Implementation Models for Banks
in the Context of the Digital Euro

Research presentation (15+ minutes) – executive briefing

Focus

Technical architecture • Cost model & synergies • Tier-specific implementation playbooks

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Executive takeaway

Digital euro is a payments infrastructure change — not just a new product.

Win condition: separate commodity compliance from differentiating services.

1) Architecture reality

Every bank must build a scheme adapter + orchestration + channel integration, even when outsourcing core services.

2) Cost is manageably bounded

Headline estimates fall sharply once design adjustments and industry synergies are applied (ECB: ~€4–€5.77bn euro area, 4-year).

3) Tiered strategy

High-tier: in-house / hybrid-plus for control. Mid-tier: hybrid default. Low-tier: vendor/consortium-first with strong exit clauses.

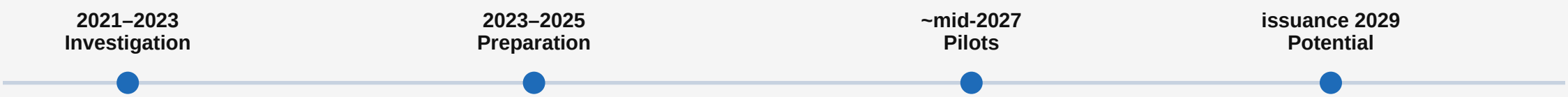
Supervisor decision lens

Which operating model (build / partner / buy) best balances compliance certainty, time-to-market, controllability, and differentiation for our bank tier?

Sources: ECB cost note (Oct 2025); thesis findings and tier recommendations.

Why this matters now (context + timeline)

- Digital euro is designed as a public, trusted digital means of payment, complementary to cash.
- Eurosystem moved from investigation (2021–23) to preparation (2023–25) and is continuing preparations in the next phase.
- Working assumption: regulation adopted during 2026; pilots could start as early as mid-2027; readiness for potential first issuance during 2029.
- Rulebook and implementation specs aim to standardise basic services across the euro area while allowing innovation on top.



Sources: ECB closing progress report (Oct 2025) timeline and cost figures; thesis timeline synthesis.

Scheme roles and privacy split

Eurosystem / DESP

- Settlement + ledger
- Issuance/redemption controls
- Rulebook + scheme services

→

PSPs (banks & non-banks)

- Onboarding, KYC/AML, support
- Fraud prevention + dispute mgmt
- Funding/defunding via DCA (waterfall)

→

End users (people & merchants)

- P2P, POS, e-/m-commerce
- Optional offline payments
- Choice of PSP; consistent UX

Standardised scheme rules + interfaces; PSPs own customer relationship

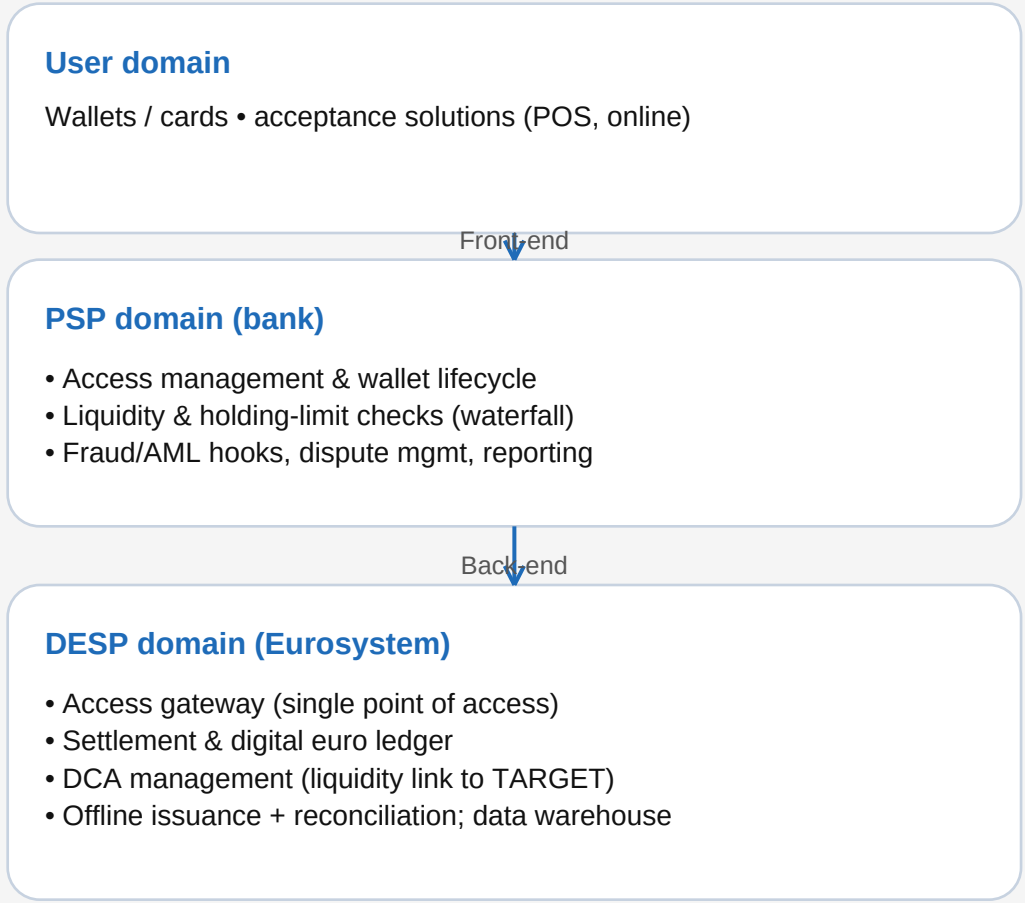
Privacy design principle

End-user identities are not visible to the Eurosystem: PSPs perform KYC/AML and process transactions using pseudonymous identifiers. For offline, controls shift toward device integrity, limits, and re-connection anomaly checks.

Sources: Thesis overview of roles; ECB materials on privacy-preserving design and offline considerations.

DESP architecture: what the bank must integrate to

- Multi-region resilience with automatic failover to ensure continuity.
- Core DESP components: settlement/ledger, transaction management, access gateway, DCA management (TARGET link), reference data, data warehouse.
- Additional platform services: alias/proxy lookup, onboarding repository (one-wallet check), offline issuance & reconciliation components.



Sources: ECB platform component scope (Annex 1 market research); RDG rulebook update on 3-domain functional architecture; thesis DESP synthesis.

Reference bank integration architecture (scheme-aligned)

Channels	Mobile • Web • POS / merchant • ATM (optional)
API gateway + BFF	AuthN/AuthZ, rate limits • Channel-optimised APIs • Correlation IDs / observability headers
Orchestration & workflow	Saga/workflows for onboarding, payments, exceptions • Auditable event trail; retries/compensation
Service bundles	Access & wallet mgmt • Liquidity & limits • Transaction processing • Risk & compliance hooks • Offline device mgmt (optional)
DESP connectivity / scheme adapter	mTLS + signing • Idempotency + versioning • Maps bank events to DESP APIs
Back-office & controls	Reconciliation/ledger posting • Statements, reporting • Ops tooling, SIEM/SOC evidence

Key point

Model choice shifts *who builds* layers, not *what must exist*: governance, auditability and end-to-end testing remain mandatory.

Sources: Thesis reference implementation architecture (Figure 6) and service-bundle decomposition; RDG rulebook implementation specifications (front-end/back-end).

Three implementation models: trade-offs (build vs partner vs buy)

In-house

- Highest control over roadmap & security posture
- Best for complex estates / multi-market operations
- Enables differentiated services (analytics, treasury, conditionality)
- Requires multi-year build + high specialist capacity

Hybrid

- Vendor handles commodity core; bank builds differentiators
- Faster time-to-market; bounded cost envelope
- Requires strong API boundaries + joint testing
- Governance must prevent duplicated logic & control gaps

Vendor / Outsourced

- Fastest compliance-grade path for smaller banks
- Predictable costs; minimal internal build
- Differentiation mainly via UX / overlays
- Concentration & lock-in risk: exit + audit rights are critical

Typical fit by tier: High-tier → In-house / hybrid-plus | Mid-tier → Hybrid | Low-tier → Vendor/consortium-first

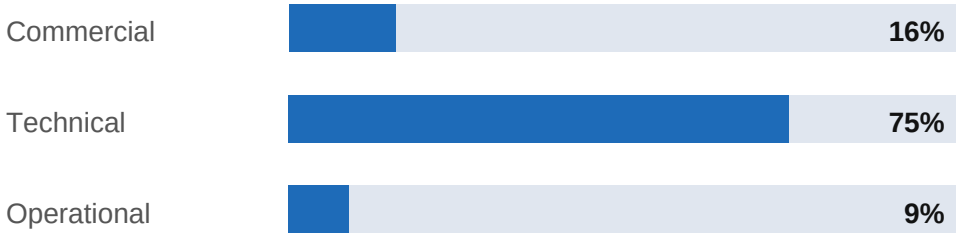
Sources: Thesis model characteristics; tier mapping in Section 9.2.2.

Cost model evidence: what drives investment

Industry baseline (PwC, rulebook v0.8a)

Extrapolated change cost: ~€18bn euro area over 4 years; average ~€110m per bank (n=19). Technical layer dominates (~75% of cost) and banks expect ~46% of relevant skilled resources tied up annually.

PwC cost distribution (avg)



Where the money goes (illustrative bundles)

Payment channels, POS/e-commerce infrastructure, interfaces, accounts & liquidity, plus branch/ATM upgrades are major drivers. Key design caveats: baseline excludes offline, multiple accounts and merchant acquiring.

Sources: PwC Digital Euro Cost Study (Jun 2025) and thesis Table 2 / cost-layer synthesis.

From headline to realistic range: design adjustments + synergies

- PwC extrapolation suggests ~€18bn euro area (4-year change costs; v0.8a assumptions).
- ECB adjusts for design assumptions (e.g., reuse of existing card/POS/ATM capability; fee-calculation handled by Eurosystem) reducing average bank cost (~16%).
- External synergies & cost mutualisation (vendors, shared infrastructures, IPS/group implementations) reduce total into ~€4–€5.77bn range (≈€1–€1.44bn annually).

Euro area range
€4.0–€5.77bn (4 years)

Annualised
€1.0–€1.44bn / year

Practical implication
Optimise for mutualisation early: shared test harness, shared ops tooling, joint procurement, and re-use of existing acceptance rails.

ECB indicates market synergy factors around 20–40% (varies by country); banking-group synergies can exceed 90% with common IT providers.

Sources: ECB 'A view on recent assessments…' (Oct 2025) and thesis adjustments/synergy synthesis.

Playbook: high-tier banks (in-house / hybrid-plus)

- Target state: own scheme adapter, orchestration, and core services to control roadmap across jurisdictions.
- Selective partnerships: secure element/offline provisioning, specialist fraud engines, certification accelerators.
- Delivery: 4-year build plan with pilots in Year 3; advanced features (conditional payments, analytics) in Year 4.

Cost envelope (in-house; own estimate)

€24.2M–€57.2M (48 months) + steady-state opex €2.4M–€5.8M/year. Main drivers: personnel (36–52 FTE), security/assurance cycles, multi-region operations.

Top risks + mitigations

Delivery overruns → staged certification + independent reviews. Legacy integration → strangler patterns + integration test harness. Compliance drift → rulebook traceability matrix + change control board. Security gaps → secure SDLC, red teaming, continuous monitoring.

Sources: Thesis in-house cost table & risk profile; tier recommendation (Section 9.2.2).

Playbook: mid-tier banks (hybrid as default)

Tiered integration approach

Tier 1: vendor-managed core

- Connectivity + baseline tx processing
- Baseline compliance controls
- Standard reports / statements

Tier 2: shared infrastructure

- Shared testing & certification harness
- Shared fraud detection consortium
- Shared ATM/POS utilities (where applicable)

Tier 3: bank differentiation

- UX & channel excellence
- SME / corporate overlays
- Analytics + conditionality engines

Cost + resources (hybrid; own estimate)

€13.3M–€26.1M implementation (excl. device rollouts). Team: ~15–25 FTE across integration, risk/data, product overlays, ops/compliance oversight.

Timeline (typical)

Months 1–4: vendor selection & planning Months 5–12: core integration + pilot Months 13–18: enhancements Months 19–30: certification + production launch & scaling

Sources: Thesis hybrid architecture (Figure 5) and cost table (Section 5.3.5); mid-tier plan (Section 6.2).

Playbook: low-tier banks (vendor/consortium-first)

- Core strategy: turnkey vendor platform for access, liquidity (DCA), transaction processing, risk/compliance and reporting.
- Bank keeps: customer relationship, local compliance ownership, support and brand integration.
- Prefer consortium model where possible: mutualise scheme adapter, testing tooling and operational monitoring to reduce cost and concentration risk.

Cost envelope (vendor; own estimate)

€4.1M–€8.5M implementation (excl. device rollouts). Typical timeline: 18–24 months.

Vendor governance (non-negotiables)

Rulebook mapping + change process; audit rights; DORA-aligned resilience SLAs; data portability (documented APIs, exports); tested exit plan; subcontractor transparency; joint incident response and certification-grade regression suite.

Sources: Thesis outsourced model (Section 5.2) and low-tier plan (Section 6.3).

Shared infrastructure & mutualisation: biggest cost lever

- One build, many deployments: shared codebase + common compliance controls reduce duplicated engineering.
- Shared operations: SOC/SIEM patterns, fraud monitoring, incident response and audit evidence can be pooled.
- Joint procurement: reduced unit cost for platform subscription, testing labs and certification services.

Testing & certification harness

Central test cases aligned to rulebook; shared device labs; regression suites.

Fraud/AML consortium

Pooled typologies + analytics with GDPR-compliant controller/processor roles.

Digital Euro as a Service

Multi-tenant managed platform for multiple PSPs; best for low-tier and parts of mid-tier.

Merchant acceptance enablement

Shared onboarding toolkits and technical support to bootstrap acceptance.

Sources: Thesis synergy mechanisms (Section 7); ECB cost note on synergies and market collaboration.

Executive decision framework + 90-day action plan

- Tier fit: are we primarily competing on scale/control (high-tier) or speed/cost (mid/low-tier)?
- Differentiation thesis: what 1–2 value-added services must we own (SME/treasury, loyalty, conditionality, analytics)?
- Risk appetite: vendor concentration vs in-house delivery risk — which is easier to govern?
- IT reality: legacy integration complexity; readiness for event-driven orchestration; DevSecOps maturity.
- Mutualisation options: consortium partners, shared testing, shared fraud/AML utilities.
- Regulatory readiness: rulebook traceability, DORA third-party ICT governance, audit evidence automation.

90-day action plan (recommended)

1) Rulebook gap assessment + target operating model (people/process/tech). 2) Define bank-owned 'differentiation layer' and API boundaries. 3) Launch vendor scan + PoC (connectivity + one channel + reconciliation). 4) Join/seed shared test harness + fraud/AML collaboration. 5) Build change control: rulebook updates → release gates + certification readiness.

Sources: Thesis recommendations by tier (Section 9.2); RDG rulebook development emphasises standardisation + optional provisions; ECB timeline assumptions.

Key references

- ECB (2025). Progress on the preparation phase of a digital euro – closing progress report (executive summary).
- ECB (2025). A view on recent assessments of digital euro investment costs for the euro area banking sector (Oct 2025).
- PwC (2025). Digital Euro Cost Study (commissioned by EACB/EBF/ESBG).
- ECB (2025). Update on the work of the digital euro scheme’s Rulebook Development Group (Oct 2025) and draft scheme rulebook v0.9.
- ECB (2023). Digital euro market research – Annex 1 (conceptual architecture & DESP components).
- Zohaib Shaikh (2026). Implementation Models for Banks in the Context of the Digital Euro (research thesis).

Note: draft rulebook and legislative process are evolving; figures represent current published estimates and thesis modelling.