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Enhancing Knowledge Management and Operational Efficiency in Singapore's Water Sector with a Generative AI-Based Digital Knowledge Companion (DKC)

BACKGROUND

PUB, Singapore's national water agency, manages the nation's water supply with an emphasis on quality, sustainability, and efficiency. PUB has also been exploring innovative methods to preserve and transfer institutional knowledge amid workforce turnover and the retirement of skilled operators.

CHALLENGE

PUB aimed to enhance the preservation and succession of operational knowledge and streamline maintenance processes to maintain the high quality of water services. This effort required improved decision-making capabilities within the organization, especially in the context of workforce turnover and the retirement of skilled operators.

TECHNOLOGY IMPLEMENTED

Generative AI Digital Knowledge Companion (DKC) featuring a Large Language Model (LLM) and Knowledge Graph (KG)

USE CASES

The DKC demonstrated its effectiveness in several applications:

VIRTUAL TROUBLESHOOTING ASSISTANT

Enhanced guided troubleshooting for flow monitoring devices.

TECHNICAL KNOWLEDGE RETRIEVAL

Quick access to necessary knowledge from documents such as flow meter manuals and reports.

EQUIPMENT PERFORMANCE COMPARISONS

Enabling rapid comparative analysis using knowledge retrieved from technical reports and industry publications to optimize decisions.

TACIT KNOWLEDGE ASSIMILATION

Continuously enriching the knowledge base with real-time data and insights from maintenance operations.

SOLUTION

PUB carried out a trial using an AI-powered Digital Knowledge Companion (DKC), integrating advanced technologies such as a Large Language Model and a Knowledge Graph tailored for the maintenance of equipment within the water supply network. This system captures both tacit and explicit knowledge, ensuring continuous knowledge transfer and access across various organizational levels. The DKC's core functionalities include:

KNOWLEDGE CAPTURE AND RETENTION

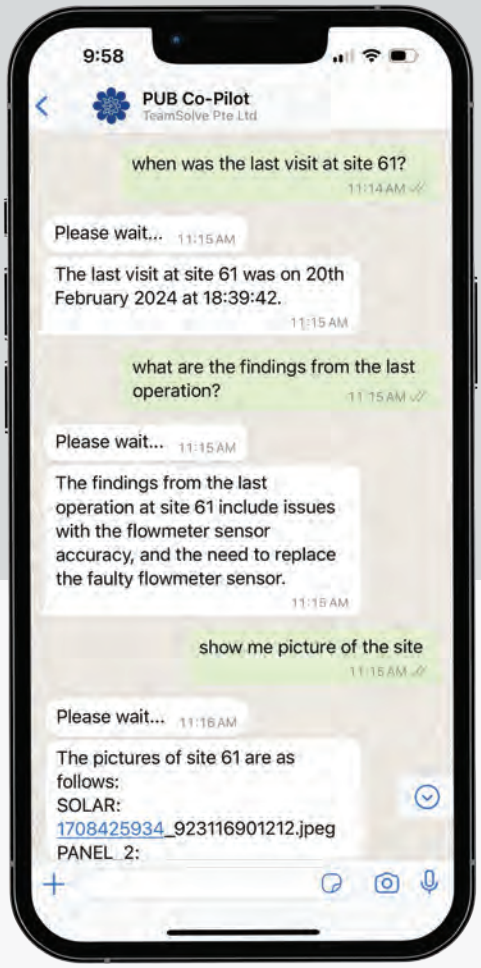
Utilizing generative AI to mimic and expand human learning processes.

KNOWLEDGE SHARING

Making crucial operational information accessible to relevant stakeholders.

INTELLIGENT SOP SUPPORT

Assisting technicians with necessary information and insights during operations, from troubleshooting to performance comparisons.



IMPLEMENTATION PROCESS

Over an eight-month period, the DKC was developed, rigorously tested, and iterated upon, with feedback incorporated for continual refinement. Integration into familiar platforms like WhatsApp enhanced user accessibility and experience.

Key Highlights:

- ***AI-Powered System:*** *Deployment of Generative AI to preserve and share operator expertise within its teams.*
- ***Enhanced Efficiency:*** *Task automation, knowledge preservation, and improved operational efficiency.*
- ***Knowledge preservation:*** *Continuous recording of knowledge and best practices ensures that operational knowledge is maintained and updated.*

OUTCOMES

The implementation of the DKC led to significant improvements in:

STREAMLINED OPERATIONS

Reduction in manual tasks like report generation and data entry, leading to more focused and efficient work by technicians.

ENHANCED EFFICIENCY AND DECISION MAKING

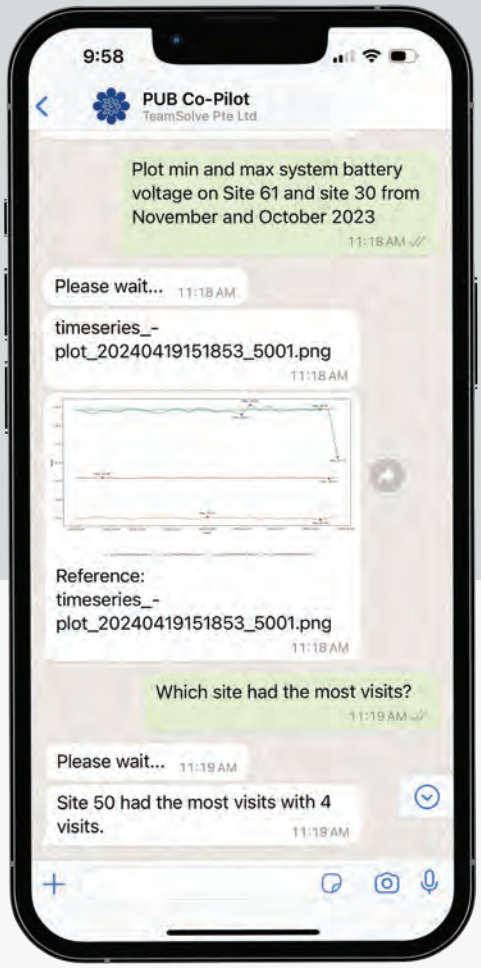
With the AI handling routine information tasks, technicians could concentrate on critical activities, supported by informed, real-time decision-making.

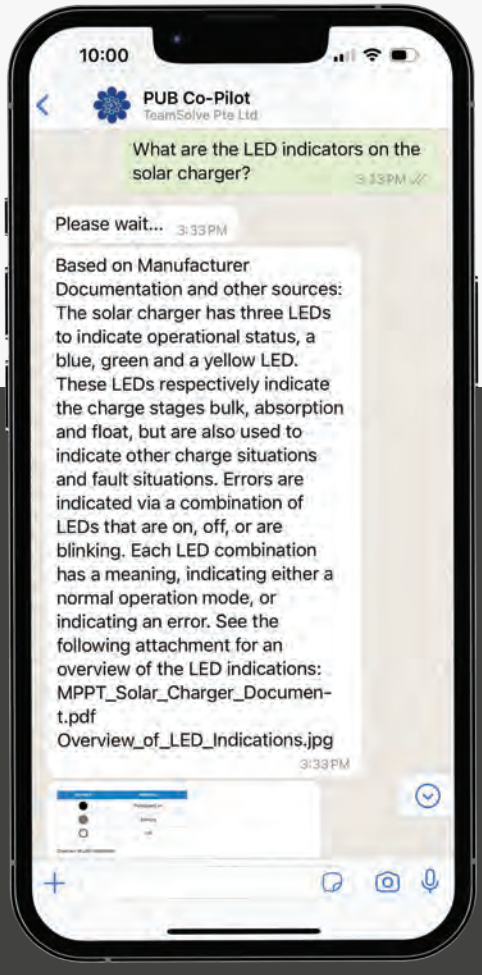
KNOWLEDGE PRESERVATION

Ensuring continuous access to institutional knowledge, vital for operational continuity, situational responses, and training new staff.

USER SATISFACTION

High approval ratings from technicians, with over 90% reporting greater ease and satisfaction in their role.





FUTURE DIRECTIONS

With the success of the DKC, further recommendations include:

SCALING AND INTEGRATION

Enhancements to the DKC architecture and framework are positioning it for future expansions in capabilities and applications across other departments and workflows within the organization.

CONTINUED INNOVATION

Investing in advancements like predictive analytics and proactive maintenance insights.

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