

Accelerating Development Activities through Open Innovation and DX

The AGC logo is displayed in a white rectangular box on a dark blue background. The letters 'AGC' are in a bold, sans-serif font. The 'A' and 'G' are dark blue, while the 'C' is a lighter blue with a small red square at its top right corner.

AGC Inc.

**Senior Executive Officer, Chief Technology Officer and
General Manager, Technology General Division**

Hideyuki Kurata

October 19, 2021

Your Dreams, Our Challenge



Director, Senior Executive Officer, CTO
Hideyuki Kurata

- 1987** Joined Asahi Glass (present AGC), assigned to Chiba Plant
- 2004** General Manager, New Business Promotion Department, Chemicals Company
- 2008** President, AGC Chemicals Americas, Inc.
- 2014** General Manager, Business Development Office
- 2015** General Manager, Strategic Planning Office, Chemicals Company
- 2017** General Manager, Life Science General Division, Chemicals Company
- 2018** Executive Officer, General Manager, Life Science General Division, Chemicals Company
- 2019** Senior Executive Officer, General Manager, Technology General Division
- 2021** Director, Senior Executive Officer, CTO, and General Manager, Technology General Division

Vision 2030

By providing differentiated materials and solutions, AGC strives to help realize a sustainable society and become an excellent company that grows and evolves continuously.

- AGC will accelerate the following strategies toward Vision 2030.

Pursuing ambidextrous management

- We will accelerate the growth in the strategic business area, and at the same time explore new business areas including those related to energy.
- In the core business, we will conduct a structural reform in the architectural glass and automotive glass businesses that need improvements in profitability and asset efficiency.
- For other businesses in the core business area, we will strengthen their profit foundation and cash generation.

Promotion of sustainability management

- Propelling materials innovation to help solve social issues
- Aiming for net-zero carbon in 2050
- Strengthening human resources and group-wide governance

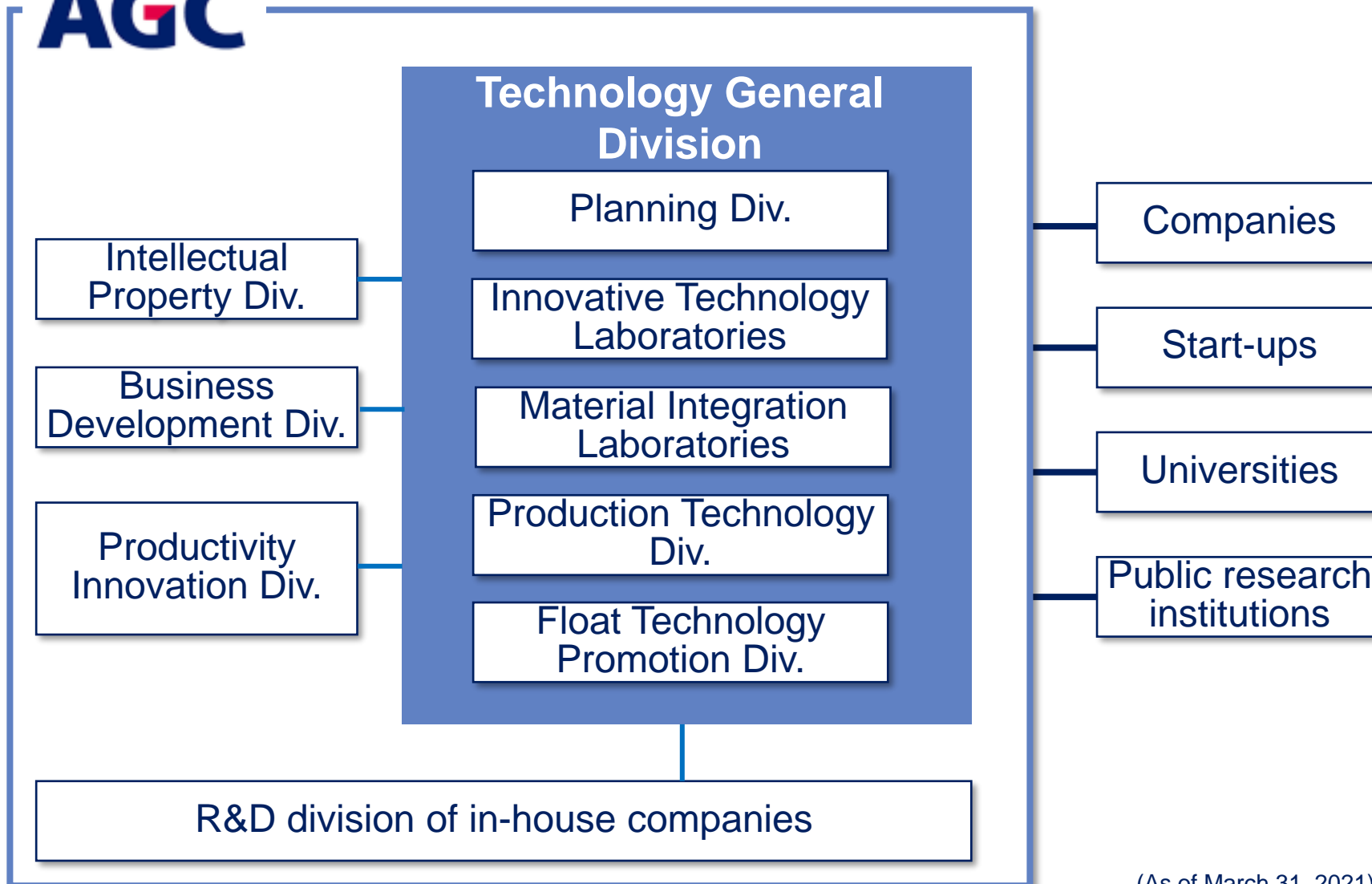


Gaining competitiveness by accelerating digital transformation

- Taking a transformation of the business model itself into consideration, leverage digital technologies to improve the process from product development to sales activities
- Use digital technologies to provide value to customers and society and gain competitiveness

■ Development structure, technological foundations, and strategy	P. 6
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Development structure, technological foundations, and strategy

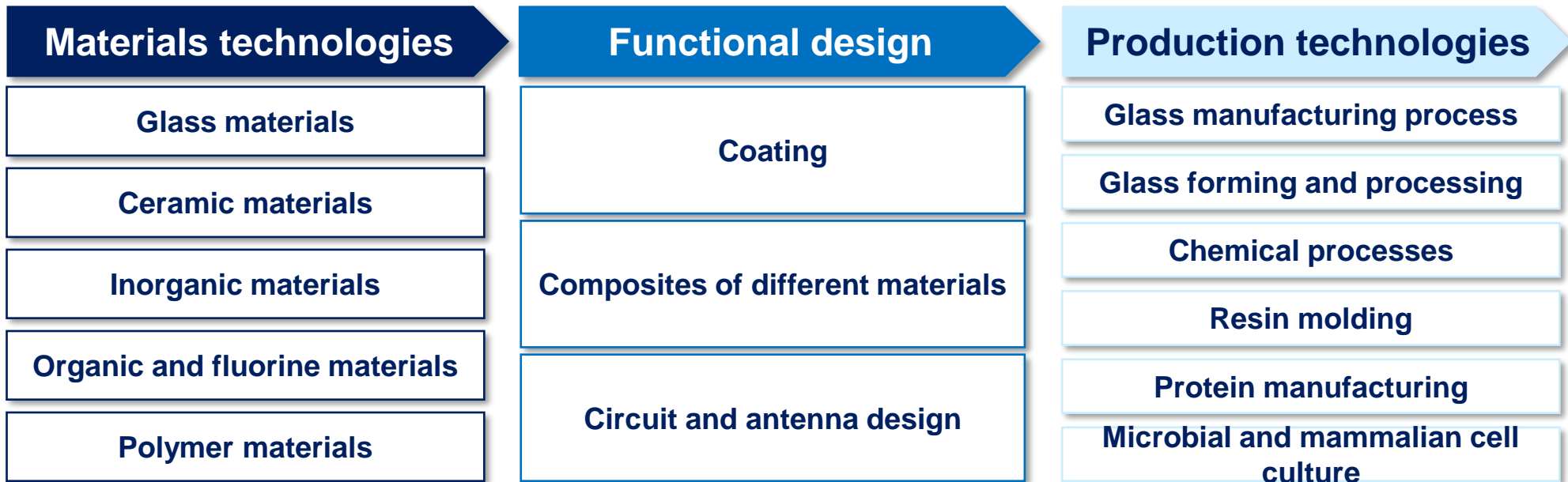


(As of March 31, 2021)

Technological foundations

- By combining core technologies with common basic technologies, we are able to provide high-value-added solutions that cannot be achieved with a single technologies.

Core technologies

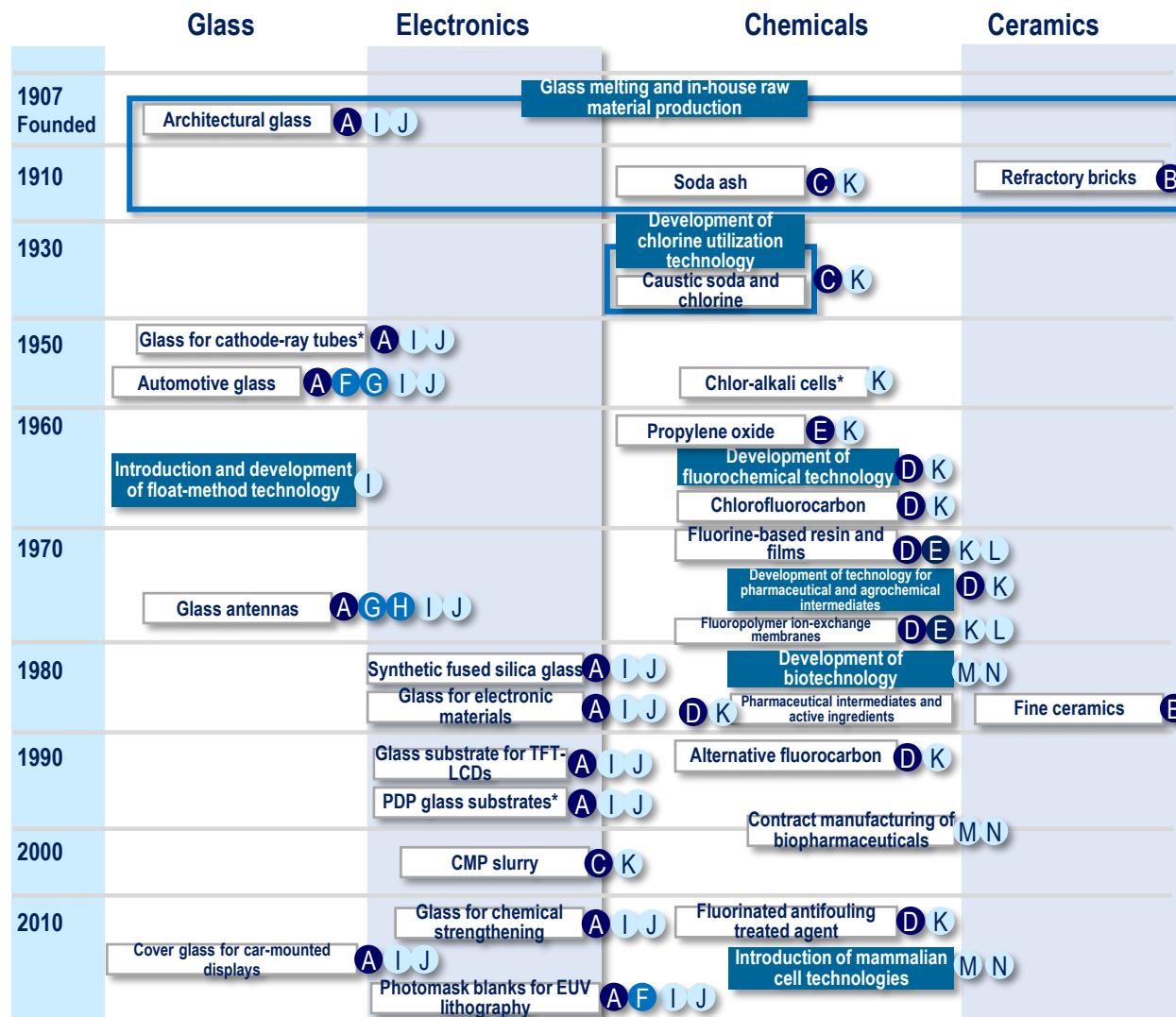
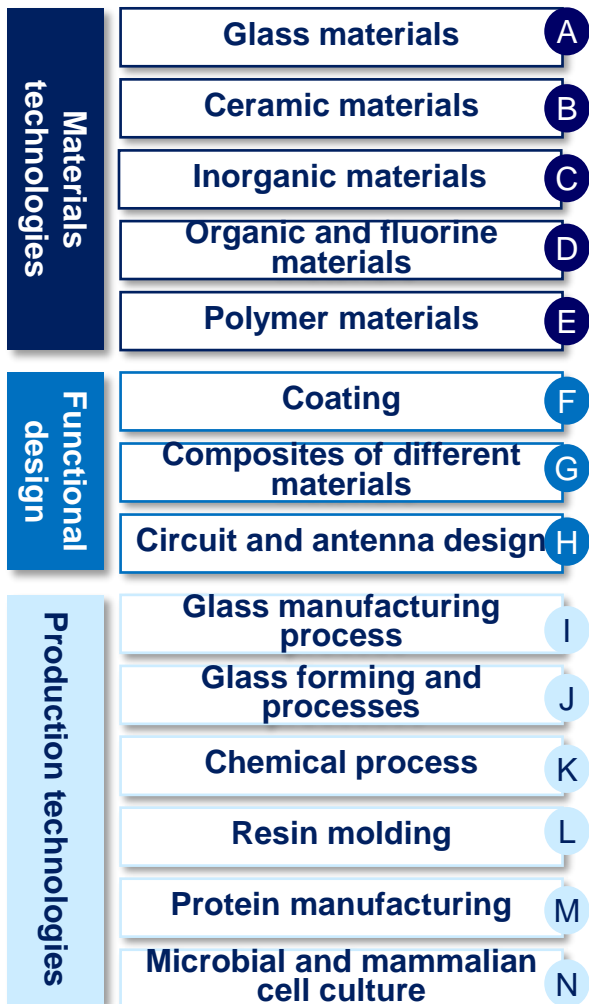


Common basic technologies



Lineage of AGC's core technologies

Core technologies



*Business discontinued

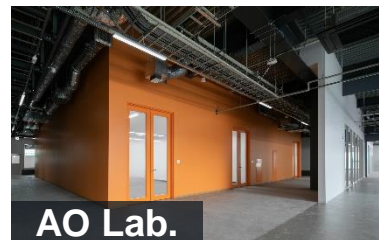
- Issues are becoming more complex than individual companies can solve alone, and the required development speed is accelerating.
- AGC proactively utilizes open innovation and DX to respond to rapidly changing society.

Ambidextrous development

Combining and repeating right- and left-handed development to create new value and contribute to society

Open innovation

Accelerating open innovation with external companies, research institutes, universities, etc. in the AO co-creation space



DX

Development using material informatics (MI), AR/VR, etc.



Ambidextrous development

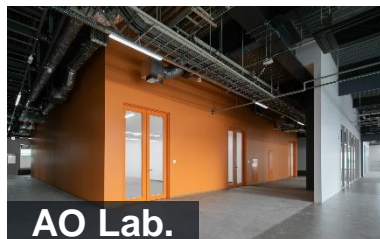
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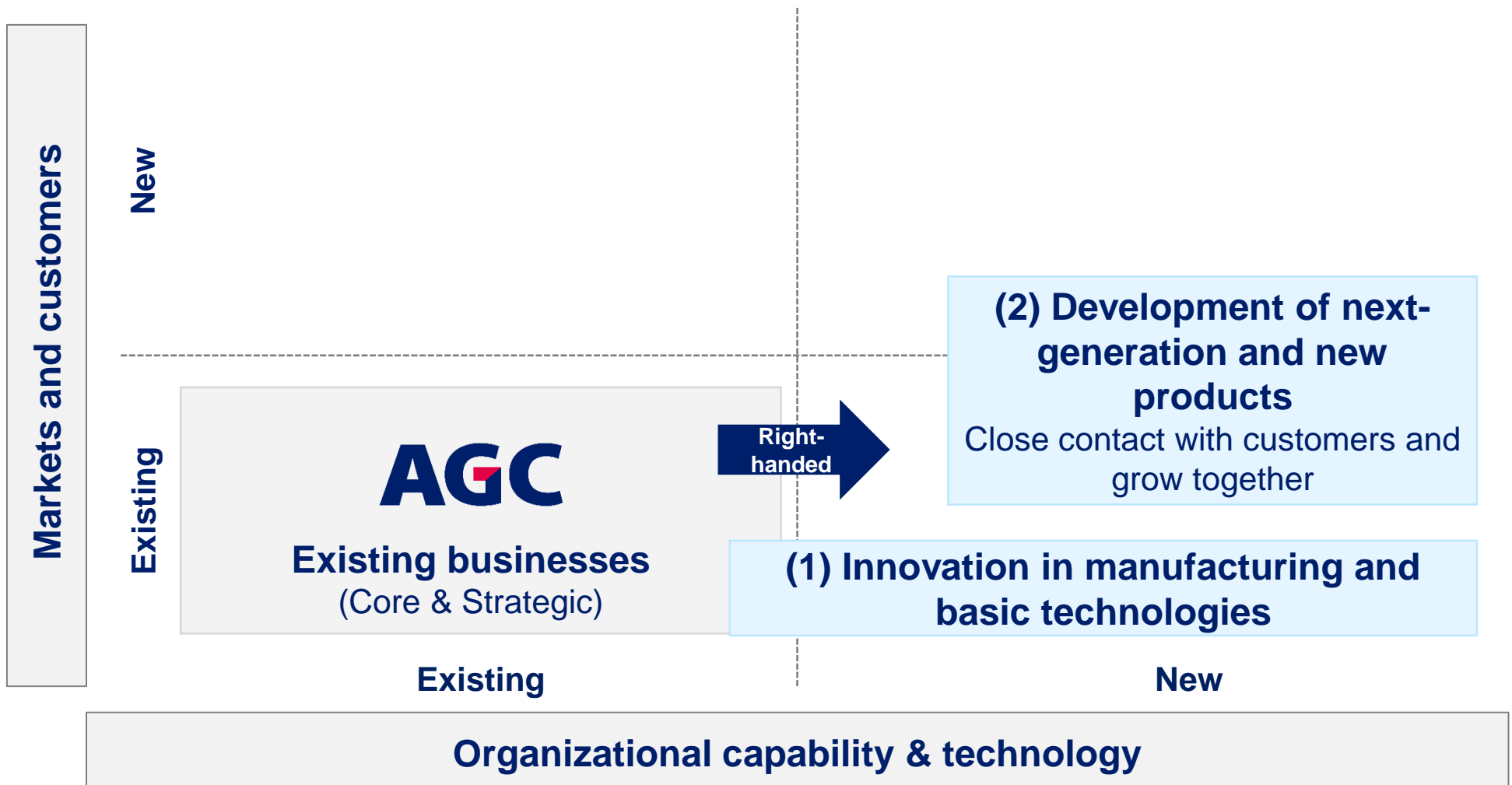
Ambidextrous development

- The starting point for development is the AGC Group's existing organizational capabilities and technologies, as well as existing markets and customers.



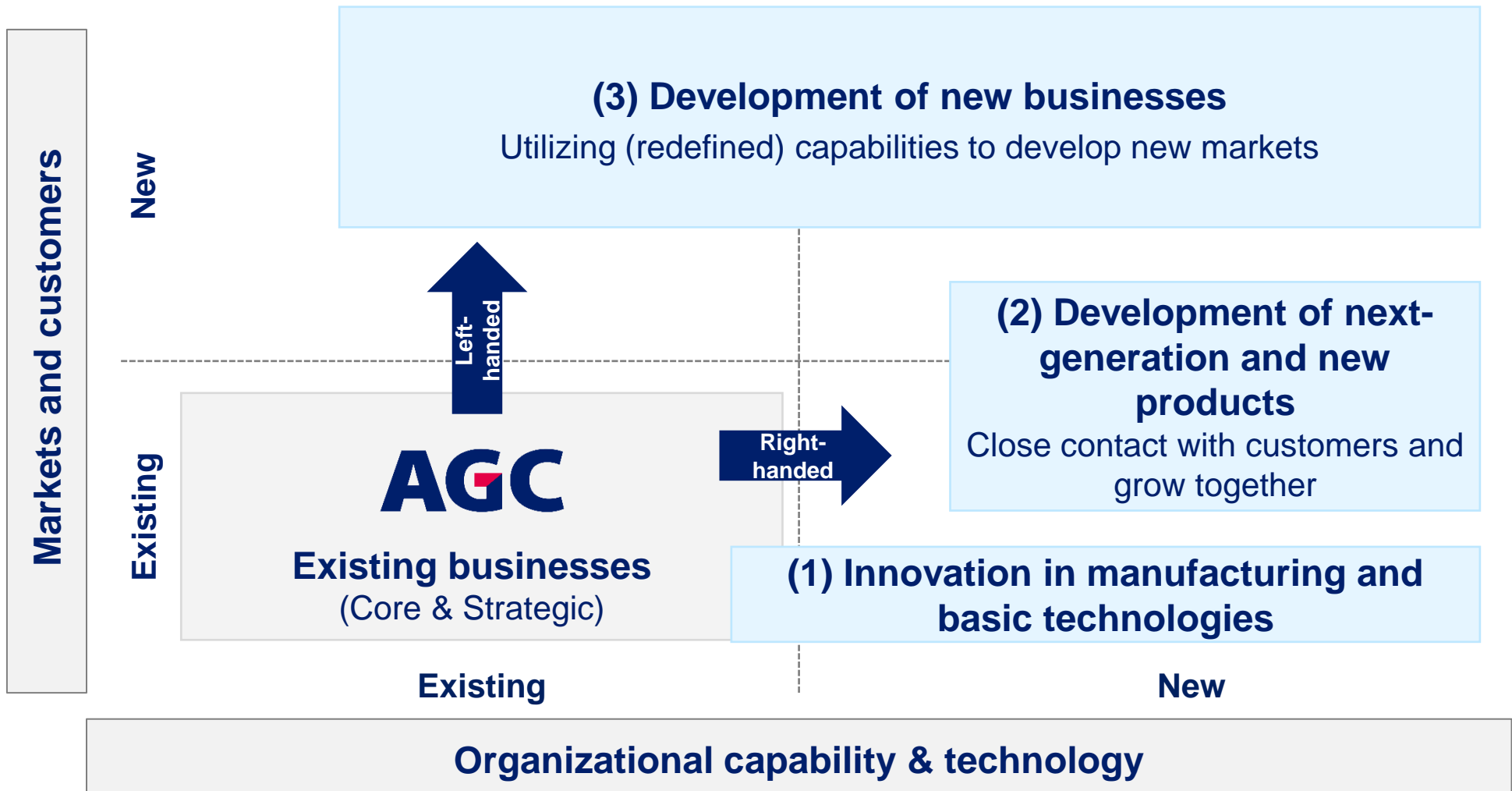
Ambidextrous development

- **Right-handed development: Innovating manufacturing and basic technologies to develop new products together with customers**



Ambidextrous development

- Left-handed development: Redefine proprietary technologies and develop new markets



Example of ambidextrous development: CDMO business

- Existing technologies include pharmaceutical and agrochemical intermediates and active ingredients, and biotechnology



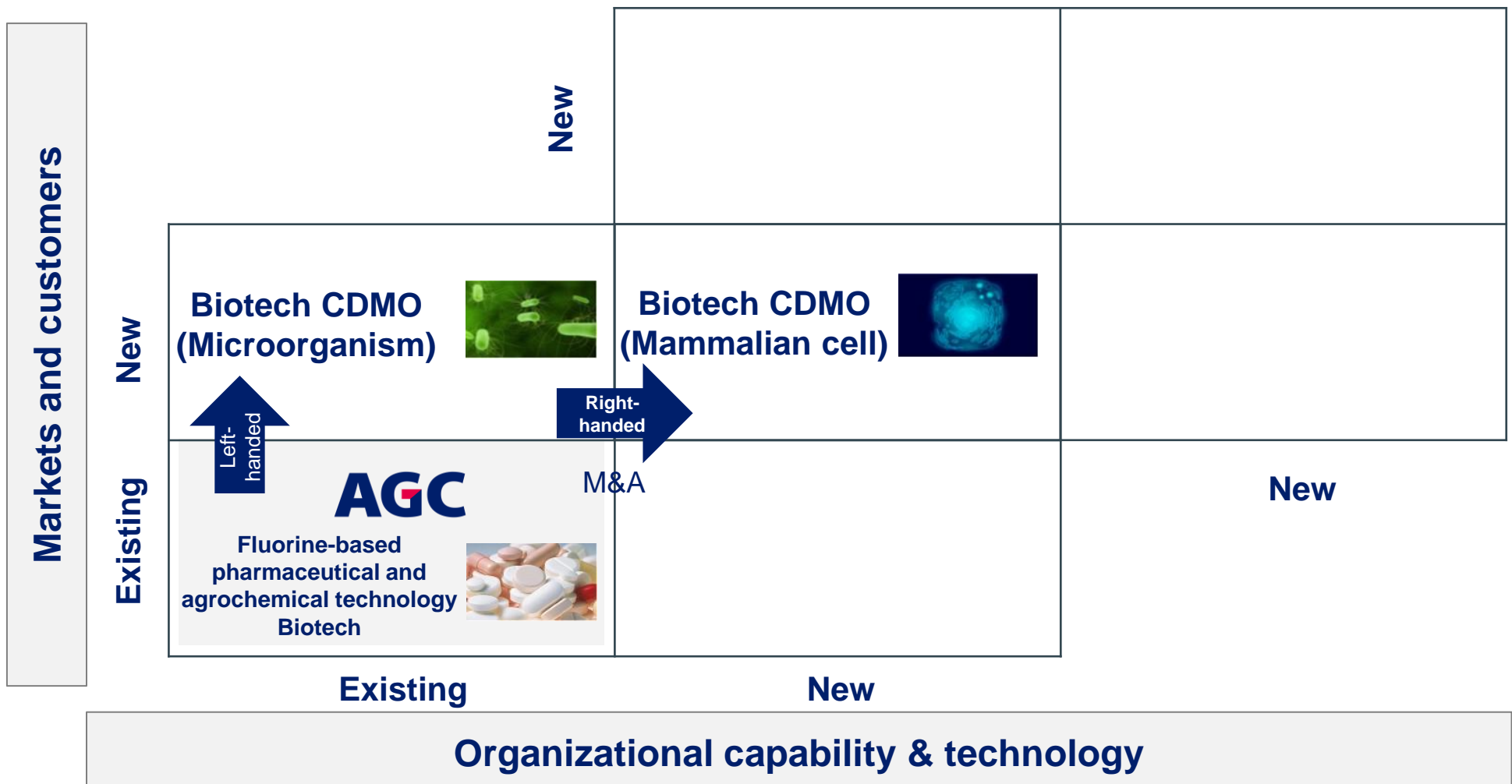
Example of ambidextrous development: CDMO business

- Redefining technology holdings through left-handed development and launching microorganism CDMO business from pharmaceutical manufacturers.



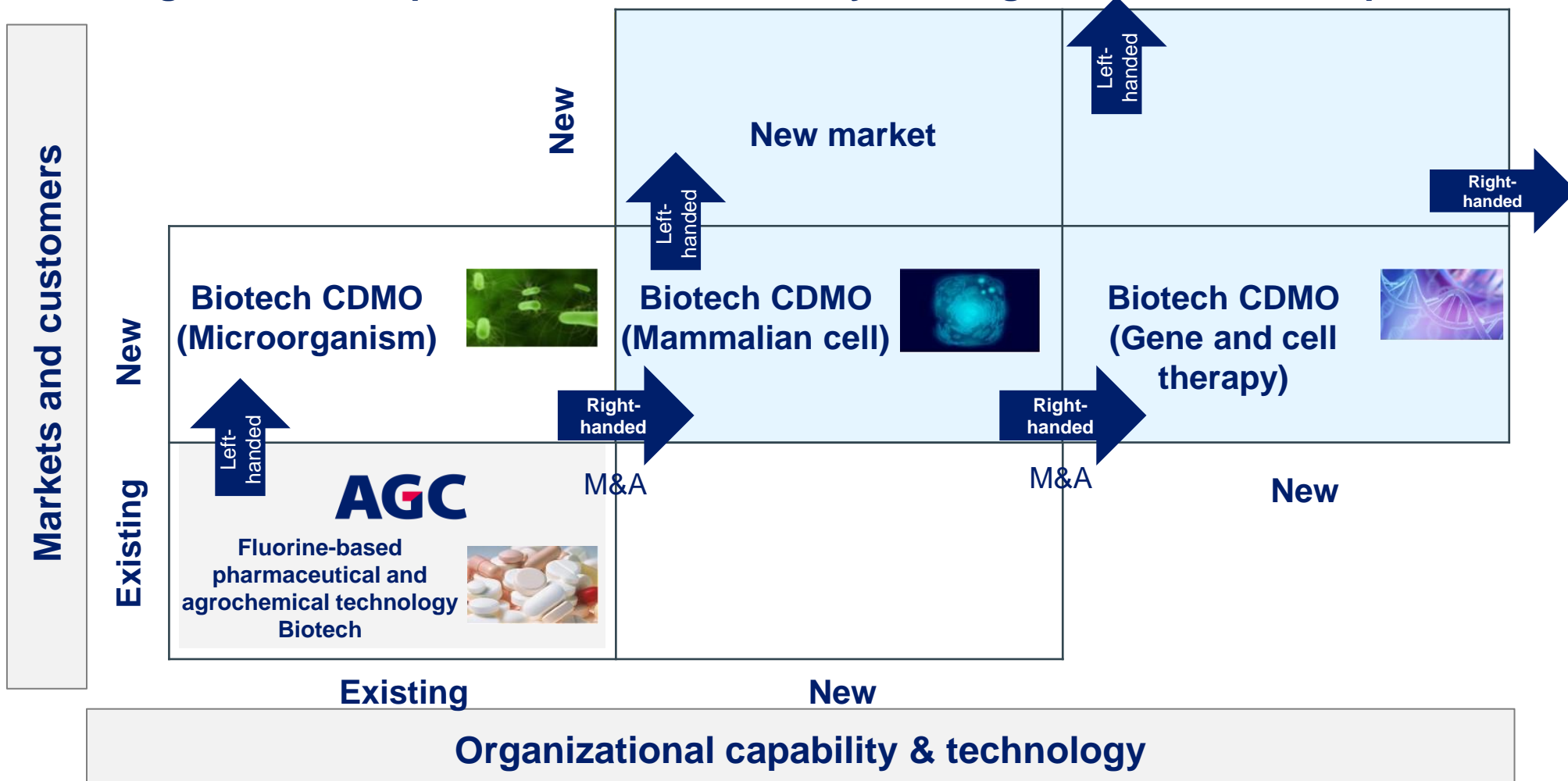
Example of ambidextrous development: CDMO business

- In 2017, acquired mammalian cell CDMO technology through M&A and started mammalian cell CDMO business



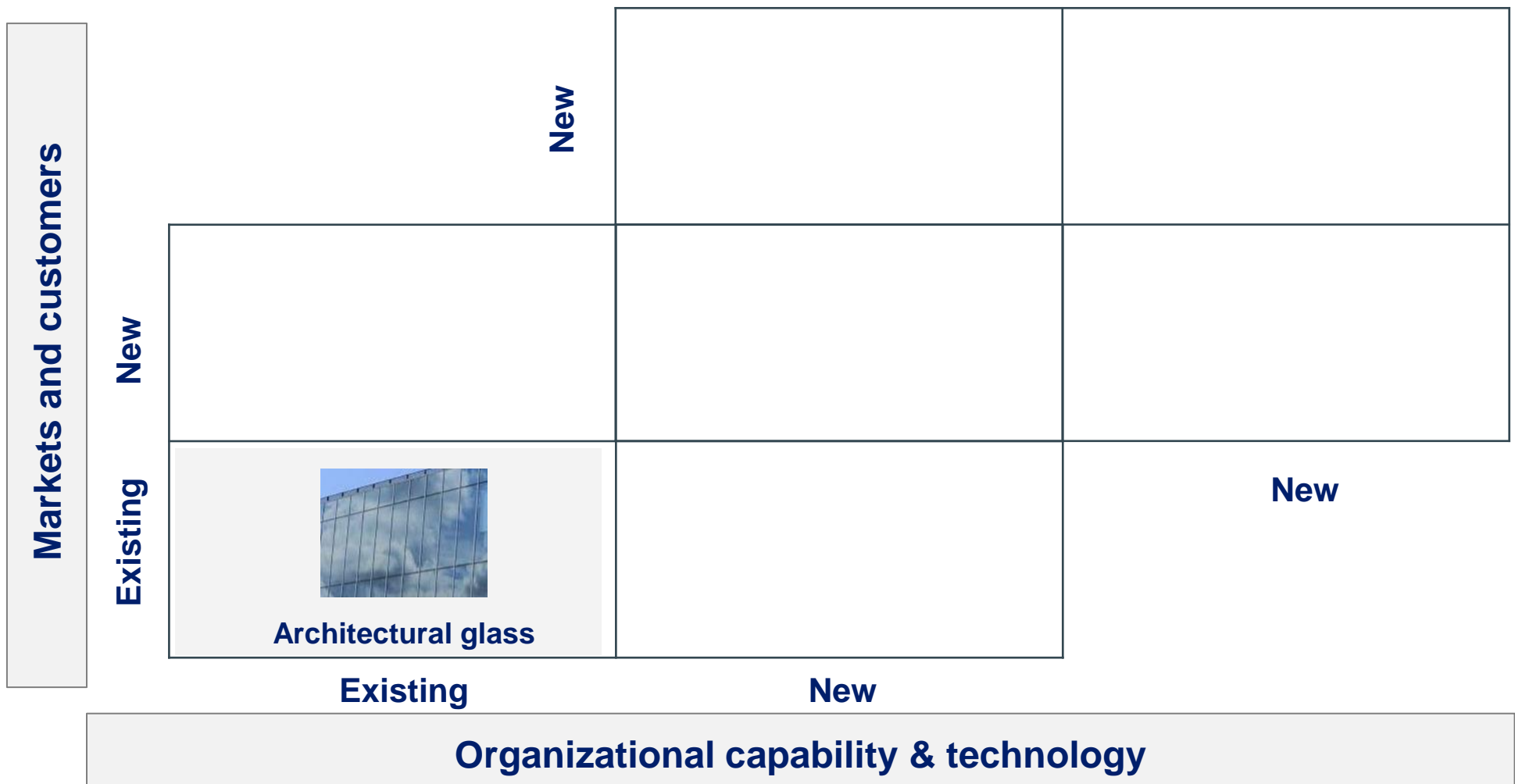
Example of ambidextrous development: CDMO business

- In 2020, acquired gene and cell therapy technology through M&A and started the gene and cell therapy CDMO business.
- Aiming to further expand into new markets by utilizing left-handed development



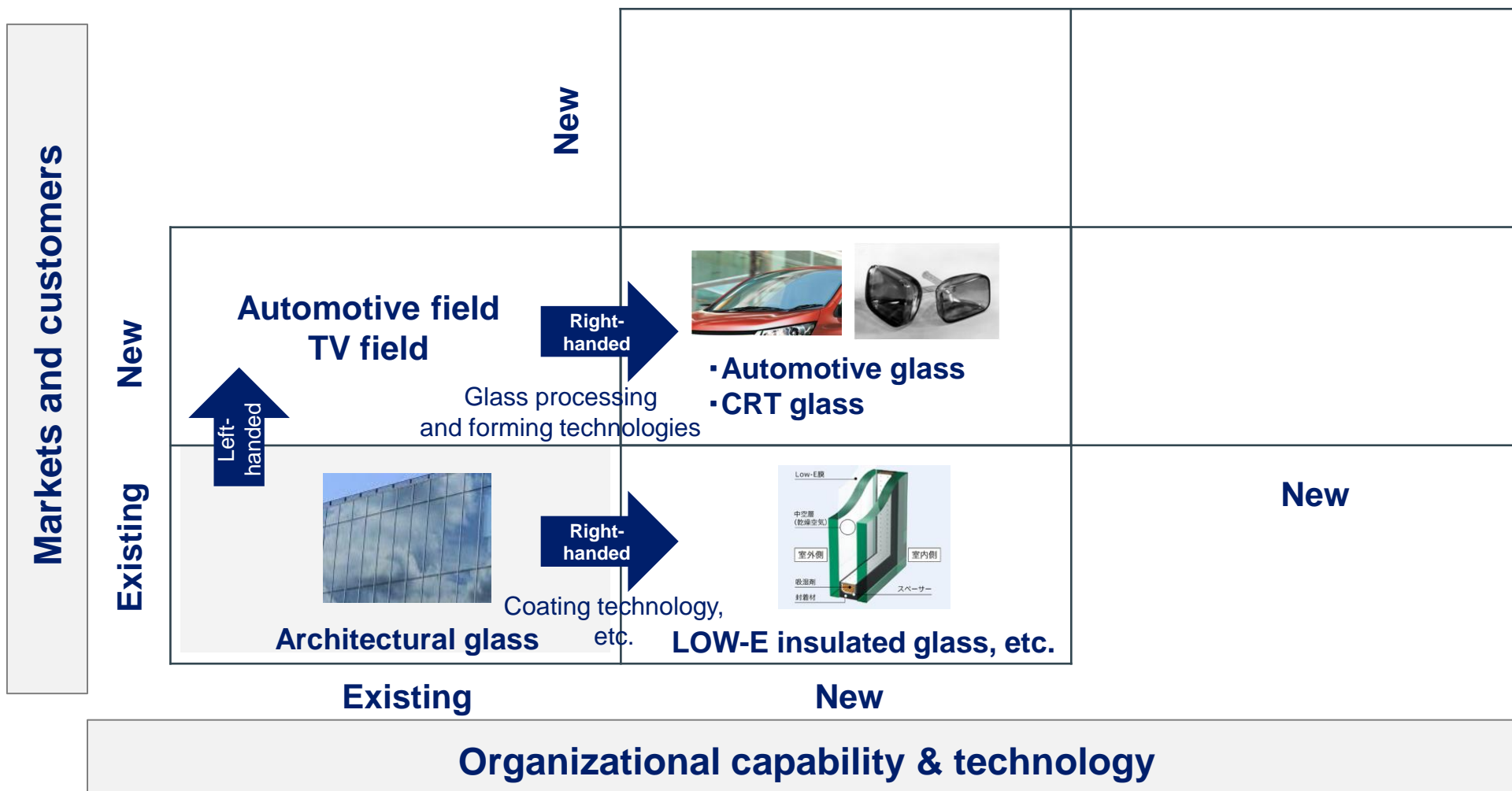
Example of ambidextrous development: Glass business

- Possesses existing technology for manufacturing flat glass



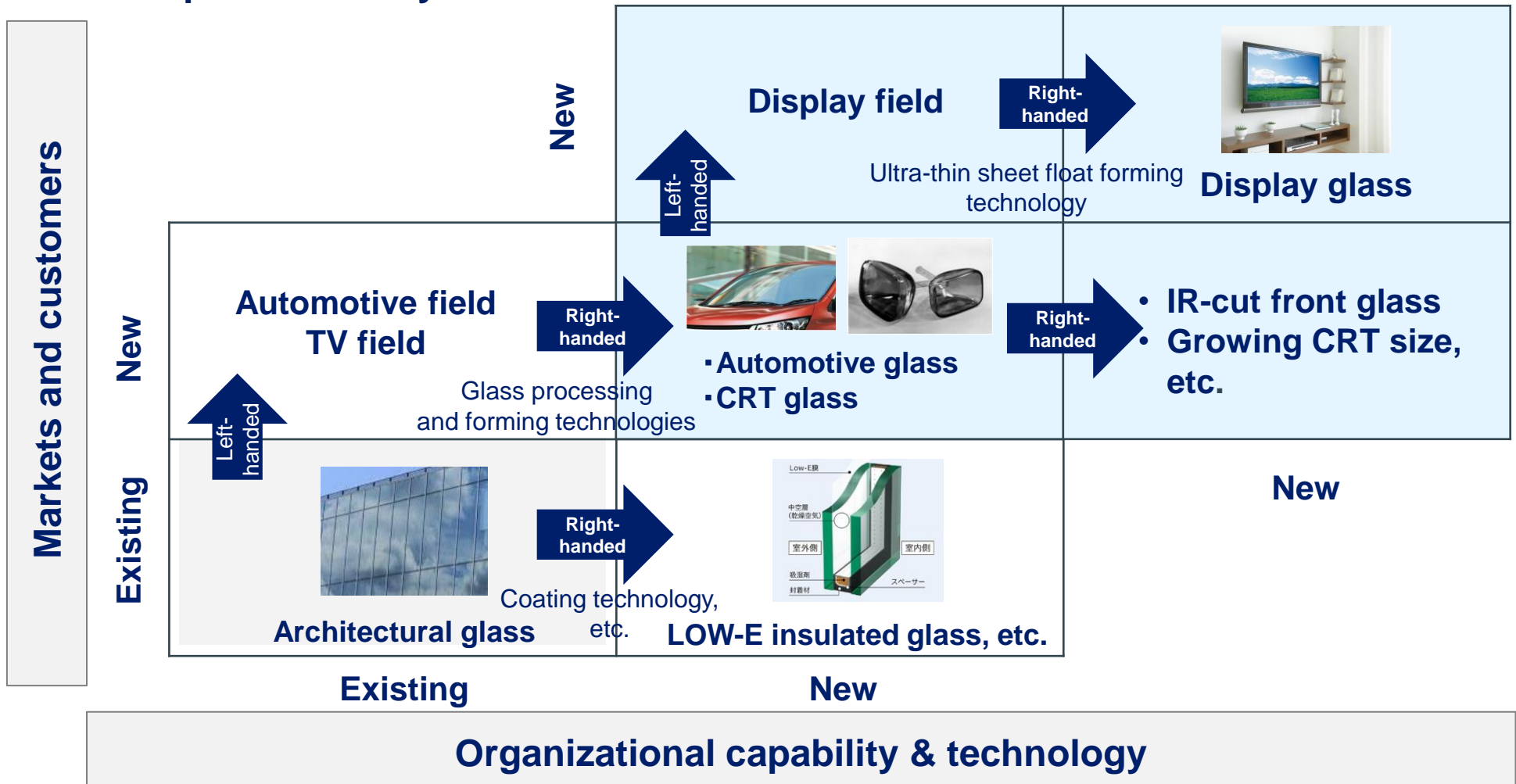
Example of ambidextrous development: Glass business

- Redefining our technology holdings through left-handed development and expanding into new business areas
Providing society with automotive glass and CRT glass in response to changing times



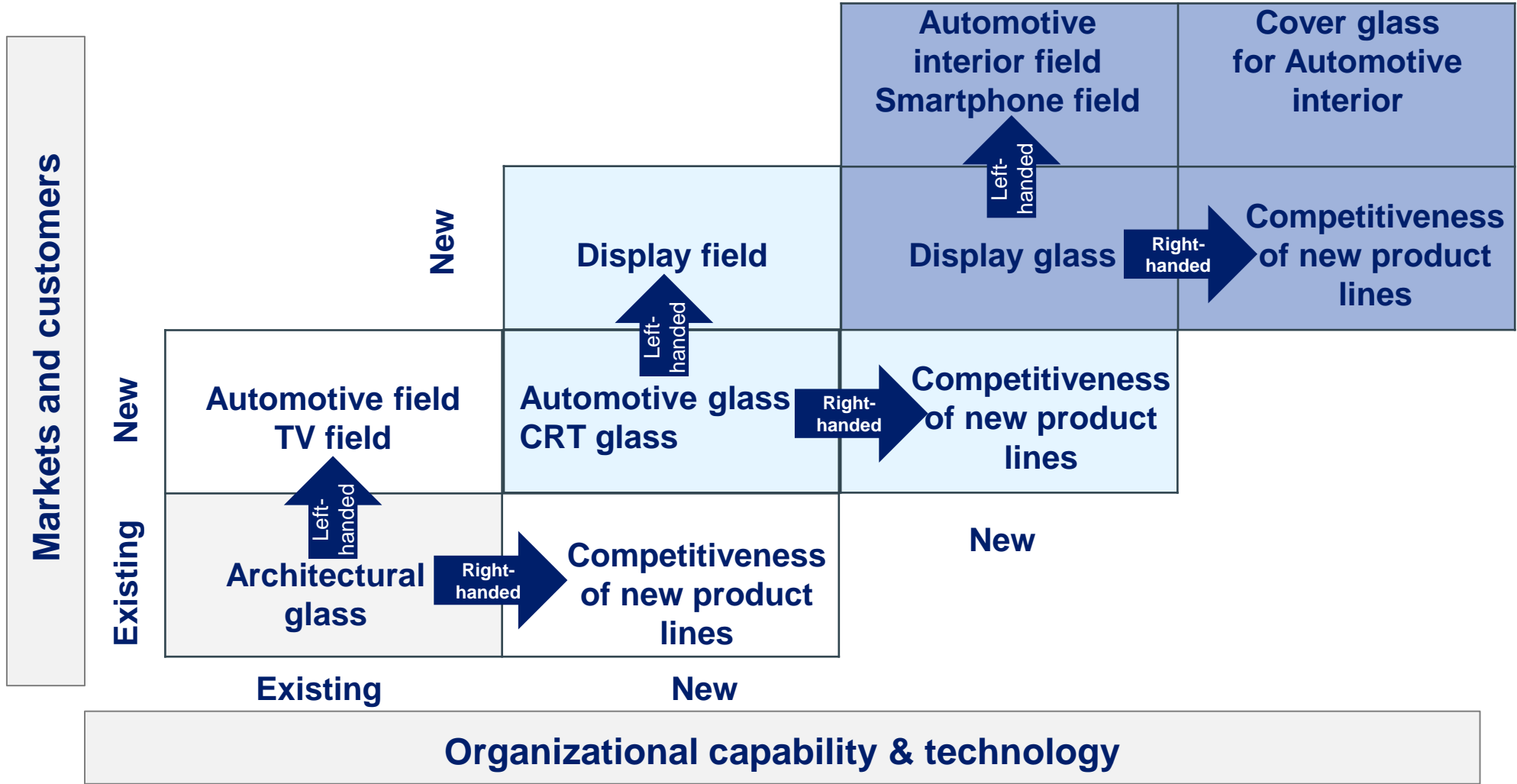
Example of ambidextrous development: Glass business

- A swift response to the historic shift from CRT to LCD TVs
Development and manufacture of display glass using thin glass forming technology developed over the years



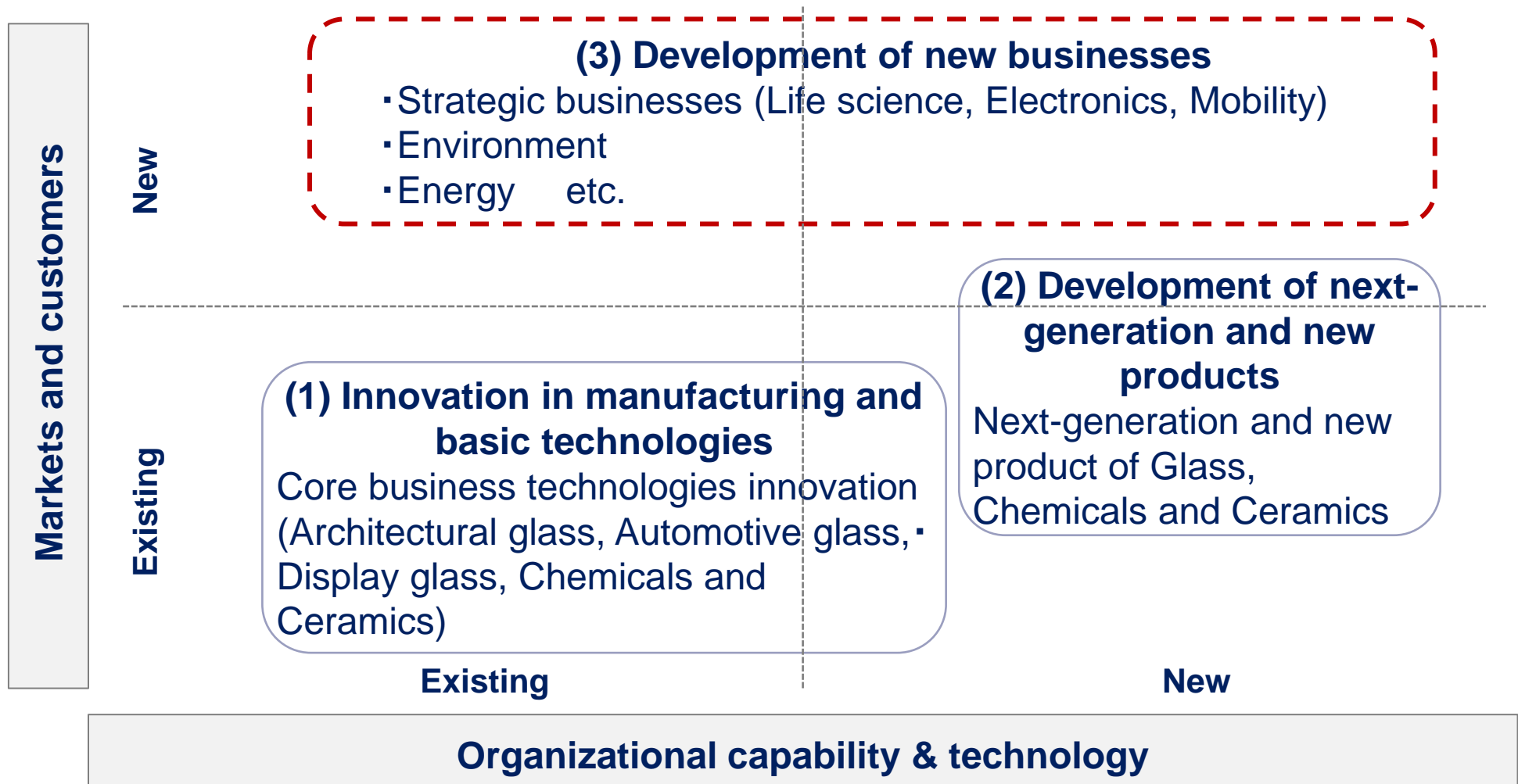
Example of ambidextrous development: Glass business

- Technological innovation in display glass continues to evolve, transforming into cover glass for smartphones and automotive interiors



Future development direction

- Aim for sustainable growth by pursuing right- and left-handed development in each field



Utilization of open innovation

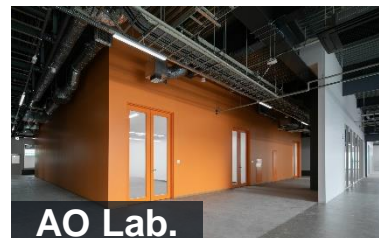
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Open innovation

Accelerating open innovation with external companies, research institutes, universities, etc. in the AO co-creation space

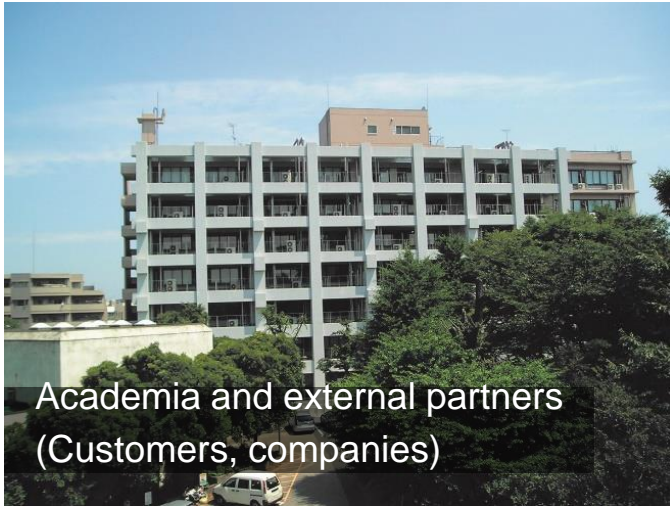


DX

Development using material informatics (MI), AR/VR, etc.



Open innovation at AGC



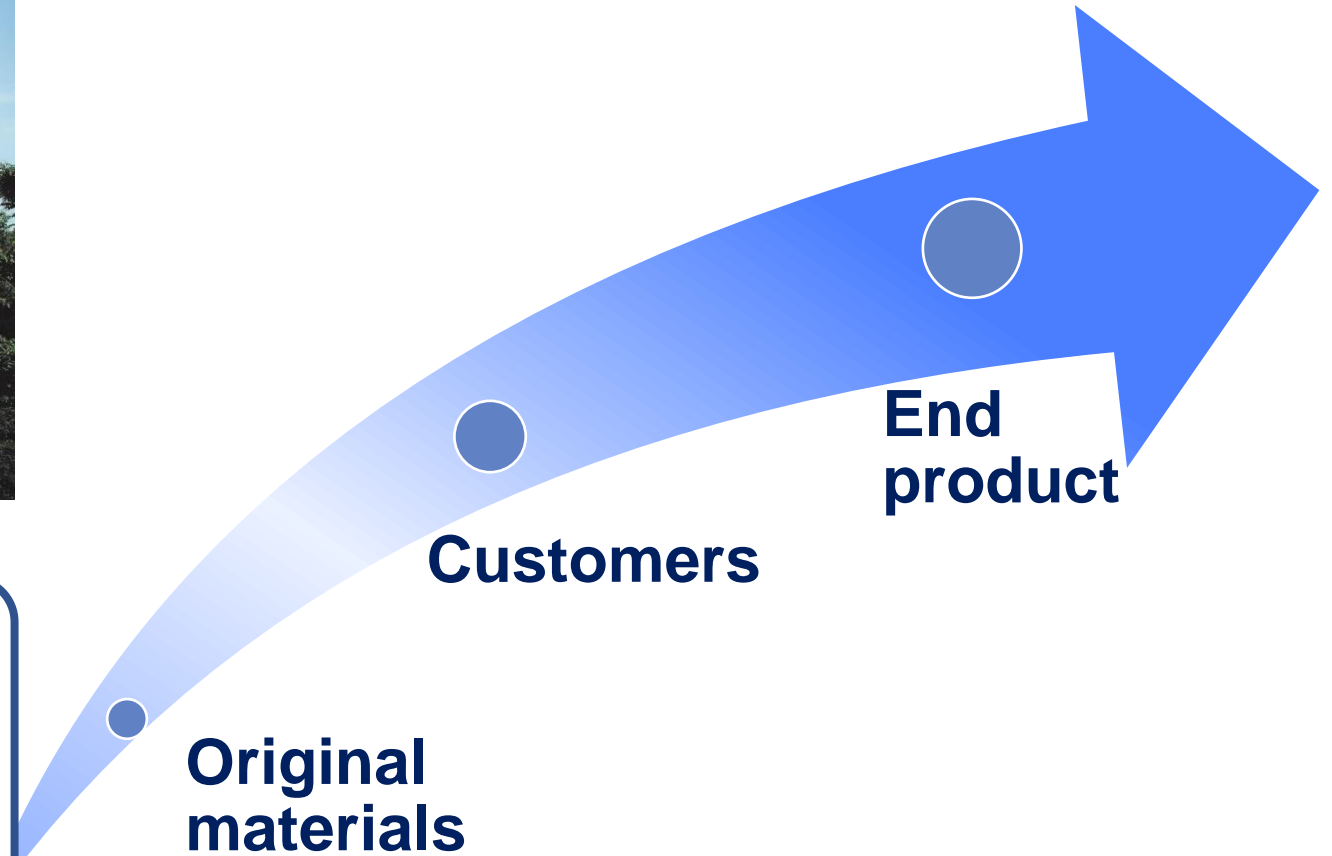
AGC



Materials
development

Process
development

Facilities
development



**Accelerating co-creation with customers
Toward social reform and advancement**

Issues faced by automakers at the time

- **Design constraints** due to antennas
- Existing antennas were **prone to damage**

AGC technology

- **Radio technology**
- Antenna wire: **Printing and calcination technology**



A scene from a glass antenna performance test by AGC (1980s)

Solution

Glass antenna developed

Conventional image



Glass antenna



Issues faced by Santen Pharmaceutical at the time

Major overseas pharmaceutical companies were leading in the development of glaucoma drugs

Santen had excellent formulation technology in ophthalmology, but **lacked experience in prostaglandin drug synthesis**



Early stage



Late stage

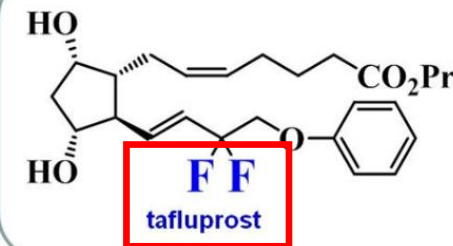
Glaucoma that can lead to blindness

AGC technology

- Fluorine compound synthesis technology (including prostaglandins)
- Molecular design capability for complex compounds

Solution

Development of **eye drops** for glaucoma treatment

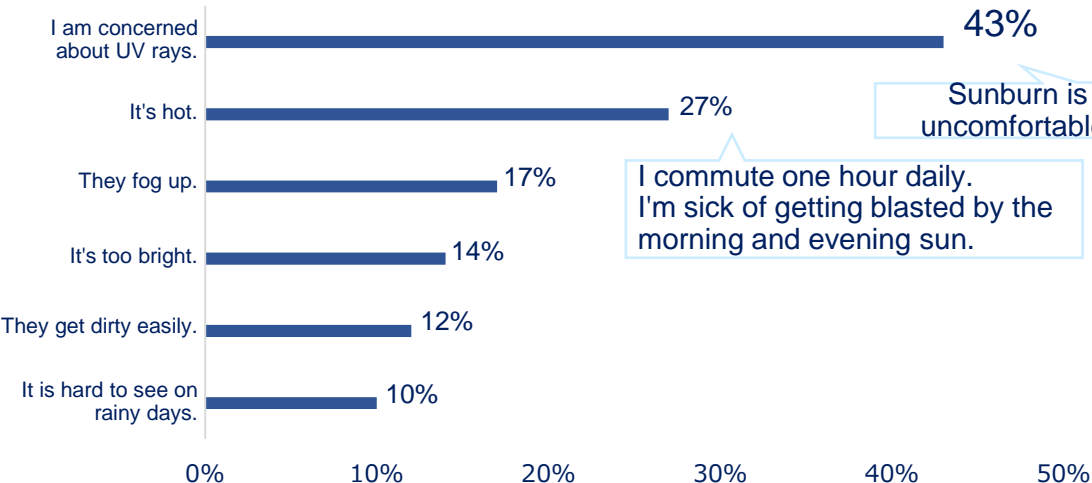


Experience in development partnerships with external parties (3)

End-user complaints

Concerned about sunburn caused by **ultraviolet (UV) rays**

Q. What are your frustrations or problems related to your car windows?*



Sunburn is uncomfortable.

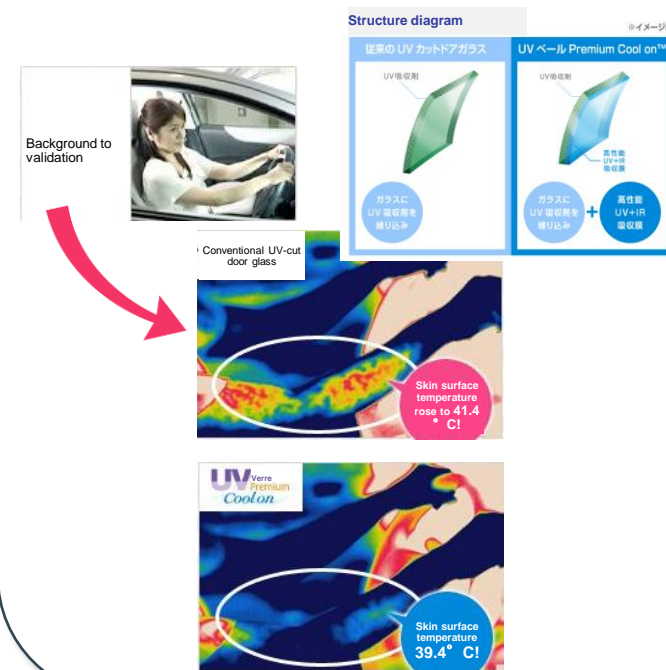
I commute one hour daily. I'm sick of getting blasted by the morning and evening sun.

AGC technology

Glass coating technology

Solution

Development of UV-cut front door glass



Proposal

Automaker

NTT Docomo

Securing antenna installation sites in urban areas is an issue as 5G expands

AGC technology

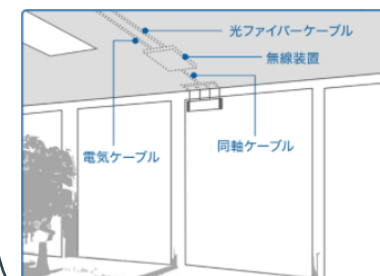
- **Transparent glass antenna design** with low transmission loss
- **ATTOCH method** for installing antennas in existing windows
- **Glass interface layer technology** reduces radio wave attenuation and reflection

Solution

WAVEATTOCH™

Collaborative development of a glass antenna that can be attached to existing window glass from the interior side

Enables flexible antenna placement
Turning building windows into antennas in prime locations in city centers



Introduction of industry-academia joint open innovation activities

External academia



Expected impact

- ✓ **Social implementation of research results**
- ✓ **Creation of new themes and academic results**
- ✓ **Educational opportunities for students**

Presentation of needs and proposal of issues
Research funding, materials and information
Researchers

Presentation of seeds and proposals for issues
Researchers, students
Knowledge and know-how
Facilities and equipment



Material Integration Laboratories
Innovative Technology Laboratories
Production Technology Division
Business Development Division
Development departments at
Companies
Planning divisions
.....

Expected impact

- ✓ **Acceleration of development speed**
- ✓ **Creation of new products and businesses**
- ✓ **Human resource development and acquisition**

Introduction of industry-academia joint open innovation activities

Partner



東京大学
THE UNIVERSITY OF TOKYO



東京工業大学
Tokyo Institute of Technology

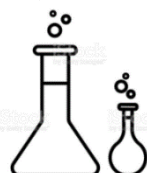


名古屋大学
NAGOYA UNIVERSITY

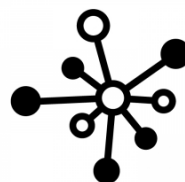
Main joint research field(s)



Glass
processing

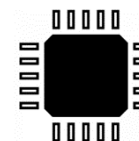


Fluorine
chemistry



MultiMaterial

Bio device



Mobility



Life Science



Content of initiatives

- ✓ Strengthening of systematic collaboration by a building industry-academia collaboration system and launching collaborative research projects
- ✓ Establishment of a joint research space on the university campus
- ✓ Joint researchers dispatched from AGC

New research building established at AGC's Yokohama Technical Center

- Establishing a new research wing as a place to "connect" inside and outside the Company



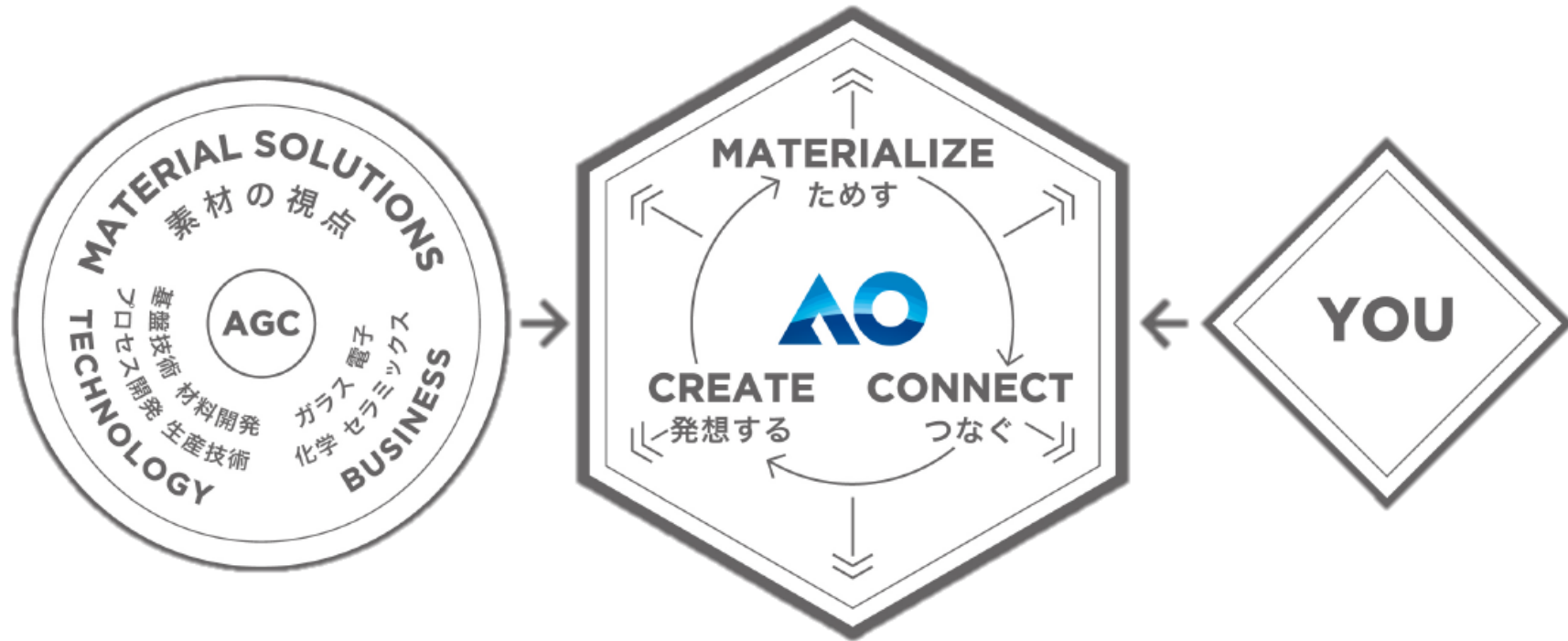
Site: On the premises of the AGC Yokohama Technical Center (Tsurumi Ward, Yokohama)

Total construction cost: ¥20 billion

Total floor area: approx. 45,000m² (Including existing researching building area: approx.70,000m²)

Completion: Completion in 2020, fully opened in 2021

"CONNECT" "CREATE" "MATERIALIZE"



Utilization of DX technology

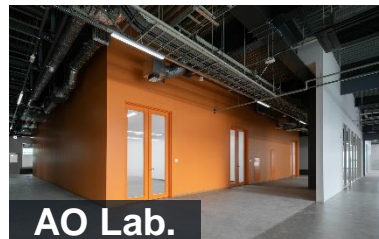
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- Implement virtual prototyping with VR
 - Accurately identify customer needs and provide products that meet them
 - Accelerate the speed of product development



Development of architectural glass



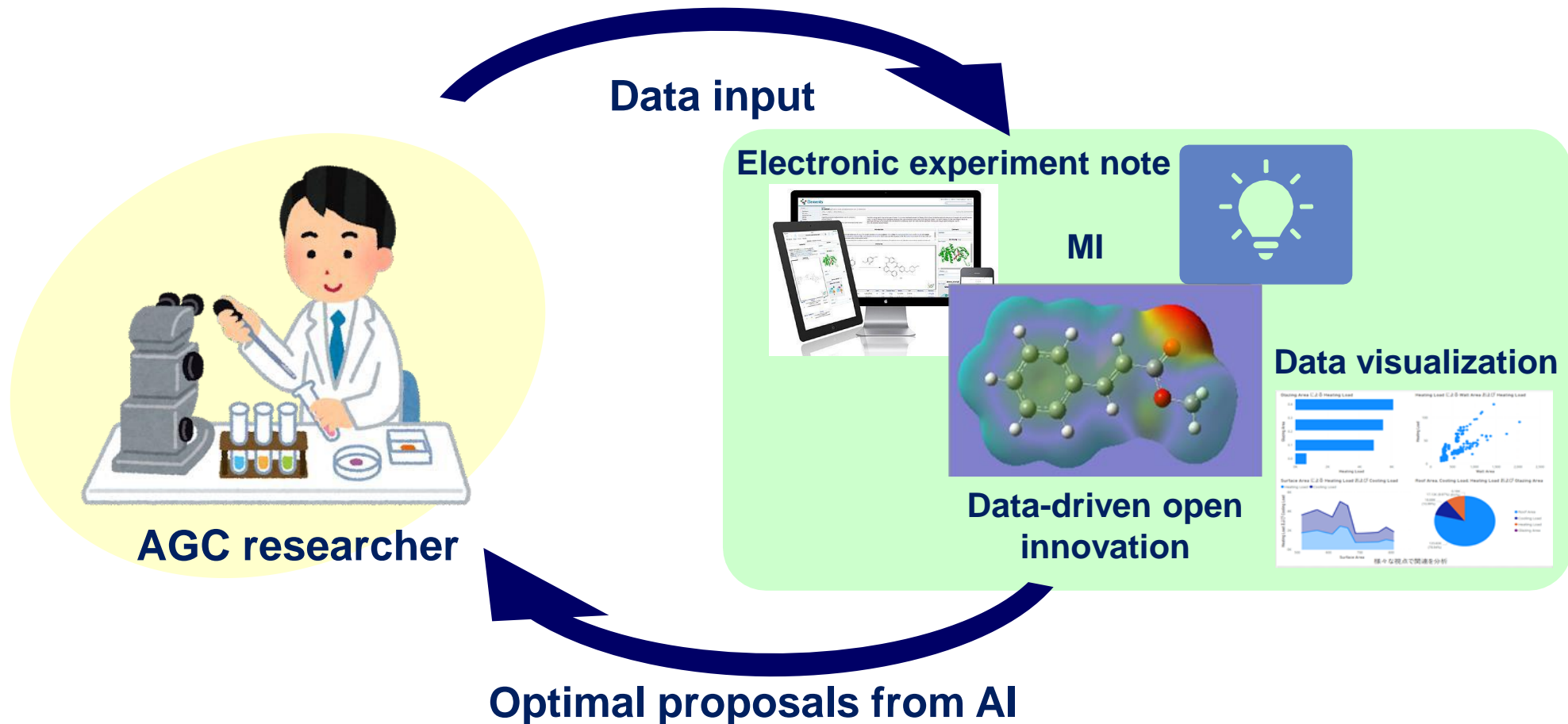
Development of automotive glass

Examples of using VR for development



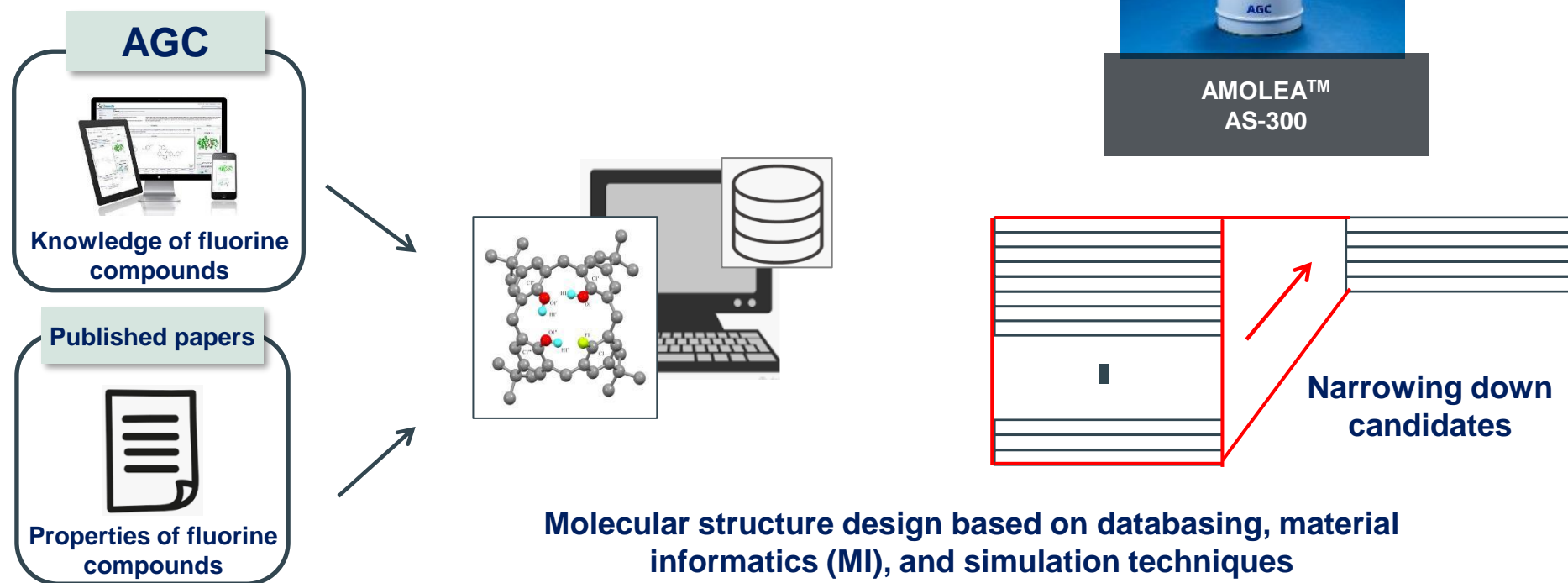
Materials development and composition development by MI (material informatics)

- Utilizing MI for material and composition development, aiming to enhance R&D competitiveness and **speed up** development.
In addition, researchers who receive proposals for AI will be able to strengthen their creativity.



MI Case study fluorinated solvent AMOLEA™ AS-300

- In the development of fluorine compounds, it is necessary to actually synthesize a large number of candidate compounds.
- **Dramatically shorten development time** by narrowing down candidate compounds to 5-6 on simulations.

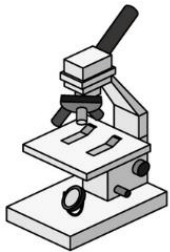


Numerical method to predict fracture patterns in chemically strengthened glass

- Depending on the production recipe, the way chemical strengthening is applied varies greatly.
Destructive testing for recipe optimization was performed on simulations.
- Replaces huge amounts of prototyping with simulations, **which can significantly reduce development time**

Up to now...

Chemically strengthened
Processing



-Observation of
fracture pattern
-Analysis of crack



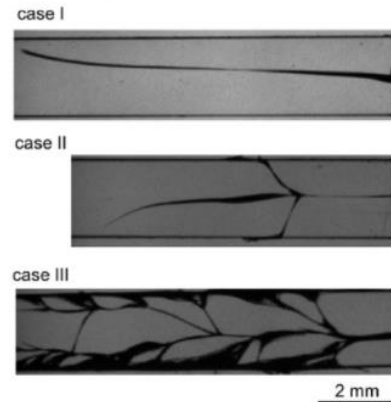
Drop test

So many try & error

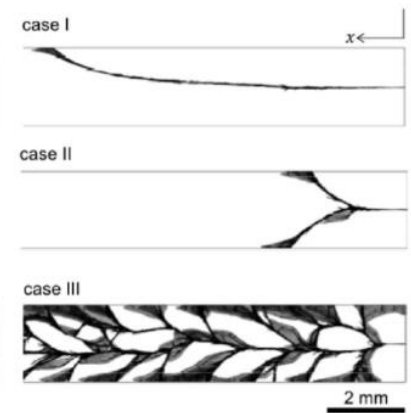


Fracture pattern analysis by
numerical method
(A **world first**)

(a) Results of observation experiment
with high-speed camera



(b) Reproduction with numerical simulation



Closing

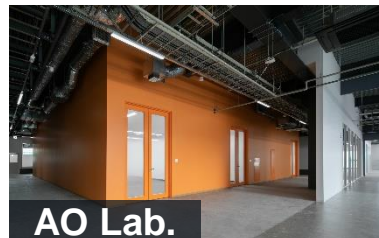
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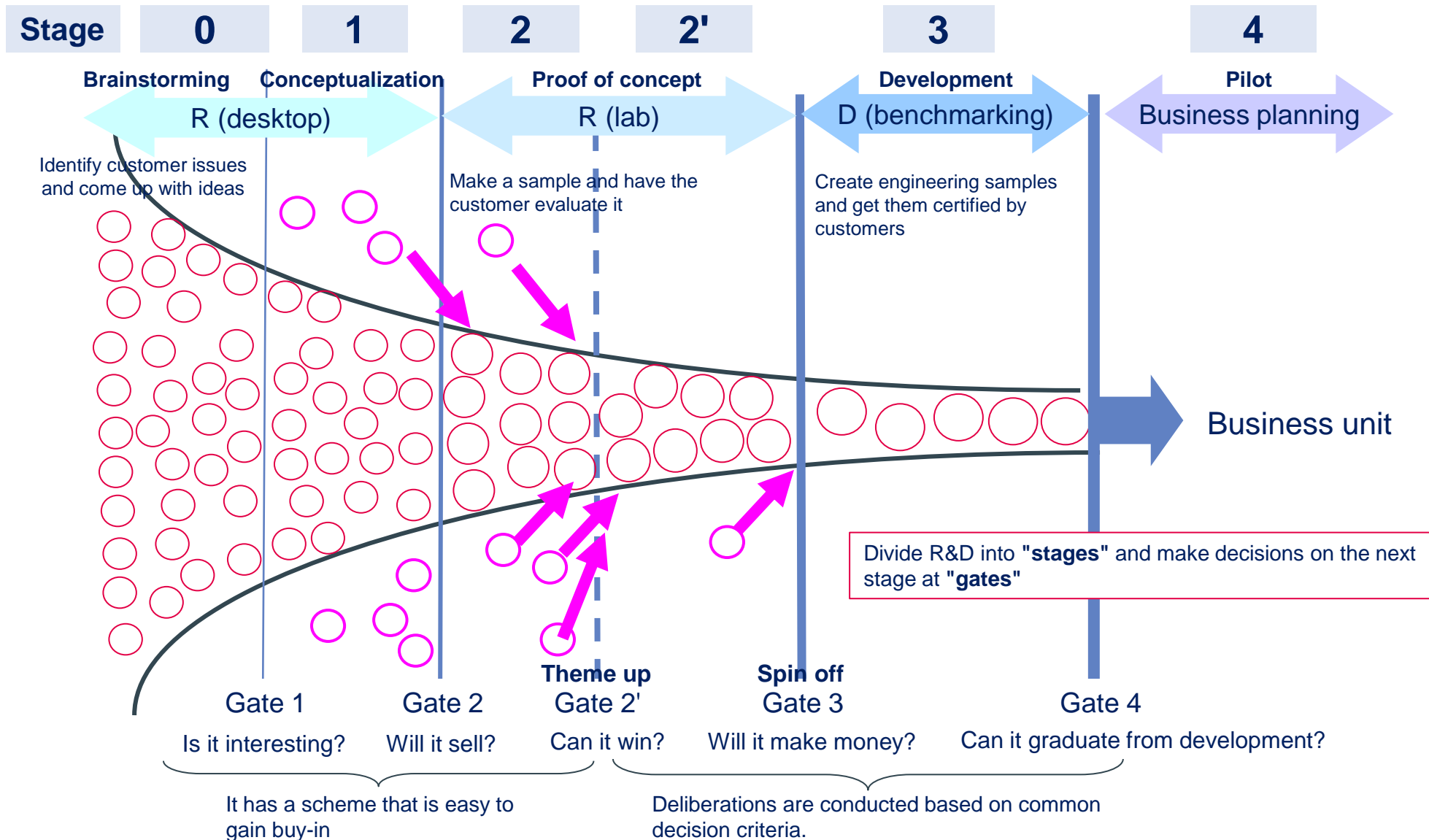
Development using material informatics (MI), AR/VR, etc.



Vision 2030

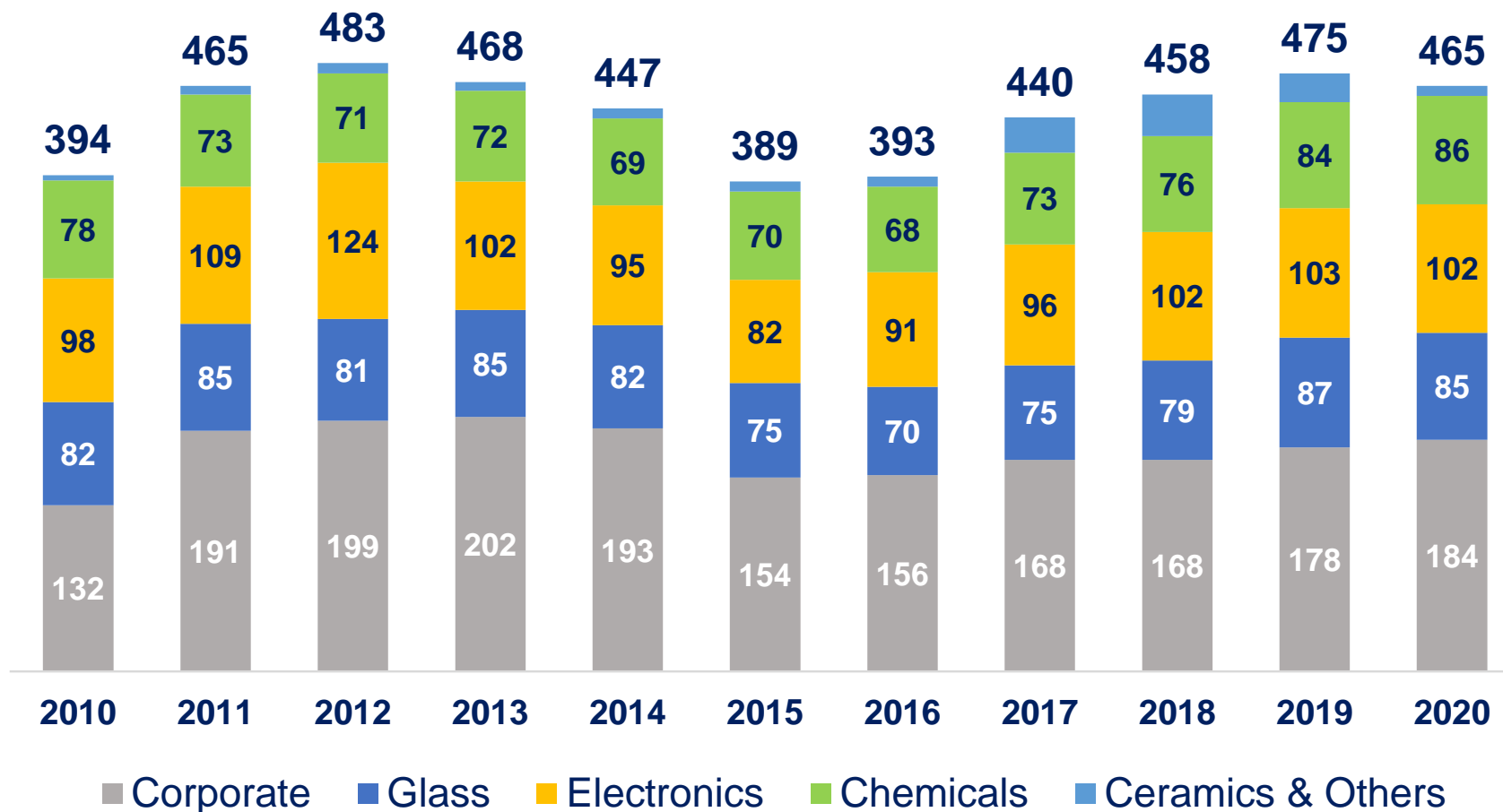
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Appendix



R&D expenses by segment

Unit: 100 million JPY



Never take the easy way out, but confront difficulties

Trust is the best way to inspire people

Strive to develop technologies that will change the world

A sense of mission leads us to advance

For more than a century, AGC has been guided by these founding spirits. Our unique materials, solutions and reliable partnerships have facilitated leading innovations across diverse industries and markets.

Today, by working with others to combine knowledge and advanced technology, we help make ever greater achievements possible, and bring bolder ideas to life.

Your Dreams, Our Challenge



Your Dreams, Our Challenge

END

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