

APPENDIX D

EVALUATION COMPUTATIONS

This appendix provides the detailed calculations for the criteria weights and architecture evaluation results that are provided within Section 6. These calculations correspond with the evaluation methodology steps described in Section 4.

Criteria Weight Calculation:

STEP 1: Identify Criteria

		C	I	F	M	U	S
Cost	C						
Implementability	I						
Flexibility	F						
Manageability	M						
Usability	U						
Security	S						

STEP 1: Determine Pairwise Comparison Scale

Weight	Preference
Equally Preferred/Equally Important	1
Moderately Preferred/Moderately More Important	2
Strongly Preferred/Much More Important	3
Very Strongly Preferred/Very Much More Important	4
Extremely Preferred/Extremely More Important	5

STEP 2: Compare Criteria Using Pairwise Scale

		C	I	F	M	U	S
Cost	C	1.00	1.00	2.00	1.00	2.00	2.00
Implementability	I		1.00	2.00			
Flexibility	F			1.00			
Manageability	M		2.00	2.00	1.00		2.00
Usability	U		3.00	4.00	2.00		2.00
Security	S		2.00	2.00			1.00

STEP 2: Complete Pairwise Comparisons

		C	I	F	M	U	S
Cost	C	1.00	1.00	2.00	1.00	2.00	2.00
Implementability	I	1.00	1.00	2.00	0.50	0.33	0.50
Flexibility	F	0.50	0.50	1.00	0.50	0.25	0.50
Manageability	M	1.00	2.00	2.00	1.00	0.50	2.00
Usability	U	0.50	3.00	4.00	2.00	1.00	2.00
Security	S	0.50	2.00	2.00	0.50	0.50	1.00
Total		4.50	9.50	13.00	5.50	4.58	8.00

Criteria Weight Calculation (continued):

STEP 2: Compute Row Averages

		C	I	F	M	U	S	Row Average
Cost	C	0.22	0.11	0.15	0.18	0.44	0.25	0.22
Implementability	T	0.22	0.11	0.15	0.09	0.07	0.06	0.12
Flexibility	F	0.11	0.05	0.08	0.09	0.05	0.06	0.07
Manageability	M	0.22	0.21	0.15	0.18	0.11	0.25	0.19
Usability	U	0.11	0.32	0.31	0.36	0.22	0.25	0.26
Security	S	0.11	0.21	0.15	0.09	0.11	0.13	0.13
Total								1.00

STEP 2: Row Averages Are Criteria Weights

	Proposed Relative Importance
Cost	22%
Implementability	12%
Flexibility	7%
Manageability	19%
Usability	26%
Security	13%

STEP 3: Tailor Weights Based on ED Judgements

	Proposed Relative Importance (Rounded)	Tailored Relative Importance
Usability	26%	20%
Cost	22%	15%
Manageability	19%	20%
Security	13%	15%
Implementability	12%	20%
Flexibility	7%	10%

Architecture Evaluation: Cost Criterion

STEP 4: Compare Cost of Architectures Using Pairwise Comparison Scale

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1		2	2
Distributed Processing/Centralized Data	DP/CD	3	1	3	3
Distributed Processing/Replicated Data Publication	DP/RDP			1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC				1

STEP 4: Complete Pairwise Comparisons

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1.00	0.33	2.00	1.00
Distributed Processing/Centralized Data	DP/CD	3.00	1.00	3.00	3.00
Distributed Processing/Replicated Data Publication	DP/RDP	0.50	0.33	1.00	1.00
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.50	0.33	0.00	1.00
Totals		5	2	6	6

STEP 4: Compute Row Averages

		CP/CD	DP/CD	DP/RDP	DP/RDC	Row Average
Centralized Processing/Centralized Data	CP/CD	0.20	0.17	0.33	0.17	0.22
Distributed Processing/Centralized Data	DP/CD	0.60	0.50	0.50	0.50	0.53
Distributed Processing/Replicated Data Publication	DP/RDP	0.10	0.17	0.17	0.17	0.15
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.10	0.17	0.00	0.17	0.11
Total						1.00

STEP 4: Row Averages Are Relative Strength of Architecture Cost

	Relative Strength Rating
Centralized Processing/Centralized Data	22%
Distributed Processing/Centralized Data	53%
Distributed Processing/Replicated Data Publication	15%
Distributed Processing/Replicated Data Consolidation	11%

Architecture Evaluation: Implementability Criterion

STEP 4: Compare Implementability of Architectures Using Pairwise Comparison Scale

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1	2	2	2
Distributed Processing/Centralized Data	DP/CD		1	1	
Distributed Processing/Replicated Data Publication	DP/RDP			1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC			1	1

STEP 4: Complete Pairwise Comparisons

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1	2	2	2
Distributed Processing/Centralized Data	DP/CD	0.5	1	1	1
Distributed Processing/Replicated Data Publication	DP/RDP	0.5	1	1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.5	1	1	1
Totals		2.5	5	5	5

STEP 4: Compute Row Averages

		CP/CD	DP/CD	DP/RDP	DP/RDC	Row Average
Centralized Processing/Centralized Data	CP/CD	0.400	0.400	0.400	0.400	0.400
Distributed Processing/Centralized Data	DP/CD	0.200	0.200	0.200	0.200	0.200
Distributed Processing/Replicated Data Publication	DP/RDP	0.200	0.200	0.200	0.200	0.200
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.200	0.200	0.200	0.200	0.200
Total						1.000

STEP 4: Row Averages Are Relative Strength of Architecture Implementability

	Relative Strength Rating
Centralized Processing/Centralized Data	40%
Distributed Processing/Centralized Data	20%
Distributed Processing/Replicated Data Publication	20%
Distributed Processing/Replicated Data Consolidation	20%

Architecture Evaluation: Flexibility Criterion

STEP 4: Compare Flexibility of Architectures Using Pairwise Comparison Scale

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1			
Distributed Processing/Centralized Data	DP/CD	2	1		
Distributed Processing/Replicated Data Publication	DP/RDP	4	2	1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC	4	2	1	1

STEP 4: Complete Pairwise Comparisons

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1	0.5	0.25	0.5
Distributed Processing/Centralized Data	DP/CD	2	1	0.25	0.5
Distributed Processing/Replicated Data Publication	DP/RDP	4	2	1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC	4	2	1	1
Totals		11	5.5	2.5	3

STEP 4: Compute Row Averages

		CP/CD	DP/CD	DP/RDP	DP/RDC	Row Average
Centralized Processing/Centralized Data	CP/CD	0.091	0.091	0.100	0.167	0.112
Distributed Processing/Centralized Data	DP/CD	0.182	0.182	0.100	0.167	0.158
Distributed Processing/Replicated Data Publication	DP/RDP	0.364	0.364	0.400	0.333	0.365
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.364	0.364	0.400	0.333	0.365
Total						1.000

STEP 4: Row Averages Are Relative Strength of Architecture Flexibility

	Relative Strength Rating
Centralized Processing/Centralized Data	11%
Distributed Processing/Centralized Data	16%
Distributed Processing/Replicated Data Publication	37%
Distributed Processing/Replicated Data Consolidation	37%

Architecture Evaluation: Manageability Criterion

STEP 4: Compare Manageability of Architectures Using Pairwise Comparison Scale

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1			
Distributed Processing/Centralized Data	DP/CD	1	1	1	
Distributed Processing/Replicated Data Publication	DP/RDP	1	1	1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC	1			1

STEP 4: Complete Pairwise Comparisons

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1	1	1	1
Distributed Processing/Centralized Data	DP/CD	1	1	1	1
Distributed Processing/Replicated Data Publication	DP/RDP	1	1	1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC	1	1	1	1
Totals		4	4	4	4

STEP 4: Compute Row Averages

		CP/CD	DP/CD	DP/RDP	DP/RDC	Row Average
Centralized Processing/Centralized Data	CP/CD	0.250	0.250	0.250	0.250	0.250
Distributed Processing/Centralized Data	DP/CD	0.250	0.250	0.250	0.250	0.250
Distributed Processing/Replicated Data Publication	DP/RDP	0.250	0.250	0.250	0.250	0.250
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.250	0.250	0.250	0.250	0.250
Total						1.000

STEP 4: Row Averages Are Relative Strength of Architecture Manageability

	Relative Strength Rating
Centralized Processing/Centralized Data	25%
Distributed Processing/Centralized Data	25%
Distributed Processing/Replicated Data Publication	25%
Distributed Processing/Replicated Data Consolidation	25%

Architecture Evaluation: Usability Criterion

STEP 4: Compare Usability of Architectures Using Pairwise Comparison Scale

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1			
Distributed Processing/Centralized Data	DP/CD	1	1		
Distributed Processing/Replicated Data Publication	DP/RDP	3	3	1	2
Distributed Processing/Replicated Data Consolidation	DP/RDC	3	3		1

STEP 4: Complete Pairwise Comparisons

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1.000	1.000	0.333	0.333
Distributed Processing/Centralized Data	DP/CD	1.000	1.000	0.333	0.333
Distributed Processing/Replicated Data Publication	DP/RDP	3.000	3.000	1.000	2.000
Distributed Processing/Replicated Data Consolidation	DP/RDC	3.000	3.000	0.500	1.000
Totals		8.000	8.000	2.167	3.667

STEP 4: Compute Row Averages

		CP/CD	DP/CD	DP/RDP	DP/RDC	Row Average
Centralized Processing/Centralized Data	CP/CD	0.125	0.125	0.154	0.091	0.124
Distributed Processing/Centralized Data	DP/CD	0.125	0.125	0.154	0.091	0.124
Distributed Processing/Replicated Data Publication	DP/RDP	0.375	0.375	0.462	0.545	0.439
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.375	0.375	0.231	0.273	0.313
Total						1.000

STEP 4: Row Averages Are Relative Strength of Architecture Usability

	Relative Strength Rating
Centralized Processing/Centralized Data	12%
Distributed Processing/Centralized Data	12%
Distributed Processing/Replicated Data Publication	44%
Distributed Processing/Replicated Data Consolidation	31%

Architecture Evaluation: Security Criterion

STEP 4: Compare Security of Architectures Using Pairwise Comparison Scale

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1			
Distributed Processing/Centralized Data	DP/CD	4	1		
Distributed Processing/Replicated Data Publication	DP/RDP	4	1	1	
Distributed Processing/Replicated Data Consolidation	DP/RDC	4	1	1	1

STEP 4: Complete Pairwise Comparisons

		CP/CD	DP/CD	DP/RDP	DP/RDC
Centralized Processing/Centralized Data	CP/CD	1	0.25	0.25	0.25
Distributed Processing/Centralized Data	DP/CD	4	1	1	1
Distributed Processing/Replicated Data Publication	DP/RDP	4	1	1	1
Distributed Processing/Replicated Data Consolidation	DP/RDC	4	1	1	1
Totals		13	3.25	3.25	3.25

STEP 4: Compute Row Averages

		CP/CD	DP/CD	DP/RDP	DP/RDC	Row Average
Centralized Processing/Centralized Data	CP/CD	0.077	0.077	0.077	0.077	0.077
Distributed Processing/Centralized Data	DP/CD	0.308	0.308	0.308	0.308	0.308
Distributed Processing/Replicated Data Publication	DP/RDP	0.308	0.308	0.308	0.308	0.308
Distributed Processing/Replicated Data Consolidation	DP/RDC	0.308	0.308	0.308	0.308	0.308
Total						1.000

STEP 4: Row Averages Are Relative Strength of Architecture Security

	Relative Strength Rating
Centralized Processing/Centralized Data	8%
Distributed Processing/Centralized Data	31%
Distributed Processing/Replicated Data Publication	31%
Distributed Processing/Replicated Data Consolidation	31%

Architecture Evaluation: Summary

Architecture	Abbreviation
Centralized Processing/Centralized Data	CP/CD
Distributed Processing/Centralized Data	DP/CD
Distributed Processing/Replicated Data Publication	DP/RDP
Distributed Processing/Replicated Data Consolidation	DP/RDC

STEP 5: Compute Unweighted Architecture Evaluation Scores

Criteria	CP/CD	DP/CD	DP/RDP	DP/RDC
Cost	0.22	0.53	0.15	0.11
Implementability	0.40	0.20	0.20	0.20
Flexibility	0.11	0.16	0.37	0.37
Manageability	0.25	0.25	0.25	0.25
Usability	0.12	0.12	0.44	0.31
Security	0.08	0.31	0.31	0.31
Total	1.18	1.56	1.71	1.54

Unweighted Architecture Evaluation Scores

Architecture	Score
Centralized Processing/Centralized Data	1.18
Distributed Processing/Centralized Data	1.56
Distributed Processing/Replicated Data Publication	1.71
Distributed Processing/Replicated Data Consolidation	1.54

Criteria	CP/CD	DP/CD	DP/RDP	DP/RDC
Cost	0.03	0.08	0.02	0.02
Implementability	0.08	0.04	0.04	0.04
Flexibility	0.01	0.02	0.04	0.04
Manageability	0.05	0.05	0.05	0.05
Usability	0.02	0.02	0.09	0.06
Security	0.01	0.05	0.05	0.05
Total	0.21	0.26	0.28	0.25

