Why Do You Want A Prototype?

A Tallix White Paper

As an electronics engineering consultancy, we are frequently asked by clients if we can make them a prototype. Our answer is, of course, “Yes”, followed by a question, “Why do you want a prototype?”.

It seems strange to some clients that we should be asking them this. After all, they’re in charge, they know they want a prototype, and perhaps we should mind our manners and just get on with providing a timely proposal. However, we know that answering this simple question can help them reduce costs and get to market faster with a product that really meets their customers’ needs.

Why All the Questions?

The reason we ask our question, is simply that “prototype” means different things to different people. If senior management want to understand risk, engineering want a development platform and marketing want something nice to photograph, it may be possible to meet all three expectations in one prototype – but it may be better to isolate some of the different needs and make 2 or 3 different prototypes. Without a doubt, it’s best to understand what your prototype should deliver for each interested party and plan accordingly. Otherwise, the time and cost of creating a prototype – one that doesn’t meet an essential requirement - can devour budgets and threaten return on investment for the whole product development; at worst, it can stop a project dead in its tracks.

What’s Your Priority?

We’ve identified a handful of parameters that are helpful for understanding why an electronic prototype might be created and how it should fulfil its purpose. We use these parameters to prompt discussion and decisions about prototyping at different stages of a project. Our list is not exhaustive, and the nature of any particular project or product may require different parameters to those listed here, but if you haven’t got a clear view about most of these points then you probably shouldn’t commit funds to prototyping.

Priority	the primary goal of this prototype	Representative	how true to life will it be, in terms of performance, feel, behaviour
Purpose	what the prototype must do	Reliability & Compliance	must it demonstrate product lifetime or inform warranty costs; must it show compliance with legislation or standards
How many designs	how many different prototypes are needed	Build method	what production method is acceptable or required
How many units	how many of each type should be made	Physical	must it be a certain shape, size or weight
Completeness	how many aspects of the intended final product will it represent	Cost	what can it cost – in absolute terms and/or relative to final production

Our experience shows that these parameters evolve throughout the product development lifecycle, reflecting changes in priority and the decisions being taken. The next table shows three kinds of prototypes that might be required as a raw idea crystallizes into a product concept, becomes a development project and moves into production. In reality, it’s helpful to think of a spectrum of requirements and, therefore, types of

prototype. Your needs may be somewhere between the types listed, perhaps between proof-of-concept and fully-functional, but it could be anything from fast-and-free to complete-but-costly.

	proof of concept prototype	functional "bench" prototype	production prototype
Priority	ability to explore a key idea quickly	assessment of design adequacy; acceleration of development	assess quality and completeness of intended production methods; design assurance
Purpose	create shared understanding; enable rapid, informed, reliable decisions; demonstrate feasibility of a critical or high risk element; secure management or investor support	check design assumptions; measure performance; use as development platform; prepare manufacturing; complete design tests; confirm integrations; test user interactions; demonstrate progress to sponsors	confirm and optimise production methods, handling, packing and testing; confirm costs; catch design faults; measure performance; complete design tests; enable certification; support partner developments; test early market acceptance
How many designs	varies – create several prototypes, each addressing one key point, or just a couple of models that each address a set of related features	one or two – a small number of iterations; complex or high risk systems may be partitioned for speed of development or availability of resources	just one; (there are sometimes iterations, and always exceptions)
How many units	typically very few; one – five	five – low tens; enough for development teams, integration partners, etc.	low tens - 100s; to match evaluation, marketing and development teams, partners, etc.
Completeness	varies; often low, but coverage is sometimes extended by making a number of different prototypes addressing different elements	medium-high; increasing with iteration	total (intended)
Representative	represents only major points in concept	fully representative of design intent and function, may not use production methods or final components	highly representative of design implemented by intended manufacturing process using specified components;
Reliability & Compliance	not usually planned	if final requirements are demanding, specific prototypes might be used to examine particular issues, such as MTBF, safety, EMC	highly representative; use as the basis for testing or formal certification (ensure you have enough units made for testing)
Build method	substantial manual build; automation if little or no tooling is required	automation where possible, but manual build where automation is uneconomic in small volume	automation as far as possible where bench prototypes have provided confidence to commit to production tooling, test design and set-up charges; manual build or test where automation is not justified by small volume
Physical	convenient for proof of concept - not necessarily related to final size or shape	may initially be in a physical form that is more convenient for use in development; later iterations become fully representative of intended final form	fully representative
Cost	highly variable – can be inexpensive for simple models; functioning models might have high cost per unit relative to final production cost	medium-high per unit	medium-low per unit; depending on complexity, automation and final volume, prototype cost could approach final unit cost

So What?

Make sure you identify the kind of prototypes you need, which will satisfy the different demands across your team, be available to support decisions and development at the right point in your project and fit your budget. Getting agreement on these parameters will help you get the results you need faster, with lower risk and cost.

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