Information Quality Research from the Healthcare Perspective

ABSTRACT

IQ researchers have been engaged in investigating causes and solutions to IQ-Problems in a holistic way for the past two decades. This presentation provides a contemporary survey of IQ-research intended to give clinicians an overview of IQ methodologies and trends. IQ-assessment is discussed in some detail to account for types of IQ-problems, dimensions, and methods. IQ-management and impact on decision making are examined. Structured and unstructured information characteristics and methods are explored.

All statistics and examples used relate to healthcare while best- and existing-practices are compared and contrasted. The aim of this presentation is to stimulate inquiry among healthcare practitioners, and to incite adoption of IQ-initiatives to add value to their efforts.

BIOGRAPHY

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Marilou Haines, president of Alamo Software Inc. and its new division AlamoIQ, received her M.B.A. and M.S. in Information Quality from the University of Arkansas at Little Rock. She is currently a PhD candidate of Applied Sciences with emphasis on Information Quality. Alamo Software, Inc. supplies business custom software to US franchises and AlamoIQ provides consultancy and software services related to Information Quality.

Information Quality Research

from the Healthcare point of view

by
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Agenda

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Introduction

Information Quality Research seeks to investigate causes of IQ problems and their solutions.

- In healthcare, patients risk being harmed beyond their existing problems. The number of errors attributed to Information Quality is well documented:
  - More people die yearly as a result of medical errors than from car accidents, breast cancer, or AIDS.
  - Medication related errors are frequent (one out of 100 admissions) resulting in in an average increased cost of $4,700 per admission.
  - IOM reports that medical errors cost the nation $37.6 billion each year; $17 billion are associated with preventable errors.
  - Yearly lost productivity in the healthcare industry accounts for $9 billion and nearly $2 billion in hospital costs

Source: Berry L. (2008) Management lessons from Mayo Clinic. McGraw Hill, New York
Source: Institute of Medicine To Err is Human – Building a Safer Health System
Source: Prathibha V. (2007) Basics of Quality Improvement in Health Care. Mayo Clinic Proceeds

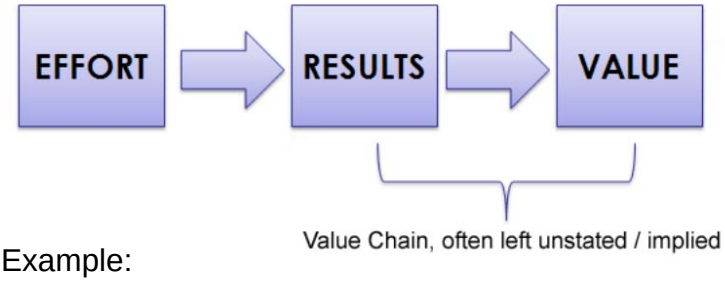
Challenges in the Healthcare Industry

- In the US reimbursements are based upon costs and not upon efficiency or success in outcomes. Therefore, efficient services, generally yielding lower reimbursements, are practically discouraged.
- Healthcare is a highly complex labor- and skill-intensive service organization. Most physicians, however, rely primarily on paper tools, memory, and other traditional methods.
- Financial Short-term orientation presses management against higher quality initiatives which require long-term planning
- Failure to adequately invest in Information Technologies
  - Healthcare investment in technology is 3.5% -4.5% while most other industries invest close to 10% annually.
- Strong resistance to performance metrics due to non-conformity of processes, regional differences, and fear of litigation.

Information Quality Objectives

1. Maximize the **value** of an organization's information assets.
   Value = degree to which goods, services, or other benefits exceed required investment
2. Assuring that the information products produced meet the needs and expectations of information consumers

Don't Confuse Results with VALUE!



Example:
Effort: Standardization from twelve different prosthetic implants to two for any one clinical indication.
Results: No compromise in patient outcomes.
Value: Within two years, the net operating income went from negative to $8 million at the Rochester practice alone.

Source: Management Lessons from Mayo Clinic, Page 224

Healthcare vs. Best Practices

Healthcare	Manufacturing	Healthcare Best Practices
Survey of 3,000 hospitals reports that only 1.5% of nonfederal US hospitals use a comprehensive EHR system; only about 8% use a basic EHR in at least one unit. Source: New England Journal of Medicine, March 25 2009 online version.	GE invested $450 million to achieve $2 billion savings Source: Arthur Jay (2004) *Six Sigma Simplified*	Mayo Clinic: In the 1990s the migration from paper to EMR began. Today, the EMR is instantly available throughout Mayo System once information is posted.
Healthcare error rate is approx. 6,210 errors per million or .62% (3.8 sigma). For some treatment activities as high as 1% Source: Trusko Brett (2007) *Improving Healthcare Quality and Cost with Six Sigma*	**Manufacturing error rate is approx. 3.4 errors per million for all processes or 99.9997% ERROR FREE** Source: Trusko Brett (2007) *Improving Healthcare Quality and Cost with Six Sigma*	**Introduction of IQ initiatives to healthcare.** Charleston Medical Center **reduced** infection rate of colon and vascular site infections **by 91%** (2.86 sigma). Annual savings in excess of $1 million Source: Basics of Quality Improvement in Health Care. Mayo Clinic Proceeds. Page 737

IQ-Research Method

Most of IQ-Research tries to answer the following three questions:

1. How to **assess** Information Quality including IQ- problems, dimensions, and methods.
2. How to **manage** Information Quality including quality-, information-, and knowledge-management.
3. How IQ **impacts** organizational contexts in Information Systems, Decision Making, and other contexts.

IQ Assessment

IQ Assessment is the process of assigning values to IQ characteristics (dimensions) in a given setting.

- The Wang-Strong Framework has 15 dimensions some of which are: accuracy, completeness, timeliness, and accessibility.
- Dimensions are linked to data by metrics
- IQ metrics can be linked to multiple dimensions causing dependencies with positive or negative correlations.
- Trade-offs can occur such as timeliness leading to inaccurate and incomplete data.

IQ Assessment (2)

- Objective view
  - Conducted by systems technicians engaged in tasks such as:
    - Measuring data integrity and finding conflicting values
    - Data profiling
- Subjective view
  - Focused on measuring “fitness for use” from the perspective of the information consumer
  - Handling information as a product and not as a by-product

IQ Problems

Garvin suggests three types of IQ problems:

1. Biased information
   - where the content is inaccurate or distorted due to the transformation process.
2. Outdated information
   - Data that is not updated to be fit for use
3. Massaged information
   - Referring to information with different representations

Classification of IQ problems

	Data Perspective (objective)	User Perspective (subjective)
Context - independent	• Spelling errors • Missing data • Duplicate data • Incorrect values	• Inaccessible information • Information is insecure • Information is difficult to aggregate • Errors created during
Context – dependent	• Violation of domain constraints • Violation of business rules • Violation of company or government regulations • Violations of constraints of database administrator	• Information is not factual • Information is not credible • Information is irrelevant • Information is incomplete • Information cannot be understood • Information cannot be manipulated

IQ Management

- The objective of IQ management is to improve the usefulness and validity of information.
- IQ management has merged three domains of management:
  - Information management
    - Following the principle "integration, validation, contextualization, activation" to structure the IQ handling and value adding activities. Eppler connects IQ management and information management with the information cycle
  - Quality management
    - Wang proposes to "manage information as a product" for Total Quality Management to deliver high quality information products to information consumers
  - Knowledge management
    - With the principle "Know-what, know-how, know-why" Huang et al propose to improve the quality of information and to transform it into organizational knowledge

IQ and Decision Making

- Regarding information overload, Keller and Staelin propose a model on how decision effectiveness is affected by IQ and information quantity.
- Based on crisis decision, Belardo and Parzer present the relationship between IQ and decision quality.
- Ballou and Parzer analyze tradeoffs between accuracy and timeliness in decision making.
- Chengalur-Smith et al consider task complexity and decision strategy.

Structured Information

Formatted for computer use

- Data is presented in a uniform, repeating format ready for computer processing.
  - Relational databases, flat files, XML
  - Information can always be found in the same format and place
- Information has been formatted for use in automated processes
  - Electronic medical records, insurance billing systems, sales transactions

Unstructured Textual Information

Formatted for humans to use

- Although images and sound are increasingly used by enterprises, the vast majority of untapped unstructured information is textual
  - Medical records, notes, annual reports, letters, documents, e-mails, spreadsheets, etc.
- On unstructured information, entities and attributes must be located, identified, and translated into a standard format to be ready for computer processing.
  - Printed or hand-written documents, reports, magazine articles, photos, recordings
- Information is not mapped into a Database Management System schema

Structured vs. Unstructured Systems

Structured Systems	Unstructured Systems
Designed, built, and operated by IT Department	No predetermined rules or structure
Closely tied to day-to-day operations	Full of textual data
Make cost justification, ROI easier	Fueled by the need for communications, informal analysis, personal
Growth fueled by competitiveness	

Textual Analytics Evolution

First Generation	Second Generation
Keyword search engines	Integrating (pre-conditioning) of unstructured data before it is searched
Tagging	Ability to integrate unstructured data at the point of analysis
Indexing	

Data Governance Definition

"Data Governance can be defined as a system of decision rights and accountabilities for developing, organizing, and implementing policies, procedures, and standards for the effective use of an organization's data assets"

Source: Dismute Wendell S. (2009) *Data Governance: A Study of the Current State and Emerging Trends*

- Data governance initiatives are sometimes driven by the desire of improving data quality. However, more often than not, they are driven by external regulations such as HIPAA in the healthcare industry.

Source: Wikipedia http://en.wikipedia.org/wiki/Data_governance retrieved 11-14-2009

Data Governance

Data Governance is the process of managing data in a comprehensive manner including data collection, creation, processing, manipulation, storage, protection, and its archival.

Data governance clearly defines who manages the data and who has authority to make changes and other types of decisions.