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PTC 242 - Improving Product Quality with PTC Windchill and WQS

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06/09/15

AGENDA

- Our (Coca-Cola) presence
- Corporate Strategy
- Business strategy
- Functional strategy
- Value chain
  - Focus on Concept & Engineering Product Development first
  - Manufacturing
  - Quality
- Lessons Learned
- Feedback

Outline of the presentation

COCA-COLA - WHERE WE ARE

Available world over in all countries with the exception of 2 countries

TCCC CORPORATE STRATEGY

What Businesses to be in

- Grow Sparkling (core carbonated brands) beverages
- Grow Still (teas, coffees, sports drinks) beverages
- Drive Productivity and Efficiency

Some of the business imperatives of the Coca-Cola company (Corporate strategy)

COCA COLA FREESTYLE BUSINESS STRATEGY

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Product Positioning

- Variety and engagement (growth)
- Very reliable, engaging beverage experience for consumers
- Smaller product form factor
- Reduced backroom requirement

What is Coca-Cola Freestyle:

- Smart Connected Product
- Ability to mix multiple flavors
- Tracks and reports the availability of beverages
- Sends diagnostic codes from the sub-systems for predictive analysis

CCFS business imperatives that helps meet the TCCC imperatives

FUNCTIONAL STRATEGY

The value activities engaged in

- Focus on Innovation
- Cost savings
- Quality
- Regulatory Compliance

The functional strategy that will help us meet our business imperatives and corporate goals

VALUE CHAINS

Strategic Planning → Concept Development → Engineering Development → Engineering Software → Quality & Regulatory → Procurement → Manufacturing → Commercial After-MKt

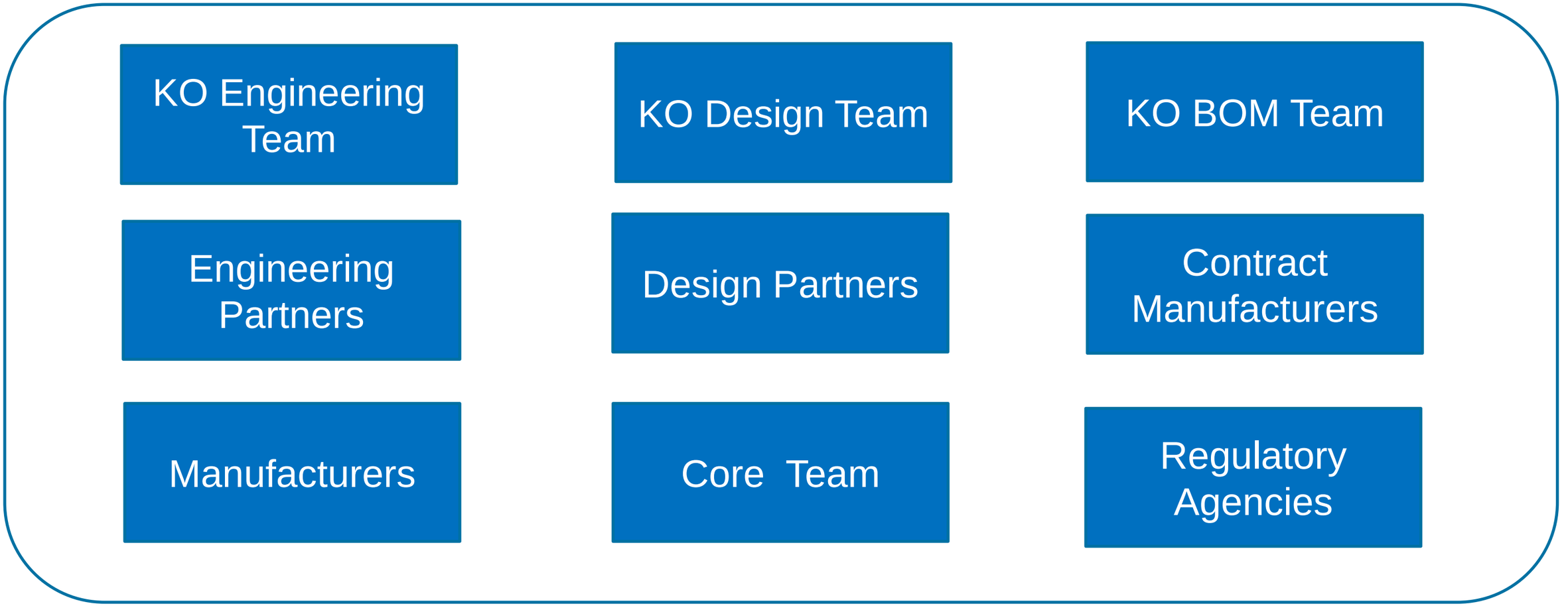
The overall product development value chain

VALUE CHAINS

Strategic Planning | Concept Development | Engineering Development | Engineering Software | Quality & Regulatory | Procurement | Manufacturing | Commercial After-MKt

Let’s focus first on the 4 chevrons highlighted above

PRODUCT DEVELOPMENT VALUE CHAINS



Internal and External product development value chains all have a role to play in innovation

Common Innovation Framework

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The Coca-Cola Way of Innovation Development

- Stages: Where the tasks are done and deliverables created
- Gates: Where decisions to resource the next stage of work are made

A collaborative stage gate process. Utilized for all projects (marketing, technical, Finance to name a few

COST AND TIME PER STAGE

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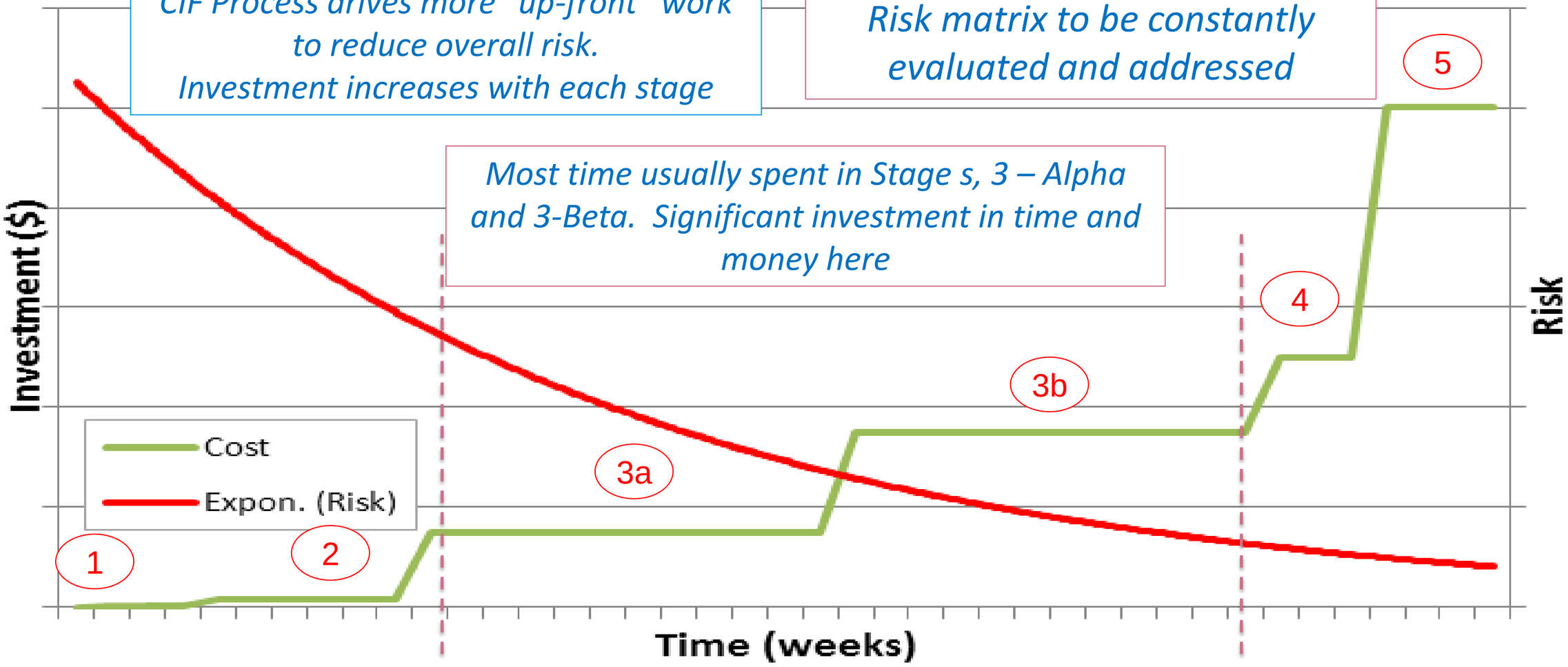
CIF Process drives more "up-front" work to reduce overall risk. Investment increases with each stage

Risk matrix to be constantly evaluated and addressed

Most time usually spent in Stage s, 3 – Alpha and 3-Beta. Significant investment in time and money here



Risks to be burnt down before commercialization

THE FIVE PILLARS OF OUR PLM ENVIRONMENT

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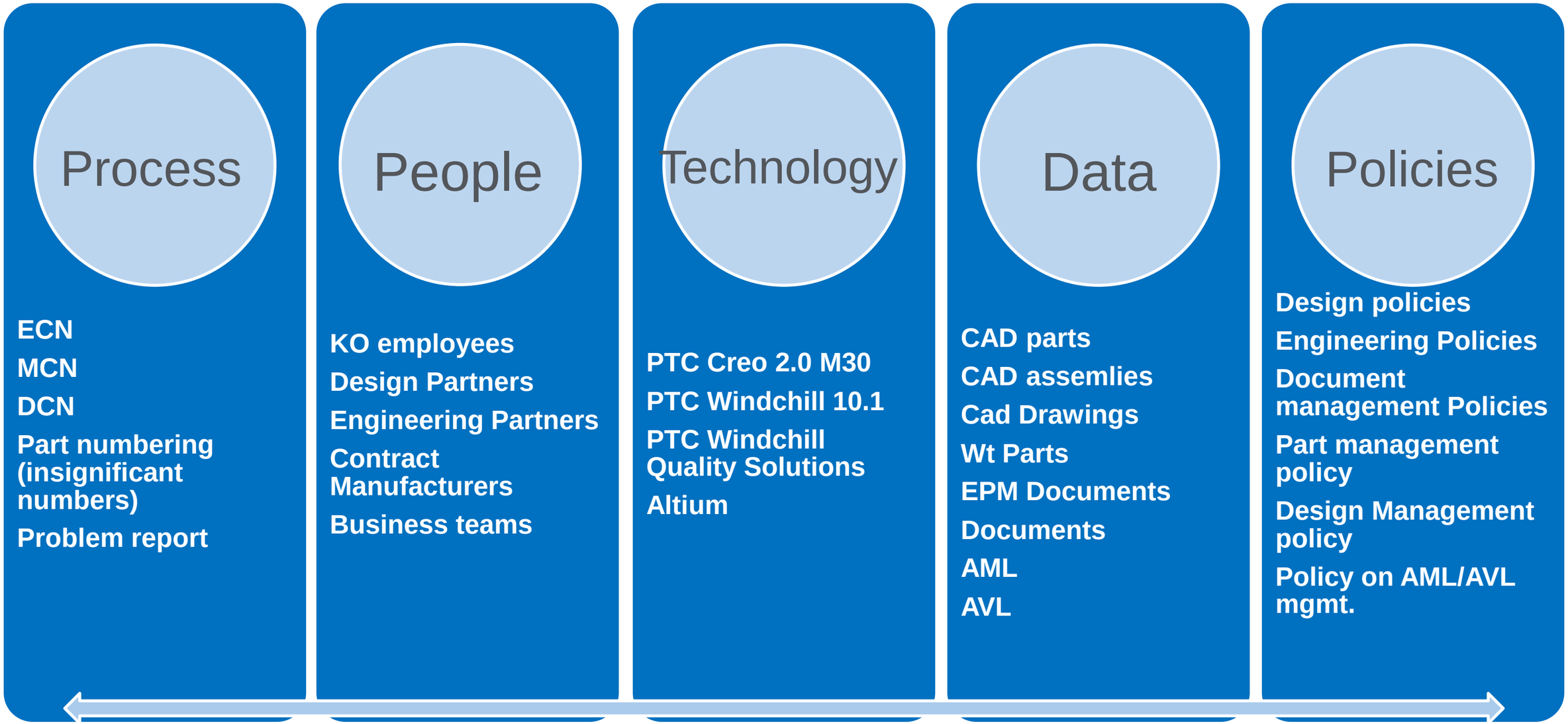


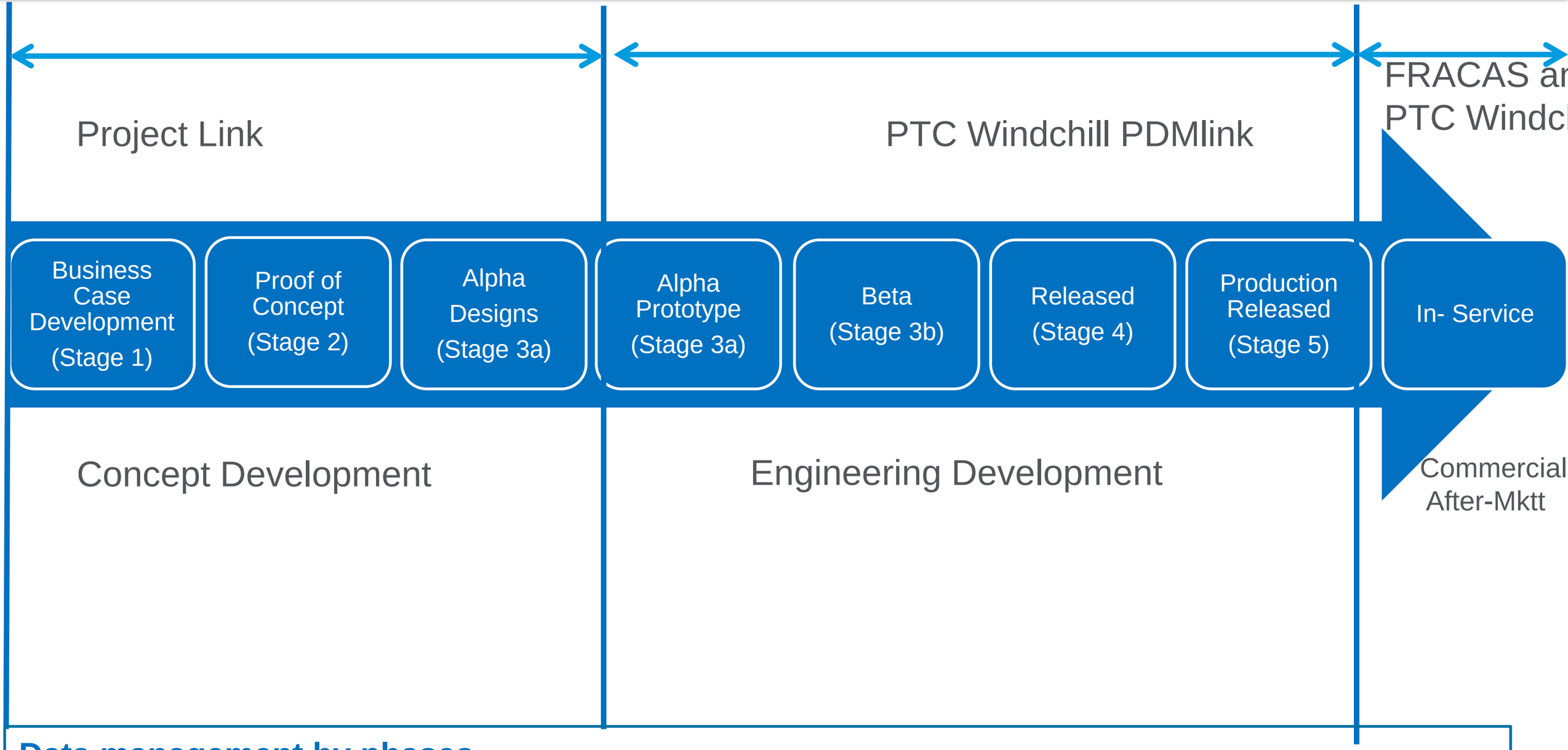
All the 5 stacks are interconnected

ACHIEVING OPERATIONAL EFFICIENCY

- Analyze process inputs and outputs
- Measure accuracy
- Measure efficiency
- Improve
  - Capitalize on experience curve effects
  - Continually Improve processes
- Control
  - Set benchmark targets
  - Strive for progress

Measure and improve processes in the ecosystem

PRODUCT DEVLOPMENT FRAMEWORK (L1 PROCESSES)



EXAMPLES OF KEY LEVEL 2 PROCESS

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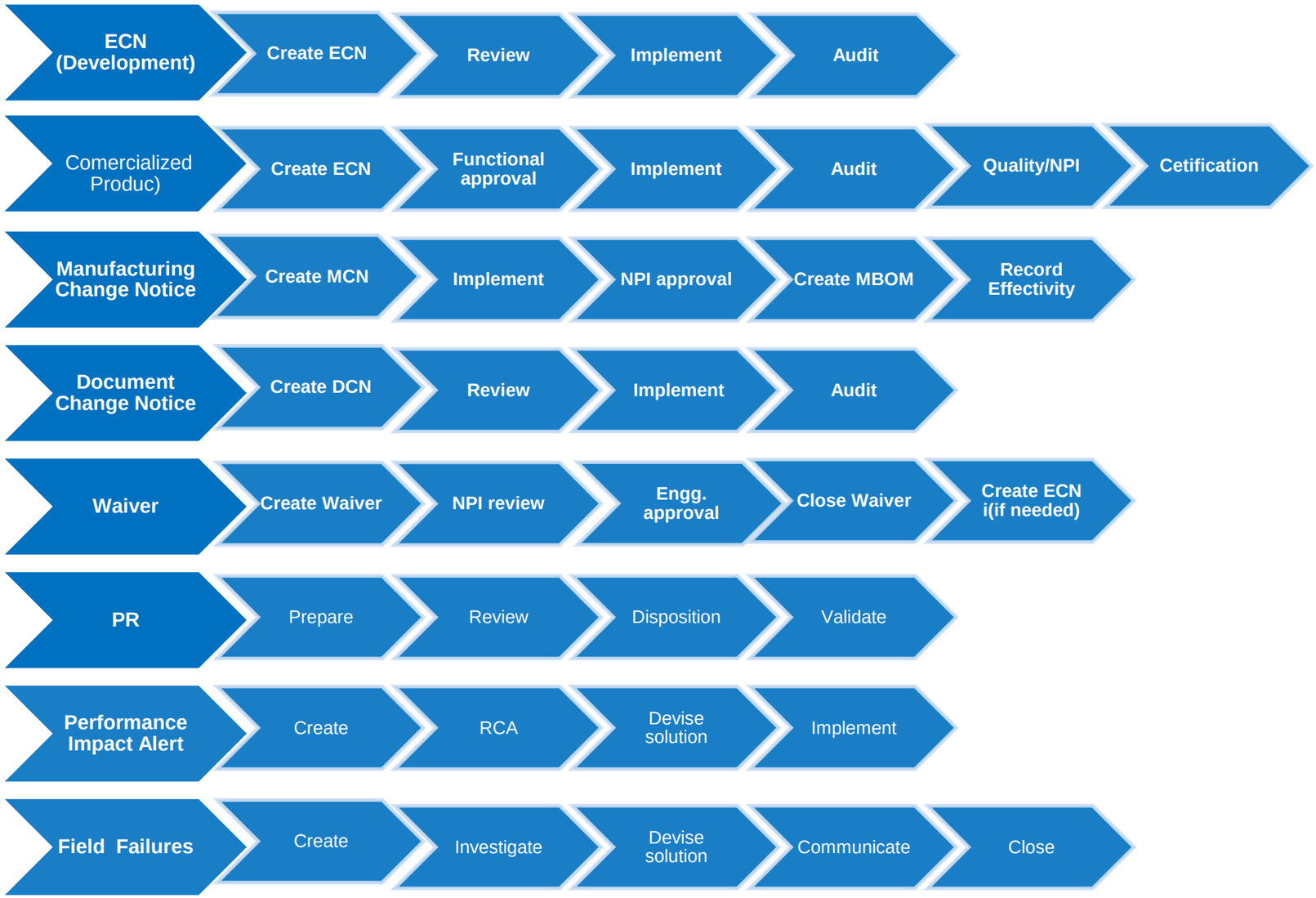


Examples of the Key L2 processes; We'll drill down on the implement phase in the next slide

LEVEL 3 PROCESS EXAMPLES

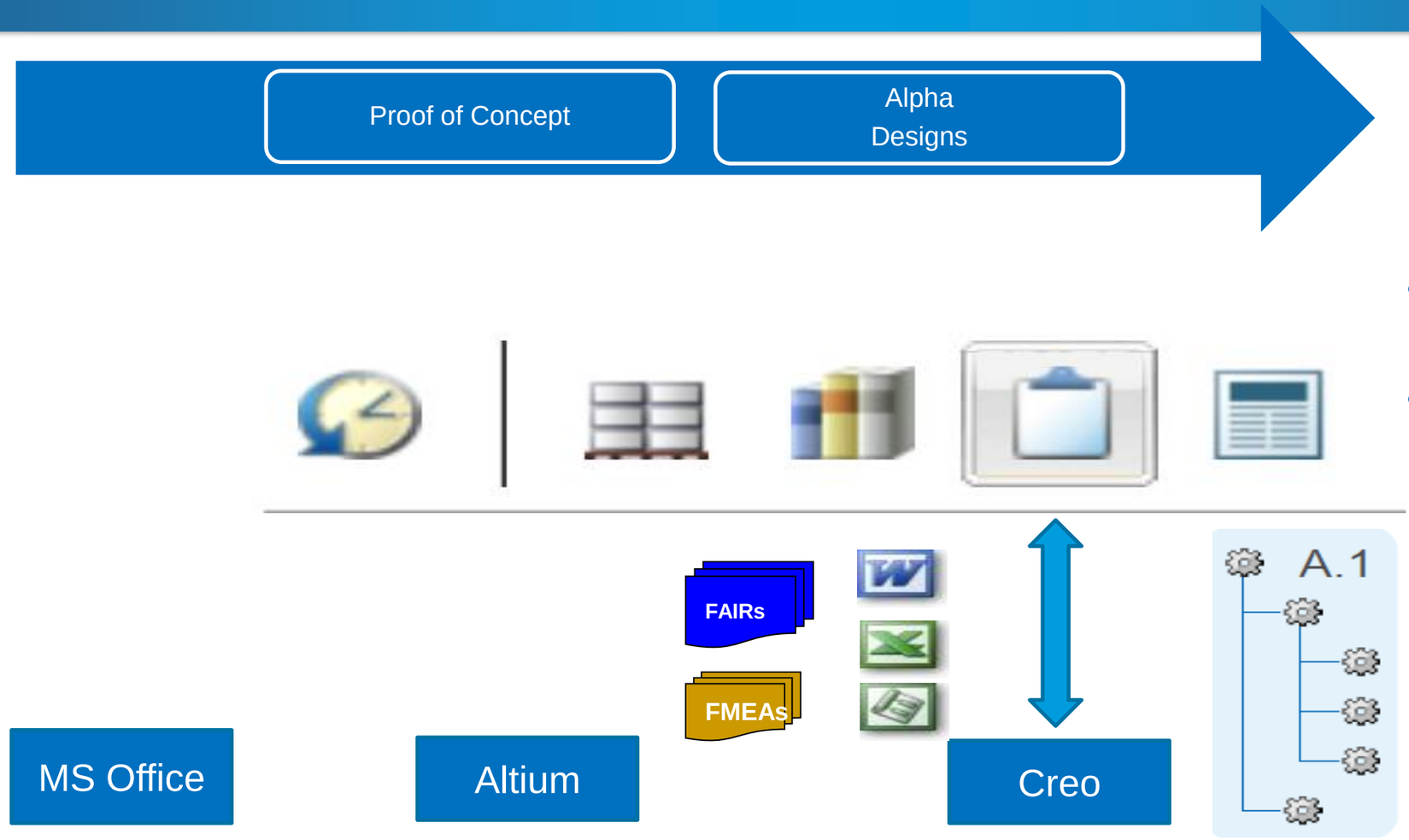
Examples of L3 Processes

Enterprise Change Management

- Permanent Changes
  - Engineering Change Notice
    - Development platforms
    - Commercialized platforms
  - Manufacturing change Notice
  - Document change notice
- Idea and Issue management
  - Problem Report
- Temporary Changes
  - Deviation
  - Waiver

Temporary and permanent change processes

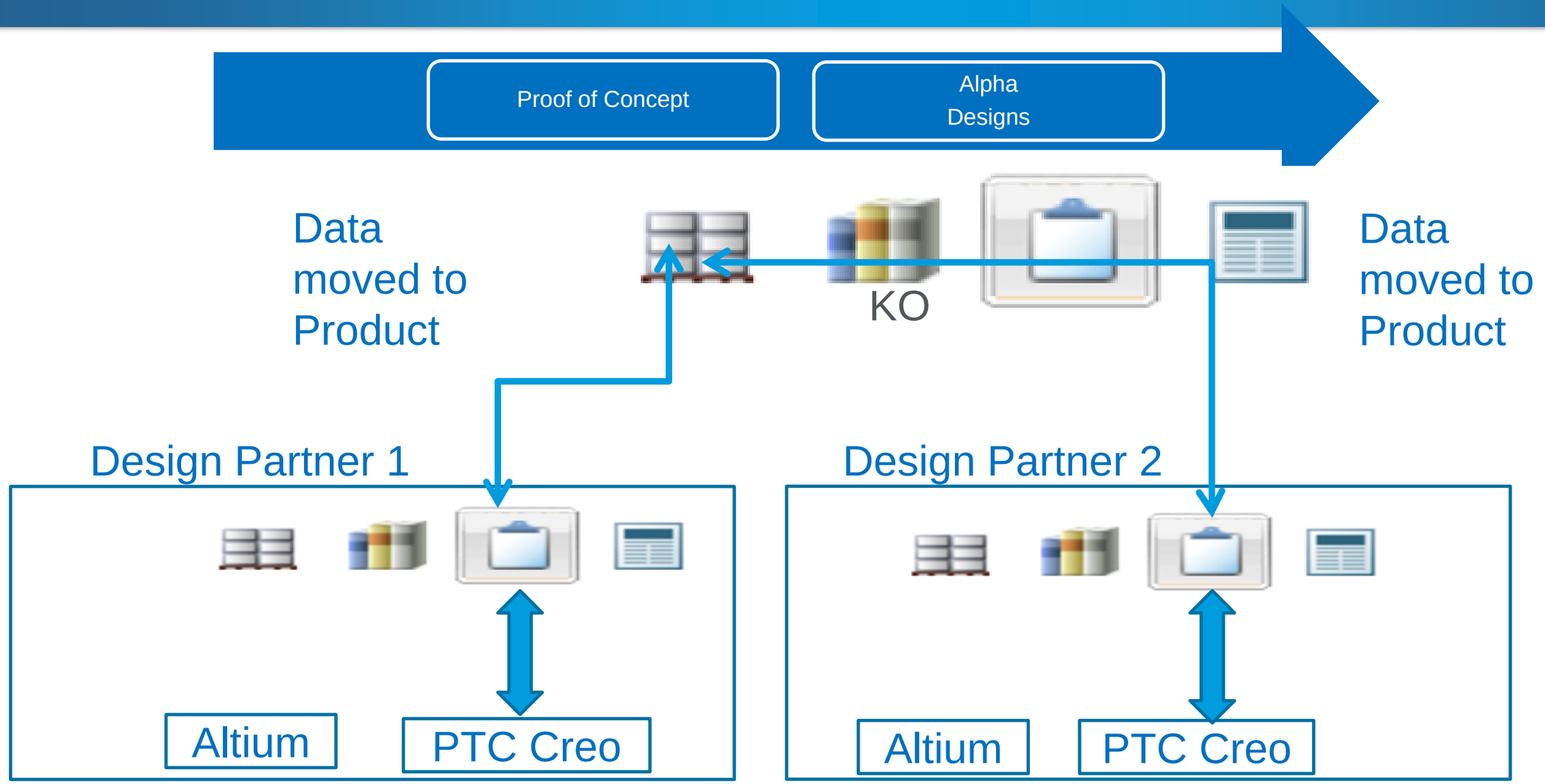
EXPLORATORY STAGES



- Higher number of Iterations
- Until product changes reach a point of diminishing returns

Provides flexibility during the exploratory phases

HOW 2 DIFFERENT DESIGN PARTNERS COLLABORATE



How 2 different design partners work in our windchill environment during stage 2 and stage 3a of our innovation framework

DATA MOVED TO PRODUCT

Proof of Concept

Alpha
Designs

Tooling / Prototype

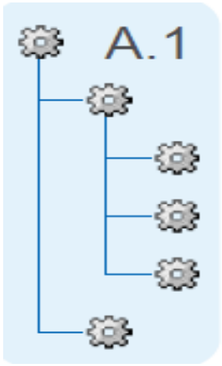
- Data that needs to be prototyped or sent for tooling identified
- Data moved to product

- Data assigned “alpha prototype” status

- Data shared to a Project from which the supplier picks up

Data that is closer to the exit criteria for stage 3a and/or needs to be sent for prototyping is moved to Product

PROTOTYPE DEVELOPMENT



ECN (Development)

- Create ECN
- Implement
- Review
- Audit

Proof of Concept

Alpha
Designs

Tooling / Prototype

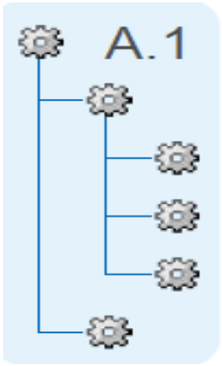
- Development ECN created
- Tasks routed to the CAD team
- Audit done by the ECN creator

- Data culminates in an Alpha prototype status

- Data shared to a Project from which the supplier picks up

Data Cuminates in a L.C. state change of “Alpha Prototype”

Beta



ECN stages (Commercialized Product)

- Create ECN
- Functional approval
- Implement
- Audit
- Quality/NPI
- Certification

Beta Prototype → **Released**

- ECN created
- Tasks executed by the CAD team

- Audit done by Technical review Board
- Data culminates in a released state

- Data ready to be shared with contract Manufacturer

A Sustaining ECN is created to release the data and for preparing the data for manufacturing

MANUFACTURING & QUALITY & REGULATORY PROCESSES

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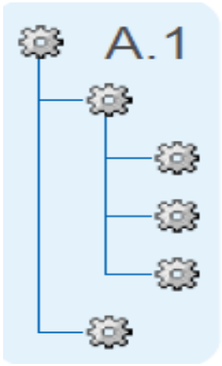
Strategic Planning | Concept Development | Engineering Development | Engineering Software | **Quality & Regulatory** | Procurement | **Manufacturing** | Commercial After-MKt

PRODUCT DEVELOPMENT FRAMEWORK (L1 PROCESSES)



MCN stages (Commercialized Product)

- Create MCN
- New Product Introduction review
- Conversion to MBOM
- Log Effectivity

Released

- Manufacturing Change Notice created
- Tasks executed

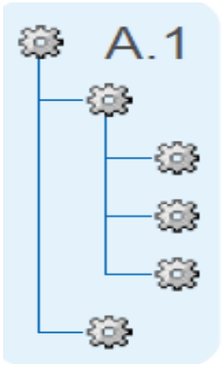
Production Released

- Audit done by NPI team
- Work order generated by CM in their system
- Effectivity information entered

- Data moves to Production released state

An MCN is created to release the data for New Product Introduction

TEMPORARY CHANGES - WAIVER



Waiver stages

- Create Waiver
- NPI review
- Engg review
- Approve
- Close

Production Released

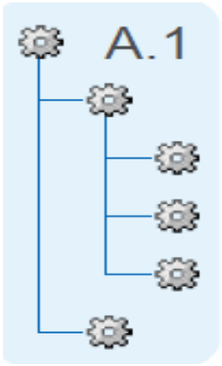
- Contract Manufacturer does inspection on parts received
- Waiver created by contract manufacturer if parts come out of spec

- Review done by NPI team and Engineering team
- Waiver rejected/approved for a set quantity or time

- Contract manufacturer Continues with the activity

Waiver created when contract manufacturer receives parts out of spec. Waiver is not a planned event.

TEMPORARY CHANGES - DEVIATION



Waiver stages

- Create Deviation
- NPI review
- Engg review
- Approve
- Close

Production Released

- When adhoc changes need to be made to Design, Engineering or Manufacturing documentation, Deviation created by Engineer

- Review done by NPI team and Engineering team
- Deviation typically approved for a pre-determined quantity or time

- Contract manufacturer Continues with the activity
- Change made if the deviation needs to be made permanent

Deviation created when there is a need to deviate from a planned and approved design or manufacturing

THE PERFORMANCE IMPACT ALERT PROCESS

Framework for prioritizing and assessing field issues

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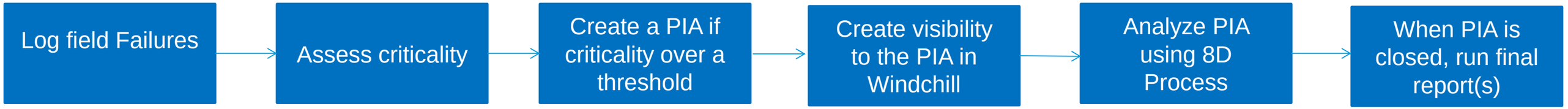
- OOTB integration to Windchill
- Ability to Pull BOM from Windchill



Field failures with criticality over a threshold are escalated and a PIA is created

COMERCIAL AFTER-MARKET PROCESSES

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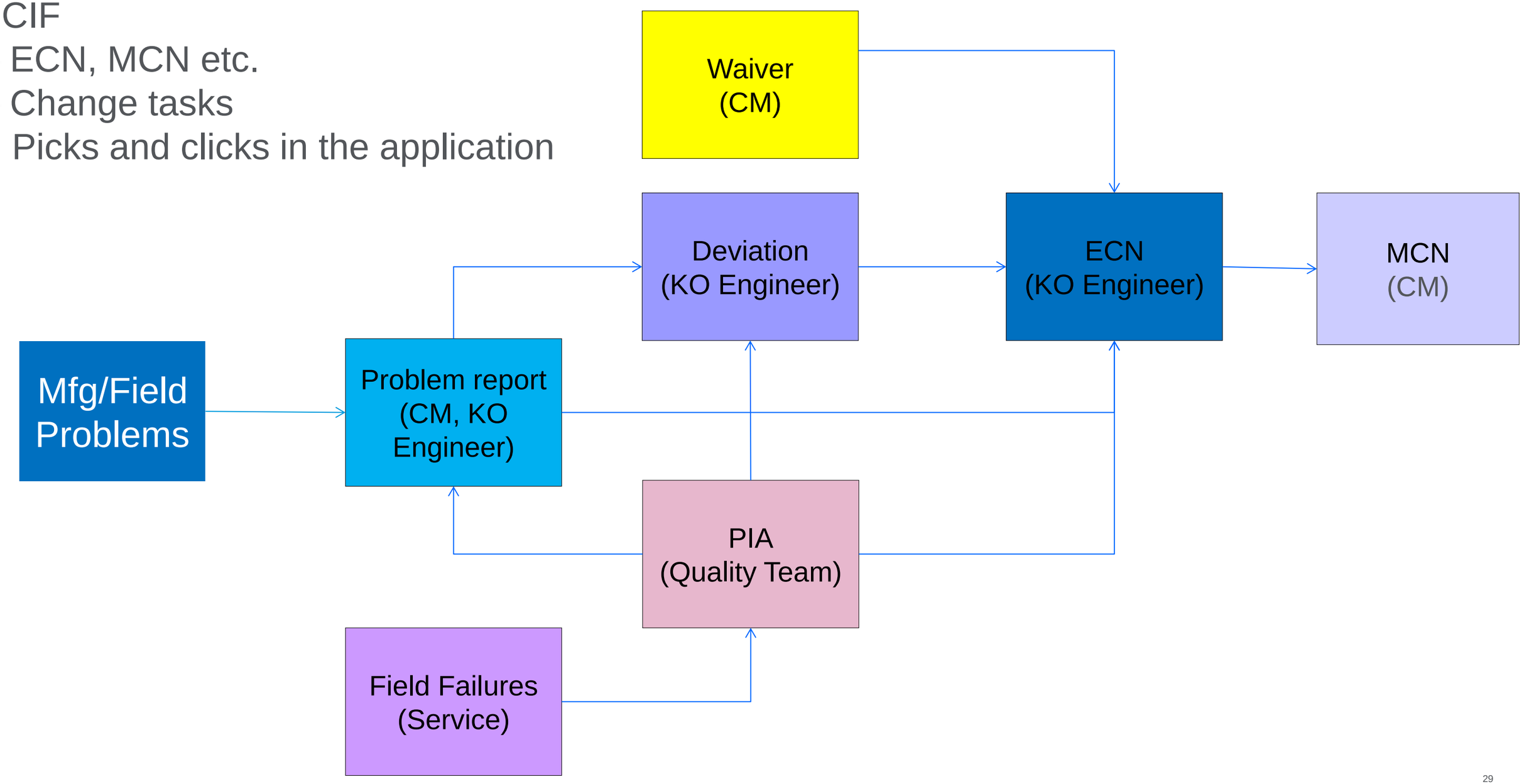
Strategic Planning | Concept Development | Engineering Development | Engineering Software | Quality & Regulatory | Procurement | Manufacturing | **Commercial After-MKt**

CHANGE MANAGEMENT WORKLOW (COMMERCIALIZED PRODUCTS)

L1 - CIF
L2 – ECN, MCN etc.
L3 – Change tasks
L4 - Picks and clicks in the application



OPERATIONAL DATA

- Categorization of the processes
  - Development
  - Commercialized
  - Assess Cycle time
  - Assess First pass yield
- Generate reports (periodically)
- Analyze the data to identify improvement opportunities

Slice the data to gather insights on performance; helps pull the appropriate levers to achieve efficiency

DATA ANALYSIS

- We analyze and Develop Dashboards on the following
  - Number of ECNS by product
  - Number of ECNS by creators
  - Number of Deviations by Product
  - Number of Waivers by Product
  - Number of Waivers by Contact manufacturers
  - Number of Problem reports/product
  - Number of problem reports by person logged
  - Number of L2 process reworks
  - Number of L2 reworks by product
  - Number of L2 reworks by assignee
  - Number of L2 Reworks and time elapsed
  - Number of repeat L2 reworks
  - Number of Problem reports

Metric generation

FRACAS LANDING PAGE FOR DASHBOARDS

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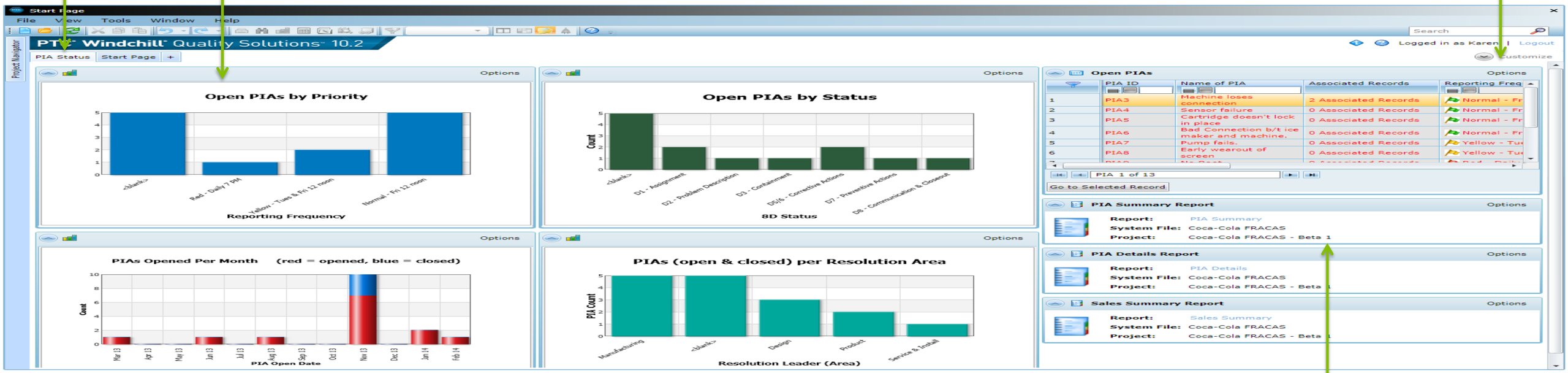
The two start pages are seen as separate tabs in the top of the WQS window. You can toggle between them by clicking on each of the tabs

Select the tab named “PIA Status” for the Coca-Cola specific Start Page.

The Coca-Cola Start Page contains graphs summarizing the PIA data.

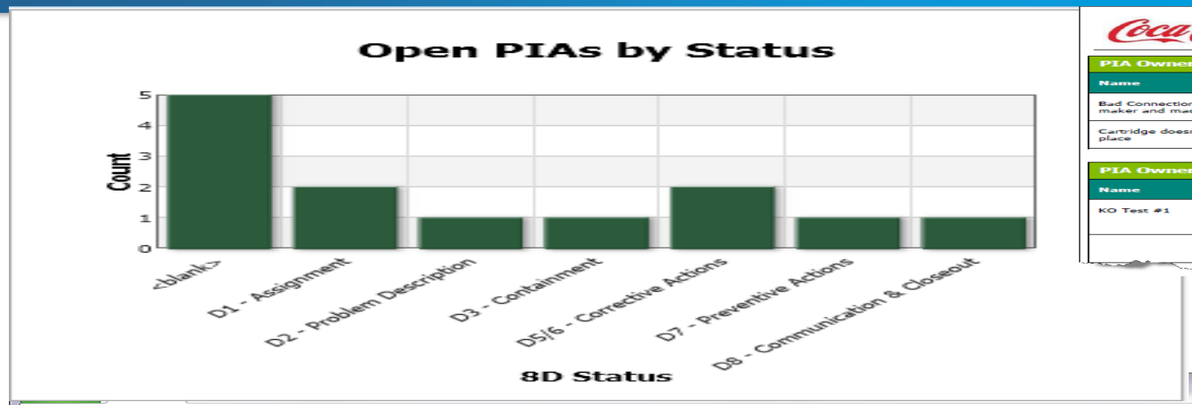
The Open PIA table shows PIAs that are open plus PIAs that were closed in the last week. It provides a list of PIAs to discuss at weekly meetings.



The Coca-Cola Start Page also contains a list of reports that can be run to give summary data of all PIAs, specific data on one PIA, or a Sales Summary.

The Landing Page provides a dashboard of open PIAs and metrics

DATA OUTPUT



Coca-Cola Freestyle

PIA Summary

PIA Owner: Cecil

Name	Workflow/Status	Opened Date	Planned Closeout	Problem Statement	Established Cause	Extent (#, %, $)	Current Status
Bad Connection b/t ice maker and machine.	New/Unassigned D1 - Assignment	3/11/2013					
Cartridge doesn't lock in place	New/Unassigned D2 - Problem Description	6/17/2013					

PIA Owner: David Parker

Name	Workflow/Status	Opened Date	Planned Closeout	Problem Statement	Established Cause	Extent (#, %, $)	Current Status
KO Test #1	Open/Assigned D1 - Assignment	11/18/2013	11/22/2013	Test of new automated PIA process	Alpha demo complete.	100%	First test to verify PIA generation. No fielded unit are affected.

Paste | Cut | Copy | Format Painter | Clipboard | Calibri | 11 | Font | Wrap Text | Merge & Center | Alignment | General | Number | Conditional Formatting | Format as Table | Cell Styles | Styles | Insert | Delete | Format | Cells | AutoSum | Fill | Clear | Sort & Filter | Find & Select | Editing

A1 PIA ID

	A	B	C	D	E	F	G	H
1	PIA ID	Name of PIA	Associated Records	Reporting Frequency	PIA Open Date	Workflow State	8D Status	Contact Name (PIA Owne
2	PIA1	Cartridge removal issue	0 Associated Records	Red - Daily 7 PM	11/3/2013	Closed/Duplicate	D8 - Communication & Closeout	Karen Bowman
3	PIA2	Hose connector leak	0 Associated Records	Yellow - Tues & Fri 12 noon	11/15/2013	Closed/Resolved	D8 - Communication & Closeout	Karen Bowman
4	PIA3	Machine loses connection	2 Associated Records	Normal - Fri 12 noon	8/12/2013	Open/Assigned	D8 - Communication & Closeout	Karen Bowman
5	PIA4	Sensor failure	0 Associated Records	Normal - Fri 12 noon	2/14/2014	New/Unassigned	D7 - Preventive Actions	Karen Bowman
6	PIA5	Cartridge doesn't lock in place	0 Associated Records	Normal - Fri 12 noon	6/17/2013	New/Unassigned	D2 - Problem Description	Cecil Webb
7	PIA6	Bad Connection b/t ice maker and machine.	0 Associated Records	Normal - Fri 12 noon	3/11/2013			
8	PIA7	Pump fails.	0 Associated Records	Yellow - Tues & Fri 12 noon	11/22/2013			
9	PIA8	Early wearout of screen	0 Associated Records	Yellow - Tues & Fri 12 noon	1/2/2014			
10	PIA9	No Boot	0 Associated Records	Red - Daily 7 PM	1/24/2014			
11	PIA10	QPM No Power	4 Associated Records	Red - Daily 7 PM	11/15/2013			
12	PIA11		0 Associated Records		11/15/2013			
13	PIA12		0 Associated Records		11/15/2013			
14	PIA13		1 Associated Record		11/18/2013			
15	PIA16	KO Test #1	0 Associated Records	Normal - Fri 12 noon	11/18/2013			

Coca-Cola Freestyle

PERFORMANCE IMPACT ALERT
Equipment/Process/System Failure Requiring Containment Activity and/or Corrective Action

PIA ID: PIA2
Workflow State: Closed/Resolved
Workflow Date: 11/15/2013

Weekly Status

Name of PIA: Hose connector leak
Current Status for Weekly Report:
8D Status: D8 - Communication & Closeout

D1: Assignment

PIA Opened By: Karen
Reporting Frequency: Yellow - Tues & Fri 12 noon
Planned Closeout Date: 12/21/2013
PIA Open Date: 11/15/2013
Resolution Leader: Manufacturing
Contact Name (PIA Owner): Karen

D2: Problem Description

Original Trigger Date: 1/1/2013
Program / Product: GS1 ☑ GS2 ☑ Other ☐
Performance Impact: Quality? ☑ Cost? ☑ Delivery? ☐
Location Name: Wendy's
Problem Statement: Many QPMs being replaced in the field. Service reps are finding no power to QPM. When QPM is replaced, Freestyle works again.
Established Cause: Unknown.
Extent (#, %, $): $1200 so far to repair failed QPMs. 100% Freestyle uses same QLM so extent could be great if not repaired.

D3: Containment

Checkboxes designate critical path actions.

Inventory Containment ☑

Inventory table is only to be used when required for inventory containment or emergency part cut-over events. Plexus and Supply Chain Planning to provide information.

Inventory Date	Open Orders (Units)		Manufacturing	Warehouse	In-Transit	Customers	Comments
	Customers	Contract Mfg.					
11/21/2013	50	100	6	1	20	542	Received sales records from Pam.

Containment Impact (Quantity, Cost, Logistics):
Not enough [illegible] inventory [illegible] cont[illegible] inventory
Cost
Short Term Corrective Action Resolution (if needed):
New [illegible]

Graphing and reporting in FRACAS

WHAT WE ARE FOCUSED ON

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BUILDING CAPABILITIES	• 10.1,Upgrade, SUMA implementation, • Process Metrics Reports (Charts and Graphs) • WQS (PTC Windchill Quality Solutions) rollout • Assessing ECAD integration
PROCESS IMPROVEMENT	▪ Analyze and continually Improve existing processes ▪ Develop Product taxonomy
PRODUCTION SUPPORT	▪ Successfully support all Projects and installed base ▪ Over the Shoulder support
INCREASE AWARENESS	▪ Tips and Techniques ▪ Training documents ▪ Wikis
IMPROVE PRODUCTIVITY	▪ Minimize unplanned downtime ▪ Help Project teams in meeting their Time to Market goals ▪ Help teams innovate to equip ourselves with a competitive advantage

Lessons Learned

- Product Classification
  - Modular Design helps immensely
- Executive sponsorship is key
- Communication is key
  - Keeping the teams abreast of changes plays a significant role
- Part numbers
  - Insignificant numbers play a pivotal role in ensuring that the organization can scale up to capacity
- Change Control
  - Optimize the number of attributes needed to create an ECN
    - Not too many or too few
  - ECNs can be routed to Functional leads / Module Leads (Electrical, Software and Mechanical) for their approval
    - One approval sufficient to move it along to the next step will prevent bottlenecks
  - Separate workflow for NPD projects and commercialized products will help as the approval process varies
  - Subscription is better than push notifications
  - In our environment based on VOC inputs, ECR creation was eliminated

LESSONS LEARNED (Continued)

- Email notifications play a vital role
  - If notifications can pictorially represent where a task is in the context of the overall process, it is very helpful (Eg. On the following slide)
- Demarcate Engineering stages and manufacturing stages if needed

EMAIL NOTIFICATION

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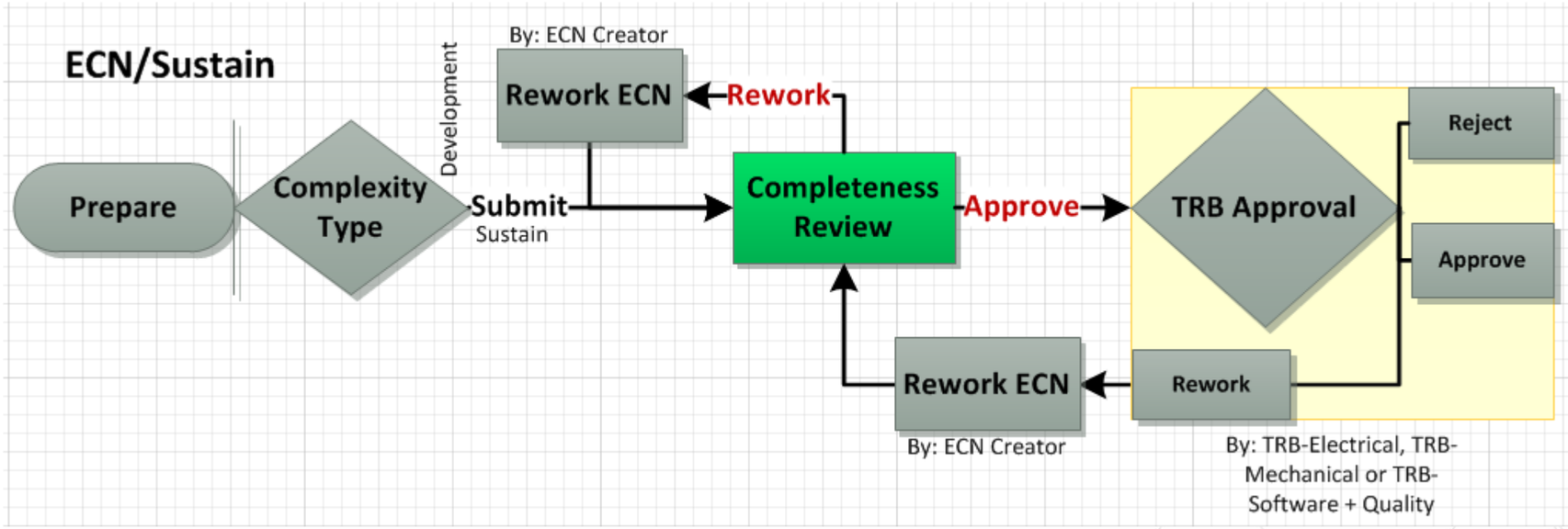
Image in the email notification on ECN changes



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