

Rapid Prototyping: Speeding Your Ideas Into Action

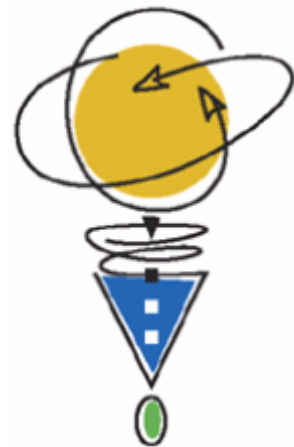
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Speeding ideas into valuable action

The definition of innovation we like to use—people putting ideas into valuable action—is more than just a catchphrase. The definition reflects the value of moving an idea from a nebulous concept into a new product, service or business model. We've defined this business process as the Concept to Cash™ business process. A critical step in the Concept to Cash process is prototyping. Creating a physical representation or simulation of the idea allows people to interact with the concept behind the idea, often revealing areas of value. The reaction to the prototype and the feedback from the prototype customers will define what to keep, what to scrap and what to add to the product or service. Early prototyping with a broad panel of potential users will provide important feedback as to market acceptance, potential market size, user profiles and price points.

Let's face it – ideas are ephemeral; they exist in peoples' heads, but may be difficult to describe and hard to imagine. Moving an idea as quickly as possible from the concept phase to a model or prototype – even if that prototype is simply duct tape and bailing wire – puts a representation of that idea into a customer's hands. Once a prototype is in a customer's hands, interesting things happen. Customers interact with the prototype. They twist it and turn it. They comment on what they like and don't like about the prototype. They suggest changes and alternatives. They compare it to other known solutions, to a problem or opportunity. In other words, customers work with and experience the product, and smart product managers listen and record what is said. The reason we advocate rapid prototyping is that customers often don't know or can't articulate what they really want or need. Rapid prototyping helps surface wants and needs in a much more concrete way than traditional requirements gathering.

In this paper we examine the reasons for incorporating an iterative, rapid prototyping approach into your innovation business process and the value that rapid prototyping will provide. We identify the four phases of rapid prototyping and document a rule of thumb to know when your prototype is complete. We quickly examine several organizations that serve as successful models for rapid prototyping and provide some ideas and next steps to help you incorporate early, rapid prototyping as a key step in your innovation strategies.

Early prototypes help you innovate with greater speed, identify products and features the market values and build new products and services that add to your bottom line. All of these concepts help your organization Innovate On Purpose™.

Rapid prototyping defined

For the purposes of our paper, we define prototyping as building a model or simulation of a product or service to represent that product or service during the initial ideation or planning and design phases. The prototype serves as a strawman to allow potential users to interact with a proposed alternative, recommend new features and attributes and suggest new uses or ideas.

We define rapid prototyping as the ability to convert a new idea into a model or simulation as early in the innovation business process as possible, and to incorporate feedback from user groups in an iterative process. In this regard the “rapid” refers to two elements – first, generating a workable prototype as early in the process as possible and second, revising and generating a revised prototype once feedback is gathered.

The four phases of rapid prototyping

There are four definable phases of a successful rapid prototyping approach: reaction, interaction, feedback and response. All of these phases are important and each can reveal something about the prototype and the likely success of the product or service.

Reaction

We call the first phase of rapid prototyping the “reaction” phase. By interacting with a physical model or a simulation, a user can move from an abstract concept to a concrete understanding of the idea very quickly. The reaction phase is the step in which the prototype is first described and introduced to the user. Generally speaking, the user will “react” almost immediately as the proverbial light bulb goes on. In an innovation setting, we should encourage immediate, honest, emotional reaction. Users are encouraged to say whatever comes to mind as they first encounter the prototype. Comments like “that’s it” or “completely wrong” are exactly what we need at this stage of the process. The emotional reaction to the idea is as important as the careful, factual review of the features and attributes of the prototype, since emotion and the “wow factor” will drive the purchase and adoption of a new product or service. By moving the idea from a very hypothetical stage to a representational model, we engage the user and participate with them as we evolve the idea. This phase has important implications for the marketing of the new product or service, as a customer’s initial reaction will indicate how potential purchasers will react to the product or service in the marketplace.

Interaction

After a user “reacts” to a prototype, they will interact with the prototype. For products that will become physical objects, a user must interact with a prototype that represents the product in size, shape and construction. Ideas that are to become new processes, new services or new business models can be simulated, allowing the user to experience the new process to the extent possible. In an innovation setting, interacting as early as possible with a representation of the new idea allows potential users to provide quick feedback about the strengths and weaknesses of the proposed solution. Interaction often uncovers attributes or features of a solution that are missing, attributes or features that should be changed, and those attributes or features the designers felt were important but customers don’t value.

It’s important to have several different types of people interact with the model or representation of the idea. A wide array of users from different backgrounds with different expectations will provide feedback across all the features and attributes of the idea. An optimal mix of users will include early adopters of new technology, as well as those who are more cautious in their acquisitions and expect a more complete product. The former give you the opportunity to understand the behavior of early adopters; the latter provides you with an understanding of the needs of early majority and late adopters.

The Power of “what if”

As we engage the user with a new product or service, we must ask questions and lead the user while they interact with the prototype. A great approach to use when prototyping is to ask the question - “what if?” What if we were to change this feature? What if we were to reduce the weight of the product? What if we could process more orders? Using a “what if” approach helps the user to overcome a common occurrence when interacting with a model or representation of an idea – the expectation that the model reflects exactly what the end product will be. Microsoft Office® Excel, one of the most successful software applications in use today, is actually nothing more than a powerful prototyping tool that supports “what if” analysis.

Excel is used by many firms to create financial models. Every entrepreneur has an Excel spreadsheet which details costs, sales and cash flow. Excel is the ultimate prototyping tool – it allows a user to quickly define the parameters of a business and build a financial model of the business. Excel also provides great power for the “what-if” stage of the evaluation. Most Excel-based models include variables that allow a user to change pricing, team size, production quantities or other attributes to determine the changes in the model.

Sometimes users will not understand that a prototype is a ***potential*** representation of the final product or service. The prototype can change based on the users’ feedback. We seek to stretch the perceptions of the users to help them look at the prototype as something that can be altered and molded to their needs – met and unmet. Rather than allow the user to look at the model and expect that the model reflects the final product, we must push the user to consider the model as a starting point for discussion which can be shaped and molded before the final product is built. If

possible, allow the user to make real time changes to the prototype or, at least, direct changes and watch as we make them. During this step, your prototyping team works to expand the concepts and uses of the prototype rather than trying to force the users to accept the prototype as an unchangeable model of the final product.

Feedback

Capturing the reactions and the information generated during the interaction sessions is vital. When your team demonstrates a new product or service generated from an idea, be sure to have a scribe capturing and documenting feedback from the users. Watching the user interact with the product adds exceptional insight. Most people have trouble articulating problems or assume that the difficulty in using a product or service lies with them. Directly observing users will uncover unarticulated problems and needs that might be missed otherwise. Some companies capture these interactions on videotape to ensure an accurate record of the comments, expressions, and actual use of the offering. It's important to capture all comments and observations, positive and negative, as well as any recommendations (stated or observed) for new features or attributes.

During this process your team must keep its goals in sight. Your team is not seeking to design by committee, but to gauge the reaction to the product and make small incremental improvements to the idea. Your team cannot and should not attempt to satisfy all the recommendations. To do so would water down the new product or service. We are all familiar with the anecdote that the camel is a horse that was designed by a committee. Accept all feedback but incorporate the suggestions and changes that align to your understanding of the market and the opportunity.

Response

After the initial interaction with the prototype, revise the prototype based on the feedback received and bring the product back to the users as soon as possible. A quick response to your users demonstrates that your innovation team takes the feedback seriously and values their opinions. This will establish your organization as one that listens to its potential customers and innovates with a purpose in the market. It also keeps your users engaged. If they know that their feedback is incorporated, they will stay involved longer to see the offering evolve. Customers with current needs will see the progress and be ready to buy when you have completed development.

These four phases – reaction, interaction, feedback and response are all critical to a successful rapid prototyping environment. The challenge to this process is knowing when you've completed enough rounds of prototyping to ascertain the final features and attributes of your new product or service – or when you are merely spinning your wheels.

When is the prototype “complete”

The most difficult decision your team can make when using rapid prototyping to support your innovation initiatives is to decide when your prototype has been through enough iterations and is ready to move to a new product development process or on to commercialization. A good rule of thumb is that most product innovations should not require more than 3 prototype iterations. The first iteration is based on the original idea, and is likely to miss the mark in several areas. The second iteration is based on the feedback from the first demonstration of the prototype and should resolve many of the initial concerns. A third iteration should only be necessary in some instances, and if you cannot resolve significant concerns after a third iteration you likely have a problem in user perception or problem identification.

Making prototypes

This is the fun part. This is where you actually get to play.

Product prototypes

Physical products are the easiest to prototype. In this case, you prototype an actual, physical representation of what you are planning to make. In the early stages, the materials for the prototype are less important than quickly creating a physical representation. The key is to produce enough to validate your concept and get feedback. As long as you ask “what if” enough, your users will realize that you are not showing them the final version.

MIT has taken this approach to a new level. Its Center for Bits and Atoms (CBA), which broadly explores how the content of information relates to its physical representation, includes FabLabs, which are inexpensive labs equipped with machinery, electronics, and other resources for rapid prototyping. The FabLab is a great example of how to go to a physical representation quickly and they’ve set up versions of the labs in Costa Rica, India, Norway, and the US.

Software is another area where prototyping is key. Although everyone worries about functionality, users will focus on the interface and ease of use, make sure you get the look and feel prototyped fast. Use image editing software to mock up the screens, and put links on them to go to other images. Once everyone’s agreed on the look and feel, you can start prototyping functionality in a more bare-bones environment. Otherwise, you will always be fighting the “yeah, but is it gonna look like that?” battle.

Service and business model prototypes

Many ideas and innovations are based on new services, new business models or other concepts which can be hard to prototype, at least in the same sense as a physical model. The value we ascribe to prototyping carries over to these intangible innovations as well as physical products, so prototyping these more conceptual ideas is important. In these cases the prototype may take the form of a simulation of the service, business model or process change. It may be more

difficult to generate a simulation of these ideas, but it is as important to prototype these conceptual ideas as it is the physical product ideas.

A powerful approach when prototyping a service or process change is to generate an experience. What will the customer experience when using the new service or business process? Produce a simulation of the service and its features, what the user will experience, and stories of how life will be different because of the offering.

People are interested in relationships, experiences, and stories. Stories and experiences can add context to prototypes for ideas that don't result in tangible products. For example, a number of years back we were involved with helping a global tire company communicate the benefits of its tires. We created a virtual time machine to allow people to experience the improvements in tires over the past hundred years. To pitch the idea we pulled together images, rapidly generated a 3D model through a contractor, grabbed some existing audio, and produced a moving storyboard that demonstrated how we would communicate the experience to users. The important result was not that we produced the final version—it was that we demonstrated enough of the experience in our prototype to communicate the value proposition. We ended up winning the project based on our ideas and our prototype.

Fast trash

Build prototypes with the willingness to use them, discard them and move on. Most prototypes are nothing more than an attempt to model a first approximation of idea or concept for a user to experience. Prototypes are not “complete” products or services. They are models that the user can interact with and that can be built inexpensively and quickly. This means that you must pick a prototyping mechanism that's fast to deploy and cheap to build. Your prototypes will probably end up in the trash – but that's OK.

At NetCentrics, we generally develop our software prototypes in a rapid application development framework, which allows us to deploy our prototype applications very quickly. True, we can't easily redeploy the prototypes to commercial code, but the prototype is meant to confirm market demand and specifications quickly, not become the commercial product.

The point is, you and your management should be prepared to throw away the prototype. Woodworkers routinely try a cut on a throw away board. Sports teams scrimmage. Architects build foam core models. Prototypes help develop an idea but, in the end, are throw aways that help the team move forward.

Which firms use rapid prototyping effectively?

In the market today, probably no one does a better observable job of rapid prototyping than Google. Google has migrated from a search engine to offering a broad array of features and services. Almost all of those offerings have been through an initial public prototyping and beta test. Google incorporates the feedback from those pilots and beta tests and updates its services. Some features and services have been cancelled based on these tests, and some features and services have become big winners for Google; Google Maps for instance. Google has several advantages over other firms when it comes to rapid prototyping, but none of these advantages are ones that other firms can't overcome.

Google's advantages in rapid prototyping:

1. Google has a large, active customer base which visits one or more of the Google sites on a regular basis. It is not hard for Google to identify its users and potential prototype or beta customers.
2. Google has an interactive customer base which is interested in new capabilities and technology. Google attracted a large number of users to Google Maps and Gmail by incorporating new technology into its existing site.
3. Google has been a fast follower. Google has watched other online sites add capabilities (Hotmail and Yahoo email versus Gmail for example) and brought online products and features that incorporate what's attractive about the competitor's products while adding new capabilities and features that showcase Google's strengths.

Another firm that conducts very successful rapid prototyping is Clorox. According to the head of Research and Development at Clorox, it's not unusual for Clorox to produce a workable prototype within 24 hours of the definition of an idea – within one week if there are substantial manufacturing issues. One member of the Clorox team often builds a prototype during a customer visit. This rapid prototyping provides the opportunity to move the conversation from an abstract idea to a product a customer can hold in his hands and experience. Clorox measures the time from when an idea is generated until the first prototype is developed. We call this metric the mean time to prototype. The shorter the time to prototype, the more likely you are to maximize the benefits we outlined above.

What can you do now?

So you know you need to prototype. What should you do first?

First, find ways to get your potential users interacting with prototypes of your products as early in the process as possible. If you are developing a software application, mock up the user interface as an image with links to other images—don't worry about the exact functionality yet, you are going for the initial reaction. If you are offering a service, storyboard experiences and put the business model in Excel. Be creative—you can do this fairly inexpensively and still get great results. Road signs convey lots of information to drivers with simple stick figures. Hollywood movie makers start with a storyboard to convey the user experience. You need to provide just enough information for your users to play with your offering and give you feedback for the second round. No more.

Second, make sure you are observing the user. Don't rely solely on surveys and interviews. Actually watch users and follow up with questions as you notice their behavior. As Yogi Berra said, "you can see a lot just by observing."

Third, start integrating rapid prototyping into your process and eventually your culture. Celebrate the prototypes that eliminated ideas fast. Celebrate the prototypes that provided insight that changed the course of an offering. Celebrate what you learned from a failed prototype. And by all means collect prototypes and stories around them to help provide unique experiences for your customers and your team.

Like anything else of value, you start by doing something. The way to get really good at prototyping is to do it. Get your storyboard paper. Buy some foam blocks. Load your photo editing software. Get it in front of users and watch them closely. Revise and repeat. You'll be amazed at what you eliminate and the features you add that look so reasonable in hindsight if you prototype early and often.

Conclusion

Let's summarize why rapid prototyping is so valuable. Rapid prototyping can

1. Help you quickly determine if the product or service meets the requirements of the market, and if not, quickly revise the prototype to the needs of the market.
2. Help you fail forward faster. Prototyping allows you to rapidly determine what offerings aren't likely to succeed, learn from the experience, and move on to the next idea. Fear of failure is one of the top inhibitors to innovation. You shouldn't fear failure—you should fear not learning from that failure.
3. Help you define the market for the product or service by the reaction and comments of the people in the prototype test
4. Help you determine the actual demand for the product and its value proposition in the market
5. Identify "whole product" concerns about the product. For example, the need for more user documentation or reliable sales channels
6. Generate excitement about the product and your company by exposing your ideas

Rapid prototyping is not just a step in an innovation process but it is an integral part of the entire innovation cycle. Prototyping does not require sophisticated models and expensive software – prototypes can be built by most people in your organization. Prototypes will provide tremendous benefits as they reduce the time to market, the cost to launch a new product and identify features and attributes that your customers want.