Mazda Monotsukuri Innovation and Further Advance by Using Manufacturing and Market Big Data

1. Mazda's target image and Monotsukuri Innovation

2. Further advance of Monotsukuri Innovation

   ・ Seamless Monotsukuri by using big data

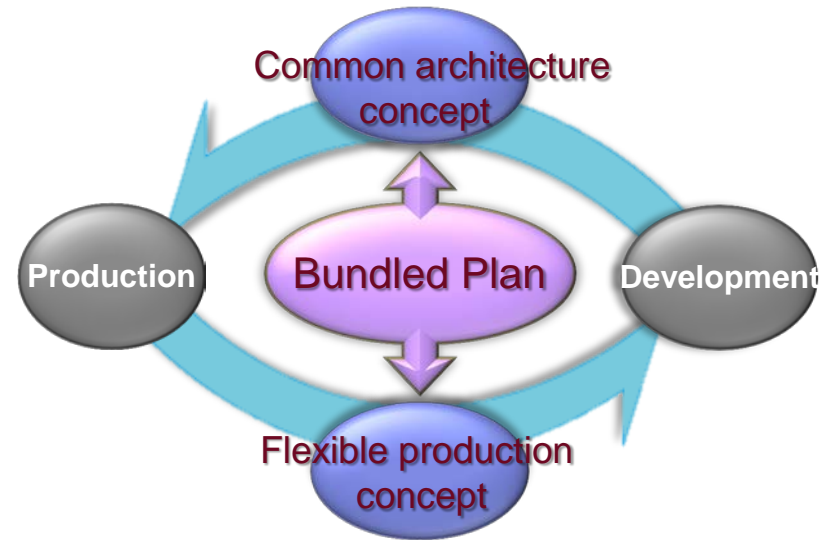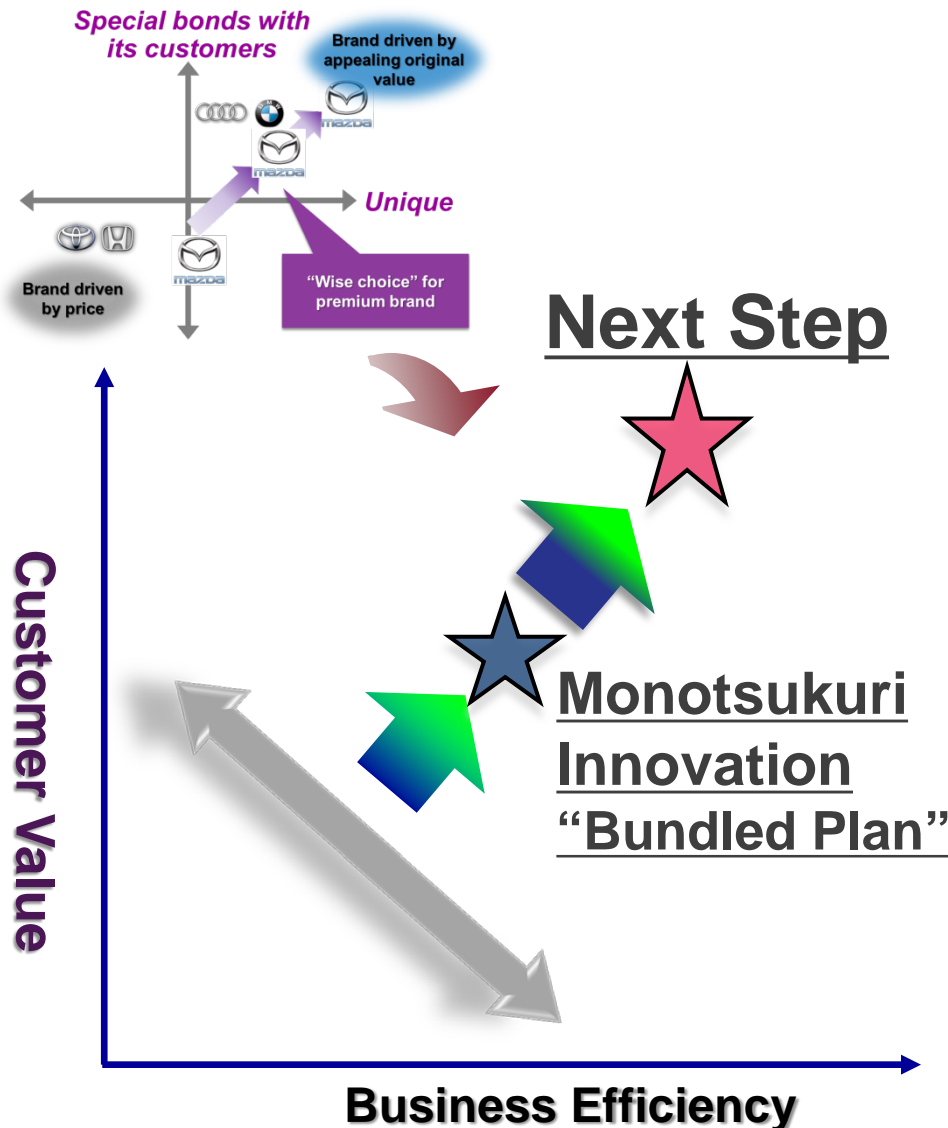   ・ Building block structure for Monotsukuri Innovation

3. Examples

December, 1st 2015

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Production Engineering Division
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1. Mazda's target image and Monotsukuri Innovation

Target of brand position

Special bonds with its customers

Brand driven by appealing original value

Unique

"Wise choice" for premium brand

Brand driven by price

Next Step

Monotsukuri Innovation "Bundled Plan"

Customer Value

Business Efficiency

Common architecture concept

Production

Bundled Plan

Development

Flexible production concept
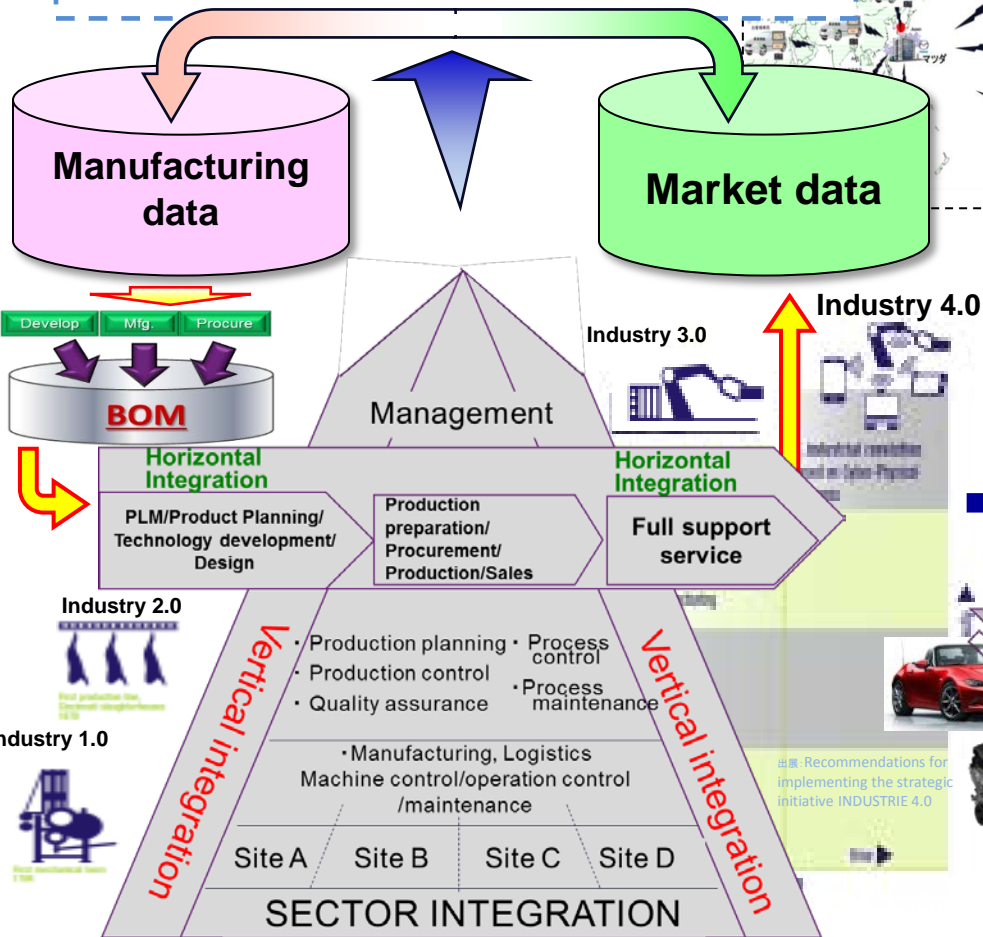
Next Step Enabler

Connect by big data and advance BOM

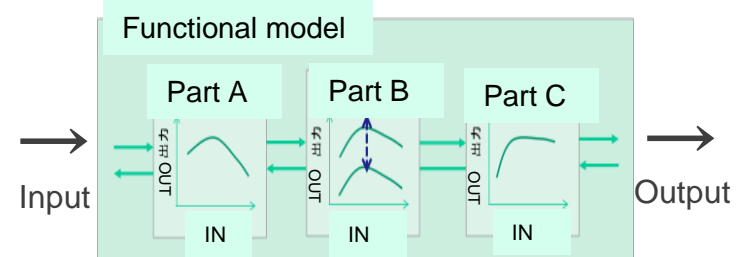| Advance Monotsukuri by seamless MBD |
|---|

2. Further advance of Monotsukuri Innovation

Seamless Monotsukuri by using big data

Pursue customer's true value

Manufacturing data

Market data

What MBD means?

Functional model

| Part A | Part B | Part C |

Input → Output

※MBD: Model Based Development

Develop | Mfg. | Procure

BOM

Industry 3.0

Industry 4.0

Management

Horizontal Integration

PLM/Product Planning/Technology development/Design

Production preparation/Procurement/Production/Sales

Full support service

Industry 2.0

Horizontal Integration

PLM/Product Planning/Technology development/Design

Production preparation/Procurement/Production/Sales

Full support service

Horizontal Integration

Vertical integration

- Production planning
- Production control
- Quality assurance
- Process control
- Process maintenance

・Manufacturing, Logistics Machine control/operation control /maintenance

Industry 1.0

| Site A | Site B | Site C | Site D |

SECTOR INTEGRATION

出展:Recommendations for implementing the strategic initiative INDUSTRIE 4.0

Marketing

Planning

Engine TM Components

Engineering development

Design

Customer care

Service

Sales

Logistics

Production

Procurement

MP preparation

Connect by big data and advance BOM

Advance Monotsukuri by seamless MBD

2

2. Further advance of Monotsukuri innovation

Monotsukuri Innovation Building Block Structure
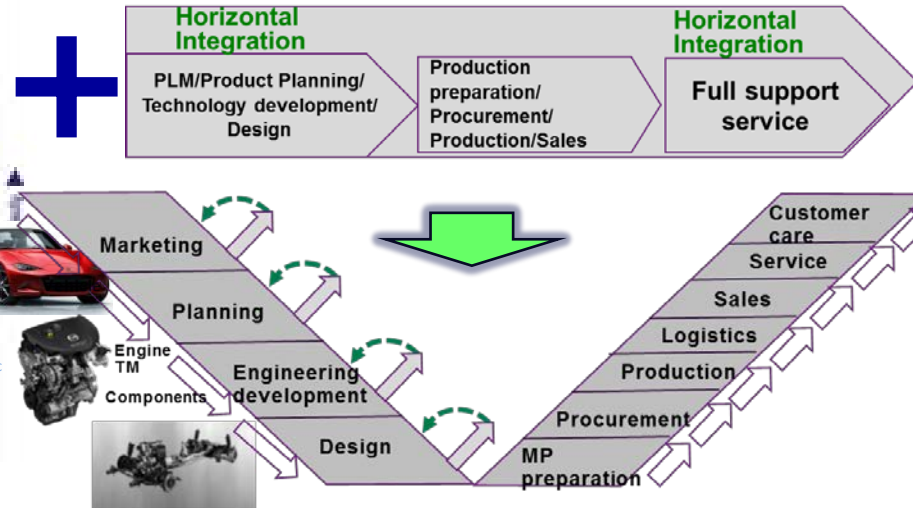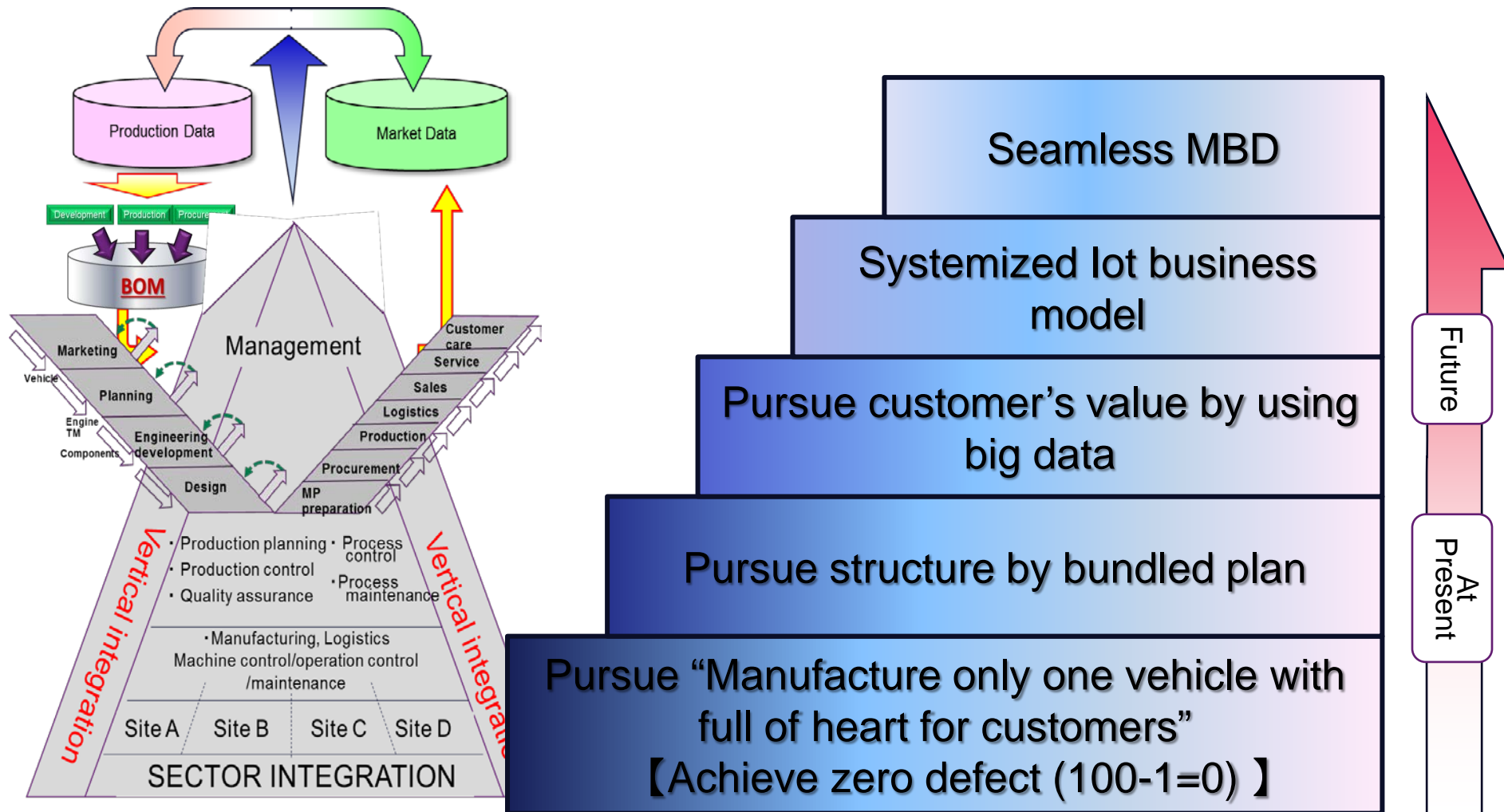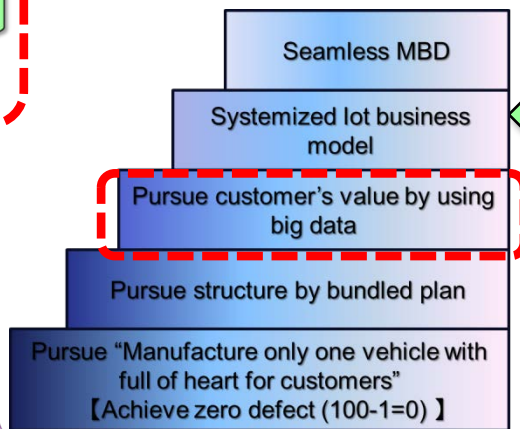

Seamless MBD

Systemized Iot business model

Pursue customer's value by using big data

Pursue structure by bundled plan

Pursue "Manufacture only one vehicle with full of heart for customers"
【Achieve zero defect (100-1=0) 】

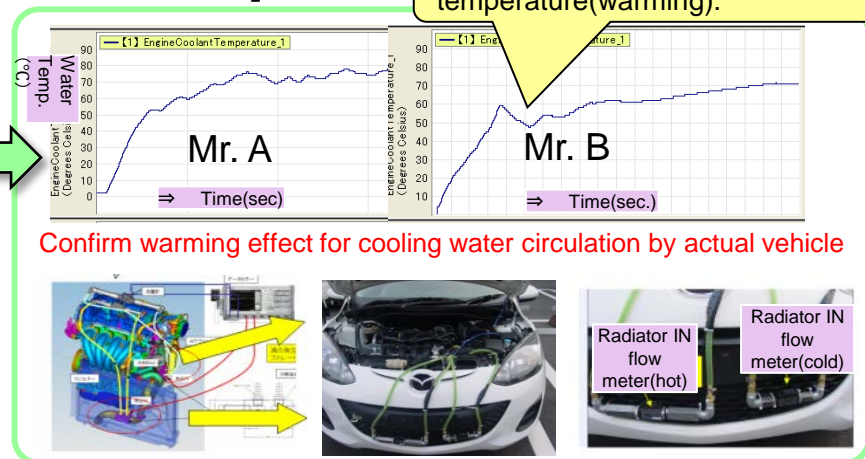Future

At Present

Monotsukuri Innovation Building Block Structure

3. Example #1: Using production big data and market big data

Improve warming characteristics(fuel efficiency) by using engine manufacturing data and market data (VOC monitor).
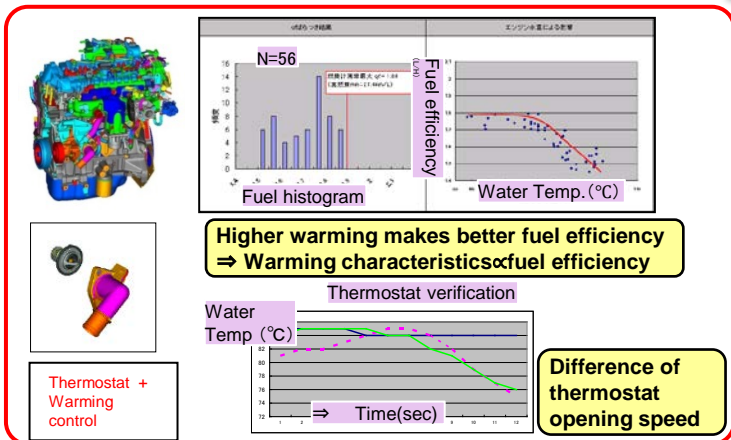

Production Data

Market Data

BOM Management

SECTOR INTEGRATION

- Seamless MBD
- Systemized lot business model
- **Pursue customer's value by using big data**
- Pursue structure by bundled plan
- Pursue "Manufacture only one vehicle with full of heart for customers"
  【Achieve zero defect (100-1=0)】

【VOC monitor result】

There is a difference of the water temperature(warming).

Mr. A

Mr. B
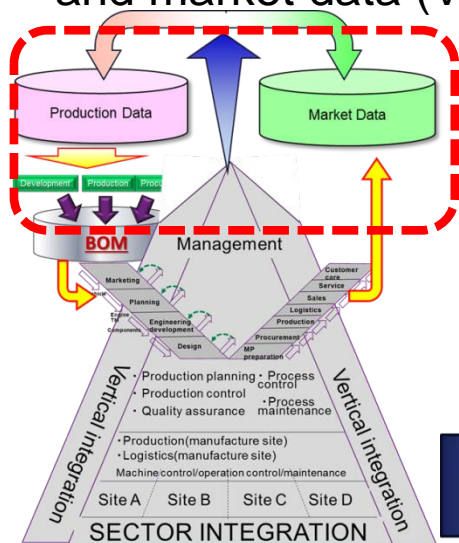
Confirm warming effect for cooling water circulation by actual vehicle

Radiator IN flow meter(hot)

Radiator IN flow meter(cold)

【Advance of warming system】
(Current) Thermostat => (Advance) water flow control valve engine to improve warming characteristics(fuel efficiency)

【Accumulation of engine production data】

N=56

Fuel efficiency

Fuel histogram

Water Temp.（℃）

Higher warming makes better fuel efficiency ⇒ Warming characteristics∝fuel efficiency

Thermostat verification

Water Temp（℃）

⇒ Time(sec)

Difference of thermostat opening speed

Thermostat + Warming control

Warm up combustion chamber promptly to reduce variation.

Verification for water flow control

W/O water flow control

W/water flow control
80℃

Water Temperature

THW

Reduce 9%
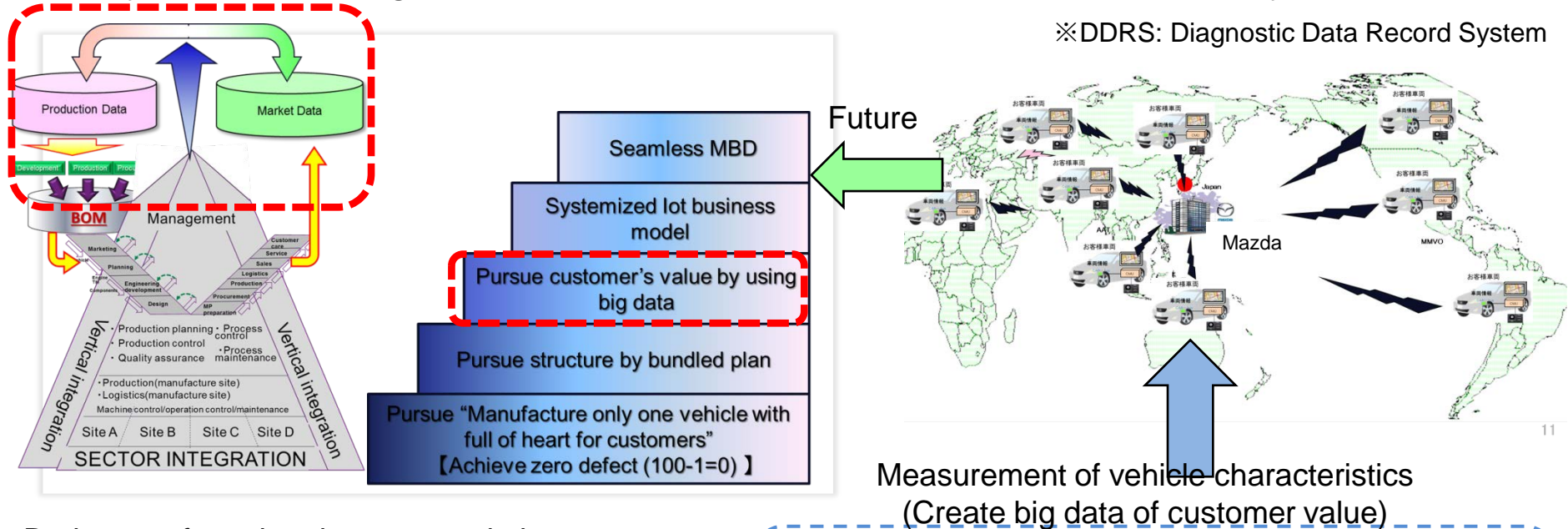
Improve 1/3 of variations
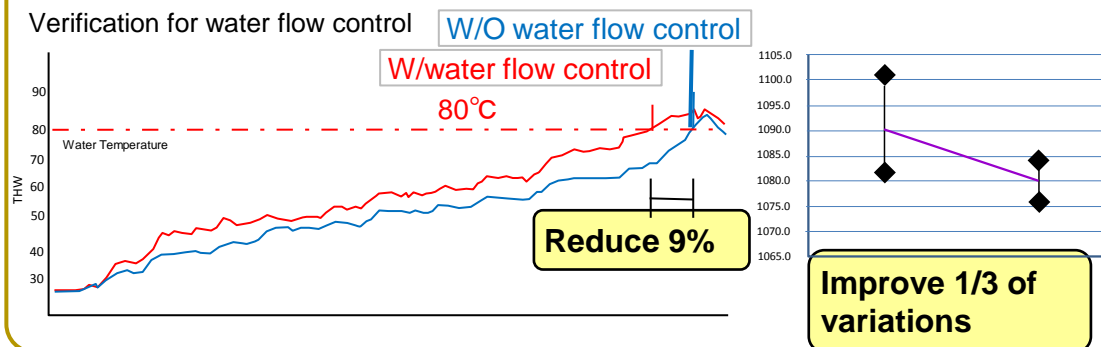
3. Example #2: Using manufacturing big data and vehicle characteristics measurement

Body manufacturing data and vehicle characteristics measurement by DDRS

※DDRS: Diagnostic Data Record System

Future

| Seamless MBD |
| Systemized lot business model |
| Pursue customer's value by using big data |
| Pursue structure by bundled plan |
| Pursue "Manufacture only one vehicle with full of heart for customers" 【Achieve zero defect (100-1=0)】 |

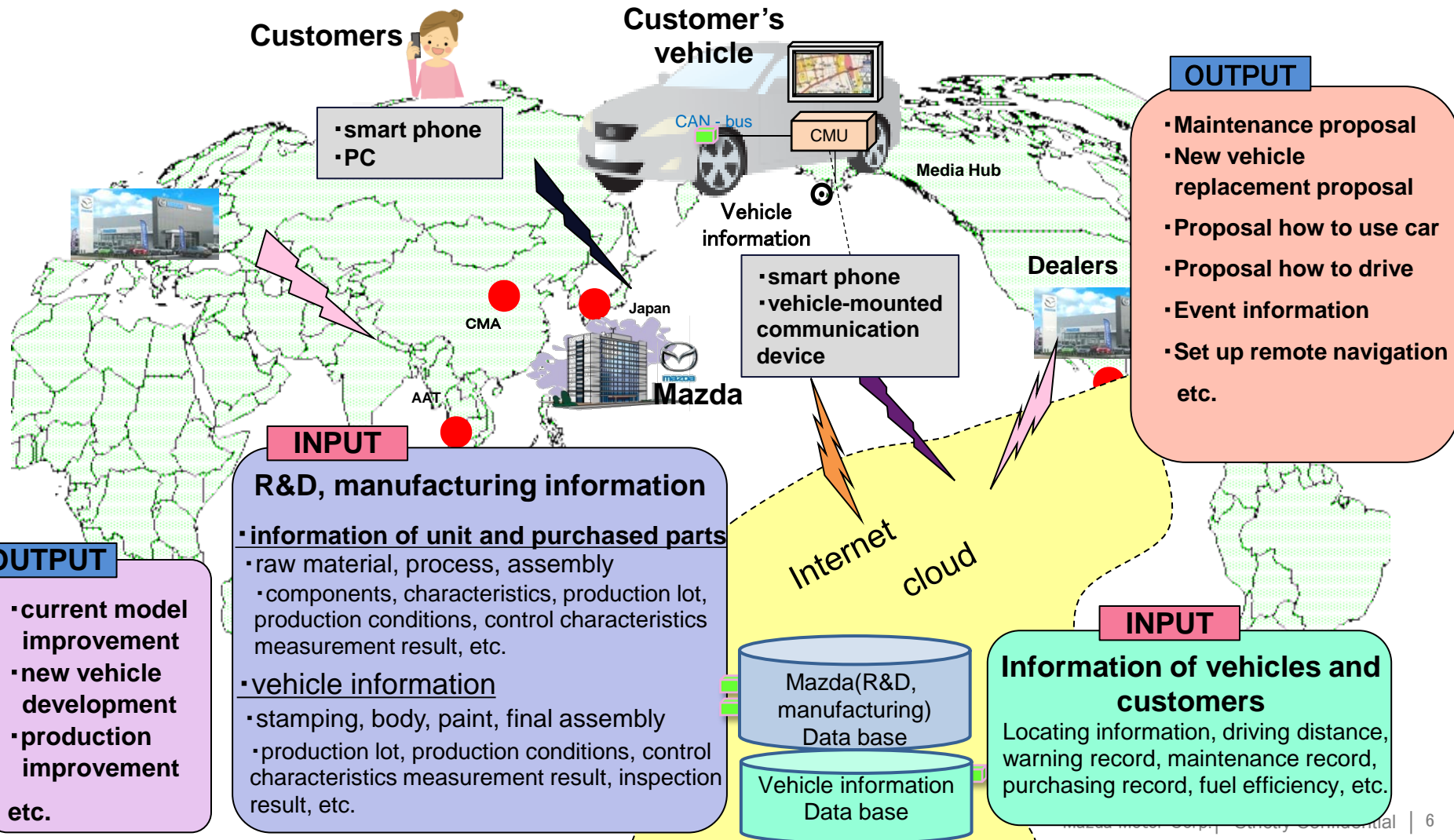Mazda

Measurement of vehicle characteristics
(Create big data of customer value)

Body manufacturing data accumulation

Input/Fr-L
Fr-R
Rr-L
Rr-R

Measurement by DDRS
More than thousands of CAN data can be obtained

Correlation between steering angle and yaw rate
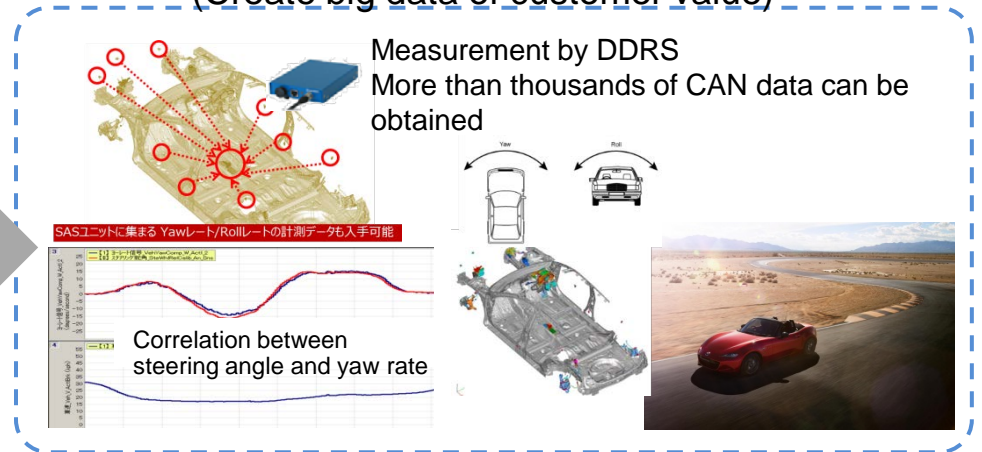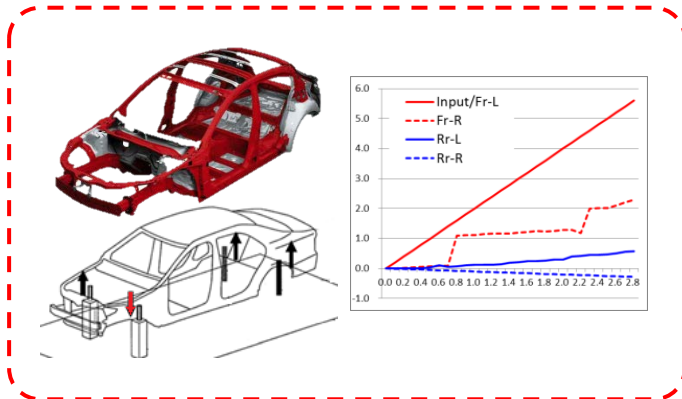
Image of final target

Use big data of manufacturing & market data fully by IoT and maximize customer value

Customers

- smart phone
- PC

Customer's vehicle

CAN - bus

CMU

Media Hub

Vehicle information

- smart phone
- vehicle-mounted communication device

Japan

CMA

AAT

Mazda

Dealers

OUTPUT

- Maintenance proposal
- New vehicle replacement proposal
- Proposal how to use car
- Proposal how to drive
- Event information
- Set up remote navigation
  etc.

INPUT

R&D, manufacturing information

- information of unit and purchased parts
- raw material, process, assembly
  - components, characteristics, production lot, production conditions, control characteristics measurement result, etc.
- vehicle information
- stamping, body, paint, final assembly
  - production lot, production conditions, control characteristics measurement result, inspection result, etc.

OUTPUT

- current model improvement
- new vehicle development
- production improvement

etc.

Internet cloud

Mazda(R&D, manufacturing) Data base

Vehicle information Data base

INPUT

Information of vehicles and customers
Locating information, driving distance, warning record, maintenance record, purchasing record, fuel efficiency, etc.

Thank you.