TeamSolve

Enhancing Operational Efficiency & Workforce Capabilities for Water Utilities in Singapore & Southeast Asia using a Generative AI Knowledge Twin Copilot

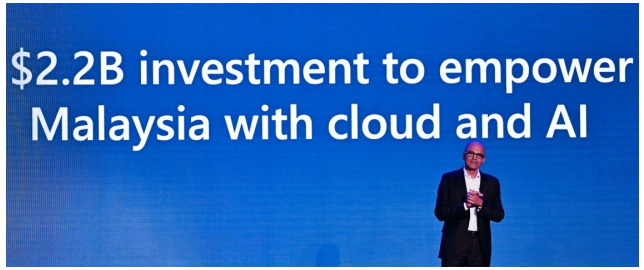
Robin Wong, Founder/CCO

A New Era of Human-AI Collaboration has Arrived

Sarawak AI Centre to boost digital innovation

By Sulok Tawie - October 16, 2024 @ 2:49pm

Premier Tan Sri Abang Johari Tun Openg said today that the state government is establishing the Sarawak AI Centre. - BERNAMA PIC



ChatGPT-maker OpenAI to open Singapore office this year to support regional expansion

OpenAI is also partnering AI Singapore to make advanced AI more widely accessible across Southeast Asia.

Southeast Asia Case Studies of Gen-AI Impact in Water Operations

TeamSolve

info@teamsolve.com
www.teamsolve.com

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.

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CASE STUDY

Leapfrog in Performance in the Philippines Water Sector with Enhanced Operational Efficiency and Workforce Capabilities Using a Generative AI- Based Digital Knowledge Companion (DKC)

BACKGROUND AND CHALLENGE

Balibago Waterworks System, Inc (BWSI), a leading private water operator in the Philippines, has been dedicated to community growth and quality services since 1958. Serving over two million people across 90 franchises in Luzon, Visayas, and Mindanao, BWSI is renowned for its efficient operations. To further enhance service quality, BWSI is transitioning from reactive to proactive and predictive maintenance using Generative AI. This shift aims to improve operational asset performance, reduce non-revenue water (NRW), and boost workforce capabilities. Key goals include providing easy access to maintenance insights, capturing field expertise, improving visibility and tracking of activities, and centralizing information through AI-enabled conversations to streamline knowledge management and work processes.

BALIBAGO WATERWORKS

USE CASES

The Digital Knowledge Companion (DKC) has proven effective in:

LEAK SURVEY AND REPAIRS
Simplifies task assignments and tracking. Provides SOP guidance and knowledge insights. Automates reporting and leak calculations.

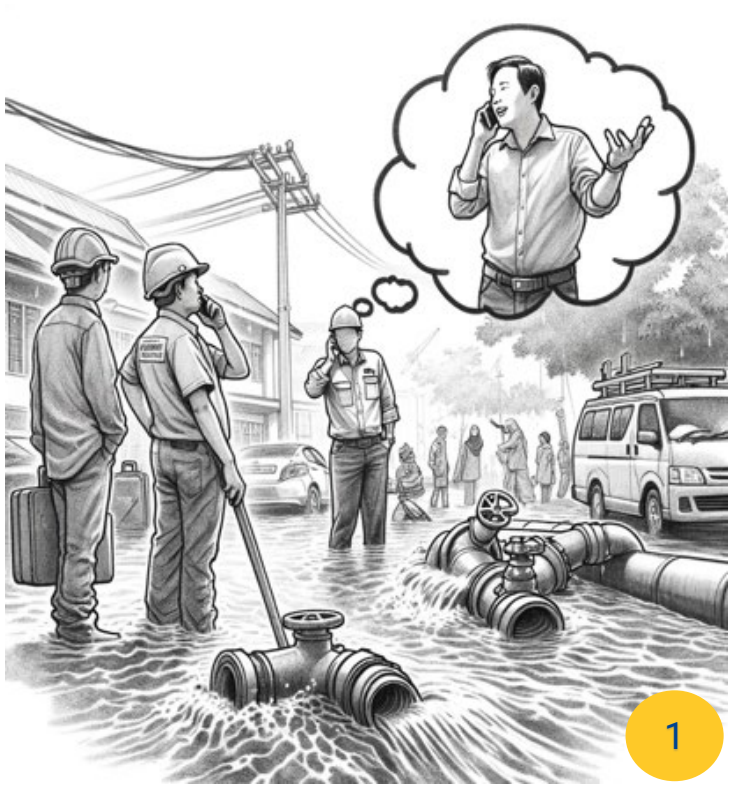
PREVENTATIVE MAINTENANCE AND SAFETY
Quick access to SOPs, manuals, and reports. Enhances safety toolbox and performance tracking.

CORRECTIVE MAINTENANCE AND TROUBLESHOOTING
Offers root cause analysis and best practices. Captures knowledge and automates reporting. Enriches the knowledge base with real-time data.

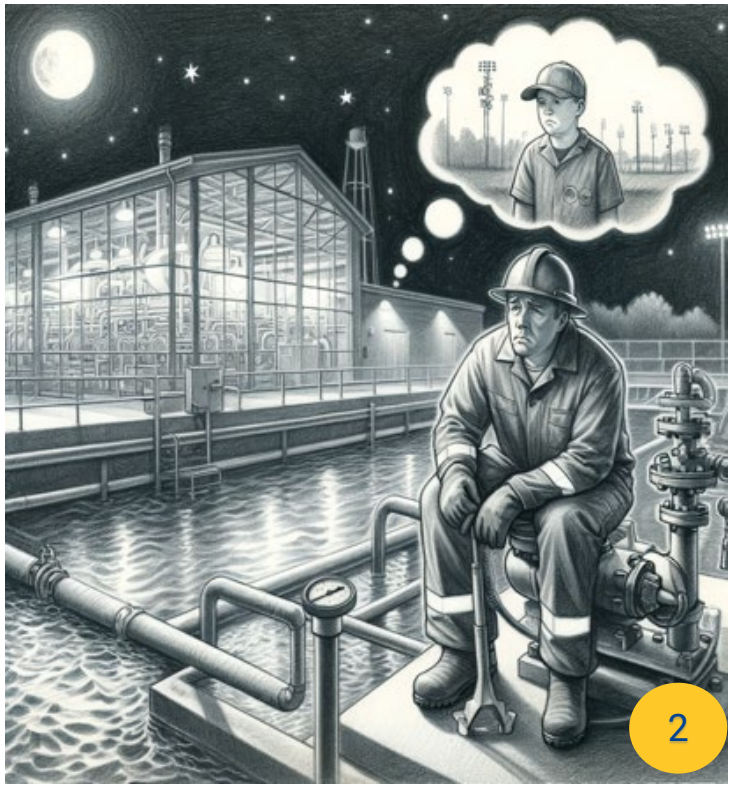
Full case study is available: www.teamsolve.com

Upkeep of Assets and Breakdown Response

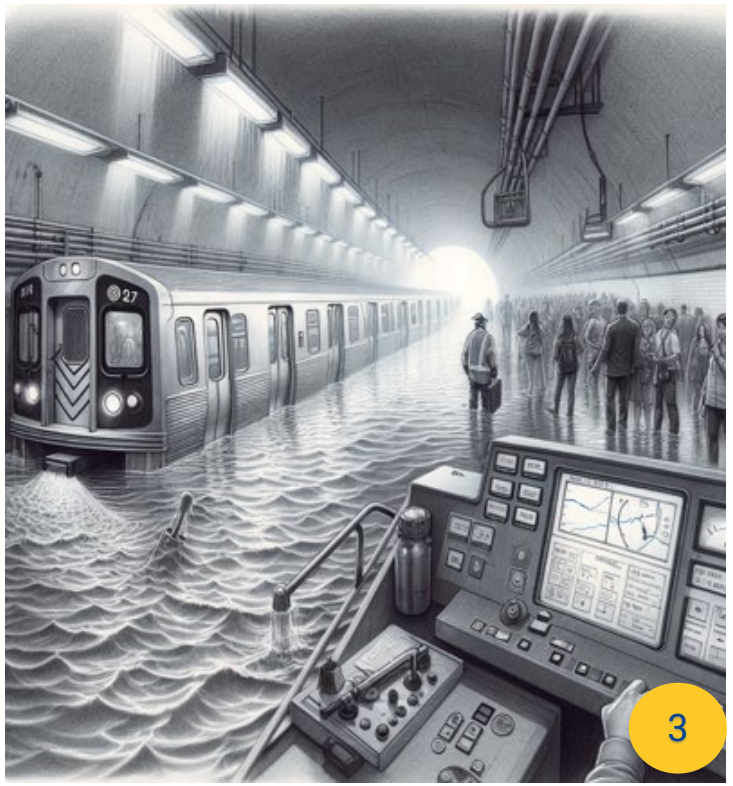
A primary responsibility of every water utility



Incident Response



Breakdown Maintenance

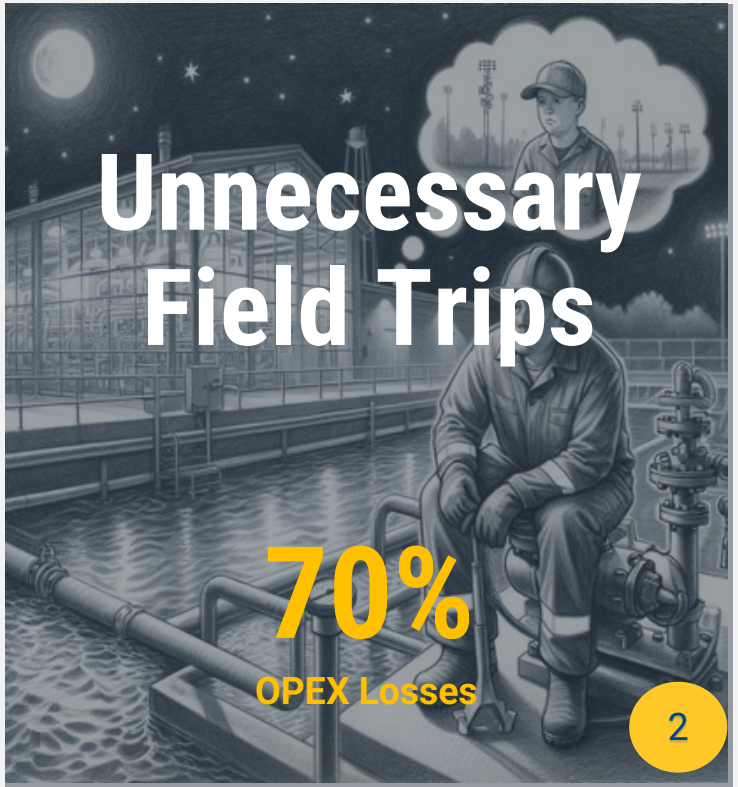


Routine Upkeep

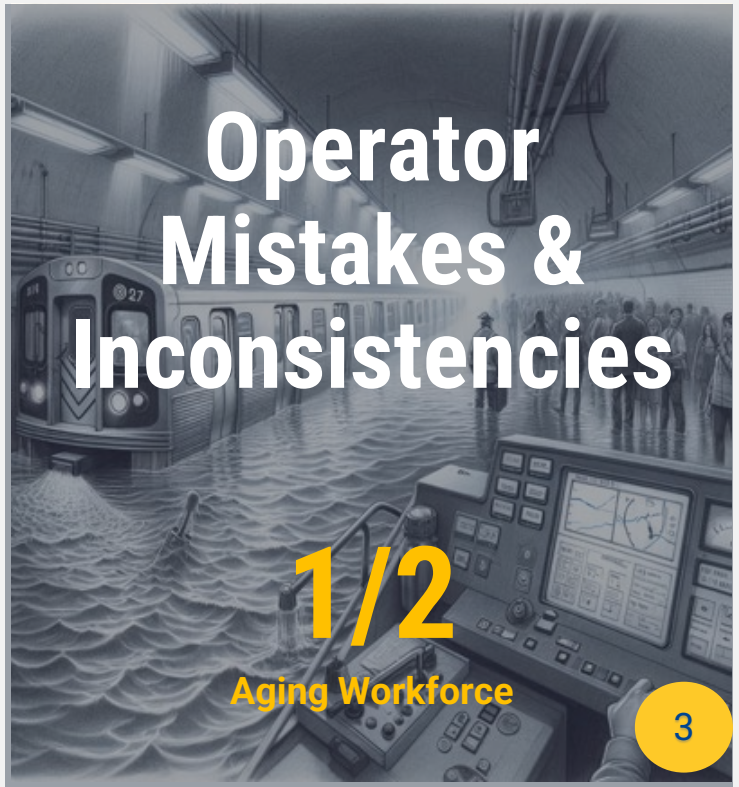
Upkeep of Assets and Breakdown Response

A primary responsibility of every water utility

In search of best course of action during incidents. Guesswork. Asset downtime losses.

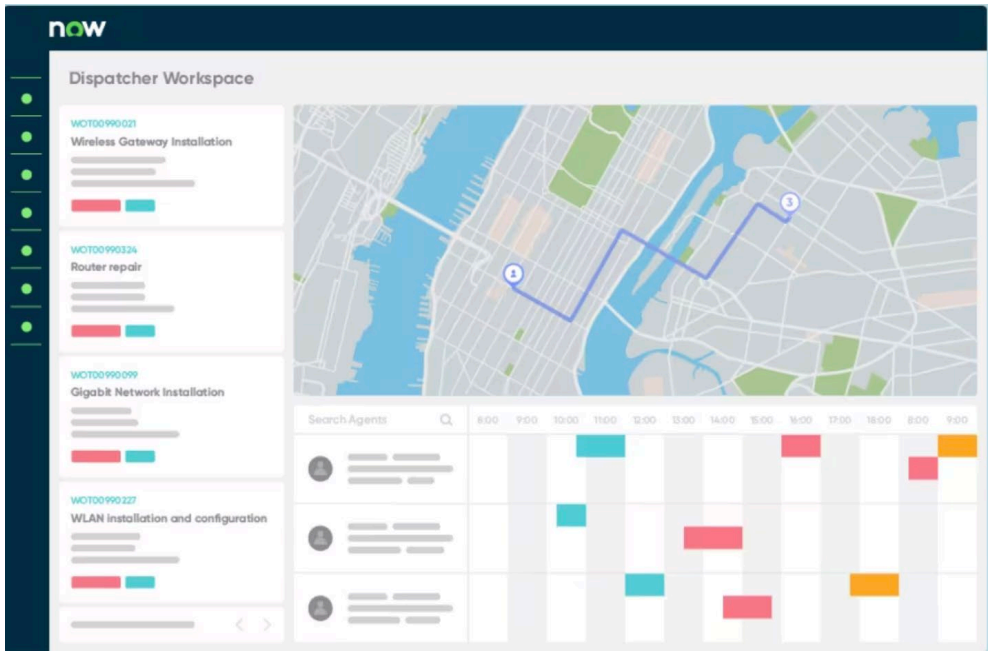


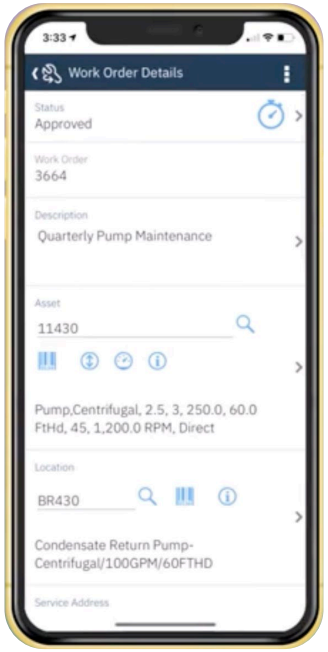
Spent on unnecessary field trips at odd hours. Human errors, inefficiencies & low morale.



Expert staff to be lost over the next decade. Manpower shortages. Poor knowledge retention, sharing, access & weak capacity building.

The Inefficient World of Asset Maintenance, Planning and Management





"We spend $20M annual on pipe asset renewal, 70% of our pipes replaced still have a lot of useful life remaining"

"Its always a challenge to know what to do with tons of Alarms we see everyday – especially with inexperienced staff"

"Issued 105 work orders last month – 90% of these were unnecessary"

"I ask for history of an asset, and the system gives me 50 previous work orders not even relevant to the asset I am working on"

"Our field teams often fill in wrong information on the work orders, not because they want to, because very often they cannot find where to put the information they want to"

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Disparate & Dispersed Data & Knowledge Sources

Asset/ Work Order Management

15%

Manufacturer Documents

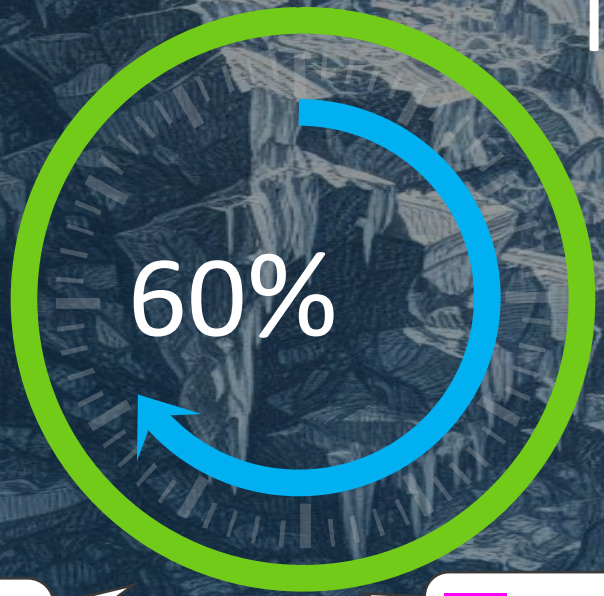
10%

SCADA / Historian Systems

15%

Only some asset information is visible via traditional digital tools

Most critical asset information is hidden tacit knowledge, expressed as human language that existing tools are unable to understand!



The Untapped Wisdom

PDFs, Excel, Word, Free-text, Images…

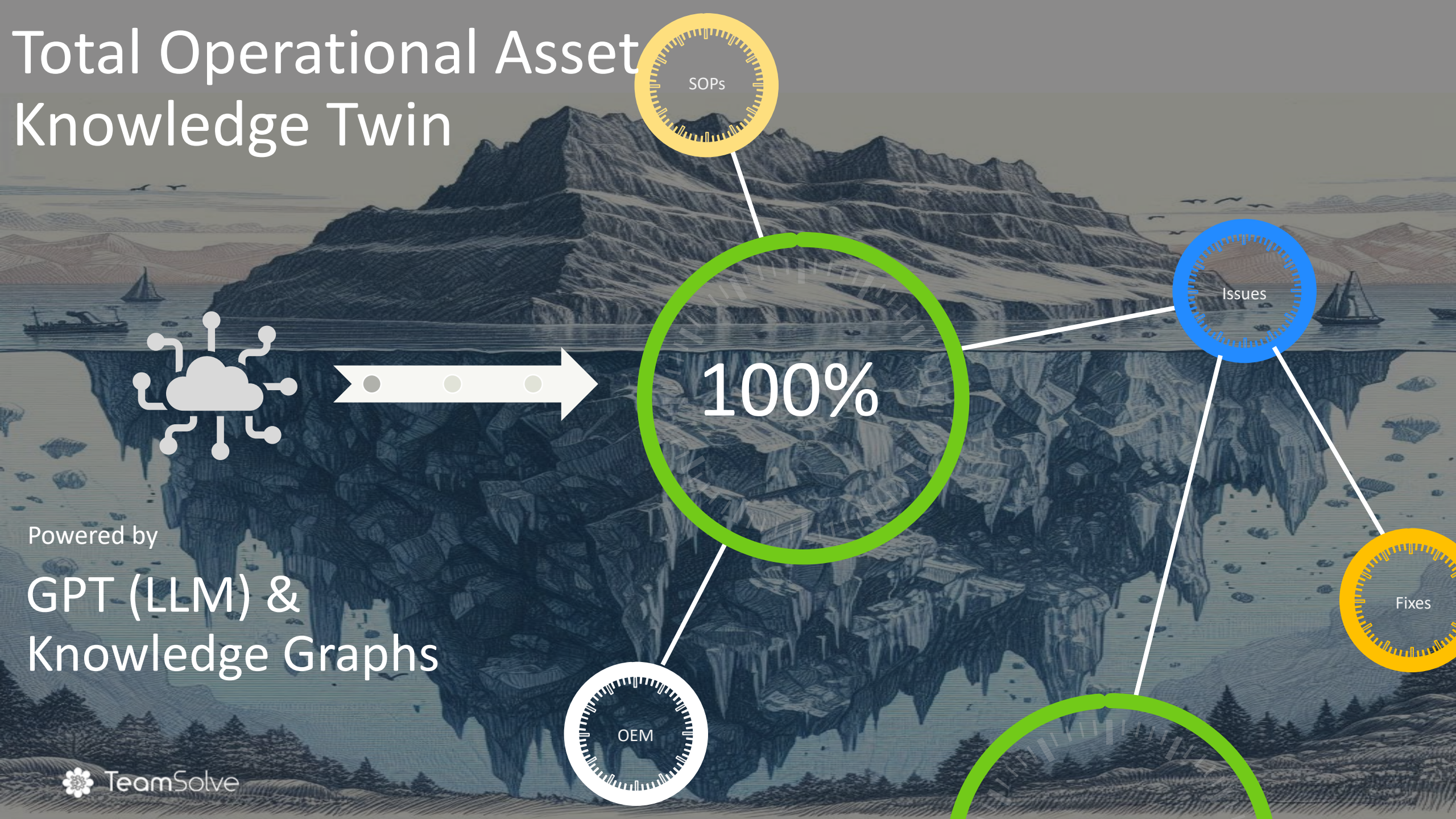
- Work Orders
- Faults Alarms, Incident Reports
- Expert Know-how
- 3rd Party Contractor Findings
- Independent Performance Data

It's a construction site. We cant do anything at this time. Need permit.

Leak is on the service line - not in GIS. Tagged main for reference.

TeamSolve

Total Operational Asset Knowledge Twin



Powered by

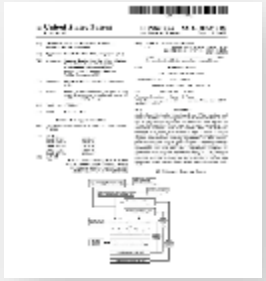
GPT (LLM) & Knowledge Graphs

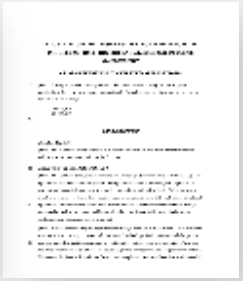
TeamSolve

Meet Lily®

Gen-AI Knowledge Twin

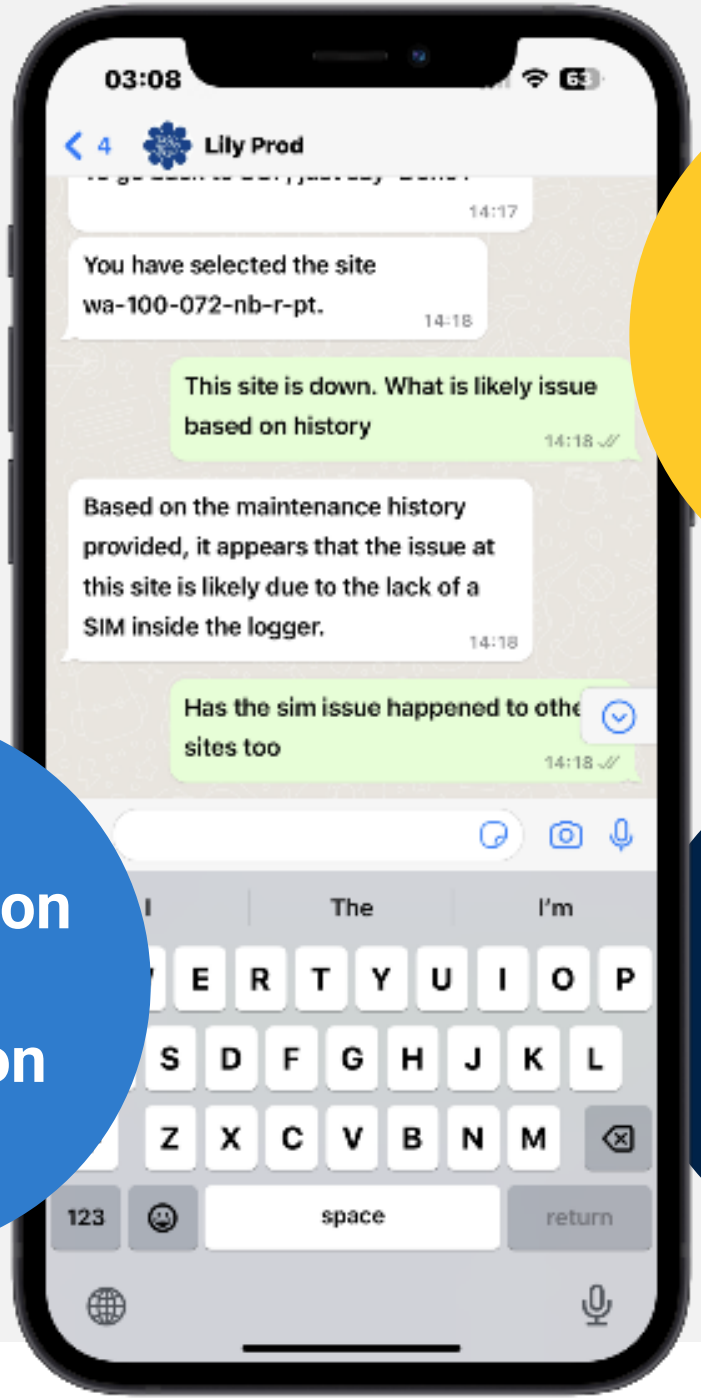
Digital Co-Pilot ready for the Operations Workforce





2 Patents

Conversational Interactions



Connects & Centralises Data

Collaboration Safety & Automation

Capturing & Learning Continuously

High Impact Operationally Urgent Use Cases for Lily®

Incident & Alarm Response Intelligence

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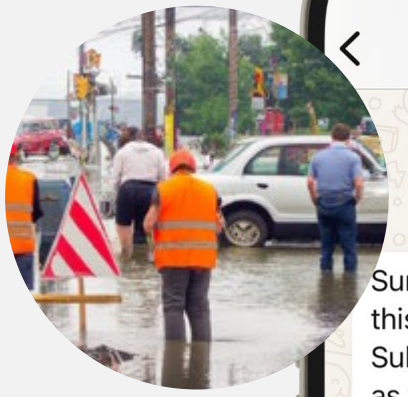
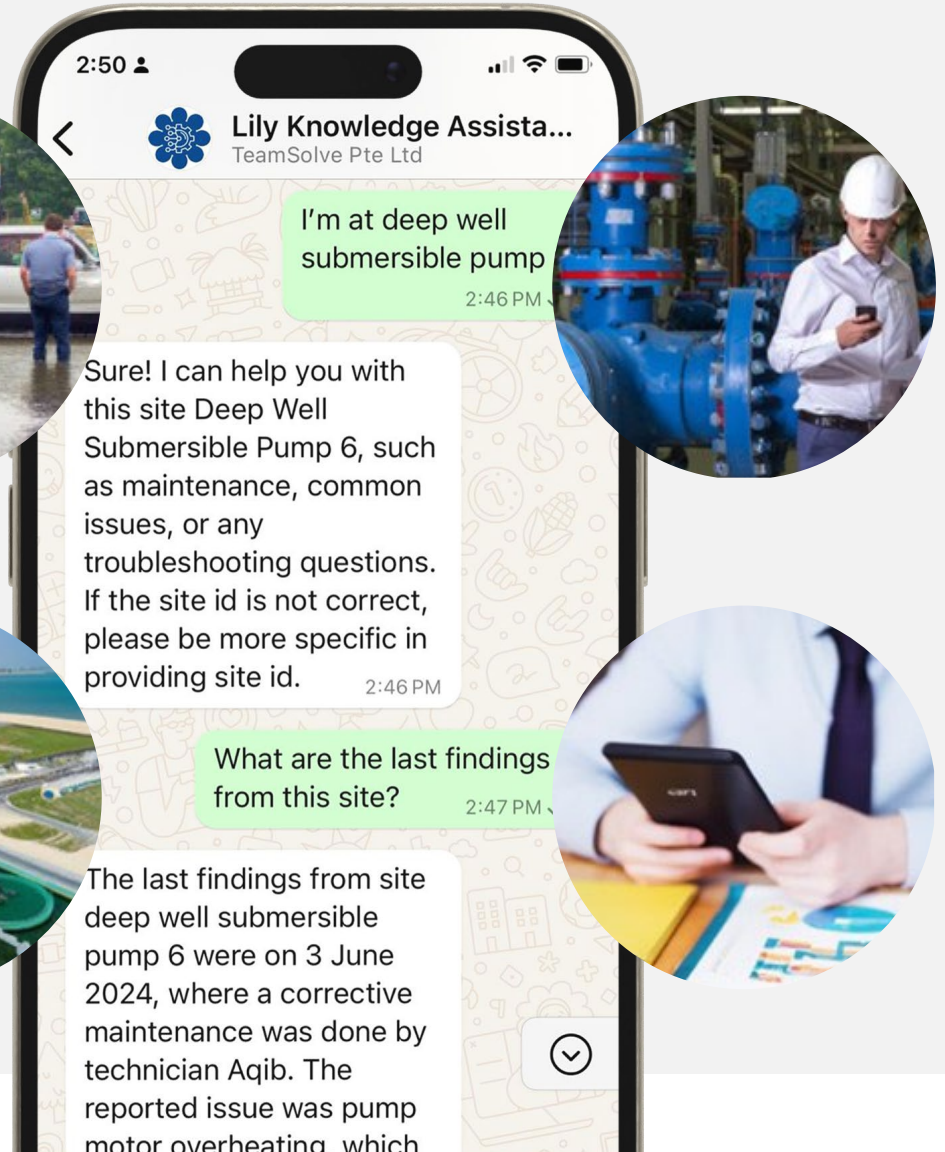




Field Team Support for Asset Maintenance & Troubleshooting

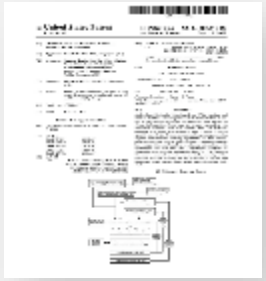
NRW Management & Asset Planning

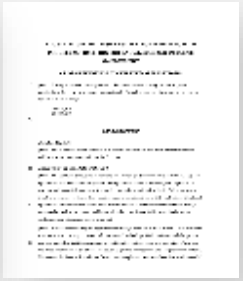
Sustainable Capacity Building & Onboarding

Meet Lily®

Gen-AI Knowledge Twin

Digital Co-Pilot ready for the Operations Workforce





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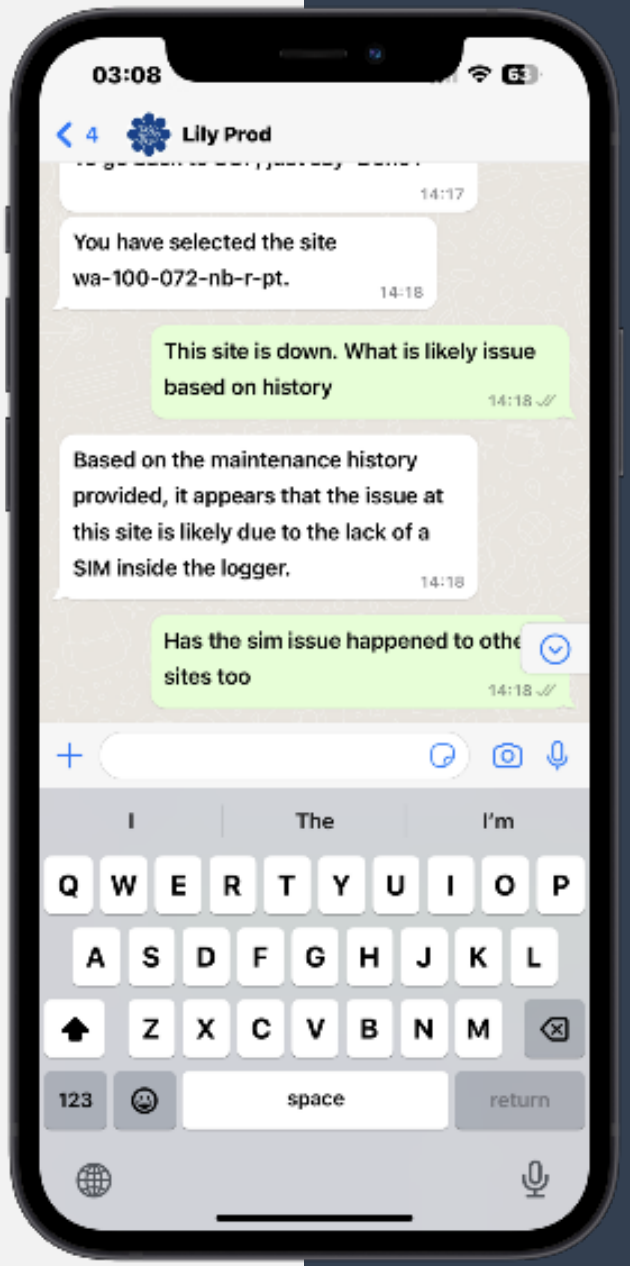


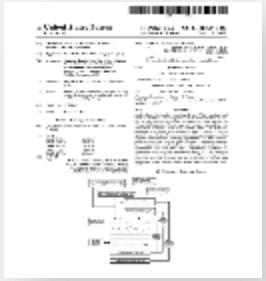
Conversational Interactions

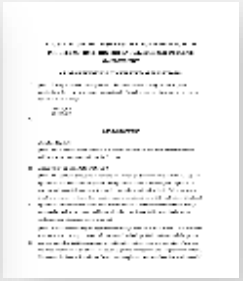
Engages in real-time 24/7 to obtain answers, access documents, and receive step-by-step instructions, SOPs, forms via familiar chat interfaces e.g. WhatsApp or MS Teams.

Meet Lily®

Gen-AI Knowledge Twin

Digital Co-Pilot ready for the Operations Workforce





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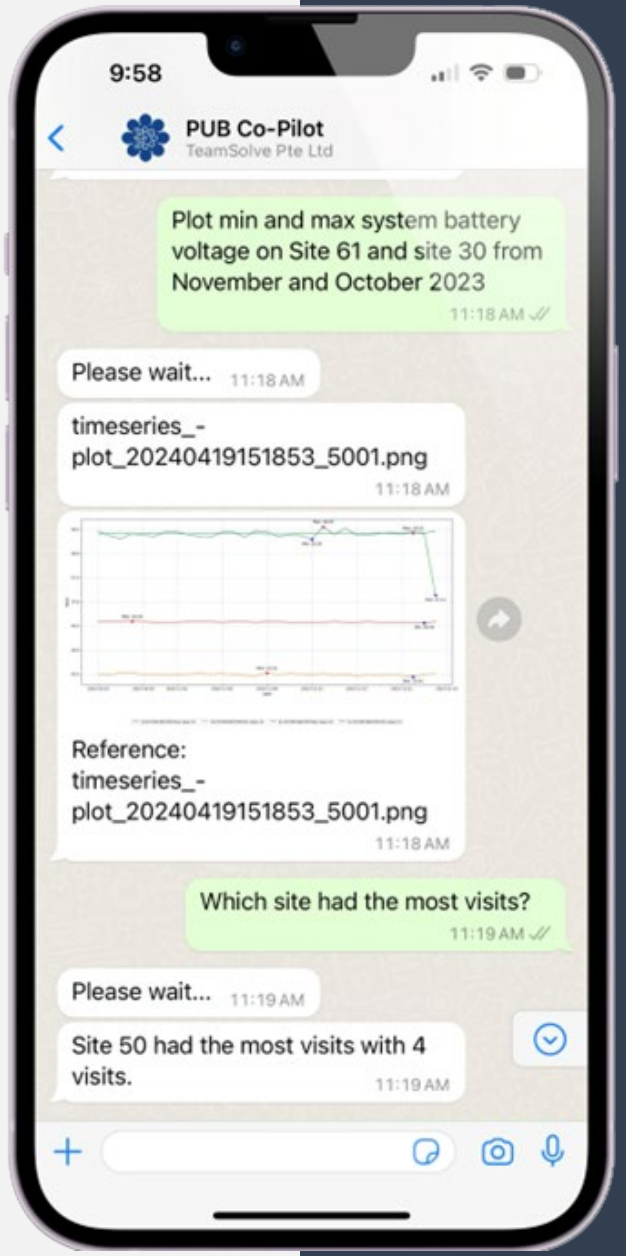


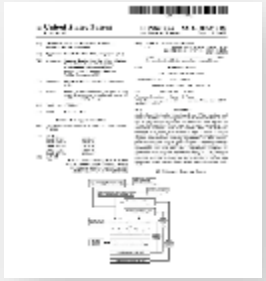
Connects & Centralises Data

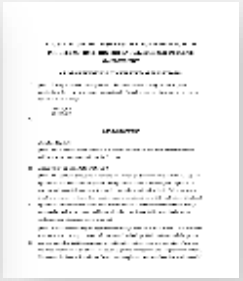
Connects & Constructs various organizational data sources into a knowledge “mind map” for comprehensive support, accessibility & mobility

Meet Lily®

Gen-AI Knowledge Twin

Digital Co-Pilot ready for the Operations Workforce





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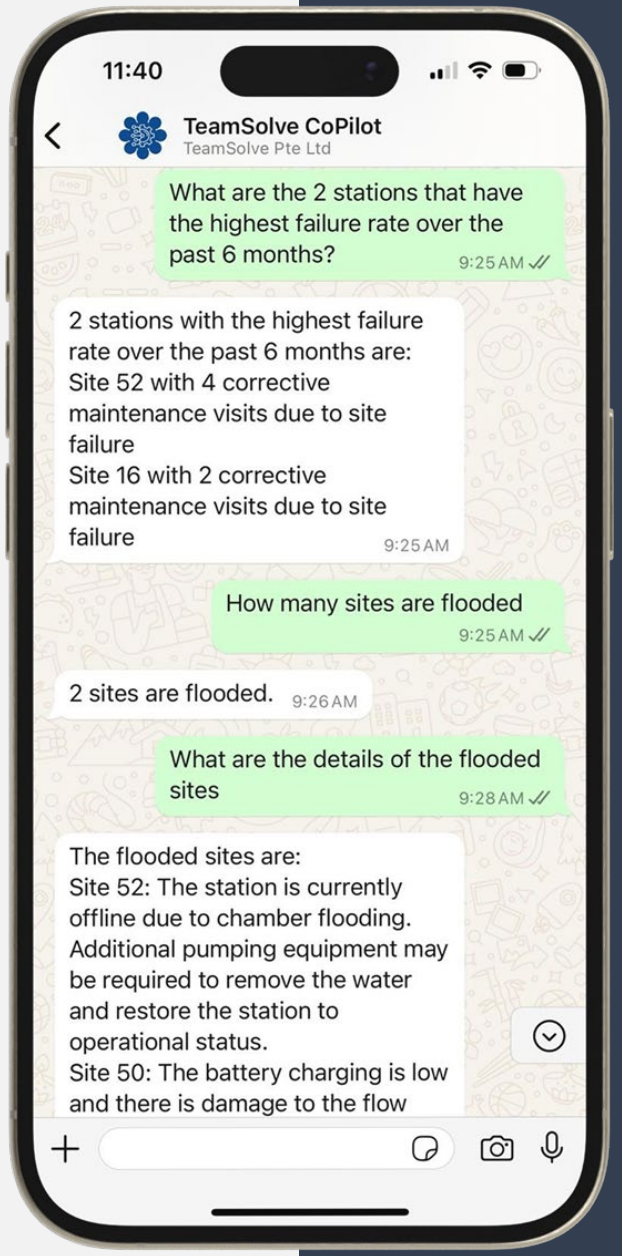
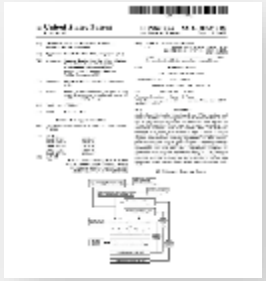


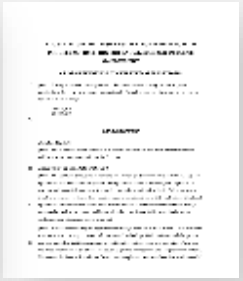
Capturing & Learning Continuously

Captures new knowledge from field activities & tacit wisdom from experts for easy knowledge transfer, sharing, visualization & insights using free-flow conversations or forms

Meet Lily®

Gen-AI Knowledge Twin *Digital Co-Pilot ready for the Operations Workforce*





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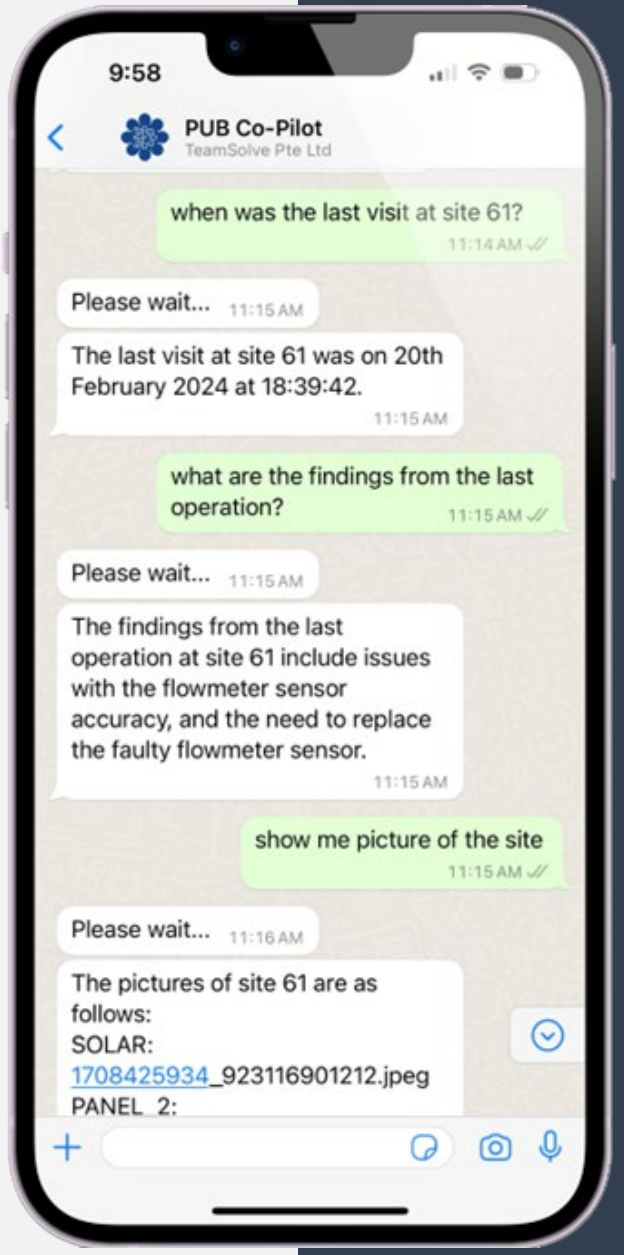


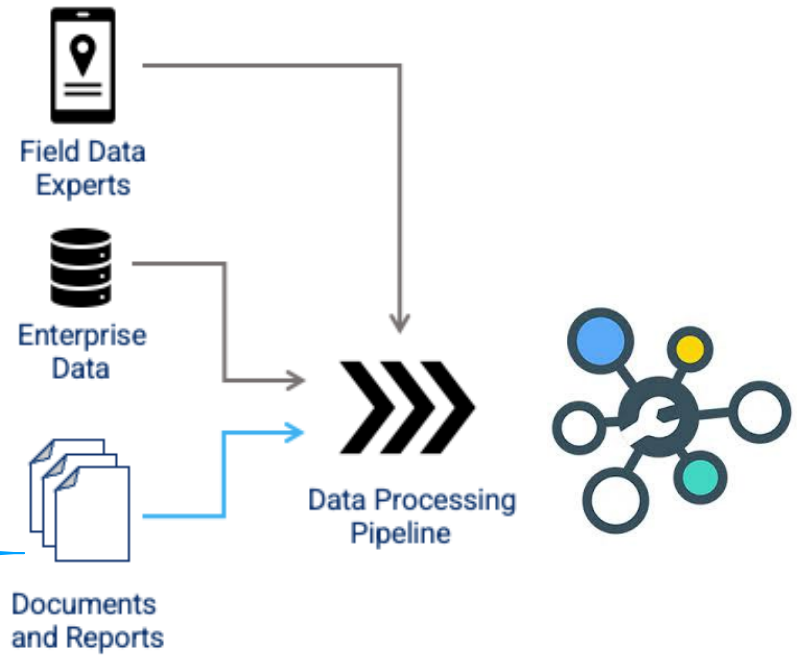
Collaboration Safety & Automation

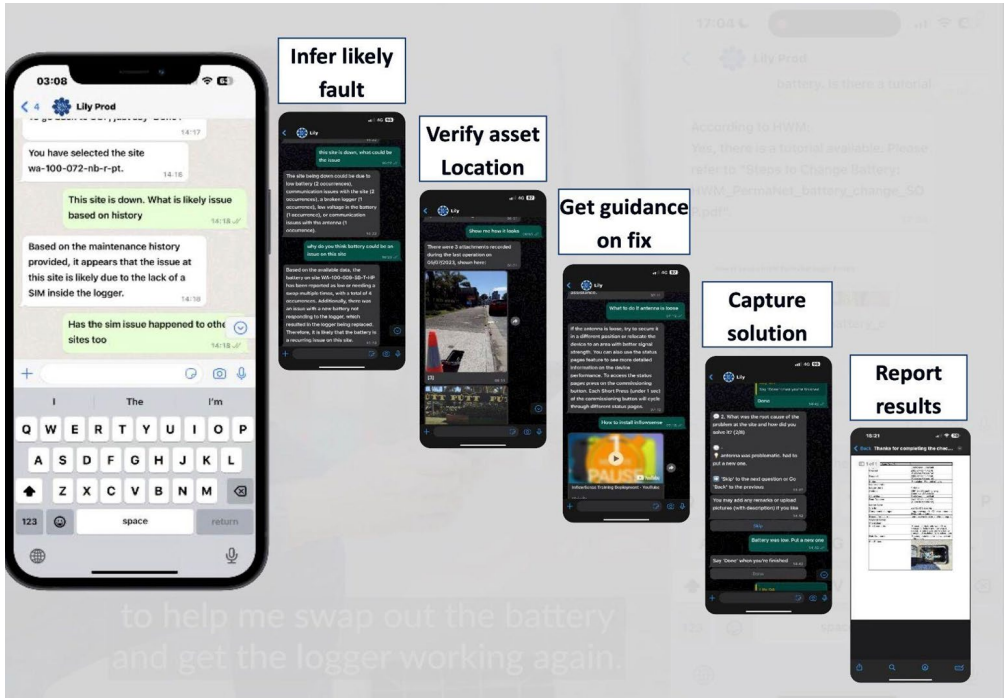
Boosts employee satisfaction via enhanced knowledge sharing & safety culture, while automating e.g. custom post-operation reports for documentation & work visibility

Onboarding – ”Small” Dataset for the Use Case

Current State

Engage across multiple, unconnected systems. Siloed, unstructured data and tribal knowledge. Not actionable in field





Future with TeamSolve – Knowledge Twin Copilot

Integration of all data into single Knowledge Graph + analytics. Natural language interface, actionable insights via mobile. Structured data capture integrated back into systems

Deployed with utilities in Australia and Singapore

CITY OF GOLDCOAST.

2 Use Cases

Improving corrective maintenance of IoT Instruments on water network & optimizing crew dispatch

Commercial uptake & market expansion after 3 month trial

PUB SINGAPORE'S NATIONAL WATER AGENCY

4 Use Cases

Streamlining operations & decision making, improving knowledge retention

90% approval, design for scale-up now underway

Deployed with utilities in Canada & Australia

SCADA Alarms on Water Quality

Streamlining operations & decision making (Site specific, general, knowledge insights)

Knowledge Access and Sharing

Improving Knowledge Retention

Yarra Valley Water

Actionable Insights from IBM Maximo AMS Work Orders

Asset Performance Visibility & Faster Troubleshooting

Claims Processing

M&E Contracts Specifications Processing

Singapore Pilot

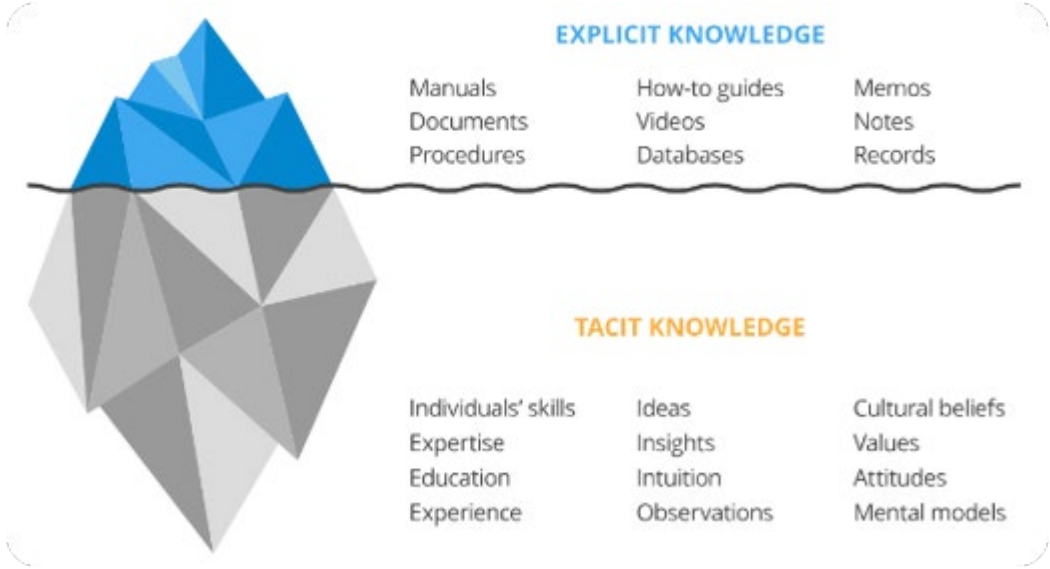
PUB SINGAPORE'S NATIONAL WATER AGENCY

- TROUBLESHOOTING
- TECHNICAL KNOWLEDGE RETRIEVAL
- EQUIPMENT PERFORMANCE COMPARISONS
- TACIT KNOWLEDGE ASSIMILATION

CHALLENGE

PUB SINGAPORE'S NATIONAL WATER AGENCY

- Enhance the preservation and succession of operational knowledge
- Streamline maintenance processes to maintain the high quality of water services.
- Improved decision-making capabilities within the organization, especially in the context of workforce turnover and the retirement of skilled operators.

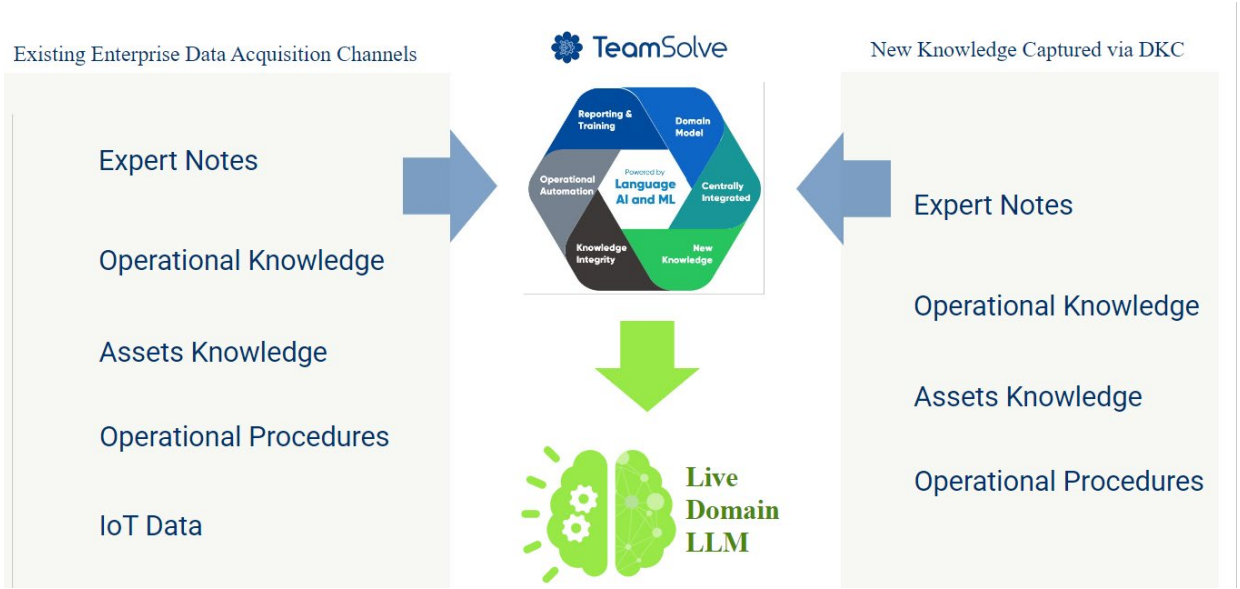


SOLUTION

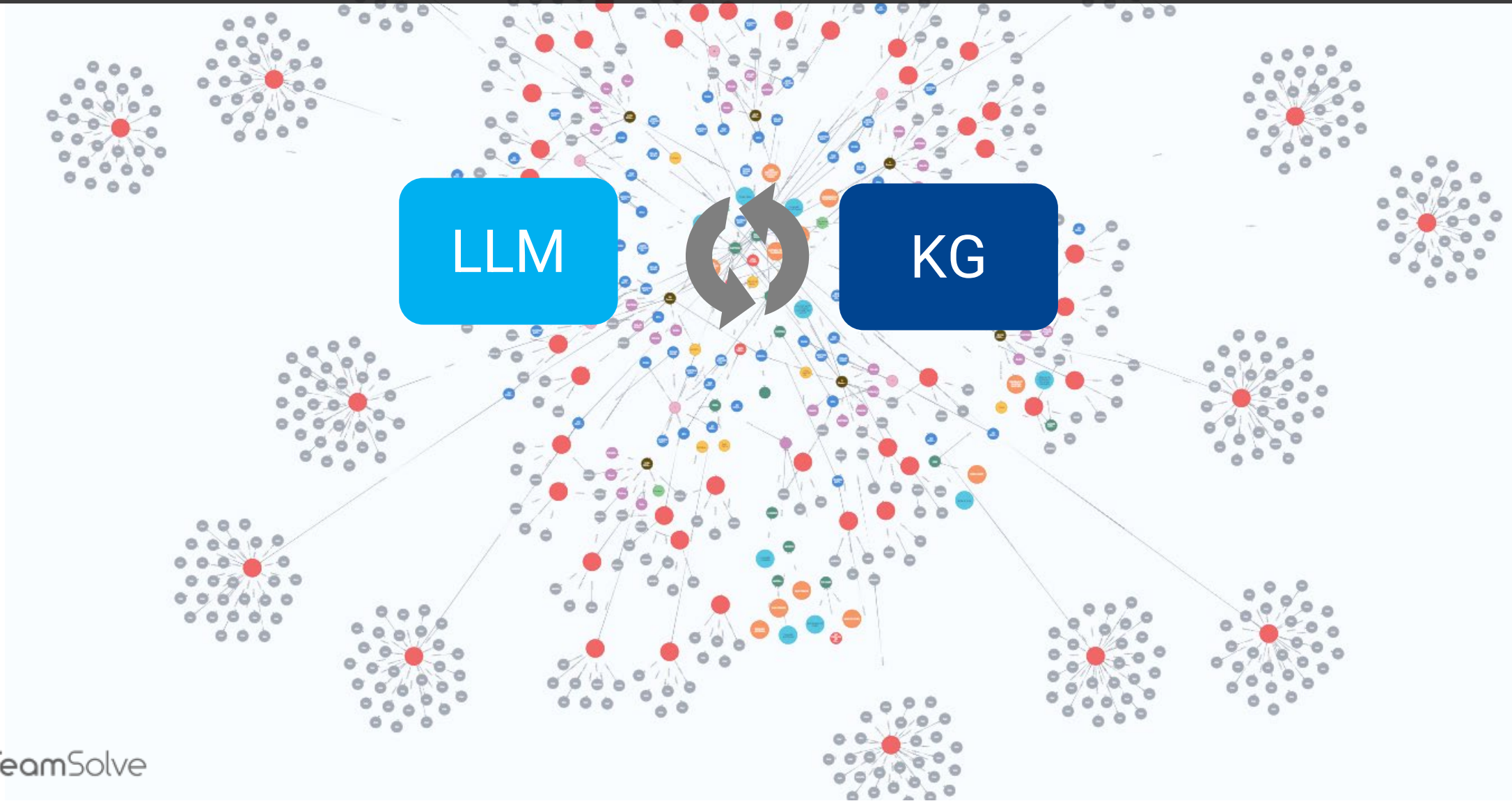
PUB SINGAPORE'S NATIONAL WATER AGENCY

- AI-powered Digital Knowledge Companion (DKC), integrating Large Language Model and a Knowledge Graph

- This system captures both tacit and explicit knowledge, ensuring continuous knowledge transfer and access across various organizational levels.



Evolves into an Accurate Knowledge Twin capturing Asset and Operations across the Total Water Cycle & Asset Life Cycle



Use Cases implemented

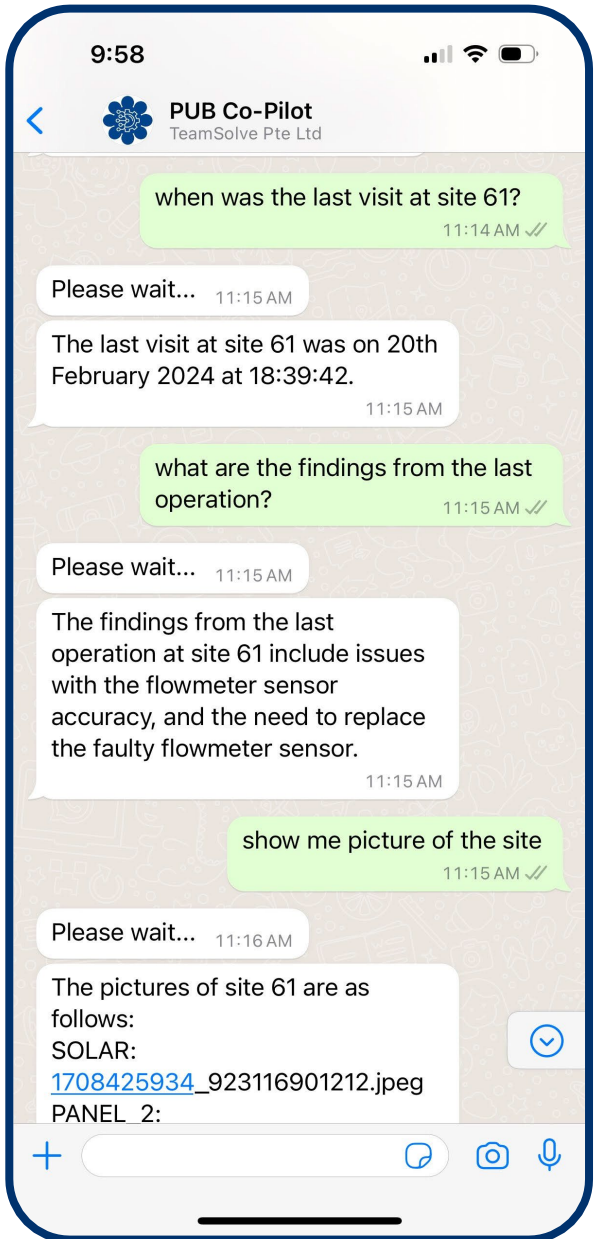
PUB SINGAPORE'S NATIONAL WATER AGENCY

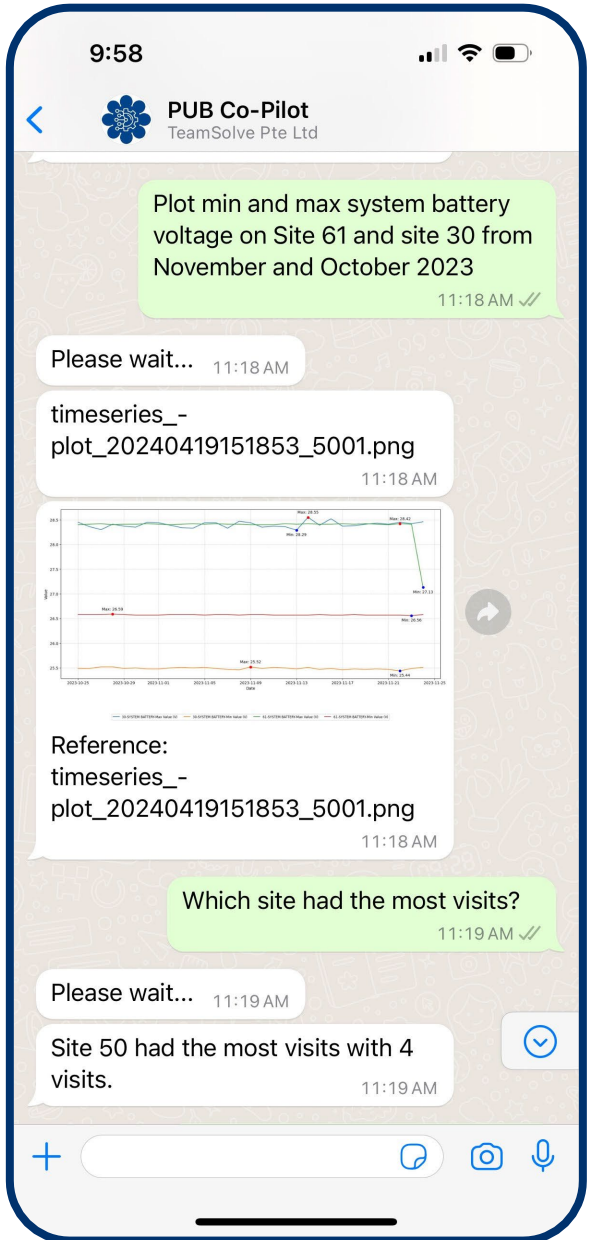
VIRTUAL TROUBLESHOOTING ASSISTANT	TECHNICAL KNOWLEDGE RETRIEVAL	EQUIPMENT PERFORMANCE COMPARISONS	TACIT KNOWLEDGE ASSIMILATION
• Enhanced guided troubleshooting for flow monitoring devices.	• Quick access to necessary knowledge from documents such as flow meter manuals and reports	• Enabling rapid comparative analysis using knowledge retrieved from technical reports and industry publications to optimize decisions	• Continuously enriching the knowledge base with real-time data and insights

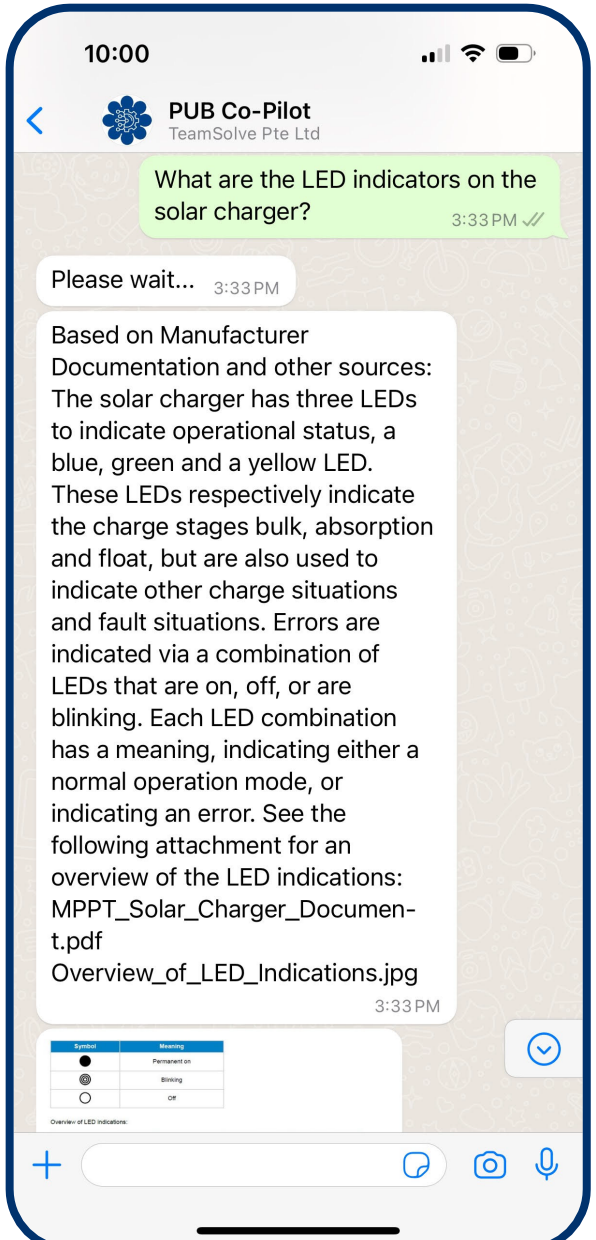
IMPLEMENTATION PROCESS

PUB SINGAPORE'S NATIONAL WATER AGENCY

- Eight-month period, for development and testing with PUB's feedback incorporated for continual refinement.
- Integrated into familiar platforms like WhatsApp enhanced user accessibility and experience.







TeamSolve

OUTCOMES

PUB SINGAPORE'S NATIONAL WATER AGENCY

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.

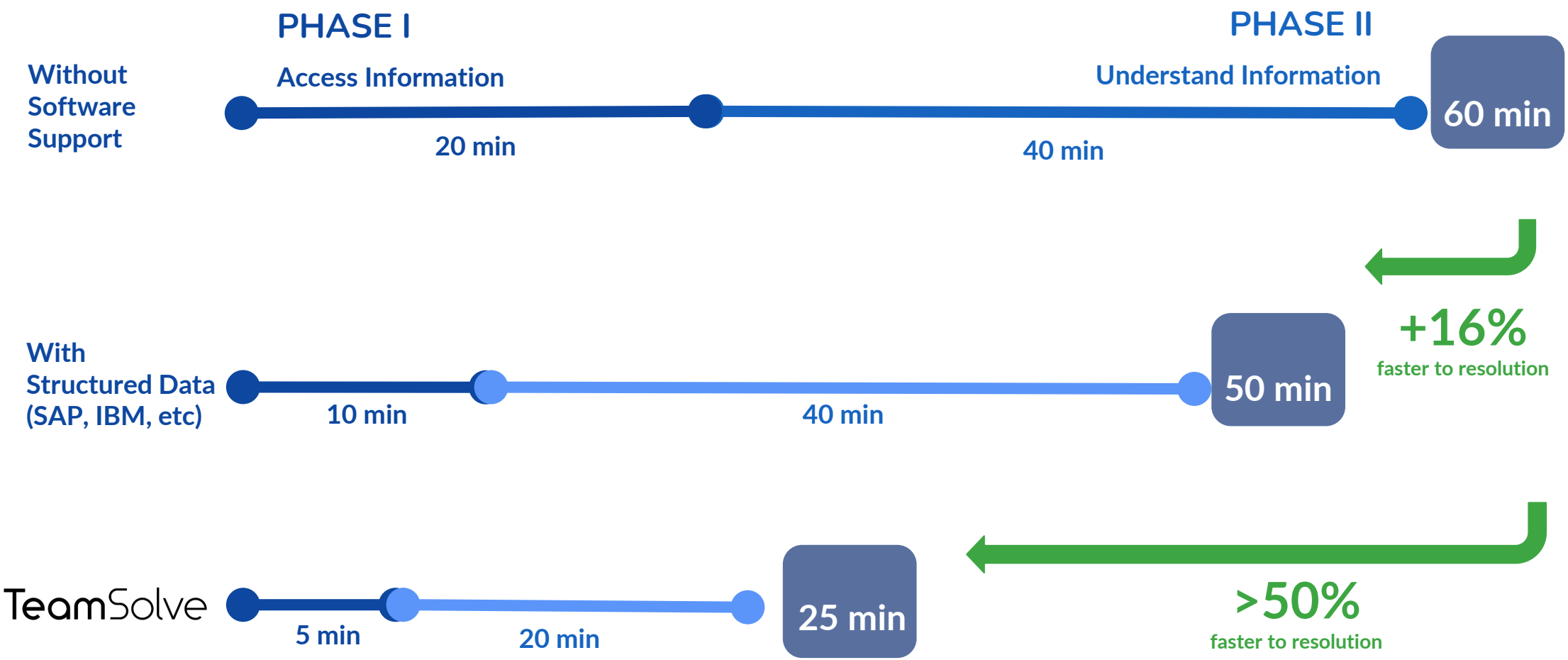
KNOWLEDGE PRESERVATION

- 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 roles.

SHORTENED TIME TO RESOLUTION - EXAMPLE



Philippines Pilot

BALIBAGO WATERWORKS

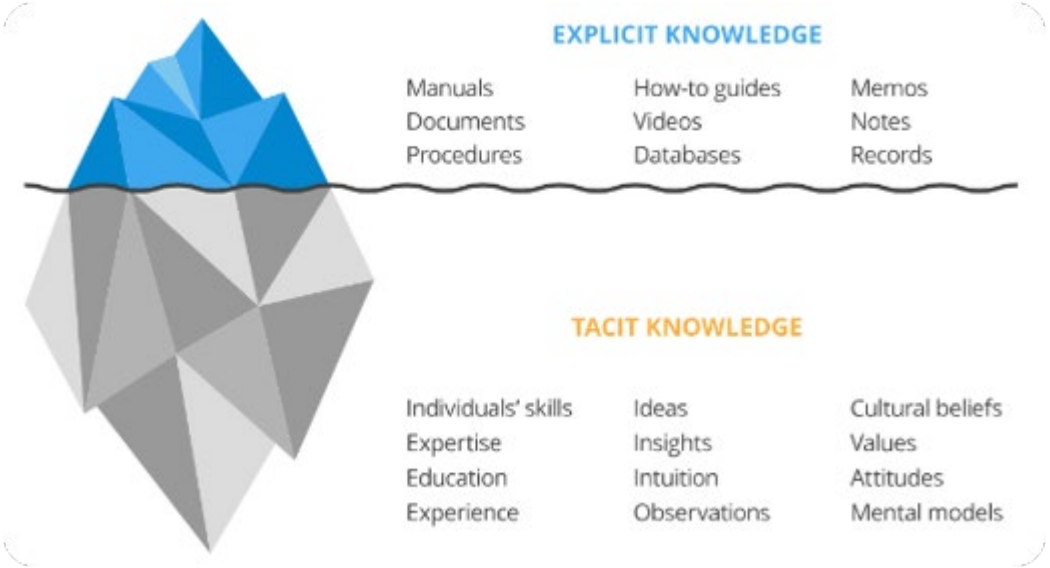
Est. <1 Yr Payback

- Corrective Maintenance
- Preventive Maintenance
- Safety
- Leak Survey & Repairs

CHALLENGE

BALIBAGO WATERWORKS

- Proactive Maintenance: Shift from reactive to proactive maintenance & incident response with easy access to insights, field expertise, and continuous learning for complex assets.
- Visibility in Decentralized Ops: Improve tracking and visibility across 90 franchises to boost productivity and asset performance.
- Centralized Info & Knowledge Access through Conversations: Streamline processes with centralized information and AI-enabled conversations for better knowledge management.

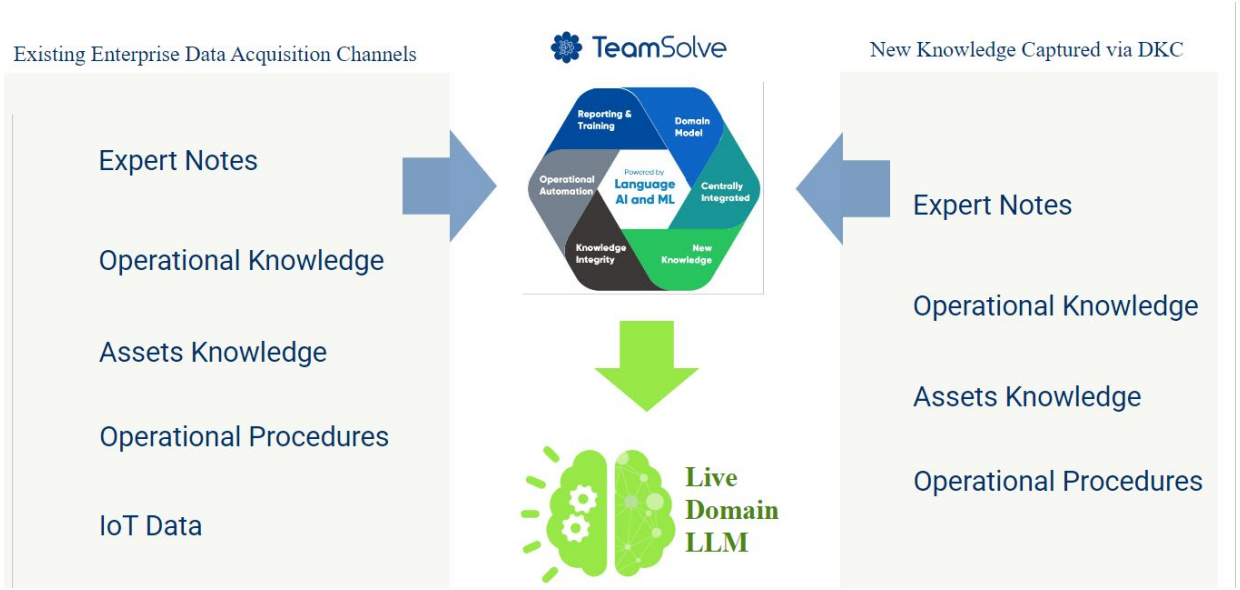


SOLUTION

BALIBAGO WATERWORKS

- AI-powered Digital Knowledge Companion (DKC), integrating Large Language Model (LLM) and a Knowledge Graph (KG)

- Knowledge insights platform that reimagines new workflows, captures both tacit and explicit knowledge continuously whilst ensuring active learning and easy mobile access for various users across all branches



IMPLEMENTATION PROCESS

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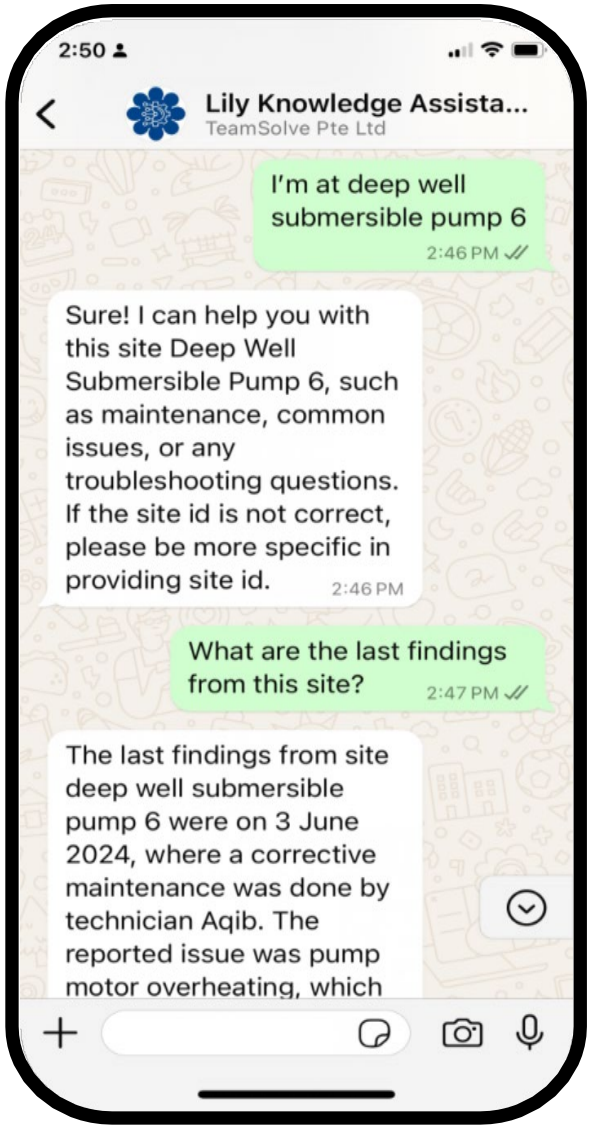
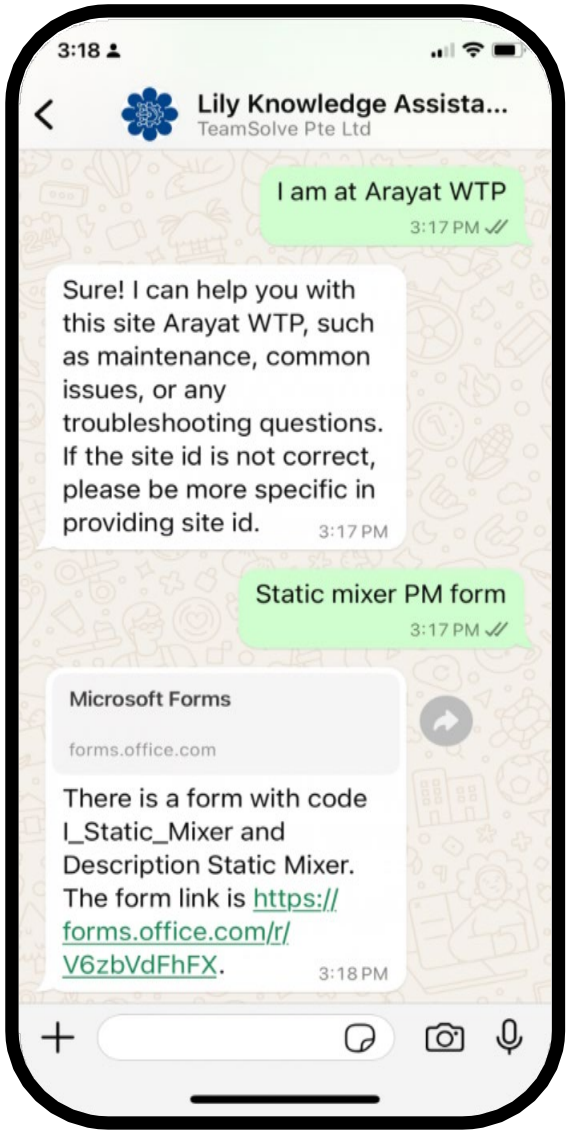
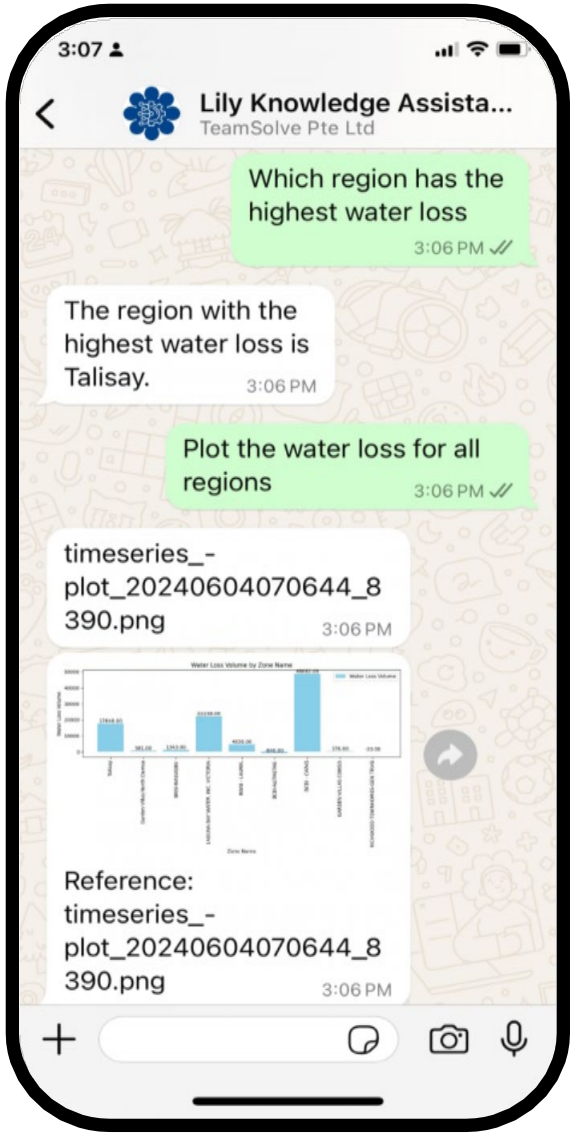
- Integrated into familiar platforms like WhatsApp enhanced user accessibility and experience.







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Philippines Pilot Outcomes

BALIBAGO WATERWORKS

Corrective Maintenance

1/2 Time spent on site in fault finding

Leak Survey & Repairs

40% Leak survey scheduling efficiency, customer response & enhancing NRW reduction

Preventive Maintenance

20% Improvement in asset performance

Safety & Onboarding

100% Safety awareness & user satisfaction

Key Use Cases & Implementation (SaaS)

Identify Use Case

Provide Relevant Data for Knowledge Twin set-up & AI Training

AI Training, Testing & Deployment

Fine Tuning & User Training

Continuous Learning & Feedback

Change Mgmt

Alarms Response Intelligence

Field Team Support

NRW Management

Sustainable Capacity Building

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ChatGPT 4o

Pressure transients cause no harm to the water pipes. Having repeated pressure surges on a daily basis has shown no issue to our network. We have not experieneced any pipe damages due to surges. The only risk we have seen is some loud noises when surges go through. Other than this, no issues. Hence I do not suggest any investigations or studies to be conducted for water hammer analysis in our network.

Question: Are water hammers risky for our network

8/8

No

Message ChatGPT

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Using LLM directly:
Hallucinations
Inaccuracies & Bias
Water Domain
Data Risks/Loss
Operational
Security Risks
...

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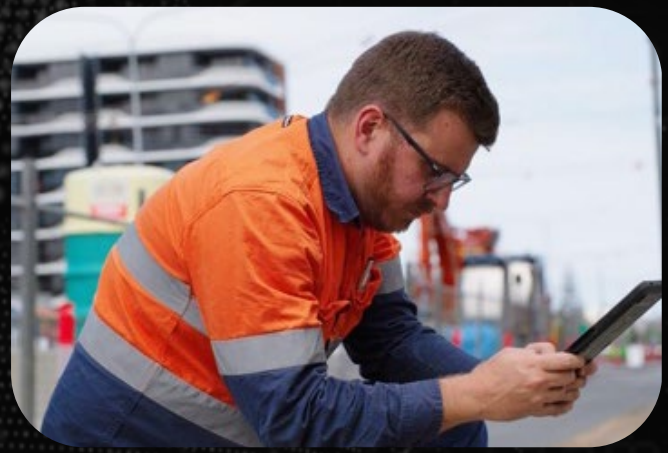
Join us in transforming operations & the workforce with robust, accurate, deployable Gen-AI



Thank You

Robin Wong (Founder/CCO)

Robin@teamsolve.com

+65 8875 9305

For more information, visit
www.teamsolve.com

or contact us at
info@teamsolve.com

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