

---

# What is Success?

---

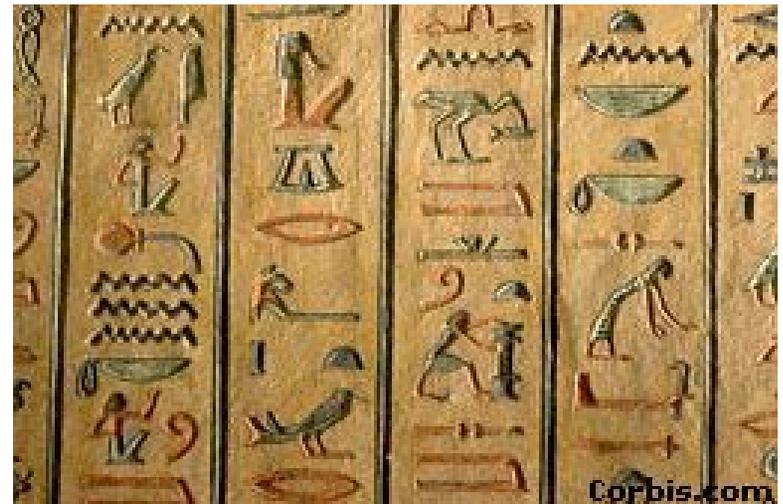
**John R. Voit**

SUNY Buffalo  
Department of Industrial Engineering  
PhD Candidate

Delphi Corporation  
Reliability Engineering Manager

# Motivation

- Lessons Learned Systems are an attempt to efficiently transfer information from an information source to an information recipient.
- LL Systems are specific examples of an information system
- Information systems have been around since people recorded history



# Motivation

- With the creation of computer-aided information technology, organizations have allocated large amounts capital to information systems
- However, practitioners and academics alike wanted to understand what makes a good information system.
- In other words, how do we define a successful system.
- Let's see what we can learn from the research on *Information System Success*



---

# The 3 P's

## Purpose:

- Review lessons learned system model and relate to information system success categories

## Process:

- Brief introduction of concepts with open discussion

## Product:

- Better understanding of the different dimensions of success and how they may be measured.
-

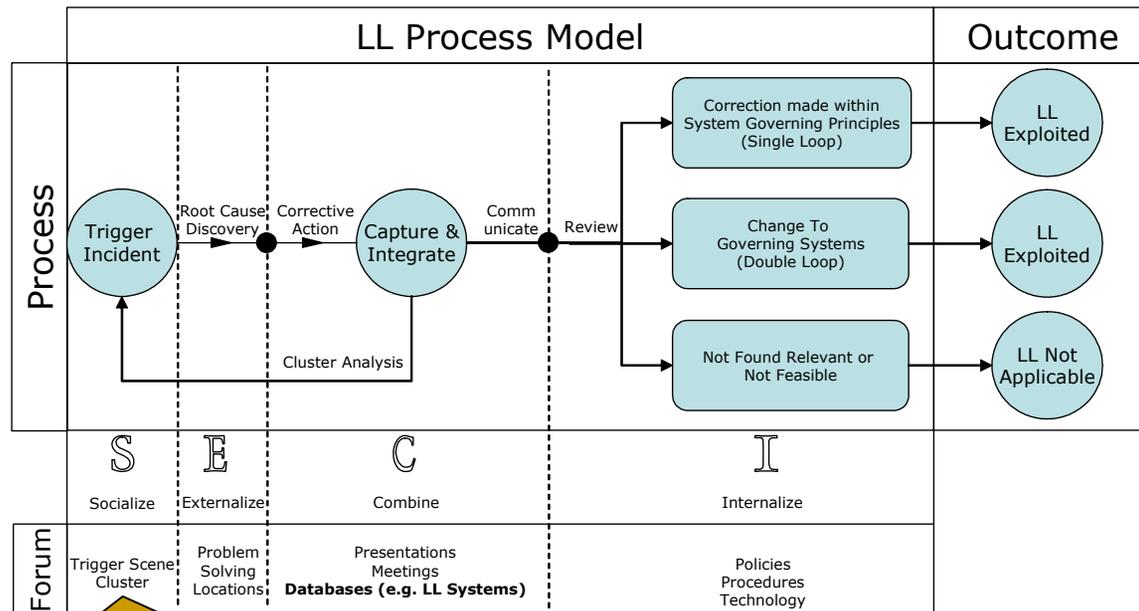
---

# Outline

- Present a General Lessons Learned Process Model
  - Brainstorm Some Success Measures
  - Categories of Information System Success
  - Information Success Model
  - What's Missing
  - Existing Survey Review
-

# Life of a Lesson SECI

We use Nonaka's well-known SECI model for knowledge creation to develop the triggered learning approach [1].

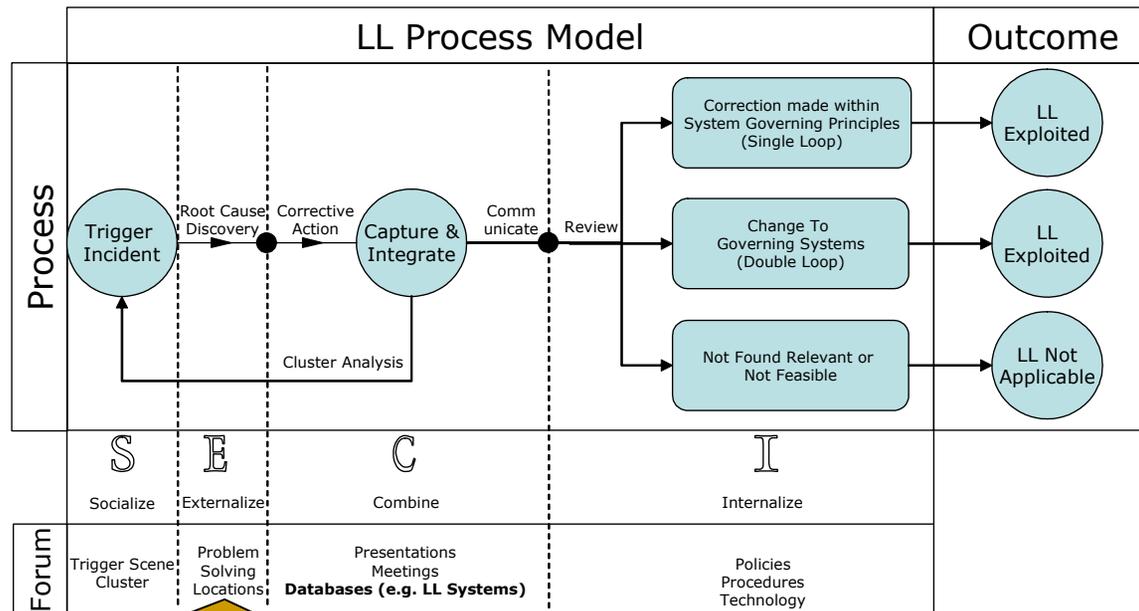


Learning is induced by trigger incidents and culminates by internalization of the lessons that lead to their implementation. Once a trigger occurs, people collect at the trigger location to experience first-hand the tacit nature of the problem (S-socialize).

[1] Nonaka, "The Concept of "Ba": Building a Foundation for Knowledge Creation.", I. Nonaka, R. Toyama and P. Byosiere, "A Theory of Organizational Knowledge Creation: Understanding the Dynamic Process of Creating Knowledge," in *Handbook of Organizational Learning*, pp. 491-517.

# Life of a Lesson SECI

We use Nonaka's well-known SECI model for knowledge creation to develop the triggered learning approach.



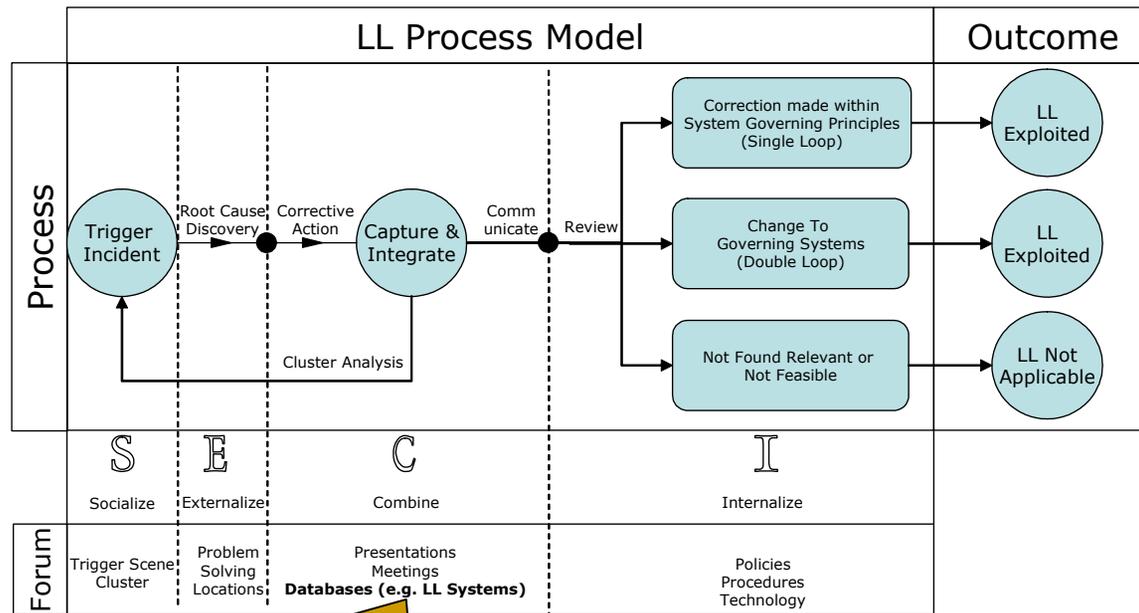
Following this event people investigate several causal chains discussing and documenting their findings along the way (E-externalize). Causal investigation iterates between data collection and analysis<sup>[i]</sup>, and may be situated in several locations depending on where a particular expertise or capability is concentrated<sup>[ii]</sup>.

[i] C. G. Drury, K. Woodcock, I. Richards, A. Sarac and K. Shyhalla, "A New Model of How people Investigate Incidents," Human Factors and Ergonomics Society 46th Annual Meeting 2002).

[ii] E. von Hippel, "'Sticky Information' and the Locus of Problem Solving: Implications for Innovation," Management Science (volume 40, 4 1994): 429-439.

# Life of a Lesson SECI

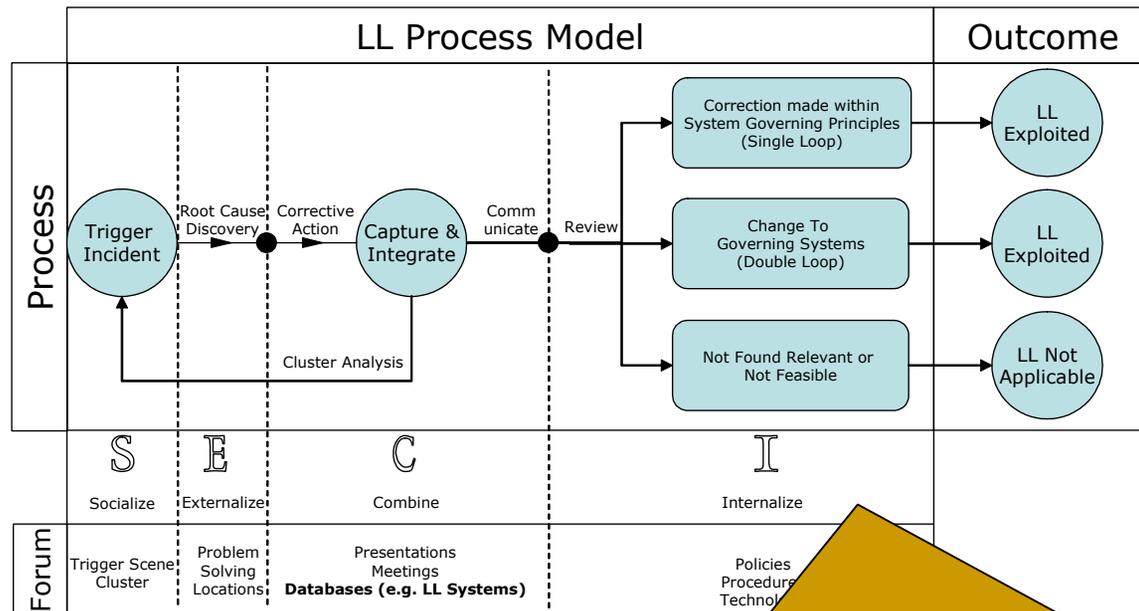
We use Nonaka's well-known SECI model for knowledge creation to develop the triggered learning approach.



After the investigation reaches a definitive stage, the causal information is integrated (C-combined) to develop a set of recommendations or corrective actions, which are contained in reports, presentations, e-mails, and databases (e.g. Lesson Learned Systems).

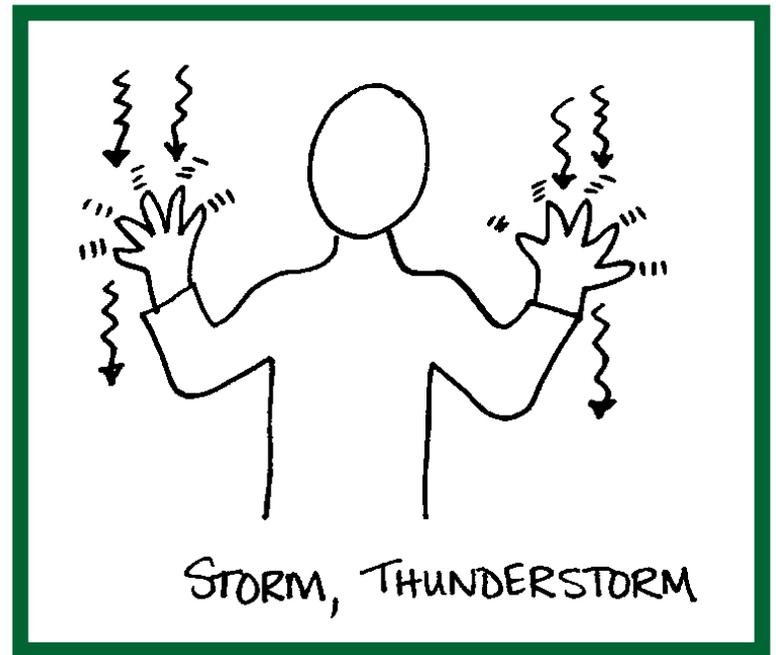
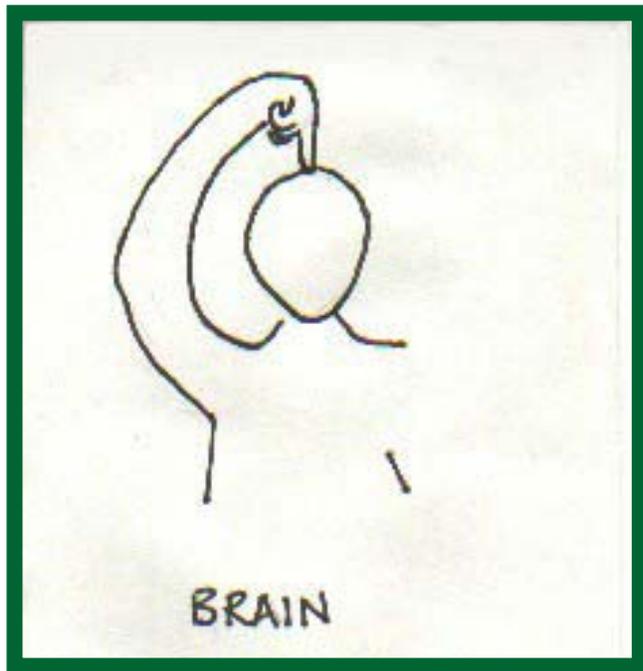
# Life of a Lesson SECI

We use Nonaka's well-known SECI model for knowledge creation to develop the triggered learning approach.



Recipients of lessons learned consider two recommendation types – 1) *Single-Loop*: an immediate fix to the current system that does not affect the governing overall system principles or 2) *Double-Loop*: changes to the underlying routines, structures, or technology that govern the system<sup>[1]</sup>. Once groups take action (I-internalize) on the recommendations the lessons are implemented and the process ends.

[1] C. Argyris, "Single-Loop and Double-Loop Models in Research on Decision Making," *Administrative Science Quarterly*(volume 21, 3 1976): 363-375.



May 2001 Copyright © by: N. Kissane, J. Bonvillian, & F. Loncke

[www.simplifiedsigns.org](http://www.simplifiedsigns.org)

What are some  
measures of a  
successful Lessons  
Learned System?



# Categories of Information System Success

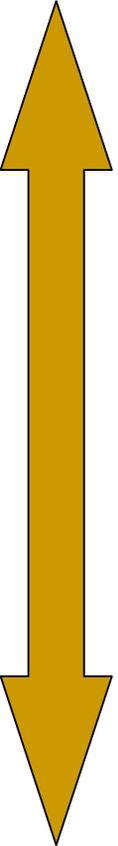
IS researchers have focused on:

- System Quality
  - characteristics of the system
- Information Quality
  - characteristics of the information product
- Use & User Satisfaction
  - Interaction of the information product with recipients
- Individual Impact
  - Influence of information product has on management decisions
- Organizational Impact
  - Effect of information product on organizational performance

---

- *Societal Impact*
  - Effect of information product on society

Delone & McLean, 1992, Information Systems Success: The Quest for the Dependent Variable. Information Systems Research, 3:1, p.60-95



---

# Grouping categories

- System Quality
    - Source v. Recipient perspective
  - Use
  - Individual Impact
  - Information Quality
  - User Satisfaction
  - Organizational Impact
-

# Lessons Learned Performance Measures

## ■ Introduction

- Sells October 13-14, 1999 Workshop provided a breakout session for the purpose of developing a set of basic LL performance measures for the DOE complex.

## ■ Approach

- The approach consisted of reviewing a typical lessons learned process flow, i.e., an activity occurs, undesirable/positive outcomes are identified, documenting what could prevent the undesirable outcome or what could be done to capitalize on the positive outcome, and then the distribution and utilization of the knowledge gained. Resources would not be a constraint.

## ■ Categories

### □ Contributing Sources

- Work package closeout
- AuditsSelf-Assessments
- Operation activities
- Management walk-arounds

### □ Distribution

- SharingWithin own organization
- Site wideDOE complex wide

### □ Utilization

- Drawing changes
- Training plans changed or developed
- Procedures changed
- Audit Plan Changed
- Changes in maintenance work packages

### □ Positive results

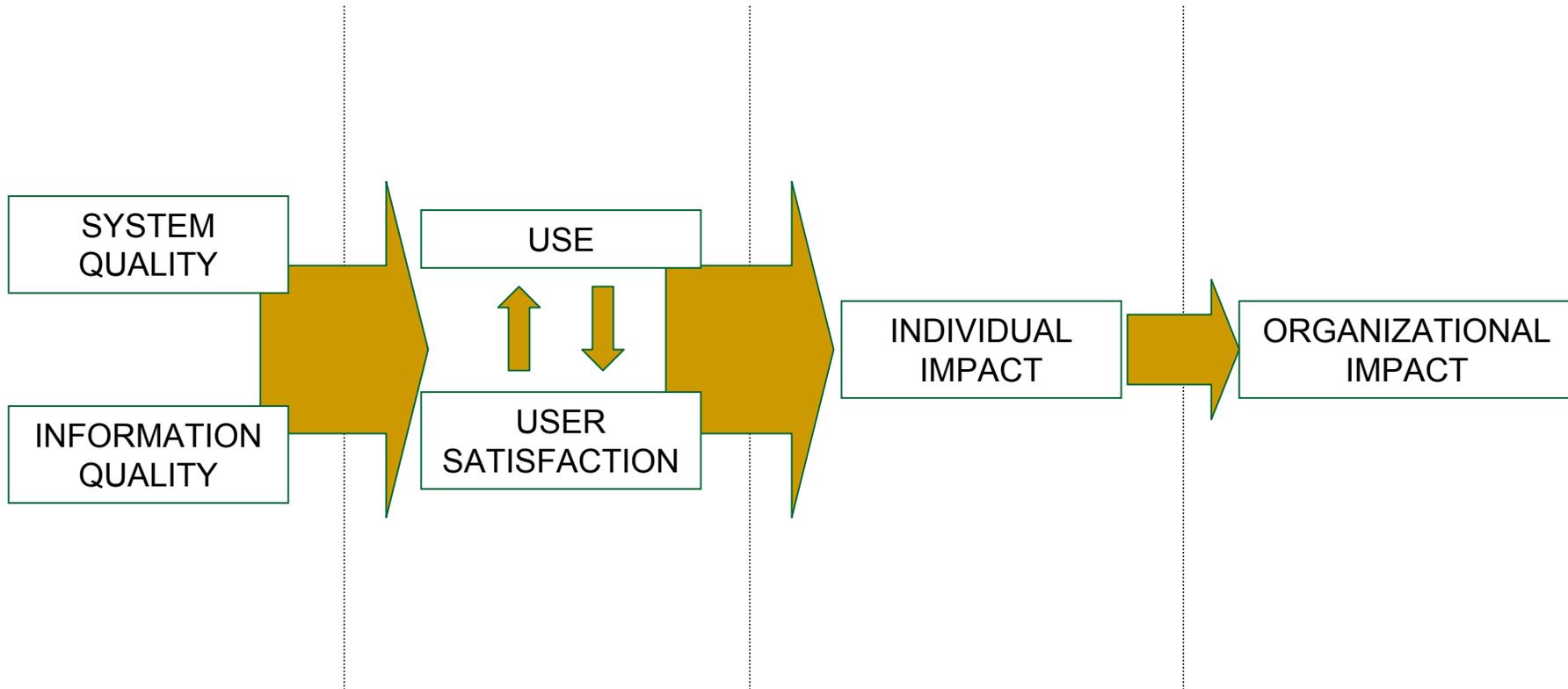
- value added

LL PROCESS  
QUALITY &  
SUPPORT

INDIVIDUAL  
IMPACT

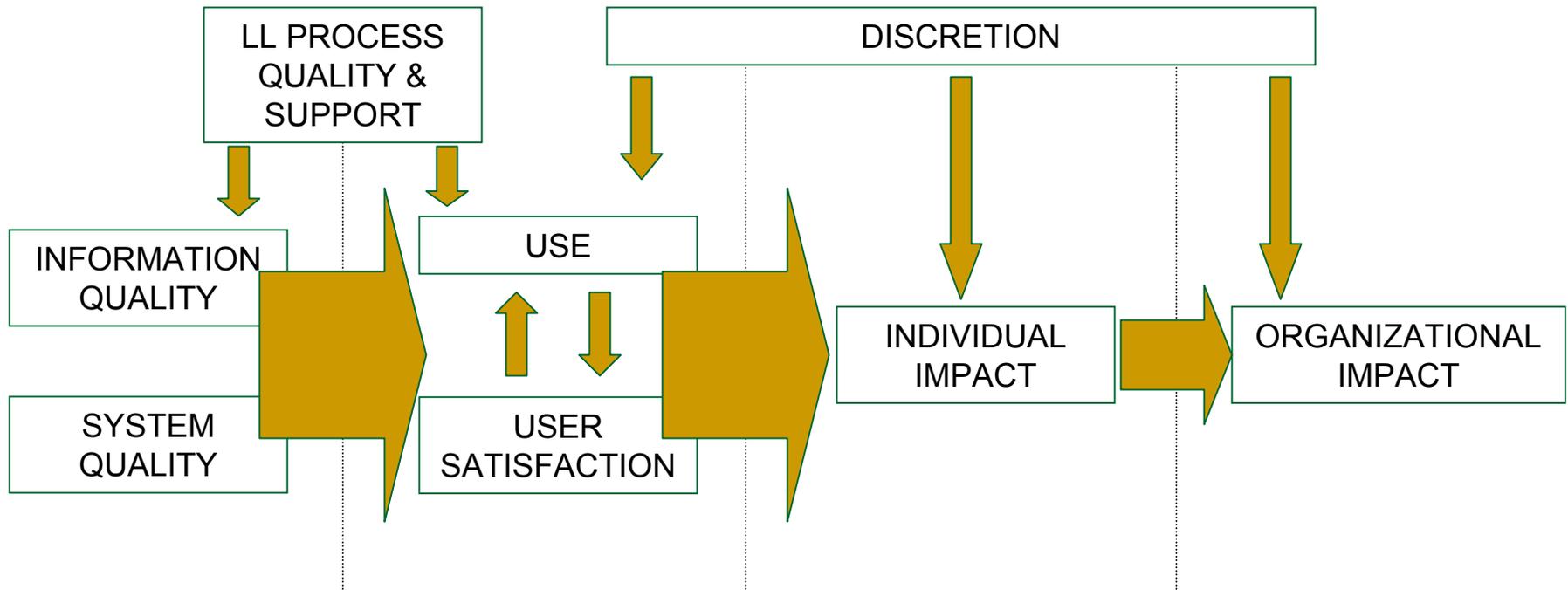
ORGANIZATIONAL  
IMPACT

# How do these categories relate?



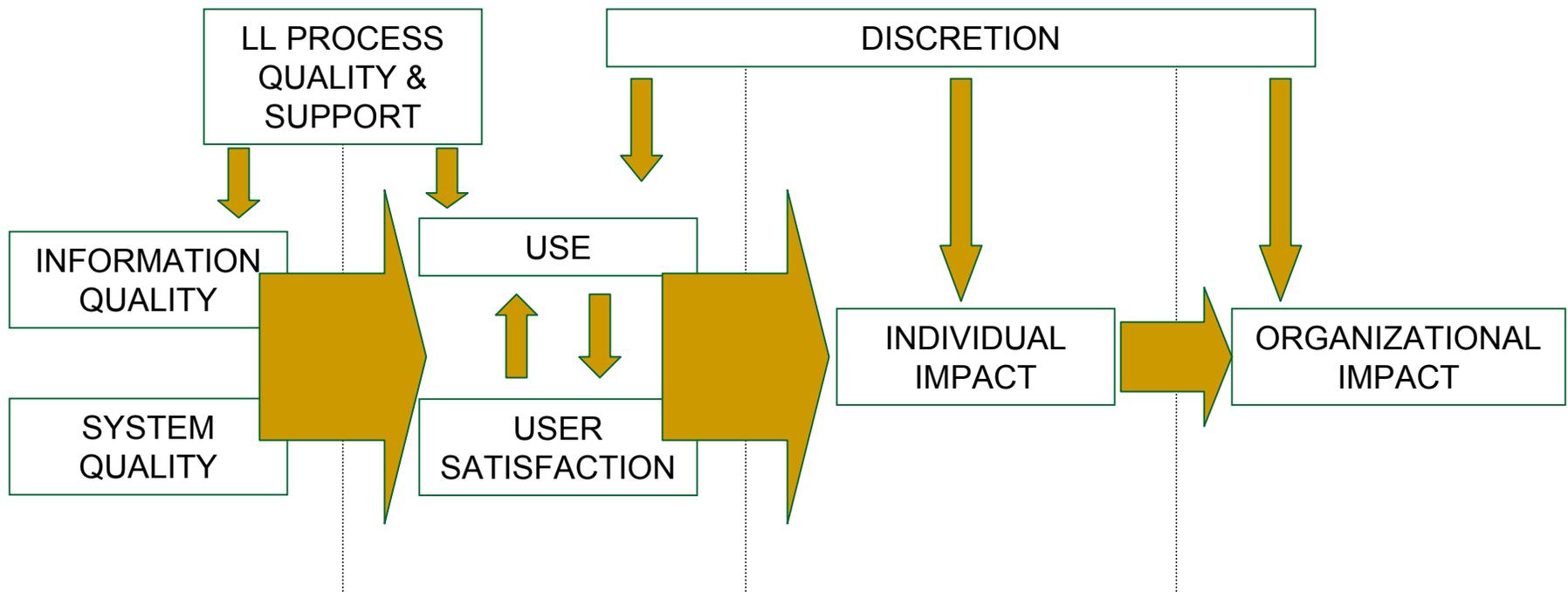
# What's missing?

- Is this sufficient to ensure Lessons Learned Systems have organizational impact?

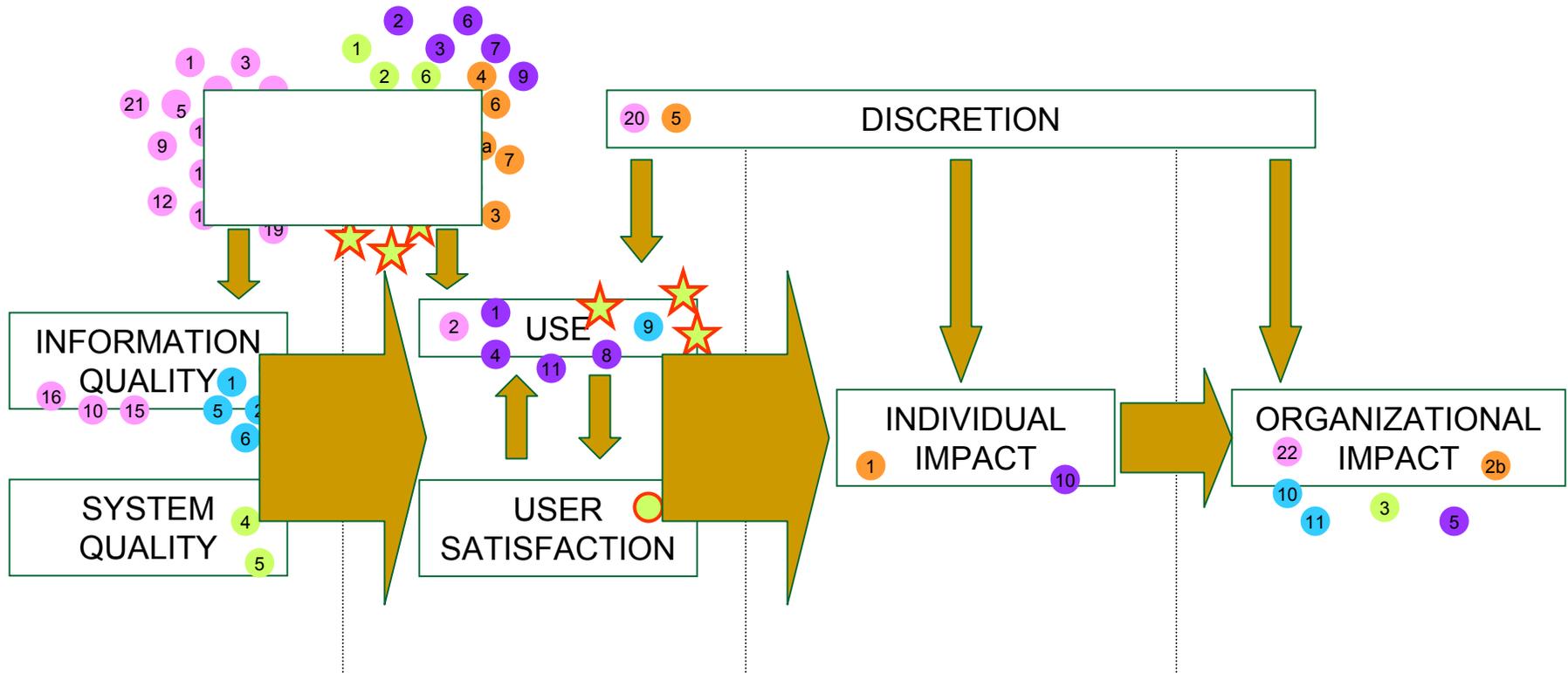


# How do we measure?

- Observation v. Survey



# Measurement Review



- Stakeholder Survey
- DOE LL List Sever 1996 Survey
- SCLL Program Survey
- Yucca Mtn Survey/System Metrics ★
- Bechtel Nevada Survey

7 13  
13 8  
12

# Metrics: Creation Rate

	CASE #1		CASE #2			CASE #3
	Division A	Division B	Product Line I	Product Line II	Product Line III	DOT/NTSB
Year Started	1998	2000	2001	2001	2001	1967
NC	847	428	206	153	117	~12,000
Creation Rate NC/Years	<b>141/yr</b>	<b>107/yr</b>	<b>69/yr</b>	<b>51/yr</b>	<b>39/yr</b>	<b>353/yr</b>
NT	453	239	182	139	96	*
Transfer Eff NT/NC*100%	<b>53%</b>	<b>55%</b>	<b>88%</b>	<b>91%</b>	<b>82%</b>	*
NA	12-62	0-31	73-105	59-91	27-55	*
Application Eff NA/NT*100%	<b>3-14%</b>	<b>0-13%</b>	<b>40-58%</b>	<b>42-65%</b>	<b>28-57%</b>	<b>82%</b>

The lesson creation rates for each of the cases are remarkably different. In particular, the NTSB creation capacity is more than twice the other cases. The NTSB budget is more than 70 million dollars that is used primarily to conduct investigations and propose recommendations to the transportation industry. With this amount of resources devoted to the investigative process it is not surprising that it results in a much greater rate of lesson creation.

# Metrics: Transfer Efficiency

	CASE #1		CASE #2			CASE #3
	Division A	Division B	Product Line I	Product Line II	Product Line III	DOT/NTSB
Year Started	1998	2000	2001	2001	2001	1967
NC	847	428	206	153	117	~12,000
Creation Rate NC/Years	<b>141/yr</b>	<b>107/yr</b>	<b>69/yr</b>	<b>51/yr</b>	<b>39/yr</b>	<b>353/yr</b>
NT	453	239	182	139	96	*
Transfer Eff NT/NC*100%	<b>53%</b>	<b>55%</b>	<b>88%</b>	<b>91%</b>	<b>82%</b>	*
NA	12-62	0-31	73-105	59-91	27-55	*
Application Eff NA/NT*100%	<b>3-14%</b>	<b>0-13%</b>	<b>40-58%</b>	<b>42-65%</b>	<b>28-57%</b>	<b>82%</b>

All mechanisms push lessons to recipients. In Case #1, the push policy was technology-driven (i.e.; automatic e-mail system); whereas, in cases #2 and #3 the push policy is facilitated, or people-driven. No data was available for case #3, but note the large and consistent increase from Case #1 to Case #2. Since Case #1's automated push system did not appear to provide advantages to the division, perhaps due to a combination of the CE network atrophy and lack of process monitoring, it may not be wise to invest heavily in developing technology-based push mechanisms without committing to developing and sustaining clear roles and responsibilities.

# Metrics: Application Efficiency

	CASE #1		CASE #2			CASE #3
	Division A	Division B	Product Line I	Product Line II	Product Line III	DOT/NTSB
Year Started	1998	2000	2001	2001	2001	1967
NC	847	428	206	153	117	~12,000
Creation Rate NC/Years	<b>141/yr</b>	<b>107/yr</b>	<b>69/yr</b>	<b>51/yr</b>	<b>39/yr</b>	<b>353/yr</b>
NT	453	239	182	139	96	*
Transfer Eff NT/NC*100%	<b>53%</b>	<b>55%</b>	<b>88%</b>	<b>91%</b>	<b>82%</b>	*
NA	12-62	0-31	73-105	59-91	27-55	*
Application Eff NA/NT*100%	<b>3-14%</b>	<b>0-13%</b>	<b>40-58%</b>	<b>42-65%</b>	<b>28-57%</b>	<b>82%</b>

The variation of application efficiency is striking among the three cases. It is true that an immense amount of resources are dedicated to evaluating and implementing the NTSB recommendations. However, *feasibility* also improves the application efficiency of its lessons. When the NTSB makes recommendations, they target specific recipient groups based on their potential to experience the same problem considering the system constraints. On the other hand, in cases #1 and #2 the corrective actions are developed based on a trigger system problem, and placed into the lessons learned system once the problem is resolved. In these processes, an observing group may not be susceptible to the same problems or the corrective actions may not be feasible. In short, if only relevant problems are transferred to a recipient and the recommendations are feasible in their systems, then the likelihood that that a lesson learned will also be applied by that group increases. Therefore, understanding the relevance of the source groups to recipient groups may provide additional insights into how to improve the application efficiency of lessons learned.

---

# What Do Organizations do to improve these systems?

- Mentorship
  - DOE order
  - E-mail by category (i.e. Relevance)
  - Intermediaries Follow-Up
  - Training
  - Attractive/Portable Newsletters
-

---

# Summary

- Discussed different dimensions of success and how they are related
  - Brainstormed some success metrics
  - Discussed how to measure: Observation v. Survey
    - Operationalizing metrics is not trivial
    - Too many may be detrimental
  - Metrics need be developed that drive the proper behavior
-