PLM Global Collaboration

Collaboration Management System (CMS) Description

Release 1.0

May 2023

Abstract

Collaboration among Original Equipment Manufacturers (OEMs) and their product design and manufacturing engineering partners and suppliers is a key aspect of any major aerospace and defense (A&D) program execution. Process analysis by the A&D PLM Action Group (AD PAG) project team has shown that many different data formats, PLM software systems, and enabling infrastructure technologies exist across the OEMs and their supply base. Further analysis revealed that the greatest near-term value opportunity lies in addressing the inconsistencies and gaps in process and protocols for establishing and managing the ongoing operation of the OEM–supplier collaboration environment. This *Collaboration Management System (CMS) Description* document provides an overview of an open-service prototype application that embodies an A&D industry collaboration framework that was defined by the AD PAG Global Collaboration project team.

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Revision Record

Release	Date	Description
1.0	May 2023	Initial Release of the Collaboration Management System Description document

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PLM Global Collaboration

1 Executive Summary

The Aerospace and Defense Product Lifecycle Management Action Group (AD PAG) is an association of aerospace Original Equipment Manufacturers (OEMs) and aircraft engine manufacturers within CIMdata's globally recognized PLM Community Program, which functions as a PLM advocacy group.

One of the key business issues identified by the AD PAG is that collaboration within a large, global, distributed supply chain of design and development partners is seriously hindered by relying on traditional, document-based development processes. In response, a project team of domain experts from the AD PAG member companies was established to evaluate current collaboration practices. The objective defined by the project team for the desired future state is to **achieve OEM and supply chain collaboration through bi-directional exchange of Technical Data Packages (TDPs) via digital tools and model-based processes.**

The project timeline is shown in

Figure 1 and described below:

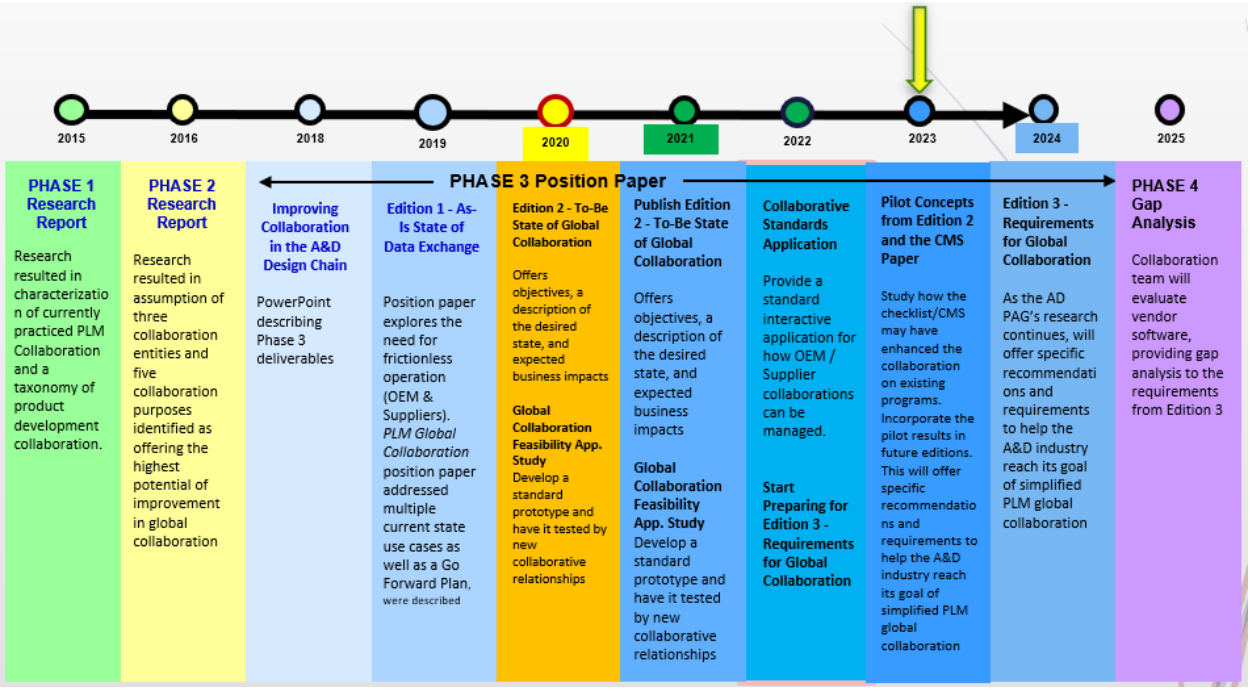

Figure 1 – Project Activity Timeline and Current Status

Project timeline events are as follows:

- **PHASE 1** – Research Report – Released June 2015

  Research resulted in the characterization of currently practiced PLM collaboration and a taxonomy of product development collaboration.

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- **PHASE 2** – Research Report – Released June 2016

  Research resulted in the assumption that the three collaboration entities and five collaboration purposes were identified to offer the highest potential for improvement in global collaboration.

- **PHASE 3** – In Progress – November 2016 - Current

  Investigation of the potential for improved collaboration between OEMs and suppliers is progressing as follows:

  - "*Improving Collaboration in the A&D Design Chain*" (Released November 2016) is a PowerPoint presentation describing the Phase 3 deliverables.
  - Edition 1 (aka Release 1.0) – Informally referred to as the "As-Is State of Data Exchange" (Released July 2019) is a position paper exploring the need for frictionless operation between OEMs and suppliers. This edition of the PLM Global Collaboration position paper identifies multiple current state use cases and provides detailed descriptions and challenges for each, includes business consequences and analysis of the root cause of current collaboration problems, and describes a Go Forward Plan.
  - Edition 2 (aka Release 2.1) – Informally referred to as the "To Be State of Global Collaboration" (Released August 2022) is the most current edition of the position paper and builds onto Edition 1. This newest information since Edition 1 begins with the Objectives section and includes a description of the desired state and expected business impacts.
  - This *Collaboration Management System (CMS) Description* document (Released May 2023) provides guidelines of how OEM–supplier collaborations can be managed.
  - Edition 3 – Informally referred to as "Requirements for Global Collaboration" (Estimated Completion Date 2024), will continue the team's research and offer specific recommendations and requirements to help the A&D industry reach its goal of simplified PLM global collaboration.

- **PHASE 4** – Gap Analysis – Estimated Completion Date 2025

  The Global Collaboration team will evaluate vendor collaboration software, providing gap analysis related to the requirements presented in Edition 3.

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In previous work the Global Collaboration project team defined model-based processes and protocols for establishing and operating a collaborative environment between an OEM, partners, and suppliers. In this most current research, the team has focused on development of a working prototype application that imbeds and facilitates the defined OEM–supplier collaboration processes and protocols. The resultant working prototype application, known as *Collaboration Management System (CMS)* can be used at any point in the product lifecycle shown in Figure 2.

Product Lifecycle

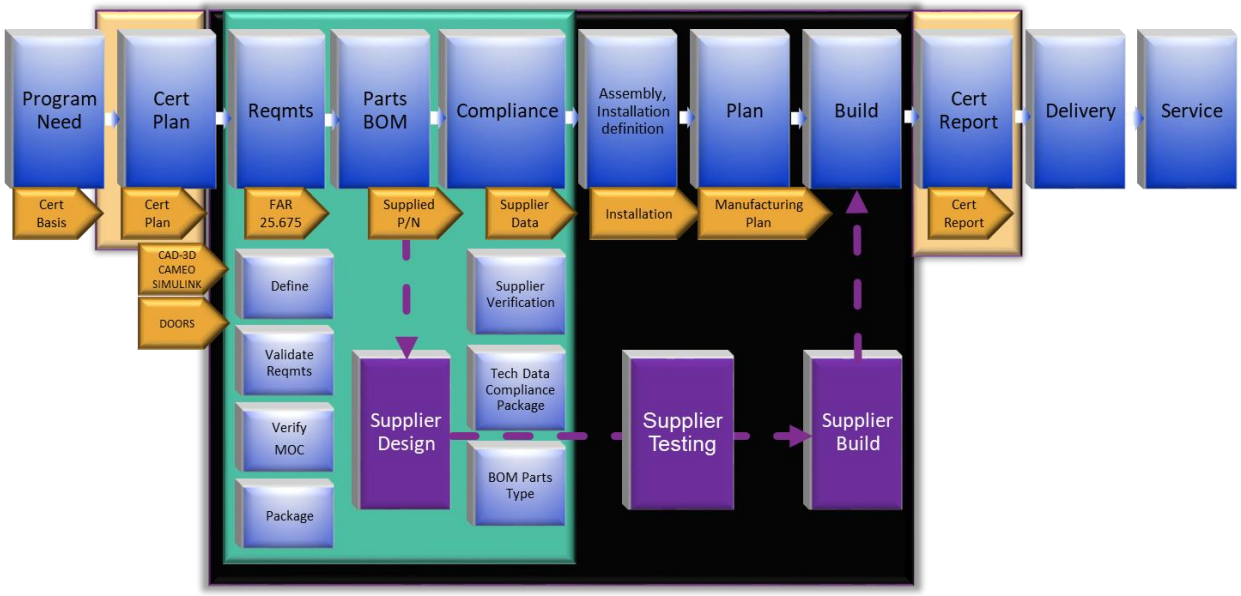

Figure 2 – OEM–Supplier Collaboration within the Product Lifecycle

The working prototype was developed as a voluntary effort by Talisen Technologies and is available online as an open-service through the AD PAG's website https://www.cimdata.com/en/aerospace-and-defense/initiatives/cms. Industrial users are invited to participate in a User Experience Engagement, the results of which will be analyzed by the AD PAG Global Collaboration project team and incorporated into a revised specification document.

2 Introduction

In March 2016, executives from the AD PAG member companies met with the intent that informal discussions would lead to consensus on priorities and plans for remediation of their common PLM pain points. These discussions resulted in agreement of the members to jointly sponsor and staff a select set of projects, each chartered to define objectives, requirements, and roadmaps for eliminating or significantly reducing a key inhibitor to the value potential of PLM.

The topic addressed by this special project, which was initiated in 2017, is PLM Global Collaboration, a pain point of friction, complexity, and/or instability that erodes the productivity and quality of product information flow through A&D system programs and inflates the cost of

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system sustainability. The overall scope of the PLM Global Collaboration project is to provide guidelines for a data integration/exchange set up and process and practice protocols consistent with industry standards. This document and other material published by the AD PAG Global Collaboration project team, detail the mechanics of configuring and integrating an OEM and suppliers in an optimal state. The intent is that the position paper will aid OEMs in setting up contracts and managing ongoing collaboration with partners and suppliers.

The team, still in the extensive Phase 3 of the Global Collaboration project, has been focused on describing the As-Is current state of collaboration, their vision of a To-Be future state, and the requirements for reaching that goal in a "working" position paper that is being developed in three editions (or releases). The scope of Edition 1, published in July 2019, focused on the current As-Is state of the data flow process during initial design, detailed design, configuration control, and change management. Those areas within the overall product development process were identified as offering the greatest potential for improvement in earlier stages of the Global Collaboration project and were described in the project's first position paper release. The scope of Edition 2, published in March 2022, focused on a description of the desired To-Be state and expected business impacts, and it also introduced a Collaboration Management System application that supports the implementation of recommended collaboration methodologies.

This *Collaboration Management System (CMS) Description* document expands on the A&D collaboration guidelines definitions and the digital CMS application that had been introduced.

After additional research, the team will publish Edition 3 of the PLM Global Collaboration position paper to offer specific recommendations and a set of requirements for a future approach to global collaboration.

3 Terms and Definitions

Terms commonly used in this document are included in Table 1 below. This information is extracted from the *AD PAG Glossary* available at www.ad-pag.com.

Table 1 – Collaboration-Relevant Terms and Definitions

Term	Definition
Collaboration	A work methodology which allows for the management, sharing, and processing of files, documents, and other types of data, among several users and systems, anytime and anywhere in real time. Including the exchange of ideas/knowledge and interaction among several project stakeholders for product introduction where design engineering, manufacturing engineering, and other functions are integrated to enable the product lifecycle. The two main types of collaboration are asynchronous and synchronous.
Extended Enterprise	An enterprise that logically includes a network of contractors, suppliers, business partners, and customers involved in creating, defining, producing, operating, or supporting a common product. A supply chain is considered part of an extended enterprise.
Interoperability	The ability of two or more systems or components to exchange information and to use the information that has been exchanged. For example, interoperable tools have access to and use the original data, not translated data or copies of the data.

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Term	Definition
Product Lifecycle Management (PLM)	A strategic business approach that applies a consistent set of business solutions in support of the collaborative creation, management, dissemination, and use of product definition information across the extended enterprise and spanning from product concept to end of life—integrating people, processes, business systems, and information
Technical Data Packages (TDPs)	Any collection of information as defined by the recipient requirement obligations. The collected technical data is gathered at a specific lifecycle stage. The technical data package will describe the contents in an organized way. This information may include but is not limited to (engineering data, purchasing data, manufacturing data, certification data, test data, service data, etc.). Some examples of these types of data are design definition, test reports, administrative agreements, installation instructions, component maintenance manuals, etc.

4 Resources for Context

This section describes the documentation and resources drawn upon in support of the A&D Global Collaboration team's current efforts.

4.1 Collaboration-Focused A&D Industry Standards

Current ISO and Mil Std standards that support collaboration are listed in Table 2.

Table 2 – Current Industry Standards for Collaboration in A&D

Standard	Publication Year	Title
ISO 11354	2011	*Advanced automation technologies and their applications — Requirements for establishing manufacturing enterprise process interoperability*
ISO 11354-2	2015	*Advanced automation technologies and their applications — Requirements for establishing manufacturing enterprise process interoperability — Maturity model for assessing enterprise interoperability*
ISO TR44000	2019	*Principles for successful collaborative business relationship management*
ISO 44001	2017	*Collaborative business relationship management systems — Requirements and framework*
ISO 44002	2019	*Collaborative business relationship management systems — Guidelines on the implementation of ISO 44001*
ISO 44003	2021	*Collaborative business relationship management — Guidelines for micro, small and medium-sized enterprises on the implementation of the fundamental principles*
ISO 44004	2021	*Collaborative business relationship management — Guidelines for large organizations seeking collaboration with micro, small and medium-sized enterprises (MSMEs)*

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Standard	Publication Year	Title
Mil Std 31000	Rev - 2009 Rev A - 2013 Rev B - 2018	Provides requirements for the deliverable data products associated with a TDP and its related TDP data

4.2 The State of A&D Data Exchange

A primary challenge in the data exchange process is to reach a bi-directional agreement regarding the work content, the information transfer mechanisms, and the process for resolving issues and pursuing escalations. Today, many OEM companies are using a PLM system to provide online workspaces for data exchange in support of collaboration with their partners. Yet, efficiency, accuracy and reliability of data exchange is severely limited.

For a detailed assessment of the current state and description of the desired future state of data exchange, you can download the *Global Collaboration Release 2.1* position paper at https://www.cimdata.com/en/aerospace-and-defense/publications/global-collaboration.

4.3 A&D PLM Software Collaborator

As described briefly in the *PLM Global Collaboration* position paper, the Global Collaboration project team is collaborating with a third party on the development of an automated collaboration management system (CMS) prototype application that embeds the best practices defined by the AD PAG Global Collaboration project team for information exchange across OEMs, partners, suppliers, customers, and academia. As a result of this collaboration A&D organizations and agencies can evaluate the benefits of an integrated approach for managing supplier and strategic partner critical data through a prototype CMS application.

The AD PAG CMS application will strengthen standard practices by facilitating consistency in the business use of collaboration standards. The specific practices embedded in the CMS application provide guidance and implementation steps and support tracking and monitoring during collaboration lifecycle activities in alignment with program milestones. The intent is for companies to have confidence in their collaboration readiness and operational consistency by having these features set in an application.

To learn more about the AD PAG CMS prototype, visit www.cimdata.com/en/aerospace-and-defense/initiatives/cms.

5 Objectives

The primary objectives of this description document are to do the following:

- Expand upon the eight collaboration steps—the AD PAG Global Collaboration team's guidelines—introduced in Edition 2 of the *PLM Global Collaboration* position paper.
- Describe a prototype application that was developed to assist in assessing, defining, and managing specific global collaboration programs in the A&D industry.

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6 Collaboration Methodologies

Collaboration methodology is a work system of methods that allows the managing, sharing, and processing of data among several users and systems, anytime and anywhere in real time.

Generally, the recommended collaboration methodology includes the exchange of ideas/knowledge using standards and interaction among several project stakeholders using an implementation strategy to enable collaboration throughout the product lifecycle. This strategy is supported by a collaboration framework that ensures consistency across the enterprise and the supporting industries for the project. Specifically, the Global Collaboration team's recommendation is that **use of ISO standards, particularly the eight stages of ISO 44001, is a good foundational reference to start the general collaboration process**.

However, the **eight steps of the Global Collaboration team's guidelines methodology for global collaboration processes have been defined to best capture the A&D industry's unique requirements**. The methodology will detail the mechanics of configuring and integrating a supplier in an optimal state. The intent is that this specific methodology will aide OEMs in setting up and executing collaboration contracts and enabling environments and operational practices with their suppliers in a consistent manner.

The key topics in this section clarify the full intent of the collaboration methodology.

6.1 ISO 44001 Collaboration Standard

The ISO organization developed and published the ISO 44001 "Collaborative business relationship framework detail" standard. This standard established the requirements of a strategic lifecycle framework to improve collaborative business relationships in and between organizations of all sizes. Collaborative business relationships in addressed by the ISO standard can be multi-dimensional, one-to-one relationships, or networked relationships involving multiple parties.

Typically, collaboration methodologies demonstrate the importance of using a standard and consistent method when collaborating. Using consistent methodologies allows business entities to reliably deploy techniques and provide opportunities for performance efficiencies during collaboration.

It is important to recognize that as collaboration continues to grow across industries, clear value exists in understanding the different methodologies available for executing global collaboration across those industries. To this end, A&D's unique recommendations are described in the following sections. In addition, *Appendix A: A&D Collaboration Guidelines Checklist* provides a summary listing that supports the eight steps outlined below. *Appendix B: ISO 44001 Assessment Checklist* provides a listing that supports the standard's eight stages outlined in that appendix.

6.2 AD PAG Collaboration Guidelines

The Global Collaboration team's guidelines describe an eight-step methodology, which is similar to that of ISO 44001 but has an A&D industry focus, in its support of global collaboration. These steps take another look at having a consistent method while supporting engagement between businesses and creating an interoperable data exchange. Each of the eight steps is shown in Figure 3 – AD PAG Collaboration GuidelinesFigure 3 and described below.

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Figure 3 – AD PAG Collaboration Guidelines

Step 1. Prepare for Collaboration and Data Exchange

Purpose: To define and describe the data to be exchanged, the capabilities required for an efficient collaboration, and the project management rules. To select a supplier based on data exchange and project management capabilities (all other **criteria** are not part of Step 1) or to define what is awaited from the supplier already selected

Prerequisites:

- Applicable regulations are identified, supporting the project (consider worldwide business relationships, governments, and regional authorities)
- Statement of Work has been defined (work scope defines category of supplier relationship, such as design and build to spec, design or other intellectual services, equipment)
- Export control and Intellectual Property (IP) agreement concerns are part of Step 3, and export control rules are not to be discussed but only observed
- Conditions to select a supplier are known

1.1 Define Type and Scope of Data

- Data structure/formats
  - Filtering product structure
  - Design data set and linked documents

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- Data compliance to international standards

1.2 Define Recommended Way of Collaboration

- Shared workspace
- Level of access to workspace
- Media and transfer method
- Sending and receiving tool/systems

1.3 Define Recommended Project Management Terminology and Tool Set

- Review terminology and agree to a common glossary
- Team agreement on the collaboration tool
- Agree on dashboard elements and metric used for managing the project
- Define project management methodologies, workflow, and communication

1.4 Define IP-Compliant Process

- Review contractual IP expectations for each participating stakeholder and partner
- Expand upon contractually-defined IP protection
- Define and implement IP protection-compliant processes for the collaboration

1.5 Assess Collaboration Capability

Consider any supporting supplier assessment materials already collected or needed for the project collaboration. Refer to the *PLM Global Collaboration* (Edition 2) position paper for detail on types of suppliers.

Suppliers may be ranked using the following criteria:

- Media and transfer method
- Sending and receiving tool/systems
- Data structure/formats
- Standardization material and processes
- Design technical requirements
- Computer-Aided Design (CAD) files and metadata
- Filtering product structure
- Design data set
- Documents linked to the design data set
- Project-unique requirements
- Customer requirements

1.6 Supplier Selection Announced

- One supplier is awarded by the company to perform the activity

1.7 Data Collaboration Agreement

- Collaboration agreement, which includes the agreed upon mechanisms and formats for data exchange, is created and signed
- Collaboration agreement is part of the main contract

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1.8 Audit and Follow-Up

- Plan audits such as those defined in the Step 3
- Perform audits
- Define corrective actions, if necessary
- Perform follow-up actions

Step 2. Establish Commercial, Contractual, and Legal Relationships

Purpose: To establish all commercial, contractual, and legal relationships about data exchange and project management

Prerequisites:

- Scope of Work, planning schedules, delivery contents, and delivery milestones are defined; work scope defines category of supplier relationship (e.g., design and build to spec, design or other intellectual services, equipment)
- Commercial aspects (price, payment, penalties, etc.) agreed; work scope evolution requests are the buyer's job and are not included in Step 2
- Commercial and technical business interfaces agreed to (focal points have been designated)
- Export control rules are not to be discussed but only observed and taken into account

2.1 Define Data Exchange Rules and Processes

- Data format(s) agreed upon for the exchange
- Data content and context
- Exchange frequency
- Work in shared session or Exchange mode (visible data, uploadable, downloadable)
- Define requested licenses and how to make them available

2.2 Define Project Management Terms

- Subsidiary, partner, or supplier management rules
- Milestones definitions
- Project reviews content and frequency
- Action plan monitoring
- Performance indicators
- Project management and action plan reviewing tools

2.3 Monitor and Manage Contract Execution and Contractual Coverage of Evolution Requests

- Deliverables' validation or rejection
- Project reviews
- Performance indicators review
- Corrective actions
- Change in design management

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2.4 Anticipate and Mitigate Contractual Risks

- Shared risk analysis
- Shared mitigation action plan
- Mitigation actions monitoring
- Contract amendment, if necessary

2.5 Amend the Contract

- Security violation escalation
- Non-quality escalation
- Delay or postponement of deliverables
- Launching of recovery actions
- Contract interruption or extension

Step 3. Set Up Governance

Purpose: Where non-public data will be shared, rules and regulations must be defined and understood before any interaction with any supplier

Prerequisites:

- Dealing with participants from around the world, not just inbound/outbound United States
- Participating locations must be clearly specified
- Dealing with only the technical data, not the actual parts/deliverables (this makes a difference with export markings)
- Identified supplier is the company with whom contracted (i.e., the supplier is not necessarily the company who manufactures the item; could be using a second tier or third-party company, or may be a different derivative of the same company)
- Suppliers will manage their own supply chain
- Retention requirements have been determined (how long will data need to be kept?)

3.1 Establish Import/Export Guidelines

- What is the import company's country location?
- What is the export company's country location?
- What regulations apply? For example, the product could be imported from Europe and exported from Asia (US not involved)

3.2 Determine Intellectual Property (IP)

- What are the IP requirements for any given program?
- What are the rules?
- Who owns the data IP?
- Is it competition-sensitive data?
- Is it second tier or third-party data?

3.3 Implement Security Protocol(s)

- Is this classified or unclassified data?

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- Is special access required?
- Is collaborating performed in a secured or unsecured space?
- How long must the data be kept by contract (i.e., data retention)?
- What are the access control policies?
- What is the disaster recovery plan?

3.4 Protect Personal Identifiable Information

- User attribute sharing: What information about a user can be shared publicly? If the users' names are going to be associated with the data, what information (e.g., user ID, citizenship, user location, etc.) can be displayed publicly?
- Are restrictions different per country? Per company?

3.5 Conduct Collaboration Platform Review(s)

The collaboration guidelines process supports collaboration platform review(s) and allows the stakeholders to assess the product and its constitutive elements for both the make and the buy activities in the frame of the Product Development Plan. Reviews ensure the product satisfies the contractual requirements and customer's expectations by checking solution compliance to technical, cost, and schedule objectives. The review process supports closure of a design phase and permits or denies transition to the next phase of the design build process.

This step involves agreement by all team members concerning the following:

- Milestones, deliverables, and measurement of Key Performance Indicators (KPIs)
- Checklist with acceptance criteria
- Change management process

Evaluate the collaboration platform on a recurring basis for performance, gaps, and improvements:

- Are all the A&D Collaboration Guidelines Checklist Steps 1-6 supporting the program review as planned, including program review milestone completion?
- Is the platform meeting the intended purpose for the project?
- Are there any open-step action items to be addressed?
- Do all participants have access as planned?
- Are there any limitations or roadblocks that need to be addressed?
- Does the platform support troubleshooting for the project collaboration?
  - Is the support structure put in place and rectifying issues?
  - Is a ticket service and/or support KPIs being met?
- Is the tool providing all the necessary services to support the project?
  - Collect feedback for future improvements (Are there any proposed enhancements?)
- Is the platform availability and accessibility as expected? Comments can be collected to address performance of the platform (market feedback analysis)
- Are performance metrics available and meeting performance expectations?

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Step 4. Establish Project Management

Purpose: Establish a common means of collaborating and managing the engineering activity, including scheduling of activities, delivery, and performance measurement

Prerequisites:

- Type of contract has been determined (see Step 2)
- Contractual agreements include what types of data are exchanged, delivery dates, and costs
- Statement of Work is the technical work description

4.1 Supply Chain Management

A dedicated organization shall be put in place by Tier 1 for Tier 2 management with specific resources as applicable; the organization will:

- Manage the flow down of OEM requirements
- Deploy all applicable tools, methods, and training
- Commit to controlling and securing quality, on-time delivery of contractual items
- Demonstrate capabilities and practices for adequate control and management of deliverables

4.2 Authority Delegation

- Determine what tasks are to be performed
- Delegate those tasks as applicable

4.3 Planning and Measuring

- Provide reporting of deliverable progress (metrics)
- Define the term *late* (how does the OEM determine when items are late?)
- Plan for end-of-life of the program collaboration (see Step 8)

4.4 Risk Analysis

- Determine any risks
- Mitigate those risks

Step 5. Set Up Interfaces and Organization

Purpose: The interface(s) between participants shall be clearly defined to enable a clear-cut and efficient collaboration between the OEM Information Technology (IT) services and the supplier from deployment to the run mode. This step also requires that the supplier shall nominate key Information System (IS)/IT representatives strictly in a timescale to meet the contract requirements

Prerequisites:

- Participants have IT infrastructure in place
- Proposed collaborative system(s) is flexible/scalable to support the business need
  - Service Level Agreement is defined in the contract (see Step 2), which can include problem triage and resolution
- Preliminary assessment of quantity of users, data to be exchanged, and duration of the use has been determined
- Collaboration administration to be determined based on contract/team agreement

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5.1 Nominate Focal Points

Determine a primary contact who is responsible for the overall coordination of activities related to the program, which include but are not limited to:

- Ensuring that their company's IS/IT organization is in place
- Distributing any OEM IS/IT solution updates
- Maintaining a list of key IS/IT contacts for the roles described in this document
- Securing the communication and skills across the specific IS/IT community.
- Updating any hardware/software

5.2 Provide Access

Designate an appropriate representative who is responsible for:

- Set up and management of the collaboration environment
- Hardware set up
- Software set up
- Account set up and role assignment
- Creation, maintenance, and deletion of user accounts
- Data archiving/data retention rules
- An exit strategy
- Decommissioning the collaboration environment

5.3 Define a Support System

IT contact shall provide the first level of IS/IT support and serve as the focal point for respective users working with specified IS/IT solutions by ensuring:

- Regularly scheduled status/touch point meetings with IT and OEM
- Meetings can include but are not limited to audits, software/hardware upgrades, and/or migrations

Step 6. Set Up the Collaboration Environment for Program Life

Purpose: Implement a system-neutral collaborative platform and determine the IT administration environment set up, configuration, and maintenance

Prerequisites:

- Supplier has been selected and is "On Contract"
- Collaboration platform is the central workspace
- Regulations, such as export, have been determined (see Step 2)
- Collaboration requirements of Steps 1-5 are complete.

6.1 Preparation

- Define collaboration rules, such as:
  - Central workspace for native or converted data
  - Mapping of attributes (issue, status)
  - Read-only versus In-work

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  - Versioning (configuration control of data)
- Define common “libraries” like standard parts
- Provide partners access to the collaborative platform
- Determine connectivity (how each environment is connected)
- Implement collaboration access rules

6.2 Initialization

- Fill the collaboration platform with data taking IT security agreements into account (see Step 3)
- Determine environment reusability of existing data in the collaboration platform (if applicable)
- If needed, convert data to the agreed format (proprietary or neutral), including validation (quality)

6.3 Operation

- Event-driven update of collaboration platform
- Ensure latest revision is available
- Run reviews and design solution
- Event-driven update of local IT-systems

Step 7. Conduct the Program Review(s)

Purpose: Collaboration guidelines support program review(s) and allow the stakeholders to assess the product and its constitutive elements for both the make and the buy activities in the frame of the Product Development Plan. Reviews ensure the product satisfies the contractual requirements and customer’s expectations by checking solution compliance to technical, cost, and schedule objectives. The review process enables closure of a design phase and permits or denies transition to the next phase of the design build process.

Prerequisite:

The collaboration process guidelines enable the collaboration platform, ensuring effective program reviews

7.1 Prepare the Optimized Program Review

The platform facilitates the evolution of the Program Review Process and development status. Program Review preparation is minimized because the latest data is available to all parties

- Review objectives and success criteria
- Review panel – Roles, Responsibilities and Authorities (RRA)
- Initiate continuous review process

7.2 Conduct the Program Review

- Ask: Do the deliverables meet the design intent?
- Review the methodology
- Review the data – models/drawings, specifications
- Complete the review checklist

7.3 Follow Up and Close the Program Review

- Publish the report and results

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- Agree to actions and follow-up
- Manage changes and updates
- Set escalation rules and a mitigation path

Step 8. Perform End State Tasks

Purpose: To define a method of operation once the program has reached maturity or its end of life. Determine who is responsible for maintaining the collaboration final data (owner of type certification); decommission of the collaboration platform

Prerequisite:

Related data types and formats are defined in the contract

8.1 Review Data for Archiving

- Review and categorize data for potential re-use and archival; different data types need to be archived:
  - Data for regulatory authorities (depending on work package type)
  - Governmental requirements
  - All other program related data (e.g., all reports, calculations, etc.)
- Determine which party is responsible for archiving which data

8.2 Archive the Data

- Determine the CAD/Product Data Management (PDM) data to be archived
- Prepare documents and other data for archive in the agreed-to, contractual, standard format
- Align the archive date to the LoTAR standard

8.3 Decommission the Program/Project Collaboration Space

- Clarify if the collaboration space could be re-used, and evaluate if the data is potentially applicable for other projects
- Determine if the space will not be re-used; if that's the case, decommission the collaboration space
- Deactivate synchronization processes, user IDs, etc.
- Determine a method for emergency or on-demand exchange (i.e., a low-volume exchange process)
- Address any remaining contract elements
- Decommission the collaboration space

8.4 Manage the Contract Expiration and Close and Terminate the Contract

- Handover of all deliverables, including hardware and software
- Proof of data archival or destruction
- Establishment of a plan for project closure

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7 Global Collaboration Management

The AD PAG Global Collaboration project team is cooperating with a third-party software supplier in the development of an open-service prototype Collaboration Management System (CMS) web application. This application supports both the ISO 44001 standard and the A&D Guidelines for information exchange across OEMs, partners, suppliers, customers, and academia.

When looking at the scope of collaboration systems, a delineation exists between collaboration governance and collaboration data exchange services. This section focuses on collaboration governance, which companies deploy within their business practices.

Global collaboration governance must be integrated with business practices in a digital solution to enable consistency for external collaboration between companies. This capability can be achieved across the industry using a collaboration management service that applies collaboration methodologies using digital controls across a company as an enterprise standard.

7.1 Collaboration Governance

A collaboration governance system will strengthen standard practices and provide consistency in business use of a collaboration service. The specific practices focus on guidance and implementation steps within a digital system that provides tracking and monitoring throughout collaboration lifecycle activities. With these capabilities in place, companies can be confident in their collaboration readiness and operational consistency. Collaboration technologies enable digital exchange and allow participants to utilize data while maintaining all business needs as part of an established practice.

7.2 Business Practices to Support Collaboration Governance

For a CMS to be embraced, business practices need to transition to support of consistent governance between OEMs and suppliers. Current processes likely vary from company to company, which leads to complexity and communication challenges that affect business strategies as the business goes through digital transformation as a company. Initiation, operation, and termination of collaboration between participants must be managed to minimize business risk and create confidence in business practices as companies become part of a digital enterprise.

7.3 Collaboration Management System

As previously introduced, the CMS application is a productivity aide with a workflow based on A&D collaboration guidelines and the ISO 44001 standard. Utilizing these sources for data exchange supports compliance with standard collaboration practices and greatly enhances communication across a networked community.

7.3.1 CMS System Capabilities

The AD PAG prototype CMS application is configurable as a Cloud service or as a stand-alone application that supports external or internal on-site installation. The configuration of this application is to be determined by company stakeholders and includes configurable cyber security and access controls.

CMS supports the *A&D Collaboration Guidelines Checklist* (see Appendix A) and the *ISO 44001 Assessment Checklist* (see Appendix B) and includes the following characteristics:

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- Collaboration identification project numbers
- Library for recording collaboration engagements
- Project workflow progress tracking and completion status
- File attachment storage supporting collaboration artifacts
- Collaboration tracking/management metrics
- Project archiving capabilities

7.3.2 CMS Web-Based Service

This CMS is a Cloud-based web service accessible via the A&D PLM Action Group website. Visit the AD PAG web page, shown in Figure 4 below, at https://www.cimdata.com/en/aerospace-and-defense/initiatives/cms for more information.

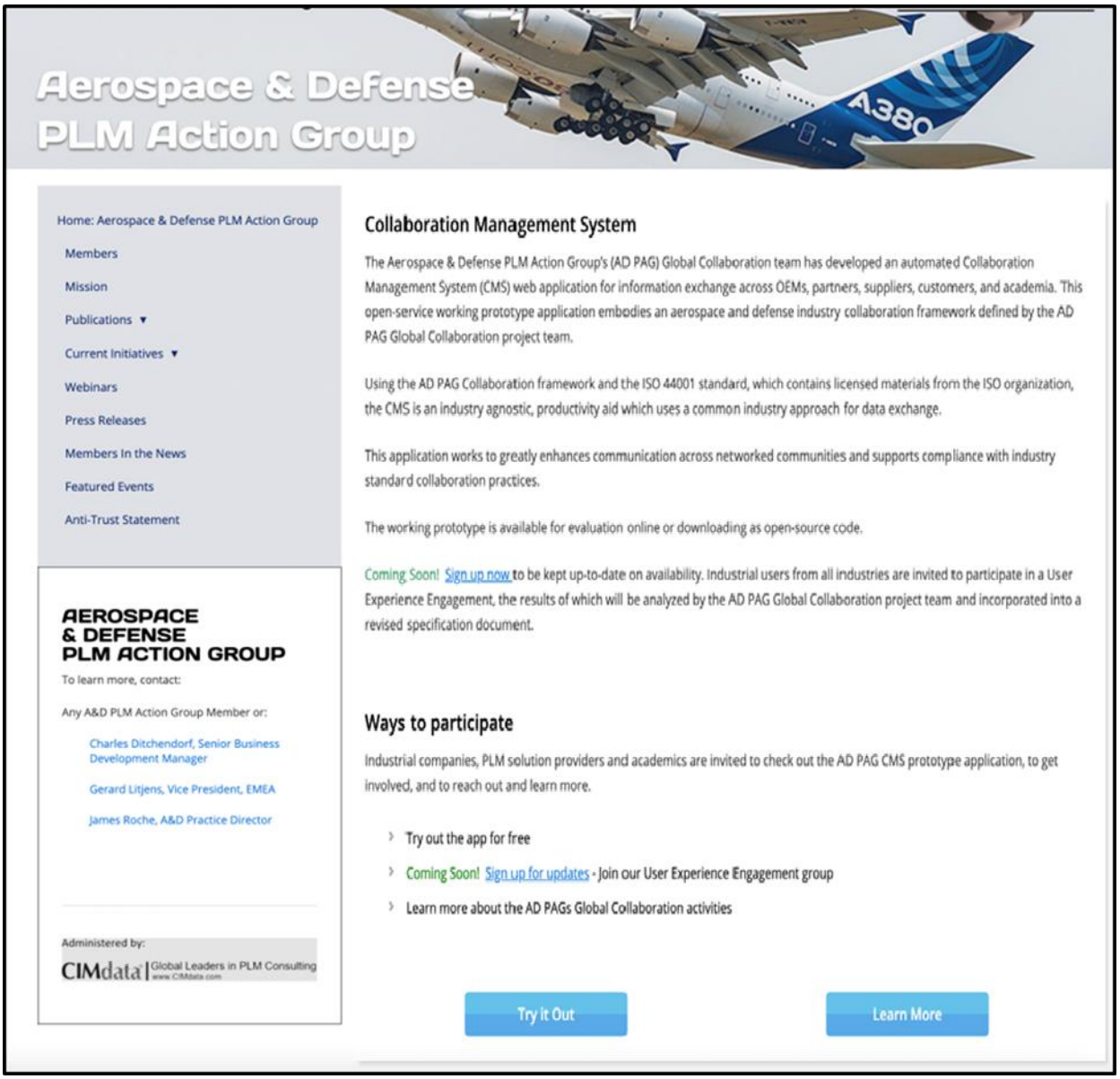

Figure 4 – A&D PLM Action Group CMS Webpage

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8 Go Forward Plan

The A&D PLM Action Group members believe the collaboration protocols and the prototype collaboration management system described in this report and companion position paper offer substantial potential value to the PLM community. They hope that the PLM community will engage, evaluate, and respond.

8.1 Response from the PLM Community

Industrial companies, PLM solution providers and academics are invited to check out the AD PAG CMS prototype application, to get involved, and to reach out and learn more.

8.1.1 Check It Out

The Collaboration Management (CMS) prototype application is available for anyone to explore or download simply by clicking a button on the AD PAG webpage.

8.1.2 Get Involved

CIMdata on behalf of the AD PAG will be conducting a User Experience Engagement (UXE) with the CMS prototype. Volunteers are currently being accepting for the UXE campaign.

- UXE volunteers will provide input on CMS content, navigation and usability, as well as assess overall effectiveness of the application
- Seeking Junior, Mid and Senior-career participants from Industry, Academia, and Professional Organizations
- Interested in participation from numerous fields including Contract Specialists, Data Exchange Specialists, CAD Modelers, Systems Engineers, and Program Managers
- Time Commitment is approximately 3 hours

You can find out more and volunteer for the User Experience Engagement (UXE) through the AD PAG website.

8.1.3 Learn More

More information on the A&D PLM Action Group and position papers and reports on a range of PLM-related topics are available for download at no charge from the Group's website.

8.2 Next Steps for the Project Team

The AD PAG Global Collaboration project team will consolidate and analyze the input from the User Experience Engagement (UXE) and generate a revision and expansion of their position paper. This new Edition 3 will contain refined and detailed requirements to guide the development of the next generation of collaboration management systems. As usual, the new specification document will be released at no charge and promoted broadly within the PLM community.

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9 About A&D PLM Action Group

The Aerospace & Defense PLM Action Group is an association of aerospace OEMs and aircraft engine providers within CIMdata's globally recognized PLM Community Program, which functions as a ***PLM advocacy group*** to:

- Set the direction for the aerospace & defense industry on PLM-related topics that matter to members (including promoting, not duplicating, the work of standards bodies)
- Promote common industry PLM processes and practices
- Define requirements for common interest PLM-related capabilities
- Communicate with a unified voice to PLM solution providers
- Sponsor collaborative PLM research on prioritized industry and technology topics

CIMdata administers Group operations, coordinates research, and manages the progression of policy formulation.

10 About CIMdata

CIMdata, a leading independent worldwide firm, provides strategic management consulting to maximize an enterprise's ability to design and deliver innovative products and services through the application of Product Lifecycle Management (PLM) solutions. Since its founding over thirty years ago, CIMdata has delivered world-class knowledge, expertise, and best-practice methods on PLM solutions. These solutions incorporate both business processes and a wide-ranging set of PLM-enabling technologies.

CIMdata works with both industrial organizations and providers of technologies and services seeking competitive advantage in the global economy. CIMdata helps industrial organizations establish effective PLM strategies, assists in the identification of requirements and selection of PLM technologies, helps organizations optimize their operational structure and processes to implement solutions, and assists in the deployment of these solutions. For PLM solution providers, CIMdata helps define business and market strategies, delivers worldwide market information and analyses, provides education and support for internal sales and marketing teams, as well as overall support at all stages of business and product programs to make them optimally effective in their markets.

In addition to consulting, CIMdata conducts research, provides PLM-focused subscription services, and produces several commercial publications. The company also provides industry education through PLM certification programs, seminars, and conferences worldwide. CIMdata serves clients around the world from offices in North America, Europe, and Asia-Pacific.

To learn more about CIMdata's services, visit our website at www.CIMdata.com or contact CIMdata at: 3909 Research Park Drive, Ann Arbor, MI 48108, USA. Tel: +1 734.668.9922. Fax: +1 734.668.1957; or at Oogststraat 20, 6004 CV Weert, The Netherlands. Tel: +31 (0) 495.533.666.

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Appendix A: A&D Collaboration Guidelines Checklist

Step	Global Collaboration Team Guidelines for A&D	Status
1	**Prepare for Collaboration and Data Exchange**	
1.1	Define Type and Scope of Data	
1.2	Define Recommended Way of Collaboration	
1.3	Define Recommended Project Management Terminology and Tool Set	
1.4	Define IP-Compliant Process	
1.5	Assess Collaboration Capability	
1.6	Supplier Selection Announced	
1.7	Data Collaboration Agreement	
1.8	Audit and Follow-Up	
2	**Establish Commercial, Contractual, and Legal Relationships**	
2.1	Define Data Exchange Rules and Processes	
2.2	Define Project Management Terms	
2.3	Monitor and Manage Contract Execution and Contractual Coverage of	
2.4	Anticipate and Mitigate Contractual Risks	
2.5	Amend the Contract	
3	**Set Up Governance**	
3.1	Establish Import/Export Guidelines	
3.2	Determine Intellectual Property (IP)	
3.3	Implement Security Protocol(s)	
3.4	Protect Personal Identifiable Information	
3.5	Conduct Collaboration Platform Review(s)	
4	**Establish Project Management**	
4.1	Supply Chain Management	
4.2	Authority Delegation	
4.3	Planning and Measuring	
4.4	Risk Analysis	
5	**Set Up Interfaces and Organization**	
5.1	Nominate Focal Points	
5.2	Provide Access	
5.3	Define a Support System	
6	**Set Up Collaboration Environment for Program Life**	
6.1	Preparation	
6.2	Initialization	
6.3	Operation	
7	**Conduct the Program Review(s)**	
7.1	Prepare the Optimized Program Review	
7.2	Conduct the Program Review	
7.3	Follow Up and Close the Program Review	
8	**Perform End State Tasks**	
8.1	Review Data for Archiving	
8.2	Archive the Data	
8.3	Decommission the Program/Project Collaboration Space	
8.4	Manage the Contract Expiration and Close and Terminate the Contract	

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Appendix B: ISO 44001 Assessment Checklist[1]

Stage	ISO 44001 Collaboration Stages	Status
1	**Operational Awareness**	
1.1	General	
1.2	Duties of Senior Executive Responsible (SER)	
1.3	Application and validation of operational governance structure	
1.4	Identification of operational objectives and value	
1.5	Establishment of value analysis process	
1.6	Identification and prioritization of collaborative business relationships	
1.7	Development of competencies and behavior	
1.8	Initial risk assessment	
1.9	Establishment of the RMP (Relationship Management Plan)	
2	**Knowledge**	
2.1	General	
2.2	Strategy and business case	
2.3	Identification of key individuals' competence and behavior	
2.4	Knowledge management	
2.5	Supply chain and extended enterprise risks and opportunities	
2.6	Implementation of risk management process	
2.7	Evaluation of the business case	
2.8	Incorporation of knowledge into the RMP	
3	**Internal Assessment**	
3.1	General	
3.2	Capability and environment for collaboration	
3.3	Assessment of strengths and weaknesses	
3.4	Assessment of collaborative profile	
3.5	Appointment of collaborative leadership	
3.6	Definition of partner selection criteria	
3.7	Implementation of the RMP	
4	**Partner Selection**	
4.1	General	
4.2	Nomination of potential collaborative partners	
4.3	Partner evaluation and selection	
4.4	Development of engagement and negotiation strategy for collaboration	
4.5	Initial engagement with potential partners	
4.6	Assessment of joint objectives	
4.7	Assessment of joint exit strategy	
4.8	Selection of preferred partners	
4.9	Initiation of joint RMP	
5	**Working Together**	
5.1	General	
5.2	Establishment of the joint governance structure	
5.3	Joint knowledge management process	

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Stage	ISO 44001 Collaboration Stages	Status
5.4	Establish joint risk management process	
5.5	Operational process and systems review	
5.6	Measurement of delivery and performance	
5.7	Improvement of organizational collaborative competence	
5.8	Establishment of a joint issue resolution process	
5.9	Establishment of a joint exit strategy	
5.10	Agreements or contracting arrangements	
5.11	Establishment and implementation of the joint RMP	
6	**Value Creation**	
6.1	General	
6.2	Establishment of the value creation process	
6.3	Identification of improvement and setting of targets	
6.4	Use of learning from experience	
6.5	Updating of the joint RMP	
7	**Staying Together**	
7.1	General	
7.2	Oversight by the SERs	
7.3	Management of the joint relationship	
7.4	Implementation of monitoring of behavior and trust indicators	
7.5	Continual value creation	
7.6	Delivery of joint objectives	
7.7	Analysis of results	
7.8	Issue resolution	
7.9	Maintenance of the joint exit strategy	
7.10	Maintenance of the joint RMP	
8	**Exit Strategy Activation**	
8.1	General	
8.2	Initiation of disengagement	
8.3	Business continuity	
8.4	Evaluation of the relationship	
8.5	Future opportunities	
8.6	Review and updating of the RMPs	

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