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Challenges of having a huge volume of marginal data & Strategies to create a win-win situation

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USIIS Background

- Utah Statewide Immunization Information System (USIIS), since 1999
- Developed, maintained and supported by the Utah Department of Health (UDOH)
- Provider participation rate
  - Public 100%
  - Private 80 %
  - Pharmacy 100%
- EHR-USIIS interfaces
  - 39 HL7 interfaces
  - 11 ASCII interfaces
  - 736 facilities

Have you ever faced the day feeling like this?

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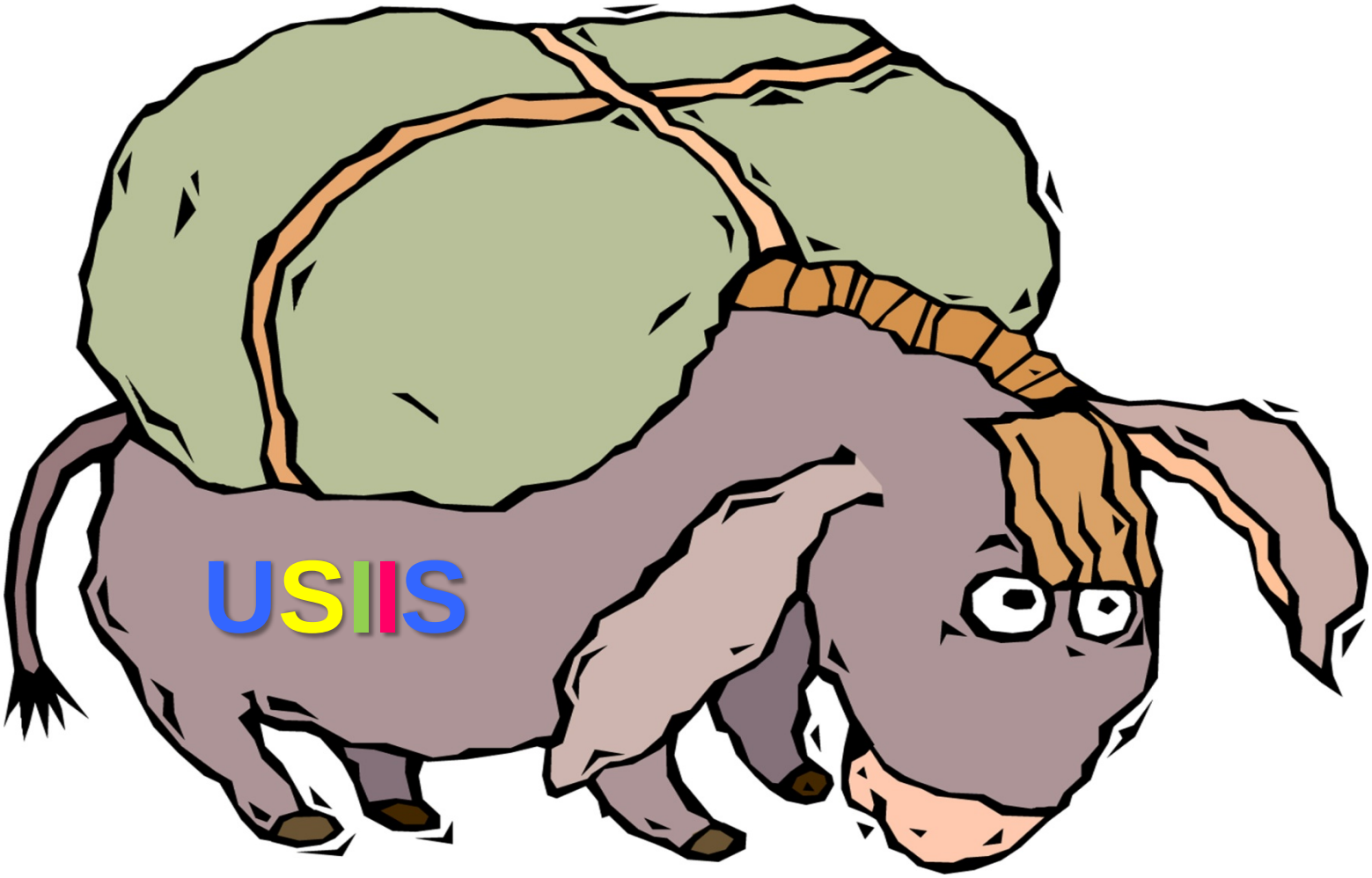

What was happening to USIIS 2014 - 2015

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1. Increasing possible duplicate records.

2. Increasing customer support calls reporting missing patients, missing vaccines and duplicate records.

3. Declining system performance.

4. Increasing data storage costs.

Evaluation of what was happening

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Two big problems

Problem 1

Volume of data from an ADT interface with Intermountain Healthcare (IHC) was causing the USIIS database to grow.

Problem 2

USIIS database design and record processing had not been reengineered since its inception.

Problem 1 background: customer relationship

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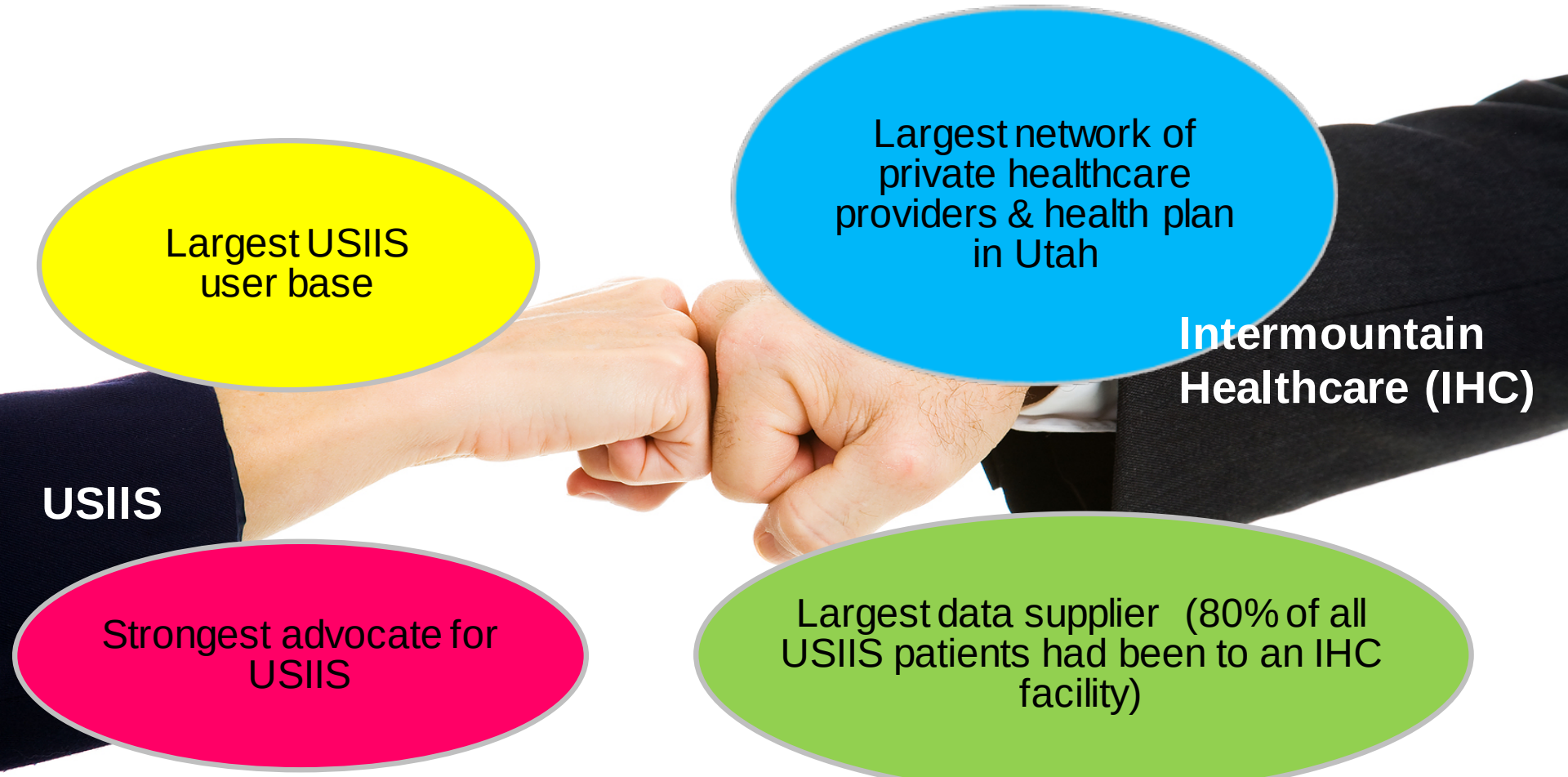

Problem 1: USIIS accommodation for IHC

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- USIIS integrated into IHC proprietary EHR system
- IHC ADT interface (Admissions, Discharges, Transfers)
  - ADT message is sent to USIIS during patient registration at an IHC facility.
  - Patient record is in USIIS when patient is routed to treatment area.
- Scale
  - ADT messages sent for all patient registrations throughout the state for all ages and visit purposes.
  - ADT messages sent from 22 hospitals, 22 pharmacies and 423 clinics.
  - IHC submitted an average of 50,000 ADT messages per day.

Problem 1: impact of IHC accommodation

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- IHC ADT data tend to be sparse and lack important data elements USIIS uses to match and merge records.
  - Rapid increase of possible duplicate records.
    - 80% were from IHC ADT interface
  - The number of USIIS patients increased to substantially more than the US census Utah population estimate.

- Most IHC (ADT) patient records were never updated with immunizations.
  - 84% of USIIS records were created from the IHC ADT interface—half maintained with no immunizations.

Problem 2 background: legacy USIIS design

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- Possible duplicate database tables
  - Designed to prevent duplicates from getting into main database tables.
    - Incoming records similar to an existing record but determined not close enough for automated merge.
    - Required manual resolution.
  - Designed when USIIS participation by providers—and data volume, was low.
  - Designed when manual resolution could keep up.

- The possible duplicate database tables were maintained separate from main database tables from which customers located their patient records.

Problem 2: legacy operational practices

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- When USIIS was originally designed it was not in a position to be choosy about data.
  - USIIS kept data that satisfied loose minimal requirements.

- Manual de-duplication had to be done in two places—in the possible duplicate tables and in the main database tables.

Problem 2: impact of legacy design

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- Long before the possible duplicate tables reached a million records, human review was infeasible.
- With data in separate database tables—one waiting for manual resolution, immunizations were increasingly split.
  - Immunization forecasts and reports viewed by providers were missing immunizations held in the possible duplicate tables.
- 80% of possible duplicate records did not have immunizations.
  - Most of the remaining records existed in the main USIIS database tables—requiring manual merging in order to be seen by providers.

Problem 1 meets Problem 2

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- Growing volume of data in the possible duplicate database tables—largely due to the IHC ADT interface, caused:
  - Declining system performance.
  - Data storage costs soared to over $17,000 per month.

Problems 1 and 2: impact on USIIS customers

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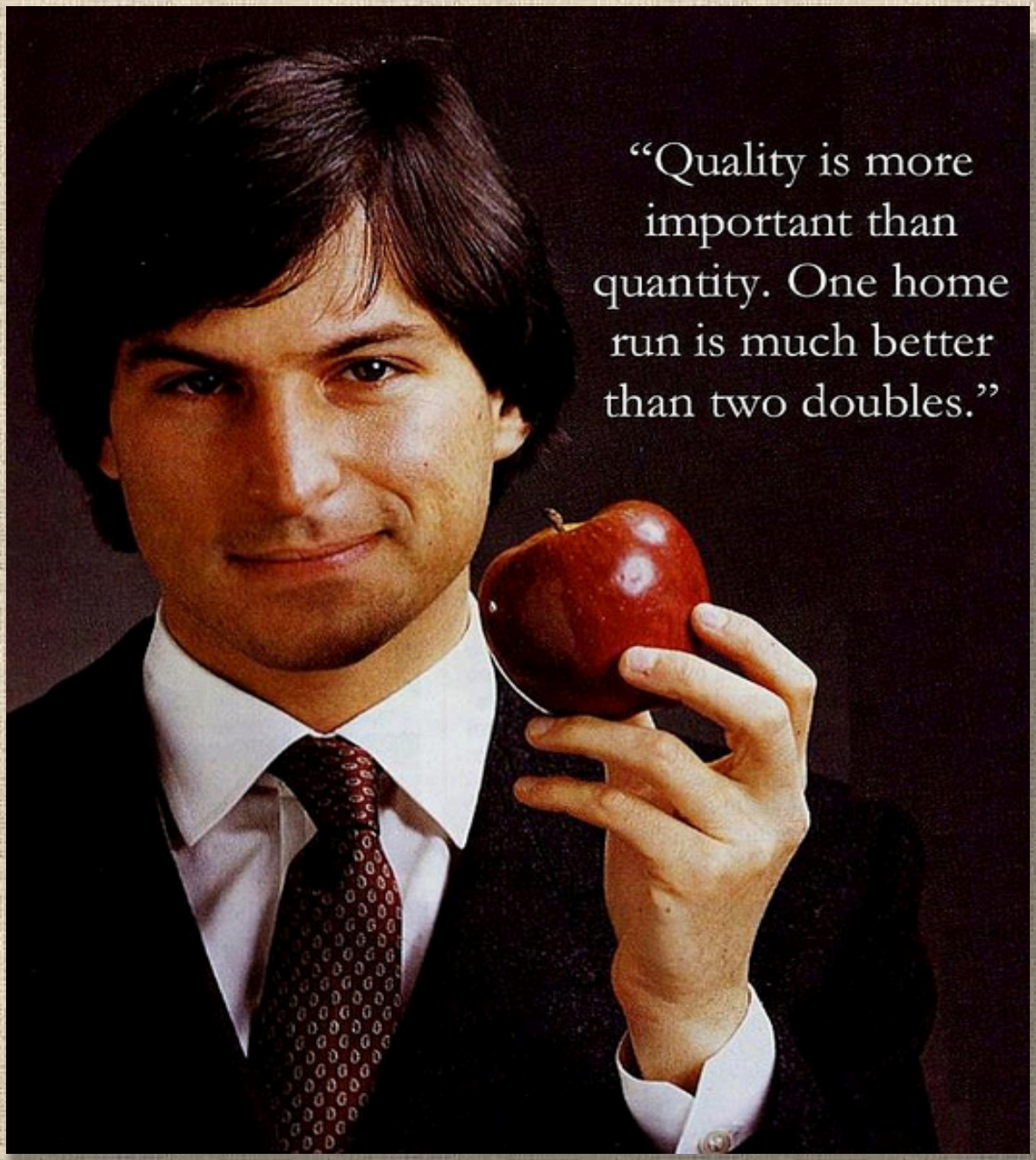
- Users calling Help Desk to report

"I know I entered them yesterday, but I cannot find my patients!"

"Shots I entered are not on the forecast!"

"I see two records for a patient. One has no shots!"


"Quality is more important than quantity. One home run is much better than two doubles."

USIIS decided to act on those two principles

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- Quality is more important than quantity
  - Storing useless data is a waste of space.
- One home run is better than two doubles
  - Create a win-win situation for IHC and USIIS.

Solution: win-win parameters

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- USIIS Win
  - Reduce the growing number of possible duplicate records
  - Improve system performance
  - Reduce storage costs
  - Reduce the number of Help Desk calls
  - Increase customer satisfaction
- IHC Win
  - Continue to employ workflow using EHR-USIIS integration
  - Continue to utilize ADT interface to accommodate workflow
- Bonus: all customers win
  - Patients and immunizations visible on forecast and reports.
  - Fewer Help Desk calls required.

Solution, problem 1: reengineer USIIS

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- Eliminated possible duplicate database tables.
  - Deleted 46% of records, age 19 and older with no immunizations.
  - Merged 39% with records in the main database table.
  - Inserted 15% as new records in the main database table.

- Modified USIIS record processing to load main database tables only.

Solution, problem 2: reengineer processing of IHC ADT data

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- Deleted IHC patient records created by the ADT interface for which no immunizations had been added.
  - Deleted such records for patients older than 14.
  - Maintained non-immunization records of patients 14 and younger.
- Modified processing for incoming IHC ADT records
  - Deleted after 2 days if no immunizations added.

Solution, problem 1 and 2: data storage

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- Database maintenance
  - Deleted tables related to possible duplicate records.
  - Moved tables related to interface logging to a different, less expensive database management system.
- Data practices
  - Modified database querying practices.
    - Create “views” not “temporary tables.”
  - Reduced detailed interface logs to maintain a 1-month history.
    - Maintain detailed error logs longer.

Impact of solutions

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- Database hosting charges reduced from $17,000/month to $5,000/month—70% cost savings.
- Total USIIS patient records reduced to a number much closer to Census prediction.
- Help Desk tickets requesting manual record resolution dropped 80%.
- System performance improved.

Overall results: we all won

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USIIS

Intermountain Healthcare

All USIIS users

Transformed!

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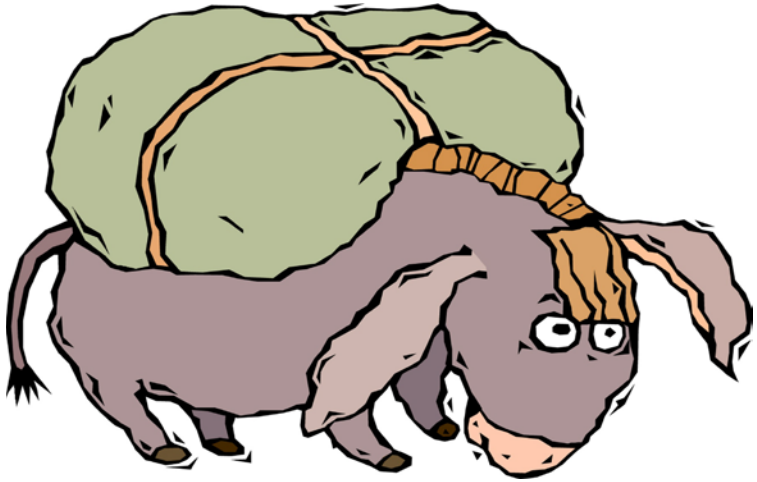

Lessons learned & Future plans

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- When customers are frustrated, there is something wrong with your practices.
- Question and re-evaluate traditional design and procedures.
- Money not wasted can be applied to other innovations.
- Conduct periodic investigation of data characteristics to identify issues to address.
- Continue to improve patient matching algorithm—at least one enhancement per year.

Thank you! Questions?

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