# 6基础设施反转

**Infrastructure Inversion**

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Video Link: <https://www.youtube.com/watch?v=5ca70mCCf2M>

Today, I’d like to talk about a concept that I like to call infrastructure inversion. I’m going to talk about how things change when a new technology must first use the old infrastructure, and how that creates a conflict, pressure that can lead to an infrastructure inversion.

今天，我想谈谈一个我喜欢称之为“基础设施反转”的概念。

我要讨论的是，当一项新技术必须首先使用旧的基础设施时，事情如何变化；它如何产生可能导致基础设施反转的冲突和压力。

## 6.1新技术，使用的是旧基础设施

**New Technologies, Riding on Old Infrastructure**

Bitcoin is new. Bitcoin is different. When I use the term bitcoin here, I’m speaking broadly. What I’m talking about is decentralized network-centric platforms. These platforms can be used for currencies, payments, and other trust applications. The platform could be bitcoin, or something else. For this talk, I’ll use the term bitcoin to cover that whole category that has now been created. It’s new, and we’re trying somehow to squeeze it on top of the existing banking system. The result is messy.

比特币是新的。比特币是不同的。

当我使用比特币这个词时，我说的很广泛。我说的是一些去中心化的网络中心平台。

这些平台可以用于货币、支付和其它信任应用。这个平台可能是比特币，或者别的东西。

在这次谈话中，我将使用比特币这个术语来覆盖已经创建的整个类别。

它是新的，我们正在设法把它挤到现有的银行系统之上。结果很混乱。

Not only is it messy, but it’s also an opportunity for those who support the traditional banking system to say, "See, it’s not working. It’s slow. It doesn’t work so well." This isn’t new. This is a phenomenon that happens every time you have a new technology that is disruptive, that in the first few years of its adoption it has to be carried by the existing technology that it is disrupting.

这不仅是混乱的，而且对于那些支持传统银行体系的人来说，这是一个机会：“看，它不起作用。它很慢。做的不太好。”

这不是新鲜的话。这是一种现象，每当你有一个新的颠覆性技术出现时，在其采用的前几年，它必须运行在它要颠覆的现有的技术之上。

Let’s take a historical look at how these things play out. When you read about a disruptive technology 20, 30, 40 years in the future, it is all very smooth. It’s obvious because hindsight provides clarity. For example, automobiles were a great invention. And of course when automobiles were invented, everyone in the world said, "Yay! We don’t need horses anymore." Right? That’s not exactly what happened. Instead, they said, "That’s crazy. Those noisy disgusting machines that are probably going to kill us all, they’ll never work. And why would anyone other than stupid rich people playing with these crazy noisy toys want to use one of these horrible machines when we have perfectly good horses?”

我们从历史上来看看这些事情是如何发生的。

当你在在未来20、30、40年读到一项颠覆性技术的描述时，一切都非常顺利。

显而易见，因为事后聪明提供了清晰性。

例如，汽车是一项伟大的发明。当然，当发明汽车时，世界上的每一个人都说：“我们不再需要马了。”

是这样吗？完全不是这样。相反，他们说：“这太疯狂了。那些吵闹的机器可能会杀死我们，他们永远不行。

除了愚蠢的有钱人玩这些疯狂嘈杂的玩具，谁想用这些可怕的机器，我们已经有了好马。”

This is what actually happens throughout history when you introduce a disruptive technology. You meet resistance. Resistance is the first reaction. The ones who succeed are the one who continue—even though the rest of society tells them they’re crazy—to pursue a crazy idea: automobiles, electrification, the internet, bitcoin. These crazy pioneers, who were made fun of by everyone else in society for their crazy ideas, persisted until everybody could see that what they were doing was correct.

当你引入颠覆性的技术时，这就是历史上真正发生的事情。

你遇到阻力。阻力是第一反应。那些成功的人是继续追求疯狂想法的人（汽车、电气化、互联网、比特币），即使其他人说他们疯了。

这些被社会上的其他人嘲笑的疯狂的先驱们，一直坚持到每个人都能看到他们所做的是正确的。

### 6.1.1马的基础设施

**Infrastructure for Horses**

Looking at that history, one of the really interesting things to me is that in the beginning, the disruptive technology has to live in a world created for the technology it’s replacing. When you first ride your brand new automobile in a city, you are riding on roads used by horses with infrastructure designed and used for horses. There are no light signals. There are no road rules. There are no paved roads.

看看那段历史，我真正感兴趣的事情之一是，一开始，颠覆性的技术必须生活在一个它要替代的技术所创造的世界中。

当你第一次在城市里乘坐一辆新汽车时，你用的是为马设计的道路，它是被马使用的。

没有信号灯，没有道路规则，没有铺平的道路。

"You are in horse society and you are the crazy one driving one of these horseless vehicles."

“你在马的社会，而你疯狂地驾驶着一辆没有马的车。”

There are a few things about horses that cars don’t have. These early cars were forward-wheel drive. So, just two wheels turning. Horses are four-footdrive vehicles, which gives them a lot of flexibility. They also have balance. You had a road that was designed for horses and it was not paved. Some of them had cobblestone, but the vast majority of roads were not paved. They were also not dry. They were usually covered in mud and horse poo (because that’s what horses do). This is the environment that the automobile had to prove itself in. It didn’t start out with “Yes, great, we have now invented an automobile. Allow me to demonstrate its capabilities on the Autobahn.” Instead, the crazy rich people who were experimenting with this technology were driving their cars on roads with deep ruts, where the horses had been. On roads not designed for automobiles, in mud. And what happened? The cars got stuck because they didn’t have balance and four feet.

有一些东西马有，而汽车没有。

这些早期的汽车是前轮驱动。所以，只有两个轮子转动。马是四个脚驱动车辆，这给了他们很大的灵活性。他们也有平衡。你有一条专为马设计的路，它不是平铺的。有些道路有鹅卵石，但是大多数道路都没有平铺。

它们也不是干的。它们通常被泥和马粪覆盖（因为这是马所做的）。

这就是汽车要证明自己的环境。它并不是以这个开始的：“是的，很伟大，我们现在发明了一辆汽车。让我来展示一下它在高速公路上的能力。“

相反，体验这种技术的疯狂的富人在泥泞的道路上开车。这些道路不是为汽车设计的，很泥泞。

发生了什么事？汽车因为没有平衡和四驱动而卡住了。

The critics said, "Ha, we told you this is never going to work. Look at yourselves. You can’t even get out of the mud. Also, where are you going to get gasoline? There is only one gasoline station. What happens if you run out of gasoline before you get there? I mean, if your horse gets hungry, you could at least go a few more miles, but if your new crazy car idea runs out of gasoline, that’s it, you’re stuck. You were already stuck because of the mud, but now you are really stuck because you ran out of gasoline. This is never going to work."

评论家们说：“哈，我们告诉过你这是行不通的。看看你们自己。你甚至无法摆脱泥泞。还有，你打算去哪里买汽油呢？只有一个加油站。如果你在到达那里之前汽油用完了怎么办？我的意思是，如果你的马饿了，你至少可以再往前走几英里，但是如果你新的疯狂汽车用完了汽油，就这样，你被卡住了。你已经被泥巴困住了，现在你真的被困住了，因为汽油用完了。这是行不通的。”

### 6.1.2从马到汽车

**From Horses to Vehicles**

Often, new technology must first use the infrastructure of the technology it will eventually replace. In the beginning, automobiles had to use roads designed for horses. Eventually, we started paving roads. Then, something really interesting happened. When you pave roads and make them suitable for vehicles, the old technology (horses) can still use them. If you want to do a nice tour of Zurich on horseback, I am sure the horse would be perfectly comfortable. Horses are very comfortable on asphalt, as are skateboards, Segways, motorcycles, and bicycles — technologies that didn’t exist. In fact, in order for those technologies to exist, you first had to build the infrastructure for automobiles.

通常，新技术必须首先使用它最终会取代的技术的基础设施。

起初，汽车必须使用为马设计的道路。最后，我们开始铺路。然后，真正有趣的事情发生了。

当你铺路时，使它们适合汽车，旧技术（马）仍然可以使用它们。

如果你想骑马游览苏黎世，我相信这匹马会非常舒服。马在沥青上很舒服，就像滑板、赛格威、摩托车和自行车，这些技术过去都不存在。事实上，为了让这些技术存在，你首先必须为汽车建造基础设施。

Flat, paved roads not only allow the automobile to exist, allow the horse to comfortably exist, but they also open the door for new technologies. Now, you have people riding Segways, scooters, skateboards, rollerblades, pushing prams and all of the other things that are moving around on our streets.

平坦、铺砌的道路不仅允许汽车存在，让马也能舒适地存在，而且也为新技术打开了大门。

现在，有人骑着赛格威、滑板、溜冰鞋、推车和其它东西，它们在街道上到处移动。

That’s an infrastructure inversion. You start with the new technology living on the old infrastructure and then, it flips. You build infrastructure and then the old infrastructure rides on top, on the infrastructure designed for the new technology.

这是基础设施的反转。你开始时是让新技术活在旧基础设施上，然后发生了翻转。你建立了基础设施，然后旧基础设施在它上面，在为新技术设计的基础设施之上。

Let’s look at more examples.

我们再来看一些例子。

### 6.1.3天然气的基础设施

**Infrastructure for Natural Gas**

One of the great things about history is that some of the most confident proclamations are often ridiculed for centuries because they are so ridiculous. For example, when electrification was introduced during the World’s Fair in Paris, the mayor of Paris at the time said, "Electricity is a fad and as soon as we close the fair and take down the Eiffel Tower, electricity will vanish in history." Wrong on two counts. The Eiffel Tower is still standing and electrification won.

历史上最伟大的事情之一是，一些最有自信的宣言常常被嘲笑了几个世纪，因为它们太荒谬了。

例如，当在巴黎世博会期间引入电气化时，巴黎市长当时说：“电力是一种时尚，一旦我们的博览会在埃菲尔铁塔下闭幕，电力将在历史上消失。”埃菲尔铁塔仍然屹立不动，电气化胜利了。

But think about the time when electrification was just beginning: there was no infrastructure. So how exactly do you put electricity into a home? First of all, the only reason to put electricity in the home is because you are one of those crazy rich people. Probably one of the same people that bought an automobile. You are now basically putting lightning in your walls, which is surely a crazy idea that will result in your house burning down. That’s what the newspapers wrote. They wrote about every house that burned down and how these crazy people were putting electricity in their homes.

但想想电气化刚开始的时候：没有基础设施。

那么，你究竟是如何把电力引入家庭的呢？

首先，把电放在家里的唯一原因是因为你是疯狂的有钱人。可能是买汽车的那个人。

你现在基本上是把闪电放在墙上，这肯定是一个疯狂的想法，它会烧毁你的房子。报纸就是这么写的。

他们写下了房子被烧毁，把电放在家里的人有疯狂。

What was the infrastructure at the time? Back then, most of the infrastructure was designed to deliver gas. In fact, gas lighting in major cities was pretty common. There were pipes that could deliver gas primarily to street lights but also for home lights, as well as heating. You couldn’t use that infrastructure for electricity. You couldn’t use it to distribute electricity to homes.

当时的基础设施是什么？当时，多数基础设施都是为输送天然气而设计的。

事实上，煤气照明在大城市相当普遍。有管道可以将气体输送到路灯，也可以用于家庭照明，也可以加热。你不能使用基础设施来供电。你不能用它来给家里供电。

At first, the only use for electricity was really for factories because that’s where you could make the most use of electricity. Prior to electricity, a factory might have a very large gas-driven motor sitting in the corner of the factory. The motor distributed power through a series of belts and pulleys distributed throughout the factory to run all of the other equipment. It was basically a gas turbine. Electricity allowed you to distribute electricity directly to all of the equipment and use electric motors.

起初，电力的唯一真正用途是用于工厂，因为这是你可以最大限度地利用电力的地方。

在电力之前，工厂可能有一个很大的气动马达坐落在工厂的角落里。

马达通过一系列皮带和滑轮传送动力给工厂，以运行所有其它设备。

它基本上是一个燃气轮机。电能让你直接向所有的设备分配电，并使用电动机。

Obviously, factories could benefit from electricity, but why put it in your home? Why would you use electricity since you already had light and heating from gas and it worked fine? And there was no infrastructure. The infrastructure for gas wasn’t useful for electricity. If you wanted it, you’d have to build new infrastructure.

显然，工厂可以受益于电力，但为什么要把它放在你的家里呢？

既然你已经从煤气中得到光和热，为什么还要用电呢？

没有基础设施。天然气的基础设施对电力没有用处。如果你想要它，你就必须建造新的基础设施。

Then we see the other aspect of this infrastructure inversion, which is that those invested in the status quo point to your new electricity projects and say, "There is not a large enough distribution network to create customers. And there are not enough customers to require a distribution network. This is never going to happen." Which is exactly what they said about cars. They said, "There are not enough gasoline stations to fill your cars and there are not enough customers to require gasoline stations. This will never happen."

然后，我们看到了基础设施反转的另一面，那就是那些投资于现状的人指着新的电力项目说：“没有足够大的分布网络来建立客户。而且没有足够的客户需要分布网络。这永远也不会发生。”

这正是他们对汽车说的话。他们说：“没有足够的加油站可以加油，没有足够的客户来加油站。这种情况永远不会发生。”

### 6.1.4从天然气到电气化

**From Natural Gas to Electricity**

Then, electrification starts happening, and people discover that once you put down electricity infrastructure, not only can you use that to do the new electricity capabilities, you can also use it to do the old applications. You can do light and heating and you can do them more effectively, in some cases, with electricity. But now, you can do new things. You can do fans and you can do air conditioning and you can do motors and you can do mixers and you can do hairdryers and, generally speaking, houses don’t burn down because of electricity too often.

然后，电气化开始发生，人们发现，一旦你建立了电力基础设施，你不仅可以使用它来做新的电力能力，你也可以用它来做旧的应用。你可以点灯和加热，在某些情况下，你可以更有效地用电来做。但现在，你可以做新的事情。你可以做电风扇，你可以做空调，你可以做电机，你可以做混合器，你可以做吹风机，一般来说，在绝大多数情况下，房子不会被烧毁。

Again, we see infrastructure inversion. For the first few years, you have to run on the old infrastructure. It’s almost impossible. You could theoretically attach a gas generator in your house and feed it with gas and generate electricity locally, but that wasn’t very efficient. Then, you build infrastructure for the new technology, and that infrastructure enables the old technology quite comfortably—lighting, heating, or horses, in the case of roads. But it also opens the door for new applications that you couldn’t do before. And the world changes.

再次，我们看到了基础设施反转。

在最初几年，你必须在旧的基础设施上运行。这几乎是不可能的。

理论上，你可以在你家里安装一个燃气发电机，用燃气产生电力，但效率不高。

然后，你为新技术建立基础设施，新基础设施使旧技术相当舒适（照明、加热或马匹）。

但它也为你以前无法做的新应用打开了大门。世界改变了。

### 6.1.5人声的基础设施

**Infrastructure for Human Voices**

My third example is a bit more technical. This is where you’ll see the audience separate into those who are over 35 and those who are under 35. Tell me if you can recognize this sound.

我的第三个例子有点技术性。

你会看到观众分成35岁以上和35岁以下的人。

告诉我，你是否能认出这个声音。

Andreas replicates the sound of a dial-up modem

Andreas模仿了调制解调器的声音

People under 35 are looking at me like I am crazy, and the people over 35 are saying, "That’s a modem. I used to have one of those! That’s how we connected to the internet." Forgive me as we go into ancient history. A modem is a modulator-demodulator. It’s a device that speaks data over a telephone line. Here is the thing: if you think about it, the telephone line is like a dirt road and you’re trying to drive a car over it.

35岁以下的人看着我就像我疯了一样。

35岁以上的人在说：“那是调制解调器。我曾经有过一个！这就是我们连接互联网的方式。”

请原谅我进入古代历史。调制解调器是一种通过电话线讲数据的装置。

这里有一件事：你想一想，电话线就像一条土路，你试图驾驶一辆汽车通过它。

A telephone line is a system designed to carry human voice. When I was a teenager, telephone lines were still analog and we had pulse dialing systems. We used to sometimes try to play music to our friends over the phone line. If you’d ever tried this, you would have discovered it didn’t really work. The reason it didn’t work is because the frequencies that a telephone line allows are very narrow.

电话线是为传送人声设计的系统。

当我十几岁时，电话线仍然是模拟的，我们有脉冲拨号系统。

我们过去常常尝试通过电话线给朋友们演奏音乐。如果你曾经尝试过，你会发现它并不太好。不太好的原因是电话线路允许的频率很窄。

You see, the telephone network is designed to do one thing and only one thing. It’s highly specialized, just like the gas network that delivers gas to houses is only designed to deliver gas. Not water or electricity or oil. Just gas, and it’s specialized. The telephone system was designed to deliver just voice, and human voice is very specific. Our main frequency is 1 kilohertz; we stay close to that range, sometimes going a bit above and a bit below. There are a few people who can go quite a bit beyond a common range. Teenagers can go

to frequencies that I can’t even hear anymore. But because of the specialized use of voice and because of the difficulties of transmitting voices, especially over great distances, engineers narrowed the acceptable range. If you allow a full range, you get voice but you also get static noises, electrical interference at very high frequencies. You also get humming noises, electrical interference from motors at very low frequencies. What happens if your phone line has static and humming noises? You add a filter that chops out the lows and another filter that chops out the highs. Now, the connection is cleaner but the human voice starts sounding weirder and weirder because it’s being compressed.

你知道，电话网络是用来做一件事的，只有一件事。

它是高度专业化的，就像将输送燃气到房屋的燃气网络，仅仅是为了输送燃气而设计的。

不是水、电、油，只是燃气，它是专门的。

电话系统被设计成只提供语音，而人的声音是非常特别的。我们的主要频率是1千赫，我们保持这个范围，有时有点高，有时有点低。有一些人可能超出一般范围。青少年可能达到我甚至听不到的频率。

但由于语音的特殊用途，以及传输声音的困难，特别是在远距离上，工程师缩小了可接受的范围。

如果你允许一个完整的范围，你得到声音，但你也会得到噪音，非常高频率的电干扰。你也会听到嗡嗡的声音，非常低频率的电机的电干扰。

如果你的电话线有嗡嗡声，怎么办？你添加了一个过滤器，过滤掉低频和高频。现在，连接更干净，但是人类的声音开始变得奇怪，因为它被压缩了。

This compressed road is a very difficult road to ride data over because when you’re transmitting data, you need to get a lot of information into a very narrow frequency band. The whistling sound that you hear with the modem is actually two modems trying to test the available frequency range on this specific connection. All of those noises are the modems saying, in different frequencies, “Can you hear me now?” and the other saying, “I heard you. Can you hear me?” back and forth until the available range is established.

这个压缩的道路对于传输数据来说非常困难，因为当你传输数据时，你需要把很多信息带到一个非常窄的频带中。用调制解调器听到的哨声实际上是两个调制解调器试图测试这个特定连接上的可用频率范围。

所有这些噪音都是调制解调器用不同的频率说：“现在你能听到我说话吗？”另一个说：“我听见了。你能听见我说话吗？”来回直到建立可用范围。

This is an insane way to do data transmission. You’ve basically got two devices that are singing to each other over a very narrow channel, trying to somehow squeeze as much data as possible through a narrow little straw. Then, we upgraded them and they got better and better at doing this.

这是一种疯狂的数据传输方式。

你基本上是有两个设备在一个很窄的通道上互相唱歌，试图通过一根窄的小稻草传输尽可能多的数据。

然后，我们升级它们，它们做得越来越好。

The phone companies hated it: "That’s not what we designed the networks for. This is a pristine, state-of-the-art voice-communicating network. What the hell are you people doing?" In fact, in the country where I grew up—in Athens, Greece—if you tried to make a long-distance call with the modem, what you would hear is the beginning of a modem connection and then an abrupt click. What? What just happened? They cut off the lines if they detected a modem. Why? Because it was competing against the phone company. Kind of like banks shutting down accounts of bitcoin companies. Or basically, exactly the same.

电话公司痛恨它：“那不是我们设计网络时所要的东西。这是一个纯朴的、先进的语音通信网络。你们这些人到底在干什么？”

事实上，在我的成长的地方，希腊雅典，如果你想用调制解调器打长途电话，你会听到的是调制解调器开始连接，然后一个突然的喀喀声。什么？刚刚发生了什么事？如果他们检测到调制解调器，他们就切断了线路。

为什么？因为它与电话公司竞争。有点像银行关闭比特币公司的账户。或者基本上，完全一样。

What did they say at the time? They said, "We could deploy data connections —fiber, coaxial cables, direct data connections at high bandwidths. But first of all, no one needs high bandwidth because what are they going to do? Transmit voice? We already have a voice network. It’s fantastic. We don’t need these new things. Secondly, you don’t have enough users to deploy coax. And you don’t have enough coax to build a user base. This is never going to happen." The same exact idea.

当时他们说了什么？他们说，“我们可以部署数据连接，高带宽的光纤、同轴电缆、直接数据连接。但首先，没有人需要高带宽，因为他们要做什么？发送语音？我们已经有了语音网络。太棒了。我们不需要这些新东西。其次，你没有足够的用户部署同轴电缆。而且你没有足够的说服力来建立一个用户基础。这是永远不会发生的。”完全同样的想法。

### 6.1.6从声音到数据

**From Voice to Data**

Then, we had one of most spectacular examples of infrastructure inversion that I have ever seen and that I recall from history. When, first, the internet was not wanted and carried over phone lines reluctantly. Then, the internet was carried over phone lines by phone companies becoming internet service providers. Then, gradually their backbones become data-oriented. Then, their entire network becomes digital. Then, their entire network starts running over the internet. Then, they start running all of their phone lines on top of the internet. Today, every single phone call you do anywhere in the world is carried over the internet, with a few exceptions at the edges in some developing countries. A complete infrastructure inversion.

然后，我们有一个基础设施反转的最壮观的例子，是我所见过的，我从历史上看到的。

首先，电话线不愿传送互联网。

然后，电话公司通过电话线承载互联网，成为互联网服务提供商。

然后，他们的骨干网逐渐变成面向数据。

然后，他们的整个网络变成数字化。

然后，他们的整个网络开始在互联网上运行。

然后，他们开始在互联网上运行他们所有的电话线。

今天，世界上任何地方的每一个电话都是通过互联网传送的，在一些发展中国家的边缘也有一些例外。

这是一个完整的基础设施反转。

It turns out, it’s very difficult to push data through a narrow phone line designed for voice, but if you flip the equation, putting voice over a data connection is trivially easy. What’s the difference? One is extremely specialized. It had already chosen the application for you. The application is voice; data is the exception that you’re trying to squeeze through. The other one is very generic. Data means anything, and voice is just one of the applications carried comfortably.

事实证明，通过为语音设计的窄通道电话线来推送数据是非常困难的，但是如果你翻转了这个等式，把语音放在数据连接上是很容易的。有什么区别？

电话网络是极其专业化的，它已经为你选择了应用，这个应用是语音，数据是你试图传送的例外。

互联网是非常通用的。数据意味任何东西，语音只是一个应用。

I think the ultimate irony for the phone companies was that special thing called “comfort noise generation.” If you’re a phone engineer, you know what I’m talking about. This is the most ironic thing ever. After years and years of people my age being used to their phone line having static all the time, when we started having cellular telephony and digital phone lines that were perfect, they had no noise. The moment the other person stopped talking, what you would have was complete silence. So, you were like "Oh, okay, I guess they hung up."

我认为电话公司的终极讽刺是一种特殊的东西，叫做“舒适噪音的产生”。

如果你是一名电话工程师，你知道我在说什么。这是有史以来最讽刺的事情。

多年来，我这个年龄的人习惯于他们的电话线始终有噪音，当我们开始有蜂窝电话和数字电话线时，它们是完美的，没有噪音。当另一个人停止说话时，你会得到完全的沉默。所以，你就像“哦，好吧，我想他们挂断了电话。”

They didn’t hang up. They were still there. There was just none of the static. Then, the phone companies invented the most brilliant technology ever, which is comfort noise generation. This is a device that sits on your end of the phone and it looks to see if the connection is still open, and if it is, it whispers static into your ear just to make you feel comfortable that the other person is still there. It actually generates high-frequency noise on purpose, artificially on your end—noise that isn’t in the system, just so that you don’t think the other person has hung up.

他们没有挂断电话。他们还在那里。知识没有噪音而已。

那时，电话公司发明了最辉煌的技术，就是舒适噪音的产生。

这是一种装置，位于电话末端，它看连接是否仍然打开，如果是，它会悄悄地进入你的耳朵，只是让你感觉到对方仍然在那里。它实际上会产生高频噪声，人为地在你的终端上产生噪音，那不是系统的噪音，这样你就不会认为其他人挂断了电话。

The very same companies that said, "We will never be able to do quality voice over the internet. We don’t want the internet on our phone lines,” are now injecting noise in order to simulate the terrible performance of the previous network because we’re now delivering CD-quality or better sound across continents. Complete infrastructure inversion.

同一公司说：“我们永远无法在互联网上做高质量的声音。我们不希望在电话线上有互联网。”

现在注入噪音，以模拟以前网络的糟糕性能，因为我们现在在全世界提供CD质量或更好的语音。

这是一个完整的基础设施反转。

## 6.2从银行业到比特币

**From Banking to Bitcoin**

Now, we have bitcoin. We have a decentralized trust platform that can do settlement of transactions on a global basis without intermediaries. But we’re still living in the old system. Today, we have to use exchanges tied to traditional bank accounts, or use IBAN transfers, or credit cards. Today, we’re riding the automobile along the muddy roads of banking. The bitcoin supercar, the Formula One of finance, is riding along on the muddy roads of 1970s mainframe-based banking, and it’s a bumpy road.

现在，我们有了比特币。我们有一个去中心化的信任平台，可以在没有中介的情况下在全球进行交易结算。但是我们仍然生活在旧系统中。

今天，我们必须使用与传统银行账户挂钩的交易所，或使用IBAN转账或信用卡。

今天，我们正在沿着银行的泥泞道路开车。比特币是超级跑车、金融一级方程式，正沿着70年代基于主机的银行的泥泞道路在行驶，这是一条崎岖不平的道路。

The banks point at this and say, "It’s not working. Look, you have to do all of the regulation that we have to do. You have to do all of the identity that we have to do. You have to slow everything down to the speed of traditional banking. This is never going to work. Not only that, but you don’t have enough users to build infrastructure, and you don’t have enough infrastructure to attract new users. So, this is clearly never going to work."

银行指出了这个，说：“它不行，听着，你必须做我们必须做的所有规定。你必须做我们必须做的所有身份。你必须把一切都降到传统银行的速度。这是行不通的。不仅如此，你还没有足够的用户来建立基础设施，而且你没有足够的基础设施来吸引新用户。所以，这显然是行不通的。”

But what we do have, just like with electricity and the automobile and the internet, is a new technology that has within it the promise of a thousand other applications they haven’t even imagined.

但我们拥有的是一项新技术，就像电力、汽车和互联网一样，它有希望有上千种他们甚至想象不到的其它应用。

I predict, over the next 15 to 20 years, we’ll see a great infrastructure inversion happen in finance. First, the banks will resist. Then, the banks will adopt. The banks will run their systems alongside blockchain and bitcoin systems, and finally they will run all of traditional banking as an application on top of a decentralized trusted ledger. Because, while it is very hard to do a decentralized trusted ledger that’s connected to all of these legacy banking systems, simulating legacy banking on top of a decentralized ledger, on top of bitcoin, an open global blockchain, is trivial. All you have to do is take all of its capabilities and slow them down. For example, I can create an application that takes your bitcoin transaction and makes it clear in three to five business days for a cost of 5 dollars. I have implemented traditional banking. It’s kind of like comfort noise generation.

我预测，在未来15到20年内，我们会看到，在金融领域发生一个巨大的基础设施反转。

首先，银行将抵制。然后，银行将采用。银行将与区块链和比特币系统一起运行他们的系统。

最后，他们将把所有传统银行业务作为一个应用运行在一个去中心化的分类账本上。

因为，虽然很难做出一个去中心化的信任账本，让所有传统银行系统都与它连接，但在一个去中心化账本之上，在比特币之上，在一个开放的全球区块链之上，模拟传统银行业务是微不足道的。你所要做的就是充分利用其所有功能，并降低速度。

例如，我可以创建一个应用程序来进行比特币交易，在三到五个工作日内结算，成本是5美元。

我实施了传统银行业务。这有点像舒适噪音的产生。

For those of us so accustomed to the banking of a previous generation who say, "I don’t like all of this fast finance. It makes me uncomfortable. I want to sit at my kitchen table every Sunday and balance my checkbook and make sure none of my checks bounced. I don’t like all of this electronic instantaneous global transfer. It scares me,” we can slow it down.

习惯于上一代银行业务的人，会说，“我不喜欢所有这些快速金融。这让我感到不舒服。我想每周日坐在厨房桌子旁，查看我的支票簿，确保没有支票作废。我不喜欢所有这种电子瞬时全球转移。这让我感到害怕。”我们可以放慢速度。

This infrastructure inversion will allow us to comfortably run traditional banking applications on top of a distributed global ledger — an open blockchain like bitcoin, the open blockchain, probably bitcoin’s open blockchain and simultaneously open the door for other applications, for applications we’ve never seen before. These new applications will look different from traditional banking. As different as a Segway or skateboard looks to those committed to traditional horse-carriages. As different as moving to electricity in an era of gas lighting in traditional Victorian homes. As alien as comfort noise on high quality data voice communication over the internet that is capable of so much more.

这种基础设施反转将使我们能够在分布式全球账本上轻松运行传统银行应用，可能是比特币的开放式区块链，同时为其它应用打开了大门，我们之前从未见过的应用。

这些新应用与传统银行业务看起来不同。与赛格威或滑板不同的是那些致力于传统马车的人。

与传统维多利亚式住宅中的燃气照明时代的电力转换不同。

与互联网上高质量数据语音通信的舒适噪音一样具有外星性，能够提供更多功能。

Enabling the future on your legacy system is very difficult. While you’re trying to do that, everyone is pointing at the future and saying, "Look. It doesn’t work." Once you flip the infrastructure, simulating the past on the network of the future becomes extremely easy.

在传统系统上实现未来是非常困难的。

当你试图这样做时，每个人都指着未来并说：“看，它不起作用。”

一旦你反转了基础设施，在未来的网络上模拟过去就变得非常容易。

What we’re part of now is the very early stages as we look at the future of money, and the first stages of the greatest infrastructure inversion the world has ever seen.

当我们看货币的未来时，我们现在还处在早期阶段，我们已经看到了世界上最伟大的的基础设施反转的第一个阶段。

Thank you.