

VDA

Agreements on CAD/CAM data exchange

4950

Non-binding VDA recommendation 4950 describes the processing (preparation, performance and post-processing) of the exchange of CAX data between various different companies.

The term "CAD/CAM data exchange" covers in this case asynchronous exchange of files by offline data exchange (CD, DVD, USB stick) or online data exchange (ISDN, ENX, web, direct line, etc.).

Synchronous exchange or comparison of data in PDM/PLM systems (e.g. via external clients) is not considered here (see in this connection VDA 4956).

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1 General

1.1 Abbreviations, terms, definitions

CAX data

CAX data denote the entire portfolio of digital data describing the geometry or structure of the products (e.g. components, subassemblies, drawings, resources, etc.) in the product development process and used in the various different CAX systems (e.g. Computer Aided Design, Engineering, Manufacturing).

Offline data exchange

Transport of CAX data by physical data carriers.

Online data exchange

Transport of CAX data by data lines and/or networks.

ENX

The European Network Exchange is a network of the European automobile industry.

PDM/PLM system

Product Data Management System or Product Lifecycle Management System denotes data management systems which organize and save product information and documents (generally in a database).

SASIG

SASIG (Strategic Automotive product data Standards Industry Group) is an organization of national automobile associations (AIAG, GALIA, JAMA/JAPIA, Odette, VDA) for jointly drafting recommendations for the global automobile industry.

PDQ

The Product Data Quality Guideline is a result of the SASIG and an internationally applicable recommendation for product data quality (ISO PAS 26183).

OBS

Short for Organizational Breakdown Structure

RASIC

Short for Responsibility Chart with Responsible, Accountable, Supporting, Informed, Consulted.

ENGDAT

The ENGINEERING DATa Exchange package is the set of data files to be sent using an ENGDAT message, i.e. the abstract file and all engineering data files linked to the message.

SE checklist

The Simultaneous Engineering Checklist is an aid to any agreements between the partners which develop simultaneously on a decentralized basis on a product.

ENGPART

The ENGPART Message is a partner profile description, readable by humans as well as computer-parseable, containing the complete or partial partner information required for the exchange of data files.

OFTP

The Odette File Transfer Protocol is a specification for electronic exchange of files.

STEP

The STandard for the Exchange of Product model data (ISO 10303) is a complex standard for describing product data, which is structured by Application Protocols (AP's).

JT

The Jupiter Tessellation Format is a neutral, file size-reduced 3D data format allowing transfer and visualization of major subassemblies.

1.2 Changes compared with the previous version

Version	Change	Chapter	Page
1	No changes, first edition		
2.0	New layout, contents updated, References to other VDA recommendations added, Attachments A and C summarized, Attachments B1 and B2 replaced by attachment from the SASIG PDQ guideline	All	All

1.3 Sources

SASIG PDQ Guideline: see VDA.

All VDA recommendations can be found on the VDA homepage:

http://www.vda.de/de/publikationen/publikationen_downloads/index.html

Odette (Organisation for Data Exchange by Tele-Transmission in Europe):

<http://www.odette.org>

2 Overview of the VDA recommendations

Number VDA...	Designation	Language	Issue date
4950	Vereinbarungen zum CAD/CAM-Datenaustausch (Verbindlichkeit von CAx-Daten)	DE	1 Jul. 11
4951	DFÜ Teile 0 - 7 Teil 1: ENGDAT V3.1 (Version 3.1) Teil 2: VDA-ENGPART V4.1 (Version 4.1)	DE	1 Feb. 09
4952	Rasterdatenaustausch	DE	1 Nov. 97
4953	Vereinfachte CAD-Zeichnung	DE/EN	1 Dec. 03
4955	Umfang und Qualität von CAD/CAM-Daten (Version 4.1)	DE	1 Dec. 06
4956	Product Data Exchange (part 1)	EN	1 Nov. 02
4958	Langzeitarchivierung, Teil 1 - 4	DE/EN	1 Jun. 05
4960	CAD/CAM - Datenaustausch in der Betriebsstättenplanung	DE	1 May 93
4961/2	Checkliste zur Abstimmung der Datenlogistik in SE-Projekten	DE	1 Dec. 01
4963	Austausch von CAD Daten in der Fabrikplanung Austausch von 2D Daten mit STEP-CDS	DE	1 May 06
4964	Harness Description List (KBL)	EN	1 Nov. 05
4965	ECM - Part 0 (ECM) ECM - Part 1 (ECR)	EN	1 Jan. 10
4966	Collaborative Product Visualisation	EN	1 Apr. 07
4967	Simulation Data Management	EN	1 Dec. 08

The existing recommendation itself in addition to the explicitly referenced recommendations are shown in **bold**.

3 Objectives and scope of application

Various CAx systems with different emphases exist. Hence, various different CAx systems and applications are used in different firms and also within the company on technical, business management or strategic grounds. A need exists to harmonize and regulate the asynchronous data exchange among the various systems. The objective of this VDA recommendation is to assist this process.

The "PLM-AK" working party in the VDA recommends use of the procedure described below for synchronization and exchange of CAx data.

Individual bilateral arrangements concerning conditions or procedures should be documented as part of the cooperation agreement. Modifications and amendments should be made in the proper form.

4 Basic principles

The data exchange partners make provisions in order to guarantee the possibility of complete, correct and traceable exchange of CAx data with the existing standards.

Insofar as an amendment in relation to the stipulations in Attachment A is made, the data exchange partner is to be notified thereof without delay. If necessary, the agreements are to be adapted and a pilot test is to be carried out if appropriate.

It is recommended concluding and proceeding according to a non-disclosure agreement for the exchange of confidential CAx data. The agreement should contain suitable technical and organizational measures in order to safeguard the data against unauthorized access, misuse, corruption or loss.

Insofar as the CAx data shared or parts thereof are to be disclosed to third parties within the context of permissible use, the written consent of the owner of the data is to be obtained. Third parties are to be sworn to treat the latter confidentially.

The rights of the partners over the CAx data generated by the latter (either in whole or in part), in addition to the duties to comply with the currently applicable regulations concerning data protection and data security shall not be affected by the exchange process.

5 Bindingness of data

During the product development process, the need arises to exchange non-binding or binding CAx data. The aim of determining and requiring binding CAx data involves company-wide use/integration of these data in the process chain without revision (e.g. verification, correction).

The prerequisite for the bindingness of CAx data is that the data should present the necessary information in the agreed form, scope and quality. Among other aspects, binding CAx data should be provided with the following information/characteristics (see also Attachment A):

- Unambiguous object identification
e.g. development (part) number, name, project number/designation
- Development/modification status
including last modification date, status and description in text form

- Indication of complete or delta scope
(Unless otherwise agreed, the complex CAx model is to be transferred following modification)
- Clear and jointly agreed intended purpose
- Responsibilities
according to the respectively applicable responsibility chart (e.g. OBS, RASIC chart)
- Status labeling (according to Attachment A)
The actual data quality and data volume must be bindingly indicated during data exchange: e.g. "Data correspond to the agreements: <Agreement identifier>" or "Data are non-binding" (non-binding data are to be labeled as such).
- Data quality
The quality of the CAx data is to be documented according to the SASIG PDQ guideline and its German derivative (VDA 4955). A number of different test programs (checktools) are available for this purpose, some of which may even issue a test seal concerning data quality.

The OEM's usually have their own rules specified for bindingness of CAx data.

The PLM-AK in the VDA recommends use of the ENGDAT file (VDA 4951) for communication of these data (together with the CAx data).

6 Data exchange process

6.1 Agreements

At the outset of the project, an agreement (e.g. according to Attachments A and B) must take place and the result be announced to all those involved. Insofar as required, these attachments are to be drafted separately for each intended purpose.

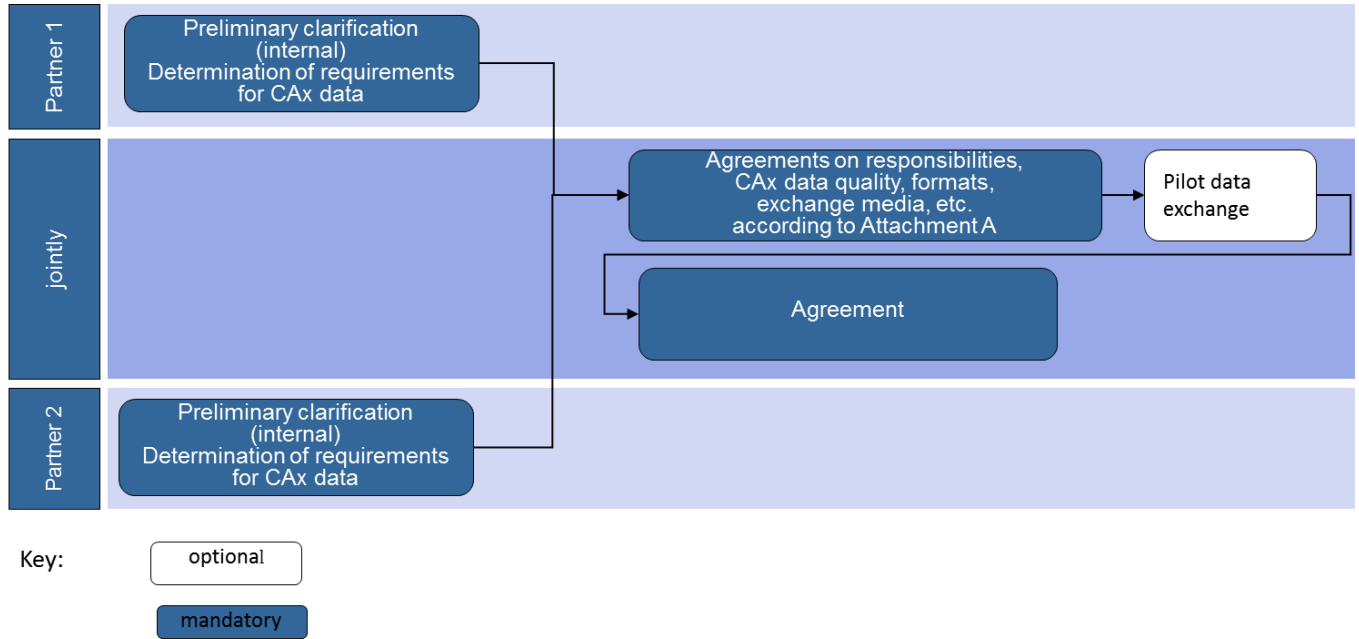
Use of VDA4961/2 "SE checklist" is recommended for more complex operations (e.g. simultaneous engineering).

The ENGPART file (VDA4951) is recommended for exchange of partner data (sender/recipient details, formats, etc.).

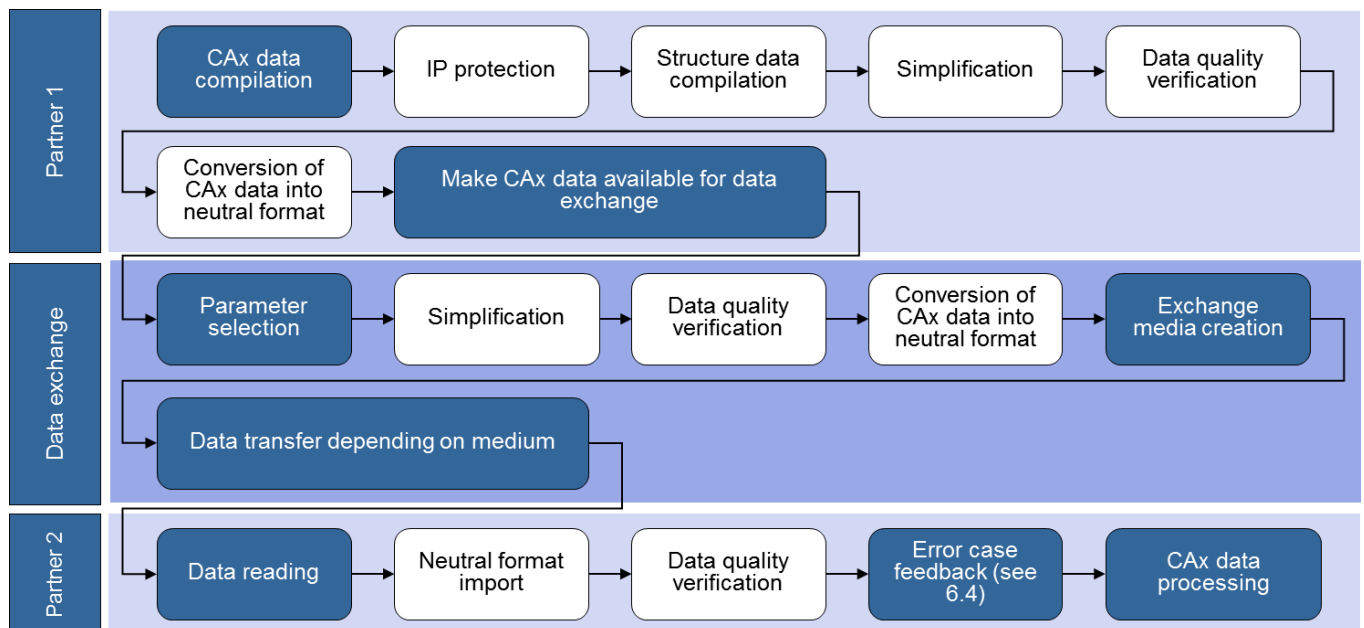
The agreements reached are to be verified in the form of a pilot test if necessary.

Overview of the data exchange process

Initial setup/initial agreements



Productive CAx data exchange



6.2 Transport

The technical details for correct data transfer are agreed separately between the partners according to Attachment A.

Transfer is to be performed by the data compiler as a matter of principle (obligation to provide); this principle may however also be reversed if necessary (obligation to collect).

The transfer medium for the data to be exchanged is to be agreed upon respectively (with Attachment A) between the sender and recipient.

Use of the forms "OFTP / OFTP2 data and parameter sheet" in VDA4951 (P0, chap. 5.1.4) is recommended for establishing an online data exchange connection.

6.3 Acknowledgement/verification

6.3.1 Physical acknowledgement

The recipient acknowledges to the sender receipt of the data according to Attachment A; though nowadays, physical acknowledgement (end-to-end response) is usually incorporated in the exchange systems.

6.3.2 Contentual verification

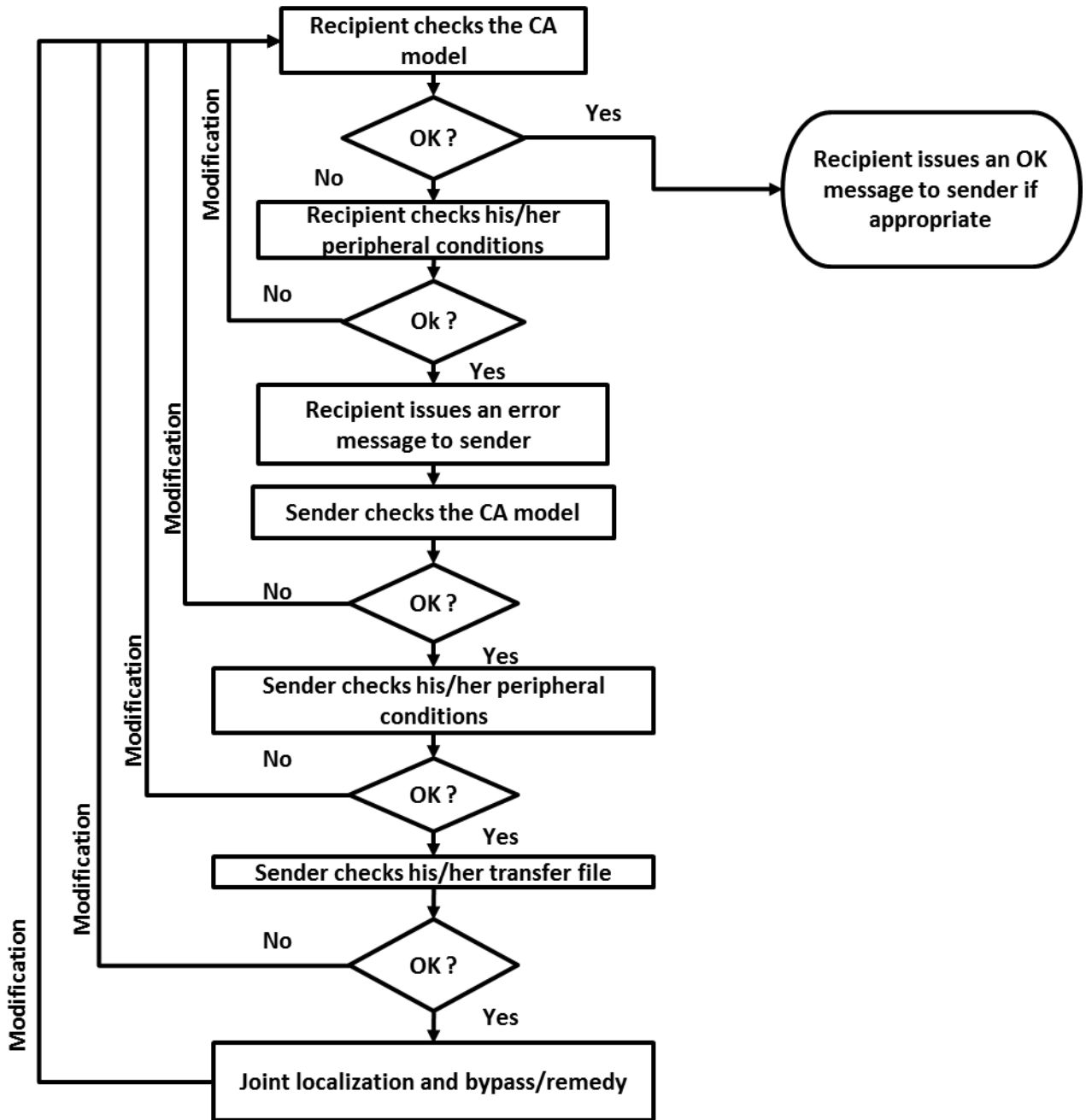
A contentual verification (the data are usable for the agreed intended use) of the CAx data must be performed as rapidly as possible. Any possible error message should be issued within a period to be agreed (Attachment A), starting from physical acknowledgement.

6.4 Conduct in case of error

"Error case" means: the CAx data fail to comply with the agreements in the recipient system.

The sender of CAx data carries the burden of proof of thorough compliance with the agreements made in the attachments.

In spite of compliance with the agreements, data errors may occur within the context of exchange. In this case, endeavors are to be made to as quickly as possible localize and remedy/bypass the source of error according to the following sequence:



7 Backup and storage

Owing to various needs for documentation (e.g. for troubleshooting), immediately after transfer and receipt of CAX data, the exchanged data should be backed up by both partners until the recipient has confirmed accuracy in terms of content according to 6.3.2.

Notwithstanding, long-term archiving for other reasons (e.g. product liability) remains unaffected.

8 Attachments

Attachment A to the CAx data exchange/bindingness agreement of: _____

Scope of validity of the agreement

Project / product: _____
underlying contract: _____
Validity period: (if ≠ project duration): _____
or for all areas of validity until revocation

Responsibilities with partner 1 (name, email, telephone)

for agreements: _____
for data transfer: _____
for data contents: _____

Responsibilities with partner 2 (name, email, telephone)

for agreements: _____
for data transfer: _____
for data contents: _____

CAx systems

Partner 1 CAx system: _____ Version: _____
Partner 2 CAx system: _____ Version: _____
Format: Native format STEP AP___ JT Other: _____

CAx data quality

Partner 1, checktool used: _____ Profile: _____
Partner 2, checktool used: _____ Profile: _____

Exchange medium

Online: OFTP (see form VDA4951 Part 0) Portal _____
 Offline: CD / DVD / USB stick encoded Code details: _____
Accompanying documents: ENGDAT (see VDA4951 Part 0) Email Fax

Reaction times

Physical acknowledgement should be given within ___ working days (when using phys. data carriers).
Contentual verification (by the recipient) should be performed within ___ working days.
Contentual acknowledgement may, according to agreement, also only be limited to the error case.
Target deadline for completion of setup: _____

	<h2 style="margin: 0;">SASIG– Product Data Quality for the Global Automotive Industry</h2>
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CAD/CAM Data Quality Exchange Agreement (Example) Date: ____ / ____ / ____

Between:

Company Name	Department	Contact Name	Contact Phone No.
Company Name	Department	Contact Name	Contact Phone No.

Applies to:

Corporate / Master	Car Program	Body / Model	Design Discipline	Part or Assembly #	Version
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By this Agreement, the companies agree that all CAD and/or CAM data to be exchanged will conform to this agreement and will either meet or exceed the Recommended or Specific values for all fields / criteria checked as required.

Accuracy/Restrictions: CAD System: _____ HW Platform(s): _____ Model Dimension: _____

CAD-Model type: Wireframe Surface Solid Space Claim (Volume only) _____

Drawings: NONE Reduced 2D only Associated to 3D model

Intended Model Use: Bid/Offer Prototype Background Info DMU Release _____

Max. Model Size: _____ MB Spec. Conditions: _____ see Attach.

Conformance Required	Code	Criteria Identification	Example (CATIA) Value (mark if ...)	Specific Value	Checked	Due Date or Milestone
Model	MU	Multi-Solid Model	Count > 1			
	HY	Hybrid Model	Yes			
Geometry	LG	Large Gap in Element	> 0.02 mm			
	NT	Non Tangent Segments	Angle > 1.0 deg			
	NS	Non Smooth Segments	> 0.8 < Ratio < 1.2			
	GP	Edge Gap in Faces	Gap > 0.02 mm			
	VF	Vertex Gap in Faces	Gap > 0.02 mm			
	CR	Curvature Radius of El.	Radius < 0.1 mm			
	WV	Waviness of Elements	Yes			
	FO	Folded Elements	Angle ≥ 120 deg			
	DC	Degenerated Curve of El.	Length < 0.1 mm			
	DP	Degenerated at Point	no Normal defined			
	SA	Sharp Angle of Elements	Angle > 178 deg			
	TI	Tiny Elements	Extent < 0.1 mm			
	NA	Narrow Area	Width < 0.02 mm			
	RN	Relatively Narrow El.	Ratio u/u,w/v > 100			
	IS	Intersection	Proximity < 0.01 mm			
	AN	Analytical Elements	Approximation fails			
	IK	Indistinct Knots	Distance < 0.001			
	HD	High Degree Elements	Degree > 9			
	FG	Fragmented Elements	> 200			
	CL	Closed Elements	Distance start /end < 0.01 mm			
	IT	Inconsistent Topology	opposite orientation			
	FR	Free Edge	not sewn edges			
	NM	Non-Manifold (OU Edge)	> 2 faces per edge			
	OU	Over-Used Vertex	> 6 edges per vertex			
	MU	Multiple Elements	> one element			
	RE	Embedded Elements	within < 0.02 mm			
	UN	Unused Patches	Yes			
	VO	Solid Void	Yes			
	NU	Non-updatable Solid	Yes			
	MH	Missing Solid History	Yes			
	UH	Unused History	Yes			

Procedural instructions:

1. Start by stipulating the project partner(s), (sender(s) and recipient(s) who will be responsible for the quality of the product data as well as the area of validity covered by the agreement (project/component part). Together with the date of agreement, this information shall represent explicit “fundamental specifications” for multi-sided agreements (one to one, one to many, many to many, supply chain inclusion as necessary). Define responsibility, validity, partners, a unique and clear framework.
2. Stipulate the intended use of the product data that are to be supplied. Often, several intended uses must be stipulated and where possible, listed in chronological order (relative to the product development process, i.e., concept, design, analysis, review, release, prototype, manufacture, etc.). Only then is it meaningful to stipulate the associated quality criteria on one form. However, it can also be more understandable to employ one form per intended use. At this point, one can use the categories (criteria and characteristics) according to update.
3. Classify each intended use of a model/geometry type, where required, the model type and as well as additional stipulations (e.g., for the degree of detailing).
4. In the left hand column, mark the pertinent quality criteria for the respective intended use (discipline) which the sender and recipient have jointly assessed to be required. Please do not mark all criteria as required but concentrate on the really important “minimum” requirements. A detailed description of the criteria may be found in SECTION II. **Note:** There may be more than one form necessary per/discipline, depending on the scope of the project.
5. Determine, then agree and adopt the limiting values for the “promoted” criteria. Use recommended values in Attachment C, or use your own. All parties need to be considered, included, and in agreement. You should fill out only necessary criteria. You may have multiple contracts between different partners in the project or throughout the supply chain as necessary.
6. CAD data could be viewed as "work in progress" and not complete. This should be considered when defining the agreement between parties.

Data exchange process model from the SASIG PDQ Guideline:

