Knowledge Management Postprints in the Era of Artificial Intelligence

Authors: Wu Qinghai

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Abstract

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Full Text

Preamble

Knowledge Management in the Era of Artificial Intelligence

Wu Qinghai
Pioneers Alliance Technology (Beijing) Co., Ltd., Beijing 100083

Abstract

[**Purpose/Significance**] This study aims to explore new development directions for knowledge management in the artificial intelligence era. [**Method/Process**] By reviewing the origin and rise of artificial intelligence alongside the 20-year history of knowledge management in China, this paper uncovers the intrinsic relationship between these two domains. [**Result/Conclusion**] As knowledge management enters the KM3.0 stage, its relationship with artificial intelligence will become increasingly close, demonstrating substantial application value particularly in scenarios such as intelligent knowledge indexing, intelligent knowledge search, intelligent

knowledge creation, intelligent knowledge recommendation, and intelligent decision support.

Keywords: knowledge management; artificial intelligence; trends; AI; KM; KM3.0
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In recent years, artificial intelligence (AI) has become a hot topic, with everyone envisioning the profound changes AI will bring to human society, economy, politics, culture, and technology. For knowledge management practitioners, we often discuss Web 3.0, semantic wikis, knowledge graphs, and intelligent search. What, then, is the relationship between artificial intelligence and knowledge management? And where is knowledge management headed in the AI era?

1. The Origin of Artificial Intelligence

Let us begin with the origin of artificial intelligence. The question of how to enable machines to perform intelligent tasks that humans can do has long fascinated many. This led to the 1956 Dartmouth Workshop, which first introduced the term "artificial intelligence" to the world. Although the conference did not achieve its expected outcomes, it secured its place in history for establishing the term, and most participants went on to become leading figures in the field.

John McCarthy, the convener of the conference, is hailed as the "father of artificial intelligence." He invented the LISP programming language and established AI laboratories at MIT and Stanford, receiving the Turing Award in 1971, the U.S. National Medal of Science in 1991, and the Franklin Institute Medal in 2003. Another active participant, Marvin Minsky, stands as an AI godfather comparable to McCarthy. He founded AI framework theory and developed the world's earliest robots, earning the Turing Award in 1969 as the first person in the AI field to receive this honor.

However, AI development has not been smooth sailing. Many expectations for AI failed to materialize into substantial breakthroughs, leading numerous institutions to reduce investment in AI research and causing AI computer talent to be marginalized. It was not until 60 years later that a human-computer Go match refocused global attention on artificial intelligence.

2. The Rise of Artificial Intelligence

In 2016, AlphaGo competed against Lee Sedol, a world Go champion and professional 9-dan player, ultimately winning with a total score of 4:1. In May 2017, at the China Wuhen Go Summit, AlphaGo defeated Ke Jie, the world's

top-ranked Go champion, with a clean sweep of 3:0. By October 2017, the new generation AlphaGo Zero, employing novel AI algorithms and self-learning training, achieved a 100:0 victory over its predecessor in just three days.

Mr. Bai Yong, General Manager of Google Greater China's Channel Business Division, once shared that training the first-generation AlphaGo to learn Go took nearly two years, whereas training the second-generation AlphaGo Zero took less than 10 hours. The most powerful aspect of machine learning lies in its self-learning capability, and deep machine learning made AlphaGo the catalyst for the AI explosion.

After more than 60 years of ups and downs, why has AI been able to erupt at this moment? Experts have offered various perspectives, but a consensus has emerged around three key capabilities humanity has developed: first, access to ultra-large-scale data; second, possession of powerful computing capacity; and third, development of exceptionally sophisticated algorithms. Based on the integrated application of data, computing power, and algorithms, the victory of AI-powered AlphaGo over humans becomes comprehensible.

As the AI era arrives, many have begun to realize their "rice bowls" are at risk. Stanford professor Jerry Kaplan conducted a statistical analysis showing that among 720 registered professions in the United States, 47% will be replaced by AI, while in countries dominated by low-end technology and manual labor, this proportion could reach 70%. In 2000, Goldman Sachs employed 600 traders at its U.S. cash equity trading desk in New York. Today, only two traders remain. Deloitte's latest financial robots can replace 15 finance personnel while operating 24/7 without interruption.

Which jobs are less likely to be replaced by AI? Figure 2 illustrates this divide: the blue zone on the left represents job categories where AI will replace and surpass humans, while the orange zone on the right shows job types where AI will serve as a tool and assistant. Evidently, future professions resistant to AI replacement primarily involve complex decision-making, compassionate companionship, creative intuition, and humanistic spirit—such as corporate leaders, business service personnel, teachers, elderly care workers, artists, scientists, psychologists, and religious professionals.

Professor Nils Nilsson of the Stanford AI Center stated: "Artificial intelligence is the science of knowledge—how to represent knowledge, how to acquire knowledge, and how to use knowledge." On one hand, AI-powered robots will replace many human jobs. On the other hand, AI itself requires more people to train it, to research knowledge representation, knowledge acquisition, and knowledge utilization.

For those who build bridges between AI and humans—such as teachers, experts, model builders, and algorithm designers across various industries—there will undoubtedly be broader career development space. Knowledge management practitioners (KMers) are also gaining increasing importance. By managing and operating knowledge, making tacit knowledge explicit and explicit knowledge

standardized, they are precisely performing this intermediary translation and transformation work.

3. China's 20-Year Knowledge Management Journey

If we take 1998, when the term "knowledge economy" entered China, as the starting milestone, knowledge management has undergone 20 years of development in the country. Upon reviewing, organizing, and analyzing major knowledge management milestones in China, we find that every six or seven years, knowledge management undergoes significant transformation. Broadly, it can be divided into several stages: the embryonic period, KM1.0, KM2.0, and KM3.0, as shown in Figure 3.

3.1 Embryonic Period (1998–2004)

Many foreign scholars began researching knowledge management in the 1960s. The OECD published the landmark report "The Knowledge-Based Economy" in 1996, defining the knowledge economy as one based on knowledge. After 1998, the term "knowledge economy" frequently appeared in public media, magazines, and journals. Numerous university scholars, such as Dong Xiaoying from Peking University, Zuo Meiyun and Zhang Bin from Renmin University of China, Gu Xinjian from Zhejiang University, and Li Rongbin from Hong Kong Polytechnic University, began researching knowledge management, marking China's entry into the embryonic period.

Simultaneously, websites like China Knowledge Management Network, China CKO Learning Organization Network, and CNKI were established. Books such as Wang Delu's "Knowledge Management: The Source of Competitiveness" and "IT Implementation of Knowledge Management," Xia Jinghua's "Knowledge Management," Dong Xiaoying's translation of "The Knowledge Management Toolkit," and Yang Kaifeng's translation of "Harvard Business Review on Knowledge Management" played crucial roles in disseminating and popularizing knowledge management concepts, methods, and theories.

Some internationally renowned IT vendors (e.g., IBM, Microsoft) and management consulting firms (e.g., McKinsey, Bain, Accenture), based on their 朴素认知 and practice of knowledge-based services, recognized the future development trend of knowledge management and advocated for it as evangelists. HP even established China's first Chief Knowledge Officer (CKO) position, held by Gao Jianhua. Leading domestic enterprises such as Lenovo, Haier, TCL, Sanjiu, and Neusoft began experimenting with knowledge management during this period.

3.2 KM1.0 Period (2005–2011)

Starting around 2005, more enterprises (e.g., China Mobile, Livzon Pharmaceutical, Gemdale Group, China Merchants Securities, Tsingtao Brewery, Capital Airport, Siemens China, Huawei) began further exploring and implementing

knowledge management. Various knowledge management forums and salons emerged across China, ushering in the KM1.0 "exploration phase," with knowledge management becoming a widespread trend.

During this stage, enterprises primarily focused on building knowledge management IT systems, emphasizing document management, knowledge classification, permission settings, knowledge search, and knowledge portals. Internally, management emphasized standardization, normalization, and integration. Different organizations, combining their business characteristics, explored effective knowledge management implementation, creating a vibrant and diverse landscape.

During this period, the National Knowledge Management Standardization Technical Committee (referred to as "Knowledge Standards Committee") was officially established in February 2015, holding its inaugural conference. Managed and guided by the National Intellectual Property Administration, its secretariat is located at the China National Institute of Standardization and the Patent Management Department of the National Intellectual Property Administration. The first national knowledge management standard, GB/T 23703.1-2009, incorporating the wisdom of numerous knowledge management practitioners and researchers, was officially promulgated in 2009. Subsequently, other knowledge management standards were developed, with a total of 10 standards released to date.

3.3 KM2.0 Period (2012–2018)

Since 2012, impacted by Internet Web 2.0 and the comprehensive, deep influence of mobile internet applications on society and enterprises, more companies (e.g., COFCO Research Institute, New Oriental, China Aerospace, Baosteel, Tencent, Alibaba, Baidu) began entering the field. They continued to explore knowledge management models through new approaches such as knowledge communities, employee networks, expert yellow pages, team spaces, and wiki entries, with Chinese enterprise knowledge management practice entering the KM2.0 "enhancement phase."

As the most authoritative knowledge management award globally, the MAKE (Most Admired Knowledge Enterprise) Award, known as the "Oscar" of knowledge-based organizations, was introduced to China in 2011, playing a positive role in benchmarking domestic organizational knowledge management practices. In the inaugural evaluation, seven mainland Chinese enterprises, including Baosteel, China Merchants Bank, China Merchants Securities, Fujian NetDragon, Siemens China, Tsingtao Brewery, and Yonyou Software, won the 2011 China MAKE Award, with China Merchants Bank, Fujian NetDragon, and Siemens China also receiving the 2011 Asian MAKE Award.

As companies engaged in benchmarking and learning from each other, Chinese knowledge management practitioners began spontaneously forming alliances. Starting in 2014, through crowdfunding and crowdsourcing, knowledge management practitioner forums were held at COFCO, Tencent, and the Chinese

Academy of Sciences. Frontline KMers from enterprises gathered to share practical experiences and learn together. Subsequently, the China Knowledge Management Alliance (CKMA) was established, successfully holding its inaugural conference in Beijing's Dahongmen in October 2015. The Innovation and Knowledge Management Alliance (IKMA) was also established, with its inaugural conference held alongside the 9th Asia-Pacific IKMAP Summit in Hangzhou in November 2018.

During this period, the best practice collection "The Secret of Knowledge + Practice" was systematically planned, crowdsourced, and revised, with the first and second volumes published in 2015 and 2017 respectively. These volumes provided readers with fresh and valuable first-hand materials from outstanding domestic knowledge management cases, including China Aerospace First Academy, COFCO Research Institute, Huawei, New Oriental, China Merchants Securities, Alibaba, Yuexiu Group, Neusoft, Arup, Baidu, Baosteel, CCDI, Far East Holding, and Yonyou University. The case collection became essential reading for KMers, inspiring different thoughts and associations upon repeated reading.

Additionally, the pure online academic journal *Knowledge Management Forum* (ISSN 2095-5472, CN11-6036/C), supervised by the Chinese Academy of Sciences, hosted by the National Science Library of the Chinese Academy of Sciences, and published by the *Library and Information Service* Magazine Press, was completely revamped with a new editorial board in 2016.

3.4 KM3.0 Period (2019–)

After years of accumulation and 沉淀, many Chinese enterprises have begun to emerge, moving from excellence to distinction. As they advance toward the high end of industry value, many have entered uncharted territories and deep waters. In 2019, as international competition intensifies and China finds itself at the center of global transformation, the competition for knowledge originality has risen to a strategic height. Against this backdrop, rethinking and repositioning knowledge management is imperative.

At the 2007 Global Semantic Conference, N. Spivak et al. proposed that through two dimensions—social connection and knowledge reasoning—Web development can be divided into four quadrants: Web 1.0, Web 2.0, Web 3.0, and Web 4.0 (Figure 4). Web 3.0, the "Semantic Web," aims to enhance the dimension of knowledge reasoning, emphasizing connections between knowledge, semantics, and ontology—precisely the scope of artificial intelligence technology. Therefore, KM3.0 must leverage the AI wave to achieve comprehensive upgrading.

4. AI Application Scenarios for Knowledge Management

For enterprise knowledge managers, it is essential to explore how to integrate artificial intelligence with daily work. This is the question KM3.0 must address. Based on existing research and practice, current AI-era knowledge management

application scenarios can focus on five key areas: intelligent knowledge indexing, intelligent knowledge search, intelligent knowledge creation, intelligent knowledge recommendation, and intelligent decision support (Figure 5). Each aspect can be expanded into numerous sub-scenarios for deep exploration. We need to analyze, identify, and excavate pain points within enterprises, considering how to use technical and managerial means to solve these problems and maximize benefits. Below are several general scenarios for illustration.

4.1 User Profiling Application Scenario

We recognize the importance of users and aim to tag them with various labels to gradually form complete user characteristic profiles. In practice, we can typically collect certain user data and information to achieve this. For example, we might create a user information table for a Ms. J. K. Rowling, including gender (female), age (28), education (master's degree), department (Quality Department), position (Testing Supervisor), work experience (3 years), and hometown (Shandong), as shown in Figure 6.

However, such data often only forms a general sense of "self." The deeper "self" remains unknown. If we can collect more user data—for instance, that she is the president of the "Cat Lovers" community, regularly participates in learning activities, is a loyal fan of the "Dedao" app, and enjoys writing and sharing insights on "Mubu"—through behavioral data collection and analysis, we can supplement additional information beyond basic characteristics and understand her at a deeper level. Analysis might reveal that this user, J. K. Rowling, is actually very studious, experiences some knowledge anxiety, is socially active, enjoys sharing, loves cats, has compassion, is a foodie, aspires to become a professional writer, wants to try innovative work, and volunteers for public welfare activities. If these deeper aspects of "self" can be automatically tagged and categorized, enterprises can gain profound insights into users, truly returning business essence to the customer.

4.2 Knowledge-Enabled Daily Work Scenario

Employees work diligently in organizations daily, completing tasks based on business processes, activities, and scenarios. Regardless of job nature, employees generally need to formulate work plans before tasks and conduct work summaries afterward, completing a closed-loop work chain of "before-during-after." This chain links to many related scenarios: work planning connects with work calendars, which further connect with project planning and meeting activities; work planning also links with project summaries and knowledge extraction scenarios. These work scenarios are interrelated, either through strong constraints in upstream/downstream processes or weak coupling in collaborative relationships. We can construct a Work Breakdown Structure (WBS) around the "task" dimension.

After clarifying the "task" dimension, we must associate the "knowledge" di-

mension. When executing a work task, inputs include not only machinery, equipment, materials, and environment but also critical knowledge-based inputs such as standards, specifications, processes, guidelines, cases, and lessons learned. After completing the task, outputs include not only tangible objects like parts, components, and products but also knowledge-based outputs such as reports, solutions, drawings, models, papers, patents, and courseware (Figure 7).

Only by interconnecting "people," "tasks," and "knowledge" can we achieve precise knowledge recommendation based on people and tasks. So-called "knowledge work automation" is essentially precise matching among "people," "tasks," and "knowledge." The higher the matching degree, the higher the automation level of knowledge work. Many enterprises expect knowledge management to be deeply embedded in business processes, but without precise matching among these three elements, the integration of knowledge management and business will forever remain an empty slogan.

4.3 Seamless KM-Business Integration Scenario

Starbucks recently launched an intelligent mobile app called "My Starbucks Barista." Customers can simply place orders through voice or text interaction, enabling coffee and food reservations, mobile online payments, and more (Figure 8), significantly saving queuing time, reducing labor intensity for counter staff, and improving overall operational efficiency.

This AI assistant is a typical question-answering robot, involving speech recognition, natural language understanding, semantic parsing (e.g., word segmentation, attribute recognition), rule engines, machine learning, and multi-turn dialogue technologies. Its core involves constructing a knowledge item database, requiring clustering of common user questions and answer matching and response, supplemented by automatic analysis and intelligent knowledge point maintenance to form a continuously learning and evolving customer service Q&A robot.

5. Summary and Outlook

Based on the important AI-era knowledge management application scenarios described above, we outline a layered technical architecture for AI-enabled knowledge management, including the infrastructure layer, technical layer, and application layer (Figure 9).

For AI capabilities to be implemented, hardware is a necessary carrier. The underlying infrastructure layer requires appropriate hardware infrastructure (such as CPUs, GPUs, FPGAs, networks, databases, and security) to support large-scale parallel computing, data storage, and accelerated computing. Simultaneously, corresponding big data, algorithms, and computing power provide indispensable foundations for AI development.

The middle technical layer is the core of AI development and plays a decisive role in the intelligence level of application layer products. Technologies involved include perception-related technologies, cognition-related technologies, and AI technology open platforms.

The application layer achieves integration with different knowledge management scenarios based on the infrastructure and technical layers. For organizations (B2B scenarios), this includes automatic knowledge classification, automatic clustering, intelligent search, and intelligent decision-making. For individuals (B2C scenarios), this includes Q&A robots, intelligent recommendation, automatic content creation, and automatic translation. Through these scenarios, AI can truly empower knowledge management and enhance its overall application level.

We observe that technological progress and development advance at a breathtaking pace, with innovation and breakthroughs continuously accelerating. Similar application scenarios across various industries will gradually increase. As more business rules become standardized and coded, mechanical and repetitive work will progressively be replaced by machine intelligence, gradually liberating human productivity. This raises deeper questions: Where should humanity go from here? If benevolent AI creates a world of material abundance, how should humans spend their free time and energy? What will remain uniquely human and impossible for AI to imitate and surpass? Will it be human intuition, creativity, and wisdom? How can we enhance human consciousness and spiritual energy levels in these areas? Will a new form of humanity evolve?

Corresponding to AI, will Human Wisdom (HW) develop in parallel? Human wisdom represents a special mode of operation at the advanced psychological consciousness level, with unique agency and creativity that current AI finds difficult to imitate. Meanwhile, AI, facing massive amounts of data, tirelessly collects, stores, computes, analyzes, and outputs—does this not serve as an external extension of the human brain to some extent?

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Author Bio: Wu Qinghai (ORCID: 0000-0003-3289-905X), Chief Consultant, Ph.D., E-mail: wqh@sunxz.cc.

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