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Applying Extended Reality (XR) with BIM model for social housing
Context-aware Facility Maintenance Management System Solution Demonstration Project

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Proposal Background



■ Proposal background:
The development trend of XR in the construction industry

Impact of Top 10 Construction Industry Trends & Innovations in 2022

Building Information Modeling (BIM)

19 %

Combining AR and VR, BIM can be quickly tested in simulated environments.

Construction Project Management

13 %

Offsite Construction

9 %

off-site construction solution

Construction Worker Safety

9 %

Modern construction is increasingly strictly complying with worker safety rules. AR/VR technology trains on-site workers to perform dangerous tasks through immersive training to reduce the chance of accidents.

Construction Robotics

17 %

Advanced Building Materials

12 %

Construction Monitoring

8 %

Green Building

5 %

3D Printing

4 %

Connected Construction Site 4 %

Off-site solution

■ Proposal background:
The development trend of XR in the construction industry

XR technology holds great potential for the construction industry !

According to GlobalData The construction industry is slowly shifting from a multi-year wait-and-see attitude to adopting digital technologies to improve the entire project life cycle from conceptual design to construction.

The need to complete projects on time and within budget is driving construction companies to utilize AR and VR technologies to save time, reduce errors, reduce safety and create long-term return on investment.

augmented reality (AR) and virtual reality (VR) are increasingly finding their use to improve the accuracy, efficiency and safety of construction projects.

The construction industry uses XR technology to reduce the cost of drawing production,
Reduce communication time and improve labor training efficiency.

■ Proposal background: The development trend of XR in the construction industry

The construction industry is leveraging *XR technology* to make building management and site operations more efficient and sustainable. The application of XR technology in the construction industry mainly uses BIM models and 3D modeling functions to make the entire construction life cycle more transparent.

In addition, the COVID-19 pandemic has created a demand for education and training that meets worker safety. The overall XR technology application scenarios in the construction industry include:



Design and display



Construction and Work Safety



Sales and Tours



Property pipeline and equipment maintenance



Education Training

■ Proposal background:
The development trend of XR in the construction industry

The Future of Architecture – Embrace XR Interactive Technology !

reduce waste

Project efficiency

save costs

improve security

enhance understanding

better decision

Proposal background



Compared with other industries, the Architecture , Engineering and Construction (AEC) industry is slow in the application of new technologies . In recent years, the concept of real-world design and construction It uses technologies such as AR , MR , XR , and BIM to conduct visual analysis, performance evaluation, and risk reduction for the entire project life cycle of engineering projects from planning, design, construction to maintenance , thereby saving time, cost, and improving Project quality.

Improve the efficiency of complex housing in facility maintenance and management operations

Construct a situation-aware facility maintenance management model based on

Combining XR positioning technology to establish an indoor and outdoor navigation mechanism to assist maintenance personnel
Can quickly and accurately find relevant facilities

The benefits of simultaneous operation of multiple people can be achieved through mobile vehicles

Introduction to the team



Team Profile



Originated in Taiwan (stock code 7406) in 2010 ,
The capital is 60 million .
focusing on XR technology development and scene
application, with years of leading independent
research and development and XR content
production capabilities, it provides a variety of XR
solutions for many well-known companies,
bringing more intuitive, vivid and interesting to the
majority of users , Visual interactive experience.

XR core technology

arplanet
宇萌數位科技

電腦視覺 Computer Vision

以攝像鏡頭+電腦代替人眼對目標進行識別、跟蹤和測量等機器視覺，並進一步做圖像處理，用電腦處理傳送給雲端之資訊源。

機器學習 Machine Learning

為人工智慧一環，運用其發展生物特徵識別與圖像搜尋引擎，採用非監督式學習判別平面目標物件，結構式解讀與訓練沒有人為標註的結果，產生正確物件特徵資訊，進而處理各種平面影像。

影像渲染 Image Render

於光影使用高階動態光搭配烘培光源技術，由動態光直接光照，並透過陰影貼圖產生即時陰影，烘培光技術更保留靜態光影細節，在效能與品質平衡上還原擬真現場。

行動導航 Location-Base Service

彙整IMU慣性測量與GPS全球定位系統等資訊，同步移除變動性外在雜訊干擾，藉由人工演算法實現行動導航功能，精準計算目標地之正確方位。

空間定位 Indoor Positioning

無須Beacon與Wifi技術等軟硬體傳輸訊號源，利用現有手持裝置、鏡頭與AR運算，達成即時測量與追蹤單一場域中物體間的距離。

雲端辨識 Cloud Recognition

透過大數據即時判讀、電腦視覺運算系統，將數據資料上傳網路空間，藉此發展獨有之AR底層辨識引擎，提供大量平台化運用。

AR 360定位技術 360 Positioning

使用AR自主開發技術結合360實境影像，達到沉浸式地理合實境的情境體驗，展現過去、現在、未來歷史情境再現。

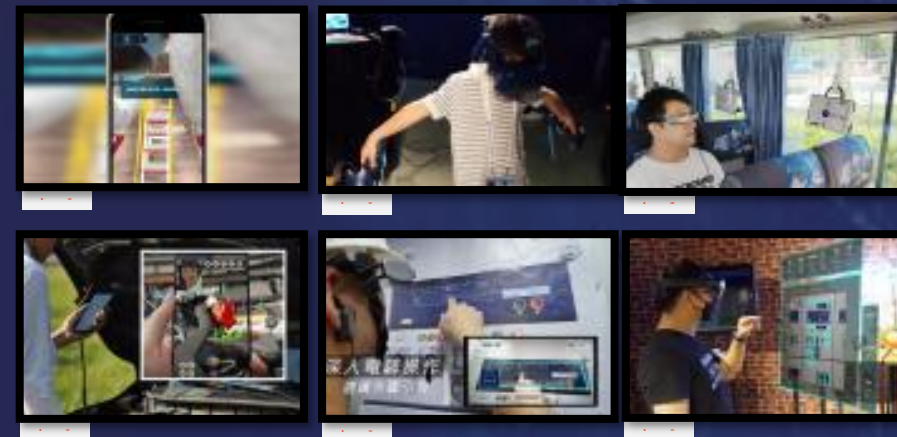
AR 平台 AR Platform

國內首創AR新媒體平台，靈活操作互動式情境體驗內容，並提供後台資料分析，是國人自主研發並超越國際水準的創意平台。

Won a number of national awards and honors Awards & Honors

ARPlanet Digital Technology (stock code: 7406) has won many national awards in research and development or platform technology over the years, and its unique innovation and entrepreneurial achievements have been recognized by all walks of life.

- Won the 2019 potential backbone enterprise award of the Industrial Bureau of the Ministry of Economic Affairs
- Won the 2019 & 2020 consecutive two years of the Ministry of Economic Affairs Small and Medium Enterprises Study Plan Learning Innovation Award
- Won the 2021 Golden Ridge Award Forward-looking Technology Award
- Won the 2018 Asian Incubation Association AABI Enterprise Torch Award (Best Technology Transfer Award)
- Won the SBIR AR Cloud Recognition Platform Technology Innovation Research Award
- Won the 18th , 20th , and 28th National Innovation Research Awards
- Won the **third** phase of AAMA Entrepreneur Honor
- Won the 11th National Innovation Business Award
- Received the award of Xinguang Avenue for Entrepreneurship in the Digital Era
- Acquired Redherring Asia Top 100 Startups
- 2014, it was listed in the first wave of IPO companies in Taiwan (stock



ARPlanet Digital Technology (stock code 7406) has been innovating continuously for 12 years, and has won a number of technical patents, realizing the technical strength of real-world technology innovation.



- 2022 : The application method and application interactive module of the augmented reality of real space virtualization (I800930)
- 2020 : XR marginal computing system (patent number: No. M603989)
- 2018 : Indoor precise navigation system using augmented reality technology (Patent No.: M560099)
- 2017 : LaiQ APP software copyright (Ruan Zhu Deng Zi No. 1592557 (Lu))
- 2016 : AR R&D platform technology eyeCRT Visual cloud identification technology (SBIR)
- 2014 : Real-life analog video generation device by means of pictures (Patent No.: M498921)
- 2013 : Multifunctional Augmented Reality System and Index Augmented Reality System (Patent No.: M446370)
- 2010 : Physical object trajectory identification system (Patent No.: M415367)

Refer to evidence records



Empirical Records - Situational Description

Through the Taipei City Development Bureau and the Taipei Smart City Office, the Director-General of Dongming House Coordinated the introduction meeting of the demonstration field and assisted Yumeng to obtain the BIM building data and files of the Dongming House District A, and the drawings of the pumping system equipment for subsequent import operations Materials to be used.

Build the existing objects of the building as the XR system of the identification mark (XR Marker) , and use the index signs or lights in the building , such as various escape signs or lights, etc. to establish indoor and outdoor
The navigation mechanism assists the maintenance staff to quickly and accurately find the facilities that need maintenance or repair.

Visually present the content related to facility maintenance in the built XR system , and establish the necessary image recognition and information presentation mechanism, so that users can interact with XR content and present it on mobile devices (Mobile Device)
Used as a reference for maintenance staff.

Empirical Records - Import Field and Scope

Dongming Community House, Nangang District, Taipei City

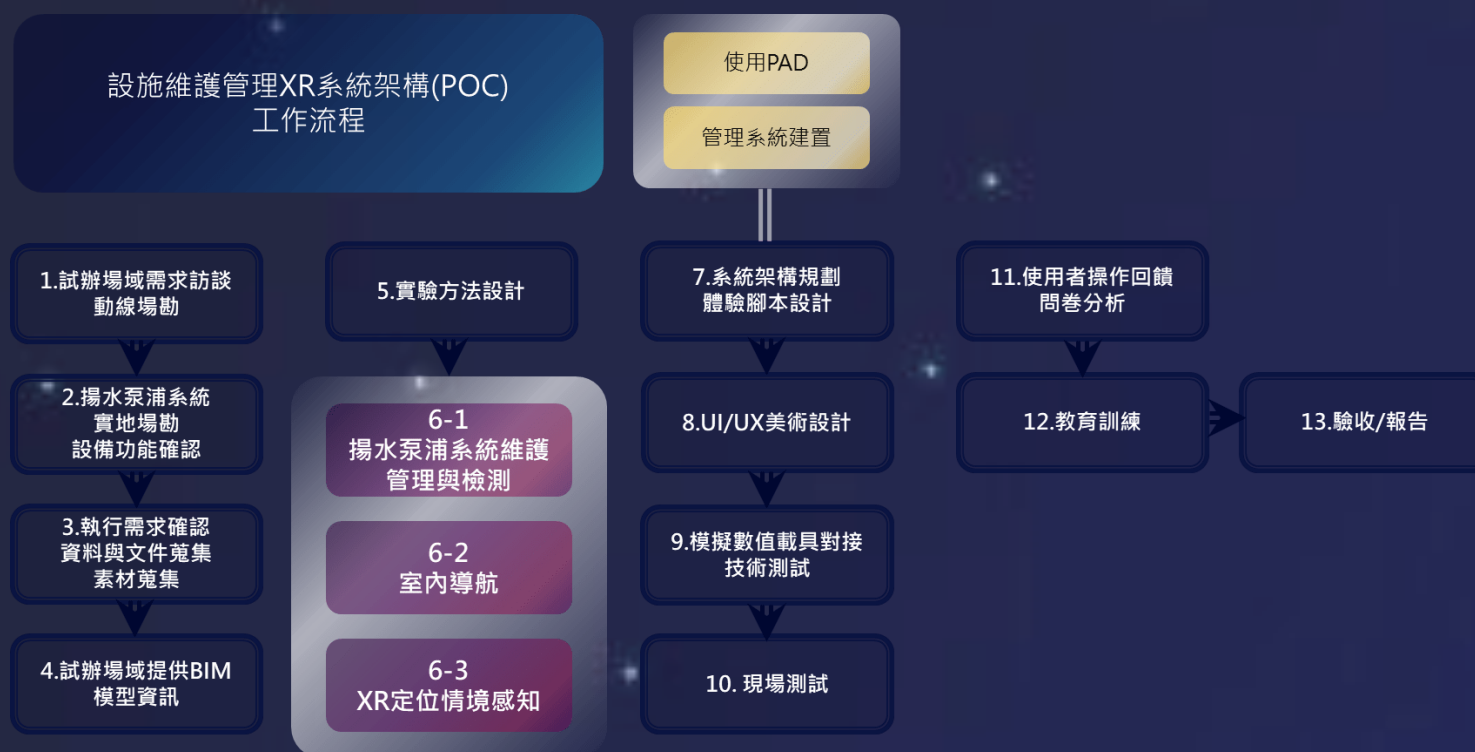


Construction method - import technology and specifications



Through ARPlanet XR XR provided by the cloud platformExtended Reality Interactive Module, Make BIM model objects visible through XR The way to locate in the real space , Finally, the maintenance operation management operation is carried out on the real environment screen of the lens.

Implementation method - import workflow

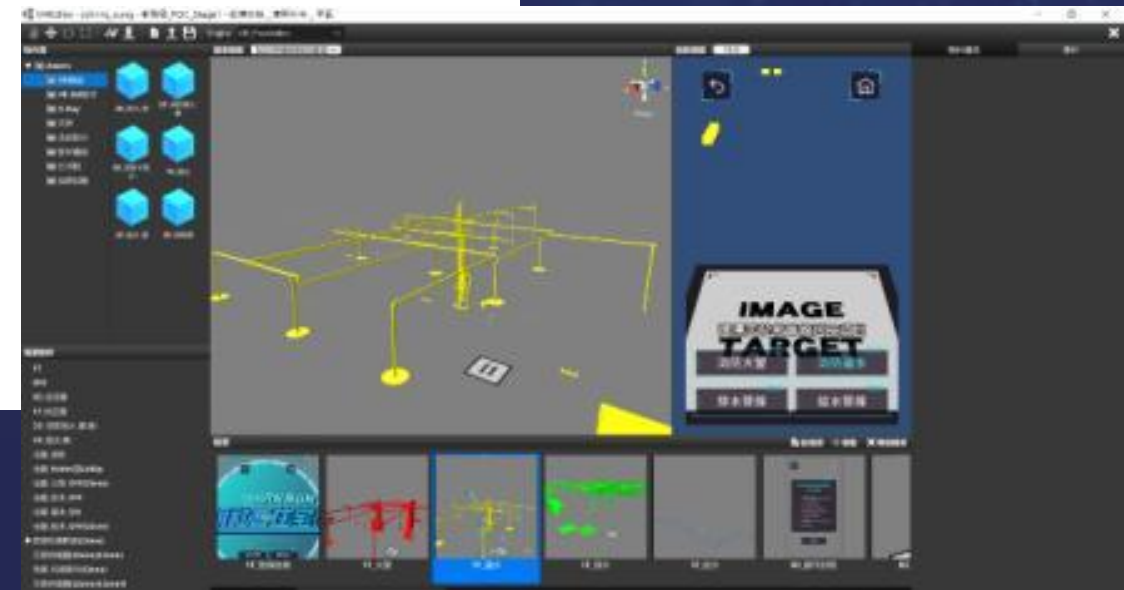
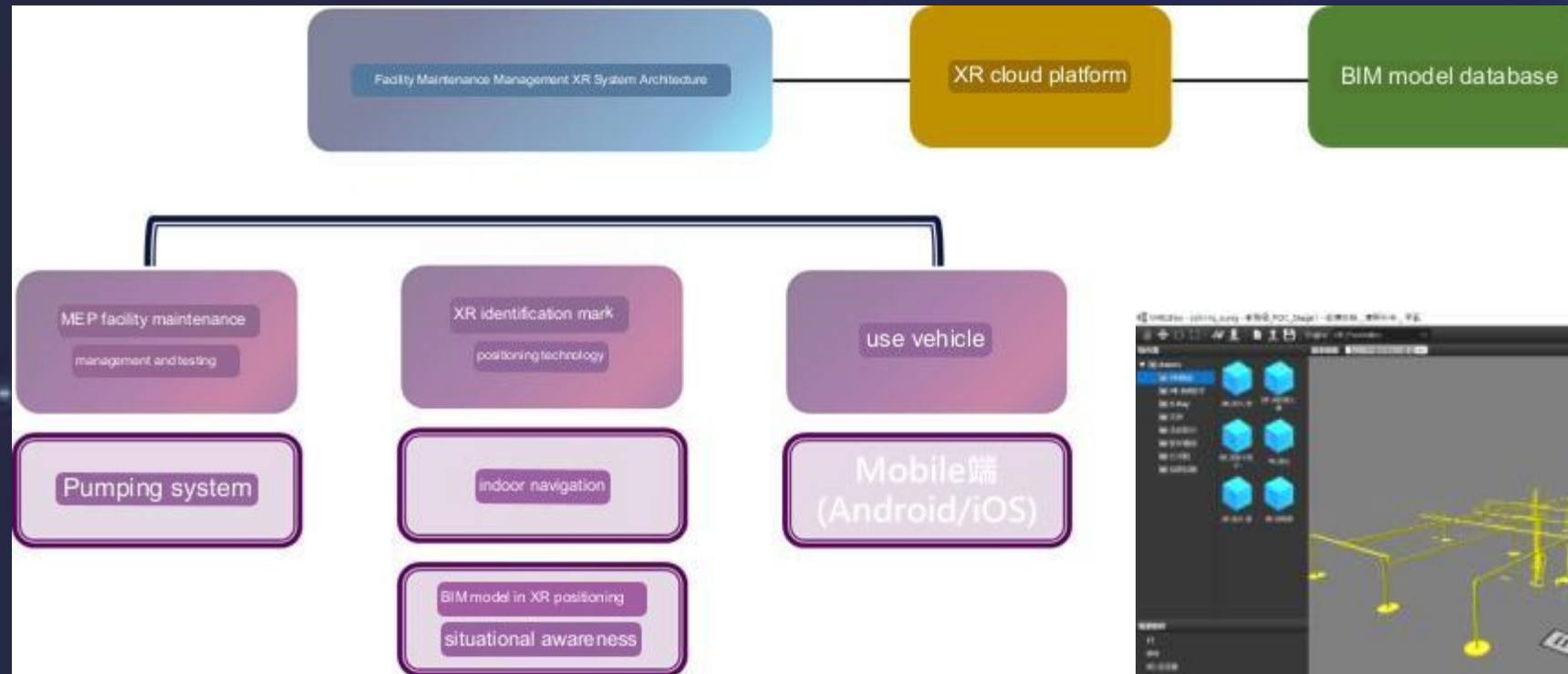


1. Trial site demand interview, moving line site survey
2. Lifting and pumping system, on-site survey, equipment function confirmation
3. Execution requirements confirmation, data and document collection, material collection
4. Provide BIM model information in the pilot site
5. Experimental method design
- 6-1 Maintenance, management and testing of pumping system
- 6-2 Indoor Navigation
- 6-3 XR Positioning Context Awareness
7. System Architecture Planning
- Experience Script Design
8. UI/UX art design
9. Simulation numerical vehicle docking technology test
10. On-site testing
11. User Operation Feedback Questionnaire Analysis
12. Education and training
13. Acceptance/Report

Implementation results

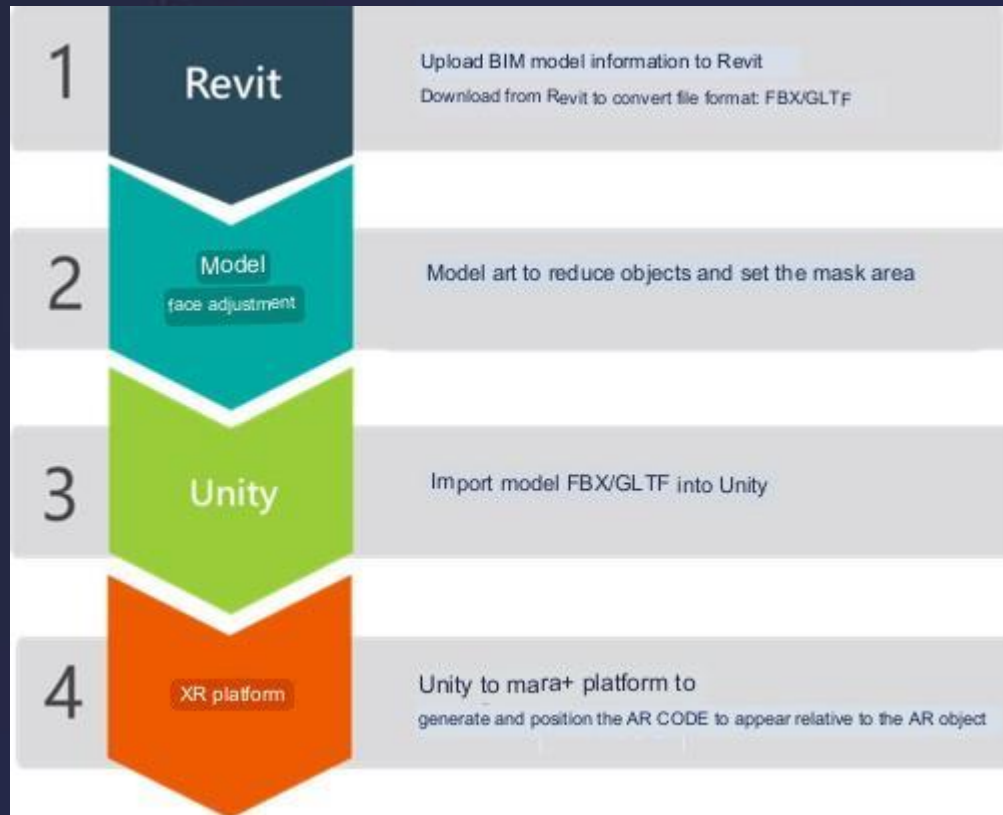


Executive Outcome - Development Architecture



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BIM model import XR platform system process



- Handheld device operating system environment: marq + APP interactive platform
Support iOS 11 and above and support Android 8 and above
A handheld device with built-in AR kit and AR core functions .
- Target users of this case: Multiple people (including mechanical and electrical facility maintenance personnel and related management personnel) operate and use this development system at the same time, and they are personnel with non-fixed shifts.
- Network : In this case, there is no 5G network built in the case site. The XR system platform is a cloud service platform, and users use it according to the network environment (4G/5G) used on site .
- the BIM and XR models can be updated synchronously
- BIM model, the XR model can be imported in batches for update.

Executive Results - Design Focus

- XR indoor navigation

XR is turned on when entering the field
The indoor navigation function guides the maintenance personnel to quickly find the location of the equipment in the field .

Navigation route: 1st floor and B3 floor



- XR pipeline inspection

will present in 2D The method of on-site inspection on the drawing is changed to XR The context-aware mode of visual pipeline inspection can effectively reduce the error rate and improve work efficiency.

the 1st floor :

1. Fire sprinkler
2. Fire alarm
3. Water supply pipeline
4. Drainage pipeline

- XR pumping system SOPs

Take Yumeng XR Positioning patented technology, superimposing BIM when performing maintenance and testing of the pumping system The model is placed in the water logging position and imported into XR The design of the three-dimensional instruction manual enables the maintenance personnel to complete the maintenance and inspection work through visual presentation of intuitive operation and guidance without having to carry paper manuals.

B3 building pumping equipment

Execution Results - Verification Method

Invite the project window and property personnel to conduct on-site operation experience. Testers conduct actual measurements through their own handheld devices.



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■ Execution results - verification results

Qualitative benefits

Through this project, import BIM model combined with XR technology to improve facility maintenance management process work efficiency .



Through XR technology , the accuracy of model positioning can be improved, which will serve as an important cornerstone and benchmark for promoting the introduction of XR into BIM and the development of construction industry applications in the future .



Through the platform of this project, the BIM 3D file is converted into an FBX file , which can be imported into the platform for editing and production of the XR interactive process, and materials can be provided
There is real-time background support when updating.



Execution results - verification results

Summary of



The subjects of this project think that **XR indoor navigation setting route guidance** is "helpful" in **unfamiliar places** , accounting for 100% .



The subjects of this project believed that the function of BIM model superimposing virtual pipelines on the ceiling and floor of the hall on the first floor of XR was "helpful" for the assessment of pipeline locations in subsequent maintenance situations , accounting for 100% .



The subjects of this project think that the **XR SOP inspection and operation guidelines for water pumping system facilities** are "helpful" for **property personnel equipment maintenance and management** , accounting for 100% .



The subjects of this project suggested that the technology of this demonstration case will have better benefits



Among the subjects of this project, they are willing to pay for the follow-up introduction of this demonstration case .

Executive Results - Online Achievement Presentation - Achievement Video



YouTube

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感謝! THANK YOU.

Thinking Forward Beyond Reality