

Acxiom's Data Quality Scorecard Solution

**MIT IQ Industry Symposium
Cambridge, Massachusetts, USA
July 18-19, 2007**



You Cannot Improve What You Cannot Measure

“Without a systematic way to conceptualize and address the data quality issue, organizations are left to grapple with this problem in an ad hoc, piece-meal manner.”

– *MIT Total Data Quality Management Program*

Overview

Acxiom's Data Quality Scorecard Solution (DQSS) helps companies determine if their data is incomplete, inaccurate or invalid. Companies equipped with this kind of knowledge can make better data decisions – such as whether to decrease the amount paid to vendors, augment their data or eliminate redundant data processing.

Purpose

- Acxiom's Data Quality Scorecard Solution helps clients understand the condition of their customer, prospect or operational data
- Whether high or low, data quality is always relative to the data's intended use. We approach data quality with a strategic, multi-dimensional view appropriate to the data's business use. This strategic management also minimizes "accidental" discovery of deficiencies

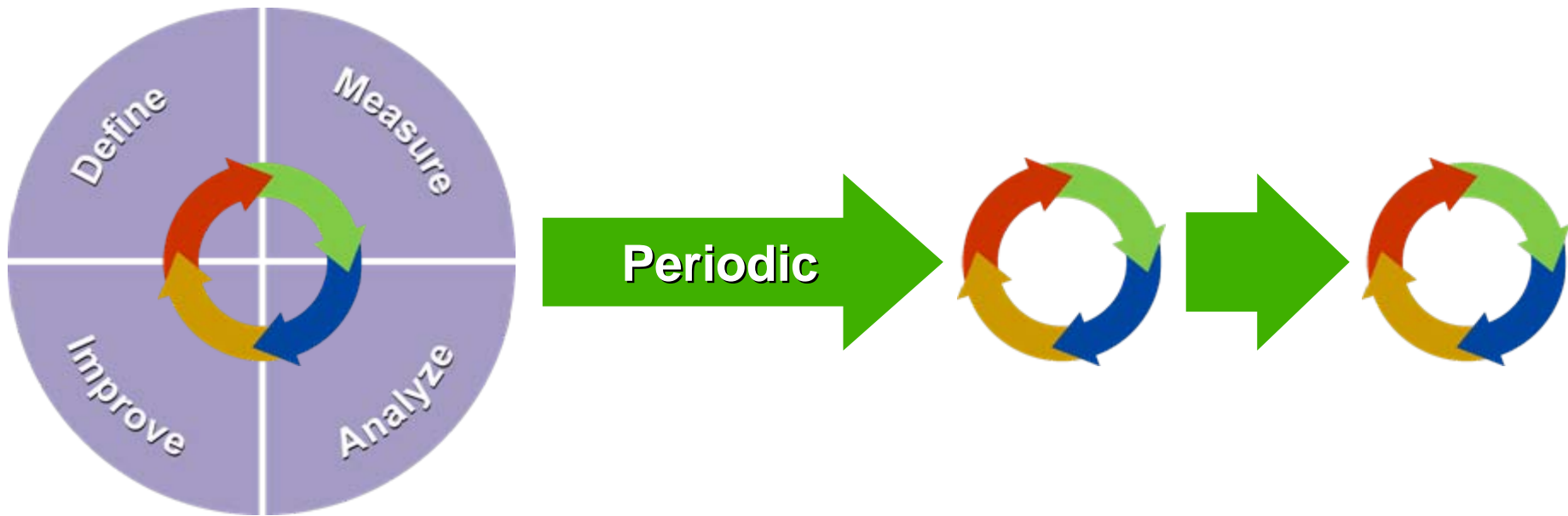
Data Quality

Data Quality Challenges	Data Quality Management Benefits
Data quality issues often recognized too late in the data integration process	DQ issues exposed through monitoring rather than accidental discovery
Complex, dynamic data environments introduce many points of failure	Unnecessary production costs are reduced through automation
Business impact of data is often not reflected in “off-the-shelf” solutions	“Fitness for use” is built into the daily DQ management. Key metrics are monitored through a central repository
Data sources introduce changes that impact data stores or individual marts	Changes are exposed early, reducing the impact on your data marts. Periodic, quantifiable measurements ultimately reduce expense for poor inbound data quality
Tactical solutions solve immediate problems without identifying and fixing underlying issues	DQ infrastructure supplements “one-time” assessments and pinpoints where the problems originate
Regulatory non-compliance or decreasing customer confidence is often rooted in vague data quality definitions	DQ management system provides statistical evidence

Solution Components

- Professional consulting with Acxiom data quality specialists to research existing data quality processes, design client-specific data quality metrics and create a Data Quality Scorecard that meets their business needs
- A complete repository system for input, storage, scoring, archiving and dashboard-reporting of data quality metrics and scorecards
- Optional data quality products (Acxiom's Data Quality Toolkit) that can be automatically integrated into the client's scorecard system

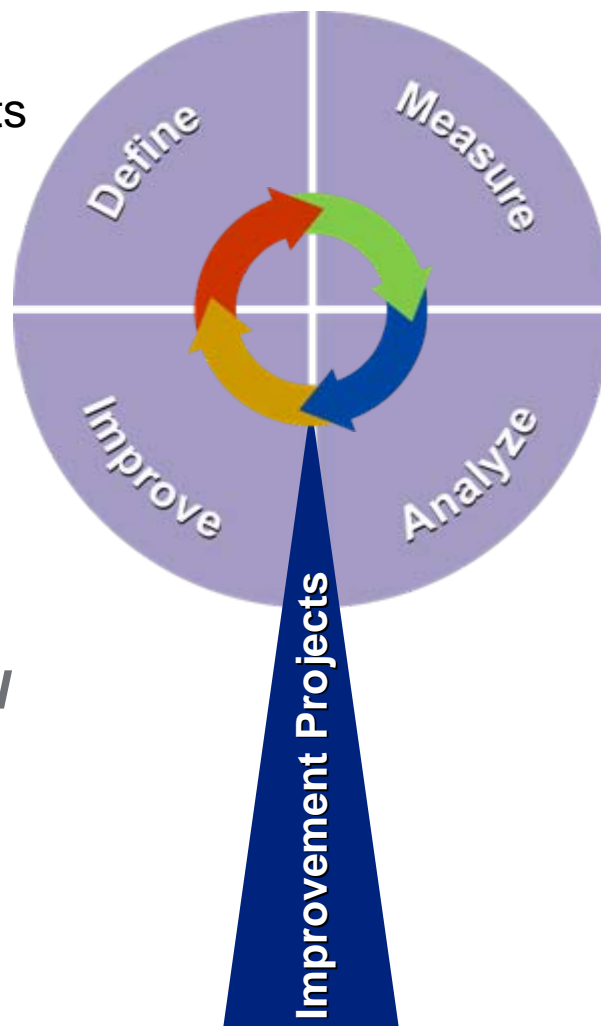
Strategic Approach: Total Data Quality Management (TDQM)



DQSS and TDQM Working Together

Professional Services

- Data Quality Assessments and Consulting
- Metrics Defined for:
 - Data Access
 - Data Accuracy
 - Data Completeness
 - Data Consistency
 - Grouping Accuracy



Measurement Utilities

- Data Validator
- NameCheck
- AccuCheck
- Opticx[®]
- AddressAbility[®]
- Hygiene
- Other Custom Applications

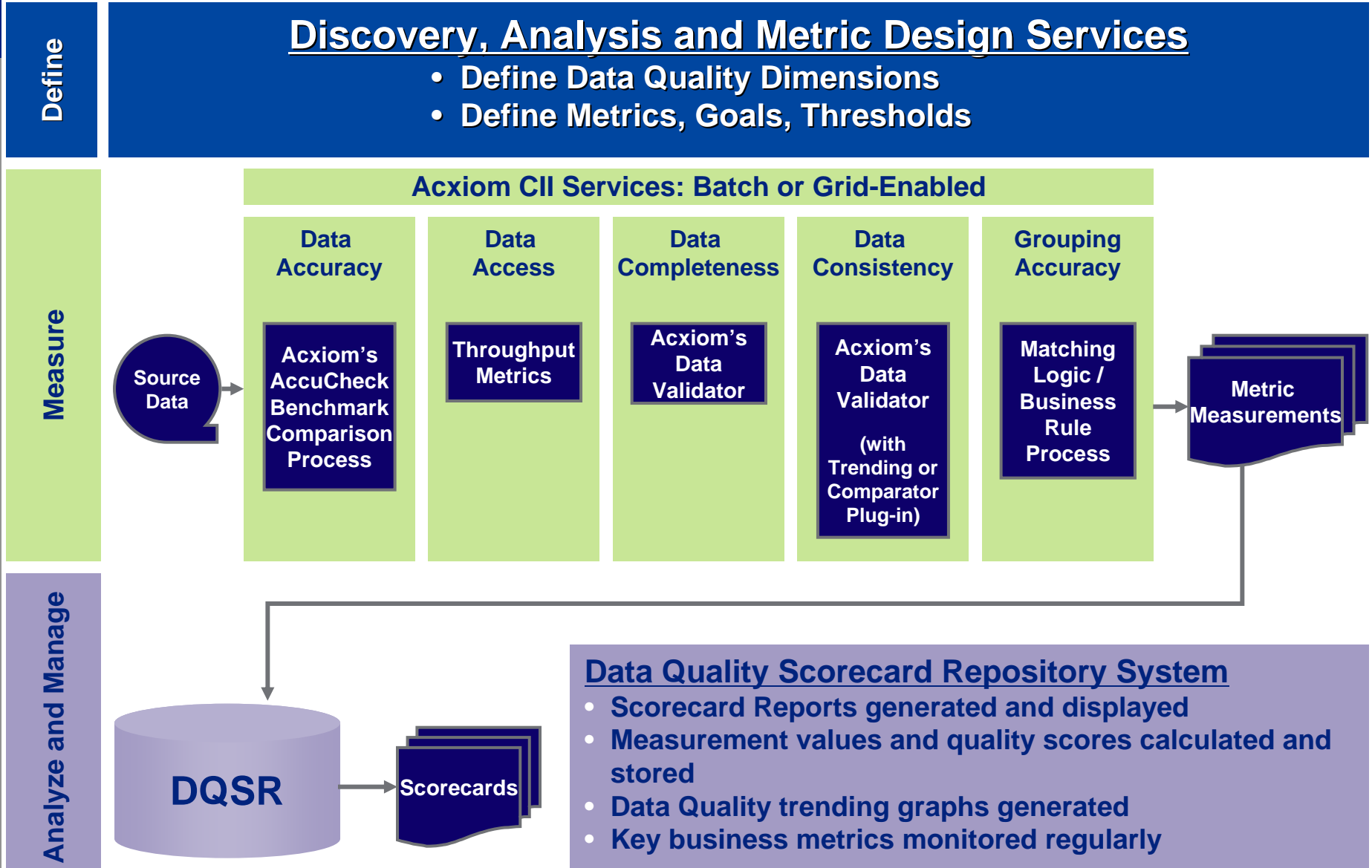
Improvement Potential

- Data Augmentation
- Analytic Capabilities
- Data Integration
- Etc.

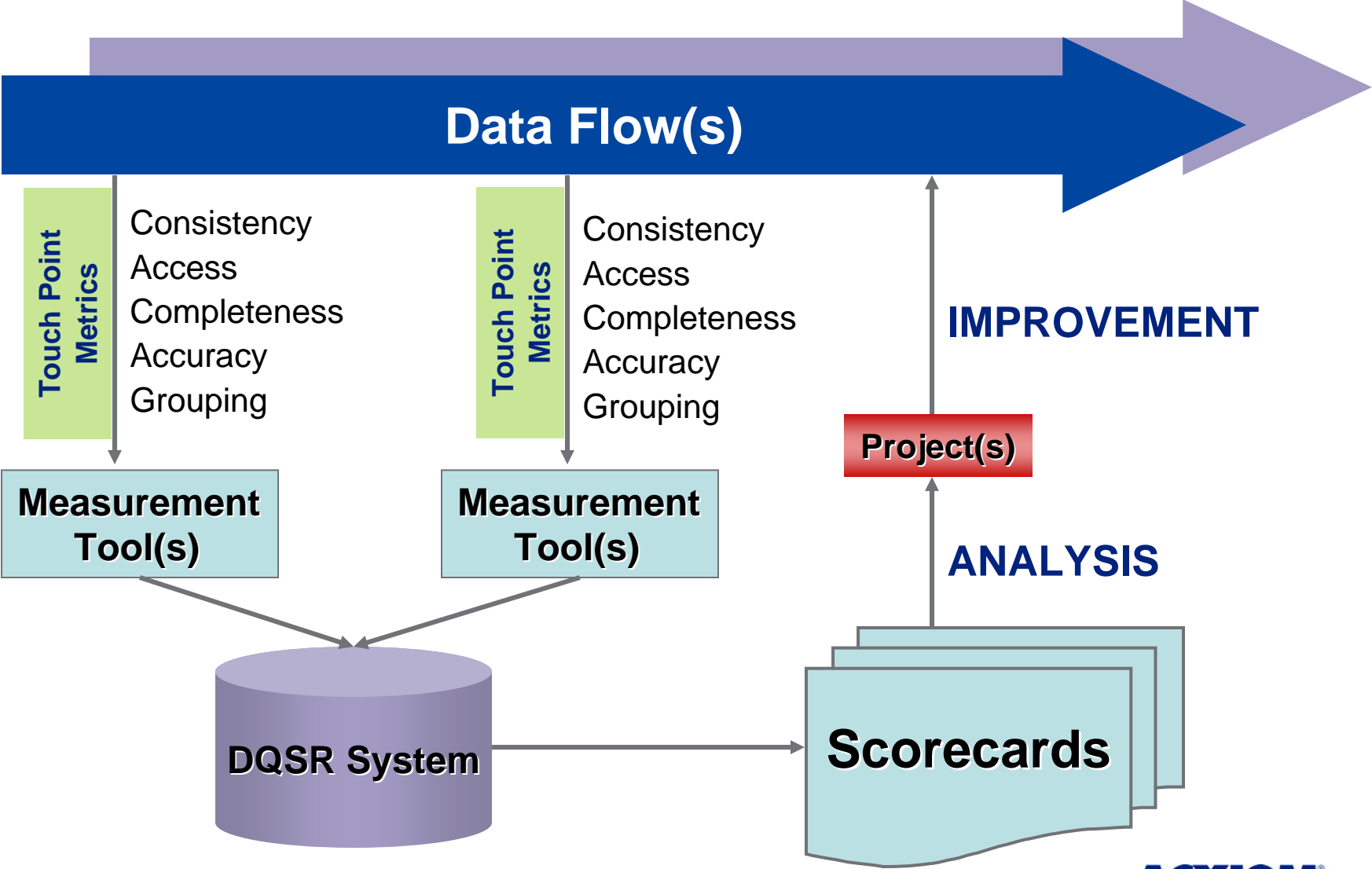
Professional Services

- Data Quality Consulting
 - Analyzing Failures
 - Utilizing Advantages
- Metric Trending

DQSS in Practice (Single Touch Point or Database)



DQSS Across the “Data Factory” (Multiple Enterprise Touch Points)



DQSS Across the “Data Factory”

- *Business Need:* Improve the approach to data quality assurance on the client’s credit card services, “Operational Data Store.”
- *Problem:* Current data management lacked methods to measure data quality in a consistent manner so that issues could be addressed proactively. This created situations resulting in:
 - lost revenue opportunities
 - unnecessary source data expense
 - decreased customer satisfaction
 - lack of end-user confidence in the system of record data
 - additional regulatory scrutiny and fines

DQSS Across the “Data Factory”

- *Project Strategy:* Apply an industry best practice approach in the form of a **Data Quality Scorecard Solution** to measure, analyze, and ultimately improve data quality.
- *Objective:* Identify and implement custom data quality metrics for the client’s operational data infrastructure and use metrics to identify improvement opportunities.
- *Scope:* Project consisted of consulting & analysis services and measurement system including Scorecard Repository.

Data Quality Scorecard Solution (DQSS)

DEFINE

Discovery, Analysis and Metric Design Services

- Define Data Quality Dimensions
- Define Metrics, Goals, Thresholds

MEASURE

```

    graph LR
      SD((Source Data)) --> DA[Data Accuracy]
      DA --> DA2[Data Access]
      DA2 --> DC[Data Completeness]
      DC --> DC2[Data Consistency]
      DC2 --> GA[Grouping Accuracy]
      GA --> S[Statistics]
      S --> OD((Output Data))
  
```

ANALYZE AND MANAGE

```

    graph LR
      DQSR[(DQSR)] --> SC[Scorecards]
      DQSR --> MCS[Metric Calculator(s)]
      S[Statistics] --> MCS
      DQSR --> DQSR_WS[DQSR Web System]
  
```

DQSR Web System

- Scorecard Reports generated and displayed
- Measurement values and quality scores calculated and reported
- Data Quality reports and trending graphs generated
- Key business metrics monitored regularly

Discovery Process--Metric Design

Initial Data Quality Assessment

Objective: Acxiom DQ consultants gathered information about the selected data, processes, and client data quality goals for Phase 1.

Methodology: Conducted interviews with the client's DQ Team; determined the data quality goals and requirements; prioritized the metrics with rankings. For the highest-ranking issues, Acxiom recommended measurement methods.

Client Discovery Participation:

- Identified the principal DQ Scorecard Champion who would have the authority to approve (sign-off on) the final set of metrics
- Identified members of their DQ team with knowledge to assist in the analysis (e.g., data stewards, SMEs, or business/end-users)
- Prepared discussion around existing or desired data quality requirements and goals.
- Educated their DQ Team using Acxiom-provided reference material in advance of the on-site consulting visit.

Define Data Quality Metrics

Objective: Reached agreement (sign-off) on the metric definitions for the projects and agreement on which of those would be implemented in the production process using Acxiom Products & Solutions.

Methodology: Consultants prepared the set of metrics and submitted to client's DQ Scorecard Champion for approval.

Deliverable: Metric Design Document and Metric Calculator Algorithms were produced for 22 metrics spanning 15 database tables.

Metric Design Document

Technical specifications are detailed within the deliverable for each client-specific metric



Metric Name	DQ Dimension	Measurement Tool
Account Balance Integrity	Accuracy	Comparator

System: OIS
 Touchpoint: OIS Core Tables

Metric Interval (Frequency of calculation): Daily

Metric Description: Verification that the current account balance in the Account table is equal to the current balance in the Transaction_Balance table.

Goal: 0% (variance) If "less than" (e.g., "# days or less")
 Max: 0%
 Failure: 10%

Table(s): Account
 Transaction_Balance

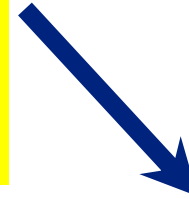
Column(s): Account.Current_Balance
 Transaction_Balance.Current_Balance

Algorithm Requirements:
 Sum of Account.Current_Balance where Current_Balance > 0 = Sum of Transaction_Balance.Current_Balance. Metric Value is the difference in sums expressed as a percentage of the Account.Current_Balance.

Technical Specification (Metric Calculator Design):
 Two Comparator report values:
 X = Value of SUM(Account.Current_Balance) where Current_Balance > 0
 Y = Value of SUM(Transaction_Balance.Current_Balance) where Account_Key > 0
 $M8 = ((ABS(x - y)) / x) * 100$

Metric Classification

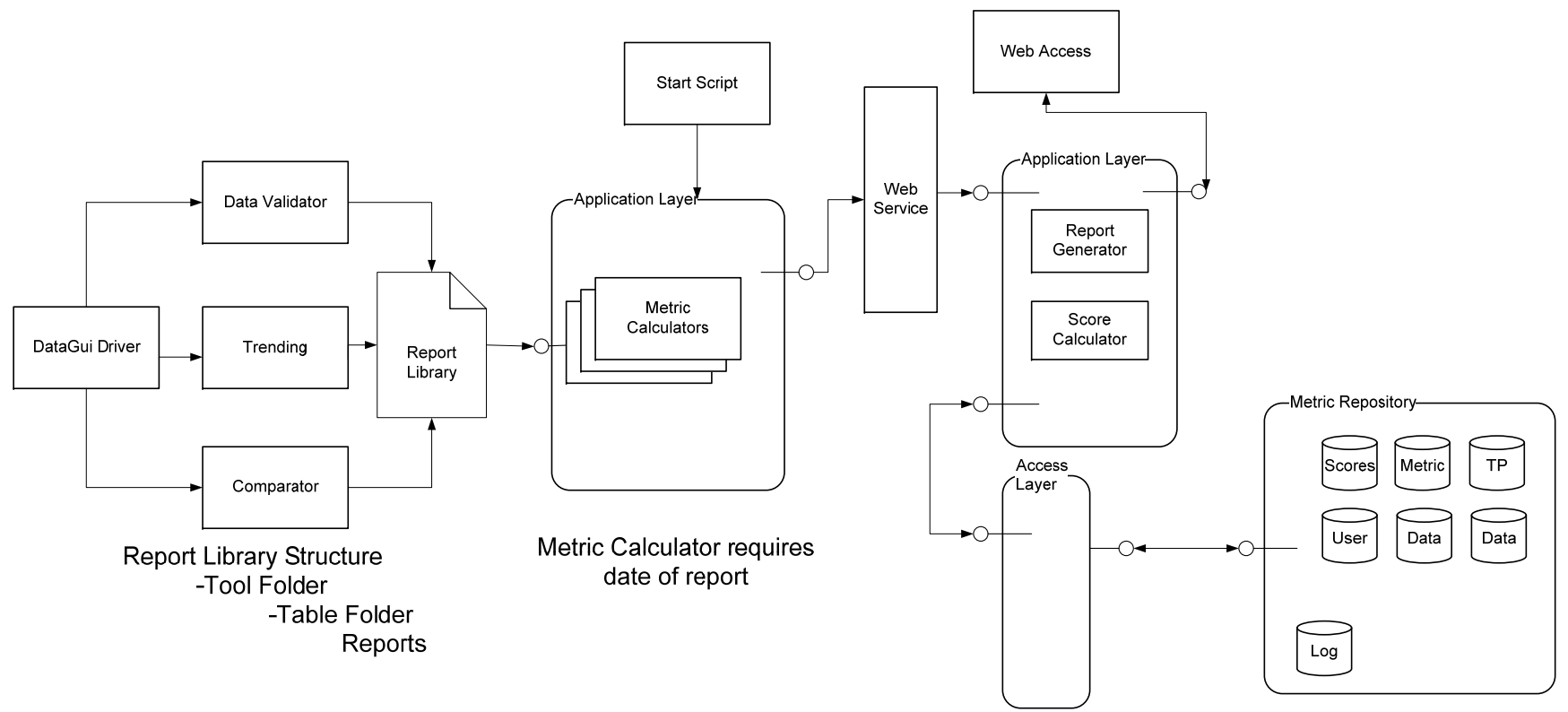
Metrics were prioritized and ranked, then classified according to DQ Dimension and recommended measurement tool




Metric ID	Metric Name	DQ Dimension	Measurement Tool
M8	Account Balance Integrity	Accuracy	DV-Comparator
M11	Cardholder Demographic Verification, Postal Area Code	Consistency	Data Validator
M25	Event Distribution	Consistency	DV-Trending

DQSS Implementation


Logical Context Diagram



Data Quality Scorecard Repository Executive Summary Dashboard



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Reports Dashboard

Click on the title tab to open the report in a new browser window.
[REFRESH REPORT](#)

EXECUTIVE SUMMARY: PAST 7 DAYS

Report created on 05/16/06 12:15:38

	05/09	05/10
Dimension	GPA	GPA
Data Accuracy	0.39	0.51
Data Completeness	4.00	4.00
Data Consistency	3.95	1.28

METRIC SUMMARY: PAST 7 DAYS

Data Accuracy

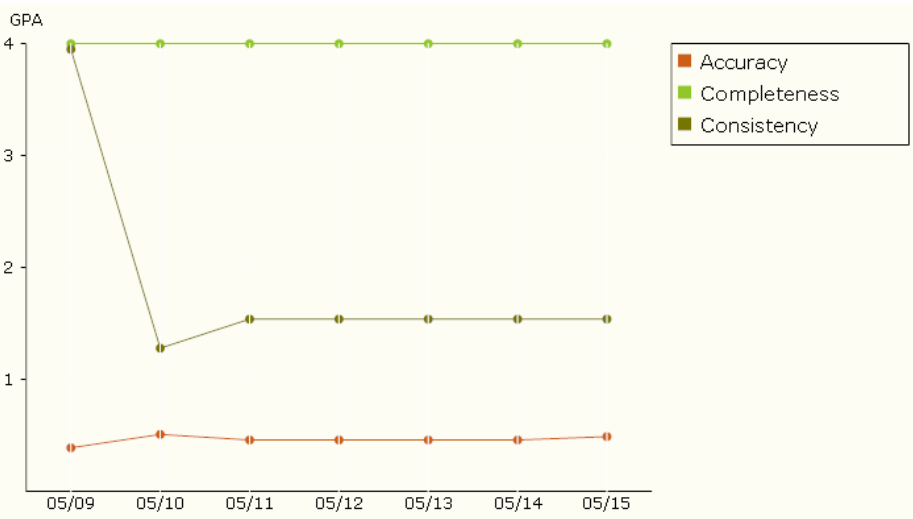
MetricName	Interval	Goal
Chart M8	D	0 Y
Chart M21	M	0 Y

Executive Summary: Past 7 Days

Fraud Management

Report created on 05/16/06 12:15:43

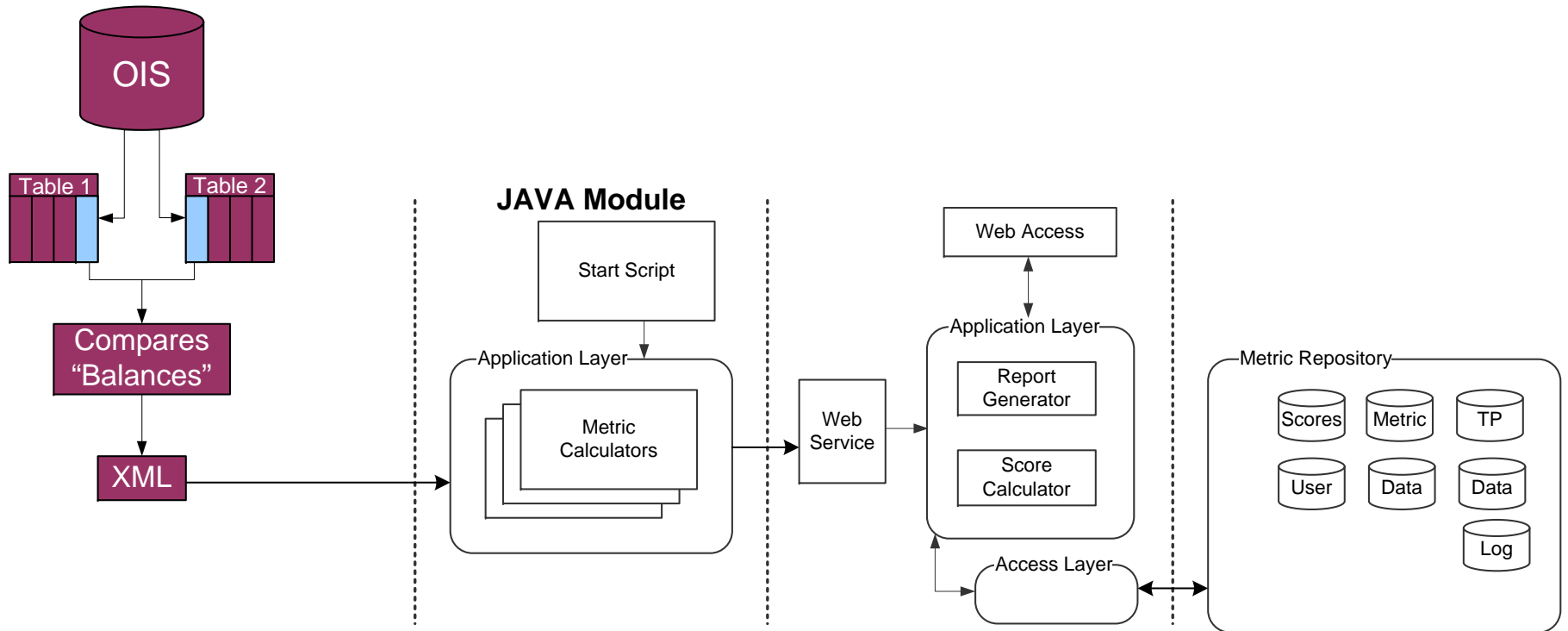
Dimension	05/09	05/10	05/11	05/12	05/13	05/14	05/15
	GPA	GPA	GPA	GPA	GPA	GPA	GPA
Data Accuracy	0.39	0.51	0.46	0.46	0.46	0.46	0.49
Data Completeness	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Data Consistency	3.95	1.28	1.54	1.54	1.54	1.54	1.54
Overall GPA:	2.78	1.93	2.00	2.00	2.00	2.00	2.01



Date	Accuracy	Completeness	Consistency
05/09	0.39	4.00	3.95
05/10	0.51	4.00	1.28
05/11	0.46	4.00	1.54
05/12	0.46	4.00	1.54
05/13	0.46	4.00	1.54
05/14	0.46	4.00	1.54
05/15	0.49	4.00	1.54

“M8: Account Balance Integrity”

Accuracy: Verification that the current balance in the Account table is equal to the current balance in the Transaction_Balance table.



M8 Data Validator-Comparator Report

Total Records: 7 of 7

Total Records: 7 of 7

Condition(s):

CURRENT_BALANCE > 0
 ACCT_FLAG > 1

Condition(s):

CURRENT_BALANCE > 0
 ACCT_FLAG > 1

TRANSACTION_BALANCE.CURRENT_BALANCE
84146
103201
75625
46250
75613
124023

ACCOUNT.CURRENT_BALANCE
84146
103201
75605
46250
75613
164023

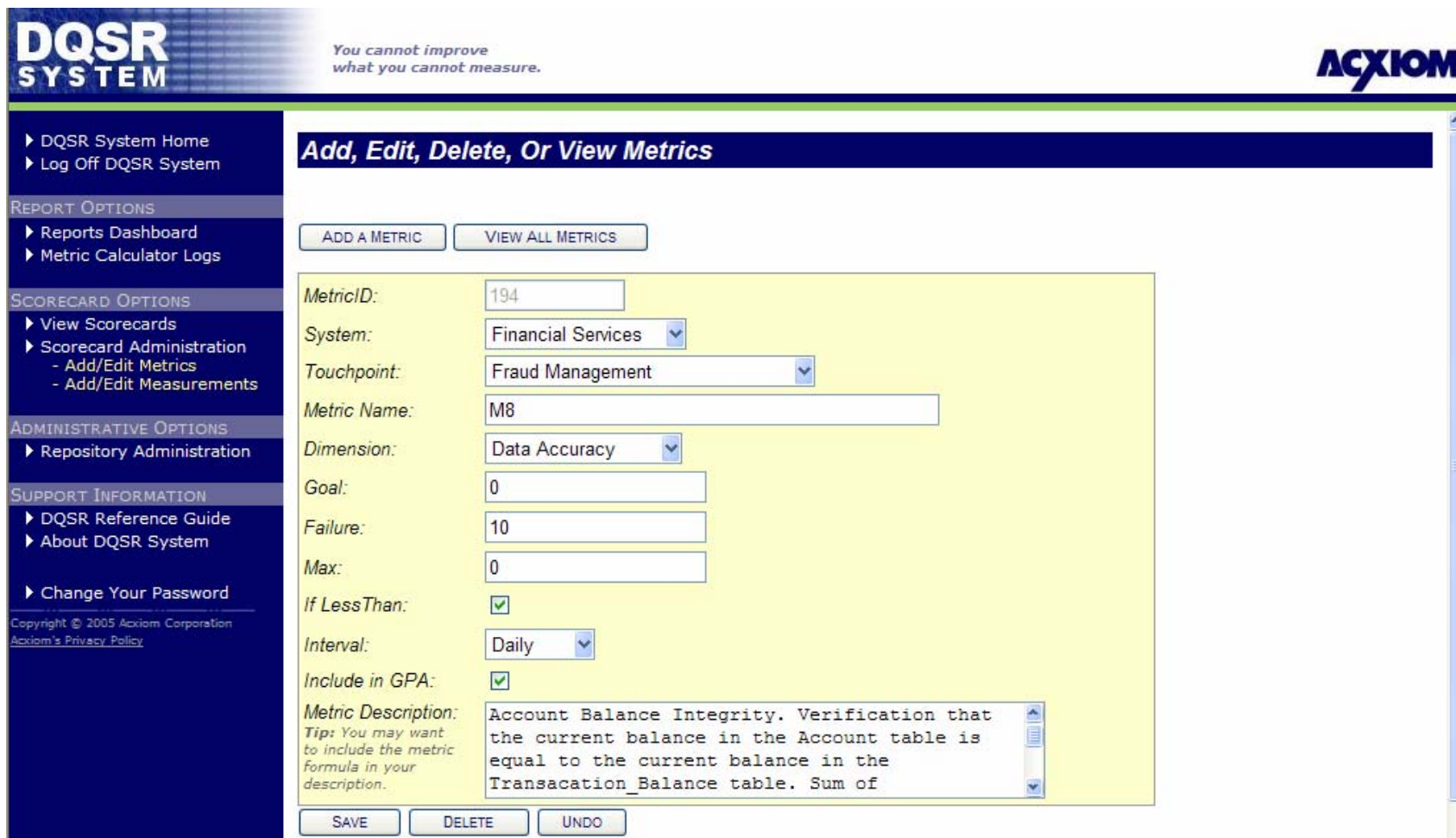
Job Summary

Description	Summary
Version	2.1
Date/Time	2006-05-07 14:14:03

Job Summary

Description	Summary
Version	2.1
Date/Time	2006-05-07 14:13:58

M8 Metric as entered into DQSR



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ADD A METRIC VIEW ALL METRICS

MetricID: 194

System: Financial Services

Touchpoint: Fraud Management

Metric Name: M8

Dimension: Data Accuracy

Goal: 0

Failure: 10

Max: 0

If LessThan:

Interval: Daily

Include in GPA:

Metric Description: Account Balance Integrity. Verification that the current balance in the Account table is equal to the current balance in the Transacation_Balance table. Sum of

Tip: You may want to include the metric formula in your description.

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“M8” Metric Scorecard displayed in DQSR



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Data Accuracy

					05/01	05/02	05/03	05/04	05/05	05/06	05/07	
	MetricName	Interval	Goal	< Max Fail	Act	QS	Act	QS	Act	QS	Act	QS
Chart	M8	D	0 Y	0 10	2.19	87.34	2.31	86.92	5.3	76.45	1.26	90.59
Chart	M21	M	0 Y	0 5	-	-	-	-	-	-	-	-

Dimension GPA= 0.48

Data Completeness

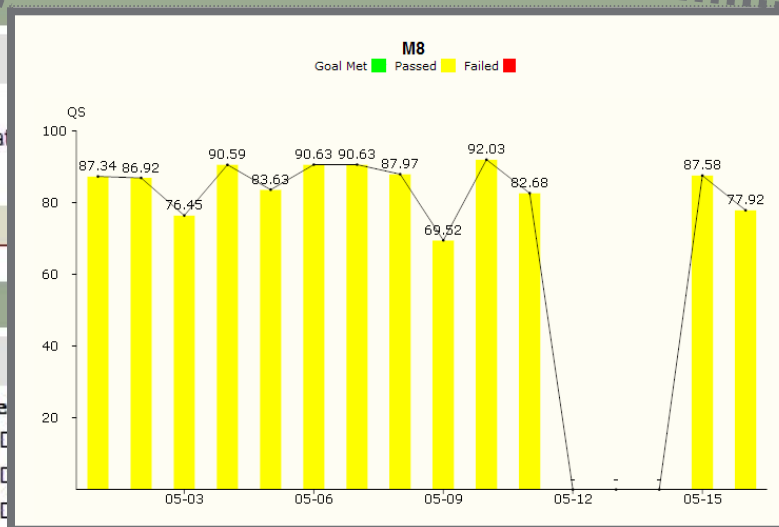
MetricName
Chart Customer identifica
Chart M2

Dimension GPA= 4.00

Data Consistency

MetricName	Inte
Chart M20	
Chart M13	
Chart M14	

Dimension GPA= 1.83

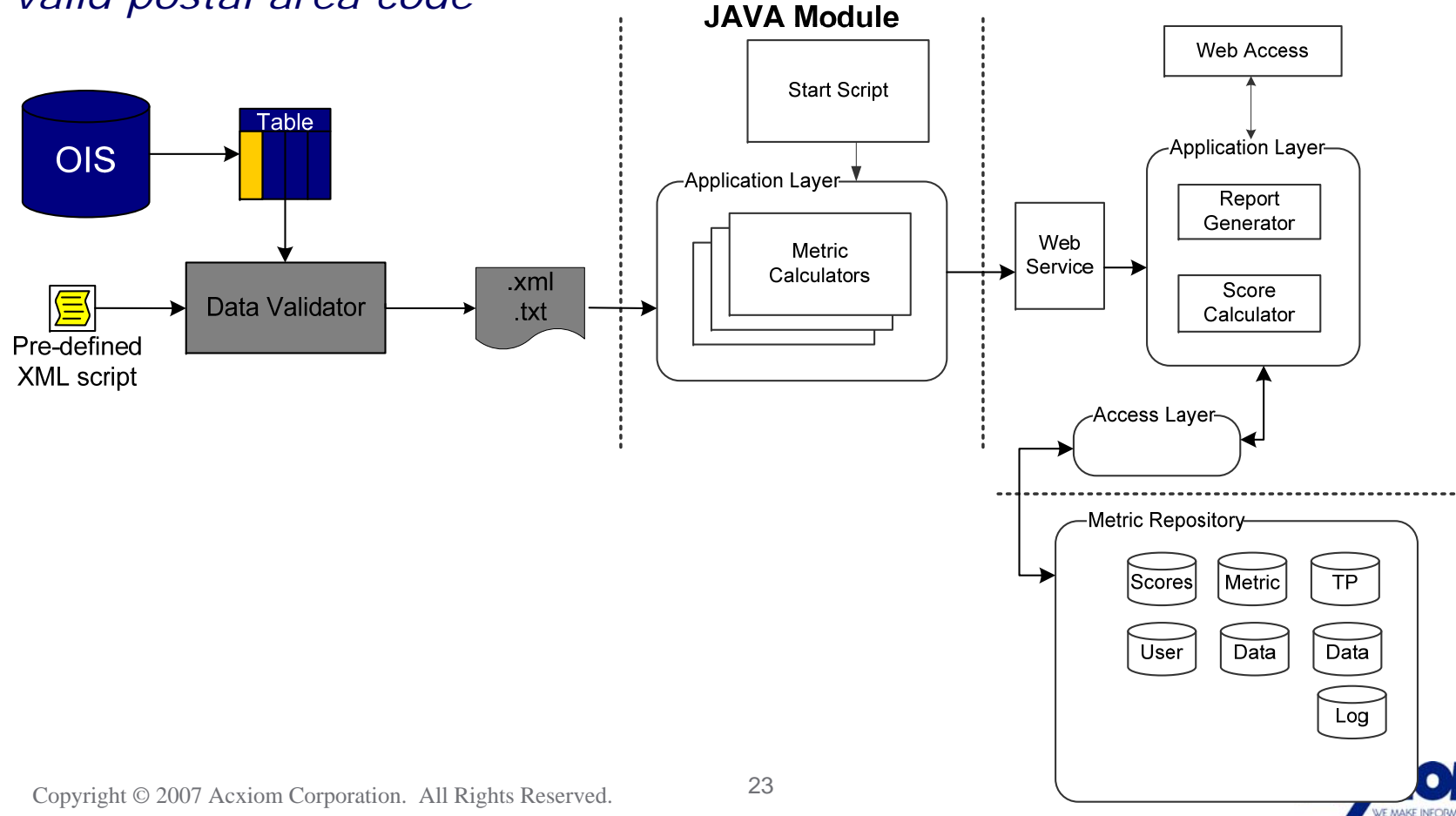


	03	05/04	05/05
QS	Act	QS	Act
-	-	-	-
00.00	100	100.00	100

	05/05	05/06	
Act	QS	Act	QS
88.19	0.00	81.2	0.00
56.2	65.43	25.3	30.36
91.74	95.87	85.24	90.84

M11: Demographic Verification/Postal Area Code

Completeness: Every cardholder has a valid postal area code



“M11” Data Validator Reports

```

*****
***  DATA VALIDATOR VALUE COUNT REPORT      ***
*****

Time: Tue May 09 10:20:23 2006
Program Version: 2.0
File: stdin
Record Length: 15
*****

Total Number of Records: 1000
-----
Element Name                Record Count   % of Total   Value Found
-----
POSTAL_AREA_CD              502           50.20%      Blank
                             39            3.90%      Invalid
                             495          45.90%      Valid ()

```


“M11” Data Validator Reports

```

*****
***  DATA VALIDATOR SUMMARY OF VALUES PER ERROR  ***
*****
Time: Tue May 09 10:20:23 2006
Program Version: 2.0
File: stdin
Record Length: 15
*****

Total Number of Errors: 39
-----
Element Name                Error  % of  Element
                           Count   Total Content
-----
POSTAL_AREA_CD
                           3    0.20%  7221
                           1    0.10%  857964257
                           1    0.10%  72205-2687
                           1    0.10%  75205-
                           3    0.20%  72212-2227
                           1    0.10%  75024 -
                           1    0.10%  75224-
                           1    0.10%  7221
                           1    0.10%  85020-138
                           1    0.10%  752240

```

“M11” Data Validator Reports

```

*****
***  DETAIL OF VALIDATION ERRORS  ***
*****

Time: Tue May 09 10:20:23 2006
Program Version: 2.0
File: stdin
Record Length: 15
*****

Record      Field      Error Element
Number      ID  Element Name      Count  Content
-----
12 001  POSTAL_AREA_CD      1  7221
14 001  POSTAL_AREA_CD      2  7221
15 001  POSTAL_AREA_CD      3  857964257
19 001  POSTAL_AREA_CD      4  72205-2687
20 001  POSTAL_AREA_CD      5  75205-
22 001  POSTAL_AREA_CD      6  72212-2227
43 001  POSTAL_AREA_CD      7  72212-2227
50 001  POSTAL_AREA_CD      8  75024 -
53 001  POSTAL_AREA_CD      9  75224-
68 001  POSTAL_AREA_CD     10  72212-2227
76 001  POSTAL_AREA_CD     11  7221
80 001  POSTAL_AREA_CD     12  85020-1328
83 001  POSTAL_AREA_CD     13  752240

```

“M11” Metric as entered into DQSR

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ADD A METRIC VIEW ALL METRICS

MetricID: 209

System: Financial Services

Touchpoint: Marketing

Metric Name: M11

Dimension: Data Consistency

Goal: 90

Failure: 50

Max: 100

If LessThan:

Interval: Daily

Include in GPA:

Metric Description: Cardholder Demographic Verification, Postal Area Code
Tip: You may want to include the metric formula in your description.

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“M11” Metric Scorecard displayed in DQSR

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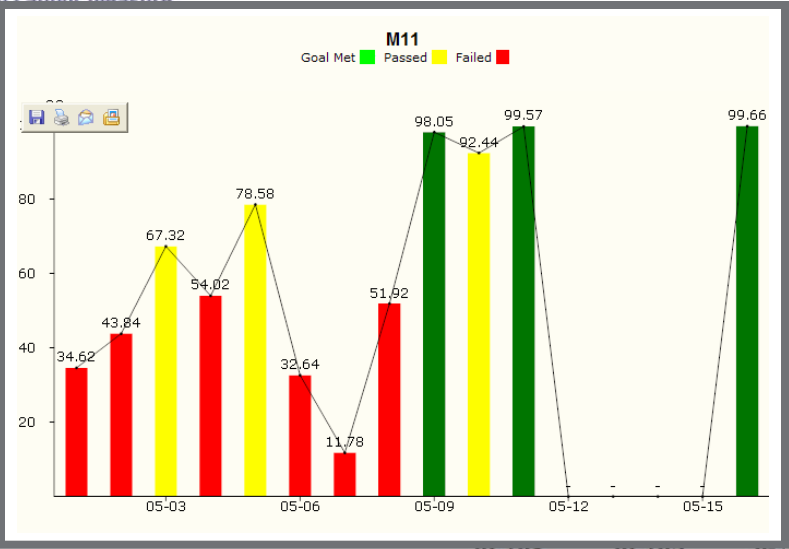
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M11

Goal Met ■ Passed ■ Failed ■



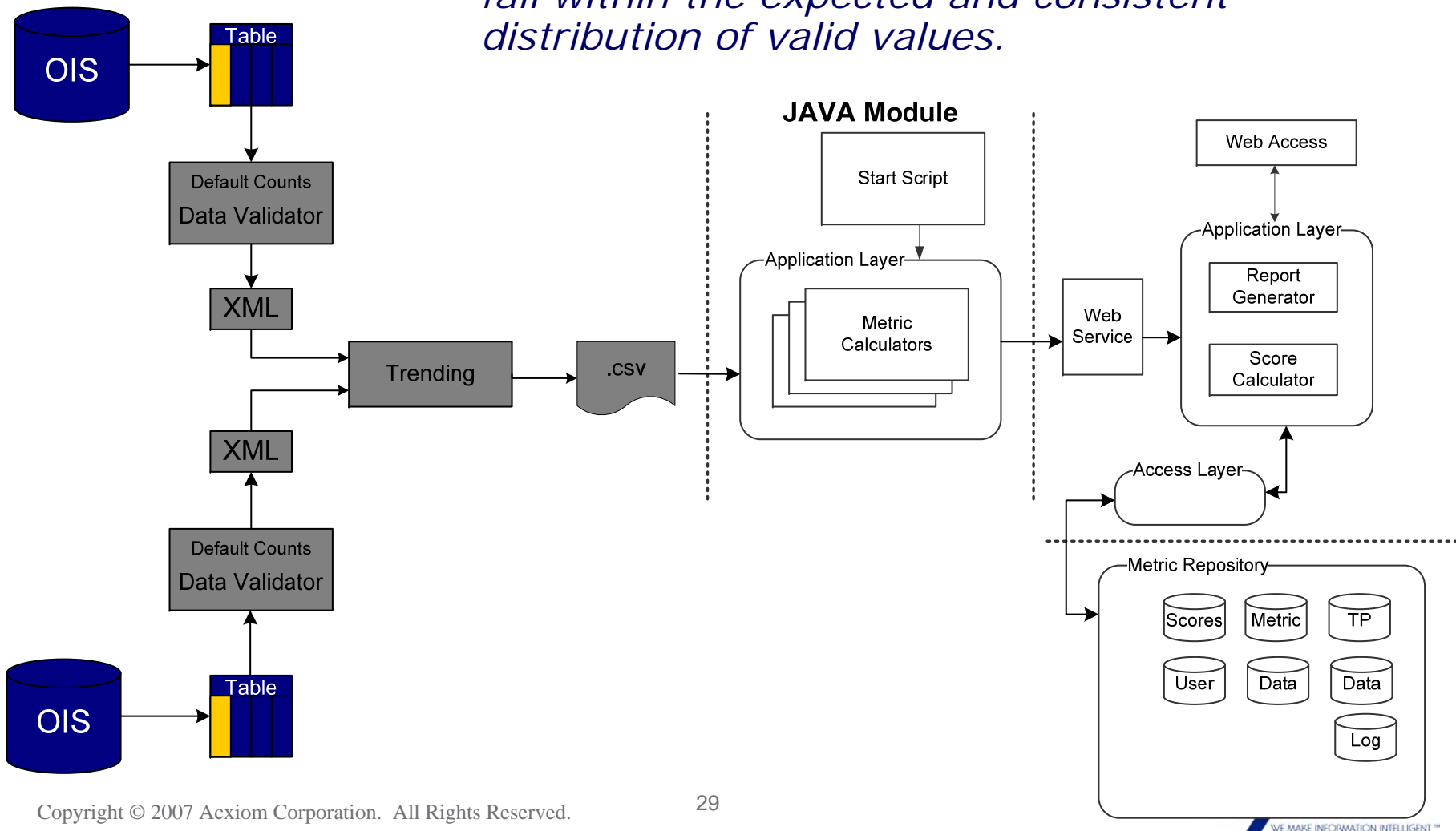
Date	Score	Status
05-03	34.62	Failed
05-03	43.84	Failed
05-03	67.32	Passed
05-03	54.02	Failed
05-03	78.58	Passed
05-06	32.64	Failed
05-06	11.78	Failed
05-06	51.92	Failed
05-09	98.05	Goal Met
05-09	92.44	Passed
05-12	99.57	Goal Met
05-15	99.66	Goal Met

				05/01	05/02	05/03	05/04	05/05	05/06	
	QS	Act	QS	Act	QS	Act	QS	Act	QS	Act
M18	66.67	67.78	38.75	38.75	17.57	17.57	50.05	50.05	26.85	26.85
M24	-	-	-	-	-	-	-	-	-	-
M25	66.67	67.78	38.75	38.75	17.57	17.57	50.05	50.05	26.85	26.85
M11	28.85	34.62	36.53	43.84	58.36	67.32	45.02	54.02	71.23	78.58
M12	27.84	33.41	95.23	97.62	91.74	95.87	32.51	39.01	5.25	6.30

Dimension GPA= 1.94

M25: Event Distribution

Consistency: Verification that all "Event Types" fall within the expected and consistent distribution of valid values.



“M25” Trending Report

M25rpt.ValueCount.txt05092006

Total Records: 1045

M25rpt.ValueCount.txt05082006

Total Records: 1005

MAINTENANCE_EVENT_TYPE

	5/9/2006		5/8/2006		Difference	
Argument	Count	%	Count	%	Count	%
Blank	0	0.00%	0	0.00%	0	0.00%
0	230	22.01%	200	19.90%	30	15.00%
1	203	19.43%	203	20.20%	0	0.00%
2	201	19.23%	201	20.00%	0	0.00%
3	200	19.14%	200	19.90%	0	0.00%
4	211	20.19%	201	20.00%	10	4.98%

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▶ View Scorecards
▶ Scorecard Administration
 - Add/Edit Metrics
 - Add/Edit Measurements

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ADD A METRIC VIEW ALL METRICS

MetricID: 203
System: Financial Services
Touchpoint: Marketing
Metric Name: M25
Dimension: Data Consistency
Goal: 90
Failure: 60
Max: 100
If Less Than:
Interval: Daily
Include in GPA:
Metric Description: Event Distribution
Tip: You may want to include the metric formula in your description.

SAVE DELETE UNDO

"M25" Metric Scorecard displayed in DQSR

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- ▶ Reports Dashboard
- ▶ Metric Calculator Logs

SCORECARD OPTIONS

- ▶ View Scorecards
 - Metric Scorecards
 - Touchpoint Scorecards
- ▶ Scorecard Administration

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	MetricName	Interval	Goal	<	Max	Fail	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS
Chart	M10	D	0	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chart	M16	D	100	100	95	93.3	58.93	3.36	2.12	84.94	53.65	89.3	56.40	16.29	10.29	19.51	12.32	37.16
Chart	M23	M	0	Y	0	5	-	-	-	-	-	-	-	-	-	-	-	-

Dimension GPA= 0.29

Data Consistency

	MetricName	Interval	Goal	<	Max	Fail	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS
Chart	M18	D	0	Y	0	6	41.23	-	-	-	-	-	-	-	-	-	-	-
Chart	M24	M	0	Y	0	1	-	-	-	-	-	-	-	-	-	-	-	-
Chart	M25	D	90	100	60	66.67	-	-	-	-	-	-	-	-	-	-	-	-
Chart	M11	D	90	100	50	28.85	-	-	-	-	-	-	-	-	-	-	-	-
Chart	M12	D	90	100	50	27.84	-	-	-	-	-	-	-	-	-	-	-	-

Dimension GPA= 1.94

Data Access

	MetricName	Interval	Goal	<	Max	Fail	Act
Chart	M29	D	0	Y	0	1	23.88

Dimension GPA= 2.98

