NIEM COST MODEL

USER GUIDE

VERSION 2.0

⟨NIEM⟩

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1 Introduction

The National Information Exchange Model (NIEM) Program Management Office (PMO) developed the NIEM Cost Model to estimate the cost of developing NIEM exchanges from the initial development of an Information Exchange Package Documentation (IEPD) to an actual implementation and execution of the exchange. Overall, the NIEM Cost Model will help organizations who want to use NIEM understand the general costs associated with NIEM implementation.

2 The NIEM Cost Model & How it Works

The NIEM Cost Model is an Excel-based model built on baseline assumptions, which are inputted by the user. The Cost Model user inputs are spread over three tabs: 2.0 Exchange Variables tab, 3.0 Cost Variables tab, and 4.0 Activities Variables tab.

2.1 EXCHANGE VARIABLES TAB (2.0)

The Exchange Variables tab contains four sections: 1. Exchange Factors; 2. Level-of-Effort; 3. Term Definition and Extension Schema Escalation Factors; and, 4. Discount Factors.

2.1.1 Exchange Factors

Exchange Factors		Base Year	Year 1	Year 2	Year 3
IEPD Reuse	Number of additional systems (beyond initial exchange) that will use the information	0	0	0	0
Number of Additional Exchanges	Number of additional exchanges that the organization plans on developing to exchange different data	0	0	0	0
Governance	Political goodwill, strong leadership and project management, and engaged stakeholders	Strong			
Number of Elements	Number of elements in exchange	0-50			
Exchange Complexity	Complexity of the exchange	Simple			

There are four variables in this section that the user must input. These inputs are:

1. **IEPD Reuse**: This variable captures the number of additional times the organization intends to reuse the same IEPDs (developed in the initial effort) to share information.
2. **Number of Additional Exchanges**: This variable captures the number of individual exchanges/IEPDs that the organization intends to develop.
3. **Governance**: Governance is one of the variables that determines the complexity of developing a NIEM exchange. This input allows an organization to determine the strength of the related governance of the exchange by selecting "Strong", "Moderate" or "Weak" governance. Governance is defined as the political goodwill, leadership and project management capabilities, and diversity/engagement level of the stakeholders involved in the exchange. This variable interacts with the Number of Elements variable to determine the Exchange Complexity.
4. **Number of Elements**: The number of elements in the exchange also determines the complexity of developing the NIEM exchange. This input allows the organization to select the number of elements from a drop-down menu of "0-50", "50-150", or "150 or more" elements. This variable interacts with the Governance variable to determine the Exchange Complexity.

The **Exchange Complexity** variable is calculated based on the user's inputs for Governance and Number of Elements.

2.1.2   Level-of-Effort Table

The Level-of-Effort table is used in conjunction with the calculated Exchange Complexity variable and the Level-of-Effort estimates from the Activities tab to assign hours needed to complete each task on the Activities tab.

Level of Effort in Hours per Complexity Level			
	Simple	Moderate	Complicated
NA	0	0	0
Low	8	16	40
Medium	30	80	120
High	60	100	150

2.1.3   Term Definition and Extension Schema Escalation Factors/Discount Factors

The cost model assumes in the baseline that some (<50%) of the elements used in the exchange already exist and have been defined in the NIEM model. If this is not the case in the planned exchanges, organizations can adjust the model for different degrees of overlap by changing the overlap variable in cell C26 Reuse of NIEM Data Elements on the Exchange Variables tab.

Term Definition (3.0) and Extension Schema (4.2.2) Escalation Factors	
Model Overlap	NIEM
All Elements Already Exist in NIEM	-100%
Many (>50%) Elements Already Exist in NIEM	-50%
Some (<50%) Elements Already Exist in	-20%
No Elements Already Exist in NIEM	0%

Discount Factors		
Existing IEPD Reuse	Does an IEPD already exist	NO
Reuse of NIEM Data Elements	Number of new elements that do not exist in the NIEM model	Some (<50%) Elements

Example: If all the elements in the planned exchange are already defined in NIEM, then the model will subtract 100% of the costs associated with defining terms with exchange partners and building the extension schema for the NIEM exchange. If many (>50%) of the elements exist in NIEM, the model will subtract 50% of the costs associated with defining terms and the extension schema for the NIEM exchange.

Additionally, the user should select if there is already an existing IEPD on the Exchange Variables tab. If an IEPD already exists, the model will remove costs associated with the creation of a new IEPD.

2.2   COST VARIABLES TAB (3.0)

The Cost Variables tab contains four sections: 1. Resource Category; 2. Other Costs; 3. Funding; and, 4. Outreach Costs.

2.2.1   Labor Rates Table

The Labor Rates table is used to assign dollar values to each task on the Activities tab. Users are free to update the labor rates with those that most accurately reflect their project.

	Title	Internal	External	Type	Rates
Hourly Rates					
	Software Engineer	$ 51.45	$ 90.00	Internal	$ 51.45
	Architect	$ 57.22	$ 110.00	Internal	$ 57.22
	Technical/Network	$ 60.44	$ 110.00	Internal	$ 60.44
	Project Manager	$ 60.44	$ 125.00	Internal	$ 60.44
	Business Analyst	$ 60.44	$ 90.00	Internal	$ 60.44
Resource Category	SME	$ 120.00	$ -	Internal	$ 120.00
	TBD	$ -	$ -	Internal	$ -
	TBD	$ -	$ -	Internal	$ -
	TBD	$ -	$ -	Internal	$ -
	TBD	$ -	$ -	Internal	$ -
	Average Rate	$ 68.33	$ 87.50	Internal	$ 68.33

2.2.2   Additional Cost Table

The cost model takes into account other costs that may be associated with IEPD development, including: NIEM Training, Hardware, and Software.

	Cost Type	Base Year	Year 1	Year 2	Year 3
Other Costs	NIEM Training Cost	$ 10,000.00	$ -	$ -	$ -
	Hardware Cost	$ 250,000.00	$ -	$ -	$ -
	Software Cost	$ 250,000.00	$ -	$ -	$ -

2.2.3   Funding

Funding is an important factor when deciding to develop a NIEM-based exchange. This table categorizes the allocation of funding.

	Amount Type	Base Year	Year 1	Year 2	Year 3
Funding	Grants	$ 500,000.00	$ 275,000.00	$ 275,000.00	$ 150,000.00
	General Funding	$ -	$ -	$ -	$ -
	Special Funding	$ 100,000.00	$ -	$ -	$ -
	Misc	$ -	$ -	$ -	$ -
	Total	$ 600,000.00	$ 275,000.00	$ 275,000.00	$ 150,000.00

2.2.4   Outreach Costs

Without the NIEM community, organizations spend annually on outreach costs. By developing a NIEM exchange, an organization can avoid existing costs associated with outreach.

Outreach Costs	Additional Discount	Cost
	Community Outreach	$ 1,000.00
	Market Research	$ 500.00
	Marketing Material	$ 200.00
	Total	$ 1,700.00

2.3 ACTIVITIES TAB (4.0)

The Activities tab breaks down information exchange development into the different steps for developing and implementing an IEPD. The inputs to these tasks are "Level of Effort" and "Discount" as explained in the following section.

Activity		Estimated Levels of Effort (Based on Education/Skill Level of FTE)										Discount Factor	
		Initial NIEM Exchange										Same Data	New Data
		Software Engineer	Architect	Technic al/Netw	Project Manager	Busines s	SME	TBD	TBD	TBD	TBD	NIEM Escalation	NIEM Escalation
1.0 Scenario Planning													
1.1	Establish a Vision	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	100%
1.2	Establish a Process	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	100%
1.3	Develop Scenarios	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	100%
2.0 Requirements Analysis													
2.1	Define Information Content and Context	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	100%
2.2	Build Domain Model	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	100%
3.0 Mapping and Modeling													
3.1	Mapping	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	75%
3.2	Define Terms with Exchange Partner	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.0 Building and Validating													
4.1	Identify NIEM Reference Schemas	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.2.1	Create NIEM Subset Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.2.2	Create Extension Schema or Entire Schema (for Custom XML)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.2.3	Create Exchange Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	50%
4.3	Build Constraint Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	50%
4.4	Validate Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	50%
5.0 Assemble and Document													
5.1	Develop NIEM Meta-Data Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
5.2	Assemble Required IEPD Artifacts	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
6.0 Publish IEPD													
6.1	Publish IEPD to Repository	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%

2.3.1 Level-of-Effort Estimates

In this section of the Activities tab, each task in the IEPD development process is broken into various labor categories that can be defined by the user (e.g. **Architecture Support; Technical Support; SME Support**). The user is expected to estimate the level of effort for each of the labor categories across all IEPD development. Users select a "High," "Medium," "Low," or "NA" level-of-effort from each dropdown box in this section. These level-of-effort estimates are used in conjunction with the Exchange Complexity variable (Section 2.1.1) to assign hours to each task. This is done by looking up the hours in the level-of-effort table on the Cost Variables tab using the complexity variable and the user selected level-of-effort.

2.3.2 Discount Section

The assumption that the cost of developing NIEM exchanges decreases over time is the foundation of the NIEM value proposition. This assumption is conveyed in the cost model as discount factors for developing exchanges beyond the original information exchange. These discount factors are a percentage (0% to 100%) of the original effort for each task in the IEPD lifecycle. For example: a 25% NIEM discount factor would result in a cost that is 25% of the original cost for a given NIEM task.

The discount section of the Activities tab is used to set discount factors for developing additional information exchanges beyond the original exchange. The discount section of the Activities tab is separated into two sections: "Same Data" and "New Data."

Same Data refers to the number of additional times the organization intends to reuse the same IEPD solution to share information.

New Data refers to the number of information exchanges that the organization plans to develop.

The distinction between "Same Data" and "New Data" is necessary because the model assumes that discounts will differ if an organization is developing an exchange for new data as opposed to replicating an existing exchange.

The model is pre-populated with baseline discount factors developed by the NIEM Business Architecture Committee (NBAC); therefore it is important to start with a new cost model spreadsheet with each analysis. **Changing the discount factors is not recommended for those new to NIEM**. For experienced NIEM practitioners, who wish to make adjustments to the discount factors, please contact the NIEM PMO for the password to unlock these fields.

2.4   SUMMARY ANALYSIS TAB (5.0)

The results of the cost model analysis will be displayed on the Analysis tab. The outputs include:

- **Itemized recurring costs for the initial NIEM exchange**
- **Itemized recurring costs for additional NIEM exchanges using the same data**
- **Itemized recurring costs for additional NIEM exchanges using new data**
- **Discount factors for IEPD reuse and reuse of data elements**
- **Total costs for each exchange type**
- **Cost comparisons per year (over three years)**

The detailed results of the cost model analysis are displayed for each year on the following tabs: Base YR (5.1); YR1 (5.2); YR2 (5.3); and YR3 (5.4).

3   Instructions

The Cost Model contains three tabs that require the user to input data and five tabs that generate outputs. To complete the model, enter all required data in the input tabs in sequential order (Exchange Variables, Cost Variables, Activities). Analysis based on these inputs will automatically be generated in the output tabs (Summary Analysis, Base YR – YR3 tabs).

Tab Color Key: **Blue** tabs require user input and **orange** tabs contain outputs and should not be manipulated.

Font Color Key: **Blue** text should be updated by the user. **Green** text is default data and should only be updated if appropriate. Cells with **black** text are formulas, locked, and should not be manipulated.

Default Data: Tabs requiring user input contain pre-populated default data values in **green**. These default values are derived from averages of actual data gathered from organizations that have implemented NIEM and custom XML exchanges. The default data are intended to provide a baseline, but the actual data for each organization may differ from this baseline. Default values should be replaced with actual values for the organization being assessed wherever appropriate.

3.1 STEP-BY-STEP

On the Exchange Variables tab:

Exchange Factors		Base Year	Year 1	Year 2	Year 3
IEPD Reuse	Number of additional systems (beyond initial exchange) that will use the information	0	0	0	0
Number of Additional Exchanges	Number of additional exchanges that the organization plans on developing to exchange different data	0	0	0	0
Governance	Political goodwill, strong leadership and project management, and engaged stakeholders	Strong			
Number of Elements	Number of elements in exchange	0-50			
Exchange Complexity	Complexity of the exchange	Simple			

Level of Effort in Hours per Complexity Level		Simple	Moderate	Complicated
NA		0	0	0
Low		8	16	40
Medium		30	80	120
High		60	100	150

Term Definition (3.0) and Extension Schema (4.2.2) Escalation Factors	
Model Overlap	**NIEM**
All Elements Already Exist in NIEM	-100%
Many (>50%) Elements Already Exist in NIEM	-50%
Some (<50%) Elements Already Exist in NIEM	-20%
No Elements Already Exist in NIEM	0%

Discount Factors		
Existing IEPD Reuse	Does an IEPD already exist	NO
Reuse of NIEM Data Elements	Number of new elements that do not exist in the NIEM model	Some (<50%) Elements Already

1. Specify how many times the IEPDs developed in the project will be reused.
2. Specify the total number of distinct information exchanges that the organization plans to develop.
3. Select the level of governance strength.
4. Select the number of elements in the IEPD.
5. Review the Level-of-Effort Assumptions. These hour values may be updated as appropriate.
6. Review the Cost Adjustment Factors table to understand how varying degrees of overlap of data elements between the planned information exchange and the NIEM Model will affect development costs.
7. Select whether or not an IEPD already exists that can be leveraged for this effort.
8. Select the estimated amount of overlap between the exchange being developed and the NIEM Model (Core).

On the Cost Variables tab:

Hourly Rates					
Title	**Internal**	**External**	**Type**	**Rates**	
Software Engineer	$ 51.45	$ 90.00	Internal	$ 51.45	
Architect	$ 57.22	$ 110.00	Internal	$ 57.22	
Technical/Network	$ 60.44	$ 110.00	Internal	$ 60.44	
Project Manager	$ 60.44	$ 125.00	Internal	$ 60.44	
Business Analyst	$ 60.44	$ 90.00	Internal	$ 60.44	
SME	$ 120.00	$ -	Internal	$ 120.00	
TBD	$ -	$ -	Internal	$ -	
TBD	$ -	$ -	Internal	$ -	
TBD	$ -	$ -	Internal	$ -	
TBD	$ -	$ -	Internal	$ -	
Average Rate	$ 68.33	$ 87.50	Internal	$ 68.33	

(Resource Category)

Cost Type	Base Year	Year 1	Year 2	Year 3
NIEM Training Cost	$ 10,000.00	$ -	$ -	$ -
Hardware Cost	$ 250,000.00	$ -	$ -	$ -
Software Cost	$ 250,000.00	$ -	$ -	$ -

(Other Costs)

Amount Type	Base Year	Year 1	Year 2	Year 3
Grants	$ 500,000.00	$ 275,000.00	$ 275,000.00	$ 150,000.00
General Funding	$ -	$ -	$ -	$ -
Special Funding	$ 100,000.00	$ -	$ -	$ -
Misc	$ -	$ -	$ -	$ -
Total	$ 600,000.00	$ 275,000.00	$ 275,000.00	$ 150,000.00

(Funding)

Additional Discount	Cost
Community Outreach	$ 1,000.00
Market Research	$ 500.00
Marketing Material	$ 200.00
Total	$ 1,700.00

(Outreach Costs)

1. Identify resources required for corresponding tasks associated with developing and implementing the NIEM exchange and enter them in the Labor Rates Table.
2. Enter the hourly rates and/or associated costs for each individual resource type identified in the Labor Rates Table.
3. Identify and enter any Other Costs, i.e. Training, Hardware, and Software.
4. Enter the estimated amount of funding and their proper category.
5. Enter the estimated amount of current Outreach Costs per year.

On the Activities tab:

Activity		Estimated Levels of Effort (Based on Education/Skill Level of FTE)										Discount Factor	
		Initial NIEM Exchange										Same Data	New Data
		Software Engineer	Architect	Technic al/Netw	Project Manager	Busines s	SME	TBD	TBD	TBD	TBD	NIEM Escalation	NIEM Escalation
1.0 Scenario Planning													
1.1	Establish a Vision	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	100%
1.2	Establish a Process	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	100%
1.3	Develop Scenarios	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	100%
2.0 Requirements Analysis													
2.1	Define Information Content and Context	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	100%
2.2	Build Domain Model	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	100%
3.0 Mapping and Modeling													
3.1	Mapping	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	75%
3.2	Define Terms with Exchange Partner	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.0 Building and Validating													
4.1	Identify NIEM Reference Schemas	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.2.1	Create NIEM Subset Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.2.2	Create Extension Schema or Entire Schema (for Custom XML)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
4.2.3	Create Exchange Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	50%
4.3	Build Constraint Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	50%
4.4	Validate Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	50%
5.0 Assemble and Document													
5.1	Develop NIEM Meta-Data Schema	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
5.2	Assemble Required IEPD Artifacts	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
6.0 Publish IEPD													
6.1	Publish IEPD to Repository	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
7.0 Data Exchange Design Implementation													
7.1	Design Instance Creation Rules (Sender)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	50%
7.2	Design Instance Processing Rules (Receiver)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	50%
7.3	Design Instance middleware routing rules based on data exchange	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25%	50%
7.4	Document Business Use Cases for data exchange	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	50%
7.5	Document Business Test Cases for data exchange	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	50%
7.6	MOU's for Data Exchange and Network Services	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50%	50%

1. Review the NIEM discount factors (right-hand columns in **green** to understand how the cost of additional exchanges will be discounted.
   - **While these escalation factors may be changed, doing so is not recommended unless by experienced NIEM practitioners.**
   - **If changes to the escalation factors are made, make sure to document the logic behind the changes, as well as any assumptions used in making the changes.**
2. For each task in the IEPD lifecycle and each role (identified resource) on the NIEM exchange section, select a level-of-effort (Low, Medium, or High). These levels of effort should be relative to the corresponding task and role of the opposite exchange.

On the Summary Analysis tab:

Four-Year NIEM Cost Summary	Base Year	Year 1	Year 2	Year 3
Number of Exchanges	2	1	2	2
Revenue				
Funded Amount	$ 600,000	$ 275,000	$ 275,000	$ 150,000
Adjustment from Previous Year	N/A	$ (43,417)	$ 203,272	$ 366,159
Total Revenue	$ 600,000	$ 231,583	$ 478,272	$ 516,159
Expenses				
Scenario Planning				
Establish a Vision	$ 4,920	$ 1,640	$ 4,920	$ 4,920
Establish a Process	$ 4,100	$ 820	$ 4,100	$ 4,100
Develop Scenarios	$ 3,280	$ -	$ 3,280	$ 3,280
Scenario Planning Total	$ 12,300	$ 2,460	$ 12,300	$ 12,300
Requirements Analysis				
Define Information Content and Context	$ 3,280	$ -	$ 3,280	$ 3,280
Build Domain Model	$ 3,280	$ -	$ 3,280	$ 3,280
Requirements Analysis Total	$ 6,560	$ -	$ 6,560	$ 6,560
Mapping & Modeling				
Mapping	$ 3,280	$ -	$ 2,460	$ 2,460
Define Terms with Exchange Partner	$ 4,100	$ 820	$ 2,460	$ 2,460
Mapping & Modeling Total	$ 7,380	$ 820	$ 4,920	$ 4,920
Building & Validating				
Identify NIEM Reference Schemas	$ 4,100	$ 820	$ 2,460	$ 2,460
Create NIEM Subset Schema	$ 4,100	$ 820	$ 2,460	$ 2,460
Create Extension Schema	$ 4,100	$ 820	$ 2,460	$ 2,460
Create Exchange Schema	$ 4,920	$ 1,640	$ 3,280	$ 3,280
Build Constraint Schema	$ 4,920	$ 1,640	$ 3,280	$ 3,280
Validate Schema	$ 4,920	$ 1,640	$ 3,280	$ 3,280
Building & Validating Total	$ 27,059	$ 7,380	$ 17,220	$ 17,220

1. Review the outputs and costs over the four years (Base YR, YR1, YR2, and YR3).
2. For detailed information on costs for each individual year, please the following tabs:
   a. Base YR (5.1)
   b. YR1 (5.2)
   c. YR2 (5.3)
   d. YR3 (5.4)