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**GARY  
GENSLER:**

Welcome back to fintech. We're getting together for our fourth class, and we're going to get going now. Thank you for tying in online via this modern technology. Today we're going to move to important customer interfaces-- user interfaces and user experiences that have been greatly enhanced by open application program interfaces.

Now, application program interfaces is not new to finance, and it didn't start in M&A finance. It's a basic concept of how one computer is talking to another computer. And again, this is not a computer science class, but we're going to spend a little bit of time on what application program interfaces are and what this concept of open API is and some of the companies around it and how companies have organized themselves, both in terms of finance, and a little bit even outside of finance and some of the challenges with regard to that.

What API has also led to is a movement of and a greater concentration around companies called data aggregators. And we'll get into that as well. As I've sort of worked through with the class already, it's my thought that certain technologies have been moving into the finance technology stack, and are really part and parcel to what finance is in 2020.

And I think open API, with its movement around the globe-- and some countries have moved further in it, some countries have moved less, some companies have moved further, some companies have moved less-- that this is a trend that will be fully incorporated into the technology stack of finance country by country, if it hasn't already been so.

But it's been a major disruptor in the last five, seven years. And it will continue to be a bit of a disruptor for the next handful of years. By the end of this decade, we'll look back, we'll say that that's probably already happened, and there'll be

enhancements around it. But we'll be fully inside of it.

Maybe not as dramatic as artificial intelligence and machine learning to our minds-- thinking of machines extracting correlations better than we can. But I think it's fairly dramatic, in terms of the advancement of finance and all that we have in front of us. So that's why I decided to take one class and one lecture on it.

I also want to thank everybody. Romain put out a survey. About a third of you took it. It was a voluntary survey. And it's helpful. And what I took back from the desires of students were could I do a little bit more talking about the companies in the fintech space? And maybe add, if I might say, a little less, whether it's on the broader technology or broader policy side.

I'll do my best. But I also want to share with you why I think there's a reason to have some foundation-- some foundation of what the technologies are, or even some foundation on the public policy side, as we move into the latter part of this class. The latter part of this class is really to talk sector by sector what the competitive landscape is, which companies are up, which companies are down, and so forth.

But as we've already talked about a bit today, the companies really matter. And I'll sort of interject that more as we go forward during this semester. One other question is whether we could have some guest speakers. I'm kind of going to have to apologize in advance. This is kind of what you get. But over the next handful of sessions, if I come up with somebody to bring in-- it's a little hard at this juncture to bring in guest speakers. But I certainly appreciate the request. And with four weeks to go, you never know. But with that, I'm going to start to share some slides. I don't know, Romain if you have anything you took from the feedback, which was very helpful.

**PROFESSOR 2:** Thank you. Thank you very much for filling out the survey. That was great. Just two small announcements from my side. One, a reminder for your team formation. Friday is the deadline. Please register your teams in Canvas in the People's tab using the Groups function. If you don't know how to do that, I'll be happy to show you. So please register your teams of three to four students for the group assignments. And then second reminder, as per the syllabus, have one of your team members just send me an email saying what is the topic that you wish to study for your group

assignments. Please don't forget to do that. The deadline is also Friday, April the 10th. Thank you.

**GARY  
GENSLER:**

Thank you. And part of that is just to really help you engage in this subject. To Romain and myself, it doesn't matter which sector you pick or whether you choose to sort of write your paper from the perspective of incumbents, to big tech, or to a venture capitalist. But it's really to help you sort of engage in the world of fintech, that which we're studying, and to pick one sector. And are you taking it from the entrepreneurial strategy of the disruptor, or are you taking it from a big firm, either incumbent or a tech firm's perspective in this regard?

So as I said, we're going to talk a little bit about application program interface, how this fits into the history of finance, deeper dive in open API and open banking. You were all asked to prepare and sort of look at the Bank of International Settlements report. So I'm not going to dive in. I'm going to hopefully assume that you've had a chance to engage with that. And then talk a little bit also about data aggregators and a movement amongst many in large financial firms to have a standard setting group-- a financial data exchange on open APIs.

And then try to close out a little bit on robotic process automation. So a lot to cover. But I think we'll keep it going. And I ask again, use the Participate button to raise the blue hands. Use the chat function. Romain's going to keep interrupting me. And we'll have hopefully a good session together.

So the readings, again, Bank of International Settlements, this consortium of 60 or so central banks around the globe, stands up reports and studies from time to time on new challenges they're seeing. So just that they pick this topic to write a report that came out this past November of 2019 is indicative right there in and of itself that it's a movement around the globe that they thought they needed to study, and an important aspect.

I picked one article out of the many articles that you can grab off the internet about fintech for the next decade. And this was one article that I thought was relevant, because it really did also include this concept of the interface-- the customer user interface and what was going on with regard to APIs. And then one article, again, just to give you sort of a primer on robotic process automation that I think is

relevant as well.

So again, just if anybody wants to give a little short brief as to what are the major trends on the marketing side that's affecting financial services right now. And we can go broader than API, of course. But Romain anybody want to sort of contribute now?

**PROFESSOR 2:** Let's see, who will be our first volunteer of the day? Michael.

**AUDIENCE:** Not sure if this is exactly marketing side, but I think customer trust is maybe more-- must have trust in connecting your personal data to a third party. I'm thinking something like mint.com, where I add my bank account. I can connect it and feel comfortable giving that information to a site that's not necessarily my bank or my credit card.

**GARY  
GENSLER:** Absolutely. Absolutely. So one of the major changes-- and this has been a number of years, as companies like Mint and others, where you'll give your data to a company that you've personally never met a human being. You've downloaded an app and you're giving your data to that company, to give you advice or to give you a better rate. Have you used Mint, by the way? And do you mind just saying what product were you shopping for, or what service were you looking for?

**AUDIENCE:** I was just trying to track my spending because I was spending way too much.

**GARY  
GENSLER:** All right, so there are also sites where it can help you keep your personal budget, if you wish-- like personal accounting and so forth. And you give them permission to look into your bank account. But this trend of using-- and there many competitors of Mint that we'll dive into in the next couple weeks. But there are many competitors. It's basically saying, all right, I am going to permission a website-- a data service provider, fintech company-- I'm going to permission them to look inside my bank account.

I have to give them my password and my username in some way and have them linked in. Big change. It takes away a little of the comparative advantage possibly of the big incumbents, because you and I can give somebody else permission to go in and look at that data.

**PROFESSOR 2:** [? lqbal? ?]

**AUDIENCE:** Hi. Morning, professor. I just want to highlight that there's an avenue to market or to showcase financial services. It's starting to be on a lifestyle platform. So if you look at, for example, Alipay, it's all about access to [INAUDIBLE] online shopping. And WeChat's about access to its gaming.

But there's a lot of these conflicting financial services and key services that people want. So it's nothing new. In fact, Walmart and even now [? Star Market ?] has banks opened up within its grocery stores. So I think there'll be a trend that will be for the [INAUDIBLE].

**GARY  
GENSLER:** And so what [? Iqbal ?] has raised is not new-- decades old-- that even big retailers, bricks and mortar retailers, thought, well, should we have a counter for you to do some finance? Should we embed finance into the retailing business with the trends with in-store and branded credit cards for decades?

But now online embedded finance inside of Alipay, which was mentioned just then, and other companies, to embed the financial aspects right in their product offerings. And some of that embedded finance is an Amazon credit card or an Alipay payment mechanism. Some of the embedded finance can even be that if you're buying a mattress from Casper-- I think I may have referenced this already-- but if you're buying a mattress from cash online, that they might offer what's called point-of-sale financing.

Now, you and I don't think of it that way. They just say, you can pay over four installments. But in fact, they're lending you money for those four installments, and it's embedded right in the product. And Uber and Lyft actually embed some finance right in their app. Now, they've built it on top of credit card companies. But they could choose to build it on top of their own sort of financing mechanism with their drivers and the like. So big change, embedded finance. Multi decades in coming, but now it's embedded finance in a technological way that it looks seamless to the user-- or can look seamless.

**PROFESSOR 2:** Nikhil.

**AUDIENCE:** The other piece that I thought was interesting was the article talk about first the uncoupling of financial services. So a lot of fintech incumbents decouple the

product offerings. But then there's a resurgence of bundling products again. So when you look at Wealthfront, they started with just asset management. But now they're offering cash management. Robinhood's the same way. It came out trading, but again, they're trying to pivot to cash management. So they focus on very niche products to begin with, but there seems to be bundling happening again.

**GARY**

Right. And I think this is unbundling and rebundling happens in many industries.

**GENSLER:**

Some of the proponents in the most optimistic side of financial technology say, we can have a flattening of finance. We can have a full unbundling, where you can get each of your products separately.

And while the technology can and does facilitate that, I think our tendencies in markets and as humans, and our behavioral science tells us that bundling happens. So even if this transitional period of time-- even if this late 20-teens and early 2020's allows for a lot of unbundling, I believe that a lot of this will stay bundled and rebundled within particular websites, particular product offerings. I don't know of Leonora is trying to speak, because your name's popping up here on the screen. But if not-- how would open API initiatives influence all of this? I've sort of said it a little bit myself, but anybody want to chime in?

**PROFESSOR 2:** Geetha?

**AUDIENCE:**

Yeah, I think I speak from the incumbent side. I think open APIs have made it so easy from a banking perspective, in terms of ability to track what is being accessed of customer data. Because before APIs and before some of the standouts like OAuth and OIDC, they were pretty much dependent on screen scraping. And it was very difficult for us to track. And the customers pretty much gave their user ID and password to these vendors. And they could pretty much log in and screen scrape anything, and we won't even know.

**GARY**

**GENSLER:**

So you're saying Gita, from the incumbent side-- from the big financial firm side, these new startups-- the Mints of the world, so to speak-- were able to get folks' usernames and passwords, and come into the incumbent systems, and grab the data through a method called screen scraping, or even through a robotic process automation, which we're going to chat about. And you're saying you feel from an incumbent side it's better to manage all of that-- those interfaces, which could be

disruptive. You'd have more awareness and more security around that interface.

**AUDIENCE:** Correct.

**GARY** And then how does it influence it from the consumer side? Anybody want to throw  
**GENSLER:** an idea from the customer side? I agree with what Gita's saying.

**PROFESSOR 2:** So I'm not sure it will be related, but Yi had his hand up.

**GARY** Sure.

**GENSLER:**

**AUDIENCE:** Yeah, I think the benefits is more for the fintech company rather than the incumbent. Because it basically lowered the entry barriers. So I guess from the consumer perspective, now you have many more options. Previously, you can only work with those like large banks. But now you can work with many more companies that are there. So the market is more competitive, basically.

**GARY** So if I permission a company like Mint, Mint can give me advice around my cash  
**GENSLER:** flow management. If I have permission a company like so SoFi, which is, frankly, competing with the banks-- competing with lending products. But if my SoFi to see my accounts, then I get more options as a consumer. SoFi might compete with the banks, but also give me a better user interface-- user experience as well.

So it's far broadened out the world for the consumers. And then I put a couple of readings in about robotic process automation and screen scraping. Gita's already raised this a bit. And it's being used. It's also being used by the financial sector. So anybody want to add how you think about robotic process automation in a positive way? In a way from the incumbents and the financial firms, how they're using it.

It's certainly also being used by the disruptors trying to get information out of the incumbents. They're using it as sort of an automated screen scraping to grab information from the incumbents. But does anybody want to sort of say how maybe the incumbents are using it in their business models?

**PROFESSOR 2:** Hassan.

**AUDIENCE:** Hi, professor. Yeah, I just have a question about the APIs. I don't actually totally

understand what are these. I mean, is it like an operating system? I mean, what's an API exactly? I've tried to google it, but I've not quite understood.

**GARY  
GENSLER:**

So I'm going to dive into it. Can I hold that, Hassan, just for a minute? Because I'm going to dive into it in the next six minutes. But fundamentally, an application program interface is a method that two computers can speak to. And the traditional way, and the old way, it was just how one system can go in and get information, get objects out of the other system.

And then we'll do a little cursory dive into what it looks like today. Because it's moved a lot from that traditional method. On a web-based API system, you can actually sort of almost-- it feels like on your computer, on your laptop, so to speak, that you're actually operating that system at a distance. So you sort of think of it like it's not only just grabbing some data or objects or records, but it's actually sort of grabbing some application, as if it feels like you're really operating it on your system.

Open API is this conceptual framework that it's a public interface, rather than a private interface. And if you think that you could literally have just a restricted private interface that you give one other computer, whether it's an affiliate of yours or a customer of yours, a contractual private interface to do that which they wish to do, or is it a public interface, where broadly it can be interfaced? And so that's sort of a thumbnail. But let me sort of develop that a little bit more over the next half hour. Does that help?

**AUDIENCE:** Yeah. Thank you very much.

**PROFESSOR 2:** So to answer your question, Gary, we have Ivy and then Andrea.

**GARY  
GENSLER:** OK. And then I'll move on. Thanks, Ivy.

**GENSLER:**

**AUDIENCE:** Yeah, I just wanted to answer the question. Because I thought the Medium article did a good job of talking about the different ways that are banking use cases. And I've actually gone through a lot in terms of just on the banking side like actually having to do customer onboarding and KYC. And like we actually have what's called a KYC analyst. So all this is actually very, very manual typically.



And going through compliance checks, we'll be working on a deal, and at the last minute, you can't get compliance checks through. And it's usually a huge pain. So I was excited to see that they could potentially change the system, because it ends up being a huge headache for everyone.

I think my question, though, is like, when I read about this, obviously it seems like-- I'm sure the technology is there. But I think about just like any bulge bracket banks-- their IT infrastructure has been in place for like 50-plus years. And changing that technology is like removing one piece of a really big complicated puzzle. So I almost just question how feasible that is. Like the article does a really good job of laying out what we can actually automate. But I guess I am a little bit skeptical as to like when that time will come.

**GARY GENSLER:** And Ivy, may I ask which bank or what country you were working in that was doing this?

**AUDIENCE:** I worked at Merrill and Barclays.

**GARY GENSLER:** So Merrill-Lynch or Barclays, you're right, they're incumbents. And they can automate many things. The technology is in advance of what they are actually doing right now. But robotic process automation can provide both incumbents and disruptors. But the Merrills and Barclays are already using it to some extent to automate that which humans are doing.

Some of it, as we'll dive into later on, is about reading documents. Just literally an object reading a document. You could say that one form of robotic process automation that we already have is when we can deposit a check by using our mobile phone. Now, that also uses natural language processing, and it sort of reads that into the computer, and so forth.

But you're absolutely right that each incumbent is dedicated to ensuring that if they're moving from a legacy system to a new system, that they do that in their own way, so that it doesn't break in the middle, and that they actually do save money. And they have to schedule it. And they might not get to that project for 18 months or even five or seven years.

And sometimes that's what gives the fintech disruptor the opportunity-- that the

incumbent can use a new technology. In this case, RPA. They can use that technology. But they can't schedule it for three years or even longer. Or if they're scheduling it, they have to do it in a very controlled way. And the disruptor then is coming along and having an opportunity in the meantime to attack that business model. So I thank you. Romain are there others, or should I move on?

**PROFESSOR 2:** We finally had Andrea, who I believe has experience on this topic. So we could all benefit from it.

**AUDIENCE:** Yeah, but I wanted to add a similar point that we just discussed with Ivy. So we can move on definitely. But what I appreciate about the RPA in the incumbents is that it helps them to increase the efficiency in operations. But at the same time, it also brings in the standardization. And people can focus-- or employees of the bank can focus on more value-adding services.

For example, the advisory to the client when it comes to more difficult products, such as mortgages or consumer loans. But at the same time, as you mentioned, the time and the resources that you need, especially in huge incumbents like Merrill or Barclays, it takes a lot of time to get there.

**GARY GENSLER:** Right. And so what's interesting about each of these technologies-- and this is true if we broaden it out-- open API, robotic process automation, they're both a tool for the disruptors to produce services and new business models to the consuming public, And, they're also tools to the incumbents, depending upon on how they can invest in those tools, how they can update their business models, and the like.

And in particular in open API, we'll see there's a real challenge, that the large incumbents-- the JPMorgan Chases and the PNC Banks and so forth-- are sharing data now with a lot of the disruptors. They're providing greater services to their ultimate end users and customers. But then also they're concerned about, are they giving up some of their inherent competitive advantage of controlling that data? And so there's some real trade offs, particularly in the open API world, as to how banks look at this.

So I wanted to go back to the question of like, what is API? I just was able to find a slide of TechTarget that I thought was helpful, just to think about this. An API, just think of two systems that are linking together. And sort of the original APIs was just

a local application program interface that sort of could connect two computers together.

Web-based API, which went further-- and web-based APIs have been around for 30 years. This is not a new technology. But web-based are designed really to represent such that they could be widely used. HTML now and later something called REST API, which is more recently, these are protocols. These are protocols that multiple parties on the web can come into your service in some way.

And then we talk about public APIs, which really sort of broadens it out further. And you could even think of this as sort of private registered APIs to broadly publicly available APIs. And what many businesses are trying to use-- and they manage it. And it's a very active part of strategy, is to manage that interface to allow the developer community to interface with your platform.

Facebook needs to do it. Instagram needs to do it. Any network-based or platform-based service actually wants to encourage developers to build applications on top of the platform. So now you bring this to finance. Does JPMorgan Chase, does Bank of America, does Barclays, does Merrill want to do the same-- encourage development of applications on top of their platform?

Recognizing that they make a lot on their platform-- their balance sheet, their funding models, their data, their analytics. Do they want to encourage the development of applications on top? And it's a little bit of a push and pull, because they're also encouraging development of applications that might compete with them, but also enhance what they're doing.

So I sort of found this other spaghetti slide that I thought was really helpful. Now, if you think about thousands of financial firms dealing with thousands of public, this spaghetti wire gets even worse. But application program interface is a classic problem of math. It's that if you only have two computers by two computers, you might need four lines of connections. But all of a sudden when you have thousands, you could have this spaghetti wire of interfaces.

So what's happened in the midst of this in sector by sector is that there have been companies that really have an API management layer in between. And in many

sectors, you've seen a consolidation around either one standard for APIs or companies that are really service providers in the middle.

And here are some examples in non-finance. And whether you know underneath the hood about Twilio or others-- Twilio probably has, I'm told, something close to an 80% market share in voice and messaging. That they're sort of that layer in between the disruptors and the service providers and the classic companies, providing a layer in the middle. A layer in the middle.

Checkr does it on employment checks when we want a check. Each one of these companies were startups over the last 20 years. Salesforce is a little bit earlier. And they really took-- even if they didn't know it at the time, they took the concept of open API and API and they built it.

And in fact, there's these words they call API first-- that you can build a strategy saying, we're going to be the best providing APIs. Now, who's done this in finance? Who's done this in finance? One company that you might think of as a payment service provider, Stripe, did it very well. Stripe basically said, we will be that API provider in the payment space.

What company did it really well most recently that we talked about last class was Plaid. And we're going to come back into Plaid as well. But Plaid did this very well. Now, they didn't start by saying, we're going to be only an API company. But they did start with being an API company. It was two entrepreneurs, in Plaid's case, about six or seven years ago that said, there really isn't a good API in the payment space. Now, there was Stripe. And I'm not sure about their foundational stories, why they didn't feel that the Stripe APIs were good enough. But they created an API. And of course, Plaid just recently sold for \$5 billion plus to Visa, or announced the sale.

So we talked a little bit about finance and this history, the stack. And I'm going back to the customer interface stack. We don't need to go back to bricks and mortars and electronic payments. But again, sort of the conceptual framework of this class and how I think about it, the most recent things added to the stack-- the internet, mobile phones, contact cards, and the like-- those are all fully engaged and part of the finance technology stack.

And now we're adding open API and chat bots, which we talked about last class, and

natural language processing, robotic processing. We're adding that to the finance technology stack. And that's sort of the conceptual framework. And I think those are where the opportunities are. In five or eight or 10 years from now, it will be taken for granted. Of course, there'll be enhancements. And every change, there's an enhancement that creates some opportunities as well.

So what do we mean by open API? To [Iqbal's] earlier question. Open Application Program Interface provides developers access to and an ability to get permissioned customer data. That means you and I give a password, you and I give a username. Open banking initiatives-- open banking is unique to the financial world-- are initiatives usually promoted by the official sector. Usually promoted either by the central banks or by the banking regulators, and sometimes promoted by competition authority, to say you must share certain data or you must create some standards for these open APIs.

And again, as I just mentioned, open APIs are in every field of online services, from voice to employment to retailing. But the competition authorities and the central banks around the globe said, well, maybe we should lean into this-- the official sector-- lean in and promote competition for this sharing of data.

And these initiatives, which you've got a chance to read about, do have policy trade offs. And why I focus on these policy trade offs is they're also about competition. Incumbents are not going to really want to embrace competition like this. Having said that, many of the incumbents recognize that it might be that they're shifting right now-- that their business models are shifting, and they have to think like platform companies.

And to the extent that the JPMorgans or the Barclays think more like platform companies, they want to encourage the developer community to develop applications on top of their platforms. If they think it's simply losing market share to the SoFis and to the new banks, then they're going to be more closed to open API. If they think more like platform companies, they're going to want to promote it.

But there are also trade offs. There are also trade offs that the big incumbents would say about cybersecurity. If we just let anybody into our platform, they can also bring down that platform possibly. And so these are real public policy trade offs,

but they're also commercial trade offs as well. [Romain I don't know if there was a question. I see some activity in the chat.

**PROFESSOR 2:** We have a question from Geetha.

**GARY** Please.

**GENSLER:**

**PROFESSOR 2:** Gary, I've been thinking a lot about incumbents becoming platforms. Other than an ability to allow access to their customer data to lenders, I'm not able to think of examples of what kind of platforms incumbents can be. Like, they are not a specific payment company. They're only servicing their own customers. So I wonder if you have any examples.

**GARY** So I think many of the major banks are already platforms. They don't necessarily  
**GENSLER:** think of themselves this way, but they are bringing together-- and this is true for centuries-- they are bringing together borrowers and lenders, or savers. So they have a balance sheet that brings together, in some cases, millions of savers and tens of thousands or hundreds of thousands of borrowers. And they're bringing that together. And when you consider that sort of the modern large financial firm with \$1 trillion or \$2 trillion balance sheet, many of the largest [? were ?] [? all-- ?] and so forth.

And so they're bringing that together, and they're managing risk. And they're very good at it, or some of them are very good at that risk management of those millions of depositors and tens or hundreds of thousands of borrowers. That in itself is a platform. That creates a data advantage that they have about risk management. And it could be a real one. And they can offer activities and products on top of that.

The fintech startups can be, in a sense, a front end distribution channel to bring more in. Because a lot of the fintech startups don't have that same balance sheet capability-- that same ability to in essence earn a spread between savers and borrowers. Now, you might contend, well no, they're losing their competitive advantage, because those startups sort of have that customer interface, that direct-- one might consider it the last mile with that customer.

But the technology companies have taken another approach in saying, we like developers developing applications on top of our platforms. We think it brings more activities. We think it brings more interface, more data. And so they're sort of a network that is bringing data and activity on the platform. But I agree with you. It's a real strategic trade off. It's a real strategic challenge. And the incumbents are still sorting it out.

**PROFESSOR 2:** Camilo?

**AUDIENCE:** Yeah, hi. I just wanted to ask, in one of the other lectures, they tried to classify the open banking between [? prescriptive, ?] to facilitate market-driven, and in-process. But there were many countries, as for example Colombia, who didn't have any classification. What's the meaning of that? It means that it's forbidden. I mean, is it impossible to scrape the data from that from the bank?

**GARY GENSLE:** So it's a good question. The Bank of International Settlements paper I think is to which you refer. And what they did was country by country review where it is. And in fact, that's probably good leading to the map that was in that report that I'll show. In many countries, the central bank, bank regulators, and competition authorities have not said much. I'm not close enough to Colombia to know.

But in those countries, you can still technologically go in and scrape. An alternative, as I lay out here, is actually scraping from the screen. And so I think actually it's the next-- I grab this slide from the Bank of International Settlements reports. And thank you, it's a great setup, Camilo. That Europe passed something called the Payments System Directive.

And it was actually the second time that the European parliament came together and said, we need to promote in the payment space-- not necessarily in the lending space, but in the payment space-- that there's more availability from merchants and from fintech startups to access your data and move money. That's Europe.

And as the Bank of International Settlements says, it's more prescriptive. In the countries that are gray on this map-- most of Africa, many parts of the Mideast, and so forth, parts of Latin America-- the Bank of International Settlements, I should say, only covers about 60 countries. So many of the parts that are gray are countries that Bank of International Settlements didn't survey.

But those countries are probably, like the US, technically market-driven. There is no federal law in the US, and there's no banking rule, that prescribes that you must have open API in the US. So I think that in Colombia it might be a technically market-driven, where the startups are using some form of screen scraping and some form of robotic process automation.

But what we found in the US is companies like Stripe, companies like Plaid, others that I'm going to list in a moment, like Yodlee and others, just built a business model out of creating public APIs. And the incumbents possibly in Colombia are dealing with the same. I don't know.

**AUDIENCE:**

Yeah. Well, I don't know. In Colombia, the banks are happy to not let create APIs, because they don't believe themselves as platforms. They prefer to charge any type of fees for whatever they can do it in the small print letter. So they get more the defensive approach, rather than what you're saying, seeing themselves as a platform and monetizing over many layers of application.

**GARY**

**GENSLER:**

Yeah, I think that in many countries and in many incumbents, they're taking a sort of guarded approach, and sort of saying, no, no, no, this is dangerous for our business model. This is dangerous for our business model. But to that incumbent that does that, often they lose out. It sometimes takes years to lose out.

But it's that somebody finds a way to encroach on that business model. And what we're finding around the globe is that more and more countries are promoting this. Brazil, for instance, is taking it to their national legislature. Now, with the corona crisis, I haven't stayed closely enough. It looked like it was going to pass this spring. And maybe one of the students knows whether they did.

But the central bank was trying to, in essence, insert more competition, so that E2O and others in Brazil had to sort of take a little bit more competition in that environment. So my prediction would be, even in Colombia, it would be hard to guard against this for multiple years. Maybe a few more years. But they'll be guarding a business model that will have some encroachment on it.

The Bank of International Settlement also sort of did this chart, which sort of said what's mandatory. Australia and Europe is fuller to the mandatory. That's why



they're at the top of this chart. And you see the US, China, Argentina, probably Colombia, is technically market driven towards the bottom.

It's also what products? Is it all about just funds transfer? Europe was more about payments. Was it also about the underlying product information? Because if it's forced upon the banks from the official sector-- in the US it's not. But in Europe, in Australia, Hong Kong, it has been. If it's sort of by the official sector, then it might well be that you have to include the product information, as well as the information underneath it.

So back to the market-driven side. So the market-driven side is what's happened here in the US. And what's happened here in the US-- and I list-- this is not just the US, but also Europe, Australia, and some places. I list about a dozen firms that are very active in this place. This is not forced by the official sector. This is basically the private sector saying, let's avoid that spaghetti wire.

These are companies that are going in between all the startups and the financial firms and saying, we can provide a standard way to do these interfaces. Plaid that I talked about just announced it's being sold to Visa for \$5.3 billion. What do these firms compete on? They compete on a lot of things. First is coverage.

If I'm Plaid, do I cover all the banks that you need? If I'm a new startup, and I'm thinking, should I use Plaid or Yodlee? And Yodlee and Plaid are deep competitors. Maybe one can stay just as competitive with each other as Goldman Sachs and Morgan Stanley. Yodlee was acquired years ago by a company called Envestnet. But Yodlee and Plaid, deep competitors to each other.

Well first, what coverage do they have? As a startup, if I use Plaid instead of Yodlee, can I get to all of the banks? What services do they give me as a developer? Obviously, what price? Are they reliable? What's their security, and the like? So all of these are important. And one of the sort of incumbents in this space, Fiserv bought CashEdge. And Plaid was being bought by Visa. So some of these get caught up. SaltEdge is in 55 countries.

And then I did a little research on a paper that was written three years ago-- or it's really a website that keeps a list. And I sort of put together-- this list is three years old. These are the account aggregators in all of these countries. And I'm sorry,

Camilo, I don't see one for Colombia.

But all of these companies in some way built up a business model to say, we will serve in these various countries to be between the incumbents and the startups. We will build some business model in between. Now, what can you do once you do that? You get a lot of data.

And so what used to be just a software company-- Plaid, for instance, started as, in essence, we can provide this software. Started to have remarkable amounts of data. And that remarkable amounts of data in Plaid-- founded in 2013, sells for \$5.3 billion to Visa, or announces the sale, only 450 employees. And Forbes estimates it's only had \$109 million of revenues.

So that's nearly 50 times revenues. Quite a multiple. You might wonder why Visa's doing this. This is from the Visa slides that Visa announced in January. This is how they sort of picture. They look at Plaid. They say, Plaid is connected to 2,600 fintech firms. That's 2,600 fintech firms connected to Plaid. And then Plaid on the other side provides an API into 11,000 data sources-- 11,000 financial firms. 2,600 fintech firms connected to Plaid, Plaid connects to 11,000.

Again, that's the classic place you want to be. Plaid is at the bottleneck. Plaid is at the gateway, you would say. And they can collect data on 200 million users. Visa thinks there's a value in that. We'll have to see. We'll have to see whether that ends up being a good acquisition for Visa or not. But these companies in the middle-- the Plaids, the Yodlees, have right in the middle created value. Romain I'm going to pause there and see if there's some discussion that we can get going.

**PROFESSOR 2:** [? lqbal. ?]

**AUDIENCE:** Yeah, professor. Can you shed some insight as to the relationship between Plaid and the financial institutions? What's in it for the financial institutions to face Plaid in reality? Were there fees involved? Because in the example we looked at some for some Latin American countries, such as Brazil, the incumbents are reluctant to participate in open API. And it would be [INAUDIBLE].

**GARY**  
**GENSLER:** It's a terrific question. And I'm going to apologize, because I'm going to slide back here on the slides a bit to go back to something. This is what they want to avoid.

Even the incumbents don't want thousands of folks to enter into contractual arrangements, enter into secure private APIs. Even the incumbents want to sort of avoid this spaghetti wire of mess.

Now, it might have been less strategic and more incremental that when you think about all these companies on this list-- these 10 or 12 that have built up these remarkable businesses, or around the globe all these-- that many of these started as small software providers. And they were saying to the big incumbents, we can handle that spaghetti wire. We can ensure that people aren't just screen scraping and using RPA. It's going to happen anyway. You need somebody to help manage.

And so every modern online company in finance and outside of finance has to have an AP management strategy. You don't normally think about something in the CEO suite, this chief executive officer who's managing this. But here we are at MIT, I'd like to bring this technology. This is an important technology question that you need to be asking is, how are we managing our developer community, our public interface? Are we going to do it internally, or are we going to hire a Plaid?

And I can tell you that the banks now-- this has happened in the last four to seven years. And many of the banks are sort of saying, this has gotten out of hand. This has gotten out of control. Is this something that we really want to allow the Plaids and the Yodles and others to commercialize our data?

But I think that in part, it was incrementally decisions about how to manage broadly this interface. And it's also possible that it wasn't far enough up in the C-suite, and it was sort of managed down in some regards. But one reaction is this financial data exchange that's happened here. And I've listed the major founders of FDX. But Financial Data Exchange-- and this is straight from their own white paper-- they want to create this group of remarkably large banks.

I think the members of FDX have \$2 trillion of market value, if I remember. Because many of these actually have \$2 trillion balance sheets. When you add up all of these companies, they've come together and said, we want to create standards for financial data sharing and secure APIs. We want to basically not sort of have the Plaids and the others commercialize our data. Even though that's not in FDX' mandate.

But in some regards, the cat's already out of the barn. And now they're grappling with it. But the JPMorgans and the PNC actually, I believe-- which is a large mid-sized bank in the US-- has stopped having Plaid have access, if I'm not mistaken. So it's sort of an interesting challenge back and forth.

**PROFESSOR 2:** You now have Geetha and then Lin.

**GARY** Geetha's from the incumbent side going to tell us why they're using the Plaids.

**GENSLER:**

**AUDIENCE:** Yeah, I just wanted to make a comment on Plaid specifically. We allow access to a number of fintech lenders to our data, because then we have no choice. Because the customer is providing access to their data, and we have to allow them to access it. To somebody's question earlier, the biggest problem with Plaid-- and I'll probably send some articles on kind of issues between Plaid and Capital One.

There was a period of time when we stopped giving access to Plaid, because Plaid wouldn't comply with any of the standards that we imposed. For example, we needed fintech lenders to come from certain IPs, because they looked like bots, right? Because they do all these batch accesses, and they look like bots. But Plaid wouldn't comply with those standards, and it became very difficult for us to differentiate Plaid from a bot.

And even though we had APIs, they would do screen scraping. Sometimes they would come through our mobile channels. Sometimes they would come through our web channels. They would come through any API. It became really hard for us to differentiate Plaid from fraudsters. So there was a period of time when we blocked Plaid. And then they came to the table, we had conversations, and then we let them in.

**GARY** And Geetha, you were at Cap One?

**GENSLER:**

**AUDIENCE:** Yes. Yeah.

**GARY** So for those who might not be familiar, Cap One is one of the largest credit card banks in the US, competing head to head with Bank of America and Citi and Chase,

**GENSLER:**

Discover, and American Express and so forth. I sort of call it the Big Seven. And Cap One's the largest that isn't in and of itself one of the big four banks in the US.

So it's a remarkable organization, and it's cut out a big chunk of its business model around serving customers in the credit card space. And here you're hearing Gita say, but we didn't really have a choice, is what you're saying. Romane, others?

**PROFESSOR 2:** Let's go with Lin, and then Carlos, if we have time.

**GARY** Please.

**GENSLER:**

**AUDIENCE:** Yeah. So in the example for Plaid, it seems like most of the data, if not all of the data, is financial data coming from financial institutions. I'm just curious to hear your thoughts on the market moving towards using non-financial data. So customer data in the retail health sector to inform or build financial services upon, and whether there are any people doing that.

**PROFESSOR 2:**

**GARY** No, it's a really good observation that the data aggregators-- I'll go back a slide. This  
**GENSLER:** whole cacophony from three years ago around the globe, or the data aggregators here in the US-- these big eight or 10 in the US and Europe-- these data aggregators are largely about financial data for now.

So their business strategy-- these dozen companies, their business strategies was sort of API first. They built an API upon which they got a network advantage to get a lot of financial data. But it is also true that they could add other data. And in fact, Plaid gets bought by Visa. Yodlee got bought by Envestnet. And Envestnet is also in asset management and fund management and so forth.

I believe you're right. Your observation is right. A lot of these "API first, data aggregator second" are also going to be adding other non-financial data.

Alternative data, as we've talked about, can come from finance, like whether you're paying your utility bill or not. It can come from finance and building full cash flow underwriting models. But it also can be your social media footprint.

And it often is. Alternative data is about your social media input and your footprint, I

should say. Your footprint. So I think you're right. Their comparative advantage is around this financial data. Plaid, that's their advantage. I want to note one company that's on this list here, I think I included, was Galileo. Did I? Yeah, I included Galileo. Galileo has done a recent fundraising round in the middle of 2019.

It's still private. I think their valuation was \$1.2 billion. Might have been a little higher. I can't recall the figure. So it's a unicorn. Not many of us have heard of Galileo. But two of their big customers-- Chime is one. I'll just say, Chime is one fintech company that's one of their big customers. Last year, Galileo had a glitch. And Chime went down for 24 hours, because Galileo's standards in API had a glitch.

So sometimes, you're that fintech startup relying upon a Galileo, in that instance. And if Galileo software has a problem, you have a problem. So there's that challenge too in the midst of this. Marqeta has done a fundraising round. I think its valuation is about \$2 billion. Again, still private, still in the venture land, and so forth. So there's significant value that has been built, API first, data aggregation second. And these companies are all somewhere between the incumbents and the developer community and the startups. Back to the class, Romain?

**PROFESSOR 2:** Carlos is up.

**AUDIENCE:** Hi. So I just want to give an example of a shout out to Plaid, really, for something they're doing at the moment. So as part of the SBA PPP program for emergency funding for small businesses with the whole corona crisis, there's \$200 billion being disbursed over the course of three months. And actually probably this Thursday there's going to be an additional \$200 billion approved. \$250, sorry.

So what Plaid is doing is they're actually helping, because of their role as a data aggregator, to populate the payroll portion of these loan applications, because a lot of banks are trying to do it manually, which is completely infeasible, given the massive size of the rollout that they're proposing. So thanks to Plaid and what they're trying to do, at least, a lot of loans can be approved, or at least applications submitted exponentially faster. And that can make a huge difference for businesses to survive.

**GARY GENSLE:** And I thank you for bringing that information in. Do you work with Plaid? Or have you worked there? Or is this something you're reading about online?

**AUDIENCE:** So I've been following, because I work for a fintech-focused VC that actually invested in Quovo, which was acquired by Plaid. So I know the model pretty well.

**GARY GENSLE:** These companies have brought a great deal more financial inclusion. These companies have opened up the banking sector, to some extent. And now the banking sector was probably going to be opened up by competitive pressures in any regard. But with the Plaids, earlier Stripe, the Galileos and the Yodlees and others, what they've done is they've brought some standardization to that spaghetti wire that I put earlier-- these interfaces.

They're in the weeds. To some of us, it might just be mundane connections. But they're not. They're really, really important connections. And I would say if you take anything out of this lecture and moving forward, if you're at an incumbent or you're at a startup, that you sort of think about your API strategy. What is it?

You might not manage it, but it's good to know what it is. You might know what your competitors view of it. But I agree with Carlos that in this time of crisis-- the corona crisis in the US, the program that he's referencing, was of this \$2 trillion package that Congress just passed, there was \$350 billion to fund small businesses. They have to be 500 employees or less. But small businesses.

It's called a Payroll Protection Program, PPP. And through the Small Business Administration, it guarantees the banking sector can make loans that are forgiven. So they're forgivable loans up to \$10 million a piece. They're a loan, but they're really a grant if you can show in your application that the money is going to support employment.

And there's various conditions and conditionality. And so what Carlos is talking about is in the loan applications, the loan applications were first being filed I think last Friday, but it might have been over the weekend. And these loan applications had to go through your employment and show who you had earning less than a certain amount of dollars per employee. So a lot of data. A lot of data. And it sounds like Plaid is actually helping facilitate that, in some regard. So thank you. Romain. I think I'm getting close to that 15 minute warning time. But is there another question, or are we just going to move on to robotic process automation for a minute?

**PROFESSOR 2:** I think we can move on. And indeed, we have 17 minutes left.

**GARY  
GENSLER:** All right. So let me just pause for a minute again on financial data exchange. I'm not close enough to it to know where they are in their development. But basically, a large set of big incumbents-- and I've just put a visual of their principal members. But then they have behind this another 50 or 100 second tier members. And by second tier, this is the group that's primarily running its board of directors and sort of coordinating.

And it has all the big US banks on here, the largest-- Quicken Loans, which is the largest in mortgage lending in the US, and CIFA, which is the trade association. They're coming together to say, we need to standardize financial data sharing standards for secure authentication and how this user experience works.

But part of it-- well, part of it is the incumbents sort of trying to reclaim a little bit of the territory. I don't think the cat's going to be able to be pushed back into the barn, so to speak. Or you might say the horse is out of the barn, and I won't use the cat. But I think that this is an interesting dynamic that's going on right now.

Now, you put that in the context of what we talked about, robotic process automation. Robotic process automation can be used in a positive way by the incumbents and by the startups to do account opening, onboarding, as we talked about earlier, loan processing. Anything that you can take and automate that which humans are doing.

And I'm not sort of moving into chat bots and the conversational interfaces that we've already spoken about. I'm talking about the more standardized documents, reading the documents, and opening the accounts, and, as was mentioned earlier and I maybe should have put on this list, also compliance for any money laundering and Know Your Customer.

Those are very positive ways. But it's also a way that challenger banks and challengers can use it to scrape the data and pull the data out of the incumbents, as long as a customer permissions it. So it's sort of both of those sides in a very positive way across the entire field of finance-- a very positive way that we can automate that which humans are doing in the past.



This is frankly just the same as when the tractor came along and we were automating what humans and the horse and the cow and the oxen were doing in the field. We can automate that which the human does. But it changes the way that-- the sort of dynamic between incumbents and startups. And then I want to pause and see if there are questions. And then I wanted to say bit on assignments, and then close.

**PROFESSOR 2:** We have a question in the chat for you from Alex, a Sloan fellow, who tells us that one of the readings one of the authors ends with consumer will access financial services from one central hub. But then another author in another reading speaks of another trend of embedded fintech. So which ones of these perspectives would you tend to agree with?

**GARY GENSLER:** Well Alex, I think that's the debate. And I think you probably could guess that I'm at neither end. I don't think that we'll end up with truly decentralized and we can sort of disaggregate. We had this discussion a little earlier. Will it be completely unbundled? I don't think so.

I think there's still going to be economic benefits to scale. Sometimes that's driven by balance sheet. The balance sheet financing side leads to scale, though securitization and asset securitization as a way to rent somebody else's balance sheet and to sort of lay off that risk to somebody else.

But I think that there's a lot of reasons that scale and network effects-- balance sheet being one of the network effects, data being another network effect, customer user interface another network effect-- that there's benefits to some scale, that there will be some concentration. Will there be one portal? Will we go all the way to one portal? Will it be that Amazon will sort of be the one place I go to for all of my online financial needs?

Jeff Bezos might have a strategy that way. You might write papers that way. I would caution that I think that there will be some competitive pressures and economic pressures on the other side-- that we'll still have some disaggregation. For instance, in country after country, for decades, there's been the debate whether insurance products will be sold by banks and banking products by insurance firms.

And for some reason around the globe by and large, we still see this separation. Some of it's just legacy and history. Some of it is regulation. But it's also how we think of the products, that we think of buying our life insurance or our household insurance or auto insurance a little differently than we think about funding the same things. Funding our house is called a mortgage and funding our car is what's called an auto loan. Now, it's true in some countries, it's come together. But by and large, it's not one portal. But Alex, do you have a point of view? Did you feel strongly one way or the other, if you're there still?

**AUDIENCE:**

I think the embedded fintech is quite insightful, because nowadays that people talk about customer-centric ideas even more than before, because we have more data to provide relevant services. But the thing is that when we talk about the jobs to be done, financial services are not actually the job. The ultimate job you want to get done, you want to buy house, so you need a loan. Which means that maybe it makes sense, some of the services will be the second layer. I mean, be embedded into those jobs that really need to be done by the customers.

**GARY**

**GENSLER:**

I want to say this about embedded finance and this concept that was in the article. And I'm glad you reminded me of this, Alex. I do think that we're going to see more what's called embedded finance. And by that term, what I take from it-- and it's not a well-defined term. You can't look at a Webster's dictionary and say what's embedded finance.

But what I take from that term is that non-financial firms will embed some aspect of finance in their product offering. Not a new concept. Even the local grocery store in the 19th century was saying you can buy your groceries and pay tomorrow. You know, that local merchant. And that led over 50 or 70 years to the modern credit card being invented in the 1940s and taking off by the 1960s.

So we've had some concepts of embedded finance. But I think that the modern technology will provide more alternatives to embed a payment mechanism or a lending mechanism. And those will be the two principal things. Some aspect of a loan or some aspect of payment right in an app. In a sense, like Uber and Lyft does.

In a sense, like of point-of-sale lending-- that I can buy something online and pay on installment over four or six payments, maybe over multiple months. I think

embedded finance is a trend. I also do think that because of this API movement-- and this is a way to close on APIs-- that startups can provide services in a way they couldn't in the past. That a Robinhood could come along-- and we'll talk about Robinhood more when we talk about capital markets.

But a Robinhood could come along and say, we offer that you can open brokerage accounts on this handheld device. You can scan your documents using robotic process automation and natural language processing. You can scan your documents by taking a picture from your phone, open a brokerage account, and trade automatically, interfacing-- there's probably dozens of APIs that stand between your Robinhood app and the New York Stock Exchange.

And it's not just Robinhood directly to the New York Stock Exchange. There's multiple interfaces in between. So I think it's facilitated a remarkable shift in finance, that we can do those things right on our cell phones. And embedded finance and these APIs relate to it. I'm just not quite there that it will all be bundled up into one service provider, or that it will all be fragmented. I think we'll have a little bit in between.

I just want to mention something on assignments, because the April 8th. Again, assignments-- particularly at this stage, where we're pass emergency, no credit emergency, or sort of colloquially pass/fail-- assignments are a great way to engage in this subject. I think of that even when we have A's and B's and things like that.

I just really ask you to engage in this subject. Pick some subject that interests you, that excites you, and you want to write to an incumbent, to a big tech firm like Amazon or Andreessen Horowitz. Which Andreessen Horowitz owns a slice of a lot of the companies we've been talking about already. I mean, they're a remarkable venture capital firm.

And just think of some sort of strategy around it. The individual papers are just a way to break up the assignment in a way that one person would write about it. Overall market analysis, somebody doing the technological trends. If you pick that you're writing to Amazon about, let's say, the consumer lending space, what are the technological trends really doing to that space? Who are the traditional competitors and who are the big tech competitors? And just breaking it up three or four pages,

900 to 1,200 words. Again, we're just helping you kind of engage in a subject.

**PROFESSOR 2:** Perhaps you can answer another question that I've received from a student who does not understand how Plaid makes money. What is the business model?

**GARY**

**GENSLER:**

With only \$110 million in revenues-- now, that's a Forbes estimate-- you sort of go, wait a minute? How does this work? But how the space makes money-- not just Plaid, but how API companies make money in finance and outside of finance is they do charge fees. I apologize, I don't know if it's a penny a transaction or what it is. And maybe somebody on this call actually knows-- Gita or others know their actual revenue model.

But charging a very small fraction of money per trade. And then what they do is data aggregation. And with that data in other fields, then you try to see how you can commercialize that data by cross-selling either directly. Or remember, a lot of these companies like Plaid and Galileo and others are in between.

They're behind the scenes, between one side of the market and another side of the market. But when you create that like Twilio, Twilio is an 80% market share between voice and messaging and things like that-- in the US, at least. So all of a sudden, then you can either enhance your fee structure, because you're such dominant oligopolies, sort of. You can collect economic rent. Or you commercialize the data. And it's the data aggregation side-- I think Visa's paying what might be 25 or 50 times revenues for that data aggregation side.