PD at the Crossroads: Changing the Focus From Parts to Systems

WHIRLPOOL CORPORATION

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Great Lakes Regional Conference
SYSTEMS AT THE CROSSROADS
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GLRC 2018
INCOSE

WE'RE REACHING ACROSS THE WORLD

Our brands serve consumers in every region

OUR SCALE AND REACH CREATE GROWTH OPPORTUNITIES

Whirlpool CORPORATION

$21B
Annual sales

70
Manufacturing and R&D centers

92K
Employees worldwide

Whirlpool CORPORATION
#1
WORLD'S LEADING MANUFACTURER OF MAJOR HOME APPLIANCES

MORE THAN
70 million
PRODUCTS SOLD
each year

1911-1948
- Manufacturing
- One Product
- One Customer

1948-1970
- Product Expansion to Full-line
- Whirlpool Brand

Whirlpool

2007-2015
- Global Financial Crisis
- Volatile Global Marketplace
- Indesit & Hefei Sanyo

2000-2007
- Innovation
- Maytag

Whirlpool CORPORATION
1911-2017

1970-1980
- U.S. Trade Expansion
- #1 U.S.

1990-2000
- Globalization: Europe, Latin America, Asia
- #1 Globally

1980-1990
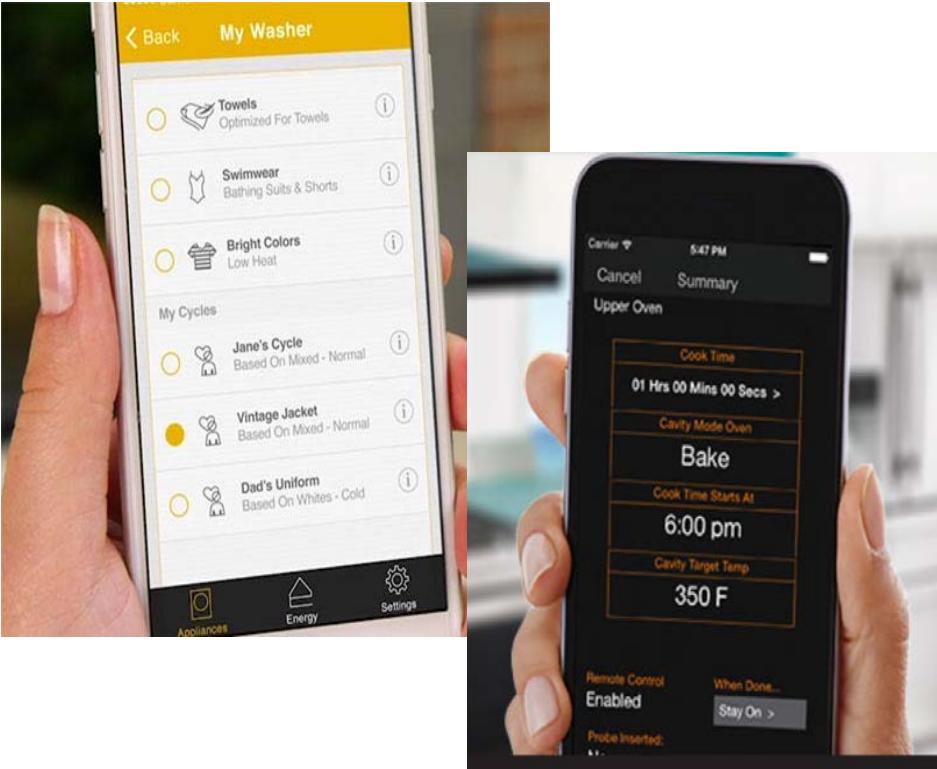- Multi-Brand: Whirlpool, KitchenAid, Roper, Estate
- #1 N. America

THE LANDSCAPE IS CHANGING QUICKLY…

THE LANDSCAPE IS CHANGING QUICKLY...

THE LANDSCAPE IS CHANGING QUICKLY…

WE ARE DEALING WITH A SYSTEM OF SYSTEMS

THE LANDSCAPE IS CHANGING QUICKLY…

WE ARE CREATING A CUSTOMER JOURNEY

IN THIS RAPIDLY CHANGING MARKET WE NEEDED SPEED AND PREDICTABILITY

FPY for the overall product was several points below components' and subsystems', showing clear integration challenges.

Problem solving felt at times like whack a mole. One attribute improvement resulted in an unpredicted change of another.

The cost of complexity was high because multiple **identical or nearly identical parts exist globally.**

Feasibility assessments were slow and often required expensive prototype assets.

Late discoveries happened when component variations were experienced showing a lack of functional robustness.

Software was used late in the programs as a plug resulting in proliferation and some lack of robustness.

TO DRIVE SUCCESS WE CONCLUDED THAT WE NEEDED BETTER SYSTEM KNOWLEDGE AND DESIGN
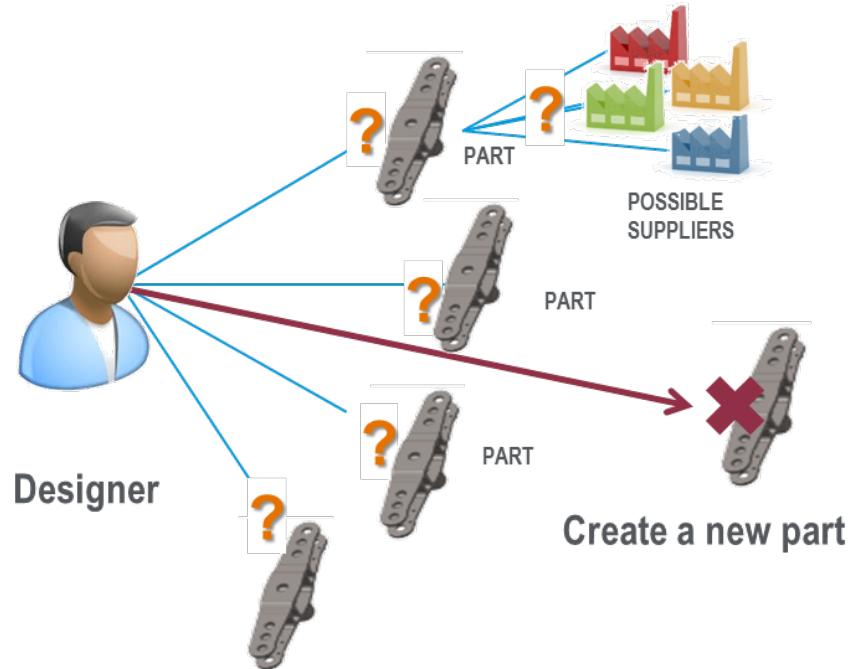
INNOVATION WITH SPEED AND PREDICTABILITY

In Use (IOT)

"Large scale, global PD **transformation** including **MBSE** is possible and can be **scaled up** relatively quickly within your organization given the right **focus**, **management support** and **follow through**"

SYSTEM
then
PART

START THE PROCESS OF TRANSFORMATION...
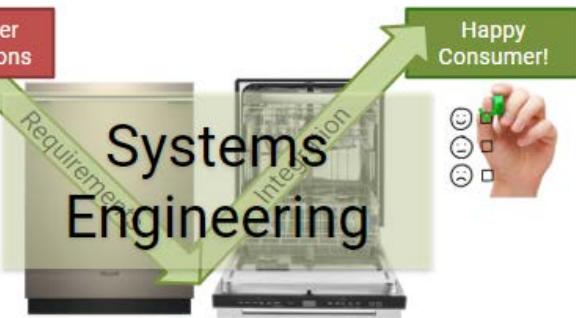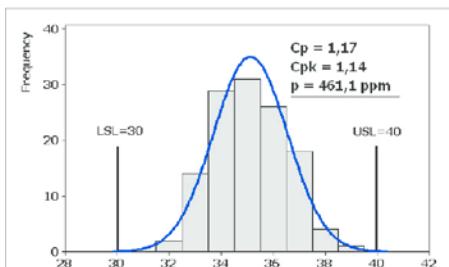
Align On The Approach

Create A Few
Thought Leaders

Bring Outside Help

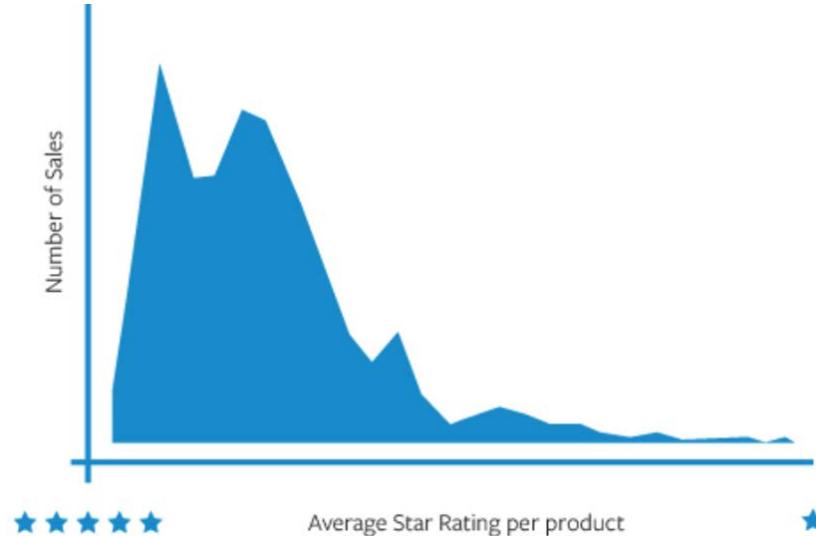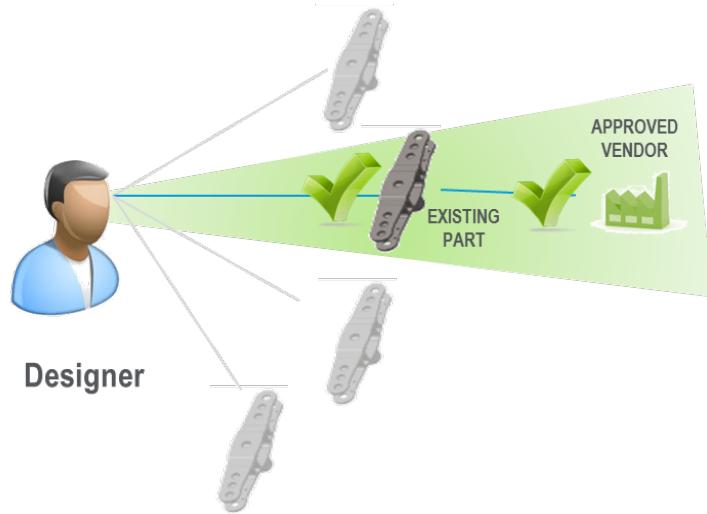OUR JOURNEY ACCELERATED QUICKLY AFTER THE TRAINING AS OUR APPROACH WAS A LOT CLEARER...AND THUS EXPLAINABLE!

**When in doubt,
make it stout,
out of things you know
about**

PROPER SYSTEM ENGINEERING IS A MORE INTERESTING AND ENGAGING WAY OF WORKING FOR EVERYONE!

Whirlpool CORPORATION

APPROVED VENDOR

EXISTING PART

Designer

Number of Sales

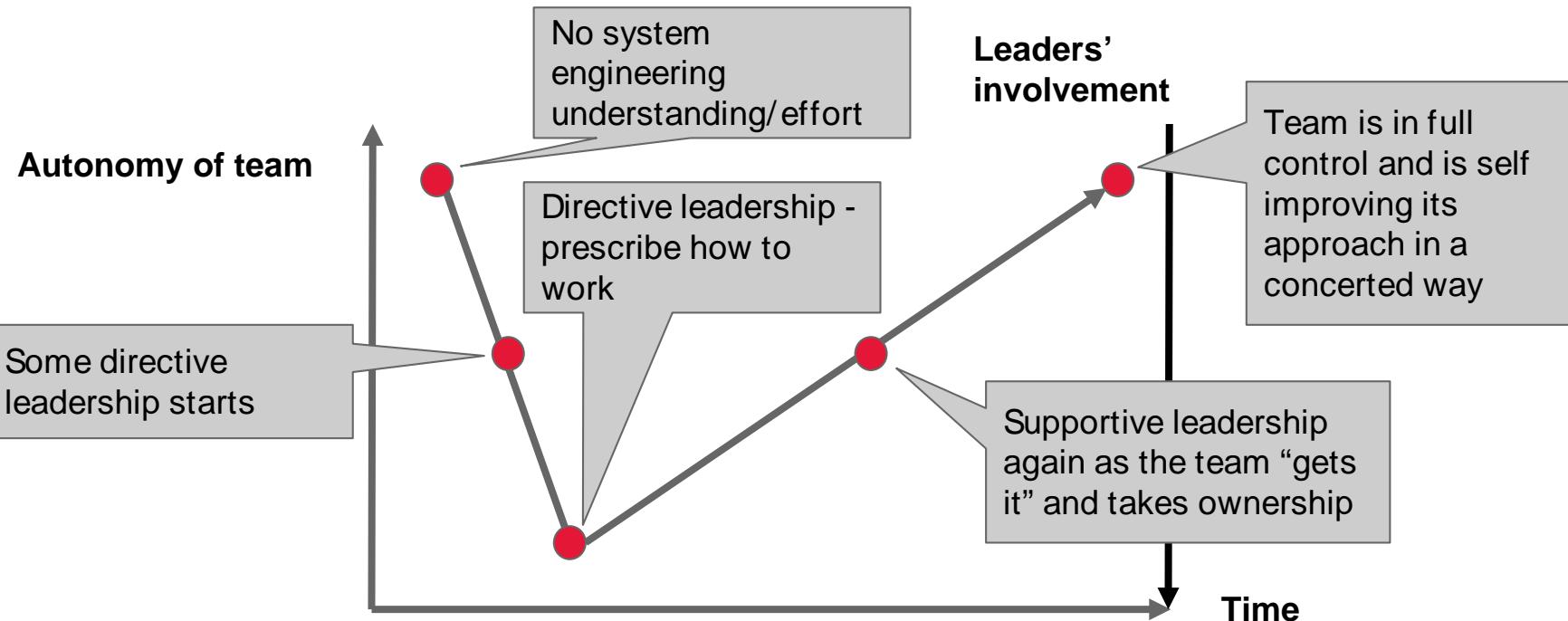★★★★★   Average Star Rating per product   ★

THEN ADVERTISE MEANINGFUL BUSINESS RESULTS

THE DISH PLATFORM CREATED A "PULL" FROM THE REST OF THE ENTERPRISE

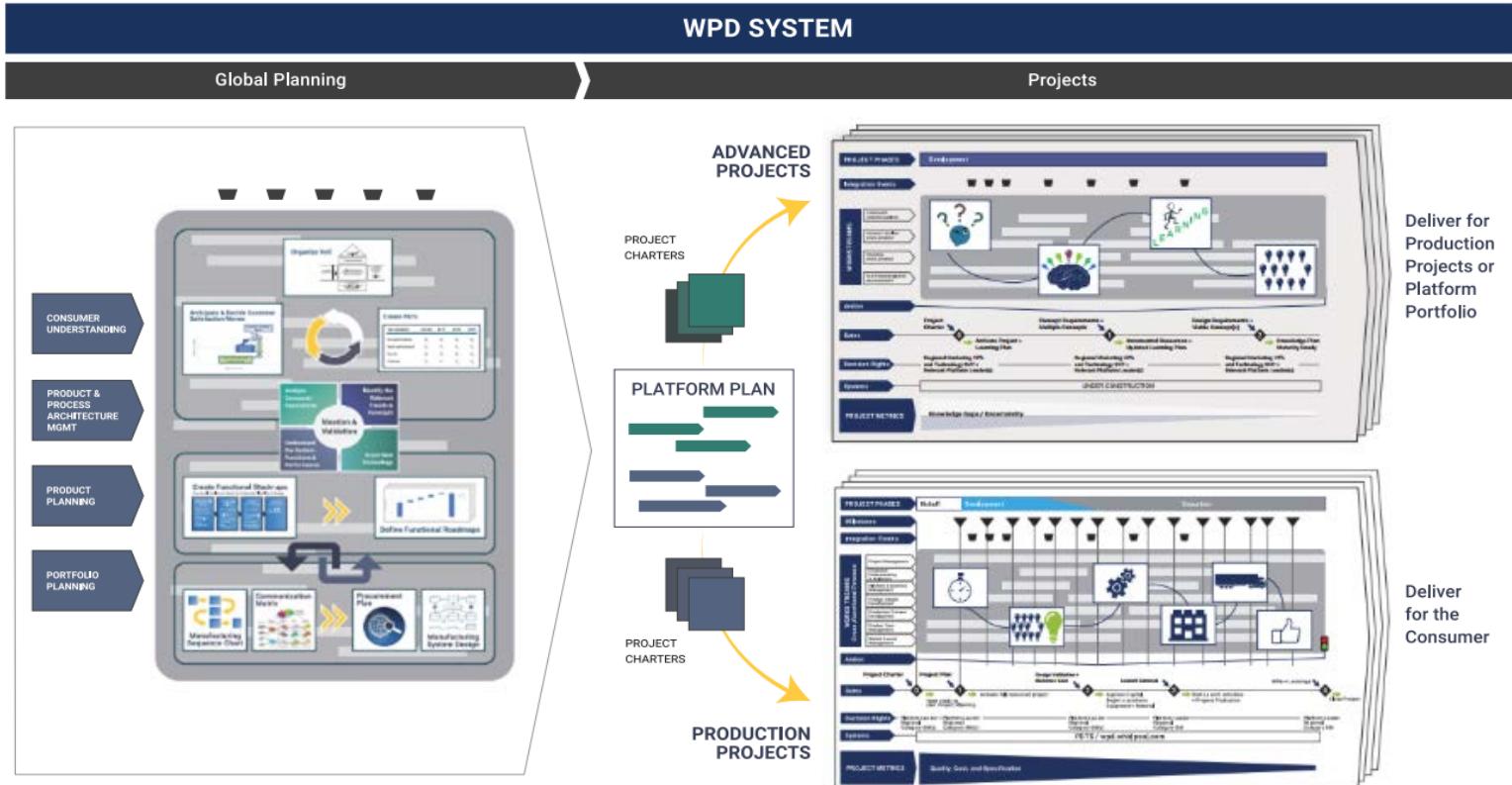# …WHICH MUST BE LED THE RIGHT WAY…

IT IS UNFAIR & UNSUSTAINABLE TO ASK A TEAM TO CHANGE WITHOUT CLEAR LEADERSHIP

SO WHAT DID WE DO AT THE CROSSROADS?

WE MADE SYSTEMS ENGINEERING THE CORNERSTONE OF OUR PRODUCT DEVELOPMENT TRANSFORMATION

WE CHOOSE TO REINVENT THE PD FUNCTION
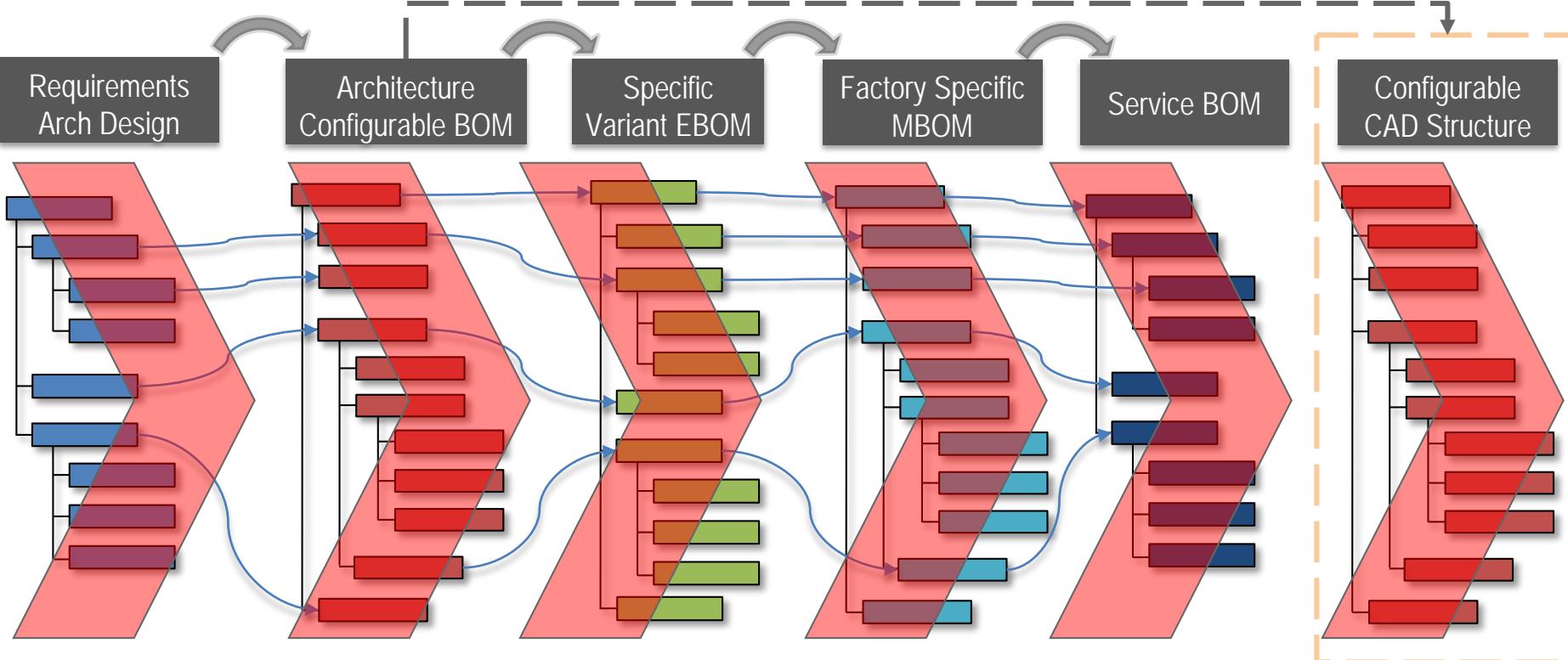
AND BETTER ALIGN THE ORGANIZATION

Whirlpool CORPORATION

Global Product Organization

| Strategic Planning & Project Leadership Office | Product Development Excellence | Global Consumer Design | Global Platforms | Global Technology | Global Quality | Global Product Safety & Regulatory Affairs | Corporate Center Support Functions |

WE CREATED A HIGH AUTHORITY CENTRALIZED DEPARTMENT WITHIN THE GLOBAL PRODUCT ORGANIZATION

WE DID AN INITIAL HEALTH ASSESSMENT
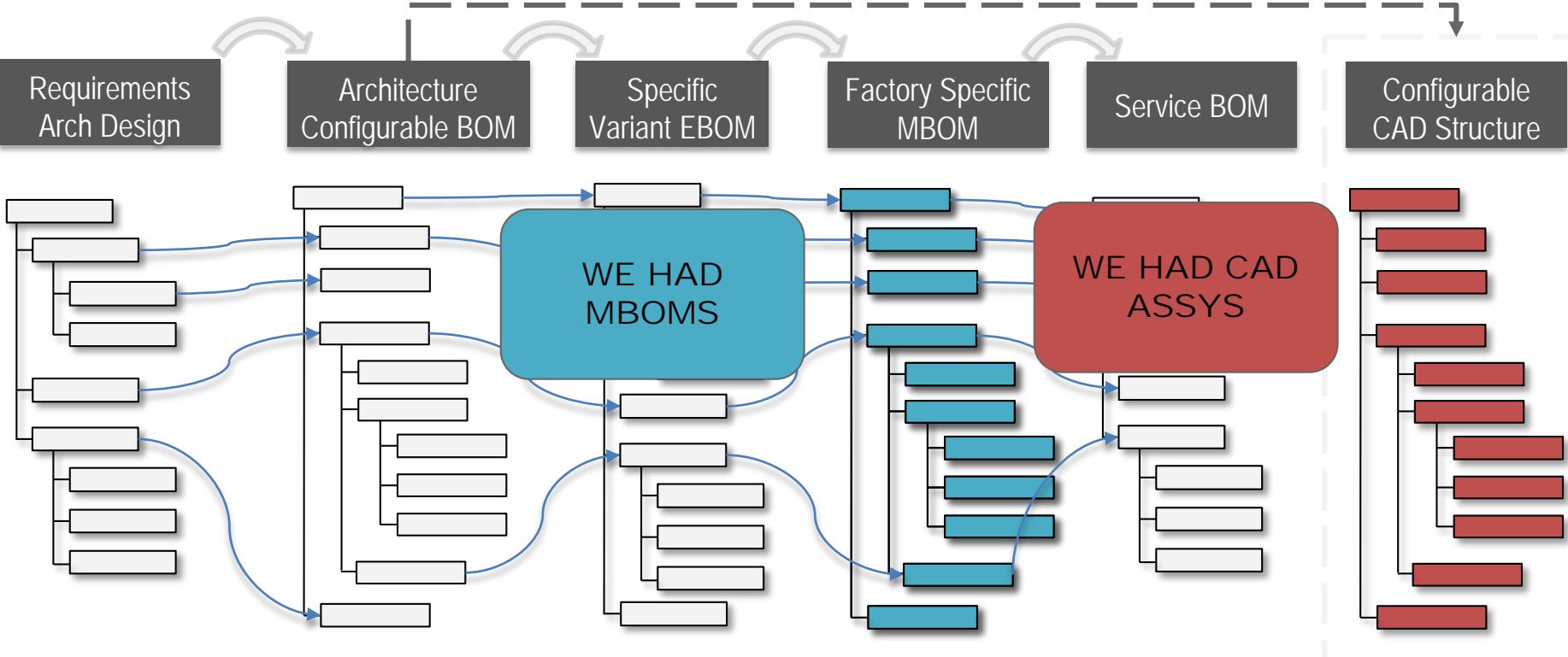

WE IDENTIFIED OUR GAPS AND A NEED FOR MORE RIGOROUS SYSTEMS ENGINEERING CAPABILITIES

WE KNEW WHAT WE WANTED...

ONE PROCESS WITH ONE SOURCE OF TRUTH!

Requirements Arch Design

Architecture Configurable BOM

Specific Variant EBOM

Factory Specific MBOM

Service BOM

Configurable CAD Structure

WE HAD MBOMS

WE HAD CAD ASSYS

THERE WERE CLEAR GAPS TO GET WHERE WE WANTED TO GO

IN 2017, WHIRLPOOL ATTENDED OUR 1ST INCOSE EVENT

2017
annual **INCOSE**
international workshop

Los Angeles, CA, USA
January 28 - 31, 2017

INCOSE
International Council on Systems Engineering

Biggest impact of Systems Engineering is <u>Risk Mitigation</u> and <u>Development Cost</u>.

SE: Systems Engineering

MBSE: Model Based Systems Engineering

MBPLE: Model Based Product Line Engineering

MBSE is an extension of Systems Engineering,
And model-based product line engineering is an extension of MBSE.

©PTC Inc 2014

"Systems Engineering doesn't save money. It prevents runaway projects that have defects, are over budget and are delivered late." (additional info: _Sandia presentation_)

Whirlpool Corporation - Confidential
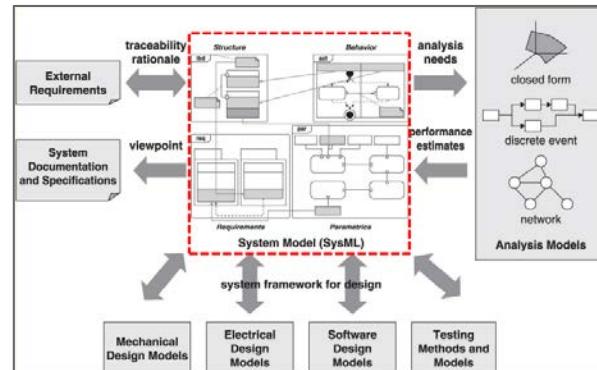
SysML is unequivocally the industry standard for MBE.

- Universal challenge to make language easier to learn
- Recommend Whirlpool follow activities of Healthcare and Oil & Gas working groups

[Additional Material: The Intersection of PLM, MBSE, SMS: What's Next?]

MANY INSIGHTS WERE GAINED AND WE GOT INVOLVED!

OUR FIRST FOCUS WAS REQTS AND ARCH DESIGN

| Requirements Arch Design | Architecture Configurable BOM | Specific Variant EBOM | Factory Specific MBOM | Service BOM | Configurable CAD Structure |

WE REPLACED OUR DOCUMENT-BASED DVP WITH A "REAL" REQUIREMENTS MANAGEMENT SYSTEM

WE LEARNED SYSML AND STARTED TO "MODEL" OUR ARCHITECTURES

WE USED OSLC TO LINK REQUIREMENTS TO THE ARCHITECTURE "MODEL"
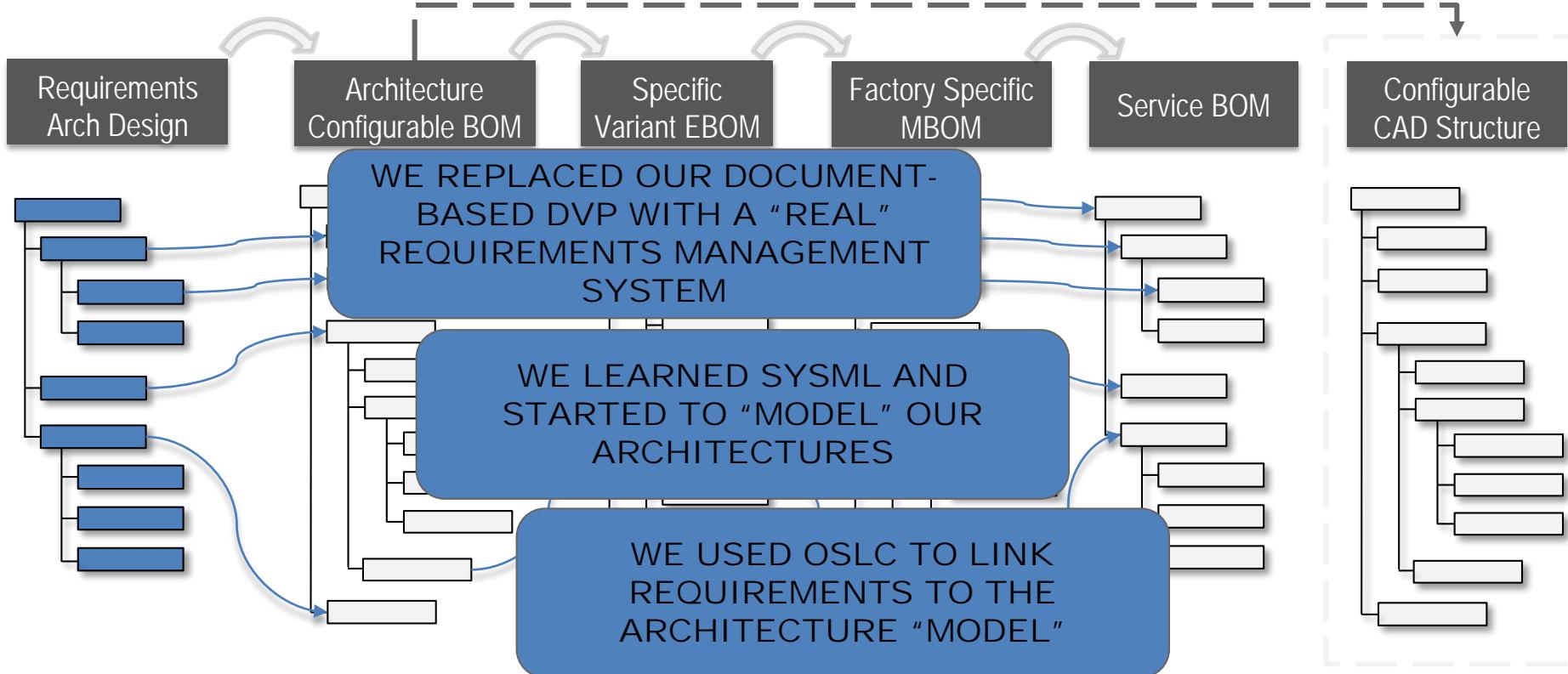
THEN FINAL INTEGRATIONS BETWEEN MBSE AND PLM

Requirements Arch Design	Architecture Configurable BOM	Specific Variant EBOM	Factory Specific MBOM	Service BOM	Configurable CAD Structure

MODELING LANGUAGE **VARIANT LANGUAGE**

OPTIONS AND VARIANTS

MPMLink

OPTIONS MODELER
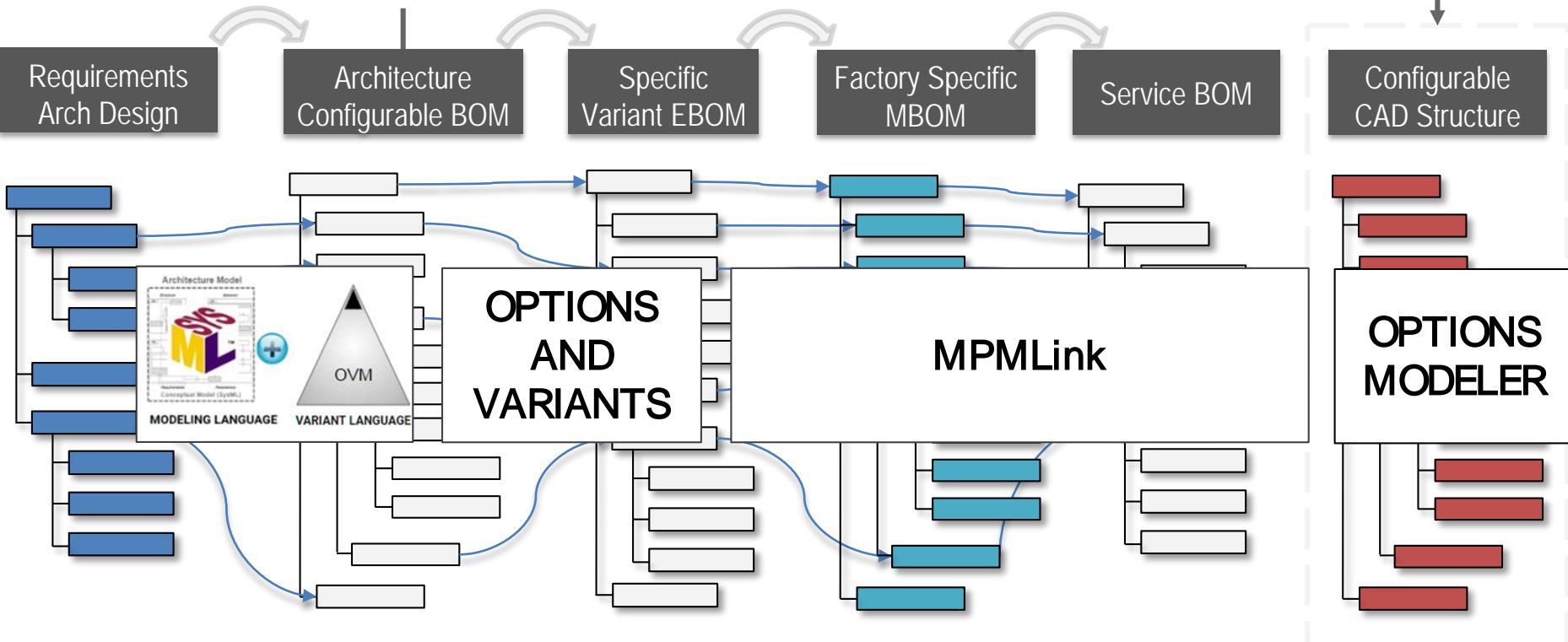
ONE PROCESS WITH ONE SOURCE OF TRUTH!

CAPABILITIES ARE PARAMOUNT…

Capstone
Practical on-the-job experience applying Systems Engineering principles to manage architecture complexity and drive demonstrable, enterprise-changing results

SE Principles SE201

Reqts Engr RE301

Arch Des AD301

Verif & Val VV301

Prod Line PLE301

Manuf Sys MSD301

MIT Arch & SE SE210

Reqts Engr (RE201)

Arch Design (AD201)

Verif & Valid (VV201)

Prod Line Eng (PLE201)

Manf Sys (MSD201)

Intro to Systems Engineering (SE101)

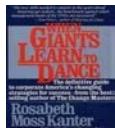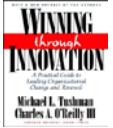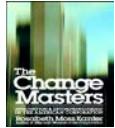**What percentage of change efforts reach their target?**

28-32%

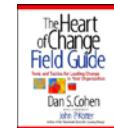**The method for driving change seems to have been documented in many books...**
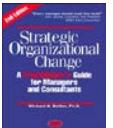
Kotter, '95
Strebel, '96
Miller, '02
Gartner Group, '02
Higgs and Rowland, '05
Burns '05
McKinsey & Co '06
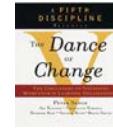
AND WHY DO THEY FAIL?!

Whirlpool

Outcome of change effort

- Success
- Lack of leadership support
- Employee resistance
- LAck of resources
- Other

30%
25%
25%
10%
10%
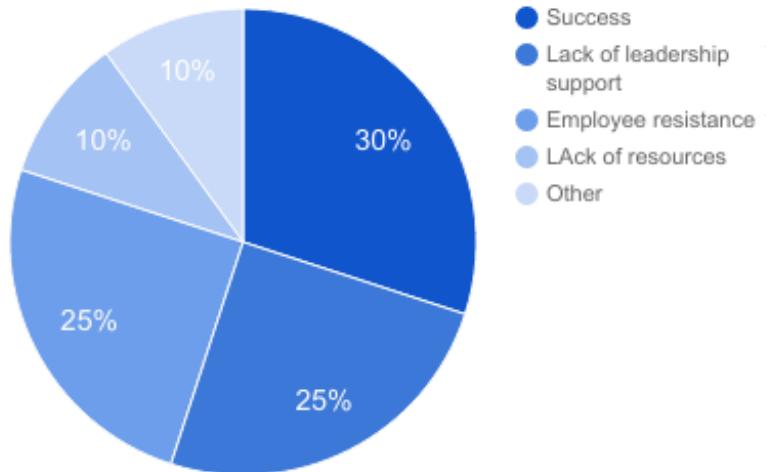
Leadership is not role-modeling the new desired behavior

Employees fear the change due to a perceived lack of skills
Employees do not understand the need for the change
Employees don't see anything for them in the change

Source: Aggrigate of various studies on organizational change management

Whirlpool
CORPORATION

Sr Leadership

SPONSOR(S)

Working staff in PD areas
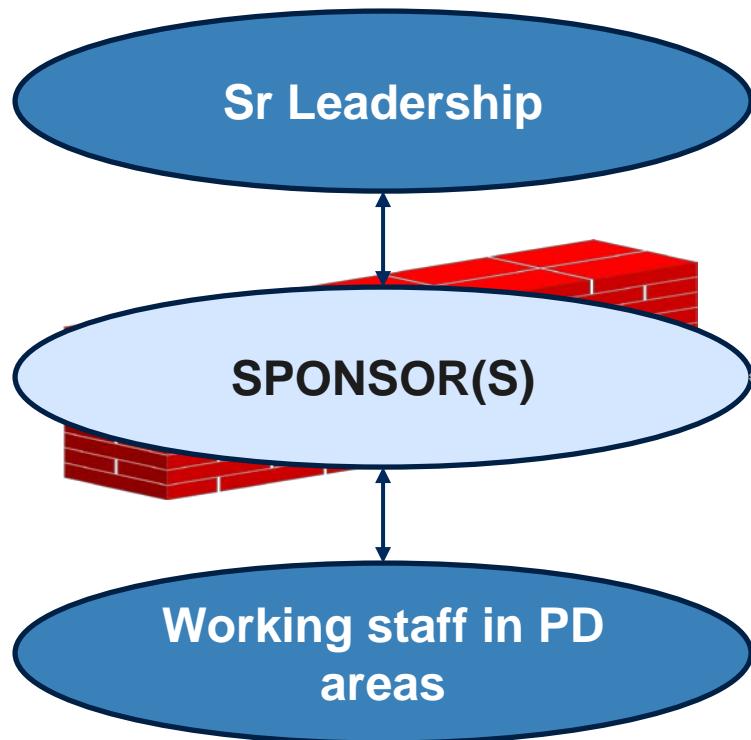
Role of the sponsors

- Create and share a vision

- Provide support in difficult times

- Ensure resources are available

- Manage Sr leaders' expectations

- Support experiments

- Highlight early wins

"Large scale, global PD **transformation** including **MBSE** is possible and can be **scaled up** relatively quickly within your organization given the right **focus**, **management support** and **follow through**"

UPON REFLECTION WE DID SOME THINGS WELL AND SOME THAT NEEDED IMPROVING

- Progress is slow so **executive sponsoring is important to manage expectations of the executive level leadership**.

- **IT systems are not and will never be silver bullets**.
  - We did not make it about the tools - we started with the people having the right skills.

- **Have good indicators to measure progress**
  - Project schedule, cost to deliver, stakeholder needed capability delivered
  - (Requirement quality, # of change requests, integration event work, etc).

MANAGING EXPECTATIONS AND MEASURING PROGRESS

- **There is no "30,000-ft management" during a transformation.**
  - Leaders must support and be in the trenches to teach "how" as much as stipulate "what".

- **Middle management is the most difficult layer to convince**
  - - **work there first** so they are ahead of their people and don't see the new way of working as an existential threat (i.e. fear of becoming obsolete).

- **Go fast but do not overrun your capacity.**
  - Tools and processes can be created faster than teams can adapt - and don't forget continuous improvement!

GETTING "MIDDLE MANAGERS" AND NOT GETTING TOO FAR AHEAD WITH THE STRATEGY

THANK YOU

Christian Gianni
Chief Technology Officer

Greg Garstecki
Senior Principal Engineer
Product Development Excellence

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WhirlpoolCorp.com

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Whirlpool® **KitchenAid**® **MAYTAG** **(i) INDESIT** **Hotpoint** * **Consul** **BRASTEMP**

AMANA® **JENN-AIR**® **Bauknecht** **acros** **DIQUA 帝度** **every drop™**

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