Functional / Technical Design Document

Contoso Vendor Risk

Vendor Risk Assessment and Compliance Management Solution

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January 2026

Exhibit 1

Title	Name
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Exhibit 2

Version history

Version	Changes	Initiator	Date
1.0	Initial Draft	Patrick Y	31/01/2025

Table of Contents

1 Introduction

1.1 The composition of the document

The functional design document (FDD) contains:

- Scope
- Organisation structure: The functional management of departments for creating a security model of the solution
- Business process: The schema of business process in the solution
- Architecture solution design: Object model, Data model
- Additional customisation
- Integration

1.2 Abbreviations

Abbreviation	Transcript
Plug-in	Plug-in is a software component that adds a specific feature to an existing software application
POC	Point of contact
FDD	Functional Design Document
TDD	Technical Design Document
API	Application Programming Interface
GUID	Globally Unique Identifier
OData	Open Data Protocol - REST-based protocol for data access
ERP	Enterprise Resource Planning
SAM	System for Award Management (SAM.gov)
OSHA	Occupational Safety and Health Administration
Virtual Table	Dataverse feature that enables external data to appear as native tables

2 Project overview

2.1 Scope

Contoso Vendor Risk is a vendor risk management and compliance solution built on Microsoft Power Platform and Azure. It provides:

- Vendor Risk Scoring: Automated multi-factor risk assessment for vendors based on compliance status, payment behaviour, tenure, and documentation
- Bulk Compliance Checking: Ability to validate multiple vendors against compliance criteria in a single operation with fail-fast support
- ERP Integration: Real-time access to ERP vendor master data and compliance registry via OData-compliant virtual tables
- Compliance Registry Integration: SAM.gov status, debarment verification, and OSHA violation tracking
- Configurable Scoring: JSON-based configuration stored in Dataverse for weights, thresholds, and scoring rules

Technology Stack:

Layer	Technology
Data Platform	Microsoft Dataverse
Business Logic	Dataverse Plugins (C# .NET Framework 4.6.2)
Backend Services	Azure Functions (.NET 8 Isolated Worker)
External Data	Virtual Tables with OData v4 Provider
Database	Azure SQL Database
Configuration	JSON stored in contoso_apiconfig table

3 Description of business processes

3.1 Common information about organisation process

This document includes the following business processes to be automated:

1. Vendor Risk Assessment (Risk Score Calculation)
2. Bulk Compliance Check
3. ERP Data Synchronization (Virtual Table Retrieval)
4. Compliance Registry Lookup
5. Configuration Management

3.2 Vendor Risk Assessment

3.2.1 Calculate Vendor Risk Score

Trigger: Custom API invocation with VendorId parameter

Purpose: Calculates a comprehensive risk score (0-100) for a vendor based on compliance, payment, tenure, and documentation factors

Process flow

Step Id	Description	Remarks
VRS-01	Validate Input	Validates VendorId is a valid GUID, AssessmentDate defaults to current UTC if not provided
VRS-02	Load Configuration	Retrieves RiskScoringConfig from contoso_apiconfig (type=100000000). Falls back to defaults if missing
VRS-03	Retrieve Vendor Data	Queries contoso_vendor for vendor details including VendorNumber, YearsInBusiness, OnboardingDate
VRS-04	Retrieve Compliance Data	Queries contoso_compliancerecord for document expiry status, counts expired/current/expiring-soon documents
VRS-05	Retrieve ERP Data	If VendorNumber exists, queries contoso_erpvendormaster (virtual table) for AvgDaysToPay, ERPStatus
VRS-06	Retrieve Registry Data	If VendorNumber exists, queries contoso_complianceregistry (virtual table) for SAMStatus, Debarred, OSHAViolations
VRS-07	Calculate Component Scores	Calculates ComplianceScore, PaymentScore, TenureScore, DocumentationScore (each 0-100)
VRS-08	Apply Weighted Calculation	Applies configurable weights (default: Compliance=0.35, Payment=0.25, Tenure=0.20, Documentation=0.20)
VRS-09	Determine Risk Category	Maps score to category: Low (>=80), Medium (>=60), High (>=40), Critical (<40 or Debarred)
VRS-10	Generate Recommendations	Creates prioritized action items based on identified risk factors
VRS-11	Return Results	Returns RiskScore, RiskCategory, RiskFactors, Recommendations, NextReviewDate, component scores

Functional design

ID	Description	Rules / Examples / Comments
VRS-FD01	Debarred vendor handling	If vendor is debarred, RiskScore forced to 0 and RiskCategory set to "Critical" regardless of other factors
VRS-FD02	Missing VendorNumber penalty	Vendors without VendorNumber receive 15-point penalty and skip ERP/Registry lookups

VRS-FD03	Compliance score deductions	Expired docs: 15 pts each (max 45). Expiring soon: 5 pts each (max 25). SAM expired: 30 pts. Debarred: 100 pts
VRS-FD04	Payment score calculation	On-time (<=30 days): 100. Slow 31-45 days: -10. Slow 46-60 days: -25. Very slow >60 days: -40
VRS-FD05	Tenure scoring	Established (>=10 yrs): 100. Mature (5-9 yrs): 85. Growing (2-4 yrs): 65. New (<2 yrs): 40
VRS-FD06	Previous assessment comparison	If previous assessment exists, calculates ScoreChange and includes in output

3.3 Bulk Compliance Check

3.3.1 Bulk Compliance Check Execution

Trigger: Custom API invocation with array of VendorIds

Purpose: Validates multiple vendors against compliance criteria in a single optimized operation

Process flow

Step Id	Description	Remarks
BCC-01	Validate Input	Parses VendorIds JSON array, validates count <= MaxVendorsPerCall (default: 100)
BCC-02	Parse Check Types	Normalizes requested check types or defaults to all: DocumentExpiry, SAMStatus, Debarment, OSHAViolations, ERPStatus
BCC-03	Load Configuration	Retrieves BulkComplianceConfig from contoso_apiconfig (type=100000001)
BCC-04	Batch Load Vendor Data	Single query retrieves all vendor records for the batch
BCC-05	Batch Load Compliance Data	Single query retrieves all compliance records with paging support (5000 per page)
BCC-06	Batch Load ERP Data	Single query to virtual table for all vendor numbers
BCC-07	Batch Load Registry Data	Single query to virtual table for all vendor numbers. If fails, sets registryFetchFailed flag
BCC-08	Process Each Vendor	Runs selected checks against cached data. If FailFast=true and vendor fails, remaining vendors are skipped
BCC-09	Determine Overall Status	Pass if all checks pass, Fail if any check fails, Warning if any warnings and no failures
BCC-10	Return Results	Returns TotalVendors, PassedCount, FailedCount, Results array, ExecutionTimeMs, FailFastTriggered

Functional design

ID	Description	Rules / Examples / Comments
BCC-FD01	DocumentExpiry check	Fail if any expired documents. Warning if expiring within 30 days or missing expiration dates
BCC-FD02	SAMStatus check	Pass if status is "Active". Fail if "Expired" or "Inactive". Warning if no data
BCC-FD03	Debarment check	Fail if debarred=true. Pass if debarred=false. Fail-closed if registry fetch failed
BCC-FD04	OSHAViolations check	Fail if count > MaxOSHAViolations (default: 3). Warning if count > OSHAWarningThreshold (default: 1)
BCC-FD05	ERPStatus check	Fail if status is "Hold" or "Inactive". Pass if "Active". Warning if no data
BCC-FD06	FailFast mode	When enabled, stops processing on first failure and reports skipped vendor IDs
BCC-FD07	Registry fail-closed	If registry batch query fails, SAMStatus, Debarment, and OSHA checks all fail (cannot bypass)

3.4 ERP Data Synchronization

3.4.1 Virtual Table Data Retrieval Flow

Trigger: Dataverse query against contoso_erpvendormaster or contoso_complianceregistry virtual tables

Purpose: Provides real-time access to external ERP and compliance registry data via OData v4 API

Process flow

Step Id	Description	Remarks
VTR-01	Query Initiation	Dataverse virtual table provider intercepts query against virtual table
VTR-02	OData Translation	Provider translates Dataverse FetchXML/QueryExpression to OData query
VTR-03	Azure Function Request	HTTP GET to Azure Functions endpoint with OData query parameters ($filter, $top, $skip)
VTR-04	SQL Query Execution	Function translates OData filter to parameterized SQL, executes against Azure SQL
VTR-05	ID Translation	Integer vendor_id/registry_id converted to deterministic GUID format for Dataverse compatibility
VTR-06	OData Response	Returns JSON with @odata.context, value array, optional @odata.count
VTR-07	Entity Mapping	Virtual table provider maps OData response to Dataverse entity format

Functional design

ID	Description	Rules / Examples / Comments
VTR-FD01	ID format conversion	Integer IDs converted to GUIDs: vendor_id=1 becomes 00000001-0000-0000-0000-000000000000
VTR-FD02	Filter support	Supports eq, ne, gt, ge, lt, le operators. String functions: contains(), startswith(), endswith()
VTR-FD03	Pagination	$top capped at 1000, default 100. $skip supported for offset pagination
VTR-FD04	SQL injection prevention	All filter values converted to parameterized queries. Column names validated against whitelist
VTR-FD05	Count support	$count=true returns total record count in @odata.count property

4 Data Model

4.1 Overview

The solution uses Microsoft Dataverse as the data platform with the following core entities:

- Vendor (contoso_vendor): Master vendor records with identification and tenure data
- Compliance Record (contoso_compliancerecord): Compliance documents with expiration tracking
- Risk Assessment (contoso_riskassessment): Historical risk assessment records
- API Config (contoso_apiconfig): JSON-based configuration storage
- ERP Vendor Master (contoso_erpvendormaster): Virtual table for ERP payment/financial data
- Compliance Registry (contoso_complianceregistry): Virtual table for SAM/OSHA/debarment data

4.2 Tables

4.2.1 Vendor (contoso_vendor)

General

Option	Enable / Disable
Display Name	Vendor
Plural Name	Vendors
Schema name (Table)	contoso_vendor
Primary field (schema name)	contoso_vendorname
Auditing	Yes
Ownership	User or Team

Form (Main)

Display Name	Schema Name	Field Type	Req	Notes	Srch
Vendor ID	contoso_vendorid	GUID	+	Primary key	
Vendor Name	contoso_vendorname	String	+	Primary field	+
Vendor Number	contoso_vendornumber	String		ERP vendor identifier, used for virtual table lookups	+
Years in Business	contoso_yearsinbusiness	Whole Number		Manual entry for tenure calculation	
Onboarding Date	contoso_onboardingdate	Date		Alternative tenure source if YearsInBusiness not set	
Risk Category	contoso_riskcategory	OptionSet		Low/Medium/High/Critical	+

4.2.2 Compliance Record (contoso_compliancerecord)

General

Option	Enable / Disable
Display Name	Compliance Record
Plural Name	Compliance Records
Schema name (Table)	contoso_compliancerecord
Primary field (schema name)	contoso_name
Ownership	User or Team

Form (Main)

Display Name	Schema Name	Field Type	Req	Notes	Srch
Record ID	contoso_compliancerecordid	GUID	+	Primary key	
Name	contoso_name	String	+	Document identifier	+
Vendor	contoso_vendor	Lookup	+	Reference to contoso_vendor	+
Expiration Date	contoso_expirationdate	Date		Document expiry date	
State	statecode	OptionSet	+	Active (0) / Inactive (1)	

4.2.3 Risk Assessment (contoso_riskassessment)

General

Option	Enable / Disable
Display Name	Risk Assessment
Plural Name	Risk Assessments
Schema name (Table)	contoso_riskassessment
Primary field (schema name)	contoso_name
Ownership	User or Team

Form (Main)

Display Name	Schema Name	Field Type	Req	Notes	Srch
Assessment ID	contoso_riskassessmentid	GUID	+	Primary key	
Name	contoso_name	String	+	Assessment reference	+
Vendor	contoso_vendorid	Lookup	+	Reference to contoso_vendor	+
Risk Score	contoso_riskscore	Decimal	+	0-100 calculated score	
Risk Category	contoso_riskcategory	OptionSet	+	Low/Medium/High/Critical	+
Assessment Date	contoso_assessmentdate	DateTime	+	When assessment was performed	+
State	statecode	OptionSet	+	Active (0) / Inactive (1)	

4.2.4 API Config (contoso_apiconfig)

General

Option	Enable / Disable
Display Name	API Config
Plural Name	API Configs
Schema name (Table)	contoso_apiconfig
Primary field (schema name)	contoso_name
Ownership	Organization

Form (Main)

Display Name	Schema Name	Field Type	Req	Notes	Srch
Config ID	contoso_apiconfigid	GUID	+	Primary key	
Name	contoso_name	String	+	Configuration name	+
Config Type	contoso_configtype	Whole Number	+	100000000=Risk, 100000001=Bulk	
Config JSON	contoso_configjson	Multiline Text	+	JSON configuration payload	
Is Active	contoso_isactive	Boolean	+	Only active configs are loaded	
State	statecode	OptionSet	+	Active (0) / Inactive (1)	

4.2.5 ERP Vendor Master (contoso_erpvendormaster) - Virtual Table

General

Option	Enable / Disable
Display Name	ERP Vendor Master
Plural Name	ERP Vendor Masters
Schema name (Table)	contoso_erpvendormaster
Primary field (schema name)	contoso_name
Table Type	Virtual Table (OData v4 Provider)

Form (Main)

Display Name	Schema Name	Field Type	Req	Notes	Srch
Name	contoso_name	String	+	Vendor number (maps to vendor_number)	+
Payment Terms	contoso_paymentterms	String		e.g., NET30, NET60	
Credit Limit	contoso_creditlimit	Currency		Maximum credit amount	
YTD Purchases	contoso_ytdpurchases	Currency		Year-to-date purchase value	
Open PO Count	contoso_openpocount	Whole Number		Number of open purchase orders	
Open PO Value	contoso_openpovalue	Currency		Total value of open POs	
Avg Days to Pay	contoso_avgdaystopay	Whole Number		Average payment time in days	
Last Payment Date	contoso_lastpaymentdate	DateTime		Most recent payment date	
ERP Status	contoso_erpstatus	String		Active/Hold/Inactive	

4.2.6 Compliance Registry (contoso_complianceregistry) - Virtual Table

General

Option	Enable / Disable
Display Name	Compliance Registry
Plural Name	Compliance Registries
Schema name (Table)	contoso_complianceregistry
Primary field (schema name)	contoso_name
Table Type	Virtual Table (OData v4 Provider)

Form (Main)

Display Name	Schema Name	Field Type	Req	Notes	Srch
Name	contoso_name	String	+	Vendor number	+
SAM Status	contoso_samstatus	String		Active/Expired/Inactive	
SAM Expiry	contoso_samexpiry	DateTime		SAM.gov registration expiry	
OSHA Violation Count	contoso_oshaviolationcount	Whole Number		Number of OSHA violations	
OSHA Last Inspection	contoso_oshalastinspection	DateTime		Date of last OSHA inspection	
Debarred	contoso_debarred	Boolean		True if vendor is debarred	

5 Additional functionality

5.1 Plugin - CalculateVendorRiskScorePlugin

A custom Dataverse plugin registered as a Custom API that calculates comprehensive risk scores for vendors.

Plugin Registration:

Property	Value
Assembly	Contoso.VendorRisk.Plugins.dll
Class	Contoso.VendorRisk.Plugins.Plugins.CalculateVendorRiskScorePlugin
Message	contoso_CalculateVendorRiskScore (Custom API)
Stage	Main Operation

Input Parameters:

Parameter	Type	Required	Description
VendorId	GUID	Yes	ID of the vendor to assess
AssessmentDate	DateTime	No	Date for assessment (defaults to UTC now)
IncludeHistoricalTrend	Boolean	No	Whether to include previous assessment comparison

Output Parameters:

Parameter	Type	Description
RiskScore	Decimal	Overall risk score (0-100)
RiskCategory	String	Low/Medium/High/Critical
RiskFactors	String	JSON array of risk factors
ComplianceScore	Decimal	Component score for compliance
PaymentScore	Decimal	Component score for payment behaviour
TenureScore	Decimal	Component score for business tenure
DocumentationScore	Decimal	Component score for documentation completeness
Recommendations	String	JSON array of recommended actions
NextReviewDate	DateTime	Recommended next review date

5.2 Plugin - BulkComplianceCheckPlugin

A custom Dataverse plugin for batch compliance validation of multiple vendors.

Plugin Registration:

Property	Value
Assembly	Contoso.VendorRisk.Plugins.dll
Class	Contoso.VendorRisk.Plugins.Plugins.BulkComplianceCheckPlugin
Message	contoso_BulkComplianceCheck (Custom API)
Stage	Main Operation

Input Parameters:

Parameter	Type	Required	Description
VendorIds	String	Yes	JSON array of vendor GUIDs
CheckTypes	String	No	JSON array of check types to run (defaults to all)
FailFast	Boolean	No	Stop processing on first failure

Output Parameters:

Parameter	Type	Description
TotalVendors	Integer	Number of vendors requested
ProcessedCount	Integer	Number of vendors actually processed
PassedCount	Integer	Number of vendors that passed all checks
FailedCount	Integer	Number of vendors that failed at least one check
Results	String	JSON array of VendorComplianceResult objects
ExecutionTimeMs	Integer	Total execution time in milliseconds
FailFastTriggered	Boolean	Whether FailFast mode stopped processing

5.3 Risk Scoring Configuration

JSON configuration stored in contoso_apiconfig allows customization of risk scoring behaviour without code changes.

Configuration Structure (RiskScoringConfig):

Section	Description
Weights	Compliance: 0.35, Payment: 0.25, Tenure: 0.20, Documentation: 0.20
Thresholds	Low: 80, Medium: 60, High: 40
Deductions	ExpiredDocumentPer: 15, Debarred: 100, SamExpired: 30, OshaViolationPer: 5, etc.
ReviewDays	Critical: 7, High: 30, Medium: 90, Low: 180
TenureScores	Established (>=10 yrs): 100, Mature (5-9): 85, Growing (2-4): 65, New (<2): 40
DocumentExpiryWarningDays	30 days warning threshold

6 Integration

6.1 Logging mechanism

Plugin execution traces are logged via ITracingService for debugging in Dataverse plugin trace logs.

Azure Function errors and informational logs are written via ILogger to Application Insights when configured.

6.2 Integration 1 - ERP OData API (VendorMaster)

Provides OData v4-compliant access to ERP vendor master data for Dataverse virtual tables.

6.2.1 Scope

Called by Dataverse virtual table provider when queries are made against contoso_erpvendormaster.

6.2.2 Interface design

Overview

Property	Value
Endpoint	GET /api/odata/VendorMaster
Single Entity	GET /api/odata/VendorMaster({guid})
Metadata	GET /api/odata/$metadata
Runtime	Azure Functions .NET 8 Isolated
Hosting	Consumption Plan
Database	Azure SQL Database

Request Format

OData query parameters: $filter, $top (max 1000, default 100), $skip, $count

Response Format

OData v4 JSON with @odata.context, @odata.count (if requested), value array containing VendorMaster entities.

6.3 Integration 2 - ERP OData API (ComplianceRegistry)

Provides OData v4-compliant access to compliance registry data (SAM.gov, OSHA, debarment).

6.3.1 Scope

Called by Dataverse virtual table provider when queries are made against contoso_complianceregistry.

6.3.2 Interface design

Overview

Property	Value
Endpoint	GET /api/odata/ComplianceRegistry
Single Entity	GET /api/odata/ComplianceRegistry({guid})
Runtime	Azure Functions .NET 8 Isolated

Request Format

OData query parameters: $filter (supports vendor_number, sam_status, debarred, osha_violation_count), $top, $skip, $count

Response Format

OData v4 JSON with ComplianceRegistry entities including sam_status, sam_expiry, osha_violation_count, osha_last_inspection, debarred.

6.4 Environment Variables

Schema Name	Description
SqlConnectionString	Azure SQL Database connection string for ERP data
AzureWebJobsStorage	Azure Storage connection for Functions runtime
FUNCTIONS_WORKER_RUNTIME	Set to "dotnet-isolated" for .NET 8 isolated worker