

## *Trends and Innovations in Product Development*

**Jason Lexell:** I'd like to welcome our listeners. My name is Jason Lexell with DH media, and today I'm here with Professor Steven Eppinger, the Deputy Dean at the MIT Sloan School of Management, and Professor of Management Science and Engineering Systems. Steven also holds the General Motors Leaders for Manufacturing Chair and has co-authored a widely used textbook entitled, Product Design and Development, published by McGraw-Hill.

Wow, well thank you very much for joining us today, and during our pre-call, you had helped us to identify what you feel are the top six key trends impacting the product design and development process today for most businesses. And during today's call, we are going to go ahead and identify those trends, and talk with you a little bit about each. How does that sound?

**Steven Eppinger:** Great, let's do that.

**Jason Lexell:** Fabulous. What I'm going to do is I'm just going to go ahead and outline those for us and people can keep along. Number one - development speed; number two - platform flexibility; number three - complexity management; number four - outsourcing and offshoring; number five - lean principles; and number six - customer involvement. Now I know some of those are going to be terms that people are not real familiar with, so we'll go ahead and go through each one and talk a little bit about each and how they are impacting effective product design and development today.

We're going to start with number one, development speed. Now, you've been very successful at training companies to increase their development speed. Can you tell me a little bit about that?

**Steven Eppinger:** Sure. Well, essentially over the past couple of decades really there's been a huge revolution in the use of digital tools in pretty much every business process. That's achieved huge efficiency gains for many of those processes, including this business process called product development. So, today we're using digital design tools, digital analysis,

all kinds of good network collaboration tools, and it's really helping us to develop products faster and get them to market faster.

**Jason Lexell:** Now are these some of the things that you're teaching your students in their graduate level courses?

**Steven Eppinger:** Well sure. We use some of these tools at MIT, but the companies generally take the tools and they customize them and sort of make them work with their own processes. So, we'll introduce our students to some of these tools, but then when they experience their internships and go to work in the field, they experience the real use of the tools.

**Jason Lexell:** Excellent, excellent. Point number two you had brought up was platform flexibility. I was wondering if you could take a little bit of time and describe for us, what is platform flexibility, you know that term, what does that mean as it applies to product development. And how do you teach people to use it to improve the product development process?

**Steven Eppinger:** Well, using product platforms is a technique that helps to essentially create product variety without creating a whole lot of production complexity. So what we do is, we use carefully planned and designed product architectures. Generally they're modular architectures that allow us to kind of move components around and create different functionality, and to do that they create the kind of variety the customers would like to have to meet their different markets, their different needs, and different segments. And there are some good ways to do this in terms of thinking carefully about the modularity, and then there are some less effective ways to do this. But the key message is how do you think that through carefully and come up with innovative platforms?

**Jason Lexell:** So in a sense, when you've set up the system, or the process for developing, you can change an element of it without changing or having to retool the entire process. I guess that's what you're meaning by modular?

**Steven Eppinger:** Right, so it allows us to, in production, create that additional variety. But also the platforms can be used to create derivative products so that in development of the future derivative products, those can be much less costly and much more quickly developed than the original

platform. So, you invest a bit in the platform and then you reap that investment with this variety of products called the product family.

**Jason Lexell:** Interesting, that's very interesting. Our third point that we had talked about a little bit in our pre-call was complexity management. Now, this is an area where you've focused a lot of your research and not only complexity management but also interaction networks. And I was wondering if you can describe for our listeners a little bit about what those are and why they're important?

**Steven Eppinger:** Yes sure. There's actually been quite a lot of research that's lately used some interesting and some pretty sophisticated network modelling methods to just look at this network of interacting elements that are in complex systems that are being developed. So think of the networks of interactions among the hundreds of thousands of components in a complex system. How are all those engineered? And that challenge is sometimes called system engineering, and some of the newest tools that are emerging are helping us come up with the right system architectures in the first place, and then to manage that network of interaction using the good system engineering methods we know.

**Jason Lexell:** I think a good point to make now before going onto our next point is, a lot of these elements that we're talking about here sound like they are for very large companies, with involved product development processes in place. Is that true, or do you see smaller companies...?

**Steven Eppinger:** Well, certainly the complexity issue is more of a large company, large system issue. But platform flexibility through modular designs, that's not necessarily for highly complex products. And on the development speed point we discussed first, smaller businesses have achieved huge gains in efficiency, maybe accelerating their processes by a factor of two or more. Larger companies have a bit of a harder time to do that, but many have achieved similar gains.

**Jason Lexell:** Okay, okay that's interesting. I would imagine with some of those software products or systems that you talk about, implementing them within a smaller company to improve development speed might also happen a little bit more graciously than with larger systems?

**Steven Eppinger:** That's almost always true, that smaller organizations have an easier time making these sorts of changes and adopting the new tools.

**Jason Lexell:** Well, let's talk a little bit here; you've mentioned outsourcing and offshoring as a strategy, and also a new development that's helping in product design, development and management. And, I know it's been a huge trend in IT; looks like engineering is included in that. How can firms take advantage of this?

**Steven Eppinger:** Well Jason, as you know, there's been a lot of negative press lately about outsourcing of information-based type of work, and flow of those jobs overseas. And of course engineering is one type of information-based job, in that engineers utilize information which can be traded and transferred over networks. So it's true that engineering activities are as portable as many other information-based jobs. So that's a reality; that's not a positioning statement, that's a reality. And what's happening is that firms are learning to take advantage of this, as they should. When I start to look into the distribution of engineering work globally, what I thought I'd find is, they're taking advantage of this to save cost. And what I found, as well, it sometimes saves cost. Not actually a whole lot of cost, but more importantly, they're actually taking advantage of global product development networks, largely to access new markets in places in the world where they'd like to operate and sell their products, as well as to access talent that is in those different parts of the world. And they want access those specific types of engineers, or people that understand the markets in those regions, and so forth. So there's a variety of reasons why this is happening, and it's just an important tool that has to be used carefully and not just moved into with blinders.

**Jason Lexell:** So in a nutshell what you're saying is don't fight it yet, instead learn how to leverage it for your company's benefit, because it's not going away.

**Steven Eppinger:** And your competitors are doing it.

**Jason Lexell:** Well, that's a motivation for a lot of companies; I think that is true. Let's move on to our fifth point here; you mentioned lean principles. Now I'm not sure if that's a common engineering term, or if it's something that's an element of your teaching that's a little more unique. But in our pre-interview you talked a bit about lean principles as a mechanism for

improving product development efficiency, and I'll just let you take it away and share a little bit more about that.

**Steven Eppinger:** Okay, so lean is a term that's been used for the past 15/20 years to describe efficient methods in business in general. So there was a big push for lean manufacturing, and we learned a lot in this country about lean manufacturing by studying Japanese firms such as Toyota. And, the idea of lean product development is essentially the application of those same principles. So, think about the elimination of waste, think about the efficiency of processes and steps and minimizing and reducing all forms of waste. So that's essentially one school of thought on lean product development; let's call that the Toyota school; and there's a whole cottage industry around implementing lean in the Toyota way. But there's also what I would call the non-Toyota school, where I see firms implementing all sorts of improvements to their product development process, but not necessarily having learned those from Toyota, not necessarily methods in improvements and ideas that work at Toyota, or that Toyota is doing at all. The key idea is it makes their process more lean, that is more efficient, more fast and less costly, and there are lots and lots of ways to do it.

**Jason Lexell:** Could you take just a second to give an example or two of things that you typically see among the engineering firms, or product development companies that you see just really wasting a lot of their time or resources?

**Steven Eppinger:** Well one of the big waste factors is poor management of the flow of engineering work, and that can take many forms. But one form of that is simply attempting or starting more jobs than can be finished in the time allotted. And so what happens is, you load the engineering factory with more work than it can do, and the engineers work as hard as they can to do that work, and the work moves around to one another, and it piles up in inventory. (I'm using the manufacturing analogies because I think they are quite applicable) And as a result, much less gets done than could if you, in fact, had loaded this factory with much less work in the first place.

**Jason Lexell:** So they become more focused, sure.

**Steven Eppinger:** Right. So they lose focus and the work itself. As we say, staple yourself to a job; if you follow the jobs along, you find the jobs

themselves are waiting a lot. A lot of the time on the job itself is being wasted, even though the workers are working as hard as they can.

**Jason Lexell:** I see, that's interesting that you say that. I'd say that applies actually to any kind of a project system, and a lot of times companies are run by creative types, or people who have a lot of ideas. So they load up their systems, and it can probably also weigh on employee morale if they are not able to see the things they're working brought to fruition or given the proper amount of attention and time.

**Steven Eppinger:** Right, so in engineering and product development situations, we go out on sales, and the sales force sells jobs. They sell jobs to customers, and they say "Yes, we can do that", and in fact we can; we can develop that, we can build that, we can configure it whatever. And then we make a good business case around it, that this is going to be profitable for us, and then we make promises, and then we release the job into the engineering organization, and in fact, it can't get done. That's very frustrating, as you say.

**Jason Lexell:** Sure. Well, let's talk a little bit here too about customer involvement. Because I think that's very unique and something that requires a certain level of management, and I was wondering if you could give us a tip on, based on what you see, what the most successful product design companies are doing. How are they involving the customers in the product development process to help improve the process, make the overall result of higher quality?

**Steven Eppinger:** Well, the marketing professionals who participate in product development processes for years have been telling us we've got to talk to customers, we've got to understand customers, we've got to do surveys and focus groups and all these good mechanisms to understand and connect with the customers. And it's true, that building that high bandwidth information channel from customers to the product developers is critically important. What's special today is that we're able to use the internet to do this even better. So the internet is making new methods to connect with customers feasible.

So, for example, we can use surveys online, and they're very easy to create. We can have websites that promote products, and we can test different wording and different click backs that we're getting, in terms of

response. So all kinds of methods that are possible that have been possible in terms of outbound marketing that is to facilitate sales are now feasible for the inbound marketing for simply understanding customers better. So what some companies are doing in some new and special ways, is they're using the order information about what features, components or configurations customers are ordering and are interested in, and they use that in real time, or as quickly as possible, to reconfigure the next generations of the product.

**Jason Lexell:** Okay, its powerful information, especially when you're collecting it over the internet; it's gathered in real time, and you're going to have real numbers. I know there are systems out there, very inexpensive systems, for companies to use that can do online surveys and collect loads of information. My question for you is, do you sometimes find there being a disconnect between the marketing departments and the engineering departments? And how this information ultimately filters back to product development?

**Steven Eppinger:** Well, certainly those disconnects are famous, and we have to make sure that we remember the lesson that essentially I think we learned pretty well in the 1980s, which is that interdisciplinary teams bring together a variety of perspectives that are important. So a marketing department, separate from an engineering department, isn't a great configuration to develop a new product. But to have marketing professionals, members of that marketing department, on the product development team that is on this special organization that's developing the product, is a mechanism to bring that expertise in. And I dare say that some firms have forgotten that message, or maybe they weren't around 20 years ago when that message was so widely discussed, and we have to remember that.

**Jason Lexell:** That's great advice, and it does sound like that would help at least to take care of many of the issues that can come from a marketing-centric view point, or engineering-centric. And if you bring them all together in that process, you can help have a much more balanced process. Steve, I was wondering if I could take a minute and tell everybody a little bit about the Executive Education course that you teach for MIT as well. It's a one-week Executive Education program, where our listeners can learn about these six elements in much more hands-on detail. The name of the program is called Product Design, Development

and Management, and anybody can get more information about that via the following website, [www.mitpd.com](http://www.mitpd.com), that's "M-I-T", "p" as in product, "d" as in development, ".com". And you'll be able to learn a lot more about the things that are covered which we've actually outlined here very quickly, and we've done that for the sake of brevity to give a good overview. I think we've got a minute here, I'd also like to ask you real quick if I could a bit about your textbooks, since you've written the book on product design and development. Would you tell us a little bit about that?

**Steven Eppinger:** Sure. The textbook we've written, which is actually titled Product Design and Development, is being widely used around the United States and very widely used now in multiple translations in many countries around the world. So it's a very successful textbook that's largely used to teach graduate students the methods for product development. So, how we do product planning and how do we do customer needs analysis, how do we think about concepts and prototypes and testing, and so on. So it's a book about the tools and methods that professional product developers utilize today in order to get these processes right.

**Jason Lexell:** Okay. That's available by any book store, [amazon.com](http://amazon.com), they can order that.

**Steven Eppinger:** Yes, its published by McGraw-Hill but its widely available, that's right.

**Jason Lexell:** Well fantastic. This has been a very informational session, and I really appreciate you taking the time with us today to give us the overview on these breaking trends, as well as a couple of sources where we can get additional information directly in your one week course or via your book. I really appreciate the time today and we hope we can have you back and talk to you again soon.

**Steven Eppinger:** Thank you Jason, its very nice talking to you.

**Jason Lexell:** Thank you very much, you have a great day.

**Steven Eppinger:** And you too.

**Jason Lexell:** Bye now.

