Acxiom's Data Quality Scorecard Solution

MIT IQ Industry Symposium

Cambridge, Massachusetts, USA

July 18-19, 2007

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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*

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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.

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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

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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

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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

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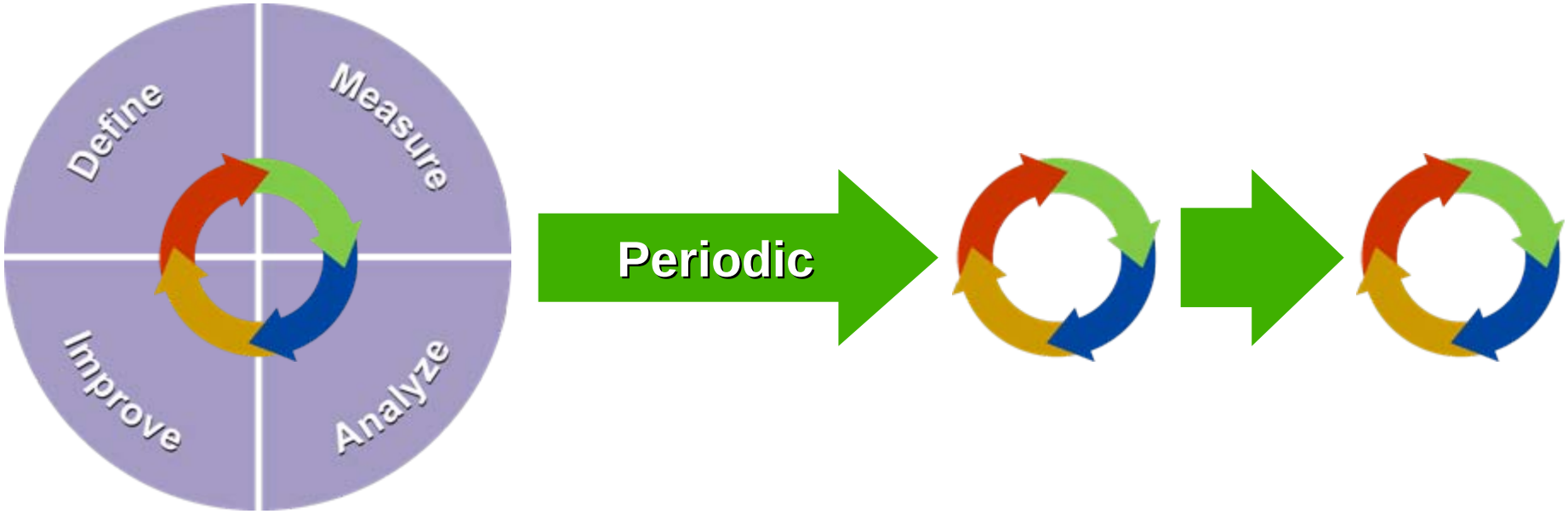
Strategic Approach: Total Data Quality Management (TDQM)



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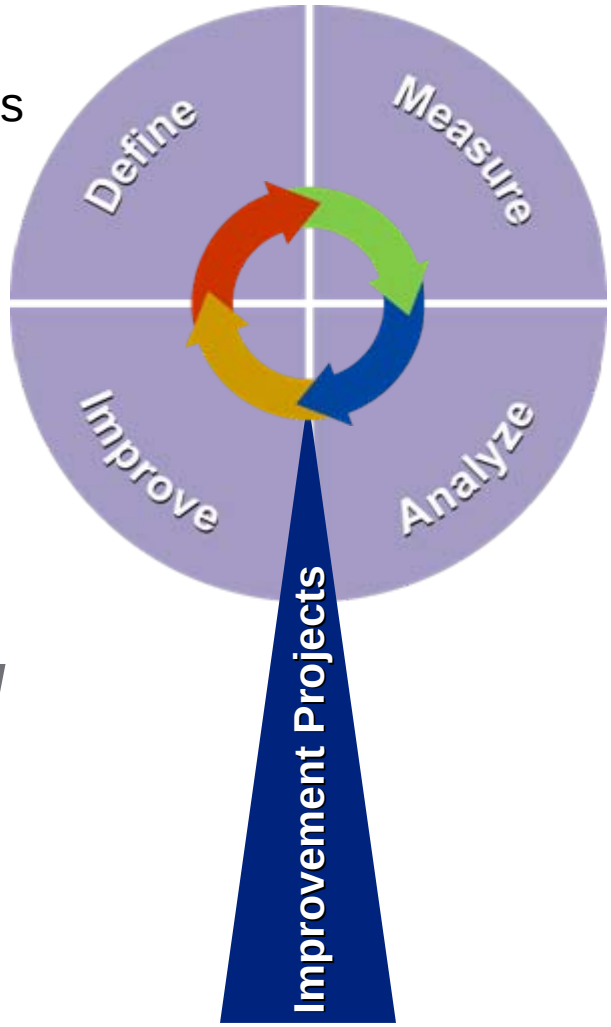
DQSS and TDQM Working Together

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

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DQSS in Practice (Single Touch Point or Database)

Define

Discovery, Analysis and Metric Design Services

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

Measure

Acxiom CII Services: Batch or Grid-Enabled

Data Accuracy	Data Access	Data Completeness	Data Consistency	Grouping Accuracy
Acxiom's AccuCheck Benchmark Comparison Process	Throughput Metrics	Acxiom's Data Validator	Acxiom's Data Validator (with Trending or Comparator Plug-in)	Matching Logic / Business Rule Process

Source Data → Acxiom's AccuCheck Benchmark Comparison Process

Matching Logic / Business Rule Process → Metric Measurements

Analyze and Manage

DQSR → Scorecards

Data Quality Scorecard Repository System

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

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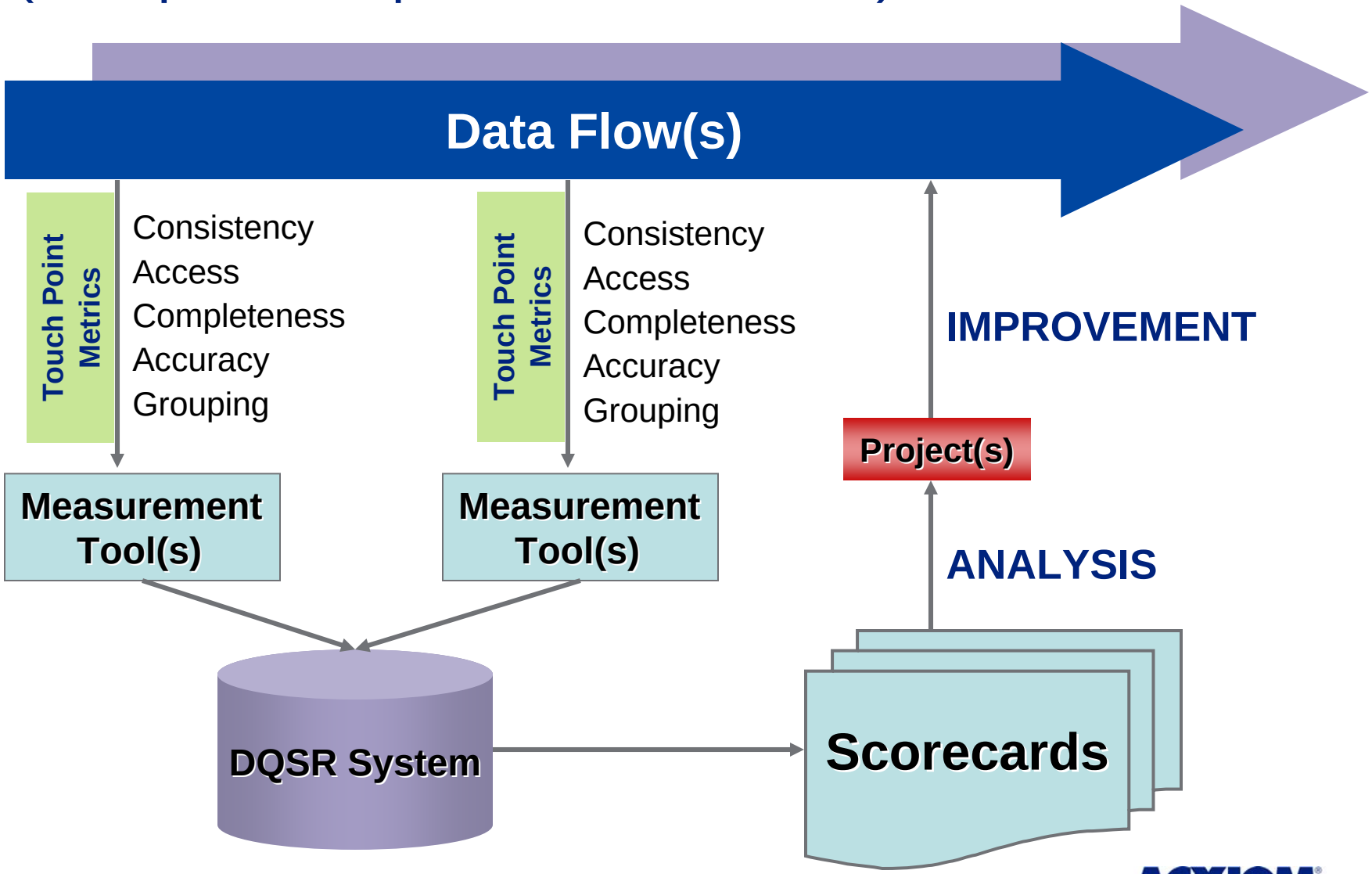
DQSS Across the "Data Factory" (Multiple Enterprise Touch Points)



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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

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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.

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DEFINE
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Data Quality Scorecard Solution (DQSS)

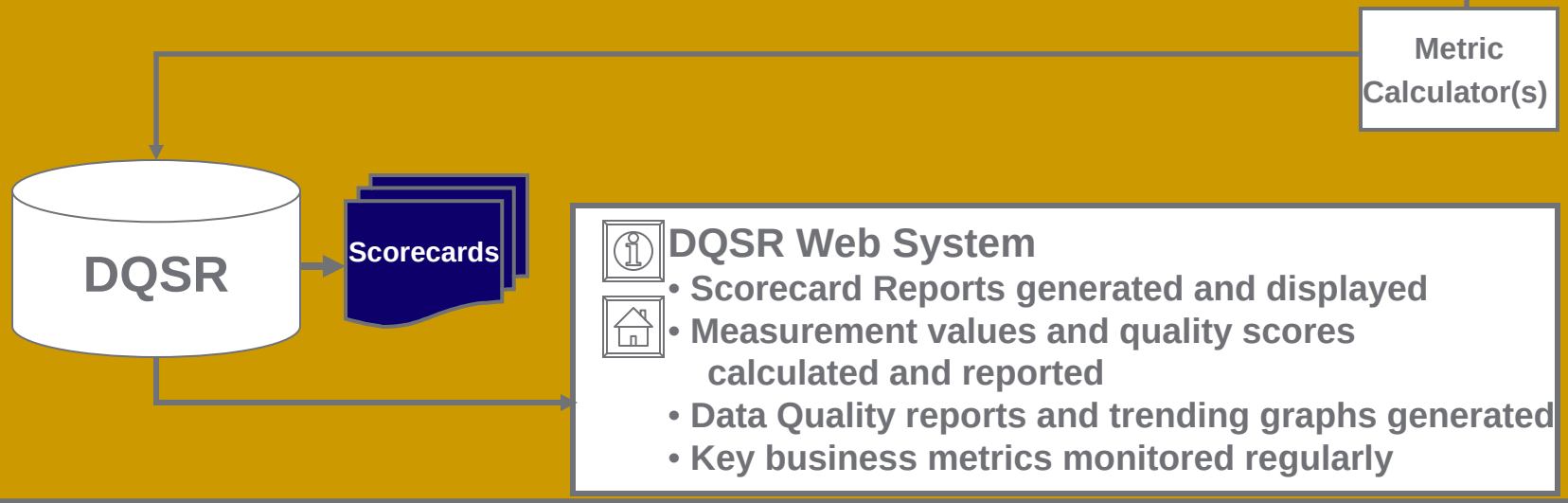
DEFINE

Discovery, Analysis and Metric Design Services

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

MEASURE

ANALYZE AND MANAGE



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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.

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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 Transacation_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

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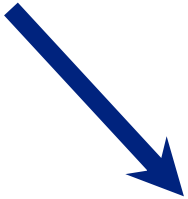
Metric Classification

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

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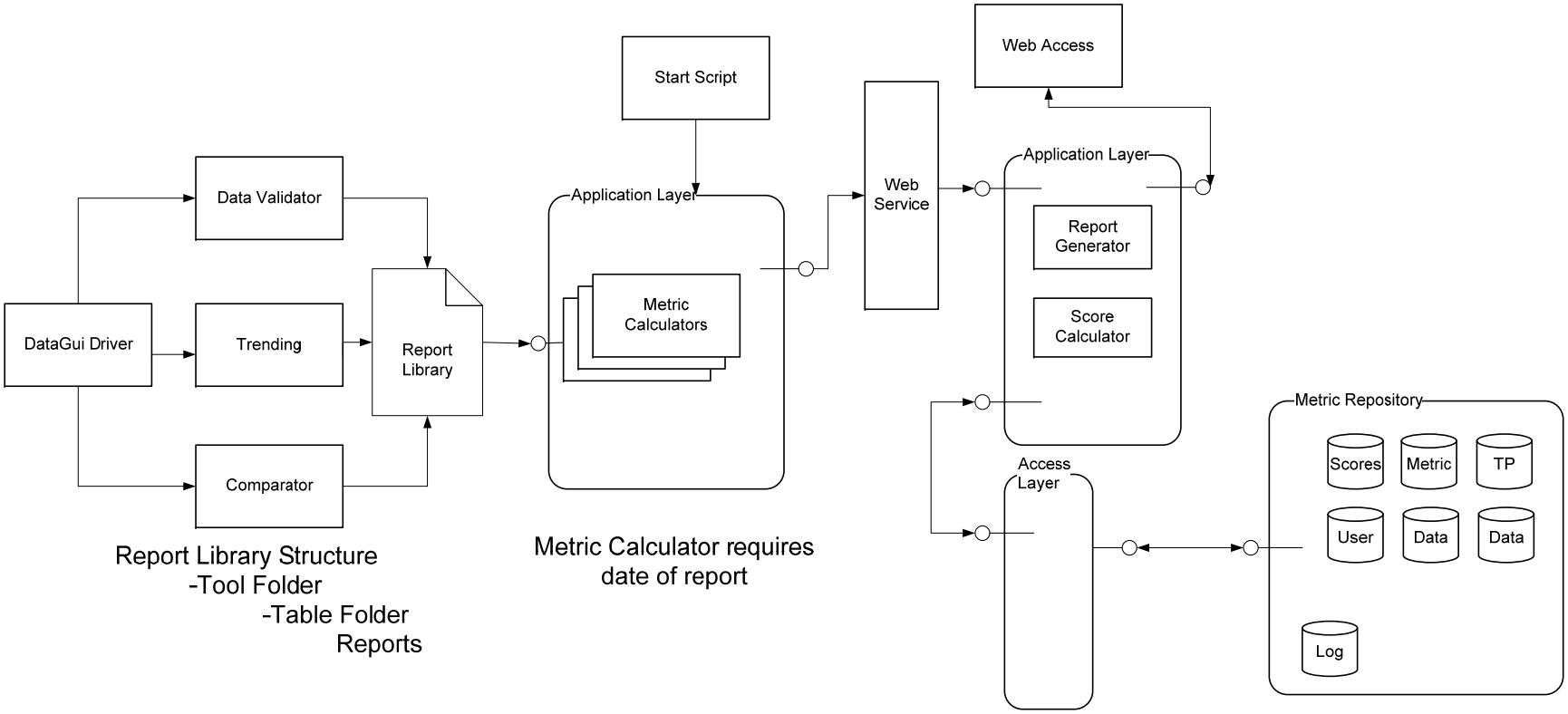
DQSS Implementation

Logical Context Diagram



Report Library Structure
-Tool Folder
-Table Folder
Reports

Metric Calculator requires date of report

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DEFINE
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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 br

REFRESH REPORT

EXECUTIVE SUMMARY: PAST 7 DAYS

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

Dimension	05/09 GPA	05/10 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

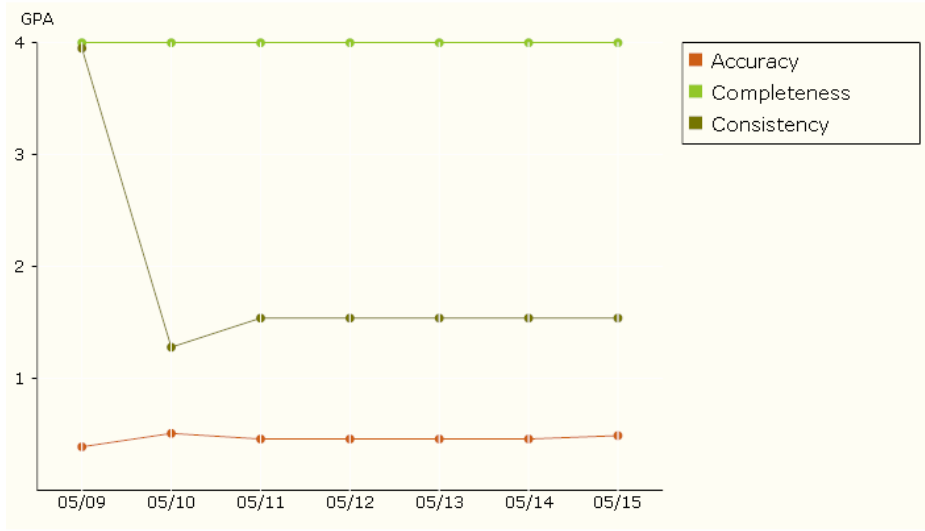
	MetricName	Interval	Goal	<
Chart	M8	D	0	Y
Chart	M21	M	0	Y

Executive Summary:Past 7 Days

Fraud Management

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

Dimension	05/09 GPA	05/10 GPA	05/11 GPA	05/12 GPA	05/13 GPA	05/14 GPA	05/15 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



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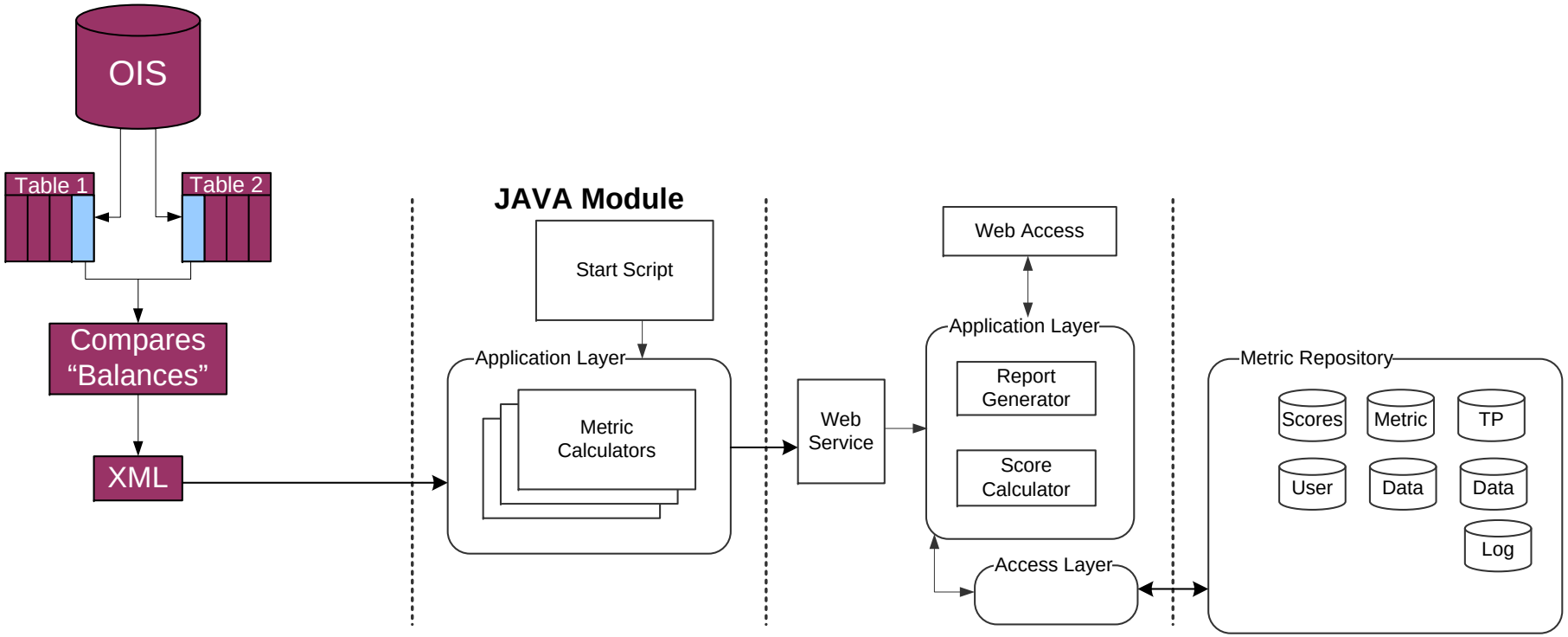
"M8: Account Balance Integrity"

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



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M8 Data Validator-Comparator Report

Total Records: 7 of 7

Condition(s):

CURRENT_BALANCE > 0
ACCT_FLAG > 1

TRANSACTION_BALANCE.CURRENT_BALANCE
84146
103201
75625
46250
75613
124023

Job Summary

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

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Data Validator Report

Total Records: 7 of 7

Condition(s):

CURRENT_BALANCE > 0
ACCT_FLAG > 1

ACCOUNT.CURRENT_BALANCE
84146
103201
75605
46250
75613
164023

Job Summary

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

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Data Validator Report

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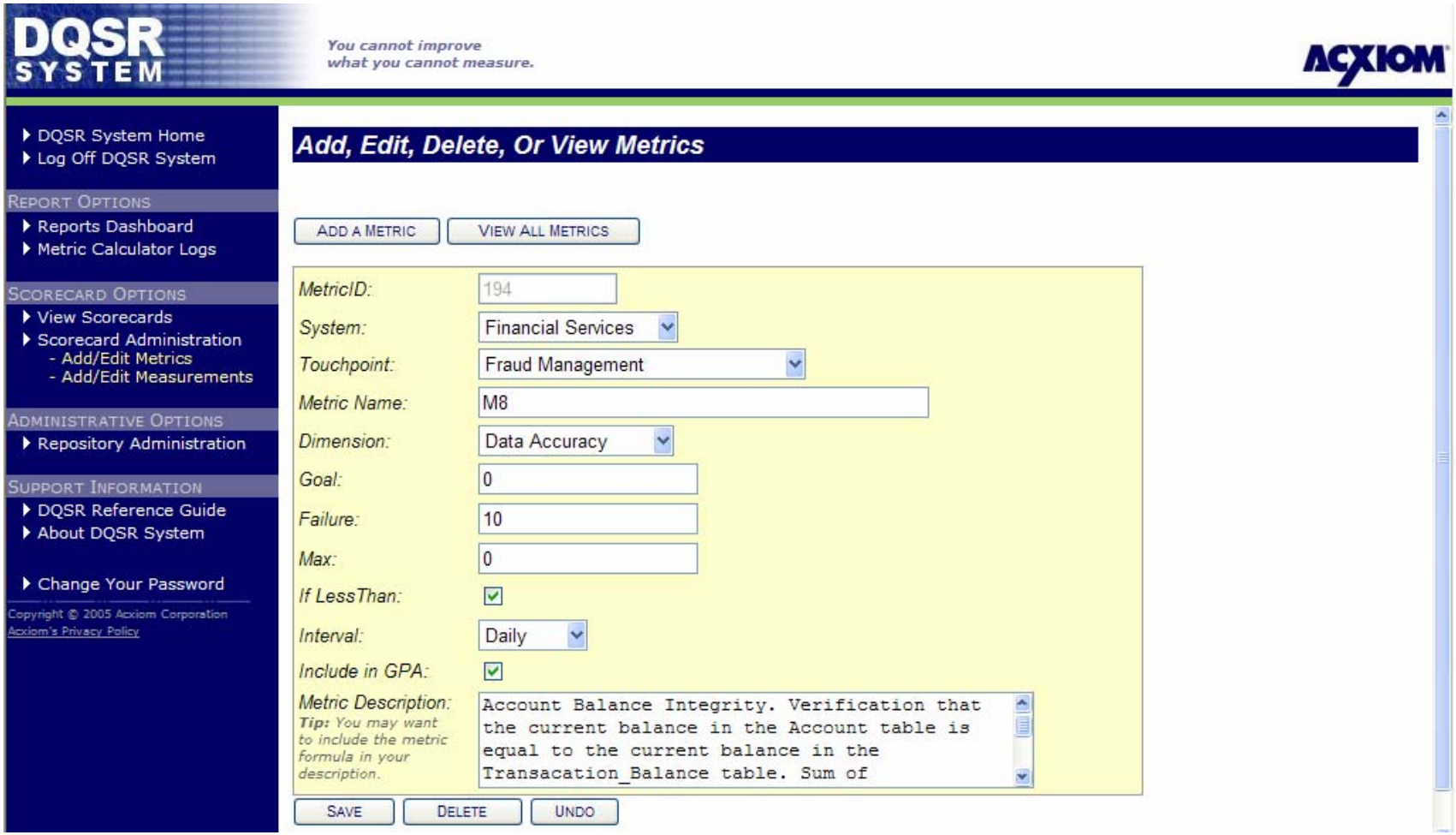
M8 Metric as entered into DQSR



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"M8" Metric Scorecard displayed in DQSR

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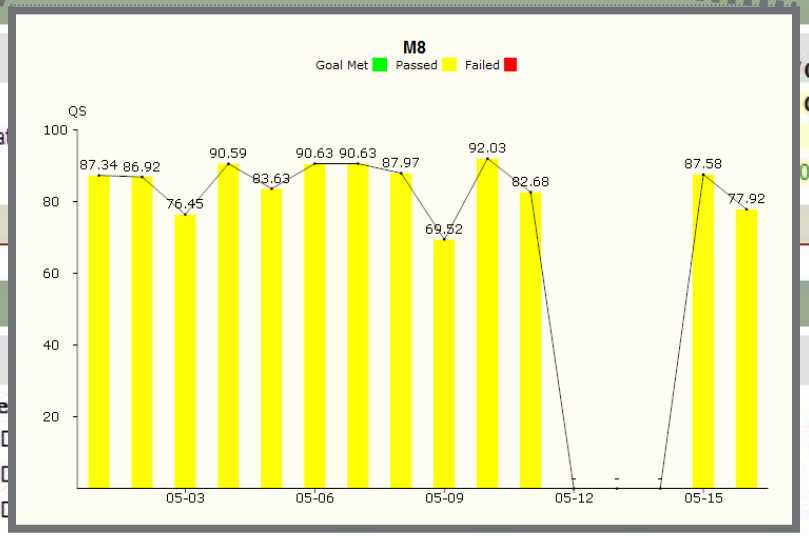
Data Accuracy

	MetricName	Interval	Goal	<	Max	Fail	05/01 Act	05/01 QS	05/02 Act	05/02 QS	05/03 Act	05/03 QS	05/04 Act	05/04 QS	05/05 Act	05/05 QS	05/06 Act	05/06 QS	05/07 Act	05/07 QS
Chart	M8	D	0	Y	0	10	2.19	87.34	2.31	86.92	5.3	76.45	1.26	90.59	3.25	83.63	1.25	90.63	1.25	90.6
Chart	M21	M	0	Y	0	5	-	-	-	-	-	-	-	-	-	-	-	-	-	

Dimension GPA= 0.43

Data Completeness



	MetricName	05/03 QS	05/04 Act	05/04 QS	05/05 Act	05/05 QS
Chart	Customer identifica					
Chart	M2		00.00	100	100.00	100 100.0

Dimension GPA= 4.00

Data Consistency

	MetricName	Inte	05/05 Act	05/05 QS	05/06 Act	05/06 QS	
Chart	M20	D	88.19	0.00	81.2	0.00	4
Chart	M13	D	56.2	65.43	25.3	30.36	3
Chart	M14	D	91.74	95.87	85.24	90.84	2

Dimension GPA= 1.83

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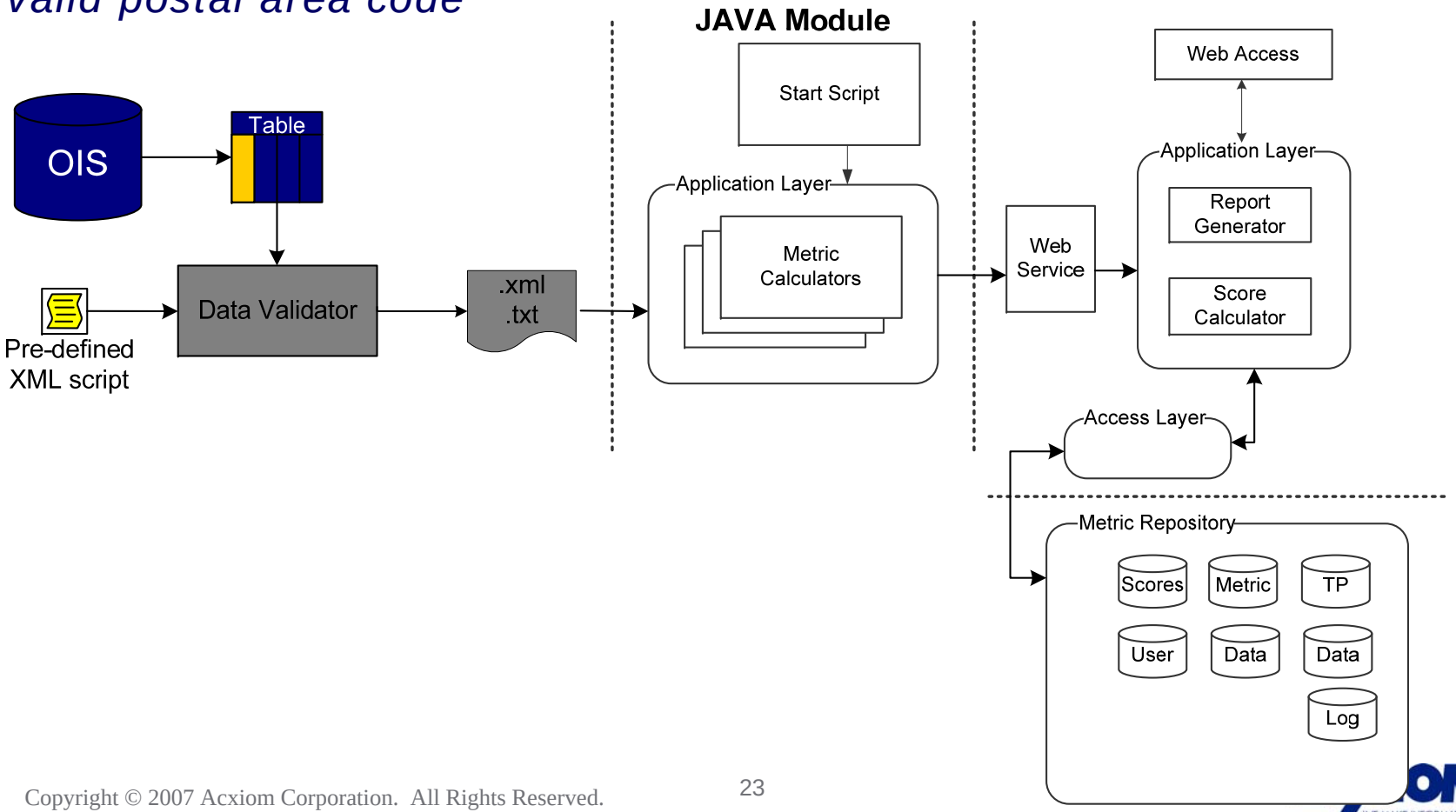
M11: Demographic Verification/Postal Area Code

Completeness: Every cardholder has a valid postal area code



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"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
-------------------------------------------------------------------
                                 Record    % of   Value Found
Element Name                     Count     Total  (or Range)
-------------------------------------------------------------------

POSTAL_AREA_CD                    502    50.20%    Blank
                                   39     3.90%   Invalid
                                  495    45.90%    Valid ()
```

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"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
-----------------------------------------------------------------
                                Error    % of   Element
Element Name                    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
```

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"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
```

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"M11" Metric as entered into DQSR

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Add, Edit, Delete, Or View Metrics

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

SAVE | DELETE | UNDO

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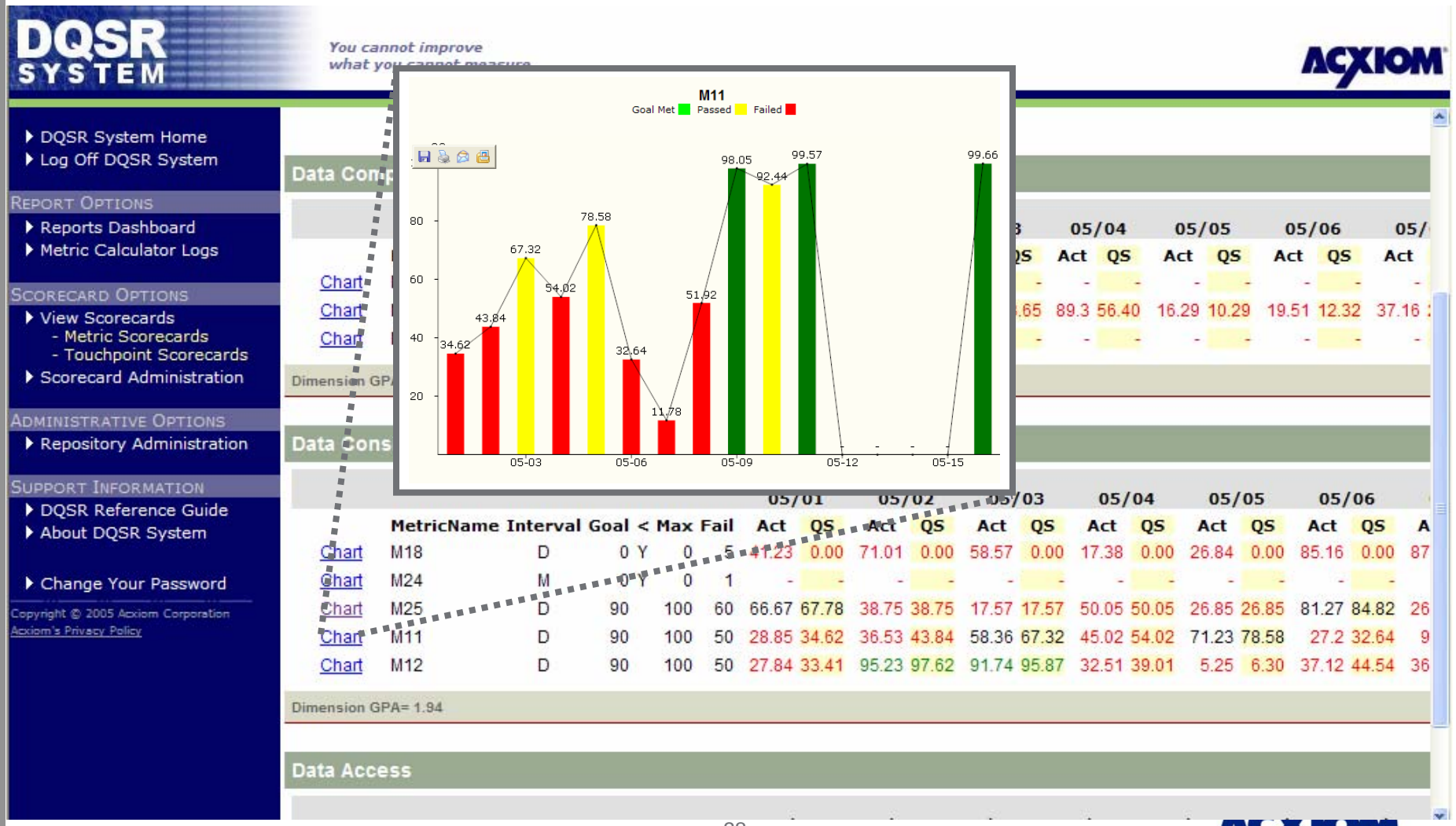
"M11" Metric Scorecard displayed in DQSR



	MetricName	Interval	Goal	<	Max	Fail	05/01 Act	05/01 QS	05/02 Act	05/02 QS	05/03 Act	05/03 QS	05/04 Act	05/04 QS	05/05 Act	05/05 QS	05/06 Act	05/06 QS
Chart	M18	D	0	Y	0	5	41.23	0.00	71.01	0.00	58.57	0.00	17.38	0.00	26.84	0.00	85.16	0.00
Chart	M24	M	0	Y	0	1	-	-	-	-	-	-	-	-	-	-	-	-
Chart	M25	D	90		100	60	66.67	67.78	38.75	38.75	17.57	17.57	50.05	50.05	26.85	26.85	81.27	84.82
Chart	M11	D	90		100	50	28.85	34.62	36.53	43.84	58.36	67.32	45.02	54.02	71.23	78.58	27.2	32.64
Chart	M12	D	90		100	50	27.84	33.41	95.23	97.62	91.74	95.87	32.51	39.01	5.25	6.30	37.12	44.54

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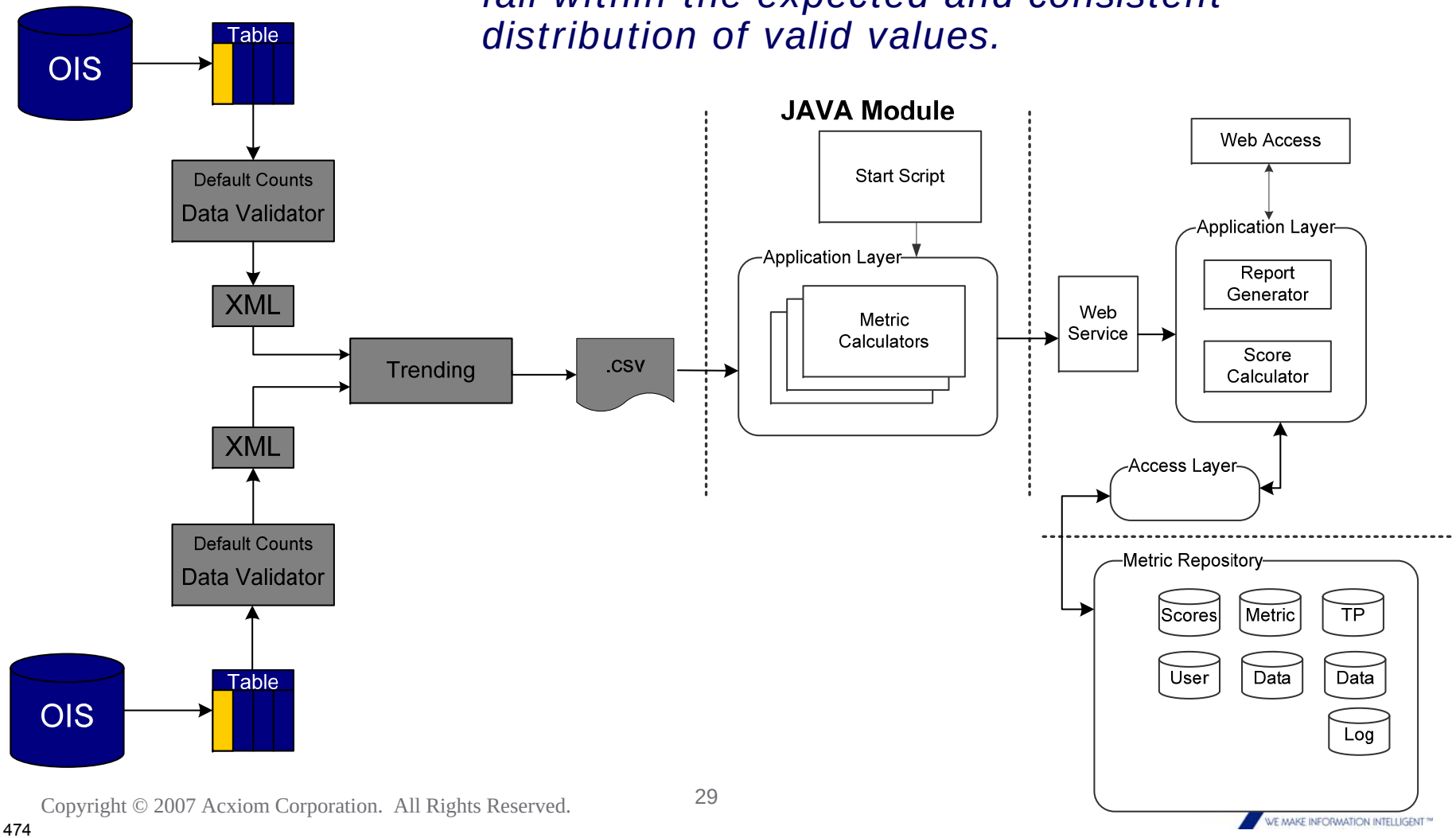
M25: Event Distribution

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



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"M25" Trending Report

M25rpt.ValueCount.txt05092006 Total Records: 1045

M25rpt.ValueCount.txt05082006 Total Records: 1005

		5/9/2006		5/8/2006		Difference	
	Argument	Count	%	Count	%	Count	%
MAINTENANCE_EVENT_TYPE							
	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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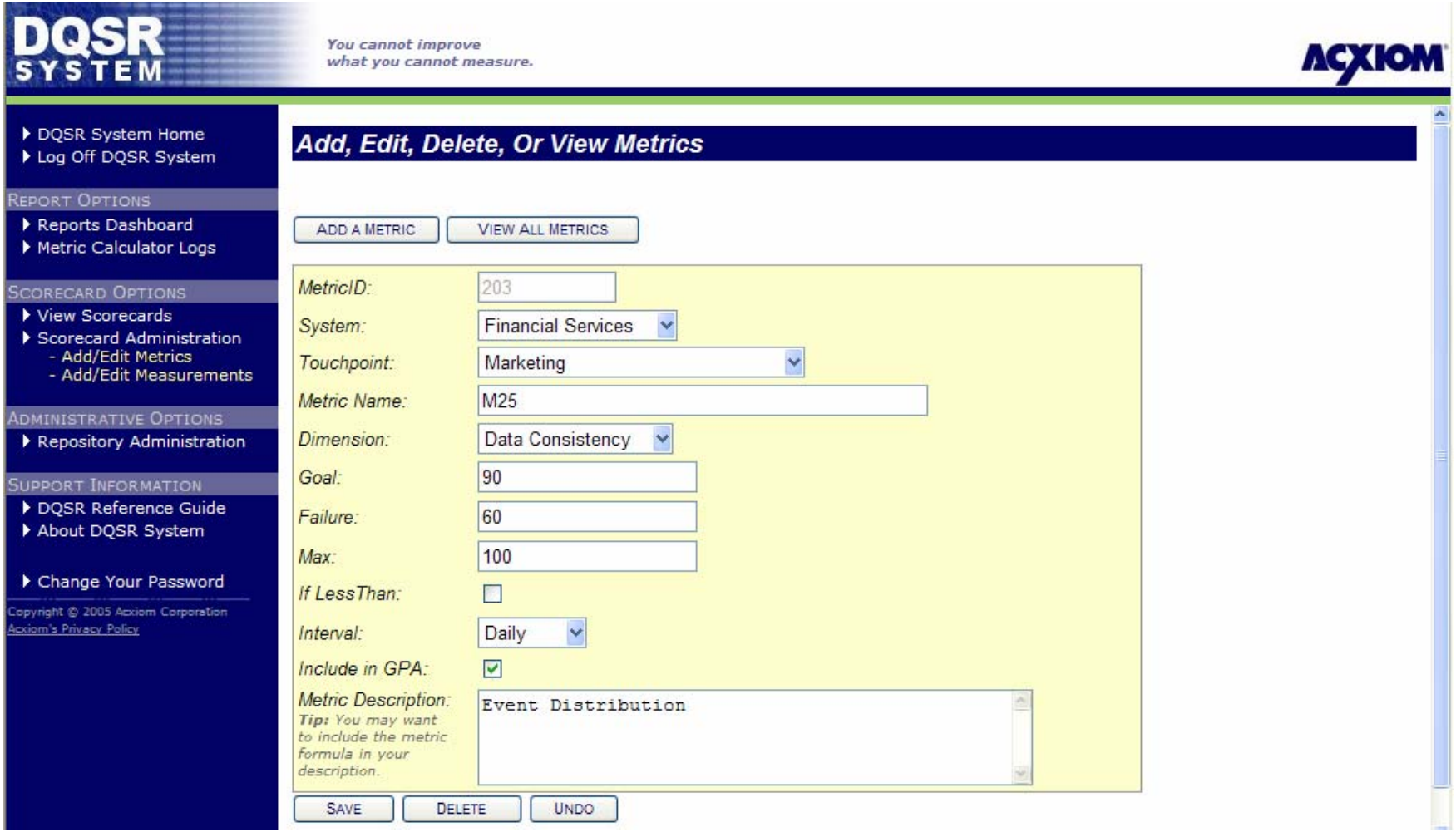
"M25" Metric as entered into DQSR



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"M25" Metric Scorecard displayed in DQSR

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	MetricName	Interval	Goal	<	Max	Fail	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS	Act
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

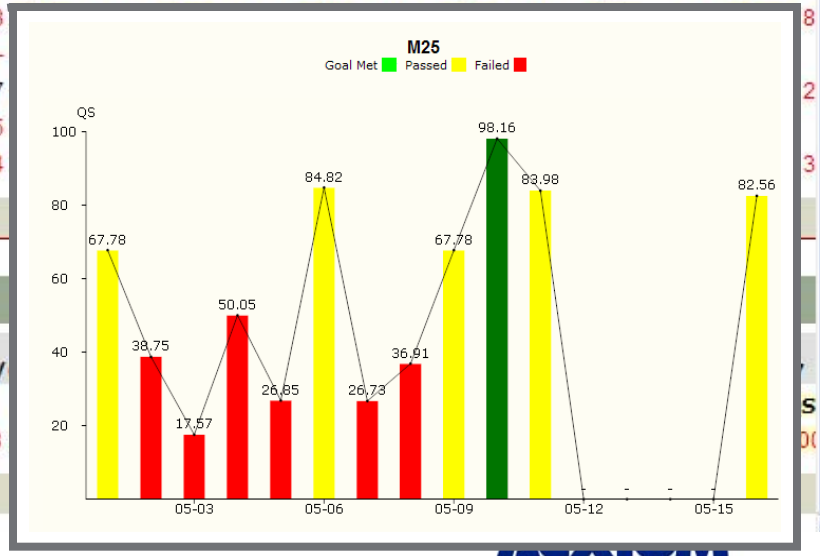
							05/01		05/02		05/03		05/04		05/05		05/06	
	MetricName	Interval	Goal	<	Max	Fail	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS	Act	QS
Chart	M18	D	0	Y	0	5	41.23											
Chart	M24	M	0	Y	0	1	-											
Chart	M25	D	90		100	60	66.67											
Chart	M11	D	90		100	50	28.85											
Chart	M12	D	90		100	50	27.84											

Dimension GPA= 1.93

Data Access

							05/
	MetricName	Interval	Goal	<	Max	Fail	Act
Chart	M29	D	0	Y	0	1	23.88

Dimension GPA= 2.98



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