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Cloud-Based Infrastructure for Scalable Financial Services: A Case for Agile Wealth Management

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Abstract

Information and communication technology have changed how financial service firms conduct their resources and business activities, thus allowing them to create scalable business models without growing operational costs. Commercializing those efficiencies to help investors is the next logical step for this digital transformation. While access to financial advice is increasing with greater availability of cost-efficient technology, gaining access to skilled resources and trading capabilities is becoming increasingly more complicated. This paper examines how a technology and infrastructure tenders earliest aspects of an agile wealth management service. It helps create a unique wealth service that focuses on real relationships—built on shared interests and values with business advisors who are committed to delivering the best possible results for clients, and to operate by embracing generations of academic research into investor behavior and its impact on financial returns. As such, this paper commences with outlining two different views of the fintech impetus before focusing on the technology underpinning a cloud-based business infrastructure and the available wealth management tools. The balance of the paper concludes by reviewing three possible approaches to implementing a fully integrated agile wealth management practice—business inertia, business innovation, and business disruption—and the roles of changing client investor behavior and attitudes along the change management continuum.

Keywords: AI, wealth management, machine learning, personalized investment, big data, finance, risk management, predictive modeling, cloud infrastructure, scalable services, agile finance, credit scoring, portfolio optimization, AI integration, cloud computing, wealth advisory, data-driven strategies.

1. Introduction

The tectonic shifts occurring in today's macro-economy are placing unprecedented burdens on financial service firms to redefine their business models to remain relevant and to assure customer loyalty. Over the past two decades, global markets have become increasingly integrated, products and services have been commoditized and priced accordingly, and customer behavior has been profoundly affected by the instant access and service provided through the Internet. As these trends continue to accelerate, financial services firms are faced with growing disintermediation threats from small fintech disruptors who are willing to push the boundaries in the development of innovative products enabled by the latest digital technologies.

Wealth management, in particular, is under increasing pressure to respond to these changes. The prevailing business model, which typically involves building personalized portfolios at high price points and low frequency to a limited number of high-net-worth customers, is being pushed to its limits. Increased demand for low-cost passive and index products, coupled with increased regulation in the form of fiduciary obligations aimed to eliminate conflicts of interest, have forced many financial institutions to unwind their proprietary non-fiduciary wealth management

businesses, hastily spin-off their internal brokerage units, or simply accept the erosion of established profit margins. Unfortunately, these responses architected to meet the business model requirements do little to ameliorate the basic scaling problem of wealth management, which is how to deliver personalized portfolio management service to the masses at prices that are economical for the masses.

2. Overview of Cloud Computing

Cloud computing offers on-demand access to a shared pool of configurable resources–e.g., networks, servers, storage, applications–that can be rapidly provisioned and released with minimal management effort and service provider interaction. These properties, along with virtualization and other technologies, enable cloud solutions to offer improved resource efficiency, lower costs, enhanced agility and flexibility, and rapid deployment.

Cloud computing is not a new concept. It is an evolution of distributed computing, and technologies like virtualization and grid or utility computing, in combination with the Internet, inexpensive hardware, enterprise infrastructure hosting, and custom application hosting, have made cloud computing a commercially viable solution. Virtualization-based resource pooling offers dynamic, flexible allocation of resources according to demand with minimal resource provisioning. This scalability enables effective economic modeling of web-based applications, which can incur significant resource demand fluctuation and spikes. Additionally, a cloud provider's ability to pool resources can lead to better resource utilization, reduced costs, and predictable pricing.

By eliminating the capital expenditure of acquiring, configuring, and supporting dedicated infrastructure for application deployment, cloud solutions improve speed of deployment for time- and revenue-sensitive applications. Moreover, the ability to quickly provision resources simplifies rolling out production versions of new applications. Automation of resource provisioning and application deployment can further reduce time-to-deployment, freeing up IT support for business priorities. The elasticity and availability of cloud resources has led to cloud deployment of applications that experience variable, unpredictable demand.

2.1. Definition and Key Concepts

Cloud computing has emerged as a revolutionary technological model that enables ubiquitous access to a shared pool of configurable computing resources – such as networks, servers, storage, applications, and services – that can be rapidly provisioned and released with minimal management effort or service provider interaction. This enabling platform allows for a new world where IT resources can be deployed quickly and modified easily to meet changing business needs. Cloud computing represents a shift away from using local servers or personal devices and toward the use of web-based applications for data storage and online services. Cloud computing is used as a metaphor for the Internet, and as a way to simplify the underlying infrastructure.

Fig : 1 Cloud-Powered Finance

Like any specialized area of research and practice, cloud computing is also marked by a considerable amount of jargon. However, its conceptual foundations can be stated when we ask five questions. The first one is: What is cloud computing? Cloud computing mixes together services, virtualization, automation, technologies, and data center physics, to provide a user-centric service offering. Another question is: What are the key concepts? Cloud computing is based on service concepts and has major impacts on enterprise architecture. Cloud computing provides a formalized, industrialized model of internal and external business service solutions in an enterprise context. Clouds emerge from resource sharing at the service and application level. At a basic level, clouds integrate partnerships by providing an always-on service grid. Another relevant question is: What are advantages? Cloud computing provides resource economics, resource poolings, and service-oriented aggregation model – changing the economics of computing or more generally, enterprise IT. Cloud computing is reshaping the economics of enterprise services and IT solutions. Why is cloud computing important? Cloud computing enables solutions for agility, business reengineering, and IT service industrialization across enterprises. The aggregated services in a shared business service platform enable industrialized processes and solutions across enterprises.

2.2. Types of Cloud Services

Cloud services typically fall into one of three categories: software, platform or infrastructure. Software as a Service (SaaS) -- typically accessed by end-users as Web applications in the "thin-client" model or as software running on end-user devices -- includes functions both for individuals, such as online photo sharing or collaborative writing, and for businesses, such as sales force automation, enterprise resource planning, customer relationship management, financial accounting and tax preparation. Other examples are "dry SaaS" utilities like Web-based e-mail. Various Web-based office productivity suites are considered true SaaS, but there are also many hybrid models, where a combination of a thin-client Web interface with rich client software that runs on a device, such as a personal computer or smartphone, is employed and the clients and the servers communicate via the Web. Platform as a Service (PaaS) provides a platform upon which developers can build and deploy software applications. Hence, only third parties use this type of cloud service, which allows them to focus on the applications without having to manage deployment of the underlying infrastructure. Examples of PaaS include large-scale grid computing services and specialized tools for specific application types, such as application hosting instruments and database management tools designed specifically for cloud environments. An example of PaaS that business end-users can use is the tools offered by some SaaS providers to "mash up" their services into composite applications.

2.3. Benefits of Cloud Computing

As noted previously, the term cloud computing has been used generically to gather various existing and emerging technologies under the same umbrella; in fact, cloud computing is more accurately seen as a confluence of various technologies. The underlying idea is that computer resources are available for use without any required knowledge about the underlying infrastructure or a high degree of interaction with service providers, and they are charged on an on-demand basis. The particular appeal of cloud computing arises from its multiple benefits, not all of which are unique to this technology, namely, cost and time saving; scalability; increased efficiency and performance; business continuity; security and collaboration; and access device independence. These benefits are overviewed below. Cloud technology offers significant cost savings compared to in-house systems; in fact, one of the biggest attractions of cloud computing is that it allows companies to pay as you go instead of investing heavily on IT systems. In addition, it is possible to have a quicker access to ready-to-use infrastructure, while freeing up the employees that were managing the in-house systems for other tasks. Cloud computing also features near-limitless scalability, since cloud clients can easily pivot their efforts from one system to another and accordingly pay for only what they are using at a given point in time. Additionally, upgrading the hardware is no longer the client company's responsibility; cloud service offerings also entail state-of-the-art technology, with periodic updates. Moreover, cloud computing resource sharing permits companies to achieve economies of scale. Since the physical resources in the cloud are shared between users, the bottom line costs are significantly lower, compared to when the resources are owned by the company.

3. Financial Services Landscape

The financial services industry has undergone a remarkable evolution since the end of the last century, during which time significant market players have adopted cutting-edge technology with the goal of empowering their operations. The facility with which people can privately and securely transact with one another through basic and indirect means of exchange has become so integral to commerce and every exchange we make in our lives that small entities are no longer restricted to physical goods and services. Now, the transference of value through the ownership of virtual properties is central to online trading activities. This evolution has led to the adoption by traditional financial services institutions of greater productivity standards, resulting from their receipt of similar market pressures to those imposed upon other industries by a growing degree of global competition. It is now incumbent upon every industry to put into place the tools needed to effectively respond to events occurring at every hour of every working day of the year, stressing the necessity of speed from any offer requester, independent of the size of the business being discussed.

In recent years, the pressure for a reduction of costs has caused investment firms to seamlessly extend their trading doors toward a wider range of clients, thus involving their business models into "wealth management" type businesses. The democratization of wealth management services stems from a rise in the disposable income of the new and young affluent population. This evolution has also led to an increase in the number of HNWIs worldwide. The investment market has been decentralized, with a total capital in liquidation increasing enormously and numerous asset players emerging to invest this capital. Among firms that are important in this configuration,

hedge funds, specialized private banks, and family offices are not exposed to a developing client segment, which is still currently not the favorite focus of the services of retail banks and financial institutions.

Eqn.1: Scalability and Cost Optimization $$C(n) = R \cdot S(n)$$

- $C(n)$: total cost of infrastructure for n concurrent users
- R: fixed resource cost per unit (e.g., per compute node)
- $S(n)$: scaling factor based on user demand

3.1. Current Trends in Financial Services Written from a retail perspective, financial services, in a broad sense, refers to mainly four areas, that encompasses the provision and transferring of risk within almost all aspects entailed in the lifecycle of a person or a company, including: (1) money – managing money via payments or deposit taking with, typically, banks, as well as various payment methods; (2) credit – lending money via loans or lines of credit, whether personal, automative, mortgage, business via credit cards or other lines of credit; (3) investment – investing surpluses with asset managers, including fund managers as well as pension and investment funds; (4) insurance – mitigating various risks of individuals and companies via insurance and reinsurance products with insurance companies. The broad term of financial services is used to describe mainly one industry branch. However, the different product areas are traditionally dominated by different companies which are regulated and supervised separately by government agencies, authorities or central banks, most commonly referred to as financial regulators. Recent years, have witnessed shifts in the market and competitive landscape of financial services. As emerging technology enables players within each product area to compete or partner with for the provision of services in other product areas, the demand and need for customer products across have intensified. Such product expansion argument is tangible within the traditional markets of banking, investment and insurance companies as well as in the emergence of new players or fintechs.

3.2. Challenges Facing Traditional Wealth Management Wealth management is a highly personal and practice-driven service industry. Delivering value is difficult and expensive, and availing the myriad of wealth management services is not always clear cut, especially for potential customers who do not have an existing fortune. Typical segmentation into categories such as corporate executives, retirees, new wealth, and affluent does not necessarily translate to sudden demands for tax support, income generation, estate planning, or small-business guidance; therefore, demand for particular services can ebb and flow quickly within these cohorts. The level of affluence required to engage a specialized wealth planner has continued to decline, while at the same time, the number of mass affluent families is growing. With the intense competition to attract new clients, it is crucial for each firm to determine its specific offering and target segment.

Difficulties in accurately determining specific service needs, greater mobility of potential investors across the wealth development stages, and the frequent conflict of commercial messaging among organizations imposes additional pressure on wealth managers to identify specific personal wealth building steps in the finance journey of a client over a lifetime. Assuming that the required investment decisions will be the same regardless of the stage of development is naive. For early-career savers, investing too aggressively might cause the individual to perish through inadequate

income protection. Conversely, a family in the diversified investment phase would be remiss to allocate 100% to equities and place its home and future nest egg in jeopardy due to cyclical market downturns. The volatility of family needs and specific situations, especially concerning estate planning, makes it essential for wealth managers to ensure their clients are kept abreast of the key milestones, and service deliveries are timed accordingly.

4. Agile Wealth Management

The ancient principle of "Work Smarter, Not Harder" is an enduring epigram of a core tenet of human industry—Leverage. Apply resources of time, energy, machines, and capital to maximize return on effort, while reducing waste. The quest for Lean, and the reductive principles of Methods Engineering, sparked a revolution in technology deployment and processes originally termed the Industrial Evolution. The focus shifted from searching for repetitive physical processes that could be mechanized and computerized to the prospect of a whole economy and other major institutions becoming structured along principles of efficiency. The economy in total is simply a complex organization of hundreds of millions of firms and organizations.

While these steps have improved both the quality, increased productivity, and democratized the availability of goods from capital-intensive manufacturing processes, a new idea of "Agile" emerged based on other assumptions, goals, and methods. The principles of Agile re-focus the attention away from organization-wide efficiency to local drivers of value; from collectives to teams; from a 'command and control' management style to self-organizing work teams; from a reliance on predicting the future through comprehensive Planning to a 'Learn By Doing', innovate-and-improve approach powered by intelligent risk management; and from hard-and-fast deadline-stipulated Project Management for delivery to continuous product delivery and upgrade as a method of company value creation.

If Wealth Management is to adopt the principles of Agile, they need to revise some deep-seated aspects of their practices and thinking. To the Wealth Management company, there are two levels to address: Internal—design and use of internal resources; External—Engaging with the Client and delivering Wealth Services. Firm Financial Technology must change to support an Agile Working Model.

4.1. Principles of Agile Management

Agile methods have emerged at the crossroads of computer science, project management, and knowledge work. While project managers have been adapting ideas from computer science for decades, these approaches typically involve predicting and controlling every aspect of projects (what is done, when it is done, cost, and quality). With the increased use of project management for non-technical fields, there is increasing recognition that projects in these contexts are fundamentally different from construction or software projects; the unpredictability and variability of human behavior, poor understanding of project execution or their concrete objective, and poorly identified context are some reasons for this distinction. Thus, as failure (or lack of success) of these projects are common, project managers in non-technical fields are forced to use one of two approaches: be pessimistic and regularly supervise (if not control) the projects, or take a hands-off approach and pray that everything goes well. Agile methods are a bridge between these two

extremes: break down the project into highly collaborative and iterative phases and cycles that allow fast discoveries, user feedbacks, and adjustments.

Many non-IT companies have examined IT agile practices, while agile practitioners have expressed a desire to transfer their own practices to non-IT domains. However, it is one thing to transfer roles and rituals; it is an entirely different question as to do the entire business, and also do it well. Following this line of reasoning, agile remains principally focused on project management processes and hardly addresses organizational processes or business processes. Although it is an excellent toolkit, it does not describe how to select and use the tools. The need for oriented "agile" organizations is urgent. After decades of delayering and downsizing organizations to achieve predictability or low-cost operations, people inside organizations are telling us that these companies are increasingly skilled, but not strategy or customer oriented, and cannot quickly react to important events.

4.2. Impact of Agile on Wealth Management

Launched in Software Engineering by the methodology of Agile, the methodologies of Agile Project Management, together with the concept of Agile Organization, are already being explored in almost all areas in which organizations are implemented. In this sense, the area of Financial Services Industry is no exception in this movement. In a look at traditional approaches, possibly triggered by increasing competition, shrinking margins, and changing customer needs, the area of Wealth Management is at the center of explorations of Agile Management corridors. Agile Wealth Management is already being implemented in some organizations, and other institutions are starting to renovate their more…

Fig : 2 Agile in Financial Services

The main difference that Agile Management presents, in practical terms, when compared with the more traditional and conventional management approaches proposed by some theories is that Agile presents a completely new managerial architecture. In the conventional managerial architecture, a realignment process is possible when only one layer of managers decouples its audience. For example, if project managers define microtasks, the program and portfolio management layers can intervene and realign the microlevel products. At the same time, if program managers misalign their products concerning the value to be achieved, the portfolio manager layer can redefine the value being pursued and change the high-level deliverables. In this model the control flows in a top-down direction. To move in the opposite direction — to go back and realign relationships at lower managerial levels — is possible, apart from situations of managerial theater in which the interests of top executives are more important than the organization's productivity; this is a rare and unwelcome situation, however. Anyway, this control system depends on the existence of

relationships of authority and dependency continuing to occupy a prominent position in the corporation. The new model has only one stage: the teams themselves.

5. Cloud-Based Infrastructure for Wealth Management

Financial Services are a perfect use-case for adopting a cloud-centric Infrastructure Architecture. The Cloud Data Foundation enables a Cloud Data Hub from where enterprises can build Internal APIs and data services to operationalize data capabilities to ML power. It is designed to provide fast, low-latency access to the enterprise's most-used and critically-important datasets. Internal Data Service Delivery and External API Gateway are the primary two consumption models and help to build mission-critical data services. The core of the Cloud Data Foundation is the hub-and-spoke architecture that provides centralized governance yet provides boundless scale.

Wealth Management is a sector that we have specific experience with. We have designed proprietary algorithms that exploit consumer behavioral patterns and white space opportunities in High-Network-Worth and Ultra-High-Network-Worth customer segments. We also have highlighted the use of AI-Based Wealth Management Services both for Use-Case selection, and then Designing Solutions for stochastic Inputs such as the Portfolio Allocation, Equity Recommendations to optimize Long-Term Gains in Wealth during Uncertain Economic Times Predictive to Probabilities of Events. As described in the other sections, we use the Agile Digital Cloud Data Foundational Principles to enable to provide Robust Algos on a Tight Latency.

In this chapter, we take a deep dive into the Cloud, Security, Performance, and Architecture Details required for Wealth Management as an example of Financial Services. We provide in-depth Security Conversations as Financial Services Data is Very Critical. In this chapter, we covered Encryption and Decryption, Data-Proxying, Multiple Domains attribution services, and Key Management System Interfaces that need to be designed before the solution delivery services are designed. These Services are Critical for Data Workers and Engineers to adopt and execute the Agile Backlog with accuracy and speed.

5.1. Architecture of Cloud Solutions

Cloud serves as a delivery mechanism for providing anything from basic computing infrastructure to complex interlinked enterprise software and business process management solutions. Cloud solutions are characterized by multi-tenancy and rapid scaling along with Global Data Centers and global presence. Cloud architectures are required to bundle the required components into a homogenous solution, suitable for high-performance enterprise applications with a critical need for high reliability. Control and Management tools are packaged with these high-performance solutions to provide enterprise-level functions such as Security, Monitoring, Backup/Restore, Disaster Recovery, High Availability, Performance Monitoring, Load balancing, and Technical Support. These additional components provide a management control system for the PaaS/IaaS and SaaS components that can be correlated for enterprise-level applications.

Cloud Software solutions for Financial Services are often vertical industry-specific and vertical-specific enterprise-wide implementations. The vertical industry-specific and enterprise-critical aspects of these applications need to be catered for by Cloud Solution Providers. Private Clouds

and Managed Clouds require a more tailored approach for enterprise solutions that need Software Reliability, Security, Manageability, Monitoring, and technical support compared to mass-market, public clouds. Further, some essential enterprise-specific features such as Governance and compliance can be added without any custom code deployment. A Cloud solution architecture for Wealth Management with a particular focus on Private Clouds, Managed Clouds, and Industry-Specific Clouds is discussed. Given the focus on enterprise-specific features for critical applications, Private Clouds, Managed Clouds, and Industry-Specific Clouds can provide the vertical-specific features for a critical Wealth Management solution.

5.2. Key Features for Financial Services

Financial services need to enhance business models and distributions while minimizing operational pressures. Many organizations have already moved to the cloud, with smaller financial services starting their transformation process. We will explore in the next sections the main features for financial services to ensure compliance with local and international regulations, security, auditing, backbone services, and business continuity solutions. We will also explore the cloud-operating model, through service management solutions, and a hybrid model where sensitive data are still kept on-premise while more dynamic applications are transferred to the cloud.

Security and auditing go beyond normal security services, as solutions would need to support a multi-auditor model while ensuring minimal exposure to unauthorized data, even when using the same workload. Many financial organizations still have auditing teams that have access to data and can perform any review at any point in time. Historically, external auditors would come in once or twice a year to review data access and ensure companies operated according to process and compliance. A cloud solution would need to replicate access and reporting capabilities for different auditors, offering either a data view for local auditors while limiting the view of remote auditors. Providing separate areas with selective data controls would help with such requirements, enabling rich controls for local auditors while also maintaining compliance for external organizations. Pre-deployment and continuous assessment capabilities are also key features needed for such multi-compliance approaches. Financial services would need to restrict the provision of services to a select group of vendors and services.

5.3. Security and Compliance Considerations Cloud-based infrastructure has great potential to provide global scalable services to wealth management institutions, but the sensitive and regulated nature of financial services requires that the cloud solution employs appropriate security and compliance mechanisms. Controls such as data encryption, at rest and in transit, must be a systematic requirement in the cloud architecture and also financial services APIs to eliminate the need to transfer non-encrypted data. Advanced access and identity management systems, supported by cloud solutions, are also key requirements, including the ability to set limits on geolocalization and multi-factor authentication.

Enterprise-grade cloud solutions also implement data protection and regulatory compliance controls, including secure payment methods. Some cloud solutions may even support self-assessment from the institutions to determine the scope of regulatory requirements and risk decisions made by the institution. With an enterprise-grade solution, ways to implement requests from the regulator, such as retaining security and other sensitive information, must also be

provided. Finally, a critical consideration for institutions is the appropriate level of internal expertise for continuous management services and periodic reviews on the cloud security systems controlling the information for which the institution is responsible against regulators.

6. Case Studies

The objective of this chapter is to demonstrate best practices for how agility can be accomplished in cloud-based solutions for wealth management. To lay the groundwork, we begin with two contrasting headlines that emphasize the cash flow generated through acquisitions in rapidly evolving areas of FinTech. We follow with actual implementations of cloud-based architecture for wealth management firms.

6.1. Successful Implementations

The purpose of the preceding description of cloud architecture is to set multi-cloud as a foundation on which wealth management applications can be successfully deployed. The technology has been built, and now we look at cases where it has been successfully utilized. One firm has put considerable contacts as well as financial resources behind the growth of their e-brokerage through a digital mortgage group. Although another firm is not a typical wealth manager holding family trusts and private foundations, they nevertheless actively provide services that risk-averse institutions like these expect. Mutual funds use a technology stack developed by a major bank. Identity Control, Access, and Security, which are major elements of the wealth management service, are critical in any service.

Discussion of the digital firm leads to several interesting insights. First, its growth potential is enormous; blitzscaling can easily apply. Exploiting the virtual branch and decreasing time in branch can actually risk back-office support. Marketing spends should focus on cost and customer acquisition. But this firm is not the typical social player. It is focused on M&A and typically securitized mortgages. So they would care little for targeting the first-time buyer. Its primary no-value add cost is the indirect costs in putting the transaction through the banking system. The final velocity point would therefore come from dynamic loan pricing that would allow lower pricing for proven repeat borrowers.

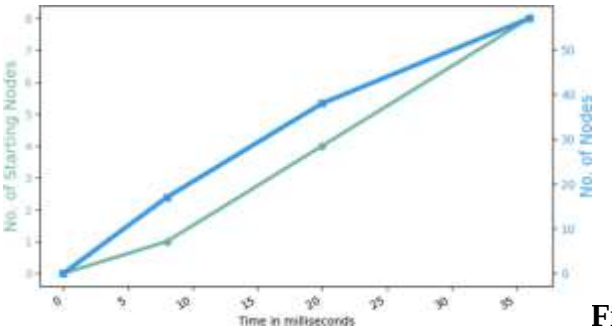

Fig : Cost modelling and optimisation

6.2. Lessons Learned from Failures

While it is interesting to see who has successfully implemented cloud services, it is also important to understand firms that have failed to see anticipated benefits. One such cloud provider is

primarily viewed as a technology partner for cloud solutions but has unsuccessfully attempted to provide cloud services.

6.1. Successful Implementations

While cloud computing is still in the relatively early days of adoption by financial institutions, several examples of successful implementations already exist. In particular, these are in segments or offerings that do not require a full-scale, "broad" or "deep" implementation of compliance and regulatory supervision, and are aimed instead at areas of business that require a light, "shallow" or "ducky" integration into compliance, or those segments engaged in wealth management innovation where existing compliance workloads dedicated to the business are low enough to allow safe innovation. Organizations have built successful wealth management businesses on cloud-based infrastructures, re-arranging value chains and re-casting resource markets as well. What's more, several of Wall Street's top-tier offerings in equity capital raising, private equity and alternative asset management are also migrating to cloud-powered, data-centric business models. Understood broadly, these success variables comprise either a "shallow" or "ducky" approach to compliance, supported by better integration of existing individual demand-side oversight structures and commercial-grade credit risk management capabilities; minimal compliance workload; involved specialization; well-defined domain focus; increased consumer market connectivity, engagement and experience; risk operating redundancy; a new media reach capacity; and low service costs.

In the alternative capital market space, the creation of successful platforms demonstrates the reshaping of traditional retail equity capital markets and commercial real estate development investment, growing efficiencies within the objective of democratizing 21st century commerce. Innovation in wealth management technology platforms within the cloud computing space have enabled back office modernization, better connectivity and enhanced transaction capabilities for independently-owned institutions in the wealth management business across the developed world.

6.2. Lessons Learned from Failures

Introduction Cloud-based financial infrastructure allows institutions to leverage unparalleled speed and perseverance, outside standardized culture and rules within traditional established infrastructures. This radical difference lays on the diversity of customers and product expectations, demographics and distribution factors, risks taking and market experimenting. Cloud nature is to deliver to everyone anytime at an affordable cost, which facilitates investing, right tool to assist narrowing inequality gaps throughout the population.

Lessons Learned from Failures Despite the mentioned advantages, in the past years, several initiatives had failure installing cloud-based financial infrastructure. In a bank industry increasingly competition driven, with growing pressure of financial regulators on costs and transparency, many players were unwilling to risk a cloud-based wealth management proposal exploration. The few solutions driven outside of the banks, by fintech startups, that were released and partially operated financial services concern were incapable to gain momentum towards profitability and relevance. At the opposite of what is actual expectation on the ease of entering into financial services due to the cloud leverage, complexity arises across all actors. The reasons behind these failures verify the warning. The essence of finance history is to explore the investor

behavior effects by identifying technical, mental and statistical edges on the others market players, in order to profit.

$$r(t) = \sum_{i=1}^{n} w_i \cdot r_i(t)$$

Eqn.2: Client Portfolio Performance Modelin g

- $r(t)$: return at time t
- w_i: weight of asset i in the portfolio
- $r_i(t)$: return of asset i at time t

The only purpose driving interests of promoting a cloud-based wealth management platform reflects on facilitating customer's investment decision making based on someone that is doing it for him, Associates mainly. The more financial institutions operate generalization practice, in order to diffuse costs, less success will have in attracting a wide audience pool. Genuinely sophisticated strategies expected from high net worth individuals will be difficult justifying from a business point of view. Cloud-based alternative investment innovations must provide customers the opportunity of investing on their own with the precise necessary information and material, providing profit to both customers and cloud manager.

7. Scalability and Flexibility

Scalability describes the ability of a system to accommodate growth. Whereas its IT description has to do with adding or removing technical resources, we focus on the business aspect of service provision. A change in growth patterns in the customer base affects the cost of each user of the system, but the knife-edge of business balance is positioned just below costs where growth introduces economies of scale—fixed costs spread over a growing number of customers. There exists a "sweet spot" to the size of the customer base where unit costs are minimized, and this "sweet spot" may change levels with changing patterns of service usage. It is a truth often ignored that financial services are not amongst the most scalable of businesses, and that large companies will typically have higher unit costs than smaller companies.

With their no-mass offering of very few products—extensive ranges of mutual funds, insurance policies or mortgages are often regarded as a sign of bad service—financial services have historically been addressed from the comparative comfort of low unit cost levels. This niche may be changing with advances in computing and telecommunication technology. The need for banks and firms to concentrate on creative employees—usually expensive—coupled with their growing lack of interest in mass-marketing of investments and insurance, as opposed to selling mortgages, means that wealth management seems destined to become more and more anecdotal. This leads to a requirement for wealth firms to lower their relative unit costs. A risk, of course, is that niche mass management degenerates into supermarket fund sales.

Everything that is done symbolically by checking each client's data and addressing them personally, writing out cover notes by hand, telephoning important clients at irregular intervals, giving the top clients a personal eye on market performance, is liable to be reduced to data

portfolios and computer bytes. However, the institutional handling of the affluent blocks of high net worth individuals in a country leads to problems of flexibility in terms of service offering, and, in particular, service offering changes with changing family circumstances or investment opportunities, and this flexibility may in the end prove a key success factor. As personal service disappears, the high net worth segment tends to get squeezed into one of two categories—either bespoke work for huge families with offshore assets or mass-management by institutions at the other end.

7.1. Importance of Scalability in Financial Services Scalability is one of the essential requirements of financial services. Scalability means the ability of the services to adjust according to increased volume and flow with minimal additional cost. Scalability in business processes is generally linked to the cost of servicing a single customer. During growth or busy times, the order service would say; 'We are very busy and are unable to take your order', thus forcing the customer to go to competing businesses. The service is non-scalable at these times. Financial services are distinguished from other goods with their non-tangible existence and simultaneous consumption with service production. Financial services require the customer to be present during the exchange process to either execute the transfer or to authorize the execution. High volume, short time, reduced cost, and at the same time, reduced risk of electronic trading, as with stock brokering, have opened the gates for new, inexperienced, and enjoyable retail customers to participate in market trading. E-trading websites have simple order execution processes and mechanized self-service schemes that help limit risks in this kind of trading.

Such rapid increases in volumes during the execution of financial services transactions cannot be ignored. The crisis and the subsequent war identified the weaknesses in the command and control structures employed in financial services organizations. Scalability is not very useful when an organization spends enormous amounts of capital on the minutia of conducting business in a trader proprietary environment. Scalability does not necessarily mean reducing your per-transaction cost to the lowest possible value as quickly and efficiently as possible. Mobile, online, and general point-of-sale payments are carried out at a phenomenal speed in a technologically managed environment.

7.2. Flexibility in Service Offerings

The cloud attributes of elasticity and flexibility are also enabled through the use of hardware and software designed to drive greater levels of automation and machine learning. The continued democratization and commodification of technology development tools have made it affordable for any size company to launch, ramp up and tear down service-oriented systems. Add-on products that address niche issues from suite providers can now be developed, deployed and integrated at low costs due in part to the plug and play technological developments driving connections between systems. One-stop-shop cloud data providers also have created a variety of useful capabilities to financial services infrastructure by having advantages when it comes to storing, managing, safeguarding and processing the flow of big data in scalable, fast and economical fashion. These data market services can add valuable capabilities to partners looking to build differentiated offers in the competitive wealth management industry, without having to become experts in every stage of development and implementation.

Fig : 3 Evaluating Scalability And Flexibility In Cloud Computing

However, wealth management is a different animal. Could a more shared infrastructure concept used to develop and support other areas of financial services equally be considered to be of use in the asset management space? The answer is a resounding "yes". Are there compelling reasons why more wealth managers, banks and other financial institutions should look to adopt more of these at least solution designs alternatives to provide better, cheaper and faster services to their clients? In terms of the need for a more effective balance between increasing economic value activities on the "investment" side and auxiliary services on the "asset gathering side", the arguments for doing so seem robust. The continued search for economic surplus by wealth holders desperate not to outlive their money combined with the increasingly high-cost and high-risk nature of pursuing investment suggests that clients are trying to fund more of their future liabilities through smart spending strategies that is increasingly become equipment and not service refinery oriented.

8. Cost Implications

As with any CeFi approach, cost implications go hand-in-hand with discussions of profit, revenue mix changes, and long-term viability. We discuss here the impact of cloud adoption on some of these dimensions. First, we list several sources of cost efficiencies that could motivate migration to cloud-native infrastructure. Some compute tasks become substantially cheaper to execute, for example, batch processing of large amounts of historical data for training machine learning models, to guide recommendations of customer-specific portfolio strategies. While the long-term marginal cost for running these batch algorithms squeeze to near zero in a highly improved architecture, the time-sensitive decision requests drive private and very expensive computation resources and demand carefully-designed solving methods. Cloud-based storage and associated data processing tools, including storage-based databases, accelerate development and financial optimization, reducing the marginal cost for these market-facing activities. These storage technologies also increase reliability and hence revenue per market opportunity, again increasing profitability. Furthermore, cloud-optimized architecture allows client firms to holistically outsource financial product design, pricing, and embedded market access. By relying on pre-set thin-client wrappers, specialized cloud-based firms could offer a financially-marker-making as a service type of business. Such client-to-cloud relationships could motivate disproportionate revenue share allocation to the market-making cloud services provider.

Finally, the cloud architectural shift leads to clear professional specialization of construction, design, activity, and market access. This increases the need for price competition across all four functions. It could therefore create pressure for a downward spiral with more and more participants

providing the shares of revenue allocated to these four infrastructure-to-client functions. The net outcome on profitability will depend on the speed of adoption of the technology innovations and the choice of relationship, wholesale or retail, of the clients with the cloud-hosted utility-like functions.

8.1. Cost-Benefit Analysis of Cloud Adoption

A change in strategy, including substantial cost outlay, investment model re-evaluation, and service level monitoring, is always forecasted to have key financial implications. Choosing an agile approach to wealth management, via acceptance of the Cloud adoption model, is no exception to that prediction. Wealth management firms expecting hyper-personalized service-level and product offers to client constituents wish to ensure economies of scale with the fastest-to-market capabilities, alongside looking in contrast for high-margin business outcomes. The question of cost or benefit of Cloud adoption implementation, and offering of Cloud scalability to private wealth management clients cannot be overestimated, but nonetheless remains poorly researched.

Cost-Benefit Analysis of Cloud Adoption

Some argue that certain companies have over- or under-represented the financial implications of Cloud adoption for such ultra-high-net-worth customers, the outcome being a mixed report of figures, some indicative of a cumulative Cloud spend-share between 10% and 30% of the total, whereas some considered Cloud privilege to have grown to over 80%. The comparison is somewhat ambiguous, as, despite being micro-targeted to affluent individuals, investors in venture-backed high-valuation startups have a much shorter decision-making cycle and investment horizon. Moreover, unlike corporate treasury departments, rich individuals do not share institutional or business requirements for allocation of client—or personal—liquidity to money market accounts offering ultra-low interest rates or near-zero coupon treasury notes. Another point of contention is revenue recognition during a potential transition phase—for those advisory firms that have yet to transition to true recurring subscriptions with predictable revenue trajectories—smaller upfront revenue from Cloud subscribers being offset against longer-term retention capabilities. In this case, service usage economics become key and more critical to asset-based fee income.

8.2. Long-Term Financial Implications

Optimistic estimates for long-term savings from cloud adoption generally assume that the major public cloud providers will be able to reduce their cost structures more rapidly over the planning horizon than traditional IT providers are able to reduce their costs. Public and private PaaS adoption by software and services vendors substantially shifts their cost structure toward on-demand infrastructure and staffing, thereby enabling them to adopt and scale new offerings at a scalable expense structure. This change potentially allows them to offer competitive offerings to enterprise service consumers at relatively low cost. Instead of charging hefty service fees, enterprise service vendors would now have the option of subsidizing service costs with PaaS-enabled offerings, thereby compressing margins considerably for vendors localizing their enterprise verticals with traditional hardware/software technologies. At the same time, a much larger enterprise market share would open for the PaaS vendors and adoptive enterprise service

consumers, allowing the aggregator enterprise service consumers to offer reduced-cost service to a wider range of businesses. Subsidized pricing would recover the aggregator vendor's marketing and promotion expenses as well as revenue intensity needed to sustain headcount and infrastructure expenses while rebuilding customer relationships. Local enterprise service vendors may also be pressured from below to lower their customer service costs, migrating their offerings to PaaS services or absorbing greater service intervals to sustain enterprise margins. If localized cost disruptions are extensive, then economies from scale would allow larger institutional operations to move down market.

9. Technological Innovations

Technological innovation is an important underlying source of sustaining innovation in strategies of financial services companies. With digital technologies applied to the wealth management process, many decisions previously performed by people can be automated. Technology innovations in the flexible digital wealth management infrastructure employed for the customer experience focus on personalized portfolios supported by varieties of rich data as well as easy-to-use architecture for advisors and clients; effective intelligent alerts, decision guidance solutions, navigation controls, and services. Convenience comes also through the cloud-based data storage platforms and high quality, user-friendly digital tools. For users, smart technology reduces the headaches of properly aligning investments with clients' risk preferences and financial goals.

The use of Artificial Intelligence and Machine Learning for strategizing different services is not a technology of tomorrow; it's something that is already being applied by pioneers in almost all functional areas of wealth management. AI and ML are automated solutions for internally-generated wealth management decision services or purpose-driven external services, covering almost every step in the traditional assets or portfolio management and clients-related decision process cycle. Managers may be challenged about available data quality and its preceding lagging for predictive purposes. Success in application on a firm-specific basis will depend on trusted outcomes of processing and management decisions taken from provisioning outputs. Different types of AI and ML solutions serving both client-facing and decision-making management applications may be broadly brought into two groups: decisioning analytics and cognitive assistants.

Many people consider blockchain application to financial services as exclusively pertaining to cryptocurrencies and token effects. In reality, it could facilitate all types of transactional financial processes: banking transactions, payment systems, identity verification or protection, record-keeping, or capital markets-related information security. The rationale for traditional banks being at combination advantages for offering wealth services to clients beyond the demanded transactional services depends fundamentally on technology. Artificial Intelligence and its latest variant, Machine Learning, combined with Big Data analytics could severely reduce the traditional banks' modularized advantages in trust, expertise, privacy, and operational efficiency. The capital markets transaction speed, cost, and information asymmetries involved in competitive positioning and strategies of firms would be transformed.

9.1. AI and Machine Learning in Wealth Management Introduction to AI/ML Disruptiveness. The wealth management segment of the financial services is probably the one most

reduced uninvested cash in the context of its relative importance. After the rise of the robo-advisors, which were first stuffing money into passive investment portfolios but are now also being forced to re-think the classic add-on model -making it more agile and, at the same time, disruptive-, digital large data analytics, artificial intelligence and machine learning are triggering a second round of the disruption cycle.

Historical examples of AI/ML in Wealth Management Context. The security selection process is usually made by a core investment team providing a multi-asset class framework that is refined by sector or area allocation for every sub-team who is responsible for security or company selection: i.e., Financing, Engineering, Health, Cars, Media/Telecom, etc. However, no other process is relying mostly on qualitative factors, avoiding the use of solutions coming from the AI/ML tools existing in the market.

Fig : 4 Growth and Stability

Thus, reconsidering Wealth Managers' value proposal in the context of a triplet strategy relying on specialization, via the use of internal/external sources of very specific knowledge and AI/ML together with an adjusted volume of assets under management are fundamental. The three-times "data at a lower cost" wealth management strategy must be stated.

First, data at a lower cost must be understood in terms of costs related to the overall management of assets in portfolios addressed to the whole complex structure of investor's risk vs. return profiles and special needs. Second, costs related to the investment decisions with AI/ML tools reducing human risks of decisions are reversed at a lower cost allowance or a smaller overall cost than peers without such an allowance of asset reverse. Finally, the wealth management strategy is going to be the winner one only in the case of special needs of the investor.

9.2. Blockchain and Its Impact The blockchain is an emerging technology innovation that has captured the imaginations of many technology entrepreneurs. It is supporting the development of new types of decentralized applications, called "dApps", that do not have a single point-of-failure because they distribute their operations across multiple users in a network. Using the blockchain and dApps, the creator of the dApp can efficiently provide services to their customers at lower cost levels than if they developed and provided the dApp services using a centralized model. The most well-known dApp is Bitcoin, which provides a decentralized currency, but there are many other dApps that have been proposed to improve the efficiency of a company's operations. The most prominent examples of proposed dApps, which have poorly performed in practice, are Distributed Autonomous Organizations (DAOs). Although the DAO

has a poorly chosen name — who would trust a disorganized organization? — the organization in question developed a very interesting model for aligning profit incentives among dApp users, which could be incredibly useful for many types of iterative data collection problems.

Eqn.3: Latency in Distributed Cloud Systems $L = L_n + L_s + L_d$

- L: total system latency
- L_n: network latency
- L_s: server-side processing time
- L_d: data access latency

In particular, the DAO model proposed to raise investment funding for developing the dApp to a stage where it could fund its own operations through the dApp users; the dApp users would be investors in the dApp, entitled to receive a share of the profits until their investment was recovered; the investors could freely trade their investment shares on a secondary market to resolve any conflicts, which might arise; and a software smart contract would establish automatically and enforce the profit-sharing rules among them. A specialized crypto-token could represent the investment share. A dApp with an investment model similar to a casino could be particularly interesting from a data collection perspective: investors would place bets on the casino games, preferably with a minor gambling addiction, until the ideal probability distributions for choosing the winning game strategies would be determined.

10. Future of Cloud in Financial Services

The ongoing adoption of cloud in financial services holds the promise to truly revolutionize the industry, making it perceived as a true enabler for innovation. The advantages of cloud are evident and while security and compliance are obvious considerations when it comes to handling financial services on the cloud, such capabilities are offered on cloud service providers around the world who are investing significant resources to address security concerns and regulatory requirements, making this concern less important by the day. Cloud was once largely considered for non-mission critical functions in the finance industry and could be defined as a backend process handling non-sensitive and non-critical information. However, the increasing maturity of cloud technology is resulting in increased adoption and usage of cloud for mission critical functions in finance to not only reducing costs but also to enable increased flexibility and scalability.

As business operations quickly move to the digital arena, cloud acts as a critical enabler to allow for these transitions to happen with speed and agility, allowing fintech and traditional banks alike to serve their customers better and provide services with no barriers to access. However, as has been witnessed with multiple cyber attacks in recent news, the cyber security area is one where organizations must tread carefully with their cloud journey. Organizations embarking on their cloud journey must be hyper-aware of the risks that cloud poses on data privacy and also ensure that they adequately prepare to defend against any such risks. These could come in the form of potential data breaches, loss of data and data protection rights, and potentially loss of operational control. To mitigate these risks, organizations must clearly evaluate what cloud service provider

will serve their needs and also how they will go about their journey to cloud adoption, adopting a risk-based approach.

10.1. Predicted Trends and Developments Future of Cloud in Financial Services: Predicted Trends and Developments Continuing on from our analysis into current cloud usage, its advantages and challenges, we outline what we believe the next three to five years hold for the future of cloud-based infrastructure in driving innovative new offerings into mainstream for financial services. Traditional players have traditionally been more reluctant to be early adopters of novel operating infrastructure. However, we believe that barriers will break down over the next two to three years as firms more often innovate to solve customer problems. First movers will look for a competitive advantage that comes from being ahead of the pack, and this may goad the stragglers into premature following of bleeding edge strategy.

As evidenced by the recent upwards trajectory in mature technology companies, the demand is there. Because in the final analysis of computation, communications and storage, alongside an ever more globally interconnected economy, global providers need to be seen as partners to the services firms, allowing traditional banking and financial services firms to collaborate with them, rather than seeing them as adversarial distributions channel or distribution of services moving upstream and taking away their business.

As banks and wealth managers become more versatile and turned outward to collaborate with inventive tech companies who have something fresh to sell to customers who don't as of now have as their main priority trust, the greatest gains will have less to do with novel and nifty underlying technology and more about smooth customer experience. Millennials in search of economical, scalable, digital-first solutions will drive the transition of services to the public cloud, coaxing at a business model level banks and wealth managers to go along and lead the effort from the front end.

10.2. Potential Risks and Mitigations

The promise of cloud technologies in expansion and transformation of the financial services is widely discussed as its benefits seem significant. On the other hand, the alarm bells about potential risks are also often raised with respect to cloud-based deployments. The reluctance towards the shift to cloud solutions comes not only from risk-averse banks but also from regulators and traditional technology companies, which fear losing the market. The regulatory pressures should not be overlooked, as it is stated that cloud service models outsourced to a small number of very large providers can lead to concentrations of systemic risk. And indeed, the absence of clear regulations may expose financial services to higher degrees of risk, which may even come from involuntary consequences of switching to cloud computing.

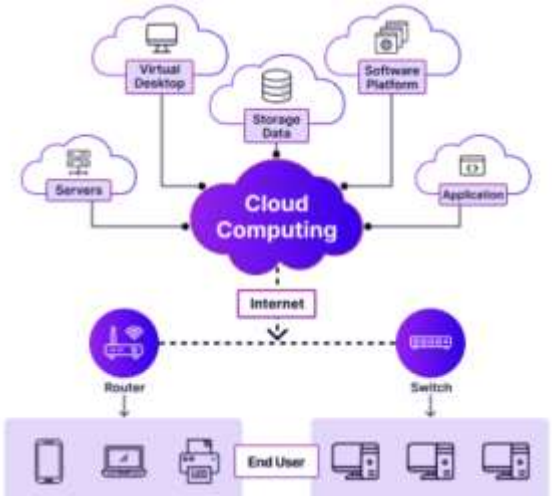

Fig : 5 The Future of Cloud Computing

The concerns about the cloud and warnings of regulators and economists have gained traction with the onset of the crisis. The high-profile outages experienced by the two largest public cloud services have been reported widely and raised concerns about using public cloud services. Ascribing blame for the outages of big technology companies has been made much easier with media coverage of opinion about whether the outages of the two companies are one-offs, general have-nots, or just serious warnings. Furthermore, cloud technologies attract hackers and other ill-intentioned actors, which adds to the concerns of technology abandonment and contributes to the lack of confidence in the cloud-based solution usage. To alleviate concerns and build investor, customer, and regulator confidence, technology service providers and financial institutions should endeavor and concentrate on developing correct procedures, solvable devices, transparent and reliable platforms, and effective risk mitigation strategies. It requires tight collaboration of financial institutions and key cloud technology players to agree on the cloud adoption strategy, while the centralized data storage, transformation, and application processes become the next level of freedom that we need to find the way to.

11. Conclusion

This paper examined the implications of policy mandates and marketplace expectations on the deployment of technology and resources within wealth management financial service firms. Cloud-based infrastructure permits business unit leaders in the wealth management setting to quickly scale their activities based on demand. The deployment of these scalable technological infrastructures enhances the economic model for wealth management firms, leading to greater margins for existing suppliers and lower costs for end consumers. Agile development cycles in the digital space facilitate the delivery of functionality for increasingly diverse end consumer bases. A series of additional partnerships and resources are made available for small players through cloud deployment and then are presented to the wealth management B-U leaders. As these product set is offered to an increasing number of suppliers, additional economies of scale are possible, leading to additional margin expansion possibilities for existing resources and smaller B-U players. The net result is a more interesting, profitable, and competitive space for active management of consumer wealth portfolios. Lower marginal costs lead to more competitive prices and better net investor outcomes if enabled by effective agile development. Although we are presenting insights

from the wealth management space, the principles of technology structuring and scaling are equally present in many traditional financial services lines. Mortgage origination, loan underwriting, and payments facilitation are all examples of product sets aggregated into organized delivery mechanisms through traditional financial service relationships. Technology clustering around specific business units permits more potent development of tech-enabled resources and enhances the value of these organized delivery mechanisms to investors. Given the financial outcome implications for both providers and consumers, additional focus and supporting clarity of policy are needed to encourage the structuring of cloud-based infrastructure services for scalable offerings in more of the subsidiaries of capital market financial services.

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