



**A Survey of User Requirements for Computer Aided  
Design/Product Data Management Integration using  
STEP**

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## CAD/PDM Integration using STEP

The STandard for the Exchange of Product Model Data (STEP) provides the ability to integrate various types of product data into one data file. This provides distinct advantages over other, older ways of doing business, primarily by:

- Improving data synchronization
- Providing data in a single format
- Allowing for trading partner data access

Various workshops and surveys have been conducted on Computer Aided Design (CAD) and Product Data Management (PDM) integration within PDES, Inc. The objectives of the workshops and surveys have been to:

- Understand the requirements for CAD/PDM integration from users (OEMs and suppliers)
- Identify vendor offerings that will support CAD/PDM integration requirements
- Compare user requirements and vendor offerings
- Define a strategy for CAD/PDM integration

The purpose of this paper is to:

- Summarize the results of these workshops and surveys
- Provide vendors with a set of user requirements for CAD/PDM integration
- Identify shortcomings with current software offerings

### First Survey

The first survey was relatively open-ended. Users were asked about their requirements for CAD /PDM integration and a number of users responded with their requirements. These were then prioritized among the member companies. The following table provides the list of prioritized requirements.

The responses that were provided were for CAD/PDM integration in general, not specifically with regard to STEP. The items that are *italicized* are ones that are enabled by STEP. The items not italicized are implementation specific requirements that can be met with or without STEP.

<b>User Requirements</b>	<b>Weighted Ranking</b>
<i>Data Synchronization/Meta Data Coupling</i>	10.2%
<i>Partner access to data</i>	9.1%
<i>Multi-platform Support</i>	9.1%
Security	8.4%
<i>Open API's</i>	8.0%
<i>3D Visualization</i>	8.0%
<i>Object Based</i>	7.6%
Single Entry Point for Data	7.3%
User Configurable	6.9%
<i>Modular Solution</i>	6.9%
Real Time Communication	5.8%
<i>Mass Properties</i>	5.5%
<i>CAD/PDM in one file</i>	4.4%
<i>STEP OMG Rationalization</i>	2.9%

## **Second Survey**

This section provides a set of graphical scenarios with descriptions that represent the output of the second PDES, Inc. CAD/PDM integration workshop. The scenarios are in order of their interest to the PDES, Inc. member companies (i.e., the first scenario is of interest to more member companies than the last).

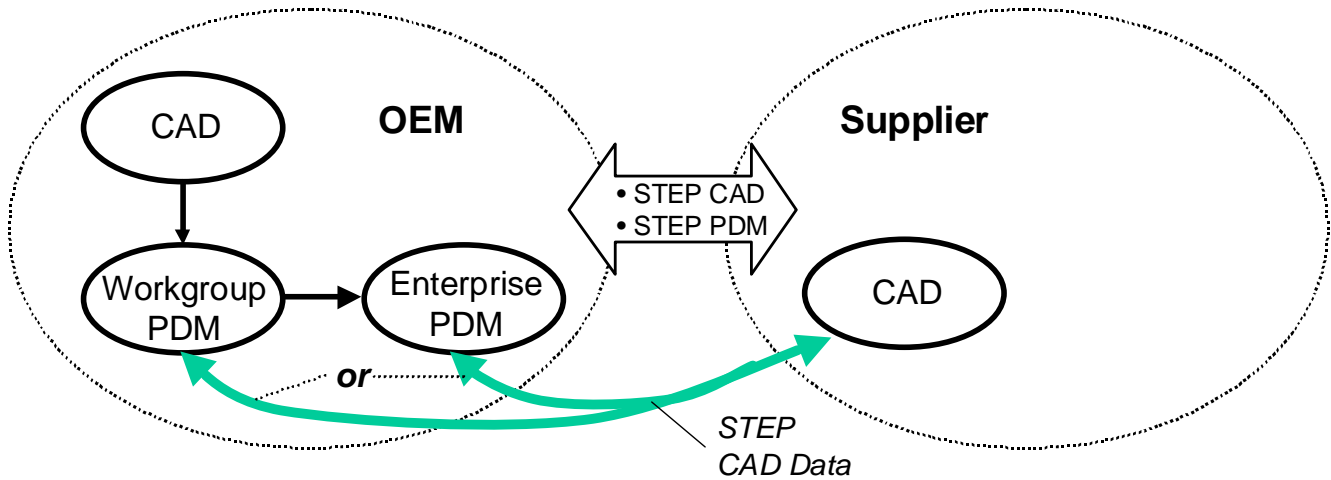
Some definitions follow to clarify some of the terms used to describe the various enterprises in this section.

An *OEM* is an Original Equipment Manufacturer. This is a company that manufactures a product and sells it to the final customer. Companies such as General Motors, Ford, and Boeing are examples of OEMs.

A *First Tier Supplier* is a large supplier that deals directly with an OEM. They are typically large companies, such as Delphi Automotive Systems and Pratt & Whitney. Examples of *Smaller First Tier Suppliers* would be manufacturing companies that produce specialty parts and prototype shops that manufacture in very low volumes.

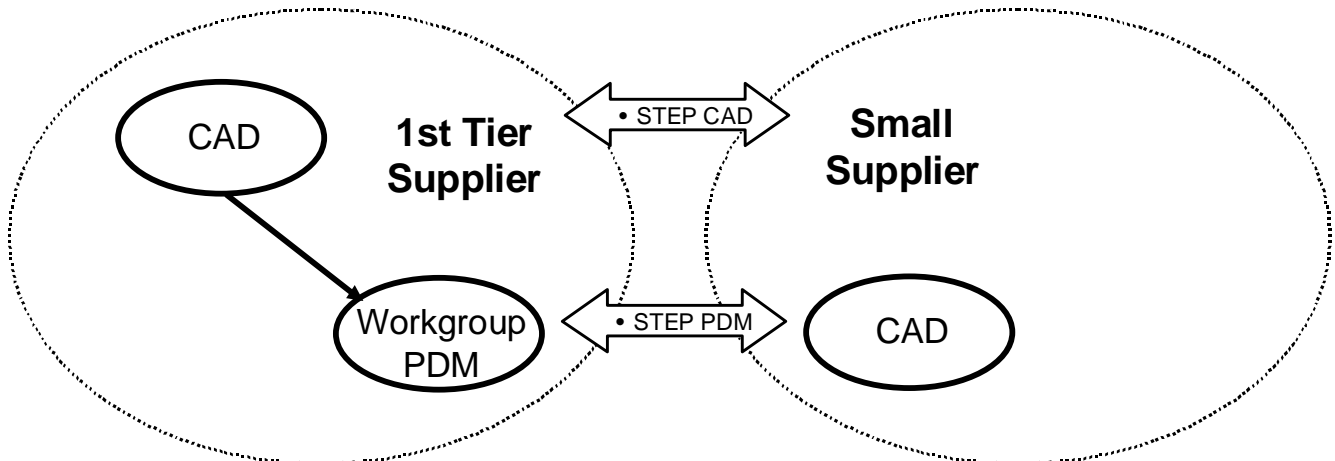
A *Small Supplier* is typically one that has less than 100 employees and limited information technology infrastructure (i.e., "Mom and Pop Shops").

## OEM to Supplier



In this scenario, a large scale OEM enterprise system exchanges data with a supplier CAD system which provides a potential for two-way exchanges. The master geometry stays at either the enterprise or workgroup PDM system. The OEM defines the geometry, maintains the native CAD data, and exchanges data using the enterprise PDM system. The supplier receives the data and updates the CAD system for the local user. In this scenario, STEP data files are used to exchange CAD and PDM data.

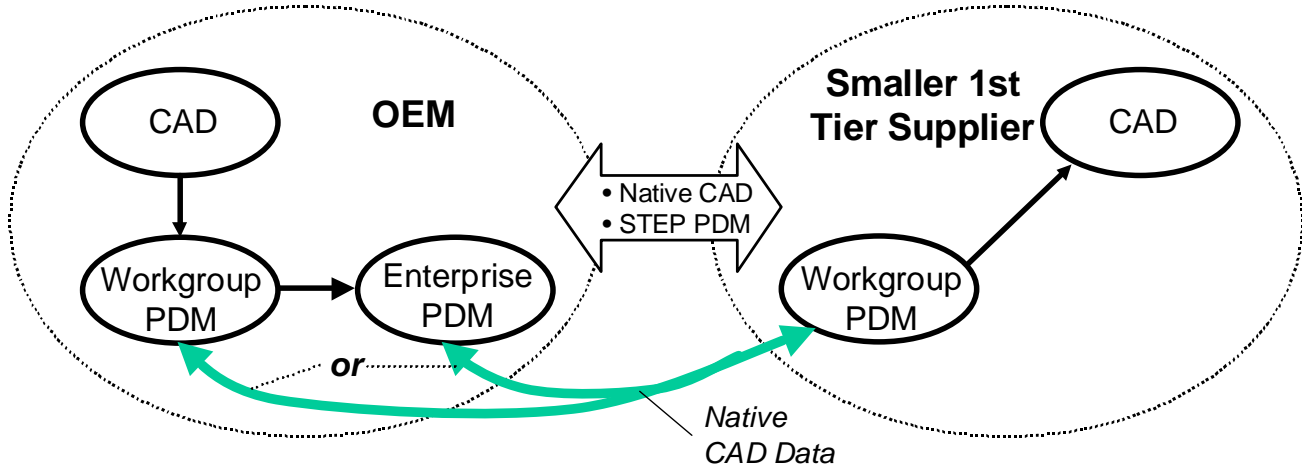
## 1st Tier to Small Supplier (Workgroup to CAD Exchange)



In this scenario, a workgroup system exchanges data with a CAD system. It provides a potential for two-way exchanges. The master geometry stays at the workgroup level. The 1st tier supplier defines the geometry, maintains the native CAD data at the

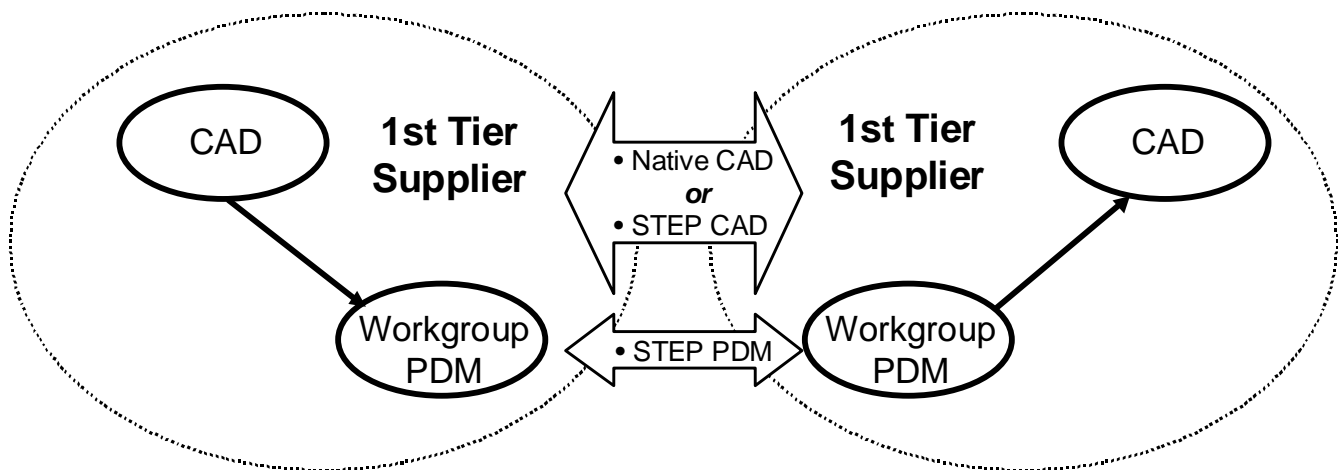
workgroup PDM system, and exchanges data from workgroup PDM system. The small supplier receives the data and updates their local CAD system. This scenario represents STEP transfers for CAD and PDM data types for dissimilar CAD systems.

**OEM to Smaller 1st Tier Supplier (Enterprise to Workgroup Native Exchange)**



In this scenario a large scale OEM enterprise system is exchanging data with a workgroup type PDM system with the potential for two-way exchanges. The master geometry is managed at either the enterprise or workgroup PDM level. The OEM defines the geometry, maintains the native data files, and exchanges the data using their enterprise PDM system. The 1st tier supplier receives the data and updates their workgroup PDM system for local users. The CAD data is exchanged using native geometry while the PDM data is exchanged using STEP files.

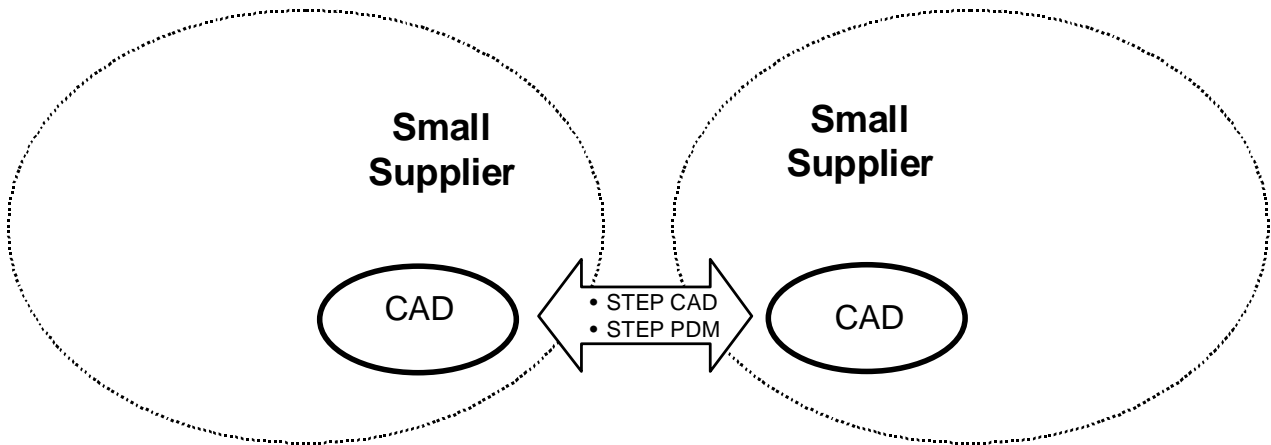
**1st Tier to 1st Tier Exchange (Workgroup to Workgroup Exchange)**



In this scenario, two workgroup systems are exchanging data with a potential for two-way exchanges. The master geometry stays at the workgroup level. One workgroup

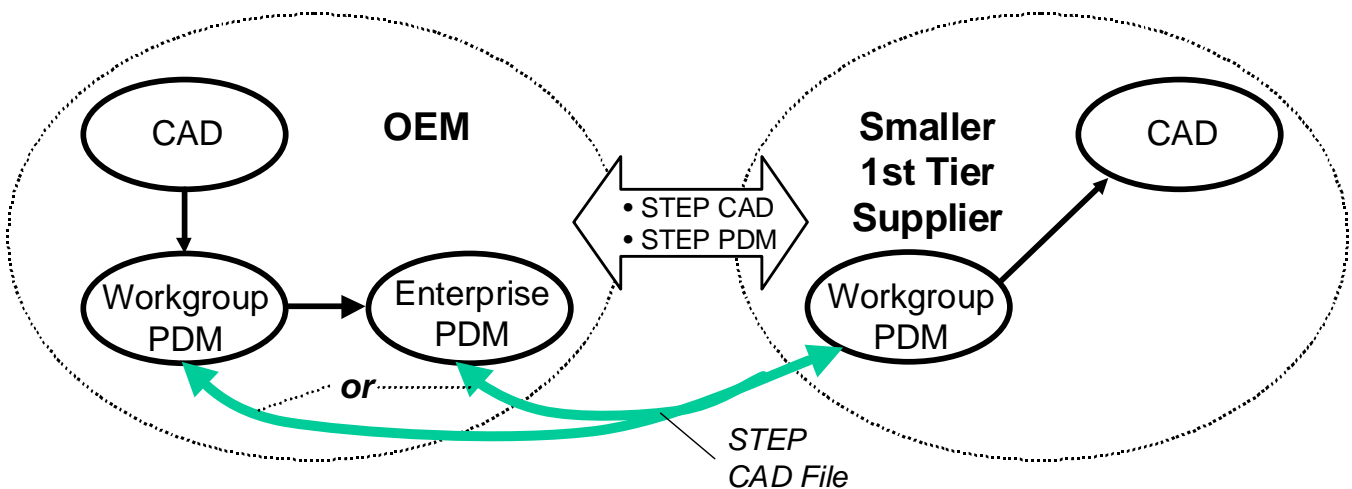
system defines the geometry and maintains the native CAD file at the workgroup level. Exchange of data takes place from workgroup to workgroup PDM system. The 2nd enterprise receives the data and updates the local workgroup PDM system for local users. In this scenario, native or STEP files are used for CAD exchange and STEP data files for PDM data exchange.

**Small Supplier to Small Supplier (CAD to CAD Exchange)**



In this scenario, one CAD system exchanges data with another CAD system with the potential for two-way exchanges. The master geometry is in the CAD system stored locally. The supplier defines the geometry, maintains the native CAD files, and exchanges data from the CAD system. The other supplier receives the data and updates their local CAD system for use. This scenario uses STEP transfers for CAD data types and the “minimum” subset of PDM data. This scenario could be two workgroups or divisions instead of two suppliers. It is basically collaboration in the design process.

**OEM to Smaller 1st Tier Supplier (Enterprise to Workgroup STEP Exchange)**



In this scenario a large scale OEM enterprise system is exchanging data with a workgroup type PDM system with the potential for two-way exchange. The master geometry is managed at either the enterprise or workgroup PDM level. The OEM defines the geometry, maintains the native data files, and exchanges PDM data using the enterprise PDM system. The 1st tier supplier receives the data and updates their workgroup PDM system for local use. STEP data files are used for both CAD and PDM data.

### **Third Survey**

The final survey was by far the most concise. The PDES, Inc. member companies were provided a series of matrices, which were divided into two groups. The first group was the “as-is” business environment and the second group was the “to-be” business environment. In each group of matrices there were sheets for the following types of exchanges:

- Product meta data only – data such as part number, version, creator, etc.
- CAD plus meta data – digital design data such as 3D solid and surface models combined with product meta data
- CAM plus meta data – computer interpretable manufacturing data such as numerical control toolpaths combined with product meta data
- CAE plus meta data – engineering analysis data such as linear dynamics or computational fluid dynamics combined with product meta data

In each individual matrix, the type of product being designed and manufactured was represented across the “X” axis. The headings were:

Commodity Design - Purchased product from catalogs or other lists of existing parts

Black Box Design - Custom designed by supplier to high level OEM specifications

Gray Box Design - Custom designed by supplier with some design aspects provided by OEM

Collaborative Design - Jointly designed by team of OEM and supplier staff

OEM Design - OEM design shipped to supplier for manufacture

The types of exchanges concentrated on business relationships. These were presented on the “Y” axis. They were:

Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)

Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)

Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)  
OEM Enterprise PDM sending to a Supplier Enterprise PDM  
OEM Enterprise PDM sending to a Supplier Workgroup PDM  
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM  
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM  
Supplier Enterprise PDM sending to a OEM Enterprise PDM  
Supplier Enterprise PDM sending to a OEM Workgroup PDM  
Supplier Workgroup PDM sending to a OEM Enterprise PDM  
Supplier Workgroup PDM sending to a OEM Workgroup PDM

The complete results of this survey can be found in the appendix.

### ***Results for “As-Is” Scenarios***

For the exchange of product meta data only, the scenario of most interest to the member companies was where an OEM design is shipped to a supplier for manufacture. In this scenario, the OEM enterprise PDM system sends data to the supplier enterprise PDM system.

For the exchange of CAD plus meta data, the scenario of most interest was collaborative design – products jointly designed by a team of OEM and supplier staff. In this scenario, the supplier enterprise PDM system is sending data to the OEM enterprise system.

For the exchange of CAM plus meta data, the scenario of most interest was when an OEM design is shipped to a supplier for manufacture. In this scenario a workgroup PDM system is sending data to/from another workgroup system.

For the exchange of CAE plus meta data, the scenario of most interest was again an OEM design being shipped to a supplier for manufacture. As in the CAM plus meta data scenario, a workgroup PDM system exchanges data to/from another workgroup system.

### ***Results for “To-Be” Scenarios***

For the exchange of product meta data only, the scenario of most interest to the member companies was collaborative design where a team from the OEM and the



supplier staff jointly designs the product. In this scenario, the OEM enterprise PDM system is sending data to the supplier enterprise PDM system.

For the exchange of CAD plus meta data, the scenario of most interest again was collaborative design where the product is jointly designed by a team from the OEM and the supplier staff. In this scenario, the OEM enterprise PDM system is sending data to the supplier enterprise PDM system.

For the exchange of CAM plus meta data, two scenarios had the same ranking. One scenario focused on OEM design, where the design is shipped from the OEM to a supplier for manufacture. In this scenario, the OEM enterprise PDM system sends data to the supplier enterprise PDM system. The second scenario focused on collaborative design, where the product is jointly designed by a team of OEM and supplier staff. As with the OEM design focused scenario with the same ranking, the OEM enterprise PDM system sends data to the supplier enterprise PDM system.

For the exchange of CAE plus meta data, collaborative design where the product is jointly designed by a team composed of the OEM and the supplier was the top ranked scenario. In this scenario an OEM enterprise system sends data to a supplier enterprise system.

### **Overall Results**

The results of this final survey focus the member company interests on two design scenarios for both “As-Is” and “To-Be”:

- Collaborative Design – Product jointly designed by a team of OEM and supplier staff
- OEM Design - OEM design shipped to supplier for manufacture

From the standpoint of the types of exchanges the member companies are interested in, two had higher ranking than the rest:

- OEM Enterprise PDM sending to a Supplier Enterprise PDM
- Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)

### **Issues with CAD/PDM Integration**

A number of issues currently inhibit CAD/PDM integration using STEP.

- Most enterprise and workgroup PDM systems do not have the ability to integrate STEP geometry and PDM data for export from the system.

- Conversely, most enterprise and workgroup PDM systems do not have the ability to differentiate the STEP geometry and PDM data on import into the system.
- Many CAD systems provide some low-level capability of populating a minimum amount of PDM data for STEP export. However, this data is not generally persistent in the CAD system and many of the values are “defaulted”. On import, the data is not stored on a persistent basis either.
- Since the concept of sharing of meta data between CAD and PDM systems in a loosely coupled architecture (CAD and PDM systems from different vendors) is a relatively recent one, the issue of synchronization arises. Companies need to develop a business process for determining whether the CAD or PDM system data is the master.
- PDM systems typically allow a vast amount of customization which is generally in the form of codifying business rules into the user interface. Therefore, the “blind” exchanges that are enabled by STEP for CAD will not be doable for PDM. The impact of this customization on a STEP data exchange is that it will require business partners to come to agreements on the values for such items as person, organization, and part number.

## Summary

The PDES, Inc. member companies represent aerospace, automotive, electronics, and computer manufacturers in the U.S. and abroad. These companies are interested in both collaborative design with their suppliers and exchanging their designs to first and second tier suppliers. They are mainly interested in both "enterprise to enterprise" and "workgroup to workgroup" exchanges.

The data contained in this paper should be useful for CAD and PDM system developers by providing them insight into user requirements and priorities.

## Results of Survey

<b>AS-IS Scenario Matrix</b>	<b>Exchange of Product Meta Data Only</b>					
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed by supplier to high level OEM specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	<b>TOTAL</b>
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	4	4	2	2	5	17
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	4	4	5	5	5	23
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	4	4	5	5	5	23
OEM Enterprise PDM sending to a Supplier Enterprise PDM	4	7	7	10	11	39
OEM Enterprise PDM sending to a Supplier Workgroup PDM	0	0	0	0	0	0
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	0	0	0	0	2	2
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	3	0	0	0	3	6
Supplier Enterprise PDM sending to a OEM Enterprise PDM	8	7	7	9	7	38
Supplier Enterprise PDM sending to a OEM Workgroup PDM	0	0	0	0	0	0
Supplier Workgroup PDM sending to a OEM Enterprise PDM	0	0	0	0	0	0
Supplier Workgroup PDM sending to a OEM Workgroup PDM	2	0	0	0	0	2
<b>TOTAL</b>	29	26	26	31	38	

## Results of Survey

<b>AS-IS Scenario Matrix</b>	<b>Exchange of CAD + Meta Data</b>					
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed by supplier to high level OEM specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	<b>TOTAL</b>
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	5	9	6	8	12	40
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	4	8	7	9	9	37
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	4	8	7	9	9	37
						0
OEM Enterprise PDM sending to a Supplier Enterprise PDM	4	8	8	7	6	33
OEM Enterprise PDM sending to a Supplier Workgroup PDM	0	1	2	2	2	7
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	0	2	3	5	4	14
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	3	5	3	7	6	24
						0
Supplier Enterprise PDM sending to a OEM Enterprise PDM	6	10	10	11	8	45
Supplier Enterprise PDM sending to a OEM Workgroup PDM	0	1	2	1	2	6
Supplier Workgroup PDM sending to a OEM Enterprise PDM	0	1	2	1	2	6
Supplier Workgroup PDM sending to a OEM Workgroup PDM	3	5	3	6	5	22
<b>TOTAL</b>	29	58	53	66	65	

## Results of Survey

<b>AS-IS Scenario Matrix</b>	<b>Exchange of CAM + Meta Data</b>					<b>TOTAL</b>
	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed by supplier to high level OEM specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.						
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	6	4	3	5	10	28
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	2	2	3	3	4	14
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	2	2	4	3	4	15
						0
OEM Enterprise PDM sending to a Supplier Enterprise PDM	1	1	3	5	5	15
OEM Enterprise PDM sending to a Supplier Workgroup PDM	0	0	2	2	2	6
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	0	0	2	2	5	9
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	3	2	2	3	8	18
						0
Supplier Enterprise PDM sending to a OEM Enterprise PDM	1	1	3	5	5	15
Supplier Enterprise PDM sending to a OEM Workgroup PDM	0	0	2	2	2	6
Supplier Workgroup PDM sending to a OEM Enterprise PDM	0	0	2	2	2	6
Supplier Workgroup PDM sending to a OEM Workgroup PDM	3	2	2	4	6	17
<b>TOTAL</b>	18	14	28	36	53	

## Results of Survey

<b>AS-IS Scenario Matrix</b>	<b>Exchange of CAE + Meta Data</b>					<b>TOTAL</b>
	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed by supplier to high level OEM specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.						
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	3	4	3	4	8	22
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	4	4	4	5	4	21
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	4	4	4	5	4	21
						0
OEM Enterprise PDM sending to a Supplier Enterprise PDM	1	2	4	4	1	12
OEM Enterprise PDM sending to a Supplier Workgroup PDM	0	1	2	2	0	5
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	0	1	2	2	0	5
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	3	4	3	3	3	16
						0
Supplier Enterprise PDM sending to a OEM Enterprise PDM	2	3	5	6	1	17
Supplier Enterprise PDM sending to a OEM Workgroup PDM	0	1	2	2	0	5
Supplier Workgroup PDM sending to a OEM Enterprise PDM	0	1	2	2	0	5
Supplier Workgroup PDM sending to a OEM Workgroup PDM	3	4	3	3	3	16
<b>TOTAL</b>	20	29	34	38	24	

## Results of Survey

<b><u>TO-BE Scenario Matrix</u></b>	<b>Exchange of Product Meta Data Only</b>					
	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed by supplier to high level OEM specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	<b>TOTAL</b>
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.						
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	5	5	6	10	6	32
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	10	12	12	13	10	57
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	7	9	10	13	11	50
						0
OEM Enterprise PDM sending to a Supplier Enterprise PDM	9	13	15	20	18	75
OEM Enterprise PDM sending to a Supplier Workgroup PDM	2	4	5	7	8	26
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	4	6	7	7	5	29
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	4	4	6	10	5	29
						0
Supplier Enterprise PDM sending to a OEM Enterprise PDM	11	12	14	17	13	67
Supplier Enterprise PDM sending to a OEM Workgroup PDM	2	2	3	6	6	19
Supplier Workgroup PDM sending to a OEM Enterprise PDM	5	5	6	8	5	29
Supplier Workgroup PDM sending to a OEM Workgroup PDM	5	5	7	10	5	32
<b>TOTAL</b>	64	77	91	121	92	

## Results of Survey

<b><u>TO-BE Scenario Matrix</u></b>	<b>Exchange of CAD + Meta Data</b>					<b>TOTAL</b>
	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed supplier to high level specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.						
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	6	6	6	10	7	35
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	10	12	12	13	12	59
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	7	9	10	13	11	50
						0
OEM Enterprise PDM sending to a Supplier Enterprise PDM	8	14	15	20	18	75
OEM Enterprise PDM sending to a Supplier Workgroup PDM	2	4	5	7	8	26
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	4	6	7	8	6	31
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	4	6	6	10	5	31
						0
Supplier Enterprise PDM sending to a OEM Enterprise PDM	12	12	14	17	11	66
Supplier Enterprise PDM sending to a OEM Workgroup PDM	2	2	3	6	6	19
Supplier Workgroup PDM sending to a OEM Enterprise PDM	5	5	6	8	5	29
Supplier Workgroup PDM sending to a OEM Workgroup PDM	6	7	7	10	5	35
<b>TOTAL</b>	66	83	91	122	94	



## Results of Survey

<b><u>TO-BE Scenario Matrix</u></b>	<b>Exchange of CAM + Meta Data</b>					<b>TOTAL</b>
	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed by supplier to high level OEM specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.						
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	6	4	3	9	10	32
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	2	3	4	7	9	25
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	2	3	5	7	9	26
						0
OEM Enterprise PDM sending to a Supplier Enterprise PDM	0	0	3	12	12	27
OEM Enterprise PDM sending to a Supplier Workgroup PDM	0	0	2	7	5	14
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	0	0	2	5	8	15
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	3	2	2	6	8	21
						0
Supplier Enterprise PDM sending to a OEM Enterprise PDM	1	0	3	11	10	25
Supplier Enterprise PDM sending to a OEM Workgroup PDM	0	0	2	7	5	14
Supplier Workgroup PDM sending to a OEM Enterprise PDM	0	0	2	5	5	12
Supplier Workgroup PDM sending to a OEM Workgroup PDM	3	2	2	6	5	18
<b>TOTAL</b>	17	14	30	82	86	

## Results of Survey

<b>TO-BE Scenario Matrix</b>	<b>Exchange of CAE + Meta Data</b>					<b>TOTAL</b>
	<b>Commodity Design-</b> Purchased product from catalogs or other lists of existing parts	<b>Black Box Design-</b> Custom designed by supplier to high level OEM specifications	<b>Gray Box Design-</b> Custom designed by supplier with some design aspects provided by OEM	<b>Collaborative Design-</b> Jointly designed by team of OEM and supplier staff	<b>OEM Design-</b> OEM design shipped to supplier for manufacture	
Instructions: Identify the current relative frequency (i.e., High, Medium, Low, NA) of each exchange.						
Workgroup PDM to/from Workgroup PDM (Intra-Co. exchange)	4	7	6	9	8	34
Enterprise PDM sending to a Workgroup PDM (Intra-Co. exchange)	9	11	12	13	9	54
Workgroup PDM sending to an Enterprise PDM (Intra-Co. exchange)	9	11	12	13	11	56
					0	0
OEM Enterprise PDM sending to a Supplier Enterprise PDM	7	11	14	19	13	64
OEM Enterprise PDM sending to a Supplier Workgroup PDM	4	6	7	9	8	34
OEM Workgroup PDM sending to a Tier 1 Supplier Enterprise PDM	4	6	7	9	8	34
OEM Workgroup PDM sending to a Tier 1 Supplier Workgroup PDM	4	6	8	11	8	37
					0	0
Supplier Enterprise PDM sending to a OEM Enterprise PDM	8	11	14	17	10	60
Supplier Enterprise PDM sending to a OEM Workgroup PDM	3	4	5	7	6	25
Supplier Workgroup PDM sending to a OEM Enterprise PDM	6	7	8	9	5	35
Supplier Workgroup PDM sending to a OEM Workgroup PDM	6	7	9	11	5	38
<b>TOTAL</b>	64	87	102	127	91	