Support System for Creating Innovation using AI "Da Vinci Graph®"

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In the face of increasing globalization, technological innovation, and complex social issues such as labor shortages due to population decline, companies and society require transformations that go beyond conventional methods for sustainable growth and new value creation. OKI has focused on the advanced information analysis and the creative idea generation capabilities of generative AI and has been advancing its systematic use as a fundamental technology for driving innovation. Furthermore, through the use of Innovation Management System (IMS), OKI has developed "Da Vinci Graph®*1." The system is a generative AI-based innovation creation support system that systematically organizes/utilizes ideas and dialogue history, enabling quick hypothesis verification of high-quality ideas and organic utilization of knowledge assets. This article discusses Da Vinci Graph's overview, features, and contributions to IMS activities.

Role of Generative AI in Innovation Creation

Modern society faces diverse and complex challenges, including intensifying global competition, advancing technological innovation, and a shrinking labor supply due to population decline. Under these circumstances, it is becoming increasingly difficult for companies and society to achieve sustainable growth and create new value using conventional methods alone. Against this backdrop, generative AI not only improves business efficiency and strengthens competitiveness, but it can also analyze vast information resources and rapidly present innovative ideas and solutions that surpass human imagination. It is a fundamental technology essential for solving social issues, creating new industries, and creating innovation.

As a proof-of-concept example, result of a joint study by Harvard University, Massachusetts Institute of Technology (MIT), and Boston Consulting Group (BCG) was reported in September 2023. In the study, a consulting team using generative AI (Large Language Model) achieved a 25% improvement in task completion speed and a 40% improvement in deliverable quality compared to a non-user group[1].

In the context of OKI's current IMS initiative, quick hypothesis verification of high-quality ideas is key to establishing a competitive advantage. By combining a variety of frameworks, analytical methods, and thinking methods, generative AI enables the rapid generation of high-quality ideas from multiple perspectives. Furthermore, through the maximization of its information generation capabilities, including text, images, videos, and coding, it strongly supports the agile hypothesis verification process of MVP (Minimum Viable Product). Additionally, by positioning generative AI as an interactive mentor to address various questions that arise during the innovation creation process, it enables users to receive prompt advice regardless of location or time, thereby promoting their growth (**Figure 1**). The ultimate goal is to build an AI infrastructure that promotes innovation throughout the organization through advanced prompt design by in-house experts, AI utilization training, and continuous feature developments.

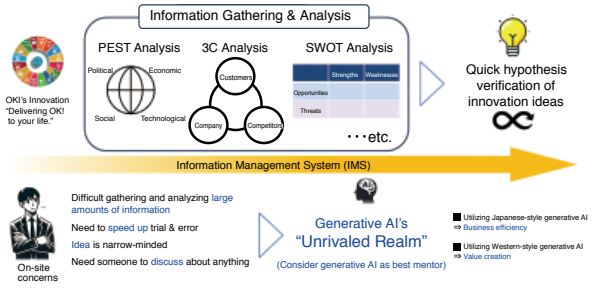


Figure 1. Role of Generative AI in Innovation Creation

Overview of Da Vinci Graph

OKI developed the Da Vinci Graph as part of its IMS initiative, aiming to dramatically improve the quality, quantity, and speed of innovation. In addition to supporting employee innovation, this system promotes the sharing and utilization of internal intellectual assets by systematically storing and visualizing ideas as graph documents (**Figure 2**).

*1) Da Vinci Graph is a registered trademark of Oki Electric Industry Co., Ltd.

Da Vinci Graph is a system that handles tasks based on various frameworks and thinking methods, such as 3C analysis, 4P strategy planning, and intellectual property analysis, for multiple themes. It structures the dialogue between the user and the system, summarizes/records each dialogue unit as a node, organically connects the nodes with edges (links) labeled with causal and semantic relationships, and visually stores them as graph documents. This allows the user to intuitively and systematically understand the flow of thoughts, dramatically deepening insights and promoting the development of new ideas.

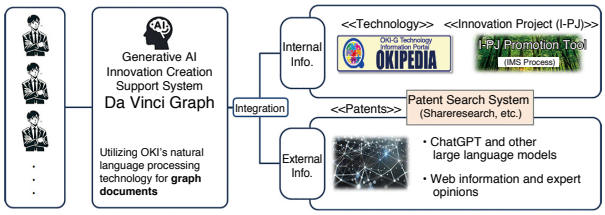


Figure 2. Overview of Da Vinci Graph

Features of Da Vinci Graph

Da Vinci Graph has four features as shown in **Figure 3**.

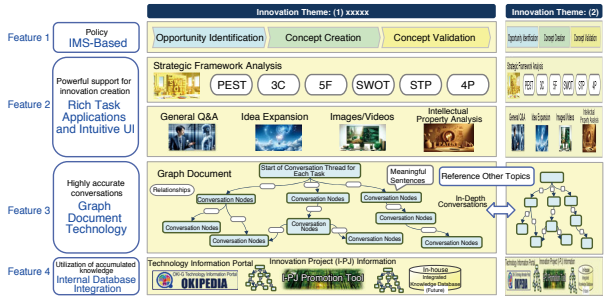


Figure 3. Four Features of Da Vinci Graph

(1) IMS-Based Innovation Activity Support

OKI complies with IMS guidelines based on the ISO 56000 series standards and became the first Japanese manufacturer to receive ISO 56001 certification in July 2025. Da Vinci Graph improves the efficiency and quality during key phases of the IMS concept development process, such as opportunity identification, concept creation, and concept validation.

(2) Intuitive Interface and Diverse Strategic Analysis Tasks

Da Vinci Graph comprehensively provides a diverse range of strategic analysis tasks, enabling agile execution of a series of processes, from PEST/3C/SWOT analyses to STP/4P strategy planning and BMC creation (**Figure 4**). The system also features a teaching function on framework utilization and its significance, making the system a valuable learning platform for business strategy. Additionally, maximum use of the generative AI's specialized tasks, such as idea generation, image generation, and intellectual property information-based analysis, is possible. Moreover, the intuitive visual UI and a feature that visualizes conversation counts and other data as neuronal growth further enhances user motivation.

Figure 4. Categories and Tasks of Da Vinci Graph

(3) Graph Document Technology for Visualizing Dialogue History

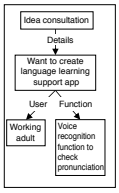
Conversations with AI and between members are saved as graph documents, explicitly recording the relevance and structure of each utterance. Past conversation history is referenced to enable efficient and highly accurate new dialogue. It also contributes to reducing hallucination, resulting in higher-quality communication.

(4) Utilizing OKI's Accumulated Knowledge

OKI's accumulated technical information and innovation project information are converted into graph documents and integrally managed using the Retrieval Augmented Generation (RAG) method. This enables high-quality dialogue generation and organic knowledge sharing.

Graph Document Technology[2)]

Graph document technology is the core technology of Da Vinci Graph. A graph document is a network-like document, with words and sentences as nodes and edges representing the semantic relationships between nodes, as shown in **Figure 5**. Graph document data consists of lists of nodes and edges.

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   {"id": "3", "content": "Working adult"},
   {"id": "4", "content": "Voice recognition function to check pronunciation"}
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   {"source": "2", "target": "3", "label": "User"},
   {"source": "2", "target": "4", "label": "Function"}
  }
}
```

Figure 5. Example of Graph Document and Data Structure

Nodes represent the smallest unit of text, and edges explicitly represent the semantic relationships and structure between texts. As a result, it is easier to understand at a glance than documents written in regular text. This is thought to be because it is similar to the way people reconstruct contents in their minds when reading a regular text document.

Graph document technology refers to the various technologies that handle graph documents. Da Vinci Graph primarily utilizes the graph document dialogue technology, which automatically generates dialogue content as a graph document, and GraphRAG technology, which targets graph documents for RAG, combining them with the large language model (LLM) that has been evolving significantly in recent years.

(1) Graph Document Dialogue Technology

In a typical LLM dialogue, system utterances are generated by passing dialogue history along with instructions called prompts to the LLM. Graph document dialogue technology not only generates system utterances but also generates additional nodes and edges that summarize the dialogue content, automatically generating a structured graph document of the dialogue content. The generated graph document is then dynamically rendered on the screen, allowing users to view not only the dialogue history but also the current dialogue content in a structured graph document format (**Figure 6**). The graph document can also be freely edited on the screen so that users can add or edit their own ideas. Furthermore, when interacting with the LLM, the contents of the current graph document are passed to the LLM in addition to the prompts and dialogue history. This allows the user's thoughts written in the graph document to be reflected in the system utterances generated by the LLM.

In Da Vinci Graph, each innovation idea to be studied is called a theme, and a graph document is associated with each theme. Ideas can be further explored and studied by selecting several tasks for each theme. Since graph documents are shared between tasks, the dialogue content of other tasks is reflected in the dialogue of the current task. This allows for in-depth dialogue from multiple perspectives.

Figure 6. Dialogue Screen (dialogue and dynamically updated graphic document)

(2) GraphRAG Technology

Da Vinci Graph allows for dialogue based on large amounts of information, such as internal technical information and innovation project information, using the GraphRAG technology. Converting RAG targets to graph documents, GraphRAG technology not only uses the vector search (semantic search) used in normal RAG, but also adds to the search results the nodes linked by edges from the nodes found by the vector search. This allows all necessary information to be passed to the LLM without omission, thereby reducing the hallucination problem in which the LLM generates plausible lies.

Da Vinci Graph stores innovation ideas as graph documents, therefore in the future, it will be possible to reference the contents of large amounts of innovation ideas using this GraphRAG technology. For example, it will be possible to gain insights from previously considered ideas, such as ways to deal with similar issues or different ways to use a certain technology.

Current Activities

Development of Da Vinci Graph began after the concept won second prize in OKI's 2023 internal innovation contest (Yume Pro Challenge). Early development began with screen design focused on user experience (UX). Using backcasting, parallel development of the UI and server-side functions was driven forward through a hyper-agile approach. As a result, an alpha version was released after about six months, and the development speed was highly praised within the company. After initial release, a trial run was conducted at an internal AI-based innovation idea contest, and a trial company-wide rollout began in May 2025. As of August 2025, over 1,200 employees were using the system.

Users have given the system high marks, citing how the AI-guided conversations have enabled them to efficiently organize elements for strategy planning and business model canvas creation, and how it has helped them gain new perspectives.

For IMS deployment, in addition to utilizing the system in traditional innovation activities such as idea generation and framework analysis, it is being considered for application in the area of management support. Specifically, studies to expand the functionality of Da Vinci Graph by implementing new tasks, such as "support for examining future trends in innovation creation," "support for decision-making during business model reviews," and "support for automating IMS internal audits," is under way.

Furthermore, various uses and co-creation cases applying Da Vinci Graph and its core technology have begun. Key examples are described below.

(1) Application in Startup Human Resources Development Programs

In a local government support program aimed at regional revitalization and digital transformation (DX) human resource development, Da Vinci Graph was used in new business idea generation and business model building process. From September to November 2025, approximately 30 participants actually used the program, and the systems effectiveness in new business development was validated.

(2) Co-creation to Improve the Management Efficiency of Manuals and Procedures

Manuals and procedures in fields such as aircraft maintenance posed an issue in terms of efficiently managing the large number of complex and scattered documents. To address this issue, an initiative was started to improve operability by converting manuals and procedures into a GraphRAG and incorporating the Da Vinci Graph UI. Co-creation projects with manual production companies and maintenance specialists are currently in progress.

(3) Application to Normalize Document Content in Government Procurements

When procuring sophisticated and complex equipment, standardizing the functionality and performance specifications of each manufacturer has traditionally required extensive expert work. Aiming to improve work efficiency through AI, development of a system that maintains accuracy by converting reference documents into GraphRAG and visualizes the work process through graphical documents is being studied.

Future Developments

Da Vinci Graph is being developed as an AI application for innovation creation, an area where generative AI can best leverage its capabilities. While it currently provides unique features such as simultaneous display of conversations and graphs, the following enhancements are planned for the future.

(1) Multimodalization

In addition to the combined input/output functions for text, audio, images, and video, work will proceed on developing web screen generation functions using PowerPoint and HTML.

(2) Expanding Scope of RAG Applications

Cross-sectional integration and utilization of information within OKI and its group companies is a central issue in generative AI operations. Da Vinci Graph is already integrated with OKI Group's internal technology information database (OKIPEDIA). The aim now is the integrated management of cross-sectoral data using a GraphRAG structure and establish a more accurate and efficient information utilization AI platform.

(3) Expanding Business Development as a Generative AI System

Da Vinci Graph is positioned as a generative AI system that understands user objectives and supports their achievement through dialogue and system integration. It converts tacit knowledge into explicit knowledge through accumulated knowledge, generates responses, and supports business execution. Going forward, advances in LLM technology and the synergistic effects of

improvements to various functions are expected to further advance the performance of the system as an AI agent. While IT vendors are expanding the AI agents for their own areas of expertise, OKI plans to promote further expansion of its business as an AI agent, starting with the innovation creation field. ◆◆

References

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2) Toshiki Murata, Yuto Maehashi, Takahiro Yamasaki: Graph Document Technology for Human-AI Coevolution to Enable Acceleration of Innovation, OKI Technical Review, Issue 243, Vol. 91 No.1, p. 80, December 2024 (in Japanese)

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TIPS【Glossary】

Large Language Model (LLM)
A language model that generates highly fluent dialogue through training using large amounts of text.

Vector Search
A technology that converts text data into vectors, which are numerical representations, and performs searches based on the similarity between vectors.

Innovation Management System (IMS)
An efficient method established in the ISO 56000 series standard for an organization to create innovations.