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Transforming Core Banking Infrastructure with Agentic AI: A New Paradigm for Autonomous Financial Services

Bharath Somu[1], Ramesh Inala[2]

[1]Senior Engineer,
Email ID: bharthsomu@gmail.com,
ORCID ID: 0009-0008-6556-7848
[2]Data Engineer,
Email ID: rameshhinala@gmail.com
ORCID ID: 0009-0009-2933-4411

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Agentic AI, Core banking transformation, Autonomous financial services, AI-driven banking infrastructure, Next-gen banking systems, Intelligent automation in finance, Financial AI agents, Self-optimizing banking systems, AI-native core banking, Digital banking innovation, Smart financial infrastructure, Autonomous banking platforms, AI in financial services, Future of banking technology, Banking systems modernization.

ABSTRACT

Digital transformation has been changing the landscape of banking and the future of banking will be very much different from what it is today. Banks are required to put in place process automation that will gain the confidence of its customers. The financial sector is becoming the least trusted sector. Financial services must embrace trust in its core business model in order to overcome this negative perception. Future of banking will include autonomous systems that must ensure trust at its core processing. The core of this technology ensures provenance, data integrity, auditability and trust.

AI is already transforming the landscape of banking and will be one of the greatest driving forces of banking's transformation in the years ahead. The widespread incorporation of AI will give rise to a new era of banking, sometimes referred to as Intelligence Banking, which will be characterised by radical changes to banking products and services, processes, and their respective ecosystems. AI is a broad term that describes machines and systems that can learn from experience and act without human intervention. This capability, in conjunction with an increased availability of and access to vast amounts of data, is reshaping virtually every industry, banking included. Important benefits have already been achieved by investing in AI, with a wide range of applications emerging that span from front to back office. AI has the potential to enhance not only efficiency, but also vital parts of the value proposition such as trust, confidence, personalization, and resilience. Overall, it has the potential to improve productivity growth and offer new opportunities for innovation in the banking sector.

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1. INTRODUCTION

Financial stability is a key priority for the Bank of England and as part of this mission, the Bank is engaging with a diverse range of innovative FinTech companies to deepen their understanding of potential emerging financial stability risks as banking is reshaped by technology. Banks face an existential threat from FinTech companies who are starting to integrate the technology into their services. Customers in the 21st century want more choices, interoperability, flexibility, control, and transparency over how they bank, and once these demands are met by alternative providers, it's very difficult for traditional

institutions to win back that share of wallet. So far, the majority of tech giants into banking services are e-commerce behemoths offering P2P payment services, however it's possible in the near future more heavyweight financial institutions are astonished by the tech companies' ability to usher in financial disintermediation. Artificial intelligence, or AI, which refers to the intelligence exhibited by machines, is a branch of FinTech which deals with the technology and mathematical algorithms used to enable machines to purposely behave intelligently in various settings and environments. AI is revolutionising many industries, providing computers software and infrastructure with cognitive capabilities which were once considered unique or superior to humans. These capabilities will allow a computer to recognise an image, hear sound, process language, communicate text, predict an outcome, or take an appropriate action, with particular situational knowledge or context. In doing so they will facilitate and improve productivity, efficiency and costs. It is in the context of AI that banks are being forced to think in a different way. AI has potential applications in the financial sector, such as capital formation, enterprise management, investment of funds, asset valuation, and the maintenance of customer relations. Recent years have seen the emergence of an increasingly diverse array of tools and applications in the areas of risk management, customer service, transaction screening, and regulatory compliance. AI applications can be powerful partners for human employees in the financial services sector, improving business outcomes, decision making and work efficiency. For customers, AI has enhanced convenience and experience. Yet there are still weaknesses, shortfalls and limitations around these technologies, particularly in building trust and confidence. Digitalisation in banks took less than two years to transform the user interfaces of core services and advance back-end technologies. As a result, banking technology plays catch-up with the integration of legacy systems, with the major solutions being the monolithic architectures from core providers. The information silos of back-end systems perpetuate poor interactions. Most legacy systems lack modern features, let alone a fulfillment tier needed for low-coding automation.

1.1. Background and Significance

As events from COVID-19 to the 2022 financial market downturn have highlighted, regulations are rightly focused on systemic risk across institutions. Events ripple through banks and the entire financial ecosystem: securities, payment settlement, companies, state revenues, consumers and ultimately society. In the view, the focus on core infrastructure components of banks with agentic AI versus its ubiquitous back-end applications should be paid special attention. Banks are, by definition, "trusted" third party, and with agentic AI, the ability to beseech commands to most services offered will be on-demand lessening the chance for human error.

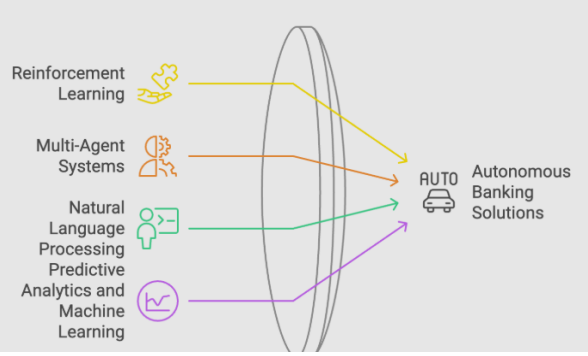

Fig 1: Agentic AI in Banking: Unlocking Autonomous Intelligence for the Financial Sector.

Specifically, it illustrates how technology can engender trust by harmonizing financial worth with the worth of data and physical provenance while ensuring access and auditability. To regain trust back from institutions, customers need an open-sourced architecture, but this "open sourcing" defeats the monopoly that banks leverage. However, if banks are made to understand these fundamentals and mandated to lift capital on their own terms, one bank with enough clout can coordinate the migration towards SSI while information is shared with other banks on a need-to-know basis. Zero Knowledge proofs consist of a theorem statement that a prover claims to know a series of inputs and corresponding values such as the secret "key" relating to the original NFT that the issuer wrote about with its unique ARDID, but without divulging the data to the Circuit. The Ethereum circuit, a language to explain the sentence mathematically, is sent to third party verifiers through a reliable source. This cannot be used by either party involved in the transaction. It can merely affirm the accuser-prover is indeed on the blockchain whilst rendering them unviewable to the verifier.

Generally, the focus is on blockchains enabling "Watch, Attend and Explain" i.e. communal visibility over a public blockchain in limited permissioned networks. However, it is important to be prevented/washed, and it becomes notorious with "blanks" in use. Industries like healthcare look at "spear-phishing attacks" to effect coerce-compile/custodship of blockchains for ransom, and these deleterious externalities fall under the ambit of "Vigilance and Control" i.e. off-chain custodial or on-chain zero knowledge-accessible layers. In the spirit of evolution and safeguard, the overarching "Phenomenological Theory of FIK" is envisioned.

2. UNDERSTANDING CORE BANKING INFRASTRUCTURE

Core banking infrastructure supports all necessary banking functions of reservations, loan processing, ledger accounts, etc., through a centralized database. The system is used to carry out disposable transactions, including fund deposits, fund transfers, etc., in real time. Client accounts constitute ice used across branches of the bank and are core banking functions. Core banking applications are reliable on a 24/7 basis, allowing customers to access banking services through multiple transactions. Branch employees utilize core banking systems to record and calculate transactions in back-office systems. The core banking system should be robust, reliable, and stable, which shows real-time processing on a financial and transactional basis. The advantages of core banking systems include centralized databases across branches of a bank, portability of operations because of ATM, internet banking, etc., reliable to use for clients and bank employees as three-tier architectures, among others.

Core banking provides a wide range of financial services. Banking operations revolve around the basic system to ensure that transactions or updates to client accounts are materialized. Connection to the existing legacy systems and wide-body system particulars for item transfers are provided. Main banking databases correlate with core banking systems to augment coverage to local branches; vendor communication for novel products, workflow detailing, and transactional/evidence keeping modules are available. Core banking or related package products are acquired within banking solutions. The coverage of a comprehensive banking suite of strength and architectural-based care in flexibility is provided. Maintenance support which includes bug fixes, enhancements, new formatting, etc., comes under scope. An annual maintenance support equivalent to monthly payment plus your quotes quoted annually over five years would be provided.

Initial compatibility to add on twenty branches simultaneously with returning disaster co-banking is a requirement. Multisite failure prevention, i.e., disaster recovery, is required so that even in major resource outcomes, either site can serve clients. Bug fixes are required to be resolved and noted within three apparent days of their being raised, while quick fixes once noted are expected to be delivered within a few days. Core banking solutions expected to prevent downtimes that affect transaction rollbacks are needed. Slotting in continuous product improvement into core banking product releases annually is a requirement to add on continuously screening vehicles for intensive creativeness in a retail format.

2.1. Definition and Components

Artificial Intelligence (AI) refers to intelligent machines capable of operating without human input. AI is a subfield of computer science focused on creating computers capable of performing tasks traditionally accomplished by humans. Frameworks formalize a computer's perception, reasoning, and learning capabilities. AI-based systems use large data sets to recognize patterns and gain insight into the workings of similar problems in varying environments. Augmented Intelligence (Augmented AI) is AI designed to assist humans in intellectual tasks, enhancing their abilities rather than acting independently. With Augmented AI, human intelligence and Achievement Intelligence are combined. Augmented AI empowers higher-order executive thinking. The classic banking model is stressed by increased competition, declining revenues, and shifting consumer preferences. As banks upgrade their IT infrastructures, re-architect them, and move banking services to an open, cloudy, and digital ecosystem, compliance and regulation are also being revisited. Difficult-to-solve problems also offer opportunities to adopt agentic AI.

Trust in conventional banking models is under siege, leading to shifting consumer sentiment. Focusing solely on cost savings reduces the effectiveness of the approach, which must shift to risk management. Rising concerns about equity, transparency, and bias must also be addressed. Advanced personalization, recommendation, and search engines enhance user experiences, but banks and central governments are moving away from focusing solely on customer convenience. Several actors involved in the problem space exist, including regulators, banks, credit providers, auditor firms, Fintech start-ups, and tech giants. Models for competition and collaboration must also be explored. Robustness and safety concerns regarding AI models and their outcomes must continue to be addressed. White-box systems explaining their decisions help gain regulatory approval. Simpler stochastic models, which can also be thoroughly examined, can boost regulatory capacity. Transaction chains can be opened up, enabling alternative methods of creating and storing trust. By carefully evaluating immediate benefits, as well as possible unintended outcomes and associated measures, adoption will likely support macroeconomic stability.

The focus is on agents required for risk assessment in credit applications, enabling banks to delegate risk decision-making to external AI software thoroughly. However, agents can be employed in various ways across the bank value chain. Banks can bolster their existing capabilities through a mix of processes and strategies. Where possible, outcomes previously regarded as impossible, too risky, or too intensive, can be addressed. On a more fundamental level, agent architectures and development tools can also be adopted, enabling the generation of specific models. Processes and standards for sound AI development and operation can be established. Generating technology competition may improve outcomes.

Equ 1: Agentic Banking System Equation

$$\text{Autonomous Banking Outcome} = f(D, A, C, R, F)$$

Where:

- D: Real-time Data Streams (transactions, risk, behavior)
- A: Agentic AI Models (goal-driven agents, LLMs, planners)
- C: Customer Intent & Contextual Signals
- R: Regulatory & Risk Compliance Frameworks
- F: Financial Product APIs (loans, payments, investments)

2.2. Current Challenges in Core Banking

Many banks face various challenges in existing business models, spanning business processes, technology infrastructure, regulatory compliance, and skilled personnel. Banks integrating many legacy technology stacks over decades face scalability and reliability issues in technology infrastructure. Increasingly frequent failures due to the brittle nature of aging systems impact customer relationships and raise scrutiny from regulators. Banks respond with technocratic initiatives, ad-hoc experimental implementations, or replatforming across multiple vendor products and architectures. Each of these has proven, at best, modest success, with chunky white-mouse bank apps still in use today and on-going royal commission inquiries into the fining of the Australian Banking sector. Business processes also need updating, becoming task orientated, inefficient, labor-intensive, and regulatory-focused, which cannot benefit select capabilities enabled by current technology stacks. Lacking comprehensive tooling to meet similar regulatory compliance demands across multiple gaps in business processes, Technology vendors turn a blind eye to the business process imperative. The industry faces a lack of investment in top-down banking regulation designing consistent transformation blueprints covering core business processes, resulting in disparate modernization patterns and a missed opportunity to roll out the best practices industry-wide. Asking budgets to compete with offshore vendors is deemed frivolous; as banks nearly all feel disadvantaged, discontinuity is largely tolerated, contributing to systemic risk. Finally, the technology-skilled personnel market for banks is inefficient, being acquired by both startups and cloud-native solutions without equity compensation, leading to overall wage inflation. Existing high vendor lock-in rates mean that necessary reversibility options are not addressed before vendor engagement. Unfortunately, the impasse of the paradox of the digital bank and the protracted circumstances befalling banks is prevalent across the FinTech 1.0 industry.

3. The Rise of Agentic AI

Agentic AI, at its core, builds on the foundations of augmented or narrow AI, which is capable of performing certain tasks typically requiring human intelligence. Beneficial to the banking industry, this form of machine intelligence has led to an increase in efficiency, reduced costs, and the automation of decision-making processes. The economic aspects of integrated AI platforms have brightened the business outlook of many financial institutions. Overall performance priorities have shifted. Banks now naturally expect tangible financial benefits from agentic outcomes and diversified AI portfolios capable of achieving business applications across many sectors. As a result, the analytical policies of banking transformation have been transferred to the design and provisioning of agentic AI initiatives. Inherent designs tend to be cyclical, and the creation of risk-averse functions amplifies complications threatening safety and compliance in banking applications. Preserving the rigidity of existing integrated agentic processes is complicated as they are highly responsive to usage patterns, and decision-making intricacies are often not disclosed. New attention must be paid to growing client use data, data infrastructures, and policies. A somewhat benign or equality-seeking way of data growth became critical. Paradigm shifts among dominant service models offer significant regulatory risks. Ultimately, the stakes are high, and decisions made will leave a lasting imprint. The need to interrogate avenues of agentic AI adoption continuously is paramount.

The innate driver of machine learning is to amplify game-theory-based risk-aware potential outcomes using aggregated behavioral data from clients interacting with machines that render and process tasks. Transformation of numerous strategic aspects is preceded by the dissolution of apparent priorities—focus areas for political actors in effecting change. These changes are tacit, complex, fragile, and mostly unknown, emerging as by-products of immediate adaptations to client use. Simultaneously, transformation mechanisms render decision-making chains vastly entangled and implemented in various processes with various time horizons. This complexity is difficult to analyze and regulate. An awareness of the transformation of machine use in banking and its intended consequences may assist in improving the safety and inclusiveness of diverse machine innovations across all domains and sectors. Data idolaters create immense evolutionary pressure on agents capable of amplifying development feedback loops by producing data. As this crucial information is mostly sought and trained on delinquent data, potential biases must be assessed.

3.1. What is Agentic AI?

Agentic AI is described as the next generation of AI that autonomously actuates digital properties. These can either be software systems or physical devices. Agentic AI can take actions, devoid of human interaction, to optimize, enhance or improve economic outcomes through digital properties. Powered by broader external datasets, networked AI, Decision-

Intelligence and Knowledge-Artifacts, it models future scenarios to take more purposeful actions. It acts as a set of rules or rationale encoded by humans, trained by historical data. Here, AI systems require the architect or designer to have very detailed information about imparting human-like intelligence, knowledge, behaviour, reasoning, common sense, memories and more. With so many parameters and high-dimensional data, nuanced real-world behaviours and performance of AI systems deteriorate. Despite significant investment on wide-ranging deep-learning systems for various industry needs, there are very few advances in transformative architecture and disruptions in devising core banks and its infrastructure. These are due to the misleading hype-cycle of generalized AI, absence of well-defined and grounded premium capabilities, lack of initial use cases, ecosystem of large stakeholders, integration complexity of legacy systems and developmental action by traditional technology suppliers.

With Agentic AI, commercial banking will be transformed completely from inside with re-imagination of bank-in-a-box architecture to core banking infrastructure. It will have widely divergent sharing of financial data, user-based personalized serving of financial products, agentic profiling of various bank assets, real-time anticipating of alarming situations, self-organization of enterprise architecture and digital twins of the bank's ecosystem. Widespread distribution of financial data will bring a new set of problems. For e.g, creation and ownership of self-sovereign identity, implementation of open banking architecture, resolution of hacking of banks, sharing authenticity of transactions between banks and fraud detection across banks. Whoever solves these problems in a scalable architecture and product, will own a premium lane of growth. AI-based aggregation of unstructured data in a purposeful and explainable way, abstraction verticalization of financial products with deep-dive into user nooks and dynamic generation of individual creative products is the second major game changing disruption. Financial institutions need to provide better understanding of bank assets among a multitude of actors to fend off any unforeseen situation. Prior to any alarming situations, agentic AI will self-actuate initiative(s) to minimize its effects and stay on course. An enterprise architecture that remains self-organizing in a purpose-driven manner continuously with profound attention to internal compliance, symmetry and topography.

3.2. Applications of Agentic AI in Finance

The paradigm shift created by agentic AI in financial services is becoming apparent as financial institutions and FinTech firms develop new agents capable of performing increasingly complex tasks in an unstructured way. In securities trading, large language models are already changing order entry and execution, and the superior efficiency at which trades are executed means that liquidity will be concentrated in fewer trading firms. As a result, markets may become less robust, increasing the chance of market crises. In lending, agents that analyse the solvency of borrowers are being constructed, which in turn will result in improved rates for loan provisioning, but may create sustainability and fairness issues. In operations, firms increasingly rely on AI agents to assist or entirely replace human overseers, increasing efficiency in operations but decreasing operational resilience.

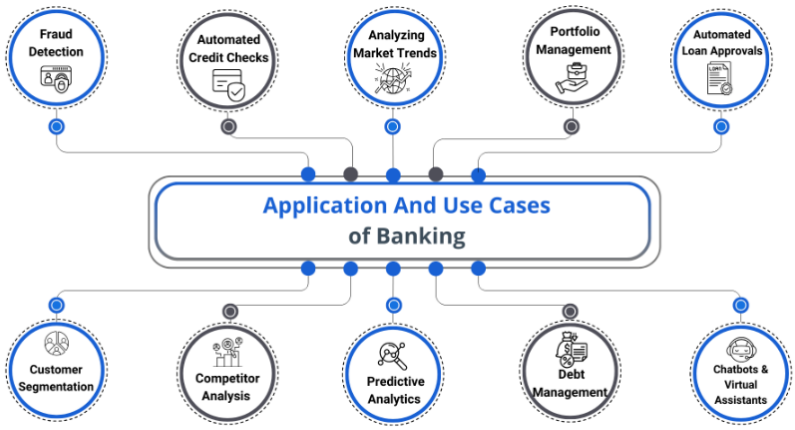

Fig 2: Applications of Agentic AI in Finance.

Additionally, agents have become more sophisticated, capable of composing new agents that operate independently, and are being used for meta-optimisation purposes. So far, a few aspects of the agentic AI revolution have been discussed. For banking agents to be developed and successfully employed in financial markets, banks and other financial institutions must be able to bank the agent. This requires changes in regulatory sandbox frameworks, allowing agents to open their own work accounts in a bank and execute regulated transactions in the financial market. It will also require compliance regulation of the agents themselves to ensure safe and fair operation.

From a high level, an ecosystem will develop involving (a) a financial institution that delegates a task to an agent; (b) an agent capable of completing this task; (c) an agentic bank, licensed to conduct KYC, AML, and activity compliance; (d) infrastructure operationally critical to the performance of the banks but not explored here; complemented by (e) regulatory sandboxes, agentic financial authorities, and compliance agents that ensure the safe functioning of this ecosystem. What

form the incentives will take for each actor to participate in this system will depend on the policies established by regulatory authorities, who must catch up with the pace at which the industry has developed new technologies and financial instruments.

4. Impact of Agentic AI on Core Banking

The banking industry has seen dramatic shifts in how they perform business, particularly after the arrival of COVID-19, advances in digital technology, and the enormous speed of change globally. A wide range of economic sectors, including the banking sector, have undergone substantial changes due to advances in technology. The arrival of large retailers has changed the structure of how clients interact with banks and other financial organisations. Customers now have alternative options for obtaining products and services. These changes have increased the regulatory burden and raised clients' expectations for financing and risk management. The impact of client migration was particularly harsh during the crisis, which resulted in financial instability and pressure to consolidate. Due to the recent economic slowdown and subsequent profitability pressures, banks have attempted to change once more by cutting employment, expanding new risk-adjusted performance measures, and pursuing new business avenues. As banks fought to remain viable, standardised products appeared to rise to the top of the consumer agenda. Businesses have hastened the rollout of automated and centralised operating models because technology wasn't a focus before the crisis. Banks must accept FinTech as competitors and collaborate with them. As a result, there is enormous pressure to make investments that will speed up digital transformation and delivery route changes. Additionally, personal data access is more disputed between banks and their clients than ever before, especially inside Europe.

AI dramatically alters how firms function. For instance, agentic Media AIs pen articles, improve coding by creating software routines, review contracts, get information, and take actions on their own. Likewise, agentic AI can change businesses such as banking. The bank might discover sophisticated strategies for trading with AI, reconstitute teams to discover newly merged firms based on data analysis, or signal to clients poorly rated transactions governance via social media. AI agentic in Organisation AI can select counterparts based on wealth and good behaviour, detect loan information, analyse that information, prepare a report, select and sign a contract, and generate the invoicing schedule. Areas of traditional banking such as decision-making in credit risk, wealth allocation, trading algorithms, or agent banking delivery routes will be particularly impacted.

4.1. Automation of Processes

To sustain their current traction and user engagement levels, digital platforms must broaden the scope of their monetization initiatives. Internet giants have begun to monetize their services in the cloud through subscription-based models or by offering in-house services to businesses that wish to incorporate aspects of their operations into the cloud. Digitally native companies are now transitioning to become fintechs, telecommunications operators, or other types of regulated financial services companies while offering their foundational components as a standalone cloud service. This development risks an increasing loss of digital services market space for existing banking platforms or platform banks, with only payment and credit origination infrastructure remaining behind, while the remainder of financial services abstraction passes into the hands of digital giants.

A major reorganization of service, interaction, and transaction architectures currently is underway. It appears to aim at flattening service distributions in respective markets, creating low touch and one-click frictionless client membership experiences that can be rapidly expanded to fully digitalized bank branches or cash points to turn offline clients online. Digitally native vertical platforms are assembling parallel offerings to banks so that first contact with consumer finance resides outside the current financial services industry. The extent to which incumbent service providers continue to be invited along for the ride will depend on their ability to adapt their architectural capabilities and assets to support the transformation of banking business service spaces and on the preparedness of a new breed of service providers to take over responsibility for full-fledged banking and financial services as both a technical and formal layer.

Micro-economical appropriation of social and economic wealth through disintermediation and value chain adaptation is surfacing to the highest leveled objectives of digital transformation. This has also reverberated into financial services. Proposals for banking revolutions are put forward by a multi-sector technology and research alliance on the platforms of various technologies. This venture serves to attract unbanked clients primarily through transaction ease, convenience, and security, with low-skew pricing, flat-fee, or no-fee transactions, while offering adjunct financially-related service offerings, like analytics, financial education, freely-accessed skilled personnel, etc. Such constructs, if unfettered, threaten the current structure and operation of legacy retail banking.

4.2. Enhanced Decision-Making

One of the most important motivators for the use of artificial intelligence, machine learning (ML) and deep learning (DL) by banks and financial institutions is the consumption and evaluation of large quantities of data to support risk analysis, improved customer service and corporate intelligence, fraud detection and prevention, and improved business analysis. Another area that can greatly benefit from AI is "RegTech," technology for regulatory compliance. Banks are subject to a multitude of regulatory requirements in each of the jurisdictions in which they operate, both from national commitments and from international standard-setting bodies. As the volume of data and data systems grows, so too does the challenge of reporting compliance with measures against money-laundering financing of terrorism (AML/CFT), the central tenet of

regulation. Known as "model risk," the risk is that: • The model may be flawed – Misspecification of model-dependent parameters • Inputs may be inaccurate or biased – Incorrect data transforms or simplifications • Results may be applied inappropriately – Application domain and robustness error Financial modeling is fraught with challenges, not the least of which is the risk/uncertainty associated with its quantitative predictions. Comments by J.P. Morgan's chairman Jamie Dimon suggesting that "models are too smart by half" shed light onto the concerns surrounding complex AI-based methods. The deployment of probabilistic models also brings uncertainty; the unique modeling challenges scale with dimensionality and with the number of data sources. The approach is underpinned by a directed graphical model known as the "Bayesian Network" (BN) – essentially a probabilistic representation of the banks' forward-looking knowledge. Unlike purely deterministic models that map data inputs to target quantities with fixed equations, the BN implements a fork-join architecture of non-linear decision trees built upon sound Bayesian game-theoretic foundations and encoding buy and sell decisions of internal asset managers as random variables. By performing inference on the network, each tree is topologically the same. However, edges (weights) ranges on the native parameters built from market estimates, assumed a mixture-of-Gaussians prior distribution on the top-market pricing factor, a beta distribution on the distribution of log-returns volatility and slewable fee proportion parameters.

4.3. Risk Management Improvements

With the proliferation of Agentic AI in complex systems, algorithms that can act on their own will change not only the functions performed, but also the overall posture of the work being done. Humans however will not stop being culpable for the outcomes of their tools. A core risk and governance framework comprises the five core elements for robust actionability as described. To make Agentic AI safe and beneficial, human involvement will need to cover these areas to a much greater depth than is usual for current techniques. The "will to act" of the Agent appears in (i) through the goal specification formulation in terms of observations and actions and the mitigation of complexity and ambiguity so that specification is manageable.

Core competencies and capabilities of the financial service organizations and the way they interrelate must change accordingly to act as a second line of defence around Agentic AI. New core competencies and capabilities as part of the first line of defence around Agentic AI will be needed. In the financial industry currently, the "will to act" capable systems are the prerogative of a few. Another organized systemic approach spanning multiple financial organizations, augmented by matured market participants' and academic's research is warranted to discover, monitor and manage unintended systemic consequences of autonomous AI's decision making outside of explicit governance. By viewing Agentic AI as ecosystems of models which exist and interact as systems of systems, a new path opens to addressing issues in collaboration and cooperation amongst deployed systems, including wider ideation and action space provisions and exploring latent unintended incentive structures.

Composition driven monitoring enables the creation of observables that capture properties of system behaviours that up till today require sophisticated monitoring orchestration across autonomous systems both in enabling and mitigating. New modes of systemic remediation will have to be proposed to enable an efficient implementation of mitigating observables across autonomous AI models. Finally, there will be an added need to understand strategies, incentives and emergent behaviours for entities in an environment where Agentic AI systems are parts of democracies.

5. Case Studies of Successful Implementation

Agentic AI is influencing banking and finance services with AI assistants providing personalized increased operational efficiency and 24-7 availability. However, today's computer based algorithms are not human-like, with human-like decision know-how and social intelligence; rather, they are a combination of rigid programming and machine learning. Banking and finance executives can influence how Agentic AI is put to use by specifying tasks and decision domains while avoiding negative impacts; this can contribute to trust, ethical use, regulatory control, monitoring, and social intelligence. Examples are given of applied Agentic AI in transforming core banking infrastructure in banking and finance. Malfunctions of one Agentic AI compared to others is described with a case example of a Retail Banking Service chatbot performing poorly compared to others.

Fig 3: Agentic AI in Banking.

Many banks are transforming their customer service call centers by rolling out AI based Agentic AI assistants or chatbots to handle unwanted customer inquiries and by deploying traditional AI options for NAT. As a result, wider Banking and Finance Sector firms have ordered and deployed Agentic AIs. Executives ordered Agents. Since a product is costly and takes over a year to build, one bank stopped the project. Executives claimed that they needed to maintain closeness of the model and lexicon to avoid the previous issues; however, implementation efforts to that end faltered.

Many customers got confused and angry with the poor understanding and its kept quiet non-response, which got picked up by media managers. This example illustrates the outcome risk of uncontrollable negative impact of Agentic AI, which translates into loss of revenue and reputational damage in the Banking and Finance Sector, as similar risks threaten other sectors too. This is self-evident, based on the societal gambles Agentic AI decisions pose regarding civil freedom, trust in technology, and economic dominance.

5.1. Global Banking Institutions

Global Banking Institutions: Processes & Agents That Make Them Work

Three areas of intervention are being prioritized internationally to address the lack of trust and confidence in the global banking system, including schemes to protect customers in a failed financial institution. The expected limitations of traditional regulatory techniques in evolving situations such as a systemically important European bank facing a crisis do not provide a user-friendly stocktake of the possibilities available to watchdogs in the face of broad, irrevocable financial instability. Many regtech innovations apply processes similar to those used in fraud detection to analysis of genuine behaviours. It would also be feasible to exploit metaphorically extended processes trained on language, as proposed for public-sector citizenship. The prospect of national authorities sharing their analysed banks' behaviours would make scalability available through chief scientists at the Bank of England and two separate attentional agents to facilitate classification and assessment of warning signals and detection of behavioural breaches.

It is regrettable because there is an expectation that banks will need to spend more than the current worldwide $270 billion annual FTE expenditure in compliance and audit. However, the high level of operational stability of Chapter 5 systems delivering services, plus partial availability of the agentic alternative, shows the direction in which a feasible solution to the compliance problem lies. It is not inherent in technology. AI regulation prohibiting existing technologies will deny much-needed operational rendering of emergent behaviours at scale. It is to copy the compliance and audit functions of the ninety largest banks wholly out of institutions' control at one stroke.

However, fear that unrestricted AI will lead to extinction is erroneous because of the impossibility of replicating the highly specialized sensitivity of humans' unique neural architectures. The same applies to expert systems constrained by thousands of rules requiring hundreds of man years to embed and without the advanced alternative decoding techniques that lifted autonomous agent behaviours. The concerns about limited accountability and unmanageable institutional complexity of deep learning with gradient descent in the billions of banks or hundreds of application clouds are more justified. Therefore, it is suggested that labelling of transparency and accountability be replaced by contactability and audibility through systems of record logs stored in compressed form on secondary deduplication devices within institutional domains.

5.2. Fintech Startups

As technology continues to grow and advance, the financial sector is rapidly embracing these changes to enhance competitiveness and retain relevance. FinTechs have emerged as specialists in developing technological innovations, and many banks have started to integrate them into their services. Many banks are expected to go this route, and customers in the twenty-first century want to have more choices, flexibility, and control over how they bank. Therefore, the focus now has shifted from integrating FinTech into banking services to FinTech becoming banking services. In this direction, Artificial Intelligence (AI), a great branch of FinTech, has sprung up lately. AI is changing many sectors, and the financial sector is no exception. The banking sector is one area where AI and its subfields, such as Machine Learning and Deep Learning, can hugely benefit banks' efficiency and costs. Investment banks can deploy AI and ML in every stage of the trade value chain, such as AI trading bots that can buy or sell market stocks on behalf of the user. However, with all the advancements and benefits I can offer to the banking sector, more on AI in the retail banking sector still needs to be explored and discussed. Even though AI is growing in the banking field, the benefits and challenges of using AI in the retail banking sector have not been investigated in depth.

In the UK, pioneering banks, such as Santander Bank and HSBC, have launched banking applications that rely on voice recognition to check customers' balances or for transactions . Royal Bank of Scotland (RBS) is planning to roll out its "Luvo" AI customer service assistant more widely following its successful trial earlier this year. Larger banks, such as Bank of America, Capital One, Société Générale, and Swedbank, are testing and experimenting with this technology. Chatbots are virtual customer assistants which advise customers with queries via texts or online web chat. AI is the technology underpinning chatbots. Even though chatbot and AI technology is undergoing rapid developments and being adopted and tested by more banks, the question of whether customers trust them still requires careful consideration. The issue of user trust in AI chatbots can be examined through the lens of customer experience at Société Générale and Swedbank.

6. Technological Framework for Integration

The investment into a financial and technological worldview should also be done regarding support and maintenance. It must be borne in mind that there is a huge influx of new employees and hence new production systems that are not yet familiar to them. It is important to ensure both the support of the systems and their further development. Otherwise, the planned benefits of the transformation will be in jeopardy. This can mean everything from increasing available training sessions to encouraging innovative thinking and suggestions.

In the financial organisation itself, a community of practice for automated infrastructure is worth establishing. This should be a body that can advise on the evolution of technological framework systems and help disseminate good practice across businesses. In large organisations with many separate production systems, there is a risk that individual developments will appear in one area with little regard for the wider organisation. This can lead to reinvention of the wheel, unnecessary costs, and the creation of impossible patchworks. From the coordination viewpoint, it also worries that some large system projects could get too big to be able to be run effectively without intervention from the outside. Therefore, it makes sense to have a system approach outside the individual business. This should probably be started on a small scale, with a few key players.

Automation provides unrivalled improvements in efficiency. When dealing with big data, the human brain can easily be overwhelmed. Heavenly ideas to benefit from the data can be thought out, but at the moment the consequences of no action can be crippling and costs out of control. Scandalously vast amounts of money are spent on fighting lawsuits under the DPA/HIPAA and NAV personas.

Implementation of vision should therefore be analysed thoroughly. Aspects it should cover are the integration of sexy, latest fireworks type products into systems installations; the tracking of data and system use against original production system(s), with a complaint/escrow structure; as well as the planning of releases and changes to these systems at all levels.

6.1. Architecture of Agentic AI Systems

As advanced hardware-attracted artificial general intelligence (AGI) becomes operational, AI systems can be warranted of strong independence and autonomy, and agential, meaning there will be no guarantees on their performance. AI systems have risks; their operation results in potential dangers, or harms. AI design is the craft of remediating AI risks and designing the agency of AI systems. With the product of engineering and design, expectations regarding AI agencies have effects on and entail effects from agencies; AI agency and ensemble design are dialectically engaged. An epistemology for engineering the agency of AI systems equips the capability narratives with the prosthesis of balanced analytic concepts and procedural methods to tighten the well-known, but generally not well-described concept. It is exposed in terms of the entry points and focus of inquiry characterizing the encyclopedic scope of this work. It is examined how the can determine a hands-on perspective on a genuine incursion of the AG.

A model can be appropriated to model regimented AG attack in agents' world that adopts an agent; its agency can be modeling an adaptive agent that adapts level of agency in response to changing situations in agents' world. Besides modeling how agents can manipulate other agents, it is very much available resourcing about conceiving architectures for agents. The inception of an agent can be conceived using state-of-the-art cognitive architectures, whereas open architectures focus on modeling agency via hybrid approaches, combining logical and non-linear modalities. Doyens in multi-agent system (MAS)

modeling like examples of formal actors having inter-subjective objectives in Monads in the Ludics or MAS as characterized by a common constellation of functions in Reversible Lattice as Ontology modeling emergence of games focusing on science can be conjectured of being AG or edging towards the AG level.

A somewhat contrasting methodology focuses on socio-economical-discursive systems modeling how, for instance, communicative buzz/stew of multiple agents' mutually constitutive narratives/other kinds of discourse sub-nationally induce a national/international high-level agency. Non-discrete forms of agency reside in computations in continuous agent worlds (e.g., bio-policing of planetary ecology as emergence of equilibrium%), and the agenting of these forms properties as perturbative computational narrative reconstructions becomes a calculus problem solved in the neural domain. Research into adopting/adapting AI/AG as agents to level subouncing galleries in cultural agent environments focused on bio-policing or other sustainable socio-economic puzzles, conceiving more mathematically applications for the continuous tensor.

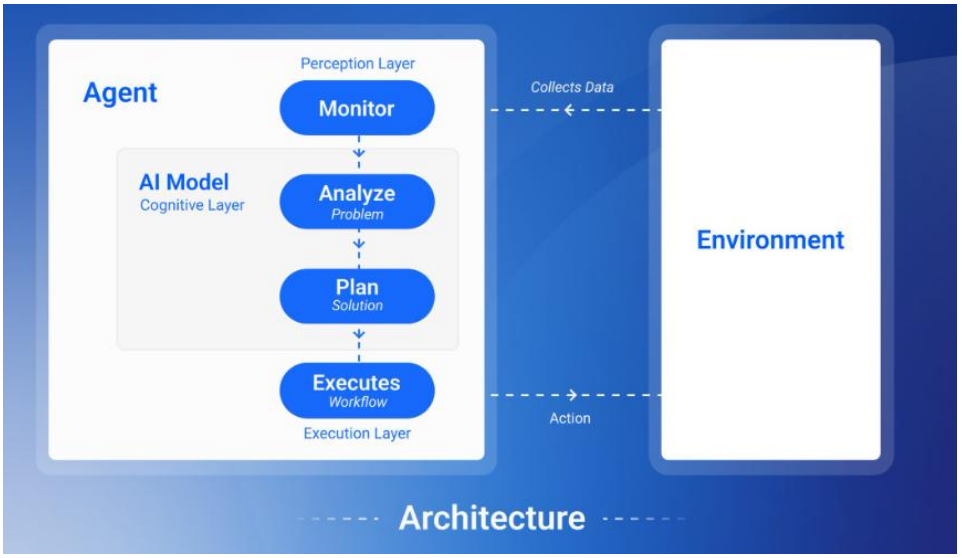

Fig 4: Architecture of Agentic AI Systems.

6.2. Data Management and Security

Effective data management is central to the overall success of a bank, especially in an age driven by information, since economic growth may depend less on physical work and more on learning and information-management capacity. Banks are information-driven organizations. In addition to attracting and managing human and financial resources, they need to focus on gathering new data, capturing and interpreting data about current and potential customers, and storing, securing, retrieving, filtering, and transforming the resulting mass of data into forms that can be analyzed and used for customer relationship development. Increased competition for the attention of customers and bottom-line revenues for banks puts increasing pressure on attention to interpretation and management of information. Banks with successful information systems are better equipped to identify profitable current and prospective customers, target marketing efforts at specific customer segments, and determine the moment and medium for marketing and relationship-building communications [3]. Banking and Information Technology (IT) Regulations and Guidelines affect all banking and financial institutions. Recommendations or guidelines for adopting a certain technology trend, or a definite approach to the eventual introduction of such a technology. For example, the regulations regarding internet banking are driven by the threat of possible customer data interception at various levels. Optimization of databases and queries being introduced owing to the explosive growth of data due to advent of technology, internet banking, social-engineering based phishing.

Equ 2: Compliance-Aware Agentic Execution

$$E = \max_{a \in A} [U(a)] \quad \text{subject to} \quad C(a) \leq \theta$$

Where:

- E: Optimal executable AI-driven action
- $U(a)$: Utility (value) of action a
- $C(a)$: Compliance risk or cost
- θ: Regulatory threshold or allowable risk margin

7. Future Trends in Banking and AI

Rapid advances in AI technology, including large language models (LLMs), generative AI, and multimodal models, have enormous implications for the future of banking. It is expected that in the near future (one to five years), banks will adopt and adapt agentic AI across multiple business lines and customer-facing functions, including operations, marketing, human resources, risk and compliance, and treasury. At this early stage, it is important to remind decision-makers of some of the societal implications, regulatory, and ethical considerations of AI. Moreover, even before the maturity of general-purpose LLMs, generative AI is transforming banking use cases from stand-alone retail operations chatbots into advanced AI companions capable of agentic interactions. Transforming core banking infrastructure with agentic AI is a top priority for large language models in banking estimated to be worth over $5 billion.

Societal implications: Redesigning banking processes for AI requires banks to review how they govern interactions between AI systems and users to meet commercial goals. Generally speaking, banks currently lack institutional capacities because they do not own alternative system architectures, knowledge bases, or machine learning models. This reliance on proprietary technology and isolation from academic research may weaken their ability to explain, understand, and address the potential negative impact of technology reliance internally and externally, such as technological over-dependence, job loss, and customer alienation.

Regulatory implications: The implementation of AI infrastructure raises questions about banks' compliance with anti-money laundering law, the know your customer (KYC) process, cybersecurity measures, and fair competition laws. AI tools have been used in the past to flout regulations because banks hired third parties and masked misconduct under the guise of algorithmic automation. There is also potential regulatory risk in not using AI for high-credit-risk customers because this is typically achieved through exclusionary practices.

Fig 5: Future of Artificial Intelligence in Banking & Financial Industries.

7.1. Predictions for the Next Decade

Over the next several decades, the hardware and environment in which core banking infrastructure operates will become increasingly agentic, self-learning, and self-correcting. The essence of core banking infrastructure will shift from being reactor and bot-based to agent-based, multimodal, and programmable. Bank core infrastructure will be replaced by self-learning banks that explain their behavior, propose alternative measures, adjust on their own, and guarantee safe transformation of the environment they operate in. In this shift, firms and financial institutions must learn new ways of dealing with novel environments and risk their overall existence. This multi-fold challenge must be met with multi-fold understanding and knowledge, tools, policies, and regulations. The notion of AI as agents that perceives and interact with complex environments has already been present in finance and banks on the market for a few years. However, less is done in reasoning about potential systemic risks such agents in capital markets can introduce.

The level of agency utilized in novel AI systems is rapidly evolving itself and especially important for long-term impacts. In explaining what AI acts and how it works its level of agency is essential in which aspect of intelligence contemporaneous systems are captured. The differences in the meaning of intelligence and consequently regulation and impact are huge. To agents working alongside humans and strong general models for all types of tasks are exchanged. Central bank models are based on small and explainable high-dimensional models. These designs give rise to questions of data privacy. Multi-agent

based problem solving is very sophisticated and central to modeling major agents' behavior on devices such as phones or laptops. Agentic AI could change household budgets and serve heuristics for mortgage, insurance, investment, etc. Financial apps are being immersed in long-term saving programs and ecosystems in anticipation of future regulations.

7.2. Potential Disruptions in Financial Services

Modern financial services platforms are constructed as a combination of mutually connected domain specific components. Digital challenges propose possibilities that traditional institutions address with legacy platforms. Moreover, fast-moving start-ups raise the complexity level, operating in the same space with simple yet attractive services. In the eyes of the traditional incumbent banks, re-platforming these complex services from proprietary monolithic framework solutions onto a modern component based architecture is a multi-billion dollar endeavor that may take decades. There is currently a great interest in the financial services space, globally and in the Nordics. The current western banking structure was established in 1980-2000 with legacy service based platforms. This period shaped a wave of plain digital banking where services merely got a paint job on a desktop browser and now an app on handheld devices. However, now with services like Paypal, Stripe, TransferWise, and N26; former banks appear slow moving, difficult and old compared to new banks. Traditional banks would position themselves as a conglomerate taking up chances to acquire and integrate simple buy-or-build services such as "one department – one bank". This approach however poses a hard challenge when operating in a more complex way via services designed by in-house Innovation departments, integrating them with bank's core offering and offering in open API's. On the other hand, retailers are merging capabilities from basic retail banking utilities with intelligent services designed to enhance loyalty and better serve customers. Yet the latest developments in AI go far beyond intelligent recommendation engines making it hard for banks to move towards complex and personalized services based on open APIs, and too expensive to protect proprietary interfaces with technology boundaries. A noteworthy side effect of the explosion of storage consumption due to financial services scrutiny and compliance obligations was that this effort was conducted mainly in the domain of Data warehouses. This development had an equally great impact on the speed of converting data to understanding and action. Machine learning systems developed from reactive rule based methods, forward triggered predictive, and inverse triggered significant event based, to today's ability to create efficient agents based on powerful problem solvers. Automated financial services operations would mean higher precision and better costs, but how do you move a first grader with a piano into the royal concert hall? The banks now possess the amount of raw data and systems to create agentic systems. The rapidly evolving ML technology provides platforms for trading, lending, and customer services far superior to anything presently available.

8. Challenges and Limitations

AI systems could be vulnerable to exploitation, where individuals work against the integrity of them for personal gain or politically motivated goals. Bad actors may target solutions by coercive payments to alert them to situations in society, hijacking of the algorithms and via impersonation of authority figures with plausible consequences. To mitigate poisoning and error or neuro epistemic variety injected at the epicenter, coping would need to move from initialized to able to modify weights or architecture once trained. AI systems could provide additional information on the context of transactions or activities that should be considered, or information on the collective ability to account for particular parameterization continuing. Financial shame from scam, debts, divorce or unexpected expenses could create a gambler's mindset. Global loss would be mitigated by the collection of such information and dissuasion of alternative behaviors.

The broader financial consequences of bad news or shocked devaluation should also be modeled against the sociality such as coordinated panic selling and withdrawal after vulnerability to the loss of accountability spanning issues of aversive beliefs and availability of alternative platforms of exchange upon which to trade or share memories. There exist a number of heuristics for viewing forecasts relative to money supply shocks or productivity for tools to estimate those bounds. A trading zone could contain the capacity for forecasting time series beyond tidy data and interpolation of high frequency movements through a raw option catalog complete with transformations for theory. Incorporation of reactants could yield polar coordinates relating rate of return cumulants to broad based credit spreads after delays for debtor bank account initializations, downgrading of credit or aggregate partly state variable trade of non-faulty debt.

8.1. Technical Barriers

The discussion about technical barriers has been a hot topic in academic literature since decades ago, especially in the banking domain. It is widely accepted that the lack of technological skills and expertise, poor internet connectivity, corruption in the information and communication technology sector, and unnecessary expenses related to the provision of internet banking services result in low levels of Internet Banking adoption among commercial banks. Not just that, but issues around illegal or wrongful processes followed in IT outsourcing and conversion activities also have an impact on customer adoption and usage of online banking systems. Furthermore, self-oriented judgments, lack of trust capabilities of banks in using online banking, and a poorly understood or unknown online banking process have been regarded as the most important customer-related technical barriers.

Moreover, it has been opined that people doubt that bank robots or virtual agents can be more knowledgeable than human agents or representatives, or they find it hard to receive and handle information presented using non-traditional interfaces. The novelty of the technology also is considered as a limiting factor, as customers find it hard to process the idea of receiving

advice or guidance on financial matters from a non-human agent. Additionally, AI agents often produce answers that are irrelevant to the initial question, which may decrease customer satisfaction while increasing the chances of negative user experience. Similarly, issues around difficulty in spelling names, concepts, and words in the correct writing manner or the customer not being familiar with the questions asked by the agent also impede the successful adoption of AI financial technology.

8.2. Cultural Resistance within Organizations

The seamless integration of newly acquired technology into an organization is never a straightforward affair with no disrupted workflow or loss of productivity. On the contrary, technology transfers from vendor companies are often marred with culture clashes, power struggles, clashes of priorities and processes, and resistance from employees imbued with allegiance to an agenda that does not align with the enterprise's vision. Cultural resistance is resistant behaviours that arise from employees when any new acceptance or understanding of a technology, process, systems, device, or neural architecture solution is contemplated or being implemented. Employees of an enterprise are comfortable with their implementing systems as they are accustomed to the output these systems generate in terms of a task's outcome and performance measures. Agents of change from acquisition companies and heads of departments cannot always understand the political resistance that emerges from employees.

Enterprise system redesign depends on an organization's knowledge-working professionals, business processes, culture, and management of change. Information technology (IT) changes; however, they do not happen on their own. They require knowledge-working performers in orchestrating institutional change; they require cultural and strategic change, the management of change; they require managerial support in developing requisite change strategies, change hierarchies, goals and communication. Employees of an enterprise may resist, reject or ridicule technology, not because of a lack of understanding, but from a view that the technology will reduce their autonomy, status or relevance to the enterprise and therefore its productivity. Organizational culture (OC) is defined as the normative, cognitive and regulative aspects of life within an organization that distinguishes it from other organizations.

9. Strategies for Successful Transformation

Only a matter of time until any bank would be forced to rethink core banking infrastructure and legacy technology. Their strategic approach corresponds to how far advanced the bank is today and how ambitious the goals are. The answers vary significantly, from a fundamental "greenfield" transformation to addressing specific urgent regulatory control issues. Options, opportunities, and best practices for each approach. The technology approach of the actual selection and usage of agentic AI tools must include a close evaluation of potential tools and platforms as well as in-depth due diligence activities. The selected platforms must be able to integrate seamlessly with other technology solutions and automate critical data gathering, management, transformation, and completeness control activities.

Since every solution is slightly different, a "fit to the use case" approach is recommended. Digital twins must be created for core processes first, allowing more deep analysis to come. Next, ensure the expected quality and performance of the developed agentic automations. During enrichment, a regular periodic back-checking should be used. Most banks have tried to attach existing static rule-based solutions. They do not work because of vastly changed behavior patterns in very high-dimensional space and variables constantly evolving. Observe manually the process in parallel with looking at results using AI. Agentic solutions must include your solution, not to remove it completely. Rethink as much as possible the process. For example, what kind of controls are important? Can controls focus on significant amounts rather than detailed transactions? Be pragmatic, keep the number of automated checks within a few thousand, no more. Embedded controls don't need significant additional monitoring.

Some decisions are essential to decide on the benefits and costs of an automated process. It is much more efficient to build agentic solutions in cooperation with clients rather than manually fixing detailed critical issues. Systematically put mistakes on hold until human involvement is really needed in judgmental decision making. Entering the bank, a clear expectation is that today it would take the third generation of smart automated agents to arrive as opposed to merely two first generations that produced precise work. The important part of the negotiation is to decide on "paradoxically few" immediate opportunities and concentrate full power to develop these processes and solutions carefully.

Equ 3: Agentic Financial Orchestration Loop (AFOL)

$$X_{t+1} = f(X_t, O_t, R_t)$$

Where:

- X_t: Current state of the financial agent
- O_t: Observations from environment (market, client, system)
- R_t: Reward function driven by KPIs (profit, NPS, compliance score)

9.1. Change Management Techniques

Understanding the challenges and opportunities inherent in bringing about organizational and workplace change is essential for leaders at all levels of an organization. Managers frequently deviate from the change management principles and methodologies associated with the transformation process. Even when satisfactory beginning steps are taken, organizations often overlook techniques necessary to ensure crews and organizations are on board with changes related to technological innovation. At times, upper management fails to support new practices or puts up jurisdictional roadblocks to organizational improvement. Information systems development has proven to be an inherently difficult and complicated enterprise, involving many players. Successfully managing organizational and workplace change requires a holistic awareness of stakeholder needs and values, and the ability to create an environment conducive to systematically achieving change with shared vision and purpose. Organizations that ignore the human side of technical change frequently come afoul of unexpected consequences. Indeed, underestimation of the difficulties of managing change has been cited as the most common reason for change program failure. There is no one way to change an organization. Nonetheless, change in organizations clearly involves common themes and processes that can be understood and modeled. There exist successful change management methodologies and checklists that practitioners may use as heuristics to guide change efforts and monitor progress. Change can be broad in scope or narrow and discrete; it can be planned or be the result of unintentional circumstance. Change is an everyday occurrence; organizations, teams, organizations, relationships, agendas, rules, procedures, environments, tasks, and many other variables become different. Change occurs at the societal level, e.g., alleged environmental pollution or social injustice, the political arena, e.g., the news media influencing political agendas, at the organizational level, e.g., downsizing laid off long-time employees, and at the individual level, e.g., adopting a healthier diet or lifestyle.

9.2. Training and Development for Staff

Novateur has extensive, practical experience as well as a wide array of innovative applications across multiple domains from Intelligent Systems requirements and specifications to design, implementation, operations and technical as well as a non-technical business case benefits. New services could be devised, prototyped, and tailored algorithmically to a knowledge competitive edge. Some examples from other domains of Intelligent Systems include: adjustment of rules and norms in context; automated or semi-automated generation of queries in context; contextualized automated or semi-automated adjustment of an assistive intelligent system's performance; on and off pass-through virtual assistants centered on as well as smart integration of the global trading from home; tailoring of investment funds performance against sustainable and regulatory mandates.

Transformation costs will be exponential, thus collective action and feedback loops should be built into the road map, roadblock accountability: "before impossible, impossible until done." Also reconsider why technology adoption ventures so often fail, among some studies: Smart Technologies Are Not All Effective. Fax machines, anti-lock brakes, and now performance support systems: Where are the productivity payoffs? Success and failure in telecommuting. Cooperative vs. non cooperative cyber security: game theoretic approaches. Automation systems learn from humans – not only why surfaces in a multitude of life domains and Artificial Agent Behavior in Telehuman Systems.

How will the bank be able to grow with its customers? Will the bank have a tight customer-focus structure? Can it also assemble different financial products and services and act not only as a facilitator, advisor and intermediary but also as an agent, providing operating lines of credit, early revenue bills discounting, supplier and subcontractor financing or equity and investments? Can fraud risks be modeled and prohibited through unusual behavior monitoring? Can it also build business models for the secondary market and business success and bankruptcy analysis? Banking artificial intelligence has become a topic of vital importance. Artificial intelligence is the discipline dedicated to developing machines that possess human-like intelligence. Banks typically consider big data to be any data beyond the capabilities of classical processes to improve data management and maintain.

10. Measuring Success and ROI

After an initial rollout phase, banks should build a culture of continuous improvement around the associated AI and data systems. Here are some recommendations on how to measure success, derive ROI, and foster continuous improvement of the AI supply chain.

Success metrics will vary based on the business intention and effort selected, but should all be clear and precisely defined. AI projects often evolve and drift from their initial intention, making it critical to reexamine objectives well after launch. Metrics may include qualitative test/review judgments that reflect how well a bank's data system meets expectations, and other measures that quantify a system's abilities once it is in production.

Some systems need active human involvement in decision-making. In these cases, the adopted NLP and content analysis methods may be assessed through qualitative investigations and periodic audits by trained analysts. Quantitative measures should emphasize success rates for systems that automatically arbitrate all decisions. These measures might extend scores of general implications such as confidence scores and uncertainty estimates, and measures of performance degradation under adversarial prompting. Success metrics for targeting systems should define success quantitatively. Banks in the industry

actively pursue AI maintenance efforts that improve and update systems. Some of these strategies, such as retraining with new material or adding new models, apply directly to systems and ideas launched as part of AI efforts.

On the other hand, more traditional banks may find that similar measures of success and improvement don't transfer well and that alternative mechanical improvements are needed to grow sustainable bases. Nonetheless, it is often true that initial efforts forming these systems should be taken as evaluation time maturing, and internal efforts can focus on enhancing improved evaluation methods and re-examining bad sources of outputs or data quality. Regardless of implementation, a combination of qualitative and quantitative measures is generally needed to get a more holistic view of a system's "health".

On a related note, it's difficult to estimate ROI for AI efforts that lead to well-functioning, accurate savings units. Moreover, evaluating channels of ability is complex when AI systems operate in cognitive domains that are less easily measured. A common issue is that evaluations rarely transpire in a uniformly comparable and numerical form, with reports rarely presenting or being structured by synthetic funds. Additionally, AI systems often generate complementary cost savings that are expected to "come in thousands but add up to millions".

10.1. Key Performance Indicators

For any organization, accurately measuring the performance of process-centric initiatives is one of the most daunting challenges. The standard "no-change" basis for comparison lays bare a stark reality: Any change made must be powerful enough to overcome the natural tendency for processes and metrics to drift. Yet even the most rigorous benchmarking against competitors post-facto is fraught with difficulty and distortion. In observance of these realities, Intellect had spent inordinate effort preparing to measure the impact of the Agentic AI initiative. The so-called "Key Performance Indicators" (KPIs) were designed with a solid basis in physics. In essence, such KPIs would automatically detect when something had changed by observing a waterfall of possible process metrics cascading down from laws of robotics. Such metrics had been embedded into the application flows themselves to ensure real-time tracking.

Most importantly, once these KPIs had been established, engineered, monitored, and tuned, the company believed it could measure impact before and after any iteration pass. However, in practice, in terms of sheer number and interaction complexity, measuring the KPIs proved to be much harder than initially expected. The key problem was simplification in engineering KPIs, as the introduction of many unseen interactions led to vast redundancies and confounding variables. One way out of this problem was to limit the number of KPIs to a few specific ones in terms of economically impactful class of metrics.

The insight that stemming from work on complex systems could typically be simplified to a few predominant flows and potential bottlenecks, were necessary. Nevertheless, what class of KPI metrics that gave economic clear impact was ever-more difficult. Intellect's biggest regret was failing to adapt to the complexity of their challenge in envisaging KPIs at a more abstract and propensity level – a change that invariably emerged too late for it to work in practice.

10.2. Long-term Value Assessment

AI applications such as ChatGPT, DALL-E 2, and Crystal can leverage existing knowledge to generate rich outputs. However, their viability is contingent upon the quality and underlying infrastructure of the input language model. If the general knowledge is incorrect or biased, outputs will not improve through add-on approaches. Banks and fin-techs need to work on their data closest to the customer to ensure that public data protects the customer's trust while still fueling the service. Knowledge 4 banks must focus on enriching data capture and storage mechanisms barring privacy, anti-money laundering, and anti-terrorism risks.

The next 5 years will see 3 revolutions in agents. A bot-logic revolution led by young entrepreneurs and brainy femto-adhocracy, and a data-recycling revolution will harvest public, expert, and competitor data. Two additional, but less revolutionary trends, will shape this revolution. Good banker function and robot organizations will emerge and proactively harvest all data to improve a bank's products. The concept of a Platonic directed research agent will also help achieve pareto-optimal decisions among given criteria. Already, trend companies for par-optimizing for client and bank profit exist, but they cannot yet be used by others than a niche clientele.

Age is the new currency in finance and banks will have to pivot to age-banking. AI-enabled mathematics will produce reliable insights into lifetime value and services for retention before AI agents churn customers. Age-automated PSD2 and EMBL will redefine comfort tailored. Just-in-time offers of clicks-free teen-injections into the metaverse or vehicle-one way-out will be anticipated through post-event sentiment analysis. Gamified offers of bespoke hugs for the elderly will competitively win hearts.

11. Conclusion

For banks seeking to leapfrog the competition, reduce opex, and improve customer satisfaction, the rational path is to prioritize a digital-native Core Modernization with a Co-Innovation-first Approach. Working with Pure-play FinTechs that have proven out Agentic AI capabilities on chosen use cases is the surest way to the learnings necessary to educate bank employees, executives, and boards on these innovative options. To that end, banks need to build models of enterprise user

goals and workflow, combined with data for Private-Public AI agent training; establish a Co-Innovation Lab, incubator, and accelerator; and outfit for pilot/beta/prod deployment and scaling teams and experts.

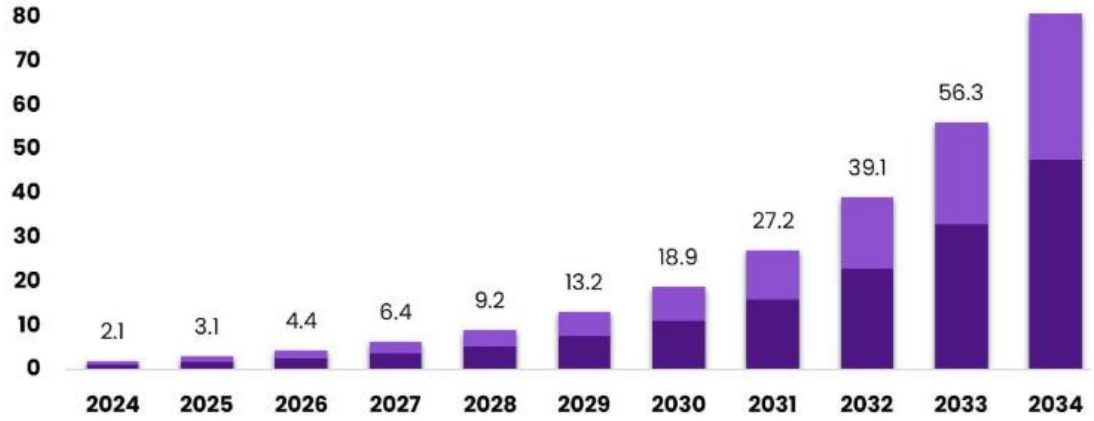

Fig 6: Agentic AI For Financial Services Market Size.

Pure-play FinTech vendors typically only open the technology platform layer to partners due to a negative enforcement cycle wherein banks teach FinTechs how to be banks, rather than focus on FinTech core innovation expertise. Core Modernization partnerships such as these will ideally enable low-friction, co-educational training on how to harness Agentic AI while avoiding the obsolescence of existing systems. The key to unlocking the full upside potential of Agentic AI capabilities is architecture where Pure-play FinTech vendors partner up with banks to re-engineer technology stack primitives. Rearchitecting underpinnings of critical things such as payments, customer communications, fraud detection and prevention, and security at the core, rather than continue to bolt-on evolution, will result in a zero-friction use case ownership and ability to take the innovations further faster than a bank's competitors. In-house or affinity Credit Unions that can keep account information more proprietary will have significant privacy and trust appealing advantages nationwide. Many banks have quashed margin-sapping baby FinTechs and should not miss the Co-Innovation opportunity with either hyper-competitors or incubating partners.

Traditionally, banks have ignored financial technology vendors that can replace their core banking systems. Differentiating offerings have become financial products that complement transaction sequences for rapidly margin-sapping digitization of just incumbents underneath. Non-bandwidth limited Native Fiservs can fundamentally upend the financial service industry on the breadth and depth of offerings across much lower cost to serve in availability, operations, and compliance. For better or worse, these reactions happen too quickly and are global, on an order of magnitude greater than typical competitive entry points and responses.

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