounce between ten elements: constraints, synthesis, framing, ideation, envisioning, uncertainty, selection, visualisation, prototyping, and evaluation.

To conventional business management ears it sounds messy and unpredictable, and therefore out of control — and which contradicts the whole premise and culture of command and control.

In contrast a prototyping culture is generative and opportunistic. Bouncing between these activities generates the maximum value in the minimum time.

"When traditional firms hire designers, their managers often find them disappointing because, like (architect Frank) Gehry, they produce prototypes for feedback instead of final products. Unfortunately for the designers, these firm managers think they are seeing a final product and -- judged by that standard -- the product is deemed patently substandard and the designer incompetent." Roger L. Martin, Dean of Rotman School of Management

As a design manager you need to overcome this perception, and explain to people what they are looking at. Its a work in progress.

the anxiety gap

Eddie Obeng calls the mismatch of expectation and reality in the context of conventional project management 'the anxiety gap', where linear expectations meet non-linear reality.

"Have you noticed how once a project is started, after half of the allocated time half of the deliverables have been achieved? And have you noticed how this continues in a straight line so that all the deliverables are available once the allocated time is reached? You haven't? Well, neither have I. Project progress doesn't go in a straight line. [But] the real issue is not that we know that the progress doesn't go in a straight line. The real issue is that many other stakeholders, such as your sponsor and client expect it to. Half the time, half the budget, they expect to see half the results."

Design processes are fundamentally non-linear because they are really about learning — about what works and what doesn't work — and prototyping is a way to learn. Each learning stage is faster than the previous one because it builds on what has already been learned, and decisions that have been made. This learning curve is literal in every project. Plotting completion on a graph over time produces an upward curve, which contradicts the straight line of uninformed expectations. The gap between these two lines is what causes the anxiety

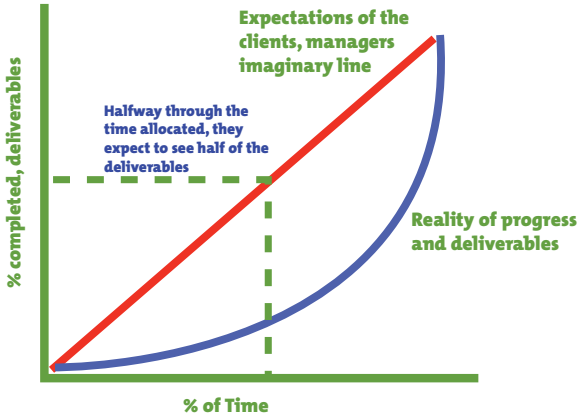
"The anxiety gap is... the credibility buster of many project managers. It is wider the more invisible the project is. To avoid the surprise you must bridge it."

Prototyping makes the work visible, and it is here that it pays off, alongside strategies for continuous stakeholder engagement, the development of project success criteria, and the attitudes and approach of good design management and thinking. What they all have in common is that these are all ways of making your project and its progress visible to the people who need to see it.

Your job is to manage the anxiety gap by making the project with its goals, activities and deliverables visible to the right people at the right time. Working in plain sight in project spaces; communicating to engage people, involving your stakeholders; and embodying the design work in appropriate prototypes are all tools to help you to do this well.

A second form of anxiety comes from the misunderstanding that prototyping takes up precious production time. The reality is that in any design investment, any prototyping work produced at an early stage avoids expensive mistakes at a later stage. As a rough guide, each stage of the design process costs about ten times the stage before it. So changing decisions at an early stage is a lot cheaper than changing finished products and services.

After just 15% of project time elapsing, around 85% of the future project costs have been determined. Naturally, you want to have made good decisions, for products and services that people want, based on a number of tested alternatives. The business case for prototyping is compelling.



The red line on the graph shows how clients and managers expect half of the work to have been produced halfway through the time allowed. The reality is that there's little to show at this point, and its important to help them get a picture of what is going on, before they get into the anxious state, and act accordingly.

what are they **for?**

There are many different design specialisms: graphic communications, industrial products, architectural environments, digital systems interactions, to name just a few. There are as many different background craft design skills as there are different kinds of design professionals. Each uses many different media to create what they create. But the common language and approach they share between them is prototyping. It is what the design thinker Donald Schon calls "a reflective conversation with materials". It's a cycle of action and reflection.

"Design thinking is inherently a prototyping process. Once you spot a promising idea, you build it. The prototype is typically a drawing, model, or film that describes a product, system, or service. We build these models very quickly; they're rough, ready, and not at all elegant, but they work. The goal isn't to create a close approximation of the finished product or process; the goal is to elicit feedback that helps us work through the problem we're trying to solve. In a sense, we build to think." — Tim Brown, IDEO

Prototypes are for sharing. Live|work develop this first draft customer journey exactly to be able to explore what it is they are dealing with, and to catch things that don't work very early. The final result may bear few similarities to this early draft.

Prototyping is this design cycle of action and reflection. Design thinkers put a big emphasis on the importance of 'failing fast'. The underlying idea is about learning what does and doesn't work using small, cheap trial and error experiments at an early stage in the design process. You could think of it as a form of sketching. Fundamental changes later in the design process are expensive, so prototypes help to iterate a design towards fitness for purpose using the phenomenon called backtalk.

But prototypes are also the means by which other people — stakeholders, users, and other players — engage with what is being designed. Prototypes are for sharing. With a prototype you have a common vehicle for feedback about what it is that needs to be understood, learned-about, imagined, changed, accepted, amplified, built-on, disseminated...

For a designer, this is a great opportunity. It makes their work open for discussion, because it is made tangible in the prototype. The whole point is that the work is open to change, not fixed.

The prototype plays many roles simultaneously. But there are three main reasons why sharing prototypes is so valuable in the design process — building to learn; evaluating progress; and connecting strategy to reality.

You can create many forms of prototypes, and in each design craft area they have their own name for them. You'll hear terms like:

- ***thumbnail sketches***
- ***animatics***
- ***dummies***
- ***scenarios***
- ***story-boards***
- ***screens,***
- ***foam models***
- ***skits***
- ***test-rigs***
- ***wireframes***
- ***bits of code***
- ***clay-models***
- ***walkthroughs***
- ***cardboard mockups***

Below: a service blueprint in progress being used by a student to explore what their early service idea needs to do at multiple levels. It is a prototype for discussion, for working on and for refining.

We have already discussed methods for participation and engagement in a general sense. More specifically, it is design management's responsibility to create an atmosphere of empathy, curiosity and warmth — a workplace where new ideas, methods and approaches are always welcome — by using a non-judgemental style of leadership.

all together **now**

Prototypes help to demonstrate what this can look like in practice. Prototypes have a wonderful quality here in that they are the focus for discussion and constructive critique, not the person who created the work. In effect, prototypes become collective property, and this phenomenon helps to avoid the negative emotional reactions that can occur when people get too attached to their own ideas. The prototype-with-group-feedback allows for the necessary critical distance. Both the creator and commentator get to see aspects of the work they may not have seen before.
Encourage conflict-resolution by iterating the prototype together. You can encourage multiple opinions and concrete constructive suggestions with them.

Many designers are attempting to use more co-design approaches with users. Getting users involved in the work takes extra thought and care. Users are often unaware of the idea of an ongoing design process, and are unlikely to know how it all fits together. As with all participants, they need clarity about what it is that you are asking them for. The idea here is not to overburden them with your concerns, but

to provide them with a frame in which to act and react. Even with co-design approaches design activities are not simply a democratic process of committee style decision-making. What users may want may not be feasible or viable. This may need to be expressed to enthusiastic participants who may want to leap from involvement in design discussions to expectations that they are actually designing the solution themselves, rather than contributing great value to the process of finding one.

Clarity of vision, direction, and decision are all ultimately the responsibility of the design managers involved.

Bringing people together to develop initial thinking helps prototype the ideas early on, and keep clarity on goals. Photo: Radarstation

Bringing users into co-design sessions requires a sensitive approach and clear boundaries, as this worksession on the feminine aspects of device design shows. Photo: Younghee Jung, Nokia

Most designers know at least one technique of prototyping, and can get a lots of benefits from trying different methods. Anyone who has ever prototyped anything knows that it brings great value. But we can all know that prototyping is valuable, and we can all know that it works, yet we can find ourselves in places where we are judged by speed of our delivery of ideas, not the depth of the exploration.

We know that its difficult in larger organisations to prototype against the tide, and we know many people who continue to do so under the radar of management and approval committees. Sometimes the only way to work is to simply do it, and then to show people, rather than tell them first. In non-design organisational cultures where Powerpoint rules, making and showing things make a point. The biggest reason for using prototypes is to get people enrolled in the design earlier.

Many people we know try to get people to appreciate their ideas, efforts, or to understand their thinking, at the later stages of a project after everything has been done. This is the 'buy-in' approach, which unfortunately turns you in to a project 'seller'. It doesn't really work. Engagement is the antidote to the myth of getting 'buy-in'.

As we mentioned earlier, people demonstrate different behaviour around what they are asked to look at, depending on when they are asked to look at it. Prototypes, when presented for feedback, naturally create an opportunity for a person to join in and add something of their perspective into the design conversation. Bringing people in earlier rather than later helps them to contribute to the design activity so that it has something of them in it. As a result, they become emotionally invested, which can change how they feel about the eventual design itself.

When people come in towards the end of a project, all they can really do is play catch-up — perhaps to ask questions about what has happened, or critique what has been produced. When people have not been involved until the very end, the tendency is for the latter. Something that seems almost finished seems to invite the most finely detailed criticism. After all the blood, sweat, and tears, hearing this is often the last thing on your mind. The odds that you might get 'buy-in' under these circumstances are stacked against you.

So phasing the disclosure of the prototype at key moments during the project is a tactic to make sure you've engaged with stakeholders strategically, rather than at the end, or at random moments.

Using the prototype to engage a community of advisors, supporters, advocates and critics gives them a clear role in which to contribute.

Organisations are making better use of prototyping by way of special workshop events to encourage a more open prototyping culture and to explore new prototyping tools.

First, in making the prototype the design group directly involved actually learn by making — design decisions become clearer, and elements of problem framing, problem solving, and expression get resolved in real time. You understand what something is, and is not, just by making a version of it, or some part of it – this is what is called *backtalk*.

3 forms of action, three forms of **value**

Second, the prototype is the focus around which people can evaluate the progress of the work, and what needs to be resolved to really fulfil the brief. What is working with the expression of design ideas, and what is not, becomes both visible and discussable – this is *feedback*.

Third, prototypes engage people in evolving the idea of what a strategy really means. Prototypes move a strategic conversation on by using ostensive definition — 'like this' or 'like this'. They allow people to experience the strategy. With something concrete to focus around, the ideas that were held in individual heads or locked in documents or powerpoint decks move beyond words to become expressed in tangible form. So prototypes ground strategic conversations in reality. They are a 'thing to think with.' Tim Brown of IDEO calls this third effect of prototyping "a way of visually and viscerally describing your strategy". The prototype tells a story, which can then connect and build a constituency of support, which can then make an impact in the marketplace and the world. And this is important, especially in large organisations, because — "so many good ideas fail to make it out to market because they couldn't navigate through the system." – this is *tangible strategy*.

Think Public designed this prototype for service ideas for people coping with the effects of dementia for the Altzheimers Society. Here, design aids a better understanding of the people who use and provide services, and then offers a range of tools and processes to support working together to develop and make improvements.

They call this co-design, a process where patients and staff come together to share experiences and ideas. They agree opportunities for improvement and form teams made of up patients, carers and staff who then use simple design tools and processes such as storyboarding, ideas generation and prototyping, to visualise ideas and make them tangible.

A selection of prototypes to elicit feedback from stakeholders.
Photo: ThinkPublic

Timo Arnall's Touch project in Oslo explored the nature of near-field technologies in everyday and not so everyday situations. One of the project's early prototypes uses 3D model characters to demonstrate some of the properties of RFID.

The prototype comes to life with sound and animation when people pick up the characters and see the results of placing them in the different zones, to their obvious delight.
Photo: Timo Arnall

So, in effect, your role as a designer is to be the stage manager for these three forms of value generating action: creating the context and conditions for the prototyping to happen in the first place; creating the opportunities for people to give feedback around the prototype; and connecting the prototype to the strategic direction. As a designer or design manager you'll need to be able to explain the rationale for working like this. You are the person who cares for and mediates these three activities.

Educator, Bill Hollins talks about how he used to create prototypes that broke easily, to simply remind people that they were still prototypes, and not something that could be put on production lines the next day.

getting effective **feedback**

In prototyping, your starting point is to understand what you need to achieve with the prototype. Are you making something to better understand what something needs to be? Do you need to understand how your users will use a design? Do you need to know how it will fit into their lives? Do you need to try out two or three versions of an approach to share with your colleagues and talk them through it?

It's important when you are prototyping for users, to understand what exactly it is that you want to learn about from them. This informs the choice and fidelity of the prototypes you make.

Degrees of fidelity

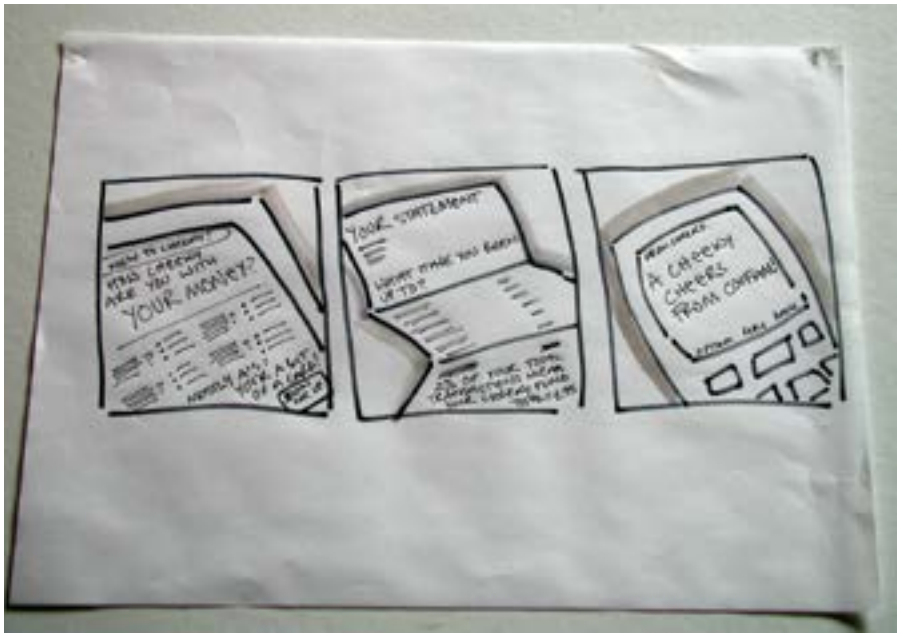
Just as there are different forms of prototypes, so there are different degrees of fidelity - of finished-ness - and they create different responses in people who see them - whether they be users or clients or managers.

Give someone a sketch on a napkin, and they'll be more likely to pick up a pen and adapt your sketch into what they think it should be. If its more finished, you'll find that people spend more time criticising the thing you show them, rather than working on it. Show them a highly finished version, and they often assume it's nearly complete (even though its still a prototype) and that you can deliver the final thing within days.

Make sure you use the right degree of fidelity for the right stage, and understand the expectations of the audience who are going to see it. If you are showing your work to Investors, make it investor ready, and be aware of all of the things that are not complete. If it is to be shown to your team, they may want to see the workings, and the examples you have dismissed, so keep it rough.

Users need to believe the thing is possible, so in order to help them to suspend disbelief, you need to create the illusion. Too little and it looks like something you've roughed up, and not necessarily credible. Work out the right balance. You do, after all, want them to bring their imaginations to bear on your ideas in progress. Where there are no buttons, or clear clues, ask them how it works.

Some prototypes are made simply to stimulate responses and to get people to reveal their thoughts – to get ideas, rather than to evaluate them. This mixture of maps and architectural figures helps people to project themselves into a physical and emotional space, and to speculate.



A three frame storyboard for a new charity credit card is perfect for simplifying and communicating complex service ideas, and getting rapid reactions.

When you are organising a session where you seek feedback from people, make sure you have thought through and developed a plan for the following:

1. Tell people what it is they are looking at. Is it a simulation? A walk-through? A storyboard about a range of alternatives? Tell them what it isn't, also.

2. Tell them what you need them to focus on in a concrete way. "Can you tell me what it feels like?" "What do you need to do next?"

Here Live|work create service evidence to discover how people react to a speculative service. Almost-real artefacts are produced to simulate the experience. Photos: Live|work

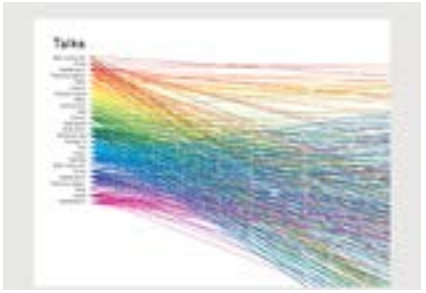
3. Ask them for specific feedback, for example "What does it do next?" or "How do you feel now?"

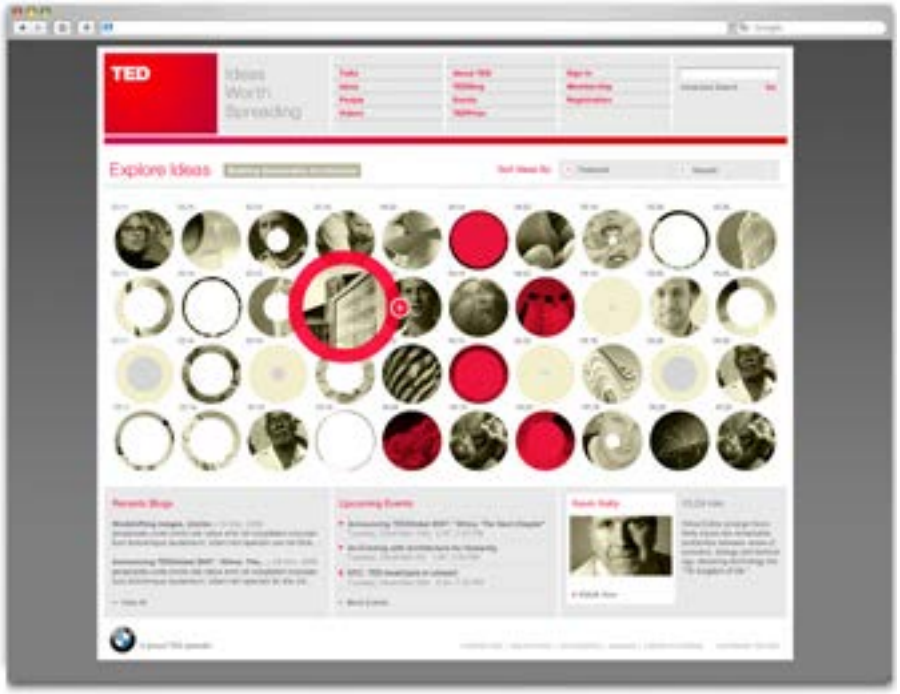
4. Make sure you can answer questions about what happens next, even if you don't know all of the answers!

TED stands for technology, entertainment, design: a hint at the wide-ranging topics at the heart of this long-running, invitation-only conference hosted each spring in Monterey, California.

In 2006, TED approached Method to help them bring the experience and content of the conference online. This would allow TED to make the amazing talks presented at its conference available to the public. These images show early screens and how the design developed into its form now. They created a variety of scenarios for how a website could make this transition and how an organization like TED could navigate the transformation. Issues such as community access rights, sponsorship versus advertising, and questions of editorial control versus user generated content were all evaluated.

The final design is simple in its structure but innovative in all its features, creating an experience worthy of the talks it presents. Controls on the home page allow visitors to change its contents, showing the themes and attributes (such as “most discussed”) they are most interested in.





Here is a range of early stage alternative prototypes for TED. Photos: Method

Here's one we made earlier. This prototype shows just-enough of the idea. It doesn't work, but it does allow people to interpret what a networked social device might do. Could we use it to find each other? Does it tell me that someone is thinking about me? Some prototypes are for provoking speculation and imaginitive storytelling.

Customising existing materials with tape & text to rapidly create an idea of what displays could show, even if they can't yet do this.

Skilled help vs DIY?

Not everyone expects to make their own prototypes.

Some design disciplines have highly skilled professional prototypers - for example the product and fashion design industry. These people are treasured, and deeply respected amongst designers. In the fashion industry, it is quite normal for people to make patterns from sketches, toiles from the patterns and even the finished item, whilst in other disciplines you are expected to do it all yourself.

There is a great value of DIY - in that you create a dialogue with the materials by actually making things, and the discovery of how they talk back to you. Sometimes you need the support of having them done by people who can create the appropriate quality you need for the stage you are at.

"Because you're testing and refining your strategy early and often in the design process, the strategy continually evolves. When the market changes... the strategy can change along with it. This gives you a big jump-start over abstract, word-based forms of strategy, in which the first time you get to test the strategy's outcome is when you actually roll it out. You can't gauge the strategy's effectiveness until you achieve the end result and do your postmortem. I don't see why that's useful. By building your strategy early on, in a sense you're doing a pre-mortem: You're giving yourself a chance to uncover problems and fix them in real time, as the strategy unfolds." — Tim Brown, IDEO

People react to how finished a prototype is — the more detailed the prototype, the less people feel they can affect the final outcome. This may cause them to be more reticent in giving feedback. For example in on-screen mock-ups which look finished may not encourage someone to tell you something fundamental about the overall service that you need to hear.

just enough?

So consider putting simpler, less refined prototypes in front of people when you need their feedback, rather than waiting until things look 'better' and more finished.

A prototype can emphasise just a single aspect of a design problem, creating a focused exploration, in the same way that a sketch on a napkin leaves out most of the detail to focus-in on the essential. The prototype becomes a shared medium for exploring, amending and building-on.

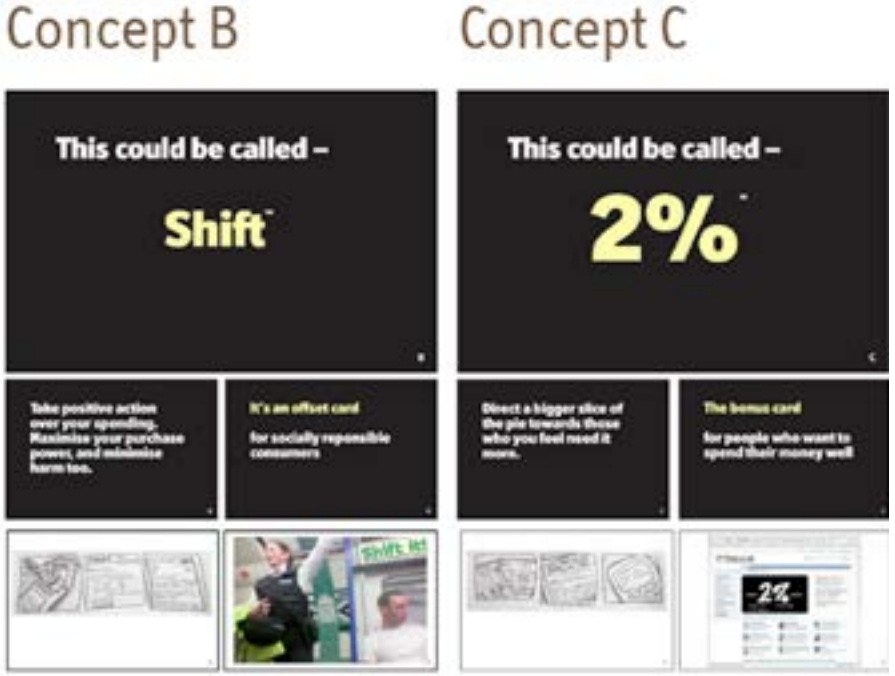
Here a prototype can help with embodying new technologies in everyday applications. The brief here was to design pairs or a series of networked objects that illustrate digital information in a physical form. The project was a scale that measures a food product's environmental impact. It looks at the carbon emitted as a result of transporting the food and measures this in terms of how many trees would be required to offset that carbon over one year. The scale is an exploration in how tangible interfaces can be used to interact with data on the web. With the increase in usage of RFID technology and as "everyday" objects become networked, we anticipate access to untold amounts of information for things as simple as an apple. With appropriate ways to interact with this data, we hope people will be able to make more informed decisions, helping to shape a more sustainable world. Photo: Adam Little

If a prototype has a simple form but few actual features, we find that people bring their imaginations with them. It can be a means of probing for, and exposing latent needs.

Both Sony and Palm used simple, pocketable wooden blocks to guide the compactness desired from their design work. They are not alone. A company developing a biosensor instrument used a simple solid block of wood without any particular details as a prototype for a handheld device. The health professionals they showed it to gave them rich valuable feedback about how they would use it in a busy emergency care setting. They could quite easily use it as a prop to act out skits from their working lives. Engaging them in a dialogue about how they thought it worked revealed their mental models, and allowed the design team to discover what issues did and didn't really matter.

Interaction design thinker and educator Gillian Crampton-Smith calls this interplay between exploration and discovery with minimal props "Just enough prototyping". You create prototypes that do just enough to make the point, or to learn from.

New service ideas can be prototyped visually at different levels - from naming, to the role they play, visualising how they work, and possible brand stories, to discover their potential appeal and how real they feel to prospective customers as well as management teams.



Prototypes can be so simple that they allow users to imagine what they might do. This opens up many possibilities for the designer to hear what users might find desirable. This prototype by Alex Michl is deliberately open - designed as a probe to capture how people might use a product.

"I think the secret of prototyping is to try to do the least you possibly can. If you can take the thing you need to find out about, whatever aspect of your project is needed just at this moment in time, and you can think 'Well, what's the simplest kind of prototype I could use for that?' And then you do that very quickly, get it done, and learn the lesson, find out what doesn't work as well as what does work, and then move on to the next kind of prototype... So using prototype techniques that are ingeniously simple, really so simple that you can use and get past them very quickly and move on to the next step, and then towards the end when you're nearly sure that everything is right about your product, your service, your environment — whatever it is that you're designing — then is the time for the full prototype that gives you an opportunity to check all the details. But in the early stages, in the innovative process, lets make those prototypes just as simple as they possibly can be."

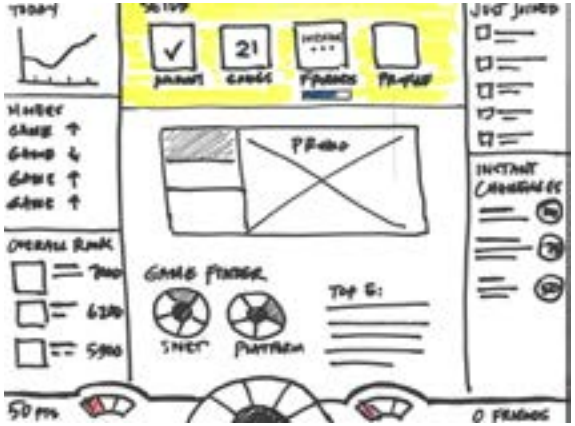
Bill Moggridge
http://itc.conversationsnetwork.org/shows/detail1731.html

BERG's Olinda radio is a prototype that crosses both product and service territories. Olinda is a prototype digital radio that has your social network built in, showing you the stations your friends are listening to. It's customisable with modular hardware, and aims to provoke discussion on the future and design of radios for the home. Six lights on Olinda show when a close friend is listening to the radio, using wifi and Radio Pop, the BBC's website for sharing 'now playing' information. Each light is a button: you can tune in to listen along with them, discovering new stations via your social network.

A friend will always appear at the same light, so you can write or draw on the radio to label it, and the lights are bright so you'll know a friend has started listening from across the room
Photo: BERG

Rupture is a social networking service for gamers. a billboard for players' activities and achievements, a new way to discover games, a new way to challenge yourself and your friends.
The following images show some of the early sketches in the development of the Rupture proposition.

The next stage is to create visualisations of interactions and then these become screen shots of how the service might look.



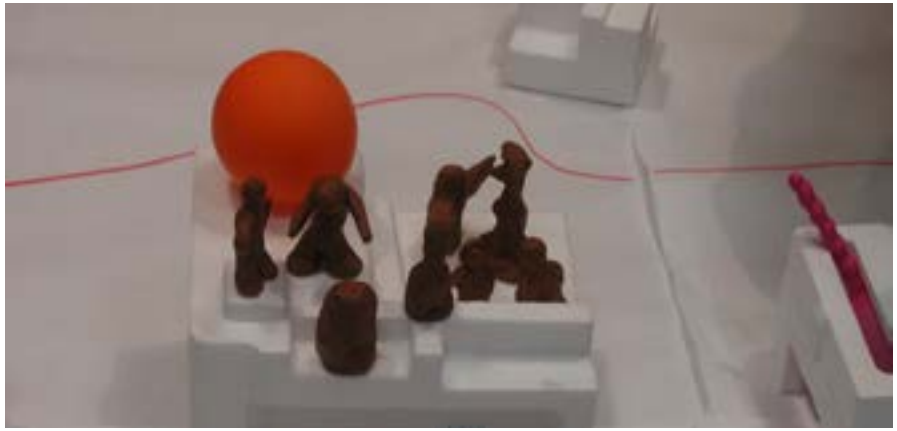
As the work progresses, the screens become increasingly refined.
Photos: Method

types of **prototype**

Different kinds of prototypes explore different aspects of the design problem and solution space. Some simply look or behave like the finished thing. These are 'look and feel prototypes' — which explore the aesthetics and meanings of appearance and use. Others work like the thing you are making and explore how something will be built — 'implementation prototypes' — to drive out technical feasibility concerns. Story based prototypes, such as scenarios, are descriptions of experiences someone may go through in using a service. These are useful to discover the role that a design proposition plays.

Its important to be able to start with ready to hand materials and to make things in a rough way. In a workshop this designer uses polystyrene, clay and found objects to visualise an idea using RFID technology to make links between people in different places.

Be open to using all sorts of materials, and bring it all to life by getting the designers to present their ideas, or make simple films from still images with a voiceover.



Each kind of prototype has a role in the design process and in the working group's learning. You need to use the right one at the right time, bring it to life through some kind of performance and tell people what you are seeking from them in their feedback and reactions.

Expression prototypes that look like your idea

Sometimes in the early stages we are trying things out for how they appear - does the size work if we fold it, will the extra parts fit in, can they hold it easily?

These are the prototypes we make when we just want to simulate something from the visual and aesthetic point of view. Finished graphics, or the intended visual language are used, including precise colours and imagery where relevant.

Role prototypes that act like your idea

As you get a clearer idea of what you are thinking about, you can craft interactions to explore the most significant sequences of the customer journey.

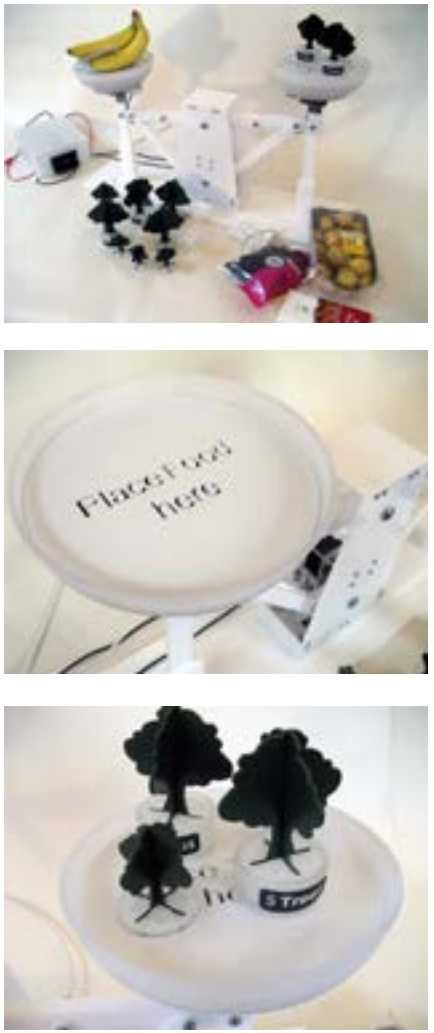
Focus on specific sequences of that journey to demonstrate and communicate the idea through physical artefacts, graphic dummys or software behaviours. Create an animated demonstration of the significant parts of your idea. This brings your idea to life off the page. Its also known as user illusions and stagecraft - using the screen as a stage.

You can improvise with everyday items to illustrate actions and behaviours you are trying to convey.

Implementation prototypes that work like your idea

Working prototypes are more finished components of ideas, perhaps with all of it working in a way that shows how it operates when you use it. In product designs we would expect to see rapid prototypes with working features. In service designs this could be through role play or a demonstration of web services that run on screens and devices where necessary.

This kind of prototype is more about communication, and testing. Methods to communicate working prototypes are those that create high resolution and finish. Rapid prototyping methods, Architects use fly-through visualisation and 3D rendering software that rotates and lights up their design. You can use Flowella, Flash, Final Cut, Maya, InDesign, in fact most of the production tools and techniques whether software or production techniques.



Prototyping to explore and communicate a service concept around the impact of food from students at CIID, Denmark.
Photo: Adam Little

Prototyping Evidence

Creating evidence of something in use, and in the world suddenly makes it real for people - your clients or your potential customers. This can have a powerful impact.

Prototype the experience of the product or service through various forms of “faked” evidence that this product or service exists. Make stories, dummy pack shots, fake press releases, fake magazine reviews, receipts, artefacts that may not even exist as yet. These are fascinating to make, as in the process of making them you can make the leap from something that does not exist yet, to something that could exist.

When designing services, creating service evidence is the tangible embodiment of the intangible value proposition. Live|work use this method to thoroughly explore future service ideas by creating “fake” evidence as if it was real, and observing the reaction from clients and users. We often use it to explore a range of service ideas and discover what appeals, and what repels. This subtle method has a lot to offer designers, public sector innovators and business thinkers alike.

Prototyping Propositions

Value propositions explain - in a highly condensed way - your ideas to people within an organisation at a very early stage, and reveal possible projected benefits.

They are simple in form, and have a powerful storytelling role in that they provoke people to imagine much of the detail. Examples include First Direct as the bank manager on the end of the phone, or the original pitch for the film Aliens as “Jaws In space”.

You can think through the idea by sketching, 6 word stories, writing short condensed stories, role play, or product description substitutions. Communicate the idea through fantasy press releases, fantasy adverts, or similar storytelling devices.

The proposition needs to be able to explain clearly what you are proposing. It needs to answer the questions: who is it for, what does it do, what is it for and, finally, what is it?

Customer Journeys

This is a diagram indicating the stages your users will experience with your product or service. You dictate what the stages are e.g. from awareness, to first encounter, to detailed stages to exit. It needs to communicate the relevant stages in the order in which people experience them.

Make this journey sharable by visualising it using any drawing method you like, so that the journey can be understood and built upon.

Identify where you think the pain points will be for them, and explore how your idea resolves these. Explore mental models about what is going on. Use Post it notes as stages, use sketched storyboards, stories - beginning, middle and end, or task analysis. Communicate the work through storyboards, customer journey diagrams and models.

Make your own customer journey template, or start it as a simple top layer which develops into a blueprint. Its important to show you understand the stages the customer goes through, and where user insights occur in the journey.

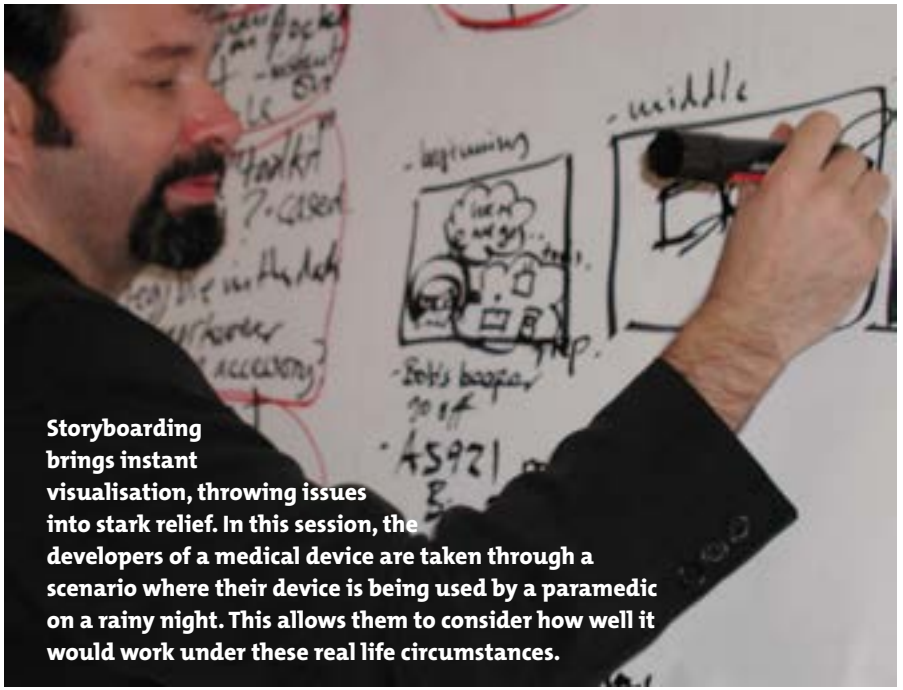
Software prototypes

These can be simulated on the intended device sometimes as behaviour sketches or later as testable experiences. They can be explored from different perspectives, or held, played or interacted with.

Behaviour sketches are crude animatics, small sequences in demo form - showing timing, character, momentum and physics, swoopability, subtlety, action and reaction, elegance visual pleasure.

Work out ideas with flicker books, sketchbooks, storyboards, animations. Communicate ideas with Flowella, Processing, Flash, or an animation package.

Progress to a demo showing more detailed levels of interaction, with for example character, physics and behaviours.

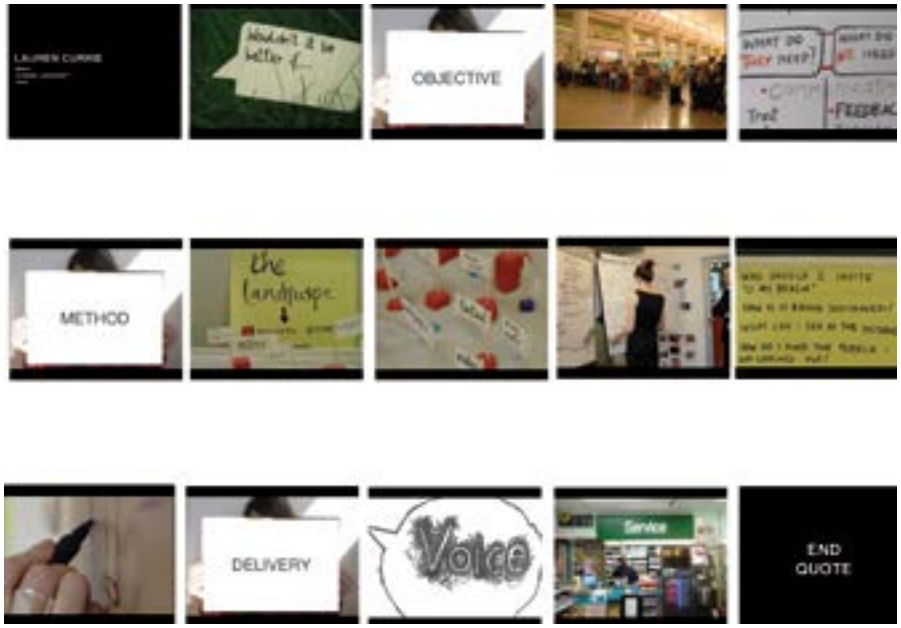


Storyboarding brings instant visualisation, throwing issues into stark relief. In this session, the developers of a medical device are taken through a scenario where their device is being used by a paramedic on a rainy night. This allows them to consider how well it would work under these real life circumstances.

Storyboards and scenarios

Telling the story of the product or service in use can help you think it through and tell others how you envisage it working. Break the journey into a sequence of action events, and illustrate them in 'frames' through simple or more crafted illustration. Photo essays work well if your drawing skills are limited, and taking images from magazines work as effectively to make a point. Write a story to accompany the frames with any appropriate dialogue. Think about the point of view the story is being told from, and compose each frame as a dynamic point in the action. Use Post it's or index cards to think through the sequence. If the frames are moveable, it's possible to orchestrate them in a way that tells a good story.

You can use Post Its to think stories through, or pre-printed storyboard sheets. When it comes to sharing them you could use storytelling tools like Keynote or Powerpoint slides, applications such as Comic Life or more specialised tools like Hitchcock for the IPhone.



Storyboarding is a technique from filmaking which is a perfect and adaptable method for prototyping. Conventionally it is a series of panels which illustrate elements of the product, service or strategy in use. Here the designer uses images and handwritten text in an engaging and vibrant way.
Photo: Lauren Currie

Dummys

For those in print media, or in packaging design, the dummy is a mock-up of the design in progress, either in plain paper or card to explore the format, or with printed covers or sections to simulate the finished thing. Printers supply blank, unprinted dummys, whilst you get a lot of value in making your own from printed sections of the final design. Holding the near-as-printed version in your hand helps you to anticipate the final printed version, and make any necessary corrections easily.

You can easily extend this approach to all kinds of design - making things cheaply out of paper or card is a rapid way to make an idea tangible.

Adapting what you have and making with junk

You can adapt clean household junk in order to make things fast to think with. Its unlikely this will work for client presentations, but as a rapid means to put ideas together, use what is around you.

Hacking and tinkering physical prototypes

More and more designers are finding their own ways of hacking and tinkering with new hard and software tools such as Arduino, Processing and a whole host of new hard and soft components. The DIY movement such as O Reilly's Make, hacklabs, work conferences in formats like foo and bar camps and informal training sessions are now available to encourage investigation. The sharing of solutions means that anyone can pick up the skills and try things out. There are many books, like the Make or Craft magazines, that do this area more justice than we can in this book.

The hacking approach to prototyping is building to discover - trying things out by making, and learning from the results. Its a refreshing collaborative movement.

Experience Prototypes

These are prototypes that simulate the experience of using the product or service. In some instances, they can be life sized arrangements of furniture and card to create spaces people can inhabit. In others they are a range of artefacts that simulate an experience on screen, with lego, props or even role-play in space.

Experience prototypes give people a chance to explore how things might work with, say, an insurance product in real life. For example: how does it work if someone tries to buy a product that doesn't exist (bending the rules of the system)? How to sell the service using a combination of web site and phone support with mock-ups of the web site and call centre script. How does it work for a sales representative in a retail environment? How does it work when you have had an accident? What is the appeal for someone who has had that accident before?

The service blueprint (right) shows a whole service prototyped through a structured visualisation at the final stages of its development. Prototyping is also a management tool: for exploring ideas about business models, flows of capital, and enhanced ways of visualising the business.
Blueprint: Garry Burns

Service Blueprinting

This is a tool that you can work with to think ideas through, and then also work up to a finished standard, for sharing with clients and colleagues. At a simple level, blueprinting contains layers that contain different slices of the action. Intrinsically there is a front stage - the part customers and users can see, and the backstage - where everything else goes on to support them. The blueprint shows a journey of the interaction between the user and the service.

This arrangement allows you to use the blueprint to think through what is happening to users throughout their journey - what they think, how they feel, what they see and what they do. It is this thinking-through stage where the method comes into its own. Engaging the appropriate people in its construction has a profound effect in bringing the service to life. It uses the expertise of those who know how things work, and engages people at a level of creativity that most companies don't get to enjoy.

The blueprint acts as a great communication tool afterwards, to share, or break up into relevant components, or simply to use as a more dynamic reference to the core service.

The examples that follow are what we call **warstories** - stories from designers and design managers about the actual experience of working, and the problems they encounter. They need to be anonymous, as, sadly, there are sometimes negative consequences to telling the full warts-and-all story.

A Designer uses prototypes to turn a client from opponent to advocate

"We were designing one of the first videophone designs for a client. We had done our background research and had a clear idea about the direction the design should go in. The client disagreed, aggressively. He really didn't like it. He looked at the work we had done and said — "My 60 year old mother couldn't use that!" So we tested it on his 60 year old mother (amongst others). Turns out she could use it. In fact, she found it to be a very good design, and he became a very vocal advocate for us. It showed me that sometimes people are just outspoken — and if you can get them on your side, they can become outspoken for you."

A Product Designer finds a way of distracting the late in the day changes.

"The Technical Director in a company I worked for used to turn up at the final project meeting, and ask for significant changes, like 'can we move this button here, to over there' which was a disaster as we had already made the tooling, we had to stop the imminent production, miss the product show we were booked into, which cost us a lot in time in time and money.

After a few times, I started getting the guys in the spray shop to paint the prototypes really awful colours, and he paid more attention to that, and we didn't have to re-make everything at the last minute"

A Service Innovation agency uses a sketch to show how prototyping can catch differences in understanding of the brief

"Our client had been developing a new service for two months. After a discussion with them we drew what they described. When we shared the illustration the developers said "that's not what we're building" while the company directors said "but that's what we wanted you to build..."

A Designer and service design team gets feedback from prototypes and the process

"I was extremely skeptical of my team's initial service concept — as was the review panel. Despite this they gave us the go ahead to prototype the experience and see what we could learn.

We used several experience prototypes to test and refine our concepts, but the catch was that our services had emotional and intangible qualities which couldn't be described in purely mechanical mockups.

However, we had used video cameras to capture a record of our prototyping process. Reviewing them afterwards yielded details which were used to refine the concept and we edited them together as a communication tool.

When shown to the review panel, the videos helped to move the conversation on from whether the concept was 'a good idea' or not, to what we could do next to improve the solution."

An Interaction designer follows her instincts and hits the mark

"I was working on a project for the police with a product design company, developing a new interface for the control room. All the existing control room material was blue and grey. It was all boxes — nothing remotely interesting in terms of shape. In my design proposal I put curves on the boxes; I made the colours pink and green.

All of the review team were men. They hated it. They asked me to change it. They registered concern about the 'extra work' for them. Of course I said 'OK', but my instincts said something different. So I didn't. Next time they asked me again to change it, and I said I would, but in fact I kept it. This happened again. In the end they laughed when they realised what I was doing.

I took them to see the target audience — a group of women who had been able to decorate the control room where they worked. They had painted it pink. And they really loved the design."

Service evidence for one of a series of charity credit card concepts gets placed in the best possible context to tell its story.

This idea works by collecting the merchants fee and pooling it as a way of collaborative giving. This website stands in for the likely audience.

fake it to **make it**

Our intention is simple. What we're attempting here is to say that prototyping sits at the heart of all design activity.

We've mentioned the three components of prototyping.

We've included some well known and some lesser known methods that are used by designers right now.

We've talked about an approach to prototyping, where an open attitude to failing fast is predominant and valued for what we learn in the process.

Finally we've highlighted aspects of cultures that value and actively support prototyping, so that we can understand the context and conditions needed for it to work well.

We hope this book encourages you to make more things and to bring your ideas to life in new, enjoyable and sharable ways.

We hope it gets you a chance to enter into a more powerful dialogue with those who make the choices about your work.

Finally we hope it helps (if only in a small way) to encourage you to create more thoughtful design, simply because you've taken the leap of making it real before it's real.

With our deepest encouragement for making great things!

Gill and Nick
June 2013

Early stage
Rough ideas as concepts (a range of sketched visual directions for example), or back of the napkin sketches, rough card models, blocks, foamcore models with the simplest of features.

Middle stage
Parts of the experience can be prototyped through small sequences, or a range of simple interactions between the product/service - on card, or on screen or enacted, or as a simple block - with aspects of the design simulated without much animation. .

Later stages
Finished prototypes that have working sequences, or can be put on devices or seen in action as near as finished. Fly-throughs, working prototypes, filmed sequences.

Prototyping Tools

Early stage
Post it notes
Sketchpads
Napkins
Index Cards
Foamcore
Card, wire and string etc.
User journeys
Storyboarding
Hitchcock Mobile
Sotryborad Composer
IPhone App
Pre-drawn Storyboard pads
Pre-printed UI sheets & templates
Animation
Flash
Flickerbooks
Flash
Illustrator
Photoshop
INDesign
CNC machine parts
3D printing
Print on demand services like Moo, Newspaper Club

Specialist Tools
Flowella for Mobile Applications
Storyboard Pads
Moleskine Storyboard Books

Credits

Many, many thanks go to all of the people who have given us images to use for this book:

Mr Schultze, Deborah from ThinkPublic, Ré from Radarstation, Lavrans from Live|Work, Adam Little, Timo Arnall, Method, Eilidh Dickson, Garry Burns, Lauren Currie, Alex Mitchl. Additional uncredited photos by Plot.

And thanks go to all of the people who have inspired us to do what we do, and those who keep us on the straight and narrow.

Want to suggest something? Email prototyping@plotlondon.net. Want to just talk to us? Email plotters@plotlondon.net, or skype plotlondon.

Booklist
Make magazine

ReWork, Jason Fried

How to Fold, Pepin Press

The Storyboard Design Course - the ultimate guide for Artists, Directors, Producers and Scriptwriters, Guiseppe Cristiano

Steve Krug, Don't make me think

The Back of the Napkin: Solving Problems and Selling Ideas with Pictures, Dan Roam

Michael Schrage on the cultures of prototyping in Terry Winograd's book Bringing Design to Software.

Tim Brown's books

Films
Objectified, Garry Hurstwit, Swiss Dots Production
Sketches of Frank Gehry, Sidney Pollack

Apps
Storyboard Composer
storyboards for the iphone
Flowella - Nokia's tool for prototyping on their phones
Comic Life for storyboards

Articles
Stephanie Houde and Charles Hill, What do Prototypes Prototype?
www.viktoria.se/fal/kurser/winograd-2004/Prototypes.pdf

Exploring the Future in the Present, Ireland & Johnson, DMJ Spring 1995

Bridging the anxiety gap, Eddie Obeng
www.lulu.com/pentacleworks

Creativity That Goes Deep, Business Week, Roger L. Martin, Dean of Rotman School of Management, AUGUST 3, 2005
http://www.businessweek.com/innovate/content/aug2005/di20050803_823317.htm

Online Resources
Make + O reilly stuff
http://oreilly.com
http://makezine.com
Tinkerit! www.tinker.it
Ponoko www.ponoko.com
FabLab Manchester, UK
www.fablabmanchester.org
Tech Shop across the USA
Adafruit Industries - kits and components
http://www.adafruit.com/

Dear Design Manager,

We implore you to earmark a range of resources for your designers to prototype their emerging ideas with. They will need the appropriate equipment, time and budget to do this.

Please don't rush them towards implementation - the time they spend now will be time well spent - they will have used the prototyping time to understand further the relevance of their ideas, and made good changes based on what they have discovered from their own responses and those of the users they have tested them with. They will need to do this again and again.

This activity will save you money in the long run. They will avoid expensive mistakes by making changes earlier in the design process. You will have reduced the risk of launching broken or unwanted things into the market that have not been tested out with users. You cannot lose by taking this approach, and your boss will love you for it, as this activity will make you, your team and your boss look good. It's a win-win-win approach.

You will all learn much, and it will add so much value to your work and expertise that you will be head hunted by the company of your dreams.*

Kind regards

Gill and Nick
*Well, maybe that part is exaggerated.

Many organisations could benefit from the prototyping approach, but in practise can't even get started. People experience these blockages to action as politics. Durrant and Wildman reveal the mechanisms and dynamics of this situation, and how to make progress.
Cameron Tonkinwise, CMU School of Design

Plot

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