



# Explanatory Documentation regarding Business Plan and Growth Potential

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June 30, 2022

**Eyes to the all machines**

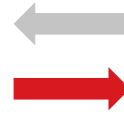
# 1. Market Environment

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# AP will be the basis for broad range of industries alongside AI

- The artificial perception technology provided by Kudan (providing machines with “eyes”) both complements and operates in unison with artificial intelligence (providing machines with “brains”) to allow a range of machinery (robots and computers) to move and function autonomously

**Artificial Perception**



**Artificial Intelligence**

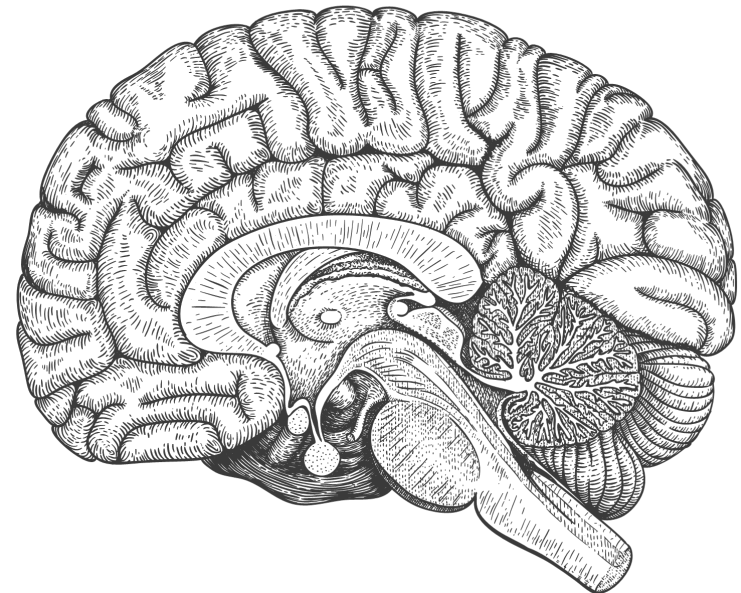
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**The “eyes” of machines,  
allowing them to perceive and  
understand their environment**



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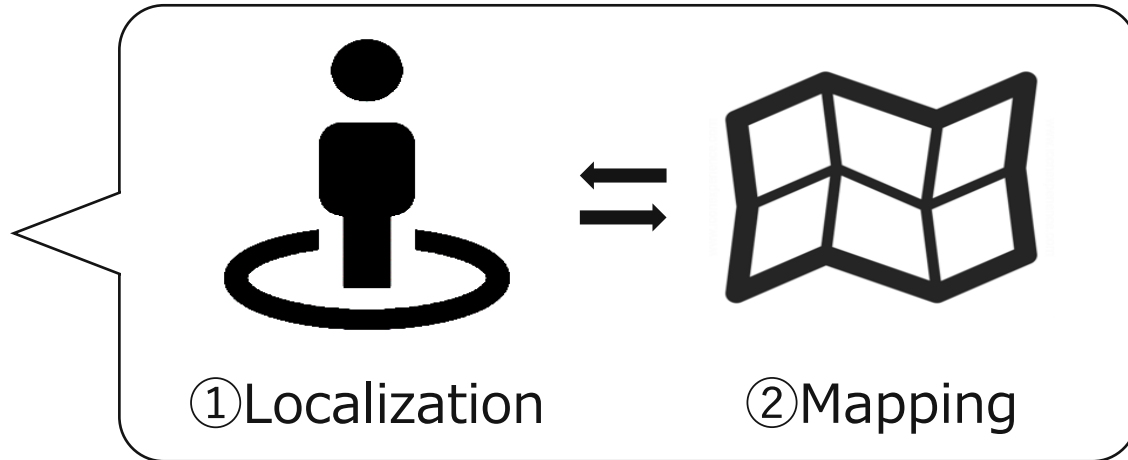
**The “brains” of machines,  
allowing them to make  
appropriate decisions**



# SLAM (Simultaneous Localization and Mapping) as the core of AP technology

- AP technology is a group of Deep Tech centered on SLAM (Simultaneous Localization and Mapping)

## SLAM technology (Simultaneous Localization and Mapping)



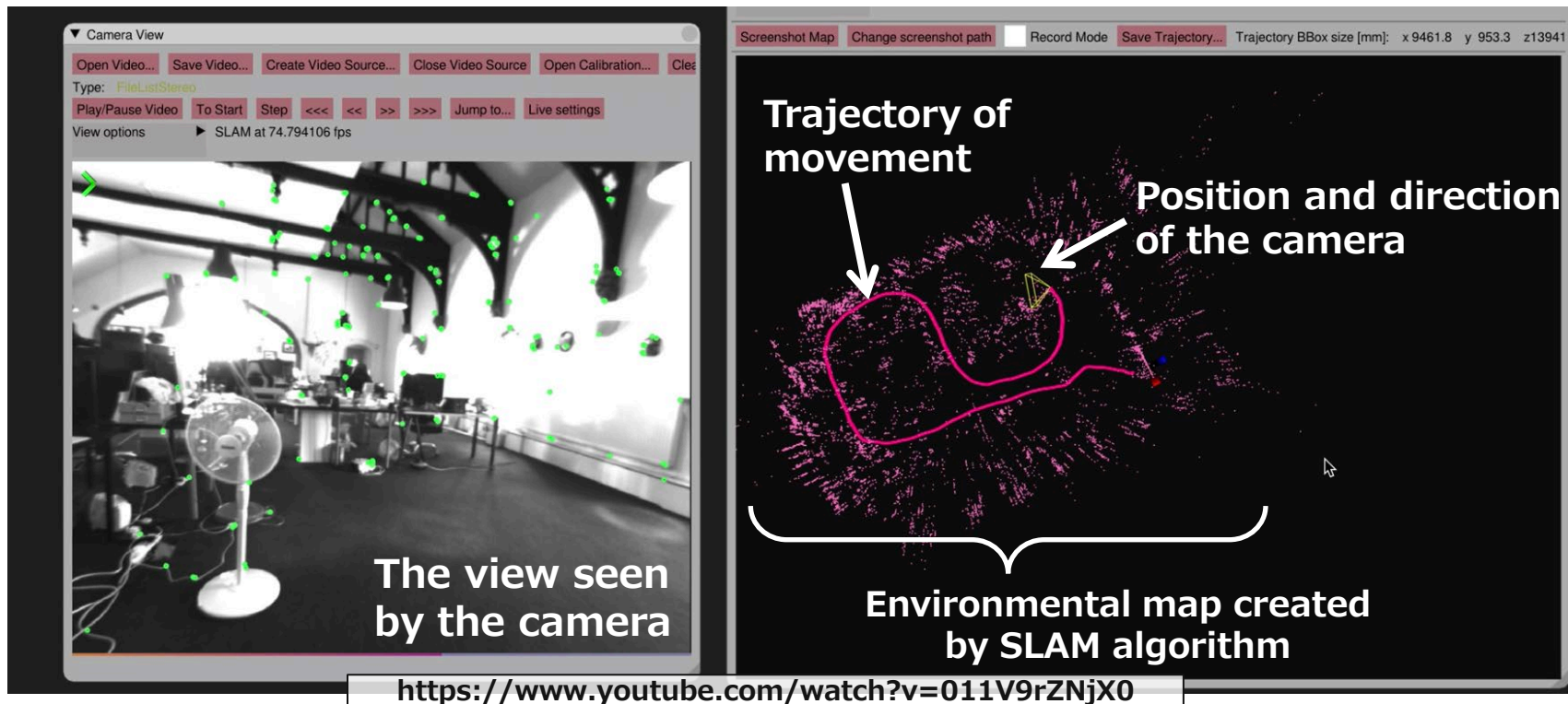
**Re-localization technology**

**Tight-coupling technology**

⋮

# What is SLAM (Simultaneous Localization and Mapping)?

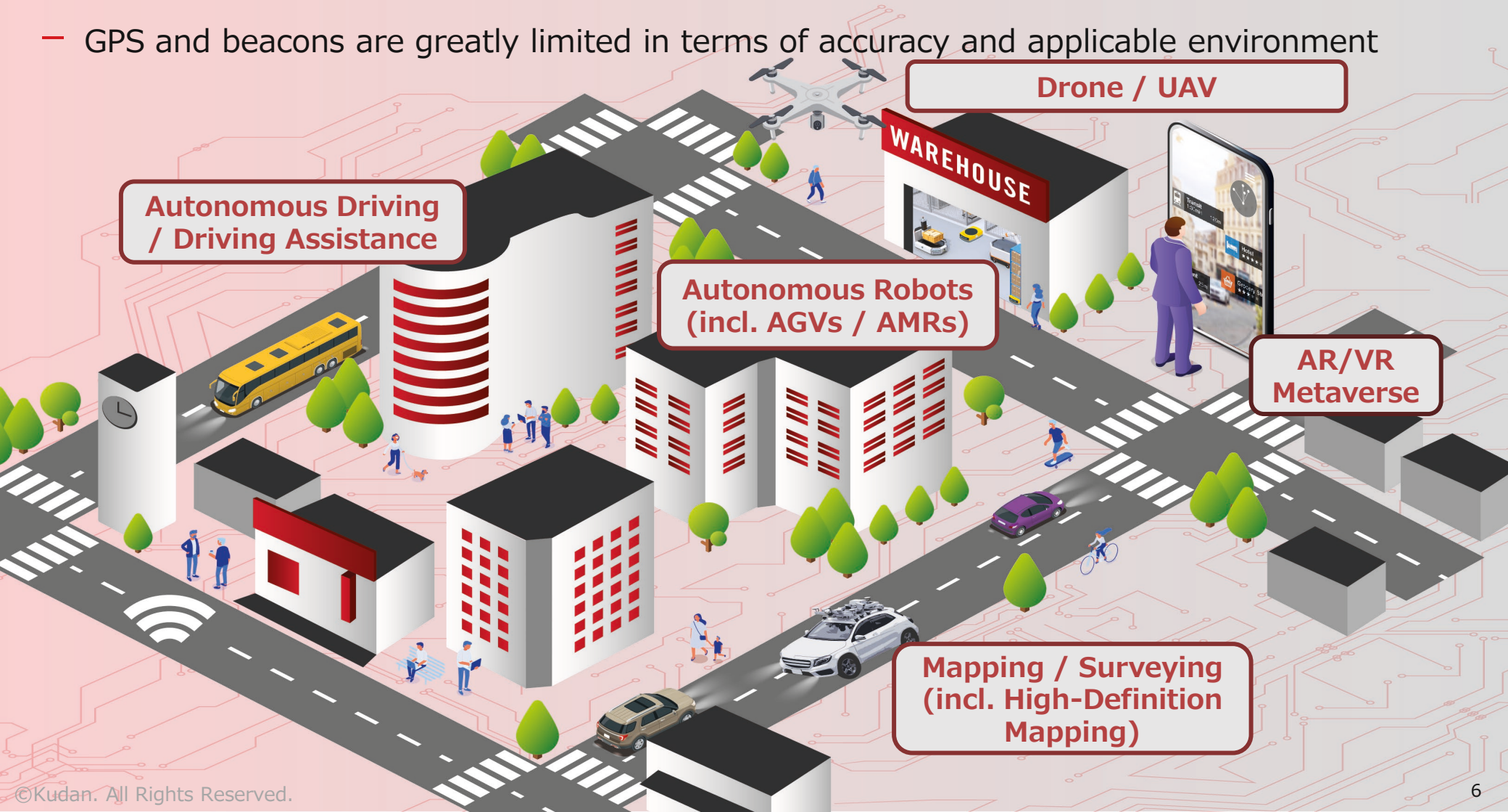
- Technology that simultaneously determines where we are (Localization) and what our surroundings look like (Mapping) based on input from sensors such as cameras and Lidars
- We can keep a track of how we move while creating a map in a new environment (tracking), and recognize where we are based on a map we created beforehand (re-localization)
- Unlike GPS and beacons, which use external radio waves to detect location, SLAM can recognize its own location as a stand-alone software and can be used in a wider range of environments, situations, and use cases





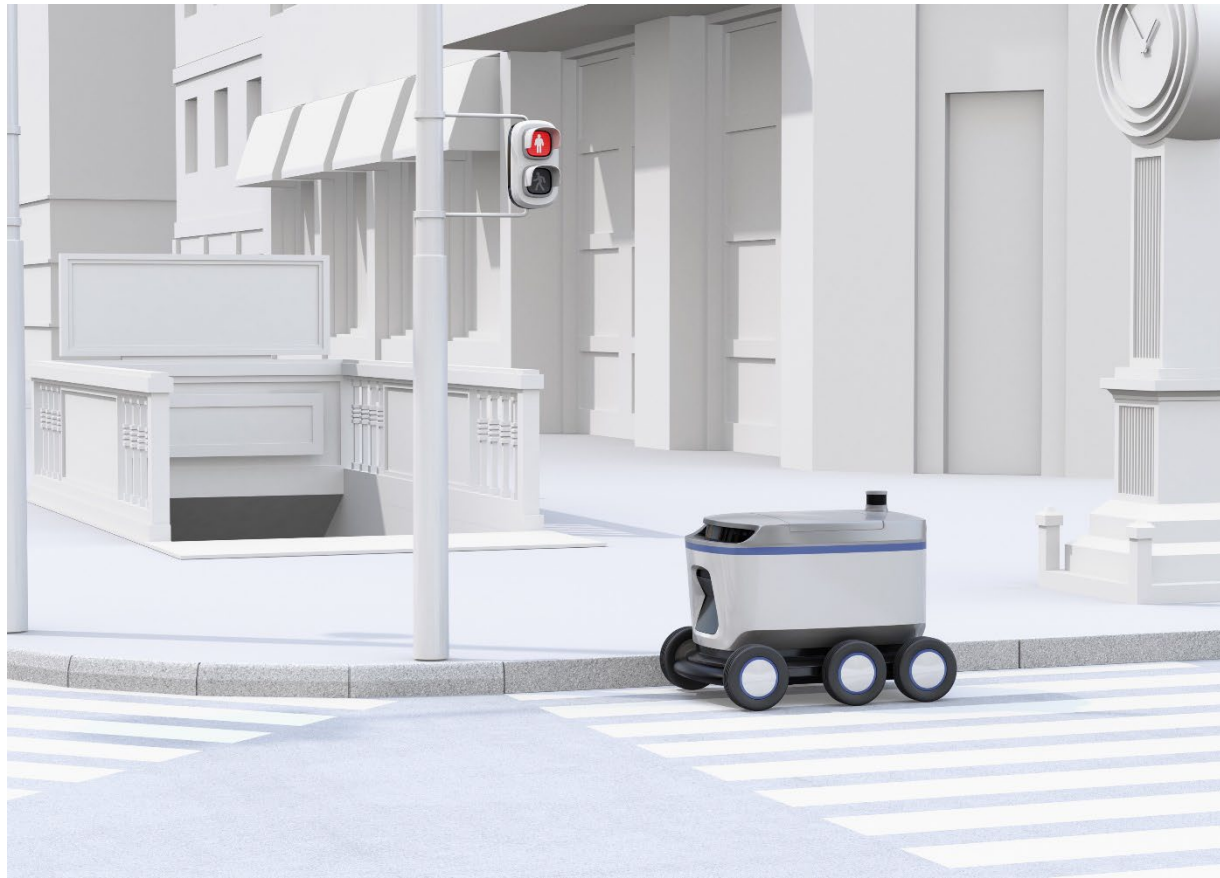
# Broad range of SLAM application

- Localization & Mapping technology centered SLAM is necessary in cases where moving machines and equipment need to change their subsequent movements and outputs depending on their positions and movements
- GPS and beacons are greatly limited in terms of accuracy and applicable environment



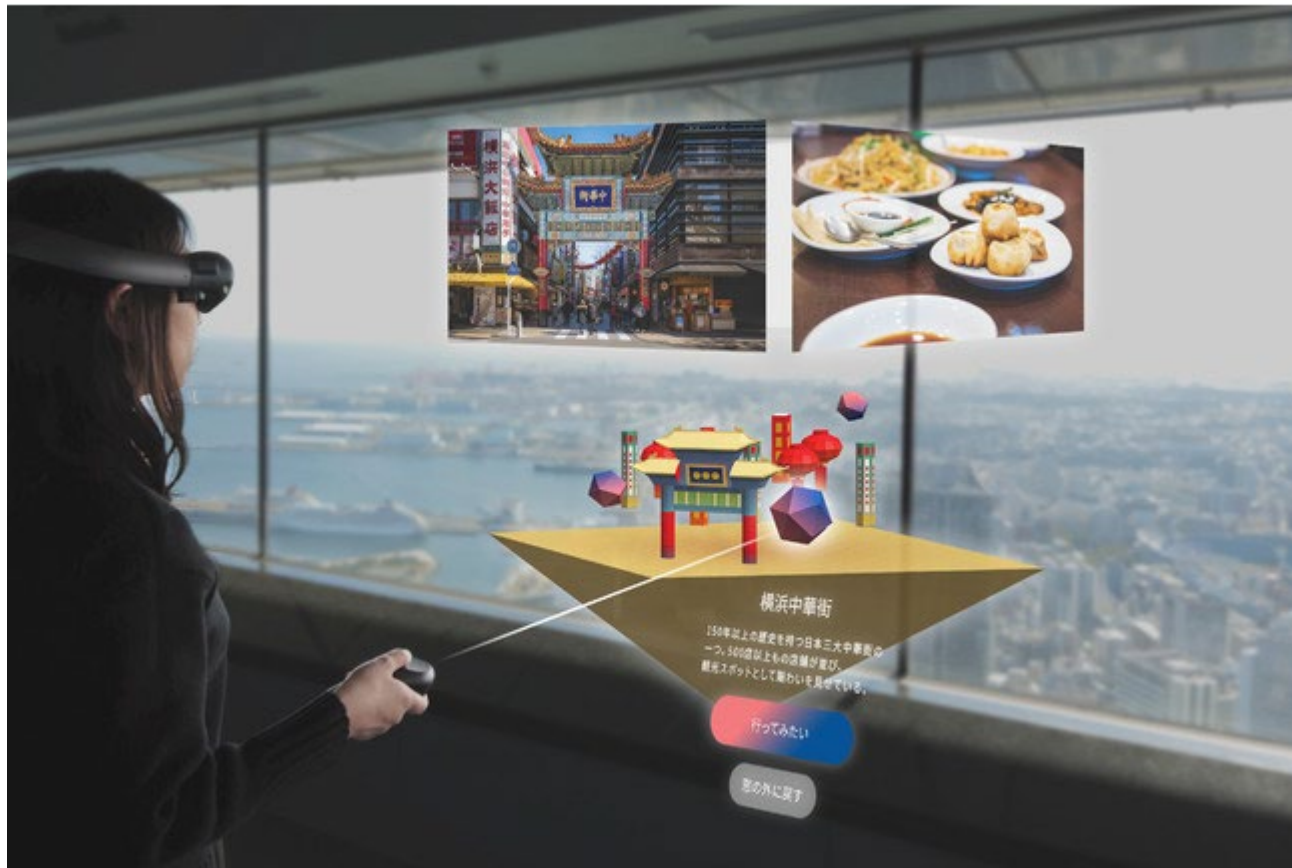
# SLAM application (Project Highlights) : Autonomous mobile robots

- **Japanese leading telecommunication company** : Progress toward commercialization of a platform that enables the cooperative use of various robots
- Several other projects including **European robot manufacturer, Japanese leading auto parts supplier**



# SLAM application (Project Highlights) : Implementation in technology infrastructure (AR/General)

- **NTT DOCOMO** : Developing an AR cloud application and released publicly in April 2021
- Several other projects including **leading telecom companies** (three of the top seven global companies), **leading telecom equipment manufacturer** (top global company)

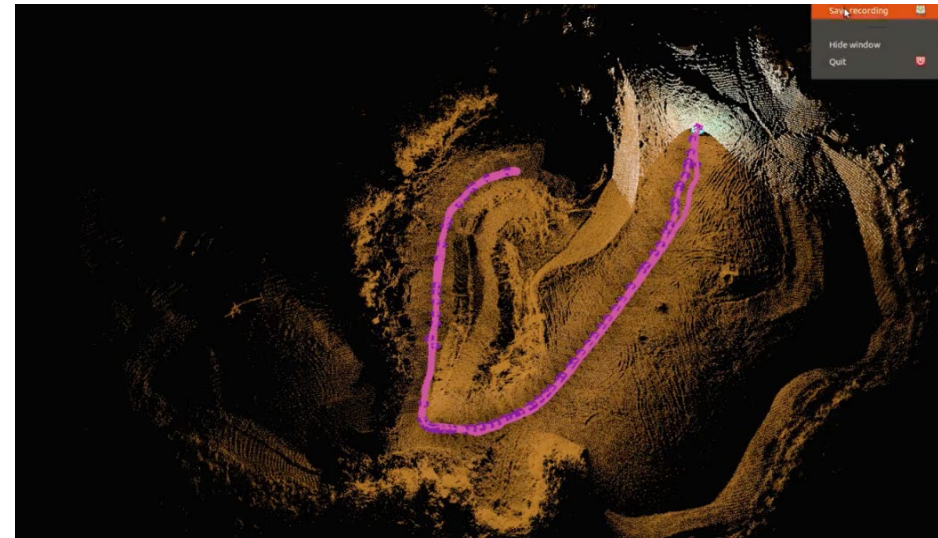


AR cloud with NTT DOCOMO



# SLAM application (Project Highlights) : Next-generation map

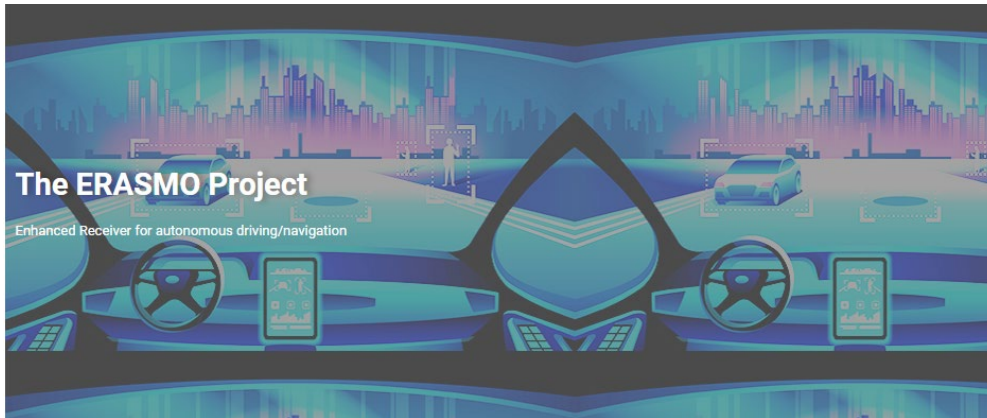
- **Atos** : Succeeded in technology validation of handheld mapping, and promote joint development for commercialization
- **US mapping solution provider** : Signed a commercial license agreement and is undergoing final development for commercialization



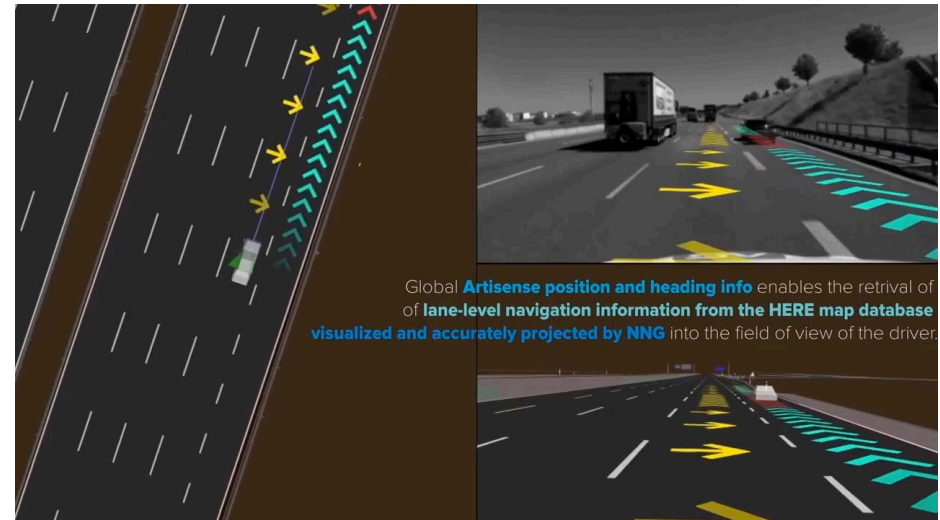
“Construction DX” (= i-Construction\* project) with Atos

\*i-Construction is an initiative by the Ministry of Land, Infrastructure, Transport and Tourism to improve the productivity of the entire construction production system and make construction sites more appealing.

- **“ERASMO”, a multi-year autonomous driving research project funded by an EU research institute** : Participation on this project with other EU companies including Renault and the development of an on-board positioning device enabling fully autonomous driving is in progress (<https://erasmo-gnss.eu/>)
- Not only autonomous driving, but also a wide variety of applications such as driving support and traffic management including **AR navigation development with HERE / NNG**
- Several other projects including **two of the top three global automotive OEMs** and **four major sensor companies**



ERASMO project



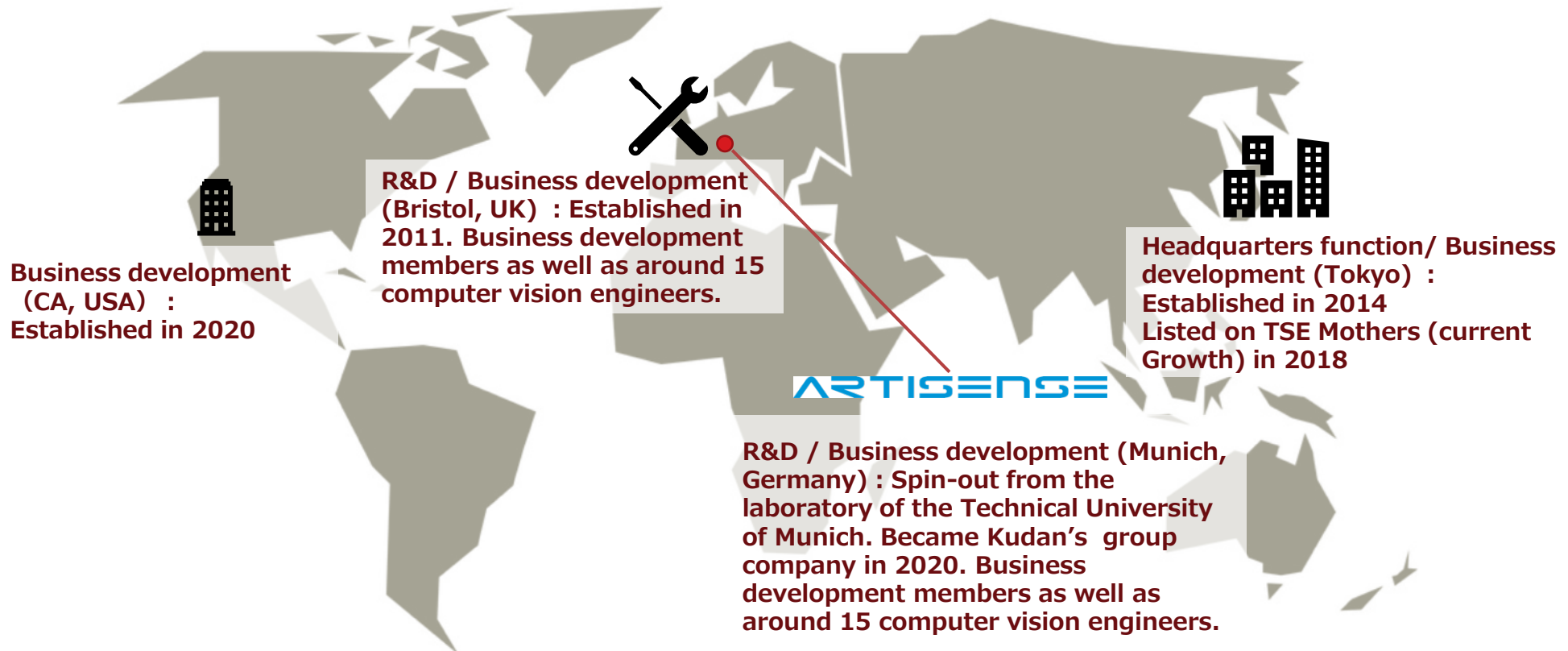
AR navigation with HERE / NNG

## 2. Business Model

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# Company overview

- **Kudan is a research and development company that provides AP (Artificial Perception) algorithms and embedded elemental technologies**, specializing in SLAM as the core, which give vision to computers and robots
- Established in the UK in 2011, and with a R&D team of about 30 people in the UK and Germany, Kudan has developed partnerships and customer projects with top global companies. Promoting business for social implementation of AP technology in all next-generation industries including AR, robotics, and autonomous driving





# Kudan is one of the world's largest SLAM development company groups



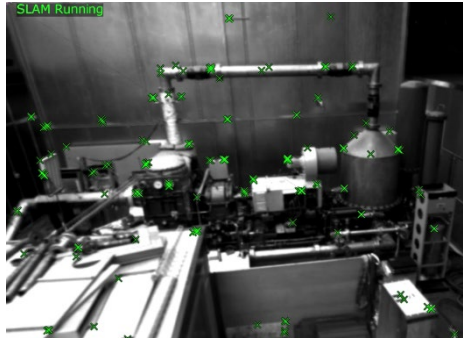
- Company solidification by securing a world-class technical team and the IP (Intellectual Property) of future technology. Achievement of a dominant position in the field
  - Aim for successful breakthroughs via industry-leading technology commercialization
- ⇒ Accelerated integrations of each technology, such as SLAM and Deep Learning, Lidar SLAM and Visual SLAM, Direct SLAM and Indirect SLAM



Strength in turning technology into business, with leading, unique methods of implementing technology, and a global track record.

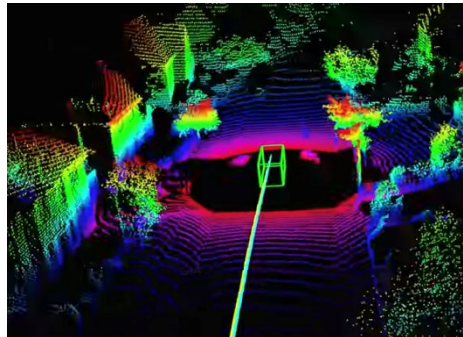
## Indirect SLAM

- Camera image (visual) processing
- Capable of high-speed recognition
- High versatility



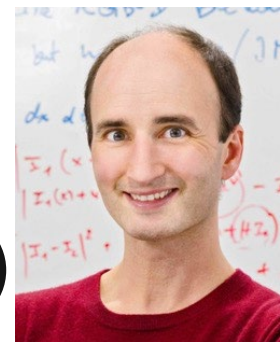
## Lidar SLAM

- Lidar data processing
- Strong in recognizing fast movements
- High stability



## ARTISENSE

Headed by a global leader in self-driving automotive research, Prof. Daniel Cremers, technical experts including Ph.Ds from TUM



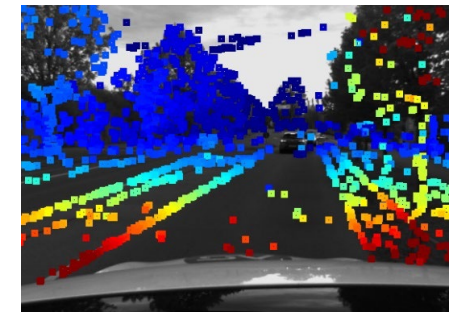
### Prof. Daniel Cremers

Artisense founder and CSO

- Over 52,000 citations of his work in academic papers, h-index 107 (Nobel laureates average 45.1)
- 2016 Leibniz Prize Winner (Germany's most prestigious academic award)
- More than 10 years of joint research with European OEMs, including Daimler, in autonomous driving research

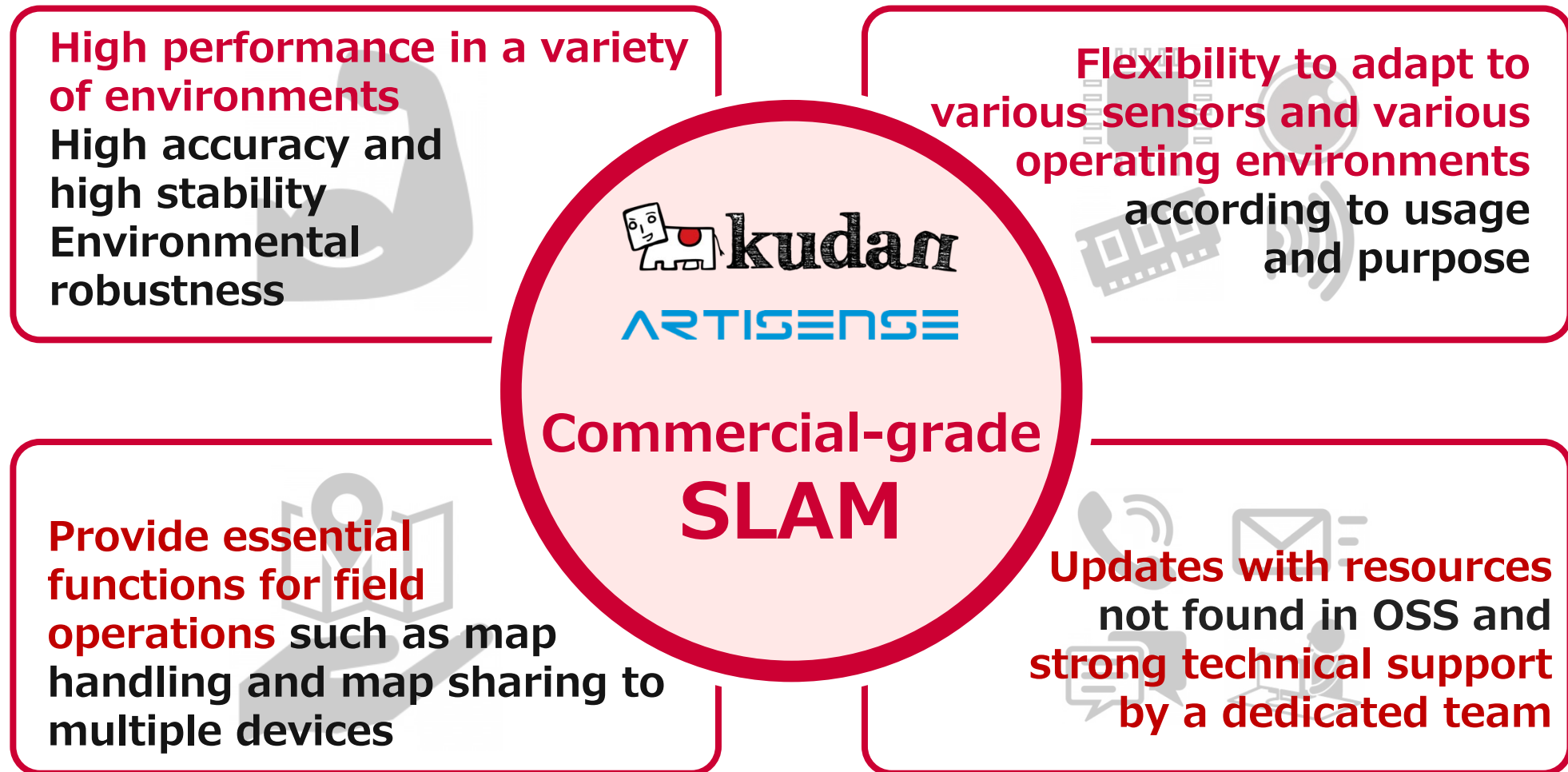
## Direct SLAM

- Camera image (visual) processing
- Capable of detailed recognition
- High stability
- Integration with deep learning models



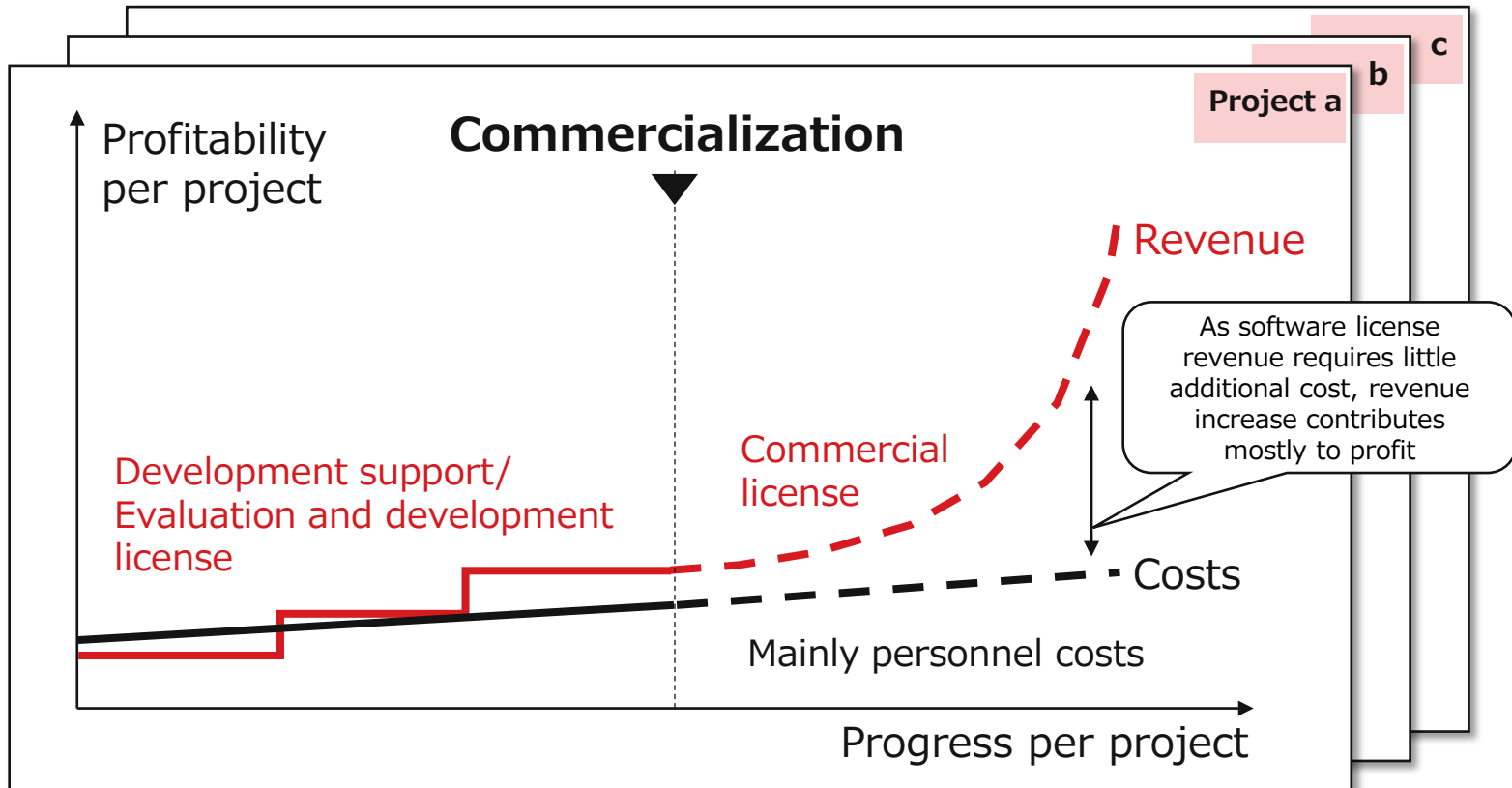


Unique algorithms **refined to overcome the "hurdle to commercialization"** many customers who are developing on an OSS (open source) basis are sure to face



# Revenue model

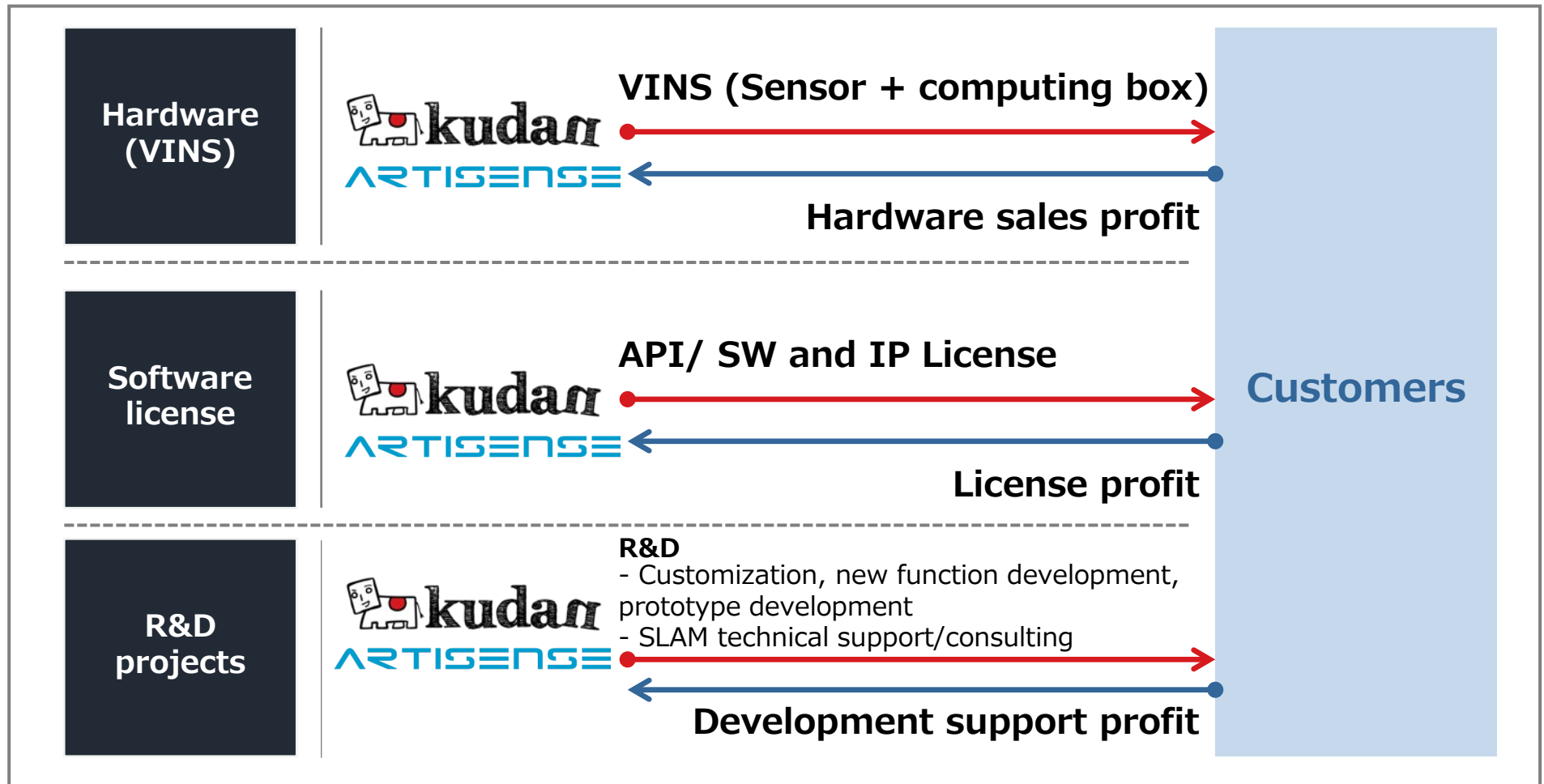
- Almost all of customers' projects are in the evaluation or development phase, and we have focused on acquiring and continuing high-quality projects that are expected to achieve customers' commercialization and expand the scale of sales in the future (Business phase in the red due to upfront investment in R&D expenses, mainly engineer personnel expenses)
- Although stable growth can be expected in revenue based on evaluation/development licenses and customer development support in the evaluation or development phase, the most important goal is **to contribute to all next-generation industries and to achieve a significant increase in revenue through commercial license profit with the implementation of Kudan's Artificial Perception technology.**



# (Reference) Revenue model (Evaluation/Development phase)



- After commercialization of customer-developed projects, expand license profit through pay-as-you-go billing based on the number of products sold, data volume ,etc. according to the customer's business model (Shift to a stock revenue model)
- In the "evaluation and development" phase, which is prior to the commercialization of customers ' products, we gain revenue mainly from license profit and development support profit based on the development volume and development period.



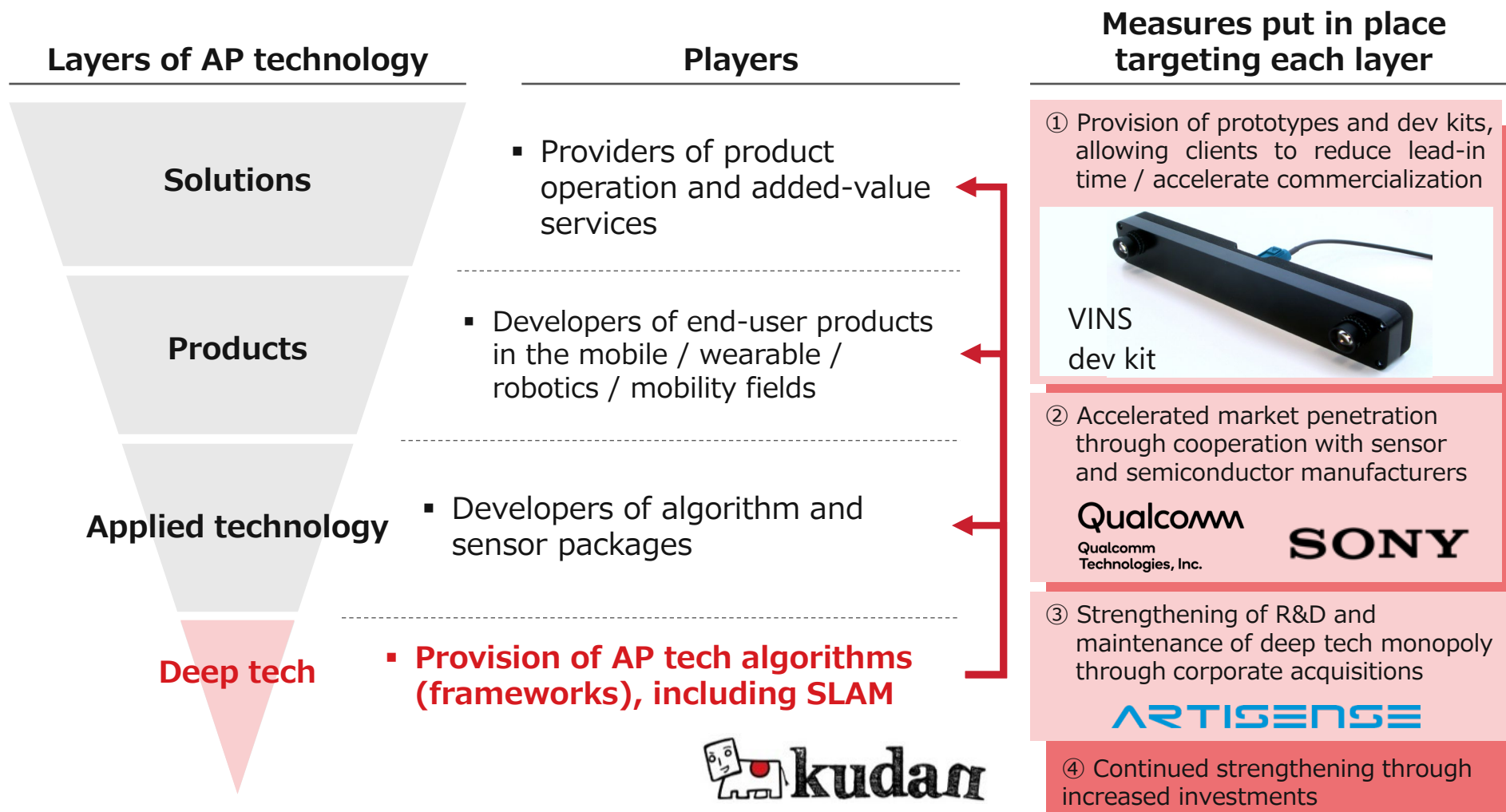
# 3. Business Strategy

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# Leader in the Deep Tech layer with strategic positioning



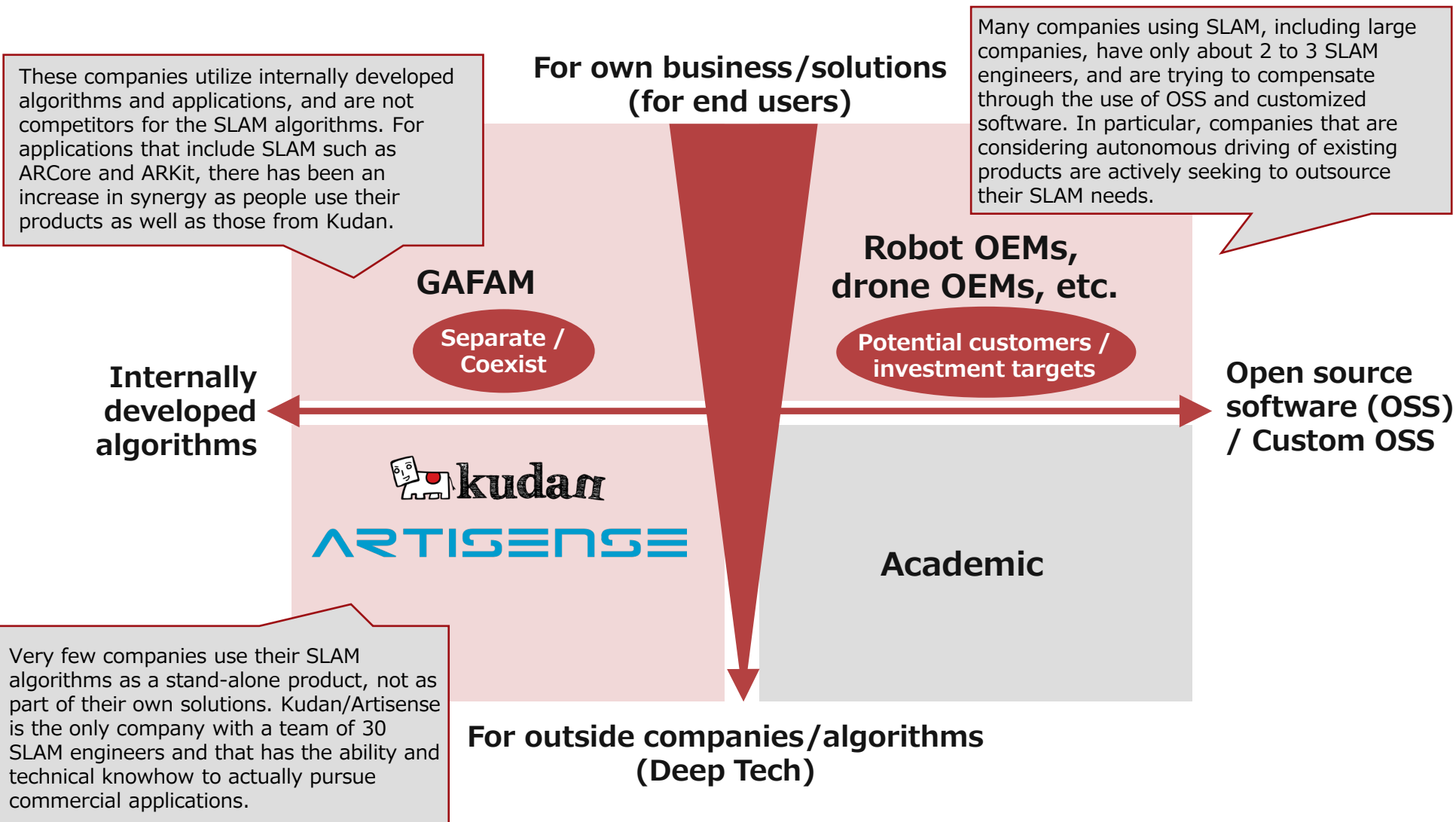
- While maintaining a fundamental focus on the establishment and maintenance of leading position on the low-volatility deep tech layer, measures are being implemented to accelerate the creation and cultivation of markets for Kudan's products in the higher layers of the AP technology pyramid



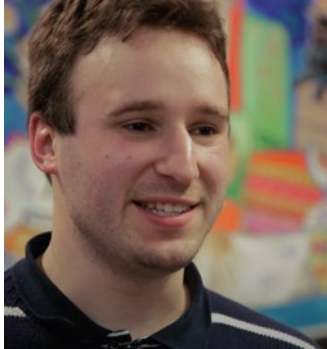


# Expansion of potential customers or investment targets through strategic positioning

Kudan/Artisense enjoys an exclusive position in the area of commercial SLAM algorithms while avoiding direct competition with GAFAM, and many companies that use SLAM technology are also potential customers or investment targets.

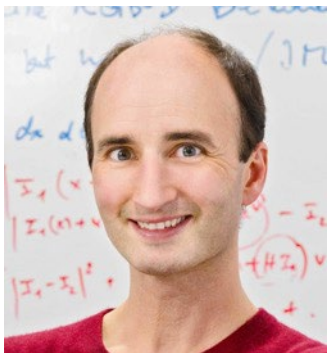


## Research & Development



### **Kudan founder & CTO John Williams**

- Implemented SLAM technology for smartphones ahead of Apple / Google



### **Artisense founder & CSO Professor Daniel Cremers**

- The most influential SLAM/robotics expert in the world  
(The head professor at the Technical University of Munich, about 52,000 citations of his work in academic papers, h-index 107)

## Other management members (previous employments)



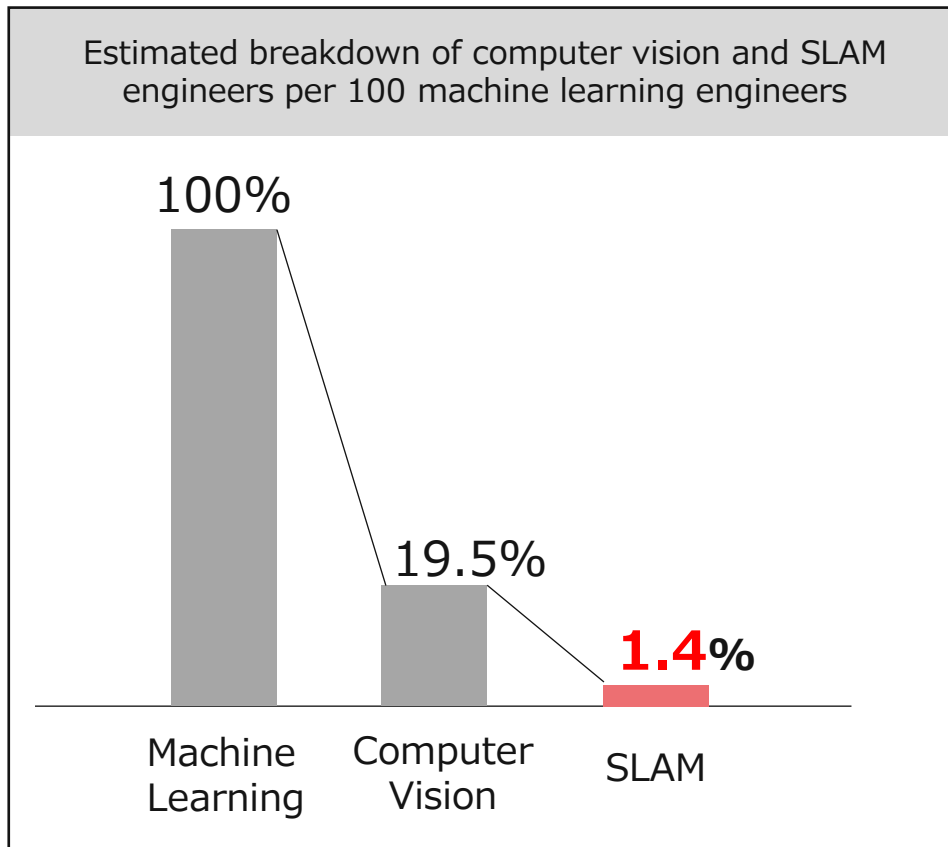
# Acquired world-class technical team to support R&D



Researchers and engineers specializing in SLAM technology are extremely rare, even in the field of computer vision. Despite this, Kudan and Artisense employ many world-class professionals with PhDs in the field. The partnership with industry leaders such as Professor Daniel Cremers and the Technical University of Munich will ensure continued access and expand further to top talent and cutting-edge research.



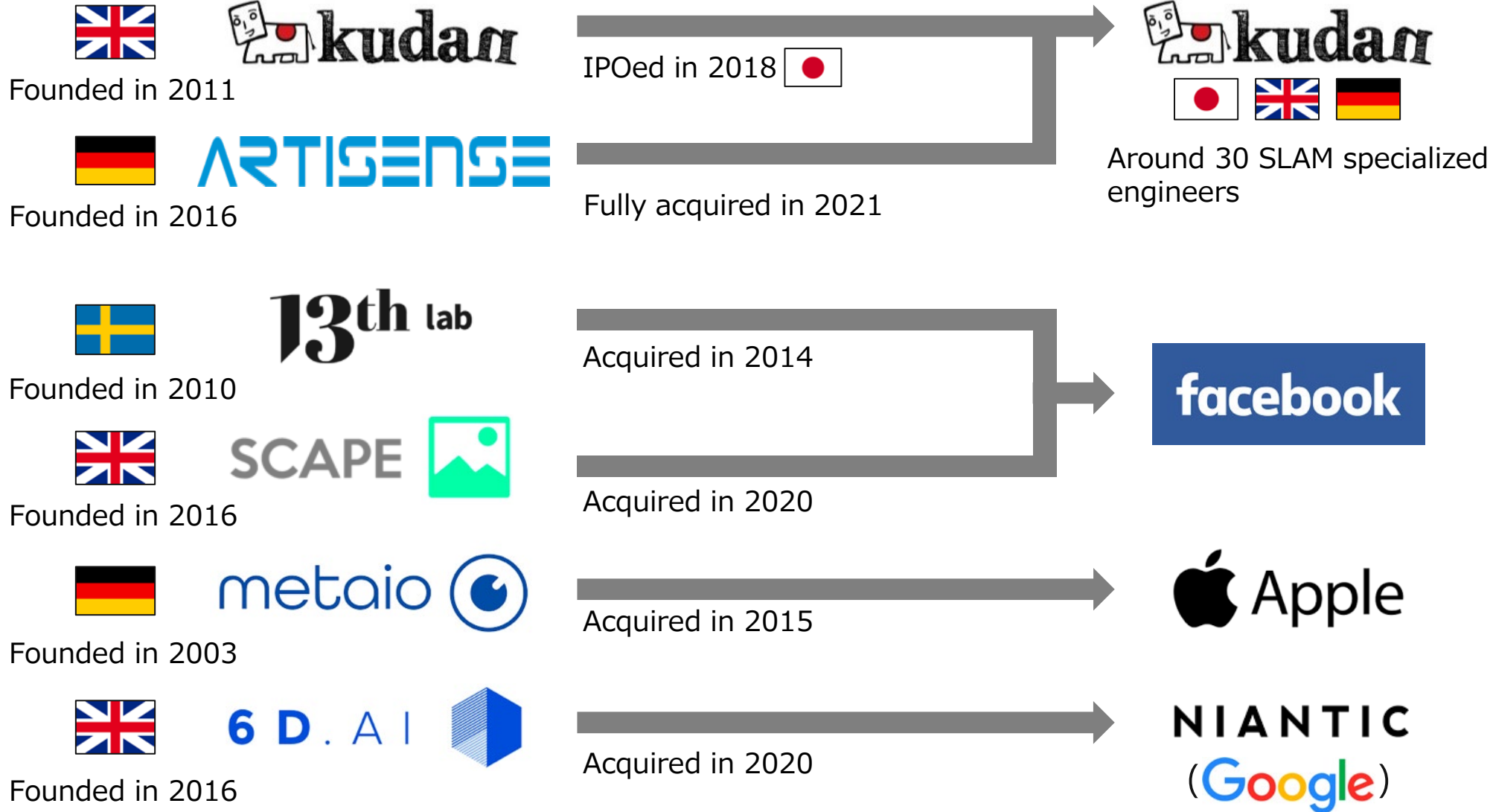
**There is Professor Cremers, a founder & CSO at Artisense**



**Other companies trying to organize SLAM engineer teams of the same level and scale will require large investments in both recruitment and labor costs**

\*Based on a LinkedIn search

# Related technologies are acquired in the world, only a few independent SLAM development companies left



While the increase of acquisitions of the related technologies, Kudan and Artisense leads the market in track record and awareness



- More limited numbers of SLAM-focus / SLAM-feature software companies due to acquisitions by larger technology companies
- Kudan and Artisense have been in a leading position in terms of breadth of offering, track record and awareness in the market

## SLAM-focus / SLAM-feature software player



**ARTISENSE**

- Offers Indirect & Direct Visual SLAM and Lidar-SLAM
- Flexible sensor options
- Track records in various applications such as AR, robotics and autonomous driving

**SLAMCORE**

- Only Indirect Visual SLAM
- Optimized for limited camera models



- Focus on very specific medical application

**outsight**

- Only Lidar-SLAM
- Optimize for their own hardware kit



# Development projects and partnership with global leading players have been increasing



Timing	Main target applications and project overview		
FY20	May.	<b>Robotics</b> ) Partnership with Thales group for next-gen tracking system development	
	Aug.	<b>Robotics</b> ) Alliance with SEAOS for warehouse automation with Autonomous robots with capital tie-up	
		<b>Mobility</b> ) Signed with Japan Unisys to collaborate as Business Scaling Partner	
	Sep.	<b>Mobility</b> ) Partnership with Macnica to develop new value-added solutions for mobility business	
		<b>Robotics, Mapping</b> ) Partnership with Ouster	
	Nov.	<b>AR</b> ) Develop RGB-D SLAM on smartphones with ToF sensor with Sony Semiconductor Solutions	
	Dec.	<b>AR/VR, Mobility</b> ) Partnership with Fixstars to offer accelerated high-performing SLAM	
Jan.	<b>Robotics, Mapping</b> ) Partnership with Cepton on Lidar-SLAM and joint exhibition demo		
	<b>Robotics, Mapping</b> ) Partnership with Velodyne on Lidar-SLAM		
FY21	May	<b>Robotics</b> ) Launch SLAM library for Qualcomm® Robotics RB3 Platform with their technical support	
		<b>Robotics</b> ) Joint development of 3D SLAM demo application with Analog Devices	
	Nov.	<b>Robotics</b> ) Partnership with Vecow to jointly offer integrated solution for autonomous mobile robots	
		<b>AR, Mobility</b> ) Artisense released Automotive AR navigation demo with HERE technologies and NNG	
	Dec.	<b>General</b> ) Achieved 40% image process acceleration with Synopsys ARC EV processor IP on Kudan SLAM	
	Feb.	<b>Mobility</b> ) Provide Lidar SLAM to IIT Bombay autonomous vehicle project team	
Mar.	<b>General</b> ) Joined NVIDIA Inception Partner Network		
FY22	Apr.	<b>AR</b> ) Released utilization of Kudan SLAM in NTT docomo's developing AR cloud	
	May.	<b>Robotics</b> ) Partnership with robotics developer UGO to integrate Kudan SLAM into robotics and joint sales	
	July.	<b>Mapping</b> ) Signed a Developing License General Agreement with BIMEXPERTS and develop joint solutions	
		<b>Robotics</b> ) Partnership with ADLINK, development of AMR, integration of Kudan SLAM into robotics, joint sales	
	Aug.	<b>General</b> ) Joined Texas Instrument's partnership network in robotics	
		<b>General</b> ) Become official SLAM partner with Ouster, a leading Lidar provider, and start offering tools on Website	
	Oct.	<b>Autonomous Driving</b> ) Participation with Renault and other companies in ERASMO, an autonomous driving project by an EU research institute	
	Mar.	<b>Robotics</b> ) Exhibited at Intel-sponsored event "Intel IoT Planet ~ Robotics Week"	

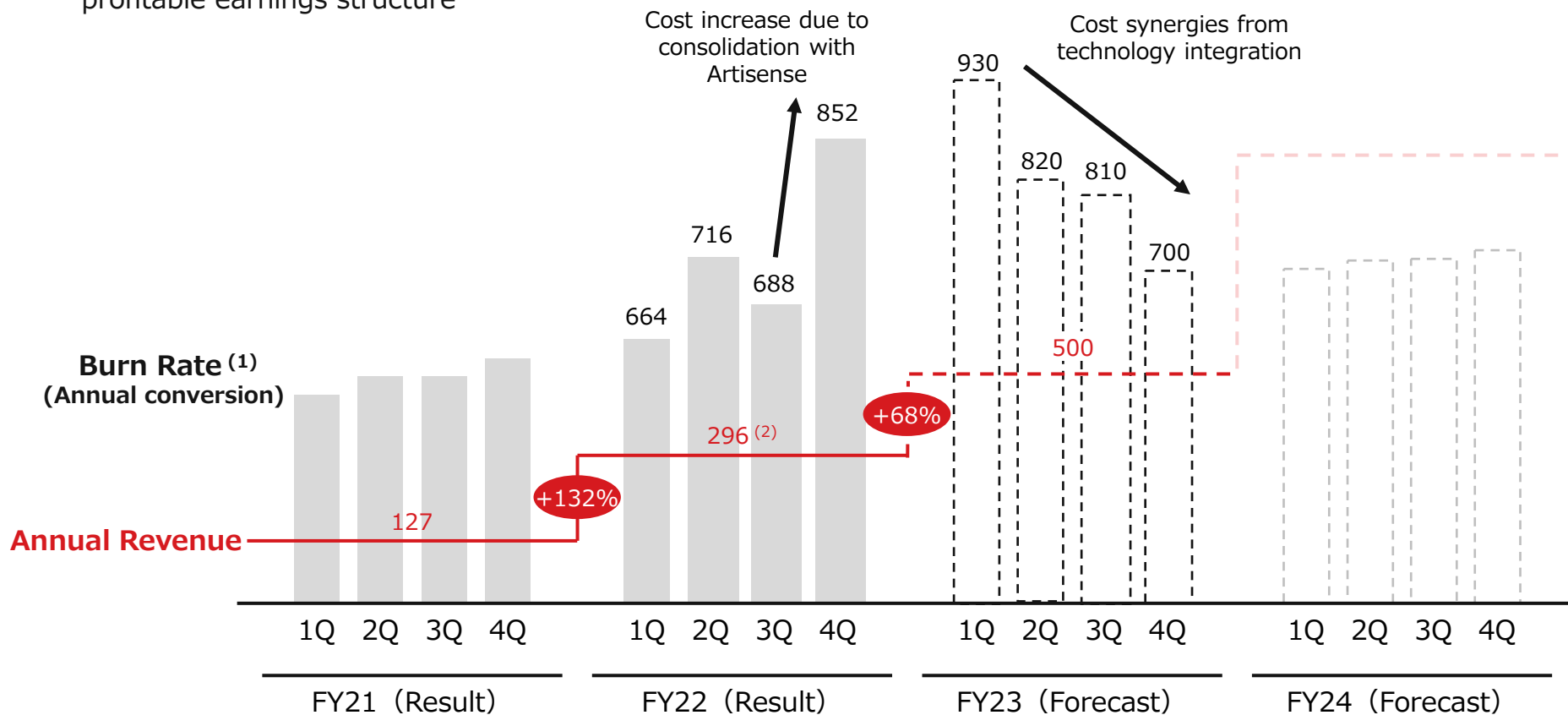
# 4. Future Growth Potential

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# About performance forecast for FY2023



- Continued business growth resulting in **+130%** (+170 million yen) year-on-year revenue growth, and projected to grow significantly by **+60%** (+200 million yen) in FY23
- In addition, cost synergies from the technology integration with Artisense (significant efficiency in development through sharing of architecture, modules, etc.) will significantly improve the loss-making structure by FY23/4Q, ensuring profitable earnings structure



(1) Annual costs required for business activities, calculated by each quarterly cost times four. Calculated by deducting R&D subsidy income from total cost of sales, SG&A expenses, non-operating expenses, extraordinary losses, income taxes, etc. (adjusted for seasonal variations, foreign exchange losses and other transitory costs). Prior to FY22/3Q before Artisense was consolidated, Artisense-related costs such as impairment losses and share of loss (income) of entities accounted for using equity method were deducted and only Kudan's costs were totaled. (2) Revenue adjusted for the impact due to accounting standards change

# Performance forecast for FY2023



- Continuous significant revenue growth is expected due to increasing of evaluation and development projects and scaling of projects
- Cost of sales and SG&A expenses are expected to increase from the previous year due to the full-year consolidation effect of Artisense (consolidated only for 3 months in the previous year), but cost structure will be improved by 4Q
- Non-operating profit is expected to include subsidy income from R&D in the U.K. and Germany

(Unit : million yen)

	Performance for FY2020	Performance for FY2021	Performance for FY2022	Forecast for FY2023
<b>Net Sales</b> (Prior to accounting standards change)	<b>456</b>	<b>127</b>	<b>271</b> <b>(296)</b>	<b>500</b>
<b>Operating Profit</b>	<b>9</b>	<b>△451</b>	<b>△433</b>	<b>△350</b>
<b>Ordinary Profit</b>	<b>△12</b>	<b>△1,575</b> (incl. "share of loss of entities accounted for using equity method"(1,232))	<b>△681</b> (incl. "share of loss of entities accounted for using equity method"(403))	<b>△300</b>
<b>Profit Attributable to Owners of Parent</b>	<b>△29</b>	<b>△1,608</b>	<b>△2,237</b> (incl. impairment losses of (1,474))	<b>△315</b>

# Accumulation of projects toward customers' commercialization









- Compared to September in 2021, the overall pipeline has expanded, and in particular, we have succeeded in raising the number of "low/medium" projects to "medium/high" in terms of certainty
- Currently three projects in FY2023 and two projects in FY2024 are highly certain to be commercialized, and projects are actively progressing

Certainty	Characteristics of projects	Number of projects		Commercialization schedule
		Sep. 2021	Mar. 2022	
High	<ul style="list-style-type: none"> <li>Clearly defined functions and performance required for commercialization, and there is sufficient potential for Kudan SLAM to meet them</li> </ul>	4	5	3
				2
Medium	<ul style="list-style-type: none"> <li>Evaluation and development projects that have already passed performance verification</li> <li>Limited risk to commercialization (competition, performance, price, etc.)</li> <li>Specific timeline for commercialization is clear</li> </ul>	17	22	
Low	<ul style="list-style-type: none"> <li>Evaluation and development projects that have already passed performance verification</li> <li>Specific timeline for commercialization is unclear</li> </ul>	23	26	

\*Details of the change in "Certainty: High" : AR/VR▲1 (Delay of development progress), Robotics/Autonomous Driving +2



# Highlights of projects accumulated for customers' commercialization

Market	New・Ongoing (Comparison at the end of 2Q)	Company	Algorithm	Overview
Robotics	Ongoing	 Major telecommunication	Visual SLAM	A platform that enables the cooperative use of various robots
	New	 Major semiconductor	Visual SLAM	Visual SLAM optimization and SLAM packaging for specific processors
Autonomous driving・ADAS	Ongoing	 TOP5 automotive OEM	Lidar SLAM	Autonomous driving project for general passenger cars
	Ongoing	 Major automotive Tier1	Visual SLAM	Development of driver assistance functions with cameras installed in commercial vehicles
Metaverse (AR/VR)	Ongoing	 Major camera OEM	Visual SLAM	Development of Mixed Reality headset for medical applications
	Ongoing	 UK engineering company	Visual SLAM	Development of digital twin solutions for industrial facilities
Mapping	Ongoing	 Mapping provider	Lidar SLAM	Mapping solutions in non-GPS environments
	New	 Construction Solution Provider	Lidar SLAM	Development of simple mapping device for construction and civil engineering

\*This page shows highlights of the projects which are close to commercialization, have made a significant progress toward commercialization, etc.

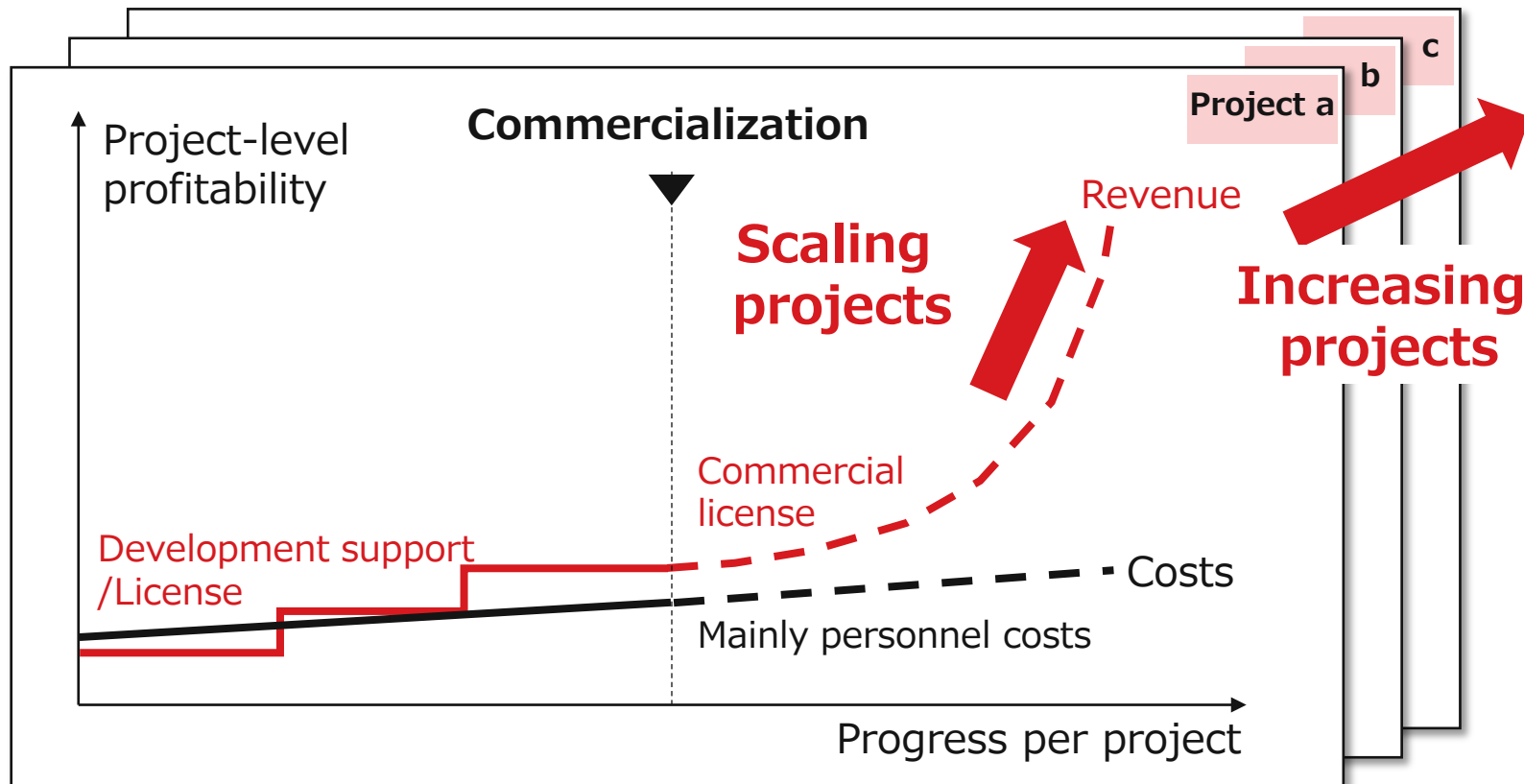
# Highlight for future growth strategy based on customers' commercialization



- With plans to have several customers launch their products using Kudan software from this fiscal year ending March 2023, **the transition from the "preparation phase" to the "harvest phase" is underway**
- To accelerate this transition, we will strengthen our business based on customers' commercialization
  - A Acceleration and expansion of customers' commercialization:** Strengthen support, technology development, and business development with the aim of increasing the number of projects to be commercialized and increasing profit at the project level
  - B Solution business launch:** Not only embedding Kudan technology in individual products, but also providing engineering service to accelerate new solution development that synchronize multiple products and expand their applications centered on Kudan technology (digital twin, robot platform, Metaverse, etc.)

# A Acceleration and expansion of customers' commercialization

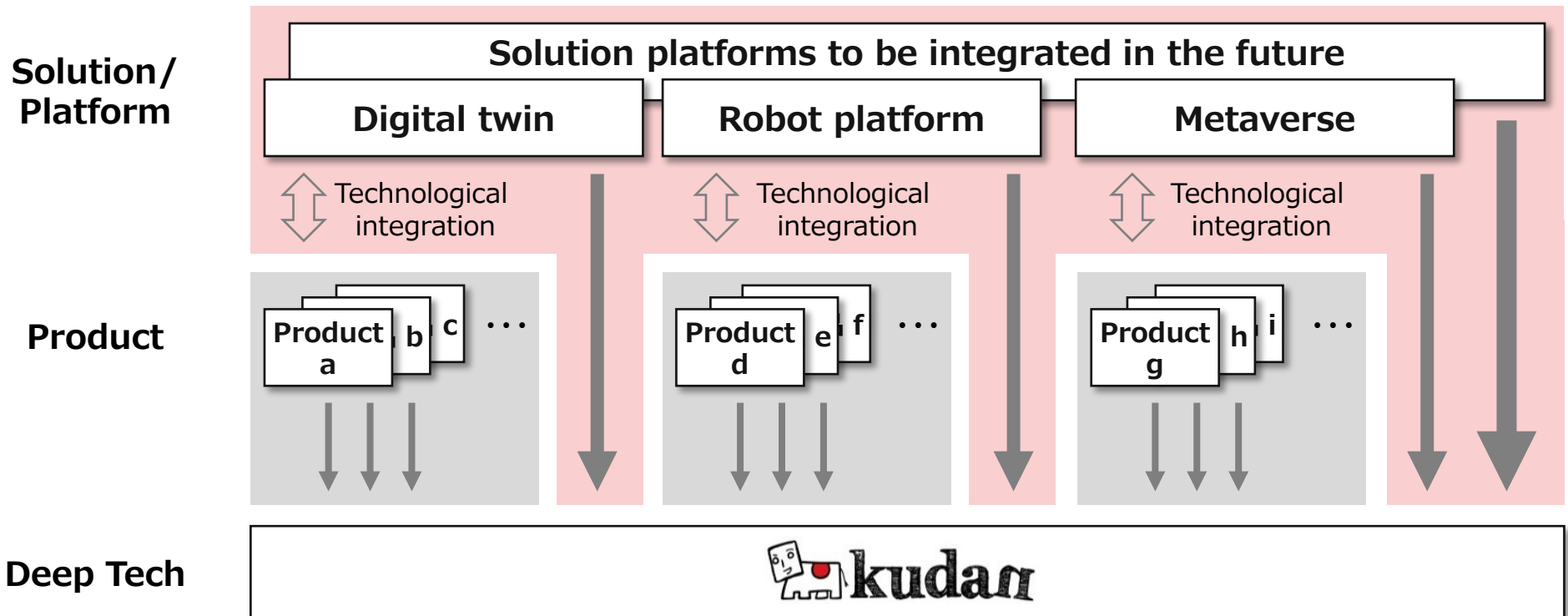
- **Scaling projects:** Strengthen support functions and technology development for the purpose of scaling projects in order to advance to the harvest phase at the project level, starting with the realization of customers' commercialization
- **Increasing the number of projects:** Strengthen business development, including global expansion, to increase the number of commercialization projects by leveraging the existing projects.



# B Solution business launch

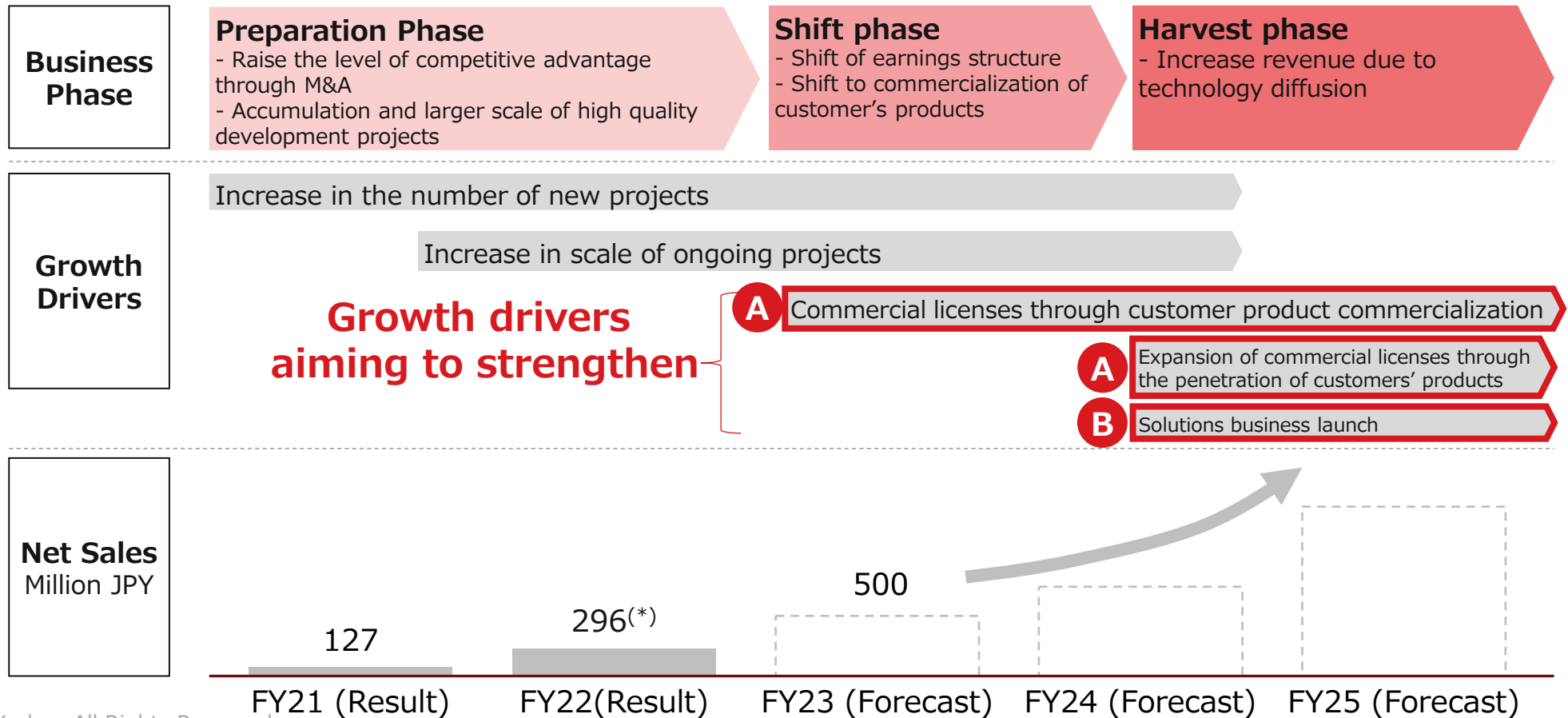
- Support the realization of solution platforms that allow multiple products to synchronize or expand their applications centered on Kudan technology
- Aim to improve profitability by taking customers' commercialization as a foothold for the solution business and by generating synergies from the solution business that will support the expansion of customers' commercialization

- Newly launched solutions business
- Existing product embedded business
- Revenue for development support and technology provision



# Shift to the harvest phase

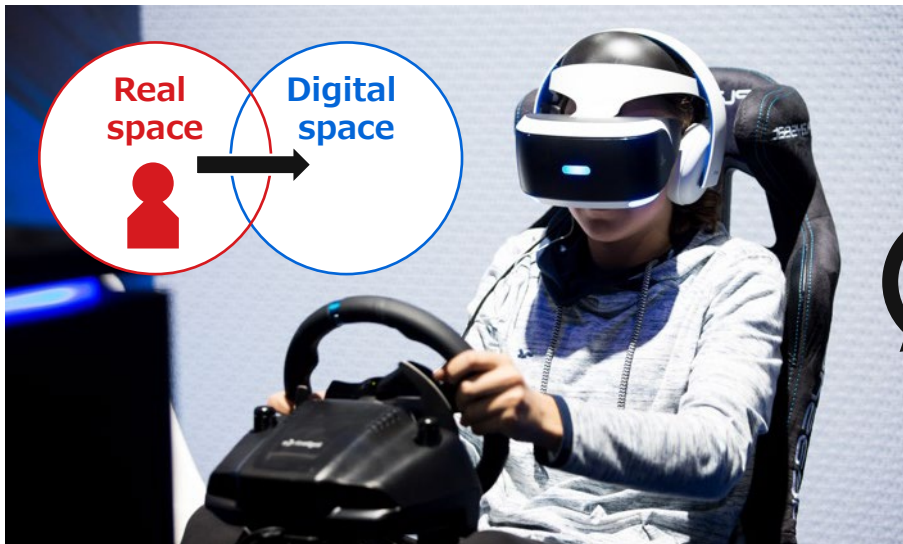
- Keep the strategy to shift earnings structure aiming for profitability and revenue model through the commercialization of customers' products to realize revenue growth from the fiscal year ending March 2024 onward.
- Aim to shift to the harvest phase from "project-level profitability" to "business-level profitability" by strengthening growth drivers
- Depending on the commercialization of customers' products, Kudan aims to generate several million yen to several tens of millions of yen per project at the start of commercialization, and then to generate revenue in the hundreds of millions of yen per project as product sales expand



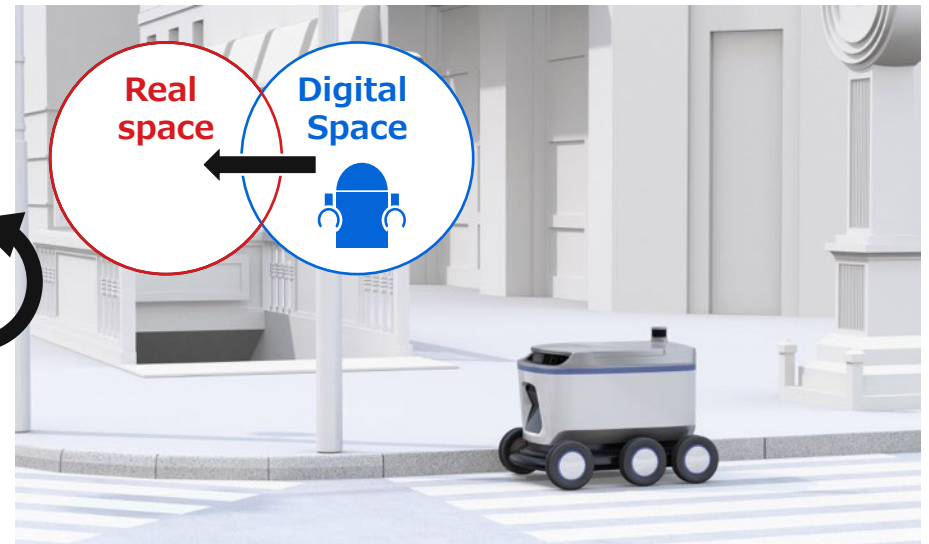
# Metaverse demand pushes us forward

- With the demand for Metaverse as a tailwind, Kudan's Artificial Perception/SLAM technology is the core technology of the Metaverse, which realizes the "coupling of real space and digital space," and further extends the Metaverse to integrate with robotics
- Capture the ongoing evolution of Metaverse demand for growth by providing versatile-purpose technology for both Metaverses

## Metaverse (AR/VR)



## Extended Metaverse (Robotics)



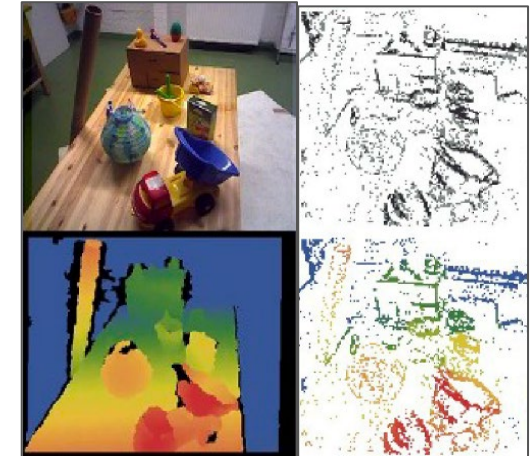
Metaverse evolves as real and digital spaces are more highly connected, such as robot operations via the Metaverse

# Mid- to long-term R&D investment for discontinuous growth

- In addition to developing its Deep Tech efforts, the company will invest in additional technological innovations for discontinuous growth over the mid to long term
- Due to the nature of an algorithm-layered Deep Tech company, the majority of R&D investment is in personnel costs, and the scale of additional investment in the future is expected to be about several additional engineers per year

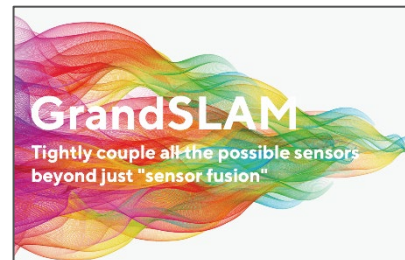
## Dramatic growth via mid-to-long term technological innovation

**Event-based camera SLAM**  
(Applied technology for next-generation cameras that imitate the visual nerve and retinal structure of living organisms. Further breakthrough technology for autonomous driving and robotics because it is ultra-high speed but stable even in dark place.)

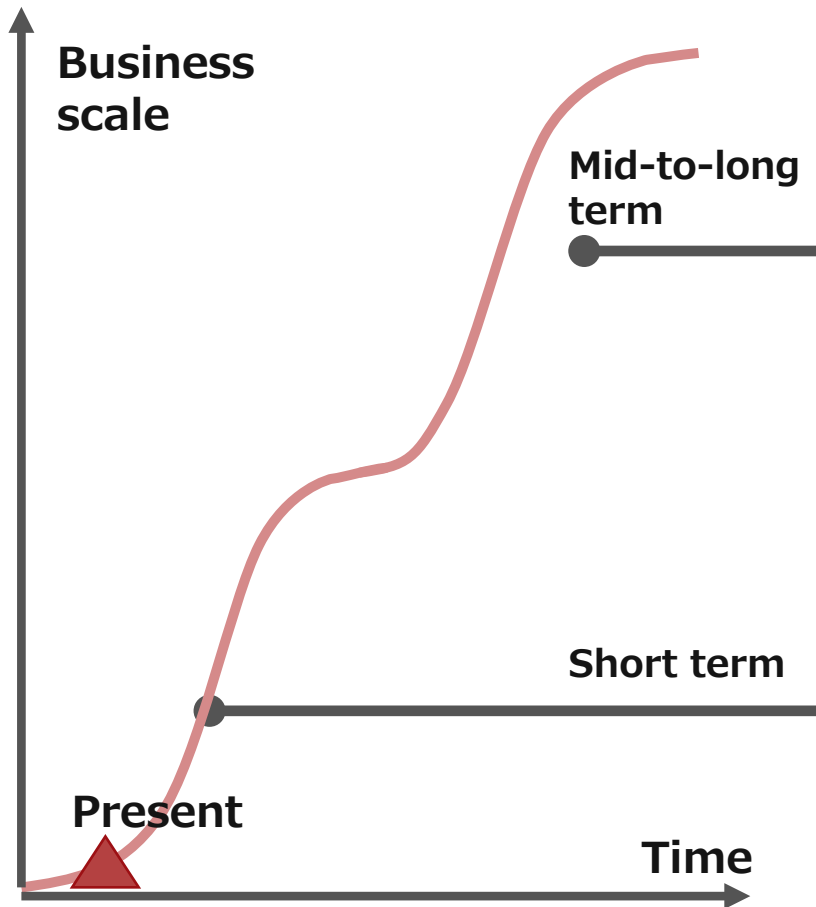
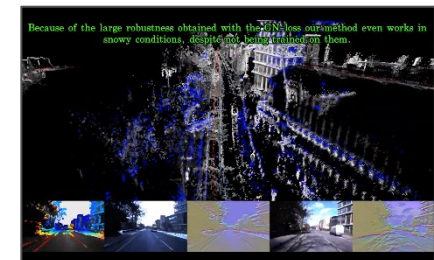


## Growth by capturing and strengthening the base upon areas where the demand is evident

**GrandSLAM**  
(Tight coupling of major sensors)



**GN-Net/Super-point**  
(Combining SLAM with deep learning)

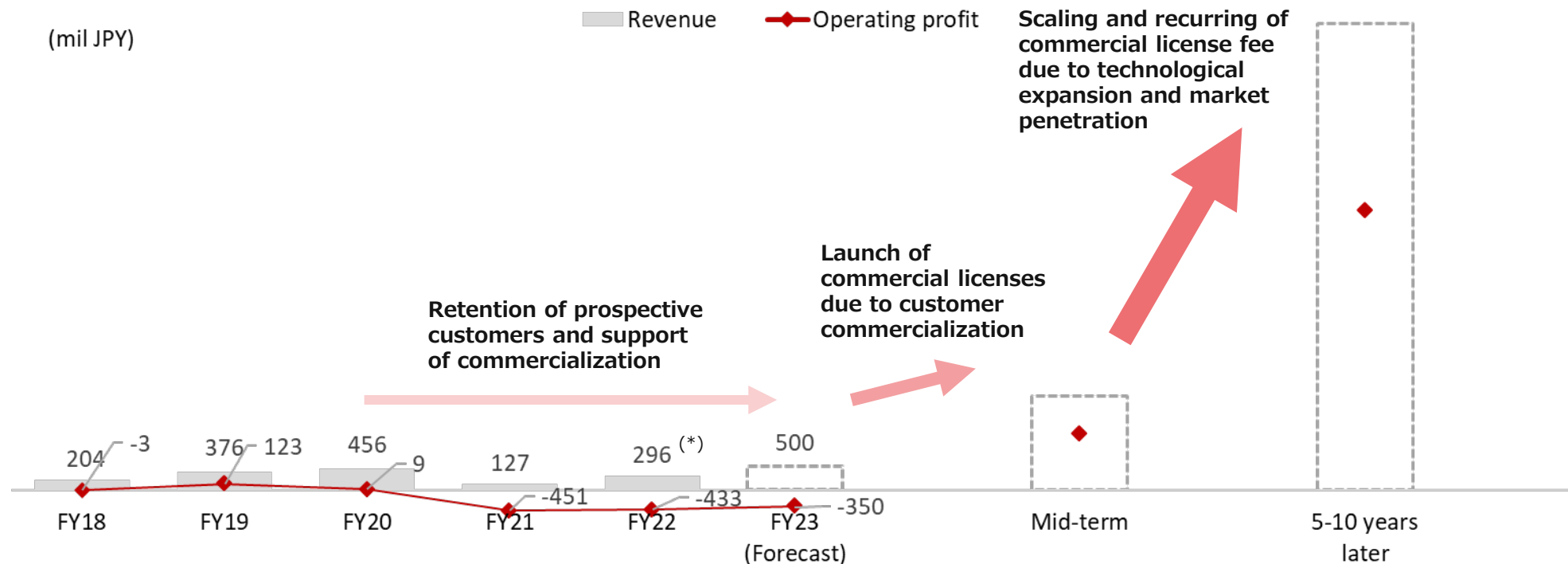




# Future growth potential (Mid- to Long-term)

- Stable commercialization from the cumulative customer projects creates technological penetration to the market, leading to recurring revenue from commercial licenses and significant growth in profit

Mid- to Long-term estimate



(\*) Revenue adjusted for the impact due to accounting standards change

# 5. Risk Information

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# Key risks and countermeasures



- Identified the following risks and countermeasures that could have a significant impact on our growth strategy
- Please refer to "Business and Other Risks" in the Annual Report for the year ended March 31, 2022 for other risks

Key risks	Period	Impact	Countermeasures
Risk that the development of each market requiring AP (Artificial Perception) does not proceed as expected	Mid- to long term	Delays in revenue growth due to delays in expected customer commercialization and commercial license expansion	<ul style="list-style-type: none"> <li>- Support for accelerating customer development projects by providing development packages such as VINS</li> <li>- Focus on markets and customer projects with high prospects for commercialization over the mid- to long term</li> <li>- Promote joint R&amp;D and business development through alliances with leading global sensor and semiconductor companies</li> </ul>
Risk that our technological advantage cannot be sustained	Mid- to long term	Decrease in mid- to long term revenue forecast due to inability to continue to maintain technological advantage in the SLAM market	<ul style="list-style-type: none"> <li>- Maintain and further improve the highest precision SLAM technology, including the development of the Kudan/Artisense integrated GrandSLAM</li> <li>- Further investment in technological innovation for mid- to long term discontinuous growth, in parallel with the strengthening of Deep Tech infrastructure, including CVC investment</li> </ul>
Risk that the amount and timing of revenue recognition may vary depending on the progress of the project	Short~mid- to long term	Volatility in revenue	<ul style="list-style-type: none"> <li>- Leveling of the timing of revenue recognition by increasing the number of projects</li> <li>- Expansion of stable revenue base through the increased commercialization and commercial licensing</li> </ul>

- This document contains Kudan's plans, estimates and expectations for the future based on its current business situation and industry trends.
- All such projections for the future inherently involve uncertainty and a wide variety of risks.
- It is conceivable that risks both understood and unforeseen, uncertainties and other factors may cause actual results to differ from the projections contained within this document.
- Kudan offers no guarantee of the accuracy of its projections for the future and accepts that they may differ significantly from actual results.
- All projections for the future included in this document are based upon information available to Kudan as of June 30<sup>th</sup>, 2022.
- Kudan plans to continue to disclose each indicator in its supplementary documentation to the financial report and other materials on a regular basis, including the progress of projects for customers' commercialization disclosed in this document.
- The next update of this document will be disclosed in May-June 2023.