

Automating Early Supplier Collaboration

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Honeywell Aerospace

GLOBAL PRODUCT DATA INTEROPERABILITY **SUMMIT** 2015



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Presenter Background

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Sagar Kumar



Work Experience

Honeywell Aerospace

- Manufacturing Tool & Process Development Lead
- PLM Strategy and Governance

Education

- **B.S.** Industrial Engineering – Purdue University
 - West Lafayette, IN
- **MBA** – Arizona State University
 - Tempe, AZ

Honeywell Overview

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\$40.3B

in sales for 2014

55%

of sales outside U.S.

- ~1,250 sites, 70 countries
- More than 127,000 employees
- **Morristown, N.J.** headquarters
- **Fortune 100**
- **NYSE: HON**

Honeywell Overview

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Aerospace



\$15.6 Billion

Automation and Control Solutions



\$14.5 Billion

Performance Materials and Technologies

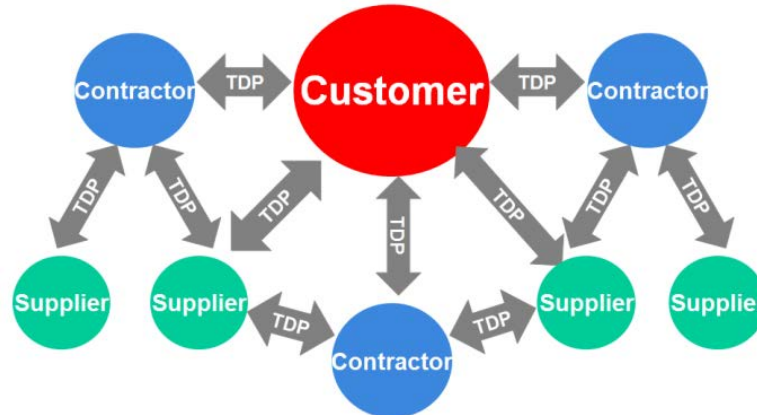


\$10.2 Billion

Current State

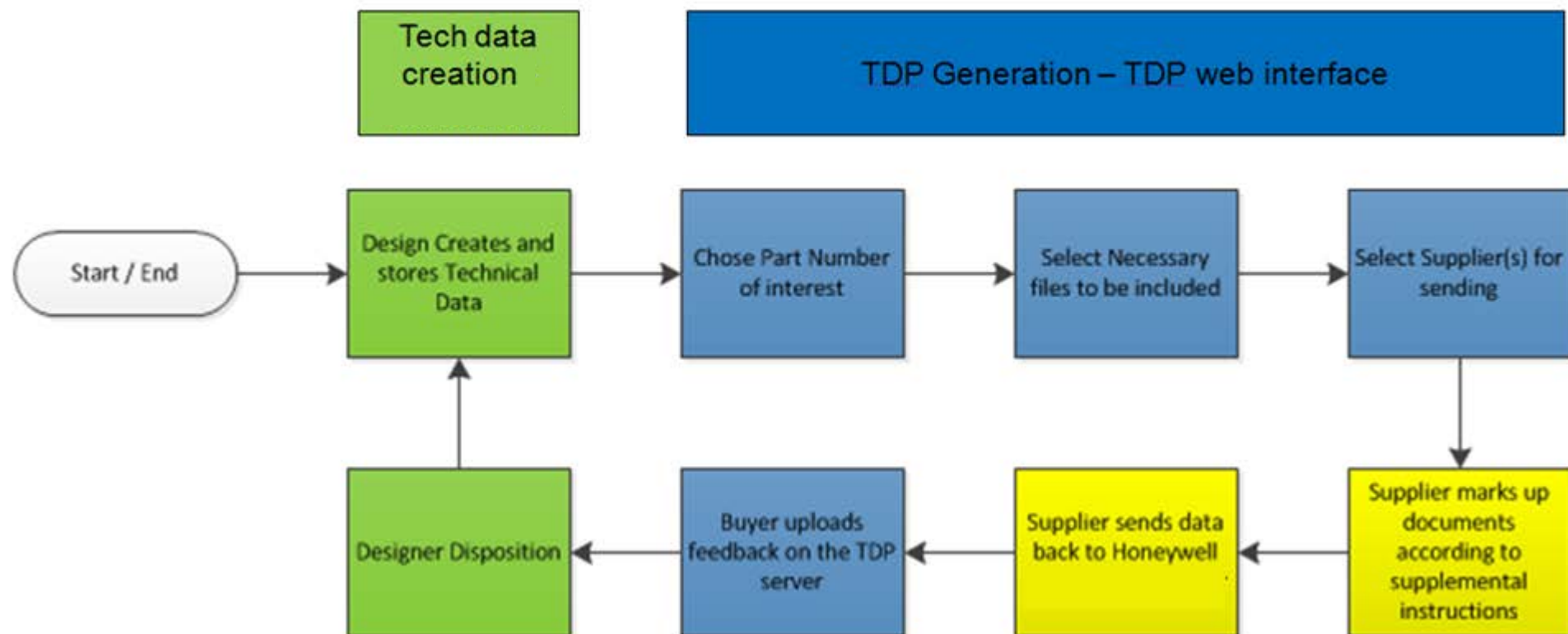
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- **There is no formal process for supplier collaboration**
- **Sporadic communication / information flow**
 - Excess email correspondence and excess file transfer
 - NVA in supply chain verifying artifact versions and versions
- **High cycle time**
 - Time intensive / manual process (error prone)
- **Not real time**
- **Supplier feedback disconnected from the design**



Design – Supplier Feedback loop (High Level)

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Requirements

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- **Linkage to design systems; both for released data, and unreleased data**
- **Linkage to secure Data Exchange mechanism**
- **Interoperability between different systems**
- **Export compliance**
- **Comply with MIL STD 31000A, STEP AP239e2, and emerging standards**
- **Exploiting existing SOAs**
- **Modifications of existing SOAs**
- **Build PLM – SOA translator**

Requirements

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- **One-stop shopping solution**
- **User friendly**
- **Web based tool working on all platforms**
- **Agile development for shifting / arising requirements**
- **Flexibility of process to accommodate new business use cases while maintaining schema**
- **Queuing mechanism**
- **Metric solution – understand what feedback was returned and what was instituted**
- **Align with Program dates**

Approach – Three prong approach

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- **Customer Facing Role**
 - Meets with the business and the supplier to relay communication and requirements / use cases
- **Software Design Modeling (UML / SysML)**
 - Logical representation of what the system will do
- **Development**
 - Takes modeling language into the logic

Management Operating System

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- **Three different environments**
 - Development, QA, Production
- **Leveraging best practices**
- **Change Management**
 - Communication to all leads
 - Rigorous end user training
- **User acceptance testing (UAT)**
 - SME personas
 - Feedback from key suppliers with test articles

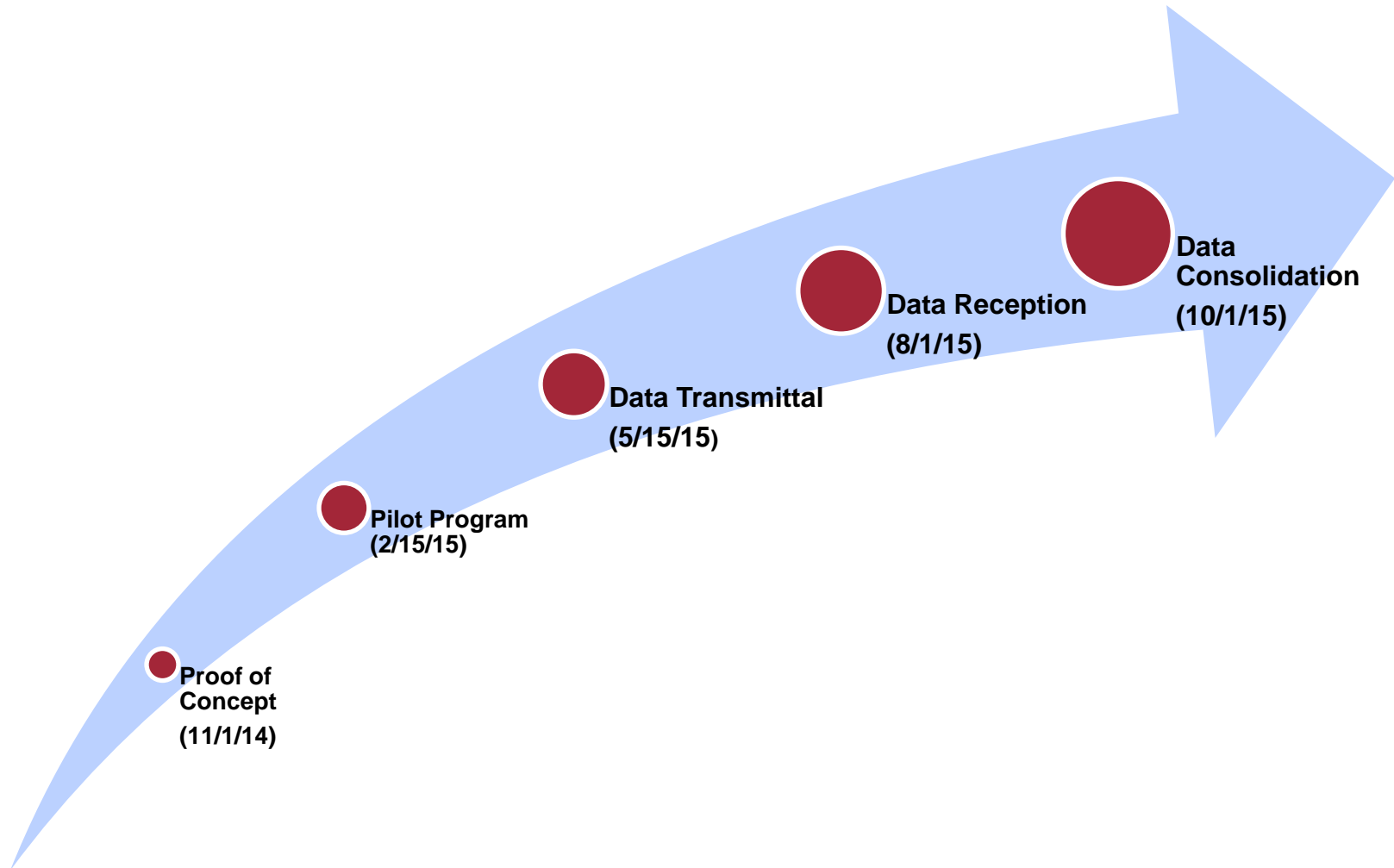
Management Operating System

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- **Daily recurring meetings**
 - Internal / External meeting
- **Activity-based management**
- **Split the project into three phases to align to program requirements / schedule**
 - Data Transmission, Data Reception, and Data Consolidation

Project Schedule

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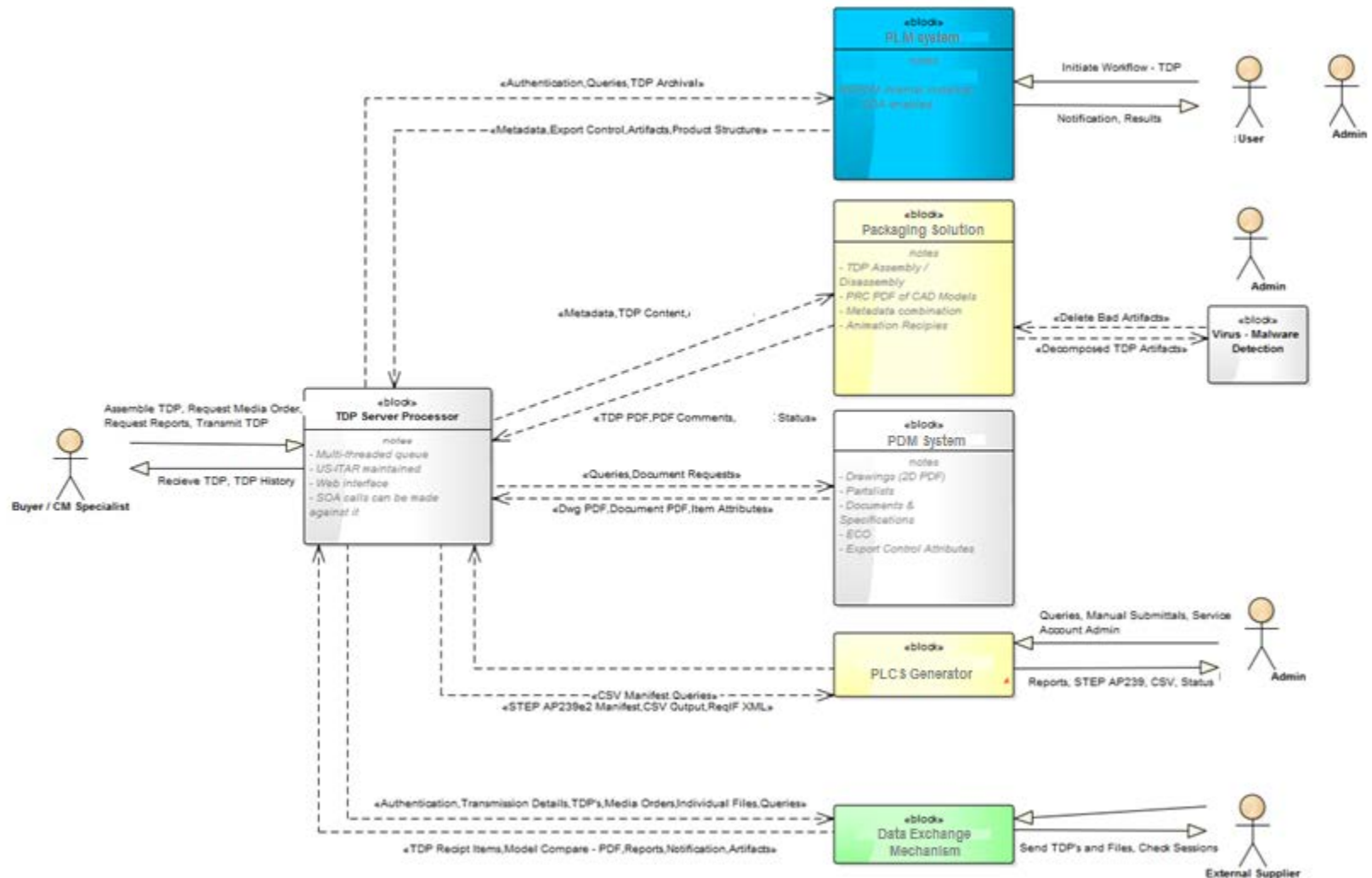
Solution – Based on an SOA architecture

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- **Based on Service Oriented Architecture (SOA)**
 - **Uses Representational State Transfer (REST)**
 - **Honeywell built SOA that interacts with PLM APIs**
 - **Uses Web Services Description Language (WSDL)**
 - **Data exchange**
 - **Data Packaging**
 - **Manifest generation**
 - **PDM**

Solution – Based on an SOA architecture

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Solution – Based on an SOA architecture

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- **Enables interoperability between systems for data sourcing and data management**
- **Simplistic user experience**
 - Keeps designer in their tool, maximizing effectively
 - Simple solution for the buying group that will not typically understand design systems
 - Groups do not need to copy and track artifacts on different repositories – easier to enforce process
- **A scalable solution able to support more data sources and different programs.**
- **Real time information, no back and forth**
 - Includes mechanisms to verify data in source systems

Storyboard – Login & Search

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Hello, ?

Input Data
No Active TDP/RFQ 0 Items

Search Type:
☐ General
☒ TDP

Part Number:
Dash Number:
Revision:
Version:

Data Source:
☒ None
☐ PLM
☐ PDM

Include Files:

- ☒ Program files
- ☒ General EHCOE
- ☒ General ISC

Honeywell TDP Processor v3.0.0

Item Revision(s)
No Active TDP/RFQ 0 Items

Get Artifacts	Get BOM Structure	Partnumber	Revision	Description	Release Status	Owning User	Owning Group
Select * Select Artifacts	* Select BOM items	MBE67411669-1		CONNECTOR ASSEMBLY; FLEX	Released; In Review; Alex Status		Design.5916
Select * Select Artifacts	* Select BOM items	MBE67411669-1	A	CONNECTOR ASSEMBLY; FLEX	New Status2		Design.9918

Storyboard – TDP Results & Transmittal

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Honeywell TDP Processor v3.0.0

TDP Monitor
No Active TDP RFQ

Refresh Display

Select	TDP	Partnumber	Revision	Version	Description	Release Status	Cage code	Tech code	Qty Class	IP Class	Username	Item Owner	% Complete	Date Processed	Results	TDP Uploaded To	DEXCentered To	D
<input type="checkbox"/>	Download	MBE67411661-1	-	2	COVER; CARD	Released	59364	9E991	ESO_1		E564345	e117878	100	9/10/2015 3:23:59 PM	Success!	TDP_MBE67411661-1_V2	e564345	9/10/2015 3:23:59 PM
<input type="checkbox"/>	Download	MBE67411660-1	-		CASE; ION DRIVE	xxc	59364	9E991	ESO_1		E564345	E117878	100	9/10/2015 3:20:29 PM	Success!			
<input type="checkbox"/>	Download	3033021-2	F		GEARSHAFT; BEVEL; TOWERSHAFT	Release	99193	9E991	ESO_1	NA	E564345		100	9/10/2015 3:17:24 PM	Success!			
<input type="checkbox"/>	Download	MBE67411660-1	-		CASE; ION DRIVE	xxc	59364	9E991	ESO_1		E564345	E117878	100	9/9/2015 1:53:15 PM	Success!			
<input type="checkbox"/>	Download	3033021-2	F	36	GEARSHAFT; BEVEL; TOWERSHAFT	Release	99193	9E991	ESO_1	NA	E564345	E564345	100	9/9/2015 11:41:23 AM	Success!	TDP_3033021-2_F_V36		
<input type="checkbox"/>	Download	MBE67411660-1	-		CONNECTOR ASSEMBLY; FLEX	Released; In Review; Alex Status	59364	9E991	ESO_1		E564345	E117878	100	9/8/2015 3:46:06 PM	Success!			

Add To Cart DEXCenter Transmitt Upload to Teamcenter Delete Upload & Transmitt

Honeywell TDP Processor v3.0.0

Push TDP to Customer [TC Logout](#)

Username:

LDAP Password:

Location:

Action:

Recipient ID:

☐ Requires ITAR

Technical Data Package – Look and feel (Demo)

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MBE67411676-1_-TDP.pdf - Adobe Reader

File Edit View Window Help

Open 774% Tools Fill & Sign Comment

Attachments

Name Desc...

- mb67411676-1_-pdf
- MBE67411676-1_-PLCSe2.xml
- mb67411676-1_-V2.stp
- mb67411676-1_CADIQ_summary_report.txt

DESC...

PRC...

STEP...

STEP...

CAD...

HONEYWELL INTERNATIONAL INC.
AEROSPACE - Phoenix, AZ USA

Honeywell

TDP OPTION SELECTION WORKSHEET
COMMERCIAL DRAWINGS/MODELS AND ASSOCIATED LISTS

SYSTEM: CASE, CARD DATE PREPARED: 11/10/2014

A. CONTRACT NO. B. EXHIBIT / ATTACHMENT NO. C. CLIN D. CDRL DATA ITEM NO(s)

MBE67411676-1

TDP Purpose: RELEASED TDP Revision: - TDP Status: RELEASED

1. DELIVERABLE PRODUCT (X ALL THAT APPLY AND COMPLETE AS APPLICABLE)

TYPE

A. ☐ 2D DRAWINGS ☐ SCHEMATICS

B. 3D MODELS: ☒ 3D MODELS ONLY ☐ 3D MODELS W/ ASSOCIATED 2D DRAWINGS

FORMAT

☐ NATIVE CAD ☐ ISO 32000 PDF ☐ HARDCOPY

☐ OTHER FORMAT (SPECIFY) _____

☒ ISO 10303 STEP AP203 ☒ ISO PRC PDF

☐ ODB++ ☐ NATIVE CAD (SPECIFY) _____

C. ☒ METADATA ☐ ASCII TEXT- PIPE DELIMITED ☒ ISO 10303 STEP 239 (SPECIFY DEX) HI_DEX

☐ JEDMICS (DLF) ☒ OTHER FORMAT (SPECIFY) ASCII TEXT

D. ☐ ASSOCIATED LISTS ☐ JT ☐ ASSOCIATED LISTS HARDCOPY

☐ GERBER/RS-274 ☐ CREOVVIEW

☐ DRILL FILES ☐ WORD

☐ NETLISTS / WIRELISTS ☐ EXCEL

☐ OTHER FORMATS _____

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View TDP Artifacts **View TDP Manifest**

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Storyboard – Feedback Import and Comment Extract

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Supplier Feedback

☐ Upload Files
☒ Search Comments

Part Number: *
 Dash Number: *
 Revision: *
 Company: *

Document ID (Teamcenter):

Tech Code	Gov. Class.	Add Files	Action
9E991	ESO_1	<input type="button" value="Choose Files"/> No file chosen	<input type="button" value="Upload"/>


	File	Tech. Code	Gov. Class.
Delete	<input checked="" type="checkbox"/> AF5236M.pdf	9E991	ESO_1

Honeywell TDP Processor v3.0.0

Supplier Feedback

☐ Upload Files
☒ Search Comments

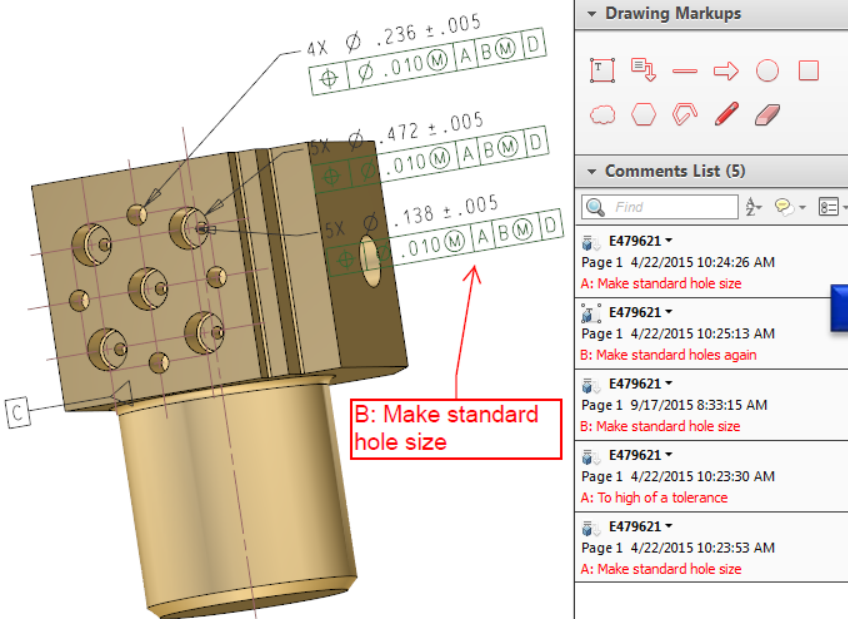
Part Number: *
 Dash Number: *
 Revision: *
 Company: *



	File Name	Name	Company	Page	Type	Date	Comment
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:23:30 AM	"A: To high of a tolerance"
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:23:30 AM	"A: To high of a tolerance"
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:23:53 AM	"A: Make standard hole size"
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:23:53 AM	"A: Make standard hole size"

Data Consolidation / Comment Extraction – In Detail

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	File Name	Name	Company	Page	Type	Date	Comment
Edit	MBE67411677_1__3DPopup_ComTest4.pdf	E013330	asdef	1	Text	4/22/2015 11:56:28 AM	"Can you also collect data from a Review Workflow running in Teamcenter?"
Edit	MBE67411677_1__3DPopup_PaulW.pdf	PaulW	asdef	1	FreeText	4/22/2015 3:09:39 PM	"A: chamfer size?"
Edit	MBE67411677_1__3DPopup_ComTest2.pdf	E479621	Cassavant	1	FreeText	4/22/2015 10:27:02 AM	"A: Relax the tolerance"
Edit	MBE67411677_1__3DPopup_ComTest2.pdf	E479621	Cassavant	1	FreeText	4/22/2015 10:27:18 AM	"A: Make .005"
Edit	MBE67411677_1__3DPopup_ComTest2.pdf	E479621	Cassavant	1	FreeText	4/22/2015 10:27:56 AM	"A1: +/- .015 is too high all tolerances"
Edit	MBE67411677_1__3DPopup_ComTest3.pdf	e276267	sa	1	FreeText	4/22/2015 11:54:04 AM	"A: Suggest using opposite face for Datum -D."
Edit	MBE67411677_1__3DPopup_ComTest3.pdf	e276267	sa	1	FreeText	4/22/2015 11:54:22 AM	"A: Change all holes to std. hole dia"
Edit	MBE67411677_1__3DPopup_ComTest3.pdf	e276267	sa	1	FreeText	4/22/2015 11:55:31 AM	"C: Change view orientation, confusing"
Edit	MBE67411677_1__3DPopup_ComTest3.pdf	e276267	sa	1	FreeText	4/22/2015 11:56:13 AM	"C1: is this to the drill tip end or the start of the angle on the drill bit"
Edit	MBE67411677_1__3DPopup_ComTest4.pdf	E013330	sa	1	Text	4/22/2015 11:56:28 AM	"Can you also collect data from a Review Workflow running in Teamcenter?"
Edit	MBE67411677_1__3DPopup_ComTest4.pdf	E013330	sagar	1	Text	4/22/2015 11:56:28 AM	"Can you also collect data from a Review Workflow running in Teamcenter?"
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:23:00 AM	A: To high of a tolerance
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:23:00 AM	A: Make standard hole size
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:24:00 AM	A: Make standard hole size
Edit	MBE67411677_1__3DPopup_ComTest1.pdf	E479621	Sagar INC	1	FreeText	4/22/2015 10:25:00 AM	B: Make standard holes again

Results

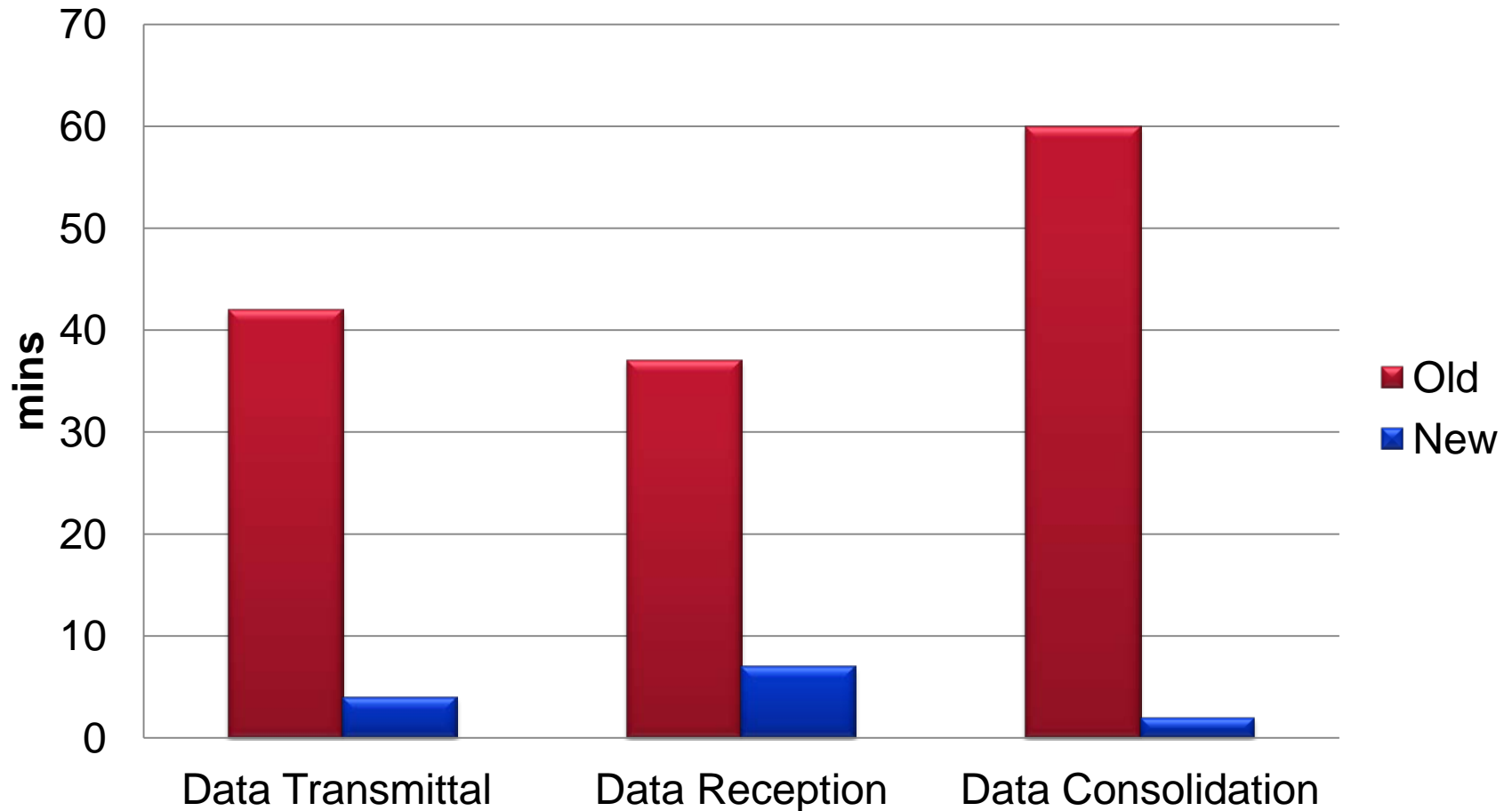
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- **All inclusive supplier collaboration process**
- **One-stop-shopping tool**
- **Designers no longer required to support model exchange**
- **Ad hoc email is eliminated**
- **Mechanized approach to track supplier feedback**
- **Positive feedback from suppliers**
 - **Cover sheet aids in tracking and internal handling**
 - **“Can see what we’re bidding on with 3D PDF – quicker to plan tooling and fixturing”**
 - **Easier to work with their suppliers using TDP**

Productivity Savings

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Savings Per Supplier Exchange



Challenges / Lessons Learned

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- **User acceptance – Getting users to think past their specific role**
 - Hard to understand requirements when the different personas not understanding the big picture
- **Maturing SOA capability**
 - Getting all the functionality in place
- **Aligning with the business needs**
 - What will help them now vs. help them later compared to the schedule
- **Competing, vendor-based solutions in the marketplace**
 - Encouraging proprietary vendor lock-in and increasing product cost

Future Enhancements

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- **Connecting more systems**
- **Expanded RFQ functions for concept phases**
- **STEP AP239/AP233 and AP242 utilities for supply chain use**
- **Data exchange traceability**
 - **Supplier 'Reply' function**
- **Automated metrics; data analytics**
- **Data extraction in context of orientation**
- **Increased Export Compliance robustness**
- **Data verification / certification**
- **Difference comparison & analysis**
- **Incorporation of more exchange standards**
 - **QIF: Quality Information Framework**
 - **EDX: PWA exchange format**

Questions?

Thank you!

Team members – Special thanks

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- **John Russell**
- **Alejandro Ventura**
- **Patsy Pelayo**