



*“We Help
Put America
Through
School”*

Data Strategy 2.0

Data Quality Implementation Methodology: Prioritization Phase Business Templates

April 13, 2004

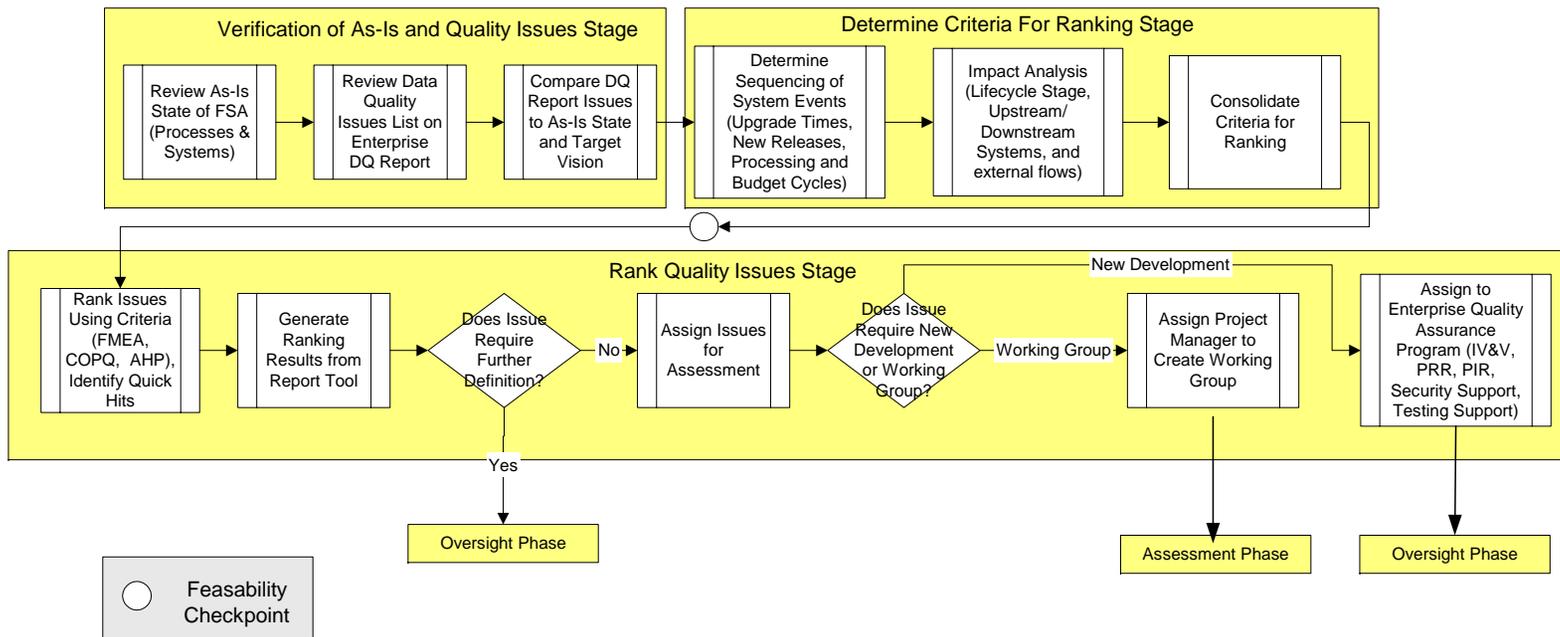
Purpose



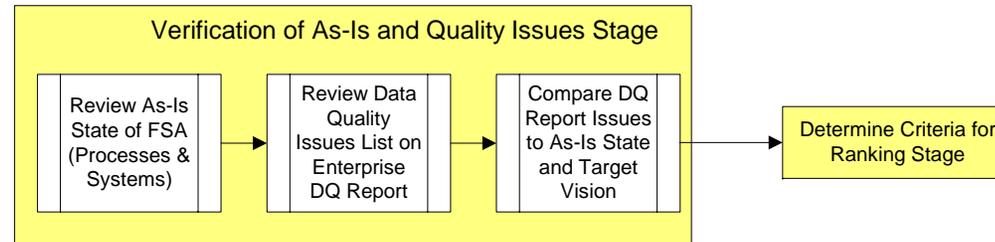
- The objective of this presentation is to introduce the Prioritization Phase and associated business templates of the Data Quality Implementation Plan.

- The Prioritization Phase is conducted in the following 3 stages with the associated business templates:
 - Verification of As-Is and Quality Issues Stage
 - Determine Criteria for Ranking Stage
 - VOC, CTQ
 - Rank Quality Issues Stage
 - FMEA, COPQ, AHP

Prioritization Phase

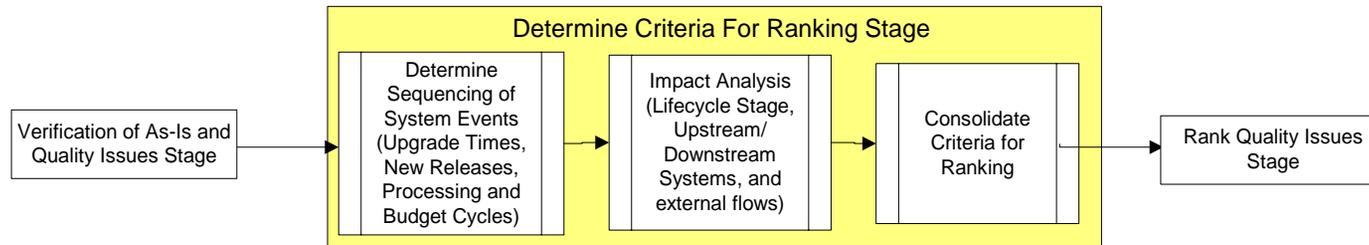


Prioritization Phase – Verification of As-Is and Quality Issues Stage



- **Review As-Is State of FSA:** Examine current state business processes and systems of the Financial Aid Lifecycle
- **Review Data Quality Issues List on Enterprise DQ Report:** Assess Quick Hits, Top Ten and additional identified data quality issues from consolidated Data Quality Summary Issue Report
- **Compare DQ Report Issues to As-Is and Target States:** Evaluate data quality issues against current and target states of the Financial Aid Lifecycle, and identify closed issues

Prioritization Phase – Determine Criteria for Ranking Stage



- **Determine Sequencing of System Events:** Identify current release schedules, system upgrades, enhancements, and budget cycles
- **Impact Analysis:** Assess data quality issues to determine impacts on business processes, systems, lifecycle stage, and Business Capability Areas
- ***Consolidate Criteria for Ranking:** Develop any additional ranking criteria and weights for data quality issues

* = Associated business template(s)

Prioritization Phase Business Templates – Voice of Customer (VOC): Develop Acceptance Criteria

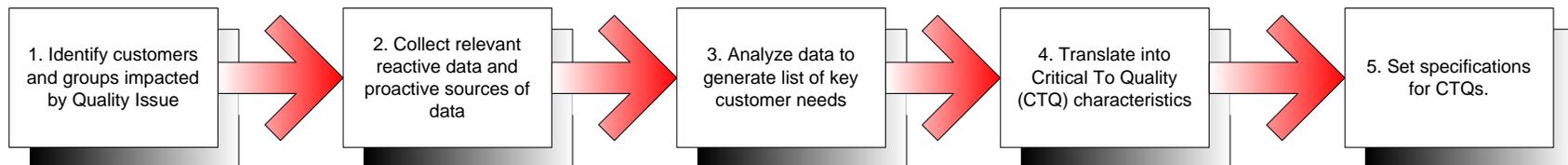


Objective:

To develop system owner (customer) requirements based on business processes, used for scoring data quality issues.

How to use this tool:

- Interview system owners to gather requirements and end-user considerations
- Create list of customers that are impacted by the data quality issue
- Create list of reactive (output) and proactive (input) events
- Generate list of key customer needs
- Define drivers and data/process attributes for Critical to Quality (CTQ) Analysis
- Develop specifications for CTQs to be translated into metrics for data quality measurement



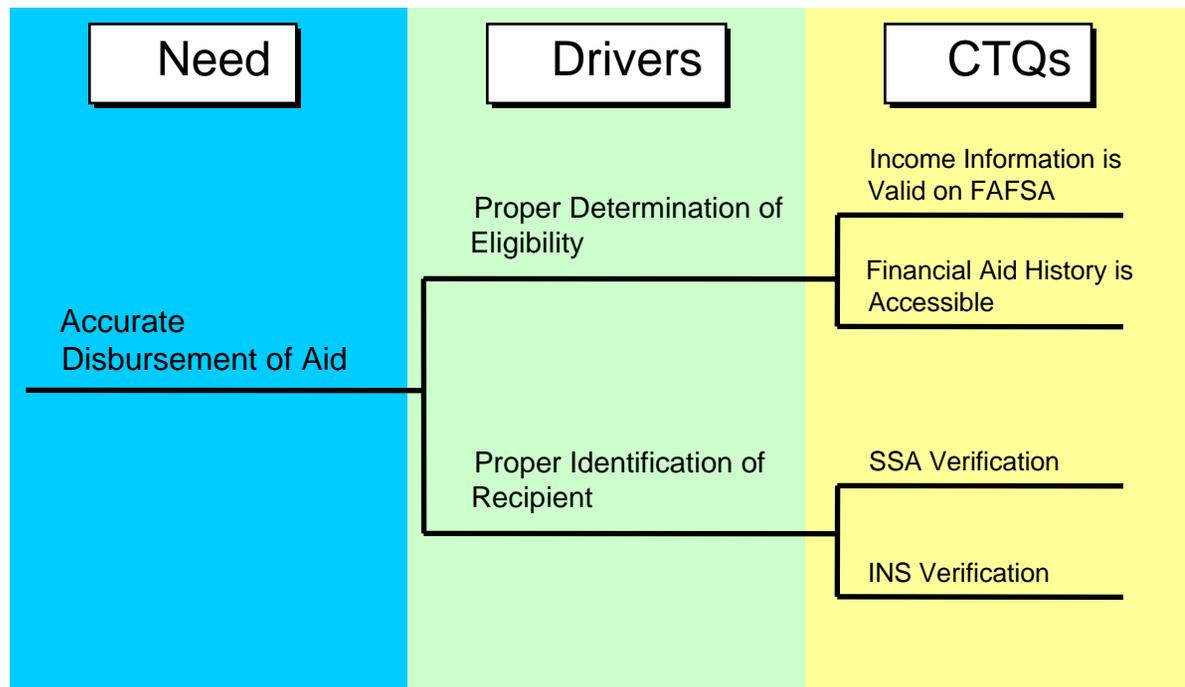
Next Steps:

- Develop list of customer requirements and corresponding business objectives
- Use requirements to perform additional issue ranking

Prioritization Phase Business Templates – Voice of Customer (VOC) FSA Example



Data Quality Issue #24 Example: Currently, there is no Social Security Administration (SSA) or Immigration and Naturalization Service (INS) verification of SSA and citizenship for Parent Loan Underwriting for Student (PLUS) Borrowers.



Prioritization Phase Business Templates – Voice of Customer (VOC): Affinity Diagram

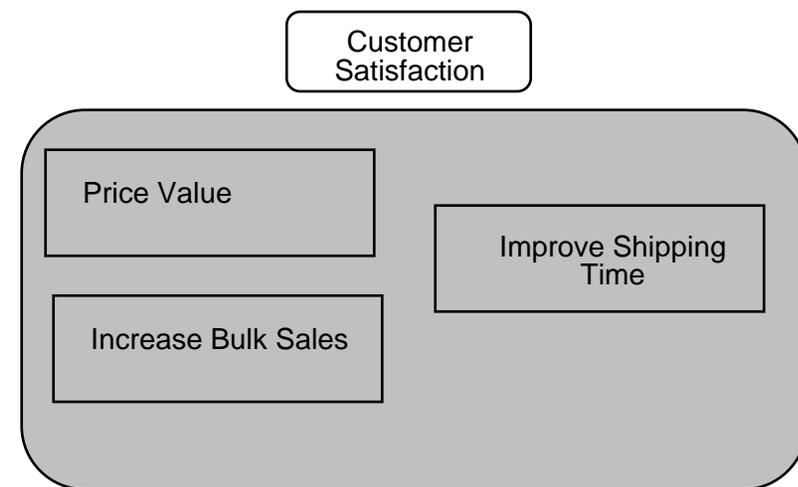
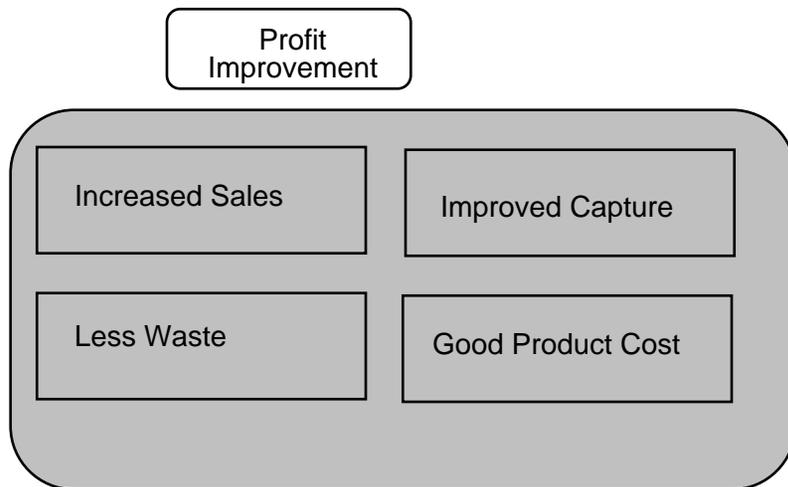


Objective:

To identify and group business objectives.

How to use this tool:

- Identify business objectives using feedback from VOC Analysis
- Group business objectives based on a shared affinity
- Generate headers for high level objectives



Next Steps:

- Align levels of business objectives using Hierarchy Diagram

Prioritization Phase Business Templates – Voice of Customer (VOC): Affinity Diagram FSA Example



Make it easier for customers to do business with FSA.

Need common edits at every entry point (receiving system).

FSA is held back from making changes to data formats because of the trading partners' inability to correctly adapt to those changes (resistance/lack of ability).

Intelligently combine technology and process to Increase Business Decision Efficiency by providing the right data, with the right security levels, to the right people at the right time.

Increase business decision efficiency.

Offer a formal registration of system of record.

Prioritization Phase Business Templates – Voice of Customer (VOC): Hierarchy Diagram



Objective:

To align business objectives according to different levels.

How to use this tool:

- Evaluate relative levels of business objectives
- Organize and align business objectives by identified levels
- Illustrate business objectives by levels



Next Steps:

- Rank high level business objectives using AHP Diagram

Prioritization Phase Business Templates – Voice of Customer (VOC): Hierarchy Diagram FSA Example



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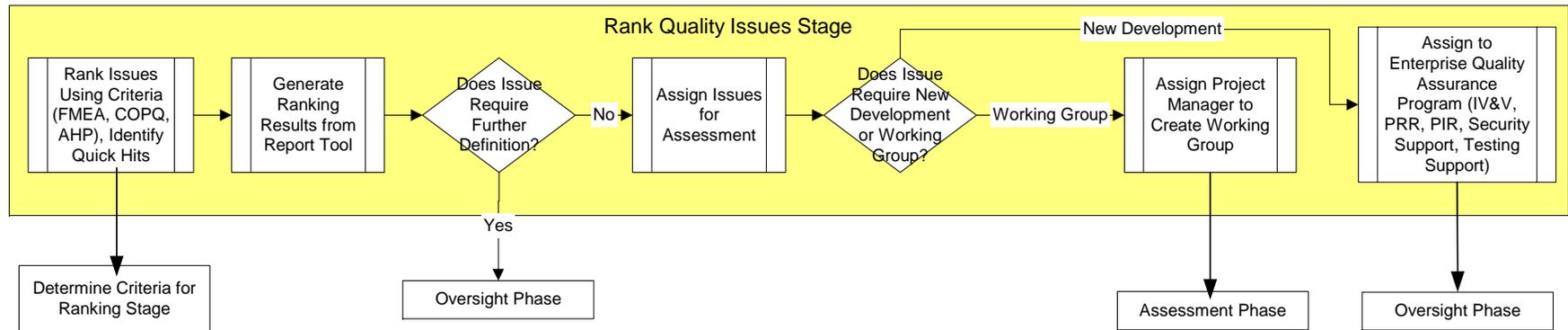
FSA is held back from making changes to data formats because of the trading partners' inability to correctly adapt to those changes (resistance/lack of ability).

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Offer a formal registration of system of record.

Prioritization Phase – Rank Quality Issues Stage



- ***Rank Issues Using Criteria:** Rank data quality issues using identified criteria and FMEA/AHP analysis
- **Generate Results from Report Tool:** Create data quality ranking results from the Data Quality Issue Management Tool
- **Assign Issues for Assessment:** Data quality issues will be assigned to the proper system owners and working groups
- **Assign Project Manager to create Working Group:** Develop a Working Group for further analysis of data quality issues
- **Assign to Enterprise Quality Assurance Program:** Inform Enterprise Quality Assurance Program of data quality issues and ensure incorporation into development plan

* = Associated business template(s)

Prioritization Phase Business Templates - Failure Modes and Effect Analysis (FMEA)



Objective:

To identify, prioritize and eliminate potential failures from systems or process flows.

How to use this tool:

- Identify potential points of failure associated with a data quality issue
- Review failure modes and determine severity levels
- Research potential causes for the failure modes and report frequency and current controls
- Review detectability level
- Calculate Risk Priority Number (RPN)

Process Step	Potential Failure Mode	Potential Failure Effects	Severity	Potential Causes	Occurrence	Current Controls	Detectability	RPN
What is the Process Step under investigation?	In what ways does the Process Step go wrong?	What is the impact on the Key Output Variables or internal requirements?	How severe is the effect to the customer?	What causes the Key Input to go wrong?	How often does cause of Failure Mode occur?	What are the existing controls and procedures that prevent either the cause or the Failure Mode?	How well can you detect cause or Failure Mode?	RPN = Severity * Occurrence * Detectability

Severity:

1 = None
4 = Moderate
7 = High
10 = Extended Shutdown

Occurrence:

1 = Almost Never
4 = Occasionally
7 = Frequently
10 = Almost Always

Detectability:

1 = Excellent
4 = Some Leaks
7 = Frequent Leaks
10 = Almost Detectable

Next Steps:

- Evaluate issue rankings based off of RPN
- Update Data Quality Issue Management Report
- Assign for Assessment

Prioritization Phase Business Templates - Failure Modes and Effect Analysis (FMEA) FSA Example



Data Quality Issue #10 - SSIM Example: Records are accepted in FSA systems with incorrect identifiers.

Process Step	Potential Failure Mode	Potential Failure Effects	Severity	Potential Causes	Occurrence	Current Controls	Detectability	RPN
Applicant records are processed and validated by FSA.	Records with incorrect identifiers are allowed to enter FSA.	Invalid Student borrowers can be created. A student could potentially have multiple SSNs in FSA. This may also cause aid to be disbursed inaccurately.	7	Lack of a SSN match in COD, DLCS, DMCS, and NSLDS (systems other than CPS and PIN site do not verify SSN).	4	No automatic verification of SSN. Manually have to look up borrower and fix information.	3	84

Process Step	Potential Failure Mode	Potential Failure Effects	Severity	Potential Causes	Occurrence	Current Controls	Detectability	RPN
Borrowers are flagged for repayment.	Plus Borrowers are flagged for repayment too early.	Poor customer service. Either a student begins paying on a loan before they should have to or the student must manually work with FSA to correct their scheduled repayment.	4	The repayment date is calculated as 60 days after the second disbursement date. However, the field is currently not required on the XML Common Record.	4	No automatic verification of whether there should have been a reported second disbursement date. All changes are manual made per request from the customer.	2	32

$$\text{RPN} = (\text{Severity}) * (\text{Occurrence}) * (\text{Detectability})$$

$$\text{RPN} = (7) * (4) * (3) = 84$$

$$\text{RPN} = (4) * (4) * (2) = 32$$

Prioritization Phase Business Templates - Failure Modes and Effect Analysis (FMEA): Expected Cost



Objective:

To determine expected cost of issue relative to risk.

How to use this tool:

- Identify Occurrence, Severity, and Detectability values from previous FMEA Risk Analysis
- Identify probability and cost scales
- Calculate Expected Cost

Example Occurrence Ratings

Occurrence	Probability
1	6.667 E-7
2	6.667 E-6
3	6.667 E-5
4	.0005
5	.0025
6	.0125
7	.05
8	.125
9	.333
10	.75

Example Cost Function

Severity	Cost
1	50
2	100
3	150
4	200
5	250
6	300
7	350
8	400
9	450
10	500

Next Steps:

- Compare cost to RPN Score
- Re-evaluate data quality issue ranking
- Update Data Quality Issue Management Report

Prioritization Phase Business Templates - Failure Modes and Effect Analysis (FMEA) Example



Example Occurrence Ratings

Occurrence	Probability
1	6.667 E-7
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Example Cost Function

Severity	Cost
1	50
2	100
3	150
4	200
5	250
6	300
7	350
8	400
9	450
10	500

RPN	Expected Cost
10	\$37.50
40	\$31
32	\$.2

Risk Priority Number (RPN) = (Occurrence) * (Severity) * (Detectability)

Note: Assume Detectability equals "1"

Expected Cost = (Probability) * (Cost)

Prioritization Phase Business Templates - Failure Modes and Effect Analysis (FMEA) FSA Example



Example Occurrence Ratings

Occurrence	Probability
1	6.667 E-7
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Example Cost Function

Severity	Cost
1	50
2	100
3	150
4	200
5	250
6	300
7	350
8	400
9	450
10	500

RPN

Expected Cost

16

\$.1

28

\$.175

Risk Priority Number (RPN) = (Occurrence) * (Severity) * (Detectability)

Note: Assume Detectability equals "1"

Expected Cost = (Probability) * (Cost)

Prioritization Phase Business Templates – Cost of Poor Quality (COPQ)



Objective:

To determine the extent to which organizational resources are used for activities that exist only as deficiencies that occur in its processes and potential savings by implementing process improvements.

How to use this tool:

- Identify all activities that exist only because of poor quality – due to data quality issue
- Identify where in the organization the cost of each activity is experienced
- Determine method to use for calculation of cost of poor quality 1) Total Cost of Resources or 2) Frequency of Activity
- Collect data and estimate costs

Activity Resulting from Poor Quality	Cost Location	Cost Location	Cost Location	Total Cost of Resources	Percentage of Resources to Counter Poor Quality	Total Cost for Activity
Total Cost of Poor Quality = $\Sigma [(Total\ Cost\ of\ Resources) * (Percentage\ of\ Resources\ to\ Counter\ Poor\ Quality)]$						

Activity Resulting from Poor Quality	Cost Location	Cost Location	Cost Location	Frequency of Activity (#/yr)	Average Cost	Total Cost for Activity
Total Cost of Poor Quality = $\Sigma [(Total\ Cost\ of\ Resources) * (Average\ Cost)]$						

Next Steps:

- Use COPQ cost values as cost scale values in the Expected Cost FMEA Analysis

Prioritization Phase Business Templates – Cost of Poor Quality (COPQ) Example



Activity Resulting from Poor Quality	Cost Location	Cost Location	Cost Location	Total Cost of Resources	Percentage of Resources to Counter Poor Quality	Total Cost for Activity
Final Inspection	Wages & Benefits	Training		\$127,000	80%	\$101,600
Rework	Wages & Benefits			\$87,500	12%	\$10,500
Customer Complaint Resolution	Wages & Benefits	Training	System Maintenance (telephone & computer)	\$63,750	100%	\$63,750
Total Cost of Poor Quality = Σ [(Total Cost of Resources) * (Percentage of Resources to Counter Poor Quality)]						\$175,850

Activity Resulting from Poor Quality	Cost Location	Cost Location	Cost Location	Frequency of Activity (#/yr)	Average Cost	Total Cost for Activity
Final Inspection	Wages & Benefits	Training		12	\$8,125	\$97,500
Rework	Wages & Benefits			7	\$2,600	\$18,200
Customer Complaint Resolution	Wages & Benefits	Training	System Maintenance (telephone & computer)	37	\$2,050	\$75,850
Total Cost of Poor Quality = Σ [(Frequency of Activity) * (Average Cost)]						\$191,550

Prioritization Phase Business Templates – Cost of Poor Quality (COPQ) FSA Example



Data Quality Issue # 44 Example: There are issues regarding school identifier mismatches regarding reporting from COD to FMSS / GAPS that result in manual data entry into those systems - resulting in audit trail and integrity issues.

Activity Resulting from Poor Quality	Cost Location	Cost Location	Cost Location	Total Cost of Resources	Percentage of Resources to Counter Poor Quality	Total Cost for Activity
Manual Data Entry	Wages & Benefits			\$40,000	5%	\$2,000
Audit Trail Reconciliation	Wages & Benefits	System Maintenance		\$62,500	8%	\$5,000
Total Cost of Poor Quality = S [(Total Cost of Resources) * (Percentage of Resources to Counter Poor Quality)]						\$7,000

Activity Resulting from Poor Quality	Cost Location	Cost Location	Cost Location	Frequency of Activity (#/yr)	Average Cost	Total Cost for Activity
Manual Data Entry	Wages & Benefits			50	\$40	\$2,000
Audit Trail Reconciliation	Wages & Benefits	System Maintenance		12	\$450	\$5,400
Total Cost of Poor Quality = S [(Frequency of Activity) * (Average Cost)]						\$7,400

Prioritization Phase Business Templates – Voice of Customer (VOC): Analytic Hierarchy Process (AHP) Diagram



Objective:

To measure importance and prioritize business objectives.

How to use this tool:

- Create a matrix with the same criteria in both the row and columns
- Compare each pair criteria in terms of importance on a one to nine scale, with one meaning equal in importance and nine meaning the row is extremely more important than the column
- Normalize columns (Column Value/Column Sum) and then add the normalized values across the rows and normalized again to yield the ratio scale % of priority

Normalized Columns

Objectives	CS	AS	LL	PI	WR	CS	AS	LL	PI	WR	Row Sum	%
Customer Satisfaction (CS)	1	5	9	5	9	.62	.77	.45	.44	.27	2.55	50.9%
Associate Satisfaction (AS)	.2	1	5	5	9	.12	.15	.25	.44	.27	1.24	24.8%
Landlord Satisfaction (LL)	.11	.2	1	.2	5	.07	.03	.05	.02	.15	.32	6.3%
Profit Improvement (PI)	.2	.2	5	1	9	.12	.03	.25	.09	.27	.76	15.3%
Win & Retain Contracts (WR)	.11	.11	.2	.11	1	.07	.02	.01	.01	.03	.13	2.7%
Totals	1.62	6.51	20.20	11.31	33.00	1.00	1.00	1.00	1.00	1.00	5.00	100.0%

Next Steps:

- Link data quality issues to business objectives

Prioritization Phase Business Templates – Voice of Customer (VOC): Analytic Hierarchy Process (AHP) Diagram FSA Example



Normalized Columns

Objectives	A	B	C	D	E	A	B	C	D	E	Row Sum	%
A: Make it easier for customers to do business with FSA.	1	.2	.33	3	5	.105	.1	.068	.29	.238	.801	16%
B: Intelligently combine technology and process to Increase Business Decision Efficiency by providing the right data, with the right security levels, to the right people at the right time.	5	1	3	3	7	.524	.5	.621	.29	.33	2.265	45%
C: Need to develop policy standards, and clearly defined common identifiers for sharing data across the enterprise and compliance with federal regulations.	3	.33	1	3	5	.315	.167	.207	.29	.238	1.217	24%
D: Provide an integrated, cross-lifecycle, web-delivered customer view that is system independent.	.33	.33	.33	1	3	.035	.167	.068	.097	.143	.51	10%
E: Need to clarify who is the owner/steward of the data at various times throughout the FSA Aid Lifecycle.	.2	.14	.2	.33	1	.02	.07	.041	.032	.048	.211	4.2%
Totals	9.53	2	4.83	10.33	21	1.00	1.00	1.00	1.00	1.00	5.00	100.0%

Summary of Prioritization Phase



- The Prioritization Phase consists of ranking data quality issues based on levels of impact on the enterprise. Data quality issues are assigned for new development, further research, or development of working group for issue resolution.
- Voice of Customer (VOC): Define customer requirements, business objectives, and acceptance criteria for scoring of data quality issues
- Critical to Quality (CTQ): Derive attributes from VOC input into metrics for data quality measurement
- Failure Modes and Effect Analysis (FMEA): Determine if data quality issue has associated failure modes and rank impacts
- Cost of Poor Quality (COPQ): Determine inefficiencies in processes and expected costs of data quality issue
- Analytic Hierarchy Process (AHP): Rank high level business objectives and align data quality issues

Questions?

