



AI Strategic Transformation Ideas and Application Practice Direction of Telecom Operators

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Abstract. when GenAI reshapes the technology boundary in a monthly cycle, the global telecommunications industry is undergoing a quiet revolution. Operators are no longer willing to "pipe" the fate, but instead compete for the infrastructure voice in the AI era. This paper sorts out the development context and key terms of AI technology, analyzes the impact of AI wave on telecom operators, puts forward the strategic transformation ideas of telecom operators' AI, and gives examples of typical AI application practice directions of telecom operators, and finally summarizes the future application fields of telecom operators' AI.

Keywords: AI; telecom operators; Impact; Transformation ideas; Practice direction

1 Introduction

Since 1960, AI technology has achieved leapfrog development, and now it has entered the third wave of growth. Its technological development can be traced back clearly, 1960S (From 1956, the Dartmouth conference marked the birth of AI^[1]. In 1957, Rosenblatt invented the perceptron Perceptron, Push AI to the first peak. In 1970, computing power could not support large-scale data training and complex tasks, and AI entered the first trough^[2]); 1980S (In 1982, Hopfield neural network was proposed^[2]; In 1986, BP algorithm made it possible to train large-scale neural networks and pushed AI to the second golden period^[2]; In 1990, AI computer DARPA plan failed, the government reduced investment, and AI entered the second trough); 2000S (In 2006, Hinton proposed the "deep learning" neural network to make a breakthrough in the performance of artificial intelligence^[2]; In 2013, the recognition rate of deep learning algorithm in speech and visual recognition was significantly improved, entering the era of perceptual intelligence^[3]; In 2016, alphago defeated the human go champion, and AI's attention increased unprecedentedly^[4]); 2020S (OpenAI released ChatGPT, and AI intelligence level achieved a leap forward, entering the era of big model^[5]; In 2024, Sora released, and the large model moved from language mode to text video multimodality^[6]). Key words of AI include AI, Application examples such as Siri, Alexa; LLM, Application examples such as Bert series, answering

questions, writing articles and conducting dialogues; Gen AI, Application examples such as Midjourney, Sora; Gen LLM, Application examples such as GPT-4(OpenAI/ChatGPT), LLAMA(Meta),

PaLM(Google); Token&word segmentation, Application examples such as LLaMA 2 and GPT-4 different Token ization algorithms (such as BPE or WordPiece) may be used, and the language tasks may be different, so their vocabularies will also be different ;word vector,The characteristic is that the size of the vocabulary and the dimension of the word vector determine the size of the vocabulary embedding matrix. The vocabulary size and the dimension of the embedding vector of different models may be different, so the dimension of the embedding matrix will also be different;G(Generative)P(Pre-training)T(Transformer),GPT-3, GPT-4, etc. are self supervised pre training models based on Transformer architecture, including excellent open source models such as DeepSeek and GLM in China. Transformer architecture solves the shortcomings of traditional models in processing long sequences and parallel computing through self attention mechanism and multi head attention mechanism, and becomes the cornerstone of modern large-scale models.In 2024, the comprehensive development of the industry still faces many difficulties, but the AI field is still booming, From OpenAI-o1 to DeepSeek-R1, slow thinking has become a popular keyword in the current AI field.

2 The Impact of AI Wave on Telecom Operators

2.1 Generative AI can Revive the Profitability of Telecom Operators

At present, the challenges faced by telecom operators include: the traditional business model can not generate enough profitability and return to maintain the required level of capital investment, the continuous development of industry structure and innovation has brought the prospect of more fierce competition, and macroeconomic uncertainty may promote more and more waves of regulatory intervention.Generative AI can reshape the integrated telecom service and operation mode, which is reflected in: (1) By redesigning the operation mode and using AI and other digital technologies, C level believes that the impact on value creation will reach 18%, while the impact on value creation by using Gen AI will reach 2%, so as to improve efficiency and effectiveness;(2) Pursue large-scale growth in B2C and B2B.

2.2 Telecom Operators began to Explore ways to deploy GenAI , and are Expected to Reshape the Industry Value Chain

Key factors around value creation, From sticking to the core business - promoting the growth of emerging businesses - maximizing asset leverage - Implementing end-to-end cost transformation - cloud transformation - deploying the next generation network - transforming the magic of GenAI into influence,It will provide better and more cost-effective customer support, develop more effective sales strategies, and improve the efficiency of management and IT departments.

2.3 Telecom Operators Actively Adopt AI To Improve Customer Experience and Productivity and Optimize Network Operations

The success expectation of AI applications continues to rise. Improving customer experience is the largest application scenario of AI. It is driving revenue growth and reducing costs. Hybrid hosting is the first choice for its solution, but the demand for cloud hosting is growing, and the industry partnership is still the key to the implementation of its solution; AI investment is growing, but the overall scale is still low. It will gradually evolve into the core component of the technology and investment roadmap of the telecommunications industry.

2.4 Considering the Benefits and Deployment Difficulties, Automation for CC and Other Internal Staff Is More Valuable

High value use cases with high data readiness and low deployment difficulty (customer Chatbot, marketing content aigc, employee oriented knowledge management and fault location support), High value use cases with low data readiness and low deployment difficulty (call center documentation, network operation and maintenance fault location and delimitation, staff workbench), High value use cases with high data readiness and high deployment difficulty (thousands of people and thousands of faces marketing, AI supported network design, network security detection), high value use cases with low data readiness and high deployment difficulty (low code, no code development, automated testing).

2.5 GenAI is the key for Telecom Operators to Unlock Personalization, Performance and Customer Participation

In terms of improving customer experience, AI driven assistants provide personalized customer support and unique interaction to help telecom companies stand out from competitors; In terms of optimizing business and operation support systems, the employee oriented generative AI assistant enables customer service to effectively manage multiple queries, broaden their expertise, and provide more personalized services; In terms of network modernization, the security, network efficiency, scalability and reliability are improved by using the carrier level, AI injected and secure hybrid cloud; In terms of unlocking new revenue sources, Azure OpenAI services are used to expand the personalized customer experience. The average revenue of each customer increases by 3% to 7% annually, and the annual customer turnover rate decreases by 20% to 30%.

In general, telecom operators accept AI faster than expected, but they are still in the stage of AI+. Most telecom operators are only consumers of AI rather than producers, so their ability to generate income is limited. Only 7% of operators choose to purchase AI directly from suppliers, and believe that the development of basic models, It is not the core business of telecom operators. Even if these enterprises consider building their own large. Model or AI technology, but lack of in-house expertise. 78% of operators will choose the mixed scheme, that is, after purchasing the technology, they will inter-

nalize it to varying degrees. This model can fill the gap between the requirements of full customization and out of the box, support enterprises to deploy AI solutions faster, and respond to external challenges at any time. Only 15% of telecom operators will develop AI technology by themselves, and are determined to become pioneers. It is a common way to develop small models for special use cases in the telecom field. With the emergence of new technologies and changes in consumer expectations, telecom companies face both challenges and opportunities, and need to constantly adapt and achieve growth; GenAI has great potential in promoting innovation and responding to industry challenges. It enables telecom enterprises to use massive data to identify patterns and generate innovative solutions, providing a new path for transforming traditional practices and promoting industry innovation, so as to support enterprises to respond to long-term challenges, realize the industry vision, and lay the foundation for a sustainable future. McKinsey believes that the value of the new GenAI use cases in the global telecommunications sector is \$60-100 billion, and ultimately \$450-680 billion of AI economic revenue can be prized.

3 Thoughts on AI Strategic Transformation of Telecom Operators

The AI development strategies of global telecom operators are generally divided into radical and conservative groups. They are different in strategic characteristics, application deployment, platform construction, model development and other aspects, as shown below Table 1:

Table 1. Characteristics of radical and conservative groups in global telecom operators

	Radicals	Conservatives
Strategic characteristics	Be more active in the application of AI, deploy AI+internal applications and AI+product innovation at the same time, and tend to Self developed AI model, investment in computing infrastructure, pursuit of technological innovation and market leading position	Pay more attention to steady development, start from the application of internal efficiency improvement, and tend to use the existing model Peace platform to achieve gradual improvement, not radical change
Typical representative		
Application deployment	AI+production and operation: reduce costs and increase efficiency internally, such as AI staff assistant, AI+code writing and repair, AI+network planning and maintenance, AI+customer service camp AI+information service: external innovation and income increase 2B (Ilmaas, platform operation), 2C (AI+traditional product upgrade, AI personal assistant, AI office assistant, AI search, etc.)	

Platform construction	Provide an open API platform for developers to call AI technologies and Solutions	There is no plan for the construction of AI platform in the short term
Model development	They tend to build LLM models for Telecom professionals and provide many industry models, rather than simply relying on third-party common models	The method of fine-tuning existing models is widely used, and multiple models are used at the same time, focusing on the interoperability between them, rather than re developing the model
AI Chip&computing power investment	• Invest in the deployment of general computing infrastructure and smart computing centers to enhance the competitiveness of GPUaaS • invest globally or acquire AI chips and large model companies to enhance large models in chips and vertical fields R&D and innovation ability and competitiveness	In terms of chips and computing power, they tend to cooperate with third parties and choose Microsoft, Google and NVIDIA Software and hardware kits related to cloud service solutions and AI development
organizational structure	Set up an independent AI department or organization to specialize in the research and development of AI models, chips and products	AI tool development is usually promoted in existing innovation laboratories or IT departments

3.1 Conservative Approach

1.Vodafone Promote AI through cooperation mode, emphasizing data quality and AI framework.

Vodafone believes that AI may be the most exaggerated technology in the communication industry for many years. Although it has the potential to change the pattern, it is more willing to adopt the "cooperation mode".In January 2024, Vodafone signed a 10-year strategic partnership with Microsoft to provide more than 300million enterprises and consumers with generative AI, digital services and cloud. In October 2024, Vodafone and Google announced a 10-year strategic partnership worth US \$1billion, focusing on providing customers with genai driven products.

2.Orange Maintains a Cautious Attitude Towards AI and Pays Attention to the Application Exploration of Improving Internal AI Efficiency.

Orange does not intend to compete with cloud service providers for AI, but believes that cooperation with industry partners of AI is the core opportunity for the success of its AI network business. To this end, in April 2024, orange and Google expanded their partnership to deploy artificial intelligence and get closer to orange and its customers' operations through Google's distributed cloud.In April 2024, after two years of testing, the Augtera Network AI was added to the NOC, reducing the daily alarm volume by

70%, and anomaly detection prevented network failures. At the same time, it is considered that the demand for LLM in private telecommunications still needs to be explored, and the application of the general large model should be explored by developing the interface with the existing LLM. Orange believes that edge computing is needed to optimize AI traffic processing, rather than processing in terminals, public clouds or data centers.

3.2 Between Conservatives and Radicals

1.Guided by business objectives and user experience, AT&T is committed to becoming an AI model expert in the telecommunications industry.

AT&T has been continuously exploring and applying AI technology since 1950s. At present, at&t is the sixth largest AI patent holder in the United States and has internally produced 600+AI/ML models. On September 1st, 2024, Ask AT&T ranked first in the bird text to SQL execution accuracy test. Its AI view is to "control data and become a model expert". It has formulated the guiding principles of "people-oriented, responsible, safe and ethical" for employees. AI policies and AI operation guidelines provide employees with a comprehensive AI strategy and the basis for specific precautions in creating, deploying and implementing AI AT&T .

2.Verizon Pays Attention to AI Governance and takes the lead in the Application Field.

The three pillars of VerizonAI strategy are to improve the company's internal work efficiency, enhance the competitiveness of its products, provide network and computing services for AI used by customers, and develop a responsible AI governance framework, including technology, governance and policies. The key application direction of AI is to lead the application in the service field at home and abroad, Internally yes Personal Research Assistan, "Fast Pass" to resolution, Personal Shopper/Problem Solver, "Segment of Me, External is Verizon conversational AI, (Google Cloud CCAI).

3.3 Radical Approach

1.SingTel released the new growth strategy of SingTel 28. AI has become the key driving factor for its strategy. SingTel NCS regards AI as the core of 3-axis strategic transformation.

It implements AI empowerment, AI skill training and talent training, cooperation and ecosystem construction for enterprises and governments.

2.In September 2023, SK Telecom announced the "Ai pyramid strategy" as a key step to become a 'global AI company' and strengthen its AI competitiveness through cooperation with leading AI enterprises inside and outside Korea. The three major areas of its AI pyramid are AI infrastructure, AIX (AI transformation) and AI services, as shown in the figure 1:

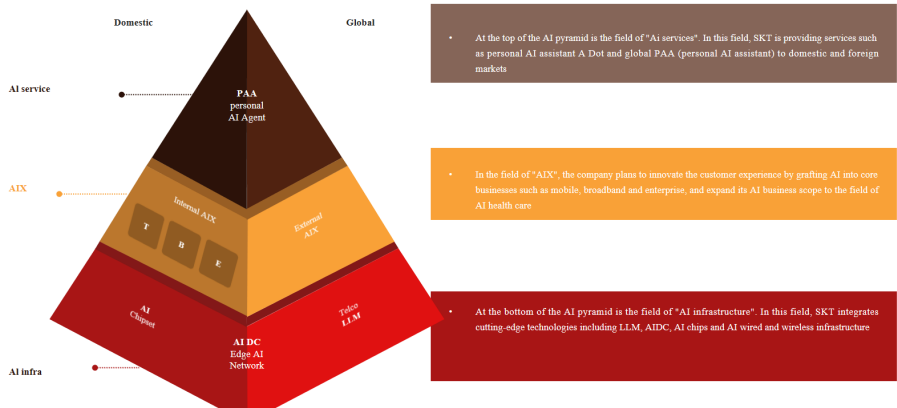


Fig. 1. "Ai pyramid strategy" of SK Telecom

Since 2021, SKT has been deploying artificial intelligence, continuously iterating AI strategy, expanding upstream and downstream cooperation in the industrial chain at the infrastructure and application levels, enhancing the influence of the AI industry, strengthening investment in the AI field with internal and external investment, comprehensively reserving AI key capabilities, and reshaping the global AI service system through internal talent training, organizational structure adjustment, and promotion of senior managers.

By summing up the practices of conservatives and radicals, we find that global operators do not go hand in hand in embracing AI. China Mobile, SKT and Softbank are obviously ahead of other telecom operators in this process, while European operators are generally conservative. But even if China Mobile, SKT, Softbank, In addition to self-developed AI and LLM, they will also choose to open access to large models or AI technologies of third parties. On the whole, most of the leading telecom operators have applied AI to the production and operation link, but the efficiency of production efficiency is different, and relatively few operators have directly applied AI capabilities to the information services provided externally. Enterprises that establish a responsive AI mechanism are more likely to create value in the future AI field. Influenced by EU policies, European operators have made clear the relevant specifications of RAI earlier, while Chinese and American operators are relatively backward in the institutionalization of RAI.

4 Examples of AI application Practice Direction of Telecom Operators

Telecom operators have applied practice cases in infrastructure layer (GPUaaS, chip R&D), model layer (basic large model, telecom industry large model, vertical industry large model), platform layer (AI capability open platform, low code/no code platform), and application layer (production operation, information service).

4.1 Infrastructure Layer

SingTel provides GPUaaS cloud GPU computing resource service to support large-scale AI load of enterprises. Its product features are:

(1) Use high performance computing resources on demand

Telecom operators have advanced GPU hardware (such as NVIDIA H100 Tensor Core GPU). Enterprises can obtain high-performance computing power through this service to meet the demand of big data and AI algorithm for computing power without investment.

(2) Integrating cloud and edge computing

Combining GPUaaS services with its own data center (Nxera) and unified orchestration platform (Paragon), it not only provides centralized cloud services, but also supports 5G edge computing environment to achieve low latency and high efficiency data processing.

(3) Help enterprises' digital transformation and AI application

SingTel's strategic cooperation with a number of partners (such as Bridge Alliance, Hitachi, Nscale, etc.) will further expand the coverage and capacity of services and promote the construction of AI ecology in the region and even in the world.

(4) Deployed in the customized next generation AI data center

GpuaaS will operate in an AI data center tailored for high-intensity computing environments, which uses specially designed liquid cooling technology to achieve maximum efficiency and minimum PUE.

4.2 Application Layer - Production Operation - Customer Service

Softbank reduces users' anger and the tension of call center operators through AI technology. It learned many expressions by changing the voice of artificial intelligence, including shouting and criticizing tone, in order to improve the success rate of voice conversion. The company recruited 10 actors to perform more than 100 phrases with different emotions, and trained artificial intelligence with more than 10000 voice data. This technology does not change the wording, but the pitch and pitch changes of the voice are softened.

4.3 Application Layer - Production Operations - Productivity Tools

AT&T is based on the application principles that must be followed in the application of artificial intelligence, such as "from people, serve people", "responsible", "safe and ethical", to create "Ask AT&T" applications to provide internal oriented services in seven major areas, including question answering, data analysis, programming, content production, classification, translation/simplification, and summary and refinement. See Figure 2 below for details:

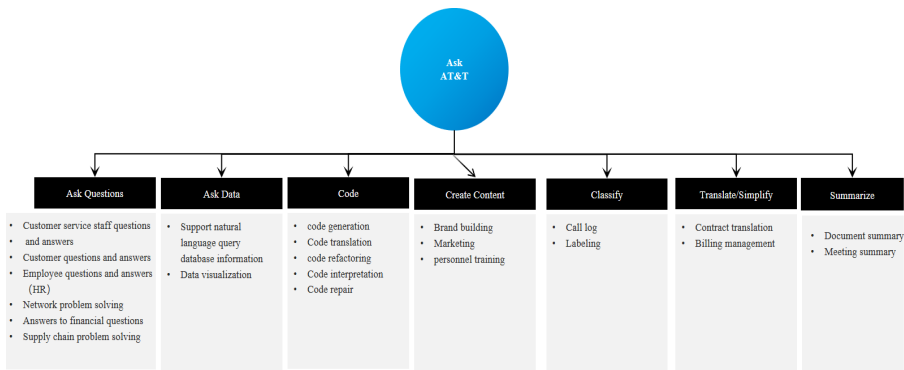


Fig. 2. application of “Ask AT&T” in seven fields

4.4 Application Layer - Production and Operation - Network Operation and Maintenance

AT&T uses AI to protect underground cables to promote intelligent construction, which is applied in spatial modeling, enhanced AI text analysis and street view image analysis, saving AT&T \$13million to \$16million annually; Eric Zavesky team won the "AT&T science and technology Medal" for providing AI and other advanced technologies and applications for this service.

4.5 Application Layer - Information Service -2c Package Value Added

SingTel provides 12 months of free Perflexity Pro service for postpaid and broadband TV users. The Perflexity Pro service is similar to "Google search+ChatGPT+Claude", which combines the search engine with the AI chat robot style interface. After users ask questions about Perflexity, they will search the most relevant information sources on the Internet, and then summarize them into a single and clear answer.

4.6 Application Layer - Information Service -2c Intelligent Assistant

The A Dot created by SKT is mainly for individual users in Korea, providing personalized AI assistant services. Help users complete daily tasks, such as playing music, watching videos, making phone calls and navigating. By accessing various digital services in the SKT ecosystem and combining the understanding of the dialogue context, it provides customized services. Its ecosystem construction is shown in Figure 3:

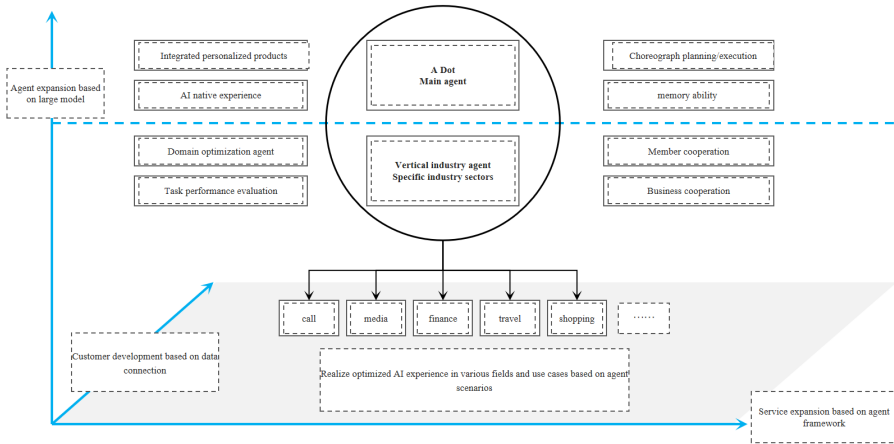


Fig. 3. A DotEcosystem construction map

The product features include the vision of providing the ultimate personalized experience, technology evolution and upgrading, data-driven decision-making, iterative development, the formation of a personal AI assistant experience evaluation index framework, collaboration and ecosystem construction.

4.7 Application Layer - Information Service -2B Unified Communication Service

Taking AT&T as an example, AT&T provides Cloud Voice with Microsoft Teams Phone Mobile service, which integrates AT&T on-line smart phones into the existing Teams platform to provide a secure and AI capable mobile office collaboration experience. The specific paradigm is shown in Figure 4:



Fig. 4. integration of unified communication service and AI

The integrated product features include: (1) unified commercial identity; (2) Seamless user experience; (3) Clear audio; (4) AI driven communication service; (5) Stable application performance; (6) Enhanced compliance; (7) Cost reduction and efficiency increase; (8) Simplify operation; (9) End to end security.

From a comprehensive perspective, Chinese telecom operators have taken the lead in AI strategy and application practice. Although the research and development of their own large-scale models and AI technologies consume a lot of costs and manpower, it is still a good direction to consider from the aspects of building AI native applications and future ability precipitation and income generation^[7].

At the same time, access to the third-party model can be considered under the premise of ensuring interoperability; AI application practice in the direction of internal production and operation has some experience. Even if the degree of AI and self-development is not enough, the current focus should be on "use" rather than "how much".

Facing the outside, no matter facing the C-end or B-end users, starting from the direction of AI+x (such as DeepSeek ontology machine, cloud disk overlay DeepSeek capability) will be a more economical and effective solution, and it can further improve AI native applications such as intelligent assistants/agents^[8]. One of the differentiated competitive advantages of telecom operators is that they can provide a package of services (hosting services) including infrastructure, models, platforms, applications and consulting services^[9].

5 Local Practice Cases of AI Application of Operators

5.1 Intelligent Computing All-In-One Machine

Provide city a big data bureau with a smart computing all-in-one machine including two sets of 910b smart computing servers and vector database integrated delivery, build private smart computing resources for customers, and help the upgrading and transformation of government affairs.

5.2 GPU Virtual Machine

The DeepSeek32B model is deployed based on the V100 GPU virtual machine (NVIDIA V100), which is applied to the work scenarios of human resources, product testing and other departments, significantly improving the data processing efficiency and intelligence level, and providing strong support for cost reduction, efficiency increase and digital transformation of enterprises.

5.3 Intelligent Computing Platform

(1) Provide DeepSeek big model service support for the portal website of city B government, call the intelligent computing service of mobile cloud Zhenze platform through API, quickly build the exclusive agent of Fangchenggang government affairs, and provide intelligent policy query service for the public.

(2) Based on Zhenze intelligent computing platform, two 910B intelligent computing resources were set up to provide efficient computing power and model support for medical database management, patient information analysis and auxiliary diagnosis, and accelerate the exploration and construction of a new AI driven intelligent diagnosis and treatment model of traditional Chinese medicine.

(3) Based on the mobile cloud Zhenze intelligent computing platform, it launched and deployed a set of 8-card 910B exclusive intelligent computing services, built the government AI agent service, integrated the wechat official account and the govern-

ment open platform, realized the intelligent upgrading of high-frequency government services such as policy consultation and information query, significantly improved the efficiency and service level of government affairs, and promoted the digital transformation of government services.

(4) Based on the mobile cloud Zhenze intelligent computing platform, a set of 8-card 910B exclusive intelligent computing service is launched and deployed, and the DeepSeek 70B model is deployed to build an insurance industry agent, which is expected to significantly improve work efficiency in terms of industry policy customer matching, data collation, information extraction, etc.

6 Conclusion

In essence, the AI of telecom operators is not the AGI pursued by DeepSeek and OpenAI. Their starting points and purposes are different, but the capabilities of OpenAI and DeepSeek can certainly be used by telecom operators^[10]. How to release the value of AI, and how to enable AI to be applied and enabled to users are the direction for operators.

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