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BANK 4.0

Banking Everywhere, Never at a Bank



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EXCLUSIVE PREVIEW

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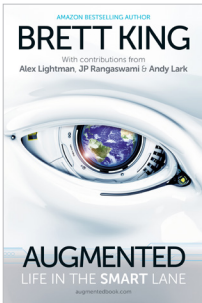
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Contents

Chapter 1 Getting Back to First Principles

Chapter 2 The Regulator's Dilemma

Chapter 3 Embedded Banking

Chapter 4 From Products and Channels to Experiences

Chapter 5 DLT, Blockchain, Alt-Currencies, and
Distributed Ecosystems

Chapter 6 Fintech and Techfin: Friend or Foe

Chapter 7 AI in Banking

Chapter 8 The Universal Experience

1 Getting Back to First Principles

Banking isn't rocket science, but as it turns out, rocket science is a great analogy for the future state of banking. Putting men on the moon is, to date, perhaps the greatest endeavour mankind has committed to. It inspired generations and, until we successfully put boots on the surface of Mars, will likely remain the single most significant technological and scientific achievement of the last 100 years. Getting men to the moon required massive expenditure, incredible advances in engineering, a fair bit of good old-fashioned luck and the "right stuff".

Before the US could get Neil Armstrong all the way up to the moon, they needed the right stuff in a different area—in figuring out the science.

At the end of World War II, there was a very serious plan that would set the foundation for the entire Space Race and Cold War. It was the race for the best German scientists, engineers and technicians of the disintegrating Nazi regime. The predecessor of the CIA, the United States' OSS (Office of Strategic Services) was instrumental in bringing more than 1,500 Germans back to America at the conclusion of World War II. The highly secretive operation responsible for this mass defection was codenamed "OVERCAST" (later to be renamed OPERATION PAPERCLIP). The primary purpose of this operation was denying access to the best and brightest Nazi scientists to both the Russians and the British, who were both allies of the US at this time. PAPERCLIP was based on a highly secretive document known within OSS circles as "The Black List", and there was one single name that was right at the top of that list: Wernher von Braun.

In the final stages of World War II, von Braun could see that the Germans were ultimately going to lose the war, and so in 1945 he assembled his key staff and asked them the question: who should they surrender to? The Russians, well known for their cruelty to German prisoners of war, were too much of a risk—they could just as easily kill von Braun’s team as utilize them. Safely surrendering to the US became the focus for von Braun’s own covert planning in the closing days of World War II. The question he faced was how to surrender without the remnants of the Nazi regime getting tipped off and putting an end to his scheme.

For this von Braun had to, twice, manipulate his superiors, forge paperwork, travel incognito and disguise himself as an SS officer to create a very small window of opportunity for surrender. Convincing his superior that he and his team needed to divert from Berlin to Austria, so that the V-2 rocket team would not be at the mercy of invading Soviet forces, von Braun engineered an opportunity to surrender himself and his brother to the Americans. In the end, Magnus von Braun just walked up to an American private from the 44th Infantry Division on the streets of Austria and presented himself as the brother of the head of Germany’s most elite secret weapons program¹.

Suddenly a young German came to members of Anti-Tank Company, 324th Infantry and announced that the inventor of the deadly V-2 rocket bomb was a few hundred yards away—and wanted to come through the lines and surrender. The young German’s name was Magnus von Braun, and he claimed that his brother Werner was the inventor of the V-2 bomb. Pfc Fred Schneikert, Sheboygan, Wis., an interpreter, listened to the tale and said just what the rest of the infantrymen were thinking, “I think you’re nuts,” he told von Braun, “but we’ll investigate.”

—*The Battle History of the 44th Infantry Division:
“Mission Accomplished”*

Private First Class Fred Schneikert likely presided over the single greatest intelligence coup of World War II, save maybe for the capture of U-570 and its Enigma cipher machine.

To understand von Braun and his willingness to work on a WWII weapon of mass destruction like the V-2 rocket (which is estimated to have killed 2,754 civilians in London, with another 6,523 injured²), it needs to be understood that he simply saw the Nazi ballistic missile program as a means to an end. In von Braun's mind, the V2 was simply a prototype of rockets that would one day carry men into space—that was his end-game.

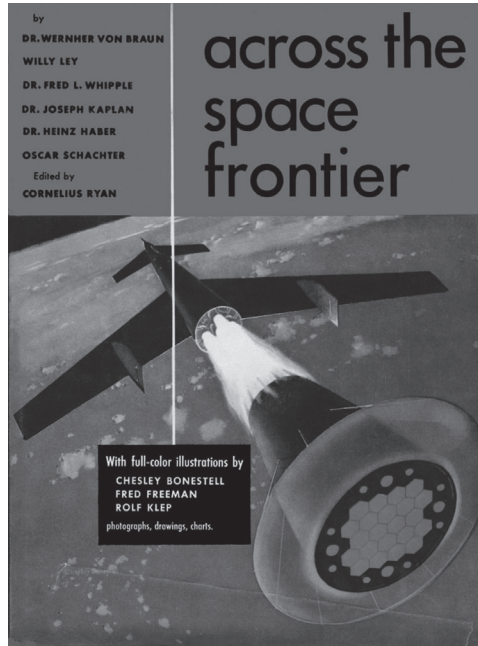


Figure 1: Von Braun's vision for manned space travel.

The images and engineering principles of spacecraft we have from the 1950s we owe largely to von Braun's designs. The three-stage design of modern rockets, the chosen propellants and fuel, the recovery ship system for returning capsules, the initial NASA designs for space stations and Mars programs, all came from von Braun's early musings and engineering drawings. Sixteen years after von Braun's surrender to Allied forces, President John F. Kennedy Jr announced that by the end of the decade the US would put a man on the moon. If this was to come to fruition, it would be in a rocket built by Wernher von Braun.

The Saturn V was an astounding piece of engineering. Today, it remains the largest and most complex vehicle ever built. A total of 13 Saturn Vs were launched between 1967 and 1973 carrying the Apollo and Skylab missions. The Saturn V first stage carried 203,400 gallons (770,000 litres) of kerosene fuel and 318,000 gallons (1.2 million litres) of liquid oxygen needed for combustion. At lift-off, the stage's five F-1 rocket engines produced an incredible 7.5 million pounds of thrust, or about 25 times that of an Airbus A380's four engines at take-off. In today's money, each Apollo launch and flight cost around \$1.2 billion.

However, despite the incredible advances of von Braun's program in the 1950s and 1960s, manned spaceflight hasn't progressed significantly since. In fact, one could argue that the United States' capabilities in this area have been declining ever since Apollo. On 20 July 1969, the Americans landed Neil Armstrong and Buzz Aldrin on the lunar surface, but after December 1972 no further manned missions were launched. In the 1980s the US had the space shuttle and could get to low-earth orbit, but today they are renting seats on Russian Soyuz vehicles to get NASA astronauts to the International Space Station.

First principles design thinking

While the cost of launching commercial payloads into space has decreased by some 50–60 per cent since the Apollo days, the core technology behind the space industry has simply gone through multiple derivative iterations of von Braun's initial V-2 work. The rocket design, production process, and mechanics all are essentially based on the work of NASA in the Apollo era, which itself was based on the V-2 design. This process of iterative design or engineering is known to engineers as “design by analogy”³.

Design by analogy works on the philosophy that as engineering capabilities and knowledge improve, engineers find better ways to iterate on a base design, perhaps finding technical solutions to previous limitations. But design by analogy creates limitations in engineering thinking, because you're starting with a template—the work is derivative. To create something truly revolutionary, however, you have to be prepared to start from scratch.

Enter Elon Musk. Like von Braun, Musk has an unyielding vision for space travel. Musk isn't interested in just returning to the Moon though—he has his sights set on Mars. For Musk, this is about nothing short of the survival of humanity. In discussing his obsession with Mars, Musk refers to the fact that on at least five occasions the Earth has faced an extinction-level event, and that we're due for another one at any moment. We've had dinosaur-killer-scale asteroids sail past Earth on near-collision courses on multiple occasions in recent years, too. Thus, Musk argues, we must build the “insurance policy” of off-world colonies.

After his successful exit from PayPal, Musk created three major new businesses: Tesla, SpaceX and Solar City⁴. Instrumental in Musk's approach to each of these businesses was his belief in the engineering and design concept called *first principles*. Unlike design-by-analogy or derivative design, first principles take problems back to the constituent components, right back to the physics of the design—what the design was *intended* to do. A great example of first principles design is the motor vehicle. At the time that Karl Benz invented the first two-seater lightweight gasoline car in 1885, everyone else was trying to optimize carriage design for use with horses. Benz took the fundamentals of transport and applied the capabilities of the combustion engine to create something new.

I think it's important to reason from first principles rather than by analogy. The normal way we conduct our lives is we reason by analogy. [With analogy] we are doing this because it's like something else that was done, or it is like what other people are doing. [With first principles] you boil things down to the most fundamental truths... and then reason up from there.

—Elon Musk, YouTube video, First Principles⁵

To get to Mars, Musk has reckoned that we need to reduce the cost to orbit by a factor of 10. A tall order for NASA, a seemingly impossible task for a software engineer who had never built a rocket before. As noted in Musk's recent biography (Vance, 2015), Musk has the unique ability to learn new skills to an extremely high level of proficiency in very short time-frames.

Thus, when it came to rocket design, he simply taught himself—not just the engineering of pressure vessels, rocket engine chambers and avionics, but the physics behind every aspect of rocketry—and even the chemistry involved. Musk reasoned, if he was to start from scratch based upon the computing capability, engineering techniques, materials sciences and improved physics understanding we have today, would we build rockets the same way we had for the last 50 years? The answer was clearly no.

In 2010 NASA was paying roughly \$380 million per launch. SpaceX currently advertises a \$65 million launch cost. SpaceX's current cost per kilogram of cargo to low-earth orbit of \$2,700 is well below the \$14,000–39,000 per kilogram launch cost of United Launch Alliance, the lowest-priced direct competitor for SpaceX in the United States.

The last major manned space program of the US, the space shuttle program, averaged a cost-per-kilo to orbit of \$18,000. Now that SpaceX has figured out how to land their first-stage vehicles back on land and on their oceangoing drones⁶, such as JUST READ THE INSTRUCTIONS and VANDENBERG OF COURSE I STILL LOVE YOU⁷, the reusability factor will reduce their cost per kilo to orbit of their Falcon Heavy launch vehicle down to around \$300. This means that if the Falcon Heavy is successful, SpaceX will have reduced the cost to orbit by at least 94 per cent in the 14 short years of its commercial operations.

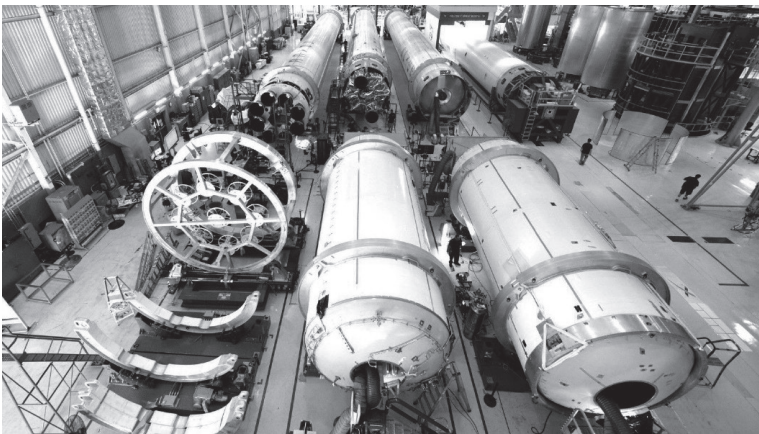


Figure 2: Part of the secret to lower cost are the advancements that SpaceX has made in integrated manufacturing.

The biggest benefit of first principles thinking, however, led Musk to an epiphany that will allow SpaceX a unique platform for reaching Mars with their rocket platform.

One morning in the shower at home, Musk had an epiphany. CO_2 is abundant on Mars, and if you have CO_2 you can make CH_4 , or methane. With methane rockets, Musk could have a specific impulse (SI) of 382—a small, but significant improvement on the current LOX-based engines. More SI means lower cost to orbit and/or greater range. But the other advantage is that liquid methane would only require passive cooling for storage on Mars, instead of the cryonics that you need to cool oxygen to its liquid state ($-218\text{ }^\circ\text{C}$) for conventional rocket engines today.

By building rocket engines that can use CH_4 Musk changed the rules in terms of viability for a return trip to Mars. A 94 per cent cost to orbit reduction, reusability with rockets that land themselves, and a fuel source that is easily manufactured and stored on Mars—welcome to the revolutionary benefits of first principles design.

The first principles iPhone

Musk isn't the only one to believe in the philosophy of first principles design. Steve Jobs was reportedly a believer in getting back to basics for redesigning well-worn concepts. Instead of iterating on the famous Motorola flip phone, the Palm Pilot or the Nokia “Banana” phone, Jobs started from scratch in reimagining a phone, browser and iPod combined into a personal “smart” device.

There's the great story about how Steve carried a block of wood around the office while the team was creating the iPhone. He wanted to remind everyone around him that things should be simple. Jobs understood that technology is only as powerful as the ability for real people to use it. And it's simple, usable functionality—not ridiculous over-engineering—that makes for technological power.

—Bill Wise, MediaBank, quoted in *Business Insider*,

12th October 2011

Now, in fairness Jobs may have got the “block of wood” prototyping idea from Jeff Hawkins, the lead inventor of the PalmPilot. The story goes that when he first imagined the PalmPilot, he carried blocks of wood the approximate size of the device he would later build around with him everyday. Whenever Hawkins saw a need for the device in his daily routine, he would tap on it, scribbling on the block of wood, or in his notebook, simulating or prototyping how the device might be used to solve that problem, whether it was a calendar entry, jotting down some notes or swapping contact details with a colleague.



Figure 3: The iPhone is a great example of first principles product design.

Both Jobs and Hawkins didn't try to iterate on an existing device design and improve on it; they started from scratch. It's why the iPhone ended up with a revolutionary touchscreen design, aluminium housing, no keyboard and an app ecosystem. Do you remember the debate when the iPhone launched over the value of the Blackberry RIM keyboard versus Apple's lower accuracy touchscreen keyboard? Many commentators were sure the Blackberry keyboard would win out. But it didn't.

Why am I focusing on this? Ask yourself a couple of simple questions. If you were starting from scratch today, building a banking, monetary and financial system for the world, a banking system for a single country

or geography or just designing a bank account from scratch, would you build it the same way it has evolved today? Would you start with physical bank branches, insist on physical currency on paper or polymers, “wet” signatures on application forms, passbooks, plastic cards, cheque books, and the need to rock up with 17 different pieces of paper and three forms of ID for a mortgage application?

No, I’m sorry—that’s just plain crazy talk. If you were starting from scratch with all the technologies and capabilities we have today, you would design something very, very different. Let us then apply first principles to banking and see if there are any examples of this type of thinking emerging today. Are we seeing systems emerge that are fundamentally different?

Applying first principles to banking

The banking system we have today is a direct descendent of the banking from the Middle Ages. The Medici family in Florence, Italy, arguably created the formal structure of the bank that we still retain today, after many developments. The paper currency we have today is an iteration on coins used before the first century. Today’s payments networks are iterations on the 12th-century European network of the Knights Templar, who used to securely move money around for banks, royalty and wealthy aristocrats of the period. The debit cards we have today are iterations on the bank passbook that you might have owned if you had had a bank account in the year 1850. Apple Pay is itself an iteration on the debit card—effectively a tokenized version of the plastic artifact reproduced inside an iPhone. And bank branches? Well, they haven’t materially changed since the oldest bank in the world, Monte Dei Paschi de Sienna, opened their doors to the public 750 years ago.

When web and mobile came along, we simply took products and concepts from the branch-based system of distribution and iterated them to fit onto those new channels. Instead of asking the question whether we need an application form in the online process at all, we just built web pages to duplicate the process we had in the branch⁸. For many banks and regulators today, they are still so married to this process of a signature on a piece of paper and of mitigating risk to the bank through a legal physical

paper record, that in many parts of the world you can't even open a bank account online or on your phone—and that's a quarter of a century after the commercial internet was launched.

Think about the absurdity of that situation for a moment. We're tied to using a first-century artifact, namely a “wet signature” to uniquely and securely identify an individual for the purpose of opening a bank account. But signatures aren't secure, they aren't regularly verified, they aren't really unique, they are easily compromised, easily copied, and in the case of an identity thief using stolen or fabricated identity documents, a signature provided might not bear any resemblance to the authentic account owner's actual signature—as long as it is the first signature that particular bank gets, then they have to presume the signature matches the owner of the account.

Don't even get me started on branches⁹.

Hence the big question. If you started from scratch today, designing a new banking system, would any of the structures we are used to seeing survive? If not, like Elon Musk's approach to SpaceX rockets or Steve Jobs' approach to smartphones, the only way we're going to get exponential progress and real efficiencies is through a first principles rethink of the banking system.

So, what would a “first principles” bank or bank account look like today?

In first principles, utility is king

Let's strip it down to the constituent physics, as Musk suggested. What does a bank do that no other organisation can do, or at least do consistently well? Or what do we rely on banks to provide that would remain in a re-imagined, first principles version of banking?

I would suggest banks have traditionally provided only three core key pieces of utility:

1. **A value store**—The ability to store money safely (investments fall into this category)
2. **Money movement**—The ability to move your money safely
3. **Access to credit**—The ability to loan money when you need it

If you describe the essence of what you want from your bank as a customer (and it doesn't matter whether that is as a retail consumer or as a business owner), ultimately you don't start off with saying I need "product A" or "product B". Ultimately, you come up with stuff like:

- "I need to keep my money safe."
- "I need to send money fast."
- "I need to save money for [insert need/dream/wish here]."
- "I need my employer to be able to pay me."
- "I can't afford to buy this thing and I need some short-term credit."
- "I need to be able to pay my staff."
- "I want to buy a home."
- "I need to pay this bill."
- "How am I going to pay when I'm in another country?"
- "How do I make more money to pay my bills?"

Whenever we talk about what a bank does for us, or what we need from our bank, we generally don't describe channels, bank departments or products—we describe utility and functionality. Banks have tried very, very hard to train us to think in terms of products, and to some extent they have been successful.

Since the emergence of banking during the 14th century, as banks we've taken that core utility and we've added structure. Initially this structure was about network—where you could bank. Banks then added structure around the business of banking, trust and identity—who could bank, what was a bank and how you had to bank. Today you could argue that these structures are reducing risk to both banks and consumers, rather than reducing risk or complexity around utility. Today, as users of banking, we must fight through more friction than ever before just to get to that underlying utility.

Technology now affords us the ability to radically eliminate that friction and create banking *embedded* in the world around us, delivering banking *when and where we need it the most*. My good friend Chris Skinner calls this "Semantic Banking".

The semantic web today is all around us. It is immersive, ubiquitous, informed and contextual. The semantic bank will have these features, too. It will prompt us with the things we need, and warn us against doing things that will damage our financial health. It will be personalised, proactive, predictive, cognitive and contextual. We will never need to call the bank, as the semantic bank is always with us, non-stop and in real-time. As a result, nearly all bank functions we think about today—paying, checking, reconciling, searching—go away as the semantic bank and web do all of this for us. We just live our lives, with our embedded financial advisor and the core utility of banking as an extension to our digital lives.

—Chris Skinner, author of *ValueWeb*

In a world where banking can be delivered in real time, based on predictive algorithms and surfaced using voice user interfaces like Alexa and Siri, in a mixed-reality head-up display like Magic Leap or HoloLens, in an autonomous car or home, or just in increasingly smarter watches and phones that you carry everywhere, banking simply becomes both embedded and ubiquitous. But let's be clear—it is not bank products that will ultimately become embedded in this smart world. Only the *purest* utility of banking.

When it comes to this new *augmented* world, banks are significantly disadvantaged over the real owners of utility, and they must constantly jostle for a seat at the new table. The utility today isn't a branch or an ATM, but the smartphone, the IP layer, data, interfaces and AI.

In this emerging world of instant payment utility, for example, the artifacts and products we associate with payments today—hard currency, cheque books¹⁰, debit and credit cards, wire transfers, etc.—will simply disappear. Ultimately, they represent only structural *friction* in enabling payment utility. A good illustration of this is the capability we see emerging in the likes of Amazon Echo¹¹ or Google Home, where you can now conduct simple commerce and transactions by using your voice. As smart assistants like this get smarter, we're going to delegate more and more of our day-to-day transactional and commerce behaviour to an AI-based agent¹²:

“Alexa, pay my telephone bill.”

“Siri, transfer \$100 to my daughter’s allowance account.”

“Cortana, can I afford to go out for dinner tonight?”

“Alexa, reorder me a pair of Bresciani socks.”¹³

In this AI and agency-imbued world, utility is the core; products become invisible as they are transformed into everyday experiences.

In a world where you delegate Amazon Alexa to make a payment on your behalf, triggered by your voice, does the airline miles program you have linked to your credit card make any difference which payment method you choose? I’d argue absolutely not. Once you have configured Alexa with your preferred payment method, the improved utility will simply demand more and more transactions go through that account—you won’t stop a voice transaction to get your physical card out and read 16 digits to Alexa. Rewards won’t be enough to disrupt that core payment utility.

Amazon, Apple, Facebook, Alibaba and others own those layers of technology that deliver experiences and utility today. Banks are already being forced to submit to app store rules just to be a part of that ecosystem. If you’re a bank that does a deal with Uber or Amazon to provide some sort of bank utility to an Uber driver or an Amazon small business, you have the advantage of access and scale, but you no longer “own the customer”. It’s no longer about having a building on the High Street or a piece of paper you can sign, it’s about the most efficient delivery of banking to the customer in real-time.

We’ve been hearing about the threat of the “Facebook of Banking”, the “Uber of Banking”, or the “Amazon of Banking” for many years now, but if you step back from the hype, we’ve already seen the emergence of new first principles competitors.

A bank that is always with you

In a host of countries around the world you can instantly sign up for a bank or mobile money account on your phone in minutes. In countries like China, Kenya, Canada, US, UK, Australia, Thailand, Singapore, Hong Kong and throughout Europe, you can pay by simply tapping your phone

or scanning a bar code. You can send money to friends via the internet instantly in more than 190 countries today¹⁴. You can pay bills in real-time and increasingly just let your phone or bank account look after those payments for you. Real first principles thinking in banking isn't happening in established, developed economies though. The real action is in emerging markets or developing countries where legacy is poor.

In 2005, if you lived in Kenya there was a 70 per cent chance you didn't have a bank account, nor could you store money safely and you likely weren't saving, unless it was under your mattress. Today, if you're an adult living in Kenya there's a near 100 per cent likelihood that you have used a mobile money account (stored in your phone SIM), and that you can transfer money instantly to any other adult in Kenya. Data shows that Kenyans today trust their phone more than they trust cash in terms of safety and utility, with people sewing SIM cards into their clothes or hiding them in their shoes so they can more safely carry their money with them. This is all possible because of a mobile money service called M-Pesa, created by the telecommunications operator Safaricom. Today at least 40 per cent of Kenya's GDP runs across the rails of M-Pesa¹⁵.

We're currently sitting at about 22 million customers out of a total mobile customer base of about 26 million. Now, if you take the population of Kenya as being 45 million, half of whom are adults, you can see we're capturing pretty much every adult in the country. We are transmitting the equivalent of 40 percent of the country's GDP through the system and at peak we're doing about 600 transactions per second, which is faster and more voluminous than any other banking system.

—Bob Collymore, CEO of Safaricom/M-Pesa¹⁶

The road to 100 per cent financial inclusion via mobile wasn't without its challenges. In December of 2008, it was reported in Kenya's *The Star*¹⁷ that a probe instigated by the finance ministry was actually as a result of pressure coming from the major banks in Kenya. By this stage it was already too late for the banks. By 2008, M-Pesa was already in the pockets of more Kenyans than those that already had a conventional bank account. The

impact M-Pesa was already having on financial inclusion in Kenya meant the regulator simply wasn't going to shut it down to curry favour with the incumbent banks. Financial inclusion was a bolder ideal than incumbent protection.

Today there are over 200,000 M-Pesa agents or distributors spread across Kenya. More than every bank branch, ATM, currency exchange provider or other financial providers. Those M-Pesa agents are at the heart of the ability to get cash in and out of the network, but being a part of that network allows them to accept mobile payments for goods and services also. It is not unusual to find M-Pesa agents who have trebled their business since taking on M-Pesa, or ones that see 60–70 per cent of in-store payments being made via phone. On average, the central bank estimates that the average Kenyan saves 20 per cent more today than in the days prior to mobile money.



Figure 4: M-Pesa is a *first principles* approach to financial inclusion.

Kenya isn't the only one to have found mobile to be transformational for financial access. Today there are more than 20 countries¹⁸ in the world where more people have a value-store or account on their mobile phone than via a traditional bank. In sub-Saharan Africa, a population of close to 1 billion people is amongst the least banked population in the world, with less than 25 per cent of them having a traditional bank account. However, today more than 30 per cent of them already have a mobile money account, and that is growing year-on-year by double digits. If you wanted to bank these individuals in the traditional way, you'd need to get them to a bank

branch and they'd need a traditional form of identity. Research by Standard Bank in 2015 showed that 70 per cent of these so-called “unbanked” people would have to spend more than an entire month's salary just on transportation to physically get to a branch. Branch-based banking was guaranteeing financial *exclusion* for these individuals.

The introduction of mobile money accounts has also had a profound effect on the banking system. The big banks that once plotted to kill M-Pesa have found incredible opportunities for expanding their horizons.

When I took this job two years ago my vision was that we were not delivering the experience the customers were asking us to, we were stuck in the traditional mode of asking customers to come to the branch. I wanted an account where you can use your mobile device to get our services. So when we started [working with M-Pesa] we had a target to reach 2.5 million customers in one year, but then in just one year we had already reached 7.5 million customers. We had kind of broken all the ground rules that we set up for ourselves...our credit products have already done \$180 million so far.

—Joshua Oigara, CEO of Kenya Commercial Bank¹⁹

Kenya Commercial Bank quadrupled their customer base, from just over 2 million customers to more than 8 million customers, in a mere two years by deploying a basic savings and credit function on top of M-Pesa. A 124-year-old bank that needed 122 years to reach its first 2 million customers took just two years to reach the next 6 million. That's all down to mobile. Another Kenyan bank, CBA, has had even more phenomenal results, going from just tens of thousands of customers to more than 12 million today, thanks to their M-Shwari savings product that they launched on top of the M-Pesa rails. Pre M-Pesa just 27 per cent of the Kenyan population was banked; today almost every adult in Kenya has a mobile money account. That is a revolutionary transformation.

While M-Pesa's effect on financial inclusion has been nothing short of phenomenal, the really big numbers aren't happening in Africa,

they're happening in China. The transaction volume of Chinese mobile payments reached 10 Trillion²⁰ Chinese yuan (US\$1.45 trillion) in 2015²¹, and is projected to reach 30 trillion yuan (US\$3.20 trillion) in 2017. In comparison, the equivalent figure for mobile payments in the United States stood at a meager US\$8.71 billion in 2015²², less than 0.1 per cent of China's traction. Even though the US is expected to top \$100 billion on mobile payments in 2017, they're still not even within shouting distance of China in terms of per capita volume, transaction volume or mobile payments adoption rates. That's down to several factors, but most notably because China is today dominated by non-bank payments capability on mobile that has massive, massive scale.

By the end of 2015 more than 350 million Chinese were regularly using their mobile phones to purchase goods and services that would exceed 700 million in 2017. Alipay is handling a huge portion of that traffic, making it the world's largest payments network by a wide margin, but WeChat Pay will exceed both Mastercard and Visa this year also. To help you understand how much larger Alipay is than conventional payments networks, in 2015 Visa reportedly peaked at 9,000 transactions per second across their network, while Alipay delivered 87,000 transactions per second at peak—almost ten times that of Visa. Alipay is now available in 89 countries across the globe, and Jack Ma is expanding that rapidly. On 11 November 2016 alone, Alipay settled 120.7 billion yuan (US\$17.8 billion) of gross merchandise volume (GMV) through its network—82 per cent of that via mobile handsets.

Given that PayPal, Apple Pay, Android Pay and Samsung Pay hit US\$9 billion in mobile payments volume for the same year, the US is significantly behind China. Visa's market cap today is \$181 billion. In comparison Alipay looks like a huge buy opportunity right now, with a valuation at their last investment round of approximately \$60 billion²³. The mobile payments market in China is growing at 40–60 per cent year-on-year and Ant Financial (Alipay) and Tencent (WeChat/WePay) claim more than 92 per cent of that volume today²⁴. Yes, you read that correctly, 92 per cent of mobile payments in China are handled by two tech players—not by UnionPay, Mastercard, Visa, Swift or the Chinese banks. By tech

companies. In Q1 of this year, mobile payments accounted for 18.8 trillion yuan (US\$2.8 trillion) in China, projecting that this year likely total mobile payments will exceed US\$10 trillion—a staggering figure.

Alipay has demonstrated better than any other company in the world, with the possible exceptions of Starbucks²⁵ and WeChat, the ability to leverage mobile for deposit-taking and payments. In 2015, Alipay, through their Yu'e Bao wealth management platform, managed \$185 billion in AuM (and growing)—all via mobile and online channels. Alipay has no physical branches for taking deposits. It is the largest money market fund in the world today²⁶, beating out JPMC's US treasury bond market fund. Yu'e Bao has proved that the most successful channel in the world for deposit-taking is not a branch, it's your mobile phone—something that is only viable using first principles thinking.



Figure 5: Yu'e Bao manages more than US\$185 billion of deposits today, all through mobile.

This has spurred a mobile deposit and payments war in the Middle Kingdom with Apple, Tencent, UnionPay and Baidu launching their own competing initiatives. WeChat's online savings fund raked in US\$130 million on its first day of operation. The downside for Chinese banks is that now that a quarter of all deposits have shifted to technology platforms, the cost of liabilities and the risk to deposits has increased by 40 per cent²⁷.

Competitors building new branch networks aren't the threat; the utility of mobile and messaging platforms are.

With the largest mobile deposit product in the world, access to more than 80 countries, investments in US-based Moneygram, Korea's Kakao Pay, Philippines GCash (Globe Telecom), Paytm in India and others, Ant Financial is no longer just an internet-based payments network in China. Today, Ant Financial is on track to become the largest single financial institution in the world. Seriously.

Within 10 years, based on current growth, Ant Financial will be valued at more than US\$500 billion, and by 2030 it will likely be approaching \$1 trillion in market cap value. This would make it four times bigger than the largest bank in the world today, ICBC of China. Today, Ant Financial is worth the same as UBS, one of the most well-respected banking players in the world. Ant Financial has a first-mover advantage as a true first principles financial institution built upon the utility of mobile. Ant Financial is not a bank, it is a FinTech, or more accurately a TechFin company—a technology company focused on financial services.

Ant Financial is clearly the 800-pound Unicorn in the bunch, but when you look for first principles in financial services, you see an overwhelming representation by FinTechs, startups, tech companies and pure-plays. I guess that's the nature of it—for an incumbent to go back to first principles they'd have to burn it all down and start again. Even when you look at the more innovative incumbent banks in the world, banks like mBank, BBVA, CapitalOne and DBS, you still rarely see evidence of even an iPhone-type first principles product design—it is still vastly skewed towards derivative products; design by analogy again. Products that were essentially created for distribution through physical branches are simply being retrofitted onto digital channels. For example, DBS's Digibank in India and Atom Bank of the UK are just digital treatments of traditional bank products and services fitted onto a mobile phone—it's all derivative. Yes, they are mobile or digital-optimized, but the product features and names all remain essentially the same.

For example, we haven't seen incumbent banks come up with a savings capability that isn't APR²⁸-based, or where interest isn't received in anything

but a very traditional manner—with one possible exception. Dubai-based Emirates NBD launched a savings product in 2016 that allowed customers to be rewarded based on physical activity measured via a wearable device that counted steps. Well played, Emirates NBD.

Other examples of first principles approaches to savings have all come from FinTechs. Digit and Acorns are two examples of behaviourally-based approaches to savings—apps that modify people’s day-to-day behaviour to save more, not just simply offering a higher interest rate for holding your deposit longer. Fidor was the first bank in the world to launch an interest rate based on social media interactions²⁹.

We haven’t seen the incumbent industry come up with credit products that aren’t based on the same models we’ve seen for hundreds of years. PayPal mafioso Max Levchin launched Affirm in 2014, which provides credit based on buying patterns, geo-location and behaviour. We’ve seen Grameen in Bangladesh pioneer micro-credit and Zopa in the UK pioneer P2P lending, but the banks that followed were largely derivative of these pioneers. You don’t see banks reinventing credit based on behavioural models.

We have very rarely seen incumbent players abandon their reliance on application form-based credit scoring to determine someone’s suitability for a loan or credit card. Yet we see startups like Sesame Credit (Ant Financial), Lenddo and Vouch experiment with social-based scoring, and LendUp creating loans that boost credit scores for consumers instead of simply rejecting them.

When it comes to money itself, you can’t effectively argue that Bitcoin isn’t a first principles approach to the problems of currency, identity and the challenges of cross-border digital transfers. When you look at the money transfers themselves, you don’t see players like SWIFT, Western Union or others using first principles or adapting blockchain (yet) to solve the problem, but you do see M-Pesa, Abra, Ripple and others solving money movement issues with great aplomb.

Distributed ledger technology like the blockchain clearly has the potential to be a first principles platform for a range of things, the most illustrative example being the creation of the DAO, or decentralized autonomous organisation. The first AI-based company that allowed

participants to invest Ether crypto-currency into Ethereum/Blockchain startups managed purely on a code and consensus basis. Technically the DAO was a stateless, crypto-currency based, investor-directed venture capital fund, with no risk or compliance officers, no management, and no traditional company structure. You can't argue that this isn't a first principles approach to VC investment.

When you look for first principles approaches to banking you can find many examples, just not amongst traditional banks.

Is it too late for the banks?

Elon Musk's SpaceX isn't the only company in the world to make rockets today, but it does have the cheapest kilogram-to-orbit platform. Tesla isn't the only electric vehicle in the world, but it is the most widely known and sold, and has reframed the motor vehicle industry with the likes of Volvo and others responding in kind because of Tesla's success. Apple's iPhone isn't the only smartphone on the planet, but it did completely redefine what we considered a phone and personal computing device.

Ant Financial, Tencent, Safaricom and thousands of FinTech startups are redefining what it means to bank today. Redefining how people use a bank account that is embedded in their phone.

Bank 4.0, however, will be about more than new value stores, payment and credit utility. Bank 4.0 is going to be embedded in cars that can pay in a drive-through without the need for plastic, or autonomous vehicles that generate their own income and pay their own road tolls. Bank 4.0 is going to be embedded in voice-based smart assistants like Alexa and Siri, available at your command to pay, book, transact, enquire, save or invest. It is going to be embedded in mixed-reality smart glasses that can tell you, just by looking at something—like a new television or a new car—whether you can afford it. Bank 4.0 is about the ability to access the utility of banking wherever and whenever you need a money solution, in real-time, tailored to your unique behaviours.

The emergence of Bank 4.0 means that either your bank is embedded in the world of your customers, or it isn't. It means that your bank adapts to this connected world, removing friction and enabling utility, or it becomes a

victim of that change. The bankers of tomorrow are not bankers at all—the bankers of tomorrow are technologists who enable banking experiences your customers will use across the digital landscape. The bankers of today, the bank artifacts of today, the bank products of today, are all on borrowed time.

Is it too late for the banks? In one sense, yes. This transformation into the semantic, augmented world is happening because of a whole range of technology changes outside of banking and the constant demand by consumers for the next big thing. The only way banks could hope for first principles *not* to undermine their businesses is if they could successfully stop all adoption of new technologies like smartphones and voice-based AI. That is patently impossible. Markets that are successful in slowing down the adoption of things like mobile payments become outliers and simply look out of date in a transformed world.

Case in point. Two-thirds of the world's cheques today are written in the United States, along with the highest card fraud volume in the world, and as you read earlier the volume of mobile payments in the US is fractional compared with the likes of China. This outlying behaviour is permitted by a system suffused with legacy, payments regulation ruled by consensus, point-of-sale architecture that is a decade behind the rest of the world, and reluctance by incumbents to remove this embedded friction because it will weaken their oligopolies. However, the fact remains, when it comes to mobile payments, Kenya is a far more advanced economy than the United States. When it comes to financial inclusion, Kenya has done more to improve the lot of its populace in the last 10 years than the US has in the last 50 years. Indeed, Kenya today has higher financial inclusion than the United States—a mind-blowing and clearly inconvenient statistic.

The US banking system is a macro example of design by analogy versus design by first principles, whereas China and Kenya are becoming the opposite. The more legacy behaviour and regulation your economy has supporting the friction of the old system, the harder it will be for your bank to be 4.0-ready because it forces slow adaptation to new technology. It is why London and Singapore are pushing so hard for regulatory reform in financial services—they know that's how the centres of finance will be defined in 2030 and beyond.

Ultimately, this fight will occur across the global stage, and the new metric for developed economies won't be things like GDP and economic growth, but the ability to leverage new technologies to become smart economies, the ability to enable automation, investments in smart infrastructure and the ability to capitalize transformation. Banking is a key part of the infrastructure of the global economy, but if your banking system is built on dumb rails, you will find more and more competition coming from offshore, and more and more blockchain and AI-based attempts at rendering you completely irrelevant.

If you're a bank steeped in tradition, run by lots of bankers, with an old core, in a market with tons of regulation, reliant on branch traffic for revenue then yes, it is very likely too late. A complete transformation of a bank to being a provider of embedded banking utility, driven by behaviour, location, sensors, machine learning and AI, needs more than an innovation department, an incubator, a mobile app and a Google glass demonstrator video.

Bank 4.0 is about that radical transformation and how the best banks in the world are responding to these shifts, and how first principles competitors are forcing us to think about banking in different ways. Bank 4.0 is about regulators that are rethinking friction, licensing and regulations themselves. Bank 4.0 is about new capabilities, new jobs and skills that underwrite competencies banks have never needed until now. Bank 4.0 is about the ability of FinTech startups to create transformative experiences faster and cheaper than any incumbent bank could ever do.

If you want to be Bank 4.0 ready, you need to strip your bank back to first principles and rebuild. If not, it's largely just a matter of time before your business is no longer economically viable, especially if you're a bank with under \$1 billion in assets. If this prospect scares you, I've successfully whetted your appetite for what comes next.

If you're looking for a book that describes how to take your bank from where it is today into the world of tomorrow, then keep reading. This may be your last chance to make the necessary changes to survive through the next decade.

Endnotes

- 1 2 May 1945
- 2 Source: British Ministry of Home Security Statistics from 1939–1945 (<http://myweb.tiscali.co.uk/homefront/arp/arp4a.html>)
- 3 As we'll find out later, this is the sole mechanism we've used to progress the banking system over the last 100 years.
- 4 I'm not counting Hyperloop and his LAX-based tunneling machine, purely because they are not yet separate businesses run by Musk.
- 5 Elon Musk explains "first principles" <https://youtu.be/NV3sBIRgzTI> (Source: Innomind.org)
- 6 ASDS—Automated Spaceport Drone Ship
- 7 SpaceX names their ocean drones and landing platforms after ships in Iain Bank's science fiction stories from the world of the "culture".
- 8 In *Bank 2.0* I was able to find an example of a bank that had done this so judiciously that their online credit card application form asked you to staple proof of income to the form—an electronic form on a screen requiring a 'stapled' proof of income.
- 9 We'll get to branches later—I assure you.
- 10 As only the US uses the spelling "checks", we'll use the globally accepted anglicized version in this book—cheques.
- 11 More generally known also as "Alexa".
- 12 For a more detailed analysis of this trend, please see my *Augmented: Life in the Smart Lane*.
- 13 Much of this is possible now, or close to possible. Check out the Alexa ad featuring Alec Baldwin, where he orders Bresciani socks.
- 14 This is just for PayPal coverage alone. AliPay is already in 80 countries and growing.
- 15 Source: *The Economist*—A new East Africa campaign, 9 July 2015
- 16 Breaking Banks Radio interview—aired 9 February 2017
- 17 Source: *TheStar*—Big Banks in Plot to Kill M-Pesa, 23 December, 2008
- 18 Source: WorldBank—those countries include China, Kenya, Tanzania and Nigeria.
- 19 Breaking Banks Radio interview—aired 9 February 2017.
- 20 With a capital "T".
- 21 Source: iResearch—http://www.iresearchchina.com/content/details7_21238.html
- 22 Source: *CIO Magazine*, "7 reasons mobile payments still aren't mainstream", James A Martin, 7 June 2016
- 23 As of their \$4bn capital raise April, 2016. To be fair, it could be argued that they are worth well in excess of \$100bn today, based on their current revenues and activity.
- 24 Source: ChinaDaily.com, 3 August 2017; "Alipay, WeChat Pay vie for customers"—http://www.chinadaily.com.cn/bizchina/tech/2017-08/03/content_30337784.htm
- 25 In 2016 Starbucks saw approximately \$8 billion loaded onto their mobile based "cards" (Source: Starbucks Investor call)
- 26 "Chinese money market fund becomes the world's biggest", *Financial Times*, 26 Apr 2017—<https://www.ft.com/content/28d4e100-2a6d-11e7-bc4b-5528796fe35c>
- 27 Source: *Asian Banking Journal*
- 28 Annual Percentage Rate
- 29 Incidentally, this would technically be illegal in jurisdictions like the US today due to disclosure requirements around savings accounts that require APR rates to be published according to a strict schedule.