Case of Cadastral Survey Innovation in Korea

Seong ha, LIM

2024. 11. 06

LX Korea Land and InformatiX Corporation

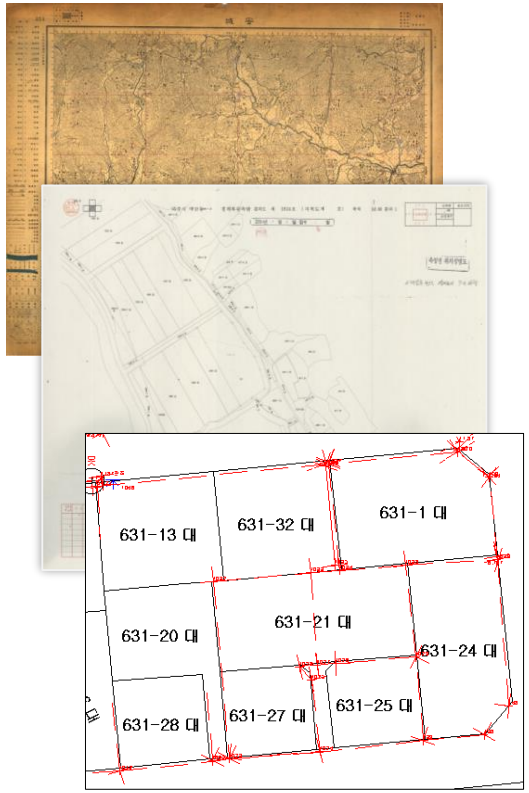
한국국토정보공사
Korea Land and Geospatial InformatiX Corporation

CONTENTS

(Intro) Fast-changing global IT technology trends

Cadastral Survey method status and limitations

" Delay adoption of advanced digital technologies in Cadastral Field "



2D Analog Cadastre 92.8%

- Paper cadasral registration errors continue to exist
- Stores land-related information in a simple form of point, line, and plane

Adherence to the traditional direct survey method

- Direct survey by T/S and RTK
- Labor-intensive, repetitive surveying

Cadastral Survey Innovation Promotion Direction

" Paradigm shift in cadastral survey and system "

- Introduction of cutting-edge surveying technologies such as MMS, drones, and LIDAR
- Improving surveying efficiency through precise surveying and 3D processing

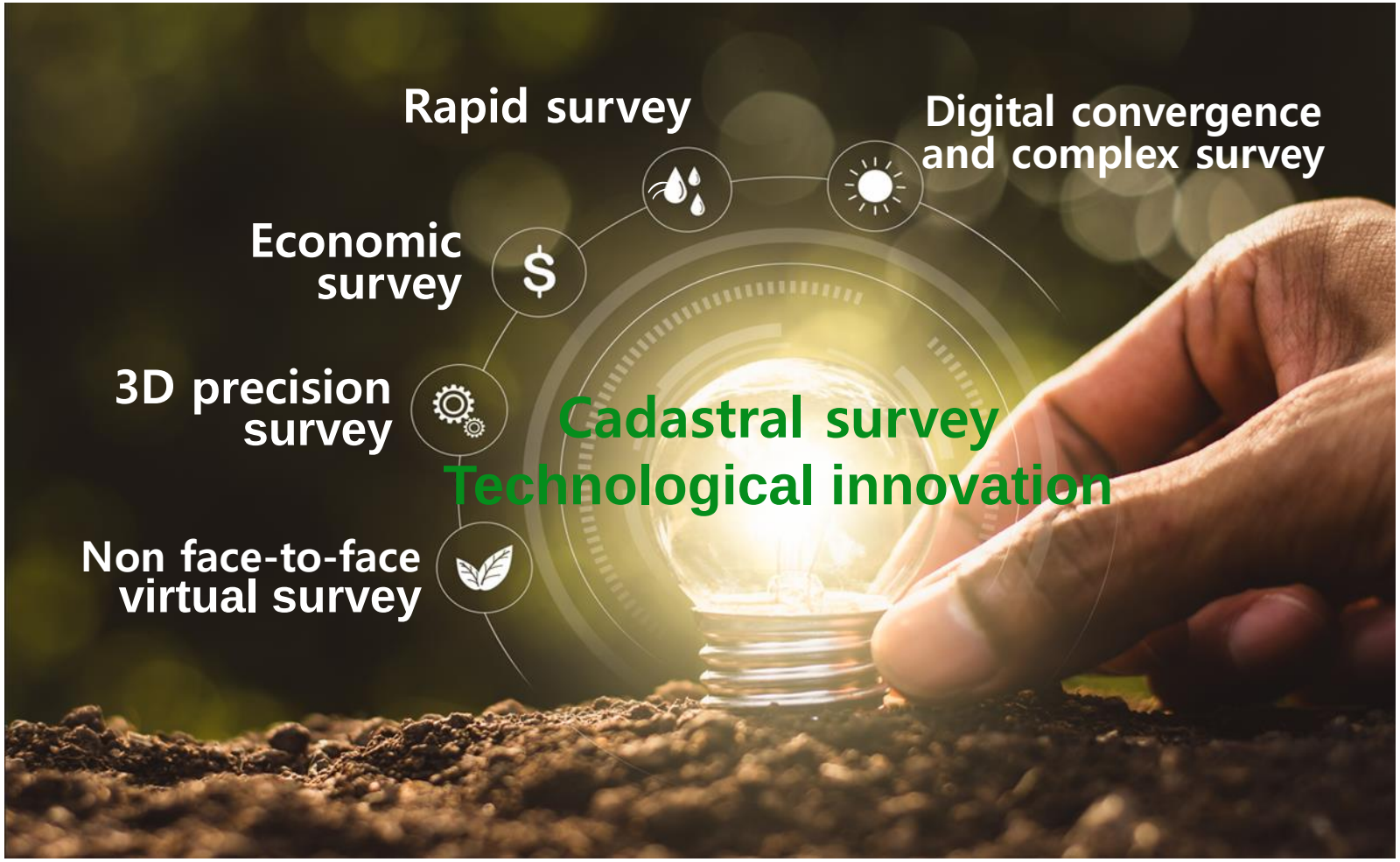
- Support conversion to digital twin-based three-imensional and digital intelligence
- Supporting the role of cadastral information as a national core infrastructure

- Expansion of intellectual field exchange and cooperation through intellectual innovation
- Creating an ecosystem through joint research and development of innovative technologies

- Improving the quality of cadastral service by introducing a quick and accurate surveying method
- Rapid response to the heightened survey service environment such as non face-to-face and mobile

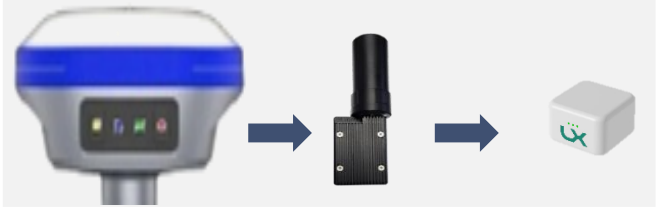
Cadastral Survey Innovation Expected Effect

" Focus on technological innovation in cadastral surveying to prepare future 3D cadastral system "



3 Major Innovative tasks in Cadastral Survey

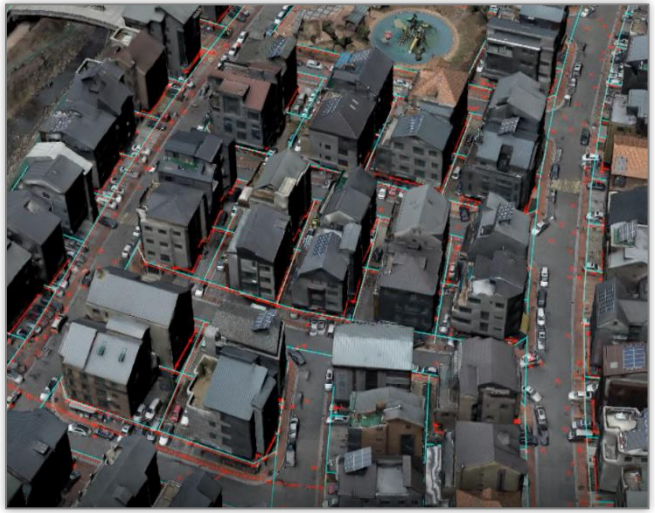
1 Compact GNSS Surveying Equipment



Ultra-compact, high-precision

Auxiliary Equipment -> Rapid Survey

2 Cadastral survey using drone images



High-resolution drone images

Extraction of cadastral status → Determination of survey results

3 MMS + drone convergence/complex survey

3D precision surveying and 3D modeling

Future 3D cadastre realization

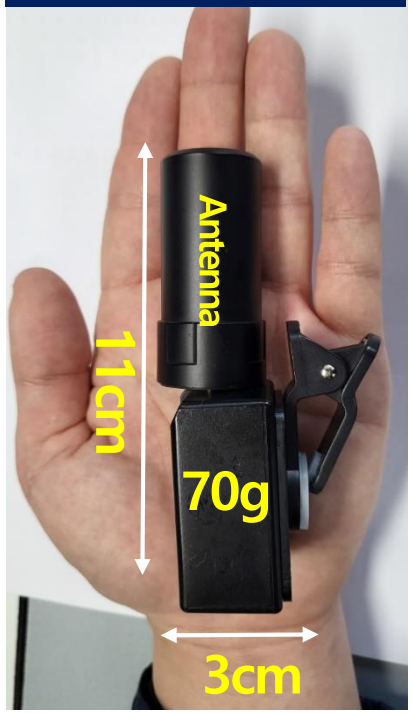
Innovation 1
Compact GNSS Survey

Compact GNSS Surveying Equipment Features

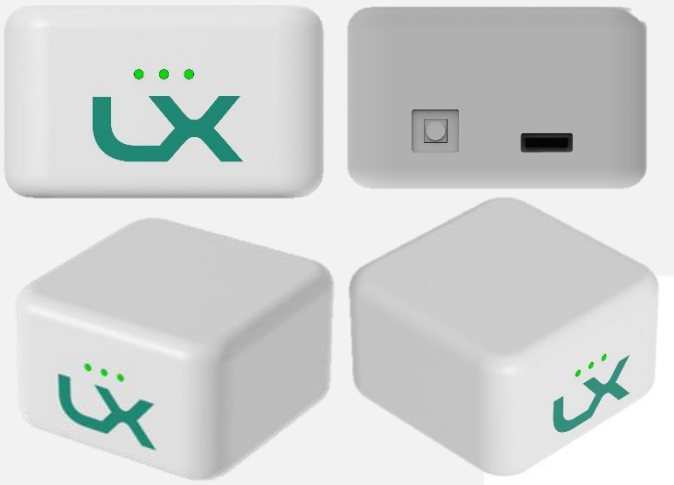
"Rapid surveying in the field and minimization of surveyor fatigue"

Traditional GNSS survey equipment

Compact GNSS equipment



Compact GNSS equipment (LX self-production)



(6 x 6 x 4cm)

Acquisition of patent, design rights

- Ultra-small, Ultra-light precision
- Surveying equipment Network RTK (VRS, FKP)
- Connect with Mobile Landygo
- Accuracy 1cm + 1ppm CEP

Utilization of cadastral survey of Compact GNSS survey equipment

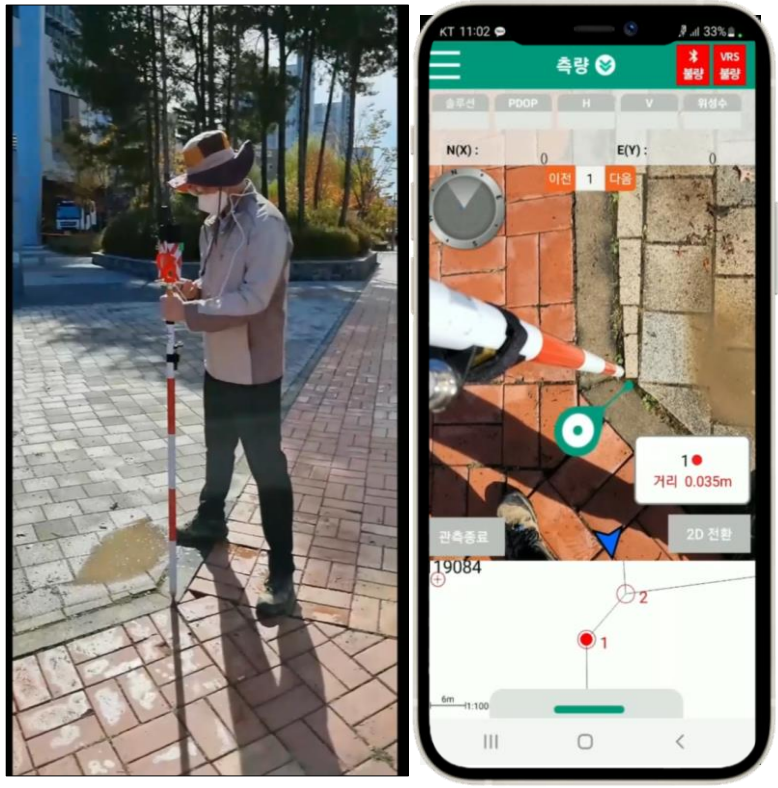
01 Simultaneous survey by 3 people

For cadastral survey support(Auxiliary survey equipment)

35% drop in labor sentiment

98.2% increase in surveyor satisfaction

02 AR Boundary Survey



AR boundary survey support

Reduce surveying time by ½

Twice as fast as installation time

Cadastral Boundary Point Marking Process

(Innovation) Boundary survey using Compact GNSS

"The process of finding the boundary point through AR + Compact GNSS + LX Landygo "

Innovation II
Cadastral Survey using Drone Images

Limitations of the current Cadastral Survey method

" Need to improve the efficiency of the current T/S and GNSS cadastral survey method "

" 1 team of 3 "
Survey with T/S and GNSS surveying equipment"

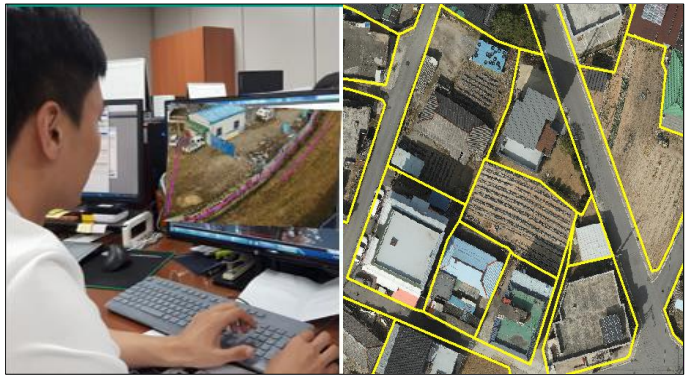
" It takes a long time to survey the current type "

Cadastral Survey process using Drone Images

"Execution of cadastral survey after determining preliminary performance by extracting current form indoors"

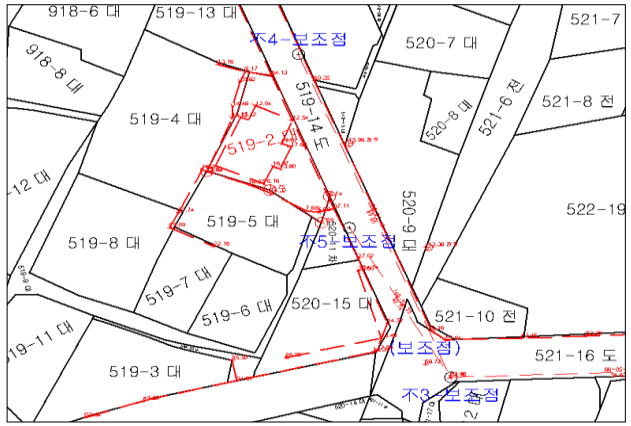
01 Drone photography and processing

02 Drone image status extraction

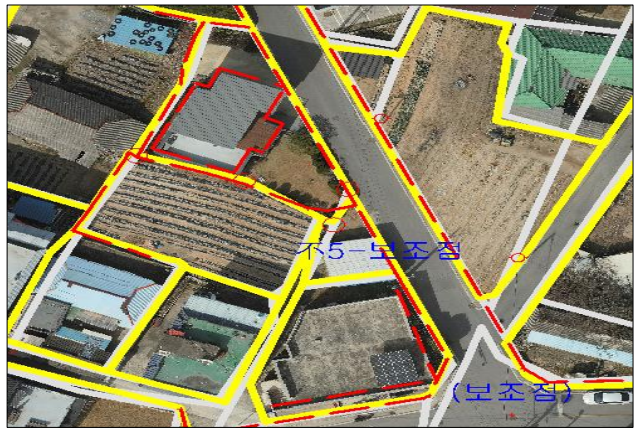


03 Priority determination of survey results in the office

04 Final decision after on-site inspection



05 Cadastral survey completed



How to use Drone Images in Cadastral Survey

" Development of accurate drone image shooting and processing technology to be used for cadastral survey "

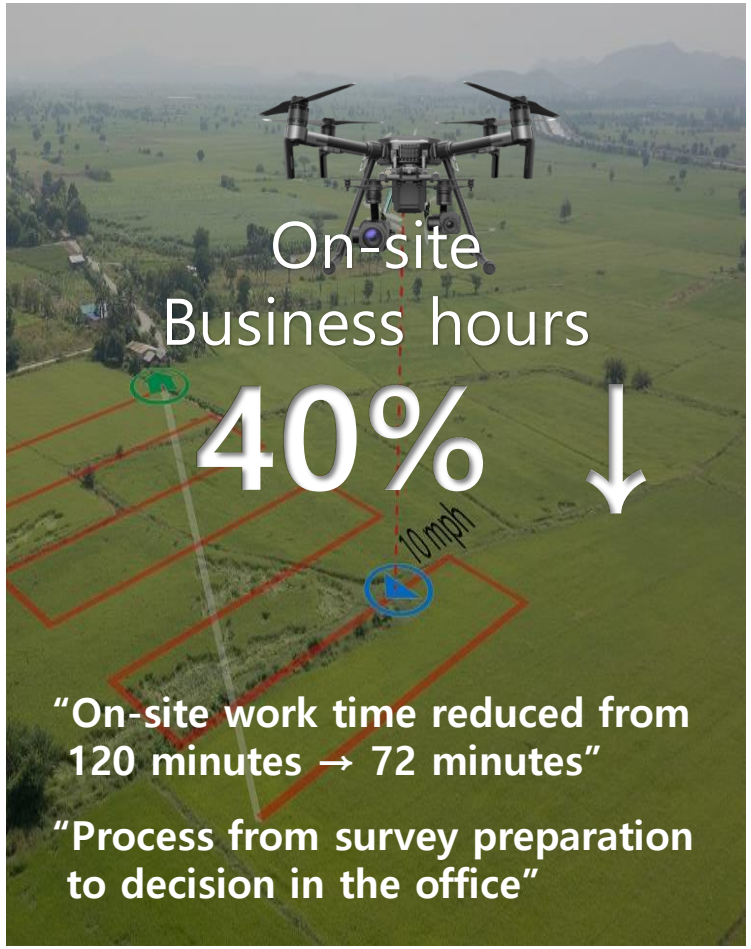
The process of extracting and utilizing patterns from drone

Effects of cadastral survey using drone images

" Save more than 80% of field survey and work time compared to before "

	AS-IS	TO-BE
Spatial resolution	5cm (Ambiguous facility identification)	1.5cm (9x improvement)
Positional accuracy	10cm (Limitation of use of cadastral field)	5cm **(2x accurate)**
Image processing time	30day (Immediate application limit)	1day (30x faster)
Camera pixel	20M (Decreased detail)	45M (4x precision)
Image modeling	2D (one-way shooting)	3D (5-way shooting)

Propulsion effect



Innovation III

Drone + MMS Convergence Survey

(Mobile Mapping System)

Limitations of Drone Images

"Existence of processing error areas in drone images"

1. Condensed areas with narrow building spacing

2. Areas with complex facilities attached

3. The facility located high

Innovation3 – MMS + Drone Image Convergence Background

Limitations of Drone Image

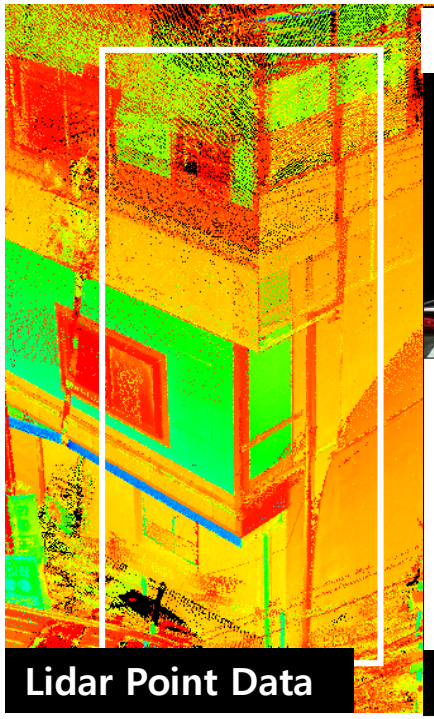
- Unphotographable under surface of a wall with long roof
- irregular modeling(wall, fence)

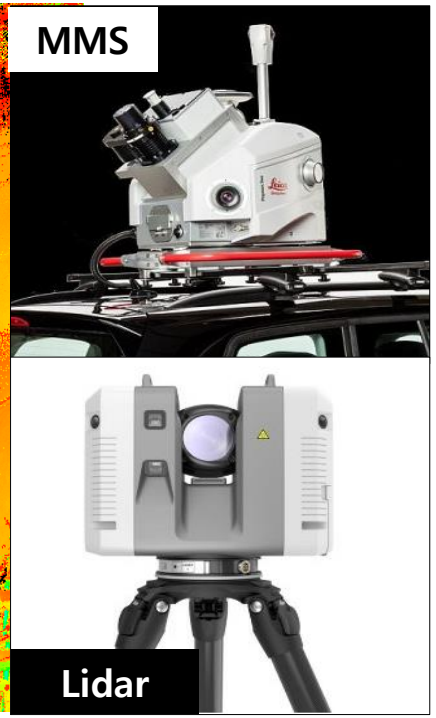
MMS(+Lidar) Surveying Supplement

- Conducting 3D surveys with Lidar scanners
- Precise survey of areas not filmed by drones

MMS + Drone Fusion Result

- Supplementing areas not filmed by drones
- **3D modeling with distortion-free facility**





MMS + Drone Image Convergence and Complex Survey Promotion Process

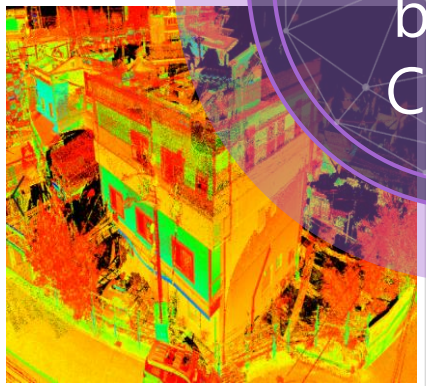
"Convergence of MMS survey data to supplement the limitations of drone images "

Innovation 3 – MMS + Drone Image Convergence Utilization Plan

"Laying the foundation for development from 2D to 3D cadastral"

01 Drone Image(2D, 3D)

02 MMS Surveying Data



3D Cadastral - based Create

03 Cadastral Data + DT

04 3D Virtual Space

- Cadastral Map+ Metaverse Virtual Space
- AR + VR mixed reality space
- The 3D relationship of land rights
- 3D Road, Address, Urban Planning

Innovation 4_ Metaverse Cadastral Surveying System Buildup

" Utilized for education in cadastral survey and current shape extraction in virtual world based on 3D drone images "

01 3D Image + Cadastral Map

02 Develop System using Game Engine

03 Cadastral Survey in Virtual Space

04 Surveying with customers in Metaverse

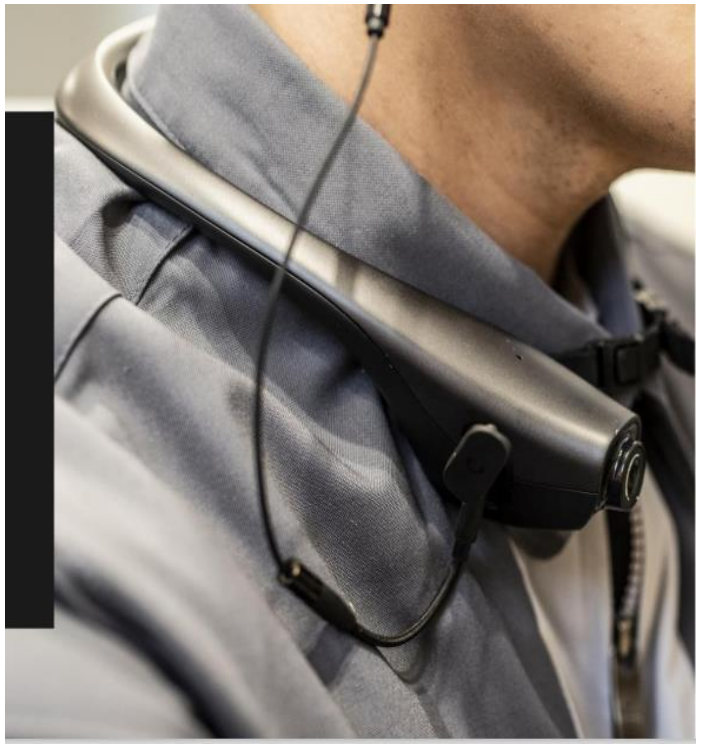
3D Digital Cadastral Map based on Metaverse

Service Change of Cadastral Survey

"Implementation of cadastral survey service considering the socially underprivileged"

Remote Communication of Surveying Process

Non-Contact Service with Camera & Video Transmission Device



Non-Contact Service of LX(Video)

Future Plan

LX Cadastral Survey Innovation

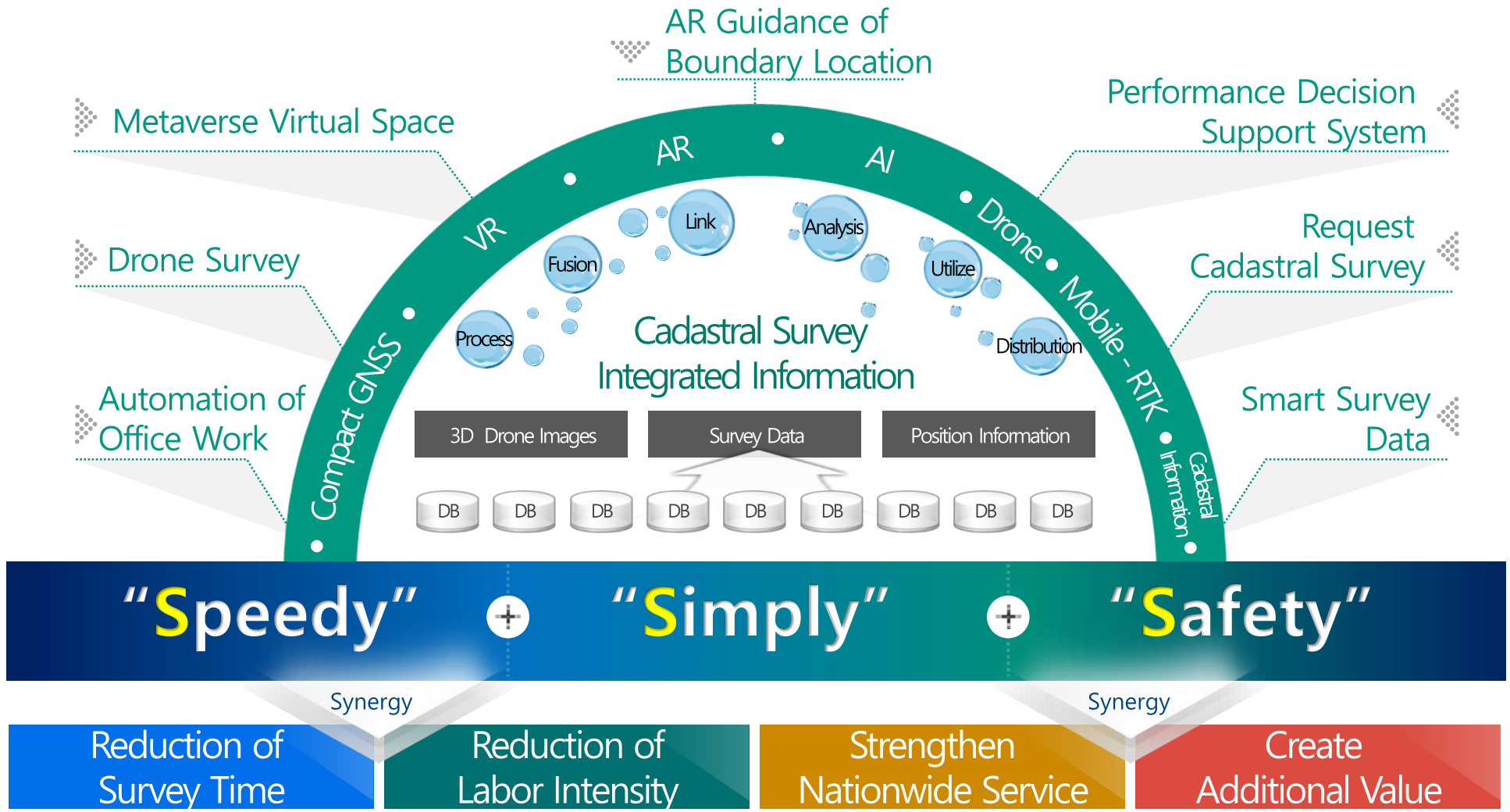
Future Plan in Cadastral Survey Innovation

ICT infra expansion related cadastral innovation
(HW/ SW, DB, N/W, Service System etc.)

Cooperation for R&D and Talent development with the Industry-University-Institute Collaboration
(Strengthening education and Innovation talent development)

Establishment of state-of-the-art cadastral surveying systems (MOLIT)
(Drone, MMS, 3D Cadastral Information etc.)

"Leading the Future of Cadastral Surveying through Constant Change and Innovation."




Thank you