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**PROFESSOR:** Welcome to another exciting day of Engineering Innovation and Design. We'll read some interesting things today so the pace might be a little bit faster. Here we go.

Pop quiz. I've given you a piece of paper there. If you don't have that paper you can use your own paper. This is the pop quiz. It's going to be given orally. Are you ready?

I want you to tell me what questions I would ask you on a pop quiz today. That is your pop quiz. Question.

**AUDIENCE:** Could you repeat that question?

**PROFESSOR:** I'd be happy to. It sounds a bit circular, right? I want you to tell me what you think I would ask you on a pop quiz today if I were giving you a quiz on the material that we've had so far.

**AUDIENCE:** What are the 10 steps in the design process.

**PROFESSOR:** You should just write this down. But I'm sure everyone would appreciate your answer because it's a good one. So write that down. You might have two or three answers. I'll give you about 34 seconds to fill that out.

And time. Take your papers. Pass them over to this side of the room all the way that side. And pass them to the top down once you've collected all those papers. Now-- and let's do it quietly-- here's the question. What questions would I ask you?

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** Your name. That's a great one. Keep going.

**AUDIENCE:** Do we write our names?

**PROFESSOR:** Oh, yes. You should write your name on your paper, of course. Yes. That's so I know who wrote this. But that would be a good question to ask on a pop quiz-- your name.

**AUDIENCE:** What is innovation.

**PROFESSOR:** What is innovation. That's great. What else?

**AUDIENCE:** A few characteristics of good and bad design?

**PROFESSOR:** A few characteristics of? Of good and bad design. Sure. What else?

**AUDIENCE:** I believe I've already stated--

**PROFESSOR:** You did. And it was a great one. Could you restate it?

**AUDIENCE:** What are the 10 steps of the design process.

**PROFESSOR:** The 10 step design process. That's a wonderful one. Because that may even occur on a subsequent pop quiz.

**AUDIENCE:** What makes a good design critique.

**PROFESSOR:** What makes a good design critique. Excellent.

**AUDIENCE:** What's the most important question to ask.

**PROFESSOR:** What's the most important question to ask particularly when you're given a problem. Absolutely. That's a great one. Any other ones?

You did a great job. You all get A's. So that's the beginning. So look for these questions that may appear on subsequent pop quizzes.

Let's start in here. I want to know if anybody here knows who these two people are. Anybody know who this person is on the right? Tell me. Who is it?

**AUDIENCE:** John Ive.

**PROFESSOR:** Johnny Ive. Absolutely. And what does Johnny Ive do?

**AUDIENCE:** He's the Chief Designer at Apple.

**PROFESSOR:** Yup. Chief Designer at Apple for hardware products.

**AUDIENCE:** Industrial Designer.

**PROFESSOR:** Industrial Designer. Exactly. And on the left-- this guy here in the black and white picture-- who's he? Hah. Not as famous as Johnny Ive, I guess. Oh, maybe he is. Hold on.

**AUDIENCE:** Is it Dieter Rams?

**PROFESSOR:** It is Dieter Rams. Absolutely. Dieter Rams and Johnny Ive-- two very important people. Let's show you a little bit about them.

Dieter Rams was born in 1932 in Germany. And he's closely associated with something called the functionalist school of industrial design. He made these things. Johnny Ive was born a lot later in 1967. And you're all familiar with his work from having experienced it firsthand or seen it firsthand.

These are Dieter Rams' work. These are Johnny Ive's work. Let's do that again. This is what Dieter Rams made. And, interestingly enough, Johnny Ives made these. Do you notice any parallels? Let's take a look some more.

Johnny Ive on the right. Dieter Rams on the left. Johnny Ive on the right. Dieter Rams on the left. And would you believe Johnny on the right and Dieter Rams on the left?

Again, Johnny Ive on the right with a speaker that has an iPod on top of it and a speaker over here that has a phonograph on it. An iMac. A speaker. Johnny Ive. Dieter Rams.

Johnny Ive on the right. It's like a television. Doesn't it look like a television? And here it's a television. So this interesting. That's a speaker I guess. What is this

product?

**AUDIENCE:** An iPod.

**PROFESSOR:** It is an iPod. And what is this product?

**AUDIENCE:** A radio.

**PROFESSOR:** It's a radio. It's a radio. So here's the question. They didn't talk about this for a very long time-- Johnny Ive and Dieter Rams. So we're going to put ourselves back up a few months or a few years ago when no one knew what's going on here or how they felt about each other. What do you think about this? What do you think about this when you see this?

**AUDIENCE:** Legally different.

**PROFESSOR:** Legally different? Legally. What does that mean?

**AUDIENCE:** It wouldn't be copyright infringement.

**PROFESSOR:** It's not copyright infringement. Yeah, totally different. These look totally different from each other. I know there's no way you could see any similarity in this corpus of work at all. Don't tell the Apple lawyers who are suing Samsung-- or who sued Samsung successfully. What else? What else do you think of when you see this? Yes.

**AUDIENCE:** Good design is repeated.

**PROFESSOR:** Good design is repeated. What do you mean by repeated?

**AUDIENCE:** Used again.

**PROFESSOR:** That's pretty clever. Used again.

[LAUGHTER]

**PROFESSOR:** It's very--

[INTERPOSING VOICES]

**PROFESSOR:** So she's saying that good design, you just use the same thing over again.

**AUDIENCE:** No.

**PROFESSOR:** No. Not quite? Am I shading it? OK. Let's see what-- go ahead.

**AUDIENCE:** No, that's all.

**PROFESSOR:** OK, fine. If you think of something, let me know.

**AUDIENCE:** As long as you don't have to redesign the wheel, [INAUDIBLE]?

**PROFESSOR:** So adapting designs for what you need, OK. What else?

**AUDIENCE:** While the designs are very similar and shared between them, the products themselves are very different.

**PROFESSOR:** Ah. He says the designs are similar but the products are different. Tell me. I see a music player on the left and a music player on the right. This one fits in your pocket. This one fits in your pocket.

This one has a circular thing that spins and this is a circular thing that spins. This allows you to select stuff. That circle and this circle allows you to select stuff. Tell me are they different?

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** A little different. Sure. Because it's a screen over here on the right. And a hard drive, yes. Actually it's kind of funny. Right now, interestingly, if you buy an iPod Touch or something, you don't have to have music on your iPod. It streams it wirelessly over the air much like a radio.

Fascinatingly similar. Everything old is new again. So you say they're different, but they're kind of similar. What else?

How do you think they feel about this? How do you think that Dieter Rams felt when he saw these things coming out?

**AUDIENCE:** Happy?

**PROFESSOR:** Happy. Why happy?

**AUDIENCE:** He inspired a whole new generation of design.

**PROFESSOR:** There we go. So he says, I'm so glad you're copying all my hardware. I feel like I've really, really contributed a lot more to society because of this. That's one interpretation.

What if someone was sitting next to you during a test and took that philosophy? Would you feel happy about the fact that they were inspiring a whole new set of A's? I don't know. At what point have you ever made something or thought, hey, you're copying our stuff?

**AUDIENCE:** You want to look at whoever wrote the textbook. You're reading the textbook and putting down the knowledge. You're stealing from them.

**PROFESSOR:** I don't know. I don't know. This is interesting.

So we have these things that definitely seem very similar. But what's interesting is that they both believe in the same fundamental approaches to how to design great stuff. And they might have come to similar conclusions either knowingly, because of this form factor, maybe somewhat unknowingly and they realized, boy this looks a little bit like this, what can we learn from that. What is step number two?

**AUDIENCE:** The information phase.

**PROFESSOR:** The information phase, yes. The information phase. So how can we leverage what's out in the world already to inform our design? And they might have looked at-- I don't know-- 50 or 100 or 200 different ideas and came on this one or a group of them that looked like this. And he said, it reminds me of this other thing that I saw a long time ago, when I was a kid. And I loved the way it worked.

So yes. I think you're right about this-- that great design has a lot of similarities. And you'll see this happening throughout history. Things change very little in history. There are few changes that occur-- fundamental changes. Take a look at kitchens.

Kitchens in the past-- I don't know, let's say 60, 70 years-- have only had really two changes that are substantive. One of them is that there are now-- almost always when the new kitchens are designed-- open to another room or to an area where people can entertain.

People use the kitchen differently now as a way of connecting with people. Before, you'd shut off the kitchen. You close the door. And you bring out the food. And you say, look at this beautiful food and not the mess in the kitchen. That changed.

And microwave ovens changed. Who here has a microwave oven? Wow. And who here has a microwave oven and doesn't have their own kitchen? So some of you don't even have a kitchen and you've got a microwave oven. Pretty amazing.

That's a big change. Otherwise, we've got refrigeration. We've got a stove. About the same height as all the stoves before it. We've got ovens.

If you're rich, you might have two ovens. Maybe you have a garbage disposal now, but there's not a whole bunch of changes. Things change very slowly.

So we'll see this in design. And what's interesting is that Dieter Rams came up with these 10 principles of good design. So let's discuss them. I want you to tell me, for each of these principles, what you think they mean and if you think they're any good.

Good design is innovative. What does that mean that good design is innovative? How about this. Who thinks good design is not innovative-- does not have to be innovative? Give me some example.

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** Sure. To prove that good design does not have to be innovative.

**AUDIENCE:** The one you just showed us?

**PROFESSOR:** So you're saying that this was not an innovation over this?

**AUDIENCE:** Well, parts of it.

**PROFESSOR:** Part of it. What part?

**AUDIENCE:** The way it looks.

**PROFESSOR:** Is innovative? Or not innovate?

**AUDIENCE:** Not if you're comparing it to the other one.

**PROFESSOR:** How come? This is made of plastic. This has different kinds of plastic. It's got a screen on it. It's got four buttons on the outside. It's got headphones that are attached to it instead of using a speaker. You think it's too similar?

**AUDIENCE:** No, I'm saying that it's as innovative. I think it doesn't have to be extremely innovative because I'm saying they look very similar. There are innovations but they're not drastic.

**PROFESSOR:** Would you say an iPod is not a drastic innovation over a radio?

**AUDIENCE:** Yes, I'm saying it is, but I'm saying the physical appearance of it.

**PROFESSOR:** The physical appearance may not be innovative. Other examples? I'm going to bring this other slide back up. Yes.

**AUDIENCE:** Some of the things that we've been using since forever, like a bowl or something-- it's really basic but I think it's good design.

**PROFESSOR:** A bowl is a good design. But if someone made a new bowl--

**AUDIENCE:** It could be a good design and innovate but I don't think it's required.

**PROFESSOR:** You don't it's required? So a new bowl doesn't have to be innovative to be well designed or to be a good design. That's interesting.

**AUDIENCE:** To go back to the last example, innovation also depends on the context when you're looking at the design.

**PROFESSOR:** What do you mean the context in looking at the design? What do you mean it depends on the context?

**AUDIENCE:** So right now, before I saw Dieter Rams, I was of the opposite position of Johnny Ives. But now I that I see a different context, maybe I see [INAUDIBLE]

**PROFESSOR:** Interesting. That's interesting. Context. What do you mean context, now? What's your context?

**AUDIENCE:** It's what I know about those kinds of designs.

**PROFESSOR:** It's what you know. Context about what you know. Could it be something else as well?

**AUDIENCE:** Context of similar designs and their past designs related to that.

**PROFESSOR:** A broader context. What else? Yes.

**AUDIENCE:** I would have to argue that this design is innovate because if a design is very good, then there is no reason you want to improve it.

**PROFESSOR:** If a design is very good if there's no?

**AUDIENCE:** There's no reason to improve it.

**PROFESSOR:** No reason to improve it.

**AUDIENCE:** If you come up with something that's good than from what is was before and it's selling well then there's clearly some improvement.

**PROFESSOR:** She said if you have a new product and it's selling well then there's clearly some improvement. What if it's not selling so well? Could it be innovative?

**AUDIENCE:** It could also be innovative because I think the innovation is defined-- well, not

defined, but it about when you decide that needs to be redesigned.

**PROFESSOR:** Innovation comes about when you decide it needs to be redesigned. Interesting. Other ideas? I think context is very interesting here and a little unusual. Context-- we look at the world in a certain way.

By a show of hands here, who thinks that their hairstyle looks ridiculous? There are no hands that went up. Who here thinks that people whose-- they see pictures of people from the '80s have ridiculous hairstyles? Yeah, a lot more hands go up now. How about the '70s?

So you don't think that in 20 years you're going to look back at pictures of yourself and go, I cannot believe my hair looked like that? Context, right? Context of our society.

Angel goes, no way, his hair looks great. That's awesome. I'm always keeping this thing. And he may. He may keep that. Some things are a little more timeless than others.

Do you know something interesting about art forgery? Anyone know a lot about art forgery? So if there's a piece of art from the-- let's say, early 1800s-- and let's suppose it's now 1920.

And I have hired Jacob to forge a piece of art-- he's a great art forger. Well, if he's great, at the time when they had these forgeries, you wouldn't be able to tell that it was a forgery. But 30, 40, 50 years later, you say, oh, that's the forgery. I can tell.

Because unconsciously, Jacob sees the world around him and he begins to put in elements of contemporary design into that piece. And 50 years later, the context has changed, and you can see it.

You can see the stuff in there. You can see those differences and everything he's done to balance out all the small differences. And it looks like a forgery. It's pretty amazing.

So maybe this is true. Maybe it's not true. How about this one? Good design makes

a product useful. Is that true? Who thinks it's not true? Who thinks it is true?

What does it mean? What does it mean to be useful? I want to know what it means to be useful.

**AUDIENCE:** Satisfies a need.

**PROFESSOR:** Satisfies a need. Tell me more about that. What's a need? Do I need to listen to all my music wherever I am? I kind of need to. I get bored easily. Satisfies a need or maybe something less serious than a need.

**AUDIENCE:** If it adds value.

**PROFESSOR:** Adds value. What does it mean to add value? What is value? Any ideas? Anyone?

**AUDIENCE:** Performs an action efficiently.

**PROFESSOR:** Performs an action efficiently. Does art perform an action efficiently?

**AUDIENCE:** It depends on how if art is useful.

**PROFESSOR:** Well, yes. Is art useful? I don't know. Is art design? Oh, different topic. Reserved for a different day. What else?

**AUDIENCE:** It does what it was designed to do.

**PROFESSOR:** Designed to do. It does what it was designed to do. So good design makes a product useful because it's doing what it's supposed to do. It has fulfilled its intended purpose.

**AUDIENCE:** I think I'd like to argue that because I think that you could have a useful product that has a purpose that wasn't intended by the manufacturer.

**PROFESSOR:** A useful product whose purpose was not intended by the manufacturer. Let's consider this. This is risky. This is a brand new Apple Macintosh Retina Display MacBook Pro which I'm going to use as a door stop. Oh, yeah. Not int--

[LAUGHTER]

Can we get a close up on that one? Can we see this over here? I don't know if you can see it down here.

This is my pride and joy here being used as a door stop. Not intended by the manufacturer. Pretty useful if we need to prop open the door I suppose I could prop it open. Oh god, that scraping sound sounds terrible. Anything for you guys. Anything.

So look how nice it props the door open if we didn't have something else. Again, not intended by the manufacturer who had to work on the tolerances of this device. So that's interesting.

What if it didn't performance its intended action and I found a new use for it? Is it still useful? I could have an Acer or something that I would think-- or maybe a five-year-old Acer that's very, very slow and doesn't work very well and I need to get rid of it anyway.

And it's broke. It's falling apart. And the screen-- every time I move it the screen falls off. And I can take it and make it a very useful doorstep. Not its intended purpose at all.

**AUDIENCE:** I still don't think that it's a good design just because it has a use, though, because you used it as a door stop but I still don't think that is one of the best choices for a door stop.

**PROFESSOR:** You don't think it's the best choice for a door stop? I think it's a beautiful door stop. Maybe the MacBook Air is better. It's wedge shaped.

**AUDIENCE:** I think the connotations of design is purposeful. So if you use it for an unintended use, I don't think it's considered a good thing.

**PROFESSOR:** If I use it for an unintended use, it's not good design. Why not?

**AUDIENCE:** Because when a designer is designing a product, they have a specific use in mind. And they're trying to achieve that goal. If they don't achieve that goal and then achieve another goal--

**PROFESSOR:** What if they achieve something far better, far more noble, far more incredible?

**AUDIENCE:** That's not what they were trying to do.

**PROFESSOR:** I know but is it good anyway? Does it matter what the intent is is the question.

**AUDIENCE:** I think it does matter what the--

**PROFESSOR:** You think intent matters. Who thinks intent matters? Who thinks intent does not matter? Who's unsure about this? Oh, yes.

This would be good for a later conversation. Let's consider this. Good design-- now know we're getting really crazy-- is aesthetic. What does it mean to be aesthetic?

[AUDIENCE MEMBERS RESPONDING SIMULTANEOUSLY]

**PROFESSOR:** Pleasing. Pleasing in what way?

**AUDIENCE:** Visually.

**PROFESSOR:** Visually pleasing.

**AUDIENCE:** All ways.

**PROFESSOR:** What?

**AUDIENCE:** All ways,

**PROFESSOR:** Pleasing in other ways too. Not just visually but auditorily pleasing. Maybe the smell of a new car. You don't think they work on that? Oh, they work on that.

In fact, Mercedes once was having an issue with some cars because it didn't quite have that Mercedes smell. So they hired a nose.

Anyone knows what a nose is? It's a person who smells really well. And it's about

one in-- I don't know-- 100,000 people or 500,000 people or a million people who have this great ability to smell things well. And the nose went to the car. And they took this car. They shipped it from wherever the car person, owner was. They gave her a different car. They shipped it down.

And she [SNIFFING] smelled all around the car. Then she went, door, take the door off. And she went, OK. They stripped the door off. She's smelling around the door.

She said take this panel off the door. They took the panel off the door. She's smelling and goes, this is it. This is the problem right here, in the door. It was the insulation.

And they went to the insulation people. They said, what did you do to our insulation. They said, we didn't do anything to the insulation. Show us what happened.

And they found out. In one part of this process, really early on, the insulation had been stored in sacks that had once stored tea. Oh, yeah. That new car smell, very important.

So good design is aesthetic. Who thinks this is true that good design must be aesthetic?

**AUDIENCE:** It's something that you're going to use and you want it to be pleasing in every sense of the word.

**PROFESSOR:** You want it to be pleasing in every sense of the word? Who thinks it's not true? Tell us why.

**AUDIENCE:** If you look at the inside of a motor or something that people aren't going to look at I feel like what it physically appears like does not matter.

**PROFESSOR:** Great. So you're saying if you look at the inside of a motor where people aren't going to look, you think it doesn't matter? There's a company that disagrees with this philosophy.

And this company is called Apple. I bring up a lot of Apple examples because I

happen to know them. And I think it's very interesting because we are all familiar with them.

Apple does something interesting. With the inside of an iPhone, if you-- I'm not going to take it apart-- I'll do a lot.

But if you take the iPhone apart, everything there matches a certain color chart that they have. They have a color chart. And if it doesn't match the color chart it doesn't go inside there because they believe if you start cheating on the inside, it'll begin to leak out. And that cheating will become revealed on the outside of the design.

They think the parts that you never see are still important. When the Macintosh first came out-- it was a big object like this. A little small display.

And if you were able to open it-- and it was only meant to be opened by professionals who are in the shop. You weren't meant to open it because of the CRT and it can be a very high voltage there. You open it and take it off the back and inside is a relief of everyone's signature who worked on that product, inside that, that no consumer was meant to see. Do you still think it's unimportant?

**AUDIENCE:** I feel like what makes a good design would be other factors.

**PROFESSOR:** Other factors. OK.

**AUDIENCE:** If you're talking about like an engine or something would you count the sound of it as aesthetic?

**PROFESSOR:** I would count the sound of an engine as aesthetic. Absolutely.

**AUDIENCE:** So I want a car that sounds like an angry weasel.

[LAUGHTER]

**PROFESSOR:** You want your car to sound a certain way. People say, oh, the roar of the car. The roar of that V8 engine, they say. Or that distinctive Porsche sound they talk about. Absolutely. Think of the sound of the car.

Good design helps us to understand a product. Who thinks this is true? Who thinks it's a lie? Who thinks it's not necessary?

Good design helps to understand a product, no? We all agree on this. What does it mean to understand a product? How do I understand a paper cup or a bowl?

**AUDIENCE:** Well, there's some cases in which you'll have something and people don't usually read manuals or anything like that. So the more intuitive you can make the design-- like make some spot for, no, this is clearly where your hand goes.

**PROFESSOR:** Yes. Intuitive. Something where it's clear, where you know how to interact with it, engage with it. Good design is unobtrusive. What does it mean to be unobtrusive? What do you mean about good design being unobtrusive?

**AUDIENCE:** Doesn't get in the way?

**PROFESSOR:** Doesn't get in the way. Who thinks this is true? Who thinks this is not true? Can you give me an example?

**AUDIENCE:** I think there are buildings that are very well designed and they're very obtrusive.

**PROFESSOR:** Obtrusive buildings that are well designed but obtrusive. What does it mean in that context to be obtrusive?

**AUDIENCE:** They can obstruct traffic, other buildings, other--

**PROFESSOR:** They could be obtrusive in terms of the visual line. Well some designs are interesting. This design is somewhat obtrusive, particularly when it's being used.

If anyone here has ever been in an environment where someone pulled the fire alarm, you'll know how obtrusive a fire alarm can be. But it's pretty good because it needs to be at that time and not now, which is why it's trying to be a little bit more quiet.

It could be even better maybe if we didn't see it at all. Maybe. I'm not sure. There must be a reason why they all have to be red. I don't know what that reason is.

**AUDIENCE:** I don't think that premise applies when part of your design is to make something obtrusive.

**PROFESSOR:** When do you want to make something obtrusive? Give me an example.

**AUDIENCE:** When you have a fire alarm.

**PROFESSOR:** Well we're trying to make it minimally obtrusive, right? They could've made it this big. It could be coming out of the wall. It could go off every hour just to let you know everything's cool.

What if they made it half the size? Or they could make it even smaller. Wouldn't that be better? Maybe. OK.

**AUDIENCE:** If you're Apple, yeah.

**PROFESSOR:** Good design is honest. Whoa. What does it mean to be honest in your design? What does it mean to be honest? Good design is honest.

**AUDIENCE:** If something looks like it's supposed to be doing a specific thing it shouldn't do something else.

**PROFESSOR:** So something looks like it should do something, it shouldn't be doing something else. So I shouldn't walk up to this and say, oh, you got a beautiful door stop. I've been looking for a door stop all day. What else?

**AUDIENCE:** If it promises to do something, it should do that thing.

**PROFESSOR:** It should do the thing it promises to do.

**AUDIENCE:** It should abide by all regulations and safety conditions so it doesn't hurt you in the process.

**PROFESSOR:** Yes. It doesn't hurt you. It protects the user.

**AUDIENCE:** Does that mean you should design it in an honest way, as in not steal the design from somebody?

**PROFESSOR:** That's a good question. Should you design it in an honest ways, as in not steal the design? I don't know. We should ask Samsung. A little jab at that. It's a good question.

**AUDIENCE:** I just don't know what it's referring to.

**PROFESSOR:** I don't either. I think we can actually find out more information now about it. But it's a good question.

What does it mean to be honest? It might mean that as well. It can mean a lot of things about what its intended use is. When I use it, does it do what it's supposed to do-- what it promises to do?

**AUDIENCE:** It can also be adding more than it needs to be-- like making a gold hammer.

**PROFESSOR:** Gold hammer. So that gold toothbrush that we saw from Napoleon. It may not be an honest design. Maybe it's silver. Silver toothbrush. Can we think of an example where this is not true? Where design is dishonest? Where you believe you could do something with it, but you can't and it's still good?

**AUDIENCE:** For instance, there's iPhone cases that look like Game Boys.

**PROFESSOR:** iPhone cases that look like Game Boys that make it not look like an iPhone. Is that dishonest?

**AUDIENCE:** It might be dishonest but I think it's still good design.

**PROFESSOR:** What about up there?

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** Little outlets. You can't figure out how to get this thing in til you turn it. Dishonest design. Who thinks that's a dishonest design? Who thinks it's an honest design anyway? Interesting.

What about this one. What about childproof bottle caps? It looks like they could be

opened, but if you are without the skill, strength, or intellect, then you won't be able to open this.

Childproof bottle caps don't just affect children though. They can affect adults who simply don't have the strength to be able to open one of these things-- to push down and open.

So they have other designs to get around that as well. But they're still a good design. But is that a bit dishonest? To give a whole population the idea that it can be opened, but you can't open it? I'm not sure.

Good design is durable. What does it mean to be durable? What does it actually mean to be durable? For the design to be durable.

**AUDIENCE:** It's not going to break. It's last.

**PROFESSOR:** An object that will last a decent amount of time.

**AUDIENCE:** I mean for the design to be timeless.

**PROFESSOR:** For the design to be timeless. What do you mean by timeless?

**AUDIENCE:** It means that five years from now it won't look antiquated and out of touch.

**PROFESSOR:** So years from now, is it will still look fresh and new and novel contemporary.

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** The idea that this was the intended concept and it will still feel like it's appropriate.

**AUDIENCE:** I feel like it's sort of difficult to do that though because--

**PROFESSOR:** Oh, yeah. Is it difficult?

**AUDIENCE:** --people's ideas of what they want change a lot.

**PROFESSOR:** You say that people's ideas of what they want change a lot. Tell us.

**AUDIENCE:** Well, maybe not a lot, but if you look back at older shows that were predicting what

the future was going to be like, they might be spot on with the technology, but the aesthetics of things-- we tend to have more rounded corners on things. We don't like the points as much anymore. Things like that, that people hadn't even considered back then, are just taken for granted now-- sort of.

**PROFESSOR:** Interesting.

**AUDIENCE:** Well, I mean, good design can be determined after the fact. Maybe when you make it, you don't know if it's a good design. And then after tastes change and you are 10 years down the road--

**PROFESSOR:** You're able to see if it's still a good, sustainable, relevant design later on. Interesting. Good design is consequent to the last detail. Who thinks it's true? Who thinks it's false? Who is unsure? Who did not vote?

Let's try it again. Given your options, good design is-- Let's clarify what it means. My mistake here. What does it mean to be consequent to the last detail?

**AUDIENCE:** Everything you put in the design has the intended effect.

**PROFESSOR:** Everything you put in the design has the intended effect. Everything. If you were going to give me a written report-- a big one-- give me some aspects of that report that you'd be concerned about.

**AUDIENCE:** Whether or not the content [INAUDIBLE] .

**PROFESSOR:** Content. What else?

**AUDIENCE:** Citations.

**PROFESSOR:** Citations. What else?

**AUDIENCE:** It's understandable.

**PROFESSOR:** If it's understandable. Comprehension.

**AUDIENCE:** Format.

**PROFESSOR:** Format. So the--

**AUDIENCE:** Structure.

**PROFESSOR:** The structure. What else?

**AUDIENCE:** I was going to say the format.

**PROFESSOR:** Format. What else?

**AUDIENCE:** Font size.

**PROFESSOR:** The font size. And therefore, what else?

**AUDIENCE:** The font.

**PROFESSOR:** The font. Absolutely. What else?

**AUDIENCE:** Is it too wordy?

**PROFESSOR:** Length of words.

**AUDIENCE:** The paper it's on itself.

**PROFESSOR:** The paper it's on itself. Absolutely. What else then?

**AUDIENCE:** Does it fulfil the task and requirements?

**PROFESSOR:** Does it fill the task and requirements? We talked about the paper. I heard something else here.

**AUDIENCE:** Color of the ink.

**PROFESSOR:** Color the ink. Absolutely. Color of the ink.

**AUDIENCE:** When you present the paper-- like if it's bound.

**PROFESSOR:** Yes. If it's bound. If it's stapled. How it's bound. All these things are details. Do you think they all matter?

**AUDIENCE:** Yes.

**PROFESSOR:** Who thinks if you take a paper that has brilliant content and a paper with the exact same content-- two of them with the same content-- and one is stapled in the corner and one is bound beautifully-- do you think that they will affect your grade at all? Who thinks it will not affect your grade? Who thinks it will affect your grade?

That's good. Statistics show that it will affect your grade. Everyone who doesn't think that it doesn't affect your grade, you should make sure that your papers are well bound-- because it looks to someone else like you put more work and effort into it and that you believe more sincerely in your product.

**AUDIENCE:** A lot of that depends on what the value system is that you're working on. If you don't actually have the money or you don't want to spend the money to bind that paper and you think that it's good enough on its own then maybe the best design isn't binding it. You might have a professor who doesn't care. Given it's on average you will score higher [INAUDIBLE].

**PROFESSOR:** So yes. You have a specific case where it doesn't matter. That's true.

**AUDIENCE:** I think you're talking about high school teachers-- that probably doesn't apply-- but once you start going into college and you're looking at the true content of the paper--

**PROFESSOR:** You think it applies in high school but not in college.

**AUDIENCE:** I think it applies less in college than it does in high school.

**PROFESSOR:** I will tell you this is not true. I will tell you from firsthand. And when I get a paper-- and I know this to be true-- if anyone submits their midterm report-- their individual project-- and it is stapled in the upper left hand corner, you will with 100% certainly be dropping the class soon afterwards.

I've seen it every single semester. Every semester, I'll get at least one person-- and I'll say, please do not do that-- and they will give it to me anyway bound like that.

And I just suddenly have to count to 10 before they drop the class.

**AUDIENCE:** But do you ask them not to staple it?

**PROFESSOR:** I say, please don't use a staple in the upper left hand corner. And they do it anyway. There's a high correlation between this. And teachers, when you get that beautifully bound thing, you think, wow, look how cool this is.

If you could sit in those rooms, you'll think there is a difference. And of course, they will read the content as well. It's not that it's going to make up for bad content. But it shows a lot more strength and structure. And their brain will start focusing a little bit differently when they review that paper.

Consequently to the last detail. Who thinks that good design is consequent to the last detail? Who thinks it is not? Why not?

**AUDIENCE:** Well, I mean, it's the same thing. It's just like, you have to consider what the audience will do. You need to know the value of that extra detail. If they don't value it, like if you're just trying to feed a lot of people and they're just incredibly hungry-- if you are trying to feed a starving population, they're not going to care that you seasoned the food that you've made exactly perfectly. They're going to care once they get something to eat and they get more of it.

**PROFESSOR:** What if you could season it perfectly? Would that be better design?

**AUDIENCE:** Well, that would be great, but that's not the world we live in. We live in a world with limitations

**PROFESSOR:** Yes. We do live with limitations. But the question I would ask you to think about is when are those limitations real and when do we impose them on ourselves unnecessarily? When do we think, well, we can't do this, instead of thinking, well, maybe we can't do this-- let's see if we can do it. You'll find a tremendous amount of innovation happens when we resolve the tension between what? From last class.

**AUDIENCE:** From what we desire?

**PROFESSOR:** Yeah. From what we desire and what we require. If we can resolve these tensions, that is where we get innovation. Absolutely. Good design is concerned with the environment. What does it mean?

**AUDIENCE:** Good design doesn't neglect anything.

**PROFESSOR:** Yes. Good design isn't just sitting in its own little vacuum. It works within a whole system, a whole big context of things, whether it's a physical environment, a social environment, or, like the iPod player, works with the iTunes Music Store. It connects to other things. Lastly, good design is as little design as possible. What does that mean?

**AUDIENCE:** I think to use other things, like how Apple used previous designs. So maybe they didn't have to redesign that much.

**PROFESSOR:** So she's saying less design. Not as much redesign. What other interpretations do we have?

**AUDIENCE:** Keep it simple.

**PROFESSOR:** To keep it simple. What else?

**AUDIENCE:** Going back to the example of Apple, they try to limit the number of buttons that you have.

**PROFESSOR:** Try and limit our buttons. Yes.

**AUDIENCE:** And also with the mouse. Let's use the Magic Mouse for example. There is no button like there are with other mice. There aren't two buttons. It's just one click that you use. And it's very intuitive to how you're going to use it.

**PROFESSOR:** So a Magic Mouse has no buttons on it at all and you can still click anyway. And it knows what you're doing. They're just trying to reduce that user experience. But they had a lot more complexity inside to figure out how to make that work. What else?

**AUDIENCE:** I think the design is as little design as possible as in off of previous designs, like going back to Dieter Rams.

**PROFESSOR:** Dieter Rams' work. Absolutely. Where he's really trying to get that functionalist-- let's think about the functions first and really build things around in the simplest most streamlined, elegant way possible.

I want to consider these steps. Part of your homework will be to consider if these are all true and reflect on them and see how they can be improved and which ones are missing. I bet you're going to be able to think of ones that are missing.

Design challenge. Are you ready? Are you ready?

**AUDIENCE:** Yes.

**PROFESSOR:** I'll take that. Here we go. Are you ready?

This is what you know. The music stops. A man is dead. That's all you know.

You need to solve what happened and why did it happen. And I will answer questions. I will say, yes. Or I will say, no. Or I will say, Relevant.

That's what you get. And we need to do this quickly. Go.

**AUDIENCE:** Was the man listening to the music?

**PROFESSOR:** Yes.

**AUDIENCE:** Was he blindfolded?

**PROFESSOR:** Yes. If you happen to know this particular question. Was he blindfolded? Yes.

**AUDIENCE:** Did he die because the music stopped?

**PROFESSOR:** Did he die because the music stopped? No.

**AUDIENCE:** Is this a human man who actually died and was living and then now is no longer living?

**PROFESSOR:** Was it a human man who died who was living and is no longer living. Yes.

**AUDIENCE:** Did the music give instructions?

**PROFESSOR:** Did the music give instructions? No.

**AUDIENCE:** Did he die while the music was playing?

**PROFESSOR:** Did he die while the music was playing? No.

**AUDIENCE:** Where'd this happen?

**PROFESSOR:** Where did this happen?

**AUDIENCE** Yes or no questions.

**MEMBER 1:**

**AUDIENCE** Does the music stopping coincide with the man's death?

**MEMBER 2:**

**PROFESSOR:** The music stopped and coincided with the man's death. What's the question?

**AUDIENCE:** Did the music coincide with the man's death?

**PROFESSOR:** I don't know how to answer that one. Give me some more detail around the question.

**AUDIENCE:** Did they happen at the same time?

**PROFESSOR:** No. Did they happen at the same time? No.

**AUDIENCE:** Was he alone?

**PROFESSOR:** Was he alone? No.

**AUDIENCE:** Did the music stopping indicate something else is starting?

**PROFESSOR:** Did the music stopping indicate something else is starting? Yes.

**AUDIENCE:** Was the music playing in headphones?

**PROFESSOR:** Was the music playing in headphones? No.

**AUDIENCE:** Did the music start in relation to that the man was dead?

**PROFESSOR:** Did the music?

**AUDIENCE:** Did the music start in relation to the fact that the man was dead?

**PROFESSOR:** Did the music start because the man was dead? No. The music stops. The man is dead.

**AUDIENCE:** Did someone stop the music?

**PROFESSOR:** Did someone stop the music? Irrelevant.

**AUDIENCE:** Did someone kill the man?

**PROFESSOR:** Did someone kill the man? No.

**AUDIENCE:** Did the man have a preexisting condition?

**PROFESSOR:** Do the man have a preexisting condition that was not covered under the health code? No. He did not have a preexisting condition.

**AUDIENCE:** Is the music playing at a funeral?

**PROFESSOR:** Is the music playing at a funeral? No.

**AUDIENCE:** Did the music stop because it ended or did it stop [INAUDIBLE].

**PROFESSOR:** I can't answer that question with a yes, a no, or irrelevant.

**AUDIENCE:** Was the music short?

**PROFESSOR:** Was the music to cut short? No.

**AUDIENCE:** Was the man's death an accident?

**PROFESSOR:** Was the man's death an accident? Yes.

**AUDIENCE:** Did the man die before the music started?

**PROFESSOR:** Did the men die before the music started? No.

**AUDIENCE:** Did the man die because the music stopped?

**PROFESSOR:** Did the man die because the music stopped? No.

**AUDIENCE:** Is the reason the man died also the reason that the music stopped?

**PROFESSOR:** Is the reason that the man died also the reason that the music stopped? No.

**AUDIENCE:** Did the man kill himself?

**PROFESSOR:** Did the man kill himself? Ask the question differently.

**AUDIENCE:** Is the man responsible for his own death?

**PROFESSOR:** Is the man responsible for his own death? Yes.

**AUDIENCE:** Was the man involved in stopping the music?

**PROFESSOR:** Was the man involved in stopping the music? No.

**AUDIENCE:** Did the man die before the music stopped?

**PROFESSOR:** No. He did not die before the music stopped?

**AUDIENCE:** Was he in public?

**PROFESSOR:** Was he in public? Yes.

**AUDIENCE:** Was he driving?

**PROFESSOR:** Was a driving? No.

**AUDIENCE:** Is the music the name of something unrelated to sound?

**PROFESSOR:** Is the music the name of something unrelated to sound? I don't know what you mean. But I want to.

**AUDIENCE:** Is the music a name?

**PROFESSOR:** Is the music a?

**AUDIENCE:** A name.

**PROFESSOR:** A name.

**AUDIENCE:** Of something.

**PROFESSOR:** Of something. I don't know what that means.

**AUDIENCE** Is it not music?

**MEMBER 1:**

**AUDIENCE** He means is there a track called "The Music."

**MEMBER 2:**

**PROFESSOR:** Oh. No. Thank you. It's hard. It's not that hard.

**AUDIENCE:** Was the man in control of the music?

**PROFESSOR:** Was the man in control of the music? No.

**AUDIENCE:** Is the music relevant to the man's death at all?

**PROFESSOR:** Is the music relevant at all to the man's death? Yes.

**AUDIENCE:** Did someone try to stop his death?

**PROFESSOR:** Did someone try to stop his death? Irrelevant.

**AUDIENCE:** Did he want to die?

**PROFESSOR:** Did the man want to die? No.

**AUDIENCE:** Is the song that was playing relevant to the man's death?

**PROFESSOR:** Is the song that was playing relevant to the man's death? -ish. Sorry to break the format.

**AUDIENCE:** So is it an internal injury that killed him? An external injury would be like a trauma, whereas an internal injury would be like a heart attack. I'm trying to figure out the way he died.

**PROFESSOR:** Ask me a very specific question.

**AUDIENCE:** Was it an internal injury?

[LAUGHTER]

Did he die of a heart attack?

**PROFESSOR:** No.

**AUDIENCE** A stroke?

**MEMBER 1:**

**AUDIENCE** Something hit him?

**MEMBER 2:**

**PROFESSOR:** Yes.

**AUDIENCE:** An ice cream truck hit him.

**PROFESSOR:** No. Did something hit him? Yes. Did an ice cream truck hit him? No. But that's very funny.

**AUDIENCE:** Was the thing that hit him intended to hit him?

**PROFESSOR:** Was the thing that hit him intended to hit him? No.

**AUDIENCE:** Did the music player fall on the guy?

**PROFESSOR:** The music player did not fall on the guy.

**AUDIENCE:** Since he was blindfolded, was he to guide himself in a certain direction?

**PROFESSOR:** Ask the question again.

**AUDIENCE:** Since he was blindfolded, was he using the music as a way to guide himself towards or away from something?

**PROFESSOR:** Yes. She asked the question was the music guiding him--

**AUDIENCE:** Was he using the music to guide him--

**PROFESSOR:** Was he using the music to guide him? Yes.

**AUDIENCE:** Is the man a performer of some sort?

**PROFESSOR:** Is the man a performer? Yes.

**AUDIENCE:** Was he a tightrope walker?

**PROFESSOR:** Was he a tightrope walker? Yes.

**AUDIENCE:** Did he fall?

**PROFESSOR:** Did he fall? Yes.

**AUDIENCE:** Was the man using the music to guide himself blindfolded across the tightrope and then the music stopped and he fell off?

**PROFESSOR:** Was the man using the music to guide him across the tightrope--

**AUDIENCE:** While he was blindfolded.

**PROFESSOR:** --while he was blindfolded. And what was the next part?

**AUDIENCE:** The music stopped so he couldn't find where he was going so then he fell off.

**PROFESSOR:** The music stopped so he couldn't find where he was going. And therefore, he fall

off. No. So close.

**AUDIENCE:** Was he supposed to jump into a net and missed?

**PROFESSOR:** We he supposed to jump into a net and missed? No.

**AUDIENCE:** Did the speakers fall on him?

**PROFESSOR:** Did the speakers fall on him? No.

**AUDIENCE:** Was he using the number of beats to traverse the tightrope?

**PROFESSOR:** Was using the number of beats to traverse the tightrope? No.

**AUDIENCE:** Was the tightrope the wire for the music player?

**PROFESSOR:** Was the tightrope the wire for the music player? Very creative. No.

**AUDIENCE:** Was the music supposed to stop when he was at the end but it stopped early?

**PROFESSOR:** Was the music supposed to be stopped when he got to the end? Yes. And that's what happened. So he's walking on a tightrope. And all of a sudden-- he's blindfolded-- and the music stops, so he figures he's at the end. And he just steps off. But he wasn't at the end. And there was no net. And he fell to his death where the ground hit him.

[AUDIENCE DISGRUNTLEMENT]

You said, did something hit him. Yes. Something hit him. I didn't lie. Something did hit him.

**AUDIENCE:** He hit the ground.

**PROFESSOR:** Oh. I'm sorry. You've all taken physics. The ground hit him as much as he hit the ground.

[INTERPOSING VOICES]

**PROFESSOR:** He wasn't dead. He was still alive.

[INTERPOSING VOICES]

**PROFESSOR:** The music stopped before he died.

**AUDIENCE:** Because arguably, he died when he hit the concrete.

**PROFESSOR:** Oh. No. I answered the questions very specifically each time. In fact, we have all the questions, here, that you asked. Any ones in particular that were of note?

So what's very interesting here is about asking questions. And it leads us into what we want to talk about here with research. Asking good questions is really hard. And when you ask questions, sometimes you find you're going down a path that's giving you information. Sometimes you don't.

Often the first question I get asked was, was he outside? No. Was he in a building. Yes. What comes to your mind as someone said he was in a building?

[INTERPOSING VOICES]

**PROFESSOR:** You'd think an office building. Right? You wouldn't think a tent or a circus.

That's a building. It's a structure. If I said no to building, would I have to say yes to tent? Like at some point if I'm being very binary. So asking questions is very hard. You see any ones that you're skimming?

**QUESTION** The internal injury one was really good.

**TYPED:**

**PROFESSOR:** Internal injuries.

**QUESTION** That put them in the right direction.

**TYPED:**

**PROFESSOR:** Hitting the ground. So when you said, did something hit him-- well, yes, something hit him. But it doesn't tell you about the direction. Right?

And now you're beginning to think an ice cream truck struck him. And this makes sense. What you did is exactly right. All this is exactly what you should be thinking about. But it shows us, given some data-- think about when you're asking questions-- you can get the exact, truthful, right answer and still be radically incorrect about what you understand from this.

That was a little induction to research here, complete with formula. So research. Just a basic thing. You want to ask questions and find out about stuff. Asking questions is important, but answers can be misleading.

Academic and scientific research is often wrong. We think it's the truth when we read it. And maybe it's truthful. Many of them are very good. But often they're wrong.

And we base beliefs and make conclusions and decisions based on faulty information. Which gets us back to the first thing I talked to you about on the first day, which was? To do what? The first thing.

**AUDIENCE:** Ask the right question.

**PROFESSOR:** To ask why. To make sure that we're getting to the underlying reasons. Because that may be wrong.

Research results may be good but the conclusions may be wrong. So here we had great research. The question was, did he die of internal injuries. Yes. Did something hit him? Yes. What did we conclude? That something hit him-- that he was stationary. Easy to do.

This is Fitts' Law. It's pretty cool. I won't bother explaining it right now. It's so interesting. It's used a lot in computer and human interaction. I'll give you the basic idea.

This distance is  $D$ . And I think, here in the formula, this is  $W$ , which really talks about-- actually, that's  $W_s$  here and  $W_e$  here. It's a margin of error, technically. But here it's a width.

And what he would do is he'd say, look, we can have people doing something like tapping. Here. Here. As fast as you can.

Now if I take those lines and I change them. I'm going to make them like this. So that's one. I do this. Faster. What if I do this?

Pretty good. Pretty good. And so I'm pretty good with that. But my speed changed. And if I wanted to go faster, my accuracy would go down.

So what can we conclude from this? Lots of things. Somethings that are very good and somethings that are incorrect.

One conclusion. If I work on a computer system that just has a keyboard and no mice at all. And it's now 1985, 1986. Should I use a graphical user interface or not?

Well the incorrect conclusion might be it will slow you down. Because every time you move your hand over-- we can calculate it out. How long it's going to take you for every action that requires you to use a mouse. And so we don't want to have people slowing down. We're going to keep everything using keyboard commands.

But it may not be true that it's going to make you faster. That's an incorrect conclusion-- maybe given that same system. But maybe if you redesign the system, it will actually become a system that you can use faster because you can use the mouse to be able to do things you couldn't do before.

And the correct conclusion that we draw is the right click for a pop-up menu-- you right click on something and then the menu's right there. So now you've moved your hand to the mouse. You move your mouse to the target. And you right click on it. And now you have a menu that's contextual, that's short and easy to get to. Instead of moving your mouse all the way to the top to a big menu bar and having to find your way through cascading menus. That is the correct use of it.

Research results may be good but conclusions may be wrong. So when you see a really good research piece like this, understand that what you do with that is really important.

We design projects for people. People don't know what they want often. I could say, do you want to have a device that's this big and flat and has a keyboard on it that's virtual and all the stuff. You might say, nah, I don't want that.

In fact, when the iPad came out, the week beforehand or two weeks before I had pre-ordered it because I had to be really cool and wanted it. And my classmates were saying, oh that's ridiculous. I said, why is it ridiculous?

Well, it's like a bigger iPhone and you don't need that. And I'm like I think it's different. They said, no, it's just a bigger iPhone. We're not going to get one.

Well within a month, of course, a whole bunch of them are ordering them because they saw it was different. But if you asked them-- if you said, would you like to pay \$600 or \$800 for an object like this, they might have said, no. And then they never would've made an iPad.

It's very hard to ask people what they want. And if they know what they want, they often can't articulate it. They don't know what words to use to convey the idea. So as a designer when you research, how you ask questions, how you interpret people's answers is really critical.

I'd like to show you this video about why it can be hard to get good answers when you ask a question. This video is for a game show called the Family Feud. Who does not know the show?

Briefly, here's how it works. They have parts of the show where they ask people-- 100 people get surveyed-- they'll ask them a question like, what would you expect to find in a refrigerator? And you want to guess the most popular answer because that will be the number of points you get. So what would you answer?

**AUDIENCE:** Milk.

**PROFESSOR:** Milk. Milk is the most popular answer. And so this is a speed round at the end where they have two different teams. And this one person comes over and he's looking away from the board and this guy asks him these questions in a row. It's like five

questions. One of them is the milk question.

You're asking this person who's on a game show-- average person, answering questions. He happens to be under pressure because he's on a game show. You'll see his responses. I'm just going to roll this for a little bit and then we're going to show you the second part of this.

**HOST (ON SCREEN):** Name an animal with three letters in its name.

**CONTESTANT 1 (ON SCREEN):** Frog.

**HOST (ON SCREEN):** Something found in a refrigerator.

**CONTESTANT 1 (ON SCREEN):** Milk.

**HOST (ON SCREEN):** A brand of gasoline.

**CONTESTANT 1 (ON SCREEN):** Regular.

**HOST (ON SCREEN):** Something that comes with a summer storm.

**CONTESTANT 1 (ON SCREEN):** Snow.

**HOST (ON SCREEN):** A sport with an all-star game.

[BUZZER]

Turn around. You may never be up here again. Let's take a look.

Name an animal with three letters in its name. You said, frog. Our survey said 0.  
Two people would have to say that.

Something found in a refrigerator. You said, milk. Our survey said 28. A brand of  
gasoline we wanted. You said, regular. That's a good brand. Our survey said.

**CONTESTANT 1** It's the brand I use.

**(ON SCREEN):**

**HOST (ON SCREEN):** Something that comes with a summer storm. You gave me the answer snow. Our  
survey said.

**PROFESSOR:** So you saw what happened here. This person is trying to answer questions under  
pressure. He's trying to provide the best answers he can. An animal with three  
letters. Frog. I can see maybe-- it's a short word, right?

Something in the refrigerator. We got milk. You all got milk. You were great.

A brand of gasoline. Regular. He thought regular is the brand instead of Shell or  
Mobil or something else. That's what he associated with that area.

Something that comes with a summer storm. Snow. It doesn't happen in the  
summer, I think, for most parts of the world. Certainly not here.

But his reaction was to supply an answer that wasn't useful, even though he  
probably would know things. But under pressure, not easy for him to be able to  
come up with good answers. Let's continue this and watch his opponent.

**HOST (ON SCREEN):** I got good news and bad news.

**CONTESTANT 2** Give me the bad news first.

**(ON SCREEN):**

**HOST (ON SCREEN):** The bad news is you need 172 points to win the money. The good news is you're

**SCREEN):** the man to do it. I'm going to ask you the same questions I asked the other Bob.  
You cannot and you do not want to duplicate his answers. If you do, you hear this.

[BUZZER]

What noise do we hear?

[BUZZER]

Thank you. I will then say try again. You'll give me another answer. Alright? Remind everyone, to Bob's shame, the answers he gave us and give me 20 seconds on the clock, please. Name an animal with three letters in its name.

**CONTESTANT 2** Alligator.

**(ON SCREEN):**

**HOST (ON** Something found in a refrigerator.  
**SCREEN):**

**CONTESTANT 2** Milk.

**(ON SCREEN):**

**HOST (ON** Try again.  
**SCREEN):**

**CONTESTANT 2** Ice.

**(ON SCREEN):**

**HOST (ON** A brand of gasoline.  
**SCREEN):**

**CONTESTANT 2** Ethyl.

**(ON SCREEN):**

**HOST (ON** Something that comes with a summer storm.  
**SCREEN):**

**CONTESTANT 2** Rain.

**(ON SCREEN):**

**HOST (ON SCREEN):** A sport with an all-star game.

[BUZZER]

**CONTESTANT 2** Football.

**(ON SCREEN):**

**HOST (ON SCREEN):** Football. You've got to give him that. Any man that says alligator, you've got to give it.

Name an animal with three letters in its name. You said, alligator. Our survey said.

You don't use narcotics. Do you?

**CONTESTANT 2** No, but I will.

**(ON SCREEN):**

**HOST (ON SCREEN):** I mean, I thought frog was bad. I thought frog was a disastrous answer until you came up with alligator. It's a real tough one. Dog was the number one answer. Dog.

**CONTESTANT 2** Are you sure it was?

**(ON SCREEN):**

**HOST (ON SCREEN):** Three letters in it's name. Dog. D-O-G.

[CHATTERING]

**HOST (ON SCREEN):** And we wanted something found in a refrigerator. You both had this nailed down very well. Unfortunately, you repeated his answer, which was milk. But you said, ice. That's the place to find it. Our survey said 17.

Milk was the number one answer. It was the only good thing that Bob did. A brand

of gasoline we asked. You said, ethyl.

**CONTESTANT 2** A brand.

**(ON SCREEN):**

**HOST (ON SCREEN):** A brand which I think you've been drinking. Our survey said. The number one answer was Shell.

**CONTESTANT 2** Shell.

**(ON SCREEN):**

**HOST (ON SCREEN):** Something that comes with a summer storm. At least you have reached. Did you see his answer? Snow! At least you said, I believe, rain. Is that correct? Well, that's good. Our survey said 9. And then a sport with an all-star game. You said, Football. It was about two minutes late but I insisted you get it. Our survey said.

[BUZZER]

So these people are not stupid. They're smart people. They're regular people. And they come with these answers under pressure which were just not the right answers by a long shot. So how you ask questions, who you ask questions to, the environment you ask questions-- it may not always be this extreme where someone says alligator for a three letter animal. But you will get shades of differences-- shades of meaning.

Sometime who is very stressed will provide really bad answers. If you're really, really-- I get test anxiety. So when I took my tests in grad school

I went to support services and got time and a half because I couldn't do it. I'd be there and I would look at these problems and the information would empty out of my mind. I just was too anxious to do it.

Like other people, you will get different responses. So how you conduct your research is really important. So one of the various ways we can research. Let's talk about this. If it was 1960, and we wanted to learn to cook like a French chef, what would we do? What could we do?

**AUDIENCE:** Go to France.

**PROFESSOR:** Go to France? Just go to France? And you just happened to have the knowledge by going to France. Yeah. if you start smoking, you get--

[GRUMBLES]

You walk down the street, and you just happened to know. No. What else do you do?

**AUDIENCE:** Talk to the chefs there.

**PROFESSOR:** Talks to the Chefs there. Sure. What else could you do?

**AUDIENCE:** What about French cooking school?

**PROFESSOR:** Go to French cooking school.

**AUDIENCE:** Watch Julia Child.

**PROFESSOR:** Watch Julia Child. Absolutely. Watch her show called The French Chef. Yes. This is good.

1848. The best way to conduct a defensive military retaliation.

**AUDIENCE:** Go to military school.

**PROFESSOR:** Military school. Yes. Look at the what's happened before in history. 1990s. The best way to clean a kitchen. We want to make the best way to clean the kitchens in the '90s. What do we do?

**AUDIENCE:** Ask your mom.

**PROFESSOR:** Ask your mom. If not, just ask your mom, however, you could also do what?

**AUDIENCE:** Watch her.

**PROFESSOR:** Watch her. Yes. 2013. You want to save money on a call center. This call center

handles technical issues for customer complaints for satellite television. What can you do?

**AUDIENCE:** Internet.

**PROFESSOR:** What would you do with the internet?

**AUDIENCE:** Just search for it.

**PROFESSOR:** Search for what has been done to save money in call centers that have these issues? I don't think you're going to get a whole lot of good responses.

**AUDIENCE:** Outsource.

**PROFESSOR:** Outsource what?

**AUDIENCE:** The people answering--

**PROFESSOR:** How would you learn though? How would you research this? Have a consulting economy. What would they do?

**AUDIENCE:** They would go out and probably talk to other people who have done similar things in order to--?

**PROFESSOR:** Yes. They could talk to other people who had similar problems, but what about this one particular call center for satellite TV, located in Denver?

**AUDIENCE:** Look at its budget.

**PROFESSOR:** Look it's budget. What would you learn from the budget?

**AUDIENCE:** Seeing where the most money is going?

**PROFESSOR:** Well, we know that a lot of money is going to this thing. How do we have them save money on this one particular part of the call center?

**AUDIENCE:** Reduce the number of workers by having an automatic system.

**PROFESSOR:** Reduce the number of workers by having an automatic system, but how would you know what the automatic system should be doing?

**AUDIENCE:** Look at what the workers do.

**PROFESSOR:** Look at what the workers do. By what method?

**AUDIENCE:** Watch them.

**PROFESSOR:** Watch them. Absolutely. Actually sit down there and watch the workers.

2015. The decision to develop an extremely new type of consumer product, like when people had to develop the iPad before they developed the iPad. What would you do?

**AUDIENCE:** Talk to people.

**PROFESSOR:** Talk to people and ask them what they want? What would you ask them? What would you ask people to figure out that brand new product that's different than anything ever before it.

**AUDIENCE:** You talk about what they actually want like why they use iPads. Maybe they want something easy in front of them to touch.

**PROFESSOR:** Yes. So to get the underlying mechanisms. Yes. So we have expert education here, as he said, correctly. Historical and cultural explanations, as you said correctly. Ethnographic research, as she said about observing someone actually performing these tasks.

This is how the Swiffer was developed. They had people with cameras watching people clean and mop their floors. And they thought, oh wait, they do all these things. The water gets dirty and all this stuff. And they could develop these ideas-- the wet Swiffer and the dry Swiffer.

Here, direct observation. Sit there and listen to those calls coming into the call center, which I did. And I heard them say things.

I sat down next to this person. You know when they say the calls may be monitored for quality control or quality assurance? Well, that was me sitting next to her, jacked into the same box. And I said, I'm just going to hear what you do.

First call comes in. I've got a problem with my TV thing. I can't get this station and she'd have a very interesting thing. Did you diagnose it? She'd work with them. 20 minutes later, it'd be done.

The next call would come in. I've got this black screen. She's like, oh, we'll, can you go in and unplug it and plug it back in. Sure. Hey, it's working now. Great.

Next call comes in. I've got this really strange problem. I was getting these channels but now I'm not getting anything. She'd diagnose it and send it a restart signal. It would work.

The next call would come in. I've got this snowy screen. She'd say, can you unplug it. Yes. And plug it back in. Yes. How's it working? Works great. Perfect.

Every other call. Every other call. Black screen. Snowy screen. Black screen. Snowy screen. Unplug it. Plug it back in. Resolved.

What's going on here. I said, how do you know that's the problem. Oh, because the installers say don't turn off the box. They'd say you don't have to worry about turning off the box.

Turns out if you don't turn off the box every week or two, eventually it will want an update, not get it, and produce a black or snowy screen. And so she knew to do that.

They were given incorrect instructions by the people who installed the box. And she gave them better instructions. Well, kind of better. The better instructions we're actually, by the way, you'll have to do this periodically, even if the installer told you you didn't have to do.

So here by observing that, we figured out that 30% of the calls to this particular part of the call center were for a black or snowy screen. Automation was introduced, as

you said-- who was it? Yes. Correctly.

Automation was introduced to solve this problem. The first question was, are you experiencing a black or snowy screen. No. All right. Let me give-- Yes. Great. Unplug it and plug it back in and let's see if that helps. I'll stay on the line. When you're ready, just say I'm ready.

And people would do that. They'd say I'm ready. Great. Did that solve the problem? Yes. Alright. You need to turn this off, periodically, like once a week or two. otherwise you'll get the same problem, even if the installer told you you didn't have to. So that's how you solve a problem. Observation.

This is the hard one. And this is exactly what you're alluding to. A deep understanding of humans. What they want. What their real desires are-- technology, culture, manufacturing, philosophy, art, design, and everything else. When you want something really radically innovative you need to understand a lot about a lot.

And while you're in school, you have an opportunity to learn a lot about the a lot. So take advantage of doing that. Steve Jobs sat in on a calligraphy class. And that's why the first Macintoshes had fonts. Before, there were no fonts in computers. But he didn't have this experience of what a font can do and change meaning of something and he wanted that in that first Macintosh computer because of the experiences of sitting in on a calligraphy class.

Have more experiences. Understand everything about culture, technology, art, design, philosophy. It'll make you better at designing very technical systems. Any questions about that?

**AUDIENCE:** I would actually disagree with that last point. You get more innovation by just trying 100 ideas and seeing what sticks.

**PROFESSOR:** You think you can get more innovation by trying 100 ideas and seeing what sticks?

**AUDIENCE:** Yeah. [INAUDIBLE] that make great things and have no idea what they're doing.

**PROFESSOR:** You think people who make great things have no idea what they're doing?

**AUDIENCE:** In some cases, yeah.

**PROFESSOR:** Can you give me some examples?

**AUDIENCE:** Some examples. If you think of a product like Facebook.

**PROFESSOR:** Facebook. He had no idea what he was doing?

**AUDIENCE:** Yeah, he was doing something cool. Ended up making a lot of money later on by [INAUDIBLE].

**PROFESSOR:** Making money. But that wasn't the objective. The objective was to make something cool.

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** But he didn't try 100 different designs. Did he? He didn't just try a 100 designs and see what stuck.

**AUDIENCE:** They updated code twice a day.

**PROFESSOR:** That's not trying 100 different designs. Facebook has maintained-- its core origin, at the very beginning, was a rating. Hot or not. Right? So like, hot or not. You would just rate people.

Then you started being able to post more. And it involved. And when it evolved to a certain point, then it became particularly big.

But it wasn't that they tried 100 designs. No one sat there and said, let's observe 100 different things we could be doing for Facebook and say, let's see what sticks. People don't often do that. It's also very costly and expensive to try 100 different designs.

**AUDIENCE:** If you look at how they do agent testing everyday?

**PROFESSOR:** Yes. But that's making small decisions. But not radically different things. We're

talking about technology that's never been seen before. A completely new type of user experience. Something that's never been tried before.

Derivative things, absolutely. You can do ABN testing. You can test 100,000 variations in an hour and see which ones people used and which ones they took longer to use. But that's for small changes. Not when you're doing something completely radical and new and very different and very innovative.

**AUDIENCE:** I just wanted to support his point a little bit. I don't think that anyone who designs these really good products sits down one day and realizes, given everything I know about art, technology, society, etc, this is how it should be.

**PROFESSOR:** You don't think so?

**AUDIENCE:** No, I don't.

**PROFESSOR:** If you were to design something, you wouldn't think that it was the amalgam of everything you've learned in your life so far?

**AUDIENCE:** No, no. It wouldn't just come at once.

**PROFESSOR:** It may not come at once.

**AUDIENCE:** Unlike the other examples-- in the other examples, you narrowed down the [INAUDIBLE] because you realized this causes this.

**PROFESSOR:** Oh, right. It is not a good example. Exactly. That is true. But it is the synthesis of everything you've learned so far. Right?

**AUDIENCE:** Right. But the process of getting to the design that you get to is a meandering.

**PROFESSOR:** Oh, yes. You may take a long time to get to that design. Absolutely. Yes. But it is the idea that, if you-- I'll bring this slide up again.

If you don't have a deep understanding of people, you're not going to design things really well for them. If you don't understand how the technology works, you won't be able to make something that's useful, that people enjoy interacting with that takes

advantage of the technology.

If you don't understand about the culture it may be the wrong time to introduce it to a certain place. If the iPad was launched in a poor country where they could never afford it, then it may not be very popular. Or a place where there wasn't internet reception for some reason.

Or if you don't understand about how to manufacture something like that, then it gets very clunky. If you don't understand about art or design, how do you make something that's aesthetically pleasing and sustainable? So that's why the idea is to synthesize.

And yes. It takes a long time to get there. That's why creativity gets better as you get older. The older you get, the more creative you will get. You don't get worse with creativity. It gets better.

Because you know more and you have more life experiences that you can synthesize. Other questions? Or comments?

**AUDIENCE:** I feel like it goes back to the conversation we had about intention.

**PROFESSOR:** Intention. The idea of intention.

**AUDIENCE:** -and what you intended it to do. I feel like it does require the deep understanding of certain things depending on what your design is. But it's like what you said, it can evolve into different things and that might mean you will look for more understanding of humans and manufacturing maybe later on depending on where the design--

**PROFESSOR:** So you'll keep evolving that. Absolutely. You will definitely keep evolving your ideas. Joel.

**PROFESSOR** Just to add a little bit, I hope you're not falling into the school idea that these  
**JOEL** questions have right and wrong answers. These are thought provoking. They're to  
**SCHINDALL:** get you thinking about things. They're to challenge your assumptions.

Some of them are absolutely ridiculous. But without looking at that, it doesn't give you the perspective that you're getting at. I think you've probably done this in other sorts of classes but it's a different type of perspective. And to get the most value out of it you need to set aside-- by the way, the people who are answering, I also want to really hand it to you.

Put yourself out there. Throw it out even if it's-- there are not right and wrong answers. We need illustrations of the wrong answers-- we need illustrations of the wide range that people come up with answers about.

I think if you're sitting here in this class, the answers that other people are giving are a demonstration of the wide range of reactions that people have to the same stimuli that you receive. And you'll receive a stimulus and you'll say, oh, yeah, of course that's true. And someone else is going to say, I object violently. Now that's worth knowing because that person's giving an honest reaction.

**PROFESSOR:** The whole point of this is to provoke your thinking. To make you think deeper about this and to set the stage for what you will be doing over the course of the semester. It is meant to challenge the ideas. We ask a lot of questions about Dieter Rams' principles and you'll be reflecting on that.

But these are ideas. And they're not meant to say this is an equation where when you put something in you get something out like this. It's not deterministic that way.

Design is a very, very complicated thing. That's why we talk about it for many different aspects and different approaches to get you to think differently. Because you'll be able to soon become much better at it through that process.

**AUDIENCE:** So I know that 2.009 is a very artificial setting because you're given a theme and you have to design a product based on that theme. But how do you think 2.009 and that process fits with--

**PROFESSOR:** I don't know a whole lot about 2.009. You said it's an artificial setting. It's not that artificial. There are companies that have innovation labs where they say, we do something with our product in this space.

Can you do something with our product that takes advantage of it somehow? And people have to figure out, OK, what do I have. What are the resources? How much time do I have to do this? Do I have an infinite amount of time or a limited amount of time? And they do that same process, just like you do in 2.009.

**PROFESSOR**

Blade, let me comment on that also. Design takes place at many, many levels. And

**JOEL**

sometimes, you just have a group of flowers and you're trying to make a floral

**SCHINDALL:**

design and you're very restricted in what you can do, but there is a methodology, there are rules. You can put the big flowers-- I don't know how to do a good one, so I better not give you examples of that.

And on the other hand, sometimes you're trying to do either a very complex technical system or perhaps a complicated political process. People design press briefings for presidential candidates. It seems amazing. It seems they're so bad it doesn't seem as if it could be designed. But it actually is very carefully researched and designed.

Now 2.009 places itself kind of in the middle of the design space. It's more creative than just figuring out how to assemble an erector set. And it does encourage you to do some innovative thinking, but not as much-- we're trying to go even one level higher and something that will apply to everything you do and just, what we call, design thinking. And it will help you in 2.009, but it's not as specifically applied to-- 2.009 is a mechanical engineering course for people who intend to grow up and design mechanical things. And so it focuses on that. This is more for people who intend to deal with life issues and come up with answers.

**PROFESSOR:**

Whenever you have to do anything-- in my software company, I apply these principles to everything we do-- the ones I'm teaching you-- to every aspect of it, whether it's to hiring, to bring people on board, to figure out what they're going to be doing the next week, how we're going to communicate internally, how we're going to communicate externally, which brings us to stakeholders.

Cul Bono. What does it mean? Anyone know? Who benefits? Who benefits? So

stakeholder. Well the definition I get off the internet-- a person or group that has an investment share interest in something. We talk about stakeholders for your education-- you or your family, teachers, school. Who else could be a stakeholder for your education?

**AUDIENCE:** The community.

**PROFESSOR:** The community. What community?

**AUDIENCE:** The one that you would benefit if you go--

**PROFESSOR:** The community that benefits when you go and do something. What else?

**AUDIENCE:** Your employers.

**PROFESSOR:** The employers. Yes. And actually potential employers. Who else?

**AUDIENCE:** The clients.

**PROFESSOR:** Clients. When you're working at the employer you have a client. Yes.

**AUDIENCE:** I think the government or the president in general.

**PROFESSOR:** The government or the president, or you could say the country. The country benefits. Absolutely. Who else?

**AUDIENCE:** I don't know if school includes this, but your classmates.

**PROFESSOR:** Classmates. Sure. Tell me how your classmates benefit.

**AUDIENCE:** The more you bring to the table, the more they're going to gain.

**PROFESSOR:** Yeah. So when you have a certain cohort in a business school, if there's people with different experiences, they can bring new ideas and formats. That's why we have discussions like this at the beginning of the lectures. You get more benefit because you hear someone's idea that you hadn't thought about before because they bring their perspective.

Here's a quick sketch. Just a quick sketch of how you might go about the process of writing out the stakeholders. Flour Bakery. Who knows it? A lot of you.

So this is a great bakery, very close by. And its owner is Joanne Chang, a friend of mine. And Joanne owns a bakery.

So I'm going to say that this is in the center and this is one of the primary stakeholders. Workers would be another primary stakeholder of the bakery because if the bakery's selling product they get paid. There's a whole bunch of others, of course, that we can fill in.

Now we go from a secondary one to the workers' banks. How do they benefit? Well, the Flour Bakery gives the workers money. The money goes into the banks. So as we go through that process, the bank begins to be able to get more money into them, particularly a local bank, perhaps, that's being used.

And what's interesting about this is there's a big profound effect. What we're going to do is we're going to have you do a quick sketch for Flour Bakery. And what I want you to do is to do that system with much more detail, right now in class.

And if you need to, you can use lines to clarify what's happening. Someone pays someone, like pay the workers, or the bank receives cash as a result. I want you to work in groups of three. If you have paper, please draw this on paper. And then, we'll project a few on the screen. So tidiness doesn't really count as long as you can explain it. And you'll have about 10 minutes to do it. You can work with any people you want.

By now, the students are trying to figure out how to map out a simple stakeholder diagram. Now this is not a very full or robust stakeholder diagram. It's just meant to get everyone thinking about the system that's involved. In a stakeholder analysis that's done really well, you'd actually phase out all the different levels. You'd think about all the different stakeholders and where they lie in the spectrum of value, too.

Here we just want to make sure that students understand the idea that things are connected and that these connections can seem very distant. But if they understand

the connections and the space, it can help them make better decisions later on. And we'll be doing that in the next slides that we show. We'll show what the students have done on the screen.

So the thing to look for in this is to see if the students pick up on some of the other more subtle aspects. Are they going to think about things like legal system or the accountant or people like that who are direct benefits and every store has to work with their legal people and their accountants, but it doesn't seem like it often pops in the radar.

And this is where all these hidden costs occur when someone's starting a business. They think, well, this one's going to cost this much or they're making a product that's only this expensive, but there's everything else around that ecosystem. And let's see if they pick up on this.

All right so let's go over your results. Why don't we take yours to start? Does that sound good?

**STUDENT** Sounds good.

**PRESENTER 1:**

**PROFESSOR:** You can take care of this. Let me know when you're ready.

So you're going to have to explain this because it's hard to get the catch of this on here. But it's OK. Just walk us through it. In fact, use the laser pointer-- this is the red button here at the top-- to point out. Tell us what we have over here.

**STUDENT** So immediately, you have the owner who benefits up here and also the employer.

**PRESENTER 1:** And so from there, their banks benefit. And that kind of leads into the economy.

**PROFESSOR:** Tell us about just the first level, right around here. [INTERPOSING VOICES]

**STUDENT** And so the suppliers who supply the materials to Flour, furniture, ingredients, and

**PRESENTER 1:** stuff like-- they benefit as well. And then down here, you have neighboring stores who benefit from the popularity of Flour, bringing in more traffic.

**PROFESSOR:** Neighboring stores. Really creative. They'll benefit from the fact that it's a popular place. Keep going.

**STUDENT** And so competition here, you can extrapolate, to them being driven to produce  
**PRESENTER 1:** better goods.

**PROFESSOR:** Wow, so competition. That's very creative. Keep going.

**STUDENT** And this actually feeds back in to customers who benefit from better quality.  
**PRESENTER 1:**

**PROFESSOR:** I guess competition is a good drive out quality from other bakeries who aren't starting to get good. Flour has to get better or lower their prices or something. Keep going.

**STUDENT** Right. And so the second level here, back to the banks-- they benefit from both the  
**PRESENTER 1:** owners and the employers making income. And then down here, you have friends slash the community. Say you refer a friend and they really like Flour, that's a benefit for them.

**PROFESSOR:** So it's a benefit for the customer if I refer a friend. It's a benefit to me if I refer you to go to Flour.

**STUDENT** It's a benefit for me if you refer me to Flour and I like it.  
**PRESENTER 1:**

**PROFESSOR:** So you get the benefit. But are you attached to me or are you attaching directly to Flour? In other words, do you benefit directly from Flour?

**STUDENT** That's fair. You could say that I definitely benefit from Flour as well if I like it.  
**PRESENTER 1:**

**PROFESSOR:** So maybe this kind of line would be a dotted line-- provides information to, and then directly from. Sure. Keep going.

**STUDENT** And so naturally, the nearby community also branches off from the neighboring

**PRESENTER 1:** stores. One more thing we have over here is the publishers because apparently Flour sells cookbooks and stuff like that.

**PROFESSOR:** Flour sells cookbooks. There's a publisher involved. And they love it. The more Flour bakeries that are around or the more people know about it the more cookbooks they buy.

**STUDENT** And so this leads to the bookstores, I think.

**PRESENTER 1:**

**PROFESSOR:** Book stores. Absolutely.

**STUDENT** And this actually feeds all the way back to the economy. And from the economy--

**PRESENTER 1:**

**PROFESSOR:** The economy "boomp." Giant. The beneficiary. That's great. And what comes off the economy?

**STUDENT** And so this is where we got creative and said that the government, the president

**PRESENTER 1:** benefits from the economy being strong. And then you can even pull out the political parties if you wanted to.

**PROFESSOR:** Sure. So political party, government. This is great. So Flour makes America strong. Forget GM. Forget Ford. Flour does it. I love that. It's a great job.

[APPLAUSE]

Who's up next on the chopping block? Let's get this going here. You get this. I'll give you this to hold. I'll give you this to use as well.

Let's talk about this. Walk us through it. At the center is Flour. What else we got?

**STUDENT** So we have Flour. And then it first goes to the banks and investors.

**PRESENTER 2:**

**PROFESSOR:** Investors. Yes.

**STUDENT** So banks. So people who have money in the bank. So it's really important that the  
**PRESENTER 2:** banks are doing well. Similarly, people who are friends with the people with money  
the banks who needed to be spotted for a meal at Flour also benefit.

So we also have the workers. Their taxes go to the government which helps  
America. And then workers. Their families also benefit from the making income. And  
then it goes to the school system.

**PROFESSOR:** How's it go to the school system.

**STUDENT** Because the children go to school. And then, thus, benefits citizens.  
**PRESENTER 2:**

**PROFESSOR:** So money goes from Flour Bakery to the workers. The workers give money to their  
families?

**STUDENT** Yes.  
**PRESENTER 2:**

**PROFESSOR:** And so how does that benefit the school?

**STUDENT** Because then the children go to school and get educated. You need people to go to  
**PRESENTER 2:** school.

**PROFESSOR:** How do the families pay for that?

**STUDENT** Through their taxes.  
**PRESENTER 2:**

**PROFESSOR:** Through taxes.

**STUDENT** And then the government.  
**PRESENTER 2:**

**PROFESSOR:** Before it gets to the school, where does it go? To the IRS.

**STUDENT** That too.

**PRESENTER 2:**

**PROFESSOR:** And them to the school.

**STUDENT** Yes.

**PRESENTER 2:**

**PROFESSOR:** To the IRS first and then to the school.

**STUDENT** Yes.

**PRESENTER 2:**

**PROFESSOR:** Yes. That is true though.

**STUDENT** And it goes back to the citizens because then you have an educated population.

**PRESENTER 2:**

**PROFESSOR:** So Flour Bakery educates the population. I love that. We'll tell Joanne. She's going to love this.

**STUDENT** Then kind of going on a more fun note-- so we also had neighboring companies,

**PRESENTER 2:** such as Novartis who's like a biotech drug development company which helps hospitals. And then the patients can go to Flour.

**PROFESSOR:** Lovely. Keep going.

**STUDENT** Similarly, we have more customers such as MIT students. And so our parents

**PRESENTER 2:** benefit from us getting an education. Professors and other MIT employees who go to flour. And also the world slash everybody is invested in.

**PROFESSOR:** The world. I can't wait til the next one that says universe. That's good. Big round of applause.

[APPLAUSE]

We've got time for one more example. Who-- yes. Let's take your example. Cannot wait to see it.

**STUDENT** So ours is similar to many of the others. We have some things that other people  
**PRESENTER 3:** didn't have--

**PROFESSOR:** Point out the differences.

**STUDENT** --in local gyms.  
**PRESENTER 3:**

**PROFESSOR:** Local gyms benefit from Flour.

**STUDENT** They do.  
**PRESENTER 3:**

**PROFESSOR:** Tell us why do local gyms benefit from a place that sells lots of bakery  
confectioneries.

**STUDENT** Flour is really delicious. And then people eat a lot of it. And they get really fat. And  
**PRESENTER 3:** then they would like to lose some of those calories.

**PROFESSOR:** So the Z Center, the MIT gym, benefits from Flour being there because more  
people use the Z Center who may not otherwise use it because they're saying, I  
love Flour so much but I've got to work out the calories.

**STUDENT** Exactly.  
**PRESENTER 3:**

**PROFESSOR:** Local bike shops maybe as well.

**STUDENT** So their employees benefit too.  
**PRESENTER 3:**

**PROFESSOR:** Their employees absolutely benefit. Yes.

**STUDENT** And we also had hospitals in that similar--  
**PRESENTER 3:**

**PROFESSOR:** As Diabetes go up.

**STUDENT** Exactly.

**PRESENTER 3:**

**PROFESSOR:** Yes, they're so tasty they cause diabetes.

**STUDENT** Precisely.

**PRESENTER 3:**

**PROFESSOR:** And hospitals benefit. And doctors from selling--

**STUDENT** And the doctors' families. Yes?

**PRESENTER 3:**

**PROFESSOR:** And the doctors' families benefit.

**STUDENT** Exactly.

**PRESENTER 3:**

**PROFESSOR:** Now this may sound bizarre, but this is true. This is how it happens. Imagine that we had to work it out for a tobacco company. All the people that benefit from a tobacco company selling things, including people who are injured by tobacco because of cancer. So that's all true. What else do we have?

**STUDENT** We had aspiring chefs because of the cookbook. So they can see that. Or even

**PRESENTER 4:** aspiring restaurateurs who see how the owner set up Flour and maybe use it as an example or inspiration.

**PROFESSOR:** Brilliant. What else do you have? What else is brilliant?

**STUDENT** We also have how MIT is generally affected. So if students are eating at Flour

**PRESENTER 5:** instead of the dining hall, then that's affecting MIT. That's affecting the classes and the professors and your classmates.

**PROFESSOR:** And maybe for good. Maybe not for food. This is great. This is an excellent one.

Here's a question. Did anyone get lawyers? Good. Two groups. How about

accountants? One group. Excellent.

Every business deals with lawyers and accountants. Lawyers accountants all the time. Every business, no matter what, deals with lawyers and accountants.

It should be on all of these because, no matter what-- and particularly as a business owner-- boy, I get on the phone with my lawyers, I talk to my accountant. I can't even avoid it. It's not even possible to avoid, particularly when you have to hire people and fire people and the whole bit.

That's why they're such big businesses-- why accounting and the law are such big businesses-- because everybody needs to use them. Any other people have examples of beneficiaries who we didn't list?

**AUDIENCE:** Insurance companies.

**PROFESSOR:** Insurance companies. Yes. Absolutely.

**AUDIENCE:** The farmers.

**PROFESSOR:** Farmers. People actually grow this stuff. Absolutely. People grow stuff and have more supply chains. And this is true. Flour Bakery may have a little impact, but McDonald's has enormous impact on cattle companies, and people who supply tomatoes and lettuce and all those things. Absolutely. Huge impact. Industries are built around these things.

**AUDIENCE:** We also listed internet providers because they offer free Wi-Fi to the customers.

**PROFESSOR:** Free Wi-Fi to the customers as well. Let's go back to slides, please. Thank you. This is excellent. You did a great job. Did we give them a round of applause?

[APPLAUSE]

You got that. This is what we care about though. Why do we care about doing this and why are you going to be doing this yourselves? It's starts out with systems thinking. Establishing a global perspective about the little problem you're trying to

solve. If I said, make a calculator-- a calculator doesn't exist in isolation. It affects a lot of things and can affect a lot of things.

We want to maintain a really big perspective over every small decision we make. Because of that, we can understand how to make good decisions and trade-offs, establish priorities or reestablish them, and be able to communicate more effectively.

Not all stakeholders have the same amount of value to a company. Different stakeholders hold different kinds of value. Joanne may say, look, I really care about my customers but she may not say, I really care about the people who work at the gym. So she may not say, let me put extra fat in the products and then advertise, by the way, with these things, if you care about it, I'll give you a discount to the gym membership.

Which stakeholders do we benefit more and which stakeholders benefit us more? Sometimes, in a nonprofit, we might think we really want to get the best thing out there no matter what because we don't care about making profit. Other times you think, well, we want to get the best thing out there, kind of, but we also want to make sure we're balancing that out with our stakeholders.

An example of this is angel investors versus venture capital. If you're starting a company, angel investors will give you a little bit of money. It's a little bit easier to get the money. And there's far fewer strings attached to that money. A venture capitalist will give you money-- much more money, but they have a lot more requirements.

And so each of them need different kinds of things. Angel investors don't need a whole bunch of return on their investment. And a venture capitalist says no, we want to make a ton of cash. So we'll give you more, but we're going to take a lot more back and have more requirements.

So different kinds of stakeholders would allow us to figure out which do we use. If we understand this network very clearly, it helps us to understand priorities and

trade-offs. And then, if I understand this diagram and convey this to you very specifically, it could help us align the team.

So my software is sold to people at companies. If everybody in my company knows who those people are, who makes the buying decisions, who is going to use it. Are they the same people or different people. How do I make sure that the buying person gets what they need and the person using it gets what they need. They may need different things.

And even though the people who use it may use 90% of the functionality and the people who buy it may use almost none of it, or 1%, do I want to invest that 1% of the functionality even if it costs me a lot of time and effort? Maybe I have to.

So it can reveal hidden cost and opportunities. A cost. A student can get an easy or a difficult C.

From a parent's perspective, which is better? The easy A or the really difficult say? Please pass the class. I'm your parent paying for it. I don't want to have to pay for you to take it again.

So maybe they might think it's really better to have an easy A class. But maybe from the student's perspective, they think, the harder C is-- I'm going to learn a lot more in. And it's better for me and my future.

Or an opportunity. If a company has enough employees, for example, a company can get better buying power with vendors or the gym or something. Because we have so many employees they say, look, we want to have our employees go to your gym or maybe some competitor's gym. If you give a bigger discount, we have more buying power.

Or to the vendors like Walmart. Walmart doesn't pay much for anything because they sell so much. And it's such a valuable brand to have when you're selling something that they make their vendors cut their prices way down-- as low as they can possibly get them. And the idea is that for them is they pass their savings on to the customers.

For the homework, I want you to map out primary and secondary stakeholders, and more if you'd like for two things. An art museum and a new kind of battery technology. So one's a museum and one is a technology.

Starting with technology in the center. I'm thinking about that. All the different ways it connects to everything else around it. A new kind of better technology.

If you have something in mind, you could use that. Just let us know what you used. And if you don't really quite know about battery technology, you could just kind of think about what it might affect. That's the objective here.

Understanding your stakeholders will make a huge shift in your ability to make decisions, to think globally from a systems perspective. And if you can do that on little small projects, as the projects get bigger and more complicated and complex, you'll be able to make better decisions.

And it will help you make decisions when you're not too sure what to do because at least you'll have a framework and be able to communicate that to other people on the team. And they can say, yes, we understand that that's an important feature to add-- to spend weeks or months adding because someone needs it in order for us to sell the product. Any questions about stakeholders or research or Dieter Rams or Johnny Ive?

**AUDIENCE:** Is the homework for Monday?

**PROFESSOR:** This homework is for Monday. In fact, I will show you on the next slide what you've done so far. We had an introduction. We went over the 10 step design process. We actually moved Dieter Rams to today.

And what's due on Monday is the game design and the stakeholder analysis for games. Have a wonderful weekend. If you have any questions, email us at eid-questions. Thank you.