

A Preliminary Study on Knowledge Management of Aerospace Enterprises Based on GPT Hybrid Large Model

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Abstract: With the continuous development of aerospace science and technology, aerospace enterprises are facing increasingly complex knowledge management problems. Traditional knowledge management methodologies have no longer been able to meet the rapidly changing internal and external challenges. In response, this paper introduces a cutting-edge knowledge management framework based on Generative Pre-trained Transformer (GPT) hybrid large model. This framework harnesses the synergy of Natural Language Processing (NLP) and deep learning technology. Therefore, intelligent acquisition, organization, sharing and application of knowledge are realized to improve the innovation ability and competitiveness of aerospace enterprises.

Keywords: knowledge management, GPT hybrid large model, aerospace enterprises

1 Introduction

"Success" represents the perpetual quest of aerospace enterprises. Only by continuously improving resource allocations, reducing management costs, and carrying out efficiency reforms can aerospace enterprises go steps further into the historical missions of strengthening the military and the nation. In the era of the knowledge economy, knowledge resources are the core of production materials. The success of an enterprise requires an extensive repository of knowledge as its foundation [1, 2]. Therefore, how to effectively manage knowledge in aerospace enterprises is the top priority of management theories.

As shown in Figure1, enterprise knowledge management refers to a kind of management activity aimed at improving enterprise's performance and competitiveness by integrating, sharing, transmitting and utilizing internal and external knowledge resources [3, 4]. This includes various stages such as knowledge acquisition, organization, storage, transmission and usage, ensuring that enterprise's members can access correct knowledge resources anytime and anywhere [5]. This facilitates informed decision-making and appropriate actions. Enterprise knowledge management can establish sustainable knowledge resources, thereby improving enterprise's decision-making capacity, innovation ability, work efficiency, and market share [6, 7].

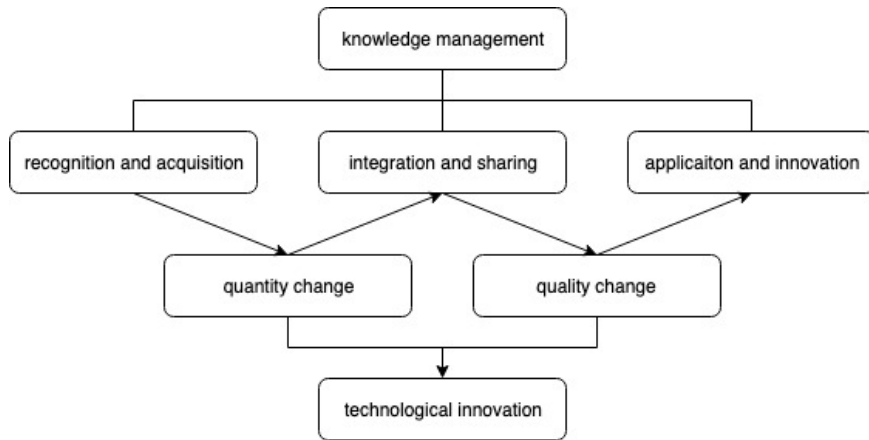


Figure 1. Schematic diagram of knowledge management of aerospace enterprises.

Knowledge can be divided into explicit knowledge and tacit knowledge, according to whether it can be clearly expressed and effectively transferred [8]. Explicit knowledge refers to knowledge that can be clearly expressed, documented, and communicated, typically existing in the form of text, numbers, images, etc., such as in books, reports, and documents. On the other hand, tacit knowledge refers to knowledge that is difficult to be systematized and communicated, usually existing in the form of personal experiences, cognitions and emotions, exemplified by skills, insights and intuitions. As an obvious conclusion, tacit knowledge requires person-to-person communications and interactions [9].

The need for self-improvement demand in aerospace enterprises have made traditional knowledge management approaches insufficient. Aerospace enterprises urgently need a more intelligent and efficient knowledge management method to maintain their competitive advantages [10]. On this basis, artificial intelligence, data mining methods and machine learning algorithms are introduced and applied to optimize enterprise knowledge management models [11, 12, 13]. The advent of Generative Pre-trained Transformer (GPT) technologies is particularly oportune [14].

Aerospace enterprises can leverage GPT by incorporating natural language processing and deep learning technologies to standardize and make knowledge management more intelligent [15]. By continuously improving the capabilities of acquiring, inheriting, sharing, and applying knowledge, aerospace enterprises can better cope with more complex situations and challenges across the industry.

Based on the considerations mentioned above, this article tentatively investigates the application of a hybrid GPT large-scale model in the realm of knowledge management. The objective of this inquiry is to assist aerospace enterprises in sustaining an elevated degree of technological autonomy, and fulfilling their fundamental duty of supporting national defense infrastructure.

2 Current situations and challenges

2.1 Current situations of knowledge management in aerospace enterprises

The core operations of aerospace corporations predominantly encompass models and pre-research projects. Aerospace projects are intrinsically complex system sciences with durations ranging from 5 to 10 years or even more. Throughout the extensive lifecycle of a project, i.e., encompassing initiation, design, testing, realization, acceptance, service, post-sales support, promotion, and transformation, a vast repository of knowledge is generated that requires meticulous management and preservation.

Recently, technologically advanced methods of knowledge management have achieved significant milestones. For instance, certain enterprises have conducted thorough analysis of project cost data requirement, developed structured framework for cost data system, and established comprehensive cost database. These enterprises have efficiently managed explicit knowledge using sophisticated quality information system and financial management system. Moreover, they also held innovation exchange conferences, where various research units conducted on-site exchanges of innovative achievements, showcasing the innovative works of skilled talents. Labor competitions, actual productions and skill master studios are also organized to transfer tacit knowledge, which tackle technical skills challenges and talent development [16].

These initiatives effectively integrate explicit knowledge and tacit knowledge. These methodologies successfully transform technology and management achievements in practical production activities, and play guiding roles in the development of aerospace enterprises and the revitalization of national science and technology.

2.2 Challenges of knowledge management in aerospace enterprises

The core business of aerospace enterprises often involves substantial financial investments, extensive human resources, and long-term commitments. The failure of a project could result in significant losses. The primary challenges they face include:

- (1) High-risk decisions, which requires accurate intelligence, data and scientific analysis.
- (2) Large-scale project managements, which involves large teams and multiple departments, requires efficient management concepts and tools.
- (3) Complex technical problems, which needs to be solved by senior scientists, experienced engineers, and skillful technicians.

With the increasingly complex and changeable competitive environment, the current knowledge management theories and methods have some deficiencies, primarily in the following areas:

- (1) It is difficult to acquire knowledge. Aerospace enterprises often value more research than management. They tend to collect, preserve, transmit, and share knowledge that is more research-oriented, such as investigative reports, design proposals, papers, patents, and blueprints. However, there is a lack of proficiency in abstracting management theories and acquiring managerial knowledge. Management experience is frequently fragmented and

unsystematic, lacking in integration and coherence. This leads to increased time and labor costs in management.

(2) It is difficult to transfer knowledge. Aerospace enterprises and teams are often relatively independent, and there is a lack of awareness of knowledge sharing. Additionally, under the context of specialized subdivisions, researchers and managers may fear that transferring knowledge could diminish their own competitiveness or introduce other potential risks, which hinders the exchange and sharing of knowledge.

(3) It is difficult to use knowledge. The ultimate goal of corporate knowledge management is to convert knowledge into enterprise value. However, in the actual production processes, because researchers and managers often adopt strategies specifically tailored to their own tasks, there is a lack of macroscopic thinking regarding the systemic and holistic aspects of aerospace enterprises. The linkage between knowledge and business operations is weak, which prevents the full realization of knowledge management benefits.

Therefore, knowledge management needs to be elevated to the strategic development level of aerospace enterprises. The existing knowledge management methods cannot meet the needs of aerospace enterprises. A more intelligent and efficient knowledge management approach is needed to achieve new breakthroughs.

3 Knowledge management based on GPT hybrid large models

3.1 Overview of GPT hybrid large model

GPT is a deep learning model based on Transformer architecture, which has made remarkable achievements in content generations. It has been widely studied and applied in the fields of text generation, machine translation, emotion analysis, etc. Compared with the traditional NLP method based on rules or templates, it has stronger generalization ability and can automatically learn through a large amount of data. The followings are main applications of GPT hybrid large models:

(1) Content extraction. It can be used for classification and regression tasks. It extracts key information from the text through coding and understanding, which is convenient for users to acquire knowledge, such as documents collection, abstracts generation, relationships extraction, reports classification, results analysis, etc.

(2) Content generation. It can be used for continuous text sequence generation tasks, such as text polishing, content processing and other scenarios, facilitating user knowledge expansion, such as articles, reports, feelings, stories, etc.

(3) Content retrieval. It can be used for retrieval appropriate answers based on users' questions and semantics. This capability is especially suitable for intelligent search engines, intelligent assistants, dialog systems, and chat robots, etc.

In general, GPT hybrid large model has a strong generalization ability and adaptability, which has brought great breakthroughs to various fields.

3.2 GPT hybrid large model empowers knowledge management

GPT hybrid large model holds significant direct and potential value in knowledge management. It enables enterprises to acquire, organize, share, and apply knowledge more intelligently. It enhances the efficiency and quality of knowledge management. Here are some leverage points of GPT hybrid large model in knowledge management:

- (1) Knowledge acquisition. It can intelligently extract valuable knowledge from an abundance of documents, reports, patents and other data sources to help enterprises quickly grasp the industry developments and technological trends. This ability makes knowledge acquisition more accurate, efficient and convenient.
- (2) Knowledge organization. It can build an intelligent knowledge graphs and label systems, structuring and categorizing knowledge to improve management efficiency and reduce the waste of human resources. This aids enterprises in focusing on knowledge processing, swiftly locating and retrieving more practical issues.
- (3) Knowledge sharing. It can facilitate knowledge exchange and collaboration among different departments and teams through an intelligent knowledge sharing platform. It can also be automatically pushed to relevant users to improve the utilization rate of knowledge.
- (4) Knowledge application. It can be employed in decision support systems, utilizing smart knowledge application and innovation to assist enterprises in making wiser decisions, better addressing market challenges, and driving technological innovation.
- (5) Knowledge updating. It can monitor and analyze changes in knowledge in real time, promptly updating and correcting the knowledge base to ensure the accuracy and timeliness of knowledge resources.

In summary, the intelligent features of GPT hybrid large model can effectively address the long-tail problems in enterprise knowledge management, enabling more efficient management of knowledge resources and enhancing the competitiveness and innovation capacity of enterprises.

3.3 Knowledge management methodology based on GPT hybrid large model

GPT hybrid big model is strong in semantic understanding, strong in knowledge representation, strong in logical reasoning, strong in knowledge completion, enhancement and generation, which undoubtedly opens a new door for the knowledge management work of aerospace enterprises. Therefore, it is expected to take a higher level of knowledge management with digital intelligence. Aerospace enterprises require an efficient, intelligent and personalized knowledge management system. The problems existing in the previous system, such as "heavy precipitation, light application", "more artificial, less intelligent", are expected to be alleviated and solved through the introduction of this technology, so as to better meet the knowledge empowerment requirements of the digital intelligence era of aerospace enterprises.

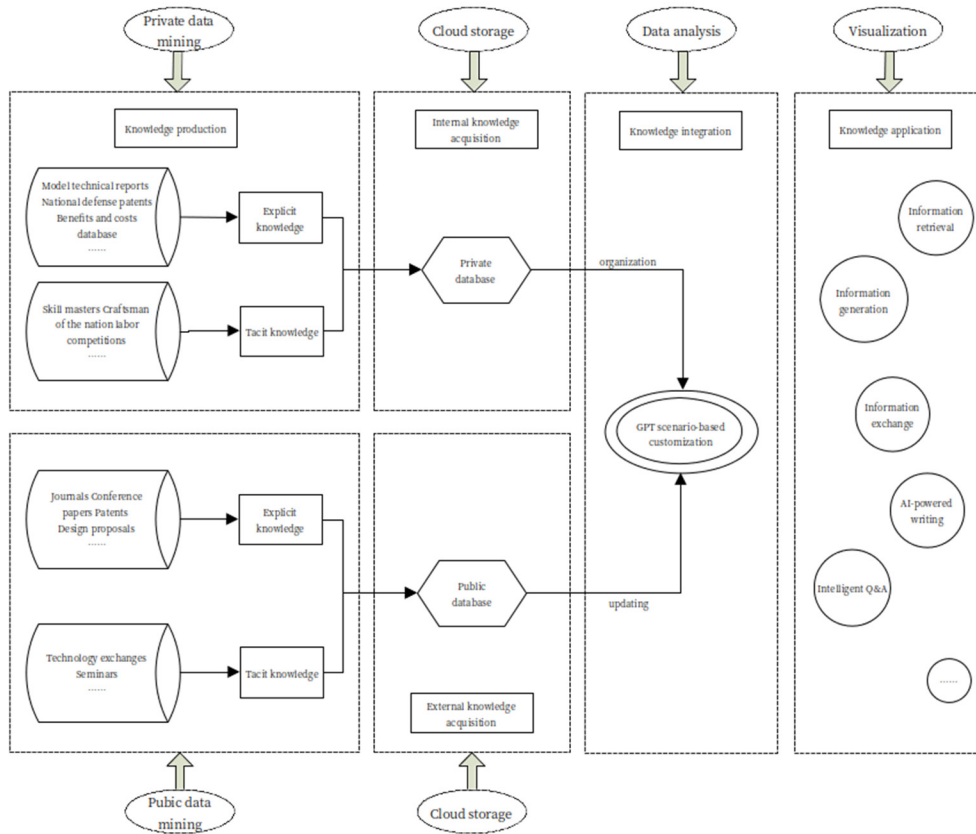


Figure 2. Schematic diagram of knowledge management of aerospace enterprises.

As shown in Figure 2, to make good use of the GPT hybrid large model, aerospace enterprises themselves involve several key initiatives:

(1) Build a knowledge database belonging to the vertical sector of aerospace enterprises. GPT, built on public domain database, cannot replace the knowledge management found within the private database of aerospace enterprises. Transitioning from public domain data to private domain data required by an enterprise is a process from ambiguity to certainty. This involves the architecture and design of knowledge software system, the sorting and importing of existing knowledge, and the production and accumulation of new knowledge. All foundational tasks need to be performed with care and precision, step by step.

The sources of knowledge for aerospace enterprises can be incredibly extensive, including technical articles, conference papers, patents, project reports, and managerial insights, scattered across various channels and formats. Initially, public domain GPT model can be utilized to extract valuable knowledge from an extensive array of documents, reports, and patents. Once the knowledge database has grown to a significant size, a private GPT model for the aerospace enterprise can be trained. With data as the driving wheel, transitioning from an open loop to a closed loop, it is essential to lay a solid foundation for knowledge infrastructure.

(2) Construct a knowledge-sharing platform system. On the basis of knowledge infrastructure, it is possible to structure and categorize the acquired knowledge, effectively interlinking different domains to create an intelligent knowledge graph and establish a comprehensive tagging system. The planning of the knowledge-sharing platform system can follow the logic of "Online integration—Scenario-based customization—Intelligent advancement." to upgrade.

(a) Online Integration: Centered on the core of knowledge classifications and storages, focused on knowledge collections. Build a foundational platform for knowledge accumulation through the construction of knowledge database, knowledge categorization, and knowledge searching.

(b) Scenario-based Customization: Centered on the core of knowledge refinement and integrations, focused on business scenarios. Enhance the application level of knowledge by aggregating knowledge, developing knowledge graphs, and integrating systems.

(c) Intelligent Advancement. Centered on the core of intelligent knowledge services, focused on intelligent creations. Further elevate the level of intelligence through AI-powered writing, intelligent Q&A, AI assistants, etc.

These approaches facilitate knowledge retrieval and sharing, making it convenient for the exchange and collaboration of knowledge. They combine knowledge with practical issues, carry out reasonings and analyses according to historical data, and realize the applications of knowledge in decision-making and innovation.

(3) Return to the essence of humanity, tap into human creativity and potential. At its core, the GPT hybrid large model continuously generates data by maximizing probabilities, which still follows the computational irreducibility and cannot independently create new knowledge. However, it can serve as a vessel for the transmission of knowledge, effectively recording and organizing the expertise and experience of the older aerospace professional generation. This helps the new generation integrate more rapidly into their roles. This also bridges knowledge gaps and ensures the long-term stable development of aerospace enterprises. Moreover, it is through the legacy of knowledge that innovation arises. Through ongoing analysis and exploration of knowledge, one can discover patterns hidden within vast amounts of data, provide robust support for the innovation efforts of aerospace enterprises.

3.4 Knowledge management practices based on GPT hybrid large model

The following is an application case of a certain Chinese aerospace enterprise. Contract management is an important part of knowledge management in aerospace enterprises. Under the current data technology means, aerospace enterprise contract management mainly faces the following difficulties:

(1) There is a vast number of contracts, making it difficult to query through them.

(2) Budgeting for contract costs is overly complex, making it hard to accurately forecast the budget.

(3) Drafting and reviewing contracts might require collaboration between legal and business personnel, which can be time-consuming.

As shown in **Table 1**, after using internal data for retraining and reinforcement, GPT is like an

experienced contract senior expert, systematically analyzing, understanding, and extracting information from text data, finding the optimal solution from it, and assisting in contract management work. The contents produced after retraining aligns more closely with the unique features of Chinese aerospace enterprises, making it more efficient and user-friendly for contract managers.

Table 1. GPT application of contract management in a certain Chinese aerospace enterprise.

	GPT original version	GPT Scenario-based customization
Q1	Generate a payment contract template for China Aerospace XXX Research Institute	
A1	<p>I can't find a specific contract template for the China Aerospace XXX Research Institute directly. However, some key elements can be extracted from the related procurement information, which may be helpful in formulating a payment contract.</p> <p>For example, there are two procurement projects published on the National Advanced Technology Transformation Application Public Service Platform. One is about "the development of a certain model of thermal test heating plate", and the other is about "the development of surface source black body". These procurement projects mentioned key terms such as payment methods, participation methods, bidding methods, etc. For example, the payment method is usually "payment upon acceptance", which means that payment will be made after the product or service is accepted. In addition, it also mentioned the documents that need to be submitted, such as detailed quotation and a copy of the business license.</p> <p>Although these information do not constitute a complete payment contract template, they can be used as a reference when formulating a contract. If you need a more detailed contract template, it is recommended to directly contact the China Aerospace XXX Research Institute or relevant legal professionals to obtain accurate and applicable templates.</p>	<p>I found some relevant information. Including technical requirements, indicators, parameters, and payment methods, etc...</p> <p>Contract template</p> <p>In accordance with the provisions of the "Civil Code of the People's Republic of China", the two parties to the contract have reached an agreement through consultation and signed this contract for the technical development of the XXX project.</p> <p>1 Party A name: Unified social credit code: Contact person: 2 Party B name: Unified social credit code: Contact person: ... 11 Requirements, content, and form of the subject technology: 12 Technical indicators and parameters to be achieved: 13 Research and development plan: 14 Research and development funds, remuneration, and payment or settlement methods: 15 Technical cooperation and technical guidance content: 16 Ownership and sharing of technical results: 17 Risk responsibility: 18 Acceptance method: 19 Calculation amount of liquidated damages or loss compensation: ... Signature of Party A representative: Signature of Party B representative:</p>
Q2	<p>Review the following contract for compliance according to the contract management regulations of the China Aerospace XXX Research Institute:</p> <p>Goods sales contract Contract number: XXX Party A: AAA Limited Liability Company Unified social credit code: XXX Contact person: AAA Party B: BBB Limited Liability Company</p>	

	<p>Unified social credit code: XXX Contact person: BBB 1 Requirements, content, and form of the subject technology: XXX 2 Technical indicators and parameters to be achieved: XXX 3 Research and development plan: XXX 4 Research and development funds, remuneration, and payment or settlement methods: XXX The research and development funds and remuneration for this project: XXX CNY Funds and remuneration payment methods and time: One-time payment: XXX CNY, time: XXX Installment payment: XXX CNY, time: XXX 5 Technical cooperation and technical guidance content: XXX 6 Ownership and sharing of technical results: Patent application right: XXX 7 Risk responsibility: XXX 8 Acceptance method: XXX 9 Calculation amount of liquidated damages or loss compensation: XXX 10 This contract is from XXX year XXX month XXX day to XXX year XXX month XXX day</p>
A2	<p>In order to determine whether a contract complies with the contract management regulations of the China Aerospace XXX Research Institute, it is necessary to carefully review various aspects of the contract. It should be noted that this is a basic review framework. The specific compliance review needs to refer to the specific contract management regulations of the China Aerospace XXX Research Institute and relevant laws and regulations.</p> <p>1 The contract number format lacks corresponding content 2 Party B does not meet the cooperation requirements for XXX reason 3 The transaction amount is not written in a standardized manner, it should be XXX, lacking tax amount, lacking capitalization of the amount 4 Should not adopt the one-time payment method for settlement, should adopt the installment method for this contract settlement 5 The contract validity period is too short, the warranty period should be added</p>

4 Conclusions

This article mainly introduces the knowledge management method of aerospace enterprises based on GPT hybrid large model. By analyzing the current situations and challenges of knowledge management in aerospace enterprises, we found that traditional knowledge management methods have been difficult to meet the needs of aerospace enterprises under the new era and new background. To solve this problem, GPT hybrid large model technology is introduced and formed the aspects of knowledge acquisition, organization, sharing and application. we discuss its direct and potential value in knowledge management of aerospace enterprises. Through intelligent knowledge acquisition and organization, aerospace enterprises can utilize knowledge resources more efficiently. Furthermore, through intelligent knowledge management and application, these enterprises can better drive technological innovation.

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