

**EPISODE 341****[INTRODUCTION]**

**[0:00:00.2] JM:** Artsy is an online art marketplace. This might sound like a simple engineering problem, you just set up a basic e-commerce site, you list some pieces of art and then you start making money, right? The art world is actually really complicated. There are four major pillars. There're patrons, art fairs, galleries, and auctions, and if you want to bring these different parts of the art ecosystem online, it's actually not trivial. In order to do so, Artsy has to work with the pre-existing ecosystem. This is not like the taxi industry where you can aggressively compete against the pre-existing businesses.

The art world is built around relationships and trust and the engineering is actually hard to. An art auction is a competition for a transaction for millions of dollars. In this way, building an auction system is like building a trading system; the latency needs to be really low you can make any mistakes or else customers are going to suffer to the tune of millions of dollars. In today's episode, we discuss all these.

Daniel Doubrovkine is the CTO of artsy and he joins me for a discussion of the complexities of the art market and the engineering challenges that come with building a software company around it. I hope you enjoy this episode.

**[SPONSOR MESSAGE]**

**[0:01:33.2] JM:** For years, when I started building a new app, I would use MongoDB. Now, I use MongoDB Atlas. MongoDB Atlas is the easiest way to use MongoDB in the cloud. It's never been easier to hit the ground running. MongoDB Atlas is the only database as a service from the engineers who built MongoDB. The dashboard is simple and intuitive, but it provides all the functionality that you need. The customer service is staffed by people who can respond to your technical questions about Mongo.

With continuous back-up, VPC peering, monitoring, and security features, MongoDB Atlas gives you everything you need from MongoDB in an easy-to-use service. You could forget about

needing to patch your Mongo instances and keep it up-to-date, because Atlas automatically updates its version. Check you [mongodb.com/sedaily](https://mongodb.com/sedaily) to get started with MongoDB Atlas and get \$10 credit for free. Even if you're already running MongoDB in the cloud, Atlas makes migrating your deployment from another cloud service provider trivial with its live import feature.

Get started with a free three-node replica set, no credit card is required. As an inclusive offer for Software Engineering Daily listeners, use code "sedaily" for \$10 credit when you're ready to scale up. Go to [mongodb.com/sedaily](https://mongodb.com/sedaily) to check it out. Thanks to MongoDB for being a repeat sponsor of Software Engineering Daily. It means a whole lot to us.

[INTERVIEW]

**[0:03:32.1] JM:** Daniel Doubrovkine is the CTO of Artsy. DB, welcome to Software Engineering Daily.

**[0:03:37.7] DB:** Thanks for having me.

**[0:03:39.4] JM:** Artsy is an art marketplace. Before we get into the engineering of Artsy, I'd like to talk a little bit about the art market, because I think that's going to can help motivate why this is a fascinating set of problems for a technology company to tackle. I saw a series of videos produced by Artsy on YouTube that described the four aspects of the marketplace of the physical art world; these are patrons, art fairs, galleries, and auctions. Can you describe how these different sides of the marketplace work for the brick-and-mortar art world?

**[0:04:16.4] DB:** Yeah, it's a fascinating business but it's also very interesting and inspiring world as well. The commercial side of the art market is of course a big deal, but the world is full of millions of people, tens of millions, hundreds of millions, billions of people who are interested in art and who interact with art all the time. Museum attendances never been as high as it is now, for example.

Once you venture in the buying art market, you have a primary market which is our dealers. Those art galleries, and you can think of galleries as agents that hire artists, maybe fresh out of school, completely unknown, and pay them for, let's say, two years to pay then put a show

together then create a real market for the artist by engaging collectors, catering to collect their needs, helping collectors find this artist. That's called the primary market.

Then the artist might become maybe well-known, their works may have more value. Maybe some works will sell at bigger galleries, more prominent ones. Maybe they'll exchange hands between private collectors, and then eventually some of these works will make it to auction. Auctions is if you want the public art market, but this is for secondary market works, and that's what you read in the newspapers about sometimes where Picasso will sell for hundreds of millions of dollars and things like that. That's the essence of the commercial art market. Of course, you have all these players like art fairs, dealer, et cetera, et cetera.

**[0:05:50.1] JM:** When Artsy got started, what were the inefficiencies in that brick-and-mortar art marketplace that you were hoping to be able to fix?

**[0:06:00.2] DB:** The hardest and the most interesting thing for us was helping people find art that is not available in their physical environment. For example, if you don't live in a major city in the United States, you actually have very few opportunities to see the fine art world. What we wanted is to really help with discovery and we wanted to find a way to do that in a some kind of unique proposition. Artsy was actually born in something called the Art Genome Project, which is a classification system for art and it tried to mimic the experience of you walking into a gallery and seeing curated show put together by an art historian, maybe a work and similar works by other artists, and then to scale this to literally millions of pieces of art. It's kind of this infinite exploration, infinite discovery process.

**[0:06:54.2] JM:** When we're talking about the way that a piece of art's market value is determined, historically, this is often done through auctions. What are some of the problems with art auctions?

**[0:07:07.7] DB:** Actually it's not quite true that the price of works is determined by auctions. Auctions determine kind of the price of works that are at the very high end, I would say, and auctions is one way to sell art. The primary market sells art typically in the \$5000 range by basically inventing that price. They just say, "This work is worth this much," and if somebody buys that's now an actual amount that the work has sold, so that creates a floor for that price. If I

can sell you something that I call art at a certain price, well that's what it's worth. Auctions is like a more visible public way of doing that.

Auctions actually are very good and efficient way to the sell art because you have all the information and everything is available to you in a very very publicly available setting. The only thing I'd say is that auctions traditionally were very much off-line and I think this has changed quite a bit. We work with every single auction house out there and put their auctions online amongst many other things.

**[0:08:11.7] JM:** Prior to Artsy, how was the internet changing the art market?

**[0:08:18.4] DB:** It wasn't. I think there were some attempts at coming online and they were always geared to commerce. A company called Artnet has existed for 20 years now and they're the true pioneers of art online, I would say. They focus primarily on auction data and maybe commerce on top of that. There were other companies that try to mimic art fairs, like notoriously known VIP Art Fair was a startup that had a lot of technology issues and tried to replicate the offline art fair experience on the internet and has not succeeded at that. Then museums were very reticent to putting works on the internet.

I guess you would find you some artworks up there from the museum world, from the gallery world, but that would be pretty spread out. With Artsy coming in, I think we really demonstrated true value of what you can do online when you bring a large data set, a lot of works on the internet, and so it has worked quite well ever since.

**[0:09:20.1] JM:** The mission of Artsy is to make all the world's art accessible to anyone with an internet connection. One part of fulfilling his goal is to bring the art world online. We've described a complex marketplace, and I'd like to eventually get into the engineer. I want to spend a little more time just kind of diagnosing this world. What does it mean to bring the art world online?

**[0:09:48.8] DB:** I think it's very similar to bringing anything online. There are aspects of this business that are done traditionally with humans and the art business is notoriously done with humans and this is great, you have art curators, historian, specialists, gallery dealers, et cetera.

This is very much a physical aspect of the art world. Then there are some basic communication needs, like if I want to find the work to buy, I'd like to see all the works available that I'm interested in. Basic discovery problems, and then some inefficiencies.

I think the online aspect of it is mostly new and enabled by the internet, and the offline aspects of it will continue being very important and relevant. It's very much like any other market where anything gets exchanged.

**[0:10:42.5] JM:** Okay. There are thousands , hundreds of thousands of art pieces for sale on Artsy. What's the workflow for an artist getting a piece of work online?

**[0:10:53.6] DB:** There are actually many hundreds of thousands and many more that are on the platform that you may not see on the site. We don't work with artists directly. We engage with their agents, galleries, museums, institutions, and so on. If you're an artist that is represented by a gallery, your gallery typically subscribes to Artsy for a fee and they are the ones managing their inventory, all the information about the artworks, and then we help a bit with artist information and stuff like that.

The content that you see on Artsy is actually content that comes from thousands of galleries that are partners. We also work with museums, institutions, auction houses alike. It's really data that is provided by a very very large and actually the largest network of gallery museum institutional partners on the internet.

**[0:11:45.2] JM:** Artsy does not take a commission. What's the business model?

**[0:11:49.7] DB:** There are three businesses. The first one is one that does not take commission, and that's working with galleries which upload works, and then a collector comes, inquires in the work, connects with the gallery, goes sees the work at the gallery and hopefully one day buys the work. We don't a commission from that, but its a subscription service from galleries.

We do take commission from auction houses for anything that we sell. You can go today on Artsy and bid on a Phillip's auction, on the Christie's auction, and so on and so forth, Julian's

auction of Street Art, that is quite awesome. If a work is going to an Artsy bidder, then we'll take a commission from that.

We are also an online publication. We actually have become the largest online art publication, and that's paid for by brands. We do engagements with brands. For example, right now, at the Venice Biennale, we have a project that is sponsored by a large Swiss bank and it's a VR project where artists are making something that has never been seen before. A little bit more on that line later

**[0:12:54.5] JM:** The third one you mentioned, brands come to you and request some sort of advanced native content.

**[0:13:02.2] DB:** It depends. Think of it as a little bit as advertising. However, we don't advertise the brand's products, we advertise the brand themselves. In some ways, nobody wants to hear about your banking services, but everybody wants to hear about art. If you can be paying for vertical on Artsy for us to produce evergreen content, pay writers well, and things like that, and engage a large amount of people to read about the content, you get brand awareness and you get the benefits of that kind of advertising.

It's like a little bit of the high-end of advertising, because the people who read art content range from high school students, to high net worth individuals, and of course most brands, like luxury brands, attempt to sell to high net worth individuals. It's the same audience, but a larger extent.

[SPONSOR MESSAGE]

**[0:14:01.2] JM:** Artificial intelligence is dramatically evolving the way that our world works, and to make AI easier and faster, we need new kinds of hardware and software, which is why Intel acquired Nervana Systems and its platform for deep learning.

Intel Nervana is hiring engineers to help develop a full stack for AI from chip design to software frameworks. Go to [softwareengineeringdaily.com/intel](https://softwareengineeringdaily.com/intel) to apply for an opening on the team. To learn more about the company, check out the interviews that I've conducted with its engineers.

Those are also available at [softwareengineeringdaily.com/intel](https://softwareengineeringdaily.com/intel). Come build the future with Intel Nervana. Go to [softwareengineeringdaily.com/intel](https://softwareengineeringdaily.com/intel) to apply now.

[INTERVIEW CONTINUED]

**[0:14:58.0] JM:** Do you think that advertising is going towards a place where there is more facilitation between creator people and the brands themselves? I'm working on a business around — A separate business from Software Engineering Daily around user generated advertising. I think this has been something that people have wanted to do for a while because the idea is — The current model of a lot of advertising is you have this agency in the middle and agency brokers a relationship between the brand and the creator, and the agency takes a massive cut. You can imagine a world in which the brand engages more directly with the creator and that middleman gets cut out.

**[0:15:40.1] DB:** Yeah, I can see that. In some ways, that probably is happening but mostly the brands are now walking quickly away from kind of pay per click advertising and are trying to get the value in these creative engagements and in the experiential aspects of it. I think the middleman, of course, should not be taking large cuts if it provides no value. If the only thing that the middleman does is connect the artist to the brand, well that's not very useful.

However, if you look at agencies or the way Artsy engages with artists and brands, that's actually a tremendous amount of work, and we produce a large amount of long tail content based on that. For example, we partnered during the Armory Show with Studio Drift, which is an artist that is represented by Pace Gallery and Microsoft and did an experience with Microsoft's HoloLens, the first time that HoloLens was actually present at an art fair. Studio Drift produced this piece called Concrete Storm, which are these 20-foot tall virtual columns that were kind of wave — Concrete columns waving in the wind, but we also wrote a lot of related content and spent a lot of effort having this content reach a very very large audience. While the experience itself is the beachhead of that, there's a lot more to it than just connecting the artist and the brand there.

**[0:17:10.2] JM:** You mentioned this move away from pay per click advertising. We've been covering this a lot on Software Engineering Daily, where if you do stuff like pay per click or pay

for a number of impressions, a lot of times these are susceptible to fraud or just faulty metrics just because you have all these third parties that are trying to interact and they're trying to decide on you know how much something should be priced and you have potential for intervening poorly aligned players. Brands are just kind of saying, "Well, you know what? Let's just forget the metrics and just like go to this experiential stuff, this brand advertising. We figure maybe we can't measure it very well but we think that this is going to work." Do you I'm accurately representing the change in mood for the brands?

**[0:18:02.4] DB:** I think it goes further than that. If you think of how a brand goes truly viral, it's now increasingly a network of people. You have to market to influencers in order to reach a very wide audience. You can no longer reach a very wide audience with banners that everybody will click. What exactly are you measuring? You may have very very few people click on the ad, but if those of the right people, that those people can truly become advocates for your brand, then you can have this network effect.

Products are no longer sold, I think, in this very direct way. What brands a finding is that that advertising just doesn't work. They want to find different ways of having customers fall in love with their product as supposed to before which it was just about informing the audience about the product. I think that the shift is pretty big and it's the shift in the way that people are choosing what to buy. They want experiences. They don't just want things as much.

**[0:19:05.3] JM:** There was a discussion for a while that like, "Oh, you can't really plan," or at least this is what I interpret it, that you can't really plan for viral marketing. Basically, companies were saying, "We'll take some gambles on stuff, but we can't plan for viral marketing. There's no way we can manufacture viral marketing." Is there way to — We saw the Pepsi ad recently. Okay, side question. Do you think the Pepsi ad was a success for Pepsi?

**[0:19:35.4] DB:** I don't think so, because on one hand, any kind of advertising is good advertising I suppose. Any kind of publicity is good publicity. I think it it can be also extremely damaging to the brand in the long run. I think what's important is that a brand is the hardest thing to create. Having something out of nothing like that, something recognizable by a broad public is extremely difficult. If you can achieve that, that's very long-lasting.



I think you may get more Pepsi sold because you'll somehow think about it, but in the long run it will signal probably a decline. I do think it matters how long you measure this and what you want out of it. I just don't think it simple anymore. It's not just about eyeballs.

**[0:20:23.5] JM:** Yeah, that's exactly how I felt about that ad was — And I was thinking, “Is this really the best way to spend \$5 million?” or whatever it cost to produce that ad, “Can't you find some sort of marketing message that's more positive?”

Anyway, I guess we're getting off topic here. Okay. You mentioned these three business, the first one was this subscription marketplace business where an art gallery can subscribe. I heard this business model similarly on Instacart. This is what Instacart does, where a grocery store, like Whole Foods, will pay a subscription to have their products indexed online. It's pretty cool because it turns what would be otherwise a marketplace business where it's transaction-based into a subscription business so your revenue becomes a lot more predictable. That's interesting.

**[0:21:17.3] DB:** It aligns interests between the buyer and the intermodal horse is now your entire values not the transaction and the in the arts world you think of millions of people interested in looking at the art but only a few will actually buy. You can't have a transactional business there. There is actually tremendous amount of marketing value as well.

**[0:21:39.6] JM:** Does Artsy handle inventory and logistics and shipping?

**[0:21:44.0] DB:** We don't, and eventually we probably will, but that's something that's handled already by many companies. You can imagine in our future where we'll just make that available to all partners through partnerships with many other players there.

**[0:21:57.0] JM:** Are there specific requirements for doing inventory and logistics and shipping for art? Because I can imagine like you need some really high-dollar insurance on those pieces of art and you need great care taken to ship it.

**[0:22:13.1] DB:** Yeah. Most art is sold with shipping and insurance to be dealt with later. You buy a piece and then like, “How would you like to ship it?” You call your personal art shipper and they give you quotes and then they come and pick it up and carry it and hang it on your wall. It

all depends on the price points of course. It's just more expensive and handled with more care. These pieces are unique, so losing a unique work of art is catastrophic compared to losing a non-unique item that can be replaced.

**[0:22:48.5] JM:** Yeah. It's not commodity.

**[0:22:50.0] DB:** No.

**[0:22:50.1] JM:** It seems like Artsy is fitting into the pre-existing workflows of the art world, but you're also trying to change things. Are there any tensions between these two goals?

**[0:22:50.1] DB:** I'd say we do the former a lot more than we do the later. We're really trying to find places where we can provide additional value and create new value as supposed to destroy something that's already there. I think tensions exist, of course. If you look in some ways, Artsy can be seen as an art fair, but just online, and you would wonder like, "Why would the gallery go to an art fair which is extremely expensive?"

I think galleries are asking those questions anyway, and Artsy has very little to do with that. There are some tensions, but overall I think the reason why we are successful is because we take a partnerships model and we try not to compete with anyone in the art world and really find value that we can add to them other than — We're not the disruptors, even though the art market is already been disrupted by the internet itself.

**[0:23:58.7] JM:** It's not like the world of taxis or the world of book sales where you have these entrenched monopolists that are taking rent from the ecosystem as much. It seems like all, all along, art has been funded by patrons, ultimately, and these patrons are interested in paying money to the artists, hanging out with the artists. It's been a symbiotic relationship all along rather than the parasitic relationship that you have in things like the taxi industry where you do have — Or the hotel industry, where you do have these businesses coming in and "disrupting".

**[0:24:43.0] DB:** Yeah, I think the art market is definitely exist because there are patrons that buy art, and I think in the future many more people will buy original art. I think it's unlike the taxi industry because the taxi drivers are ultimately more like a necessity than anything else, and

once we have autonomous cars then nobody needs to drive the car anymore, like everybody is alike.

In the arts world, the specialists, the galleries, the artists are extremely unique. If you imagine any business as a graph of relationships, then the art world is extremely heavy on the edges, and there are many many many of these edges. While businesses, like hotel businesses, or taxi businesses, can be centralized for greater efficiency and everybody wins, except of course the people who work in the old scheme of things.

Yeah, there is of course speculation the art market. There mega galleries. There are people who control the art market by buying, selling large amounts of inventory, et cetera. It's not necessarily uniform as you might think.

**[0:25:48.1] JM:** Why are more people going to buy art in the future?

**[0:25:50.8] DB:** Because I hope that people will realize more and more it's value. I think that once you've replaced most human repetitive activity with robots and once you have things like universal basic income, we're going to have to find something to do.

**[0:26:08.1] JM:** I was hoping that would be your answer.

**[0:26:10.0] DB:** We're not going to become artists. Artists is just one part of the equation. We'll grow the entire ecosystem around. There will be more artists, but they'll also be more galleries because there'll be more interest in art, there'll be more education. We'll pay attention to the schools a lot more, et cetera, et cetera. That's, I think, the bright future as I imagine it.

**[0:26:30.8] JM:** Even the, I think, pessimistic version of the future — By the way, I completely agree with you, but even the pessimistic version where we go to District 9 and we just have like 5% of the population is just extraordinarily wealthy and 95% of population is completely unemployed and living in a slum, there probably would be more artistic transactions, because the 5% is just extraordinarily rich just need something to do.

**[0:26:58.2] DB:** We all speak French at that point, right? Actually, the actually the more transactions in the art market is something that's happening anyway because the rich are getting richer and the poor are getting poorer. If you think about people who are able to buy art, there is an increasing amount of people able to buy art and that's happening without kind of positive disruption in the world. I'm just thinking that instead of this continuing forever, this probably will get fixed and it will get fixed by things like UBI, but I think it's in a while. It's not going to happen tomorrow, but sooner than we think.

Today, the statistics are saying for every family that buys art, there're 250 families that can afford art and don't buy it. I think most people who are listening to this podcast can afford art. Art doesn't cause tens, hundreds, millions of dollars. Most art transacted in very very low thousands and you pay that for a month on a rent. Buying one piece a year or one piece every two years is completely reasonable.

I think the other problem is that today we think of art as a luxury and it will, I think, become a little bit more like asset allocation and a little bit less as like buying something that has no value in itself because as the market grows, you'll be able to sell it if you don't want it anymore. It will hold its value its intrinsic value. Right now it only holds value if there is speculation around it and maybe you bought something that become suddenly extremely successful and goes to auction and then sells for hundreds of times that amount. I think it will be more like houses and a little bit less like art is sold today.

**[0:28:41.8] JM:** Yeah, it's fascinating. Okay. Describe the tech stack for Artsy.

**[0:28:46.7] DB:** Yes, let's talk about the text stack.

**[0:28:48.9] JM:** Yes, welcome to Software Engineering Daily.

**[0:28:53.4] DB:** Yeah, the art market, it's very interesting. By no means, I'm not an expert in the art market, whatever I may think of it happening. I think there's many many smarter people that know a lot more than me about it.

Yeah, software engineering, I know a tiny bit more than about the art market. Artsy 's tech stack. We started as a typical Rails monolith and we peeled off different parts of the system into different services, front-ends, back-ends, and stuff like that. When you go to Artsy today what you see is mostly JavaScript set of applications and those applications talk to some graphic URL layer most of the time which itself talks to a bunch of back-ends which has services backed with databases that are not your typical MongoDb's or Postgres. Then there's a bunch of services on the side that kind of take data in and do something with it and send data back to be rendered maybe somewhere on the front-end. That's I guess the very high level overview of the system.

**[0:29:59.3] JM:** Are you using Kubernetes at all?

**[0:30:00.9] DB:** We are. We we've started deploying a lot of services with Kubernetes in the back-end. We're still, I'd say, in a second experimentation phase. We continue using Heroku heavily for our apps. For example, [www.artsy.net](http://www.artsy.net) is an Node.js app that runs on Heroku. Then for larger things, we've been using OpsWorks, AWS OpsWorks, and now we primarily standardize on Kubernetes for services and trying to get out of the grip of this whole large-scale system and deployed in a more uniform way. So we'll end up with Kubernetes a hundred percent I think.

**[0:30:38.3] JM:** Hosted where?

**[0:30:39.5] DB:** AWS is our default place.

**[0:30:41.9] JM:** You think Kubernetes will be hosted on AWS even in the future?

**[0:30:45.8] DB:** I think so. Yeah, I don't see why not. Maybe these things will be replaceable. Maybe it will be Google's cloud or whoever else's. I don't think that's very important. We've been users of AWS in every single possible way. We'll continue using that as much as we can.

**[0:31:00.5] JM:** Sure. You mention AWS OpsWorks. I don't know what that is. Can you tell me what that is?

**[0:31:06.2] DB:** Yeah. OpsWorks is — You can build a very simple — It's service by Amazon and you could imagine your app has a certain model of which could be, let's say, a Rails app, you can push it to Heroku and you don't need to worry about anything. Then you say, "I want to decompose my app into maybe a load balancer, some back-end, some front-ends of the debate," stuff like that. You can describe this in OpsWorks, and OpsWorks as a Chef-based environment. Basically you write Chef scripts and you can describe your entire system that way and OpsWorks runs it, deploys it, upgrades it, and all these kind of stuff. It's a layer on top of all these primitives that Amazon provides and the glue is Chef.

**[0:31:49.0] JM:** It's like a declarative layer, right?

**[0:31:52.5] DB:** Yeah. If you used Chef before and you wonder what should you do now that you've written all the Chef stuff? Where you go? OpsWorks could be the plates. That gives you tools to do some things well.

**[0:32:08.4] JM:** Is that something you would want even like as you grow to having more and more stuff on Kubernetes. Do you need that kind Chef scripting stuff?

**[0:32:19.6] DB:** No you don't. I think that's — The key is — Now you can build Docker containers on your own machine if you want, or in some kind of pipeline and gets rid of a lot of that logic about what that looks like once deployed because Kubernetes does it for. By all means, this is an older way of doing things.

**[0:32:37.4] JM:** Yeah. To what degree do you want to prioritize? I guess it's not a huge deal probably for Artsy, I'm guessing. How big of a priority is it to get your stuff onto Kubernetes? You have this nice little declarative place that looks like it's the future rather than this sort of legacy system.

**[0:32:55.8] DB:** The way we work is that as we build new things, or as we replace existing things, we tend to replace their ingredients and components. I'd say the majority of the work today is done in the way which leverages this kind of new technology and then the majority of maintenance uses the old stuff, because we don't want to change it yet.

We actively delete systems. We tend to go slower on retrofitting existing systems into something newer unless we want to do a ton of work in them. If it's working, we tend to not touch it as much. I'd love to have our front-end not be hosted on Heroku for a variety of reasons, but it's not exactly showing problems, so I'm okay with not touching it too often.

**[0:33:44.1] JM:** You're in a nice place because it's not like a Twitter or an Uber type of business where it's super data-intensive and you're going to have these crazy customer spikes that are unexpected. You probably have a pretty stable, just like slow growth, slow and steady growth where maybe you have spikes in load but it's mostly due to like a backend cron jobs and stuff like that.

**[0:34:07.5] DB:** I think there are some aspects of this business that are very spiky. For example, live auctions, real-time auctions. We have to build systems to allow you to bid on a hundred millisecond round trip. That's a good example of where we've taken and build completely new technologies. If you look at the — We've built a service in Scala to do real-time bidding and its using Akka very heavily, and we built front-ends with React, and there is Redux and others so that the whole workflow is totally different from the way we've built the website or apps before. It's an event-based system and it's a totally new kind of beast.

Where we could get away with building 60% of Artsy is Ruby and another 60% of Artsy is a JavaScript Node.js. It's used to be backbone, stuff like that. That was really the question of; how do we change that entire system to support this totally new wild requirement? I'd say it's quite esoteric in places and we've learned from that we are applying that in many many other places today.

**[0:35:15.5] JM:** The auctions, are those entirely online or are you synchronizing with some real in-person auction that's occurring?

**[0:35:24.1] DB:** The auction is actually occurring physically in the auction house with a person with a hammer and the paintings being carried around. I encourage you to visit. If you're in any big city, go visit an auction. These are usually open with no registration required, [inaudible 0:35:37.5] and others.

There's a person with a hammer and then there is a bunch of people that are writing down the numbers. There's an Artsy person that writes down the number onto an app and then we run the auction online and peril. We bid for you.

In a way, it's the same thing as phone bidding. Before you can get an agent who was on the phone and bidding on your behalf in the room, now we can have one agent for millions of people if millions of were to bid, but at least hundreds and thousands of people today that are bidding actively in auctions. We also run the auction beforehand, so before there's the actual hammer event. There are some offline, like eBay style going on until the auction opens.

The last 10 feet of the auction is still very manual and I think it will take a few years until the auction houses let different people integrate with electronic systems and that various degrees of sophistication today. Some have them. Some don't have real electronic systems. Some use off-the-shelves stuff. It's all over the place, literally.

[SPONSOR MESSAGE]

**[0:36:50.2] JM:** Catch bugs before your users do with full stack error monitoring in analytics, for developers, by Rollbar. With Rollbar's error monitoring, you get the full stack trace, the context, and the user data to help you find and fix impactful errors superfast. You can integrate Rollbar into your existing workflow. You could send error alerts to Slack, or HipChat, or you can automatically create new issues in Jira, Pivotal Tracker, or Trello.

Adding any of the Rollbar SDKs is as simple as a single command. Start tracking production errors in minutes. One cool feature is that GitHub repos could be deep linked directly to your stack traces in Rollbar. Go to [rollbar.com/sedaily](https://rollbar.com/sedaily), sign up and get the bootstrap plan for free. Used by developers at companies like Heroku, Twilio, Kayak, Zendesk, Twitch, and more.

To check out Rollbar, go to [rollbar.com/sedaily](https://rollbar.com/sedaily). Sign up and get the bootstrap plan for free. Thanks to Rollbar for being a sponsor of Software Engineering Daily.

[INTERVIEW CONTINUED]



**[0:38:07.7] JM:** What a strange — I have not profiled any businesses quite like this because you have this social network/e-commerce platform that's if somebody makes a mistake, if there's some kind of like minor bug, it's not a huge deal, right? You could probably fix most of those things. Then auction, that's a real-time high sensitivity stuff that you really don't want to mess up.

**[0:38:35.7] DB:** Yeah, and it's ironic because when we started working on live auctions, I was trying to build up a new team to build this real-time auctions engine and I have really hard time finding people inside the company who wanted to take on the challenge of building something like this because it was so stressful. At the same time, I had really no hard time finding these people externally because they liked this new challenge.

**[0:39:03.7] JM:** And you live in New York.

**[0:39:04.9] DB:** Yes. There's this contrast of auctions are totally a different beast, and we learned to deal with failure in those — Sometimes the hard way. I think we've done an exceptional job. We have very very very few failures, but it's also because we've built a very robust system. You're right. It's totally stressful and there is one chance to succeed and the sums are high and you don't get the second chance. The work will be sold, the end.

**[0:39:34.3] JM:** I worked at trading place in Chicago for five months and I saw this on the trading side where it's like when the software screws up and millions of dollars of trades are pending, It's just like, "Oh my God!" Just complete panic in the room. I mean not complete panic, but it's like an undercurrent of panic. It's like, "Oh my God! Let's figure this out," because it's like — Did you hire somebody for Goldman Sachs, or J.P. Morgan, or somebody, who's work on trading systems?

**[0:40:03.9] DB:** You're right. Actually, trading system — It's a good point. Trading systems are also auctions most of the time. They're sometimes more complicated, sometimes less complicated. And I'd say the difference is that when the floor stops bidding, everybody's stops bidding. Here, the auction house keeps bidding when your system is down.

I went to look — New York is full of finance companies that have lots of experience with auctions. I went and met lots and lots of people from every auction type business, financial business out there and eventually I concluded that a lot of them are still built papers, scissors, and glue and that I shouldn't be too afraid of rebuilding these systems. We didn't hire any specialists that had auction experience, but we certainly learned a lot from people who are working in this area.

In the end, we ended up building first and eBay style off-line auction which had very few real-time requirements. That served us for three years to the benefit auctions and such and that was extremely simple. Then once we learned from that, we built the live auction system. We did hire and got very lucky to hire somebody who is really knowledgeable in real-time event-based systems and really designed something much more scalable and robust.

**[0:40:03.9] JM:** The paper, scissors, and glue comment is very funny, because if I recall from my time — I've spent so little there. I may be speaking out of turn, but a lot of times these financial companies have to integrate with like a NASDAQ or just the — You have to integrate because you're playing in this big marketplace, and it's not like integrating with a modern API like a Twilio, or some Google cloud API. It's integrate with these horrific legacy systems.

**[0:41:49.7] DB:** You're FTPing text files to banks, right? This is the state-of-the-art, and I'd say the art world is behind that. They don't quite send pigeons to each other, but there are some of that going on. There're different levels of precarious technologies out there inside of this, like legacy things that work quite well but that could be replaced by something much much better with just the minimum of the effort.

**[0:42:17.3] JM:** For a site like Artsy, design is a really crucial. Design is crucial for every business these days, but it's especially crucial for an art marketplace. What's the interaction pattern between the designers who work at Artsy and the engineering team?

**[0:42:33.0] DB:** I love this question. You have to really look at where it comes from first. We get a lot of compliments on the Artsy design, to a point where when the iPhone 6s launched, the Apple person on stage demonstrated for [inaudible 0:42:46.7] with the Artsy app, and people really have complimented us on this, and we've spent a lot of effort.

We actually don't think about it as design. We think about it as something that's quality-worthy of art. If we are going to display works of art that are going to survive us, our generation and the next generation, it has to be a museum-like experience. It's not a coincidence that museums are beautiful buildings. They house humanity's legacy. We wanted to get as close as possible to that, and so we try to design our way out of any kind of heavy presents. We wanted less. Less is more was definitely the approach.

In the early days, we're very heavily design-driven where our head of design was always advocating for this value-based quality worthy of art question, and so you'd constantly go around and be like, "Is this worthy of the art that we are putting up there?"

Today, this is bigger. There're more designers. There're as more engineers. We embed engineers and designers and product managers into collaborative teams and they work like small startups. Their interaction is a full-time collaboration, and they work together, and they each have their own specialties but they comment and bring on all of the other things at the same time.

It's a discussion and ultimately responsibility of the designers to create something that's beautiful and usable and it's the responsibility of the engineer to create something that is also beautiful and usable but also is scalable and robust and so on and so forth, the product manager's responsibility to build the right thing that customers want. It's endless discussions and it's a lot of passion, research, and collaboration.

**[0:44:38.6] JM:** I think it's more about that passion, research, and collaboration than it is about A-B testing.

**[0:44:44.0] DB:** Yes. That's right, because not everything can be measured. You have to rely on a lot of intuition about what is better because these things are sometimes complicated and it's not just about the outcome of who clicks where. It's about creating a product that people love. Not necessarily about creating a product that people only use. Of course, it has to be usable, but it is about treating something that you can feel something about. Really, it's about the art. If everything else is just a service to the art, then we truly win.

**[0:45:16.9] JM:** Yeah, I think this fanaticism for A-B testing sort of gripped the tech world for several years and it's really driving so many decisions at companies like Facebook and Google. I think since then we're starting to realize this, especially with the stuff came out at the election where it's like, "Look at how the stuff could be weaponized."

There's a lot of reflection going on around you how do we really want to design this stuff? Do we really want to design things that make people use a product more and make people click things more but make people feel sick to their stomach? It's sort of like the Pepsi ad. It's like, "Do you really want that kind of advertisement?" Do you really need to do things that way? Why not design just up more pleasurable experience even if it lowers engagement a little bit?"

**[0:46:06.8] DB:** It's interesting. We do A-B testing and all those things, of course, but we're doing them to learn something, to answer questions. Not necessary to build the most efficient product. We really have to think about what KPIs matter, I think, collectively. For example, for an editorial team, I can certainly get A-B tested into a place where I get more social clicks, right? I can get more engaging titles BuzzFeed style where, "This painting is sold \$140 million." My kid can paint that, and that's like everybody is going to click on that.

I think that's like on the A-B testing version of things. What performs better? However those users are less engaged, and therefore I'm getting more clicks, but I'm getting less of actual value that the brand is paying me for. We made the KPI of the editorial team engagement and not how many clicks they have. They strive to maintain the very very high engagement, and they of course measure how many people get to read the whole thing. If whatever they do reduces engagement, they won't do it, and maybe they A-B around that and not around how many people click on stuff.

**[0:47:20.0] JM:** Artsy started, I think you said, in the early days working on this Art Genome project. Can explain what that is?

**[0:47:29.0] DB:** Yeah. It's a manual classification system run by art historians. You have a group of art historians that's kind of having the perfect art historian job, which is to look at art, understand what it's about, and classified it. They create a dictionary for every single work and

they score genes and then they create new genes and this whole taxonomy evolved. For example, you look at a painting and you say, "This is contemporary feminism and I think it's 75 out of 100 contemporary feminist work." They do it based on not what they see in terms of image but in terms of what they know about the work, what they know about the program from the gallery and so on so forth.

This manual data set which is currently many hundreds of thousands of works and many millions of entries in a continuous metadata research project that feeds an algorithm, which is a nearest neighbor algorithm, and that shows you similar works by other artists.

In essence, that's what it is. You see a painting and it would show you similar works by other artists. That's the main navigation system on Artsy. That's what powers recommendations. That's what makes it actually interesting to browse art on the site.

**[0:48:38.2] JM:** Netflix and Spotify and Amazon, I know in the early days — I'm sure to some degree they still do this, but they base a lot of the recommendation systems off of collaborative filtering. If I watch 10 episodes of House of Cards and Netflix is going to recommend those episodes of House of Cards to my friends not because they're making any specific judgment about the content within House of Cards just based off the fact that people like me will probably like the same things that I like. Is there a collaborative filtering component in addition to the categorization? Because what you outlined in your discussion was like, "Okay. You try to figure out the genome of the piece of art," like how much feminism does it display, like, "Oh, okay. You are recently viewing something in feminism. Let's display more feminist stuff to you. I don't know. Maybe you can give more color on the collaborative filtering versus the categorization matching stuff.

**[0:49:44.1] DB:** The Art Genome project is something that's not based on your preferences. It's based on what the art historian says. It's a dataset that is produced — In some ways it's similar to the Pandora maybe a little bit or even Spotify. That a dataset that's the same for everyone. Now, the recommendations that we do on top of that, it's a combination of our genome data and a little bit of collaborative filtering. It depends what your goals are.

If your goal is to show you similar results to what everybody's looking, say, a popularity contest, and sometimes that can be the goal, then collaborative filtering works very well. If my goal is to expand your horizons and show you things that are related but kind of further away, so you can discover more things, then I want something based on data that done by professionals and not based on your preferences. Otherwise you end up with like all green artworks that fit your couch and that's definitely not what we want. We want a discovery engine. We want you to see more. We want you to learn more about art. We think that is what causes you to go from amateur to actually walking into gallery or a museum and maybe one day buying a piece. Not the kind of like everybody likes a specific artist because everybody else likes a specific artist. We want you to learn more and discover not just to buy more.

**[0:51:05.0] JM:** There are these other platforms like Facebook and Instagram and Snapchat where original content, original art is being shared as well as new people talking about — If I go to a museum, of course, I'm going to take a picture of what I see at the museum and post it on Instagram. To what degree do you want to integrate with these platforms, or are you integrating with them?

**[0:51:31.0] DB:** I think Instagram is really powerful in many ways in the art world as this like what is everybody looking at right now in a big city like New York. It is kind of the entry point of a lot of images into your social graph and I think that's great. It really encourages people to kind of get up from wherever they were browsing those pictures at and walk to the real museum. I think Artsy is not dissimilar from that except we come from very different — From kind of very different places.

I think we are very similar in that way. Then on the other hand we are a very rich and curated record of all these work. It's not based on like your friends. It's based on the thousands of galleries, museums, and institutions. It's also a permanent body of works and hopefully — The galleries own their materials, so often they take their stuff down, but most often they're not to keep it. We just hope that this continues growing and once an artwork is sold it still is available, findable, searchable and the information about it lives on the internet forever. You might not be able to see it physically because somebody owns it but at least you can see its image similar to how you cannot see the Mona Lisa today because you can't be in Paris.

**[0:52:49.0] JM:** Businesswise, Artsy seems like it has a really big mode, because it takes some effort to establish these relationships with galleries, or museums, or artists. Can you talk more about those ongoing relationships, and do you build back-end tools for these different parties to interact with Artsy?

**[0:53:13.1] DB:** Absolutely. We started the early days of Artsy, we would go and beg galleries and museums to give us some works. Then we demonstrated that the Art Genome Project works and that's something that can only happen on the internet. You cannot replicate the Art Genome Project to the real world. You just don't have enough wall space. Most works at the Metropolitan Museum are in the basement and will never be seen because there's just — Even though that museum is big, it's not big enough for all those works to be ever seen. It really resonated with them and they solved real value.

Yes, we maintain those relationships at a very high cost. We build a lot of tools for them. We are now building a lot of tools for galleries trying to show them what works, what has interest, what sells, merchants-type tools, and then we're just making the transactions really easy as well over time. You can collect payment and stuff like that without having to constantly use wires or whatever other mechanisms you had before.

Eventually, we'll probably lower, make the transaction fees low and the tools great, and the tools will provide you with the data you need to run your business. I think the software that's out there to run a gallery is way too expensive and one day I hope to be able to tackle this kind of challenges of building really really cheap software for anyone to open a gallery and since there'll be many more, like 100 bucks a month kind of thing. It's not a feasible priority today for me to really focus on that but I think eventually we'll want that, and the tools should be available to everyone. Same thing for collectors, I think. The tools to manage a collection should be free and so on and so forth.

**[0:55:01.9] JM:** It's so funny that's just like every other established vertical where you have some off-the-shelf third-party solution that was built in like the late 90s and early 2000's, words like you Art House Manager 3000, and it's just way overpriced, and it sounds like there's a real opportunity there.

**[0:55:25.9] DB:** Yeah. There are still — Museums use systems that — I'm not kidding when I say they run on thoughts. This is still [inaudible 0:55:32.8].

**[0:55:33.4] JM:** Right. Of course.

**[0:55:34.1] DB:** I think it's very difficult to create the business on tooling like that alone because the revenue opportunity is actually not that big, so I think that's also why. There are great systems out there that do inventory, but they're not thriving companies necessarily.

**[0:55:50.5] JM:** Yeah. On the Internet we're seeing video overtake static images in popularity and much of the visual art you see in museums is a static image or sculpture, or sometimes — There are certainly some more dynamic installations. There are things that are like some sort of wavy material and the wind blows and it makes the material move but does seem like there is a real opportunity for video installation and things with robotics, just like a more electronic infusion for art. Are you starting to see that stuff, and does Artsy — Does Artsy index those types of art?

**[0:56:36.8] DB:** The answer is yes and yes, and actually the video art has been a big deal for decades now in the art world. I think that kinetic sculptures are a big deal too. If go to a good art fair today you're going to find pretty sizeable amount of these and you find galleries that specialize in that kind of art quite a lot. A lot of this large-scale conveying art is also making it in the mainstream and is visible all around the world as.

Artsy has a lot of the still images from those and we've definitely done some video. We've partnered with the Moving Image, which is an art fair, and many others. You'll find that on Artsy as well. A lot of our brand engagements have video components. The one we're doing at the Venice Biennale is actually a 360 video. It's not just video, also VR, AR and so on and so forth. It's totally happening, yes.

**[0:57:32.9] JM:** We're nearing the end of our time. I can envision a lot of the obvious directions for growth for our team and you can grow each of those different verticals that you described. For the publishing side of things, you could obviously get into more video content. I could see that publishing business getting giant. It could become a huge vertical, or maybe it's already — It sounds like it's already quite huge. What are the what the more grandiose business



opportunities for Artsy? What are the things that Artsy is going to be doing in 10 years that would totally surprise me today?

**[0:58:08.1] DB:** I think that would have to surprise me too. 10 years is a very long time. I think that we hope to really aggregate the entire art world. I think we definitely want to one day work with everyone and everything that engages with the world of art, and I'm not sure what that looks like. I think, for now, we are very very happy to solve some real problems between the players that are here today and we'll see how this evolves and what we can do to continue serving the needs of the art world at large.

I think we're going to find out how people consume, buy, and interact with art overtime, and that is certainly going to be big shifts for us. I think that's probably going to change too. It could be that the majority of art is interacted through VR or AR, which is discovered that way. Maybe Artsy will be — Maybe our main application will be on HoloLens and not on the internet, on the web. I can just imagine that if I can see every single piece of the holographic view, Artsy will do all the same things, but the main display will not be a JPEG. The main display — It will be a hologram. That's like pretty — It's a long stretch, but I think 20 years ago if I told you that you'll be experiencing art on your phone, you'd laugh at me.

I think that's where the real innovation and change will come, but it will be the same thing, right? The devices will change. What art looks like will change, but the fact that there are people making art, or AIs maybe will make art, robots will make art, and that people want to consume art and earn more about, I don't think what will change. That's immutable.

**[0:59:56.7] JM:** Yeah. Oh man! We didn't get to the AI stuff. I was at a Google event recently and I was seeing some of the deep dream stuff in-person. They had printed it out on some high quality paper and it was just — That stuff is so beautiful.

**[1:00:11.0] DB:** It is.

**[1:00:12.0] JM:** All right. DB, thanks for coming on Software Engineering Daily. It's been a great conversation.

**[1:00:15.8] DB:** My pleasure.

[END OF INTERVIEW]

**[1:00:21.0] JM:** Thanks to Symphono for sponsoring Software Engineering Daily. Symphono is a custom engineering shop where senior engineers tackle big tech challenges while learning from each other. Check it out at [symphono.com/sedaily](http://symphono.com/sedaily). That's [symphono.com/sedaily](http://symphono.com/sedaily).

Thanks again to Symphono for being a sponsor of Software Engineering Daily for almost a year now. Your continued support allows us to deliver the this content to the listeners on a regular basis.

[END]