

DRIVING QUALITY

Through Toyota's Digital Transformation



PW
19

MYLENE MAYERS

Divisional Information Officer, IS After Sales
Information Systems, Toyota Motor North America

KEITH SKIDDLE

Sr. Manager Quality Systems & Technology
NA Quality, Toyota Motor North America

CHRIS ANSERT

National Manager NA Quality Systems
Information Systems, Toyota Motor North America

AGENDA

Toyota's North American Operations

Mylene Mayers

North America Quality Business Objectives

Keith Skiddle

Solution Overview & Lessons Learned

Chris Ansert

Q&A



TOYOTA US FOOTPRINT

10 Plants
in the U.S.³



365,000 Jobs
created in the U.S.¹



60
YEARS

operating in the U.S.

\$21.9 Billion



direct investment in the U.S.

\$32.9 Billion
parts & materials purchased²



1,334,691
vehicles produced

9 Models built in the U.S.⁴



Sienna
Sequoia
Highlander



Camry
Avalon
Lexus ES



Tacoma
Tundra



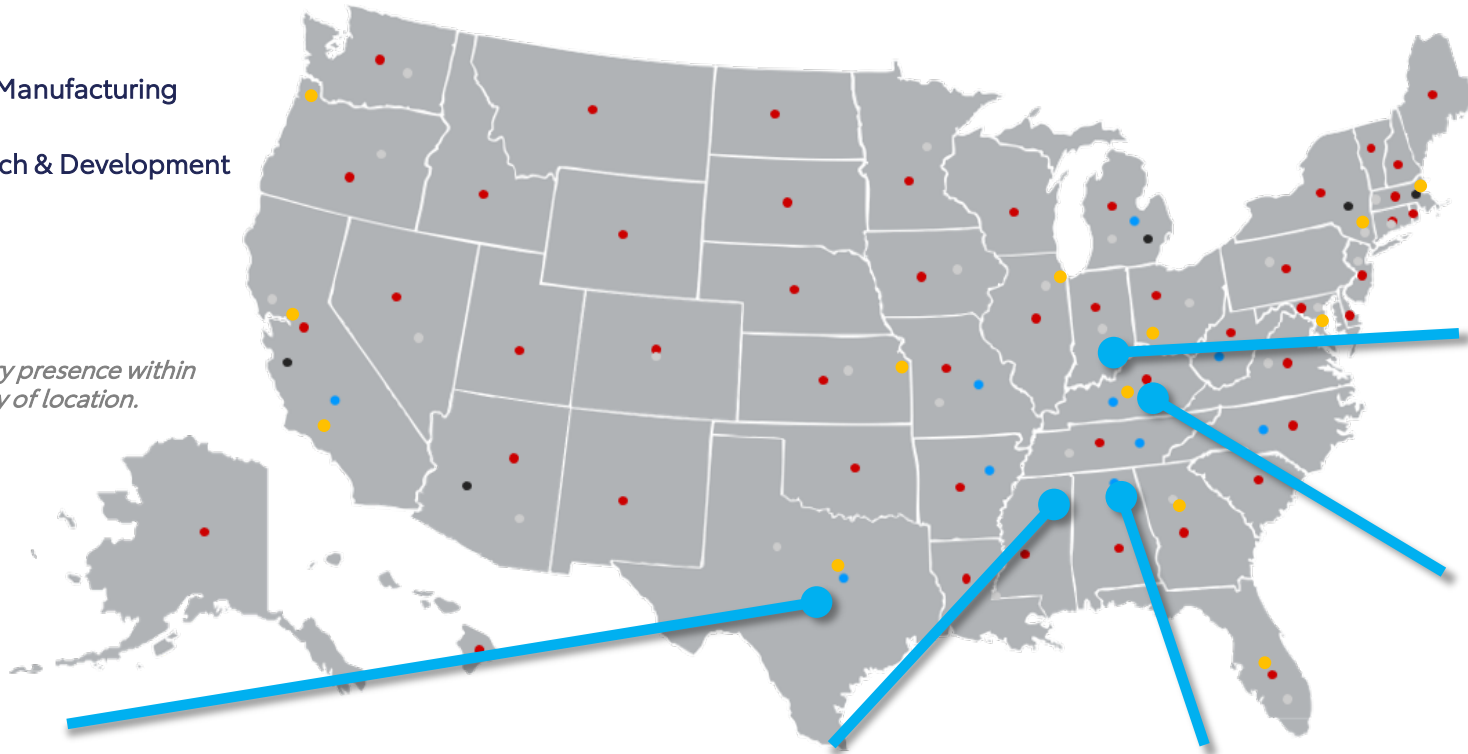
Corolla

TOYOTA VEHICLE OPERATIONS

United States 2019

- Offices
- Engineering & Manufacturing
- Design, Research & Development
- Dealerships
- Parts Centers

Dots represent category presence within a state and not quantity of location.



TEXAS



Tacoma



Tundra



Corolla

MISSISSIPPI

ALABAMA

COMING SOON:
Mazda / Toyota
Manufacturing US

INDIANA



Sienna



Sequoia



Highlander

KENTUCKY



Camry



Avalon



Lexus ES 350

Locations accurate as of January 2019.

TOYOTA VEHICLE OPERATIONS

Canada 2019

- Offices
- Engineering & Manufacturing
- Design, Research & Development

Dots represent category presence within a province and not quantity of location.



ONTARIO



Lexus RX 350



Lexus RX 450h



RAV4

Locations accurate as of January 2019.

TOYOTA VEHICLE OPERATIONS

Mexico 2019

- Offices
- Engineering & Manufacturing
- Design, Research & Development

Dots represent category presence within a province and not quantity of location.



BAJA CALIFORNIA



Tacoma

GUANAJUATO



Tacoma

Locations accurate as of January 2019.

MOBILITY TRANSFORMATION



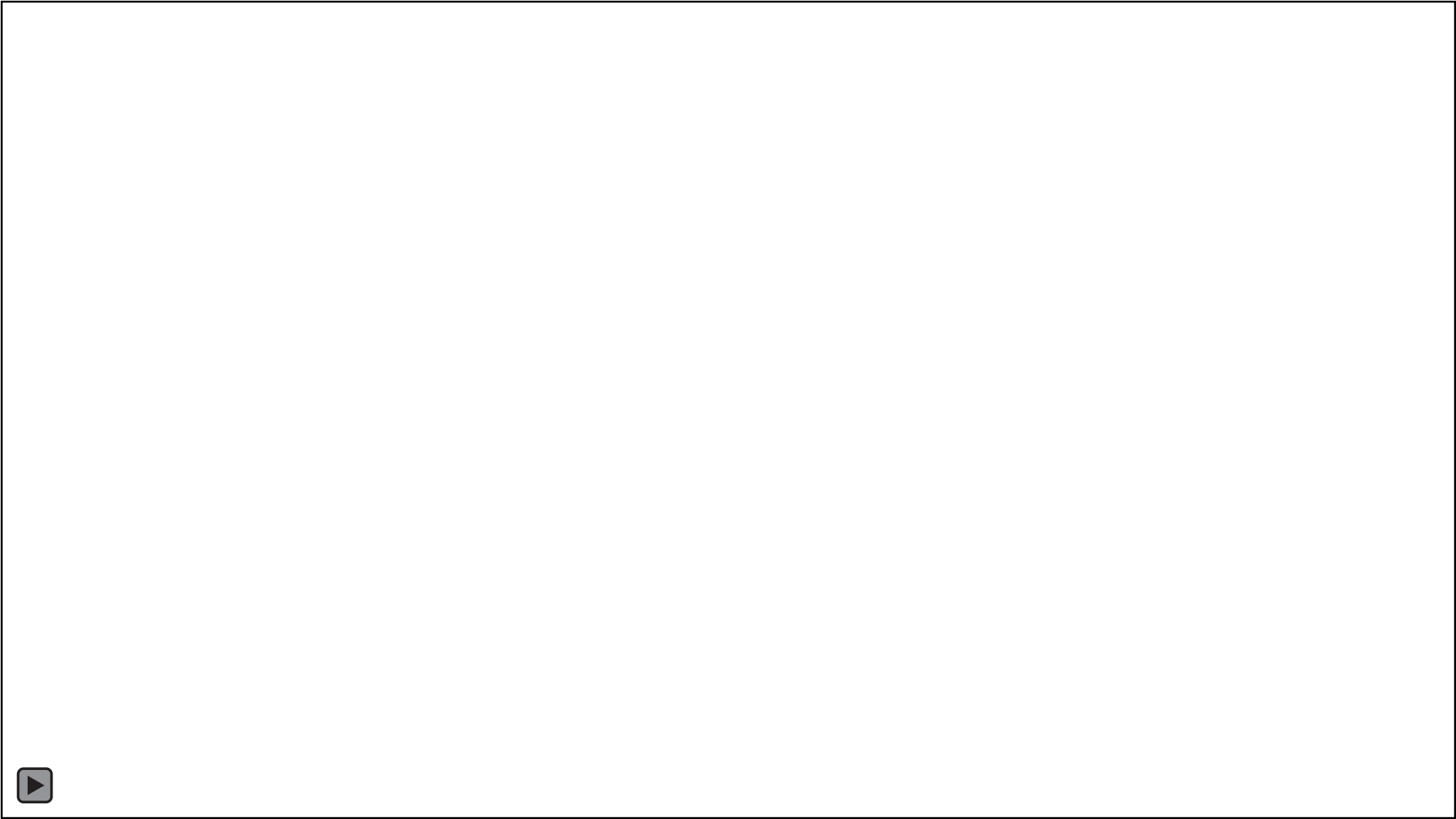
CHALLENGES:

- Non-OEM Competitors
- Dramatically different sense of speed
- New forms of mobility
- New mobility Fintech competition



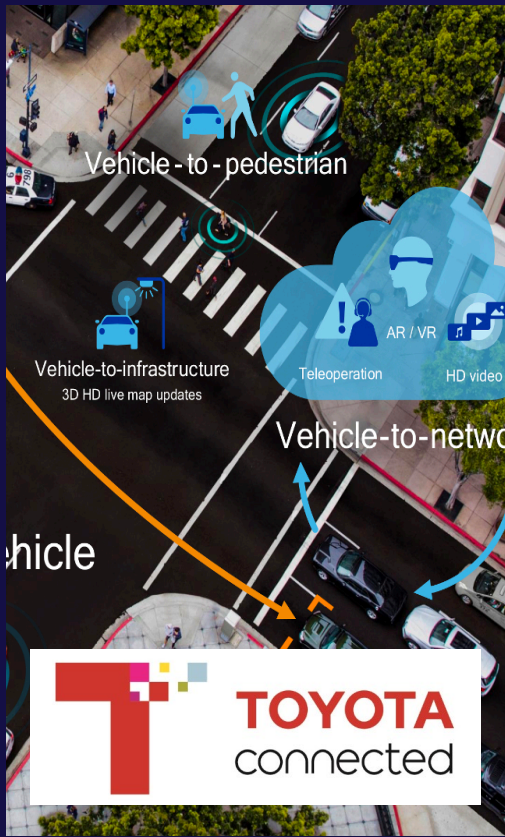
RESPONSE:

- C** CONNECTED
- A** AUTONOMOUS
- S** SHARED
- E** ELECTRIC



MOBILITY COMPANIES

CONNECTIVITY




Vehicle-to-pedestrian

Vehicle-to-infrastructure
3D HD live map updates

Vehicle-to-network

Teleoperation AR/VR HD video

Vehicle



TOYOTA
connected

MOBILITY (MaaS)



RIDE SHARING 37


FAB LAB

Pizza Delivery



MOBILITY MaaS

AUTONOMOUS



TOYOTA
RESEARCH INSTITUTE

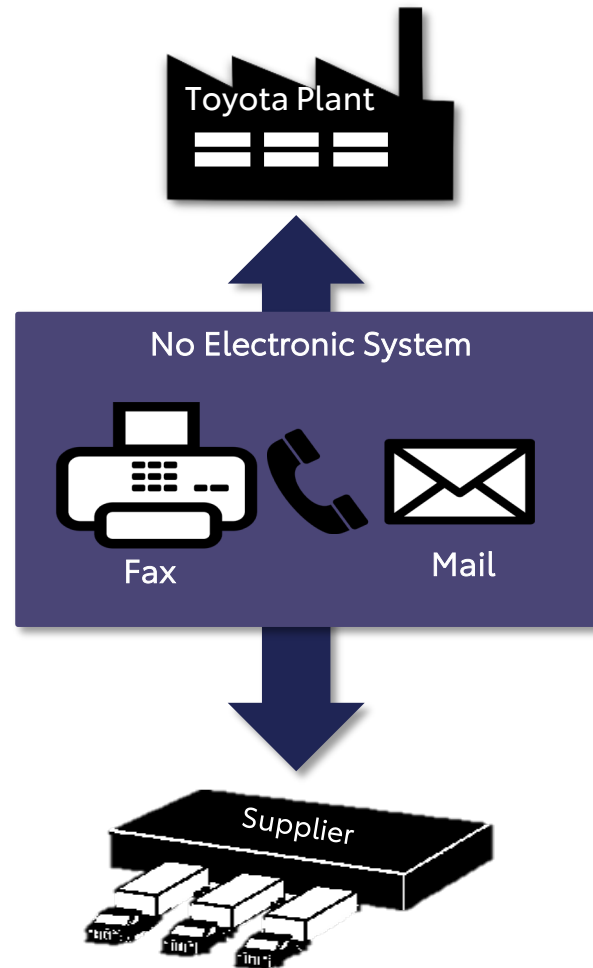
Quality Information Management Systems (QIMS) Overview

IN THE BEGINNING

Manual paper processes



Typical Work Station File Cabinets, Limited Computers & Fax Machines



BUSINESS IS TRANSFORMING

Core Systems need to be scalable

MARKET



REGULATORY



TRADE

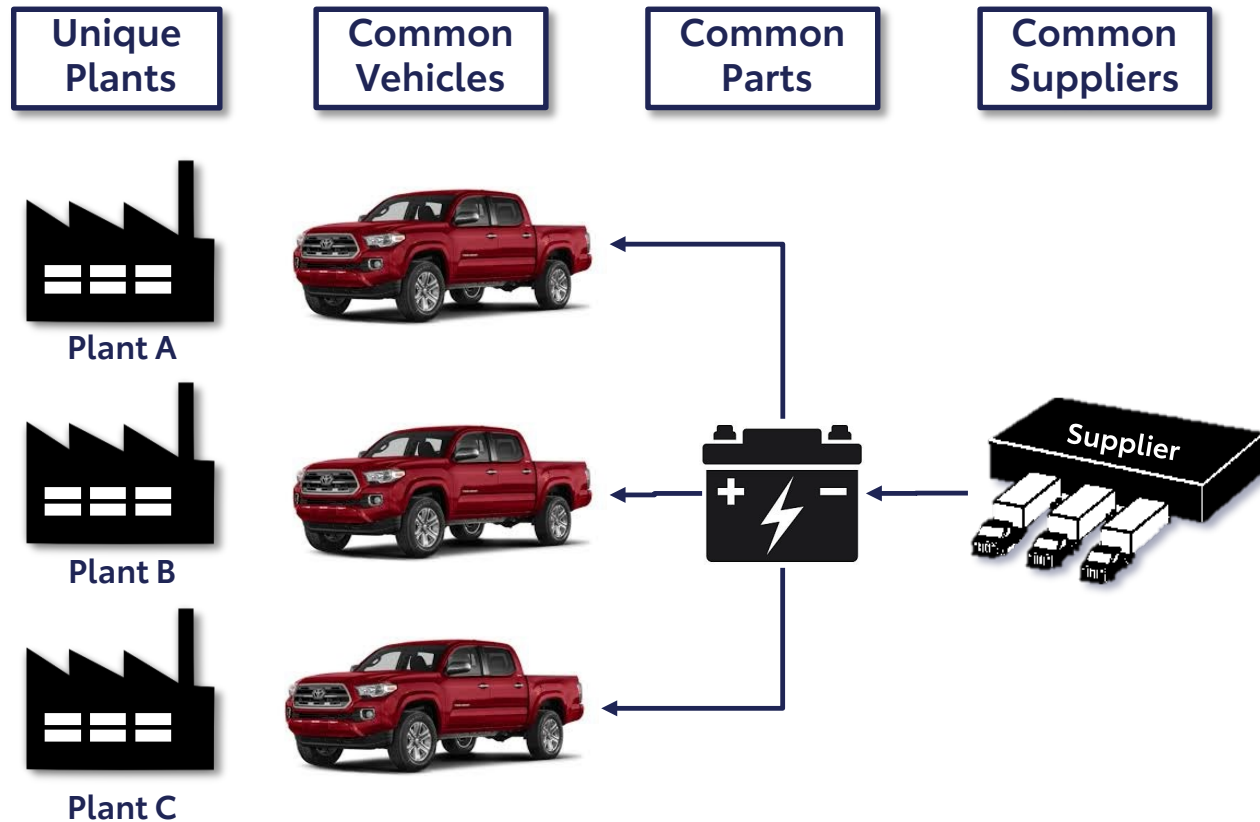


MOBILITY



BUSINESS IS TRANSFORMING

Core Operations need to be flexible



Multiple
Toyota Plants
using
Common
Supplied
Parts

Today's Challenges

- ✓ **Strengthening Our Core:**

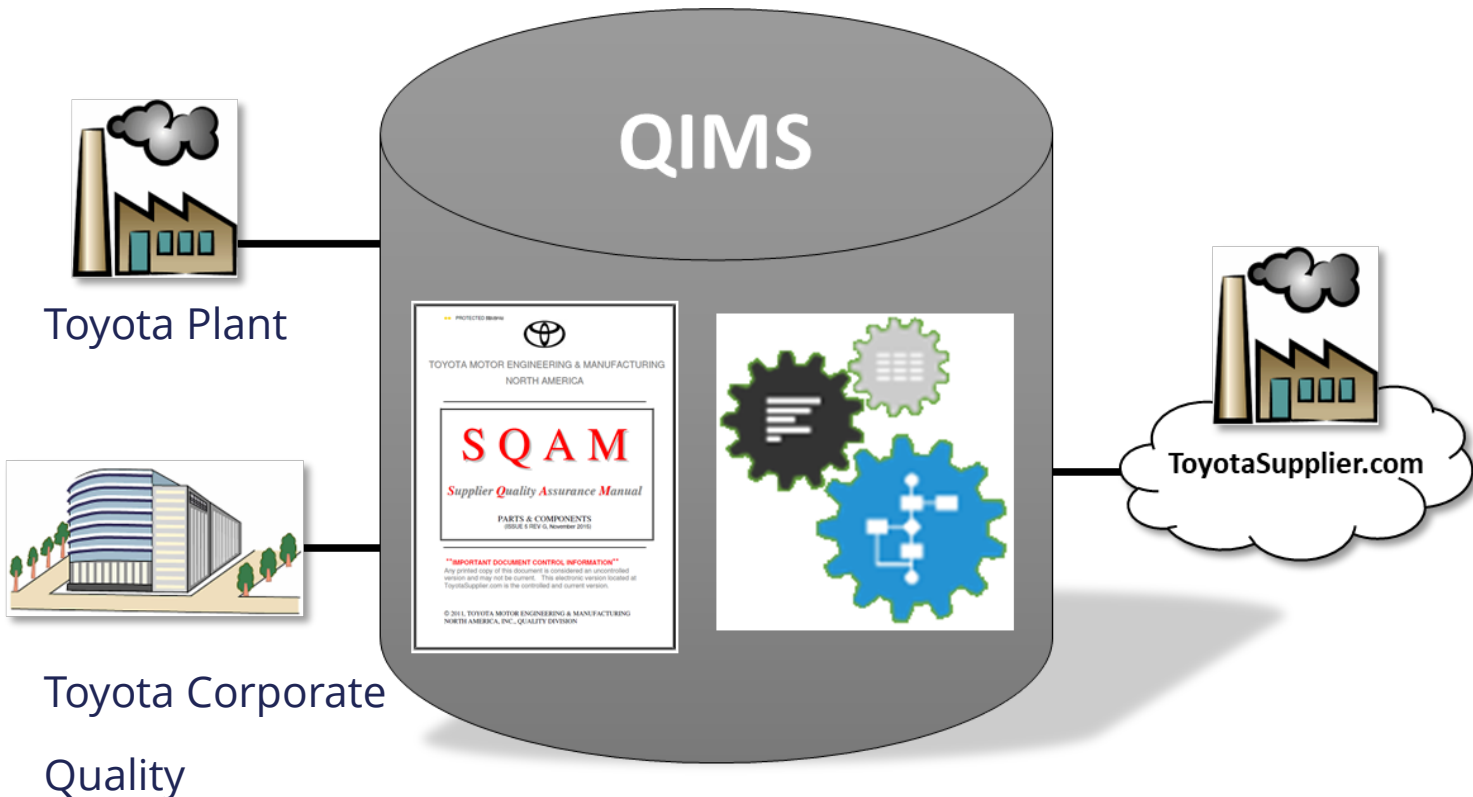
Making work flows more efficient & visualizing performance

- ✓ **Customer Delight:**

Incorporating ALL the Customers Voice as our Business Transforms

BUSINESS PROCESS OVERVIEW

Quality Information Management System (QIMS)

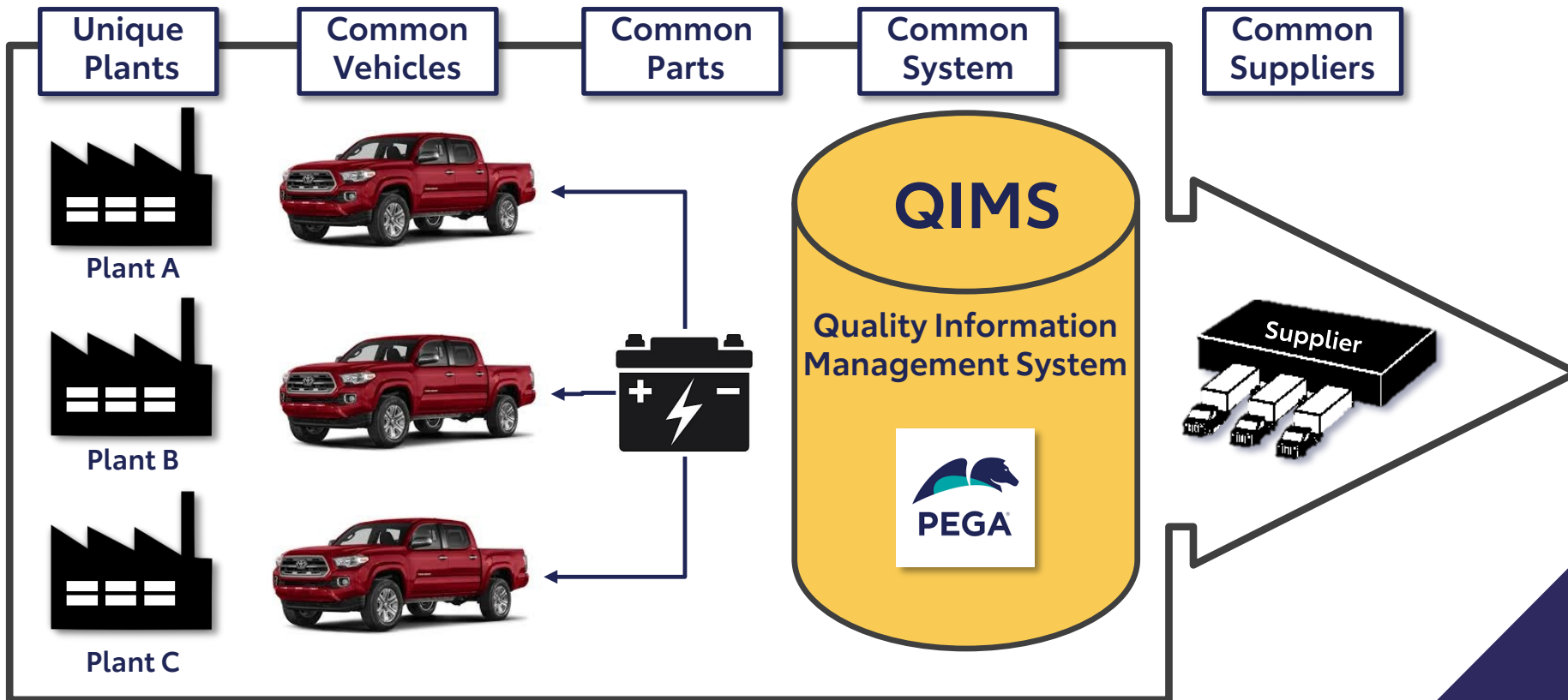


GOALS:

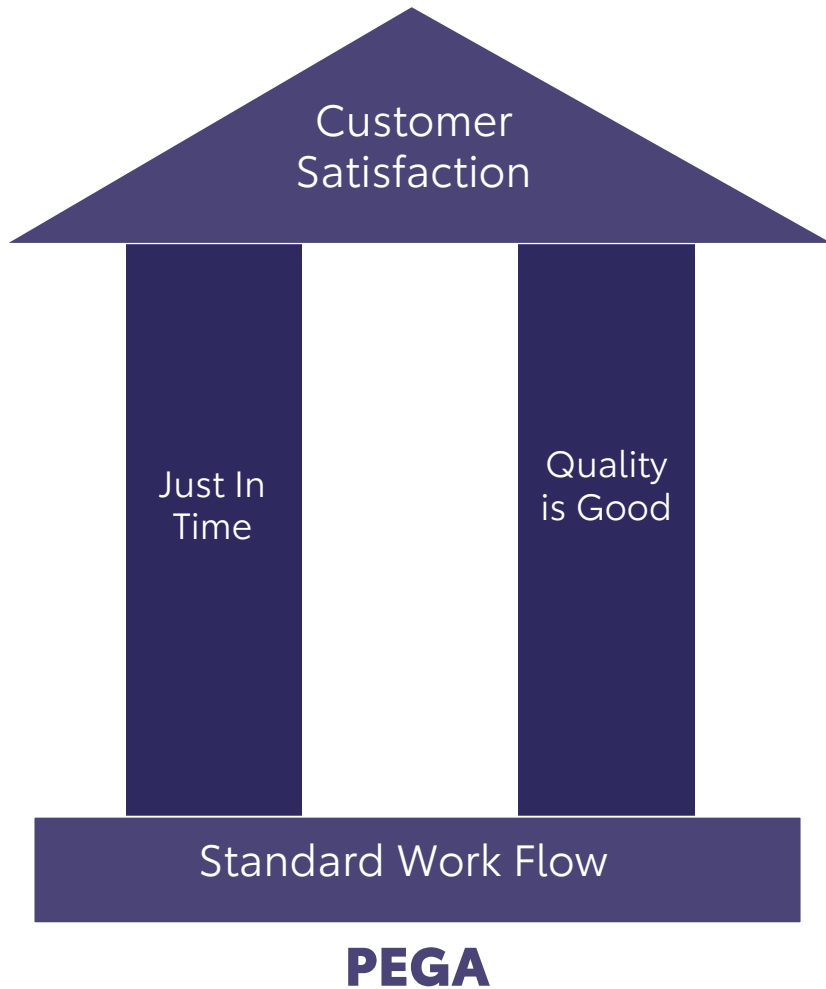
- Standardize Regional Workflows
- Automate Quality Process interactions between Toyota & Our Supply Base

2ND GENERATION

Objective: Systems NEED to be Automated, Flexible, & Scalable



Share information across multiple Toyota plants and supplier



A **Toyota Production System**
(Productivity Element)

The Toyota Production System is a framework of concepts & methods to achieve continual gains in productivity while satisfying Customer Expectation for Quality & Delivery.

B **Ji Kotei Kanketsu**
(Quality Element)



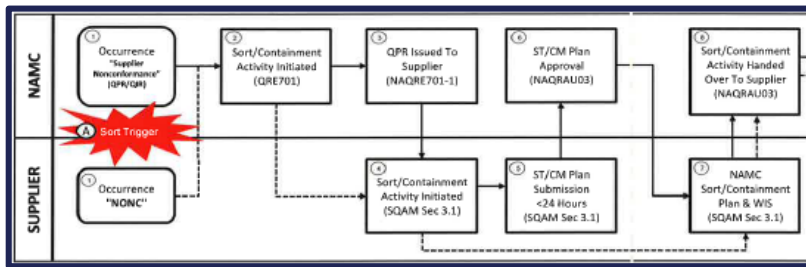
Building in Quality with Ownership

APPROACH:

1. Identify who the customers are
2. Identify the final outputs of the job
3. Develop an optimal work flow

Standard Work Flow

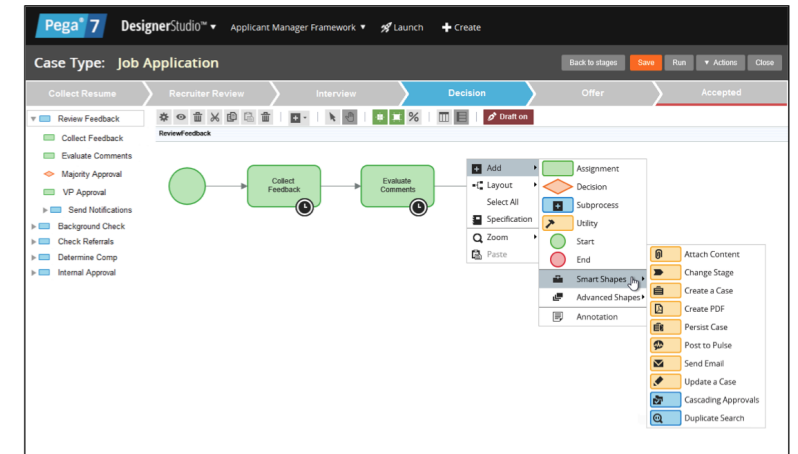
Toyota Way of Quality



Standard Work Flow



Incorporate Policy Requirements (Quality Thinking)



Utilize PEGA Work Flow

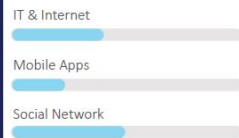
CUSTOMER DELIGHT

Ji Kotei Kanketsu

MANUFACTURING



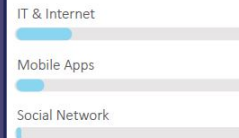
Technology:



RECEIVING & INSPECTION



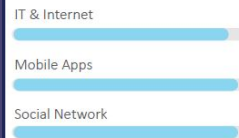
Technology:



QUALITY ENGINEERING



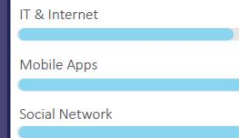
Technology:



MIDDLE MANAGEMENT



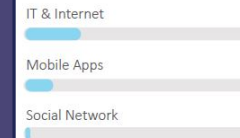
Technology:



SENIOR EXECUTIVES



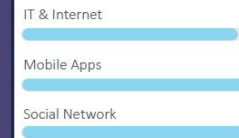
Technology:



SUPPLIERS



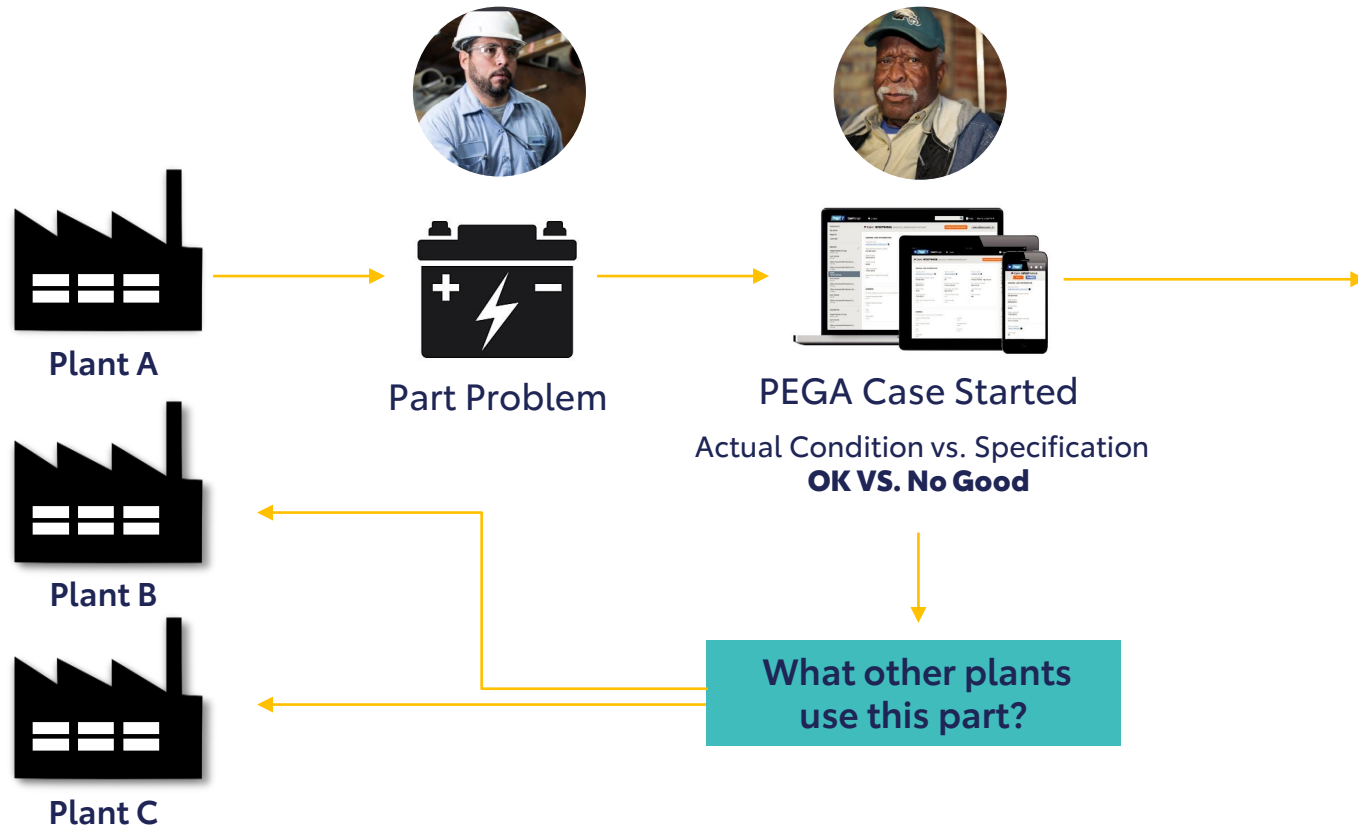
Technology:



Workflow designed with each Customer's Data Needs and Skill Sets

MULTIPLE PATHS

Toyota Way of Quality

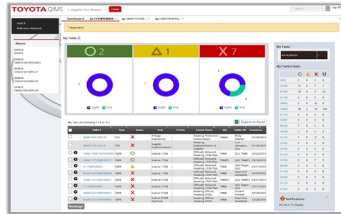


All involved parties are notified of issue depending on role in process

CUSTOMER DELIGHT

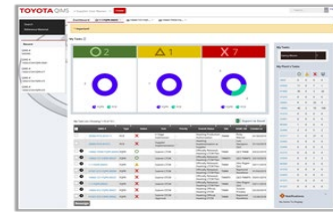
Visualizing Performance

MANUFACTURING



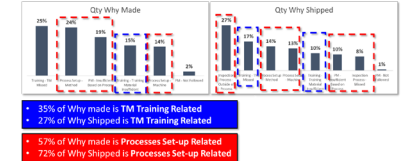
Example:
Productivity Impact

QUALITY ENGINEERING



Example:
Judgment Required (approval)

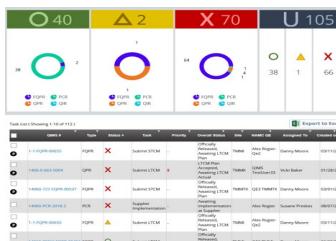
EXECUTIVE MANAGEMENT



Example:
Cost of Quality

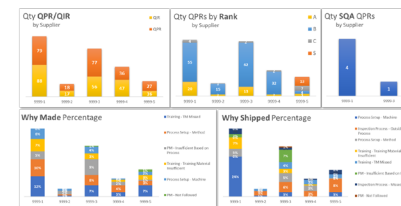
Visualizing Daily Task Prioritization & Quality Performance

RECEIVING & INSPECTION



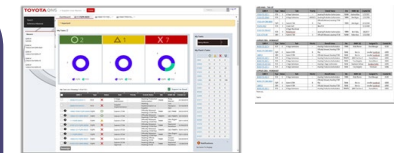
Example:
Parts on Sort

MIDDLE MANAGEMENT



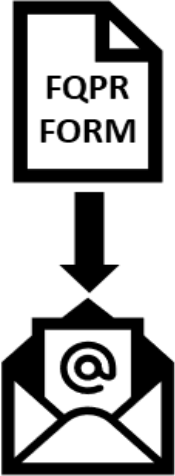
Example:
Supplier Impact to Operations

SUPPLIERS



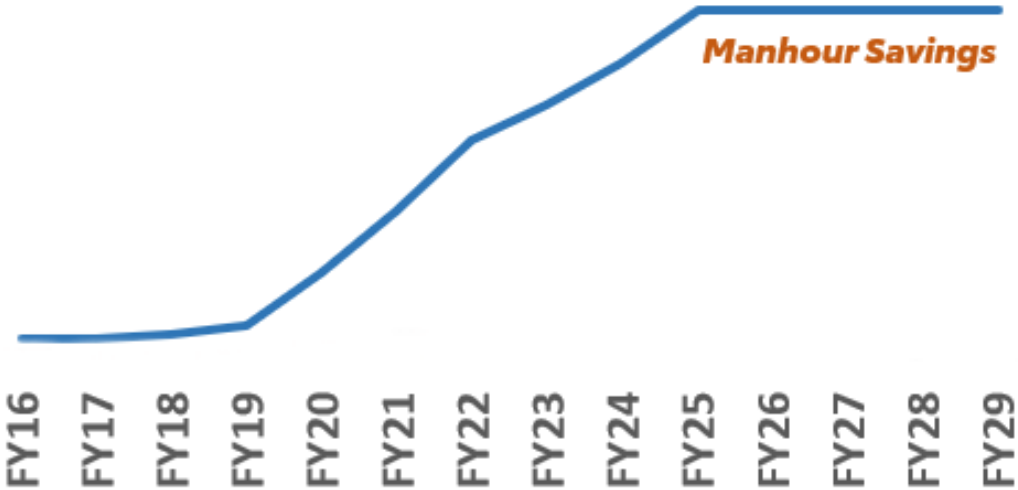
Example:
Response Due Dates

Field Problem Handling



Digitally transforming process will reduce the Early Resolution by 300%

Toyota & Supplier Engineer Efficiency Gains



Digitally transforming process with automation will increase engineer efficiency by over 10%

THE FUTURE

A Digital Transformation & Mobility for All



Data

Analytics

Visualize

**FIND
PROBLEM(S)
BEFORE
CUSTOMER
RECEIVES**

- Identify/resolve problem(s) before customer receives product
- Quickly adjust to the changing business landscape

Approach & Delivery Methodology – Our Journey to Agile

OUR PEGA JOURNEY



- PEGA was new platform
- First 2 products delivered by PEGA Professional Services

2016



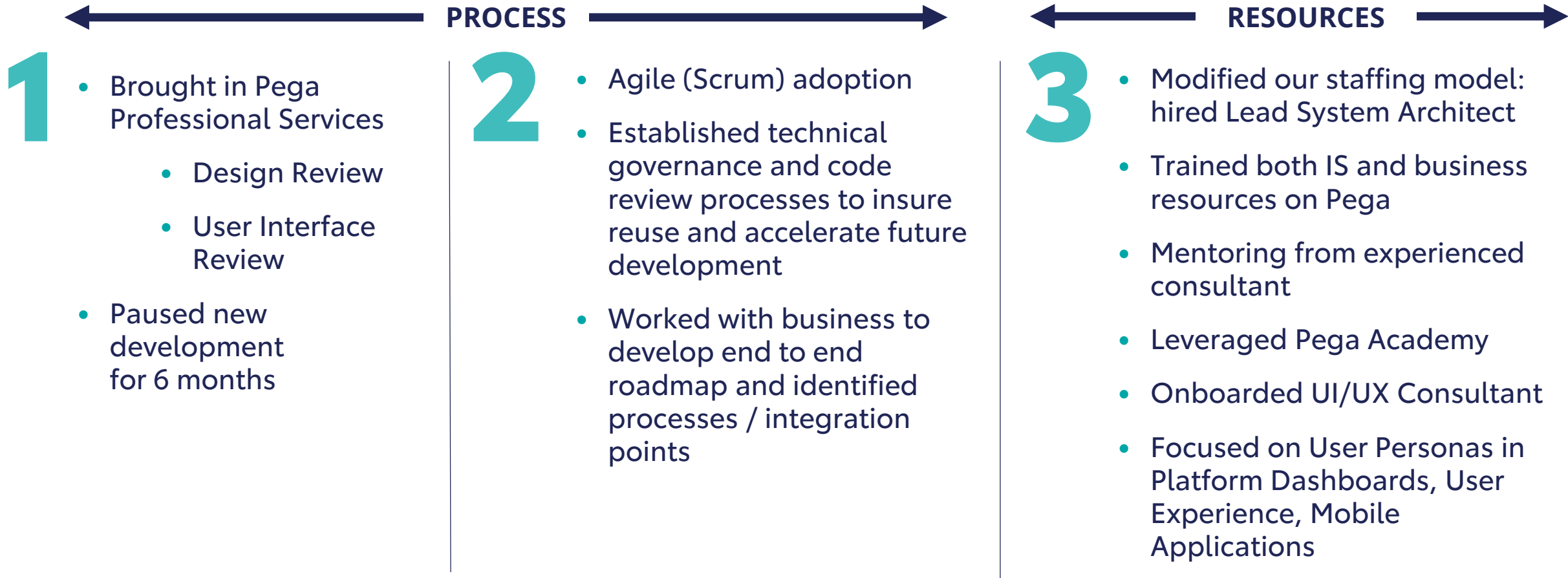
- Second set of 2 products delivered by internal resources and contract staff
- Slow Delivery
- Difficulty adapting to change
- Little to no feedback loops from users
- Methodology approach must change

2017



- Identified Resource and Process gaps in delivery model

COUNTERMEASURES



THE TOYOTA WAY & AGILE



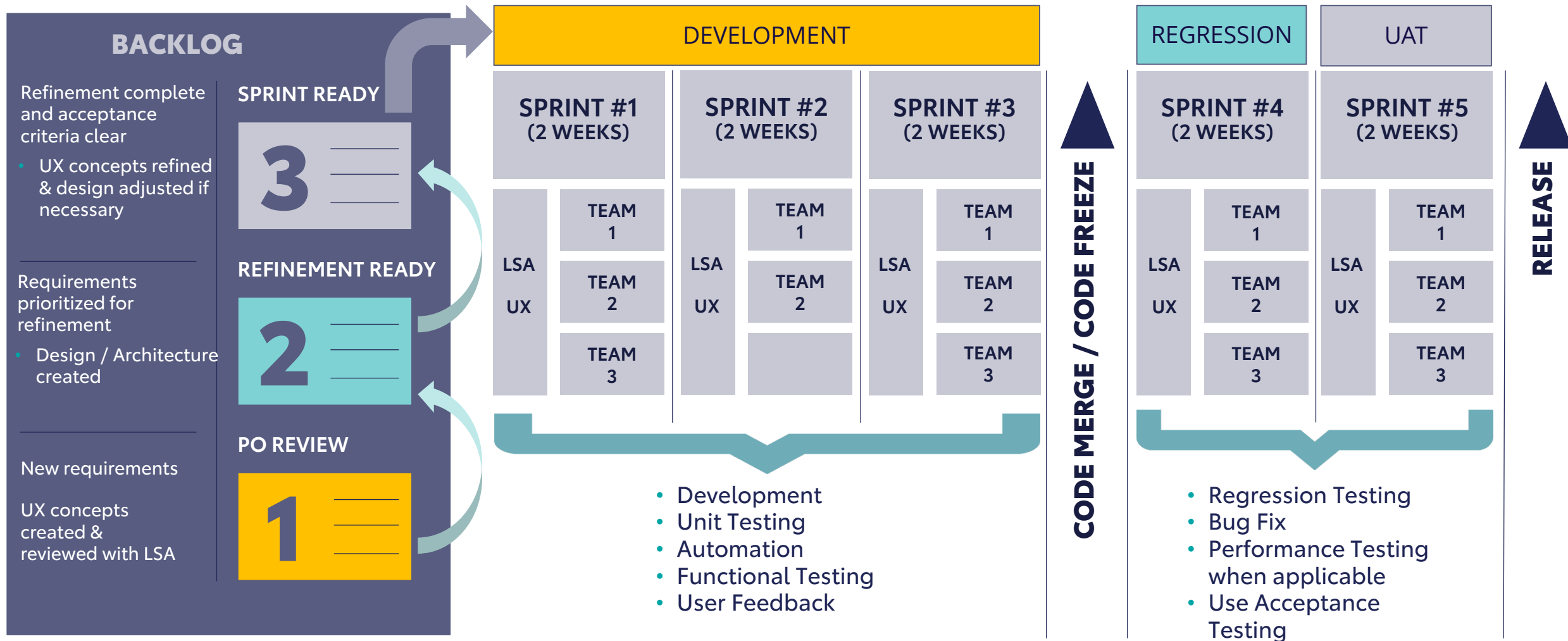
"The Toyota Way must be practiced every day in a very consistent manner, not in spurts"

- Taiichi Ohno,
Considered Father of Toyota Production System



Scrum is a standard repeatable process for PDCA

SCRUM APPROACH



RESOURCE MODEL



BEFORE (2016/2017)

- Business SME
 - Program Manager
 - Business Analyst
- } No PEGA Knowledge
- Technical Team
 - CSSAs 70%
 - CSAs 30%

CURRENT 2019

- Business SME
 - Program Manager
 - Business Analyst (CPBA)
- } PEGA Business Architect Training
- Technical Team
 - CLSAs 15%
 - CSSAs 70%
 - CSAs 15%
 - UX Designer
 - Automation Resources

Solution & Technology Stack

BUSINESS & IT COLLABORATION



Business

- Respond to Business Changes
- Standard Business Processes
- Process Visibility
- Process Audits
- Add new apps quickly



IT

- Reusability
- Integration to Legacy Systems (API/Services)
- DevOps (CI/CD)
- Mobile Capability
- Integrated Platform (Process/UI)

QIMS LAYER CAKE



QIMS

LC NCD PCR FQPR ICF

REUSABLE RULES INTEGRATION: OTHER CORPORATE PEGA APPLICATIONS

**Toyota
Org**

ORG RULES

INTEGRATIONS: EXTERNAL DB, SOAP, REST

Pega

PEGA MANUFACTURING

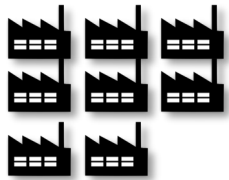
CASE MANAGEMENT

BRANCHING REPORTING BIX AGENTS MOBILE AES/PDC

QIMS ARCHITECTURE

14 NORTH AMERICAN PLANTS

8* VEHICLE PLANTS



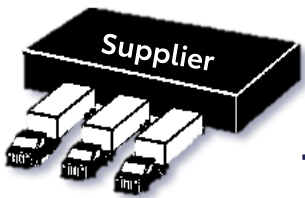
+

3 UNIT PLANTS



+

800 SUPPLIERS



=

OVER 6,500 USERS

ToyotaSupplier.com

Quality Systems in AWS VPC

Application

App Layer

LC NCD PCR FQPR ICF

ORG Layer

Integrations: External
DB/SOAP/REST

PEGA 7.3

Manufacturing Fwk. (7.31)

BIX Reporting MOBILE

AES/PDC Agents

DATA

TOYOTA (North America)

Authentication & Identity
Management

Manufacturing
Quality Systems

Material Quality
Assurance Systems

Purchasing Systems

Production Control Systems

Manufacturing
Data Warehouse

TOYOTA (Japan)

Global Parts Systems

QIMS is a high availability system supporting:

- 14 North American Manufacturing Plants
- 8* Vehicle Plants
- 3 Unit Plants
- 800 Suppliers
- 6,500+ Users per Week
- 19,500 Toyota Specific Rules
- 5 Case Types

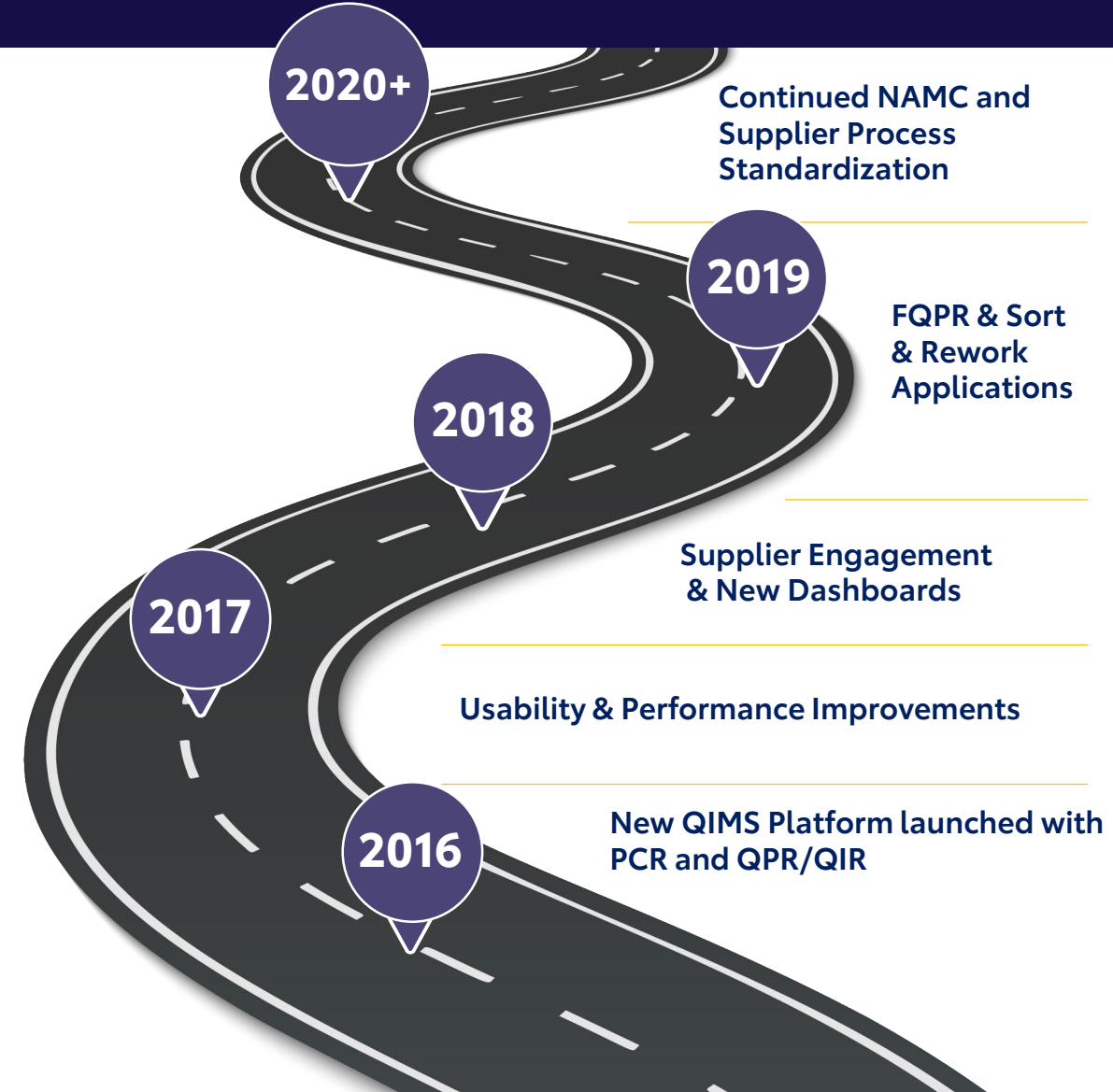
QIMS PEGA TECHNOLOGIES & ROADMAP

Currently in Production

- ✓ Autonomic Event Services
- ✓ High Availability
- ✓ Omni Channel
- ✓ Decisioning
- ✓ Business Intelligence Exchange
- ✓ Integrations
- ✓ Reporting

Future Roadmap

- ✓ Direct Web Access
- ✓ Dev Ops
- ✓ Advanced Decisioning
- ✓ Robotic Process Automation
- ✓ Integration
 - ✓ Kafka
 - ✓ Sketch
- ✓ Cloud Secondary Storage for Archival on Inactive Cases



LESSONS LEARNED

INFORMATION SYSTEMS

- ✓ **Technical Governance (CoE)**
- ✓ **Co-located Teams (Business & IS)**
- ✓ **Ruleset Architecture**
- ✓ **Importance of Lead System Architect**
- ✓ **Importance of PEGA Business Architect**
- ✓ **More Time & Priority on Reporting**
- ✓ **Importance of UI/UX Resource**
- ✓ **Invest in Test Automation**

BUSINESS

- ✓ **Ability to reuse business work flows**
- ✓ **Continuity in multiple applications is critical**
- ✓ **Recognizing all stakeholders**
- ✓ **Establishing the role of SME**
- ✓ **Regional workflow standardization**
- ✓ **Dedicated Product Owners**
- ✓ **Vision to link all applications**

THANK YOU TO OUR TEAM



PRODUCT OWNERS

- Chad Johnson (CPO)
- Banji Adebayo
- Lisa Wink

BUSINESS STAKEHOLDERS

- Reuben Reyes
- Emmanuel Kwizera
- Quality Control Teams
- Supplier Engineering & Development
- NA Suppliers

TECHNICAL LEADS

- Dianne Adams
- Erika Takahagi

ARCHITECTURE LEADS

- Srdjan Stekovic
- Amanda Lee
- Sam Rayi

DEVELOPMENT TEAMS

- Tamika O'Conner
- Munish Rajendran
- Erica Mukherjee
- Pratik Joshi
- Erica Mukherji
- Gopal Pathivada
- Sai Yarabati
- Prashanth Bhavani
- Ram Munirathinam
- Monika Reddy
- Sundar Varadhan
- Madhu Ramaswamy
- Sadhasivaraj Malathi
- Balaji Subramaniam
- Manjunath Mahadev
- Sadha Malathi
- Preston Lau
- Sean Robinson



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Build for Change[®]