IN THIS CHAPTER

- Defining FinTech
- Distinguishing FinTech's dimensions
- Understanding financial technology changes
- Looking at the size of FinTech around the world
- Checking out important FinTech vocabulary

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Chapter 1

Navigating the FinTech Landscape

FinTech has undoubtedly become one of the hottest topics in business. Web searches for the term *fintech* in Google have grown exponentially in the last several years, so it's obvious that people are curious about it. But what is it, and why is it relevant to today's financial industry? This chapter looks at those very basic questions, helping prepare you for the more detailed information you discover later in this book.

REMEMBER

Having FinTech knowledge gives you a competitive advantage in your personal career, because FinTech experts are in high demand globally. Reading this book will also empower you to help your institution innovate and develop its services faster than your competitors. Globally, the FinTech market is booming, and we see investors investing across all stages of FinTech companies' life cycles.

THE BIRTH OF NUMERIX

In 1996, Michael Goodkin, Mitchell Feigenbaum, Nigel Goldenfeld, and Alexander Sokol teamed up to form Numerix, a software company created to supply the finance industry with quantitative research and tools.

Each founder had already had great success in his own right. Michael Goodkin was a quantitative analyst and author of the book *The Wrong Answer Faster.* Mitchell Feigenbaum was a MacArthur Grant recipient and one of the pioneers of chaos theory. Nigel Goldenfeld was a statistical physicist and director of NASA Astrobiology Institute for Universal Biology. Alexander Sokol was a writer and professor at the University of Illinois.

Numerix was initially a think tank for mathematicians, computer scientists, and theoretical physicists in search of uses for a series of financial industry–specific projects. The first Numerix product was a software tool kit leveraged to speed up Monte Carlo simulations, tree and difference finite methods, and value-at-risk calculations. It sped up the computation time by factors of four, while not negatively impacting the accuracy of the results. Merrill Lynch and Price Waterhouse were the first companies to deploy this product in 1998.

The use of the Numerix Monte Carlo method provided more accurate pricing faster. This enabled banks to mitigate their intra-day risk more effectively.

Between 1998 and 2003, Numerix focused on creating many projects, some paid for by clients but most based on a desire to solve perceived financial industry–related problems. By 2003, the company had amassed 20 different kinds of potential products in search of clients. However, the company was distracted and unfocused and had spent more than $25 million to create a business that was barely generating $4 million in annual billings. During the summer of 2003, a multibillion-dollar financial service company attempted to buy Numerix for $5 million, only to have its offer rejected by the primary shareholder. The company at that time was a broken start-up building "'cool" technology for the sake of it rather than solving real market problems. At this stage, it was going out of business unless it could get backing from committed investors to pivot into a new product or approach. Sometimes parallel changes in the market environment enable your pivot timing.

What Is FinTech, Anyway?

REMEMBER

There are many definitions of FinTech, but for the purposes of this book, this one is the most relevant: FinTech companies are businesses that leverage new technology to create better financial services for both consumers and businesses. Of course, that begs another question: What is *financial technology?* We define it as all

parts of technology that help provide financial services and products to customers. Those customers can be individuals, companies, or governments.

FinTech is also frequently used as an umbrella term for various subcategories, such as WealthTech and RegTech. You find out more about these subcategories in Chapter 2.

NUMERIX: THE PIVOT

The desire for greater profits drove the financial industry to create new instruments that were of significantly higher risk. Credit default swaps (CDS) and mortgage backed securities (MBS) became the instruments of choice for many hedge and investment funds that were promising high rates of return to their investors. However, these instruments were complex and not easy to price. MBS and CDS often had many different components bundled within them, making it hard to determine the true value of what was being sold or bought. This was a real market problem that Numerix could solve.

Coauthor and Numerix CEO, Steve O'Hanlon joined Numerix in January 2002 to lead global sales, marketing, and support. In 2004, Greg Whitten, chairman of the board and CEO, appointed Steve to run the day-to-day operations as president and COO. Steve's primary goals were to refocus the company and eliminate all the distractions. Steve set forth five tenets of operations to bring clarity of purpose and focus to the 50 employees:

- Evolve as a financial-focused software analytic company for derivatives.
- Replace the "term software pricing model" with "recurring software subscription model."
- Complement direct sales initiatives with a partner strategy that licenses some or all financial asset class pricing capabilities to financial software companies that require Numerix's caliber of analytics.
- Eliminate 17 of their then-20 products. Take the three remaining products and merge them to create a groundbreaking multi-asset class pricing tool.
- Shut down CrossAsset software, a majority owned Numerix company, to eliminate a $5 million annual spend.

Analyzing FinTech's Dimensions

REMEMBER

FinTech may sound simple from the definition you read in the preceding section, but there are multiple dimensions. You need to think about each of these factors:

- Which part of finance is being impacted (financial sector)?
- Which business model is being used?
- Which technology is being used?

FINTECH Circle has coined the term *Fintech Cube* to describe the intersections of these factors. Figure 1-1 illustrates this cube, in which there are three axes: the financial sector on the x-axis, the business model on the y-axis, and technology on the z-axis.

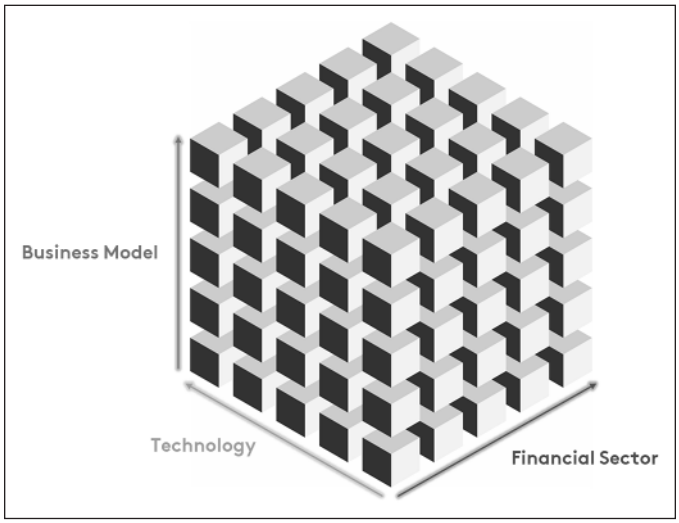

FIGURE 1-1: The Fintech Cube combines financial sector, business model, and technology factors.

Source: FINTECH Circle, 2020

Each of these dimensions can be further categorized. For example, Figure 1-2 expands on the concept by adding key areas of financial services that can benefit from FinTech. All financial sectors are shown on one side of the cube, including retail banking, trading, and insurance (among others).

Figure 1-3 summarizes the most important business models from business-to-consumer (B2C), business-to-business (B2B), business-to-business-to-consumer (B2B2C), to business-to-government/regulator (B2G), to platform-based business models, crowdfunding, and peer-to-peer (P2P) lending.

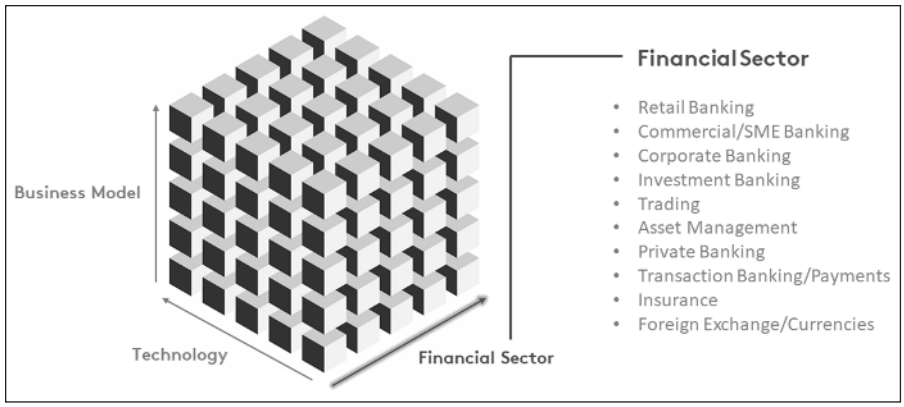

FIGURE 1-2: Key areas of financial services that benefit from FinTech.

Source: The Fintech Cube, FINTECH Circle, 2020

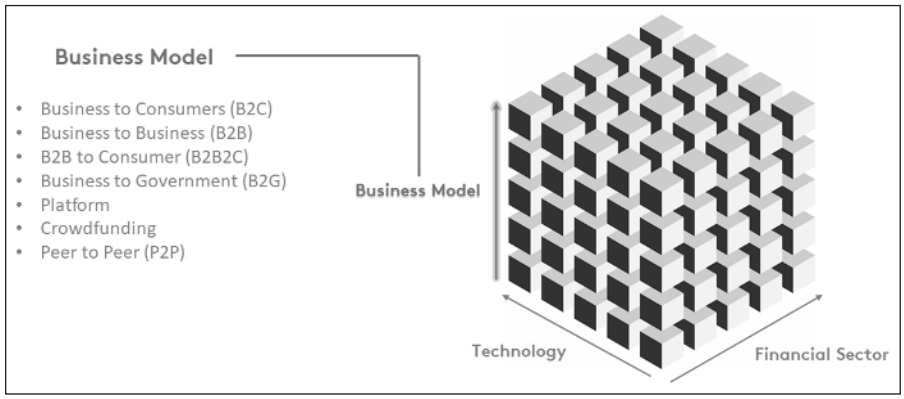

FIGURE 1-3: A dimension of main business models.

Source: The Fintech Cube, FINTECH Circle, 2020

Figure 1-4 shows the third dimension — the technology being used, which can range from cloud computing, big data, artificial intelligence (AI)/machine learning (ML), blockchain (distributed ledger technologies), the Internet of Things (IoT), and quantum computing, to augmented and virtual reality. Part 2 covers these technologies in more detail.

FinTech start-ups, for example, can now be more easily categorized and compared. For example, you may have a retail banking (financial sector x-axis) solution focused on the business model of B2C and using various technologies, such as cloud, big data analytics, and AI. Such a company would be called a challenger bank, sometimes also referred to as digital bank or neo-bank.

NUMERIX: EVOLUTION AND A NEW SOFTWARE LICENSE MODEL

Numerix established clear internal and external branding as a software company focused on the derivative and over-the-counter (OTC) markets, servicing the needs of the four core trading desks: fixed income, equity, foreign exchange, and credit. Its internal communication was constant and consistent about being a financial analytic software company. Externally, it participated in 15 different industry-specific trade shows in different parts of the world to make itself known, while developing industry contacts and leads resulted in product sales.

The financial software industry was fraught with legacy sales models. One of the most common was the perpetual license model (PLM), which involves an initial license fee (ILF) upfront and then an annual maintenance fee (AMF) of about 20 percent of the ILF for each subsequent year to receive supports and updates. The ILF payment ensures perpetual rights to use the software even if the client stops paying annual maintenance.

The other popular software license type in 2004 was the term license model (TLM). It required an ILF similar to a PLM, but generally the ILF for a TLM was lower, because a TLM would generally have a five-year term, after which the client had to renew by paying the original TLM ILF fee to continue to use the product. Like a PLM, the TLM would have an AMF equal to 20 percent of the TLM ILF, and this too would be paid annually.

Numerix successfully shifted from a TLM to a subscription license model (SLM), which at that time was common for enterprise software but not for financial software. Since Steve O'Hanlon came from the Enterprise software world, he moved Numerix into the new world of a SLM. This change shifted the way clients paid for Numerix products. For existing TLM Numerix clients, Numerix took the sum of ILF and five AMF periods, added them together, and then divided by 5 to determine what the SLM would be for renewing clients. For example, if a client originally paid an ILF of $100,000 and an AMF of $20,000 each year for five years, where the client's first-year payment would be $120,000 and each subsequent year would be $20,000, the client would have spent over five years the sum of $200,000, Numerix divided the $200,000 by five years, making the SLM price $40,000 per year. Numerix then used the same logic when re-creating the TLM as an SLM price book. This SLM enabled Numerix to have recurring billings of 83 percent of the gross in 2019.

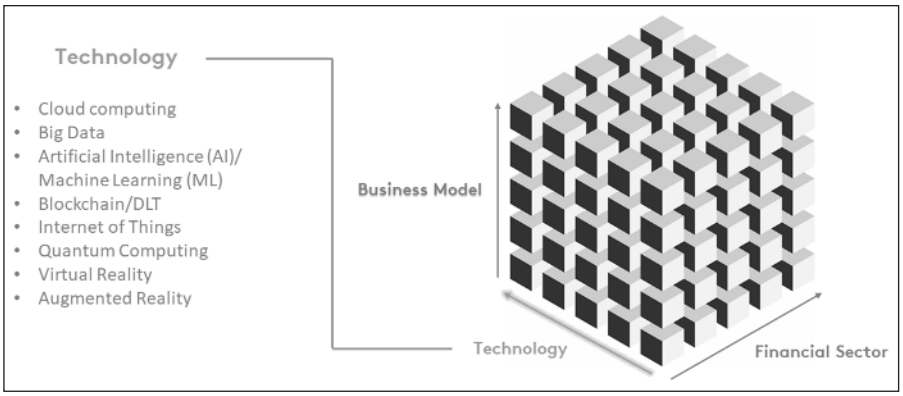

FIGURE 1-4: The key technologies used to achieve change.

Source: The Fintech Cube, FINTECH Circle, 2020

As another example, you may have a WealthTech company that sells its software to hedge funds. You could describe it as being focused on asset management (x-axis), B2B business model (y-axis), and using several types of technology from the z-axis in combination.

Understanding What Has Changed in FinTech

There have been tremendous changes in the financial technology landscape in the last decade. We look at these changes and their effects in detail in Chapter 2, but it may help to survey the basics here as well. Consider the following:

- Just 20 years ago, it would have been very expensive to launch a FinTech company, whereas today the required expenditure is much more affordable. The decreasing technology costs have reduced the barriers to entry.
- The funding landscape is also different now. Twenty years ago, there was little funding available for early-stage FinTech firms, but today venture capitalist and corporate venture arms of both financial institutions and tech companies invest large sums in scalable FinTech companies. (See Chapter 16 for more information.)
- The industry dynamics have also changed. Previously, technology suppliers to financial services firms were seen as pure vendors. Lately, there has been a powershift in which FinTech companies, larger scale-ups, and unicorns are clearly seen as partners or competitors to established financial players. Even tech giants such as Facebook and Google, which have historically focused on

e-commerce or social media platforms, have moved into the FinTech arena. In China, we have seen Ant Financial and WeChat taking leadership positions with their FinTech offerings, which are integrated into their other services in a seamless way.

REMEMBER

Established financial institutions should read this book to understand how the tech giants embraced the digital age and transformed the industries they now dominate. They need to appreciate how they can adopt their own transformation rather than be disrupted by new firms entering the industry.

Traditional banks have already seen their revenues and margins decrease as FinTech firms have undercut their prices on, for example, foreign exchange, lending, payments, and traditional banking services, particularly as open banking is promoted by regulators.

NUMERIX: THE "INTEL INSIDE" STRATEGY

Coauthor Steve O'Hanlon worked in the enterprise software arena before he came to Numerix. He leveraged the skills from those experiences to make Numerix an early adopter in the financial software markets by implementing an SLM. The concept of Software-as-a-Service (SaaS) was still in its infancy, and the cloud offerings that are available today weren't offered (see Chapter 6 for more about the cloud). Introducing an SLM (which was more common in enterprise software sales) to the financial software market enabled Numerix to become an early adopter of a license approach that the industry embraced. It's still the approach Numerix uses with its products today. This very early approach brought greater market value for Numerix investors.

Having witnessed the growth of Intel with its *Intel Inside* strategy, Steve reasoned that Numerix pricing analytics could be licensed in part or whole to financial software companies that lacked the ability to price complex derivatives. His mandate in January 2004 was to complete the software development kit (SDK) for the pricing analytics so that any financial software vendor could easily consume Numerix pricing analytics. This strategy has endured since 2004 and has resulted in 90 global partners that represented nearly half of Numerix revenue in 2019.

Many FinTech firms today should investigate the potential to partner with complementary software providers, especially larger firms that have established sales with large financial institutions, to piggyback on their success, while also reducing their own dedicated sales force requirements.

Asset managers have already seen their margins reduced by a move to passive rather than active asset management, but this has further developed into robo-advisors that use algorithms to disintermediate financial advisors and portfolio managers. Equally, the insurance industry has found that companies using predictive analytics, based on big data access, are better able to price and manage risks than they have.

In all of these organizations, boards need to develop new strategies based around digital transformation and innovation teams that will work in conjunction with existing product and business development. They must also work with technology teams to help them determine how they compete in this new environment. Of course, one of their biggest hurdles will be themselves as they need to instill a new culture that embraces change from the top down. Flip to Chapter 17 for more discussion on this topic.

Highlighting the Size of Global FinTech

Figure 1-5 shows some data from the "Innovate Finance 2019 FinTech Investment Landscape Report," published in partnership with PitchBook. It shows that FinTech hubs are globally diversified, but some are more dominant than others, particularly China, the United Kingdom, and the United States.

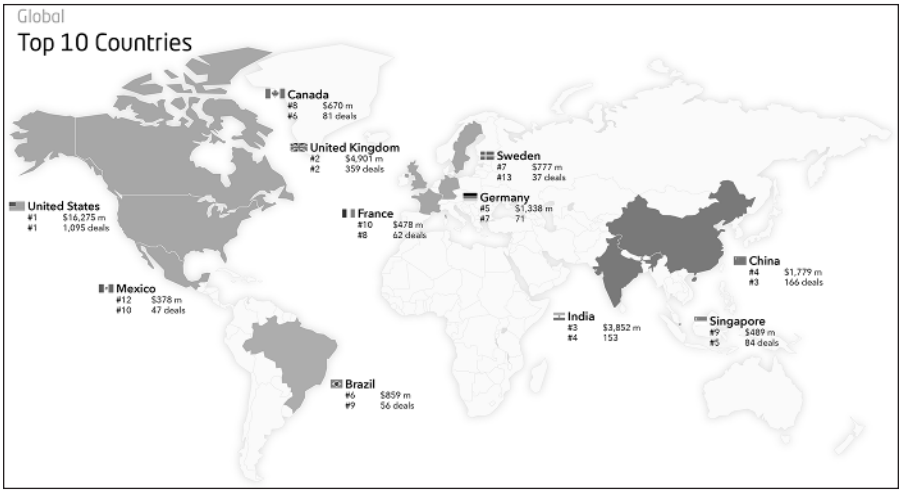

FIGURE 1-5: FinTech hubs are globally diversified.

Source: Innovate Finance, 2019 FinTech Investment Landscape Report, PitchBook. Data has not been reviewed or approved by PitchBook analysts.

Although FinTech investment fell to $35.7 billion in 2019, as shown in Figure 1-6, this was largely driven by a sharp fall of funding to Chinese FinTech firms.

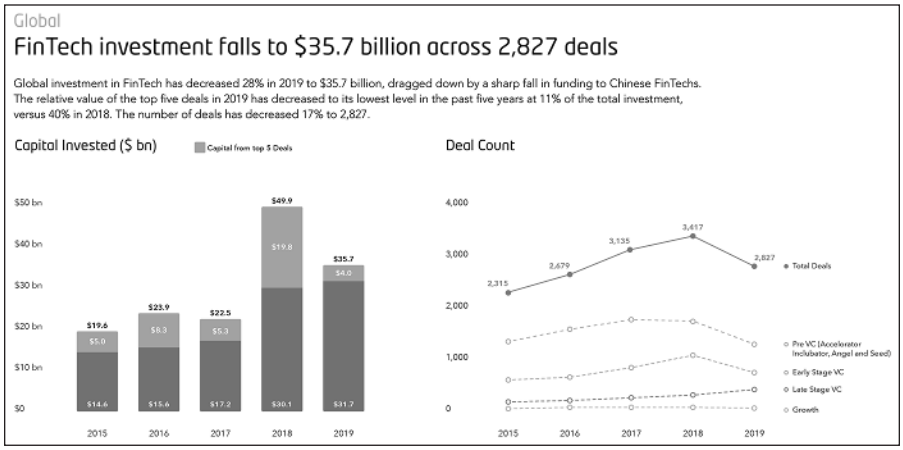

FIGURE 1-6: A 2019 drop in global FinTech investment.

Source: Innovate Finance, 2019 FinTech Investment Landscape Report, PitchBook. Data has not been reviewed or approved by PitchBook analysts.

While FinTech investment decreased in Asia in 2019, long term we believe that Asia will be a growth engine for the global FinTech sector. Meanwhile, all other regions' total investment increased, primarily due to the number of large size deals that were completed (see Figure 1-7).

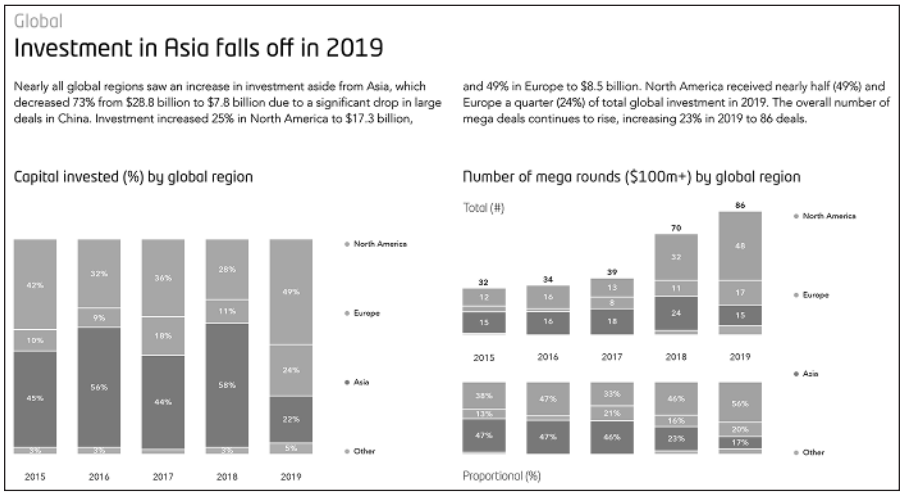

FIGURE 1-7: FinTech investment in Europe and North America continued to increase in 2019.

Source: Innovate Finance, 2019 FinTech Investment Landscape Report, PitchBook. Data has not been reviewed or approved by PitchBook analysts.

NUMERIX: A FOCUS ON FEWER PRODUCTS

When Steve O'Hanlon took the helm in January 2004, Numerix was distracted and unfocused and was building more products than it could possibly ever sell through its four direct salespeople. Steve, a veteran of seven software start-up companies over 37 years, believed that focus was the only way a start-up would have a chance to grow into a larger company. He determined that at least 17 of Numerix's 20 products had a completely different market focus or would need a different sales approach. Four salespeople could never focus on more than one of these products. In addition, none of the products were complete and were in various stages of product maturity. This lack of focus was the main reason Numerix sales weren't growing significantly enough for the size of company it was. Steve made the choice to eliminate 17 products and focus on the three core pricing analytic products: Numerix Toolkit, Numerix Engine, and Numerix Library.

The Numerix Toolkit was sold to financial quants as a stand-alone tool where they would use an SDK to create their own applications on top of the Toolkit. Its sluggish sales led Numerix to create the Numerix Engine product, a full application for pricing fixed income, credit, equity, and foreign exchange derivatives. The Engine was built on top of the Toolkit, so it effectively rendered the Toolkit product obsolete.

In 2002, Numerix's then-CEO hired a financial software quant to build the next generation of the Engine, which was dubbed the Numerix Library. This dual focus of building the same product twice became known in Numerix as the "Pepsi Challenge." The then-CEO created competition between the Engine and Library development teams. This meant that the four sales reps were attempting to sell both the Engine and the Library. When clients asked about the difference between the two products, the sales rep would state that the Engine was legacy with more features, but the Library was next-generation and would eventually catch up to the Engine features. Potential clients were understandably not thrilled with that answer, and it was yet another reason for insignificant billing growth at Numerix.

Steve identified the problem in the sales approach and sought to rebrand the products to stop the confusion. He immediately took the Toolkit out of the price book so that salespeople could no longer sell it as a separate product. He eliminated Toolkit, Engine, and Library product names and instead began using the company name, Numerix, as the product name.

Steve then renamed the Engine Numerix 3.0 and renamed the Library Numerix 4.0. He refocused the Numerix 3.0 product (the Engine) developers on Numerix 4.0 (the Library). Just a couple of developers were left to maintain Numerix 3.0. His goal was to speed up the process of enhancing Numerix 4.0 with new features and features that were only in Numerix 3.0.

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All this new work became known as Numerix 5.0, which was delivered at the end of 2004. The sales team could show the road map that took all the features of Numerix 3.0 and moved them to Numerix 4.0, resulting in Numerix 5.0. This sales story was very focused, and prospective customers could clearly understand the benefits of licensing 4.0 knowing when they would get the gap fillers from 3.0. It was this single focus that caused Numerix billings in 2004 to nearly double over the prior year!

The process Numerix went through in its analysis of the effect of conflicting software and market perceptions is not unlike the analysis FinTech companies provide to their banking customers. The need to identify redundancy, consolidate functions, and provide clear messaging both internally and externally is key to the modernization of financial institutions and a service that FinTech is integrally involved in.

Discovering a Few Important FinTech Terms

REMEMBER

Throughout this book, you find many terms to describe the various parts of the FinTech industry and its inner (and outer!) workings, and we try to make this as digestible as possible. To get started, though, here's a core set of definitions that it may help to have in your back pocket at the outset:

- An *application programming interface (API)* is a software intermediary that enables two applications to talk to each other. It delivers your message request to a provider and then delivers the response back to you. (See Chapter 4.)
- *Data management* means to collect, cleanse, manage, and analyze data to generate additional business intelligence. (See Chapter 4.)
- A *decentralized application (DApp)* stores data in a decentralized database and uses decentralized computing resources in a peer-to-peer network. This open source code can be accessed by all network members. (See Chapter 5.)
- *Digital transformation* is the change that happens to a business when you apply and integrate digital technology. It includes changes to business processes, business models, domain expertise, technology, and culture.
- *Disruption* refers to the way emerging FinTech firms and technologies are interfering or competing with the traditional way business has been done in the past.

- *Microservices* is an approach to application development in which a large application is built as a set of modular components. (See Chapter 4.)
- *Open source* is software for which the source code is freely available to anyone. Any capable programmers can then use, modify, and distribute their own versions of the program. (See Chapter 10.)

NUMERIX: CLOSING CrossAsset LLC

In addition to building 20 software products pre-2004, Numerix had also created a company called CrossAsset Software LLC. Numerix owned 70 percent of it, and Toronto Dominion and ICAP each owned 15 percent. CrossAsset Software focused on building a front-to-back office trading system for Toronto Dominion. There were only 15 developers, and they were tasked with not only building the system but also building a Bloomberg-like terminal.

CrossAsset software was losing $5 million per year, and there was no deliverable product anywhere on the horizon. Therefore, when coauthor Steve O'Hanlon took over Numerix in January 2004, one of the missions was to shut down CrossAsset Software without incurring legal damage from ICAP or Toronto Dominion. By the end of March 2004, the partnership was successfully terminated and Numerix retained the rights to the name CrossAsset Software, which was trademarked. The name CrossAsset eventually became the product name that replaced Numerix 5.0.

The company's new approach focused developer efforts on creating a single pricing platform that hedge funds, second tier banks, and partners could all use. During this pivot, Numerix developed and used a tool kit of creative analysis that provided a way forward to new and definitive software and services that would be utilized in the future to support its FinTech customers in their transitions.

The problem the Numerix software was set to solve was to provide consistent and fast pricing information across an entire institution's workflow process. It was driven by these considerations:

- Mass process analysis was nonexistent.
- Customers needed information on-demand.
- Financial deal structures were extremely fluid and ill defined.
- It was difficult to assess the impact of different models when pricing.

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- Customers needed to create dealer quality models that were flexible and provided for customization.
- Traders required nearly instantaneous response time.
- End users wanted customizable views.
- Data needed to be mutable, delivered in the forms the user wanted.

Numerix software had the flexibility required to price the most exotic instruments and was built on a world-class analytics library that had models in every asset class.

The Numerix differentiators were

- Depth of instrument coverage
- A wide range of models for each asset class
- Depth of domain knowledge within Numerix
- Ability to price exotics for the business lines they cover (Equity, FI, Credit, and FX)
- Instrument building capabilities
- A consultative approach to selling and deployment
- Ongoing support for the product after deployment
- A historical precedent of excellence
- A flexible technological infrastructure that addresses the needs of partners as well as financial institutions

The way forward would incorporate

- Attacking the hedge fund market with analytics
- Capitalizing on the emerging market: credit
- Partnering with companies that could embed their analytics
- Moving upstream to second-tier banks with analytics
- Becoming the most pervasive analytics company in the world

In Chapter 2, we continue the story of Numerix, and you discover how this path forward took shape.