DFMA Culture Shock at Kohler

Adam Guenther

Ben Marotz

Bill Devenish

Matthieu Da Rocha

Stephanie Freier

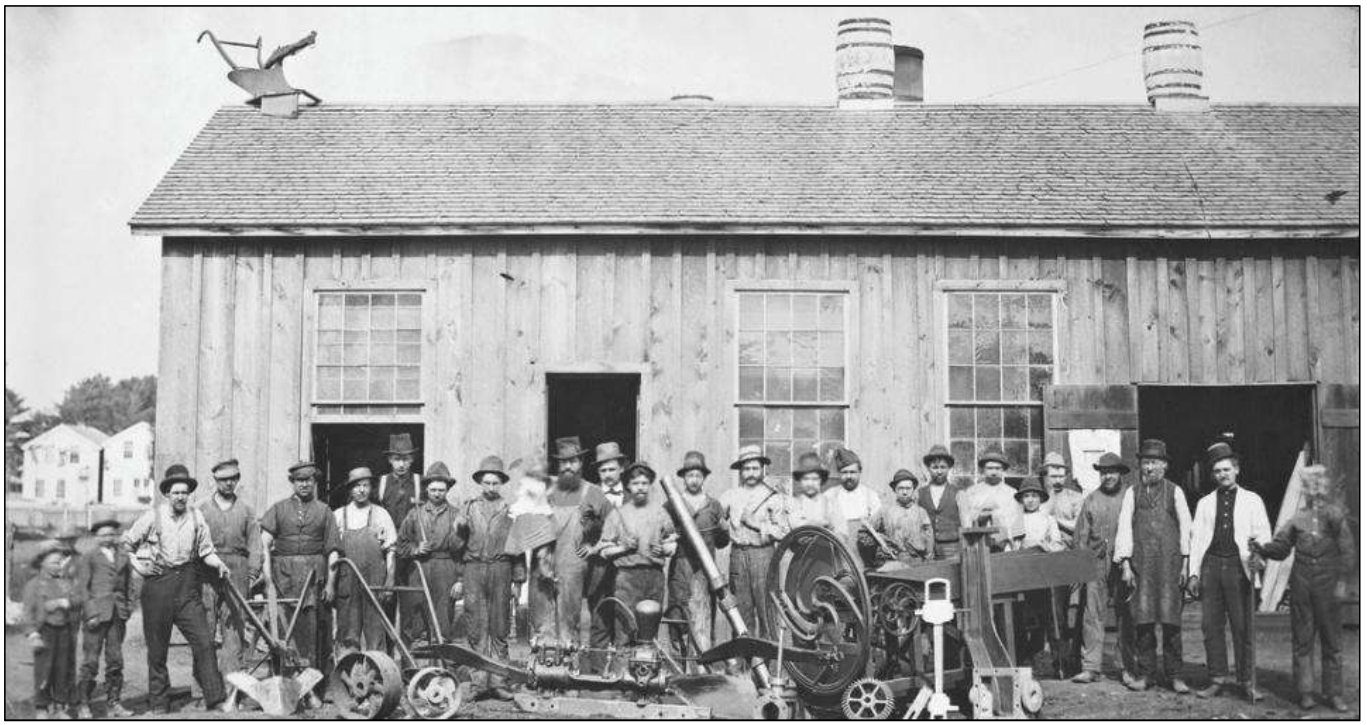
Agenda

- Kohler Overview
- Early DFMA Investigations
- Early DFMA Efforts
- Initial DFMA Project Examples
- Implementing DFMA
- DFMA Communication and Socialization
- Culture Shock
- Conclusion

“When a great adventure is offered, you don't refuse it.”

Amelia Earhart

A Tradition of Quality, Craftsmanship & Innovation



Founded in 1873 by Austrian immigrant John Michael Kohler,
Kohler is one of America's oldest and largest privately-held companies

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KOHLER History

Enameled version of cast-iron hog scalder and water trough sold as bathtub in 1883

Since 1873

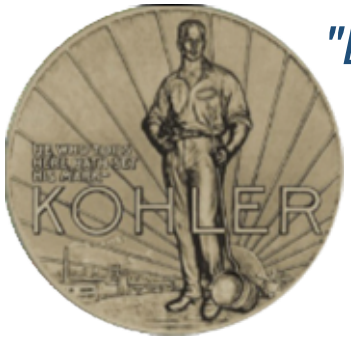
John Michael Kohler

Walter Kohler

Herbert V Kohler, Sr.

Herbert V Kohler, Jr.

David Kohler



*"Every day of our working lives, we seek **to improve the level of gracious living** for those people who are touched by our products and services."*

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A Global Industry Leader

Kitchen & Bath

Power

Interiors

Hospitality

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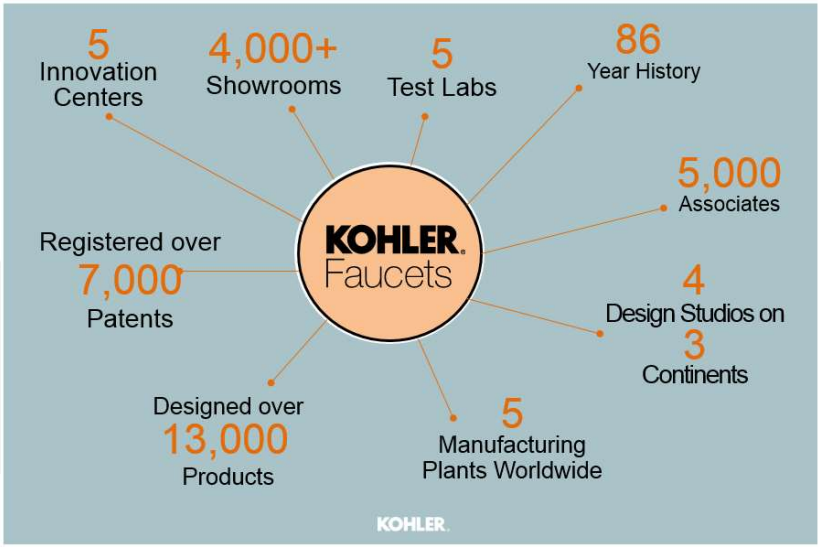
A reminder about Kohler

- Kohler Co. is a private company, headquartered in Kohler, WI
- Founded in 1873, the company includes Kitchen and Bath, Decorative Products, Power and Hospitality businesses.

- Our mission: Gracious Living. Gracious living is characterized by charm, good taste and generosity.
- Kohler is now a truly global company, with tens of thousands of associates located at more than 50 manufacturing locations globally.

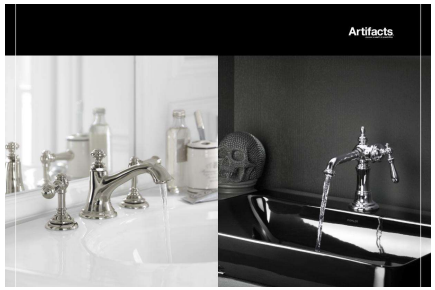
A Bit About Global Faucets



Technology Innovation

Material Innovation

Design Innovation



Quality Innovation

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The NEED for Change in Global Faucets…

Landscape & Feedback

- Teams don't understand / communicate costs
- Team members communicate opinions as fact
- Team members are slow to answer questions
- Many Silos in Kohler
- Designs are inefficient
- Manufacturing Processes are not aligned with the product design needs

NPI Strategic Focus

<u>Strategic Planning</u>
Planning support for innovation and leading edge manufacturing technology.

<u>Simultaneous Engineering</u>
The simultaneous collaboration of Product and Manufacturing Engineers to optimize the design for manufacturing and assembly.

<u>Project Launch</u>
The detailed project management of time, cost and scope to deliver New Products to Market

Simultaneous Engineering

- ❑ Change "Us vs. Them" to "We"
- ❑ Create collaboration events to achieve "efficient and effective results"
- ❑ Quantify concept improvements through a credible tool

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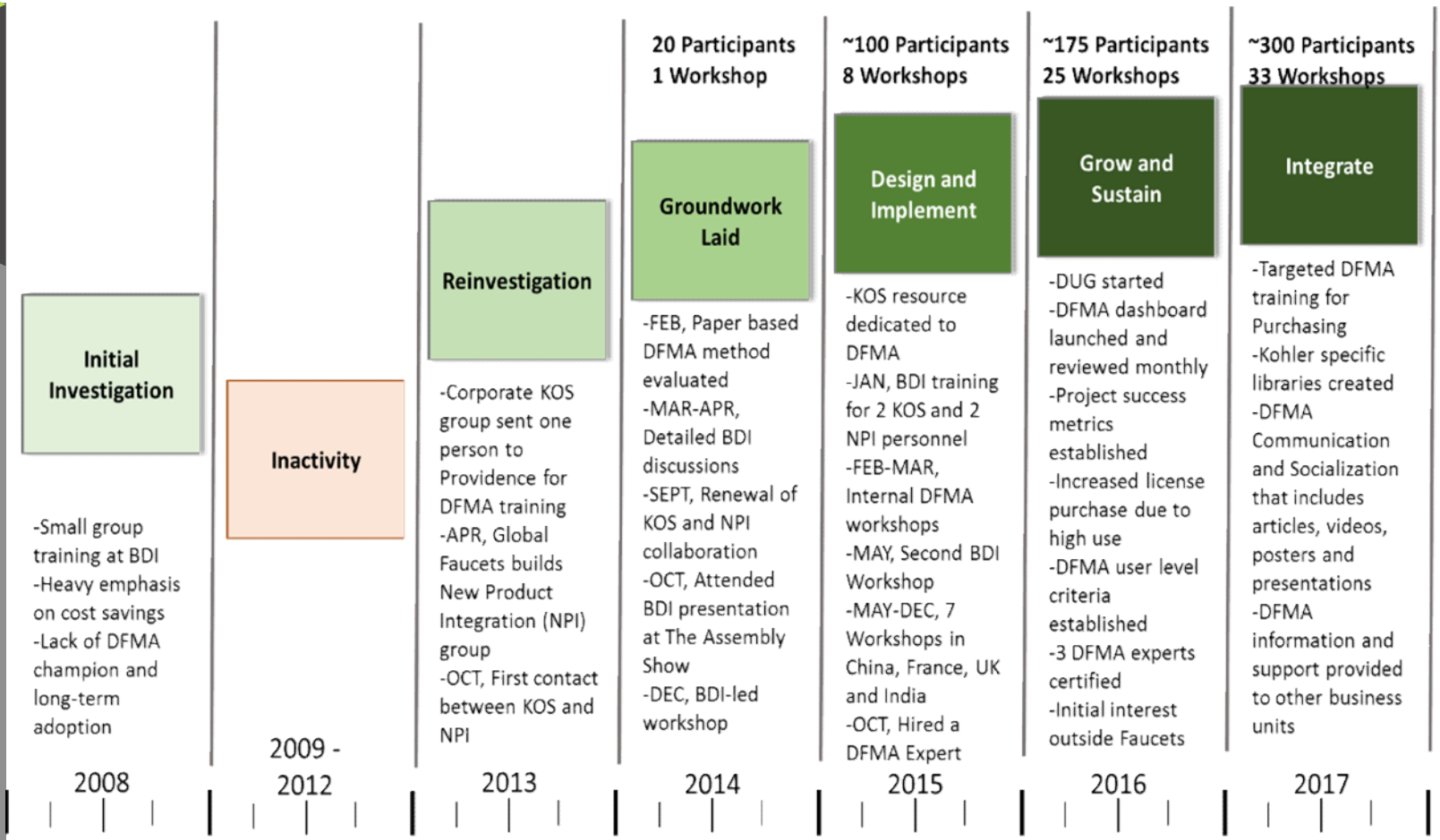
Timeline


Initial Investigation
-Small group training at BDI
-Heavy emphasis on cost savings
-Lack of DFMA champion and long-term adoption
2008
Inactivity
2009 - 2012
Reinvestigation
-Corporate KOS group sent one person to Providence for DFMA training
-APR, Global Faucets builds New Product Integration (NPI) group
-OCT, First contact between KOS and NPI
2013
20 Participants
1 Workshop
Groundwork Laid
-FEB, Paper based DFMA method evaluated
-MAR-APR, Detailed BDI discussions
-SEPT, Renewal of KOS and NPI collaboration
-OCT, Attended BDI presentation at The Assembly Show
-DEC, BDI-led workshop
2014
~100 Participants
8 Workshops
Design and Implement
-KOS resource dedicated to DFMA
-JAN, BDI training for 2 KOS and 2 NPI personnel
-FEB-MAR, Internal DFMA workshops
-MAY, Second BDI Workshop
-MAY-DEC, 7 Workshops in China, France, UK and India
-OCT, Hired a DFMA Expert
2015
~175 Participants
25 Workshops
Grow and Sustain
-DUG started
-DFMA dashboard launched and reviewed monthly
-Project success metrics established
-Increased license purchase due to high use
-DFMA user level criteria established
-3 DFMA experts certified
-Initial interest outside Faucets
2016
~300 Participants
33 Workshops
Integrate
-Targeted DFMA training for Purchasing
-Kohler specific libraries created
-DFMA Communication and Socialization that includes articles, videos, posters and presentations
-DFMA information and support provided to other business units
2017

Initial Investigation

- Kohler first explored DFMA (and other programs) in 2008
  - A small number of personnel were sent to training at Boothroyd-Dewhurst's facilities in Providence
  - Software was not purchased, and effort eventually ended
- In 2013, Kohler's Corporate Continuous Improvement group (KOS) reinitiated the effort as part of a broader focus on DFSS
  - One individual sent to train and socialize the method.
  - A fortuitous meeting (in the UK, where DFA was in use) led to introduction of the method to the Global Faucets New Product Integration (NPI) team

Reinvestigation: 2014

- Initial focus: understanding the method
- Early 2014: Webinar
  - Paper-based methodology
  - ~20 participants
  - Developed understanding of DFA method
  - No immediate demand
- Re-engagement with KOS
  - Commitment of a resource to drive DFMA effort in Global Faucets NPD
  - Further investigation at The Assembly Show seminar by BDI: October 2014
  - First BDI Workshop: December 2014
    - 20 participants

Real Rain

	Parts	Entries	DFA Index
Original	63	95	5.52
Safe	45	60	10.38
Reach	36	47	12.92
Stretch	34	43	12.42

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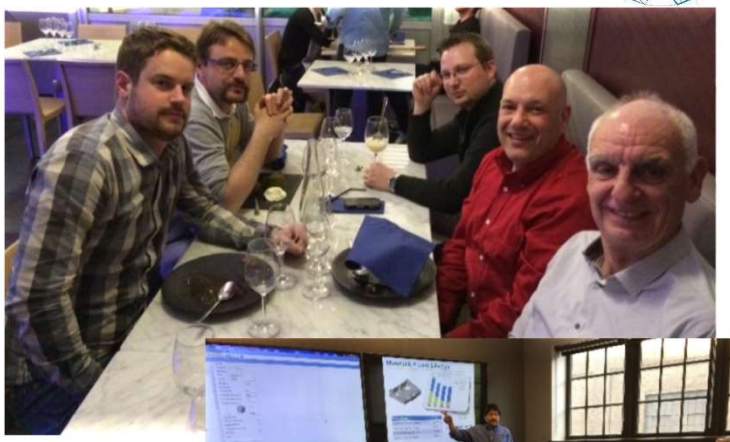
First Year: 2015

- Initial Goals:
  - Acquire DFMA software and train NPI group as facilitators
  - Conduct workshops in Kohler, Mira (UK), Reims (EMEA), Beijing (CN) and Gurgaon (IN)
  - Drive usage to all NPD projects supported by NPI
- Initial training (4 personnel) in Providence Jan, 2015
- Workshops held in US, UK, CN, and EMEA created significant savings and drive for improvement
- Frequent management updates and dashboard conveyed successes and challenges
- Work reached “tipping point” of common use



Artifacts Bridge

RESULTS

Within 4% of est. Cost

Within 8% of est. Time

Baseline Design Concept (Unmanufacturable)	Next Design Concept (Complicated Assembly)	Final Design Concept (Simplified Assembly)
• DFA Index: 11.2 • Number of Parts: 37 • Assembly Time (min.): 8.6	• DFA Index: 8.4 • Number of Parts: 61 • Assembly Time (min.): 12.8	• DFA Index: 15.1 • Number of Parts: 60 • Assembly Time (min.): 8.2

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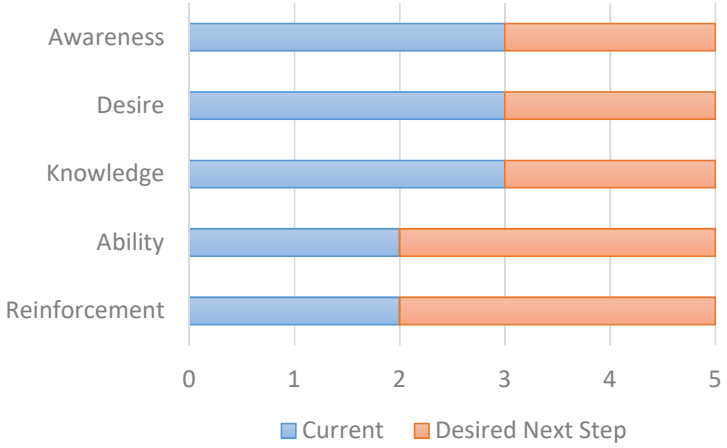
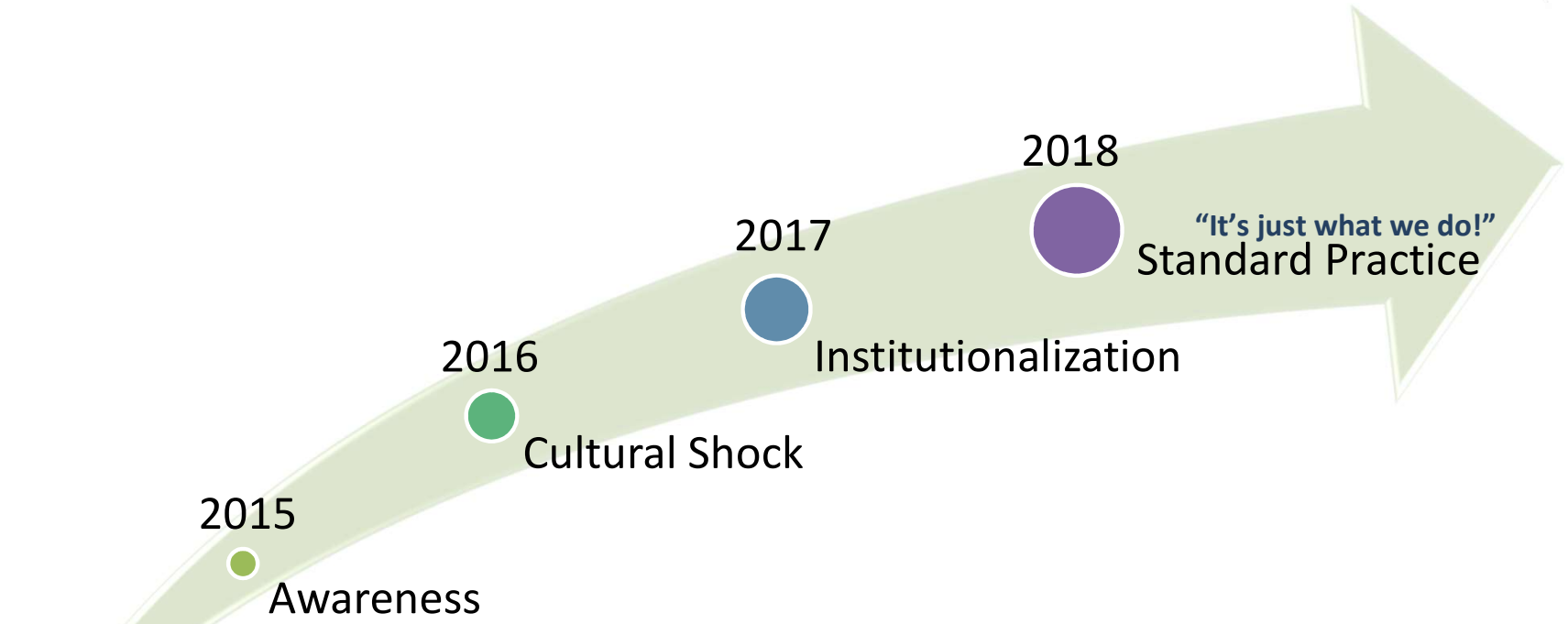
Grow and Sustain

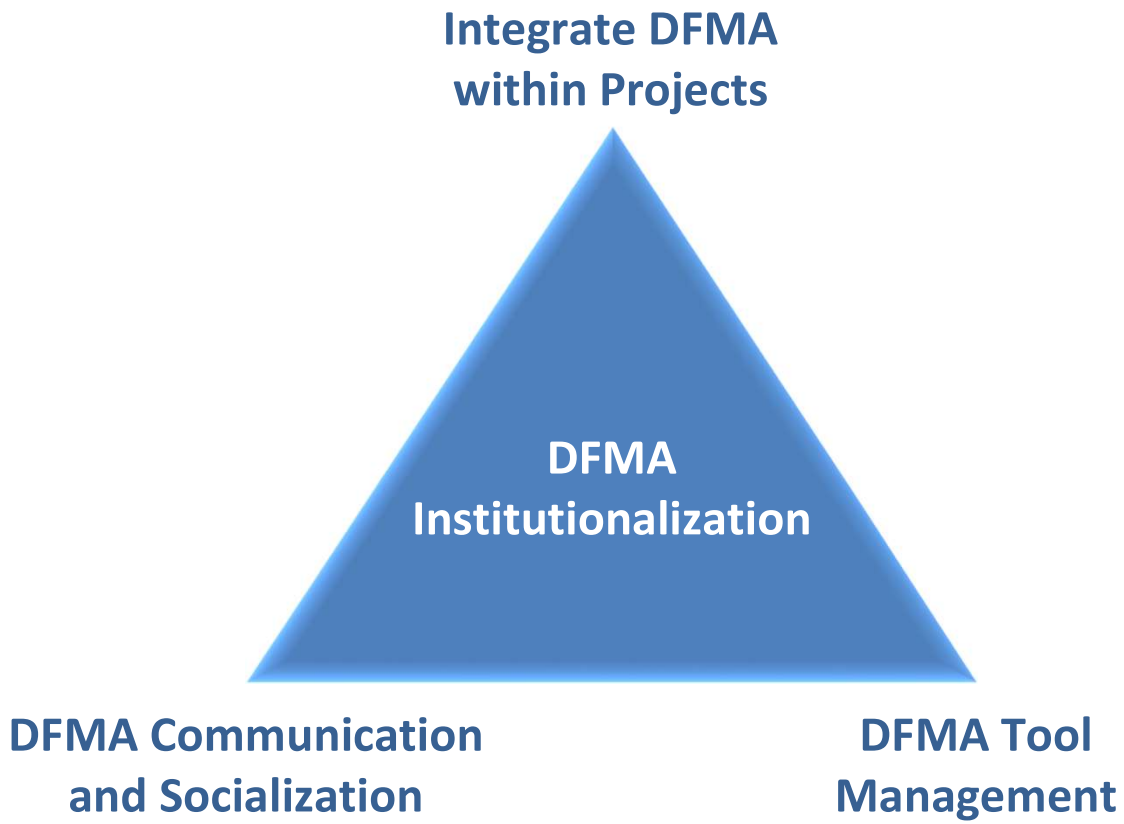


Internal Champion

Implementation Plan



Strategy


Integrate DFMA within Projects
DFMA Institutionalization
DFMA Communication and Socialization
DFMA Tool Management

DFMA User Group (DUG)

Our DFMA objective is to reduce development time, improve cost position, and foster early collaboration through rapid data driven design decisions.

- **What**
  - A group of DFMA tool users who create best practices for DFMA tool use
- **Why**
  - Continuously improve use of the DFMA tool
  - Foster collaboration and camaraderie among the DFMA tool users
- **Who**
  - Representatives from each location who regularly use the DFMA tool during the course of their work
  - Charter Members: 10 people from 5 global locations
- **When**
  - Regular, hands-on, working meetings are held every other Wednesday at 7:00 AM Central Time
  - It is expected that the members will be allowed to devote 10% of their time to supporting the DUG activities

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DFMA Expert Assessment

KOHLER DFMA EXPERT ASSESSMENT

CANDIDATE NAME:	DATE:	
ASSESSMENT TEAM:	OVERALL ASSESSMENT RANKING AVERAGE:	
	0.0	
	RANK	COMMENT
DFA EXPERTISE	**0.0**	
Perform many DFA Analyses for a variety of assemblies	0	
Calculate & explain the DFA Index	0	
List & define the Minimum Part Criteria categories	0	
Describe the various Handling & Insertion Difficulties	0	
Explain the different Securing Processes	0	
Import a Parts List/BOM	0	
Generate Results & Reports	0	
Compare DFA analysis results between design options	0	
Create & test Kohler specific library Operations	0	
DFM EXPERTISE	**0.0**	
Perform many DFM analyses for a variety of parts	0	
Demonstrate awareness of Automated Assembly	0	
Use the Geometry Calculator to estimate Part Volume	0	
Explain & estimate Surface Patches	0	
Import a CAD model	0	
Generate Graphs and Reports	0	
Compare DFM analysis results for materials & processes	0	
Create & test Kohler specific DFM library items	0	
TECHNICAL KNOWLEDGE	**0.0**	
Basic familiarity with part fabrication processes: Injection Molding, Casting, Machining, Forging, Hydroforming, Stamping & Forming	0	
Competency with drawings, tolerances & CAD models	0	
Proficient user of SAP & WindChill	0	
Use DFMA to support competitor product analysis	0	
FACILITATION SKILLS	**0**	
Demonstrate competent training skills	0	
Manage conflict resolution	0	
Organize multiple DFMA workshops/events	0	
Competently present training modules for DFMA Overview, DFA, Piston Exercise & DFM	0	
Identify and resolve common DFMA beginner mistakes	0	
DFMA ADVOCACY	**0.0**	
Active involvement in the Kohler DFMA User Group	0	
Attend & share BDI sponsored DFMA Webinars	0	
Collaboration with BDI, & DFMA Forum contributions	0	
Provide DFMA information to others	0	

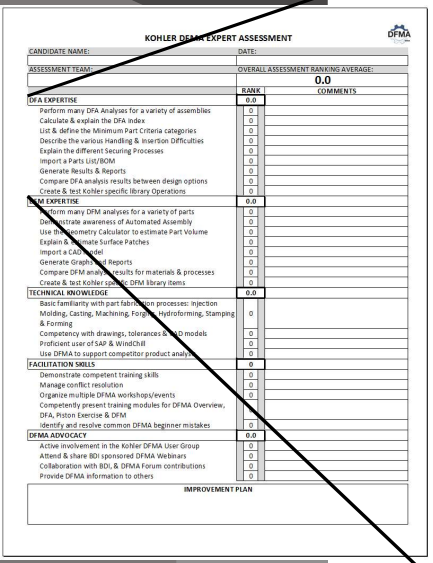
IMPROVEMENT PLAN

Overall assessment average must be 7 (out of 10) or higher

Each section must average 6 or higher

KOHLER

DFMA Expert Assessment



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Compare DFA analysis results between design options		0	
Create & test Kohler specific library Operations		0	
DFM EXPERTISE		0.0	
Perform many DFM analyses for a variety of parts		0	
Demonstrate awareness of Automated Assembly		0	
Use the Geometry Calculator to estimate Part Volume		0	
Explain & Eliminate Surface Patches		0	
Import a CAD Model		0	
Generate Graphics and Reports		0	
Compare DFM analysis results for materials & processes		0	
Create & test Kohler specific DFM library items		0	
TECHNICAL KNOWLEDGE		0.0	
Basic familiarity with part fabrication processes: Injection Molding, Casting, Machining, Forging, Hydroforming, Stamping & Forming		0	
Competency with drawings, tolerances & 3D models		0	
Proficient user of SAP & WindChill		0	
Use DFMA to support competitor product analysis		0	
FACILITATION SKILLS		0	
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Provide DFMA information to others		0	

IMPROVEMENT PLAN

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Calculate & explain the DFA Index	0
List & define the Minimum Part Criteria categories	0
Describe the various Handling & Insertion Difficulties	0
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Import a Parts List/BOM	0
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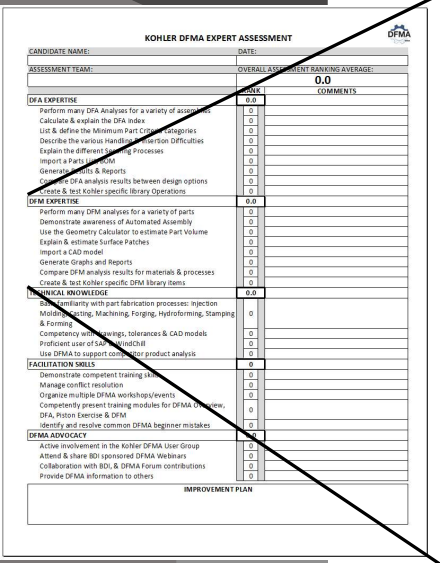
KOHLER

DFMA Expert Assessment



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Import a Parts list BOM	0	
Generate Graphs & Reports	0	
Compare DFA analysis results between design options	0	
Create & test Kohler specific library Operations	0	
DFM EXPERTISE	0.0	
Perform many DFM analyses for a variety of parts	0	
Demonstrate awareness of Automated Assembly	0	
Use the Geometry Calculator to estimate Part Volume	0	
Explain & estimate Surface Patches	0	
Import a CAD model	0	
Generate Graphs and Reports	0	
Compare DFM analysis results for materials & processes	0	
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MECHANICAL KNOWLEDGE	0.0	
Basic familiarity with part fabrication processes: Injection Molding, Casting, Machining, Forging, Hydroforming, Stamping & Forming	0	
Competency with drawings, tolerances & CAD models	0	
Proficient user of SAP or WindChill	0	
Use DFMA to support competitor product analysis	0	
FACILITATION SKILLS	0	
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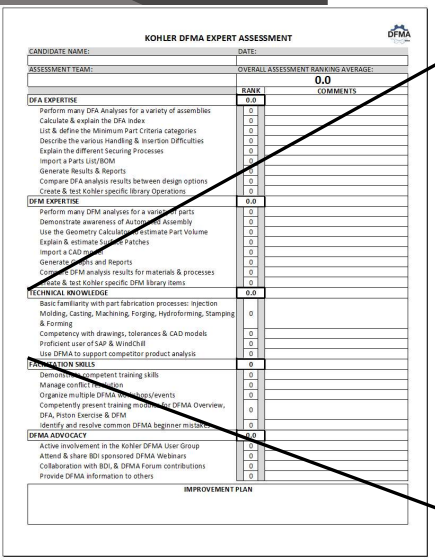

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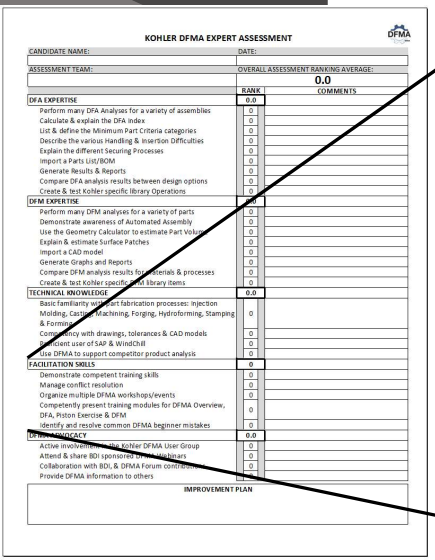

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IMPROVEMENT PLAN

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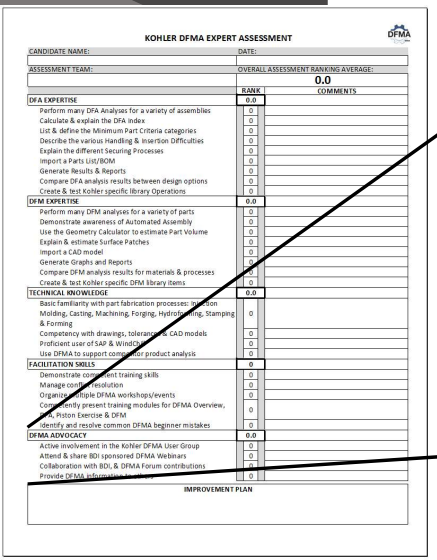
DFMA Expert Assessment



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Monthly DFMA Dashboard

DFMA DASHBOARD (2017.APR.30)

PROJECT USAGE

2017 Projects Requiring DFMA = 100
Cumulative # of Projects Utilizing DFMA = 34

Project Participation Rate (YTD) = 34%

Projects Utilizing DFMA This Month

LOC	PROJ#	PROJECT	PHASE	NAME(S)
SFO	1234	Sample Parts	D2	J Doe
MIRA	1823	Hi-Profile Assy	D3	J Doe Jr
WFO	4321	New Product	D2	D John
WFO	5678	High Efficiency Product	D1	J Smith
IFO	8765	Mini-me Look-a-like	D4	J Smith, B Jones
WFO	9753	Flux Capacitor, Rev-2	D1	J Smith Jr
WFO	7531	Next Gen Assy	D2	D John
BFO	2468	Advanced Tech Parts	D3	C Wang

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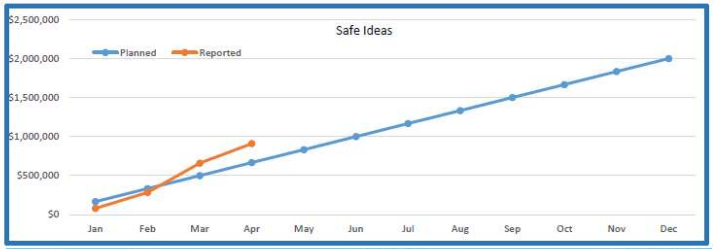
DFMA WORKSHOP RESULTS



Date	Location	DFMA Workshop	DFA Index %Δ
7-Apr	WFO	Flux Capacitor, Rev-2	38.7%
16-Mar	BFO	Advanced Tech Parts	N/A
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25-Jan	WFO	Next Gen Assy	23.2%

COMMUNICATION & SOCIALIZATION

DFMA Advocay & Application

	Plan	Act
DFMA Workshops/Events	14	7
Lunch-n-Learn/Presentations	6	5
DFMA SharePoint Site Visitors	200	229

- The DFMA Roadmap was presented to Purchasing management. Additional meetings have been setup to develop DFM proficiency within Purchasing.
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DFMA User Group Activity

	Plan	Act
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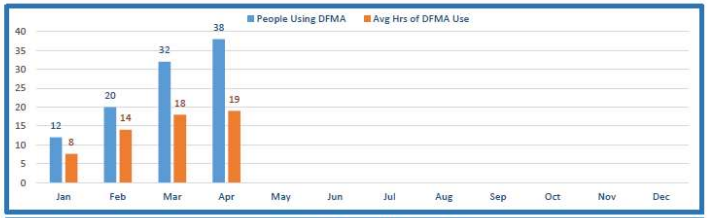
TOOL MANAGEMENT



Licenses Used Simultaneously

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	2	12	22	37								
5	13	27	34	56								
4	22	23	48	67								
3	76	108	198	315								
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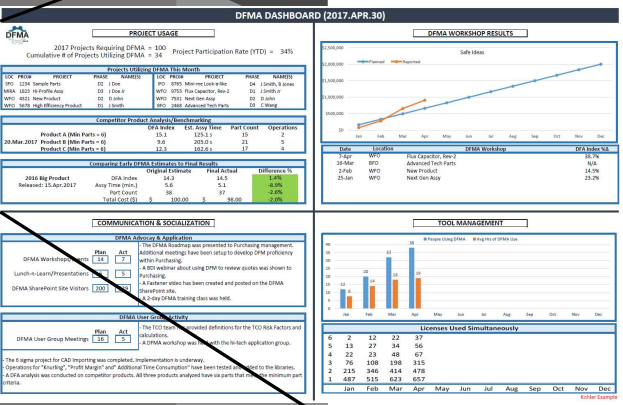
1	487	515	623	657								

Kohler Example

Monthly DFMA Dashboard


DFMA DASHBOARD (2017.APR.30)

PROJECT USAGE

2017 Projects Requiring DFMA = 100 Project Participation Rate (YTD) = 34%
Cumulative # of Projects Utilizing DFMA = 34

Projects Utilizing DFMA This Month

LOC	PROJ#	PROJECT	PHASE	NAME(S)	LOC	PROJ#	PROJECT	PHASE	NAME(S)
SFO	1234	Sample Parts	D2	J Doe	IFO	8765	Mini-me Look-a-like	D4	J Smith, B Jones
MIRA	1823	Hi-Profile Assy	D3	J Doe Jr	WFO	9753	Flux Capacitor, Rev-2	D1	J Smith Jr
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COMMUNICATION & SOCIALIZATION

DFMA Advocacy & Application

	Plan.	Act.
DFMA Workshops Given	14	7
Lunch-n-Learn/Presentations	5	5
DFMA SharePoint Site Visitors	100	147

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Kohler Example

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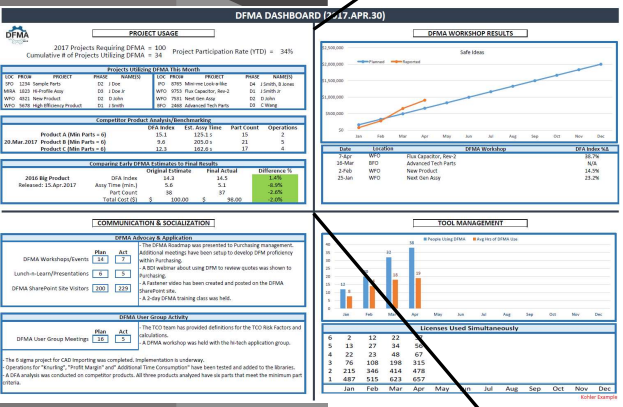
Monthly DFMA Dashboard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Projects Utilizing DFMA This Month

LOC	PROJ#	PROJECT	PHASE	NAME(S)
SFO	1234	Sample Parts	02	J Doe
MRA	1822	Hi-Profile Assy	03	J Doe Jr
WFO	4921	New Product	02	D John
WFO	9678	High Efficiency Product	01	J Smith
IFO	8785	Mini-me Look-a-like	04	J Smith, B Jones
WFO	9753	Flux Capacitor, Rev-2	01	J Smith Jr
WFO	7591	Next Gen Assy	02	D John
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Kohler Example

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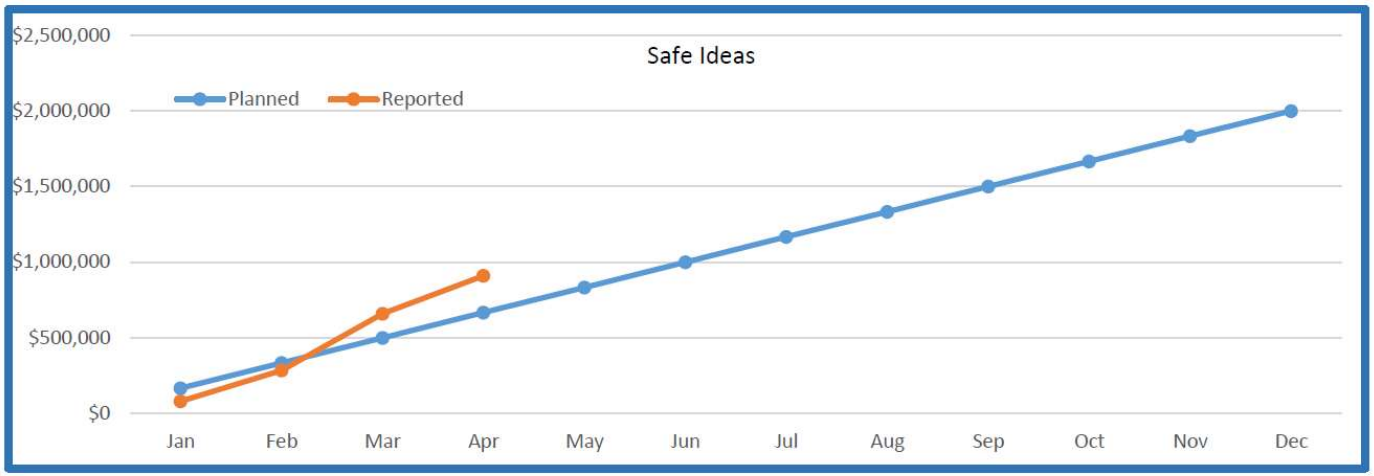

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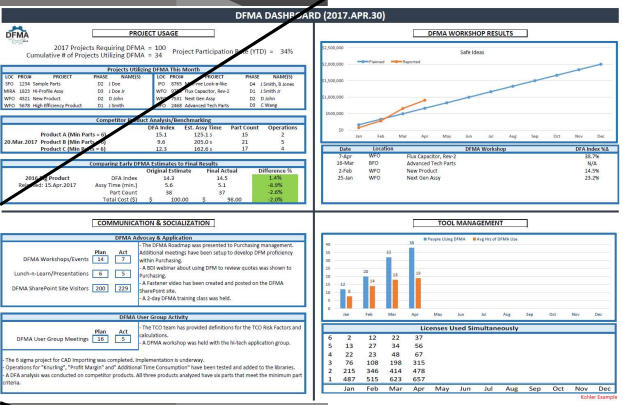

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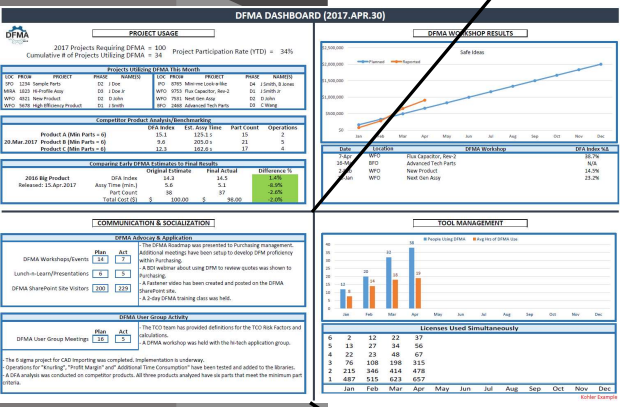
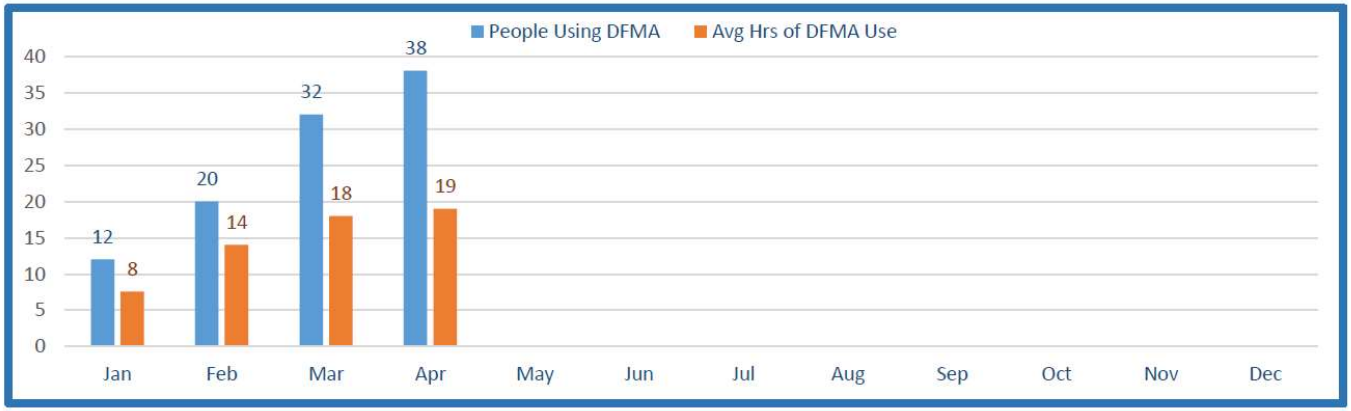


TOOL MANAGEMENT



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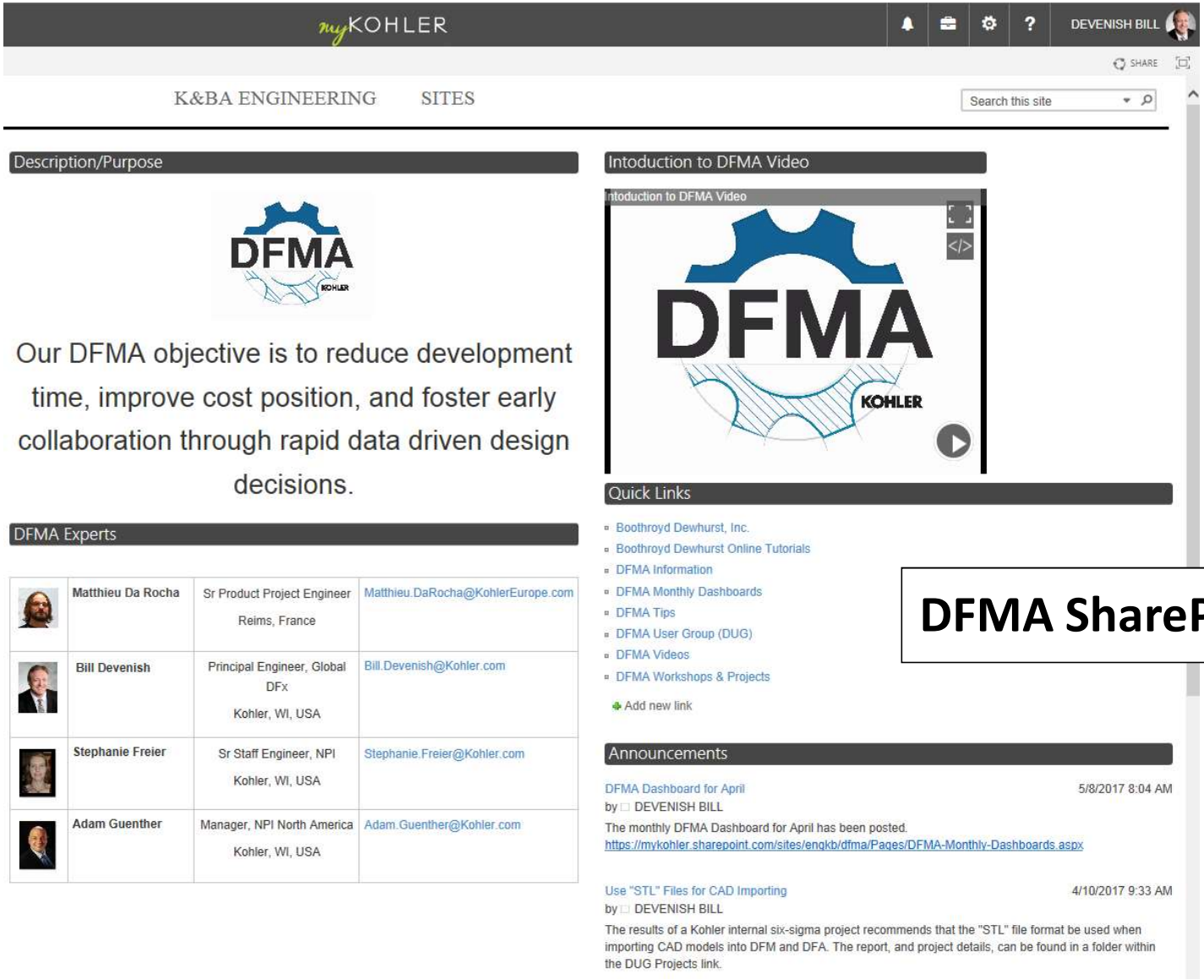


DFMA SharePoint Site

DFMA Poster

SAVE
TIME,
MONEY,
& EFFORT
OPTIMIZE YOUR PROJECT WITH AN EFFICIENT DESIGN APPROACH
Your team can reduce development time and cost, optimize product design and foster early collaboration through a Design for Manufacture and Assembly (DFMA) workshop. Engineering, Industrial Design, Supply Chain, Manufacturing and Quality participate in the workshop, which facilitates rapid data-driven design decisions that lead to measurable reductions.
PRODUCT SIMPLIFICATION
PRODUCT COSTING
SUPPLIER COSTING
SCHEDULE A THREE-DAY, HANDS-ON DFMA TRAINING WORKSHOP TO KICK-START YOUR PROJECT. FOR ADDITIONAL INFORMATION, GO TO THE DFMA SHAREPOINT SITE, OR CONTACT SOMEONE FROM NPI.
KOHLER.

myKOHLER Articles

Devenish Honored for His Work in Design for Manufacture and Assembly

2016-07-14

Kohler Co.'s Bill Devenish, Principal

Design for Manufacture and Assembly Streamlines New Product Development

2017-01-10

This is the third article in a series about

In our third installment of New Product D
assembly.

We talked about Design for Manufacture
quick refresher.

What is DFMA?

Commercialized by two professors of me
tool that makes it possible to evaluate, es
while still in the design phase.

The two basic principles of DFMA are alr

Reduce the number of assembly steps b

Optimize part manufacturing processes a

It may seem simple today but this concep
during the early 1970s when DFMA was
simplifying individual parts to cost less ar
development of DFMA exposed the fact t
relative to the use of fewer, multi-functior

Tenacious Collaboration Brings New Products to Market More Efficiently

2017-05-16

What happens when you put experts from disciplines like industrial design, manufacturing and assembly, quality control and supply chain on one project team? You get cutting-edge product design that exceeds customer expectations, is efficient to manufacture, limits environmental impact and hits the market quickly. You get tenacious collaboration. You get New Product Integration (NPI).

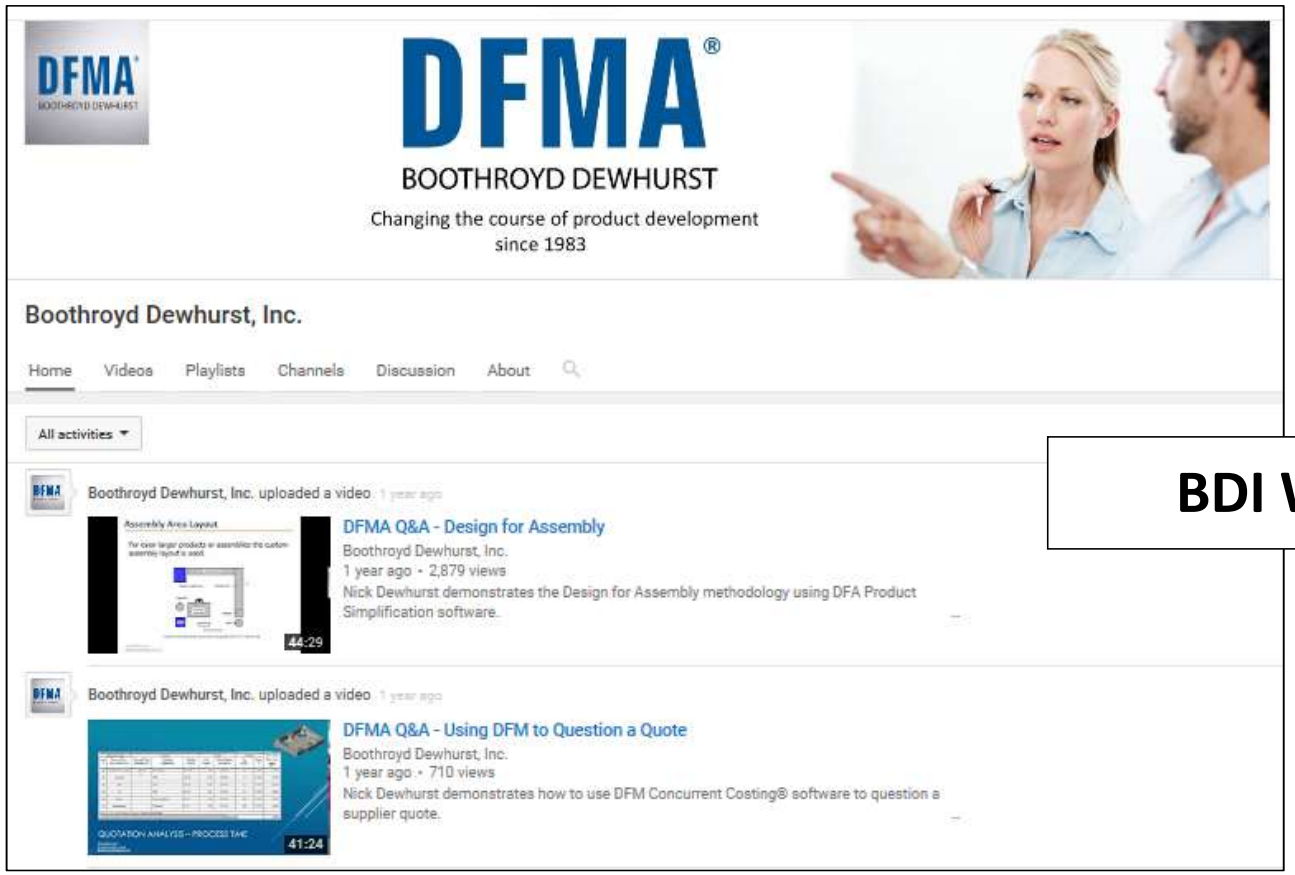
Using tools like Lean New Product Development and Design for Manufacture and Assembly (DFMA), the Global Faucets NPI team is working hard to help create that collaborative environment.

"One big thing about NPI's work is bringing experts together and providing tools which enable them to come to the best solution,"

DFMA Videos

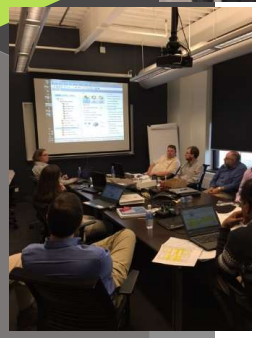
asteners
Fasteners.mp4
Mfg at Kohler.mp4
DFMA Intro.mp4
DFMA Workshops.mp4
DFA Index.mp4
Dance of the Faucets.mp4

Makers Meeting



BDI Webinars

Global DFMA Efforts

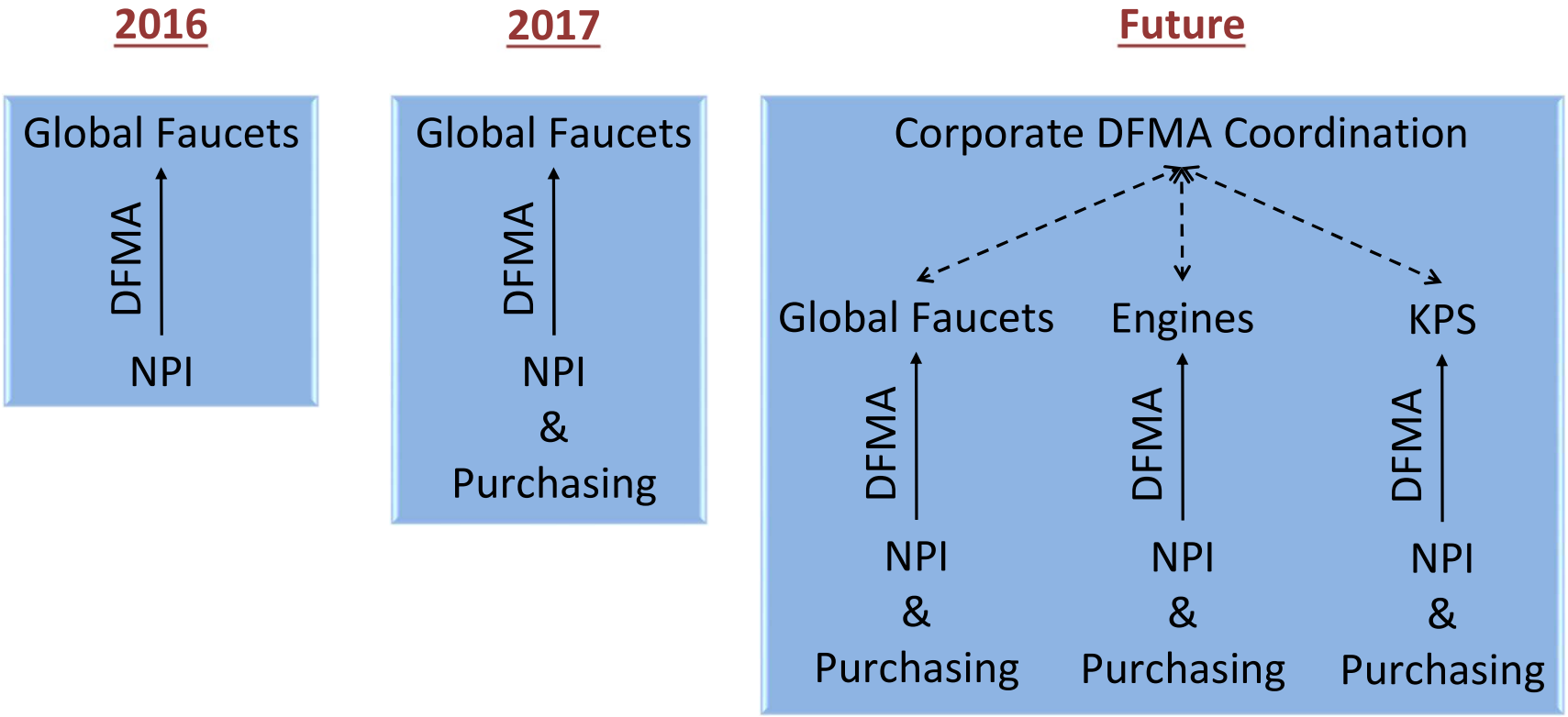


KOHLER

Culture Shock

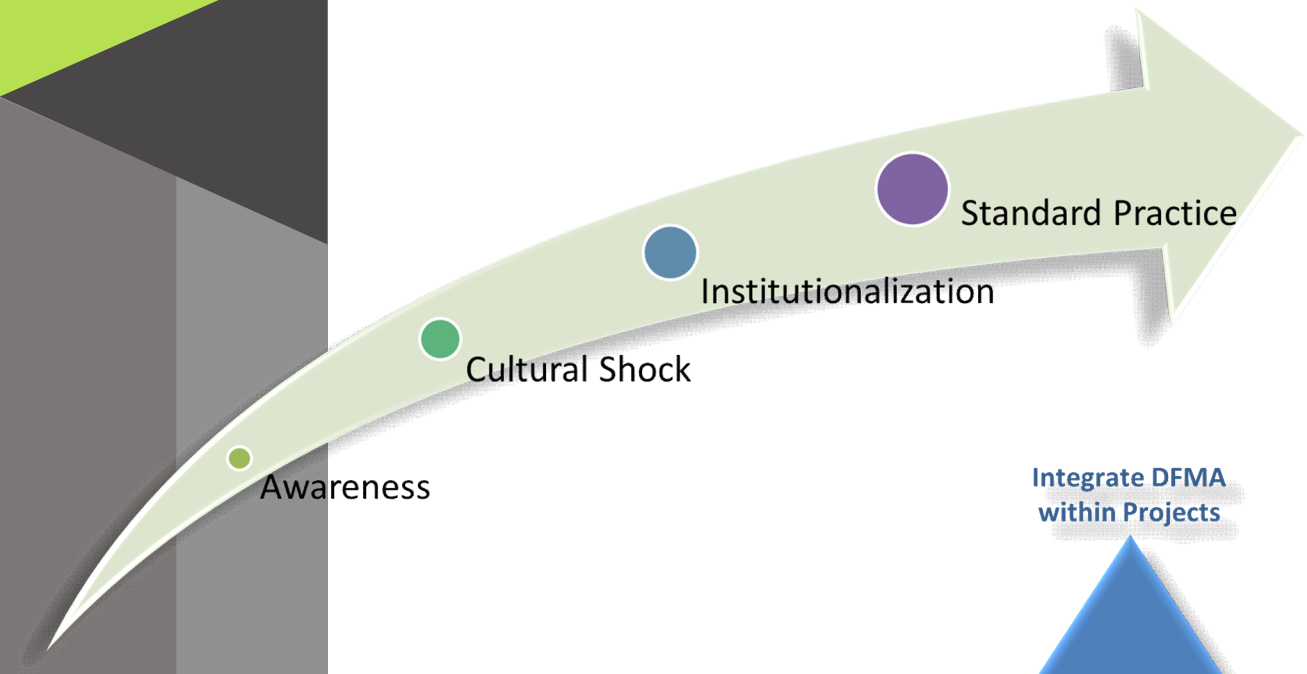
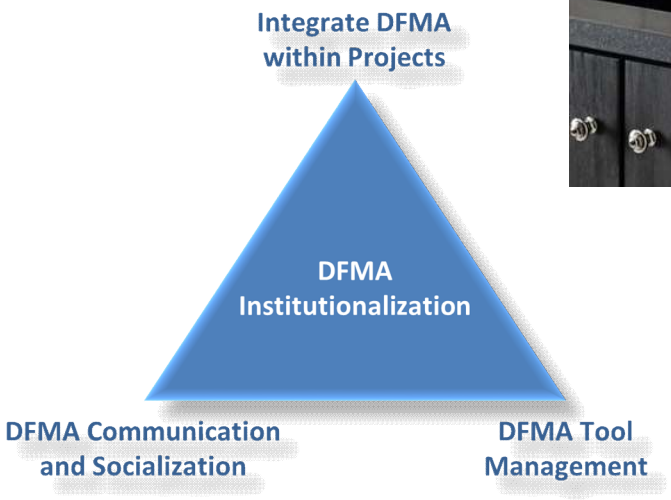
KOHLER

The Spread of DFMA



KOHLER

“All adventures, especially into new territory, are scary.”

Sally Ride

Panel Discussion