Good Fit

Model Building
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Tim Sheiner
tim@lincdesign.com
415.896.2194

Scope

This document is not about how to build models, but what model to build. The good fit we will be discussing is a contextual one, not a mechanical one. It may seem like overkill to raise what is essentially an intellectual issue in the context of a skills-based class. However, a common mistake I see students make is not using their models as the powerful design tools that they can be. I will try to present here a framework for deciding, in a given situation, what sort of a model to make, how much energy to expend, and what results to expect.

Definitions

I will begin by defining what I mean by good fit. I believe that it is directly related to context, and tremendously influenced by the assumptions of the observers.

The Right Thing

My definition of good fit is being the right thing at the right time. It is the thing which is appropriate with respect to the given context. It is neither excessive, nor insufficient. It is efficient, clear, and on point. It is a solution which is fully aware of the problem which it solves.

Relative to Context

Obviously, this definition begs the issue of context. Something cannot be judged appropriate or not until the context has been defined. Because contexts change, something may be appropriate now but inappropriate later. This is true whether we are discussing ID models, cocktail party conversation, or shiny red shoes. The solution cannot be understood independently of the problem.

Assumptions

The most difficult part of defining the correct context is taking into consideration your assumptions and the assumptions of others. Uncovering other people's assumptions is difficult. Asking them directly is a good start, but people are often surprisingly inarticulate about what they believe. Extended observation is really the best way to understand someone else's point of view, but this is often impractical. Sometimes, if you are skillful, you can find out what other people are assuming by presenting them with something they haven't expected. Their reaction shows both you and them what they expected to see. However, both of these techniques take time and energy. When resources are limited you will be forced to guess. Guesses are problematic because they are biased by your own assumptions, and anyway, even good guesses can be wrong.

The true way out of the problem of other people's assumptions is to be clear about your own. If you know what problem you want to solve, and what issues you want to consider, you can dictate the context in which your ideas should be viewed. Because you determine the context, you can take care that what you say, show, and do is appropriate. And by defining your assumptions you will help other people define theirs because it will become obvious to them where their ideas differ from yours.

Implementation

Creating appropriate models is simple, but it requires that you go through two steps before you

Define the Context

Defining the context means asking yourself some questions. This process forces you to confront your own assumptions and makes you think about the assumptions that others viewing your work may have. I believe there are five important questions to answer.

1. What problem do I want my model to solve?

The answer to this will determine whether your model should be works-like or looks-like. It is generally not a good idea to try to resolve functional and aesthetic issues with the same model. This is because the modeling techniques and materials appropriate to one are often inappropriate to the other.

2. At what stage in the design process am I?

This question has a lot to do with the level of finish of your model. At the beginning of the design cycle, you can be approximate with many aspects of your model, but at the end of the process your models must address details.

3. Who is my audience?

This question helps you understand what aspects of your model can be left rough and which need to be completely rendered. Engineers, industrial designers and marketeers will all respond differently to the same model. The difference has to do with their different concerns, assumptions and points of view. You need to be sensitive to this in building your model if you want to get reasonable feedback from a particular group.

4. What is my budget in terms of time and money?

The effects of this should be obvious, but are often overlooked. Be realistic about these things. If you don't have money or time, don't try to build a complex, or material intensive model. You are much better off scaling down the type of model, and doing a good job with it, than trying to make something much grander for which you haven't got the budget. The result will be disappointing, and your limited resources will have been wasted.

5. What is my desired result in making and showing this model?

This question will make you face assumptions, yours and those of your audience. Before you begin a model you must be realistic about your goals. Is this a model to prove something to yourself, or is it intended to prove something to someone else? Are you making it because you think it is the right answer, or because you think it might convince you to try something different? Are you making this model in order to raise money or solve technical issues? Articulating your goals is essential in allowing you to achieve them.

Find Materials and Process

Once you have defined the context you will have a good idea of what your model should look like and how it should perform. You then need to select materials and methods for moving them that are consistent with these characteristics. I have another set of five questions you can ask yourself.

1. Will my materials and process address the problem?

If the problem is essentially mechanical, you will need to use structural materials and precise production methods. Aesthetic problems need materials whose surfaces can be controlled and shaped. If you mix these up you will waste time and produce models that don't answer the questions you were asking.

depending on the desired level of finish. Understand the differences and choose correctly. With regards to functional issues, the level of detail you need to address is often directly related to the stage in the design process. In the beginning it may be sufficient to show that in general a particular mechanical problem can be solved, but at the end you will need to show that you can solve it with the specific materials and manufacturing processes that will be used in the final product.

3. Will the model be understandable?

Will the materials and process you are considering result in a model that is clear about the issues it is trying to address? Is there anything about the color, surface, density, etc. that will distract from the message you are trying to communicate?

4. Is this choice of materials and process the most efficient way to achieve my desired result?

This question asks that you consider various ways to get your message across. For instance, imagine that you need to model a mechanism. An actual-size, accurate model will be costly and time-consuming to make. A less precise, scaled up version would be faster and easier. If this is just one of various mechanisms you are exploring, it may be more efficient to make the easier version to see if it works at all. If however, you know this is the final mechanism then you should probably try to make it accurate because you will need precise information to finish your design. Your goal should be to work hard when you need to, and save your energy for other tasks when you don't.

5. Will the materials and process support the goals of the model?

Your materials and process should support the communication goals of your model. This may mean following an indirect path. For example, in the case of the mechanism described above, if your goal is to communicate the beauty of the mechanism to a room full of people, the accurate version might be the wrong choice. The scaled up version will be easier to demonstrate and explain. Don't make the accurate version until you are ready to address detail questions.

Justification

Models, even inappropriate ones, take a long time to build. Therefore, every model that you make should teach you something valuable about your project. In the best case your model clearly shows you the solution to the problem. However, often what you learn from your model is that there are problems with your idea. This is a fine result. What matters is that the energy you spent building the model has furthered your design process.

Inappropriate models detract from the process. They can do this by being either insufficient or excessive. An insufficient model is one which doesn't meet the challenge of its context. An excessive one distracts from the context. Both of these cases lead to different kinds of problems.

Insufficient Models

• Don't answer the questions

Because the model doesn't go far enough, it remains unclear if it is the correct solution or not.

• Don't clarify the questions

The model is so underdeveloped it isn't even clear if it is asking the right questions.

• Don't engender interest

Not enough energy has been put into the model to attract the attention and input of other people

• Don't document the true level of your ideas

An insufficient model will not demonstrate the problems with its approach and so you may continue to pursue that solution only to discover later that it is flawed.

Excessive Models

• Give complete answers to the wrong questions
The solidity and tangibility of completely detailed model can distract attention from the fact that its whole approach is misguided.
• Trump other ideas
A detailed model can make a bad idea look superior to a better, but less produced idea.
• Skip steps
If built too soon, a finished model can cause you to skip important brainstorming and development steps in your design process.
• Can get inertia moving in the wrong direction
Once people see a finished model of one approach it can be very difficult to get them to consider a different idea.
• Can waste time
An excessive model takes an excessive amount of time to make.

Towards a Framework

The thesis of the above discussion is that the kind of model you build is determined by context in which it will be viewed. In order to help you establish in your mind a framework for understanding the different kinds of models which are possible, I have created the table on the following page.

View this table as a set of guidelines which can be altered to fit your specific needs. Although the table develops categories, constraints, and characteristics, in reality no model is exactly of one sort or another. Each one is unique, responding to its particular context, and representing the skills and interests of its creator. Use the table as a rough guide; abandon it as soon as it constrains you.

Type of Model	Design Field	Usual Scale	Major Concerns	Characteristics
sketch	All	nts		
form study	ID	accurate overall dimen-	punch, success as reference to design cliches	inexpensive, unfinished, low resolution, drawn
functional study	PD, EE, ME	1:1 or greater	should be neutral w.r.t. other concerns	uses “invisible” materials, inexpensive, ex-
maquette	Furniture	1:4 or less	to real, consideration of real-world mechani-	properties as final materials, analogous produc-
architectural	Arch, Interior Arch, Environ. De-	greatly re- duced	materials, proportion, detailing	accurate material appearance, precise joinery
prototype	Furniture, PD, ME, EE	1:1, often only part of total	of ensemble of elements, relationship to site	joinery, use of pre-manufactured supporting
appearance	ID, PD	correct pro- portions, 1:1 overall	robustness, replication of production materi-	accurate w.r.t. properties of final materials and
check	ID, PD, ME	Exact 1:1	proportion, crispness, punch, gloss	high quality materials, carefully rendered de tails, some “cheating” for visual impact
			accuracy to specified dimensions	a perfect replica of the production unit in every detail