

Evaluate the managerial effectiveness of Artificial Intelligence

– Case studies from HSBC and iQiYi

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ABSTRACT

The concept of Artificial Intelligence (AI) has become more popular today due to the increased data volumes, advanced algorithms, and improvements in computing power and storage. Many industries began to have high demand for various AI capabilities to facilitate smarter internal and external transactions and operations. This paper discusses the AI applications in two of the important industries: financial industry and video streaming industry. Specifically, it conducted two descriptive case studies to investigate the managerial effectiveness of AI campaigns in HSBC and iQiYi (China). Managerial implications were given at the end.

KEYWORDS

AI applications, Case study, HSBC, iQiYi

1 Introduction

Artificial Intelligence (AI) is a branch of computer science that aims to create intelligent machines, and enables computers to behave like humans [20]. According to International Data Cooperation (IDC), AI spending will reach \$57.6 billion in 2021. The years 2016-2021 will experience 50.1% compound annual growth rate (CAGR), owing to aggressive investments in AI solutions across multiple industries [22]. Today, AI has evolved to provide many specific benefits in every industry, e.g., finance, manufacturing, retail, healthcare, logistics and transportation, etc. The combination of AI with big data and IoTs will generate even greater value for most companies that are keen in using new information technologies and data applications. For example, in the health care industry, AI applications can provide personalized medicine and treatment based on patients' medical history and health condition. In manufacturing, AI can analyze factory IoT data as it streams from connected equipment to forecast expected load and demand using recurrent networks. In addition, for retailing, AI provides virtual shopping capabilities that offer personalized recommendations for products and services [29]. In the market, the popular AI offerings include Amazon AI services, IBM Watson Assistant, Microsoft Cognitive Services, and Google

AI services.

There are roughly seven popular areas of study in terms of AI technologies [25, 29]:

1. AI automation
2. Machine learning (including deep learning)
3. Machine vision
4. Natural language processing
5. Cognitive computing
6. Robotics
7. Self-driving cars

Past research in the discipline of computer science has discussed intensively about the above topics from multiple layers and perspectives. These topics are highly technical and specialized in a certain research area. The research on the application level and from the management perspective is however rare. In this study, we mainly discuss the applications of three important sub-areas of AI: machine learning, natural language processing and robotics. We intend to understand how these AI technologies are being used in typical financial and video streaming industries. The research questions are presented as follows:

1. What kind of AI technologies HSBC and iQiYi are adopting? And for what purposes?
2. What are the benefits and problems AI bring to both companies?
3. Are there any similarities and differences between both companies in terms of managerial implications?

2. Machine learning, natural language processing and robotics

2.1 Machine learning

Machine learning (ML) is a part of AI that grants machines the ability to learn and make improvements independently from experience without the need for programmers to input the aforementioned comments [6]. It uses methods from neural networks, statistics, operations research and physics to find hidden insights in data without explicitly being programmed for where to look or what to conclude. The primary aim of machine learning is to allow the computers learn automatically without human

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intervention or assistance and adjust actions accordingly. Deep learning is part of the machine learning methods. It uses multiple layers to progressively extract higher level features from raw input, and attempt to mimic how a human brain react [18]. Machine learning has a wide application in a variety of business fields. For example, Netflix uses machine learning as the major technology in the recommendation engine to predict users' watching preferences; the wall street journal uses machine learning to predict the financial crisis [27].

2.2 Natural language processing

Natural language processing (NLP) is the ability of computers to analyze, understand and generate human language, including speech. NLP draws from many disciplines, including computer science and computational linguistics, in its pursuit to fill the gap between human communication and computer understanding. Today, computers or applications (e.g., Siri) can analyze more language-based data than humans, without fatigue and in a consistent, unbiased way [30]. Take smart speakers for an example, thanks to the advanced technology of NLP, Amazon Alexa, Apple Siri, and Google assistant can all understand people's languages and dialects, even with strong regional accents. Business has also used NLP to extract important trends from customer feedbacks and complaints.

2.3 Robotics

Robotics is also a major field related to AI. It is the use of machines (robots) to perform tasks done traditionally by human beings. Robots are widely used in industries such as automobile manufacture to perform simple repetitive tasks, and in industries where work must be performed in environments dangerous to humans. When getting involved with AI, robots may be equipped with the equivalent of human senses such as vision, touch, and sense. Researchers are also using machine learning to build robots that can interact in social settings. The most typical example in our daily life is chatbot. Chatbots are a form of conversational AI designed to simplify human interaction with computers. Using chatbots, computers can understand and respond to human input through spoken or written language. The three examples of chatbots include: customer service chatbots, e-commerce chatbots, and virtual assistants [1].

3. Case studies

3.1 AI at HSBC

HSBC is one of the largest banking and financial services organizations in the world, with operations in 66 countries and territories, and serving more than 39 million clients worldwide. Established in 1865, HSBC aims to finance trade between Europe and Asia [9]. In recent years, HSBC has implemented a series of AI technologies and platforms to enhance daily operations. The three major AI implementation areas are: customer services, investment and securities services, and money laundering services.

3.1.1 AI in HSBC's customer services. Toward the customer service, HSBC mainly adopted the robotic technologies. For instance, HSBC started using a humanoid robot named Pepper in the New York city last year [26]. The major duties of this robot include customer greetings, navigation assistance and answering guests' questions. This robot can also tell jokes and take selfies with customers in order to build a friendly atmosphere. HSBC leverages this kind of robots to relieve bank tellers from the above duties and let them focus on tasks that are more important and increase the overall productivity. The second application of robotics is the online chatbot – Amy. Amy is a virtual assistant that the customers can use via personal computer or smartphone. It generates answers to questions automatically by determining key terms [16]. The purpose of using the chatbot is to cut operating expenses and increase the quality of customer service by changing customer behavior and speeding up the processes [2].

3.1.2 AI in HSBC's investment and securities services. AI has the potential to perform a huge range of investment functions and deliver a wide variety of client benefits. For example, AI helps with investment analysis. The asset managers in HSBC can use the AI tools such as ML and NLP to screen unstructured data from web traffic, social media and mobile devices. The investment team is able to use AI to monitor investments, enhance asset allocation and even for portfolio construction [8]. In addition, customers in HSBC with a minimum of £ 1,000 investment are eligible to use the mobile application - "My Investment" services on PCs or through mobile devices. After completing a short form regarding their past investment experience and financial circumstances, the system (mobile app) will generate a personalized portfolio for each customer by using AI.

3.1.3 AI in HSBC's money laundering services. HSBC applied the analytical technology of Ayasdi, an AI startup, to solve some of their complicated compliance breaches, and more specific, money laundering problems [24]. Anti-money laundering is a massive problem that governments have stepped up their regulatory requirements, oversight and fines. Banks have scrambled to respond to the regulatory burden, and the result is the increasing cost of compliance. Banks have tremendous efforts in compliance checks. Among these efforts, over 95% of anti-money laundering is false positive transactions that are flagged for investigation, but not leading to suspicious activity reports. AI, especially ML and NLP are suitable in such a context. Machine learning has the ability to continually learn and decode patterns; it keeps learning, relearning and unlearning [21]. It uses unsupervised learning techniques automatically to divide customers into groups by analyzing previous and current customer activity and understands how likely they are to be money launderers [3]. The NLP can analyze data, recognize contextual patterns and importance and then convert the data sets into a suspicious transaction report automatically. In sum, by implementing AI technologies, HSBC has increased the likelihood that compliance efforts are efficient, cost-effective, and successful.

3.2 AI at iQiyi

iQiyi is a one of the dominant video streaming platforms in mainland China. Similar with Youtube, users of iQiyi can upload their self-created videos and watch the videos uploaded by other users. Besides providing video sharing services, iQiyi also serves as a video provider, in charge of creating its own dramas and importing videos, dramas, and movies from other video producing companies, e.g., Netflix and TVB. As a technology and innovation driven entertainment company, iQiyi was liked by most of young audiences in China. Starting from 2014, iQiyi has started a disruptive revolution in streaming experiences by using many AI technologies. Its AI innovation has permeated every area of video production and operation, which results in a 15% increase in audience rating [32]. The major areas of AI applications include: content creation and production, personalized recommendation, actor searching, customer service and interaction, relevant advertisement, and so on.

3.2.1 AI in content creation and production. Back to 2014, when iQiyi first started AI, the technologies were used to examine content uploaded by users to assist copyright protection [19]. In the later stage, for video creation, iQiyi used machine learning to analyze the content of novels and stories to find potential IPs, and value/risk of investment [14]. In terms of production, iQiyi uses AI smart editing to deal with tremendous amount of unstructured data, and helps to deal with the tedious post production procedures, e.g., screening, indexing, and tagging, which significantly enhanced the working efficiency, and reduced the use of man power [32].

3.2.2 AI in personalized video recommendation. Today, most of the users will watch videos and movies based on product recommendation scheme from the video stream platform [13]. iQiyi collected users' data from multiple sources, built up behavioral model, used machine learning to generate user profiles, and give personalized recommendations. Furthermore, by leveraging knowledge map and deep learning technologies of AI, iQiyi was able to optimize the video recommendation user model, and developed the unique functions of "private cinema" and "short video simulcast". These functions greatly improved high-end viewers' watching experience [32].

3.2.3 AI in actor searching. Based on the self-developed facial recognition technology, iQiyi developed the largest smart star bank. Based on the information of the bank, iQiyi further presented a smart character selection system – "Yihui". Through NLP and AI smart matching, directors can locate the most suitable actors or actresses for a film [19]. After the film is finished, "Yihui" can further analyze the audiences' comments, and enrich the content in the database. Again, this is AI's continuous learning process.

3.2.4 AI in customer service and interaction. To better serve the online customers, iQiyi developed a smart customer service chatbot – "Qixiaoyi" in 2016. On the basis of big data, ML and NLP, the chatbot has the basic functions to answer users' queries, as well as to infer the hidden meaning in the conversations. To provide a better user experience, iQiyi proposed a new AI-based function – "searching drama based on picture". This has significantly changed the traditional way of drama searching (by texting names), and dramatically reduced the searching time to 0.5

second [14]. Last, iQiyi developed an innovative AI projection screen device – "Dianshiguo", which can project the contents on smart phones and tablets to TV and large-screen projectors. With the assistance of iQiyi HomeAI, users can use their voices to control and interact with "Dianshiguo" [33]. Users can therefore feel free to use any suitable mode to communicate with the device, and enhance users' watching experiences.

3.2.5 AI in advertisement. For advertisement, iQiyi provides pre-video advertisements, pop-up advertisements, in-feed advertisements and innovative advertisements based on content [17]. Regarding to the last type of advertisement, iQiyi has successfully used big data and deep learning to set a connection between drama content and advertisement. For example, in summer 2018, the story of Yanxi Palace (延禧攻略) has arose extensive discussions over iQiyi platform. The context relevant advertisements, as a new form of advertisement, were most welcomed by the Chinese audience. The characters in the drama can jump out of the show, and promote a medicine or new mobile application to another character in the drama. This new type of advertisement can help iQiyi to achieve the dual effects of brand promotion and user experience enhancement [14].

3.3 Evaluation of effectiveness

After introducing the major implementation facts in both companies, we began to evaluate the effectiveness and problems AI bring to both companies.

3.3.1 Effectiveness in HSBC. Financial industry is expected to spend more on AI than any sector in the next few years [23]. AI technologies are beneficial to financial industry and HSBC in particular in many aspects.

First, AI enhances customer experience and increases customer satisfaction. "Customers don't expect you to be perfect, they expect you to fix things when they go wrong", Donald Porter, the V.P. of British Airways believes that "the customer experience is the next competitive battleground." In the environment of online banking, a virtual assistant (Chatbot) is very necessary, and sometimes crucial, in case customers find difficulties in online transaction. In the physical branch, the robot-pepper, with a tablet screen can assist customers in getting more information about products, answering simple questions, or just "having fun". Robots in these cases, are trying to make the banking experience more "human"! [26]

Second, AI reduces the use of labor and increases productivity. For middle office operations, the ability to analyze data for hidden patterns means that AI can replicate much of the work of quantitative analysts, often with lower error rates [26]. That includes detecting investment tail risks, analyzing the performance of portfolio managers and detecting fraud or money laundering. Toward the customer handling, robots and other customer-facing AIs are able to release bank tellers or data analysts from daily greetings or query routines, and let them focus on tasks that are more important for business. All these have greatly enhanced the working efficiency of the internal employees.

Third, AI can help to reduce operational cost, and avoid fines. The integration of AI into HSBC's operations can greatly help prevent money laundering and fraud. First, AI can spot patterns and inconsistencies that would be impossible to uncover by humans; second, it reduces the incidence of false positives, but keep the same level of flagged transactions; third, it can find new cases and patterns directly correlated with fraud and do so faster than humans. By doing so, AI gives HSBC a "win-win" situation, reduces risks and costs less money [15]. In addition, because of the effectiveness of anti-money laundering, HSBC is able to stay compliant with regulations and avoid fines from the government.

3.3.2 Problems of AI in HSBC. The first obvious limitation of implementing AI in most of the financial institutions is the lack of experts in AI and the specific training issue. AI is a fancy idea, however, most of the employees think it is quite difficult to use AI due to lack of professional skills. Developing and operating AI requires significant input from engineers, data scientists and quantitative analysts, especially for machine learning and deep learning [10]. There is currently no specific training available for future job positions at HSBC. Professionals in the fields of conversational interface design, universal service advice, mixed reality experience design and more will have to be sought after [11].

The second problem is that customers cannot fully understand the benefits AI brings to the banking system. Customers of HSBC cannot define the benefits of innovation, which makes it hard for them to trust the new technology. For example, according to HSBC's trust in technology report, the majority of customers do not trust that voice recognition, robo-advice, mobile payments and investment advice are secure enough, and tend to use traditional banking methods [12].

The last one goes with information security. AI needs strong data support. Managing AI is more challenging, since managers need to know how to apply ML and NLP appropriately, but also how to manage big data and cloud computing. More data means more security concerns. In some cases, banks will collaborate with external partners and even outsource significant portions of their AI development. This increases the possibility of data leakage to the third party. In other cases, customers are requested to disclose more information to HSBC to support AI. For instance, more customer detailed information can help to spot unusual patterns and prevent money-laundering activities [5]. Criminals can access these data from cloud-based AI system, and engage in the money laundering process.

3.3.3 Effectiveness in iQiyi. IQIYI is a leading tech-driven online entertainment service company. By leveraging the power of AI, this "Netflix of China" has revolutionized the world of entertainment by increasing the audience rating by 15% and revenue by 57% in 2018 [4]. In general AI benefits the company in the following ways:

First, similar with HSBC, AI helps iQiyi enhance the user experience and productivity. These users include directors and online audiences. AI (Yihui) can help directors to find the right actors/actresses without a need to search them manually. Yihui can tell who is good at what play, and who can star what character.

The application of Yihui can tailor directors' options more accurately and hence improve directors and producers' work efficiency [19]. The AI-based recommender system can understand online users' current moods and emotions. Combining with the knowledge of past watching behaviour, it can provide customized and personalized recommendations. What is more, the robot "Qixiaoyi" and the projection screen device – "Dianshiguo", can both significantly assist the viewers, enhance the user experience and satisfaction, which leads to customer loyalty and stable market share.

Second, AI has upgraded significant parts of iQiyi's entertainment ecosystem, which includes production, distribution, and consumption of content. For content production, AI has the ability to detect copyright issue and direct investment; it can also reduce the time directors find the right actors. For content distribution, users' searching habit has been changed from the traditional searching in the company's content library to the AI recommended pool; from the keyword searching to the picture-match searching; from using the controller by hands to voice-based instruction. In sum, iQiyi set up a good example, and is about to bring revolutionary change to the entire entertainment industry in China by using AI.

Third, AI reduces the operational cost and drives revenue. For example, AI can help automatically recognize the key guests in the reality shows, which enormously reduces operation time. The "smart editing" and intelligent searching functions can also shorten the operational time and minimize production and post-production cost. The tailor-made advertisement can also help to attract more investment, and bring new revenues. Due to the above AI applications, iQiyi's annual revenue keeps soaring over the years. IQiyi even acts as a powerful driver for the revenue of its head company, Baidu. On June 14th, 2018, iQiyi stock surged toward the best day on record right after its announcement of new AI competition.

3.3.4 Problems of AI in iQiyi. IQiyi is still a relatively young company, supported by its parent company – Baidu, it has invested aggressively in AI in recent years. However, similar with any company that is adopting innovative technologies, iQiyi also suffered from major challenges in AI implementations.

First, from the internal operation's perspective, there are some communication problems among different departments of iQiyi. For example, the language used in the content creation department is quite different from the technology department; and the former is lack of confidence in AI technology, and the change AI can bring to iQiyi [7]. Sufficient communication and collaboration among internal parties are strongly needed to improve the current situation. What is more, as a leading streaming company in China, iQiyi should have a way to prove that AI can be and should be used successfully in entertainment industry.

Second, as AI generated more data from users' activities and the spending patterns of services, it raises the problem of data management and delivery. It has been recorded that some users are not able to access videos for a certain period. This is because the AI systems may not be able to handle vast amount of

operational data, which leads to a delay in video content delivery. What is more, some of the “personalized” recommendations may not be that tailor-made to the viewers’ needs. This is partially due to the immaturity or limitation of the AI technologies at the current stage.

Third, iQiyi may also face the security concern of its AI technologies. IQiyi used its AI to replace labor sources, and used it to recognize the faces of actors and actresses. These data include actors and actresses’ time of appearance, characters, suitable dramas and reviews on these celebrities. Due to owning such a large amount of personal information (on not only the celebrities, but also the viewers), iQiyi can easily become the target of cyber attack. On top of that, due to the immaturity of AI technologies, there must be bugs from time to time. Once the cyber problem is detected, attacked and controlled by hackers, the consequences may be catastrophic [28].

4. Managerial implications

Through two case studies on AI, we understood how AI could possibly transform a traditional industry like finance and video streaming. In the last session, we would like to summarize some similarities and differences in terms of their managerial implications.

First, the similarities and differences of the major facts are summarized as below.

| | HSBC | iQiyi |
|--------------------------------|---|--|
| Industry position | Traditional and leading bank in financial industry | New and leading video streaming platform in entertainment industry |
| Major AI technologies | Machine learning (including deep learning), NLP, Robotics | |
| Major application areas | <ul style="list-style-type: none"> • Customer services • Investment and securities services • Money laundering services | <ul style="list-style-type: none"> • Content creation and production • Video recommendation • Actor searching • Customer services and interaction • Advertisement |
| Major benefits | <ul style="list-style-type: none"> • Enhance customer experience and satisfaction • Reduce labor use and increase productivity • Reduce operational cost and avoid fines | <ul style="list-style-type: none"> • Enhance user experience and productivity • Upgrade the entire entertainment ecosystem • Reduce operational cost and drive revenue |
| Major challenges | <ul style="list-style-type: none"> • Lack of talents and training • Customer | <ul style="list-style-type: none"> • Internal communication • Data |

| | | |
|--|---|---|
| | <ul style="list-style-type: none"> • education • Security | <ul style="list-style-type: none"> • management challenges • Security |
|--|---|---|

Table 1: Comparison of the major AI facts

From Table 1, we can see that both HSBC and iQiyi are leading companies in its industry, though one has a relatively long history and another has a short history. From this fact, we can infer that AI technologies are needed in at least these two industries, e.g., from the traditional finance giant to the emerging star in entertainment. In particular, we cannot ignore the rapidly developing role of China and Chinese enterprises in new technology development and implementation. Second, in both cases, due to the industry specific features, the major AI technologies used are machine learning, NLP, and robotics. This shows a relatively clear signal that most of the financial institutions and video stream companies can learn from these two leading companies to pilot the three major AI areas first in their daily operations. Third, in terms of major application areas, though different companies may have various industry-specific needs, AI technologies here are more customer-oriented, with a central idea to help promote a better customer/user experience. AI is also used to analyze a larger amount of unstructured data, and bring new core values to both companies. Forth, besides enhancing customer experience, the major benefits of AI also include reducing operational and manpower cost, and enhancing productivity and efficiency, etc. These facts implied that managers in the technology department have to pay special attention to AI development and usage, especially in the area of customer service, data analytical skills, and new revenue breakthroughs. Last, regarding to the common challenges, both companies are facing threats in data security and cyber security, lack of understanding, knowledge and talents in AI, and insufficient internal or external communication at the current stage. Managers therefore, need to hold a positive posture to welcome the era of AI, but also be cautious in the specific steps in implementation. What is more, business managers and data analytic experts need to work together to help a company smoothly transform to the whole new platform of AI enabled or AI facilitated business model.

5. Conclusion

AI is not a new technological term, the recent explosion of data volumes and computing power has prompted a dramatic re-evaluation of AI. This paper reviews some basics of AI, discusses two cases of AI implementations at HSBC and iQiyi, and evaluates the effectiveness of AI in both companies. After a comparison, managerial implications were given to companies that wish to leverage AI in the near future.

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