\Orchestrating a brighter world NEC

NEC's New Strategy for Inbound/Outbound Open Innovation

May 7, 2019

Motoo Nishihara
Executive Vice President and CTO
NEC Corporation

The First Joint Venture
between Japan and US

Establishment

1899

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NEC's Social Value Creation

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7 Themes for
Social Value Creation

SDGs

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NEC's Social Value Creation

NEC Safer Cities

Creating Societies that are Safe, Secure, Efficient, and Equal

NEC Value Chain Innovation

Smart Connectivity

NEC the WISE

Bio-IDiom

Cyber Security

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Social Problems

Increase in urban population

2018 → 2050

4.2 Billion → 6.7 Billion

1.6 times

The increased movement of people and things emphasizes the need for maintaining peace and order and ensuring the safety and security of infrastructures.

From: United Nations Population Forecast (2018)

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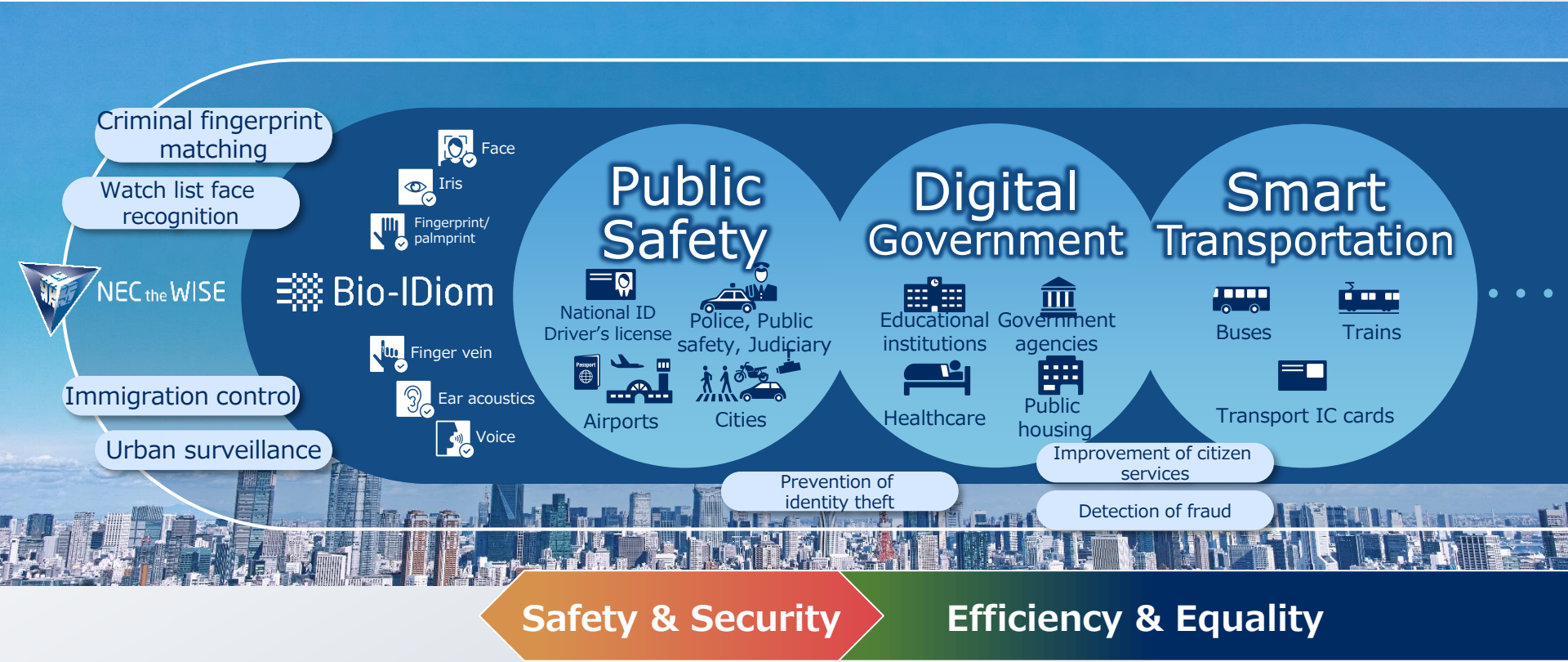
NEC Safer Cities



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Case Study

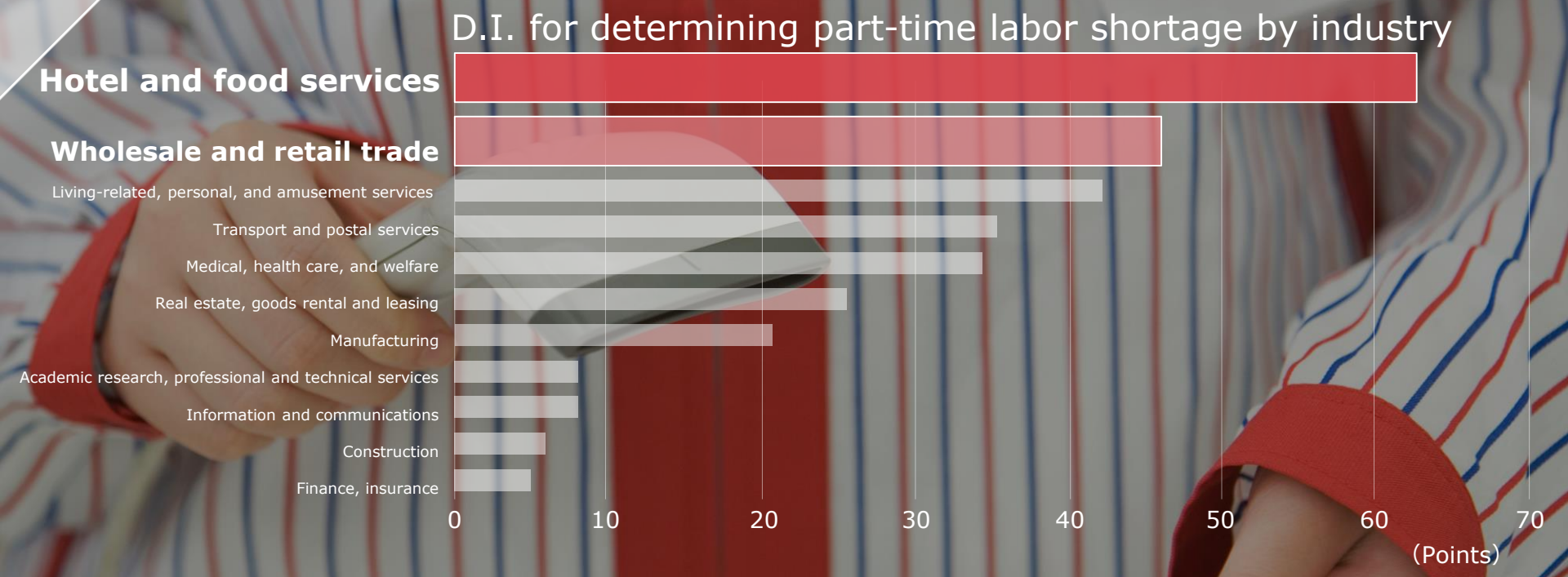
City × Digital
Tigre, Argentina

80% reduction in vehicle theft

Based on 2008 to 2013 comparison, according to research by Tigre city government

Social Problems

Labor shortage Restaurant & retail



Ministry of Health, Labour and Welfare “Survey on Labour Economy Trends” (Nov. 2016 Summary)

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Customer Experience

Operational Excellence

More comfortable and convenient

- Smart purchase
- Provide safe and secure food

Labor-less type store

Focus more on customer relations

- Efficient Store operation
- Reduce workload

NEC the WISE

Bio-IDiom

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NEC Contributions for Social Value Creation

NEC Safer Cities

Santander, Spain
Efficient city operation

Singapore
Contribution to the innovative safer city concept (SSIPO)

Tigre, Argentina
Real time city surveillance

NEC Value Chain Innovation

Kagome in Portugal
Contribution to Low Input/High Output crop yield

India
Contribution to economic development via “Make in India”

Retail Store in Taiwan
New shopping experiences while streamlining store operations

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Introduction of NEC Laboratories

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NEC Global R&D Network

NEC Labs. Europe
R&D through EU projects and standardization activities

NEC Labs. China
Development of core technologies in AI and NW

Central Research Lab (Japan)
- Value Co-creation Center
- Data Science Research Lab
- Biometrics Research Lab
- Security Research Lab
- System Platform Research Lab

NEC Labs. America
Development of cutting-edge core technologies

Israel Research Center
Promote marketing-type research.

NEC Labs. India
Create core technologies to address the challenges of emerging countries

NEC Labs. Singapore
Co-creation of innovative solutions with customers and partners, mainly for developed countries.

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Real World

AI (Data Science)

NEC the WISE

Visualization

Analysis

Prescription

Social Value

Computing

Networking

Security

NEC's Cutting-edge AI Technology Suites "NEC the WISE"

NEC the WISE

AI technologies from NEC
for enriching human intellect and creativity

Visualization

Digitalization, Improvement of data quality

- Image clarification
- Only1 Learning based super-resolution
- Only1 Multi-modal image fusion
- Only1 Micro-size ID as a dot
- Only1 Discovery of rare critical events

Recognition & identification using the five senses

- No.1※1 Face recognition
- No.1※2 Fingerprint recognition
- No.1※3 Iris recognition
- Only1 Object fingerprint recognition
- Only1 Ear Acoustics Authentication
- Only1 Optical vibration sensing
- Speech, emotion recognition

Analysis

Understanding of meaning & intent

- No.1※4 Textual entailment recognition
- Only1 Crowd behavior analysis
- Only1 Profiling across spatio-temporal data
- Only1 Customer profile estimation
- No.1※5 Acoustic situation awareness

Analysis with interpretation

- Only1 Heterogeneous mixture learning
- Only1 Invariant analysis
- Only1 Log pattern analysis
- Only1 Automated Security Intelligence
- Only1 Predictive analytics automation technology
- Graph-based relation learning

High-precision analysis

- RAPID machine learning

Prescription

Planning & optimization

- Only1 Autonomous and adaptive control
- Only1 Predictive robust optimization framework

*1 : Ranked 1st four consecutive times in task assessment sponsored by NIST, *2 : Ranked 1st five times in task assessment sponsored by NIST, *3 : Ranked 1st in task assessment sponsored by NIST (2018)
*4 : Ranked 1st in task assessment sponsored by NIST (2012) , *5 : Ranked 1st in task assessment sponsored by IEEE AASP Challenge DCASE2016

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Achievements of Conference Presentation

Artificial Intelligence

- Ranked 5th place at the benchmark of academic paper since 2000
- Numbers of papers were accepted by top-level conferences. (e.g. KDD)

Security

- High visibility at top-level conferences in secure computation area (e.g. CCS, Eurocrypt, S&P)

Network

- Number of papers were accepted by top-level conferences. (e.g. OFC)

	The last 3 years	Whole period
1	Microsoft	Microsoft
2	Google	IBM
3	IBM	Google
4	DeepMind	Yahoo
5	Yahoo	**NEC**
6	Facebook	DeepMind
7	Baidu	Facebook
8	**NEC**	AT&T
9	Adobe	NTT
10	Amazon	Baidu

※1 NIPS、ICML、KDD、ECML-PKDD、ICDM
※2 ICML、CVPR、IJCAI、KDD、ECCV、ICCV、NeurIPS (NIPS)、AAAI

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World top-level Researchers

Visualization

Hitoshi Imaoka

Development of the world's No.1* Face recognition technology

Manmohan Chandraker

Development of Video recognition and scene understanding under various conditions.

Networking

Ting Wang

Development of the world's highest level optical communication network using AI

* No.1 at the NIST(National Institute of Standards and Technology) competition for 4 consecutive years

Analysis

Hans Peter Graf

Development of "Torch", a worldwide used framework for deep learning, and its product version.

Mathias Niepert

Development of AI technology that logically infers and creates predictions from incomplete information.

Security

Ghassan Karame

Development of the high-speed, secure and scalable blockchain technology.

Kazue Sako

- Steering Committee of IACR Real World Cryptography (2018-)
- President of the Japan Society for Industrial and Applied Mathematics (2017-2018)

Former NEC researchers in the various fields.

Vladimir N. Vapnik
The co-inventor of the support-vector machine method

Kai Yu
Horizon Robotics, Founder & CEO

Yann LeCun
Win ACM A.M. Turing Award 2018

Thai Jaw Shen, Yasunobu Nakamura
First demonstrator of electrical coherent control of a qubit. One of quantum computing's basic requirements.

Yidong Huang
Professor, Chair of the Department of Electronic Engineering, Tsinghua University.

Ronan Collobert, Jason Weston
Win Test of Time Award at ICML 2018

Leon Bottou
Win Test of Time award at NeurIPS 2018

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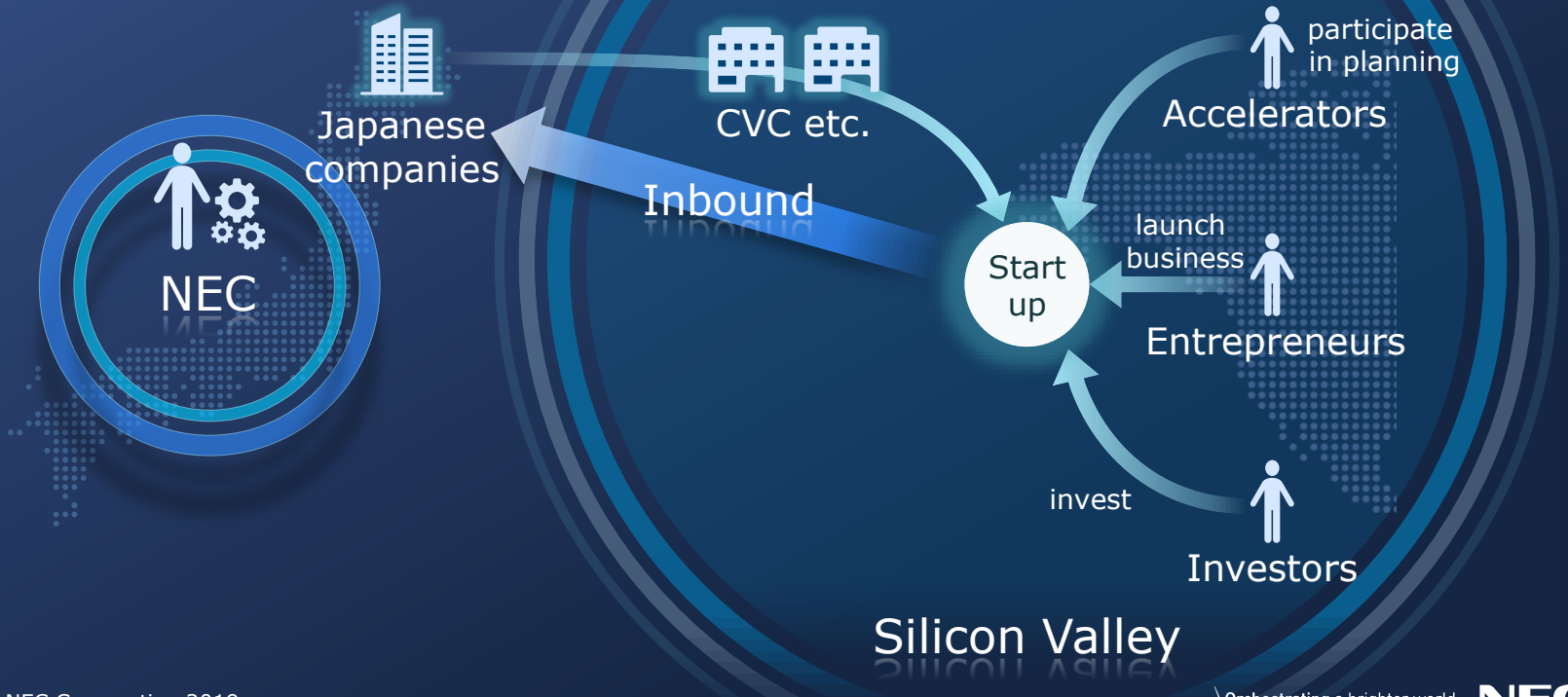
NEC’s New Strategy of Open Innovation

“Inbound” Open Innovation

Monetization of laboratory technologies used to focus primarily on product development within the company. Although Japanese companies are actively investing startup businesses in the Silicon Valley ecosystem, most are focused on inbound collaboration.



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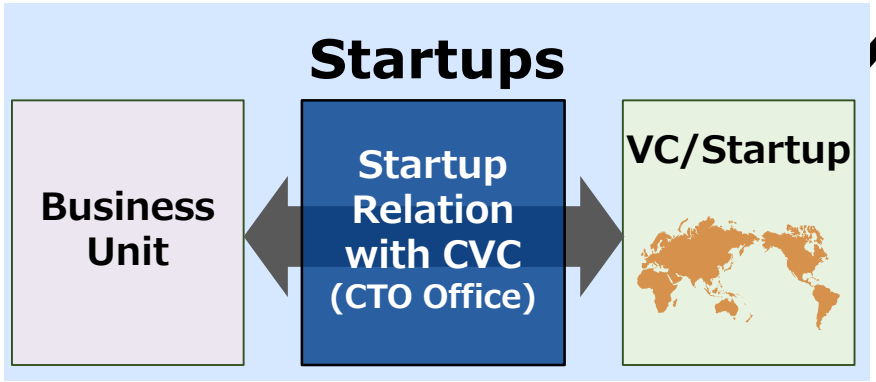
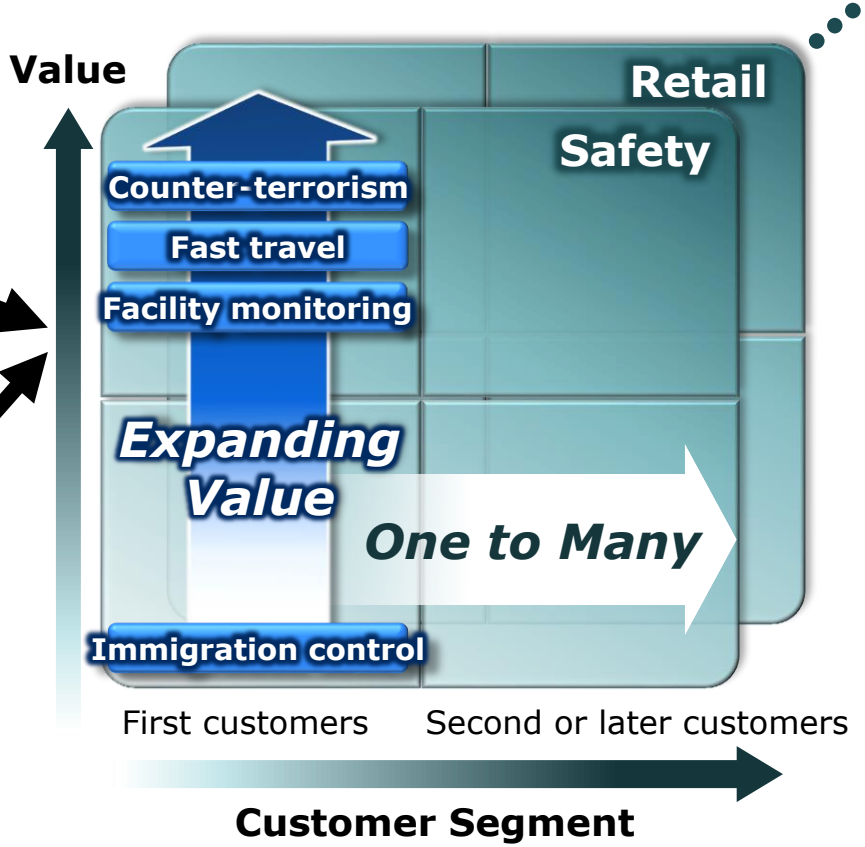
NEC's Inbound Open Innovation Scheme





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“Outbound” Open Innovation

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Problems in Large Companies

Where are talented people?

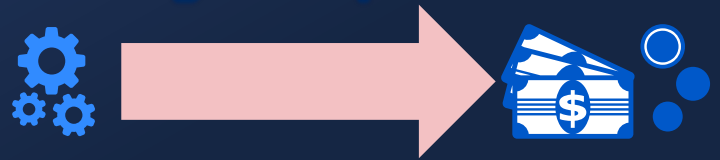
Startups

Large Companies

How can we accelerate commercialization?

Startups

Large Companies



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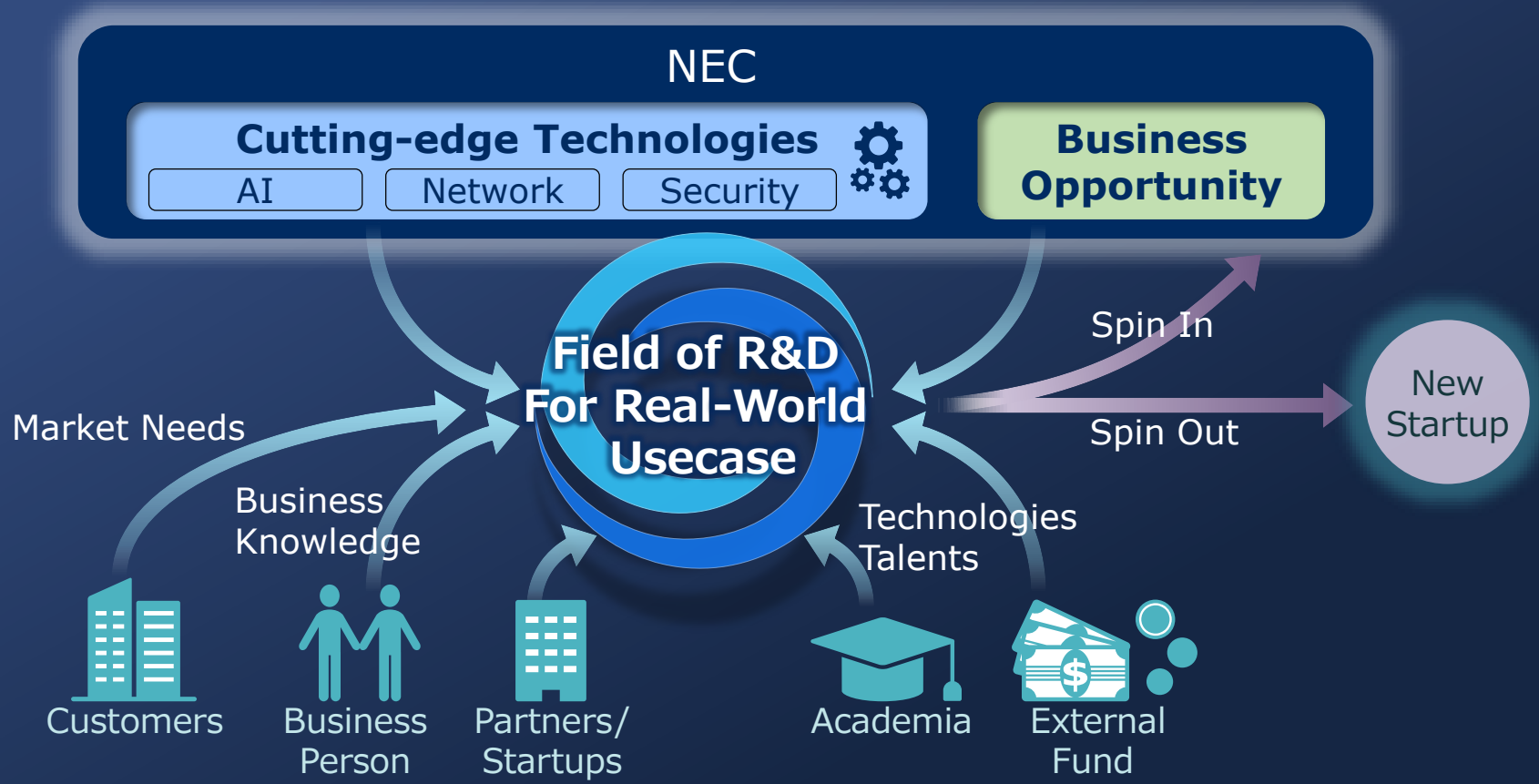
NEC's New Strategy : R&D Ecosystem



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dotData

Promptly developing business
from the white-box type AI technologies

- Accelerating business development by capitalizing on external resources
- A global first
- Tapping new talents

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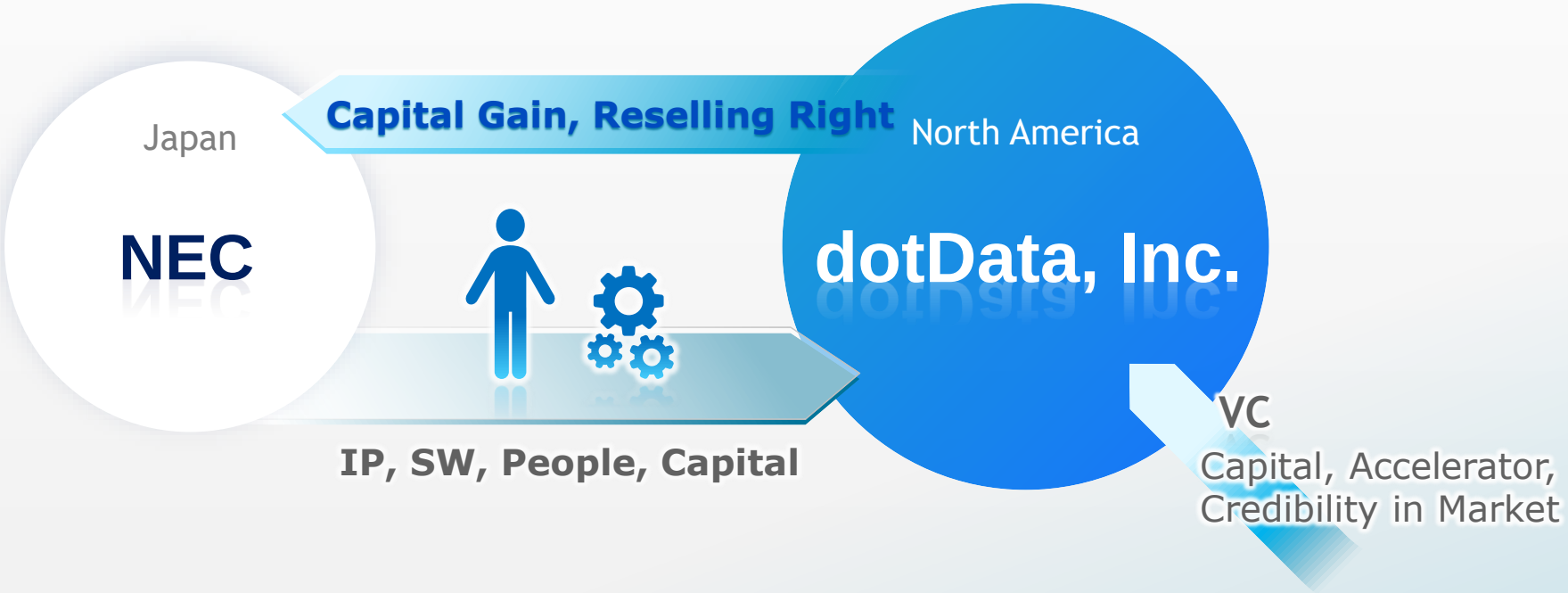
dotData as a strategic carve-out from NEC

Maximize monetization speed of cutting-edge core technologies
OUTSIDE NEC as an independent company



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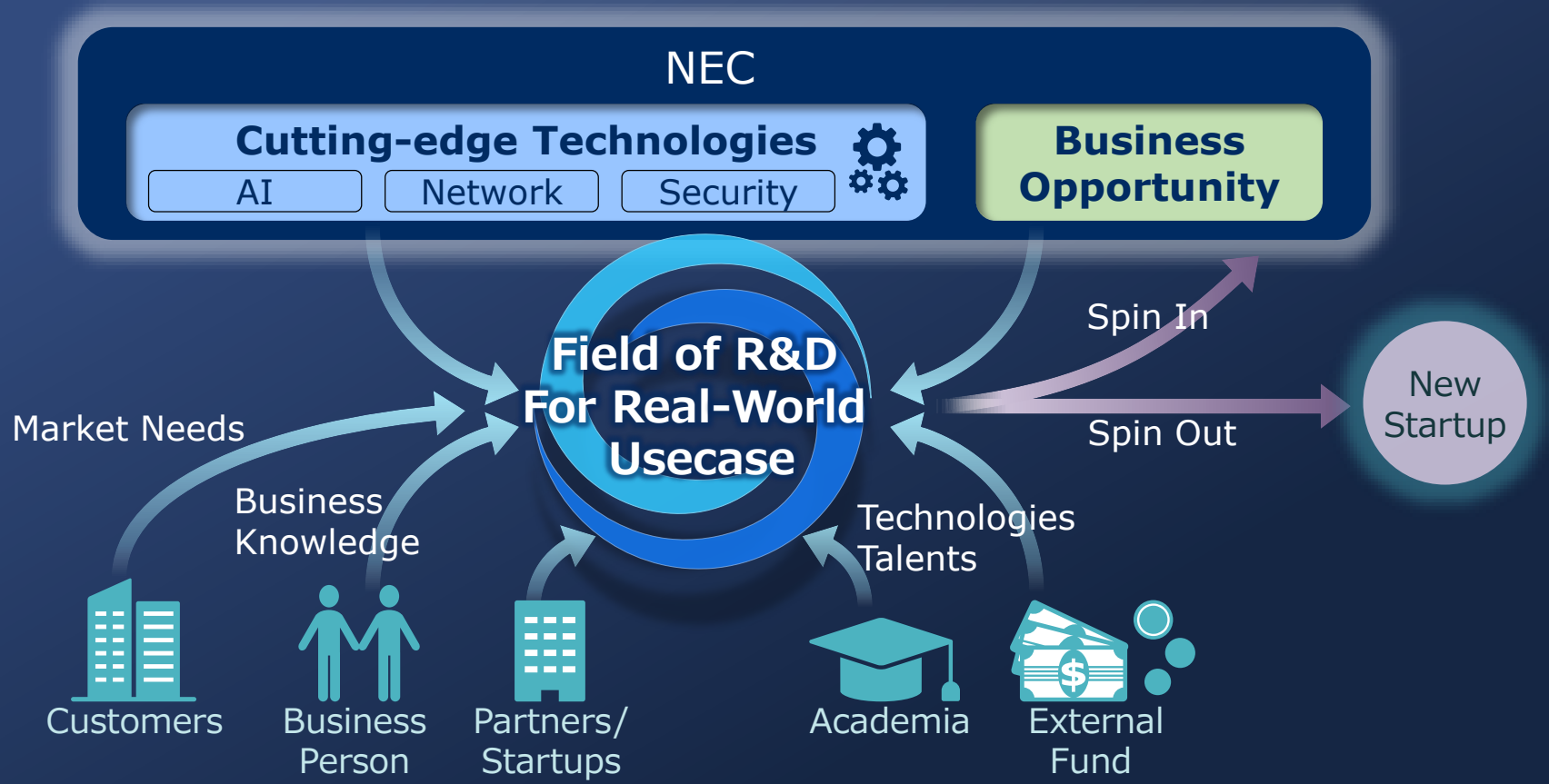
Integration of Inbound and Outbound



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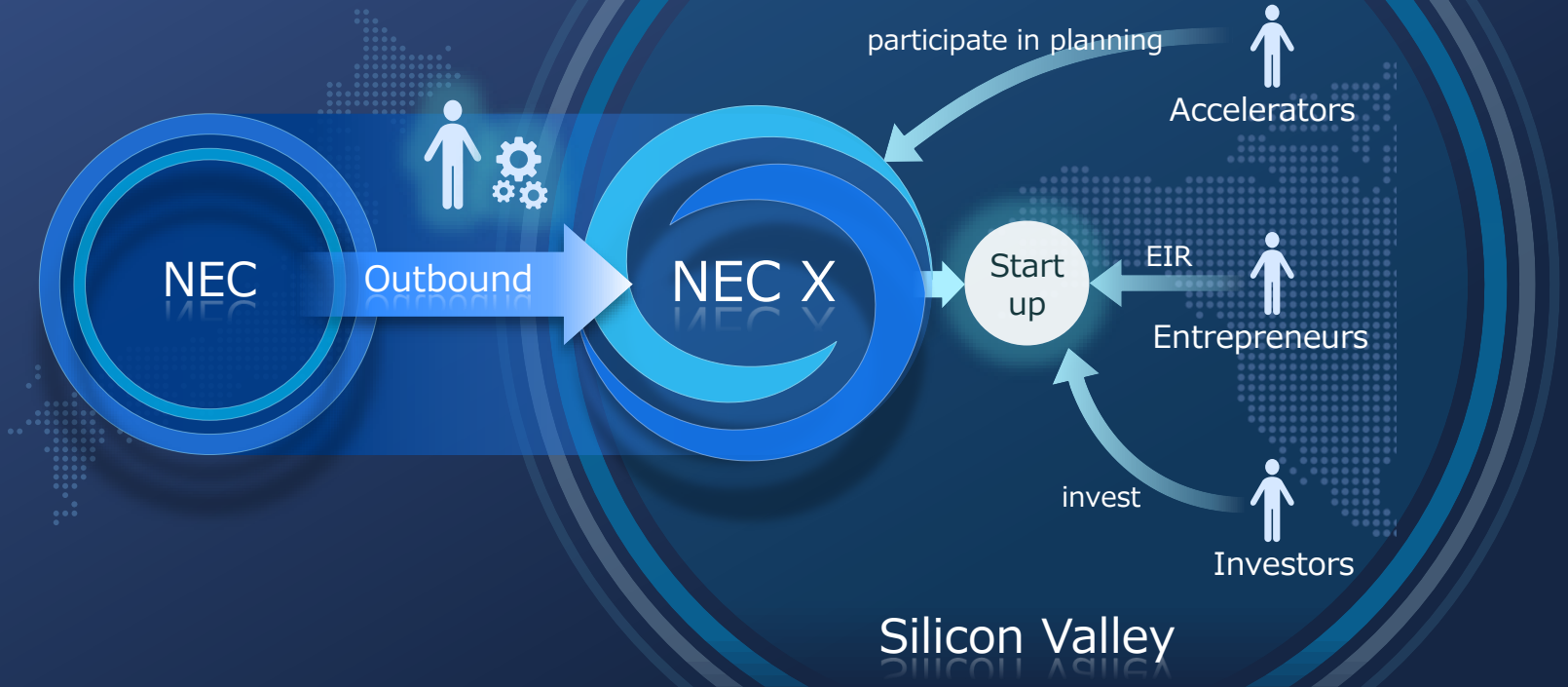
NEC X's Prospective Initiatives

NEC X has been launched within the Silicon Valley ecosystem to enable rapid business deployment based on cutting-edge laboratory technology seeds (outbound collaboration)



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NEC X

Shigeto Ihara, CEO

Accelerating new business development with cutting-edge technologies

We welcome

Business Leaders and VCs

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Open Our Cutting-Edge AI Engines

NEC-X provides opportunities for potential users and solution partners to try-out our cutting-edge and brand-new technologies.

20+ AI technologies

NEC the WISE

New cutting-edge technologies

Early adoption of advanced technologies (α-level)

We welcome

Startups and Partners

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Vector Engine Data Acceleration Center

Recently opened in silicon valley

- Remote access to **NEC's new AI Platform**
- **100x** faster with Apache Spark-compatible APIs

We welcome

Data Scientists

https://money.cnn.com/news/newsfeeds/articles/globenewswire/7588368.htm

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Let’s Create the Future Together

Towards the provision of socially accepted AI

Safety, Security, Efficiency, Equality

To pursue "For all people, an abundant society," we are strengthening activities towards respect for privacy and human rights

"NEC Group AI and Human Rights Principles"

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