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Redefining Financial Risk Strategies: The Integration of Smart Automation, Secure Access Systems, and Predictive Intelligence in Insurance, Lending, and Asset Management

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Abstract : This research study develops for the first time concepts that bring to the forefront an order of magnitude leap in the way financial risk is managed and mitigated by corporations, and in their interactions with their financial services suppliers. At the core of the research work are the development of a specific type of enterprise robotics theories and solution methodologies; end-to-end systems for secure access, navigation, and protection for financial applications using federated identity and attribute management; and the introduction of predictive intelligence using a few dominant principles, modeling, and estimation methods, risk equations, and estimation feedback protocols. In addition to the foundation studies for each of the three major components, we integrate the three into an enterprise financial risk solution and demonstrate through a set of complex activity models and problem derivative-specific applications the nature and degree of financial engineering, financial and data communications, modeling and corporate customer service integration analytics, information and business intelligence, managerial zones, and innovation theories involved.

Keywords: Financial Risk Management, Enterprise Robotics, Solution Methodologies, Secure Access, Federated Identity, Attribute Management, Predictive Intelligence, Modeling Methods, Estimation Methods, Risk Equations, Feedback Protocols, Enterprise Financial Risk, Financial Engineering, Data Communications, Corporate Customer Service, Integration Analytics, Business Intelligence, Managerial Zones, Innovation Theories, Complex Activity Models, Problem Derivatives.

1. Introduction

We are living in a new age of production and consumption, fueled by technological innovation. Smart automation technologies, including robotics and artificial intelligence, are transforming the financial services sector to help deliver products and services more effectively and efficiently, at a speed and cost that has never been imaginable before. The germination of this transformation is happening at the points where large financial services complexities meet systemic social issues. Smart automation technologies are being deployed to detect and stop illegal or unsuitable transactions, to increase trust in financial organizations, to provide lower-cost, higher-value, and safer services to those customers currently underserved, and to ensure resiliency and robustness in financial services, especially in the new financial technology companies. Despite these social values, the germination of the financial services transformation is already being changed by an evolving and challenging financial services risk landscape. Examine a few successful financial services companies that have embraced large investments in technology to reshape financial services, establishing industry dominance and wealth, while avoiding public catastrophe. Headline risk has grown as companies discovered inadequacies in the oversight of high-speed predictive intelligence and secure access to enterprise technological infrastructure that, alongside smart automation, enables the financial services transformation. These inadequacies have sparked conversations about what controls businesses want to use, have to use, and may need to use to protect their financial and reputational infrastructures from those attempting high and low-tech financial engineering to defeat them.

1.1. Context and Rationale

The modern economy has greatly benefited from financial products and very large leveraging, but has suffered repeatedly from hubris, opacity, and puts and calls that transfer as much risk onto the balance sheets of inefficient actors as they do risk into stable and Faustian markets. It is easier for the government and for businesses to talk about the transparency of financial issues than it is to produce transparency and obvious solutions. Yet, the only defense against disaster is control. Rational defense begins in the present by integrating the best available inherent characteristics, smart automation, and secure access systems at all levels, not as mere inputs for risky processes. After recognizing how the increasingly systemic nature of insurance, asset management, and lending profoundly changes the context, we focus on ways to readjust the risk-reward and synchronize the time horizons of agents, clients, and principals.

One motivation for the work presented is that, while more efficient models are evolving, profound and systemic financial effects are undermining historical stability. In the last decade, the stability and performance of our economies have been fundamentally challenged by deep modifications of the financial system, and systemic deep dependencies on pure financial engineering have migrated, plodding specific dependencies of whole economic systems upon single strategic solutions. The volume also tests the hidden opportunities of big data, intelligence, privacy, security, entropy, and technology concerning the present priorities of banks. Prosperity can indeed be permanently managed, controlled, and protected by reformulating the strategic priorities of those in charge. Social and economic stability and the availability of funding for public investments are strategic imperatives that can rarely grow from chance.

2. Understanding Financial Risk

A security breach is an investment management that invests mostly in risky securities and only one principal. These situations are two examples of financial risk, which, in the first case, involves loss and, in the second, a possible profit, but without the lease of safety characteristic of the transaction. In finance, the risk is the uncertainty that an investment eliminates to make a loss, which a process computer exposes to a security breach or a payment default by a creditor. Eliminator, investment, computer, security, breach, payment, and default are discrete financial objects that, with the help of statistical inference, are used to provide a distribution of the possible losses whose expectation indicates the amount of the risk involved. In this chapter, we discussed Bayesian analysis of the possible losses from computer security breaches, and information deficiencies that may lead to the absence of a clear response to attributes of risk in insurance, and we introduced the instruments created to transfer it through an activity that spans thousands of years: insurance. The introduction is fundamental and may be particularly appealing to underage readers because it is based on the connection of probability models of risky situations with chance. The chapter ends by referring to management activities that may reduce or eliminate their risk more fully.

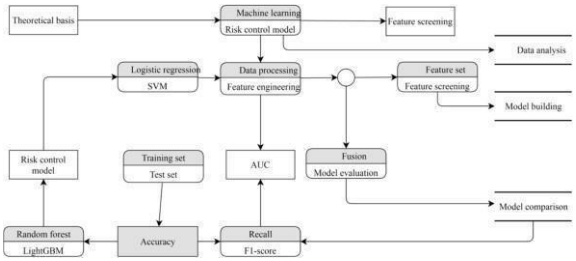

Fig 1 : Financial Risk Management

2.1. Definition and Types of Financial Risk

Financial risk is an essential subject to be analyzed since it plays an important role. Financial risk is often associated with the prominence given to the entire business purpose, which lies in the maximization of shareholder wealth generation, depending on the acceptance and realization of financial risk in exchange for anticipated yields. The selection of the types of financial risk that best fit the business reality of the company is very important in the process of identification, measurement, and management of these risks. Financial risk is the chance that the outcome of an investment may differ from expected earnings, which involves the possibility of that investment failing to achieve its intended return. The basic principle for any form of investment is that the higher the expected return, the higher that investment's risk.

About costs, the shareholders of the company also require higher returns to offset these same increased risks. Therefore, health means making risks and rewards a function of the clear business opportunities that arise. The two basic types of financial risks are: risks that directly affect corporate assets or business risk and risks that specifically affect financial rights or financial risk. Every type of financial risk that modifies the present value of investment is a risk that shareholders face, while the types of financial risk unrelated to business assets arise because a firm uses the present value of investment, which are risks that bear on the debtholders. There exist different indicators that can be influenced by any type of financial risk.

Equation 1 : Predictive Risk Scoring for Lending

$$R_p = \sum_{i=1}^{n} (W_i \cdot X_i) + \epsilon$$

where

R_p = Predicted risk score,

W_i = Weight assigned to risk factor i,

X_i = Risk factor value,

ϵ = Model error term,

n = Number of risk factors.

2.2. Historical Perspectives on Financial Risk Management

The term "risk management" is rarely used in older literature. One concept that predates the modern use of the term is the principle of having an adequate portfolio capable of protecting against several economicallysignificant risks. Multiple sources of risk became evident for bankers in the 19th

century, which led to the evolution of joint stock banks and more liberal ownership limits. A common practice in lending activities in the late 19th century involved achieving diversification through numerous short-term loans backed by readily saleable assets together with a more subjective risk assessment process. Insurers have had to address risks to insured issues since the creation of the many medieval guilds that self-insured their members. Guilds were examples of mutuals wherein benefits arising from risk pooling were payable to a large number of disparate parties. The Church was responsible for the underwriting of the coverage of the risk of fire to buildings in the Middle Ages. The Dutch had insured ship hobbyists through marine insurance policies which preceded the creation of several insurance corporations that laid the foundation for the modern insurance industry.
One would define the concept of financial risk management as keeping economic ruin at bay. Financial risk management in large, public corporations is a relatively modern concept. Not until government-backed business forms such as the general partnership and limited liability corporation gained prominence in the 1820s and publicly traded corporations gained legal and operational legitimacy in the mid-19th century did modern corporations become a significant U.S. business form.

3. Smart Automation in Financial Services

Smart automation is the combination of technology and best practices in business operations designed to expedite complex, rule-based work. It invisibly weaves solutions among workers, customers, and partners and intends to scale successful workflows, define and categorize bottlenecks, and reduce the time consumed in day-to-day processes. By digitizing underutilized, valuable content in processes, smart automation provides management with a greater understanding of business risks, tasks, and service delivery-related issues. As a result, businesses can strategically optimize operations and the information system's needed functionality. Smart process automation—the result of smart automation—provides the flexibility and agility that businesses need to change with markets and asset demands. Without smart process automation, banks and non-bank financial firms have high operation costs and slow time to market. They probably have second-rate, non-integrated consumer and operational performance. The current approaches to attaining such capability are simply "not smart enough" to keep up with the rapid change in Fintech.

3.1. Overview of Smart Automation Technologies

Over the last decades, intelligent technologies have been penetrating and transforming various areas representing varied complexity, such as complex scientific and engineering problems, medical diagnostics, weather forecasting, banking and financial systems, and managerial decision-making tools. Among them are expert systems in artificial intelligence, which have been recognized as a technology able to encapsulate the knowledge of diverse subject-oriented experts to provide intelligent advice and assistance. Expert systems have found commercial applications, particularly in banking, insurance, securities investment, analysis of new business opportunities, and many other forms of decision-relevant problems in industry and commerce. However, traditional expert systems are only one example of the extensive use of specialized expert tools in embedded intelligent systems, including predictive econometric modeling.
If we ask an experienced expert in the banking or financial field how many intelligent algorithms their management uses in a daily routine, their answer will most probably be "a lot of us," or at least "based on special bank, commercial, or information systems." However, this expert system will fail when we try to understand which of them are "really intelligent" and why. We expect that these intelligent recommendations will be generated by relatively powerful yet user-friendly predictive systems, based both on a mix of powerful theoretical background and vast empirical investigations and practical tests, i.e., the systems able to self-learn on their own.

3.2. Benefits of Automation in RiskManagement

Risk management and assessment processes in lending and asset management are becoming more efficient as businesses adopt computer-aided technologies. Smart automation, which is the application of cognitive computing capabilities like big data analytics, machine learning, natural language processing, and cognitive machine reading to make tools and processes smarter, is improving underwriting processes and automating claims management, thus helping insurers to assess risk, calculate premiums, and set reserves. Furthermore, by providing a real-time synchronized view of risk by monitoring risk daily and creating a complete enterprise risk management dashboard, businesses are provided with the necessary information, down to the policy level, to make informed business decisions.

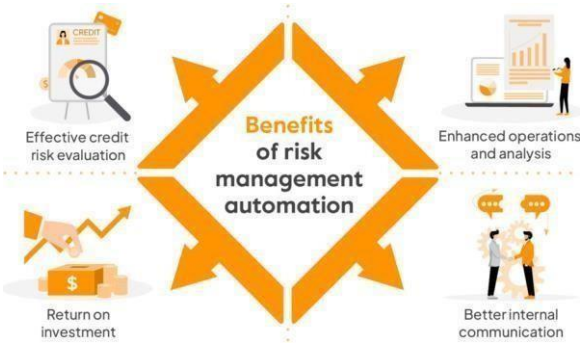

Fig 2 : Risk Management Automation

Several financial services organizations are using smart automation to strengthen risk management and assessment processes in lending and asset management to reap the benefits of enhanced risk data and reporting by making use of consistent, timely, and accessible data across the organization. However, without stringent data access security and protection measures, all data may be accessible to provide sensitive information to nefarious sources. Consequently, the research question presented in this paper is the following: "What operating principles and procedures do businesses employ in their risk management and assessment processes in lending and asset management using the integration of smart automation and secure access systems to protect data and privacy?"

3.3. Case Studies: Successful Implementations

Proposals, ideas, and theories are all well and good, but like any field, the subject can only be mastered by actual doing. In this section, we offer three snapshots of successful applications of our integrated model: a transformative solution for a city, a system for an agricultural commodity, and a unique breakthrough in lending developed for a special cause.

3.3.1. Property and Health Insurance and Smart Security System for Public Spots in Chemical Williamsburg An insurance and reinsurance proposal was developed in association with a feeder fund to address the effects of chemical events in security-sensitive neighborhoods, close to several of the world's largest maritime chemical zones. Information was shared with the owners and operators of the chemical plants, along with real-time information from sensors deployed in a 10-block area. Special products were sold to the buildings designed to offer a mix of regulatory and insurance mechanisms to protect them and their most valuable asset, the people in the office on the clock, outside on break, or offsite but in touch by phone. The project was covered within guidelines, offering the principal persons of the plants both new reporting tools and strategic equity benefits.

3.3.2. Security and Insurance-linked Lending: AgroTech A groundbreaking concept was developed as an integrated solution to obtain both year-round security and insurance-linked securities. Localized solutions were developed to cover larger crops. Each low-profile solution offered higher lateral fault-space values, similar to a gravel foundation under a large office building. All commercial agro-tech personnel are supervised by the teams themselves and report to the county, state, and federal authorities. All missing income items needed to be covered over the term if there was a year-end loss, and elements were designed so both private and public resources could pour back into any involuntary shortfall situation, like an emergency services event or a supply chain event. These risk losses were planned to rely on weed, precipitation, heat-related events, labor supply, insurrections, strikes, lockdowns, and new insurance-based regulatory fines. All crops were designed to have an understructure value from building to building. The state-of-the-art software product leads in the organic field and is currentlybeing reviewed with potential sales coverage in over 150 geographic regions.

4. Secure Access Systems

Secure Access Systems play an essential role in securing the inward and outward flow of data. Forming part of the second and third lines of an enterprise's defense, secure access solutions can identify customer identity and validate system access, offering an increasing degree of biometric protection. Views on current global technology heuristics in the area explicitly address the implementations of synthetic neural networks, principal component analysis, independent component analysis, support vector machines, genetic algorithms, random pulse function theory, application of wavelet functions to the detection of hidden information in the process of encryption, adaptive methods to construct the firs t set of eigenvectors to compromise the repeated transmission effect of processing electronic white noise signals, hardware components, and software systems for secure data exchange, and hybrid multi criteria decision-making models.

For Security Access, some of the commonly used technologies include: Bayesian models for phishing fraud risk evaluation in a cloud computing environment, a secure electronic access control system with voice response and finger biometric characteristics, biometric verification by the waveform of the electrocardiogram in a system of secure information access, the use of symmetric ciphers in secure information access systems, conversational multiaccess with various levels of security, development of a secure network access system to Internet services using a vibrating channel, a secure, encrypted, and delay-tolerant data access project via a long-haul ad hoc network, two-level login, and access control architecture using advanced technology, a secure, non-invasive identity authentication system in real-time, secure and simplified password-based user authorization technique, secure access technology for next-generation IP networks, and a new secure access structure.

4.1. Importance of Security in Financial Transactions

The capabilities necessary to access and work with the underlying system's attributes and available information must remain deeply secure and private, both in the act of transacting information and in the knowledge that it is secure and private. For decades, larger organizations and then smaller ones have been incorporating into their business dealings enterprise resource planning and customer management and planning systems to gain value from the rapidly increasing pace and volume of digitally captured and associated data generated by everyday business transactions. As the transfer and processing of this electronic information become closer to real-time, the need for integrating end-to-end secure dealings of the data increases in importance and complexity; ensuring that digital access is only available to those citizens and employees who are authorized to perform the assigned tasks through legitimate channels becomes part of the network information fabric through security best practices strategies known as secure access systems.

XML developed the necessary underpinning of secure access messages, data encryption, and secure communication that made e-commerce both feasible and secure, but over 20 years later, cybersecurity issues continue to challenge this digital revolution. There is no lack of effort on the part of either the global private sector or the U.S. government to develop the latest, most secure strategies, but the risks quickly adapt as well, leaving a gap in the security while they are developed, updated, and field-tested that can be particularly costly in loss of private and/or financial client data or greatly tarnish the reputation of the affected organization's managerial staff.

4.2. Technologies for Secure Access

Physical, manual, digital, and electronic forms of identification, along with authoritative and notarized reviews of living wills, powers of attorney, and trusts, are necessary but not sufficient. A secure client onboarding process, provided by a company that meets the know-your-customer, anti-money laundering, and other legal requirements, is essential to establish a secure trust-based client relationship. Another approach is to use smart cards for trusted access to personal wealth applications, person-to-person currency exchange platforms, e-will creation, and similar notary applications. Examples of e-ID and e-health cards can provide secure access to medical information, and by extension, a digital living will, in the case of emergencies. Biometrics, the manipulation and analysis of distinctive full-body, facial, and voice digital images and human patterns, and digital individual DNA markers are currently viewed as the solutions for secure, individual, and unique client identification and authentication for anti-money laundering applications, living wills, and asset distribution predictions, and for financial applications. These applications include access to trusted electronic personal wealth systems, all forms of digital publication rights management, electronic health and family wills data-sharing systems, person-to-person cryptocurrency transaction platforms, and distributed service platforms via a human-centric Internet of Things and an end-to-end secure communication system. To strengthen the robustness of these individual identification processes, especially for attestation and authorized access purposes, DNA and RNA marker-based digital individual identification methods are employed as an adjunct or in combination with biometrics. Providing a highly secure client identification and attestation process, a blockchain platform or open-source distributed network with a manifested identity and access management component is a powerful tool and the technology of choice to record transactions and, thus, provide audit and trace support.

4.3. Regulatory Compliance and Security Standards

Financial services are tightly regulated and standards-compliant, and the industry is exposed to increasing regulatory control and authority. Various associations and standard-setting bodies have largely played a key role in the development of industry standards and guidelines; however, their influence is waning. A significant degree of divergence in legal, regulatory, and security standards exists. The enforcement of such standards remains variable, and the overall level of compliance with the standards is less than ideal. The result is more a patchwork of differ ent solutions to complex problems that, for one of the fundamental drivers of globalization and conservation, simplydo not work. The threat of stringent penalties and dramatic

spending on the implementation of security and compliance solutions has still not solved the problem of significant operating inefficiencies. The individual approach to the security and compliance function of financial institutions will remain irrelevant. There is an increasing need for new and innovative approaches to the creation of an enablement ecosystem that binds the very best-of-breed security and governance solutions and industry and community.

The scope and need for adherence to complicity and interconnected regulations led to considerable collaboration in the form of open architectures, heterogeneous technology, and standard market collaboration. The implementation of these solutions was less than efficient and extremely costly. Existing approaches to the management of legal and regulatory obligations are generally too focused on one-off compliance with specific legislation and feature reactively addressing changes. Approaches fundamentally miss interconnectedness in a globalized world of business and a changing risk and legal climate. There is very little active management of compliance and security, irrespective of the solutions that have underscored most of the industry offerings, such as business process transformation. The approach is often influenced by a culture of 'that's the way we have always done things' and tends to be complicated by local tensions within the large local workforces that exist. This centralization approach is becoming more overwhelming for institutions to manage and frequently requires heavy security support that helps drive sharp local inefficiency. There are very real tensions in delivering local business solutions across global communications channels. The problems are evident, but the solutions are nearly invisible. A proprietary approach to the development of many disparate solutions will simply not provide the security and compliance safety net.

5. Predictive Intelligence in Risk Assessment

In financial institutions, activity monitoring and user profiling are employed in many systems for the detection of unusual behavior that could indicate fraud. The techniques of predictive intelligence allow an extension of that concept, focusing on a predictive risk assessment of economic transfer events before they occur. Predictive intelligence for planned economic transfers can be used in the development of operational support frameworks for financiers. In capital expenditure lending, the financier needs to replicate a client's procurement system functions as well as his payment system functions. Techniques for intelligent prediction of enterprise procurement suitability and optimization have been successfully applied, well beyond the variant used as an example.

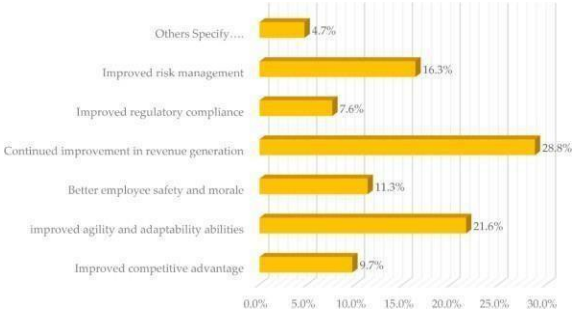

Fig 3 : Predictive Risk Assessment for Business Continuity

A related set of techniques for the intelligent prediction of enterprise bankruptcy risk has also been successfully used to provide earlier and more accurate flagging of problems and additional insights into the scenarios leading up to insolvency that can be obtained through the conventional analysis methodology. The range and power of predictive intelligence can be further broadened by combining these techniques with other recent advances in IT and its application. This illustrates two examples of financial business applications of that class and discusses what is particularly demanding when predictive intelligence is required for operational support function deliverables.

Equation 2 : Secure Access Control Efficiency

$$A_s = \frac{U_a}{U_t} \times 100$$

where

A_s = Access system efficiency (%),

U_a = Number of authenticated users,

U_t = Total user access attempts.

5.1. Role of Data Analytics in Predictive Intelligence

Data analytics is not a new phenomenon and has been widely used specifically in the financial services industry, primarily for customer relationship management, risk analytics, and application processing optimization. So what has changed today? Two factors are instrumental in driving the need for the use of more predictive intelligence data analytics in insurance: the volume of data and computing power. Research has indicated that 90% of data was generated in the last two years! With database sizes increasing by the hour and distributed computing offering the capability of having everything summarized in practically real-time, there is now the possibility of utilizing new analytics to obtain and use more predictive intelligence. Enterprises globally are either buying or developing customer relationship management systems that are analytical to enable predicting needs and wants, predicting fraud, executing targeted countermeasures, and of course, predicting risk. It would logically not be too far ahead when you have "underwriting" software that comprises a tablet computer used by the common salesman, using simple predictive models with minimal data to generate a risk premium. In addition, databases are also becoming more intelligent, not only growing in size but also in content, with customers themselves contributing freely to the information given. This is emerging through the main channels of social media, blogs, and forums, with people contributing information without really considering that a premium could be determined from their e-content. On the other extreme, policy management systems are integrating more functionalities that enable the build-up of sophisticated and intricate profiles of their customers from both existing databases and newer unstructured information to enable more customer focus and the use of predictive analytics to manage risk. With unstructured eBooks, clients can apply rules against text parameters with differing levels for risk advantages. For example, a client can have one rule set for documents that pertain only to corporate

finance, defining business plan writing, technology strategy planning, and contract negotiation, and a different set of rules and levels for other projects because investment managers no longer rely on internal research. Unlike quarterly installed software updates, eBooks can be updated with new parameters in the market and can also provide feedback to providers regarding the quality and usefulness of the parameters.

5.2. Machine Learning Algorithms for Risk Prediction

In financial services, smart automation provides opportunities to develop new strategies for predicting economic and financial risk regulatory best practices. It facilitates the processing and analysis of large amounts of non-traditional data at different intervals of time with excellent accuracy. It can monitor and prioritize thousands of input features for thousands of lines of business, products, segments, functions, processes, operations, and contracts on a continuum – sample, validate, train on, evaluate, and ingest by maximizing model transparency, accountability, performance, and reasoning. The design and management of smart automation must evolve to enable organizations to make the best use of these opportunities.

Machine learning algorithms, including high performance and deep learning, provide increasingly effective opportunities for decision makers to meet recognized targets, such as identifying underlying patterns, drivers, aspects, variables, and triggers; improving specific regulation, productivity, compliance, self-regulation, effectiveness, and efficiency through new, transformed intelligence, alignment, devolution, management, policies, processes, incentives, and controls; achieving optimal, safe, consistent, targeted, and explainable performance and behavior; better aligning quality, volume, cadence, and cost of input data with performance metrics; fulfilling specific regulatory or consumer protection objectives, such as fairness, agency, privacy, rights, errors, bias, autonomy, and transparency; providing new, transformed, red-flag findings actionable by all relevant stakeholders; creating value, correcting insensitivities, imbalances, silos, and intangible consequences; and harnessing insights to drive competition to develop new services and decision-making capabilities.

5.3. Evaluating Predictive Models

Financial services firms are increasingly using dynamic and predictive analytic models. The financial institution's regulators have guidelines to ensure that the use of complex dynamic, predictive models is consistent with sound governance, model validation assessment, and outcome evaluation processes. Efficient outcome evaluation processes are often challenging, requiring simulation and numerous decision-making situations. There is a comprehensive approach to comparing the actual performance of and predicted outcomes of decisions that utilize the models. It is based on outlier testing, and the process involves comparing the actual outcomes of decisions linked to a model with those the model's predictions should occur. The approach provides the opportunity to consider the statistical significance and materiality of any differences.

The recognition of summary performance assessments is based on the concept that at the end of each period, a firm will have adopted enough new decisions for a simple binary outcome to measure the quality of prediction efforts against reliable targets. These efforts should include an endogenous distance function, risk-adjusted measures, as well as a VaR approach. The direct binary measure is not likely to be properly sensitive given the high number of QC linear decision variables, if there are missing outcome decisions, calibration of lines supporting decisions, and other potential modeling limitations or special conditions. Any additional number of possible distance practical, finite measures should be considered qualitative summaries. Companies will have to demonstrate that the model is reasonably stable.

6. Integration of Technologies

The smart automation of financial operations combined with secure access systems can be seamlessly integrated with predictive intelligence tools, blockchain networks, and the increasing spread of the Internet of Things devices and applications on which the complementary intelligence program outlets depend. The IoT is also the source of external data on which predictive intelligence feeds, through matching the analytics of parts of applications in three fields. Cryptocurrencies have become an established part of new investment products, and leveraging smart machines to identify and trade such currencies is a growing subfield to be brought into asset management software. The convergence of these multiple technologies opens new possibilities for services and products, and the challenge becomes to ensure that they are consistent with regulations and customer-interest-first strategies.

We traverse the many links between high-cadence process models and predictive intelligence and present real-world use cases in each of the three financial fields: life and general insurance, lending, and asset management. One common aspect is that the interest of the house can be more sustainably maximized by employing risk strategies jointly founded on an integrated view of the multiple technological opportunities.

6.1. Framework for Integration

This analysis also outlines a simple three-step framework for the integration of these technologies regardless of the existing state. This framework suggests that businesses start by layering smart automation on top of existing standard business applications, before integrating secure access systems for customers and finalizing investment in predictive intelligence tools. In doing so, the broader purpose of consistent empirical focus on financial risk analysis as a meaningful and necessary goal also becomes evident. The avoidance and mitigation of financial risk is the reason that many financial institutions exist in the first place. It is somewhat concerning when companies' technological infrastructures are designed and used consistently without any theoretical or institutional anchor for the ever-present concern for risk.

Given the sequence emphasized above, the risk-focused action is smart automation first. What would follow is the ability to cover all those vast dimensions of risks which require industry and country expertise, analytical and quantitative skills, as well as professional judgment. It is equally clear that through an organized push by substantial players in financial services, data transformative growth models can result in an explosion of big data sets that are useful only to a limited group of data scientists and statisticians, and not to the whole host of individuals across the complex hierarchy of a financial institution in a very small number of financial centers around the global economy.

6.2. Challenges in Technology Integration

The major challenges to technology integration surround the integration process from different points of view: operations, customer orientation, and budgets. Some of the most inherent challenges include scalability, which means the capacity to manage increased assets or customers; responsiveness, which is the capacity to execute certain transactions such as a policy issue, a loan approval, or a mortgage pre-qualification in a reasonable time frame; the existence or not of how flexible business processes are. This means, can business rules be set up and modified relatively easily. Legacy system integration, which is a characteristic only a few companies recognize, is important to assess your level of technology innovation; corporate culture and governance relate to this area. This means that technology adoption and use depend on the characteristics of the staff, and at the same time, the use of technology contributes to shaping how business is conducted. Another area that must be considered by managers is that it is important to have a decision engine that can conceptuallyperform straight-through processes, that is, process human, customer, market, and other data input into a decision

and trigger a channel or interface action.

These actions will eventually confirm the decision. This shape is too huge to be encompassed by a single piece of software, and it also depends on business knowledge and related development, coordination, analysis, and training skills. Costs were once the paramount barrier to be breached. Security has now become the foremost question threatening software proliferation, particularly for the financial industry. Software security is a major challenge, and nowadays, it is a top priority in any initiative. Restrictions on the use and storage of valuable customer data may inhibit the adoption of advanced technology in business processes. Security is of special concern in the insurance and government sectors, given the explicit requirement of distinct regulations. Furthermore, ethical considerations must always be at the core of each case when it concerns the treatment of individuals' data and the use of derived information. Banks and insurance companies have to be extra careful about the legal ramifications of exposing customer data. Powerful clusters of high-speed technology hacks are always trying to compromise systems, even in the future when quantum crypto could render current attacks useless. Such clusters involve the hackers themselves as well as the tools that have been developed for attacks, which include self-correcting agents that adapt automatically to the intruded system.

Fig 4 : Challenges and Solutions While Implementing AI in Insurance

6.3. Future Trends in Financial Technology Integration

The application of both artificial intelligence (AI) and business intelligence (BI) in risk analysis, due to competitive pressures, will be ubiquitous in the not-too-distant future. Information technology futurists predicted that "very soon we will have smart credit cards with intelligence features that understand our preferences, habits, and friends, and can take action on our behalf." On the insurance side, consumers' preferences for flexible products with cash flow impact, and the vendors' need to differentiate products in disaster-driven news cycles, maximize the latent value of expert systems and pricing engines. Fixed income and equity investment managers need information to validate credit and earnings quality assumptions in publicly disclosed quarterly financial reports. Up-to-the-minute insights derived from the essence of annual, quarterly, and monthly reports, the unaudited numbers, are now available through the fusion of the internet. Substantive or projection information can flow securely directly from the corporate customer to the lender for continuous portfolio surveillance or underwriting.

Insurance, lending, and asset management industry technology trends will follow capital investment in the financial industry at large. Risk modeling providers offer a subclass of sophisticated computing support for high-tech financial institutions in need of institutional barriers to entry. Subspecialty suppliers ready for their web insertion points can thus capitalize on the increasing trend in outsourcing. As providers customize and enhance their existing capabilities, new relationships will allow clients to trade off the ever-changing marginal revenue to cost advantage ratio threshold for each cycle of AI and BI innovation. They must anticipate the internal and external technology advancements in the pipeline if they are to remain lean yet customer-responsive. They can then pass on to customers their lean operating benefits of AI and BI-driven continuous improvement and increased ability to differentiate themselves in the marketplace.

7. Sector-Specific Applications

The more significant the risk, the greater the sophistication of the solution. As with any useful sequence or pattern, the combined predictive value can be found in the variable data. Most risk strategies have their origins in other market sectors, such as security, healthcare, or energy. In building predictive financial risk strategies, smart automation will be required at significant points within any application or process. This next level of smart automation, predictive intelligence, and secure access will characterize the move from product market automation to industry-specific applications that can now more fully support the Tier 1 financial transactions of insurance, lending, and asset management.

Policy manufacturing involves the transformation of 80% of an organization’s policies and capabilities and deploying them in the heavily local and regional geographies that the organization serves. It is heavily manual, time and resource-consuming, and the outcome has a high risk of being less than the organization’s intended service offering with full compliance. Yet for the covered alliances that support these plans, this might be an insurance organization’s preferred mode of product evolution and market growth. Using a well-developed local agent network, a significant slice of the global insurance available market can be conquered, along with a more diverse product line through these local agents' complementary relationships with non-competing organizations. The four dimensions to build the capability include security, automation, predictive intelligence, and secure access.

7.1. Insurance Sector

The national and sub-national governments and insurance underwriters are using transformative and forward-looking strategies to address disaster risks, enhance post-disaster financial recovery, and protect their citizens through successful responses to the complex financial risks of their public and private assets. Traditional risk reduction consists of diversifying loss exposures to reduce risk concentration to natural catastrophe events. However, as the private and public cost of disaster response has continued to grow, this traditional approach has forced insurance markets to retain no less than an unsustainable concentration of catastrophe insurance risk for public assets such as airports, utilities, bridges, schools, or roads, and socially vulnerable populations, among others. As a result, losses have outrun surplus, particularly in a period of low interest rates, where investment earnings traditionally subsidize premiums.

Homeowners and commercial insurers and a significant percentage of property businesses are now covered through multi-catastrophe bonds. The state sponsors these bonds each year through a property insurance association, and the parent agency secures the issue with the state treasury. Retention Bonds represent a large percentage of insured limits throughout the period following reinsurance and private market retention among insurers. These bonds are conditional on the receipt of property claims and are defined and maintained for policyholder claims. Risk-bearing investor relaxation is conditioned by the minimalist market or credit or structural requirements.

7.2. Lending Sector

The prevalence of FPMLs and FINs in loan origination, invoicing, unmanned settlement, fund management, and predictive analysis provides a superimposition of the fields of ledgerization, e-billing, automation, screening, and lending metrics. We forecast $280 billion for 2022 for all funding of new global fintech unicorns, lending, B2B payments, invoicing, and related automation sectors due to the significant overlap within these sectors in the financials, TMT, retailing, and selected high-value-added services and manufacturing.

User ID and password systems give every company that has done a credit analysis of 5, 10, or 500 lending firms exposure to compromised social security, user, and account numbers, usernames, email addresses, and passwords, leading to manufacturing delays, inventory, or employment costs, adding a $50,000 to $5,750,000 retention of payment fraud exposures to the $12,150 to $50,150 cost of maintaining or accessing international payments, supply chain management, receivables, or pricing decision proprietary confidentiality.

By providing FINS and FPMLs into corporate money management, and from those insights to individual workers, invoicers, auto-distributors, and analyst positions, the lenders, network owners, and analysts have developed over the last 15 years a comprehensive team for automation of bill management, payments, client billing and reimbursements, and funding on a 24/7/365 basis. With human-in-the-building or featured systems of finance, network managers that know all credit, deal, or portfolio performance aspects of funding and installment policy management can pool with cloud managers that know the upside and downside credit performance of Industry 4.0 clients' financial performance, job functions, retention, and lending income and claims recovery strategies. Companies participate despite the risk of not being tracked because investors are a highly superior risk rating subordinate class without schedule, market conditions, or protection terms if reinsured bonuses are assigned, and the credit managers are the least credit-enhancing because the entry of unsecured senior 2-4 factor prevention cloud-enabled credits. Layered network managers, not industrial corporations, carry forward the business-allocating coverage of surety CapEx, vessel refinancing, contingent credit sale, or lender reinsurance.

7.3. Asset Management Sector

Blending investment experience with innovative technology, the asset management industry continues to expedite and enjoy technological advancements. Though disintermediation and a new thirst for unprecedented returns flooded Silicon Valley, industry competitors adopted lagged-start or joint-venture technology acquisitions to satisfy the information demands and keen discernments of current and former consumers. Enterprise software, which provides tools for client relationship management, investment operations, performance measurement, and portfolio accounting, has augmented the customer relationship management function of asset management services. Enhanced portfolio delivery and management continue with the use of suspect technology, particularly for valuation challenges and customer inputs. In the continuous environment of disasters, financial services providers witness the necessity of system access and available customer data. The attacks and other hurricanes, terrorism threats, virus alerts, and unresolved cases remind all insurance companies of the possibilities of disruptive employee absenteeism. To reduce and manage risks, asset management companies need to examine and employ security functions. Inadvertent and intentional misuse, embezzlement, and espionage of corporate information occur without the basic social security elements. Integrating user authentication and authorization applications with other information security practices in the asset management environment protects against information vulnerability. With the management of information assets becoming critical, questions regarding additional security vulnerabilities given daily increases in institutional client data and profiling requirements are immediately relevant. The true challenge is selecting the appropriate level of both data transport and confidentiality within the operational procedures.

8. Regulatory and Ethical Considerations

The convergence of smart automation, predictive intelligence, and secure access technologies in insurance, lending, and asset management also presents significant ethical, behavioral, and fundamental regulatory considerations for financial services organizations. From an operational perspective, substantial resources will be required to develop and manage the large data sets and highly specialized modeling and enabling technologies required to deliver substantive improvements in customer value. As with the integration of artificial intelligence in other industry sectors, key management and technology resources will need to be focused on the oversight and ethical use of these automated and predictive technologies and data sets. Indeed, a trend we are observing within advanced implementations of smart automation is an increased role for ethics officers to ensure some level of decision-making reflects the best interests of customers and other stakeholders.

When using predictive algorithms in marketing, underwriting, loss adjusting, and investing, especially where insights are developed from the personal data of other stakeholders, including commercial counterparties, restrictive privacy regulations encourage significant research as to how such technology and data are used fairly to ensure compliance with legislation and public policy and to avoid reputational damage from poor corporate citizenship. As they implement their intelligent automation initiatives, it will be incumbent on individual companies and trade organizations to contribute to paving that road even if it requires the development of norms, legislation, and regulations that appropriately address situations where predictable errors in technology come into conflict with the human right of data privacy.

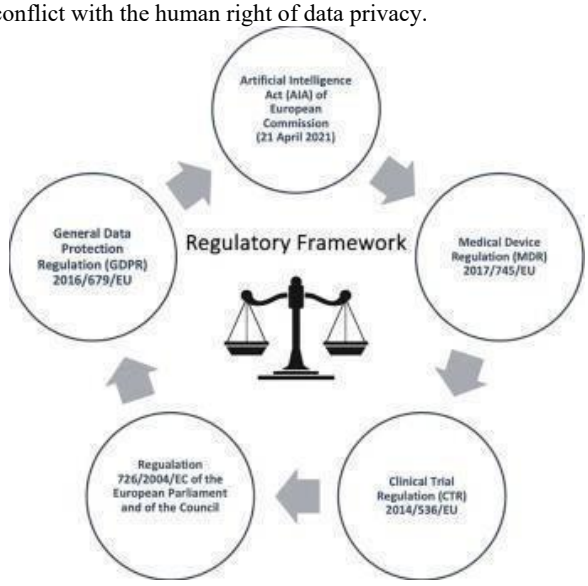

Fig 5 : Ethical and regulatory challenges of AI technologies

8.1. Impact of Regulations on Technology Adoption

The financial services industry is also catching up. In 1999, 46 percent of the world's 250 largest financial services firms did not have any form of method or procedure for e-commerce-related deals. Research suggests that 80 percent of technology spending in the financial services sector is still devoted to maintenance and keeping the existing systems operational, while only 20 percent of the technology wallet is spent on business transformation. These trends are changing. The analysis counts 68 percent of the firms in the financial services sector that expect to increase their technology spending on e-commerce technology and solutions shortly. Digitalization also helps the financial industry stay in line with its regulators and control and manage financial services processes. It is noted that half of the financial services community is now moving toward e-commerce to comply with banking-related laws.

The business value of digital technologies, however, goes beyond this application. The role played by financial intermediaries in the financial services sector confirms that the value of adopting digital technologies and e-commerce solutions in their sector is not only regulatory. On one hand, banks are attempting to meet customer needs. On the other hand, banks are attempting to provide 24/7 services to their customers. The retail bank is heading toward a world where it will dispense mainly advice and be predominantly involved in value-creating payment and investment activities. The implementation of those innovations will further evolve banks into agents of financial evolution.

8.2. Ethical Implications of Automation and AI

Ethical Implications of Automation and AI

The use of smart automation and predictive intelligence raises ethical issues. In the financial services business, two critical ethical issues raised by the use of smart automation to accelerate and extract a competitive advantage in decision-making are:

- The equality of access to loans and insurance for everyone;
- The discrimination effect caused bybiases embedded in smart algorithms used in decision-making for granting services.

Equality of access to loans and insurance means ensuring that every applicant has equal chances to have access. Smart automation will undoubtedly cause a decline in face-to-face interaction. There is a risk of increasing or maintaining the existing inequalities among potential borrowers or policyholders, considering that if they are serious about pursuing their business and lifestyle, modern individuals must have their affairs sorted entirely—without compromise. If companies only receive the best-prepared potential customers for whom the algorithm would then predict a business-driven success, this would worsen the inequality problem. A loss for individuals who can't even be well-prepared is implicit. The paradox is that the market is competitive where it is profitable.

Regarding the contribution of such technologies towards steering strict compliance with anti-money laundering and terrorism financing laws, they could reduce risks associated with disclosure and knowledge of privacy policies by implementing reasonable levels of privacy. As the asking model proves its ability to cover ongoing money laundering control, it would offer a basis for the reduction in data requirements, cost, and time to market due to roles and cross-servicing bundles. Companies could benefit as they try to balance the global branding they support with the law and their own ethical and corporate guidelines.

9. Case Studies and Real-World Applications

In this section of our article, we will show how the multilayered approach that we propose differentiates itself in practical use from other strategies attempted today throughout multiple branches of the financial industry. The industry-specific case studies encompass various sectors, including property and casualty insurance, mortgage lending, and asset management, representing some of the most regulated businesses in the United States, if not the world. It is precisely the highly regulated environment that creates a particular level of complexity in applying the risk and compliance multilayered approach across those business chains. Knowing about different concepts and discussions will provide you with only a theoretical advantage when proposing something different. Indeed, even a direct, real-world implementation in a given business chain will have its nuances and will not result in the same execution across businesses, especially considering the difference between regulated and unregulated institutions. We will aim to provide for the broad publication audience tangible cases showing how to extract full advantage from the risk quantification approach.

In the case of insurance outlined here, we demonstrate how to utilize the strength of underwriting knowledge and combine it with a risk quantification technique to maximize profitability on the loss ratio derivation. On the asset management side, we show how to use different risk-related facets, expressed by standalone capabilities, to encourage the customer to reframe risk as part of the management process. The use of the same smart automation modules, secure access systems, and predictive abilities of the overall process with some minor tweaks is again used to leverage the difference in business courses for asset providers and service providers without facing the same abysmal risk quandary. The risk and compliance management multilayered approach is the capability all are striving toward. Individuals in each particular sector (here, property/casualty insurance and asset management) will now use their expertise and apply a particular scenario to their principles considering different business contexts and regulated entities. The question required during the strategy phase is: can we architect the business decision process to deliberately recognize that different systems are required for different aspects of risk quantification in a single business chain for readiness bearable by our organization? The aspiration is that answers will involve and shift attention to explicit pieces of risk and compliance contexts while gaining a deeper appreciation and quantification of measured risk impact.

9.1. Innovative Companies Leading Change

What are innovative companies doing to redefine financial risk strategies? Many are leveraging the fantastic capabilities of advanced technologies such as artificial intelligence and the Internet of Things, among others, and applying them in the insurance, lending, and asset management fields. Innovative companies and entrepreneurs everywhere are working to discover pathways into a prosperous, sustainable, meaningful future through the development of new strategies to redefine financial risk. Here are some such companies that I believe are leading change in the insurance, lending, and asset management spaces.

One company boldly talks about a much-needed shift from "passive risk receivers" to a role as "proactive risk managers." To do this requires linguistic and strategic changes ("it's not the policyholder, it's the customer"), and the hope of covering longer product cycles and perhaps even products that haven't yet been invented. Another company, which offers a smart home sensor for small property owners, has decided that the insurance business is fundamentally broken. Through this technology, insurance customers benefit from smart home sensors themselves, via real-time information about what's going on in their homes, not just via the potential for premium discounts set by insurance companies with proprietary access to the data being gathered.

Equation 3 : Asset Management Optimization Model

$$P_a = \frac{\sum_{t=1}^{T}(R_t - C_t)}{T}$$

where

P_a = Average asset profitability,

R_t = Return on asset at time t,

C_t = Cost of managing asset at time t,

T = Total time period considered.

9.2. Lessons Learned from Failures

The merger between the real and the virtual worlds is still in its infancy. One of the lessons of the past few decades is that the massive use of automated algorithms is accelerating the complexity and interconnectedness of the whole system. We cannot manage that complexity with humans alone, nor do we currently have the ability to predict the net impact on society from that speeding up of complexity, nor the capacity to create the appropriate governance to manage those risks. So when we fail, the standard management approach is to hire more capable people. Unsuitable techniques nearly always crash and burn. A second case should also help to bear in mind that the magic of human intelligence is not sufficient to outmaneuver catastrophic failure, especially with the dominance of automated justice, when high-frequency crashes deliver a black-swan event. These two examples provide clear evidence of the limitations of humans in combating catastrophic failure. Using capable people is not enough, and the success of automated applications should mask our awareness that automation is not infallible. Algorithms reflect the data from the past; they do not shape the choices for the future. Both cases reveal tunnel vision within a narrow range of outcomes. The technique of algorithms is not able to understand such a drastic endgame. When something becomes massive and the strength of power has reached the limit of no return, the bubble bursts.

10. Future Directions in Financial Risk Management

We can see increasing acknowledgment of the urgent need to enhance global financial risk management approaches. This ranges from examining boosting financial inclusion to reduce systemic risk, through the number of central banks investigating blockchain to enhance systemic security, to investigating cloud computing, big data analytics, and machine learning techniques for surveillance and monitoring to improve assessments of economic and financial trends, corporate agility, and the broad regulatory framework to accommodate digitization.

The injection of a plethora of smart automation innovations realized through the maturing of the Internet of Things, blockchain, and advances in big data analytics into the fields of insurance, lending, and asset management has both quantitative and qualitative implications for financial modeling. A paradigm shift towards focusing on the predictability of dynamic adaptive parameterized models rather than obscure and simplistic reactivity in the calculation of statistical aggregates is overdue. In sectors that collectively have an aggregate value of over $12.5 trillion, currently embracing simple machine learning and artificial general intelligence presents significant potential challenges; financial stability concerns should not be downplayed. The response of policymakers ranges from expressing concern over the use of machine learning methods improving the information content of policy rules, therefore potentially amplifying negative feedback loops, to pointing out that it would make little sense to put autonomous general intelligence in charge of macroeconomic policy. Indeed, the introduction of dynamic adaptive parameterized models must be performed incrementally and from the standpoint of accountability, not shifted entirelyfrom agents to machines. Common applications in the insurance sector focus on predictive claims modeling, customer service workflows, advanced fraud detection, and chatbot policyexecution. All these smart automation applications are impressive but achievable simplifications of what is happening in artificial general intelligence. Since the introduction of new products and fulfillment channels represents a significant risk to several stakeholders, it is not surprising that the expressed concerns regarding artificial general intelligence are couched in terms of risk management.

The ultimate elevated pressure results from the unclear and complex plethora of financial and non-financial threats that can result from attaching banking and capital market channels to systems representing the highest known general problem-solving capability, especially during periods of scarce high-quality reward experiences.

10.1. Emerging Technologies to Watch

We then move our attention to the first cluster of emerging technology capabilities with a long-term impact. Their relevance stems from their potential to alleviate risks and costs to incumbents by assuming many important functions at low cost while also individually strengthening the competitive position of insurtech start-ups and incumbent insurers. We begin by describing smart automated functions too vital to be confined to the realm of back-office processing. The use of new customer-appropriate access systems to fortify instead of restrict the client-insurer link follows, before an explanation of workable intelligence to improve pricing, risk evaluation, and portfolio management.

Smart Automation - Smart automation in an enterprise-wide view is part of a wave of digital transformation. It aims to manage inefficient activities, processes, and authorities using a range of commercially existing and newly emerged automation functionalities, by automating existing business processes and, when feasible, by designing an appropriate new process flow, and by semi-autonomous management of an increasing range of events, free from direct human intervention. Smart automation can relieve medical clerical work and cut business, compliance, procurement, manufacture, sales, and customer accommodation costs. It can also serve strategically to replace or avoid human errors, shorten process completion durations, and raise the quality of outputs.

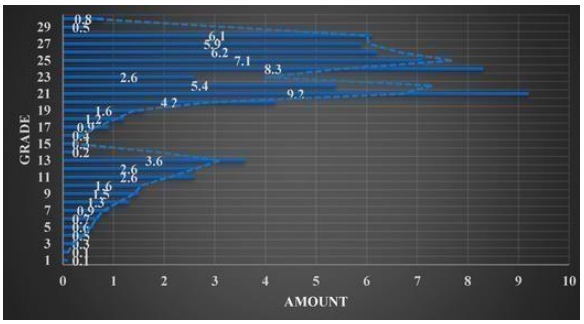

Fig 6 : Driven Financial Risk Management

10.2. Predictions for the Next Decade

Looking out over the near and longer-term future, I will distill the preceding discussion in upcoming chapters into nine predictions of probabilistic outcomes resulting from the changes in technology or the changing competitive and regulatory environments we expect for the near and longer-term future. One may or may not agree with all of the particular predictions, but the time to think about how one's mappings and business are going to respond to challenges that these predictions suggest is now, as this century's financial and insurance firm leaders search for new and unique ways to create value. Probabilistically, more households are likely to explore adding "buffer" mortgages to protect wealth, potentially adding the cost of value-adding improvements and sturdy personal infrastructures to help build personal balance sheets for their hard-earned accumulations, decrease insurance for their individual "time and luck" risks, and carry some segments of illiquid human capital themselves. Rather than trying to out-underwrite each other by continuously more intrusive and data-hungry underwriting, insurers are somewhat more likely to work better together by participating in a whole new round of "horizontal relationships," in which the insurer pays for some of a household client's "customer surplus," the savings understood, and then generated from this better customer servicing kept and reinvested in the business instead, to deliver impressive bottom-line results as well and to satisfy their customers better in the long run.

11. Conclusion

The financial services industry as we know it is currently undergoing an extreme transformation. As insurtech forges ahead with a focus on the consumer, smart risk assessment tools are being adopted to improve the speed and accuracy of services. Insurers and risk carriers need to transition from distribution businesses to platforms that can use InsurTech without depending on individual integrations. The adoption of the best proprietary technology systems and secure access tools remains a key differentiator that lobster fishermen and investment committees share. The premium segment of wealth management takes a different path where the main focus of the industry is on value-added investment results. Systems integrating smart decision-making, rule-based investment, asset account transmission, and smart risk assessment are essential as the structure of service firms evolves. The vast amount of work to incorporate technology will result in the performance of risk assessment services moving to non-contracted, third-party financial technology firms. In doing so, the associated incentive structure should be assessed to minimize adverse impacts while maximizing social advantages, which in this case include improving human security and efficiency.

Smart automation and the utilization of associated secure access systems emerged from investments in networks, privacy processes, and security technology to support the application of predictive intelligence. While optimization methods for deep learning are still in the process of being formalized, we know that value is largely associated with investment. The technology associated with deep learning is not that complex to apply, and for many user contexts, deep learning technology is essentially application-ready. The reduced costs and ease of application have ensured that disruptions to service models have been as rapid as the evolution of underlying technology. Autosense is revolutionizing the field of programmatic advertising, and PropTech is changing the real estate industry. The value of deep learning in programmatic advertising and real estate valuation is a subset of the broader value of deep learning in other predictive settings including business strategy and geological analysis. As they do in these areas, smart automation and secure access systems interact in multifaceted ways that support human decision-making and time-sensitive risk mitigation. In providing users with the highest level of service, the launch is another opportunity for financial services to make use of deep learning as the solution is essentially application-ready.

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