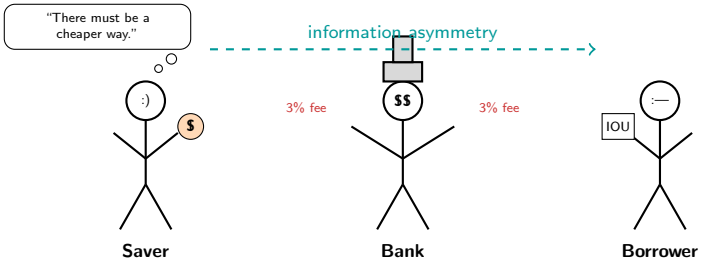
FinTech Fundamentals & Payment Systems

Lesson 01

Digital Finance



For centuries, the middleman was the only game in town...

Outline

Learning Objectives

By the end of this lesson, you will be able to:

1. Explain why financial intermediaries exist and how technology is transforming their role
2. Define FinTech and classify its major segments using an economic framework
3. Describe the evolution of payment systems from correspondent banking to real-time digital payments
4. Analyze the FinTech ecosystem including key business models, value chains, and the Swiss landscape

Why Do Financial Intermediaries Exist?

You want to lend money to a stranger. They might not pay you back. Yet billions of dollars flow between strangers every day.

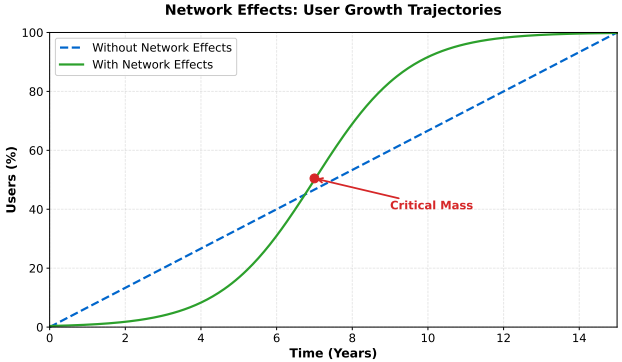
Financial intermediaries exist to solve three fundamental problems:

- **Information asymmetry** (information mismatch between parties) – borrowers know more about their risk than lenders; intermediaries specialize in screening and monitoring creditworthiness
- **Transaction costs** (costs of finding and contracting) – finding, evaluating, and contracting with counterparties is expensive; intermediaries aggregate demand and supply to spread these costs
- **Risk transformation** (converting risky assets to safer ones) – converting illiquid, risky assets into liquid, safer ones through diversification, maturity transformation, and pooling

Banks, insurers, and asset managers each solve different combinations of these problems. Understanding these functions is key to understanding where and how FinTech can disrupt traditional financial services.

These three problems explain why financial intermediaries have existed for centuries – and why FinTech can disrupt them.

How Do Network Effects Drive FinTech Growth?



Three concepts from platform economics explain FinTech's rapid growth and disruption potential:

- **Two-sided markets** – platforms connecting buyers/sellers, lenders/borrowers. Each side benefits from the other.
- **Network effects** – each additional user makes the platform more valuable for all. Creates winner-take-most dynamics.
- **Switching costs** – once users invest time, data, or relationships, leaving becomes costly. Locks in users.

These concepts explain rapid growth through positive feedback loops AND incumbent resistance.

Network effects and switching costs are revisited in Lessons 02, 05, and 08.

What Are the Five Core Financial Functions?

Every financial service performs one or more of five core functions:

Function	Traditional Provider	FinTech Alternative
Payments	Banks, card networks	Stripe, Revolut, Twint
Lending	Banks, credit cooperatives	LendingClub, Funding Circle
Insurance	Insurers, brokers	Lemonade, wefox
Investment	Asset managers, brokers	Robinhood, Wealthfront
Advisory	Financial advisors, banks	robo-advisors, aggregators

Every FinTech innovation targets one or more of these functions by reducing information asymmetry, lowering transaction costs, or improving risk transformation. This taxonomy structures our entire analysis.

This taxonomy structures the entire course – each lesson covers one or more of these functions.

What Makes FinTech Different from Traditional Finance?

Financial services worked the same way for centuries. Then smartphones, cloud computing, and APIs arrived — and the cost of intermediation dropped by orders of magnitude.

FinTech (financial technology): technology-driven innovation in financial services that reduces information asymmetry, lowers transaction costs, or improves risk transformation.

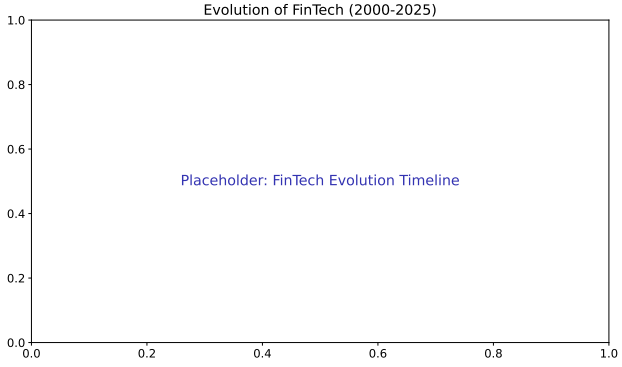
Key characteristics that distinguish FinTech from traditional financial services:

- **Digital-first** – designed for mobile and web from the ground up, not digitized legacy processes
- **Data-driven** – uses real-time data and machine learning to automate decisions and personalize services
- **Unbundled** – focuses on specific functions rather than full-service offerings, competing on specialization
- **Platform-based** – often operates as a two-sided market connecting users directly

This definition grounds FinTech in economic fundamentals rather than hype.

FinTech is not a new industry – it is technology applied to the oldest industry problems.

How Did Four Technology Waves Reshape Finance?



Key insights:

- **Wave 1 (Infrastructure)**: ATMs (1967) and SWIFT (1973) digitized back-office operations, reducing manual processing costs
- **Wave 2 (Internet)**: Online banking (1990s) and PayPal (1998) eliminated geographic barriers and enabled direct peer-to-peer transactions
- **Wave 3 (Mobile & Platform)**: Smartphones (2007+) made financial services accessible anytime, anywhere; platforms enabled instant matching of supply and demand
- **Wave 4 (Open & Embedded)**: APIs (2018+) unbundle financial services into modular components; finance embedded into non-financial apps

Each wave corresponds to a technology shift that lowered a specific type of transaction cost.

Which Revenue Model Reveals Which Problem a FinTech Solves?

Revenue models reveal which economic problem each FinTech solves:

Revenue Model	Economic Logic	Examples
Transaction fees	Payment for intermediation service	Stripe (payment processing), card networks
Subscription/freemium	Payment for convenience and features	Revolut (premium accounts)
Data monetization	Information as product	Credit bureaus, risk scoring
Marketplace commissions	Platform takes cut of matched transactions	Lending platforms
Lending margins	Spread between borrowing and lending rates	Digital banks with lending

Traditional banks rely primarily on lending margins (net interest income) and fees. FinTechs diversify revenue sources by unbundling these functions.

Revenue models reveal which economic problem each FinTech solves.

Why Are Legacy Core Banking Systems So Hard to Replace?

Every bank transaction — your salary deposit, your card payment, your loan installment — passes through one system. Most of these systems were built in the 1970s and run on COBOL code that nobody wants to touch.

Core banking system (central ledger for all bank operations): the central technology system that manages all bank accounts, transactions, and reporting.

Key functions:

- Account management (opening, closing, updating accounts)
- Transaction processing (payments, transfers, withdrawals)
- General ledger (recording all financial events)

Legacy systems (1970s-80s):

- Batch processing (overnight updates)
- Mainframe-based (COBOL code)
- Monolithic architecture
- Expensive to maintain and modify

Modern cloud-native (2010s+):

- Real-time processing
- API-first architecture
- Modular microservices
- Rapid feature deployment

Examples: Temenos (legacy), Mambu (cloud-native). Why migration is hard: critical systems with decades of customization, regulatory requirements, and risk of disruption.

Legacy infrastructure explains why traditional banks struggle to innovate quickly.

Why Do Cross-Border Payments Take Days and Cost 7%?

SWIFT (Society for Worldwide Interbank Financial Telecommunication): a messaging standard for international bank communication, not a payment system itself.

Correspondent banking model:

- Banks hold **nostro accounts** (our account at their bank) and **vostro accounts** (their account at our bank) with partner banks in other countries
- Cross-border payments route through chains of correspondent banks
- Each intermediary adds cost and delay

Limitations through transaction cost lens:

- **Slow** – 2-5 days for settlement due to batch processing and time zones
- **Expensive** – multiple intermediaries each take fees (typically 3-7% for remittances)
- **Limited hours** – operates during business hours only, no weekend processing
- **Opaque** – difficult to track payment status across multiple banks

Understanding SWIFT's limitations explains why cross-border payments are a major FinTech opportunity.

What Makes Digital Infrastructure Fundamentally Different?

Traditional banking infrastructure:

- Batch processing (end-of-day settlement)
- Branch-based distribution
- Siloed data (different systems for different products)
- Manual compliance processes
- Institution-centric (built around bank operations)
- Closed systems (proprietary protocols)

Digital FinTech infrastructure:

- Real-time processing (instant updates)
- Digital-first, mobile-native
- Unified data (single customer view)
- Automated compliance (RegTech)
- Function-centric (built around customer needs)
- Open systems (API-based integration)

This architectural difference drives FinTech's competitive advantage: faster time-to-market, lower operational costs, and superior customer experience. Traditional banks must either modernize infrastructure or partner with FinTechs.

The shift from institution-centric to function-centric architecture drives all FinTech innovation.

How Does Money Actually Move When You Tap Your Card?

You tap your card and the coffee is paid for. It feels instant. Behind that tap, five parties exchange messages, and actual money won't move for days.

Economic function of payments: transferring value between parties with finality (certainty that payment is complete and irreversible).

The four-party model:

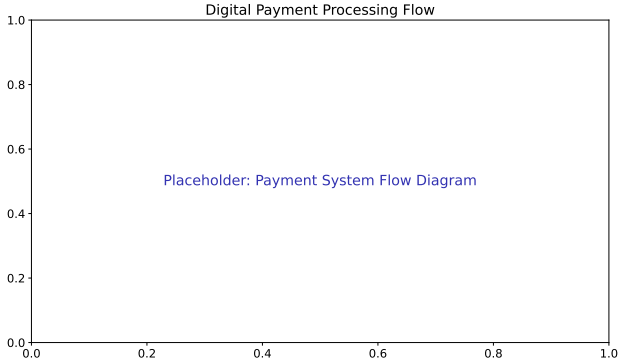
- **Cardholder** (buyer) – initiates payment
- **Merchant** (seller) – receives payment
- **Issuing bank** (cardholder's bank) – authorizes and funds payment
- **Acquiring bank** (merchant's bank) – processes payment for merchant
- **Card network** (Visa, Mastercard) – provides infrastructure and rules connecting issuers and acquirers

Three-stage flow:

1. **Authorization** – checking if cardholder has sufficient funds/credit (real-time)
2. **Clearing** – exchanging transaction details between banks (batch)
3. **Settlement** – actual movement of funds between banks (1-3 days)

The four-party model is the foundation of all card-based payment systems worldwide.

Where Does the 2–3% Merchant Fee Actually Go?



Key insights:

- **Information flows in real-time** – authorization happens in milliseconds using secure messaging
- **Money flows in batch** – settlement (actual fund movement) takes 1-3 days despite instant authorization
- **Multiple intermediaries** – each party (network, issuer, acquirer) takes a fee, typically 2-3% total for merchants
- **Risk during delay** – merchants face risk if cardholder disputes transaction after goods delivered but before settlement

This mismatch between instant authorization and delayed settlement creates opportunities for FinTech innovation in real-time payments.

Notice how information flows in real-time but settlement (actual money movement) can take days.

Should Payments Settle One-by-One or in Batches?

Two approaches to settling payments between banks:

RTGS (Real-Time Gross Settlement):

- Each transaction settled individually
- Immediate and irrevocable
- Lower risk (no credit exposure)
- Higher cost (requires large liquidity buffers)
- Examples: SIC (Switzerland), Fedwire (US), TARGET2 (EU)

DNS (Deferred Net Settlement):

- Transactions batched and netted
- Periodic settlement (e.g., end of day)
- Higher risk (intraday credit exposure)
- Lower cost (less liquidity needed)
- Examples: SEPA (EU retail), ACH (US)

Switzerland's SIC system: One of the world's most advanced RTGS systems, processing over CHF 200 billion daily in real-time. All major Swiss banks connected. Enables instant payment finality.

Switzerland's SIC system is one of the world's most advanced RTGS systems.

What Invisible Layers Carry Every Payment You Make?

Theory: Payment rails are the layered infrastructure that carries payment messages and settles funds.

Layer	Function and Examples
Messaging	Transmits payment instructions (SWIFT MT/MX, ISO 20022)
Clearing	Calculates net obligations between parties (ACH, SEPA, CHIPS)
Settlement	Final transfer of funds between accounts (RTGS, DNS)

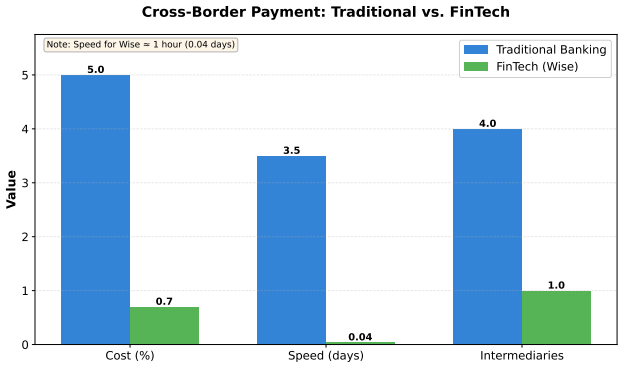
Key insight: FinTech innovators build *on top of* existing rails:

- Stripe rides card network rails (Visa, Mastercard)
- Wise uses local payment rails to avoid correspondent banking fees
- Apple Pay is an interface layer over existing card infrastructure

ISO 20022 migration: Global shift from legacy SWIFT MT messages to structured XML-based ISO 20022 format (2022–2025). Benefits: richer data, interoperability across payment types, enables straight-through processing.

Every FinTech payment innovation rides on existing rails—understanding the stack explains what can and cannot be disrupted.

How Does Wise Bypass the Correspondent Banking Chain?



Theory: Cross-border payments are expensive because of FX spreads, correspondent banking fees, and time value.

Traditional model:

- Chain of correspondents
- Fees: 3–7%
- Speed: 2–5 days
- Opaque FX markup

Wise model:

- P2P matching of currency flows
- Local transfers in each country
- Fees: 0.5–1.5%
- Speed: minutes to hours
- Mid-market FX rate

Other innovators: Ripple (blockchain settlement), Payoneer (multi-currency accounts)

Wise bypasses correspondent banking by matching currency flows locally—solving the cross-border cost problem at its root.

Which Friction Point Does Each Payment Innovation Attack?

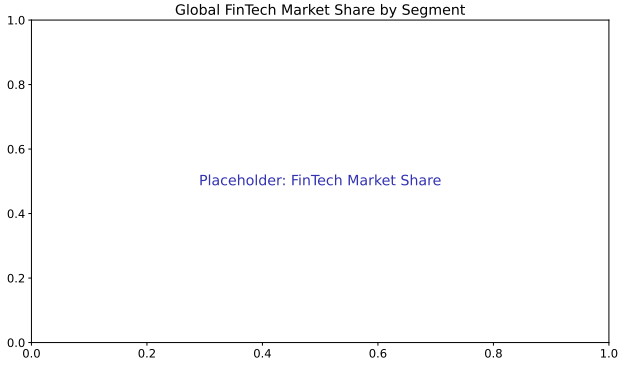
Key innovations attacking friction points:

- **Mobile payments** (payments via smartphone) – NFC (near-field communication for contactless), QR codes (camera-based payment initiation), in-app payments. Reduces transaction costs by eliminating physical cards and terminals.
- **Real-time payments** (instant account-to-account transfers) – SEPA Instant (EU: under 10 seconds), FedNow (US), RTP (US). Eliminates information asymmetry by providing immediate payment confirmation and settlement.
- **BNPL (Buy Now Pay Later)** (short-term interest-free installment plans) – unbundles credit from payment, targeting millennials averse to credit cards. Shifts risk transformation from issuers to merchants and BNPL platforms.
- **Twint (Swiss mobile payment app)** – QR-based, account-to-account, instant settlement via SIC. Example of combining mobile convenience with real-time infrastructure.

Each innovation targets a specific friction identified in Section 1: convenience, speed, transparency, or credit access.

Each innovation attacks a specific friction identified in Section 1.

Why Do Payments Dominate the Global FinTech Market?



Key insights:

- **Payments dominate** – highest transaction volume and most to gain from cost reduction (currently 2-3% per transaction)
- **Lending second-largest** – information asymmetry problem most amenable to data-driven solutions (alternative credit scoring)
- **Regional differences** – Asia-Pacific leads in mobile payments (e.g., Alipay, WeChat Pay), North America in institutional FinTech, Europe in open banking
- **Growth drivers** – smartphone penetration, API standardization, regulatory support (e.g., PSD2 in EU)

Payments dominate because they have the highest transaction volume and most to gain from cost reduction.

Why Is Switzerland a Global FinTech Laboratory?

Swiss FinTech ecosystem (2025):

- Over 400 FinTech companies, concentrated in Zurich (financial center) and Zug (Crypto Valley)
- Key segments: payments (Twint), digital banking (Neon), wealth management (Descartes Finance), blockchain (Ethereum Foundation)

Why Switzerland attracts FinTech:

- **Regulatory innovation** – FINMA sandbox (testing without full license), DLT Act (2021, legal framework for tokenized assets)
- **Banking tradition** – 150+ years of financial expertise, strong wealth management sector
- **Stability** – political neutrality, strong currency, rule of law
- **Talent** – multilingual workforce, ETH Zurich and EPFL for technical talent
- **Infrastructure** – advanced SIC payment system, high digital penetration

Swiss companies: Twint (mobile payments), Neon (digital bank), wefox (insurtech).

Switzerland's regulatory innovation (e.g., DLT Act 2021) makes it a global FinTech laboratory.

How Are InsurTech and WealthTech Completing the Unbundling?

Theory: Every financial function is being unbundled by technology-driven startups.

InsurTech — technology-driven innovation in insurance:

- **Peer-to-peer insurance:** Groups pool premiums; unclaimed funds returned (Lemonade, Friendsurance)
- **Usage-based insurance:** Premiums based on actual behavior via IoT/telematics (Root Insurance, Metromile)
- **Parametric insurance:** Automated payouts triggered by objective data—no claims process (e.g., flight delay, earthquake magnitude)

WealthTech — technology for wealth management beyond robo-advisory:

- **Fractional investing:** Eliminate minimum investment barriers (Robinhood)
- **Social/copy trading:** Replicate strategies of successful traders (eToro)
- **Automated tax optimization:** Tax-loss harvesting algorithms (Wealthfront, Betterment)

Information problem solved: Telematics reduces adverse selection in auto insurance; copy trading addresses information asymmetry between expert and novice investors.

InsurTech and WealthTech complete the FinTech taxonomy—every financial function is being unbundled.

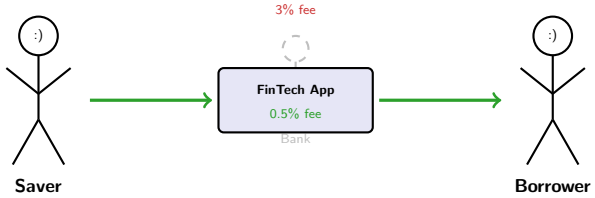
How Do Eight Lessons Map to Five Financial Functions?

This course maps the five financial functions to eight lessons:

Lesson	Topic	Functions Covered
01	FinTech Fundamentals & Payment Systems	Payments (foundation for all)
02	Neobanks & Open Banking	Payments, advisory (account aggregation)
03	P2P Lending & Robo-Advisors	Lending, investment, advisory
04	RegTech & Compliance	Cross-cutting (enables all functions)
05	Blockchain Fundamentals	All functions (decentralized)
06	Financial Markets & Trading	Investment, risk transfer
07	Risk Management & Regulation	Cross-cutting (quantifying risk)
08	Emerging Topics in Digital Finance	Integration and emerging trends

Each lesson builds on the economic framework from this lesson: which problems do these innovations solve, and how?

This roadmap connects back to the financial services taxonomy from Frame 3.



Technology changes the cost of trust — but does it change the need for it?

Summary

Key takeaways from Lesson 01:

1. **Financial intermediaries exist to solve three problems:** information asymmetry (screening and monitoring), transaction costs (matching and contracting), and risk transformation (diversification and liquidity provision). FinTech innovations target one or more of these.
2. **FinTech applies platform economics to financial services:** two-sided markets, network effects, and switching costs explain rapid growth and winner-take-most dynamics. Understanding these concepts is essential for analyzing competitive strategy.
3. **Payment systems evolved from batch/correspondent to real-time/direct:** traditional infrastructure (SWIFT, correspondent banking) is slow and expensive due to batch processing and multiple intermediaries. Modern systems (SEPA Instant, SIC) enable real-time settlement.
4. **Switzerland is a leading global FinTech hub:** regulatory innovation (FINMA sandbox, DLT Act), banking tradition, and advanced infrastructure make Switzerland attractive for FinTech innovation. Over 400 companies operate in the Swiss ecosystem.

Next lesson: Neobanks and Open Banking – how digital challengers contest traditional banking markets.