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Kudan Inc. (4425)	kudan

Corporate Information

Exchange	TSE Growth
Industry	Information and communications
Managing Director & CEO	Daiu Ko
Address	2-10-15 Shibuya, Shibuya-ku Tokyo
Year-end	End of March
URL	https://www.kudan.io/

Stock Information

Share Price	Shares Outstanding (end of term)	Total market cap	ROE Act.	Trading Unit
¥2,031	8,509,267 shares	¥17,282 million	-59.3%	100 shares
DPS Est.	Dividend yield Est.	EPS Est.	PER Est.	BPS Act.	PBR Act.
0.00	-	-¥63.47	-	¥88.84	22.9 x

*The share price is the closing price on July 5. Each figure is taken from the financial results of the fiscal year ended March 2023.

Earnings Trend

Fiscal Year	Sales	Operating Income	Ordinary Income	Net Income	EPS	DPS
Mar. 2020 (Actual)	456	9	-12	-29	-4.17	0.00
Mar. 2021 (Actual)	127	-451	-1,575	-1,608	-214.97	0.00
Mar. 2022 (Actual)	271	-433	-681	-2,237	-283.74	0.00
Mar. 2023 (Actual)	332	-598	-394	-413	-49.30	0.00
Mar. 2024 (Estimate)	520	-560	-520	-550	-63.47	0.00

*Unit: yen, million yen. Net income is profit attributable to owners of the parent. Hereinafter the same shall apply. The earnings forecasts are that of the company.

This report briefly describes Kudan Inc., the financial results of the term ended March 2023, and growth strategies.

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Key Points

- Kudan Inc. is a company that carries out research and development of deep technology specializing in the algorithms for artificial perception (AP), which corresponds to the "eyes" of machines (computers and robots). Its strengths and characteristics include the capability of flexibly responding to the growth of diverse demand, which is expected in the future, and a group of professionals in AP. The company has secured a firm position based on the alliance with Artisense Corporation, which is led by Professor Daniel Cremers, who has produced globally recognized research results as a pioneer in self-driving technologies.

- In the term ended March 2023, sales increased 22.4% year-on-year to 332 million yen, and operating loss was 598 million yen. Commercialization of products by customers was achieved ahead of schedule, and sales expanded. On the other hand, in order to accelerate the full-fledged launch of product-related revenue, the company focused on the robotics and mapping fields, which are expected to start soon, and began offering a productization package that will serve as an incentive for the spread of commercialization. As a result of the measures for boosting these product-related revenue, the company reduced some of the development projects that were far from commercialization and areas other than robotics and mapping, and costs were higher than initially expected, so both sales and profits fell below the forecast.

- For the term ending March 2024, it is forecast that sales will increase 56.3% year-on-year to 520 million yen and operating loss will be 560 million yen, almost unchanged from the previous fiscal year. It is expected that the narrowing down of focus areas will prove effective, leading to the expansion of product-related revenue and that overall sales will also grow steadily. On the other hand, costs are projected to increase year-on-year due to the development and sales of a productization package and the strengthening of the system to expand product-related revenue. As a non-operating income, the company expects to continue receiving R&D subsidies from overseas governments. Last year, it aimed to transform its earnings structure to become profitable in the term ending March 2024. However, the company will prioritize business transformation and sales expansion in order to accelerate the launch of product-related revenue.

- Regarding the forecast for the number of commercialization projects for the term ending March 2024, the company forecasts the number of commercialization projects to be at or above the same level as that in the previous fiscal year. Rather than the number of commercialization projects, the company plans to disclose the content suitable for each stage of the projects in the future. The commercialization of products for customers is progressing steadily. In the term ended March 2023, following the first project in the second quarter, the company had two projects in the third quarter, and one project in the fourth quarter, for a total of four projects, exceeding the forecast of three projects at the beginning of the term, mainly for robotics and mapping.

- With the start of commercialization by customers, the company expects that sales linked to customer products (product-related revenue) will become a pillar of medium- to long-term growth and has decided to aim for a full-fledged launch and has narrowed down its focus areas to two, robotics and mapping, which have already been commercialized by customers and are expected to grow quickly in the future. For areas other than the two focus areas (automated driving, etc.), the company will narrow down the medium- to long-term growth potential and continue to pursue promising projects.

- Since its founding, the company has basically focused on expanding sales as a deep tech company. The company recognizes that turning profitable is a transit point, and although it cannot clearly indicate the timing at this point, it believes that turning profitable will be achieved as a result of the process of scaling up. Although the company will not disclose the forecast for the number of commercialization projects from this term, we are looking forward to the quarterly releases regarding commercialization.

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1. Company Overview

Kudan Inc. is a company that carries out R&D of deep technology (or deep tech), specializing in algorithms for artificial perception (AP) which acts as the eyes of machines, such as computers and robots.

Working in pairs with artificial intelligence (AI), which serves as the brain of machines, to complement each other as deep tech, AP helps machines evolve to function autonomously. The company operates business based on its unique milestone model focused on the deep tech that has an impact on a wide range of industries through highly sophisticated technological innovations.

【1-1 Corporate history】

Mr. Tomohiro Ohno, currently serving as a Managing Director, became convinced of the prospects and growth potential of the AP technology when working at Andersen Consulting (currently Accenture PLC) and set up Kudan Limited in the United Kingdom in January 2011, at which he pursued his own research and development on the Simultaneous Localization and Mapping (SLAM) technology that provides a basis for the AP technology.

In November 2014, he established Kudan Inc. intending to extend the administrative department through business expansion while moving further ahead with his research and development. The company started offering evaluation software for demonstration of the Kudan SLAM technology in December 2016 and officially began to provide Kudan SLAM in the term ended in March 2018.

It got listed on the Market of the High-Growth and Emerging Stocks (Mothers) of the Tokyo Stock Exchange (TSE) in December 2018. In April 2022, the company got listed on the Growth Market of TSE, through market reclassification.

Consisting of four inside directors, Managing Director & CEO Daiu Ko, who joined the company after working for Toyota Motor Corporation and McKinsey & Company, Managing Director Tomohiro Ohno, Kohei Nakayama, a director and CFO, and Tian Hao, COO, Kudan's management team places a heavy emphasis on swiftness.

【1-2 Corporate philosophy】

Kudan's corporate philosophy is "**to stand alone, and dare to create what is new and different**."

The philosophy guides the company into avoiding following suit and daring to challenge the generally accepted wisdom. Embracing the philosophy, the company aims to expand its business and research and development, raise shareholder interests, and become a one-of-a-kind company in the market by formulating policies that enable them to stand out from all other companies.

While adopting a corporate vision of "Eyes to the All Machines," Kudan aims to become a player that offers technology essential for full autonomy and automation, goals that all kinds of machines and devices will strive to reach.

【1-3 Market environment】

In recent years, the increasing need for automation of operations in every industry and advancement of hardware technology, including sensors and semiconductors complementary to algorithms, have been rapidly spreading and practically utilizing the AP algorithms.

In addition, the impact of the spread of COVID-19 has resulted in soaring demand for saving labor and working remotely for operations that require neither human interaction nor group work in all industries. The growth of demand for automation technology, such as robotics, autonomous driving, and drones, is significant particularly in the fields of logistics, manufacturing, construction, retail, etc.

The material for the 10th meeting for discussing new governance models for realizing Society 5.0 held on October 6, 2020 by the Ministry of Economy, Trade, and Industry (METI), which was titled "Reference material 2: Case studies for estimating the economic impact of advanced technology," provides estimates for the economic impact of the Internet of Things (IoT), artificial intelligence (AI), autonomous driving systems, and drones as follows:

Target technology/device	Economic impact
IoT	Real GDP boosted by the increase in the use of IoT and AI is estimated at **132 trillion yen in 2030**.
	The number of people in employment in 2030 when the use of IoT and AI is promoted is facilitated

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Target technology/device	Economic impact
	further is estimated to be 63 million, up 7,390,000 compared to the number of people employed when the use of IoT and Ai is not promoted.
AI	GDP in 2030 is expected to be 9.8% (11.2 trillion dollars) to **14% (15.7 trillion dollars) higher** with an impact of AI than without.
Autonomous driving systems	It is projected that the passenger economy (*) will stand at **800 billion dollars in 2035 and 7 trillion dollars in 2050** globally when autonomous cars are put into practice. The economic impact is broken down into Mobility as a Service (MaaS) for consumers (3.7 trillion dollars), MaaS for businesses (3.0 trillion dollars), and newly emerging driverless vehicle services (0.2 trillion dollars). *The passenger economy: economic and social value realized by level-5 fully autonomous cars
Drones	The market scale of the drone business in Japan is forecasted to be 193.2 billion yen in FY 2020, up 37% from the year before, and reach **642.7 billion yen in FY 2025 (about 3.3 times larger than that of FY 2020)**. Drone services were the strongest market in FY 2019 with a 68% year-on-year increase to 60.9 billion yen followed by the drone body market which grew 37% year on year to 47.5 billion yen and the drone peripheral services market which showed a 46% year-on-year rise to 32.6 billion yen. These three markets are expected to continue booming, with the market scales for FY 2025 are estimated at **442.6 billion yen (about 7.3 times greater than that of FY 2019) for the services market, 122.9 billion yen (about 2.6 times greater than that of FY 2019) for the body market, and 77.1 billion yen (about 2.4 times greater than that of FY 2019) for the peripheral services market**, respectively, in descending order.

*Created concerning "Reference material 2: Case studies for estimating the economic impact of advanced technology" used at the 10th meeting for discussing new governance models for realizing Society 5.0 as posted on METI's website. The red and bold parts were provided by Investment Bridge Co., Ltd.

In addition to these applications that are already under development, there are many areas where AP (Artificial Perception) technology will be applied and integrated in the future by supporting various advanced technologies, and it is expected that AP (Artificial Perception) technology will be implemented in society at a speed beyond what was previously expected.

【1-4 Business content】
Kudan has issued a license for Kudan SLAM, a software for integrating such algorithms as SLAM, which is the mission-critical technology of AP, into hardware, and grants it to customers.

It is essential to learn about AP (Artificial Perception) and SLAM to understand the business and technological superiority of Kudan. Below are descriptions of AP and SLAM.

<What is AP?>
Artificial perception (AP) is a technology put forward by Kudan Group that is carrying out research and development thereof.

The evolution of AI (artificial intelligence), a technology that replaces the human brain, is remarkable.
However, the recent evolution of AI is mainly limited to "Internet AI" that does not directly operate in the real (physical) space. At the same time, the demand for "embodied AI" that can directly affect the real space is expected to increase significantly in the future. Machines (computers and robots), which have remained in the Internet space for a long period of time, are heading toward autonomous functions in the real space.

However, autonomous actions and functions of machines cannot be realized by AI alone. It can only be realized by mutually linking and complementing AI (Artificial Intelligence) with the advanced technology AP (Artificial Perception), which is equivalent to the "eyes" for understanding the surroundings. AP (Artificial Perception) is an essential technology that gives machines advanced visual capabilities like human eyes.

With the evolution of AI, the need for AP technology that connects machines and the real world is expected to grow even more in the future.
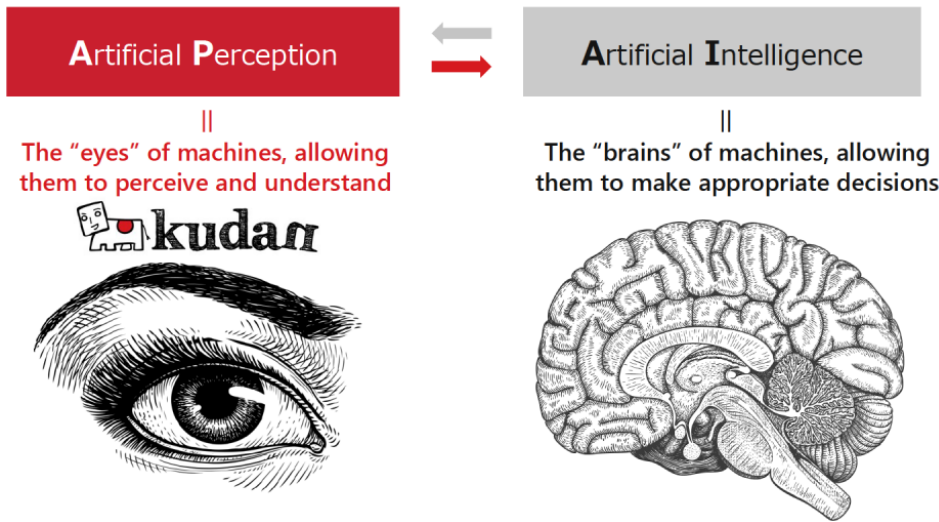
(Taken from the reference material of the company)

<What is SLAM?>
"SLAM: Simultaneous Localization and Mapping" plays a key role in enabling the AP (Artificial Perception) to fully demonstrate its required capabilities.

SLAM is a technology for each computer to concurrently "estimate the self-location (localization: checking where you are)" and "produce an environmental map (mapping: checking your surroundings)" in the real environment based on data input from external sensors, such as cameras and lidar.

It is possible to record how you have travelled in a new environment while producing a map (tracking) and recognize where you are based on a previously produced map (re-localization).

Unlike GPS and beacons, which detect the position from external radio waves, it recognizes its own position in a standalone manner. Thus, it can be used in a wider range of environments, situations, and use cases.
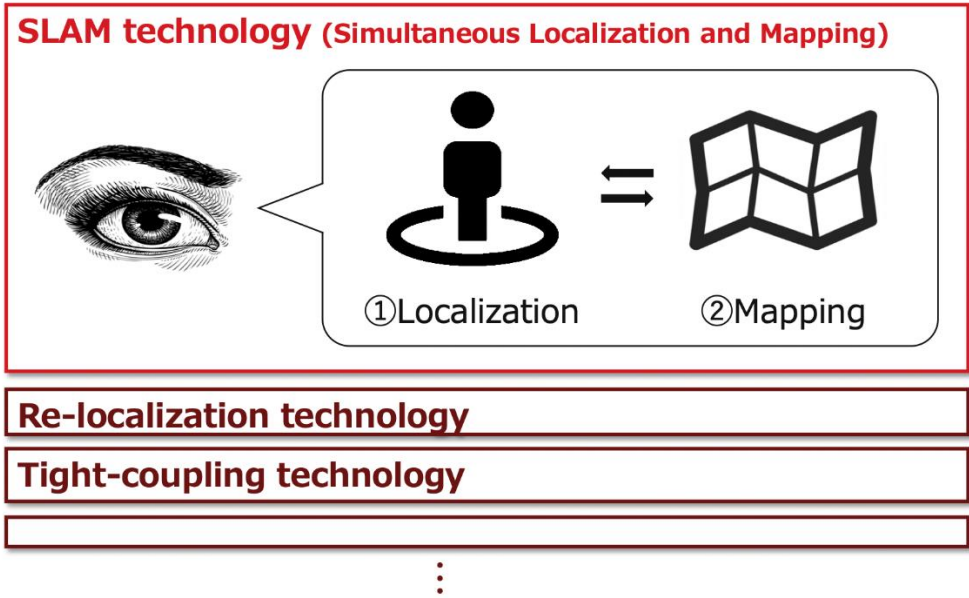
(Taken from the reference material of the company)

Taking a car applied with the SLAM technology as an example, the technology localizes the car based on a computer program of mathematically processing the distance that the car has travelled, camera images, and sensor information provided by Lidar, which is a sensor using laser light, and outputting three-dimensional information (such as the direction, distance, and size) and kinesthesia (such as the location and movement) on a real-time and precise basis and, at the same time, makes a three-dimensional map based on data on the surroundings amassed by the sensors.

In the case of cars, SLAM enables drivers to obtain basic information for safe travel by car by using a three-dimensional map drawn from time to time by the technology while driving cars, even if they have no information in advance on road conditions (such as the location of cars driving in the front, back, left, and right of their cars, how fast the cars in all directions drive, the road width, and the number of road lanes).
Differing from GPS, which detects a position with external radio waves, and beacons, it recognizes the self-position in a stand-alone manner, so it can be used in a broader range of environments, situations, and cases.

SLAM is the most critical technology for AP, and what are extremely important are precision and processing speed when it comes to ensuring the safety in autonomous cars. Such technological issues have been pointed out as obstacles to using SLAM for general purposes.

In this regard, GrandSLAM offered by the Kudan Group is comprised of three different SLAM algorithms, each of which has its own unique strengths.
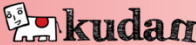
(Taken from the reference material of the company)

Kudan Indirect Visual SLAM, for example, is capable of processing information over 10 times faster with less processing power than the most prominent open-source software of camera-based SLAM technology. Compared to other solutions that can generally give only centimeter-level localization precision, such as 5 cm, the precision of Kudan Indirect Visual SLAM can be as small as millimeters.
By combining these algorithms, etc., the company aims to further improve the function with higher speed and higher precision both indoors and outdoors, using multiple sensors, such as cameras and Lidar, together by integrating the systems through clock synchronization between the sensors (a process called tight coupling).
This technological superiority has been enhanced further by the acquisition of Artisense Corporation as its subsidiary as mentioned later.

Kudan began offering Kudan Indirect Visual SLAM under the name of Kudan SLAM in the term ended March 2018. Then, it started to provide Kudan 3D-Lidar SLAM in March 2020. The company has been striving to broaden the customer base in the following three areas:

Area	Example customers
Augmented reality (AR) and virtual reality (VR) application area	Optical sensor manufacturers, optical equipment manufacturers, mixed reality (MR) glasses manufacturers, telecommunications equipment manufacturers, electrical equipment manufacturers, e-commerce platforms, computer games producers etc.
Robotics and IoT area	Optical equipment manufacturers, heavy industrial and industrial robot manufacturers, electrical equipment manufacturers, transportation equipment manufacturers, signal processing internet protocols (IPs), etc.
Application area targeting cars and maps	Car components manufacturers, digital map companies, spatial information consulting companies, etc.

Like this, having both Visual SLAM and Lidar SLAM, Direct SLAM and Indirect SLAM in Visual SLAM, and having a hybrid technology combining them is a major strength of the company.

**<Growing number of fields in which AP can play roles>**
Using one of the existing technologies called computer vision (a set of base technologies of sensor and image processing mainly on a two-dimensional basis) as the foundation after reconstructing it, Kudan has developed its own unique AP technology.

As AP is the base technology necessary for every kind of device that uses cameras and three-dimensional sensors, the company expects that it will be the base technology adopted to diverse next-generation solutions on a cross-cutting basis.

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It has been a technology essential for automatic control of all autonomous machines as robotics in a broad sense, including industrial robots, domestic robots, next-generation mobility such as cars, and flying machines such as drones, just to name a few.

It will also be required for spatial perception in AR and VR that will serve as user interfaces of next-generation computers.
In addition, the technology will be applied to an extremely wide range of purposes as the base technology for next-generation digital maps, dynamic maps (a dynamic mapping system that swiftly reflects the conditions of the reality environment), digital twin (information on the virtual space synchronized with the reality environment on a real time basis), and the like.
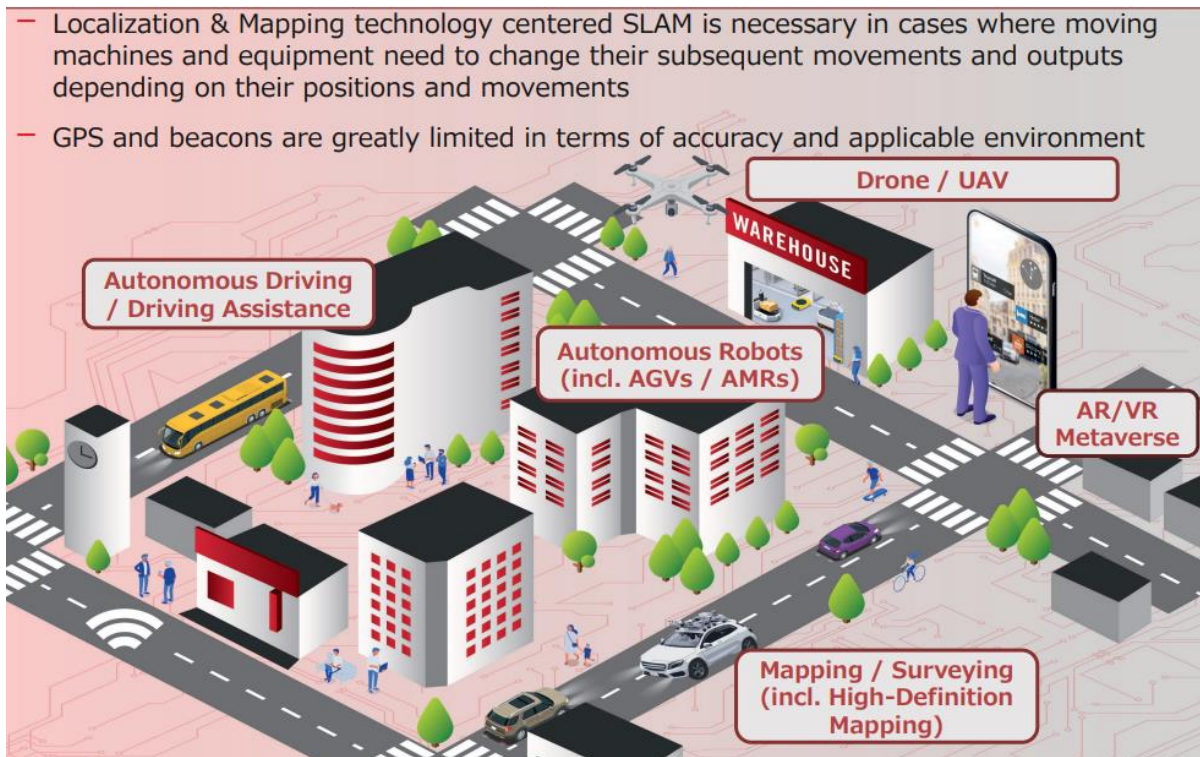
(Taken from the reference material of the company)

【1-5 The company's vision】
<Technical Strategy and Management Strategy>
◎ Technology Strategy
The company is targeting only achieving full automation. Full automation is difficult to achieve by merely accumulating non-automated and semi-automated technologies. By focusing on this, the company is accumulating technology while achieving full automation in each area in stages, "mapping" → "indoor robot" → "outdoor robot" → "automated driving," in order to realize applied technology with a high degree of difficulty.

◎ Management Strategy
Based on the technology strategy, the company is focusing on algorithm research, software development, and licensing in Deep Tech, which is equivalent to the fundamental technology located in the deepest technological layer below solutions, finished products, and applied technology.
With overwhelming technological strength as its weapon, the company is promoting customer acquisition globally and aiming for "maximization of corporate value with a select few employees" and "positioning that is difficult for customers to replace."
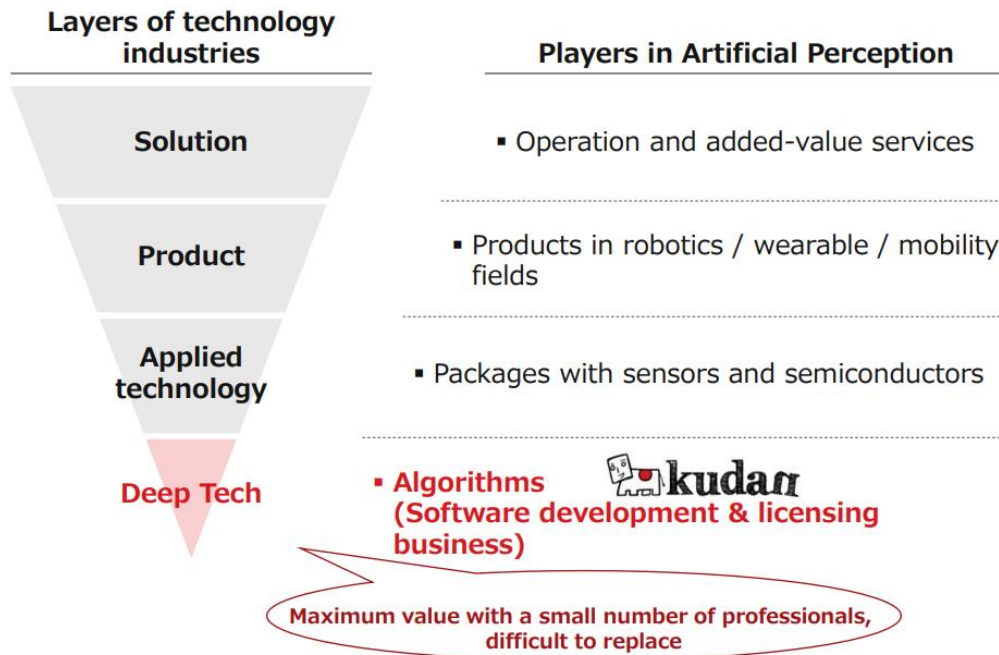
(Taken from the reference material of the company)

<Acquisition of Artisense Corporation as a subsidiary and business alliance therewith>

One of the most noteworthy points of the Kudan Group's business strategies is the acquisition of Artisense Corporation (whose headquarters are based in the United States) as a subsidiary and a business alliance with the company.

(Overview of Artisense Corporation)

With such fields as autonomous driving, robotics, AR and VR, and drones being its application areas, Artisense Corporation provides AP algorithms that perceive the space and location, taking pride in its capability of putting camera-based visual SLAM into practice on a commercial level.

Artisense Corporation was founded in 2016 jointly by Professor Daniel Cremers, who has delivered the world's best research results as the leader of the Technical University of Munich (TUM) that has a world-leading research group in AI and computer vision and as a leading expert on the autonomous driving technology, and Mr. Andrej Kulikov, a serial entrepreneur.

The Artisense Group consists of two global companies, which are the parent company that is based in Silicon Valley, California, U.S., a German company engaging in research and development in collaboration with TUM and the European auto industry.

Artisense conducts research and development on AI and computer vision and offers technology related thereto in the field of the spatial and location perception technology, in which Kudan operates business, and the strength of its direct visual SLAM, in particular, lies in the algorithms developed through approaches different from those taken by Kudan.

(Purposes of the acquisition of Artisense Corporation as a subsidiary)

Although Artisense Corporation is a direct competitor, Kudan entered into a contract with it in January 2020 for gradually getting its shares with the intention of acquiring it as a subsidiary.

By grouping together leading companies in the increasingly oligopolistic field of artificial perception (AP) technology, Kudan aims to consolidate its position as one of the world's largest forces in the field of artificial perception and SLAM, and to secure an overwhelming market share by increasing its competitive advantage and growth potential.
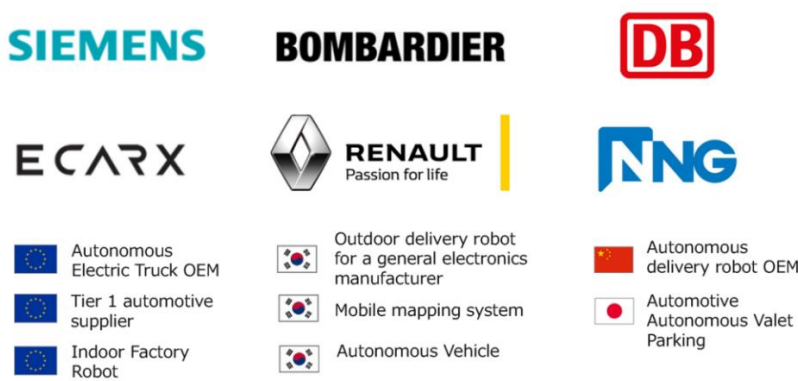
In addition, the technological collaboration between the two companies is expected to solidify their footing by securing IP (intellectual property) for future technologies, and synergistically improve performance by complementing the technologies in which each company excels, thereby realizing advanced spatial and positional recognition in more complex environments.

Kudan concluded a business alliance with Artisense in May 2020.

Specifically, in research and development, Kudan aims to develop and put into practice its unique SLAM, an algorithm that is as most sophisticated as one can theoretically think of by achieving a breakthrough with integration of the direct SLAM that Artisense uniquely possesses as a next-generation technology into Kudan's indirect SLAM, or into Kudan's Lidar SLAM technology, and Artisense's deep learning-based AI technology called Deep Feature.

By realizing such breakthroughs through industry-leading technology commercialization, Kudan believes that it can further promote technology-driven market growth in areas of automated driving, robotics, AR/VR, and drones.

These efforts are not just limited to research and development, but are already leading to a number of projects on a global scale, backed by world-class technology, including the following.

SIEMENS   BOMBARDIER   DB

ECARX   RENAULT Passion for life   NNG

- Autonomous Electric Truck OEM
- Tier 1 automotive supplier
- Indoor Factory Robot
- Outdoor delivery robot for a general electronics manufacturer
- Mobile mapping system
- Autonomous Vehicle
- Autonomous delivery robot OEM
- Automotive Autonomous Valet Parking

BOMBARDIER : Canadian industrial transportation equipment OEM, mainly aircraft, and sales of $6.5 billion (2020)
DB (Deutsche Bahn) : Germany's largest railroad company, and sales ~€40 billion (2020)
ECARX : Chinese autonomous intelligent solutions provider, which received investment from Baidu and Geely and has signed a partnership agreement with Volvo.
NNG: Hungary's Tier 1 automotive supplier. More than 30 automotive brands have adopted its solution, and seven of the top 10 OEMs have adopted it.

(Taken from the reference material of the company)

In business development, the company will further strengthen its global sales structure in Asia (including Japan and China), Europe, and North America. In addition, the company aims to achieve dramatic growth over the medium to long term by expanding the number of business development personnel at its global sales bases, investing in partner companies to expand product and solution development, and promoting further development and investment in Deep Tech (deep layer technology) in addition to SLAM development and commercialization.

【1-6 Competitive superiority】
(1) Technological features
Kudan believes that its AP technology has enormous advantages in taking in not only the existing demand for product development but also demand for research and development on highly novel and complex future technologies, because the AP technology can help the company strategically take in technological demand fueled by continuous advancement and wider applications of the technology in mid-/long-term.
According to the company, the AP technology has the following five features.
Kudan can flexibly fulfill future demand, which is expected to grow and be diverse, by combining their sophisticated and flexible research and development capabilities that they cultivated by focusing on the AP field:

Feature	Overview
(1) Uniqueness of the algorithms	The Kudan Group possesses diverse families of technologies that consist of uniquely developed algorithms. Regarding how to perceive image feature points (fairly noticeable local areas in an image) that provide the basis for perceiving three-dimensional geometric structures at an advanced level, for

	example, the company has developed a unique, high-speed and greatly precise method by integrating and hybridizing a high-speed perception method and a highly precise and stable perception method. Furthermore, the density of feature points perceiving within an image can be adjusted flexibly to optimize the precision of perceiving three-dimensional structure (a set of three-dimensional feature points) and the processing speed, according to the practical application environment. In addition, a wide range of unique mathematical models that guarantee the feasibility of the technology are integrated, including optimized calculation that increases the precision of a group of three-dimensional feature points perceived sequentially in a three-dimensional manner, and a high-speed matching method with already-known, stored data.
(2) Flexibility and powerful performance	The uniqueness of the algorithms allows high-speed processing (with a light calculation load) as well as realizes great perception precision (which means that deviation from a true value is slight) and robustness (which indicates that the technology performs stably regardless of the environment and conditions in which it is used). In addition, the AP technology will be able to deliver strong performance that is optimized for a myriad of practical applications as it is designed in a manner that allows users to make detailed adjustments to the perception precision, robustness, processing speed, data size, and other individual functions according to the conditions under which the technology is used and required specifications.
(3) Flexibility in sensor use	As limiting the number of sensors can narrow the scope of applications of the AP technology, the Kudan Group's technology is designed to be compatible with various sensors. Specifically, it can function with a variety of cameras, the technology can be adjusted flexibly according to the number of cameras (such as monocular cameras, binocular cameras, and multiple cameras), and the data read format of optical sensors (such as whether to read data sequentially or simultaneously). Besides cameras, the technology can also be combined with a multitude of sensors, including three-dimensional sensors (such as Lidar and Time of Flight (ToF)), internal sensors (such as inertial measurement unit (IMU) and machine odometry), and position sensors (such as the Global Positioning System (GPS) and Beacon), which will allow advanced application of the technology while taking advantage of the strengths of each sensor.
(4) Flexibility in arithmetic processing environments	Flexibility in arithmetic processing platforms is also an important factor for applying the AP technology to a wider range of fields. As the Kudan Group's technology can work in multifarious arithmetic processing environments, it can be compatible with all kinds of processor designs and thus can speed up calculation processes by optimizing the software according to the kind of processor used (such as a central processing unit (CPU), a digital signal processor (DSP), and a graphics processing unit (GPU)). It can also function in a wide range of system environments through porting a software to major operating systems (such as Linux, Windows, MacOS, iOS, and Android).
(5) Flexibility in using part of the function	Complex fusion with other technologies is necessary for advanced applications of the AP technology. Parts of the function (software modules) of the Kudan Group's technology can be selected so that they are flexibly integrated into customers' existing software. The degree of dependence on processor designs (the degree of abstraction of software) of each part (software module) of the technology's function varies, and therefore it can be optimized flexibly either at a semiconductor level (with a lower abstraction degree) or at a software application level (with a higher abstraction degree).

(2) Group of experts on AP

Kudan has laid a firm technological and business foundation as a group of experts in AP.

Researchers and engineers specializing in SLAM are a handful in the rare computer vision field. Among them, the company has many first-class personnel with doctoral degrees.

In addition, the number of players who specialize in SLAM or have SLAM as their core business has become more limited due to continued M&A by major technology companies.

(3) Outstanding business achievements and customer awareness

While the number of players in the market is limited, the company is far ahead of existing companies in terms of the breadth of technology it offers, its track record of projects, and its recognition.

To date, the company has achieved development and partnerships with many top global companies and has been highly evaluated by the world's leading companies.

Development projects and partnership with global leading players have been increasing

| Timing		Main target applications and project overview	
FY20	May.	**Robotics**) Partnership with Thales group for next-gen tracking system development	THALES
	Aug.	**Mobility**) Signed with Japan Unisys to collaborate as Business Scaling Partner	UNISYS
	Sep.	**Mobility**) Partnership with Macnica to develop new value-added solutions for mobility business	macnica
		Robotics, Mapping) Partnership with Ouster. Provide localization and mapping solutions with Lidar	OUSTER
	Nov.	**AR**) Develop RGB-D SLAM on smartphones with ToF sensor with Sony Semiconductor Solutions	SONY
	Jan.	**Robotics, Mapping**) Partnership with Cepton on Lidar-SLAM and joint exhibition demo	CEPTON
		Robotics, Mapping) Partnership with Velodyne on Lidar-SLAM	Velodyne Lidar
FY21	May	**Robotics**) Launch SLAM library for Qualcomm® Robotics RB3 Platform with their technical support	Qualcomm
		Robotics) Joint development of 3D SLAM demo application with Analog Devices	ANALOG DEVICES
	Nov.	**Robotics**) Partnership with Vecow to jointly offer integrated solution for autonomous mobile robots	Vecow
		AR, Mobility) Artisense released Automotive AR navigation demo with HERE technologies and NNG	here NNG
	Dec.	**General**) Achieved 40% image process acceleration with Synopsys ARC EV processor IP on Kudan SLAM	SYNOPSYS
	Mar.	**General**) Joined NVIDIA Inception Partner Network	NVIDIA
FY22	Apr.	**AR**) Released utilization of Kudan SLAM in NTT docomo's developing AR cloud	docomo
	May.	**Robotics**) Partnership with robotics developer UGO to integrate Kudan SLAM into robotics and joint sales	ugo
	Jul.	**Mapping**) Signed a Developing License General Agreement with BIMEXPERTS and develop joint solutions	BIMEXPERTS
	Aug.	**Robotics**) Partnership with ADLINK, development of AMR, integration of Kudan SLAM into robotics, joint sales	ADLINK
		General) Joined Texas Instrument's partnership network in robotics	TEXAS INSTRUMENTS
		General) Become official SLAM partner with Ouster, a leading Lidar provider, and start offering tools on HP	OUSTER
	Oct.	**Autonomous Driving**) Participation with Renault and other companies in ERASMO, autonomous driving project by EU research institute	
FY23.24	Oct.	**Robotics**) Adopted as a commercial SLAM for Edge Insight, Intel's platform for AMR	intel
		Robotics, Mapping) Partnership with Innoviz to promote digital mapping project	INNOVIZ TECHNOLOGIES
	Apr.	**Robotics**) Partnership with Cadence to enhance SLAM performance for robotics	cadence

【1-7 Business model】

(1) Acceleration and expansion of customer commercialization

Currently, the majority of projects are in the evaluation and development phase, and the business is in the red due to upfront investment in research and development expenses.

A certain level of profitability and growth is expected for evaluation and development licenses/customer development support, and product-related revenue are expected to increase significantly as technology penetrates the market through the spread of customer products. Sales after commercialization by customers are mainly software license income. As a result, additional costs are negligible, and the increase in sales will contribute to profit. Therefore, a dramatic increase in profit can be expected.
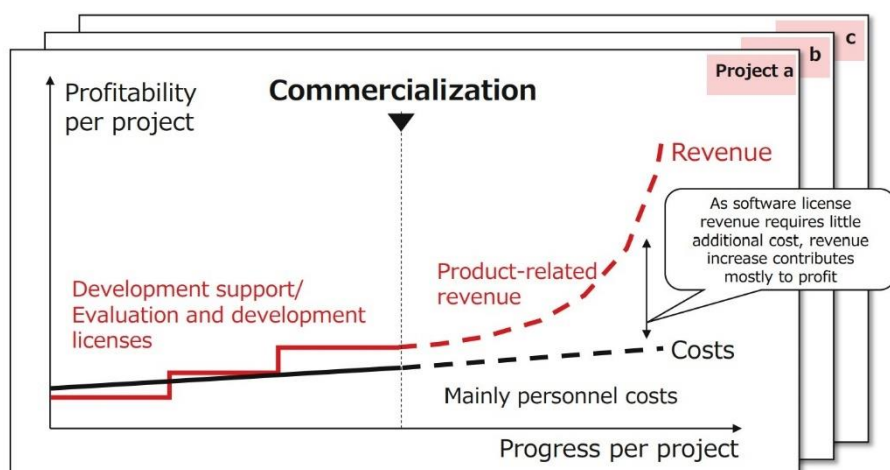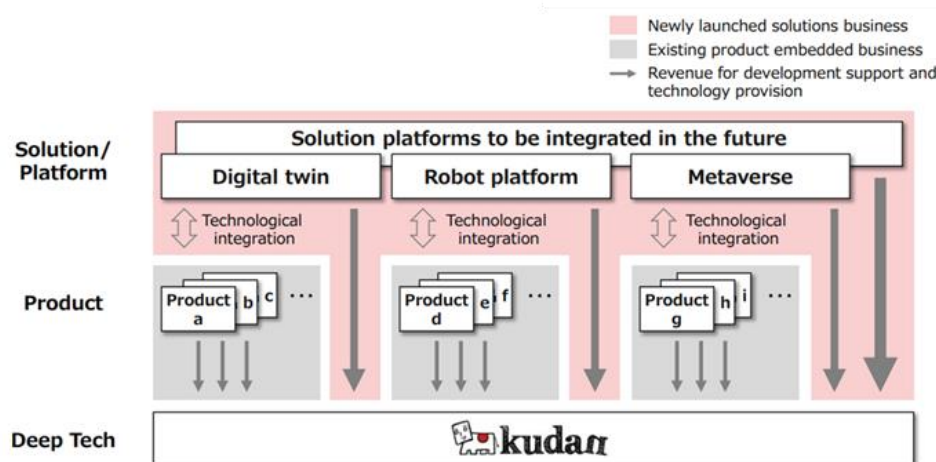
(Taken from the reference material of the company)

(2) Operation of the solution business

As customer commercialization expands, it will not only incorporate its technology into individual products, but also concentrate on the provision of new solutions, including the synchronization of multiple products and the expansion of purposes of use based on Kudan technology. Recognizing clients' commercialization as a foothold for the solution business and expecting synergy in the solution business for clients' commercialization, the company aims to increase earning opportunities.

It is assumed that their services will be offered in the fields of digital twins, robot platforms, and metaverse.

(Taken from the reference material of the company)

2. Fiscal Year ended March 2023 Earnings Results

【2-1 Overview of the consolidated results】

	FY 3/22	Ratio to sales	FY 3/23	Ratio to sales	YoY	Forecast
Sales	271	100.0%	332	100.0%	+22.4%	500
Gross Profit	124	45.8%	176	53.0%	+41.6%	-
SG&A	557	205.1%	775	233.0%	+39.0%	-
Operating Income	-433	-	-598	-	-	-350
Ordinary Income	-681	-	-394	-	-	-300
Net Income	-2,237	-	-413	-	-	-315

*Unit: million yen. Net income is profit attributable to owners of the parent. Hereinafter the same shall apply.

Sales grew and profit dropped, falling below the forecast.

The sales in the term ended March 2023 were 332 million yen, up 22.4% year on year, and operating loss was 598 million yen.
Sales expanded due to the achievement of customer product commercialization ahead of schedule. In order to accelerate the full-scale launch of product-related revenue, the company focused on the areas of robotics and mapping, which are expected to be up and running more quickly and began offering a productization package that will serve as "priming" for the expansion of product commercialization. This strategy to boost product-related revenue resulted in a reduction of some development projects in areas other than robotics and mapping, as well as projects that are far away from commercialization, and costs were higher than initially expected.
*The status of commercialization by customers, details of measures to boost product-related revenue, its impact on sales, etc. will be stated later in 【2-3 Topics】.

Transition of sales (unit: million yen)
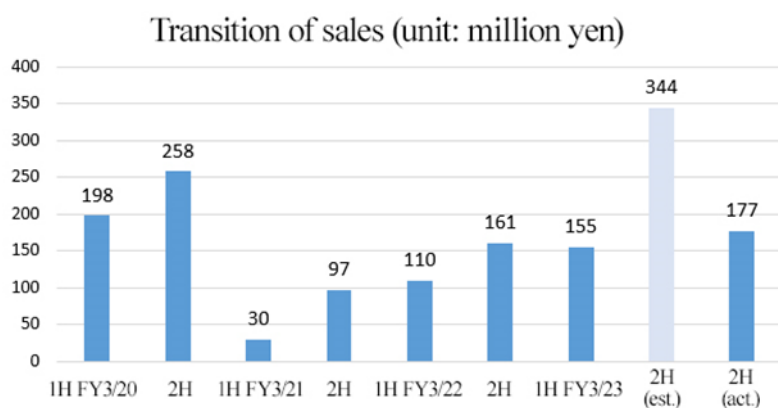
* Cost

The cost synergy of 200 million yen due to acquiring Artisense, which was planned as a cost reduction measure, was effective, but the development of revenue (60 million yen for a productization package) resulted in the augmentation of costs.
In addition, costs increased due to external factors (70 million yen due to exchange rates in Europe and the United States, inflation, etc.). Therefore, the total cost exceeded the initial estimate.

【2-2 Financial standing and cash flows】

◎ Balance sheet indicating major items

	End of Mar. 2022	End of Mar. 2023	Increase/ decrease		End of Mar. 2022	End of Mar. 2023	Increase/ decrease
Current Assets	754	991	+237	Current Liabilities	125	241	+116
Cash and deposits	604	852	+247	ST Interest-Bearing Debts	0	200	+200
Noncurrent Assets	15	16	+1	Noncurrent Liabilities	6	6	0
Tangible Assets	0	0	0	LT Interest-Bearing Debts	0	0	0
Investment, Other Assets	15	16	+1	Total Liabilities	132	248	+116
Investment Securities	0	0	0	Net Assets	637	759	+121
Total Assets	770	1,008	+237	Capital	897	345	-552
				Retained Earnings	-2,382	-332	+2,050
				Total Liabilities and Net Assets	770	1,008	+237

*Unit: million yen

Total assets increased 237 million yen from the end of the previous fiscal year to 1,008 million yen due to an increase in cash and deposits.

Net assets increased 121 million yen from the end of the previous term to 759 million yen due to the decrease in capital, compensation for the deficit with capital surplus, and issuance of new shares.

As a result, the equity ratio decreased by 7.8 points from the end of the previous fiscal year to 75.0%.

◎ Cash Flow

	FY 3/22	FY 3/23	Increase/decrease
Operating Cash Flow	-514	-619	-104
Investing Cash Flow	-137	-20	+117
Free Cash Flow	-652	-639	+12
Financing Cash Flow	9	870	+860
Cash and equivalents	604	852	+247

*Unit: million yen

The positive balance in financing CF increased due to proceeds in revenue from stock issuance year on year, etc. The cash position increased.

【2-3 Topics】

(1) Variation in the number of projects and progress & prospects of clients' commercialization

The commercialization of products by customers is progressing steadily.

Following 1 project in the second quarter, there were 2 projects in the third quarter and 1 project in the fourth quarter, for a total of 4 projects, mainly in robotics and mapping. The number of projects exceeded the forecast at the beginning of the term, which was 3.

Of these, the following Intel semiconductor products are the first in the world to adopt commercial SLAM technology fully.

Kudan Visual SLAM is now available as the latest edge insight adoption software for Intel's AMR platform.

In October 2010, Intel Corporation, a strategic technology partner, launched its latest Edge Insight software platform for Autonomous Mobile Robots (AMR) and selected Kudan Visual SLAM (KdVisual) as the commercial Visual SLAM software. Kudan Visual SLAM (KdVisual) has been selected as the commercial Visual SLAM software.

The combination of KdVisual and Intel's Edge Insight enables AMR OEMs and developers to more quickly and efficiently build robust and reliable AMR for the most demanding tasks without sacrificing accuracy or performance.

KdVisual is the first commercial SLAM to be fully adopted on a major semiconductor platform and the first company in the world to specialize in this technology area.

Intel's platform provides a comprehensive set of software capabilities for the next generation of autonomous driving functions that require significant investment and time to develop in-house by robot manufacturers, in which Kudan technology is a core module for mapping and utilization.

In addition, Kudan's SLAM performance has been significantly improved through specialized customization for the interlocking Intel hardware chips.

This will greatly lower the hurdles to commercial development for robot manufacturers that use Intel products and is expected to expand the commercialization of efficient and rapid autonomous driving.

The practical application of autonomous robots is expected to expand.

(2) Measures to boost product-related revenue
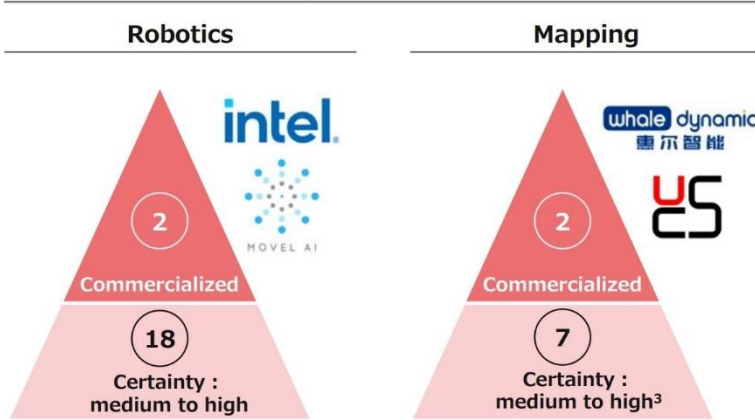
① Narrowing down focus areas

With the start of commercialization by customers, the company expects that sales linked to customer products (product-related revenue) will become a pillar of medium- to long-term growth and has decided to aim for a full-fledged launch. The company has narrowed down the areas of focus to two markets, "robotics" and "mapping," which are expected to develop quickly in the future and have already been commercialized by customers.

For areas other than the two focus areas (automated driving, etc.), it will narrow down the medium- to long-term growth potential and

continue to pursue promising projects.

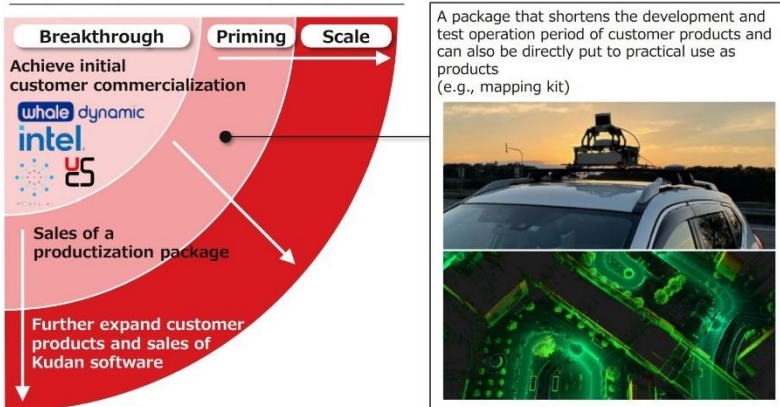**Customer commercialization progress**
[Number of projects]

Robotics

intel.
MOVEL AI
2 Commercialized
18 Certainty : medium to high

Mapping

whale dynamic 惠尔智能
UCS
2 Commercialized
7 Certainty : medium to high[3]

(Taken from the reference material of the company)

② Provision of a productization package

After narrowing down the areas of focus, the company will develop and provide a productization package, aiming to provide an incentive for further expansion of commercialization by customers and sales expansion of Kudan software.

Expanding business by selling a productization package

Breakthrough | Priming | Scale

Achieve initial customer commercialization
whale dynamic
intel.
UCS

Sales of a productization package

Further expand customer products and sales of Kudan software

A package that shortens the development and test operation period of customer products and can also be directly put to practical use as products
(e.g., mapping kit)

(Taken from the reference material of the company)

③ The impact of the measures to boost product-related revenue

Since the company prioritized measures to boost product-related revenue, some projects outside of focus areas and development projects far from commercialization were reduced, which affected sales.

On the other hand, in the current term ending March 2024, product-related revenue are expected to rise due to the boosting measures and account for about 30% of total sales (sales of 150 million yen or 20 times those in the previous year).
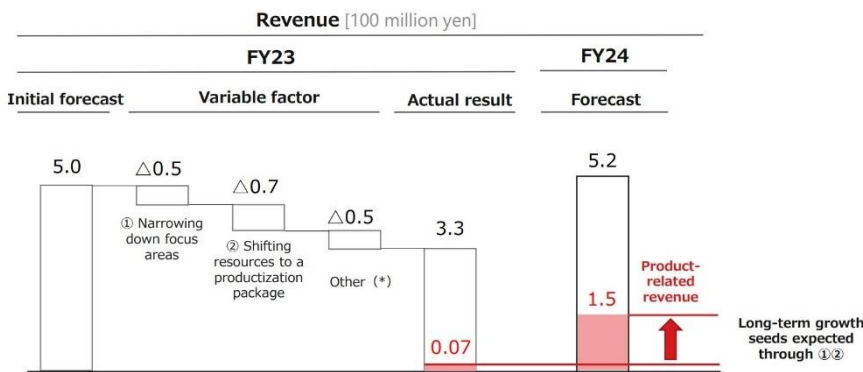
(Taken from the reference material of the company)

(3) Accumulation of projects toward customer commercialization

While narrowing down the focus areas to "robotics" and "mapping," the company has been proceeding with the following projects for commercialization by customers.


(Taken from the reference material of the company)

(4) Development of partnerships

In addition to using the technology in Intel commercial products, the company is also increasing and deepening partnerships with major semiconductor and sensor companies that are similarly expanding the ecosystem to make significant progress toward the industry standardization of Kudan technology.

In the term ending March 2024, it will work with Intel to enhance product functions and provide support for customer implementation to expand product sales.

In addition, along with promoting partnerships with semiconductor and sensor companies for further commercialization, the company will also strengthen collaboration with system integrators who implement Kudan technology as solutions.
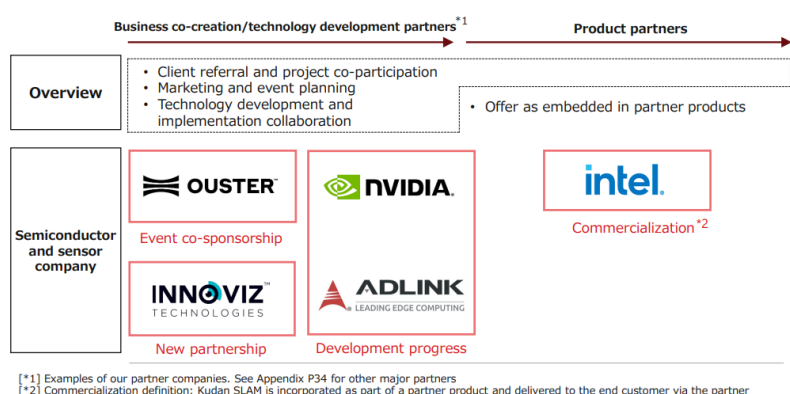
(Taken from the reference material of the company)

(5) Completed integration of hybrid technology into customer products

Regarding commercial SLAM technology, the company succeeded in hybridizing indirect SLAM and direct SLAM for the first time in the world.

By combining the merits of the indirect SLAM, which has high processing speed and versatility, and the direct SLAM, which has accurate recognition and high stability, the basic performance has been greatly improved. This is expected to contribute to the expansion of the customer base in a broader range of applications.

In addition to the application in customer projects, the technology integration into customer products has been completed, and it is expected to contribute to product-related revenue from the term ending March 2024.

(6) Demonstration cases of next-generation technology

In addition to the focus areas of robotics and mapping, the company is working on selecting demonstrations from a medium- to long-term perspective.

Along with the above hybrid SLAM technology, it has demonstrated location recognition incorporating AI and sensor integration for autonomous driving and has achieved effective results.

(Project example)

In order to establish vehicle position recognition technology in urban areas, which is difficult even with next-generation high-precision GPS, the company is conducting demonstration experiments in collaboration with GPS manufacturers and major European automobile companies.

3. Fiscal Year ending March 2024 Earnings Forecasts

【3-1 Earnings forecasts】

	FY 3/23	Ratio to sales	FY 3/24 Est.	Ratio to sales	YoY
Sales	332	100.0%	520	100.0%	+56.3%
Operating Income	-598	-	-560	-	-
Ordinary Income	-394	-	-520	-	-
Net Income	-413	-	-550	-	-

*Unit: million yen. The forecasts were those released by the company.

The company is expected to expand product-related revenue by narrowing down focus areas.

For the term ending March 2024, it is forecast that sales will increase 56.3% year-on-year to 520 million yen and operating loss will be 560 million yen, almost unchanged from the previous fiscal year.

It is expected that the narrowing down of focus areas will prove effective, leading to the expansion of product-related revenue and that overall sales will also grow steadily. On the other hand, costs are projected to increase year-on-year due to the development and sales of a productization package and the strengthening of the system to expand product-related revenue. As a non-operating income, the company expects to continue receiving R&D subsidies from overseas governments. Last year, it aimed to transform its earnings structure

to become profitable in the term ending March 2024. However, the company will prioritize business transformation and sales expansion in order to accelerate the launch of product-related revenue.

【3-2 Outlooks and initiatives】

Regarding the forecast of the number of commercialization projects, the company expects the commercialization projects to be at the same level as that in the previous term or even higher this term. Instead of the number of commercialization projects, the company plans to disclose information that is appropriate for each stage of the project.

4. Growth Progress and Initiatives

With the aim of expanding product-related revenue through the introduction and popularization of customer products, the company will continue to strategically promote measures to accelerate the progress of customer products, using the stage of development of customer products as an index.

Basically, the company focuses on massively expanding sales as a deep tech company. It recognizes that turning profitable is a transit point, and although it cannot clearly indicate its timing at this point, it believes that turning profitable should be achieved as a result of the process of expanding.
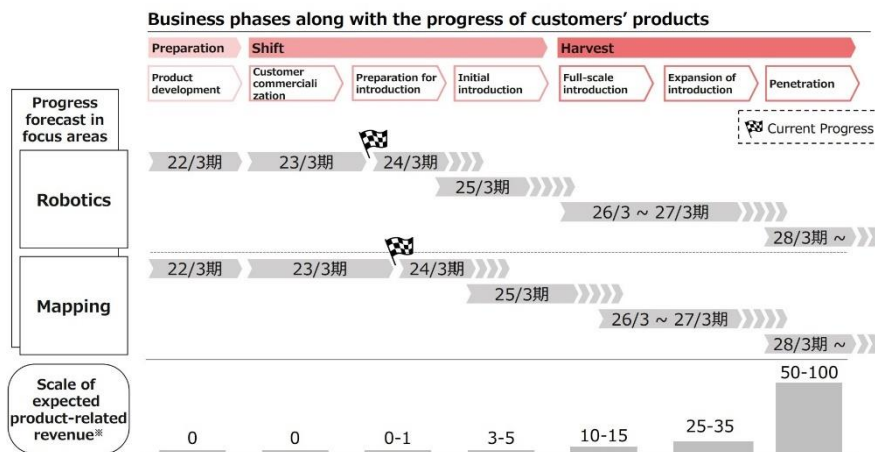
(Taken from the reference material of the company)

Regarding financing, the initial plan was to procure 1.06 billion yen over several years in line with the progress of commercialization by customers and shareholder value, but the procurement was carried out ahead of schedule. Funds for creating a system for promoting commercialization by customers and the solution business, which was originally envisioned, were secured almost ahead of schedule with this procurement.

From this term onward, the company aims to develop product-related revenue through various measures quickly. Accelerating procurement is also a response to the uncertainty in global financial markets.
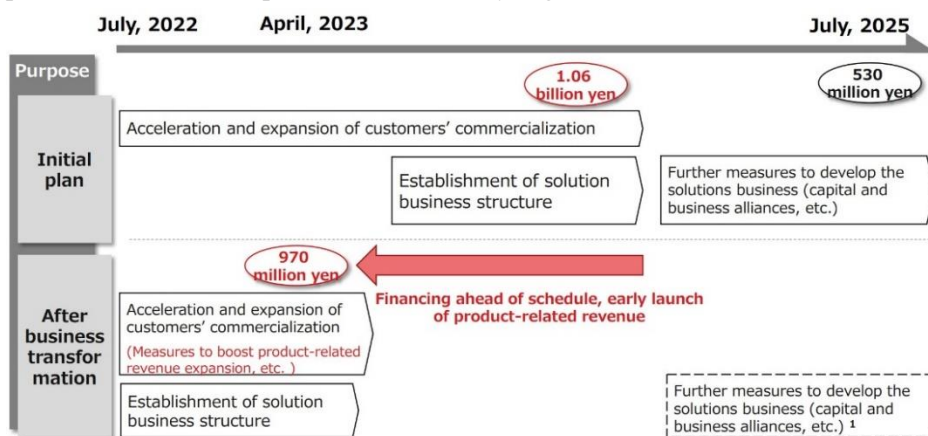
(Taken from the reference material of the company)

*As stated in the release dated March 27, 2023, "Notice Regarding Cancellation of Exercise Conditions for the 13th and 14th Stock Acquisition Rights (with Exercise Price Amendment Clause)," earnings conditions and the stock price conditions were stipulated for the unexercised portion of stock acquisition rights issued to raise funds. Among them, commercialization by customers, which is the earnings condition, has been achieved according to the business plan, so the stock price condition has been canceled.

As shown in the April 10 and April 12, 2023 releases, "Notice regarding mass exercise, completion of exercise, and monthly exercise status of the 13th stock acquisition rights (third-party allotment) with exercise price revision clause" and "Notice regarding mass exercise, completion of exercise, and monthly exercise status of the 14th stock acquisition rights (third-party allotment) with exercise price revision clause," both stock acquisition rights were fully exercised, and the company raised approximately 970 million yen.

5. Conclusions

The commercialization of products for customers is progressing steadily. In the term ended March 2023, following the first project in the second quarter, the company had two projects in the third quarter, and one project in the fourth quarter, for a total of four projects, exceeding the forecast of three projects at the beginning of the term, mainly for robotics and mapping.

With the start of commercialization by customers, the company expects that sales linked to customer products (product-related revenue) will become a pillar of medium- to long-term growth and has decided to aim for a full-fledged launch and has narrowed down its focus areas to two, robotics and mapping, which have already been commercialized by customers and are expected to grow quickly in the future. For areas other than the two focus areas (automated driving, etc.), the company will narrow down the medium- to long-term growth potential and continue to pursue promising projects.

Reference: Regarding Corporate Governance>

◎ **Organizational form and compositions of directors and auditors**

Organizational form	Company with audit and supervisory committee
Directors	8 directors, including 4 outside ones
Audit & Supervisory Board Member	3, including 3 outside the company

◎ **Corporate Governance Report**
Last updated in June 23, 2023

<Basic Policy>
Our company recognizes that it is indispensable to establish corporate governance, in order to improve our corporate value, maximize the profits of shareholders, and foster good relationships with stakeholders.
Under this recognition, the Managing Directors, other Directors, and employees of our company will strive to tighten corporate governance by understanding their respective roles and developing and operating internal control systems.

<Reasons for not following the principles of the corporate governance code>
We follow all the basic principles of the corporate governance code.