Innovation Management

Prototype It!
A Management Framework for Early Prototyping in Digital Economy
One way to handle uncertainties is the adoption of iterative, learning-oriented methods. “Early Prototyping” and “Business Experiments” constitute two of those methods. By applying the framework, managers can unhinge early prototypes and business experiments from their particular discipline boundaries. Furthermore, the framework shows how managers can combine both concepts in a structured manner in order to unfold their benefits on an organizational-wide level.

The omnipresent innovation imperative of the last decades has changed many business environments fundamentally: Steadily shortening product life cycles, the ever increasing speed of new technologies, an endless float of new product categories as well as rapidly changing customer needs bid defiance to companies. In the same time all-encompassing uncertainties are a fundamental part of modern business environments: A rising complexity of products, an on-going digital transformation – the use of new technologies like mobile, cloud, social networks, internet of things and Big Data – and an accelerated change of market demands dramatically complicate companies’ strive for long-term business success. That is why companies have to accept that traditional planning paradigms do not work in a usual manner anymore. Consequently, firms have to find ways to cope with these challenges and take a proactive step towards uncertainties.*

Some disciplines and professions cope with uncertainties by adopting iterative development processes: They consider prototyping and experimenting as a response to uncertain, unpredictable environments. Florian Redeker, Scrum Product Owner bei orderbird AG, explains: “There should be a clear picture of all of the uncertainties related to a new opportunity as soon as possible so that possible problems can be tested systematically over the course of a large number of small iterations in the form of prototypes. This is the only way to obtain valid information about opportunities and risks without vainly running through budgets in the millions!”

Mainly in the start-up and entrepreneurship space, iterative, learning-oriented approaches gained recent attention under the term “early prototyping” and “business experiments” These approaches highlight the importance of trial-and-error-learning and offer a process-view for the testing of ideas and prototypes with customers to optimize product and service development.

But how can insights from organizational learning, business experiments and design research on early prototypes be combined to a framework for the management of early prototyping in complex and fast changing business environments for industrial and service companies in the phase of digital transformation?

In this opinion paper, we introduce an integrated and more general perspective on managing iterative methods within new product and service development projects. Our approach has been synthesized from existing methods, Detecon’s very own first-hand experience across innovation projects globally, and expert interviews with selected corporate innovation practitioners. As a result, we are able to present a comprehensive framework for the management of early prototyping that has sufficient practical relevance and is capable to answer current, practical challenges innovating firms have while using early prototyping.

What’s in a name? Defining the key terms

First of all, it is necessary to define the key terms on a relatively general level in order to sustain a broad applicability for different kinds of early prototypes as well as a wider spectrum of industries. Prototypes, by definition, are first or preliminary versions of future products and services. As such, their main purpose is to:

- Showcase an idea/concept to key stakeholders (e.g., investors, sponsors, potential buyers, partners)
- Test and validate value propositions with actual users or customers
- Generate feedback to iterate and pivot a new product or service.

Prototypes can come in many different shapes. For example, as mockups in a “fake it till you make it” fashion, as click dummies that simulate the user experience of apps on mobile devices, or fully functional prototypes.

We understand Early Prototyping as the underlying activity and thus focus on a process-centered definition:

Early Prototyping is an iterative method for early phases of new product development. It explores and communicates representations of ideas and concepts and experiments with them to sharpen their underlying problem definition and enhance possible solutions in order to learn for the further product development.

Of course, it is necessary to go on with developed prototypes: the creation and development of any kind of prototyping is only worthwhile when it is used for experimentation – for example, showcasing a prototype to a group of potential customers. It thus becomes obvious that business experiments and early prototyping can be seen as two methods that act as complementary extensions to each other. Accordingly, the following definition of business experiments includes notions of the definition of early prototyping in the same manner that the above-noted prototyping definition already hints at experiments:

**Business Experiments are defined as an iterative method that utilizes early prototypes by designing, conducting and analyzing trial and error tests that check previously defined assumptions in a systematic manner in order to learn to better understand and decide in unknown, uncertain business environments.**

Management Framework for Early Prototyping and Business Experiments

The following framework (see Figure) offers a comprehensive perspective on early prototyping by utilizing strengths of the design discipline as well as business experiments. The framework itself was designed in an iterative process by the author and has been overworked and changed several times while executing the projects, conducting the interviews and gathering feedback from practitioners.

**Practitioners’ challenge: Incompleteness**

Interviewee 1: “You have to educate people on that. Especially in large corporations, people don’t think in prototypes. People only think in finished products.”

Incompleteness has to be seen as a strength that reduces the complexity of a prototype: Its tentative and dubious status is helpful to foster discussion and active reflection on the artefact leads to openness. Sleek and expensive prototypes increase the commitment of the team for their prototype, which dilutes feedback and reduces willingness to change. Interestingly, many experts are aware of those benefits of incomplete prototypes but experienced problems with this approach.

Therefore, managers and prototyping teams have to choose the fidelity of a prototype not only based on the needs of the most critical assumptions but also on the expectations of the audience in the upcoming show & discuss. Furthermore, innovation managers should educate teams as well as executives regarding early prototyping.

**Practitioners’ challenge: Keeping the vision alive**

Interviewee 2: “You should have to design the organization along the market needs, not along the corporate needs. Especially if you have a very early project or even early product at the market place. You have to protect it from the former organization.”

In contrast, some interviewees pointed out that early concepts could collapse under internal constraints. They reported that their organization tends to adapt concepts to existing products instead of endorsing an innovative, originally disruptive. Furthermore, it was stated that prototypes and fragile, vague but promising business ideas have to be protected from the existing “corporate immune system”.

The challenge can be understood as a problem of the ambidextrous. Consequently, managers and teams have to balance the gathered feedback and must decide to which extent they adapt their concept.

**Practitioners’ challenge: Failure acceptance**

Interviewee 3: “When it comes to iterations and to these more agile methods, it is more about like showing iterations, getting feedback, everybody knows it doesn’t work, nobody is mad on each other. So, I think it is more like how you reflect and show the iterations.”

Corresponding to the feedback cycles of early prototyping, many interviewees emphasized the need for a high internal failure tolerance. They claimed that an open and honest feedback that understands the value of failures for a learning process is essential for an agile project management approach.

This means as well, that teams have to have the boldness to see when a project has to be stopped. Otherwise it is not possible to exploit the cost and time saving benefits of early prototyping.

**Practitioners’ challenge: Handover**

Interviewee 4: “If I could wish something, then I would wish that the team that was working on an early prototype would also get the detailed design.”
A smooth transition to the traditional new product development is crucial, if one wants to profit from the generated learnings. But it is often tricky to establish such a frictionless transfer. In the best case the team can switch completely and realize the actual product by itself. Unfortunately, such a straightforward handover is often not possible due to time and budget limitations. To circumvent such a loss of knowledge, it is important to appoint a responsible and motivated owner of the project that steers the project through the later stages.

**Practitioners’ challenge: Keeping knowledge in house**

Interviewee 5: “And the other advice would be „Don’t rely on agencies or research agencies in an early stage because they will bring in the results. […] I require that the acting guys talk to customers themselves.”

As much as the building of prototypes can lead to implicit learnings, it can be assumed that the team learns additional aspects as well while experimenting. This aspect is in line with the high focus of internal learning that was stressed by several decision makers.

It follows that managers should prevent the externalization of experiments, if possible, in order to assure that the early prototyping team can learn by itself through conducting the experiment.

**Benefits**

**Failing faster and saving costs**

The central economic factor that has been raised by nearly all interviewed experts is the possibility to save costs and time early on. Expert statements show that changes in later project stages lead to significantly higher costs as they would cost in early phases. In this context, early prototyping enables managers to explore critical aspects of concepts as early as possible, which provides the potential to save budget and time by unearthing the critical show stoppers and unanticipated challenges in early project stages.

**Staying lean and agile**

Some interviewees stated that enterprises and corporations tend to invest too much innovation budget in the early stages. According to them, this leads to an overly complex team structure and analysis that could be prevented by focusing on fast and agile prototypes and experiments. This is particularly relevant, if management is challenged to maintain flexibility in uncertain business environments.

**Validating assumptions**

According to a more business-oriented view on early prototyping and business experiments, some interviewed experts...
underlined the value of early prototyping for the validation of underlying assumptions regarding the uncertain business environment. They described the benefit of early prototypes and experiments to explore and understand uncertainties by gathering learnings. On that note, the interviewees pointed out the importance of contact with real customers and the direct feedback from the market.

**Gaining acceptance**

Another aspect raised by the interviewees is the relevance of internal acceptance for new ideas and concepts inside the organization.

The interviews revealed that the demonstration benefits of prototypes make it possible to use the artefacts as so called “boundary objects” that make it possible to discuss and represent new concepts to a wider audience with diverse professional backgrounds.

The value and importance of early inclusion of operative needs and requirements in projects with strategic relevance is discussed by several scholars from different fields.

Such an approach is not bottom up or top down but rather oscillates between a conceptualization stage and the operative level where affected employees can give their input as early as possible. We suggest to include stakeholders step by step in an iterative manner depending on newly identified demands of the project. Such a course of action fosters the successful implementation of new products and strategies. This is because the participatory nature of the process increases the internal understanding and commitment for the prototyped ideas.

**Understanding each other**

Several experts stated that the presentation of prototypes induces a significantly better understanding of an idea and brings discussions and feedbacks to a new level.

They explain that prototypes prevent misunderstandings and foster deeper interactions between team members. Teams are able to discuss concepts and suggestions in more detail and build a shared understanding. It is explained that the externalization of thoughts and vague ideas force designers to concretize their individual mental models while the resulting representation of the ideas gives the group a basis to agree on.

Furthermore, prototypes have the capability to transfer tacit knowledge between team members by constantly discussing and interacting with prototypes. Narrations and languages have an elementary part in such a process and can be understood as “language games”: Teams discuss and cultivate a distinct vocabulary to make sense of their prototypes and form a mutual understanding of the built representations. All in all, prototyping is a social process that can be perfectly understood as a part of organizational learning. Furthermore, it is argued that building a prototype together improves the bonding of the team by establishing a collective ownership of the particular prototype.

**Implement it and get advantages of early prototyping.**

In this article, we proposed a practical early prototyping framework. We introduced the so-called „uncertainty backlog“, as well as structured „show and discuss” sessions to manage the central steps „prototype!” and „experiment!”. Within the framework, the „uncertainty backlog“ plays a central role and
acts as an intersection point between the concepts as it allows for overlapping commonalities while keeping distinctive characteristics separated.

While designing the framework, the opinions and insights of practitioners have been included. The expert interviews revealed that topics with minor relevance in literature often present the most pressing challenges in practice. For example, practitioners highlighted aspects like resource allocation or the internal acceptance of iterative methods as crucial. Hence, those challenges have been emphasized and possible solutions to deal with these aspects have been proposed. As a result, the framework guides managers in combining and steering iterative methods, like early prototyping and business experiments, in a structured manner.

The conducted evaluation phase has revealed that the designed framework can be applied to a diverse set of business problems and seems specific as well as adaptable enough to be helpful in different business settings.

By applying the framework, managers can unhinge early prototypes and business experiments from their particular discipline boundaries and can unfold their benefits on a broader, organizational-wide level. Furthermore, the implementation of the framework should shed light on the power and advantages of early prototyping and inspire managers to attach greater importance to it in order to improve organizational learning capabilities in the early phases of new product development projects. “It is not possible to underestimate the power of a prototype! When an idea has become visible, tangible, and concretely perceptible, the underlying vision becomes understandable to everyone. It suddenly becomes a much simpler matter to obtain feedback from colleagues and customers, and progress toward better versions can be made iteratively in small steps.”, so Florian Redeker. Ideally, managers are able to achieve improved product market fit, save costs due to early problem identification and enjoy a wide range of communicative advantages by using the presented framework.