



台灣金融研訓院
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International Trends and Financial Innovations in Artificial Intelligence (AI)

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Abstract

Artificial intelligence (AI) is the study of intelligent entities and their design – referring to a system that can observe its surrounding environment and take action to achieve its goals. This study focuses on the financial industry, which has been the first to bear the brunt of the rise of AI, and discusses related financial innovations, practical applications, and potential challenges and responses for the Taiwanese financial industry.

The connotations of modern AI include memory, judgment, and cognition. Its benefits to the financial industry are multifaceted, including smart customer service, identity verification, precision marketing, robotic financing, process automation, customer credit risk assessment, Regtech, improvements in user experience, and operational optimization all help banks reduce their operating costs and improve their efficiency and profitability. The use of AI in the financial industry however requires overcoming non-trivial structural problems including technology, operations, and supervision.

Potential challenges to the financial industry from the rise of AI include a shortage of skills and talent, transformation and re-engineering of corporate culture, acquisition and regeneration of training data, and development of valuable applications. In response, this study recommends that financial institutions consider idiosyncratic strategies to fit AI into their own business, rather than chasing new and unique technologies. Through education and training, financial practitioners can learn the foundations of AI, which, when combined with domain knowledge and AI specialties, will lead to further financial innovation. Institutions should continue to upgrade their financial information infrastructures, develop finance-specific AI, and regard AI as a part of overall human resource allocation, allowing human-machine collaboration to play a multiplier role.



Research Findings

The development of AI experienced various ups and downs until key breakthroughs were made in deep learning in recent years, supplemented by big data and tremendous increases in computing power. AI applications have once again captured our imaginations.

Based on existing literature and these research results, we can find that in terms of AI development, current technology companies focus on deep learning/machine learning (applications and platforms), natural language processing, computer vision/image recognition (applications and platforms), and personal virtual assistants. Cases of AI applied to financial innovation are summarized in Table 1 below.

[Table 1] AI development and related financial innovations

Machine Learning Applications	
Machine learning applications: Algorithms allowing machines to learn and enhance themselves, finding patterns from big data and making applications that can make predictions through machine learning.	
Case	Description
Avant (US, 2012)	Company type: Online lending platform Service items: Online loans Purpose: To establish accurate customer credit information through big data and machine learning, while reducing the risks of default and fraud.
Upstart (US, 2012)	Company type: Big data credit scores, online P2P loan platform Service items: Credit scores, smart loans, self-service pricing engine Purpose: The first lending platform to use AI and machine learning to price credit and automate the lending process.
Lending Club (US, 2007)	Company type: Online P2P lending platform, big data risk assessment Service items: Online loan services and real-time lending risk assessment Purpose: To apply AI to consumer finance, using AI and big data for risk control and platform operations.
AppZen (US, 2012)	Company type: Automated AI financial solution platform Service items: Audit monitoring, compliance, settlement, case management, data analysis, and fraud prevention Service description: Assisting companies to independently test and quickly review financial statements errors and fraud using natural language processing and ReceiptIQ deep learning.



IdentityMind Global (US, 2009)	<p>Company type: Risk management platform for fraud prevention</p> <p>Service items: Conformity verification (KYC, Fintech, ICOs, Bitcoin), fraud prevention, PEP screening, MSB solutions, risk management, and customer validation.</p>
Featurespace (UK, 2008)	<p>Company type: Fraud detection</p> <p>Service items: ARIC platform</p> <p>Purpose: An adaptive behavior analysis technology provider for fraud and risk management, detecting anomalies in individuals' behavior through adaptive behavior analysis.</p>
Highradius (US, 2006)	<p>Company type: Accounts receivable analysis</p> <p>Service items: simplifying banks' accounts receivable operations with AI</p> <p>Purpose: The cloud platform is divided into five main blocks: the credit cloud, EIPP cloud, cash application cloud, debit cloud, and collection cloud. AI is used to run the credit-to-cash platform.</p>
Feedzai (US, 2009)	<p>Company type: Fraud prevention platform for banks</p> <p>Service items: Fraud prevention, customer accounts</p> <p>Purpose: The platform provides three main functions: compliance, innovation, and risk. It promote financial security for banks, payment companies and retailers through case management, audit compliance and data collection and analysis.</p>
Ravelin (UK, 2014)	<p>Company type: Regtech, online fraud detection platform</p> <p>Service items: Ravelin Enterprise, Ravelin Connect, Ravelin Lookup</p> <p>Purpose: Real-time assessment of each customer interaction through machine learning, instant mapping through link analysis, and financial fraud prevention through data visualization.</p>
AQMetrics (UK, 2012)	<p>Company type: Data management and risk assessment & monitoring</p> <p>Service items: AQMetrics risk tagging, monitoring, and reporting</p> <p>Purpose: Quantitative data analysis and automated cloud risk monitoring & reporting Regtech and online fraud detection.</p>
Encompass (UK, 2012)	<p>Company type: IT</p> <p>Service items: Audit compliance</p> <p>Purpose: To improve the efficiency of financial audit compliance through big data source analysis. Consolidating a vast array of data sources around the world and gradually verifying the compliance of their lists for anti-money laundering (AML) and counter-financing of terrorism (CFT).</p>
Comply Advantage (UK, 2014)	<p>Company type: Regtech</p> <p>Service items: AML controls, sanctions screening for payments, transaction monitoring</p> <p>Purpose: AML, financial crime prevention</p>
Funding Circle (UK, 2010)	<p>Company type: Online lending platform, big data risk assessment</p> <p>Service items: Credit risk assessment</p> <p>Purpose: Companies applying for financing must pass audits and approvals; providing SMEs with multidimensional data and the latest risk assessment technology</p>



Natural Language Processing and Speech Recognition	
Natural Language Processing (NLP): Handling and using natural language. Natural language generation systems transform computer data into natural language. Comprehension systems transform natural language into more manageable computer code. Speech Recognition: Automatically converting human voice content into corresponding text.	
Case	Description
AlphaSense (US, 2008)	Company type: Big data financial search engine Service items: Investment research, smart search Purpose: Using natural language search technology to help professional investors query key financial messages with unprecedented speed and accuracy

The benefits that AI brings to the financial industry are multi-faceted, such as smart customer service, identity verification, precision marketing, robotic financing, process automation, customer credit risk assessment, and Regtech – all of which can be used to improve customer experience or optimize operations, helping banks reduce costs and increase their efficiency and profitability. The use of AI in the financial industry however requires overcoming non-trivial structural problems including technology, operations, and supervision. Table 2 below shows some examples of AI applied to banks.

[Table 2] AI applications in banking

	Category	Applications in banking
Audio recognition	<ul style="list-style-type: none">• Speech recognition• Emotional analysis• Fraud detection	<ul style="list-style-type: none">• Telephone customer service• Telemarketing• Telephone service fraud detection
Machine learning	<ul style="list-style-type: none">• Risk detection• Operational analysis• Recommendation engines	<ul style="list-style-type: none">• Prediction of incidents in computer centers• Program trading• CRM decision engines
Text mining	<ul style="list-style-type: none">• Reasoning• NLP• Counterfeit detection	<ul style="list-style-type: none">• Automatic report generation• Public opinion monitoring/network voice analysis• Chatbots incorporating DNNs
Image recognition	<ul style="list-style-type: none">• Computer vision• Facial recognition• Expression analysis	<ul style="list-style-type: none">• Document inspection• Cash dispenser risk detection



Conclusions

We put forth the following recommendations for banks to respond to the financial innovations brought by AI and their impact on the financial industry.

1. Financial institutions should consider their own operating strategies to determine their use of AI

The application of AI to financial innovation is likely to change the face of today's financial industry. However, this is a gradual process. For financial institutions, it is not easy to introduce too many different innovations at the same time, so prioritization is required.

Financial institutions should consider which AI technologies can be introduced earlier from the perspective of their own business strategies, instead of simply pursuing novelty and uniqueness. For example, if a bank is in consumer finance, then it may be possible to consider smart customer service and robotic wealth management first. Particularly if the strategic objectives include expanding the credit customer base, it is possible to develop a credit rating system based on big data analysis of non-traditional credit information such as personal communities, mobile communication, and consumer behavior. Institutions who are interested in expanding overseas will initially serve a relatively limited base of existing Taiwanese customers as their main business, but different countries' regulations vary, and international AML standards are becoming stricter, therefore AI is worth considering for creating Regtech like AML controls. Although it will not bring specific profits, it can prevent huge (intangible) losses.

2. Actively introduce AI into relevant processes in response to international AML/CFT standards

Looking at the AI cases covered in this study, there is no lack of Regtech applications, such as (US) IBM Watson Financial Services and (UK) AQMetrics, etc. all of which can integrate financial regulation expertise with AI systems to help banks meet increasingly stringent and frequently changing regulatory requirements, such as building anti-money laundering detection systems, customer complaints databases, and stress testing. Considering that if banks develop their own technology for regulation, it may be incomplete, and they must independently bear the risk of failure, it is recommended that the financial industry join strategic alliances, partnerships, joint ventures, and mergers with AI startups to increase their innovation. Particularly in AI-based Regtech, this is the



only way to immediately and effectively respond to the challenges of increasing regulation.

3. Continue to upgrade financial information infrastructure and develop financial AI

Banks must first improve their information infrastructure in order to incorporate AI. AI performance is closely related to the quality of its input data. The core of financial goods and services includes pricing (interest rates and processing fees), credit (lending amounts) and risk management – all of which requires full planning, execution, verification, and management. A large amount of data analysis is required, so collecting large, diverse, high-quality, and representative dataset, and establishing data warehouses, are important parts of information infrastructure construction. Dynamic data collection from multiple sources and instant updates will enhance the depth and breadth of customer data collection.

In addition, in order to effectively analyze non-structured data such as chats, videos, and photos, etc., it is also necessary to invest heavily in data format conversion, automation and analysis tools.

Data is the foundation of AI analysis, but because its analysis capabilities involve the interests of consumers, information collectors, and users, traditional financial institutions may not be up to the tasks of data management, application, and customer protection. Data security not only affects the customers' trust, but also directly affects the cost of obtaining information, and is therefore another important part of financial information infrastructure.

4. Education and training on basic AI concepts

Despite the enthusiasm of many financial institutions to embrace artificial intelligence, many banks are still taking a wait-and-see attitude. The key problem is a lack of trust in new technologies, which may come down to insufficient understanding of new technologies. Therefore, it is recommended that banks spread the basic concepts of AI through employee education and training.

There is more than one reason for financial practitioners to learn the basics of AI. FinTech development involves a combination of financial and technical expertise. It is difficult for technicians who do not understand financial services to find effective applications on their own. Financial institutions who do not understand technology may understand the pain points, but they won't know which tools to use to resolve them. The more bank employees understand the foundations of AI, the more opportunity they have



to us it to improve operational efficiency. Second, the idea that AI will displace human labor has become a consensus. The sooner a professional attains knowledge related to AI, the sooner they can start thinking about their future position and gradually adjust their professional ability. As more employees get ready to coexist with AI, banks will find it easier to promote AI-related innovations with less resistance.

5. Consider AI as a part of overall human resource deployment

As AI improves machine learning, the pendulum will gradually swing from real to artificial “human resources.” In the face of AI development, many financial practitioners worry that robots will replace bankers. However, the main purpose of robots should not be to reduce manpower, but to use it in a smarter and more efficient way, so that bank employees can focus on tasks that are more important to operations. Through modest education and training, and a clear division of roles, the “human-machine collaboration” model will have a multiplier effect, with more efficient work execution than in traditional processes, in addition to freeing employees from other activities. Take money laundering as an example. Once AML analysts are liberated from the exhaustion of inspecting of false positive transactions, they can concentrate on more in-depth analysis of complex suspicious transactions. That is to say, the main change brought about by the use of new technologies is the redistribution of human resources, forming a completely different financial service ecosystem.