Island Digital Futures Institute

TECHNICAL REPORT
NOVEMBER 2026



SEVEN PILLARS · EVIDENCE TO 2026 · A STAGED PATH

# Intelligent Banking 2030
## *from vision to execution*

Seven pillars, the evidence as it stands in 2026, and a staged path for Islamic and small-market banks

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TECHNICAL REPORT · VERSION 1.0 · NOVEMBER 2026

# Intelligent Banking 2030: *From Vision to Execution*

*Seven pillars, the evidence as it stands in 2026, and a staged path for Islamic and small-market banks*


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# Abstract

ABSTRACT

Many banking strategies written in 2024 and 2025 rest on a small set of widely repeated cases: a fintech assistant said to do the work of 700 agents, a voice biometric said to have halved attempted telephone fraud, palm payments at the supermarket, and promises of 40–60% cost reduction from artificial intelligence (AI). This report presents a structured longitudinal reassessment of those claims two years on. It proposes a seven-pillar model of intelligent banking, organized in three layers (customer experience, operational core, and real economy) above shared foundations and a single governance spine. It then records 54 cases and regulatory developments in evidence ledgers, against their status in early November 2026. Of the 30 cases that were widely cited in 2024–25, 12 held or grew, 15 needed material revision, and 3 had been discontinued or could not be traced to a verifiable source. Four shifts stand out. Conversational agents scale where they are scoped, grounded, and confirmed, and falter where headcount is cut ahead of measured deflection. Authentication has moved from biometrics as the credential to device-bound keys, driven by regulators retiring SMS one-time passwords, with national digital identity serving as a trusted route for identity proofing. Institution-reported productivity gains for specific tasks fall mostly between 10% and 30%, whereas bank-wide net cost reductions of 15–20% remain a scenario projection rather than an observed outcome. Tokenization has entered regulated production in wholesale markets and controlled pilots in Islamic capital markets. We argue that intelligent banking is not an obligation to adopt seven technologies but a disciplined way of choosing, integrating, and governing capabilities that produce demonstrable value. The report therefore classifies the pillars as essential, conditional, or opportunity-led, and provides board-level stage gates, an accountability architecture for AI agents, and a protocol for Shariah accountability in automated systems. For small-market banks, the binding constraints are data, integration, language, and correspondent banking rather than model capability.

SEVEN FINDINGS · ONE PER CORAL

# Key *findings*

## 01 Scoped beats autonomous.

The largest customer assistants (Erica at 3.2 billion cumulative interactions; DBS at 10 million users) grew through constrained intents, grounding in bank data, and confirmation before money moves. The two best-known setbacks (Klarna's return to guaranteed human service and Commonwealth Bank of Australia's reinstated roles) followed staffing decisions made before deflection was proven.

## 02 The credential is now the device; national identity anchors proofing.

Banks in the UAE, the Philippines, Singapore, and Malaysia have moved away from SMS one-time passwords for login or high-risk transactions, in most cases at regulators' direction. Passkeys now carry 36% of sign-ins across services in the FIDO index. Cloned voices have beaten voice ID at several UK banks, and Amazon One closed for lack of adoption.

## 03 Agentic value is real but smaller and slower than claimed.

Banks report task-level gains of 10–30%, mostly in software engineering. Bank-wide net cost reduction of 15–20% is McKinsey's most likely scenario (rated 30% likely), a projection rather than an observed outcome; gains above 40% appear only in scenarios rated below 5% likely.

## 04 Compliance AI is the best-measured pillar, and its evidence is ageing.

HSBC's 2–4 times uplift in suspicious-activity detection with 60% fewer alerts (2023) remains the reference case. Newer gains come from shared utilities (Singapore's COSMIC) and liability regimes (UK reimbursement of push-payment fraud).

## 05 Tokenization has reached Islamic capital markets, as pilots.

Malaysia issued its first tokenized sukuk in an April 2026 pilot, and a controlled pilot in August 2026 issued RM1.38 billion of sukuk in tokenized form to test settlement with tokenized deposits. No live bank smart contract yet distributes murabaha, ijarah, or mudarabah profit on-chain.

## 06 Distribution and regulation, not ledgers, drive retail investment.

Fractional property reached scale through licensed fund structures (Stake reports more than 2 million users), and fractional sukuk is live in a bank app. Title-deed tokenization remains a regulated pilot.

## 07 For small markets, the constraints are external and structural.

Correspondent banking relationships in the Pacific fell by about 60% after 2011, and global AI readiness indices cannot score some small states for lack of data. Shared infrastructure and regional cooperation matter more than any single bank's model.

# Decisions for boards, *in brief*

EXECUTIVE BRIEFING

Intelligent banking is not an obligation to adopt seven technologies. It is *a disciplined way of choosing, integrating, and governing capabilities* that produce demonstrable value.

## 1 Design one architecture; deploy in sequence

Build the shared foundations once (data, integration, models, identity, and governance) and let each pillar use them. Architectural integration does not require simultaneous deployment.

## 2 Strengthen how the bank operates first

Pillars 01 to 04 improve how the bank serves, authenticates, operates, and controls. Compliance and identity come first because they protect customers, reduce fraud, and keep correspondent relationships open.

## 3 Treat new markets and assets as conditional

Pillars 05 to 07 change what the bank offers and where it competes. Proceed only when regulation, partners, reliable data, and demand justify the investment.

## 4 Fund by evidence gate, not by calendar

Release each tranche against a baseline, an agreed target, validation by a second-line function, and a recorded decision to proceed, remediate, defer, or stop (see the gate template in Section 6).

## 5 Keep accountability human

Delegating execution to an AI agent never delegates institutional accountability. This holds for consumer redress, model risk, and Shariah accountability alike.

EXHIBIT A

### Where each pillar sits for a resource-constrained bank

**ESSENTIAL, EARLY**
*How the bank operates*

- 04 Continuous compliance — Regulatory credibility, fraud prevention, correspondent relationships
- 02 Frictionless identity — Authentication and recovery underpin every trusted transaction
- 03 Agentic operations — Early, under control: measurable internal value and staff capability
- 01 Conversational banking — Early to medium term: access, language, and controlled transactions

**CONDITIONAL**
*Where conditions already exist*

- 06 Real economy integration — Where reliable asset data and a clear benefit already exist
- 07 Platform reach — Where corridors, partners, and legal feasibility are proven

**OPPORTUNITY-LED**
*When the market is ready*

- 05 Digital asset infrastructure — When regulatory permission, custody, and commercial demand justify it

EXHIBIT B

## Three stages to 2030

STAGE 1 · 2027 TO MID-2028

### Foundation

Data, integration, and AI governance in place; device-bound authentication replaces SMS codes; machine-learning controls run alongside rules; staff copilots with logged use.

STAGE 2 · MID-2028 TO 2029

### Scale

Authenticated agents act within limits; three to five processes run end to end with agents; pre-transaction controls and codified Shariah rules; an asset-data pilot only if justified and approved.

STAGE 3 · 2030

### Ecosystem

Conditional and opportunity-led pillars proceed where gates are met: fractional investment, custody partnerships, and cross-border services through partners.

### What the evidence supports

- ✓ Scoped, grounded agents with confirmation before money moves
- ✓ Device-bound authentication in place of SMS codes
- ✓ Machine-learning compliance alongside rules, and shared utilities
- ✓ Agents in document-heavy, rule-bound processes, with human review
- ✓ Reuse of regulatory and public data in asset finance
- ✓ A strong domestic digital franchise before cross-border expansion

### What to avoid

- × Staffing cuts based on projected rather than measured deflection
- × Voice as a sole credential; central biometric stores without an exit plan
- × Proprietary ledgers or consortia without a lead funder and real volume
- × Tokenization or custody builds ahead of permission and demand
- × Offshore digital units before corridors and correspondent capacity exist
- × Value claims without a baseline or a control group

EXHIBIT C

## Key numbers, and how strong each one is

OBSERVED

**88%**

Share of UK push-payment scam losses reimbursed in the first period of mandatory reimbursement (regulator)

REPORTED

**36%**

Share of sign-ins made with passkeys across services participating in the FIDO Passkey Index, October 2026

REPORTED

**2–4×**

Suspicious activity detected by HSBC's AI system, with 60% fewer alerts (2023)

REPORTED

**RM1.38bn**

Sukuk issued in tokenized form in a pilot testing settlement with tokenized deposits, Malaysia, August 2026

ESTIMATED

**10–30%**

Task-level productivity gains where processes are redesigned (author's synthesis)

ESTIMATED

**USD 6.5tn**

Global Islamic finance assets in 2025, banking about 71% (LSEG and ICD)

PROJECTED

**15–20%**

Bank-wide net cost reduction in McKinsey's most likely scenario, rated 30% likely

PROJECTED

**>40%**

Cost reduction appears only in scenarios each rated less than 5% likely

> **For small markets.** Shared utilities for financial-crime intelligence, identity verification, language resources, and standards can give small banks the scale that no single institution has (Section 3, "The small-market advantage").


BRANCHING CORAL

1

INTRODUCTION

# From digital banking *to intelligent banking*

The last decade of banking technology moved services from the branch to the phone. The next one moves decisions and actions from people to *systems that perceive, decide, act, and learn*, under human supervision.

Digital banking optimized channels. It digitized forms, moved transactions to mobile applications, and shifted a large share of routine work from bank staff to customers. Intelligent banking changes the institution behind the channel. Four technologies are converging to make this possible: agentic AI that can interpret intent and execute multi-step tasks, digital identity that can recognize a customer without repeated challenges, distributed ledgers that can represent and settle assets under programmable rules, and connected devices that can report the condition and use of financed assets. None of these is new in isolation. Their combination, and the maturity of each by 2026, is new.

DEFINITION

We use *intelligent banking* for an operating model in which customer intent, operational execution, and control are mediated by AI agents and programmable infrastructure, with people supervising outcomes.

Strategies built on these technologies were written quickly. Between 2023 and 2025, boards across the industry were shown a familiar set of cases. A payments fintech reported that its AI assistant did the work of 700 agents. A global bank reported that voice biometrics had halved attempted telephone fraud. Palm payments were spreading through supermarket chains. Strategy material commonly cited reductions of 40–60% in operating costs from AI. Many of these cases were accurate when first reported, although some were never more than claims. By late 2026, several had changed materially, and some had been discontinued.

For banks, a strategy anchored in outdated cases risks over-investing in modalities that the market has abandoned and under-investing in the controls that the successful cases relied upon. For researchers, the gap between announced outcomes and verified outcomes is itself evidence about how AI is adopted in a regulated industry, and it is rarely documented in a systematic way.

## Aim and contributions

The aim of this report is threefold. First, it sets out a model of intelligent banking that is specific enough to guide investment and general enough to apply across conventional and Islamic institutions of different sizes. Second, it tests the evidence commonly cited for each part of that model against its status at the end of October 2026. Third, it translates the result into a staged path that a bank can execute and a supervisor can follow.

This report makes three contributions. First, we propose a seven-pillar model arranged in three layers (customer experience, operational core, and real economy) above shared foundations and a governance spine that applies to every pillar from the first release (Section 3, Figure 1). Second, we introduce an *evidence ledger* for each pillar, which records what was claimed for a case in 2024–25, what the latest verifiable source shows, and what the difference teaches. Third, we derive a decision framework for execution: a classification of the pillars as essential, conditional, or opportunity-led; a staged path to 2030 with board-level stage gates tied to evidence rather than to calendar dates; and an accountability architecture for AI agents and for Shariah rules in automated systems. A research agenda identifies the questions that the available evidence cannot yet answer.

## Who this report is for

The report is written for board members, executives, and transformation leaders in banks, particularly Islamic banks and banks in small or geographically dispersed markets; for supervisors and policy-makers who must respond to these developments; and for researchers in information systems, Islamic finance, and digital government. The small-state perspective is deliberate. Small island developing states (SIDS) face the same technologies as large markets with fewer staff, thinner data, narrower correspondent relationships, and languages that global models serve poorly. These conditions make them critical cases: constraints that are visible early in a small state are often present, but hidden, everywhere else.

## Structure

Section 2 describes the method and the evidence ledger. Section 3 sets out the context for Islamic and small-market banks and presents the seven-pillar model. Section 4 examines each pillar in turn. Section 5 explains why the pillars must operate as one system. Section 6 sets out the staged path, the stage gates, and the governance arrangements. Section 7 draws together the lessons from the cases that changed, Section 8 proposes a research agenda, and Section 9 concludes. Appendix A lists the full evidence ledger. An executive briefing before Section 1 summarizes the decisions that follow for boards.


PLATE CORAL

2

METHOD

# Evidence, *re-examined*

A case is useful to a strategy only if it is still true. This report therefore treats every case as a claim with a date, and asks *what the latest verifiable source shows*.

## Design

The study is a structured longitudinal reassessment of selected public claims. It is not a systematic review: the cases were chosen because they shaped strategy, not sampled from a defined population, and the counts reported below describe this set of cases rather than the industry as a whole. The design has five steps: defining two cohorts of cases, tracing each original claim, searching for the latest evidence, classifying the result under explicit rules, and checking every figure a second time.

## Cohorts

Cohort A comprises 30 prominent cases selected from publicly available banking strategy material, institutional disclosures, industry reports, and media coverage during 2024 and 2025. Cohort B comprises 24 cases and regulatory developments added during the reassessment. Most date from 2025 and 2026; a few are earlier cases included as retrospective counterexamples, such as the trade-finance consortia that closed in 2022 and 2023. Cohort B cases met the same criteria and filled a gap, with priority given to Islamic institutions, emerging markets, and multilingual settings. A case entered either cohort if it met at least one of three criteria: deployment at scale in a regulated institution, exposure to regulatory or supervisory review, or a measurable outcome reported by the institution itself. Regulatory developments entered Cohort B where they changed what banks can or must do.

## Search and sources

For each Cohort A case, the original claim was traced to its earliest available source. For every case, searches were then run between September and November 2026 for the most recent statement, in a fixed order of preference: regulator and central bank

publications; the institution's own releases, results, and investor material; reputable independent reporting; and, only where nothing else existed, vendor case studies or aggregators. Sources were last checked on 3 November 2026, and every figure in this report carries the date of its source. Where a widely repeated figure could not be traced to a primary or reputable secondary source, it is reported as not verified rather than repeated. A second verification pass compared every figure in the text with its source notes, and a further pass replaced secondary citations with primary sources wherever they could be found; the corrections from both were applied before release.

## Classification

Each case receives one status, which describes what happened to the case; the cohort records whether it belonged to the 2024–25 set. A Cohort B case is therefore usually marked New, but it is marked Reversed or Ended where it changed direction or closed (for example, Commonwealth Bank of Australia's reinstated roles in 2025, and the trade-finance consortia that closed in 2022 and 2023, included as retrospective counterexamples). The counts in the abstract refer to Cohort A only. Status marks use shape as well as colour so that they remain legible in print.

| | | | |
|---|---|---|---|
| ● HOLDS | The claim is still supported by the latest source | ◆ GREW | The case has scaled beyond the claim |
| ◐ REVISED | The claim is materially dated, narrower, or mis-stated | ○ REVERSED | The institution changed direction |
| ◌ ENDED | The service or initiative was discontinued | ▩ NOT VERIFIED | No traceable primary or reputable source |
| □ NEW | Added to the evidence base in 2025–26 | | |

## Evidence types and confidence

Numbers in this report are not equally strong, and the report labels them accordingly. Four evidence types are used wherever a figure carries weight: OBSERVED for outcomes measured by a regulator or an independent party; REPORTED for figures reported by the institution or its vendor; ESTIMATED for estimates from research, including the author's own synthesis; and PROJECTED for scenario projections and forecasts. Each ledger entry also carries a confidence rating, assigned by a two-step rule. The rating starts from the type of the latest source: high for a regulator or the institution itself, medium for reputable secondary reporting, and low for a vendor, an aggregator, or a single untraced source. It is then lowered by one level where the figure is self-reported without a published method, dated, incomplete, or reported only in part by the press, and the reason is recorded in the rationale for that entry. Confidence describes how well the evidence supports the status assigned to a case; it does not mean that figures reported by an institution have been independently audited. A bank's official disclosure of transaction volumes, for example, can be fully traceable and still be reported rather than audited.

## The evidence ledger

Each pillar in Section 4 includes a ledger table that records the case, the claim as cited in 2024–25, the latest verified status, and what the difference teaches. Appendix A lists all 54 entries with a case identifier, cohort, original and reassessment sources, observation date, evidence type, confidence, and the rationale for each classification. The same ledger is published with this report as a supplementary dataset, so that it can be reused, checked, and updated.

## Limitations

The method has five limitations. First, banks disclose successes more readily than failures, so the ledger is likely to understate reversals. Second, many figures remain self-reported by the institutions concerned and have not been independently audited. Third, several 2026 developments are pilots whose outcomes are not yet known. Fourth, the cases are weighted towards institutions that publish in English, which under-represents Islamic banks in some markets. Fifth, classification involves judgement, which the published rationale for each entry is intended to make open to challenge. The ledger is therefore a structured reading of public evidence, not an audit, and its conclusions are stated with corresponding caution.


SEA FAN

3

CONTEXT AND MODEL

# Small markets, Islamic finance, *and seven pillars*

The same technologies arrive in every market. What differs is the institution that receives them: its scale, its data, its languages, its correspondent relationships, and, for Islamic banks, *the contractual logic that its systems must respect*.

## Why small markets are different

A bank in a small or geographically dispersed market faces the same technology choices as a large bank with a fraction of the resources. Five constraints recur in the small-state literature and in practice. The first is scale. Fixed costs of platforms, model governance, and specialist staff are spread over fewer customers, producing the diseconomies of scale that have long shaped public service delivery in small island states. The second is data. Models need volume, and small populations generate less of it; the International Monetary Fund (IMF) AI Preparedness Index could not compute an overall score for the Maldives in its December 2024 revision because fewer than a quarter of the required variables were available.[1] The third is language. Global models serve major languages well and minority languages poorly, while customers in small states often switch between a national language and English within one sentence.

PACIFIC SIGNAL

**−60%**

Fall in Pacific correspondent banking relationships since 2011, about twice the global average (World Bank, 2025).

The fourth constraint is external dependence. Small-state banks rely on a shrinking number of correspondent banks for access to foreign currency and international payments. In the Pacific, correspondent banking relationships fell by about 60% after 2011, roughly twice the global average, and a World Bank diagnostic attributed the withdrawals more to economies of scale than to risk perceptions.[2] The Asian Development Bank (ADB) observed in May 2026 that there are now fewer banks in the Pacific than ten years ago.[3] For such banks, demonstrably strong financial-crime controls are a condition of remaining connected to the global system, not a regulatory formality. The fifth constraint is vendor dependence. A small bank rarely builds its own core platform or models, so its choices about hosting, data location, and switching costs shape its sovereignty over its own operations for a decade or more.

## The small-market advantage

The same features that constrain small markets can, under the right institutional conditions, make coordination easier. Small states often have a single national digital identity, a domestic instant-payment system, a small number of banks, and a regulator close enough to the industry to convene it. Where these conditions hold, shared infrastructure can be agreed and adopted faster than in fragmented markets. Small banks do not necessarily implement AI faster, and scale and capacity constraints remain. Small markets can, however, organize shared capability more readily, and the strongest small-market cases in Section 4 reuse national rails for identity, payments, and data rather than duplicating them.

Three opportunities follow. The first is shared utilities in place of duplicated capability: financial-crime intelligence of the kind Singapore pools through COSMIC, identity verification anchored in national identity, language resources such as speech and text data for a national language, and common industry standards. The second is island-specific finance: fisheries, inter-island transport, tourism, resilient infrastructure, and protection triggered by climate events, all areas where verified data can reduce risk. The third is regional cooperation: interoperable identity, compliance, and payment arrangements across small states that reduce dependence on the capacity of any single institution, along the lines of the shared payments mechanism under study in the Pacific.[2] Each requires deliberate coordination by regulators and banks, and none follows automatically from smallness.

## Why Islamic finance is different

Global Islamic finance assets reached USD 6.5 trillion in 2025, an increase of 9%, and are projected to exceed USD 10.5 trillion by 2030; banking accounts for about USD 4.6 trillion, or 71% of the total.[4] The Islamic Financial Services Board (IFSB) uses a narrower definition and reported USD 3.88 trillion for 2024.[5] Two features of Islamic finance bear directly on intelligent banking.

The first is asset-backing. Islamic contracts such as ijarah (lease), murabaha (cost-plus sale), salam (forward sale), and istisna (manufacturing finance) require a real asset, a real sale, or real delivery. Data that verifies the existence, condition, and location of an asset therefore supports Shariah substance as well as credit risk. The second is governance. Islamic banks already operate a second line of normative control, through Shariah boards and Shariah compliance functions, which decides what the institution may do and how. We argue that this existing structure is an advantage. A bank that already codifies Shariah rules and evidences compliance to a board is closer to "continuous compliance" than one that must create such a function from nothing. The same structure, however, raises questions that standard setters have not yet answered. No AI-specific standard from the IFSB or from the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) was found as of November 2026.[6,7]

## The seven-pillar model

We propose a model of intelligent banking with seven pillars arranged in three layers (Figure 1). The customer-experience layer changes how customers reach the bank: through conversation rather than menus (Pillar 1) and through identity that recognizes rather than challenges (Pillar 2). The operational-core layer changes how work is done: by agents that execute and people who supervise (Pillar 3), under controls that act before a transaction completes rather than after (Pillar 4). The real-economy layer connects the bank to assets and markets beyond its balance sheet: through regulated digital assets and custody (Pillar 5), financed assets that report their condition (Pillar 6), and reach beyond the domestic market through partnerships rather than premises (Pillar 7).

We use the coral reef as the organizing image for the model. A reef is built by many species, each with its own form and function, and its strength comes from their interdependence rather than from any single species. A reef also shows how such systems fail: stress on one part spreads, and a reef that loses diversity loses resilience. Each pillar in this report is therefore given the colour of a coral (Figure 1), and the colours recur in every chapter, figure, and table. Coral reefs also sustain the economies of many small island states, whose financial institutions are the focus of this report.

## Foundations and the governance spine

Beneath the pillars sit two kinds of foundation. Four are enterprise foundations that every pillar uses and every bank needs: a governed data platform; an integration layer that exposes core systems through real-time interfaces; a model platform; and identity and consent services. The fifth, ledger and custody infrastructure, is investment-specific. It is needed only when a bank pursues Pillar 5, and for most small banks it is bet-

ter obtained through a regulated partner than built. A governance spine (AI and model risk, data protection, Shariah governance, operational resilience, and sovereignty and exit) runs through every pillar from the first release. The model is deliberately technology-neutral. A bank may host models privately, use regulated cloud services, or combine the two; what the model requires is that the bank retains control of its data and its rules, and ownership of the governance and risk of any keys held on its behalf.

## Not seven obligations

The pillars form one architecture, but they are not one investment. Architectural integration means that each pillar uses the same identity, data, rules, and evidence trail; it does not require that all seven are deployed at once, or at all. A bank can gain substantial value from stronger compliance, identity, integration, and controlled AI without tokenized sukuk, connected assets, or international expansion. We therefore classify the pillars by their position for a resource-constrained bank (Table 1). Pillars 01 to 04 strengthen how the bank operates, and their case rests on control, cost, and service. Pillars 05 to 07 change what the bank offers and where it competes, and their case rests on market conditions that the bank does not control. The two groups therefore have different investment justifications and risk profiles.

TABLE 1 · POSITION OF EACH PILLAR FOR A RESOURCE-CONSTRAINED BANK

| PILLAR | POSITION | STRATEGIC RATIONALE | CONDITION TO PROCEED |
|---|---|---|---|
| 04 Continuous compliance | ESSENTIAL, EARLY | Regulatory credibility, fraud prevention, and correspondent relationships | None; a precondition for the rest |
| 02 Frictionless identity | ESSENTIAL, EARLY | Authentication and recovery underpin every trusted transaction | Regulatory direction on SMS codes; device coverage |
| 03 Agentic operations | EARLY, UNDER CONTROL | Measurable internal efficiency and staff capability | Machine-readable procedures; agent register in place |
| 01 Conversational banking | EARLY TO MEDIUM TERM | Customer access, multilingual service, and controlled transactions | Real-time interfaces to core systems; grounded answers |
| 06 Real economy integration | SELECTIVE | Where reliable asset data and a clear economic benefit already exist | Data available from regulators, platforms, or utilities |
| 07 Platform reach | CONDITIONAL GROWTH | Proven corridors, partnerships, and legal feasibility | Licensing, correspondent capacity, Shariah recognition |
| 05 Digital asset infrastructure | OPPORTUNITY-LED | New instruments and investor reach | Regulatory permission, custody partner, and demand |

FIGURE 1

# The intelligent banking reef: *seven pillars, three layers, shared foundations*

## CUSTOMER EXPERIENCE

*How customers reach the bank*

### 01

*Branching coral*

**Conversational banking**

Intent in natural language, executed by agents with confirmation and a human route

### 02

*Brain coral*

**Frictionless identity**

Device-bound authentication; national digital identity supports proofing where available

## OPERATIONAL CORE

*How work is done and controlled*

### 03

*Plate coral*

**Agentic operations**

Agents execute end to end; people supervise outcomes

### 04

*Soft coral*

**Continuous compliance**

Controls and Shariah checks before the transaction completes

## REAL ECONOMY

*How the bank reaches real assets*

### 05

*Sun coral*

**Digital asset infrastructure**

Regulated tokens, custody, and settlement

### 06

*Sea fan*

**Real economy integration**

Financed assets that report back

### 07

*Bubble coral*

**Platform reach**

Scale through partners, not premises

## SHARED FOUNDATIONS

*Enterprise foundations, built once and used by every pillar; one investment-specific foundation*

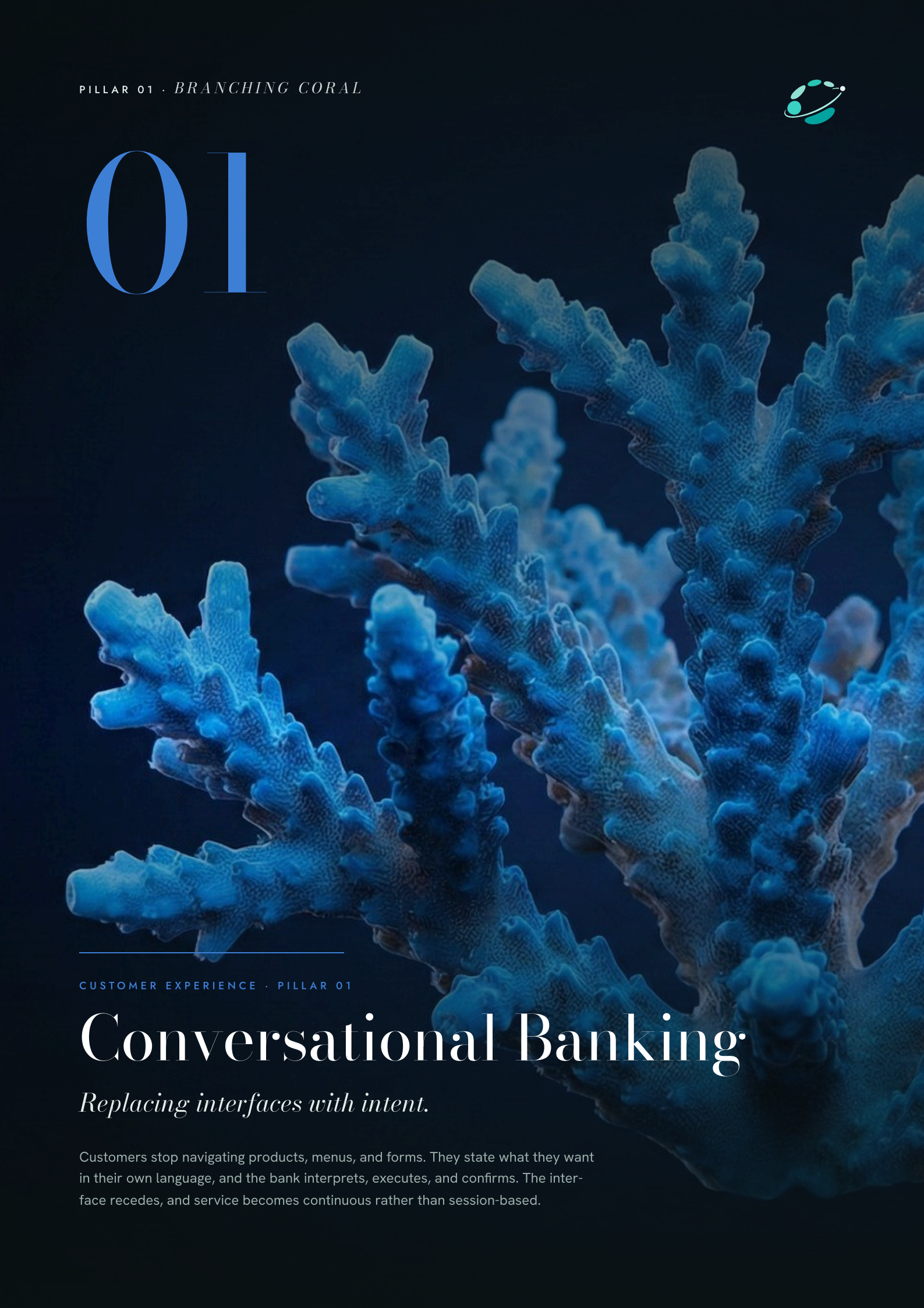
- **Data platform** — Governed, bank-controlled, model-ready
- **Integration layer** — Real-time interfaces to core systems and partners
- **Model platform** — Choice of models; private hosting where needed
- **Identity and consent** — Proofing, authentication, authorization, consent
- **Ledger and custody** — Investment-specific: needed for Pillar 05, usually through a regulated partner

## GOVERNANCE SPINE

AI AND MODEL RISK · DATA PROTECTION · SHARIAH GOVERNANCE · OPERATIONAL RESILIENCE · SOVEREIGNTY AND EXIT

FIGURE 1 The seven pillars of intelligent banking, arranged in three layers above shared foundations and a governance spine that applies to every pillar from the first release. Ledger and custody infrastructure (dashed) is investment-specific rather than universal. Each pillar carries the colour of its coral, which identifies it throughout this report.

# 01



CUSTOMER EXPERIENCE · PILLAR 01

# Conversational Banking

*Replacing interfaces with intent.*

Customers stop navigating products, menus, and forms. They state what they want in their own language, and the bank interprets, executes, and confirms. The interface recedes, and service becomes continuous rather than session-based.

4.1

CONVERSATIONAL BANKING

# From self-service *to concierge*

For a decade, digital banking moved work from the branch to the customer's phone. Conversational banking asks the bank to learn the customer's language, *rather than the reverse*.

Mobile banking succeeded by teaching customers the institution's vocabulary: account types, beneficiary screens, product codes, and menu trees. The burden falls hardest on customers with limited literacy, limited confidence in English, or limited time, which in many small markets describes a large share of the population. A conversational model inverts this arrangement. The customer expresses intent in natural language, by voice or text, and an agent with access to verified data and a defined set of permitted actions carries it out. The interface becomes a conversation, and the burden of navigation moves from the customer to the bank.

| DIGITAL BANKING | | INTELLIGENT BANKING |
|---|---|---|
| – Menus, forms, and product codes | | – Intent in natural language, by voice or text |
| – The customer learns the bank's language | → | – The bank interprets, executes, and confirms |
| – Service begins when the customer logs in | | – Service is continuous and proactive |
| – Chatbots answer questions | | – Agents complete tasks, with a human route |

## What held, and what changed

The best-known case of 2024 has been revised. Klarna reported in February 2024 that its AI assistant handled two-thirds of service chats in its first month, the work of 700 full-time agents, with an estimated USD 40 million profit improvement.[8] In May 2025 its chief executive said that the focus on cost had lowered quality and that customers should always be able to reach a human, and the company began building a flexible human support workforce.[9] Klarna continued to claim that the assistant did the work of 853 agents, yet its reported customer service and operations expense rose year on year, from USD 44 million to USD 53 million in the third quarter of 2025 and from USD 51 million to USD 58 million in the second quarter of 2026.[10,11] The full-time-equivalent claims did not translate into a lower cost line.

TABLE 2 · EVIDENCE LEDGER, CONVERSATIONAL BANKING

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Erica<br>Bank of America · United States | 2 billion interactions; 42 million clients since 2018 (April 2024). | ◆ GREW<br>More than 3.2 billion cumulative interactions by March 2026; nearly 700 million from 20.6 million users in 2025. The 42 million figure is cumulative, not current users.[12] | Scale came from a curated library of about 700 responses and narrow, reliable intents. |
| AI assistant<br>Klarna · Sweden | Two-thirds of chats; work of 700 agents; USD 40m profit gain (2024). | ◐ REVISED<br>Pivot to guaranteed human access (May 2025). Claimed 853 FTE equivalent, while service cost rose year on year.[10] | Agent-equivalents are not savings. Design the human route first. |
| Customer service AI<br>Commonwealth Bank · Australia | Not widely cited before 2025. | ○ REVERSED<br>45 roles placed under review after a voice bot was introduced were retained in August 2025 after call volumes rose; the bank apologized.[13,14] Later cuts followed as its chatbot reached about 90% resolution.[15] | Cut staff after deflection is measured, not before. |
| AXAA voice bot<br>Axis Bank · India | 100,000 calls a day at 90% accuracy. | ◐ REVISED<br>Launch sources (2020) give an 85%+ success rate and 2.23 million customers served; 65–70% of engaged callers still tried to reach an agent. No 2025–26 metrics.[16] | Deflection is not resolution. Measure repeat contact. |
| Hello Ujjivan<br>Ujjivan SFB · India | 1.3 million users, 98% women, INR 690 crore transacted. | ● HOLDS<br>Confirmed in October 2025, with correction: 1.3 million downloads; 98% of microbanking users are women; 11 languages.[17] | Voice, visual, and vernacular design reaches first-time users. |
| Advisor assistant<br>Morgan Stanley · United States | Retrieval-grounded GPT assistant for advisors. | ● HOLDS<br>Used by over 98% of advisor teams, with predeployment evaluations and a daily regression suite (vendor case study).[18] | Employee-facing, evaluated use is the low-risk entry point. |
| digibot and DBS Joy<br>DBS · Singapore | *Not previously cited* | □ NEW<br>Over 10 million users (July 2026); about 9 in 10 retail queries resolved digitally in H1 2026; corporate assistant completes requests in-chat.[19] | Agentic features activate only after login, step by step. |
| Ryt AI<br>Ryt Bank · Malaysia | *Not previously cited* | □ NEW<br>Launched August 2025 on an in-house model trained for Malay, English, and Chinese code-switching; 1.2 million customers by April 2026, nearly half using the AI.[20,21] | Low-resource and mixed-language use needs its own model or data. |
| Agentic payments<br>Visa · Mastercard · Google AP2 | Announced April and September 2025. | □ NEW<br>Live agent purchases at 31 European issuers, authenticated with passkeys (July 2026); no volumes disclosed.[22,23] | Banks become issuers of agent credentials and mandates. |

## What the newer evidence shows

The 2025–26 cases show three patterns. The first is that scale has come from constraint. Erica, the largest documented banking assistant, passed 3 billion cumulative interactions in August 2025 and more than 3.2 billion by March 2026, yet it draws on a curated library of about 700 responses.[24,12] DBS reached more than 10 million users of its generative AI assistants by July 2026, with about nine in ten retail queries resolved digitally in the first half of the year; its agentic features, such as card blocks and fee waivers, are being added only after login and one capability at a time.[19]

IN NUMBERS

**10m+**

Users of DBS generative AI assistants, July 2026.

**57%**

Financial answers from general-purpose chatbots that were wrong or incomplete in a 2026 test (88% for complex queries).

The second pattern is that transacting agents now exist, with explicit safeguards. Ryt Bank in Malaysia launched in August 2025 with an assistant that starts a transfer from a single sentence such as “send 50 ringgit to Siti”; every transaction still requires the customer’s confirmation, and the architecture separates guardrail, intent, payment, and information agents.[21] Nubank allowed payments through its Pix instant-payment system by voice, text, or WhatsApp message, with caps of R$200 per transfer during testing.[25] In the United Kingdom, NatWest planned to give 25,000 customers an agentic assistant built on OpenAI models by early 2026, and Lloyds targeted more than £100 million of value from generative and agentic AI in 2026.[26,27]

The third pattern concerns the gap between grounded and ungrounded systems. A September 2026 test of general-purpose chatbots found incorrect or incomplete financial answers in 57% of more than 10,000 responses, rising to 88% for complex queries.[28] Although the comparison with bank deployments is not like for like, the result supports a design principle in which a bank assistant answers from the bank’s own verified data and policies and acts only within permissions defined in advance.

## Language and inclusion

Language is where the small-market case is strongest and the evidence thinnest. Ujjivan Small Finance Bank’s voice-visual-vernacular application had 1.3 million downloads and had carried more than INR 690 crore of transactions by October 2025, across 11 languages, with women making up 98% of its microbanking users.[17] India has gone further by treating language as public infrastructure: the Reserve Bank of India (RBI) and the national language platform BHASHINI agreed in February 2026 to build models for 22 scheduled languages into bank applications and customer service.[29] Ryt Bank chose the opposite route and trained its own model because available models handled Malaysian code-switching poorly.[21] For a small state with its own language, the second route is rarely affordable. A shared national or regional language model, with speech data collected deliberately, is the more realistic path.

FOR BANKS

## Practical *implications*

1. Expose core banking through secure, real-time interfaces before building the assistant. Without write access, a conversational layer can only answer questions.
2. Ground every answer in verified bank data and approved policy, and test against a regression suite before each release.
3. Require explicit confirmation before money moves, with low limits in early releases.
4. Guarantee a route to a human and measure repeat contact, not deflection.
5. Change staffing only after deflection and resolution are measured over a full cycle.
6. Treat the national language as a data programme, and seek shared models where the market is small.

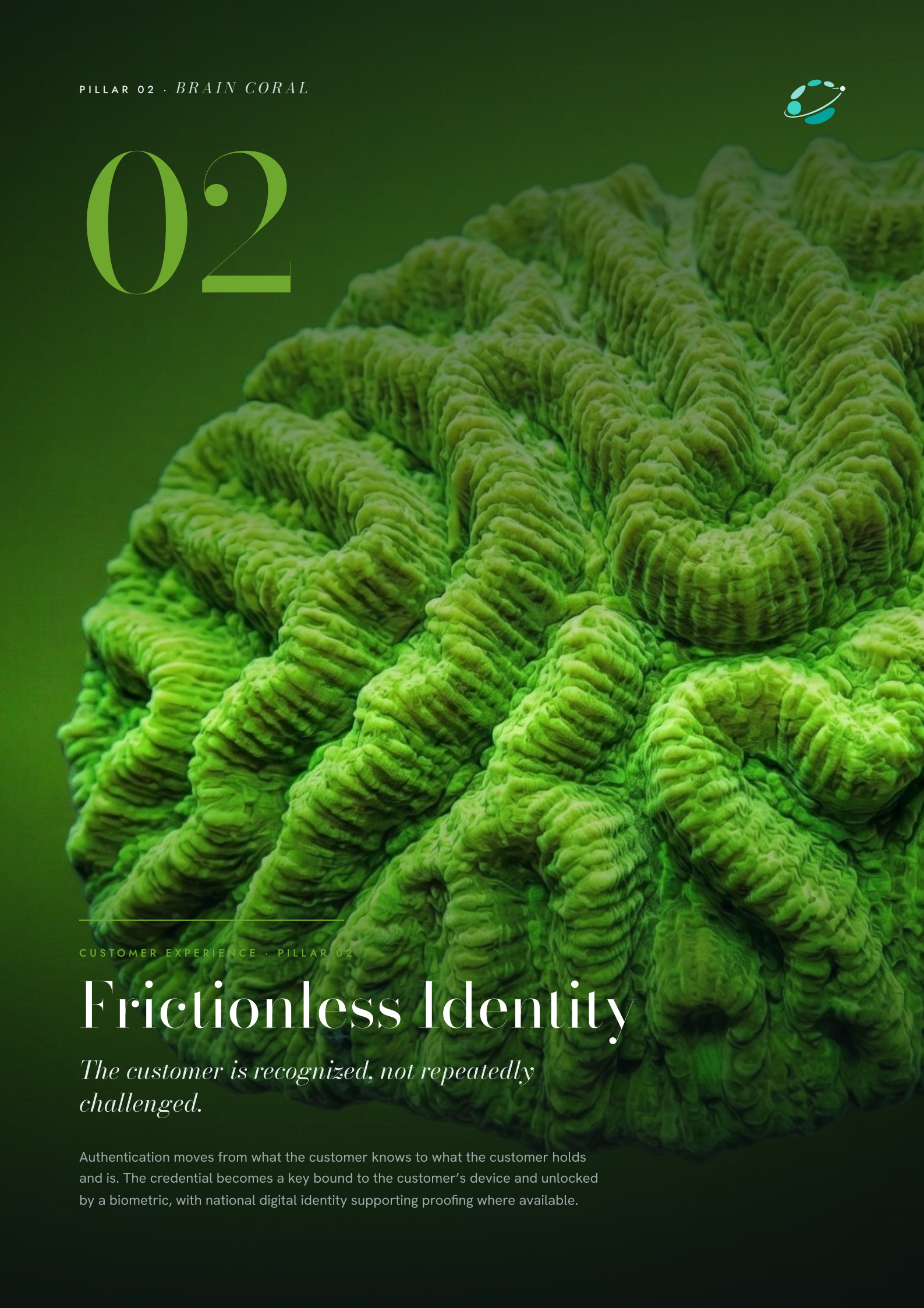
FOR RESEARCHERS

RQ1.1 How do customers in low-resource language communities calibrate trust in voice agents that transact on their behalf?

RQ1.2 Under what conditions does conversational access widen financial inclusion rather than add a further channel for existing users?

RQ1.3 Who is accountable when an agent executes an instruction that the customer later disputes, and how should consent be evidenced?

# 02



CUSTOMER EXPERIENCE · PILLAR 02

# Frictionless Identity

*The customer is recognized, not repeatedly challenged.*

Authentication moves from what the customer knows to what the customer holds and is. The credential becomes a key bound to the customer's device and unlocked by a biometric, with national digital identity supporting proofing where available.

4.2

FRICTIONLESS IDENTITY

# From authentication *to recognition*

The 2024 vision was that the body would become the password. The 2026 evidence points somewhere more practical: *the device holds the key, the biometric unlocks it, and, where law and infrastructure allow, national identity anchors the proofing*.

Passwords, personal identification numbers, and SMS one-time passwords (OTPs) interrupt every journey and fail in predictable ways. SMS codes can be intercepted or socially engineered, and they depend on network coverage, which is uneven across scattered islands and at sea. The original pillar proposed replacing these with voice, face, and palm biometrics. Two years later, the direction of travel is clear but different in an important respect. Regulators have moved banks away from SMS codes towards device-bound, phishing-resistant authentication, while several high-profile biometric modalities have stalled or been defeated.

| DIGITAL BANKING | | INTELLIGENT BANKING |
|---|---|---|
| – Passwords, PINs, and SMS one-time codes | | – Device-bound keys and passkeys |
| – Identity checked at the gate, then trusted | → | – Continuous risk signals through the session |
| – Biometric templates stored centrally | | – Biometric matched on the device or to national ID |
| – Voice as a credential | | – Voice as one risk signal among several |

TABLE 3 · EVIDENCE LEDGER, FRICTIONLESS IDENTITY

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Voice ID<br>HSBC · United Kingdom | £249m of attempted fraud prevented; telephone fraud down 50%. | ◐ REVISED<br>Figures date from May 2021 and have not been updated. Cloned voices defeated voice ID at other UK banks in 2023-24.[30,31] | Voice is now a risk signal, not a credential. |
| Palm vein ATMs<br>Bradesco · Brazil | 30,000+ ATMs; 700m+ transactions without fraud; pensioner proof of life. | ▨ NOT VERIFIED<br>No primary or independent 2024-26 source found; the vendor case study is no longer available.[32] | Do not build strategy on untraceable figures. |
| Amazon One<br>Amazon · United States | Palm payment and loyalty in 500+ Whole Foods stores. | ◌ ENDED<br>Retail palm payment discontinued by 3 June 2026, citing “limited customer adoption”; biometric data to be deleted.[33] | A biometric rail needs dense acceptance and an issuer link. |

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| **Palm payment**<br>Tencent with Visa · Singapore | Expansion of palm payment beyond China. | ◐ REVISED<br>Still a single-café pilot with DBS, OCBC, and UOB cardholders; China scale of about 50 million users is self-reported.[34,35] | Ecosystem density, not the sensor, drives adoption. |
| **Face pay**<br>PopID · UAE | Live in grocery and coffee chains; event deployments. | ◐ REVISED<br>Moved into a UAE Central Bank sandbox proof of concept (January 2026); no volumes published.[36] | Merchant face pay remains pre-scale. |
| **Aadhaar face authentication**<br>UIDAI · India | *Not previously cited* | ☐ NEW<br>282.9 million face authentications in November 2025; over 5 billion since 2021; almost 60% of pensioners' digital life certificates.[37,38] | National-ID face matching scales for proofing and proof of life. |
| **SMS OTP phase-outs**<br>UAE · Philippines · Singapore · Malaysia | *Not previously cited* | ☐ NEW<br>UAE phase-out from July 2025 (reported deadline 31 March 2026); Philippines by June 2026 for high-risk transactions; Singapore login OTPs removed for digital-token users in 2024; Malaysia from 2022.[39,40,41,42] | Regulation, not technology, set the pace. |
| **Passkeys**<br>FIDO Alliance index | *Not previously cited* | ☐ NEW<br>36% of sign-ins across participating services (October 2026, from 26%); 93% sign-in success against 78% for traditional multi-factor login.[43] | Phishing-resistant and faster at the same time. |

## What the newer evidence shows

The clearest change is regulatory. UAE banks began phasing out SMS and email OTPs from July 2025, citing a central bank circular, with a reported compliance deadline of 31 March 2026; from January 2026 several large banks stopped sending SMS codes for online card payments, and customers who insist on SMS must accept the fraud liability themselves.[39,44] The Philippine central bank required SMS and email OTPs to be replaced for high-risk transactions by June 2026, major banks in Singapore removed OTPs for login by customers with digital tokens in 2024, and Bank Negara Malaysia directed the move away from SMS codes in 2022.[40,41,42] India is the deliberate exception. Its 2025 authentication directions, effective April 2026, retain SMS codes while requiring at least one dynamic factor and allowing biometrics and risk-based checks.[45]

The replacement is not a single biometric but a pattern: possession of a registered device, unlocked by the device's own biometric or a PIN, with national identity used, where it is available and lawful, for onboarding and for high-risk events. Passkeys built on the FIDO standard follow this pattern, and the FIDO Alliance index for October 2026 shows them carrying 36% of sign-ins across participating services, succeeding 93% of the time against 78% for traditional multi-factor login, and saving about 27 seconds per sign-in.[43] Because the biometric template stays on the customer's device, this approach also avoids most of the privacy exposure of central biometric databases.

**ENDED**

Amazon announced on 27 January 2026 that it would end palm payment across its retail stores, citing limited adoption, and delete all enrolled palm data.

The biometric cases tell a more cautious story. HSBC's widely quoted Voice ID results (2.8 million users and £249 million of attempted fraud prevented in one year) date from May 2021.[30] Since then, journalists have used cloned voices to enter accounts protected by voice ID at Lloyds, Santander, and Halifax, and in July 2025 the chief executive of OpenAI told a Federal Reserve conference that AI had "fully defeated" voiceprints.[46,31,47] Amazon closed its palm payment service for retail in 2026 after years of operation in more than 500 stores.[33] By contrast, face authentication against national identity records has scaled rapidly: India's Aadhaar system recorded 282.9 million face authentications in November 2025 alone, and almost 60% of pensioners' digital life certificates that month were generated by face authentication.[37]

## Four functions, not one

Identity is often treated as a single function, when it comprises four functions with different purposes. Identity proofing establishes who a customer is at onboarding or recovery, and is where national digital identity adds most value. Authentication confirms that the person returning is the same customer, and is where passkeys and device-bound keys belong; passkeys do not require national identity at all. Transaction authorization confirms that the customer approves a specific payment or change, and should bind the approval to the details of that transaction. Consent records what the customer has allowed the bank, a partner, or an agent to do with data or on their behalf, and must be revocable. Each function has different risks, controls, and legal bases, and a design that merges them tends to over-collect data or under-protect transactions.

## Where the risk moves

When SMS codes are retired, fraud shifts to onboarding, account recovery, and the registration of new devices. Deepfake identity documents and synthetic video injected into the camera stream are growing concerns, and the United States Financial Crimes Enforcement Network (FinCEN) issued an alert on deepfake-enabled fraud in November 2024.[48] Liveness testing under ISO/IEC 30107-3 addresses presentation attacks such as photographs and masks, but not injection attacks, which require device attestation and capture-integrity controls. For small markets, the practical conclusion is to invest in the recovery and re-binding journeys as heavily as in the login itself, and to reuse national identity infrastructure (such as eFaas in the Maldives, UAE PASS, or Aadhaar) for proofing rather than building parallel biometric stores.

FOR BANKS

## Practical *implications*

1. Plan the retirement of SMS codes now; regulators in several markets have already set deadlines.
2. Adopt device-bound keys or pass-keys as the default credential, with on-device biometrics.
3. Use national digital identity as a trusted route for proofing where it is lawful and reliable, not as a requirement for authentication.
4. Treat voice as a risk signal, not as sufficient proof of identity.
5. Require injection-attack detection as well as liveness testing in procurement.
6. Offer a non-biometric alternative, and plan data deletion from day one.

FOR RESEARCHERS

RQ2.1 How does the removal of SMS codes affect access for older customers, customers without smartphones, and customers in areas with weak connectivity?

RQ2.2 What fraud displacement follows OTP phase-outs, and how quickly do controls on recovery and device binding adapt?

RQ2.3 How should liability be shared when a customer chooses a weaker authentication method, as the UAE regime allows?

# 03



OPERATIONAL CORE · PILLAR 03

# Agentic Operations

*Work stops queuing and starts executing.*

AI agents carry out defined tasks end to end, from document review to reconciliation and follow-up. People set the rules, approve what is material, and handle the exceptions. The bank shifts from doing work to governing how work is done.

4.3

AGENTIC OPERATIONS

# From processing work *to supervising outcomes*

Agentic operations are now in production at the largest banks. The evidence shows real gains, concentrated in software engineering and document-heavy work, and *smaller and slower bank-wide returns than early strategies assumed*.

Traditional operations depend on manual checks, sequential approvals, and people coordinating between systems that do not talk to each other. Robotic process automation reduced some of this effort but broke whenever an input changed. Agentic AI introduces reasoning: an agent receives a goal, reads unstructured documents, applies policy, uses permitted tools, and escalates what falls outside its limits. Standard operating procedures become machine-readable instructions, and staff move from processing cases to supervising queues of agent work.

| DIGITAL BANKING | | INTELLIGENT BANKING |
|---|---|---|
| – Manual checks and sequential approvals | | – Agents execute tasks end to end |
| – Rules-based automation that breaks on change | → | – Policies and procedures as machine-readable rules |
| – People coordinate across systems | | – People supervise exceptions and thresholds |
| – Approval of each task | | – Governance of rules, permissions, and outcomes |

TABLE 4 · EVIDENCE LEDGER, AGENTIC OPERATIONS

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| COIN contract review<br>JPMorgan Chase | 360,000 hours of lawyer time saved a year. | ◐ REVISED<br>A 2017 bank statement describing past manual effort on about 12,000 agreements, not a measured saving; not restated since.[49] | Date every claim; retire origin stories. |
| LLM Suite<br>JPMorgan Chase | Deployed to 140,000+ employees; coding productivity up 10–20%. | ◆ GREW<br>About 150,000 weekly users and production use cases doubled in 2025; "about $600 million in efficiencies, some of which are AI-related" (February 2026).[50,51] | Breadth is easy to show; value is hard to isolate. |
| Developer productivity<br>Goldman Sachs | About 20% productivity gain for software developers (chief information officer, 2025). | ● HOLDS<br>Restated as efficiency gains of up to 20% (June 2026); firm-wide assistant (June 2025) and agents for trade accounting and onboarding; no measured study or method published.[52,53,54] | An executive estimate is not a measured outcome. |

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| **Auto-loan agent**<br>FORUM Credit Union · United States | 99% extraction accuracy; approval in under 10 minutes. | ◐ REVISED<br>Vendor case (Multimodal, not nCino): 99% classification and extraction precision on 62 loan packages, with audit trail and human override; time stated only as "hours to minutes".[55] | Accuracy claims need sample sizes and dates. |
| **Digital employees**<br>BNY | *Not previously cited* | ☐ NEW<br>About 140 "digital employees" alongside about 47,000 staff (March 2026); over 40% of code AI-authored.[56] | Agents managed like staff: identity, role, manager. |
| **AI tools and Arc agents**<br>Citi | *Not previously cited* | ☐ NEW<br>Agent platform launched with every agent "monitored, auditable and governed" (April 2026); AI-assisted code reviews free about 100,000 hours of capacity a week; servicing effort down by up to 25% for 6,000 service agents (May 2026, self-reported).[57,58] | Auditability is designed in at launch. |
| **AI economic value**<br>DBS · Singapore | SGD 750m of value in 2024. | ◆ GREW<br>About SGD 1 billion in 2025 (annual report); measurement against control groups described in press coverage of its results.[59,60] | Control groups make value claims credible. |
| **Corporate-function roles**<br>Standard Chartered | *Not previously cited* | ☐ NEW<br>More than 15% of corporate-function roles to go by 2030, reported as 7,000 to 8,000 roles (May 2026); the chief executive later apologized for his wording.[61,62,63] | Workforce change needs a plan, not a slogan. |

## Where the value is, and how large

The best-documented gains are in software engineering. Citi reported that AI-assisted code reviews free about 100,000 hours of capacity each week and that developer productivity rose by 30–40%; Bank of America said its coding tools saved the work of about 2,000 people; BNY reported that more than 40% of its code was written by AI; and JPMorgan's chief information officer said in March 2025 that a coding assistant had raised engineers' productivity by 10–20%.[58,64,56,65] These are institution-reported figures, mostly without published baselines. In operations, the evidence is earlier and thinner: Goldman Sachs is building agents for trade accounting and client onboarding, BNY uses digital employees for payment validation, and Citi reports that AI tools have reduced servicing effort by up to 25% for its 6,000 service agents.[54,58]

**15–20%**

Bank-wide net cost reduction in McKinsey's most likely scenario (rated 30% likely)

PROJECTED MCKINSEY · DEC 2025

**14%**

Measured productivity gain from a generative AI assistant in customer support

OBSERVED NBER FIELD STUDY

**12/50**

Leading banks reporting a realized or projected AI return

OBSERVED EVIDENT AI INDEX · OCT 2026

At the level of the whole bank, the evidence is projected rather than observed. McKinsey's scenarios for agentic AI in banking put the most likely outcome, which it rates at 30% probability, at a 15–20% reduction in the aggregate cost base, and reductions above 40% only in scenarios rated less than 5% likely; it also expects competition to pass much of the saving to customers.[66,67] A large field study found that a generative AI assistant raised customer-support productivity by 14% on average, with the largest gains for less experienced staff.[68] Of the 50 banks in the Evident AI Index, only 12 reported a realized or projected return across their AI activities in 2026, and only 12% of use cases reported impact against operational indicators; Evident's quarterly tracker counted 16 banks putting a number on group-wide AI value by mid-2026, while only 27% of new use cases in the second quarter carried a disclosed outcome.[69,70] Across industries, the MIT NANDA study reported that 95% of organizations were getting zero return from generative AI, a figure that has been criticized for its small sample (interviews with 52 organizations and 153 survey responses) but that points in the same direction, and Gartner forecast that more than 40% of agentic AI projects would be cancelled by the end of 2027.[71,72]

We therefore replace the 40–60% cost-reduction figure used in many 2024–25 strategies with two statements of different strength. The first is an estimate of our own: task-level productivity gains of about 10–30% where processes are redesigned. It synthesizes the institution-reported gains above (10–20% at JPMorgan, 30–40% at Citi, 25% in Citi servicing), the 14% measured in the field study, and Accenture's projection of gains of up to 30%,[68,73] and it applies to specific tasks rather than to whole functions. The second is a projection, not an outcome: scenario analysis suggests potential bank-wide net cost reductions of 15–20% under substantial AI adoption, but this is not yet an empirically established result for the average bank. Actual value will depend on process redesign, integration costs, human oversight, customer adoption, and competitive effects. DBS offers the strongest method for claiming value: it reported economic value of approximately SGD 1 billion from AI and analytics in 2025, and has described comparing customers served by AI-driven solutions with control groups.[59,60]

## Risks that come with write access

Once an agent can change records or move money, five risks become material. The first is excessive tool permissions: an agent given broad access to systems for convenience can act far beyond its task, so permissions should be scoped to the task and granted for the shortest useful time. The second is prompt injection, in which instructions hidden in an email, document, web page, or customer message redirect the agent; content that an agent reads must be treated as data, never as instructions. The third is compromised information sources, where a poisoned policy document, knowledge base, or external feed leads the agent to act correctly on false premises. The fourth is the loss of separation of duties: an agent that prepares, approves, and executes the same transaction collapses controls that banks keep separate for people, so the same separation must apply to agents and between agents. The fifth is irreversibility. A drafted email can be corrected; a sent payment or a closed account often cannot. Approval requirements should therefore rise with the materiality and irreversibility of the action (Table 5).

TABLE 5 · ILLUSTRATIVE CONTROL LEVELS FOR AGENT ACTIONS

| LEVEL | EXAMPLES | AGENT MAY | HUMAN ROLE | EVIDENCE KEPT |
|---|---|---|---|---|
| 1 Customer information | Balances, product terms, status of a request | Answer from verified sources | Sample review; handle escalations | Answer log and sources used |
| 2 Administrative servicing | Update contact details, order a card, book an appointment | Act after customer confirmation | Review exceptions | Action log and confirmation |
| 3 Reversible transactions | Transfers between own accounts; low-value payments within limits | Act within limits after authorization | Set limits; monitor anomalies | Authorization bound to transaction details |
| 4 Material financial transactions | Payments to new payees, disbursements, fee waivers above thresholds | Prepare and recommend | Approve before execution (four-eyes) | Recommendation, approval, and rationale |
| 5 High-impact decisions | Credit decisions, account closure, suspicious-activity reports, Shariah rulings | Gather evidence and draft | Decide; the agent never decides | Full case file for audit and review |

Levels are illustrative. Each bank sets its own thresholds within its risk appetite and applicable law.

## Workforce and governance

Workforce effects became explicit in 2026. JPMorgan's headcount was flat at about 318,500, while operations roles fell by 4% and revenue-producing and front-office support roles rose by 4%.[74,50] Standard Chartered set a target to reduce corporate-function roles by more than 15% by 2030, which press reports put at 7,000 to 8,000 roles.[61,62] Commonwealth Bank of Australia reversed 45 AI-justified job cuts in 2025 and then reduced outsourced chat and technology roles in 2026 as its chatbot resolved about nine in ten conversations.[13,15] In the Gulf, by contrast, Evident found no sign that AI was reducing jobs at the leading banks.[75] The pattern so far is that effects appear first in contract and outsourced layers and in operations, through attrition rather than layoffs.

Supervisors addressed agentic AI more explicitly in 2026, mostly in non-binding form. The Financial Stability Board (FSB) consulted on sound practices for AI adoption in June 2026 and finalized them in October 2026; the consultation included boundaries on what agents may do, human approval at checkpoints and for transactions above set values, and treating agents as "synthetic employees" under controls adapted from human resources.[76,77] A Deputy Governor of the Bank of England observed that a human in the loop for every agent action is unlikely to be realistic and asked whether market-wide guardrails, such as circuit breakers or kill switches, are needed.[78] In the United States, revised model risk guidance issued in April 2026 (SR 26-2) superseded the 2011 guidance and explicitly excluded generative and agentic AI, leaving banks to govern agents through their general risk frameworks.[79] We propose that each agent should have an identity, a named human owner, defined permissions and limits, a log of every action, a measured error rate, and a means of suspension. The governing principle is that delegating execution to an agent never delegates institutional accountability (Section 6).

FOR BANKS

## Practical *implications*

1. Start with document-heavy, rule-bound processes where errors are visible and reversible.
2. Rewrite procedures as machine-readable rules before automating them.
3. Register every agent with an owner, permissions, limits, and a kill switch.
4. Set approval thresholds by materiality rather than reviewing every action.
5. Measure value against a control group and publish the method internally.
6. Plan redeployment and reskilling before announcing efficiency targets.

FOR RESEARCHERS

RQ3.1 How should supervisory approval thresholds for agent actions be set, and how do they change as measured error rates fall?

RQ3.2 What new roles and skills does “supervising outcomes” require, and how quickly can operations staff acquire them?

RQ3.3 Do agentic operations reduce the scale disadvantage of small banks, or increase their dependence on a few model vendors?

# 04



OPERATIONAL CORE · PILLAR 04

# Continuous Compliance

*Controls that act before the transaction completes.*

Financial-crime, conduct, and Shariah controls move from periodic sampling after the event to continuous validation before it. Rules are codified, monitoring never stops, and every decision leaves evidence that a supervisor or Shariah board can follow.

4.4

CONTINUOUS COMPLIANCE

# From reactive oversight *to embedded control*

Compliance is the best-measured pillar and the one on which small banks depend most, because *access to correspondent banking rests on demonstrable control*.

Traditional compliance operates after transactions occur, through sampling, periodic review, and manual investigation of alerts generated by static rules. Most alerts are false, investigators spend their time clearing noise, and genuine risk is found late. Continuous compliance moves the controls into the transaction flow. Machine-learning models score behaviour across networks of accounts, scam interventions interrupt a payment before the money leaves, and every automated decision records its reasons. For an Islamic bank, the same logic extends to Shariah rules encoded into product and transaction workflows.

DIGITAL BANKING

- Static rules and high false-alert volumes
- Sampling and periodic review
- Detection after the money has moved
- Each bank sees only its own data

→

INTELLIGENT BANKING

- Network-level models that learn
- Preventive checks before completion, where logic is defined in advance
- Real-time intervention with the customer
- Shared utilities and privacy-preserving analytics

TABLE 6 · EVIDENCE LEDGER, CONTINUOUS COMPLIANCE

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Dynamic Risk Assessment<br>HSBC with Google Cloud | 60% fewer false positives; 2–4 times more true positives. | ◐ REVISED<br>Primary source (November 2023) reports 2–4 times more suspicious activity and 60% fewer *alerts*, over 1.2 billion transactions a month; 2025 update: more than twice the suspicious-activity reports.[80,81] | Quote the metric the source used. |
| Sherlock fraud engine<br>Revolut | Scores in under 50 ms; USD 3m saved in year one. | ◐ REVISED<br>Figures from a vendor case study of about 2020. The 2024 scam-intervention feature cut card-scam losses by 30%.[82,83] | Intervention with the customer adds to detection. |
| Cheque Chain<br>Emirates NBD · UAE | Blockchain has all but eliminated cheque fraud. | ▨ NOT VERIFIED<br>Launched in 2018; no fraud-reduction figures found in public sources.[84] | A ledger is a control only if outcomes are measured. |
| APP fraud reimbursement<br>Payment Systems Regulator · UK | *Not previously cited* | ☐ NEW<br>88% of losses to in-scope push-payment scams reimbursed (October 2024–June 2025), up from 66%.[85] | Liability rules create the business case for interdiction. |

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Scam controls<br>Commonwealth Bank · Australia | *Not previously cited* | ☐ NEW<br>Customer scam losses down by more than 70% over two years, with name and caller checks.[86] | Layered, customer-facing controls work. |
| COSMIC<br>Monetary Authority of Singapore | *Not previously cited* | ☐ NEW<br>Shared risk platform live since April 2024 with six banks; to expand to more banks and risk areas within two years (August 2026).[87] | Shared utilities see what single banks cannot. |

## What the evidence shows

The reference case is still HSBC's Dynamic Risk Assessment, built with Google Cloud. Reported in November 2023, it detected two to four times as much suspicious activity as the previous rules-based system (about twice in commercial banking and almost four times in retail) while reducing alert volumes by 60%, across more than 1.2 billion transactions a month. The comparison was made over twelve months before and after go-live, adjusted for seasonality.[80] The figure widely repeated in 2024–25 strategy material ("60% fewer false positives") misstates the source, which reported fewer alerts. An HSBC update in 2025 said the system finds more than twice as many suspicious-activity reports and works four times faster, without further percentages.[81]

IN NUMBERS

**2–4×**

Suspicious activity detected by HSBC's AI system, with 60% fewer alerts (2023).

**88%**

Share of UK push-payment scam losses reimbursed in the first period of mandatory reimbursement.

Newer evidence comes from two directions. The first is liability. The United Kingdom made reimbursement of authorized push-payment fraud mandatory from October 2024, and the Payment Systems Regulator reported that 88% of in-scope losses were returned in the following nine months, against 66% a year earlier.[85] Once banks bear the loss, real-time interdiction pays for itself, and the most effective controls now involve the customer directly: Revolut's scam flow questions the customer and can escalate to a specialist, and Commonwealth Bank of Australia reported customer scam losses down by more than 70% over two years.[83,86] The second direction is collaboration. Singapore's COSMIC platform, through which banks share information on accounts of concern, has been live since April 2024 and will be extended to more banks and risk areas; the Financial Action Task Force (FATF) evaluation of Singapore affirmed its effectiveness.[87] The Bank for International Settlements (BIS) showed in Project Aurora, using synthetic data, that collaborative analysis with privacy-enhancing technologies detects laundering networks better than banks working alone.[88]

## What "before the transaction" can and cannot mean

Not every compliance decision can or should be made before a transaction completes. Sanctions screening, limit checks, scam interventions, and Shariah screening against approved lists belong in the transaction flow, because their purpose is prevention and their logic is defined in advance. Other controls are necessarily retrospective: investigating patterns that only appear over time, filing suspicious-activity reports, periodic customer review, and Shariah audit of how products were actually used. Continuous compliance moves to the transaction what can sensibly be decided there, and gives retrospective work better data, earlier alerts, and a complete evidence trail.

## The regulatory frame in late 2026

The rules governing AI in banking matured during 2026, although unevenly. In the European Union, the AI Act "digital omnibus", in force from 27 July 2026, moved the high-risk obligations for credit scoring and creditworthiness assessment from August 2026 to 2 December 2027.[89,90] The Monetary Authority of Singapore (MAS) issued final Guidelines on AI Risk Management on 7 October 2026, effective a year later, covering generative AI and agents, with board accountability due by October 2027 and life-cycle controls by October 2028; agent-specific guidance is to follow a consultation planned for 2027.[91] The Central Bank of the UAE issued a guidance note on responsible AI and consumer protection in February 2026, Qatar's central bank has had an AI guideline since September 2024, and the Hong Kong Monetary Authority (HKMA) is running a second generative AI sandbox cohort with 20 banks.[92,93,94] Bank Negara Malaysia remained at discussion-paper stage, and the RBI's FREE-AI framework of August 2025 is a committee report of recommendations, followed in June 2026 by draft guidance on model risk management that covers AI models.[95,96,97] Common to the MAS, CBUAE, QCB, and HKMA instruments are board accountability, an inventory of AI uses with a materiality assessment, explainability proportionate to impact, human oversight of decisions that affect customers, and control of third-party models.

## Shariah compliance at machine speed

No AI-specific standard from the IFSB or AAOIFI was found as of November 2026; the nearest IFSB work, on regulatory practice in digital Islamic banking, does not address AI.[6,7] Islamic banks therefore combine conventional AI guidance with existing Shariah governance. This gap is also an opportunity for Islamic banks. Shariah rules on permissible counterparties, asset classes, profit calculation, and late-payment treatment can be codified and checked before a transaction completes, in the same way as sanctions screening, with every check recorded for the Shariah compliance function and the Shariah board. Continuous Shariah compliance of this kind is technically ordinary. Its difficulty is institutional: deciding which rulings can be encoded, who signs off the encoding, and how exceptions return to scholars.

Four distinct activities are involved. Automated screening applies an approved list or test, such as permissible sectors or counterparties, and is the most suitable for automation. Encoding approved contractual rules turns a ruling the Shariah board has already made, such as the sequence of ownership in a murabaha or the treatment of late payment, into system logic. Monitoring Shariah substance checks whether transactions actually conform in practice, for example whether the asset existed and passed to the bank before sale, and combines automated tests with human review. Making a new Shariah judgement, on a novel product or a contested case, remains with scholars and cannot be delegated to a system. Section 6 sets out a protocol for the accountability that connects these activities.

FOR BANKS

## Practical *implications*

1. Run machine-learning models alongside existing rules first, and compare alert quality over a full year.
2. Record the features, reasons, and overrides behind every automated decision.
3. Build customer-facing scam interventions, not only back-office detection.
4. Support shared utilities for information-sharing; small jurisdictions benefit most.
5. Codify Shariah screening rules with the Shariah compliance function, and log every check.
6. Map each AI use to the regulator's inventory and materiality expectations now.

FOR RESEARCHERS

RQ4.1 Can AI-enabled compliance lower the cost per transaction enough to slow correspondent-banking withdrawal from small states?

RQ4.2 Which categories of Shariah ruling can be encoded as executable rules, and which must remain with scholars?

RQ4.3 How should explainability be designed for three audiences at once: customers, supervisors, and Shariah boards?

# 05

REAL ECONOMY · PILLAR 05

# Digital Asset Infrastructure

*From ledgers to governed, programmable instruments.*

Permissioned and regulated ledgers turn deposits, sukuk, and other assets into instruments that settle instantly, carry their own rules, and report their state in real time. The technology serves the real economy, and the bank retains ownership of governance and risk, whether it holds keys itself or through a regulated custodian.

4.5

DIGITAL ASSET INFRASTRUCTURE

# From records *to programmable instruments*

Tokenization moved from experiment to regulated production in 2025–26, and in 2026 it reached regulated sukuk issuance in Malaysia. *Retail tokenization, however, remains small.*

Traditional asset administration relies on manual contract management, periodic reconciliation, and settlement cycles of several days. A tokenized instrument records ownership on a shared ledger, settles delivery against payment at the same moment, and can carry rules for eligibility, transfer, and distribution in code. For Islamic finance, the appeal is particular. Asset-backing, transparent profit calculation, and verifiable transfer of ownership are central requirements of Shariah-compliant instruments, and a well-governed ledger can make each of them easier to evidence.

DIGITAL BANKING

- Manual contract administration
- Settlement in days, with reconciliation
- Large minimum tickets for sukuk
- Profit distribution run by operations

→

INTELLIGENT BANKING

- Rules and eligibility carried in the instrument
- Atomic settlement against tokenized money
- Fractional access through the bank's app
- Distribution logic approved and then automated

TABLE 7 · EVIDENCE LEDGER, DIGITAL ASSET INFRASTRUCTURE

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Smart Sukuk<br>Abu Dhabi Islamic Bank · UAE | Tokenized fractional sukuk from USD 1,000 instead of USD 200,000. | ◐ REVISED<br>A digital fractional platform (April 2025) not described by the bank as blockchain-based; extended to UAE sovereign retail sukuk from AED 4,000 (November 2025), with 70+ listings.[98,99] | Retail access came from distribution and regulation, not ledgers. |
| Orion digital bonds<br>HSBC · Hong Kong | Multi-currency digital green bond, T+1 settlement (2024). | ◆ GREW<br>Over USD 3.5bn of digital bonds; HKD 12bn issue for the Hong Kong Mortgage Corporation (June 2026); chosen for the UK digital gilt pilot.[100,101] | Sovereign and quasi-sovereign issuers lead. |
| Gold Token<br>HSBC · Hong Kong | Retail tokenized gold. | ◆ GREW<br>Over USD 1bn traded across more than 100,000 transactions (November 2025).[102] | Familiar assets in a familiar app sell. |

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Onyx, now Kinexys<br>JPMorgan Chase | Programmable interbank settlement. | ◆ GREW<br>Over USD 4tn processed in total and average daily volume above USD 7bn (June 2026), up from USD 2bn a day in 2024; deposit token JPMD on a public chain, live for institutional clients (November 2025).[103,104,105] | Deposit tokens keep money on the bank's balance sheet. |
| mBridge<br>Multi-central-bank platform | Cross-border wholesale CBDC with GCC participation. | ◐ REVISED<br>BIS handed the project to its partners in October 2024; Saudi central bank membership ended after the proof of concept in May 2025, disclosed in September 2026.[106,107] | Geopolitics shapes settlement infrastructure. |
| Tokenized sukuk<br>Khazanah · Malaysia | *Not previously cited* | ☐ NEW<br>First tokenized sukuk in Malaysia: RM100m wakalah tranche, piloted with the Securities Commission (April 2026).[108] | Wakalah structures tokenize most easily. |
| Tokenized deposit settlement<br>CIMB Islamic · Malaysia | *Not previously cited* | ☐ NEW<br>Controlled pilot (August 2026): RM1.38bn of an RM1.68bn sukuk issued in tokenized form to 12 investors, testing settlement with tokenized deposits under the central bank's innovation hub.[109] | Islamic DvP settlement tested in a pilot. |
| Stablecoin regimes<br>United States · Hong Kong · UAE | *Not previously cited* | ☐ NEW<br>Hong Kong licensed its first two issuers (April 2026); US OCC final rule (October 2026), Act effective January 2027; UAE dirham tokens licensed.[110,111,112] | Bank-issued, fully reserved tokens are now regulated. |

## What the evidence shows

Wholesale tokenization is in production. HSBC's Orion platform had supported more than USD 3.5 billion of digitally native bonds by mid-2026, including an HKD 12 billion issue for the Hong Kong Mortgage Corporation described as the largest digital bond to date, and the third Hong Kong government digital green bond, which offered settlement in tokenized central bank money.[100,113] JPMorgan launched its deposit token for institutional clients in November 2025.[105] The BIS Project Agorá published its prototype report in May 2026, finding that tokenized deposits and reserves can coexist on one platform with atomic multi-currency settlement, while noting that its tests used synthetic transactions.[114] The HKMA began real-value tokenized-deposit transactions under Project Ensemble in November 2025.[115]

ISLAMIC FIRST · PILOT

**RM1.38bn**

Sukuk issued in tokenized form by CIMB Islamic in a controlled pilot testing settlement with tokenized deposits, August 2026, under Bank Negara Malaysia's Digital Asset Innovation Hub.

The most significant development for Islamic finance is Malaysian. Khazanah Nasional issued the country's first tokenized sukuk in April 2026, an RM100 million one-year tranche structured as wakalah bi al-istithmar.[108] In August 2026, CIMB Islamic completed a pilot that tested the settlement of tokenized sukuk with tokenized deposits in a controlled environment: of an RM1.68 billion issuance under its wakalah programme, RM1.38 billion was represented in tokenized form and subscribed by 12 institutional investors.[109] Both are pilots rather than routine production, and neither yet distributes profit or handles redemption on-chain. We found no verified live bank deployment in which a smart contract calculates and distributes murabaha, ijarah, or mudarabah

profit. The constraint is not technical, as coupon automation is routine for conventional digital bonds. In mudarabah and ijarah, profit depends on the performance of off-chain assets and on calculations approved by a Shariah board, so the binding constraints are data feeds and governance. Wakalah structures dominate early issuance because the underlying pool need not itself be tokenized.

## Custody: governance versus keys

Bank ownership of governance and risk is not the same as direct control of every cryptographic key. A bank remains accountable for the assets it holds for customers, for the custody model it chooses, and for the risks of that model. It can meet that accountability by holding keys itself, by using a regulated third-party custodian, or by a shared arrangement such as multi-party computation in which no single party holds a complete key. For most small and mid-sized Islamic banks, a regulated custodian under a clear service agreement is a valid and often better operating model, provided the bank can verify holdings, control instructions, and exit the arrangement.

## Money on the ledger

Bank-issued tokens became regulated products in 2025–26. Hong Kong's stablecoin ordinance took effect in August 2025 and the first two licences, to HSBC and a Standard Chartered-linked issuer, were granted in April 2026 out of 36 applications.[110] In the United States, the Office of the Comptroller of the Currency (OCC) finalized its rule under the GENIUS Act in October 2026, ahead of the Act's effective date of 18 January 2027.[111] The UAE requires full reserves for dirham payment tokens, licensed its first in October 2024, and has approved bank-issued dirham tokens since.[112] Fully reserved, non-yielding tokens sit closer to Shariah principles than interest-bearing deposits, but open questions remain about how reserves are invested and how fees are charged. Shariah-positioned stablecoins exist only at the margins and none is issued by a major bank.[116]

Retail tokenization remains small. Tokenized real-world assets distributed on public chains (excluding stablecoins) were about USD 34 billion in May 2026 and about USD 39 billion by early November, dominated by tokenized government debt funds, with no material sukuk component.[117] Custody shows a similar pattern: Standard Chartered built its own digital asset custody in the UAE and Luxembourg and controls Zodia Custody, while other Gulf banks invested in or partnered with specialist custodians rather than building their own.[118,119] For a mid-sized Islamic bank, sub-custody with a regulated custodian is the realistic first step.

FOR BANKS

## Practical *implications*

1. Where the investment is justified, begin with non-transferable digital certificates and tokenized records inside a regulatory sandbox.
2. Partner for custody and ledger infrastructure; retain ownership of governance, risk, and exit.
3. Engage the Shariah board early on token structure, reserves, and distribution logic.
4. Prefer interoperable, regulated platforms to proprietary ledgers.
5. Use wakalah and asset-light structures first; leave ijarah token transfer for later.
6. Avoid speculative crypto exposure; tie every token to the real economy.

FOR RESEARCHERS

RQ5.1 Under what conditions does tokenized ownership satisfy Shariah requirements for transfer of ownership and risk in ijarah sukuk?

RQ5.2 Which oracle and governance designs allow mudarabah profit to be distributed automatically while preserving Shariah board authority?

RQ5.3 Can small states issue sovereign or quasi-sovereign tokenized sukuk at a scale and cost that conventional issuance cannot match?

06

REAL ECONOMY · PILLAR 06

# Real Economy Integration

*Financed assets that report back.*

Vessels, vehicles, equipment, stock, and buildings generate data about their location, use, and condition. When that data reaches credit and risk systems, financing responds to what is happening rather than to what was last reported, and investors can see the assets they own.

4.6

REAL ECONOMY INTEGRATION

# From periodic monitoring *to continuous visibility*

The early cases of bank-owned sensors and blockchain trade networks mostly ended as experiments. What lasted was finance that *reuses data already produced for regulators, platforms, or public utilities*.

Asset-backed finance traditionally depends on static valuations, periodic inspections, and documents supplied by the borrower. Real-economy integration aims to connect financing to observable reality: a loan that responds to the use and condition of the asset it finances, trade finance released when goods are verified to have moved, and investors who can see the performance of the asset behind their certificate.

| DIGITAL BANKING | | INTELLIGENT BANKING |
|---|---|---|
| – Static valuations and periodic inspection | | – Continuous telemetry on use and condition |
| – Paper documents supplied by the borrower | → | – Verified data from utilities and platforms |
| – Late detection of distress | | – Early warning and adaptive terms |
| – Bank-built sensor pilots | | – Reuse of regulatory and public data |

TABLE 8 · EVIDENCE LEDGER, REAL ECONOMY INTEGRATION

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| IoT commodity finance<br>Standard Chartered with Huawei and Trafigura | Sensors on financed commodities; payments triggered by location. | ◐ REVISED<br>The Huawei IoT work was a 2018 pilot; no source links Trafigura to it. Trafigura's documented deal (2022) used Singapore's SGTraDex data utility instead.[120,121] | Shared data utilities outlast bank-built sensor stacks. |
| Almond shipment<br>Commonwealth Bank · Australia | Blockchain and IoT track a shipment end to end (cited as 2017). | ◐ REVISED<br>Took place in July 2018 and was described as an experiment; no commercial launch was announced.[122] | Demonstrations are not deployments. |
| Poseidon Principles<br>Ship finance · global | Banks align ship portfolios with climate targets using vessel data. | ● HOLDS<br>36 signatories, about three-quarters of ship finance; misalignment fell below 12% (December 2025). The insurance counterpart closed in September 2026.[123,124] | Data-linked finance needs a regulatory anchor. |
| Fractional property<br>Stake · UAE and Saudi Arabia | Shariah-compliant fractional property from AED 500. | ◆ GREW<br>USD 31m Series B led by Emirates NBD (February 2026); 2 million+ users; SAR 416m raised through Saudi funds; tokenization still at in-principle approval.[125] | Regulated fund structures scale before tokens do. |

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Tokenized title deeds<br>Dubai Land Department with PRYPCO Mint | *Not previously cited* | ☐ NEW<br>Over AED 9m tokenized in the first month (2025); secondary market opened February 2026; still labelled a pilot.[126,127] | Government registries can anchor tokenized ownership. |
| Device-locked credit<br>M-KOPA · Sun King · Africa | *Not previously cited* | ☐ NEW<br>M-KOPA net profit of USD 4.8m for 2025 after a restated 2024 loss; over USD 2bn of credit unlocked since launch; 3.4m active customers; Sun King's USD 156m local-currency securitization (July 2025).[128,129] | Asset control enables credit for thin-file customers. |
| Trade-finance consortia<br>we.trade · Marco Polo · Contour | *Not previously cited* | ◌ ENDED<br>All three closed between 2022 and 2023, through committee governance, low volumes, and no lead funder.[130,131] | Governance and network effects, not technology, decide. |
| Parametric cover<br>CCRIF · Caribbean | *Not previously cited* | ☐ NEW<br>USD 91.9m paid to Jamaica within about two weeks of Hurricane Melissa (2025); Jamaica's USD 150m World Bank catastrophe bond also paid in full.[132,133] | Data-triggered finance delivers speed for island states. |

## What the evidence shows

The private trade-finance networks built on blockchain between 2017 and 2023 did not survive. We.trade became insolvent in 2022 after operating without a chief executive under committee governance; Marco Polo followed in early 2023;[134] and Contour closed in November 2023 when no shareholder bank would lead a funding round.[130,131] What replaced them is a legal and public-infrastructure layer. Thirteen jurisdictions had adopted the United Nations Commission on International Trade Law (UNCITRAL) Model Law on Electronic Transferable Records (MLETR) by late 2026, among them small states such as Kiribati, the Marshall Islands, Papua New Guinea, Timor-Leste, and Mauritius.[135] In July 2025 HSBC completed a pilot working-capital loan supported by shipment records from Hong Kong's port community system through the HKMA's Commercial Data Interchange.[136] Electronic bills of lading still made up only about 11% of the total in 2025, against an industry commitment of 100% by 2030.[137]

**DURABLE PATTERN**

Finance that lasts consumes data already produced for regulators (ship fuel reporting), platforms (ride-hailing earnings), or public utilities (port and trade data exchanges).

The ship-finance case follows the same logic. The Poseidon Principles, with 36 signatories representing about three-quarters of global ship finance, reported 95% disclosure and portfolio misalignment falling from about 19% to under 12% in December 2025, using fuel-consumption data that shipowners already report to the International Maritime Organization.[123] Its sister initiative for marine insurance closed in September 2026 amid uncertainty over net-zero policy, a reminder that data-linked finance is only as durable as the regulatory anchor behind its metric.[124]

Device-linked credit has grown fastest outside banking. M-KOPA reported a net profit of USD 4.8 million for 2025, after restating its 2024 result to a loss, with more than USD 2 billion of credit unlocked since launch and 3.4 million active customers,[128,138] and Sun King closed a USD 156 million local-currency securitization of solar receivables in Kenya.[129] Credit risk remains material: M-KOPA's expected-credit-loss provi-

sion covered about 47% of gross receivables, a ratio the company attributes partly to an accounting change.[128] A United States enforcement action alleged about 7,500 wrongful remote vehicle disablements, and the RBI issued rules in August 2026, effective January 2027, that allow device restrictions only on the financed device, in graduated steps, with essential functions preserved, certified technology, no access to personal data, and compensation for wrongful locks.[139,140,141] These conditions form a usable governance template for any bank that links finance to asset control.

## Relevance for island economies

For small island states, the most mature form of data-triggered finance is parametric insurance. After Hurricane Melissa in 2025, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) paid Jamaica USD 91.9 million within about two weeks, and Jamaica's USD 150 million catastrophe bond paid out in full; by our estimate, these covered about 3.5–4% of estimated damage of USD 6–7 billion.[132,133] We found no documented bank product that uses vessel-tracking data (from the Automatic Identification System or vessel monitoring systems) to monitor fisheries or small-vessel loans, although many island fleets already transmit such data under fisheries regulation. For Islamic banks, data-verified warehouse receipts and asset telemetry could also answer a long-standing criticism of commodity murabaha, that the underlying goods are not always real or identifiable. Evidence of Islamic banks using such data remains thin; a Shariah-compliant warehouse-receipt financing launched in Pakistan in October 2026 points in this direction, although no data or sensor component has been disclosed.[142]

FOR BANKS

### Practical *implications*

1. Reuse data that regulators, platforms, and utilities already collect before installing sensors.
2. Pilot in one asset class with clear covenants on data access and quality.
3. Adopt purpose limitation, graduation, and fast unlock if any asset control is used.
4. Prefer regulated fund and registry structures for fractional investment.
5. Support national adoption of electronic transferable records law.
6. Explore pause clauses linked to parametric triggers for island borrowers.

FOR RESEARCHERS

- RQ6.1 Does verified asset data change credit outcomes for small-vessel, fisheries, and tourism borrowers in island economies?
- RQ6.2 How does remote asset control interact with Shariah principles on late payment and coercion?
- RQ6.3 Can data-verified commodity and warehouse structures strengthen the Shariah substance of murabaha in practice?

# 07



REAL ECONOMY · PILLAR 07

# Platform Reach

*Scale through connection, not construction.*

A digital bank can serve customers and partners beyond its home market without building branches there. Interfaces replace premises, partnerships replace ownership, and one governance model applies wherever the platform is used.

4.7

PLATFORM REACH

# From domestic bank *to digital platform*

For a bank in a small market, growth beyond the domestic economy is a strategic necessity. The 2026 evidence favours *strong digital incumbents* over separate offshore digital banks, with diaspora corridors a promising but unproven route.

Traditional regional expansion depends on physical branches, local staff, and heavy fixed costs. Digital platforms change the economics: a bank can reach customers abroad through partnerships, embedded finance, and licensed digital entities, and can offer services such as custody, sukuk distribution, or payments to other institutions through interfaces. The original pillar envisaged a separate digital-markets subsidiary serving a regional Islamic finance market. The evidence since then suggests a more cautious sequence.

| DIGITAL BANKING | | INTELLIGENT BANKING |
|---|---|---|
| – Branches and local staff abroad | | – Interfaces and licensed digital entities |
| – Growth limited by the home market | → | – Diaspora and trade corridors first |
| – Separate systems for each country | | – One platform, configured by market |
| – Ownership as the route to presence | | – Partnerships and embedded finance |

TABLE 9 · EVIDENCE LEDGER, PLATFORM REACH

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| Nomo<br>Boubyan Bank · UK and Kuwait | First UK-based Islamic digital bank for GCC customers abroad. | ◐ REVISED<br>No customer, deposit, or profit figures published; in February 2026 management said the group had focused on its domestic business.[143] | Offshore digital units are hard to scale. |
| Mox Bank<br>Standard Chartered · Hong Kong | Digital attacker model for regional expansion. | ◐ REVISED<br>Conventional, not Islamic; over 750,000 customers and breakeven in Q1 2026, about five and a half years after launch.[144] | Plan for five years or more to breakeven. |
| Islamic finance market<br>Global | Global Islamic financial services industry of about USD 3.25 trillion (2022). | ◆ GREW<br>USD 3.88tn in 2024 on the IFSB measure, or USD 6.5tn of assets in 2025 on the broader LSEG measure.[5,4] | Cite the source and definition. |
| NEO digital bank<br>Mashreq · Pakistan | *Not previously cited* | ☐ NEW<br>Fully Shariah-compliant digital retail bank launched September 2025, marketed partly to Pakistanis in the UAE; USD 100m committed.[145] | A licence in a large market, linked to a diaspora corridor. |

| CASE | AS CITED, 2024–25 | STATUS, LATE 2026 | WHAT IT TEACHES |
|---|---|---|---|
| D360 Bank<br>Saudi Arabia | *Not previously cited* | ☐ NEW<br>Shariah-compliant digital bank; one million customers within four months of its December 2024 launch.[146] | Large home markets fill quickly. |
| BYOND<br>Bank Syariah Indonesia | *Not previously cited* | ☐ NEW<br>About 6 million users by December 2025; BYOND transactions reported at about Rp820 trillion, up 48% year on year.[147] | Incumbent super-apps scale on an existing base. |
| AEON Bank<br>Malaysia | *Not previously cited* | ☐ NEW<br>First Islamic digital bank in Malaysia (May 2024); losses still rising in early 2026.[148,149] | Standalone digital banks need patient capital. |

## What the evidence shows

The two cases most often cited for this pillar have both been revised. Nomo, launched by Boubyan Bank in 2021 through its UK subsidiary, has published no separate customer, deposit, or profit figures, and in February 2026 the group's management told analysts that it had focused its efforts on its domestic business.[143] Mox Bank in Hong Kong is a conventional bank; it reached more than 750,000 customers and broke even in the first quarter of 2026, about five and a half years after opening in September 2020.[144] New digital banks in Malaysia show the same economics: the five licensed digital banks had 1.97 million customers and RM3.1 billion of deposits combined in September 2025, while several continued to report losses.[150,149]

MARKET

**USD 6.5tn**

Global Islamic finance assets in 2025, projected to exceed USD 10.5tn by 2030 (LSEG and ICD, October 2026). Banking is about 71%.

More promising evidence comes from two other models. The first is the incumbent digital upgrade. Abu Dhabi Islamic Bank combined record profits with fully digital onboarding, fractional sukuk, and the first licence in the UAE as a third-party provider under the central bank's open-finance framework.[151,152] Bank Syariah Indonesia reached about 6 million users on its BYOND super-app within about a year.[147] The second is the corridor model. Mashreq launched a fully Shariah-compliant digital retail bank in Pakistan in September 2025 and marketed it partly to Pakistanis working in the UAE, linking a licence in a large Muslim market to an established remittance corridor; no customer figures have yet been published.[145] Smaller Islamic banks also feature among recent digital leaders: Meethaq in Oman reports 90% first-contact resolution from its AI assistant, and Dukhan Bank in Qatar verifies customers through the national digital identity.[152]

## Preconditions for small-market banks

For a bank in a small state, platform reach depends on preconditions that are easy to underestimate. Correspondent relationships must be secure before cross-border services can grow, and the Pacific experience shows how quickly these can contract.[2] Financial-crime controls must be strong enough to satisfy partner banks and foreign supervisors at transaction volumes the bank has not yet seen. Identity must be verifiable across borders, which favours national digital identity systems that can be recognized by partners. The most realistic first steps are therefore narrow: serving the diaspora and the visitors who already move money through the home economy, distribut-

ing sukuk and investment products through partner platforms, and offering custody or Shariah-screening services to institutions that lack them. A separate licensed entity abroad becomes sensible once these flows exist, not before.

## Market-entry constraints

Digital distribution removes the need for premises, not the need for permission. Seven constraints apply to any cross-border service, whatever the channel.

1. **Licensing.** Serving residents of another jurisdiction usually requires a licence there, a regulated partner, or a recognized passporting or reverse-solicitation basis.
2. **Customer eligibility.** Rules on who may be onboarded remotely, and with which identity documents, differ by market and by product.
3. **Data localization.** Some jurisdictions require customer or transaction data to be stored or processed locally, which constrains shared platforms.
4. **Foreign exchange.** Capital and exchange controls can limit the currencies a bank may hold, convert, or remit for non-residents.
5. **Tax.** Withholding, reporting, and permanent-establishment rules apply to digital services as they do to branches.
6. **Shariah recognition.** Products approved by one Shariah board may need review or recognition by the Shariah authority of the host market.
7. **Correspondent risk.** New corridors raise the bank's risk profile in the eyes of its correspondents, who must be willing to support the added flows.

FOR BANKS

### Practical *implications*

1. Upgrade the domestic franchise first; it funds and proves the platform.
2. Map the corridors that already exist: diaspora, tourism, trade, and remittances.
3. Secure correspondent relationships and controls before cross-border growth.
4. Use partnerships and open-finance licences before acquiring or creating entities abroad.
5. Build a five-year business case for any standalone digital entity.
6. Offer platform services (custody, screening, distribution) to other institutions.

FOR RESEARCHERS

- RQ7.1 Which expansion models allow banks in small states to grow without increasing their exposure to correspondent-banking withdrawal?
- RQ7.2 Can regional shared infrastructure (payments, identity, and compliance utilities) give small-state banks the scale that single institutions lack?
- RQ7.3 How do digital Islamic banks maintain consistent Shariah governance across several jurisdictions with different Shariah authorities?



CONVERGENCE AND EXECUTION

# One Reef

*Seven corals, one ecosystem.*

The advantage of intelligent banking appears when conversation, identity, agents, controls, digital assets, and asset data operate on one governed foundation. Pursued as seven separate projects, the same capabilities create new failure modes.

5

CONVERGENCE

# One reef: a system, *not a stack*

The customer does not experience pillars. The customer experiences *continuity*: one conversation, one identity, one agent coordinating services, and controls that are present without being visible.

Each pillar removes a constraint from the next (Figure 2). Conversational banking creates demand for execution in real time, which requires trusted identity. Verified identity allows agents to act on a customer's behalf. Agents that act need controls that operate at the same speed. Controls codified as rules can run inside digital instruments as contract logic. Digital instruments need real assets behind them, which asset data can verify. Verified assets and instruments can travel across borders through partners, and reach brings new customers, languages, and requests back to the conversational layer. The loop is the reason the pillars belong in one programme. As on a reef, the strength of the whole lies in the dependencies between its parts, and the same dependencies carry stress from one part to the next.

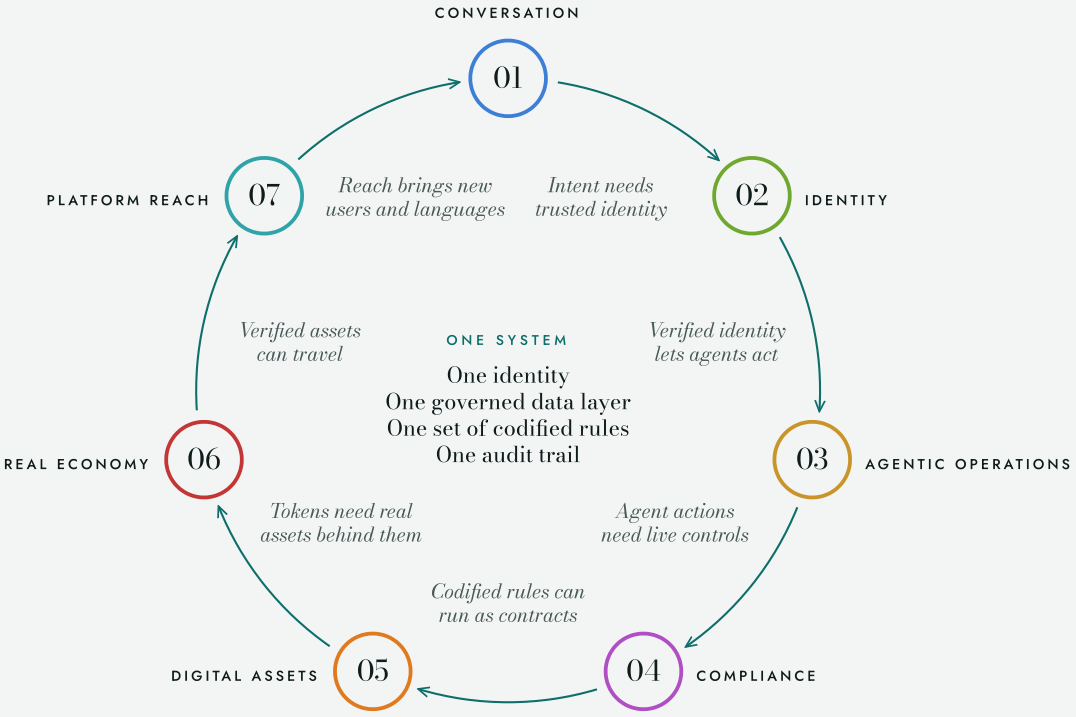



FIGURE 2 The reinforcement loop. Each pillar removes a constraint from the next, and all seven depend on one identity, one governed data layer, one set of codified rules, and one audit trail.

## Why partial adoption fails

Implemented in isolation, the pillars produce predictable failures. Conversational banking without embedded compliance increases risk, because an agent that executes faster than controls can check simply moves errors and fraud faster. Agentic operations without real-time identity and permissions cannot be trusted with material actions. Digital assets without real-economy data detach from the value they claim to represent. Platform reach without strong compliance amplifies governance weaknesses into correspondent-banking risk. The setbacks recorded in Section 4 fit this pattern. Klarna and Commonwealth Bank of Australia scaled the conversational layer ahead of the human and operational design behind it, and the blockchain trade consortia built ledgers without the governance and network effects needed to use them.

Convergence has three practical requirements. The first is central architectural ownership of the shared foundations, so that each pillar uses the same customer identity, data definitions, and integration layer rather than building its own. The second is a single rulebook: policies, limits, and Shariah rules defined once, in machine-readable form, and applied by every agent and channel. The third is a single evidence trail, so that any customer outcome can be reconstructed across pillars for a customer, an auditor, a supervisor, or a Shariah board. These requirements are organizational before they are technical, and they require board-level sponsorship beyond the technology or operations functions.

# 6 From vision *to execution*

EXECUTION

A vision becomes a programme when it has a sequence, stage gates, owners, and metrics. The staged path in Figure 3 rests on *evidence gates rather than calendar dates*.

## Sequencing principles

Five principles follow from the evidence in Section 4. First, foundations precede front-ends: the data platform, integration layer, and governance spine must exist before agents are allowed to act. Second, employee-facing uses precede customer-facing ones, because staff can absorb errors that customers should never see. Third, information precedes transaction, and low-value transactions precede material ones. Fourth, sandboxes precede products for anything involving digital assets or new legal structures. Fifth, staffing changes follow measured outcomes rather than projected ones. Most of the setbacks recorded in this report broke one of these principles.




FIGURE 3 A staged path to 2030 in three stages. Each stage ends at a stage gate, and later funding depends on the evidence listed beneath each band. The year 2030 is the strategic horizon; the dates are indicative for a bank starting in early 2027 with a core banking platform that already offers usable interfaces. Items marked "if justified and approved" or "if gated" belong to conditional or opportunity-led pillars: they are options released by the board at a gate, not default milestones, and may extend beyond 2030 where their gates are not yet met.

## Stage gates and metrics

Each stage ends at a stage gate at which the board decides whether to release the next tranche of investment. The gates are defined by evidence. Table 10 lists indicative metrics for each pillar. The baseline for every metric is set in Stage 1, before any agent or model goes live, because a value that cannot be compared with a baseline cannot be claimed.

TABLE 10 · INDICATIVE GATE METRICS BY PILLAR

| PILLAR | ADOPTION | QUALITY AND RISK | VALUE |
|---|---|---|---|
| Conversational | Active users; share of journeys started by conversation | Answer accuracy against regression suite; repeat contact; complaints | Cost to serve; resolution time; inclusion of first-time users |
| Identity | Share of sign-ins by passkey or device key | Account-takeover rate; recovery fraud; failed-login rate | SMS cost avoided; onboarding time |
| Agentic operations | Processes with agents in production | Agent error rate; override rate; incidents | Cycle time; unit cost against control group |
| Compliance | Share of transactions scored in real time | Alert precision; time to detect; Shariah exceptions | Investigation hours; losses prevented |
| Digital assets | Instruments issued or held | Settlement failures; custody incidents | Settlement time; investor reach |
| Real economy | Financed assets reporting data | Data completeness and integrity | Early-warning lead time; loss rate |
| Platform reach | Partners and corridors live | Correspondent and partner incidents | Non-domestic revenue share |

## From metrics to decisions

Metrics alone do not make a gate. A gate needs a decision rule: what result allows the bank to proceed, who validates the result, and what happens if it falls short. Table 11 is an illustrative template for a board investment gate. For each initiative it records the baseline, the target agreed before go-live, the measured outcome, any risk exceptions, the accountable owner, the source of the evidence, and the decision. Four decisions are available: proceed, when the target is met without unresolved exceptions; remediate, when the target is nearly met and the gap has a known fix; defer, when external conditions such as regulation or partner readiness are not yet in place; and stop, when the target is missed by a wide margin or a material incident has occurred. Results should be validated by a second-line function independent of the team that delivered them, such as risk management or compliance. Internal audit, as the third line, assesses periodically whether the gate process itself is well designed and operating effectively, rather than validating every deployment. Actual thresholds are set by each bank within its risk appetite.

TABLE 11 · ILLUSTRATIVE BOARD INVESTMENT-GATE TEMPLATE (STAGE 1 TO STAGE 2)

| INITIATIVE | BASELINE | AGREED TARGET | MEASURED OUTCOME | RISK EXCEPTIONS | OWNER | EVIDENCE SOURCE | DECISION |
|---|---|---|---|---|---|---|---|
| Conversational agent, information and servicing | Repeat contact 22%; answer accuracy not measured | Accuracy ≥ 95% on regression suite; repeat contact ≤ 18% | Accuracy 96%; repeat contact 19% | None open | Head of retail service | Regression suite; contact-centre data; risk validation | REMEDIATE |
| Passkeys replacing SMS codes | Account takeover 14 per 100,000 users a year | ≥ 60% of sign-ins by passkey; takeover ≤ 7 per 100,000 users | 64%; takeover 6 per 100,000 users | Recovery-fraud review completed; no material exception | Head of digital channels | Fraud system; risk validation | PROCEED |
| Agent for trade document checks | Cycle time 2.5 days; error rate 3% | Cycle time ≤ 1 day; error rate ≤ 3% | 1.1 days; error rate 5% | Two incidents of incorrect release | Head of trade operations | Case management system; incident log | STOP AND REDESIGN |
| Tokenized certificate pilot | Not applicable | Sandbox approval; custody partner contracted | Sandbox approval pending | None | Head of treasury | Regulator correspondence | DEFER |

All values are invented for illustration. Each bank defines its own metrics, thresholds, and validating function.

## Accountability architecture

The governing principle for this programme is that *delegating execution to an AI agent never delegates institutional accountability*. The principle applies to ordinary banking controls, to consumer redress, to model risk, and to Shariah accountability. It requires an architecture that connects board decisions to the people who own each agent and each process, with independent assurance alongside rather than beneath them (Figure 4). The board and its risk committee set risk appetite, approve investments at each gate, and oversee results. Executive AI governance owns the portfolio, standards, approvals, and the inventory of models and agents, while Shariah governance owns the contract rules and rulings that systems implement, validates their implementation, and decides exceptions. Accountable business and process owners hold each agent's permissions, its customer outcomes, its human escalation route, and its performance. Risk and compliance functions validate results as the second line, Shariah review checks Shariah conformity, and internal audit, as the third line, assures the effectiveness of the whole arrangement; these functions report directly to the board, so that assurance does not become subordinate to the processes it reviews.

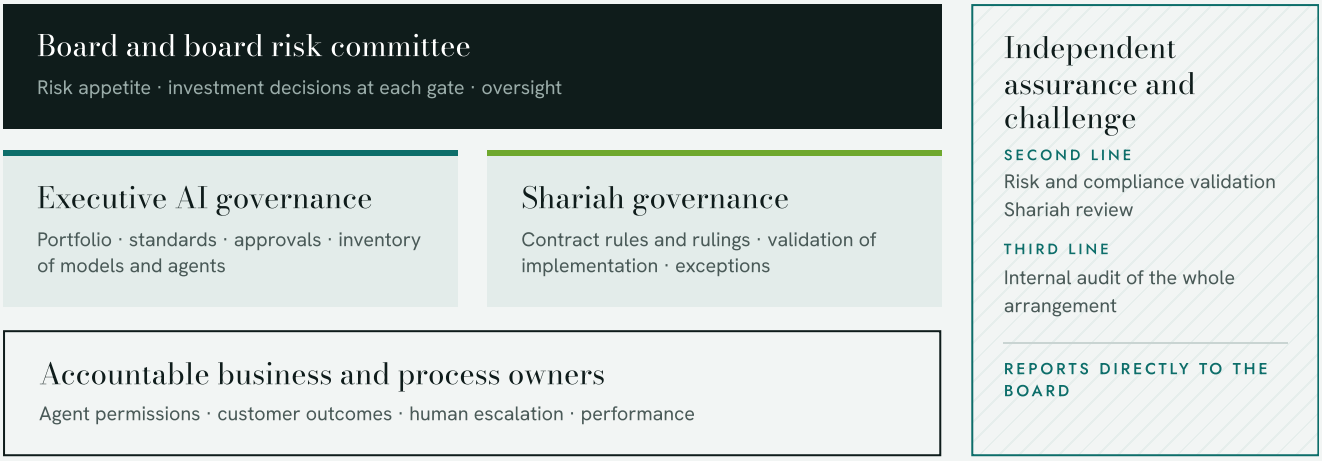



FIGURE 4 Accountability architecture for intelligent banking. Lines of decision run from the board through executive and Shariah governance to accountable owners; independent assurance sits alongside them and reports directly to the board.

## Governance instruments

The architecture works through four instruments. The first is an AI and data governance committee reporting to the board, with an inventory of every AI use, a materiality rating for each, and approval thresholds linked to that rating, consistent with the direction of the MAS guidelines (which require board oversight but not a dedicated committee) and the FSB's sound practices.[91,77] The second is an agent register: every agent has an identity, a named owner, defined permissions and limits mapped to the control levels in Table 5, a log of actions, measured performance, and a means of suspension. The third, for Islamic banks, is a Shariah algorithmic accountability protocol, set out below. The fourth is a sovereignty policy covering where data and models are hosted, which vendors hold critical dependencies, who governs any cryptographic keys, and what exit options exist. In small states with few providers, the last of these deserves particular attention, because switching costs grow with every year of integration.

## Shariah algorithmic accountability

Section 4.4 distinguished four activities: automated screening, encoding approved contractual rules, monitoring Shariah substance, and making a new Shariah judgement. Only the first three can be implemented in systems, and each needs a clear chain of authority. We propose a seven-step protocol that an Islamic bank's governance and Shariah committees can adopt and adapt (Table 12). Its purpose is to ensure that every rule a system applies can be traced to a ruling, an approval, a tested implementation, and a responsible person, and that every case the rule cannot settle returns to scholars.

TABLE 12 · SHARIAH ALGORITHMIC ACCOUNTABILITY PROTOCOL

| STEP | WHAT IT REQUIRES | RESPONSIBLE | EVIDENCE KEPT |
|---|---|---|---|
| 1 Rule authority | Every encoded rule cites the Shariah board resolution, standard, or fatwa it implements; rules without an authority are not deployed | Shariah compliance function | Rule register linked to resolutions |
| 2 Approval | The Shariah board approves the governing rulings and normative requirements; routine implementation mappings are approved by the Shariah compliance function within authority delegated by the board; novel interpretations, contested cases, material changes, and exceptions remain with the board | Shariah board; Shariah compliance function under delegation | Board resolutions; delegation instrument; signed approval of each rule specification |
| 3 Implementation | Technology teams build the rule from a traceable specification, document every interpretation made in coding, and escalate substantive ambiguity for Shariah approval before release | Accountable process owner; technology | Specification-to-code mapping; interpretation log |
| 4 Validation | Independent testing against approved cases, including edge cases, before go-live and after every change | Shariah review with risk validation | Test cases and results |
| 5 Version control | Each rule carries a version, effective date, and change history; transactions record which version applied | Shariah compliance function | Versioned rule library; transaction logs |
| 6 Exception handling | Cases the rule cannot settle are routed to people, not forced into a default outcome; novel questions go to scholars | Process owner; Shariah compliance function | Exception queue and resolutions |
| 7 Shariah board review | Periodic review of rule performance, exceptions, and audit findings, with authority to amend or withdraw any rule | Shariah board; Shariah audit | Review minutes and decisions |

## Capability

The cases with the most durable value, such as BNY, DBS, and JPMorgan, invested in people as heavily as in technology. BNY trained nearly all staff on its internal AI platform; DBS reports that its internal assistant aids two-thirds of its employees; and JPMorgan describes redeployment rather than layoffs as its response to automation in operations.[54,59,51] We propose an AI stewardship programme with three levels: literacy for all staff, proficiency for those who supervise agents or own processes, and expertise for a small internal group that can evaluate models, write rules, and challenge vendors. For small banks, the third level is the scarcest and the most important, because without it the bank cannot govern what it buys.

SELF-ASSESSMENT

# Readiness *checklist*

### FOUNDATIONS

- ☐ Core systems reachable through real-time interfaces
- ☐ A governed data platform with agreed definitions
- ☐ Trusted identity proofing, using national digital identity where available
- ☐ A sovereignty and exit policy for critical vendors

### GOVERNANCE

- ☐ Board-approved AI policy and risk appetite
- ☐ Inventory and materiality rating of AI uses
- ☐ Agent register with owners and kill switches
- ☐ Shariah technology protocol agreed with the board

### PEOPLE

- ☐ AI literacy programme for all staff
- ☐ Named owners for each pillar and foundation
- ☐ An internal team able to evaluate models and vendors
- ☐ A redeployment plan before efficiency targets

### EVIDENCE

- ☐ Baselines set before go-live
- ☐ Control groups for value claims
- ☐ Regression suites for every customer-facing model
- ☐ Stage gates written into the investment approval

SECTION 7 · SIX LESSONS FROM THE EVIDENCE LEDGERS

# What the changed cases *teach*

The cases that held and the cases that changed yield six lessons that apply beyond any single pillar.

## 1 Date every claim

Several of the most influential figures in 2024–25 strategy material were years old when they were used: the HSBC Voice ID results (2021), the JPMorgan COIN estimate (2017), and the Revolut fraud-engine figures (about 2020). Others could not be traced at all. A strategy built on undated evidence cannot be audited, and it cannot be updated when the evidence changes.

## 2 Measure outcomes, not equivalents

"The work of 700 agents" and "2,000 people saved" describe capacity, not value. Klarna's cost line rose while its agent-equivalent figure grew. DBS has described measuring value against control groups, the most credible approach in the industry. Banks should report unit cost, resolution, error, and loss against a baseline.

## 3 Constrain before scaling

The largest deployments (Erica, DBS, Ryt Bank, Citi) share narrow, well-tested intents, confirmation before money moves, and human review or audited monitoring of agent output. Breadth followed reliability, and none of them began with open-ended autonomy.

## 4 Adoption needs an ecosystem

Amazon One had more than 500 stores and still closed for lack of adoption, while face authentication against national identity records scaled in India, and UAE banks moved their customers to in-app authentication under central bank direction. Technologies that depend on new behaviour from customers and merchants need either a dense network or a regulatory push.

## 5 Governance decides consortia

We.trade, Marco Polo, and Contour had working technology and bank shareholders. They failed through committee governance, the absence of a lead funder, and too few transactions. What replaced them were public utilities, common law, and open standards. Small states, which cannot fund their own networks, should favour this route.

## 6 Regulators set the pace

The fastest changes recorded in this report were regulatory: SMS codes retired by deadline, push-payment fraud reimbursement made mandatory, stablecoin licences issued, and AI guidelines finalized. Banks that engage early with supervisors, through sandboxes and consultations, shape the rules that will later bind them.

8

RESEARCH AGENDA

# Questions the evidence *cannot yet answer*

The evidence ledgers record what is known and, pillar by pillar, what is not. From them we draw *five flagship research opportunities*, each framed as a question that matters to banks, supervisors, and Shariah boards alike, and a supporting agenda of 21 questions by pillar.

## 1

### Value and its measurement

Only a minority of the most AI-mature banks report a realized or projected return, and most use cases report no outcome. Comparative studies using control groups, consistent cost definitions, and longer observation periods are needed before the industry can say with confidence what agentic AI is worth, and to whom the gains accrue once competition passes them through to customers.

FLAGSHIP QUESTION

*What is agentic AI worth to a bank, measured against control groups and net of the costs of integration and oversight?*

## 2

### Accountability for agents

Supervisors disagree on how far human oversight can extend when agents act at machine speed. Research is needed on approval thresholds, agent identity and permissions, kill-switch design, and the allocation of liability when an agent acts on a mandate that the customer later disputes.

FLAGSHIP QUESTION

*Where should human approval sit when agents act at machine speed, and who bears liability when an agent acts on a disputed mandate?*

## 3

### Shariah governance of automated decisions

No standard yet addresses how Shariah rulings are encoded, approved, and audited in automated systems, or how profit distribution in mudarabah and ijarah can be automated while preserving the authority of Shariah boards. This is a clear gap for the IFSB, AAOIFI, and researchers in Islamic finance, and it connects to wider questions of whether AI can respect the substance as well as the form of Islamic contracts.

FLAGSHIP QUESTION

*Which Shariah rulings can be encoded, validated, and audited in automated systems without displacing the authority of Shariah boards?*

## 4

### Inclusion and language

Conversational and biometric channels can widen access or add another layer of exclusion. Studies of older customers, customers without smartphones, and speakers of low-resource languages are needed, including on the effects of SMS-code retirement and on the data required to serve minority languages well.

FLAGSHIP QUESTION

*Do conversational, biometric, and device-bound channels widen or narrow access for older, low-literacy, and minority-language customers?*

## 5

### Small states as critical cases

Small island developing states are under-measured in global AI readiness indices and exposed to correspondent-banking withdrawal. Longitudinal case studies of small-state banks adopting these pillars would show whether intelligent banking reduces the scale penalty of small markets, or deepens their dependence on a small number of global vendors and correspondents. Regional mechanisms (shared compliance utilities, language models, payment and identity infrastructure) are a promising focus.

FLAGSHIP QUESTION

*Can shared regional utilities for compliance, identity, language, and payments reduce the scale penalty and correspondent-banking exposure of small states?*

SUPPORTING AGENDA

# Research questions *by pillar*

The 21 questions that close each pillar in Section 4, gathered in one place in support of the five flagship opportunities. Numbers follow the pillar (RQ3.2 is the second question for Pillar 03).

| | | |
|---|---|---|
| 01 Conversational banking *Branching coral* | RQ1.1 | How do customers in low-resource language communities calibrate trust in voice agents that transact on their behalf? |
| | RQ1.2 | Under what conditions does conversational access widen financial inclusion rather than add a further channel for existing users? |
| | RQ1.3 | Who is accountable when an agent executes an instruction that the customer later disputes, and how should consent be evidenced? |
| 02 Frictionless identity *Brain coral* | RQ2.1 | How does the removal of SMS codes affect access for older customers, customers without smartphones, and customers in areas with weak connectivity? |
| | RQ2.2 | What fraud displacement follows OTP phase-outs, and how quickly do controls on recovery and device binding adapt? |
| | RQ2.3 | How should liability be shared when a customer chooses a weaker authentication method, as the UAE regime allows? |
| 03 Agentic operations *Plate coral* | RQ3.1 | How should supervisory approval thresholds for agent actions be set, and how do they change as measured error rates fall? |
| | RQ3.2 | What new roles and skills does "supervising outcomes" require, and how quickly can operations staff acquire them? |
| | RQ3.3 | Do agentic operations reduce the scale disadvantage of small banks, or increase their dependence on a few model vendors? |
| 04 Continuous compliance *Soft coral* | RQ4.1 | Can AI-enabled compliance lower the cost per transaction enough to slow correspondent-banking withdrawal from small states? |
| | RQ4.2 | Which categories of Shariah ruling can be encoded as executable rules, and which must remain with scholars? |
| | RQ4.3 | How should explainability be designed for three audiences at once: customers, supervisors, and Shariah boards? |
| 05 Digital asset infrastructure *Sun coral* | RQ5.1 | Under what conditions does tokenized ownership satisfy Shariah requirements for transfer of ownership and risk in ijarah sukuk? |
| | RQ5.2 | Which oracle and governance designs allow mudarabah profit to be distributed automatically while preserving Shariah board authority? |
| | RQ5.3 | Can small states issue sovereign or quasi-sovereign tokenized sukuk at a scale and cost that conventional issuance cannot match? |
| 06 Real economy integration *Sea fan* | RQ6.1 | Does verified asset data change credit outcomes for small-vessel, fisheries, and tourism borrowers in island economies? |
| | RQ6.2 | How does remote asset control interact with Shariah principles on late payment and coercion? |
| | RQ6.3 | Can data-verified commodity and warehouse structures strengthen the Shariah substance of murabaha in practice? |
| 07 Platform reach *Bubble coral* | RQ7.1 | Which expansion models allow banks in small states to grow without increasing their exposure to correspondent-banking withdrawal? |
| | RQ7.2 | Can regional shared infrastructure (payments, identity, and compliance utilities) give small-state banks the scale that single institutions lack? |
| | RQ7.3 | How do digital Islamic banks maintain consistent Shariah governance across several jurisdictions with different Shariah authorities? |



SECTION 9 · CONCLUSION

# Ambition, *grounded in evidence*

The direction set by intelligent-banking strategies in 2024 and 2025 holds. Much of the evidence offered for it *needed revision.*

This report argues that intelligent banking is best understood as one governed system of seven pillars, arranged in three layers above shared foundations, rather than as a portfolio of technology projects. Re-examining the cases most often used to justify such strategies, we find that the direction remains sound while much of the original evidence required revision. Conversational agents scale where they are constrained, grounded, and confirmed. Authentication has moved to device-bound keys, pushed by regulators, with national digital identity supporting proofing where available. Agentic operations deliver real but moderate gains, best claimed against control groups. Compliance AI is well evidenced and increasingly collaborative. Tokenization has entered regulated production and, in Malaysia, Islamic capital markets. Real-economy integration lasts when it reuses data that regulators and utilities already hold, and platform reach favours strong domestic franchises over offshore digital units, with corridor models promising but not yet proven.

The first contribution of this report is the seven-pillar model with its foundations and governance spine. The second is the evidence ledger, which records for each case what was claimed, what can now be verified, and what the difference teaches. The third is a staged path with evidence gates, governance arrangements, and a research agenda. For Islamic banks, the existing discipline of Shariah governance offers a foundation for continuous compliance, provided that standard setters and scholars address the encoding of rulings in automated systems. For banks in small states, the binding constraints are data, integration, language, and correspondent banking rather than access to models, which makes shared national and regional infrastructure as important as any single institution's investment.

*The question for boards is therefore no longer whether to pursue intelligent banking, but whether to pursue it as one system, in the right sequence, and with evidence at every gate. For small island states, the answer will determine whether these technologies narrow the scale penalty that has long shaped their financial systems or add a new dependence to it.*

A

APPENDIX

# The evidence *ledger*

All 54 entries, with the cohort, sources, observation date, evidence type, confidence, and the rationale for each classification. The same ledger is available as a supplementary dataset.

**COHORT** A: prominent in 2024–25 (30 cases); B: added during the reassessment (24 cases). **TYPE** of the latest source. **CONF.** confidence in the status assessment, not an audit of reported figures: H high, M medium, L low, under the rule in Section 2. **SOURCES** original claim, then reassessment. Numbers refer to the reference list.

## PILLAR 01 · CONVERSATIONAL BANKING

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P1.01 | Erica<br>Bank of America · United States | A | GREW | Institution | H | Bank of America release, April 2024 (via FF News) → 12 | Mar 2026 | Interactions rose from 2bn to 3.2bn; the 42m clients figure is cumulative. |
| P1.02 | AI assistant<br>Klarna · Sweden | A | REVISED | Institution | M | 8 → 10 | Aug 2026 | Company pivoted to guaranteed human access; service cost rose year on year. Confidence lowered: equivalence claim self-reported without method. |
| P1.03 | Customer service AI<br>Commonwealth Bank · Australia | B | REVERSED | Secondary | M | – → 13,14,15 | Jul 2026 | Roles cut for a voice bot were retained after call volumes rose. |
| P1.04 | AXAA voice bot<br>Axis Bank · India | A | REVISED | Vendor/operator | L | 16 → 16 | Dec 2024 | Only 2020 launch figures traceable; cited 100k calls and 90% not found. |
| P1.05 | Hello Ujjivan<br>Ujjivan SFB · India | A | HOLDS | Institution | H | 17 → 17 | Oct 2025 | Figures confirmed; 1.3m is downloads, not users. |
| P1.06 | Advisor assistant<br>Morgan Stanley · United States | A | HOLDS | Vendor/operator | L | 18 → 18 | n.d. | Still in use; adoption figure from a vendor case study. |
| P1.07 | digibot and DBS Joy<br>DBS · Singapore | B | NEW | Institution | H | – → 19 | Jul 2026 | New 2026 evidence of scale with staged agentic features. |
| P1.08 | Ryt AI<br>Ryt Bank · Malaysia | B | NEW | Secondary | M | – → 20,21 | Apr 2026 | New LLM-native bank; customer figures from secondary press. |
| P1.09 | Agentic payments<br>Visa · Mastercard · Google AP2 | B | NEW | Institution | M | – → 22,23 | Jul 2026 | Live agent purchases reported. Confidence lowered: no volumes disclosed. |

## PILLAR 02 · FRICTIONLESS IDENTITY

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P2.01 | Voice ID<br>HSBC · United Kingdom | A | REVISED | Institution | M | 30 → 30,31 | May 2021 | Cloning attacks succeeded at peers. Confidence lowered: figures dated 2021. |
| P2.02 | Palm vein ATMs<br>Bradesco · Brazil | A | NOT VERIFIED | Vendor/operator | L | 32 → 32 | Jul 2006 | No primary or independent source found for the cited figures. |

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P2.03 | Amazon One<br>Amazon · United States | A | ENDED | Secondary | M | – → 33 | Jan 2026 | Retail service discontinued, citing limited adoption. |
| P2.04 | Palm payment<br>Tencent with Visa · Singapore | A | REVISED | Vendor/operator | L | – → 34,35 | Jun 2026 | Expansion still a single-site pilot; China scale self-reported. |
| P2.05 | Face pay<br>PopID · UAE | A | REVISED | Secondary | M | – → 36 | Jan 2026 | Moved from merchant deployments to a central bank sandbox. |
| P2.06 | Aadhaar face authentication<br>UIDAI · India | B | NEW | Regulator | H | – → 37,38 | Sep 2026 | New national-ID face authentication at scale. |
| P2.07 | SMS OTP phase-outs<br>UAE · Philippines · Singapore · Malaysia | B | NEW | Regulator | M | – → 39,40,41,42 | Jun 2026 | New regulatory deadlines. Confidence lowered: UAE details from press reports only. |
| P2.08 | Passkeys<br>FIDO Alliance index | B | NEW | Institution | H | – → 43 | Oct 2026 | New industry index of passkey use. |

## PILLAR 03 · AGENTIC OPERATIONS

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P3.01 | COIN contract review<br>JPMorgan Chase | A | REVISED | Secondary | M | 49 → 49 | Mar 2017 | Claim dates from 2017 and describes past effort, not measured savings. |
| P3.02 | LLM Suite<br>JPMorgan Chase | A | GREW | Institution | H | 65 → 50,51 | Feb 2026 | Use cases doubled; about 150,000 weekly users. |
| P3.03 | Developer productivity<br>Goldman Sachs | A | HOLDS | Secondary | L | Goldman Sachs chief information officer, Yahoo Finance interview, May 2025 → 52,53,54 | Jun 2026 | Traced to executive statements. Confidence lowered: no measured study or method published. |
| P3.04 | Auto-loan agent<br>FORUM Credit Union · United States | A | REVISED | Vendor/operator | L | 55 → 55 | n.d. | Vendor case; accuracy confirmed, time claim not stated. |
| P3.05 | Digital employees<br>BNY | B | NEW | Secondary | M | – → 56 | May 2026 | New: digital employees managed alongside staff. |
| P3.06 | AI tools and Arc agents<br>Citi | B | NEW | Institution | M | – → 57,58 | May 2026 | New: developer and servicing gains. Confidence lowered: self-reported without method. |
| P3.07 | AI economic value<br>DBS · Singapore | A | GREW | Institution | H | DBS Annual Report 2024 → 59,60 | Feb 2026 | Value rose to about SGD 1bn; control-group method reported by the press. |
| P3.08 | Corporate-function roles<br>Standard Chartered | B | NEW | Institution | H | – → 61,62,63 | May 2026 | New: workforce plan for corporate-function roles. |

## PILLAR 04 · CONTINUOUS COMPLIANCE

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P4.01 | Dynamic Risk Assessment<br>HSBC with Google Cloud | A | REVISED | Institution | H | 80 → 80,81 | Oct 2025 | Source reports 60% fewer alerts, not fewer false positives. |
| P4.02 | Sherlock fraud engine<br>Revolut | A | REVISED | Vendor/operator | L | 82 → 82,83 | Feb 2024 | Engine figures from a c.2020 vendor study; newer scam figures added. |

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P4.03 | Cheque Chain<br>Emirates NBD · UAE | A | NOT VERIFIED | Secondary | L | 84 → 84 | 2018 | Confidence lowered: no fraud-reduction figures found. |
| P4.04 | APP fraud reimbursement<br>Payment Systems Regulator · UK | B | NEW | Regulator | H | - → 85 | Oct 2025 | New liability regime with reported reimbursement outcomes. |
| P4.05 | Scam controls<br>Commonwealth Bank · Australia | B | NEW | Institution | M | - → 86 | 2025 | New: layered scam controls. Confidence lowered: loss reduction self-reported without method. |
| P4.06 | COSMIC<br>Monetary Authority of Singapore | B | NEW | Regulator | H | - → 87 | Aug 2026 | New: supervisor-run information-sharing platform. |

## PILLAR 05 · DIGITAL ASSET INFRASTRUCTURE

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P5.01 | Smart Sukuk<br>Abu Dhabi Islamic Bank · UAE | A | REVISED | Institution | H | 98 → 98,99 | Nov 2025 | Platform is digital fractionalization, not described as tokenized. |
| P5.02 | Orion digital bonds<br>HSBC · Hong Kong | A | GREW | Institution | H | HKMA release, February 2024 → 100,101 | Jun 2026 | Platform scaled to larger sovereign and quasi-sovereign issues. |
| P5.03 | Gold Token<br>HSBC · Hong Kong | A | GREW | Secondary | M | HSBC launch, March 2024 → 102 | Nov 2025 | Retail token reached over USD 1bn traded. |
| P5.04 | Onyx, now Kinexys<br>JPMorgan Chase | A | GREW | Institution | H | JPMorgan Onyx/Kinexys, 2024 → 103,104,105 | Jun 2026 | Volume grew from USD 2bn to over USD 7bn a day; deposit token live. |
| P5.05 | mBridge<br>Multi-central-bank platform | A | REVISED | Institution | M | BIS mBridge project, 2023-24 → 106,107 | Sep 2026 | BIS handed the project to partners; Saudi membership ended. Confidence lowered: membership details from press reports. |
| P5.06 | Tokenized sukuk<br>Khazanah · Malaysia | B | NEW | Regulator | H | - → 108 | Apr 2026 | New: first tokenized sukuk, a pilot. |
| P5.07 | Tokenized deposit settlement<br>CIMB Islamic · Malaysia | B | NEW | Institution | H | - → 109 | Aug 2026 | New: controlled pilot of tokenized-deposit settlement. |
| P5.08 | Stablecoin regimes<br>United States · Hong Kong · UAE | B | NEW | Secondary | M | - → 110,111,112 | Oct 2026 | New: licensing regimes for bank-issued tokens. |

## PILLAR 06 · REAL ECONOMY INTEGRATION

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P6.01 | IoT commodity finance<br>Standard Chartered with Huawei and Trafigura | A | REVISED | Institution | M | 120 → 120,121 | Sep 2022 | Later deal used a data utility. Confidence lowered: link to the cited partner not confirmed. |
| P6.02 | Almond shipment<br>Commonwealth Bank · Australia | A | REVISED | Institution | M | 122 → 122 | Jul 2018 | No commercial launch announced. Confidence lowered: experiment dated 2018. |
| P6.03 | Poseidon Principles<br>Ship finance · global | A | HOLDS | Institution | H | Poseidon Principles disclosure reports → 123,124 | Dec 2025 | Framework continues; insurance counterpart closed. |
| P6.04 | Fractional property<br>Stake · UAE and Saudi Arabia | A | GREW | Institution | M | Stake company announcements, 2024 → 125 | Feb 2026 | Platform grew; tokenization still at in-principle approval. Confidence lowered: user counts self-reported. |

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P6.05 | Tokenized title deeds<br>Dubai Land Department with PRYPCO Mint | B | NEW | Secondary | M | – → 126,127 | Feb 2026 | New: registry-anchored tokenization, still a pilot. |
| P6.06 | Device-locked credit<br>M-KOPA · Sun King · Africa | B | NEW | Secondary | M | – → 128,129 | Oct 2026 | New: device-linked credit at scale. |
| P6.07 | Trade-finance consortia<br>we.trade · Marco Polo · Contour | B | ENDED | Secondary | M | – → 130,131 | Nov 2023 | Consortia closed between 2022 and 2023. |
| P6.08 | Parametric cover<br>CCRIF · Caribbean | B | NEW | Institution | H | – → 132,133 | Nov 2025 | New: data-triggered payouts for an island state. |

## PILLAR 07 · PLATFORM REACH

| ID | CASE | COH. | STATUS | TYPE | CONF. | SOURCES | OBSERVED | RATIONALE |
|---|---|---|---|---|---|---|---|---|
| P7.01 | Nomo<br>Boubyan Bank · UK and Kuwait | A | REVISED | Institution | M | Boubyan Bank launch, 2021 → 143 | Feb 2026 | Group focus returned to domestic business. Confidence lowered: no outcomes published. |
| P7.02 | Mox Bank<br>Standard Chartered · Hong Kong | A | REVISED | Institution | H | Mox / Standard Chartered, 2024 → 144 | May 2026 | Conventional bank; breakeven after about five and a half years. |
| P7.03 | Islamic finance market<br>Global | A | GREW | Institution | H | 153 → 5,4 | Oct 2026 | Industry grew; estimates differ by measure and definition. |
| P7.04 | NEO digital bank<br>Mashreq · Pakistan | B | NEW | Institution | M | – → 145 | Sep 2025 | New: corridor model launched. Confidence lowered: no outcomes published. |
| P7.05 | D360 Bank<br>Saudi Arabia | B | NEW | Institution | M | – → 146 | May 2025 | New: rapid customer growth in a large market. Confidence lowered: growth self-reported. |
| P7.06 | BYOND<br>Bank Syariah Indonesia | B | NEW | Secondary | M | – → 147 | Mar 2026 | New: incumbent super-app scale. |
| P7.07 | AEON Bank<br>Malaysia | B | NEW | Secondary | M | – → 148,149 | Apr 2026 | New: standalone digital bank still loss-making. |

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Mohamed Shareef is an advisor, researcher, and speaker on digital development, governance, and sovereignty, *seen from a small island*.

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