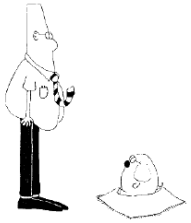


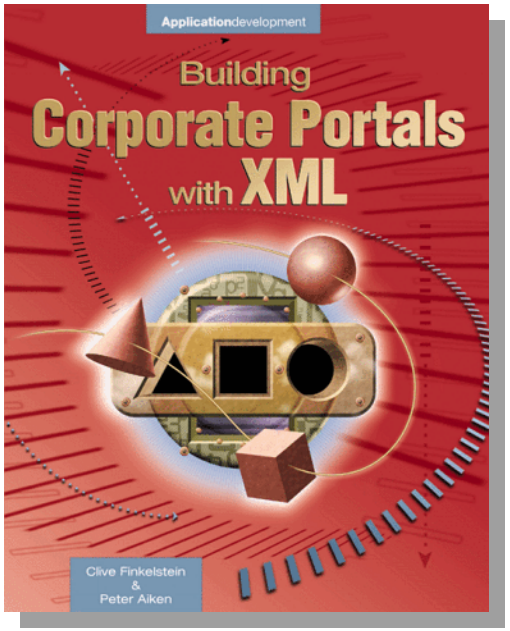
Expanding Your Notion of Data Quality Challenges

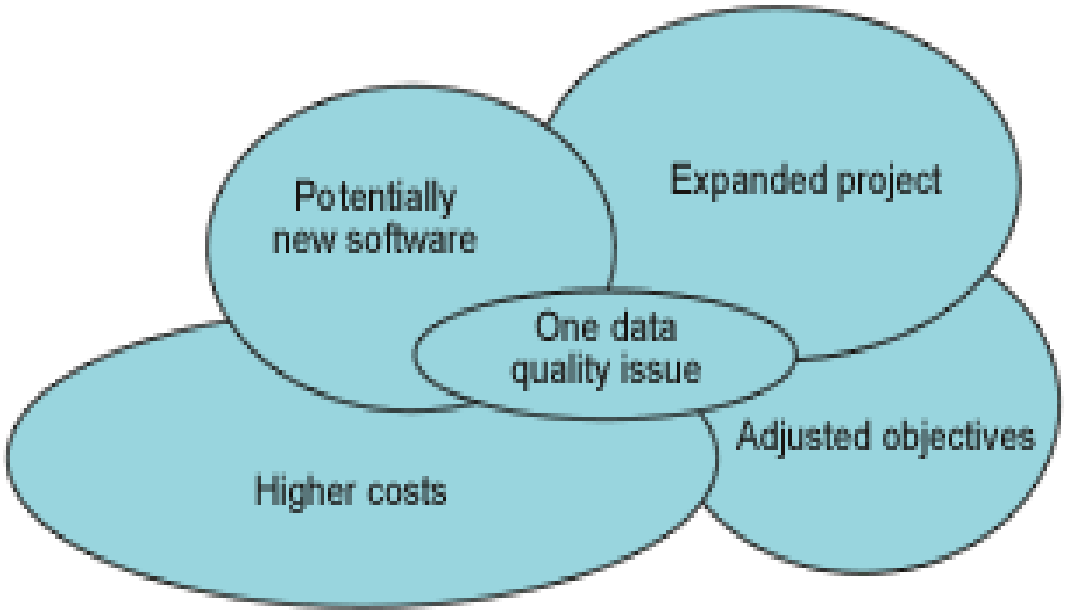
John Sells
Data Blueprint

jsells@datablueprint.com

Famous Words?

- Question:
  - Why haven't organizations taken a more proactive approach to data quality?
- Answer:
  - Fixing data quality problems is not easy
  - It is dangerous -- they'll come after you
  - Your efforts are likely to be misunderstood
  - You could make things worse
  - Now you get to fix it
- A single data quality issue can grow into a significant, unexpected investment



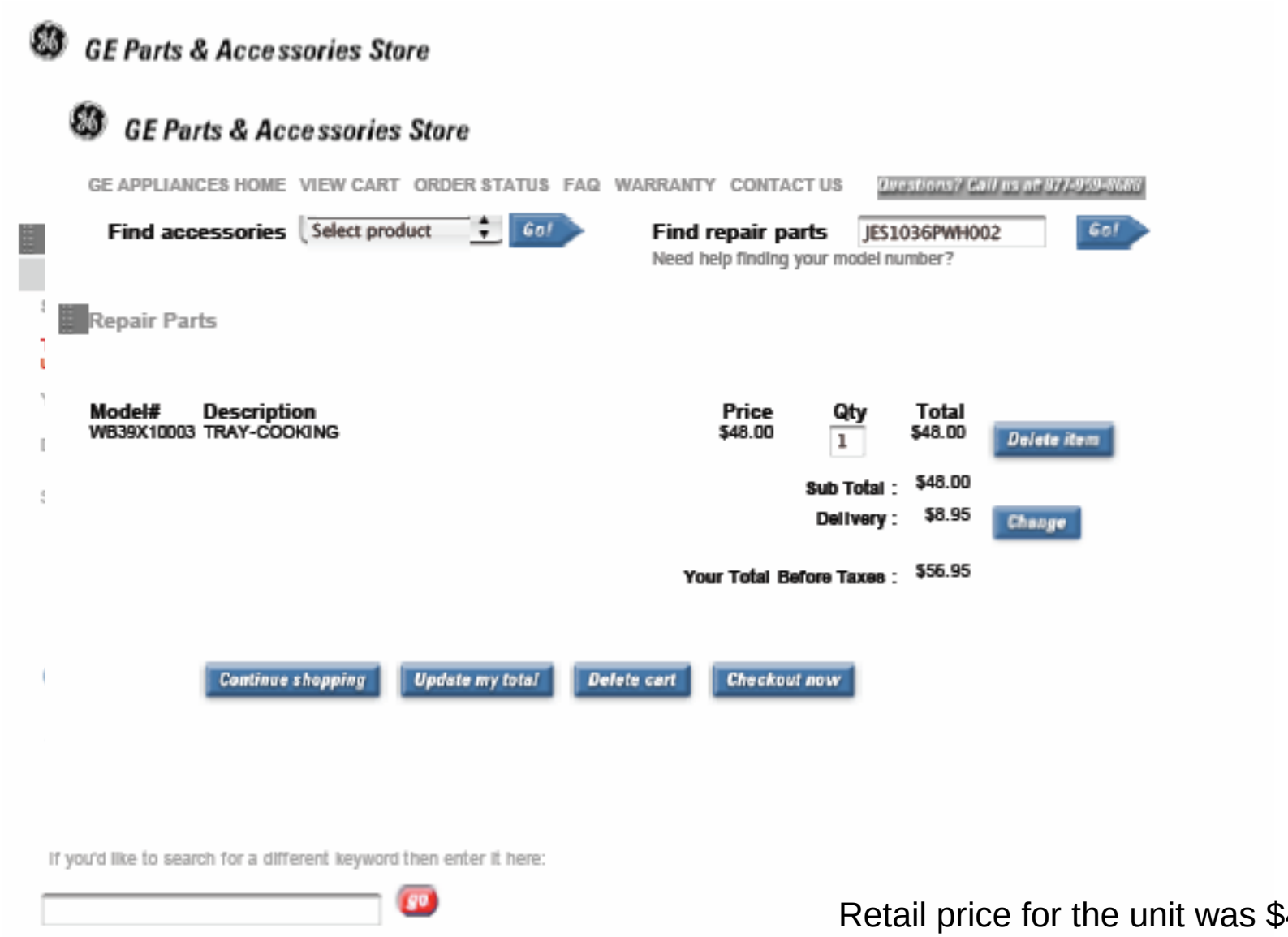


Oct 2004 IRS Accomplishment

- Unified five definitions of "child"
- Reduce 5 definitions to 1 for tax return preparations such as:
  - Dependent
  - Earned income tax credit
  - Child credit
- Different reasons, either it
  - "Was developed to carry out social policy objective(s), or
  - Someone perceived it was going to save revenue"
- "Is it easier for (customers) to understand and it is easier for IRS to audit and there a lots of things like that we can do"
- Initiative started in 1991 - it took **13** years including 2.5 years moving as legislation!

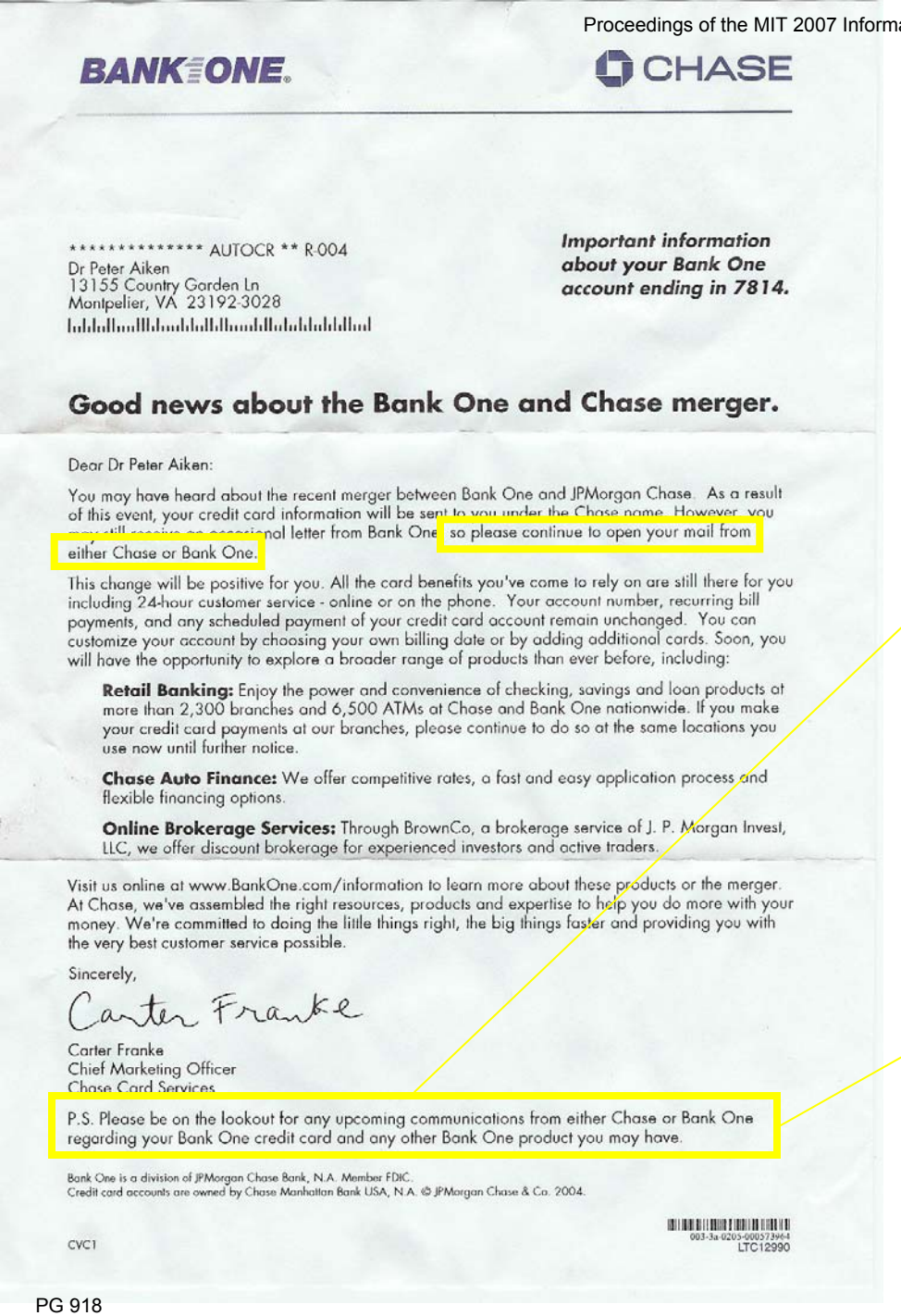
Source: Pamela F. Olson former Assistant Secretary for Tax Policy (quote from the Diane Rehm Show • 11/29/04 • http://www.wamu.org/programs/dr/04/11/29.php)

How to solve this data quality problem using just tools?



Retail price for the unit was $40

Letter from the Bank



BANK ONE. CHASE

********** AUTOCR ** R-004
Dr Peter Aiken
13155 Country Garden Ln
Montpelier, VA 23192-3028

Important information about your Bank One account ending in 7814.

Good news about the Bank One and Chase merger.

Dear Dr Peter Aiken:

You may have heard about the recent merger between Bank One and JPMorgan Chase. As a result of this event, your credit card information will be sent to you under the Chase name. However, you may still receive an occasional letter from Bank One so please continue to open your mail from either Chase or Bank One.

This change will be positive for you. All the card benefits you've come to rely on are still there for you including 24-hour customer service - online or on the phone. Your account number, recurring bill payments, and any scheduled payment of your credit card account remain unchanged. You can customize your account by choosing your own billing date or by adding additional cards. Soon, you will have the opportunity to explore a broader range of products than ever before, including:

Retail Banking: Enjoy the power and convenience of checking, savings and loan products at more than 2,300 branches and 6,500 ATMs at Chase and Bank One nationwide. If you make your credit card payments at our branches, please continue to do so at the same locations you use now until further notice.

Chase Auto Finance: We offer competitive rates, a fast and easy application process and flexible financing options.

Online Brokerage Services: Through BrownCo, a brokerage service of J. P. Morgan Invest, LLC, we offer discount brokerage for experienced investors and active traders.

Visit us online at www.BankOne.com/information to learn more about these products or the merger. At Chase, we've assembled the right resources, products and expertise to help you do more with your money. We're committed to doing the little things right, the big things faster and providing you with the very best customer service possible.

Sincerely,

Carter Franke

Carter Franke
Chief Marketing Officer
Chase Card Services

P.S. Please be on the lookout for any upcoming communications from either Chase or Bank One regarding your Bank One credit card and any other Bank One product you may have.

Bank One is a division of JPMorgan Chase Bank, N.A. Member FDIC.
Credit card accounts are owned by Chase Manhattan Bank USA, N.A. © JPMorgan Chase & Co. 2004.

CVC1

003-3a-0203-000573964
LTC12990

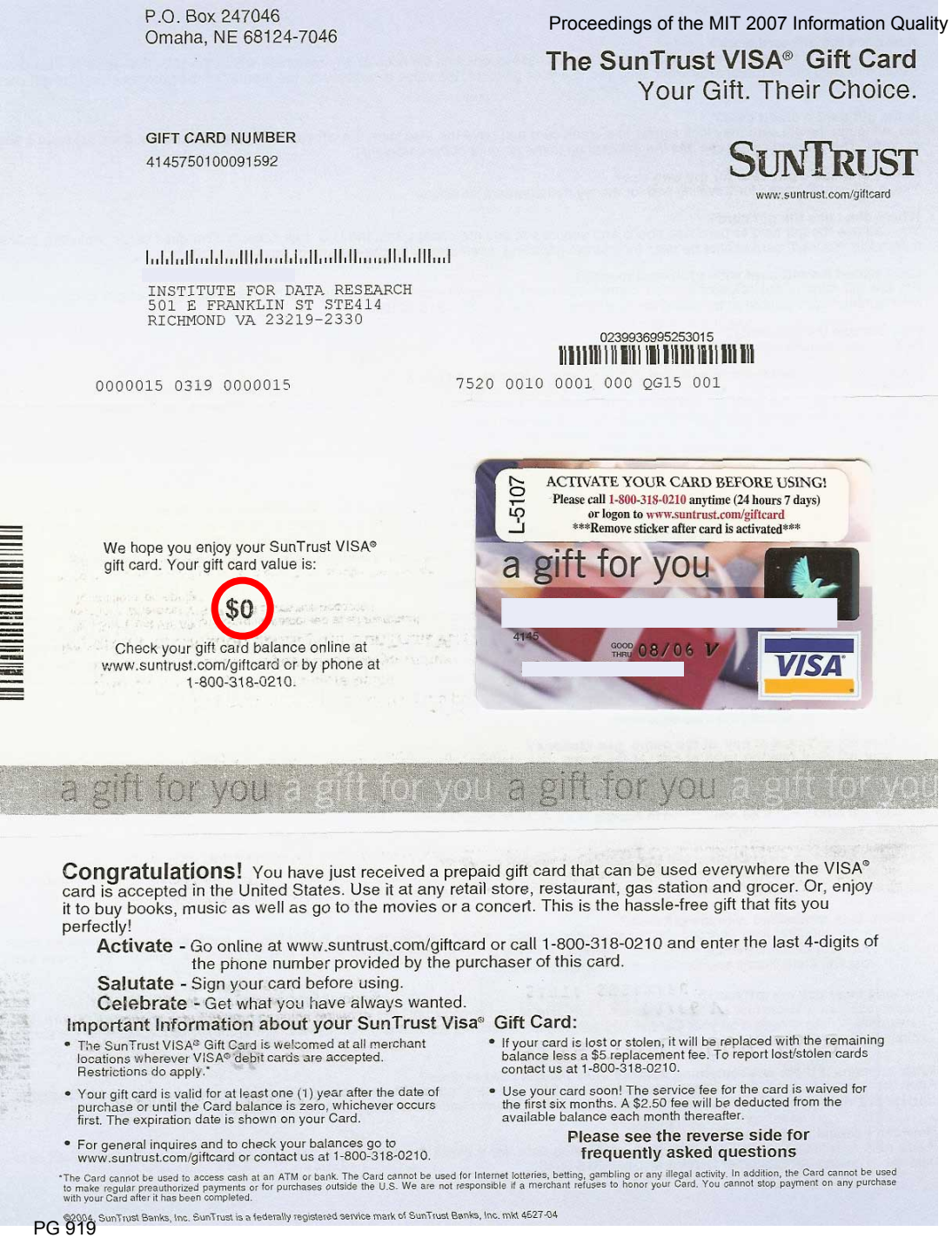
… so please continue to open your mail from either Chase or Bank One

P.S. Please be on the lookout for any upcoming communications from either Chase or Bank One regarding your Bank One credit card and any other Bank One product you may have.

Problems

- I initially discarded the letter!
- I became upset after reading it
- It proclaimed that Chase has data quality challenges

A congratulations letter from another bank



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a gift for you a gift for you a gift for you a gift for you

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Salutate - Sign your card before using.

Celebrate - Get what you have always wanted.

Important Information about your SunTrust Visa® Gift Card:

- The SunTrust VISA® Gift Card is welcomed at all merchant locations wherever VISA® debit cards are accepted. Restrictions do apply.*
- Your gift card is valid for at least one (1) year after the date of purchase or until the Card balance is zero, whichever occurs first. The expiration date is shown on your Card.
- For general inquires and to check your balances go to www.suntrust.com/giftcard or contact us at 1-800-318-0210.
- If your card is lost or stolen, it will be replaced with the remaining balance less a $5 replacement fee. To report lost/stolen cards contact us at 1-800-318-0210.
- Use your card soon! The service fee for the card is waived for the first six months. A $2.50 fee will be deducted from the available balance each month thereafter.

Please see the reverse side for frequently asked questions

*The Card cannot be used to access cash at an ATM or bank. The Card cannot be used for Internet lotteries, betting, gambling or any illegal activity. In addition, the Card cannot be used to make regular preauthorized payments or for purchases outside the U.S. We are not responsible if a merchant refuses to honor your Card. You cannot stop payment on any purchase with your Card after it has been completed.

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Problems

- Bank did not know it made an error
- Tools alone could not have prevented this error
- Lost confidence in the ability of the bank to manage customer funds

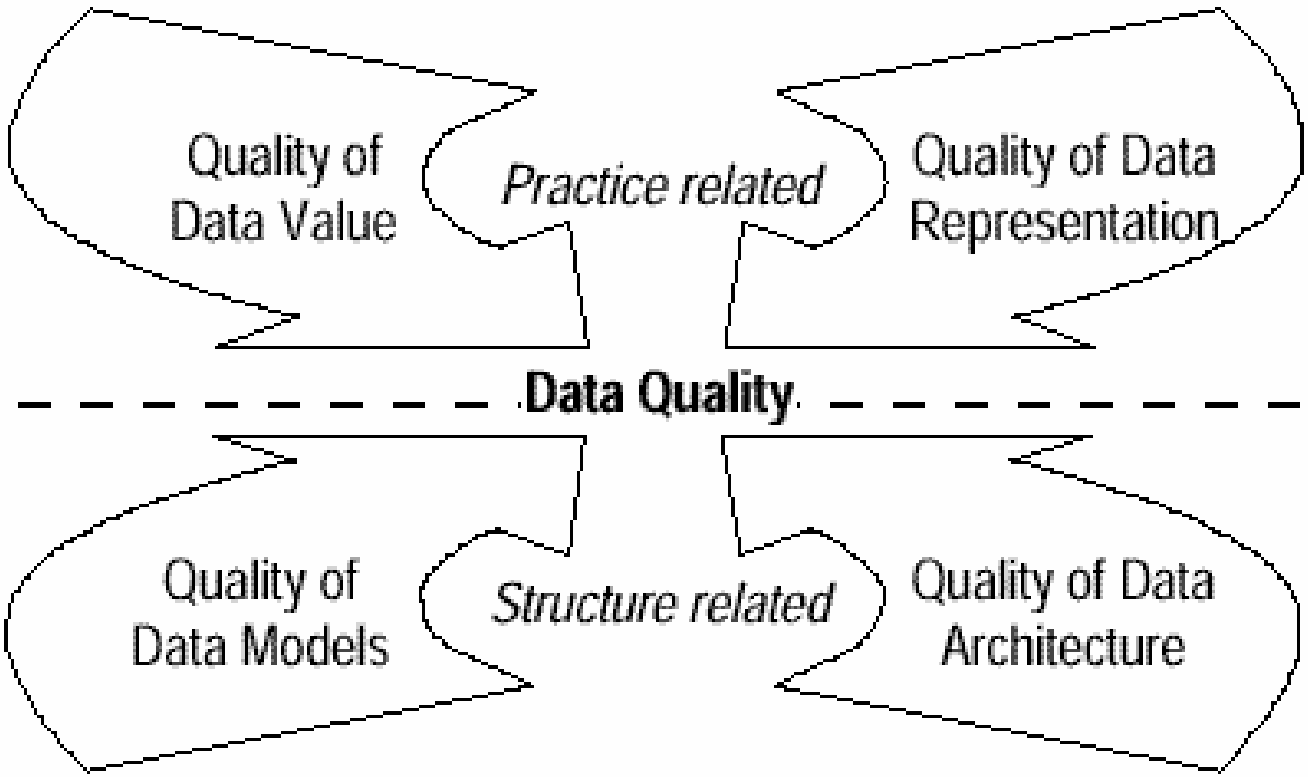
Perfect (adjective)

- Lacking nothing essential to the whole; complete of its nature or kind."
- Metadata quality goal is to be accurate and lacking nothing essential
- Lack of anything required to respond to the customer's request is considered imperfect.
- Imperfections are either practice-oriented or structure-oriented

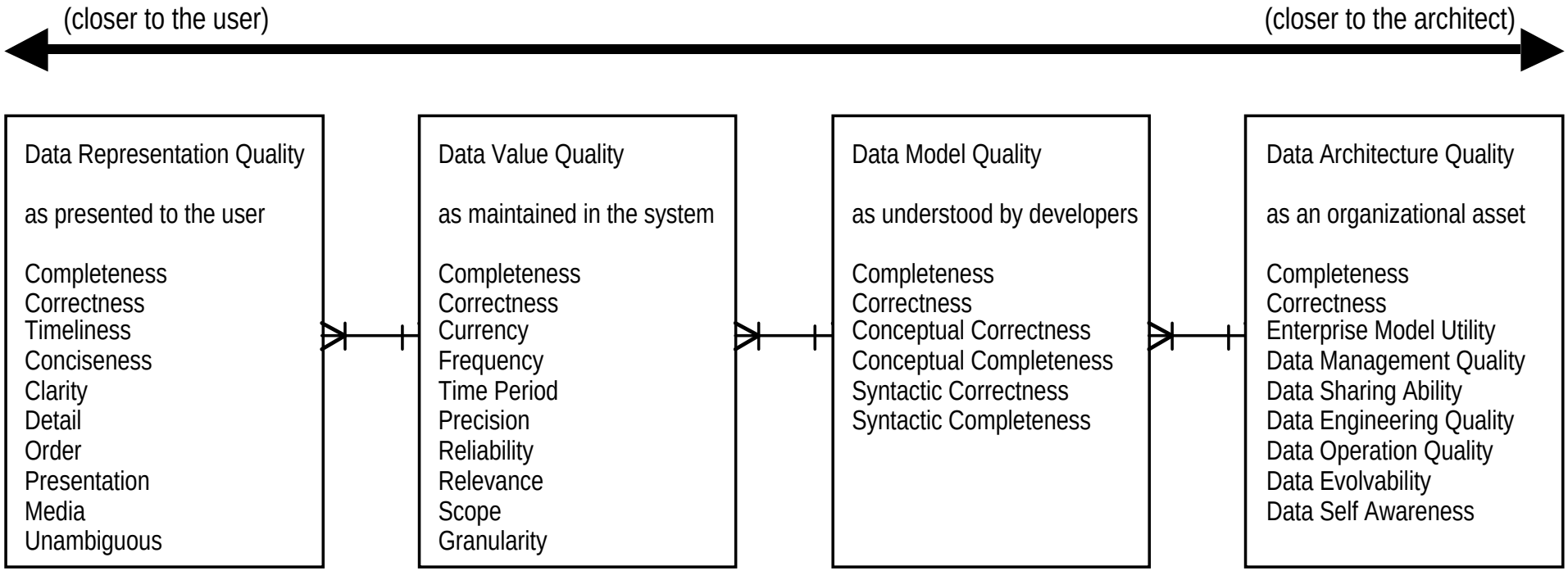
[American Heritage English Dictionary 1993]

Metadata Quality Dimensions

Figure 9-1
Refined dimensions of perfect Enterprise Portal data.



Quality Attributes



Traditional Quality Life Cycle

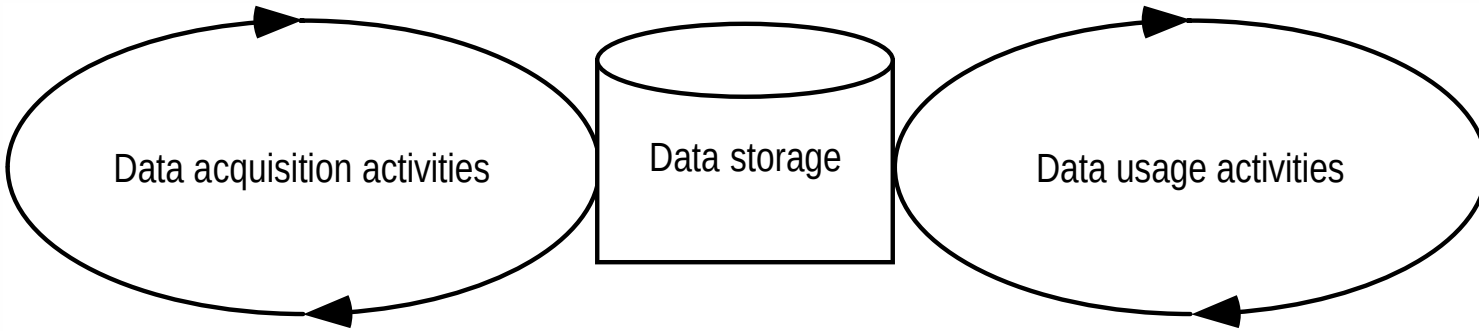
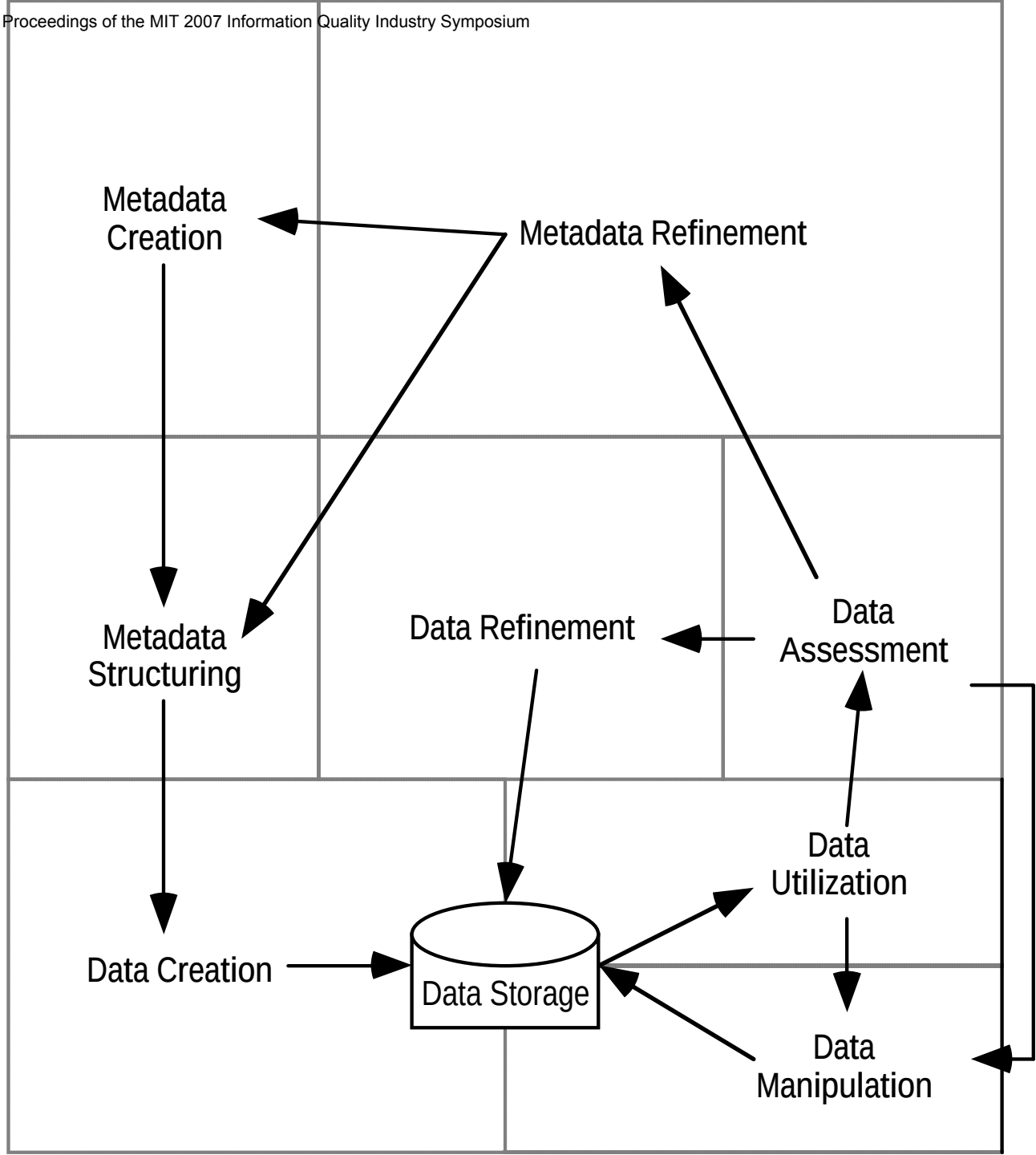


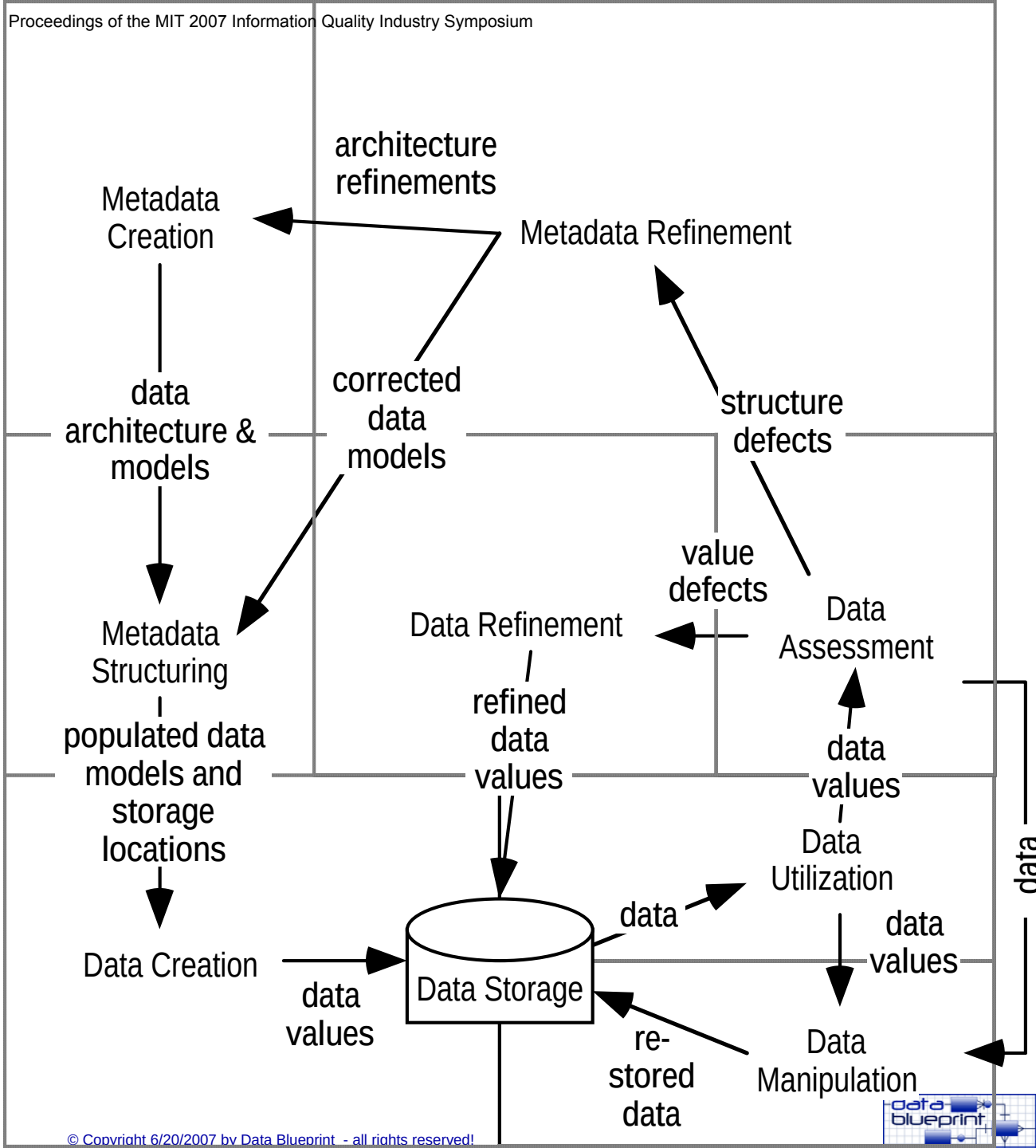
Figure 9-8
Levitan and Redman's Data Acquisition and Usage Cycles [Levitin and Redman 1993].

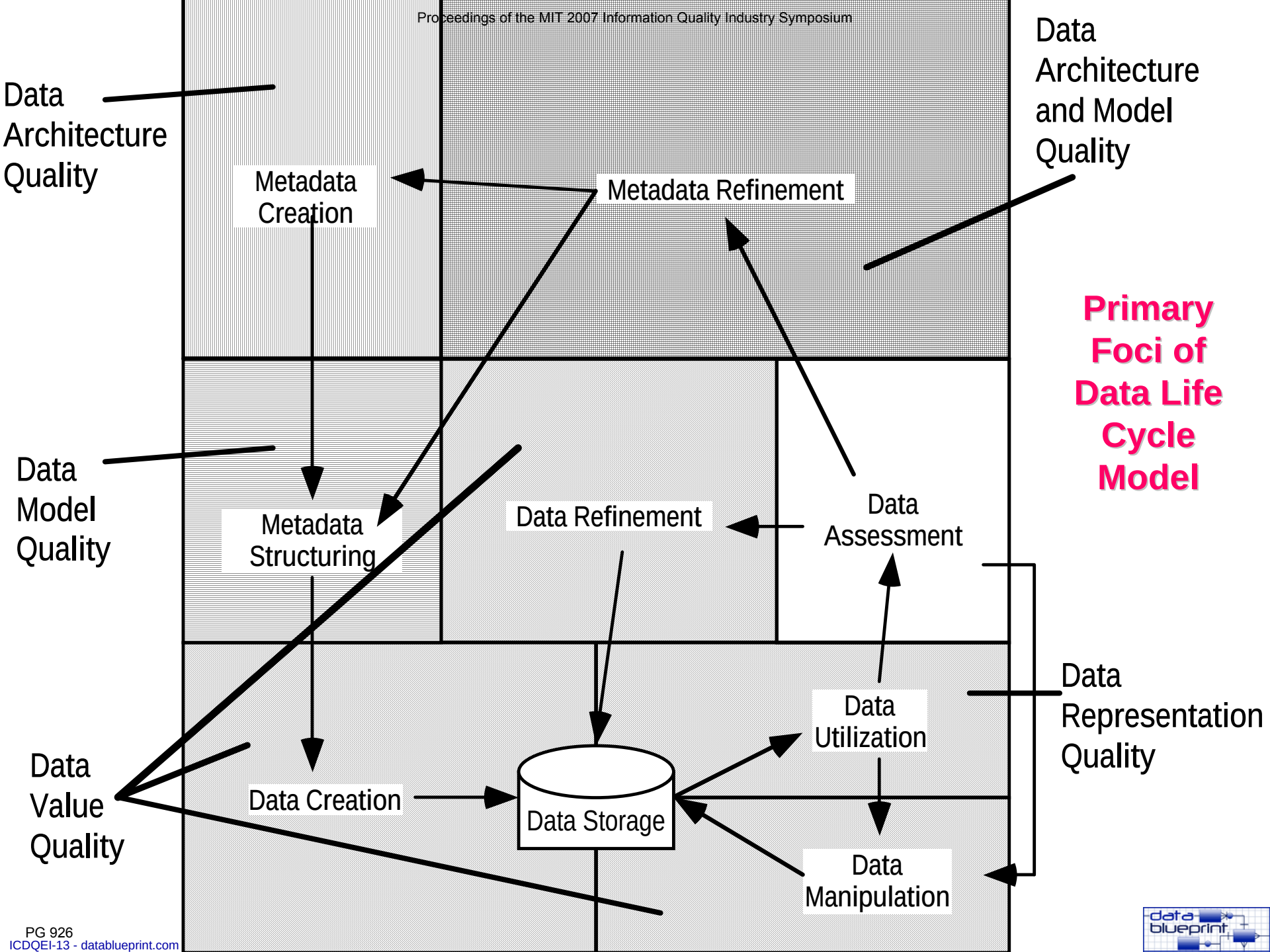
Data Life Cycle Model



Data Life Cycle Model

With inputs and outputs added




Data Architecture Quality
Metadata Creation
Metadata Refinement
Data Architecture and Model Quality
Primary Foci of Data Life Cycle Model
Data Model Quality
Metadata Structuring
Data Refinement
Data Assessment
Data Representation Quality
Data Utilization
Data Value Quality
Data Creation
Data Storage
Data Manipulation

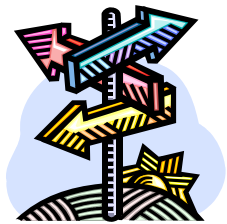
What is DM3?

- Data Management Maturity Measurement
- You are currently managing your data,
  - But, If you can't measure it,
  - How can you manage it effectively?
- How do you know where to put time, money, and energy so that data management best supports the business?

- DM3 is an adaptation of the SEI-CMM® to the discipline of Data Management

Carnegie Mellon Software Engineering Institute

- An assessment of the relative development of organizational data management practices using a CMM framework



SEI CMMI Capability Maturity Model Levels

"Self" Improving

Unsustainable

Unpredictable

Inconsistent

Out of control

Optimizing
(5)

We have a process for **improving** our DM capabilities

Managed
(4)

We **manage** our DM processes so that the whole organization can follow our standard DM guidance

Defined
(3)

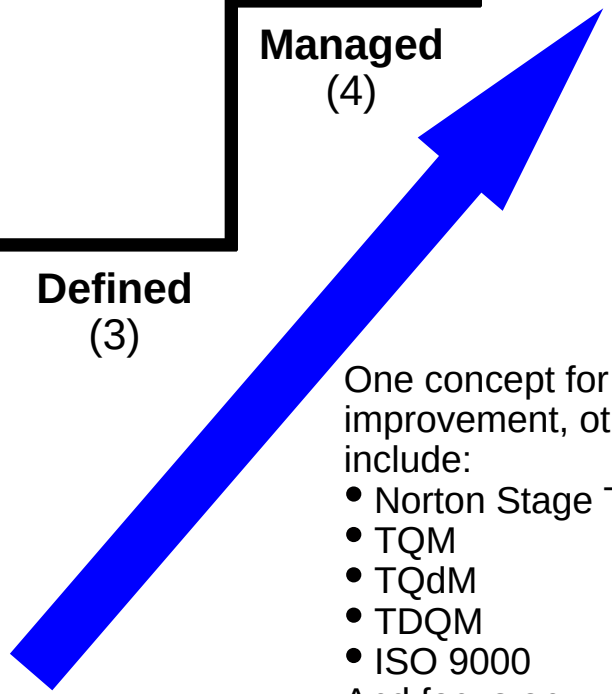
We have experience that we have **standardized** so that all in the organization can follow it

Repeatable
(2)

We have DM experience and have the ability to implement **disciplined** processes

Initial
(1)

Our DM practices are **ad hoc**

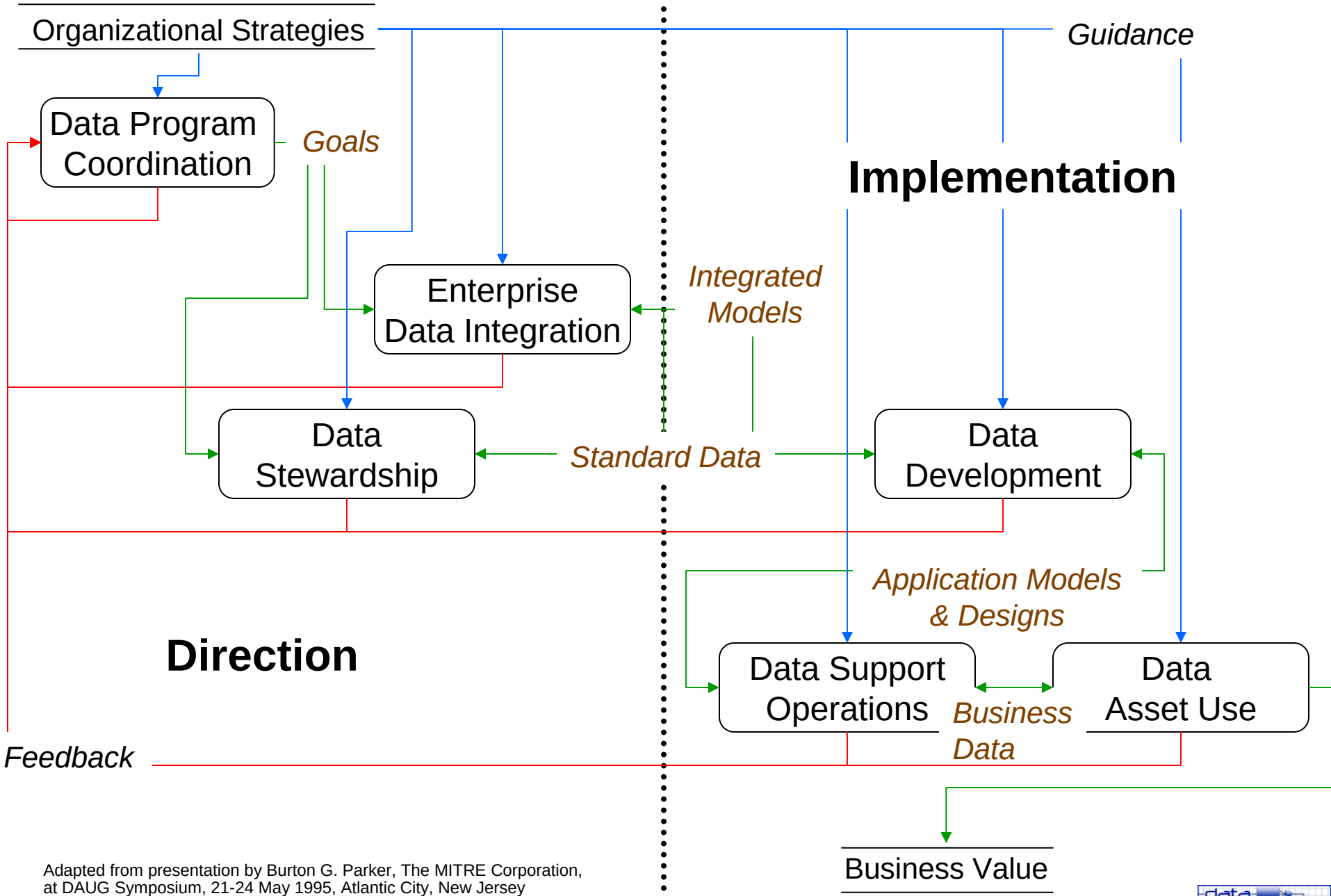


One concept for process improvement, others include:

- Norton Stage Theory
- TQM
- TQdM
- TDQM
- ISO 9000

And focus on understanding current processes and determining where improvements can be made.

Enterprise DM Functions and their Inter-relationships



Adapted from presentation by Burton G. Parker, The MITRE Corporation, at DAUG Symposium, 21-24 May 1995, Atlantic City, New Jersey

After more than a decade …

Question	How many software practices (surveyed) are above level 1 on the CMM?
Answer	By far most organizations surveyed are producing software using informal processes
Question	How many organizations have demonstrated at least some proficiency according to the DM3? (i.e., scored above level 1)
Answer	One in ten organizations has scored above level 1 in the DM3 according to our surveys

Phase	Problem at Hand	Approach	Benefits
Initial Test	SAMMS stored data in free-text fields.	Evaluated automation of data extraction from free text fields for one DLA Supply Center for Option B.	Documented Data Audit Business Case that outlined potential feasibility and savings.
I		Extract text data from Option B and retrieve associated data from other data sources for one Supply Center.	Substantial time and monetary savings as a result of Data Quality Audit versus a complete manual approach.
II		Audit extracted textd ata against defined quality standards for one Supply Center for Options B and E.	A repeatable process was created for extracting data out of free text fields. Documented results of Business Case.
III	Initial Test - Phase II was only implemented at Richmond Supply Center.	Expanded Phase II to all Centers and added business rules to harmonize differences between Centers.	Successfully provided cyclic audit results and expanded Initial Benefits DLA-wide.
IV	Required method to ensure that production data remained clean.	Provided web-based data cleansing environment to correct non-textual fields and continue data auditing.	Post-audit data remained clean; knowledge worker-friendly web-based front-end enforced business and data quality rules.
V	Needed to address other textual Options and lack of a real-time Data Audits.	Updated web application for all Options and a pseudo-real time feature to conduct Data Audit.	Fulfilled desired Data Quality objective for business process and technology with a terminal interface.

Sample Free Text

1	Manufacturer Accel Systems
2	CAGEC 44910
3	Aircraft frame aluminum MIL-STD-339184
4	P/N 33919340-44491
5	SEE ALSO REF 331018

**Manufacturer Accel Systems
CAGEC 44910
P/N 33919340-44491
SEE ALSO REF 331018**

Sample Free Text (cont'd.)

Manufacturer Accel Systems
CAGEC 44910
P/N 33919340-44491
SEE ALSO REF 331018

NSN	CAGE	PART
1234567890123	44910	33919340-44491

- Data here is extractable – we can tell by looking at the metadata markers
- These two fields naturally go together by order

Three Categories of Data

- Extractable Data
  - The markers are found, and the data is pulled.
- Ignoreable Data
  - There is no data in the field, and we can prove it.
- Unextractable Data
  - We cannot be sure if there is or is not data.

Solution Goals

- Maximize the extracted.
  - These are where the actual results come from
  - The more accurate the approach, the bigger this set.
- Maximize the ignored.
  - Size the problem. Which records are not worth worrying about?
  - This set may have its own set of interesting characteristics
- Minimize the unextractable.
  - These records ultimately must be addressed manually
  - Only the most unpredictable in this category

	Unmatched	Unmatched Items	Ignoreable	Ignoreable Items		Avg Extracted	Items Matched	
Rev#	Items	(% Total)	NSNs	(% Total)	Items Matched	Per Item	(% Total)	Items Extracted
1	329948	31.47%	14034	1.34%	N/A	N/A	N/A	264703
2	222474	21.22%	73069	6.97%	N/A	N/A	N/A	286675
3	216552	20.66%	78520	7.49%	N/A	N/A	N/A	287196
4	340514	32.48%	125708	11.99%	582101	1.100022161	55.53%	640324
...	...	...	...	...	...	...	...	...
14	94542	9.02%	237113	22.62%	716668	1.114291415	68.36%	798577
15	94929	9.06%	237118	22.62%	716276	1.113928151	68.33%	797880
16	99890	9.53%	237128	22.62%	711305	1.11530075	67.85%	793319
17	99591	9.50%	237128	22.62%	711604	1.115439205	67.88%	793751
18	78213	7.46%	237130	22.62%	732980	1.207281236	69.92%	884913

An Iterative Process…

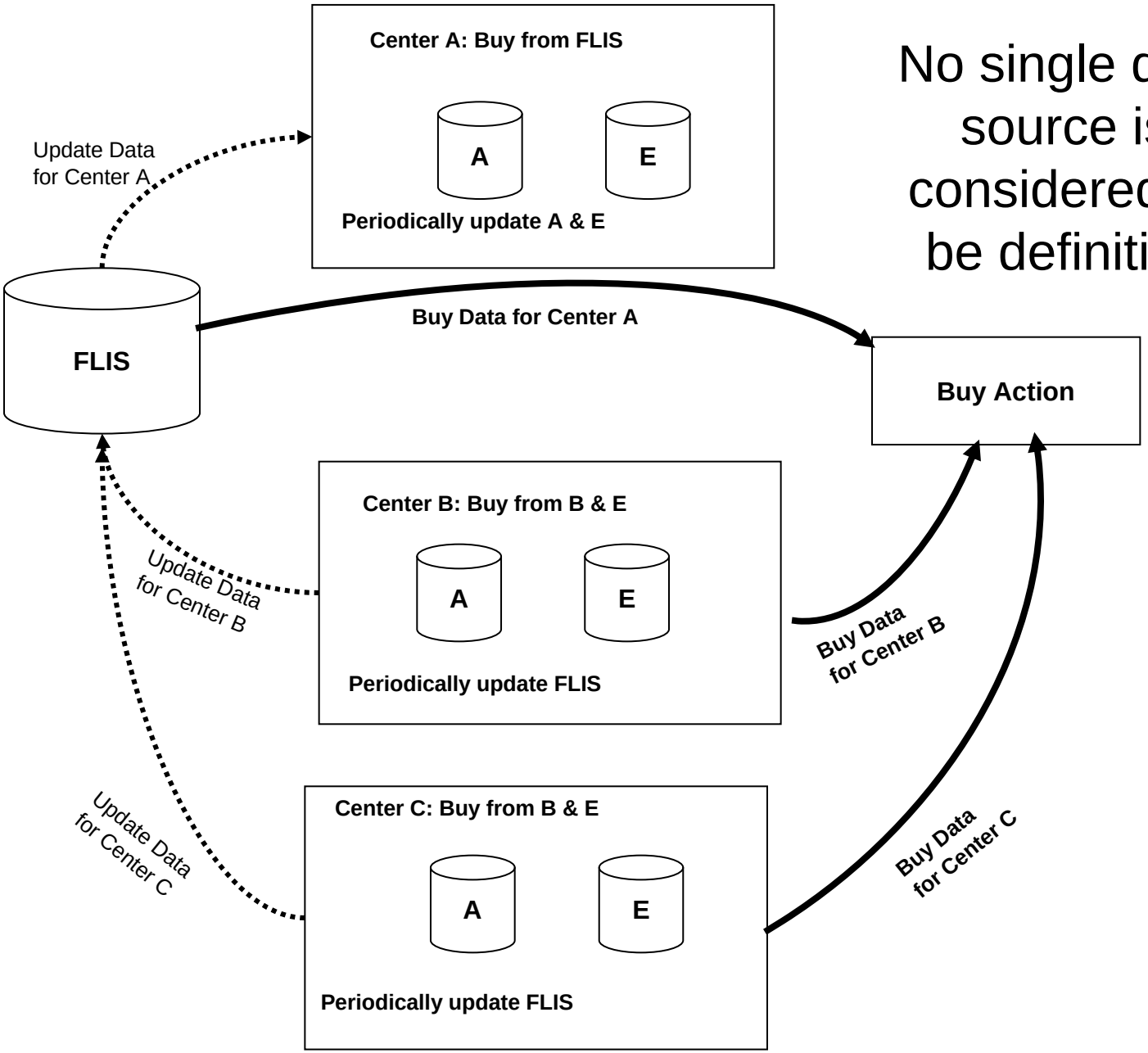
Efficiencies

- 1,000,000 items were run, comprising over 6,000,000 lines of text.
- About 70% had all data extracted.
- About 23% provably had no data.
- The remaining 7% could not be handled.
- The scope of the manual effort was reduced from 1,000,000 records to 70,000

Savings

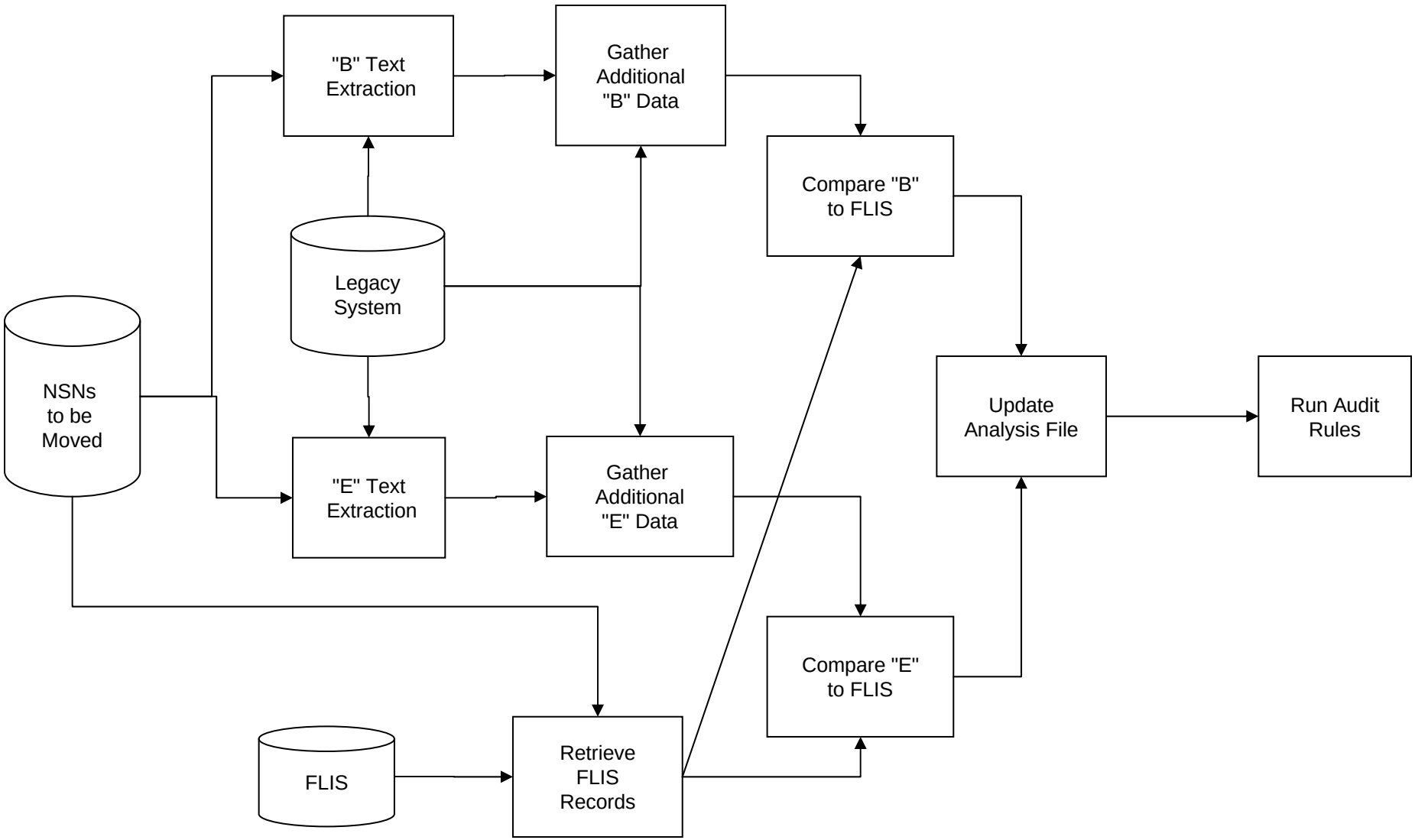
- Average manual rate was 5,000 recs/person/month. This varies by person and by data.
- Problem size was 1,000,000 records.
- On this project, automated savings amounted to 12.75 person years.
- With FTE costs of $60,000+/year, this is over $750,000 in savings.

DLA Information Coordination

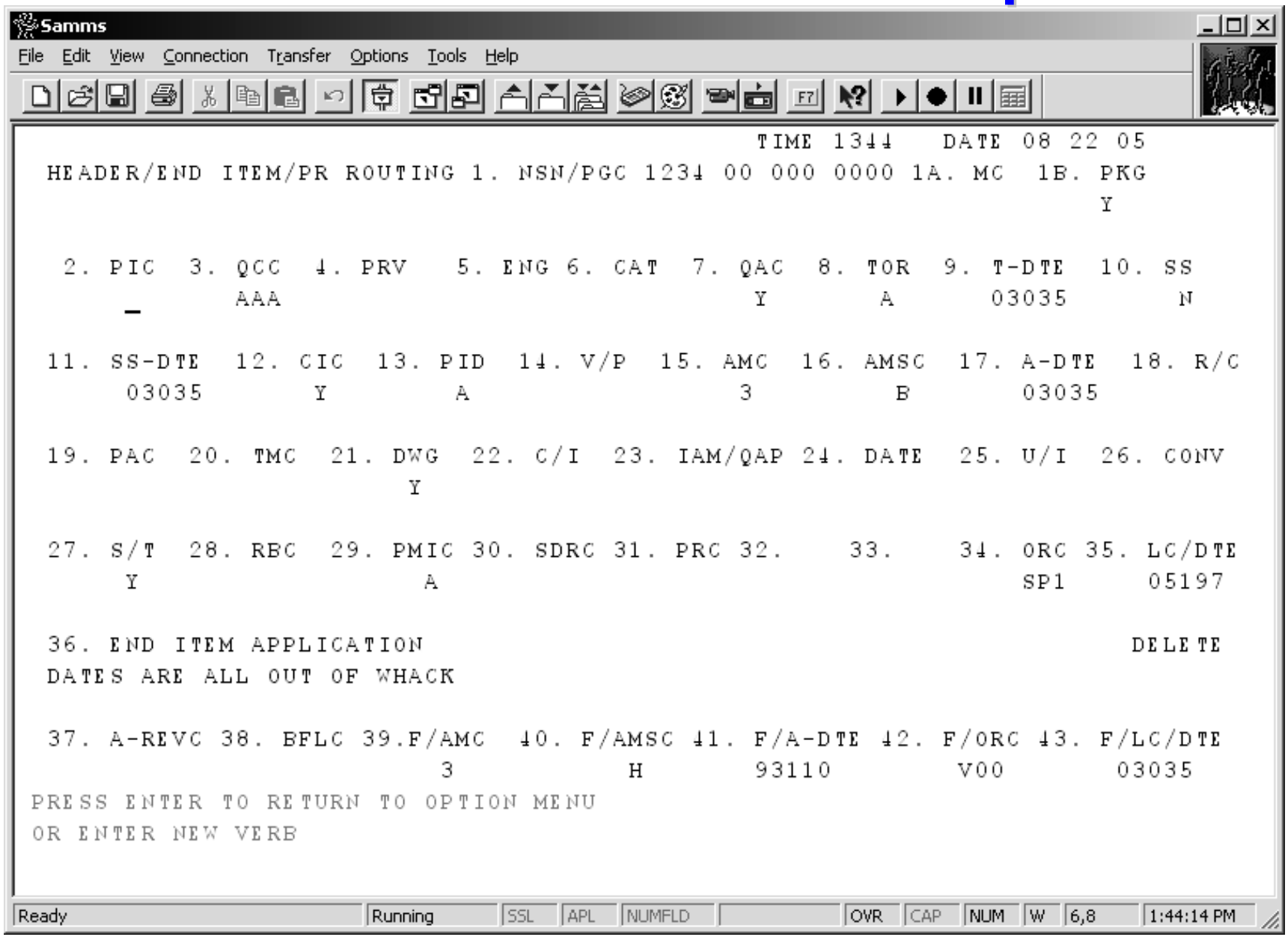


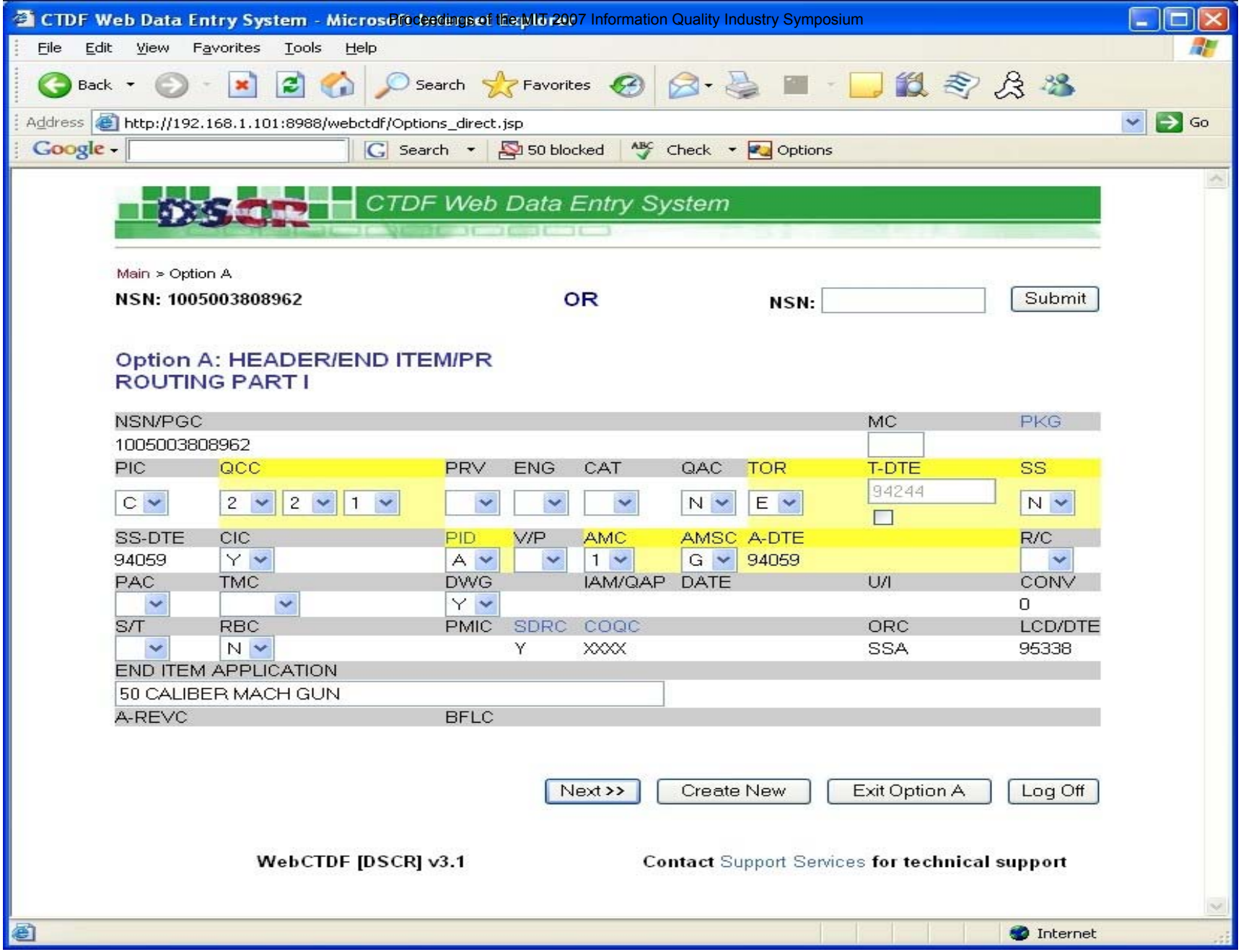
No single data source is considered to be definitive

Sample Analysis Audit Flow



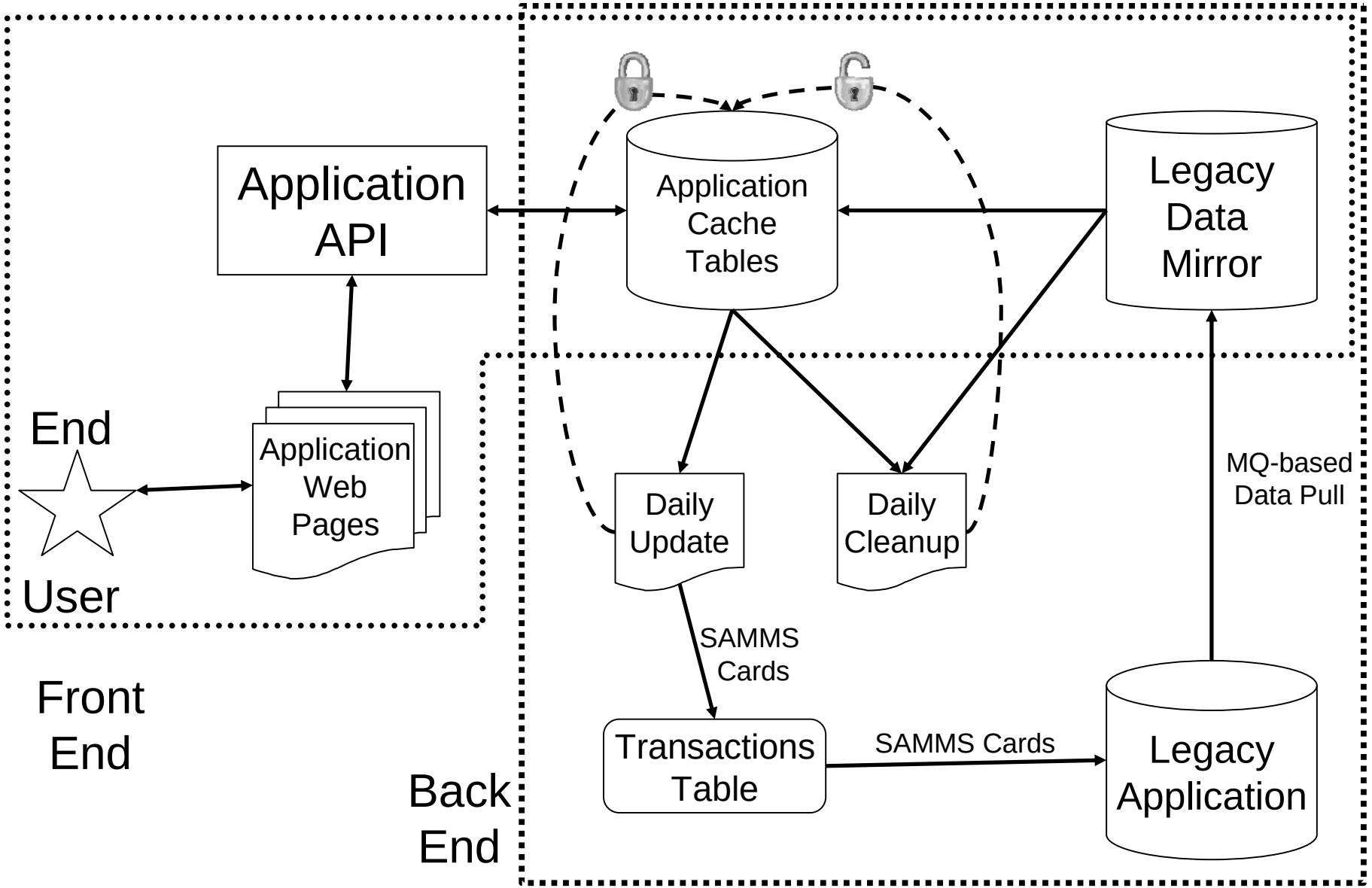
SAMMS Terminal Interface Option A





Corresponding Web-based Front-end

WebCTDF Architecture



Quantitative Benefits

Time needed to review all NSNs once over the life of the project:	
NSNs	2,000,000
Average time to review & cleanse (in minutes)	5
Total Time (in minutes)	10,000,000

Time available per resource over a one year period of time:	
Work weeks in a year	48
Work days in a week	5
Work hours in a day	7.5
Work minutes in a day	450
Total Work minutes/year	108,000

Person years required to cleanse each NSN once prior to migration:	
Minutes needed	10,000,000
Minutes available person/year	108,000
Total Person-Years	92.6

Resource Cost to cleanse NSN's prior to migration:	
Avg Salary for SME year (not including overhead)	$60,000.00
Projected Years Required to Cleanse/Total DLA Person Year Saved	93
Total Cost to Cleanse/Total DLA Savings to Cleanse NSN's:	**$5.5 million**