End User Computing (EUC) – Remediation approach

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The better the world works.

Building a better working world

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EUC: *Definition, Scope and Remediation Objectives*

EUCs are designed to automate business functionality including formatting, calculating, transforming, classifying, and/or transferring data and are typically created and/or modified, maintained, and operated by or within the end user's department.

They are defined as "spreadsheets & databases" accessible and modifiable by end users and meet 3 or 4 of the following criteria:

- *Contain mathematical calculation or logical process step (e.g., formula, pivot, macro, or query)*
- *Developed and managed outside an environment that uses formal IT controls*
- *Controlled or developed using desktop software (e.g., Access, Excel, VBA [not controlled by third parties])*
- *Continuous or repeatable business process*

Scoping of EUCs is typically based on impact and usage, focused on high risk processes or key controls:

- *Financial Reporting (including valuation of on and off balance sheet items)*
- *Regulatory Reporting (including CCAR, Liquidity, RRP, NFRR)*
- *Capital Planning and Liquidity Management*
- *Pricing for customers, products, and services*
- *Other high risk processes per Operational Risk program (e.g., may contain customer information)*

Many organizations are conducting large scale EUC remediation programs with the following objectives:

- *Strengthening the Control Environment*
- *Providing EUC Risk Transparency & Reporting*
- *Identifying EUC Efficiency Drivers*
- *Rationalizing, Automating and Eliminating EUC's*

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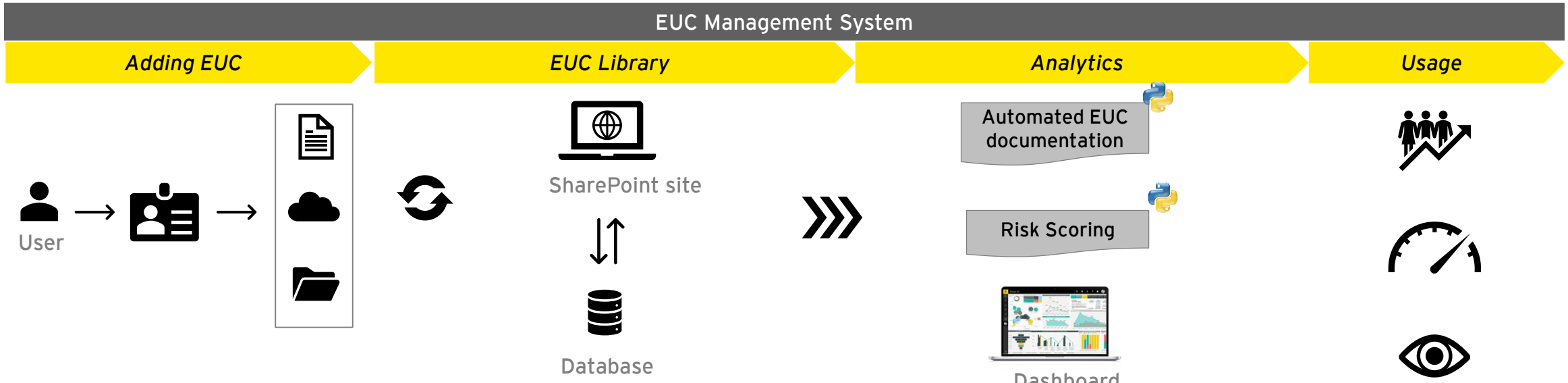
EUC Management System



KEY ACTIVITIES:

1
- Authentication
- Single EUC upload
- Bulk EUC Upload
- Shared folder Scan
- Network folder scan
- Auto Sync
- Scheduled Scans

2
- Secure Storage
- Keyword Search
- EUC filter based on multiple criteria
- Version control
- Files synced with local system

3
- Risk Scoring
- Auto Documentation
- Customizable Dashboard
- Remediation analysis
- Customized Workflow

4
- Scheduled Alerts
- Approval workflow
- Access level setting
- Site usage metrics

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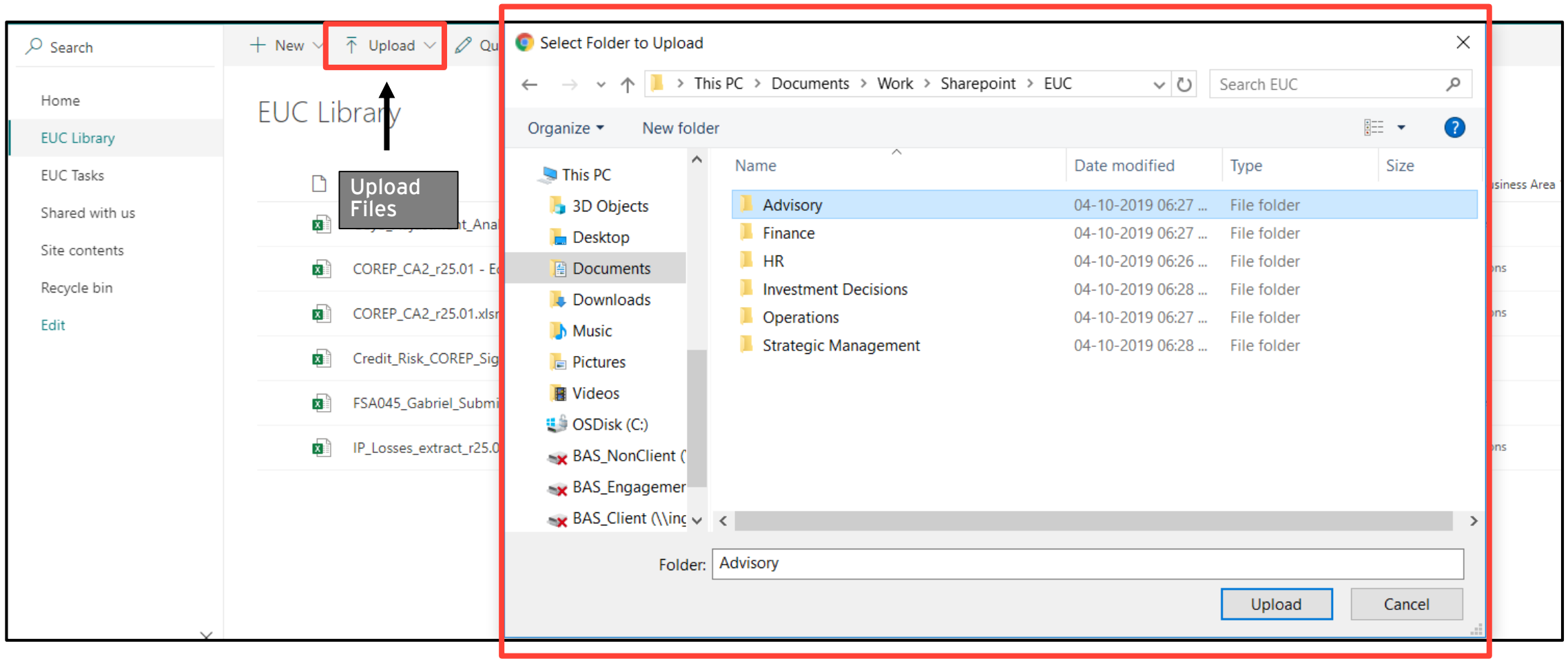
Demo: *Upload single/multiple files*



While uploading files, the user is prompted to fill details about the EUC

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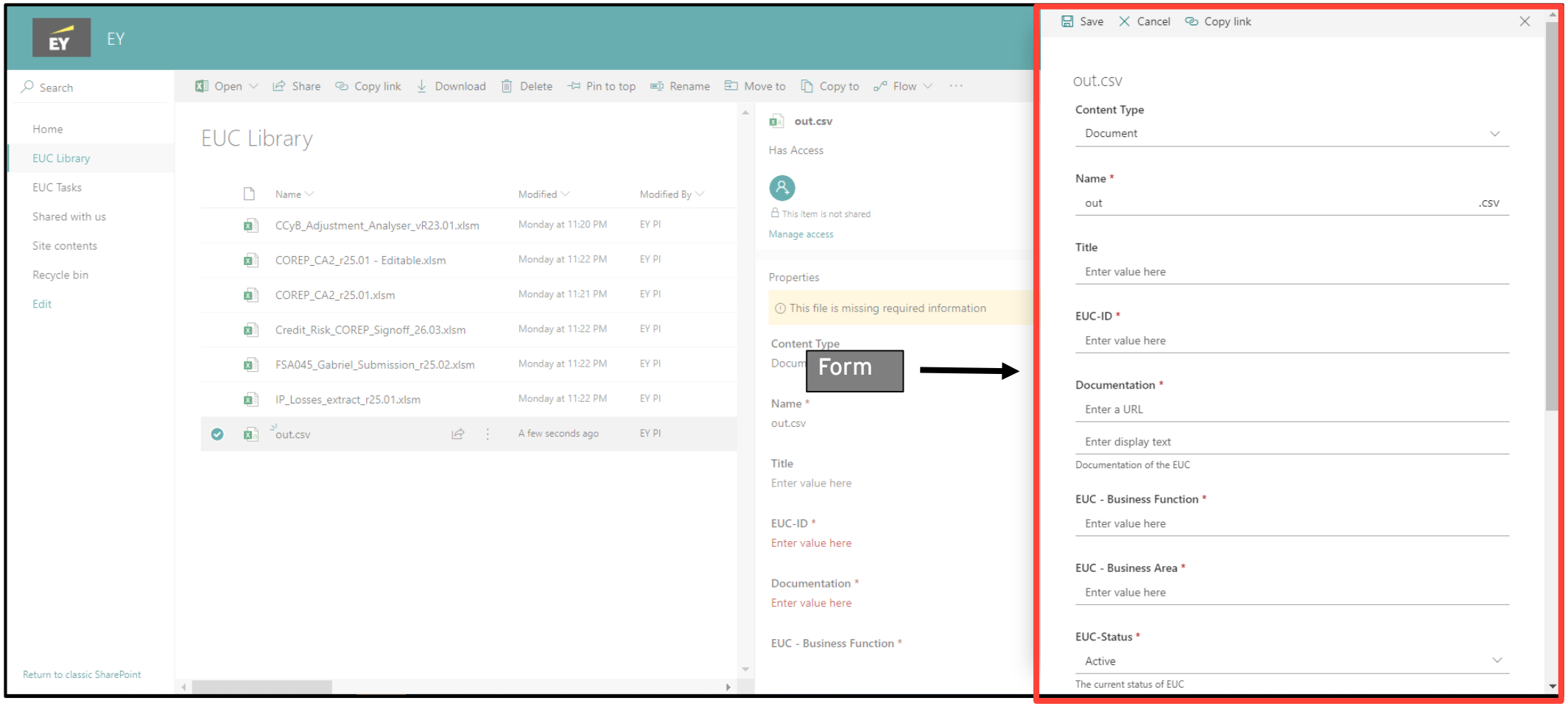
Demo: *Upload form for EUCs*



While uploading files, the user is prompted to fill details about the EUC

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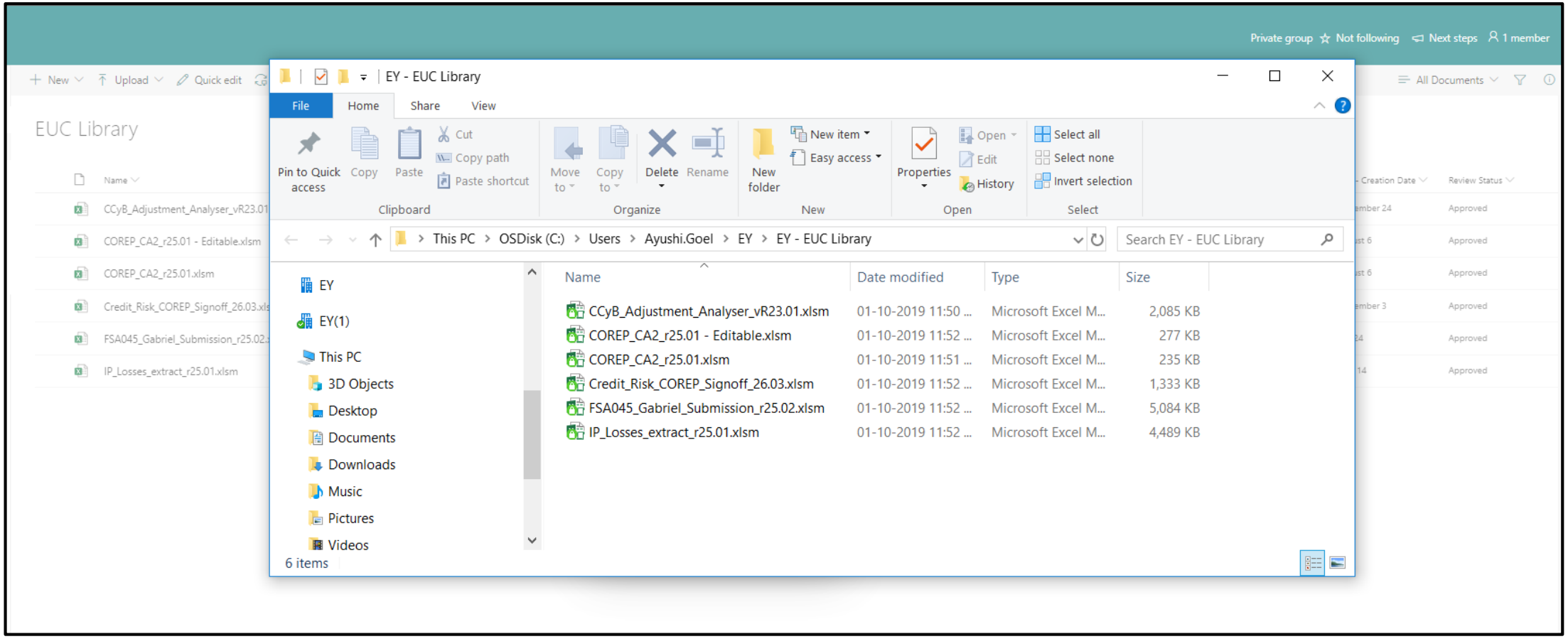
Demo: *Files synced with local system*



All the files within the EUC Library are well synced with a local folder on the system, and any changes made in either the file on site or on system are immediately updated at both places

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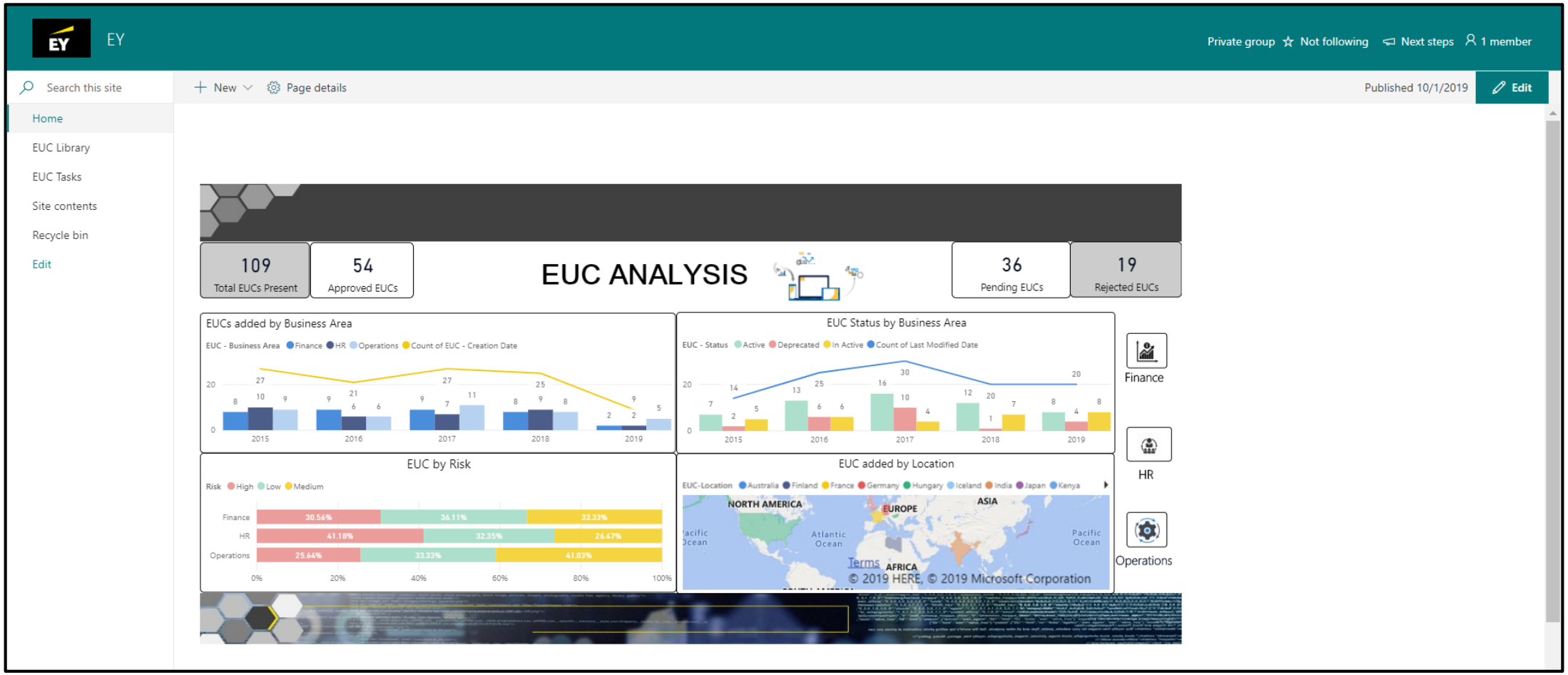
Demo: *Dashboard summarizing EUCs*



The home page displays a PowerBI dashboard, summarizing information over the EUCs within the site

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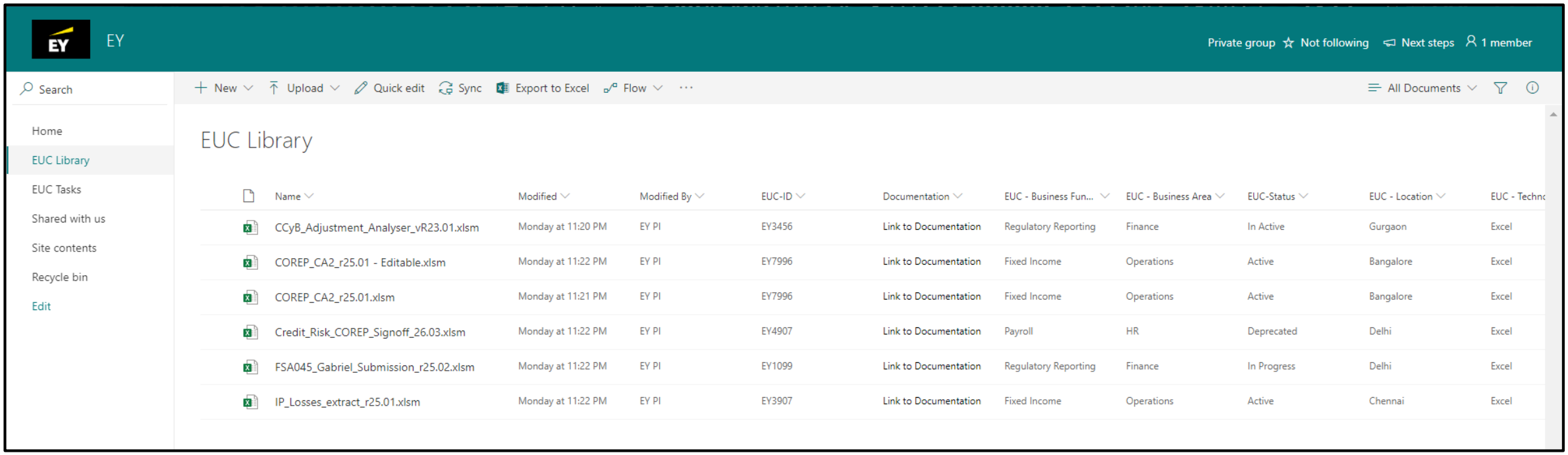
Demo: *EUC Library*



EUC Library provides a comprehensive view of all the EUCs stored within the site, which can be edited and automatically versioned.
New EUCs are uploaded on the same portal, while allowing the user to add related information about the EUC.

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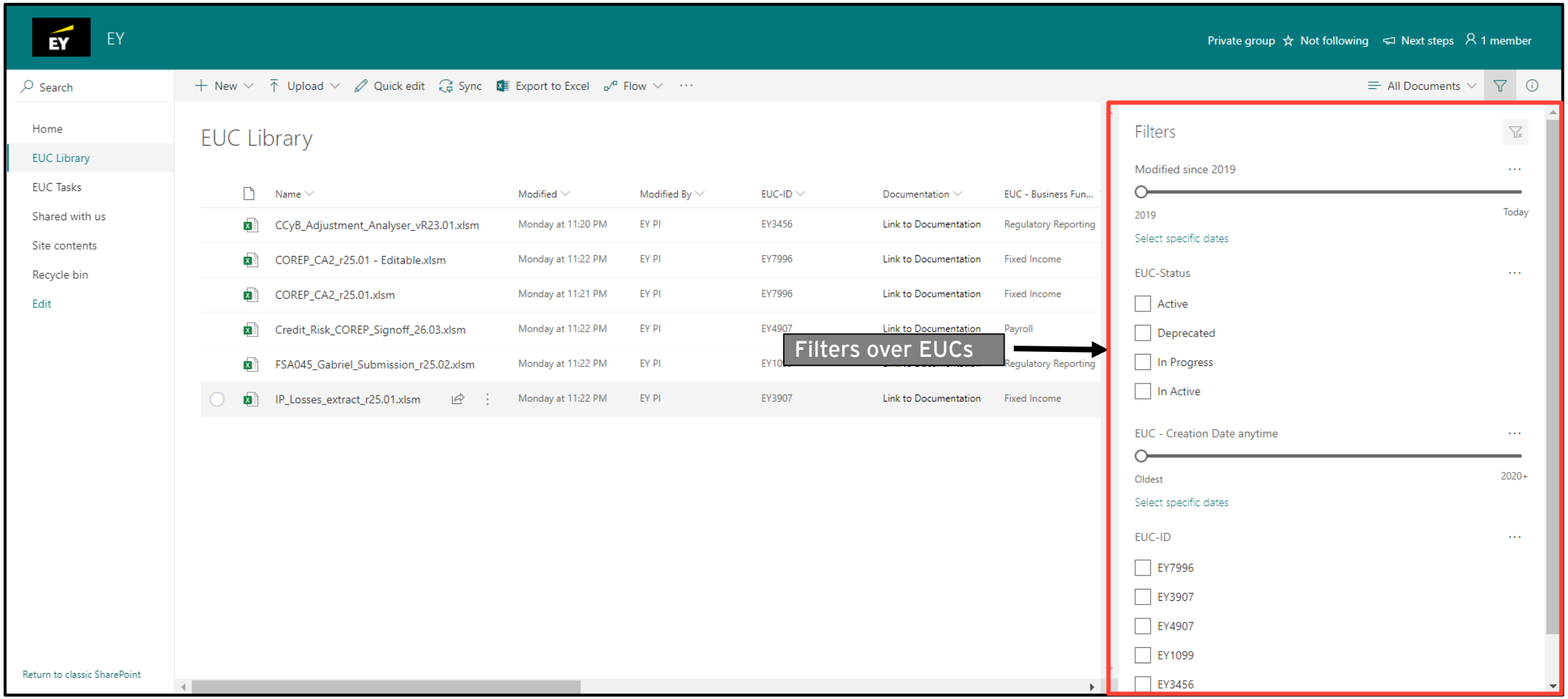
Demo: *Filter options*



The EUC Library can be filtered based on various parameters for an easy search

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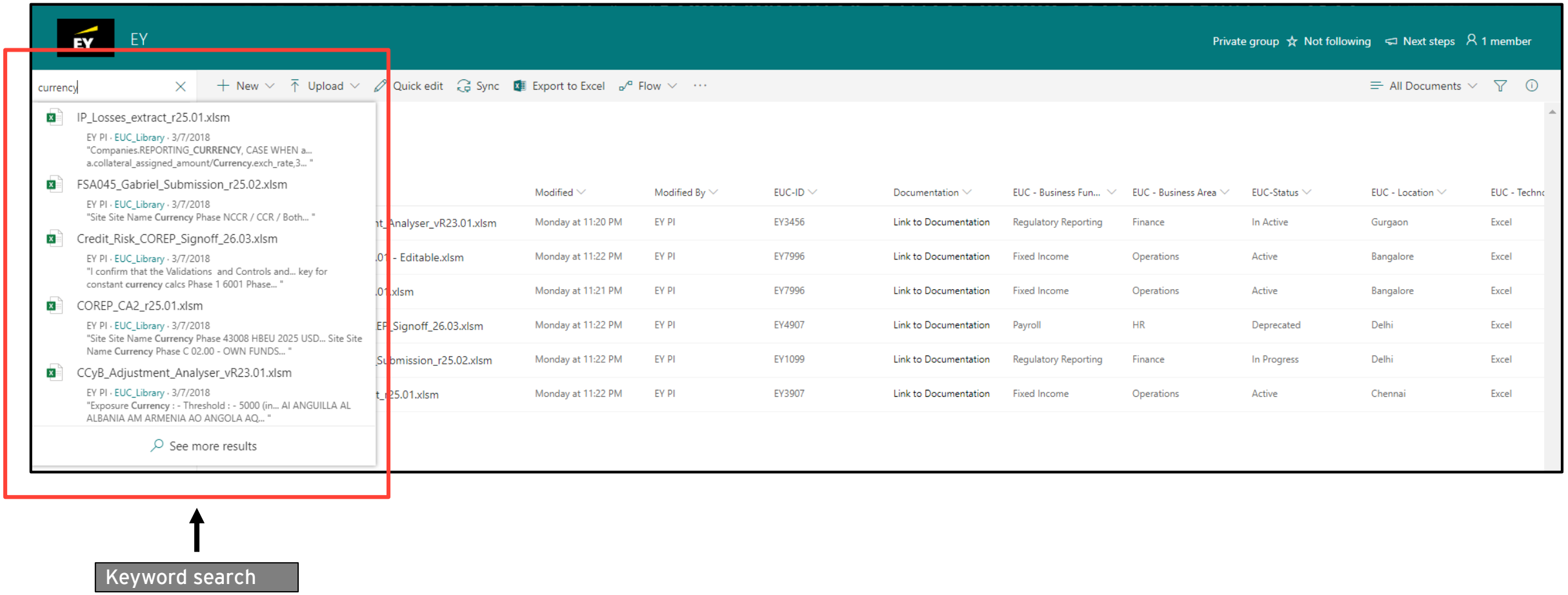
Demo: *Keyword based EUC search*



Keyword search

Any file within the EUC library can also be searched by some keyword present within the EUC

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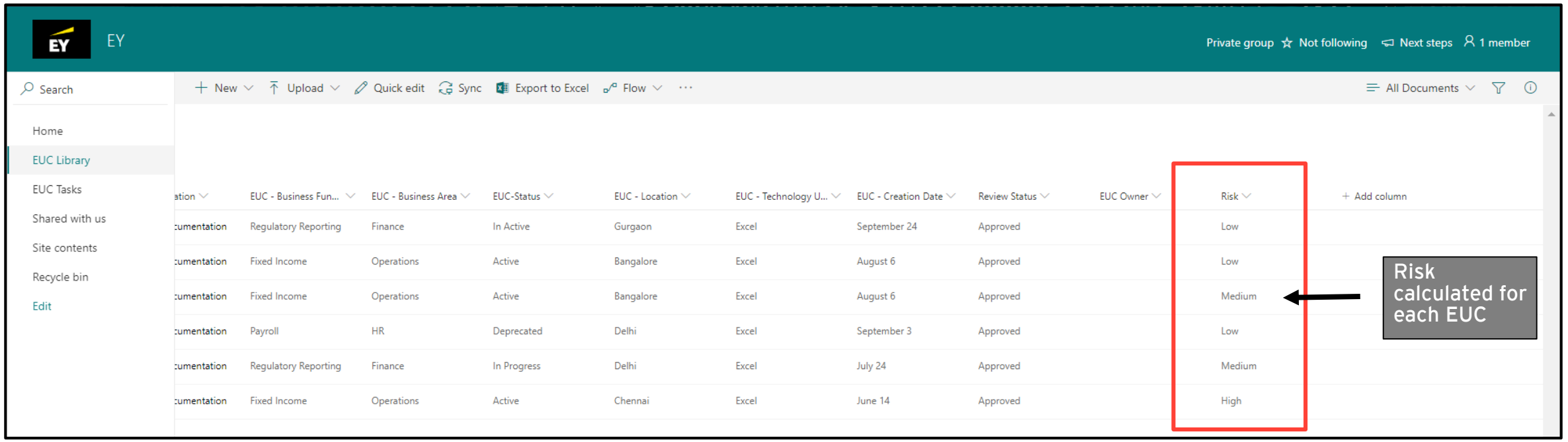
Demo: *Risk Categorization*



For each EUC uploaded, a risk score is calculated, which is then bucketed into three main classes, low, medium and high

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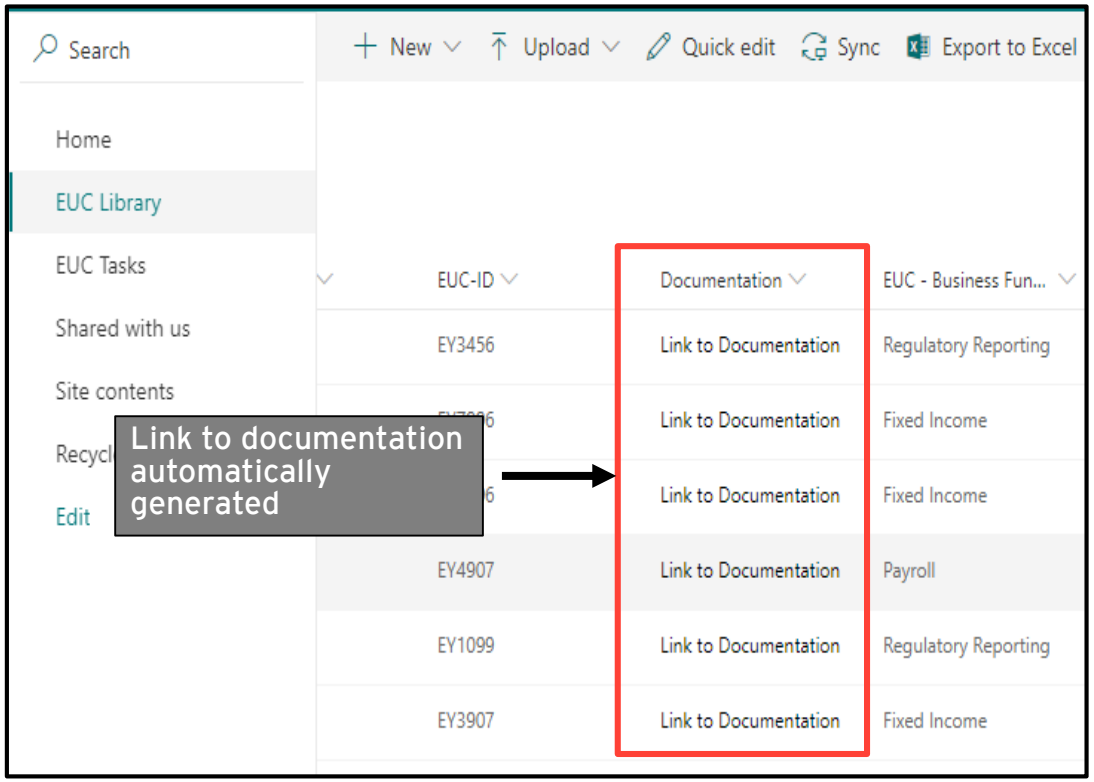
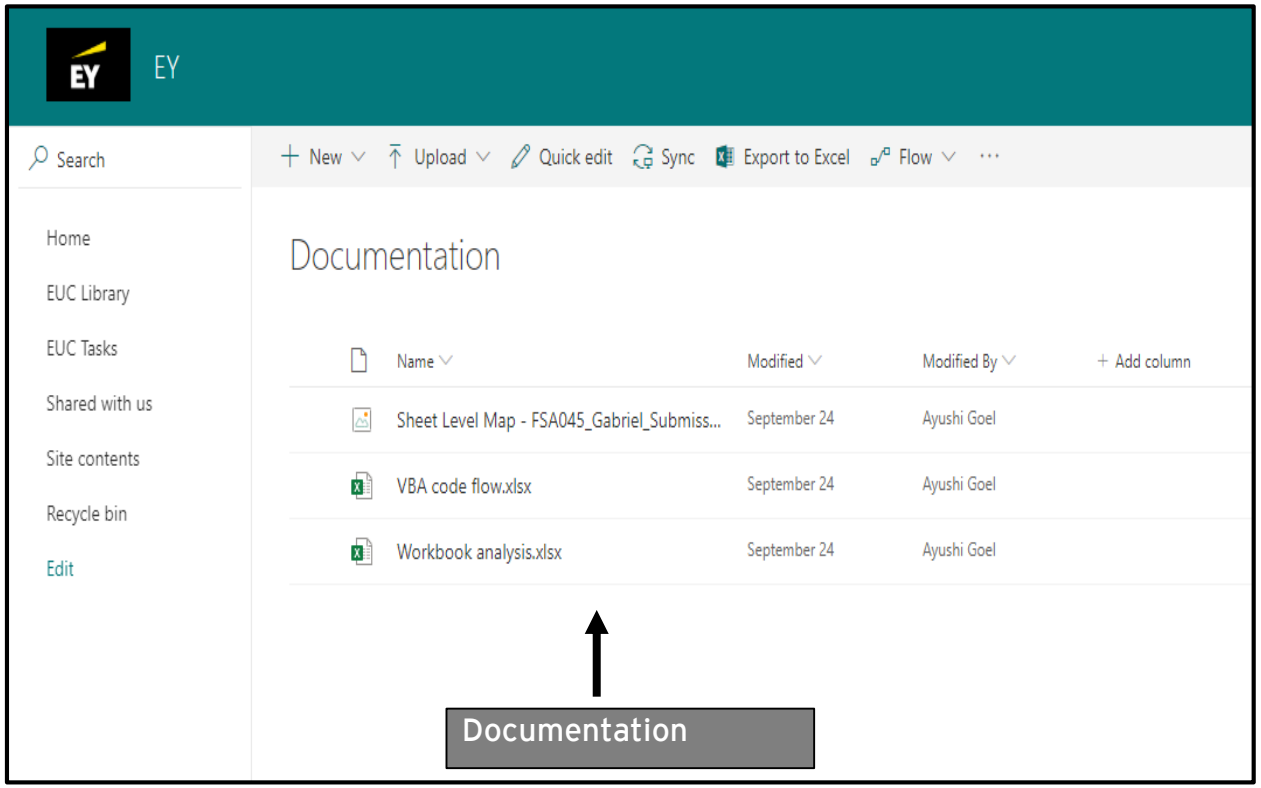
Demo: *Auto generation of documentation for each file uploaded*





For each uploaded file a workbook analysis sheet, a data lineage map and a VBA flowchart is generated automatically

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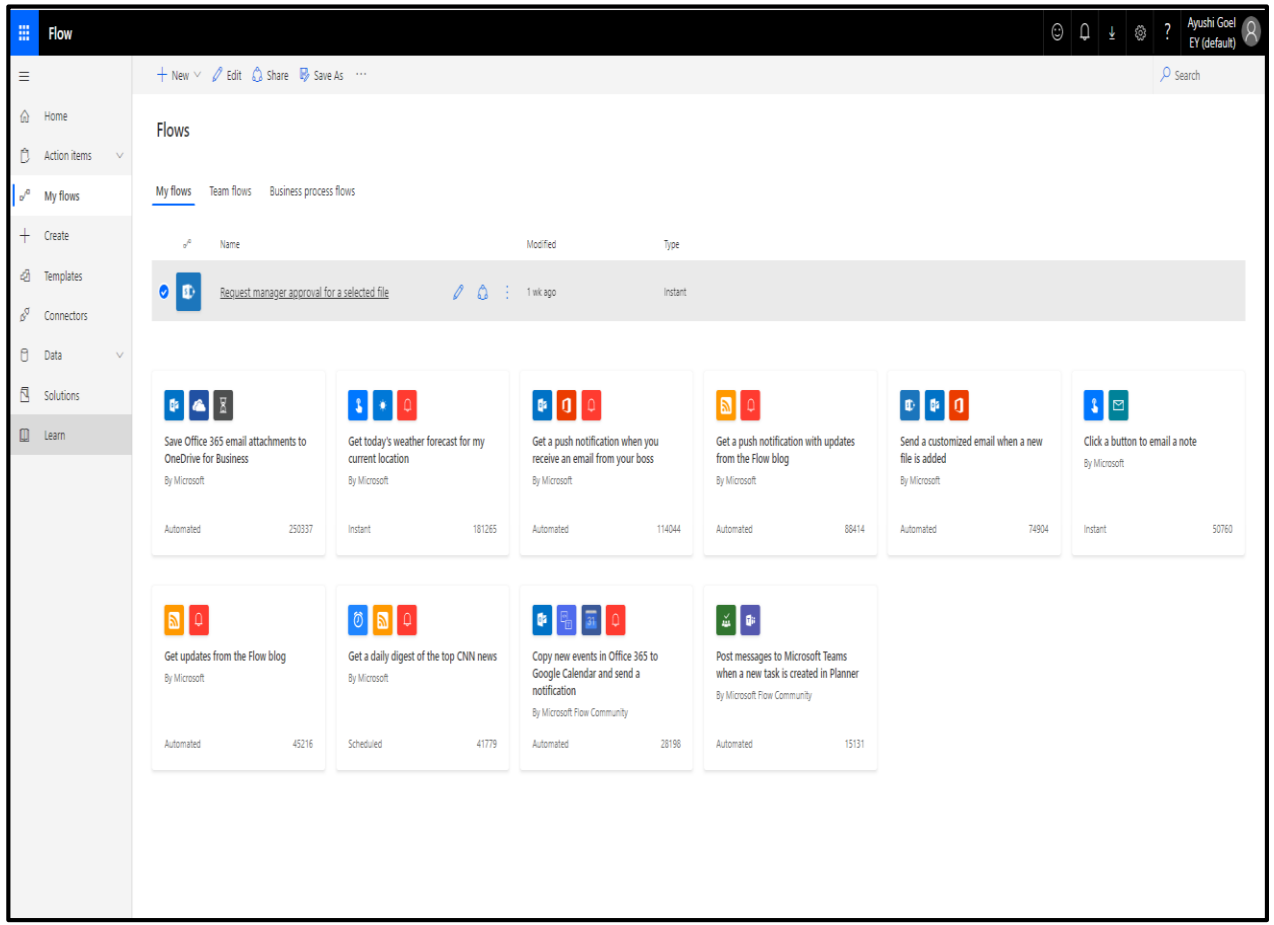
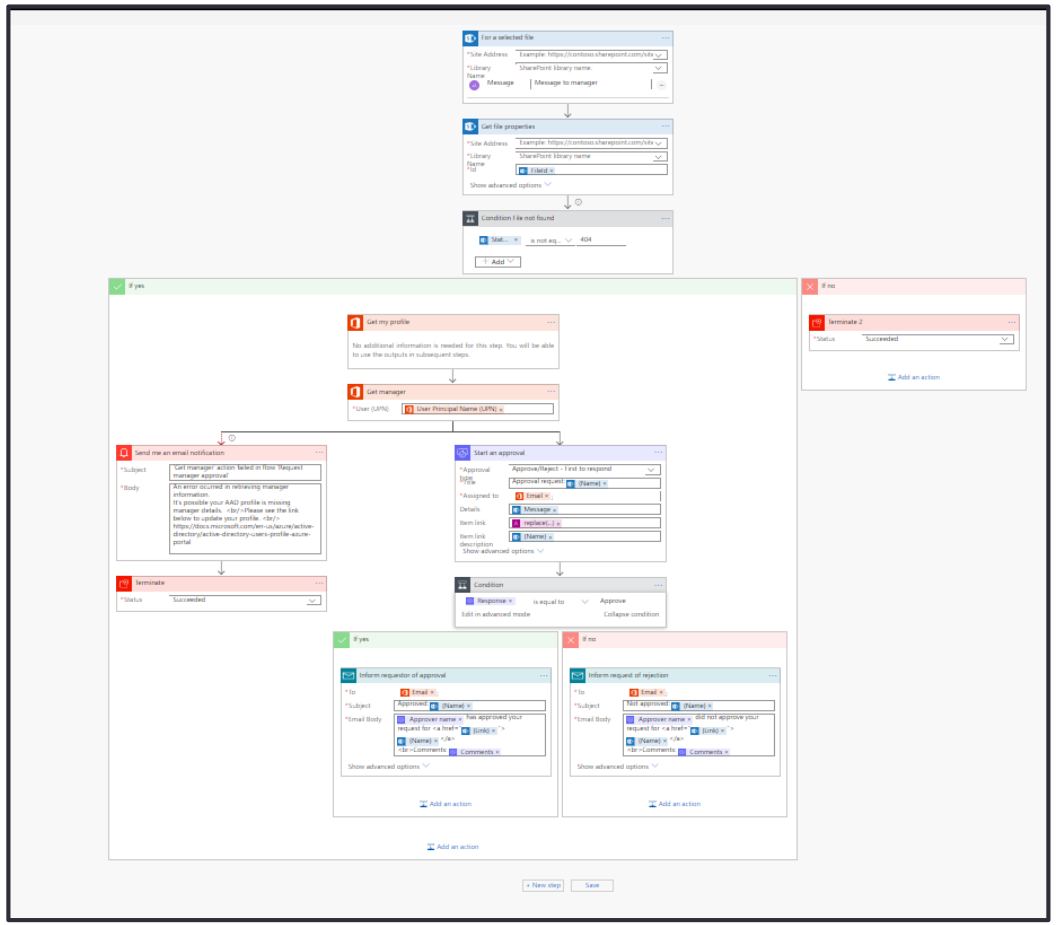
Demo: *Create Custom Workflows*





Along with many pre-built flows, the system allows to build any number of custom flows and connect with the site

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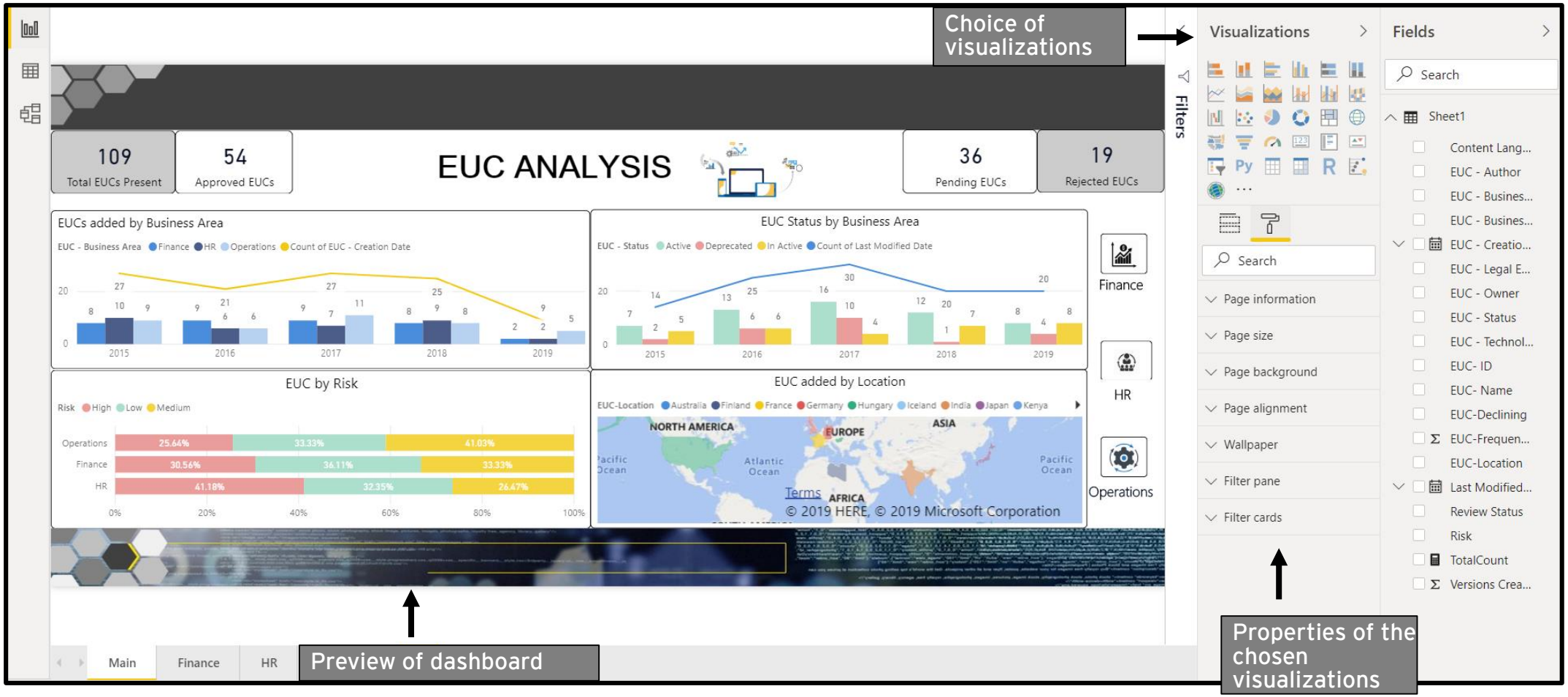
Demo: *Customizable dashboard*



The dashboard along with the entire metadata is fully customizable according to the specific business requirement

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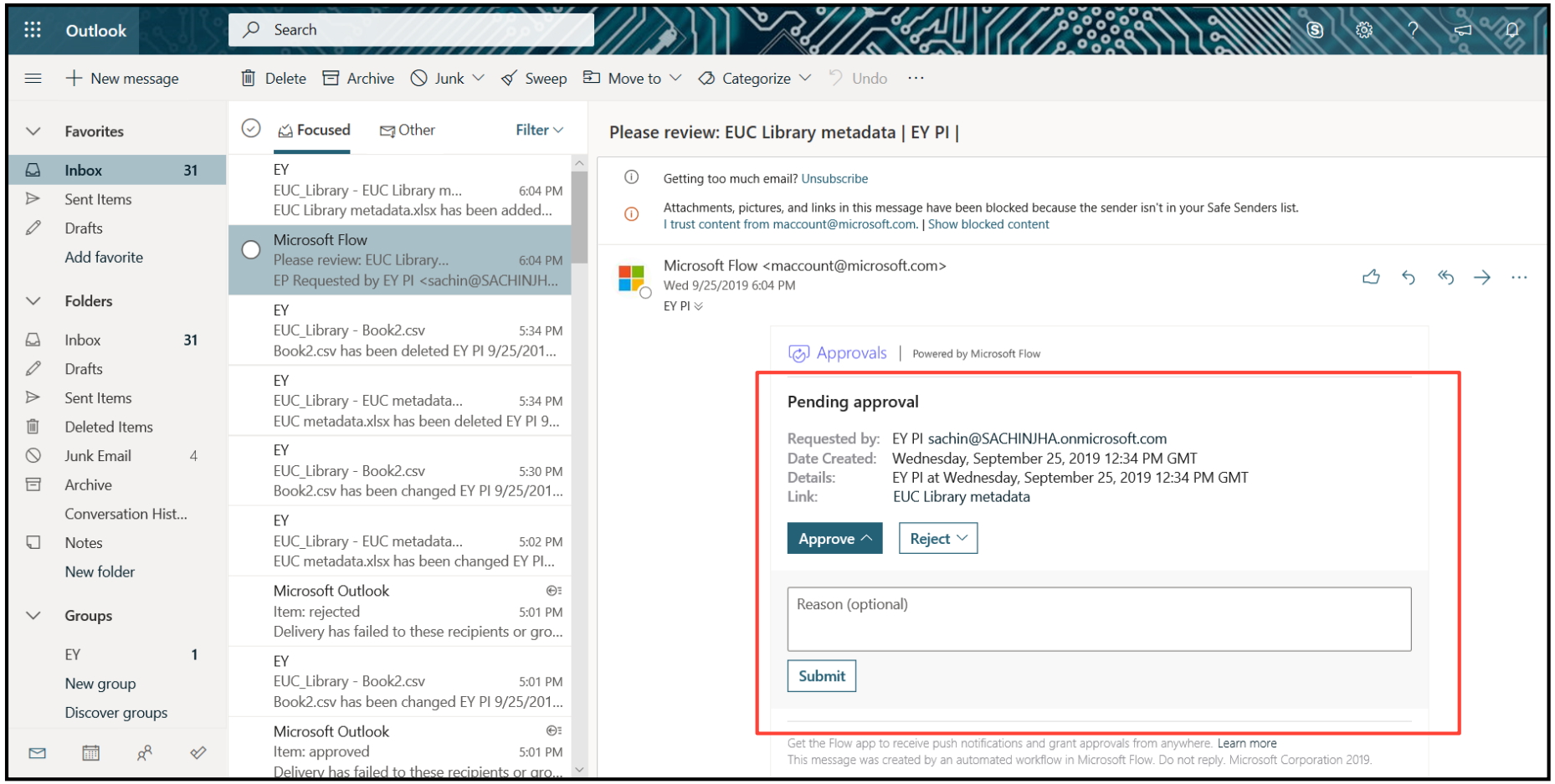
Demo: *Customized alerts*



As soon as a file is uploaded the admin is sent a mail seeking approval for the file uploaded

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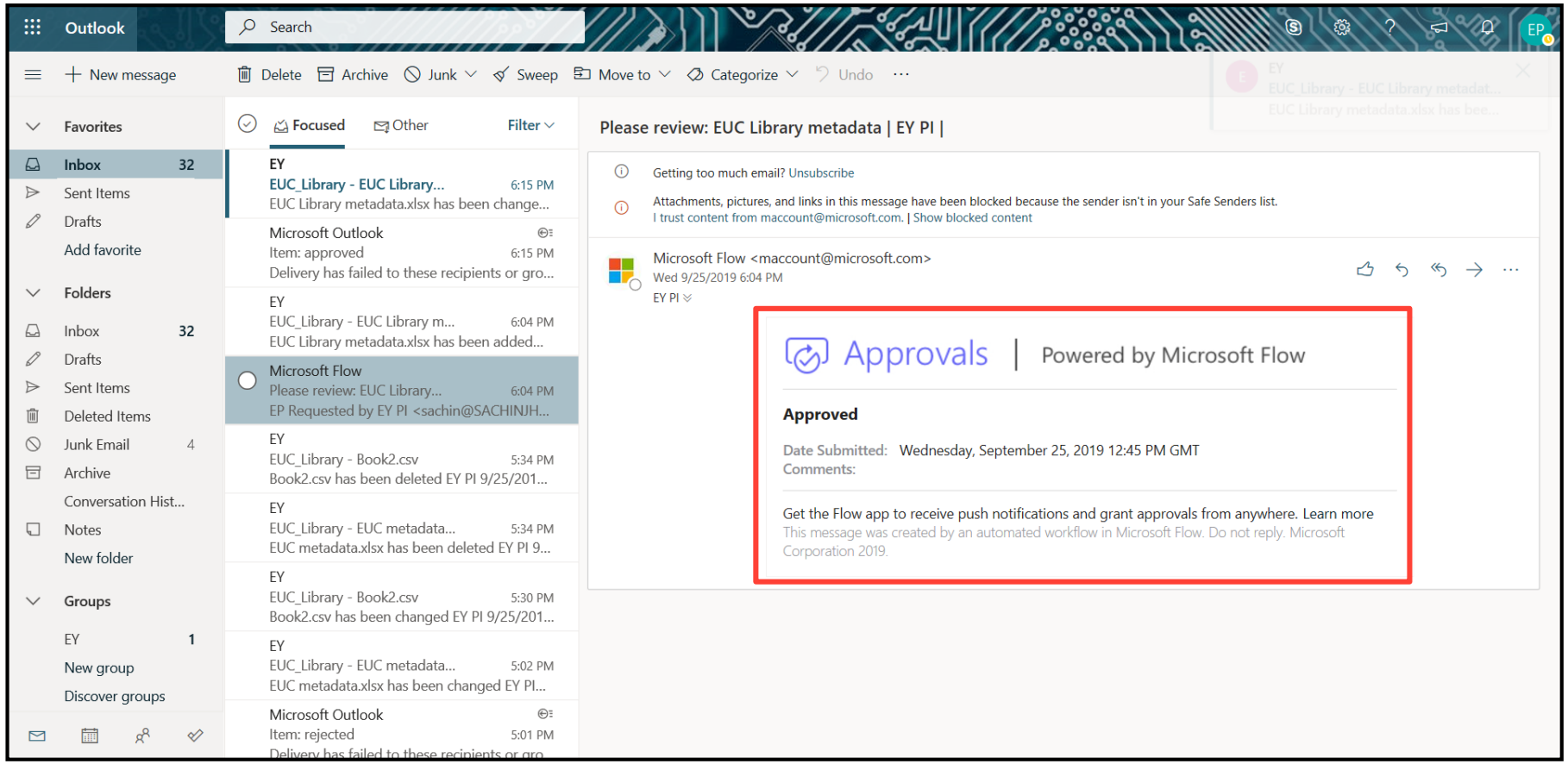
Demo: *EUC Approved Confirmation*



The admin is notified of all approved EUCs

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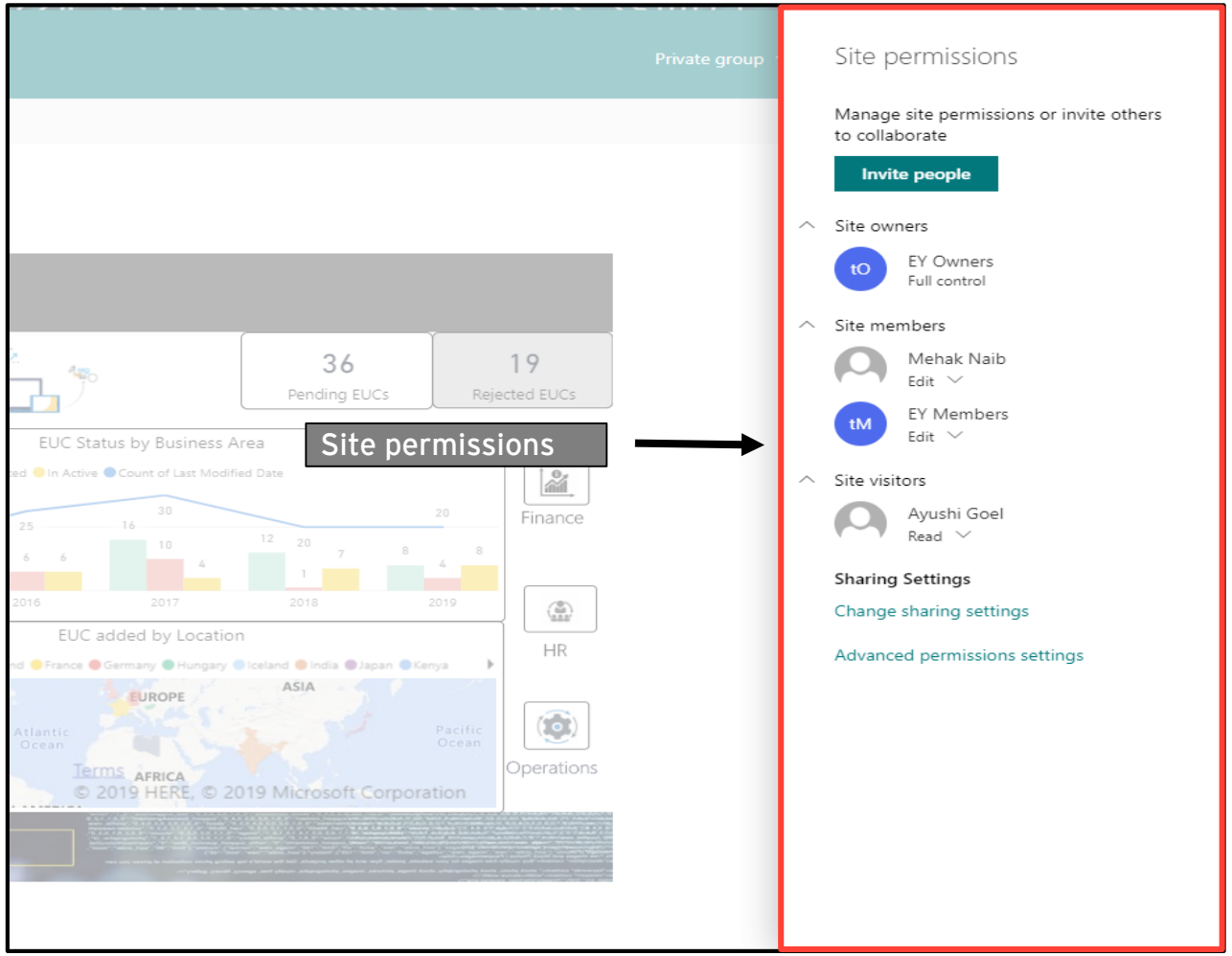
Demo: *Access level for different users*



The site provides full control over which member can view and edit what file

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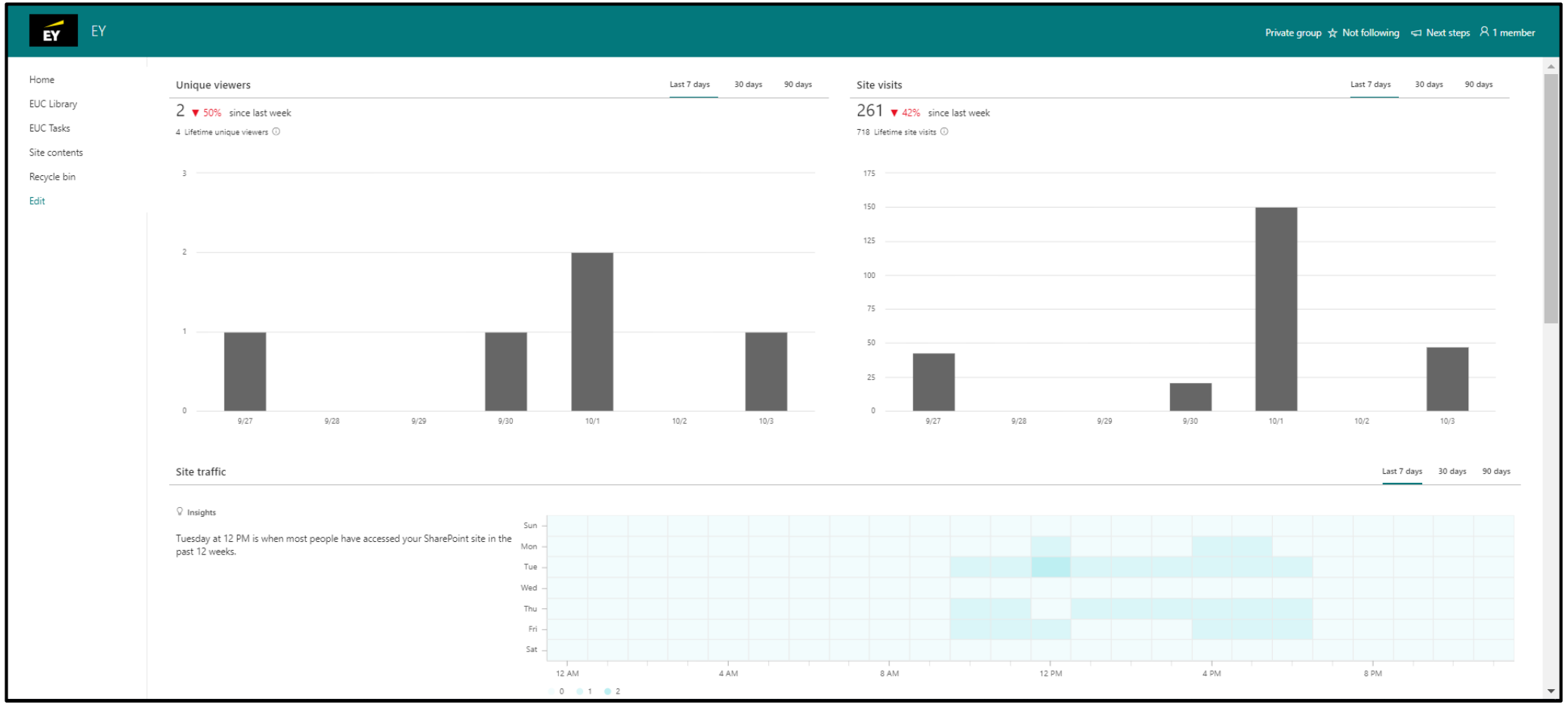
Demo: *Site usage metrics*



There is a complete track of all activities within the site and a summary report is generated

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Measuring EUC Risk

- Types of EUC applications used; how many there are of each type
- level of complexity: heavily coded, use macros, rely on connections to other spreadsheets, databases, etc
- 'Criticality' of the EUCs to the business.
  - Criticality must be assessed based on the quantitative (dollar loss) and qualitative (reputational risk, client exposure, regulatory sanction, loss of business functionality) impact on the business if these files were lost or otherwise unknowingly damaged or altered. For instance, assess what the cost to the business would be if the creator of a vital spreadsheet application left the organization? Would another member of the team have intimate knowledge of how the application works and needs to be maintained? Would they be able to test the integrity of the application in the event of inadvertent or malicious changes to any codes or macros in the application?
- EUC complexity
- Use of scripts
- External links
- Formulae design
- Size or scale of the application
- Processing frequency

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Measuring EUC Risk

- Risk of an EUC is an aggregation of various factors combined together.
  - Complexity – factors within the spreadsheet itself:
    - Within worksheets
    - Across workbook
  - Functionality – purpose being served by the EUC
  - Usage – utilization of the EUC

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Potential drivers of complexity: *within worksheet*

- Number of worksheets present
- Coupling between worksheets – high coupling between worksheets implies increased complexity
- Different types of cells present:
  - Empty cells – Do not contain any data or text
  - Value cells – actually contain the data:
    - InputValueCell – captures the type of data in cell
    - FormulaCell – represents cells which compute their value based on an expression
  - Label cells – not referenced by formulas and only serve as documentation and description of value cells
- Abstract Syntax Tree(AST) – level of nesting of the formulas
- Decision count – number of conditional within a formula:
  - Function
  - Operator
  - Constant
  - Parenthesis
- Dependencies between formulas:
  - Reference – references to single cell
  - Range – reference to a one or two dimensional cell block(range references have a higher impact than references to single cell)

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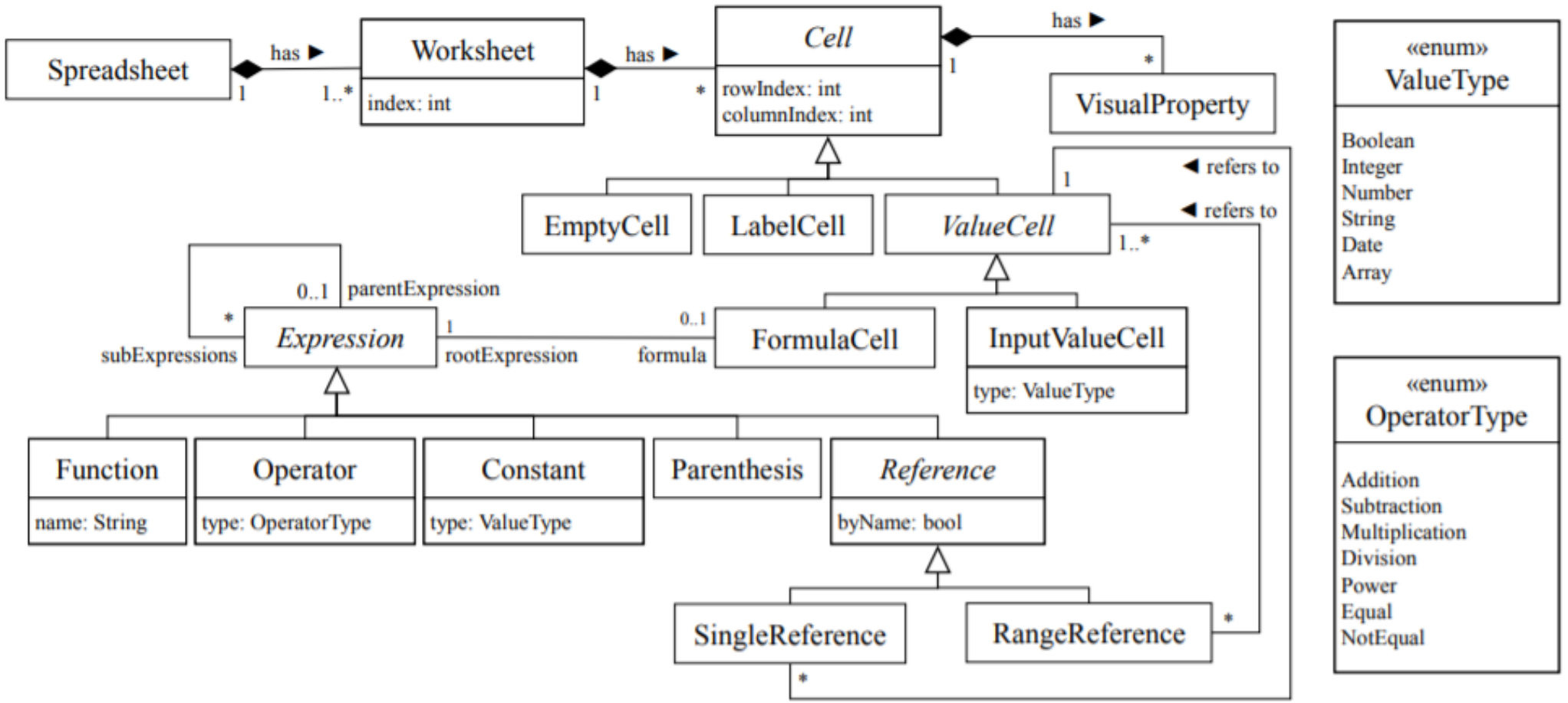
Conceptual and integrated model measuring complexity in worksheets



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Selection of complexity metrics based on potential drivers

Name	Description
Average AST depth per formula	The average depth of the abstract syntax tree which is formed by the Expressions of a FormulaCell.
Max AST depth per formula	
Number of formula cells	The size of the spreadsheet which is determined by the number/ratio of different kind of Cells, e.g., ValueCell and FormulaCell.
Ratio of formula cells to non-empty cells	
Number of input cells	
Ratio of input cells to non-empty cells	
Ratio of formula cells to input cells	
Number of distinct formulas	Number of distinct FormulaCells which have an equally structured AST which only differs with respect to its References.
Average fan-out per formula	Number of incoming and outgoing references of FormulaCells.
Max fan-out per formula	
Average fan-in per formula	
Max fan-in per formula	
Average number of conditionals per formula	Number of Boolean expressions within one FormulaCell, e.g., functions with the names IF, COUNTIF, SUMIF, etc.
Max number of conditionals per formula	
Average spreading factor per formula	Maximal Euclidian distance between References in a Formula. In this sense, rowIndex and columnIndex of the Cell and index of the Worksheet represent the x, y, z coordinates of a three-dimensional space.
Max spreading factor per formula	

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Measuring EUC Risk

A comprehensive proposed set of complexity criteria for spreadsheets

- Sheets
- Formulas
- Formula with Errors
- Array Formulas
- Nested Ifs
- Max Nested If Level
- External Links
- Macros
- Pivot Tables
- Named Items
- Invisible Cells (text and background are the same color)
- Hidden Rows and Columns
- Hidden Sheets
- Very Hidden Sheets (sheet made invisible through use of VBA code)
- Password Protected
- Workbook Size

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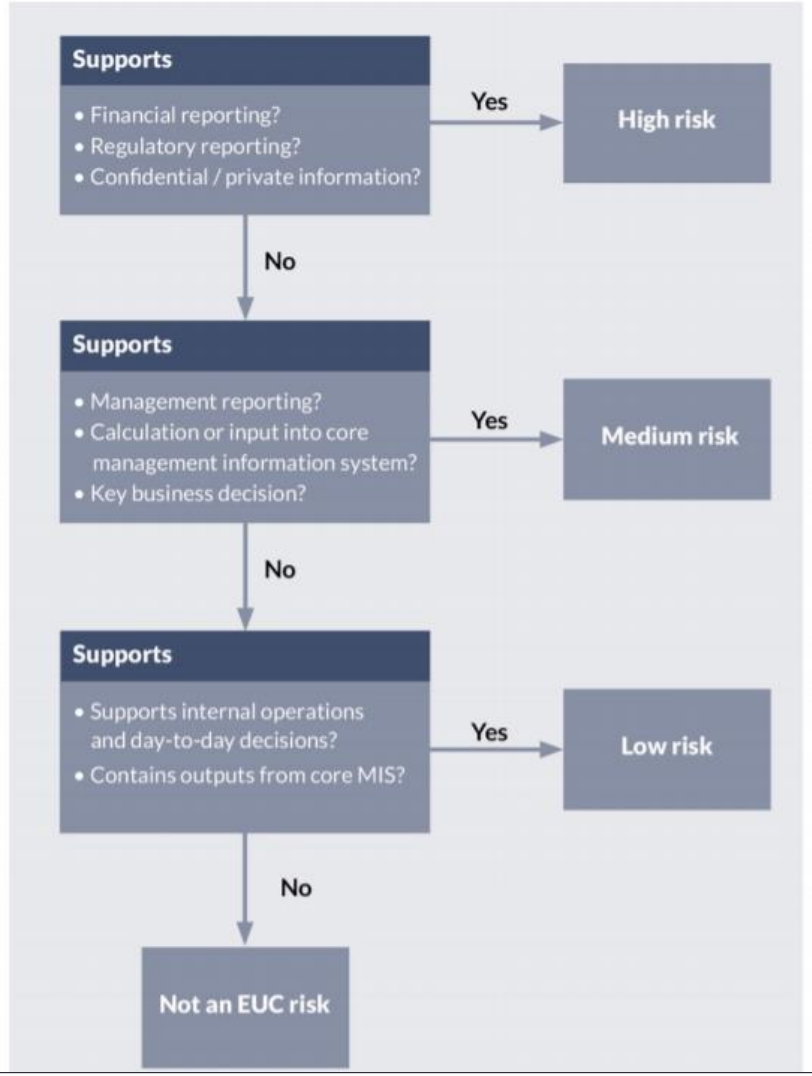
Measuring EUC Risk

5.3. An example EUA risk assessment and categorization process



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System fields being captured for EUCs

Provided by User

- EUC-Name
- EUC-Technology Used
- EUC-Owner
- EUC-Description
- EUC-Approver Comments
- EUC-Rejection Comments
- EUC-Status
- EUC-Business Area
- EUC-Location
- EUC-Legal Entity
- EUC-Business Function

Captured by the system

- EUC-Frequency of Use
- EUC-Created BY
- EUC-Creation Date
- EUC-Last Modified By
- EUC-Last Modified Date

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