

Featured Articles

Utilization of AI in the Financial Sector Case Study and Outlook for FinTech Era

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OVERVIEW: A succession of new user-oriented services combining finance and IT have been appearing recently. Known as FinTech, these services influence competitive advantage for their ability to create innovation beyond the framework of conventional financial services. Acting as an enabler for creating innovation, Hitachi is taking a close look at AI, and working on its utilization in the financial sector. This article looks at phenomena such as FinTech and the IoT as precursors of changes in the financial industry. It discusses how AI is being used in the financial industry through activities designed to raise management KPIs by quantitatively evaluating organizational activity levels from action data acquired from wearable terminals. The article also describes the future outlook for AI use by examining concepts such as the development of business applications that use embedded AI.

INTRODUCTION

FINANCIAL services have developed along with advances in information technology (IT). The use of IT among financial institutions extends to every aspect of their business, and IT has become an indispensable part of finance. However, until recently, IT has mainly been used to improve the efficiency of operations performed by humans.

New services called FinTech, due to their combination of finance and IT, have recently been gaining attention, and financial services offering users a high level of convenience have appeared one after another⁽¹⁾. These services go beyond the framework of existing financial services, creating new value for clients. The financial industry is on the verge of a new era of innovation that will radically transform business models through IT.

Acting as an enabler for creating innovation, Hitachi is taking a close look at artificial intelligence (AI) and working on introducing it to the financial sector. In particular, anticipating the arrival of the Internet of Things (IoT) era, Hitachi is taking on the challenge of new services that support business optimization that use AI to analyze sensor data from wearable terminals, etc. that was unobtainable by financial businesses in the past.

This article looks at how FinTech and the IoT are changing the financial business environment, and describes how AI is being used in the financial sector through activities designed to improve the management key performance indicators (KPIs) of financial institutions by using AI to analyze action data obtained from wearable terminals. The article also describes the outlook for the use of AI in the financial sector by looking at concepts such as the development of business applications that use embedded AI.

CHANGES IN THE FINANCIAL BUSINESS ENVIRONMENT

Appearance of FinTech

FinTech is a portmanteau word coined from Finance and Technology. It is characterized by the creation of innovative financial services that offer users a high level of convenience by combining finance and IT. The succession of FinTech services that have appeared include user-to-user fund transfer services the use Internet peer-to-peer (P2P) communication technology, and cloud funding services that enable direct procurement of funds from multiple individuals through social media. These services have gained a large amount of user support for their low cost and procedural simplicity.

New FinTech services are being provided by IT industry startup companies, etc., which were previously not major names in the financial industry. As a result, the ability to create innovation that can drastically transform financial business models using technology is influencing competitive advantage.

AI has gained attention as the core technology of FinTech. Financial services driven by AI include new credit services and investment support services that improve credit/risk management precision by using AI to analyze Internet-based activity data and transaction data. The use of AI is expected to produce more advanced credit and risk management models through discovery of new factors that were previously undiscoverable.

Arrival of the IoT Era

The IoT is creating a network of objects that are connected to the Internet, and its growth is driving the innovation of services that use object operation data and human activity data acquired from sensors. IoT-driven innovation has become influential in fields such as production management and product maintenance in the manufacturing industry. Its use should continue to advance in finance and many other areas in the future.

Several new IoT-driven insurance services are appearing and growing in popularity. Examples include telematics insurance in which driving data acquired from vehicle onboard sensors is used to evaluate accident risks to adjust insurance premiums, and new medical insurance that evaluates the risk of illnesses from health data acquired from wearable terminals.

Creation of Innovations in Finance

In the IoT era, it will become possible to use sensors attached to objects and people for realtime acquisition of various types of data used in various applications. The IoT era will see many innovative services appear one after another. They will be made possible by finding new connections by merging external data acquired from sources such as the IoT, with internal data gathered from financial operations.

Joseph Schumpeter, the father of innovation research, said that innovation is created from new combinations of existing things. For financial institutions to constantly create innovation, it is important for them actively gather external data from sources such as the IoT, and to discover new connections by combining this external data with their own internal data.

But discovering new connections from large volumes of external data that change daily is not easy.

Hitachi is looking closely at AI as a technology that exceeds human abilities to discover new connections, and is working on developing analytical methods for finding new correlations among massive volumes of variables. The next chapter describes how AI is being used in the financial sector through activities designed to improve management KPIs by using AI to analyze human behavior data obtained from wearable terminals.

AI USE IN FINANCIAL SECTOR

Background and Aims

To respond to the changing financial business environment, Hitachi is working on financial service applications of the IoT and AI. One of these efforts was a study on how to use technology for measuring and analyzing human behavior⁽²⁾ to improve the quality of financial institution services and to help innovate work styles. It included a trial conducted with The Bank of Tokyo-Mitsubishi UFJ, Ltd. The trial studied 40 office workers from the planning department of the bank's headquarters. Differences in action characteristics on days of high and low levels of organizational activity⁽³⁾ were extracted as proxies for productivity indicator values, and it was found that specific knowledge on productivity improvement could be extracted.

Management Support Driven by Human Action Measurement and AI

Hitachi has developed technology for ID card-type wearable sensors used to measure the actions of people in groups. By connecting this technology to AI, it is studying the creation of management support systems that present quantitative advice on working styles that increase productivity (see Fig. 1).

In a previous study, Hitachi acquired action data about communication and deskwork from several hundred subjects in one-second increments. However, quantitatively expressing the actions and subjects that contributed the most to the organizational activity level was a costly and time-consuming task requiring careful analysis by experts. The aim of the recent study was to enter a large volume of sensor data in the Hitachi AI Technology/H artificial intelligence system (hereafter referred to as H) to speed up comprehensive searches and the refinement of objectives, and to enable analysts to focus on presenting advice tailored to the client's industry/job type characteristics.

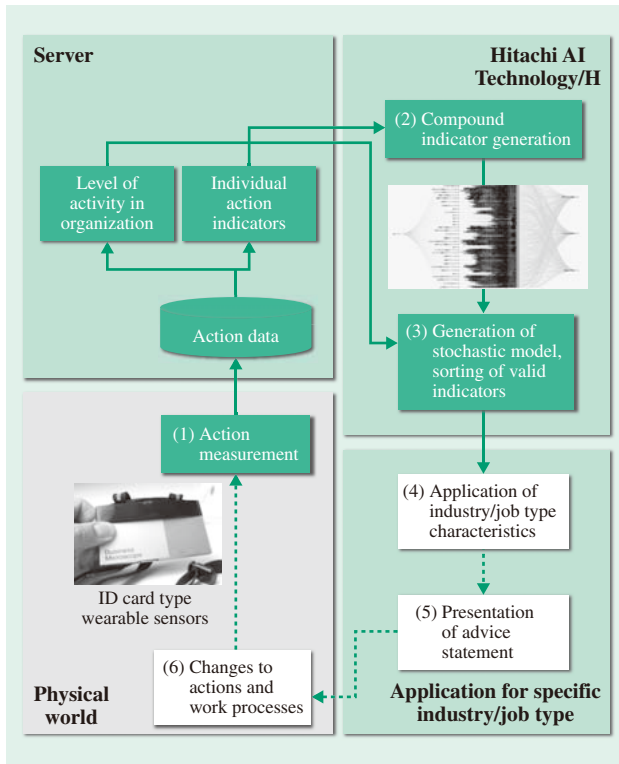


Fig. 1—Conceptual Diagram of a Management Support System. AI is used to analyze collected human behavior data, to provide advice on work methods designed to increase productivity.

Trial Procedure and Analytical Results

Action data was collected for three weeks at The Bank of Tokyo-Mitsubishi UFJ, Ltd. and, using the procedure shown by items (1) to (3) in Fig. 1, a search was conducted for correlated action indicators, with

organization activity level as the target variable. Items (4) to (6) were done by analysts, since work characteristics needed to be taken into account.

To quantify typical office worker work patterns, groups of indicators related to deskwork and communication were used as action indicators. The indicators that were collected daily were entered into H (see Table 1). H generated compound indicators combining attributes and actions, refined them into effective indicators that could describe organizational activity levels, and generated stochastic models.

Fig. 2 shows some of the results. The first finding was that days on which subjects in their 30s had short, frequent conversations had higher overall organizational activity than other days. A difference in action indicators between new and experienced department members was also found. The activity level was better when new department members (with less than 3.5 years in the department) did prolonged deskwork (at least 30 minutes). However, for more experienced department members (with at least 3.5 years in the department), the activity level increased more when deskwork was divided into sessions of less than 30 minutes due to interruptions for reasons such as answering questions. This finding shows that although the personal productivity of more experienced workers may decline, they improve the productivity of the overall organization. This corroborates the notion that more experienced workers contribute to raising team synergy. Quantitatively expressing this contribution to the entire organization

TABLE 1. List of Action Indicators for Office Workers
Hitachi has defined indicators for interactive communication and deskwork.

Category	Indicator	Definition
Duration of interaction (min)	Total time	Time during which interaction with at least one other person is detected
	Two-way	Time during which two-way conversation is in progress
	Pitcher	Time during which subject is speaking
	Catcher	Time during which subject is listening
Number of interactions: Number of instances of each category of interaction duration	(a) Continuing for < 5 min	Number of short conversations (greetings or passing on a message)
	(b) Continuing for 5 < 15 min	
	(c) Continuing for 15 < 30 min	Number of long conversations (such as meetings)
	(d) Continuing for ≥ 30 min	
Duration of deskwork (min)	Total duration of deskwork	Time during which subject does not interact with others and has minimal physical movement
	Maximum duration of continuous deskwork	Longest period of uninterrupted deskwork during the day
Number of instances of deskwork: Number of instances of each duration category	(a) Continuing for < 5 min	Number of times deskwork is interrupted (by being spoken to, going for a walk, etc.)
	(b) Continuing for 5 < 15 min	
	(c) Continuing for 15 < 30 min	Number of times deskwork continues for a long period with few interruptions
	(d) Continuing for ≥ 30 min	
Length of time sensor is worn (min)	Length of time sensor is worn	Time measured by ID card type sensor (in the case of office work, this is the office's working hours)

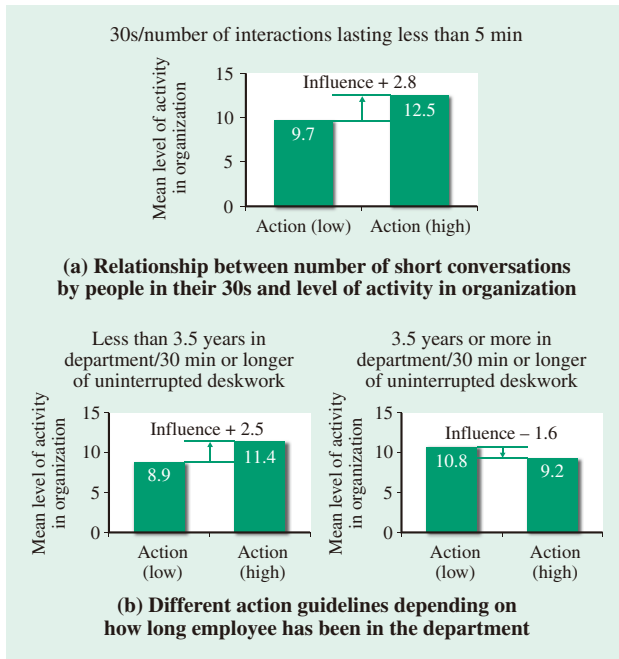


Fig. 2—Example of Action Characteristics Analysis for Different Attributes*.

(a) The level of activity in the organization is higher by 2.8 on days on which people in their 30s had frequent short conversations such as greetings or passing on a message.

(b) Opposite guidelines were obtained for uninterrupted deskwork time depending on how long the employee has been in the department.

may help experienced workers understand the value of their support to others, and be effective for overall optimization of service and work methods.

Validity and Remaining Challenges

The case study described in the previous section confirmed the validity of the following:

- (1) It was possible to extract knowledge for improving service and work methods in a financial institution through quantitative analysis of data from wearable terminals.
- (2) It was possible to use AI to comprehensively scrutinize which employees to focus on, and which actions of those employees to focus on.
- (3) It was possible to use AI to extract individual indicators for overall optimization.

Achieving ongoing operation by automating the presentation of advice is a remaining challenge for achieving a management support system. The analysis of the results output by H are currently being interpreted and compiled by analysts, and client work

*The experimental data shown in this article (see Fig. 2) is a mock up for presentation purposes. However, the knowledge obtained is the same as that achieved in practice.

characteristics are being considered when presenting advice. To increase the efficiency of these processes, it may be necessary to embed functions such as work applications into H to automate the analysis, and to create a method of visualizing and sharing results on a daily basis.

FUTURE OUTLOOK

This section describes the future outlook for the use of AI in the financial sector, looking at the projects that are currently underway.

Creation of Social Innovation in the Financial Sector

Hitachi is focusing on its Social Innovation Business, which solve problems in public systems by combining infrastructure technology and IT. By using IT to link public infrastructure projects in areas such as finance and railroads with related peripheral projects, it aims to produce innovative services by creating new connections that exceed the framework of existing projects.

Expectations for innovation are increasing in the financial sector, and AI has gained attention as an enabler for the discovery of new connections. For example, new FinTech services are being created by linking finance and electronic commerce (eCommerce), with functions such as calculation of credit scores of eCommerce providers by using AI to analyze the data of transactions on eCommerce sites.

Hitachi is working on optimization problem searches in financial operations, an area in which AI is effective. It seeks to speed up the creation of Social Innovation in financial operations by using AI to develop optimization models.

Combining Financial Operation Data and IoT Data

The arrival of the IoT era will greatly increase the scope of data that financial institutions can use. Acquiring position information and operation data from sensors attached to objects such as vehicles and residential facilities is already possible, and it is becoming possible to acquire activity data and health data in real time from wearable terminals worn by people.

The use of this data holds the potential to radically transform the business models of financial institutions. Specifically, the insurance industry is expected to evolve from calculating risks using traditional statistics to calculating risks for each policy individually using the IoT.

Creating analysis environments and methods by accurately combining in-house data acquired using existing financial operations with new external data acquired from the IoT will be an indispensable requirement for achieving these new business models.

To meet this requirement, Hitachi is creating AI analysis models that combine financial operation data and IoT data, and developing and applying methods of creating new financial services from the connections discovered by these models.

Development of Embedded AI Business Applications

To maximize the benefits of AI-driven analysis, AI should ideally be embedded in routine operations, and new models for financial operations should be constructed that coordinate humans and AI.

To achieve these aims, there is a need for embedded AI business applications that provide support for routine decision-making using financial business applications with embedded AI. For example, an embedded AI application that proposes policy plans could be developed for the insurance industry that would enable optimum plan proposals to be derived by coordinating the efforts of AI and humans. By using AI to perform analysis that combines existing policyholder data with IoT-based action data and health data, this application could be expected to propose appropriate policy plans that capture the risks and preferences of individuals in real time.

In the future, Hitachi would like to develop embedded AI business applications that draw on the strengths of AI to bring new innovations to financial operations.

CONCLUSIONS

This article has discussed the expanding use of AI in the financial sector by looking at trends in the creation of innovations in finance in light of the changing financial business environment resulting from FinTech and the IoT. Also described were a study undertaken by Hitachi as the first step toward achieving these innovations in which organizational activity levels were measured using ID card type wearable sensors and AI, and the future outlook for AI.

In the future, the growth of the IoT should create an era in which the degree of skill in the use of external data will affect the competitive advantage of financial businesses. To prepare for this coming era, Hitachi wants to help create financial sector innovations by creating analytical methods that combine internal data from financial operations with external data, and working on developing embedded AI business applications.

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