ilLUminate Blog Transcript: Natalya Vinokurova on What Happened to Kodak?

Recorded February 11, 2025. Listen to it here.

ANNOUNCER: 00:12	[music] This podcast is brought to you by ilLUminate, the Lehigh Business Blog. To learn more, please visit us at business.lehigh.edu/news.
JACK CROFT: 00:24	Welcome. I'm Jack Croft, host of the ilLUminate podcast for Lehigh University's College of Business. Today is February 11th, 2025, and we're talking with Natalya Vinokurova about how the rise and fall of Kodak is a prime example of a once dominant company that failed to navigate a turbulent period of technology transition. Dr. Vinokurova is an associate professor of management at Lehigh's College of Business. Her research focuses on understanding problems of innovation diffusion, or why some good ideas fail to spread while some bad ideas are widely disseminated. Thanks for being with us today, Natalya.
NATALYA VINOKUROVA: 01:07	Thank you for having me.
CROFT: 01:08	Now, I'm curious, what first drew your attention to exploring that question of why some good ideas fail to catch on and why some bad ideas wind up catching fire?
VINOKUROVA: 01:21	Well, I grew up in the Soviet Union. I was born in Minsk, in Belarus. And growing up in a totalitarian regime had many oddities, but one of which was people kept saying things like, "Things were so much better under Stalin," right? And so that left me with a curiosity why ideas such as totalitarian regimes don't seem to lose popularity, even though patently killing millions of people seems like a bad idea.
CROFT: 01:54	Yes.
VINOKUROVA: 01:57	And so from there, when I moved to the United States, I was very interested in problems of innovation. So when I worked for Capital One as an analyst, one of the things I was curious about is what does it take for an idea from somebody working at the bottom of a hierarchical organization to make it to the top. And as part of that interest, I've explored it on the financial innovation side, looking at mortgage-backed securities, but also on the technological innovation side. So my co-author Rahul Kapoor and I, we wrote a paper about why Xerox invented the personal computer, but then failed to commercialize it.
CROFT: 02:38	Now, what was it about Kodak that led you and Rahul Kapoor, your co-author from the Wharton School in Philadelphia, to focus on that particular company's rise to the top of its field over the course of a century only to fall into bankruptcy when digital technology swept in?
VINOKUROVA: 03:01	Well, we wrote this paper on the Xerox, and as part of that research, there was a lot of information about Kodak and the high-quality copiers Kodak was making and how much of a competitive threat they posed to Xerox. And there is a very popular HBS [Harvard Business School] case on Kodak that is frequently taught in technology strategy classes to MBAs. And Rahul, whose specialty is technology strategy, was teaching this case. And he said to me, "Hey, you talked to all these Xerox people. You did some Kodak research. Can you find me somebody from Kodak who will come and talk to my class?" And I did a little bit of searching. And sure enough, the first person I came across was Steve Sasson, who was the inventor of the first portable digital

camera at Kodak. And Steve is a lovely, lovely human. Among his many positive qualities is he's willing to come and talk to the MBAs. And so we called up Steve and Steve started talking to us about his work. And talking to him, reading the materials we came across when we were doing Xerox research made it very clear that the case that the MBAs all over the world were taught about Kodak was at odds-- and the case is kind of the standard inertia story of they didn't see it coming. They underinvested. They couldn't make the change. And that image of Kodak as a company that underinvested, didn't see it coming, couldn't make the change, was at odds with both our research on Kodak from the Xerox perspective and also what we were learning from Steve about the technology that Kodak had. And that really set us on this road to find out-- and right now we have a paper accepted in the Business History Review. We have another paper that we're hoping to resubmit to Strategic Management Journal.

VINOKUROVA: 04:57 But our overall bigger project is to write a book with the provisional title of What Really Happened at Kodak, right? Because like you said, they were so successful for so long, and yet they couldn't survive this technological transition.

CROFT: 05:14 Now, you conducted a very deep dive, examining the public and company documents, newspaper, magazine, and trade press accounts, as well as extensive interviews with former Kodak employees to gain insight into why the company that had dominated film and print photography for so long failed to successfully transition to digital technology. But first, let's start with what you learned about how Kodak rose to its position of market dominance with film and printmaking in the first place.

VINOKUROVA: 05:53 Absolutely. And this story is fascinating because most people don't realize that in the 1870s, if you wanted to be an amateur photographer, you would have to carry equipment that weighed anywhere between 40 and 70 pounds. You had to have extensive chemical expertise because you had to mix corrosive chemicals to sensitize glass plates, which were kind of sheets of glass. So imagine a window pane that would be cut in, let's say, 8 by 10s, 5 by 7s. And you would carry these glass plates along with the chemicals. You had to mix the chemicals in a certain way to sensitize the glass plate. And while the glass plate was still wet, you had to capture this image and the image capture took 30 minutes, right? So this was this laborious, expensive process. And when George Eastman, who founded the Eastman Kodak Company, started getting interested in photography, there were a total of two other amateur photographers in Rochester, New York, which at the time had a population of about 80,000 people, right? So that was photography before George Eastman got involved. And about 10 years after buying his first photographic equipment, his company introduced this camera called the Kodak camera, which was among the first film cameras. So the weight of the equipment had shrunk from 40 to 70 pounds where you literally had to have a pack horse following you with the equipment to a small box that could be lifted by anybody. And the small box had enough film for 100 exposures. It cost half as much as Eastman's equipment back when he bought it.

VINOKUROVA: 07:52 And all you had to do, the entire expertise of taking pictures was down to what Eastman termed, "You push a button and we do the rest." So you took this box. You pointed it at whatever you were taking a picture of. You pushed a button. And when you took 100 pictures, you sent the camera, first the camera and then just the film to Kodak. And Kodak would develop the pictures for you. They would print you the pictures and they would mail the whole thing back to you with the camera reloaded with film. So this meant that not only was photography more affordable, it was also

more accessible. And Kodak progressively would market-- so Eastman would change his company's name to Eastman Kodak. And in 1888, the camera cost $25. In 1895, it cost $5. By 1901, they introduced the Brownie camera for $1. And this completely changed photography because all of a sudden, you could take a picture in an instant. It no longer took two to 30 minutes of exposure time. And you could take this camera anywhere. And so I think one of the first articles on privacy and concerns about privacy law came by Louis Brandeis writing in 1890, two years after Kodak cameras came on the scene, saying that now we're living in this different world where anybody can have a camera and they can take a picture of anybody else doing whatever they're doing and this has implications for privacy law. And so Kodak developed this market first in the U.S., and they quickly went global. So they had subsidiaries in Australia, in Russia, in the United Kingdom, in France, in Germany, you name it, there was a technological innovation of film and film cameras. But there were also business innovations.

VINOKUROVA: 09:51 So Eastman sold these cameras in drugstores, in grocery stores, really trying to make it available as widely as possible. And the other innovation, which is what we today would call a business model innovation, is that the cameras were very cheap because in Eastman's calculation, each camera would last for at least 20 rolls of film. And that's where Kodak would make its money. And so you can think of it as a camera film business model where the hardware is cheap, but the software is where you make the margin. And then when Gillette razor came out in the 20th century, this became known as razor blade business model. But he [Eastman] had the razor blade business model 20 years before Gillette even thought of going into the razor business.

CROFT: 10:45 Now, what did you learn from that deep dive about, as we get into I guess it was the 1970s as the very first rumblings about this digital technology came in, about how Kodak reacted and what they did and what led to their failure? I mean, as you talk about there, it's widely kind of spread that Kodak was either unwilling or unable to change with the times, but it seems like it was more complicated than that.

VINOKUROVA: 11:22 Absolutely. And I think an important legacy of George Eastman to Kodak was that investing in R&D was fundamental to the company's success. And this was not just R&D of the, "Let's get the next generation of cameras out or let's invent the next color film." This was also basic research. And so to kind of-- to understand Kodak history of investment in digital, we'd have to back up to the 1950s. And in the 1950s, Kodak worked with the U.S. government in part on the surveillance programs on the space satellites. And they developed a camera, and we were fortunate to interview folks who worked on this camera, which would go into space. And in space, this camera would develop its own images, scan them in using an analog scanner, and then broadcast the images as signals to Earth. And there would be three radio stations on Earth picking up those signals and reconstituting them into images. So this camera enabled-- from kind of a world history perspective, it enabled the lunar landing because this camera took the pictures that told the Apollo program where they could land. But from a technological perspective, if somebody asks you, "When did Kodak know about wireless transfer images?" 1950s.

CROFT: 12:54 Wow.

VINOKUROVA: 12:56 And so I think as we think about Kodak, there are these two interacting pieces. One piece is a technological innovation. So in 1969, the Bell researchers developed this technology called the charge-coupled device, the CCD. And what the CCD was is it

allowed you to have an electronic sensor for taking photographs. So that was 1969. In 1972, the Kodak Research Laboratories created a group of researchers whose job it was to come up-- to take this charge-coupled device and turn it into a full-color sensor that could be used in an electronic camera. So that happens in 1972. And by 1974, these researchers have a prototype. And in 1975, Steve Sasson at Kodak invents the first portable digital camera. But as early as 1981, Kodak markets, it was an analog electronic image camera that could take 2,000 images per second for them in kind of the industrial application side. So Kodak starts investing into digital before there is any kind of inkling that there would be a market. And when they look at the consumer piece of it, what they realize is that the expense of the materials, the expense of these sensors-- because by the way, in the 1970s, nobody in the world knows how to mass-produce charge-coupled devices. Nobody in the world knows how to mass-produce these electronic sensors. And in 1981, Sony introduces, or rather, Sony demonstrated a prototype of an electronic camera.

VINOKUROVA: 14:47

And Sony says, "Oh, yes, yes, this will be out. It'll cost $660 and will be out in 18 months." And this is kind of the real public announcement here. The age of new photography is here, where this is all happening. Except for the problem is, even back in the day, $660 was a lot of money. Something like 80% of consumers operated with cameras that cost less than $50 at the time. And resolution-wise, neither Kodak's prototype nor Sony's prototype remotely comes close to reproducing the quality of these images. And so despite this announcement, Sony takes another five or six years to actually bring something to market. And during this time, it becomes clear that the consumer market will not be there for this device. And Canon and Kodak and Sony, all three, switch focus to journalists as a target market. In the reviews when the pictures come out in '86, '87, because it's not like-- the cameras they had in the '70s and the '80s were not like the cameras we know today. So these cameras, they could take a picture, but then there was no display device. So you needed a display device. And so let's say you had a TV, but you needed some kind of a device to tell the TV what to do. So you would need to spend about $30,000 to take this camera, which turned out to be priced at around 3 or 4,000 dollars, and actually do anything with it.

VINOKUROVA: 16:30

So imagine you are a journalist in the newsroom, and good news, this technology saves you a couple of hours. Bad news is it costs hundreds of thousands of dollars if you need to have several of these systems. And also, by the way, the pictures come out that are barely good enough to be a newsprint, never mind fancy magazine photography. And so Kodak and Sony and Canon all do their best to improve the various pieces of this technology. But there is really no consumer market. The consumer demand for this technology does not emerge until the late '90s. So imagine you are in this position where you have the technology, or at least you know it's coming, you are pioneering all these developments. And so Kodak was different from Sony and some of the other Japanese manufacturers because for the Japanese manufacturers who were, by the way, heroically trying to figure out how to mass-produce sensors, for them, the goal was to use the same quality sensor in their video cameras as in the digital photography, which at the time was not quite digital. And so these sensors were very low resolution, right? So you would put one of those pictures on TV and it would look very grainy. And Kodak had a very different approach, right? For them, they were trying-- their aspirational point was to get to the high resolution to replicate the quality of their color film, which was, depending on whom you ask,

anywhere from 10 to 20 to 30 megapixels a frame. Kodak channeled these advances into introducing products for industrial and professional photographers.

VINOKUROVA: 18:26

So in '86, Kodak comes up with the first megapixel sensor. And in the same year, they introduce a camera for industrial applications, which is the first camera that if you take these images and you print them out, you can match the level of detail of a 4 by 6 [inch]print. So we already have 30 years of investment. So Kodak starts in the '50s. And by '86, a mere 30 years later, they have a sensor that can match 4 by 6, which is a reasonably small format of printing, right? So you've already invested for 30 years, and the market is still nowhere near coming. And so what does Kodak do? They continue to invest. And one of the ways they channel this pioneering high-resolution technologies, they introduce a line of professional digital cameras. Not only do they introduce this line, but they actually open a center in Camden, Maine, to train professional photographers to use digital cameras, right? And again, going to price points, a high-resolution, first single lens reflex camera that Kodak introduces is around $20,000 in, let's say, 1992. And so it's clearly that very few people can afford it, very few photojournalists can afford it. And Kodak keeps introducing these breakthroughs, eventually pushing the resolution of the camera to six megapixels. Even as they make most of their money at the time, they make that on the film products. And they're 30 years in, 40 years in, they're still waiting for digital to take off.

CROFT: 20:21

Now, that gets us up close to the 2000s. And it seems like one of the key moments for Kodak was its decision to invest heavily in inkjet printing after, as you say, decades of investing heavily in digital imaging that still did not seem on the verge of having a market. So how did their investment in inkjet printing—again, with this idea that that was the future, people would be printing their own images at home—how did that go so wrong for them? And what effect did the advent of smartphones with the large screens and high-resolution cameras have on Kodak's business model?

VINOKUROVA: 21:09

Right. So, I mean, and to be very clear, by 1999, digital cameras do take off. But by that point, there are lots of competitors in this space, right? So the only way you could make money in this business is it wasn't enough to have top market share, you had to have a dominant market share to make money. And absolutely nobody makes money because you have tens of dozens of competitors in the digital camera space. And so for Kodak, Willy Shih, who is now at the Harvard Business School, leads a division that commercializes digital cameras. And one of Willy's brilliant breakthroughs was to charge royalties on the patents Kodak had generated along the way. So if you are a manufacturer who is trying to get into digital cameras, Kodak people will come to you and say, "OK, well, did you know that we hold all these patents and you have to pay us a licensing fee?" But despite that kind of genius, the fundamental dynamics of the industry for standalone digital cameras were such that it was barely breaking even. And so Kodak is sitting there and they need to figure out what to do. And they see HP making a lot of money on inkjet printing. And by the way, Kodak, as part of its R&D investment in multiple technologies, was investing in R&D and had a number of projects, including partnering with HP, as far back as the 1980s. So this is not like a sudden, "We woke up one morning and we'll do inkjet printing," but this is this idea that, "If digital cameras enable more people to take pictures, then they're going to print these pictures. So we might as well have a part of that pie."

VINOKUROVA: 22:59 And as you previewed, the unfortunate thing about Kodak timing is that Kodak comes out with its first printer in 2007, consumer-oriented printer. And the idea they had is they would charge half the amount of what HP was charging for its inks and still make a lot of money. The unfortunate thing about their timing is the same year as they come out with their inkjet printer, Steve Jobs introduces the first iPhone. And the smartphones don't just get rid of the need of us to have digital cameras. They also obviate the need for us to print them in order to share them or to view them. And it's one of these interesting pieces where it's not like Kodak didn't see smartphones coming. There are folks at Stanford who wrote this wonderful piece about how Kodak anticipated Facebook and Instagram back in 1996, almost 10 years before Facebook was launched.

CROFT: 24:07 Wow.

VINOKUROVA: 24:07 The problem is they had no way of making it from the future they saw to the future they saw from their starting point. And so this is the story of Kodak where they invented a lot of these technologies. They anticipated a lot of the technologies. But as a company, they couldn't cross over from space A to space B. And in part, we think this had to do with the uncertainty about the timing of adoption of digital photography. And part of that uncertainty stemmed from all the other pieces of the ecosystem that needed to come together, right? So personal computers had to become more powerful. Printers had to become faster. All the wireless technology had to become faster. In the 1990s, I think it's easy to forget that printing a single digital image took 10 minutes, an 8 by 10, if you wanted to print it in color. And so I think for Kodak, it's a combination of seeing things coming but not knowing when they will come that made managing this transition particularly difficult.

CROFT: 25:25 And the transition or, I guess I should say, the downfall happened relatively quickly for a company that had led in innovation for so much of the previous century. I mean, by early 2012, Kodak was in bankruptcy.

VINOKUROVA: 25:47 Right, right. And-- go ahead.

CROFT: 25:50 Yeah, well, I was just going to mention, you've called it a canonical example of a company that failed in the face of technology transition. And based on your research, it seems obvious that they did a lot of things right, and they tried to do other things right. So I'm wondering, what lessons do you see that other companies that now hold leading market positions in what is a highly competitive and almost constantly disruptive field of high-tech today, what can they do to avoid the same fate?

VINOKUROVA: 26:31 Absolutely. I think I agree with you that Kodak story is so relevant to companies today, whether in high tech as they're facing AI or for car manufacturers, the future looked like it was hybrid and maybe electric and maybe hybrid again. So a lot of companies are dealing with these issues of uncertainty, around the timing of the adoption. And I think the other thing that makes it harder for the leadership of these firms to make good choices is there are so many things that could-- there are so many potential futures that could realize. And so in Kodak's case, one of the things we didn't talk about that they did is they tried to diversify. They tried to diversify into copiers. They tried to diversify into pharmaceuticals as kind of alternatives of, "If I can not win in this business, what do I diversify into?" And I think the lesson for the companies today is there isn't a silver bullet. And what's frustrating about the Kodak example is they followed a lot of the management literature's recommendations on

what they should do, right? They invested in R&D, they explored new markets, they diversified, they brought in external executives. Part of the message of this work is not necessarily like, "Here's the recipe for how you do it differently." The message of this work is, "This is an important challenge faced by these companies," right? And the extent to which they experiment widely and try different things, that's really the only prescription we can offer.

VINOKUROVA: 28:16 But I think part of it is there is an organizational challenge of, imagine your CEO of a highly successful company comes to you and says, "Look, we need to make these investments. And by the way, they will be very expensive." Kodak was spending hundreds of millions of dollars a year. And the outcomes of them are uncertain. Having patience for those investments is one of the lessons.

CROFT: 28:44 Now, the work you've been doing with Kodak fits into this broader thing, as I mentioned in the introduction, of innovation diffusion, how ideas spread, why good ideas don't make it sometimes and why bad ideas do make it sometimes. So I believe one of the first studies you did in this area was looking at the mortgage-backed securities, one of the contributing causes to the financial crisis of 2007 and 2008. And you cite this as a prime example of a bad idea that should not have diffused. So again, what were the lessons we should have learned from previous experiences with mortgage-backed securities in U.S. history?

VINOKUROVA: 29:33 Absolutely. So I think one of the things people don't realize, and this is the value of historical work, is the United States had at least three markets for mortgage-backed securities backed by residential mortgages. There was a market in the 1870s, there was a market in the 1920s, and then there was a market in the 1970s. And one of the lessons of my work is in presence of fragmented regulation, it's hard to manage systemic risk because there isn't even a memory for the previous experiences. When I say fragmented regulation, the United States has dozens of bank regulators and hundreds of banks. In places like Canada, in places like Denmark, you have one regulator in four or five banks, which makes regulation a more tenable proposition. And specifically, it makes memory for the past a more tenable proposition.

CROFT: 30:32 What are some of the other examples of bad ideas that should not have caught on that you've come across in your work?

VINOKUROVA: 30:41 Right. And when we think about bad ideas, I think of ideas that cost people's lives or impact people's lives negatively. So kind of easy examples of that is leaded gasoline. When GM introduced leaded gasoline, their scientists knew that there were other ways to make gasoline more stable. But they proceeded to introduce it anyway. And it didn't just catch on here. It caught on all over the world. You can say cigarette smoking is an example of a very bad idea that unfortunately still continues to cost people's lives.

CROFT: 31:19 And what are some of the examples of good ideas that should have caught on, but didn't, that you've come across?

VINOKUROVA: 31:26 Well, so let's take electric cars. One of the things people don't realize is at the birth of the automobile, electric cars were already an option. So imagine what our world would look like if instead of the gasoline-powered engine, the electric-powered engine would win back in the 1900s. We would live in a very different world with less dependence on fossil fuels, one can imagine.

CROFT: 31:53 Now, finally, we've covered a lot of ground today, but I'd like to give you the opportunity if there's anything we haven't talked about in terms of your research that you think our listeners should know regarding how business ideas diffuse?

VINOKUROVA: 32:08 I think kind of one of the themes of my research is this idea that oftentimes ideas diffuse by analogy. And failure to question the analogy by which ideas diffuse is in part what allows them to do so. So Rahul and I are working on an op-ed for the Wall Street Journal about why Bitcoin is not like gold. And any kind of belief that Bitcoin is gold or a good store of value could lead to a financial crisis like the one we saw in 2008. So this idea of analogies as a means of promoting the diffusion of ideas, a powerful means that need to be questioned is the broader theme of my work.

CROFT: 32:55 Natalya, I want to thank you for being with us on ilLUminate today.

VINOKUROVA: 33:00 This was great. Thank you so much.

CROFT: 33:02 Now, Natalya's research has been published in top academic journals and won numerous awards, including the Philip B. Scranton Prize for Best Article in Enterprise and Society, the Most Novel Research Award from the Behavioral Strategy Division of the Strategic Management Society, and the first prize from the Industry Studies Association for her dissertation. This podcast is brought to you by ilLUminate, the Lehigh Business Blog. To hear more podcasts featuring Lehigh Business Thought Leaders or to follow us on social media, please visit us at business.lehigh.edu/news. This is Jack Croft, host of the ilLUminate podcast. Thanks for listening. [music]