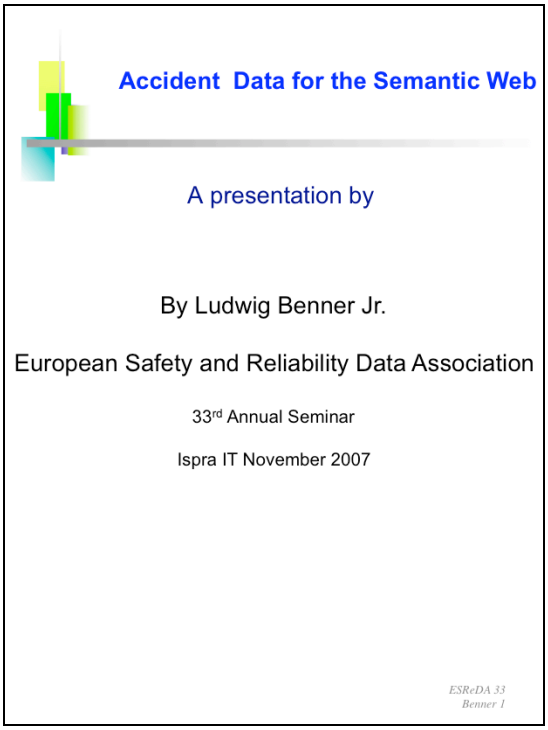
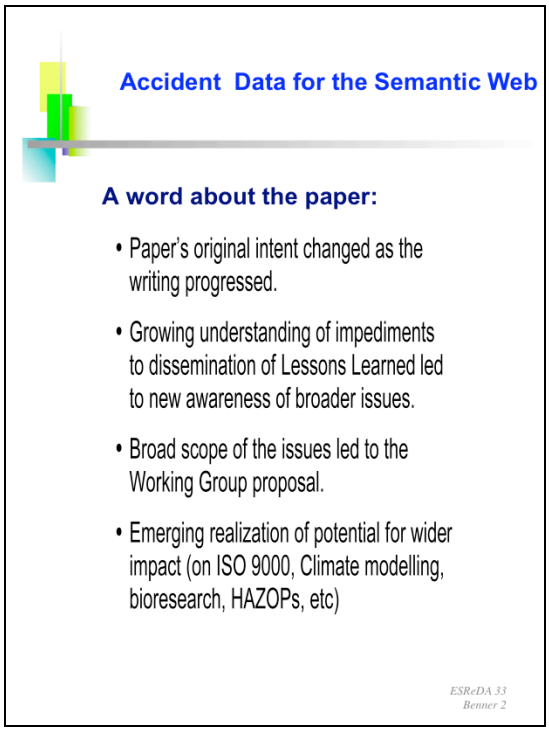

Accident Data for the Semantic Web
A presentation by
By Ludwig Benner Jr.
European Safety and Reliability Data Association
33rd Annual Seminar
Ispra IT November 2007
ESReDA 33
Benner 1

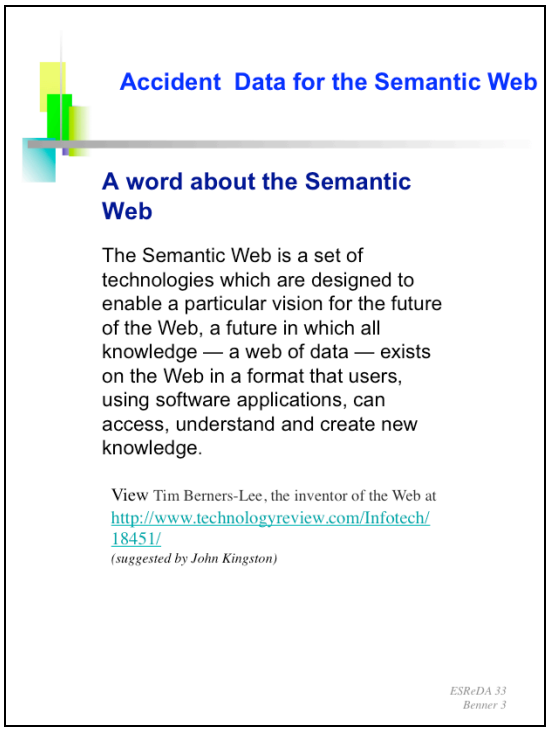


The Paper reflects the expansion of the paper's original intent as the work progressed, from a look at lessons learned dissemination, to broader issues posed by the present mishap investigation lessons LEARNING system..

Understanding of present lessons LEARNING system impediments led to a realization that they were rooted in broader investigation process shortcomings, and that those problems needed to be described and resolved before lessons learned impediments could be overcome

> The scope and nature of the investigation process issues led to the realization that broader expertise was required to address the issues, leading to the working group proposal.

The more I worked with the example, the more I realized the research-defining aspects of the work had the potential for wider impact on other "behavioral" efforts, but that is beyond the scope of this paper.

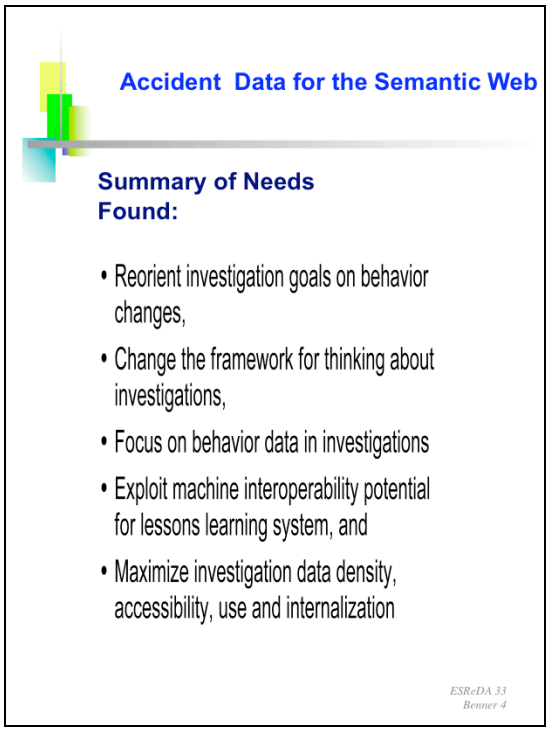


To provide context for the paper, the Semantic Web vision should be noted.

Here is the vision as I see it:

A vision for the future of the Web, a future in which all knowledge — a web of data — exists on the Web in a format that users, using software applications, can access, understand and use to create new knowledge.

View Berners-Lee's video for a more detailed discussion of that vision by the creator of the internet.



By the the time I finished the paper, I identified certain needs that have to be satisfied if we want to improve lessons learning system performance

They include the need to

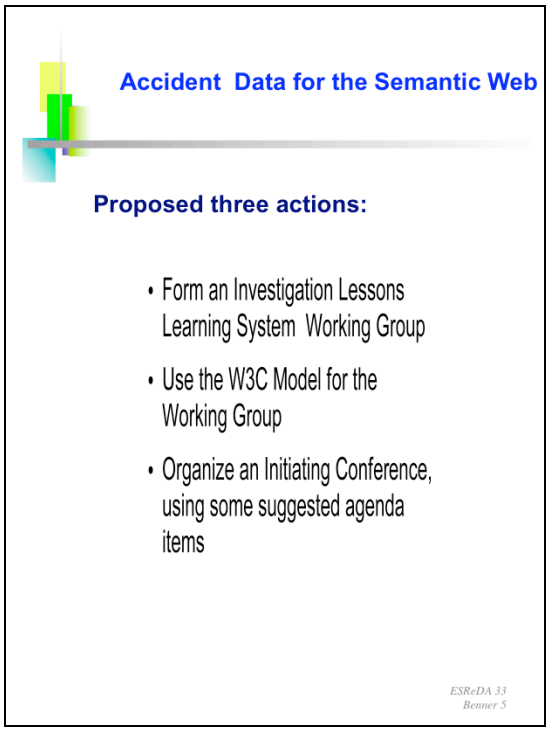
Reorient investigation goals

Change the framework for thinking about investigation

Focus on behavior data

Exploit machine interoperability potential

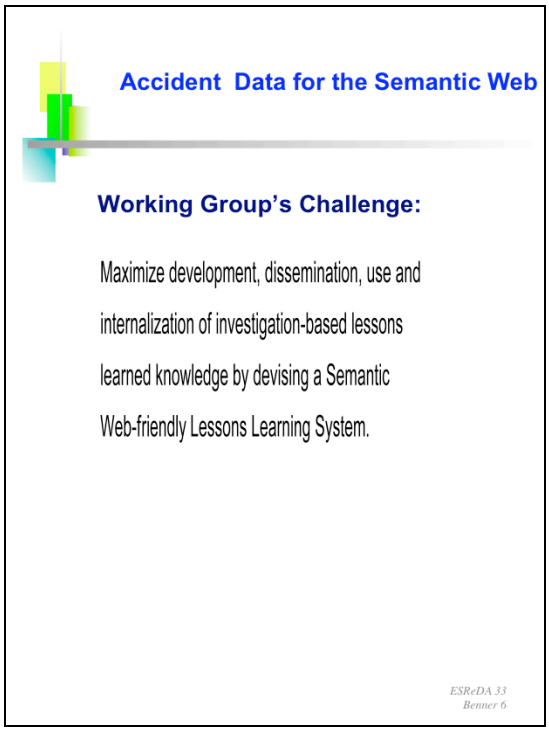
Maximize investigation data density and internalization.



The paper includes some ideas for how to bring about the improved value of mishap investigations.

Three specific steps are proposed:

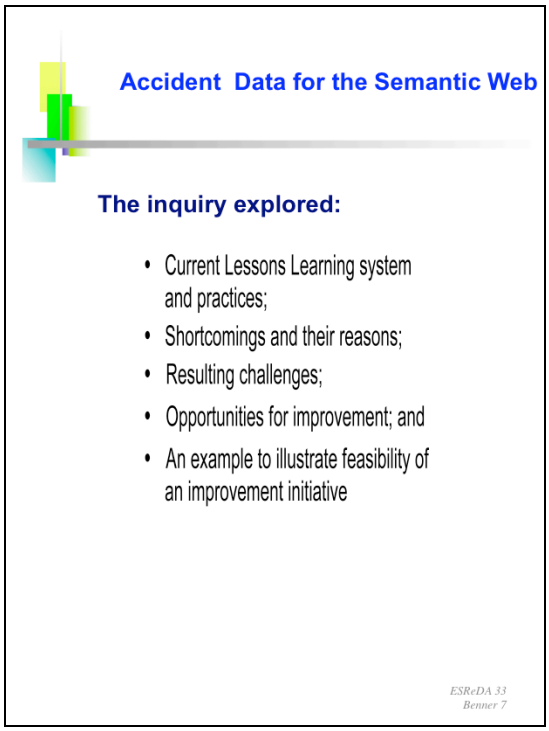
1. Form a Lessons **Learning** System Working Group
2. Use the World Wide Web Consortium, or W3C model for the group
3. Organize an initiating conference to launch the initiative



The Working Groups challenge, or perhaps its charter, would be to

(read slide)

e.g., create a whole new Lessons Learning System design and structure, or system **Architecture**



The approach to the preparation of the paper was to pursue concerns about lessons learned implementation. That led to exploration of

The current system and practices

Their shortcomings,

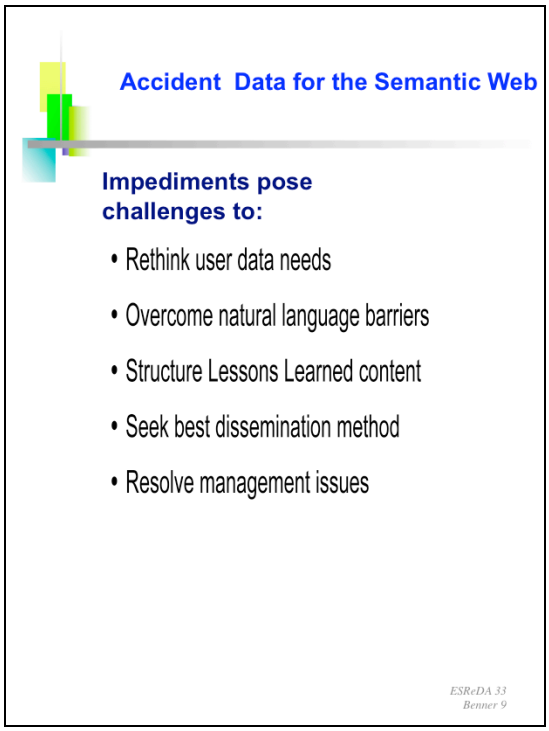
Resultant challenges

Opportunities for improvement

I recognized that I would need an example to show the discussion had substance.

We need to acknowledge the impediments to maximizing lessons learned performance, which are described in detail in the paper. These impediments affect all major components of the present lessons learning system, including lessons learned…

- Development: what lessons are learned by investigations?
- Dissemination: where are lessons delivered to users?
- Access: how are lessons accessed by users?
- Use: how can users relate to lessons presented and
- how might users internalize lessons to produce change?

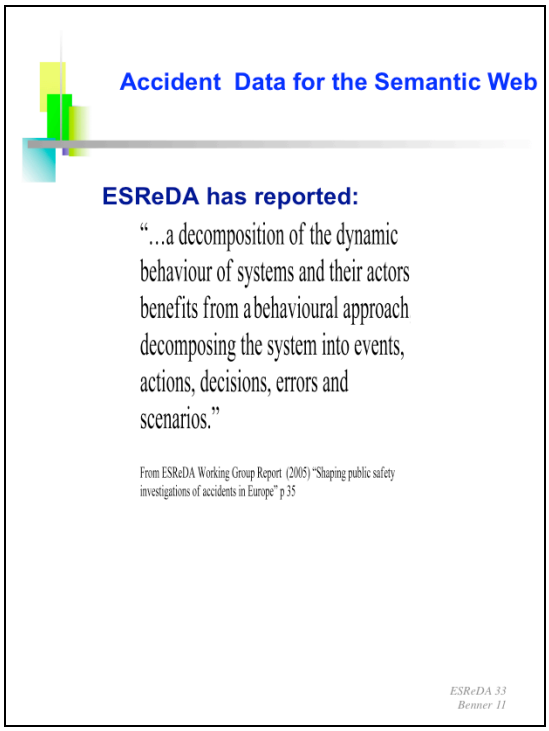


The impediments reported pose many formidable challenges to anyone who seeks to develop a better system. The challenges include

- Rethinking and redefining what data users really need to bring about changed behavior
- Overcoming language barriers to investigation lessons learned development
- Developing the data grammar, content, format and structure of lessons learned to be communicated
- -Developing the best vehicle for machine processing, dissemination, access and use of Lessons Learned data
- Resolving the management issues like planning, organization, funding, staffing, control and feedback to support any new system

However, some relatively modern developments hold promise for an improved system to overcome the impediments found.

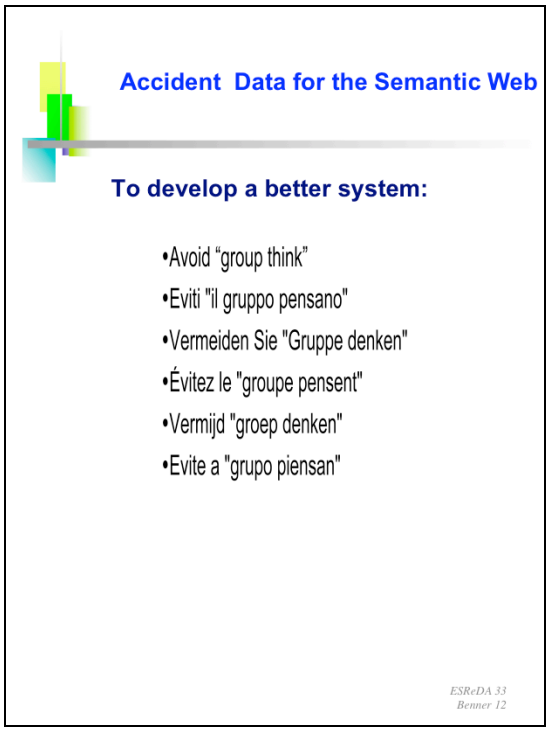
These prior research, Semantic Web and W3C developments are described in the paper.



Note the third line -

The focus on behaviors reported in our paper is not particularly original --- the ESReDA working group recognized the benefits of the behavioral approach to decomposing the system in 2005.

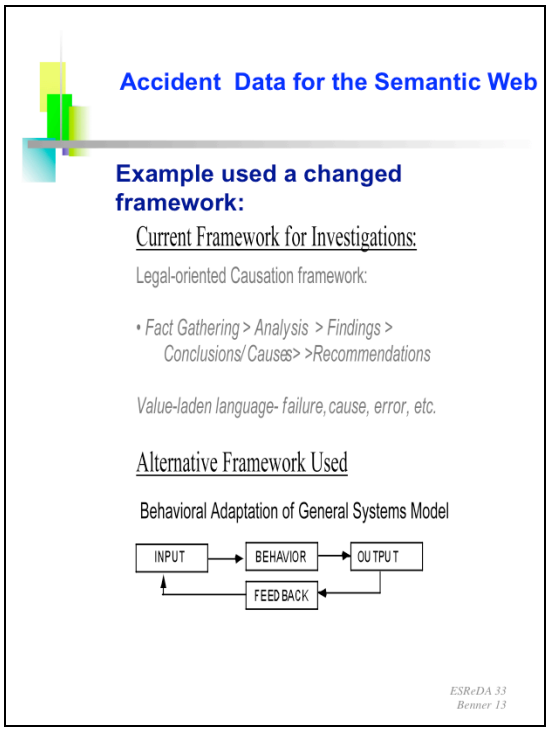
Our work supports the benefits envisioned.



But a better Lessons Learning System will require fresh new thinking, IMO. I would advise anyone interested in pursuing any effort to develop alternative approaches to

Avoid Group Think

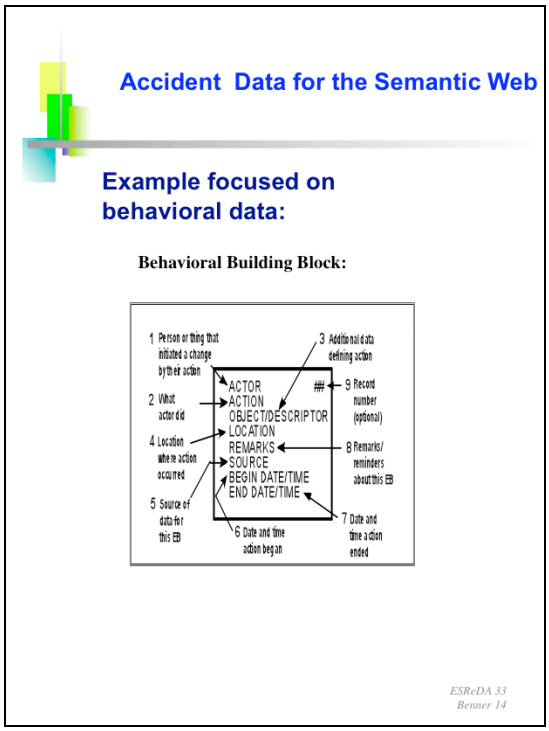
Challenge everything about the present system.



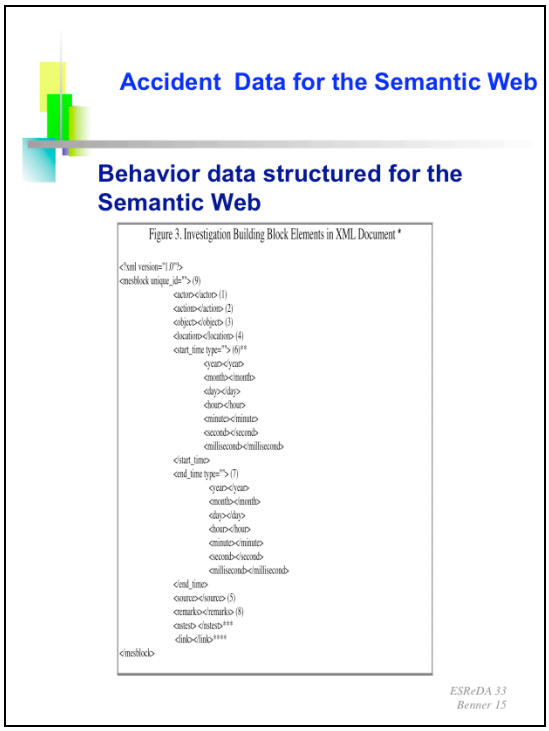
We tried to do that, with some interesting results that are described in the example reported.

First, we concluded that the constraints imposed by present practices needed to be overcome by rethinking the traditional framework --within which the present practices evolved. The challenge was to find another framework for thinking about the lessons learning process. After pondering the purposes of the lessons learned dissemination efforts we concluded that since changed behaviors were the ultimate aim of safety investigations, a behavior-based system was essential. We selected the general systems model and modified it to incorporate behaviors in place of the more ambiguous “operation.”

Behaviors is used in the broad sense to describe what people, objects and energies do during mishaps.

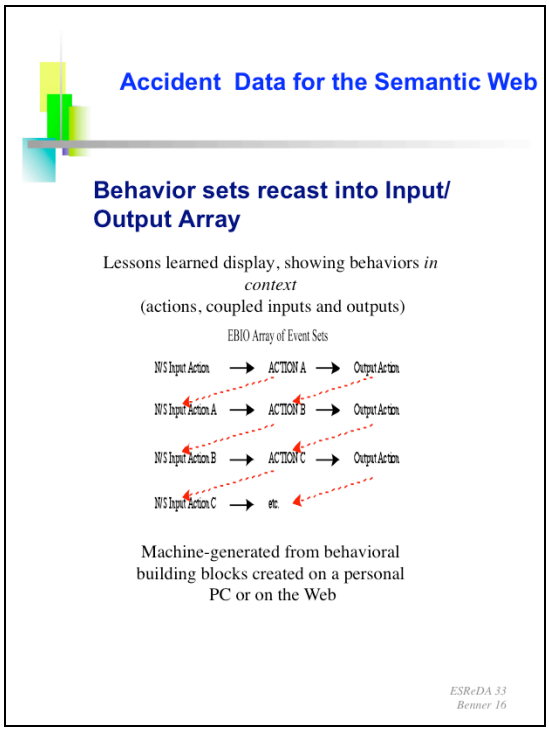


When it came to data needed for lessons learned, if changed behaviors are the goal, the building blocks investigators use to support mishap process descriptions and development of lessons learned have to be behavior based. The selection of the behavioral building blocks we used is described in the paper.



To make the behavior data Semantic web friendly, we converted the manual behavior building block to a an XML structure, with tags for each element of the building blocks. As needs for data elements grew, new tagged elements we just added to the XML file.

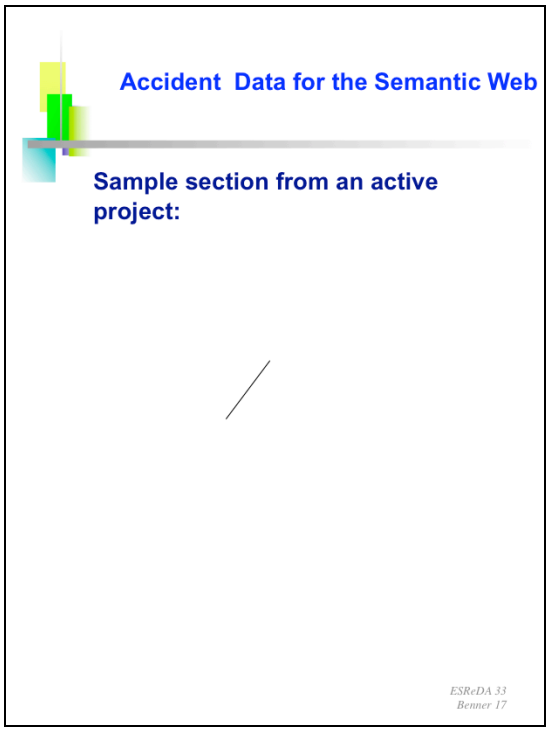
Among the elements added were links to couple related behavioral building blocks, reflecting the relationships among actions required to produce process outcomes.



This XML data permitted us to develop machine-generated BEHAVIOR DATA SETS from the investigator's behavior building blocks. Each set shows an action or behavior ***in context***. The input actions and output actions necessary to produce the process outcome, as determined by the investigators, are shown.

That in turn, enabled us to generate the Event Block Input Output arrays of behavior data sets that occurred during the process. By sequencing sets in the order in which they occurred, the sets show the progression of actions required to produce the outcome, AND the inputs and outputs or context of each such action.

This opened the door to providing users concrete action sets to which they can relate their own tasks or work processes, showing them how their processes can be corrupted. By posting aggregated machine-generated set data on the Web, users can access and return for refresher reviews or new queries as often as they like.



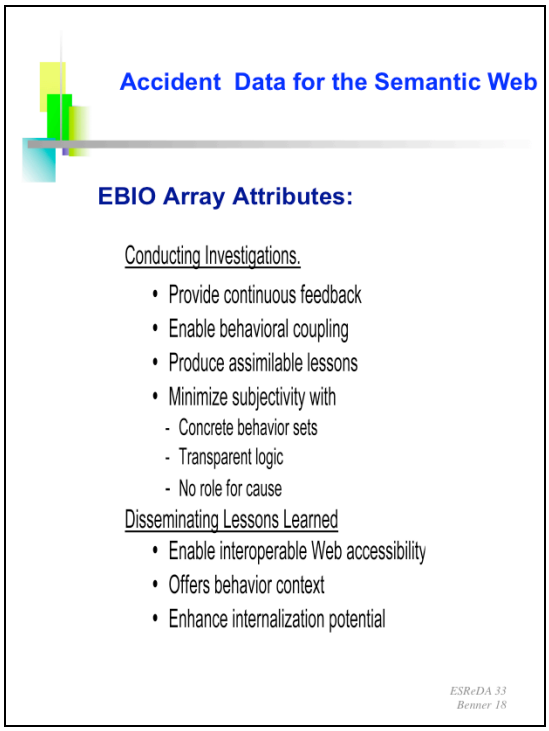
This example from the paper shows how the process works. The project is an analysis of a published model investigation, and shows its investigation problems

Examine it at your leisure.

When completed, the behavior data sets provide all the lessons learned from the investigation, like this.

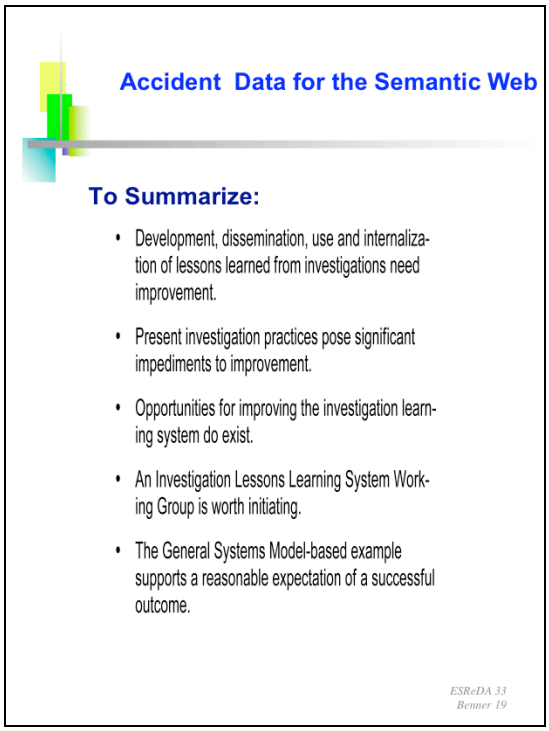
** HOLD UP a printout of the present status of the case.

I think it's very dense lessons learned data.



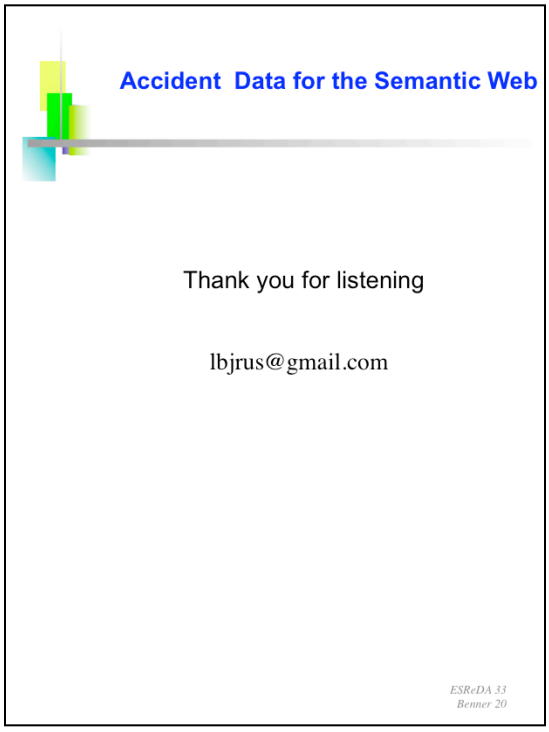
These arrays have numerous attributes adding value to tasks during and after investigations. They are described in more detail in the paper. A few are highlighted here.

The point is that the sets help during as well as after investigations, in many ways.



In summary, I hope the paper makes the case that

- present practices need rethinking,
- that they pose serious impediments to improvement,
- that opportunities for improvement do exist
- that the task is so complex that a developmental Working Group on the W3C model is worth initiating and
- that -- hopefully --the general systems model-based example supports the expectation of a successful outcome for such an initiative.



Feel free to contact me by email if you are interested in dialogue about this vision for investigation lessons learned.