New Business Building Program

Developing Prototype Career By Using 3D Printing Technology

CHUO MALLEABLE IRON CO.,LTD

Company Overview

About company

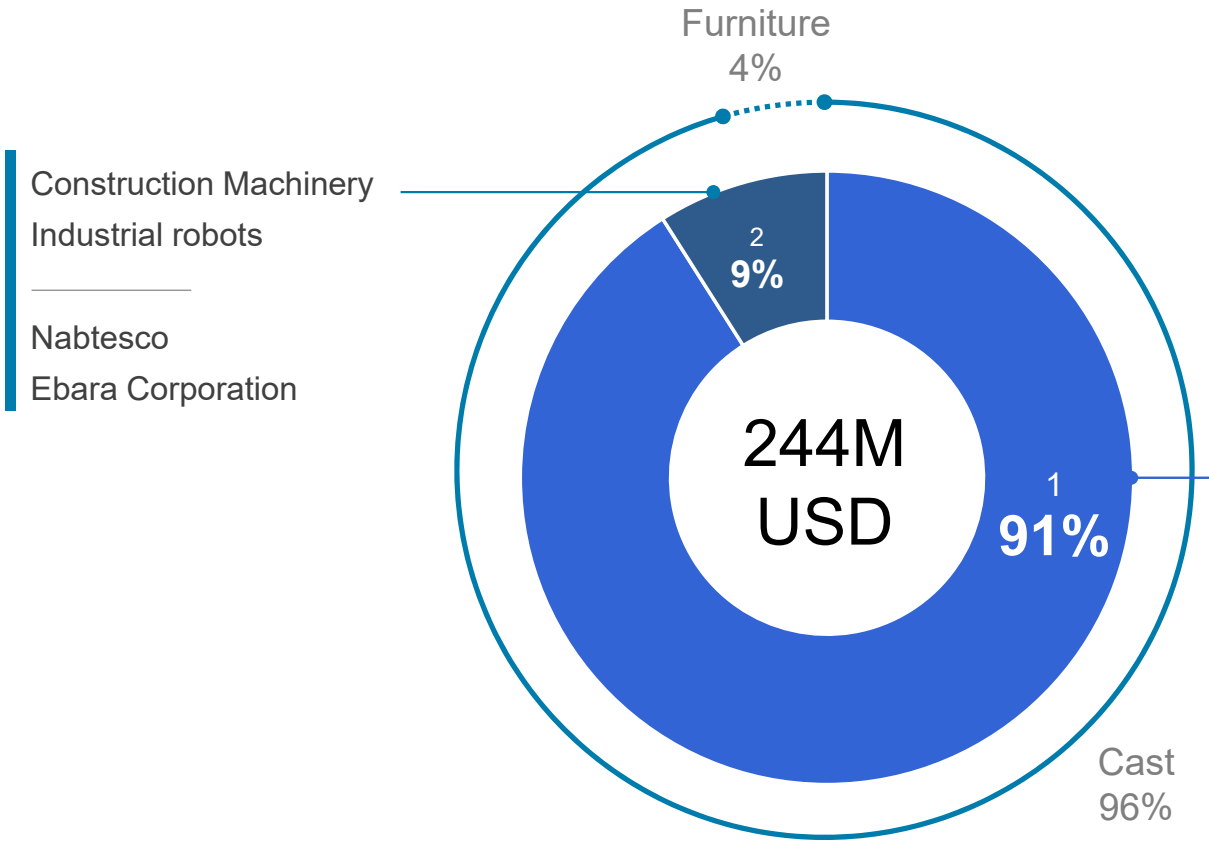
General Profile

Established	January,1944
Capital	9.1 million USD
No. of employees	755 person（Group 1056）
Sales amount	245 million USD（As of Mar. 31, 2023）
Stock market	Nagoya stock exchange CODE : 5607 （Major shareholder；TOYOTA 5%）
Business Overview	• Cast - Iron（Ductile）and Aluminum • Office furniture

History

1944	Established
1948	Started business with Toyota（Rear hub）
1959	Introduction of Japan's first automatic molding line（with SINTO）
1960	Listed on stock exchange
1978	Introduction of FVB（with TOYOTA＆SINTO）
1979	Developed automatic pouring machine
1980s	Started parts of construction machine and robot
1980	Started Aluminum gravity casting
1983	Awarded TOYOTA quality control prize
1998	Started Aluminum die - cast（Laminar flow & squeeze）
2000s	Advanced to China　Mar 2001 ISO 14001／Sep 2004 ISO 9001
2019	Introduced the world's fastest automatic molding line
2020	Capital alliance with Toyota Industries Corporation
2022	Organizational reform for new business development（established Business Innovation Department）

Sales Composition Ratio



Group Customer

Toyota Motor Corporation

HINO MOTORS, LTD.

DENSO Corporation

JTEKT Corporation

Toyota Tsusho Corp

MITSUBISHI HEAVY INDUSTRIES ENGINE & TURBOCHARGER

Nabtesco Corporation

Hitachi Astemo, Ltd.

PLUS Corporation

NAIKI CO.,LTD.

OKAMURA CORPORATION

ASKUL Corporation

New Business Idea

Points for Today

1. **High-mix & Low-volume Production Model by New Processing Technologies**
   (Additive Manufacturing, 3D printing etc.)
2. **Production Design Optimized by AI**
3. **Targeting Semiconductor, Space & Healthcare industry**

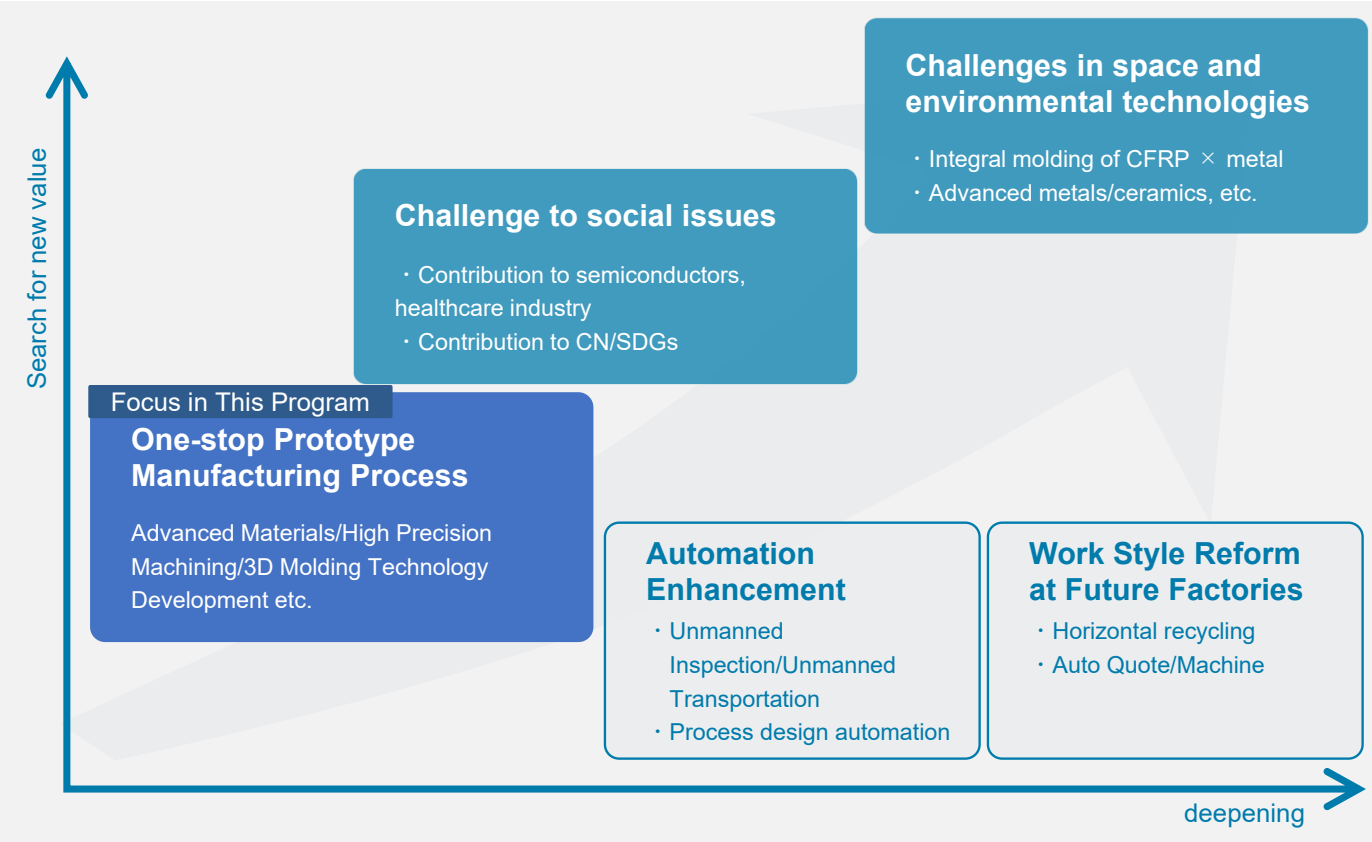
Background

Accelerate the Electrification of the Automotive Industry & Strengthen Response to Mature Automotive Markets

- Develop products that are not Automobiles and Automobile Engine parts
- Establishment of High-mix & low-volume Production model
- Responds to environmental needs such as CN/SDG
- Build an extensive market network/relations

2030 Roadmap

Aim to build One-stop Prototype Manufacturing Process that can meet a wide range of needs with short delivery times through this program



Collaboration Vision

We aim for realizing high-mix & low-volume production model by new processing technology and create value to companies

To-Be (the Future Vision)

・ Realizing high-mix & low-volume Production Model by new processing technology and create value to companies

・Creating a system for optimal design proposals by using AI

As-Is (Current Situation)

・Having mass production technology for Cast Iron/Diecasting/Machining for Automobile Parts

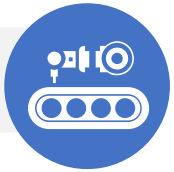
Exploring Technology

- Additive manufacturing (3D Printing) –related technology for high-mix & low-volume production
- Software technology including AI for Optimal Processing Design Proposals

Collaboration Direction

Efficient & Optimized Manufacturing

01 High-mix & low-volume Prototype Production by Additive Manufacturing (3D Printing)



Customer Issues

- Lost-wax casting (suitable for medium lot production for industrial applications) takes very long time to process and Labor intensive

Possible Solutions

- Additive Manufacturing can realize more precise products & make processing time shorter by lower cost in total for users

02 Additive Manufacturing (3D Printing) for Space Industries (Rocket Combustors etc.)

Customer Issues

- Lead time of Plating Lamination (Common processing style for space industry in Japan) is so long that mass production could be impossible

Possible Solutions

- Additive Manufacturing can make processing time shorter by lower cost in total for users

03 Additive Manufacturing (3D Printing) for Healthcare Industries (Artificial bones etc.)

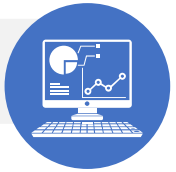
Customer Issues

- High cost as high quality standards are required

Possible Solutions

- High-precision molding of titanium/ceramics that are harmless to the human body by Additive Manufacturing with lower costs in total for users

04 Optimal design/Manufacturing process proposals by AI & Analytics



Customer Issues

- Labor intensive as manufacturing process/design is selected based on human experience

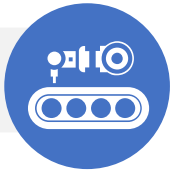
Possible Solutions

- Proposing construction methods based on drawings and models
- Product design proposal for further cost reduction
- New product proposal based on data accumulation

Collaboration Direction

Efficient & Optimized Manufacturing

01 High-mix & low-volume Prototype Production by Additive Manufacturing (3D Printing)



Scouting Technology

- **Additive Manufacturing technology of Sand mold, Gypsum mold or Ceramic mold**
  - Applicable for highly functional material development（High precision/Low cost）
  - Applicable for Non-destructive Inspection/Quality Assurance/Know-How Construction（Traceability）
  - Easy to maintain & Material Replacement in short time

02 Additive Manufacturing (3D Printing) for Space Industries (Rocket Combustors etc.)

Scouting Technology

- **Additive Manufacturing technology for special copper alloys with high thermal conductivity and high strength**
  - High precision/High surface roughness Molding
  - Flexibility such as Porous/Hollow/Flow Path
  - Applicable for Non-Destructive Inspection/Quality Assurance (Traceability)
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03 Additive Manufacturing (3D Printing) for Healthcare Industries (Artificial bones etc.)

Scouting Technology

- **Additive Manufacturing to develop high-precision materials: harmless materials including titanium/ceramics, etc. with low cost process**
  - High Precision/High Surface Roughness molding technology
  - Flexibility such as Porous/Hollow
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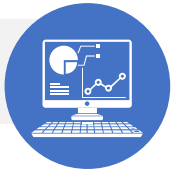


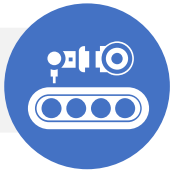
Scouting Technology

- **Analyzing optimized design/process by AI or Analytics**
  - Accumulating Data of Non-destructive Quality Assurance
  - Product proposals based on Accumulated Data （AI）

Collaboration Direction

Efficient & Optimized Manufacturing

01 **High-mix & low-volume Prototype Production by Additive Manufacturing (3D Printing)**



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Efficient & Optimized Manufacturing

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Collaboration Direction

Efficient & Optimized Manufacturing

03 **Additive Manufacturing (3D Printing) for Healthcare Industries (Artificial bones etc.)**

Customer Issues

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Scouting Technology

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Collaboration Direction

Efficient & Optimized Manufacturing

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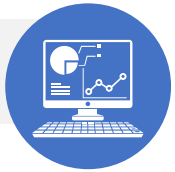

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Scouting Technology

- **Analyzing optimized design/process by AI or Analytics**
  - Accumulating Data of Non-destructive Quality Assurance
  - Product proposals based on Accumulated Data （AI）

Our Providing Assets

1

Knowledge of Auto-Parts Manufacturing

Competitive advantages in high strength and precision automotive components
and robust evaluation , mass production quality control

2

Strong Motivation as Innovation Team

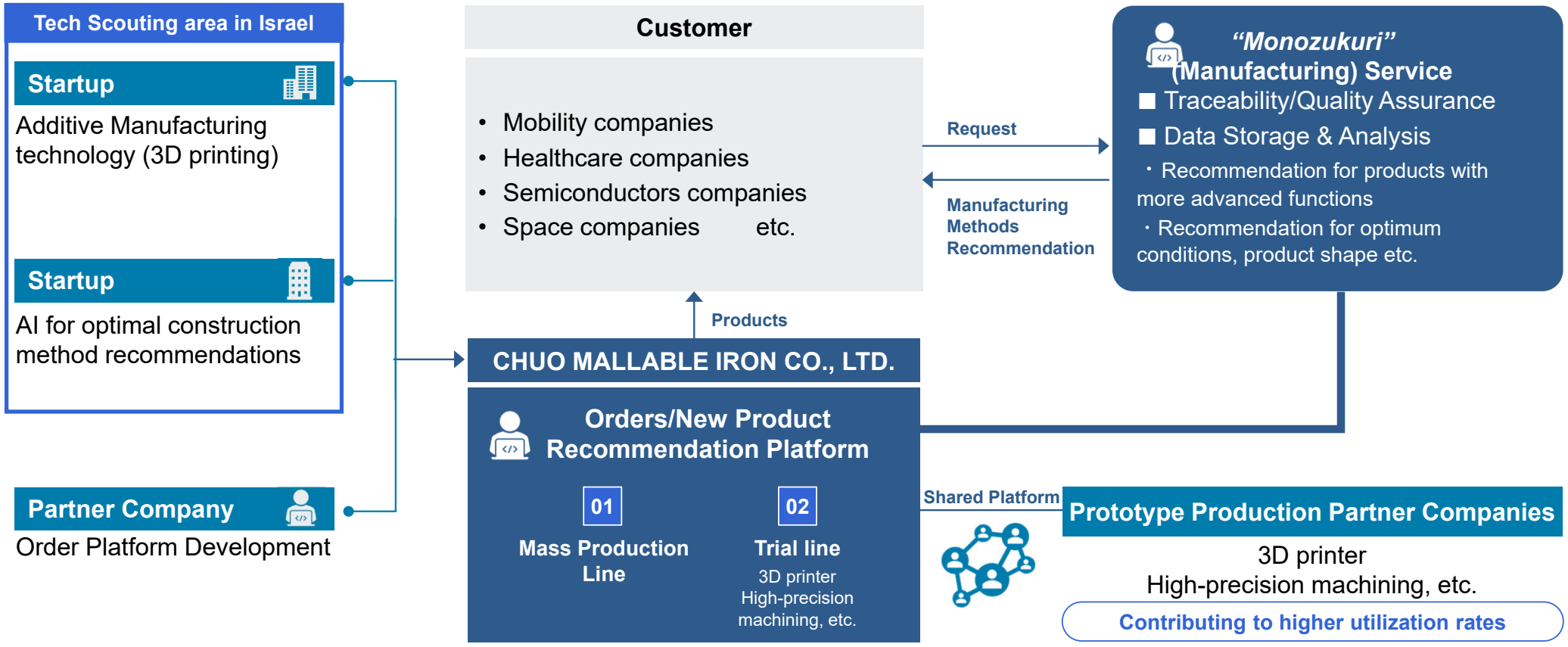
Having flexibility by having innovation/new business building team including
an executive director focusing on this project

3

Wide Network/Relation of Manufacturing

Having wide network/relations for manufacturing industries,
Universities and overseas companies

Business Model (As for 2023 Oct)



PoC Proposal

Startup

Maintain high-precision 3D modeling technology

Provide Additive Manufacturing (3D Printing) technology

Startup

Provide suitable process by AI

Provide the optimal process by using AI

Partner Company

Building a platform

	Our Company	
	Prototype Line High-precision machining by 3D printer Sand mold casting after 3D modeling	**Productivity** **Quality Management** **Mass Production Evaluation**
	Robust Evaluation in 3D modeling machine	**Quality Management** **Mass Production Evaluation**

Schedule (Tentative - As for 2023 Oct)

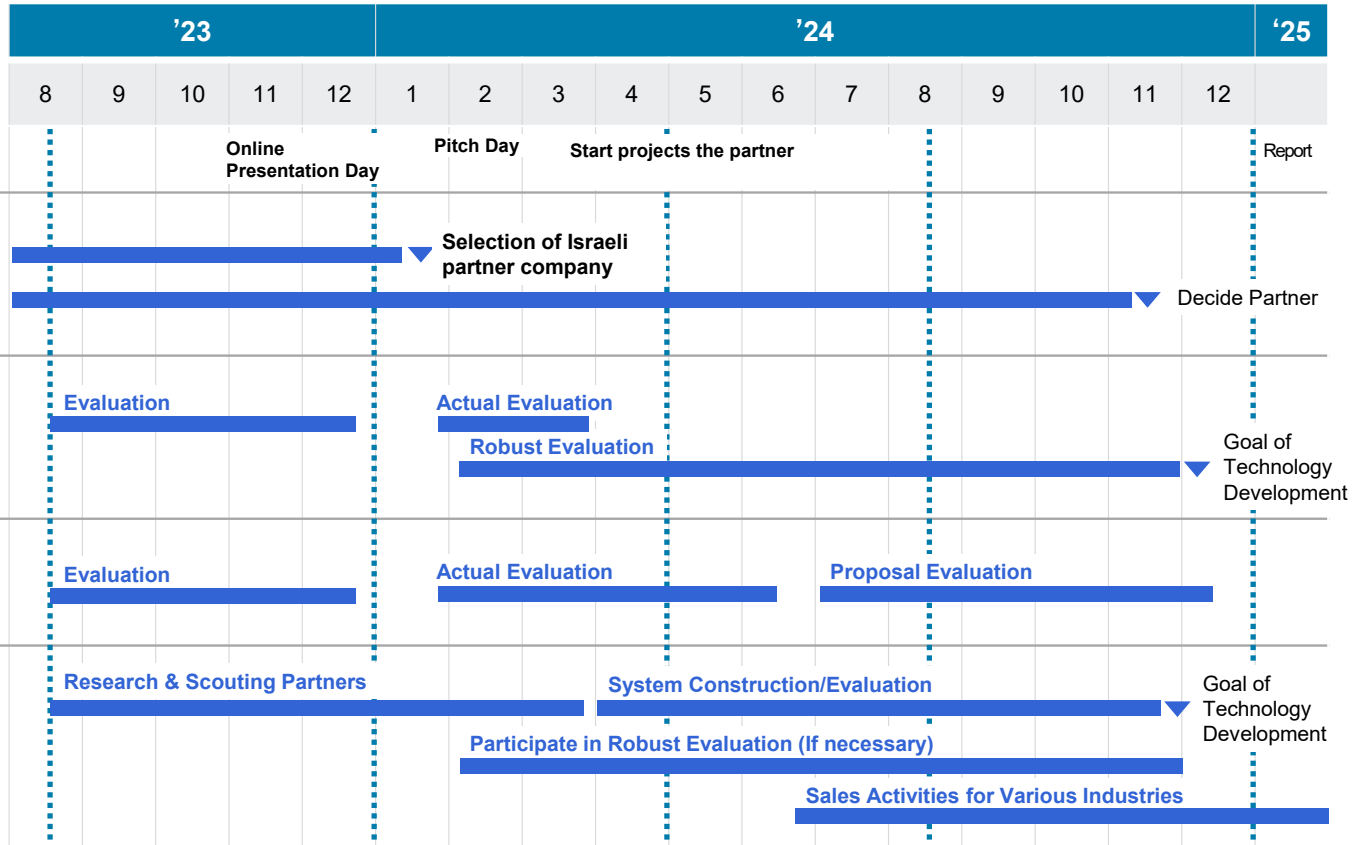
The whole milestone

01 3D modeling technology research
- Understand Israel & Israeli startup technology
- Explore domestic production partners

02 3D Modeling Technology Development
- Discussion on the optimal Process
- Elucidation of Mechanism/PoC Planning

03 Optimal Process Proposal AI Technology Development

04 Activities for Commercialization
- Develop the order Platform
- Discussion with partner companies
- Customer Development



Message

We are looking for Israeli startups with cutting-edge technology as a collaboration partner to realize Smart Manufacturing in Aichi, Japan!

We would be happy if this program will be a good opportunity not only for us, but also for Israeli companies.

Thank you very much!

FAQ- About the New Business

Q	A
What vision for the new business do you have?	By utilizing the knowledge from automobiles and industrial machinery, we aim for **contributing to industries such as space, healthcare, and semiconductors.** As a first step, we aim to build **a one-stop prototyping platform that can meet a wide range of needs with short delivery times.**
Why do you focus on Israeli companies?	We recognize that **Israeli companies have advantages** over other countries in the area of **software and AM/3D printing technology**. We are also **looking for cutting-edge, unique technology and knowledge of space tech and health tech**.
Do you have connections/relationship with partner companies for the new business?	We started collaboration on lightweight materials in 2021. **To date, we have built relationships with hundreds of companies both domestically and internationally.** We will continue to collaborate in the area of AM/3D printing. We are also looking for a company that can help us launch a new business from scratch.
Do you have connections/relationship with our potential clients?	In addition to existing customers in the automobile and industrial machinery industries, **we already have connections with potential customers in the space development industry.**

FAQ- About the Collection

Q	A
Please tell me the priority among the four themes	**Priorities are determined based on the superiority of the companies' technology and its compatibility with customer needs.** We understand that it is possible to simultaneously collaborate with some technologies to realize optimal construction methods and estimation systems using AI.
What do you focus on when selecting partner companies to collaborate with?	**We focus on technological superiority and compatibility with customer needs**. In addition, because potential customers such as automobile, robot, space, and healthcare industries require strict quality assurance, we are looking for companies that can tenaciously handle quality assurance.
Is it possible to research and develop AM/3D printing technology seeds?	**Yes.** If the company has technological superiority and compatibility with customer needs, we will select you as a partner, even if it is a startup that is currently developing for practical use.
Do you have accuracy standards for AM/3D printing technology?	**The greater the amount of cutting required after 3D printing, the lower the accuracy**. We would like to work together to pursue precision that can minimize the amount of cutting to meet customer needs.

Appendix

Detailed Collaboration Idea #1

Proposal①

High-mix & low-volume Prototype Production by Additive Manufacturing (3D Printing)

Current situation

Common in lost wax process in Japan

Problem：・Process is very long
・Labor intensive and limited productivity

Advantages：Strong mass production capacity for consumer/industrial applications

Scouting Knowledge

- 3D sand mold/gypsum mold/ceramic mold forming - they greatly shortens the process
- Better accuracy by minimizing deformation and dimensional changes
- Cost reduction (vs. lost- wax process)
- Sand Cutting Technology by Robot.

Goal

※）Accuracy is a provisional target.

- **Production Accuracy : ±0.05mm at 100mm**
- **Production LT : 3 at 100mm Within 2 hours**
- **Cost : The production cost is less than 50% of lost wax process**

The Accuracy of Low-Wax Process

Liner tolerance - Dimensions	Normal Tolerance	Premium Tolerance
~25	±0.25mm	±0.15mm
25-5-mm	±0.40mm	±0.30mm
50-75mm	±0.50mm	±0.40mm
75-100mm	±0.70mm	±0.50mm
100-150mm	±0.90mm	±0.60mm
15mm and over	±1%	±1%

Angle Tolerance - Dimensions	Normal Tolerance	Premium Tolerance
Up to 45° incl.	±1%	±0.5%
45° and over	±1%	±1%

Surface Roughness
6S-25S（15S on average）

Detailed Collaboration Idea #2

Proposal②

Additive Manufacturing (3D Printing) for Space Industries (Rocket Combustors etc.)

Current situation

Common in electroplated lamination in Japan
（3D metal layer molding in the USA）

Problem：The process is very long

Lead time is very long and mass production is almost impossible.

Laminated products cannot be imported from North America.

Product Advantages：Stable Quality

Scouting Knowledge

- 3D molding of special copper alloys with high thermal conductivity and high strength（Materials/Equipment）
- Quality Assurance/Productivity, etc.

Goal (For Reference Only)

・**Production Accuracy**：**±0.1mm at 100mm**

※）Accuracy is a provisional target.

Detailed Collaboration Idea #3

Proposal③

Additive Manufacturing (3D Printing) for Healthcare Industries

①Artificial bones/implants, etc. ②Treatment equipment

③Medical equipment jigs, etc.

Current situation

Few 3D molding healthcare applications in Japan.

Scouting Knowledge

- Customer development such as medical care-related needs such as artificial bone
- High-precision molding by using materials such as titanium/ceramics/resin which is harmless to the human body.
- Develop low cost construction methods

Goal

- **Production Accuracy ±0.1mm at 100mm**
- Other necessary requirements for medical treatment

※） Accuracy is a provisional target.

Target customer – detailed

01 The company that has evaluation system for manufacturing Diagnostic and Therapeutic Medical Devices by AM/3D printing
Issues - It is difficult to prove the validity of the medical instrument in terms of quality and safety.

02 The company that design process reduction on Diagnostic and Therapeutic Medical Instrument manufacturing process using 3D
Issues - Even if the model is completed on the virtual ,trial and production are also difficult to achieve.

03 The company that can produce Diagnostic and Therapeutic Medical Instrument , Medical Jigs, etc.
Issues - Medical Equipment can not be suitable for various Individual Characteristics.

Values

- Composite Materials Modeling
- Flexible Shapes

Detailed Collaboration Idea #4

Proposal④

Optimal design/Manufacturing process proposals by AI & Analytics

Current situation

Judgment based on human experience and human intensive

Scouting Knowledge

Step 1）Add data of process proposal
Step 2）Add data of lower cost design solutions
Step 3）Create a model based on basic accumulated data