Multilinear Events Sequencing Technology

A brief description of the origins,
nature and applications of a research-based

INVESTIGATION TECHNOLOGY

for investigations of all kinds

Multilinear Events Sequencing Technology for Investigation

Investigate:

- to examine systematically;

- to observe or inquire into, usually some phenomenon.

The basic purpose of investigations is to gain understanding of some phenomenon. Sometimes investigations are undertaken simply for the sake of new knowledge. Other times, they are undertaken to be able to better control future phenomena or processes. Whatever the reason, all investigations have a common thread: they seek to describe and explain the phenomenon, clearly, validly and consistently so users can act on the new information.

Investigations are conducted in many ways, ranging from casual single person efforts to elaborate international team investigations, using many investigation methods with varying results.

What is the MES-based investigation technology?

The Multilinear Events Sequencing-based investigation technology is an integrated body of concepts, rules and procedures for investigating a wide range of desired and undesired processes or system operations, before or after they happen. It can best be characterized as a process investigation and analysis technology. MES focuses on behaviors and changes that will achieve improved future performance.

Why was the MES technology developed?

This investigative technology was developed to overcome observed deficiencies in traditional investigative practices. A new comprehensive, coherent, objective and replicable investigative methodology was needed to remedy widespread investigation problems. Those problems included ambiguous perceptions of the nature of the phenomena being investigated; misdirected investigation objectives; erratic and inefficient data acquisition documentation and use; flawed, inconsistent and subjective outputs; limited utility of work products; lack of objective quality assurance measures; and frequent controversies about findings.

What does MES Technology do

MES technology guides and supports the investigation and analysis of incidents or risks, hazard analyses, operating procedures, facility design, safety reviews, emergency response assessment, and research. The technology provides principles, rules and tools enabling investigators to develop data-driven explanatory descriptions of interactions during a process or system operation, and find changes to achieve better future performance.

MES investigation technology provides investigators with

* a framework for thinking about investigations,
* a structure for capturing and organizing data which defines the process or system operation,
* documentation of behaviors and system interactions,
* search methods to discover problems with the interactions and identify candidate control actions, and
* guidance for monitoring predicted system performance over time.
* easy integration of investigation findings into other activities within an organization and across organizations,

The technology has led to several advances in investigation capabilities. It is ***"research defining"*** in that it identifies what one knows and doesn't know but needs to find out about a process during an investigation, improving investigation efficiency. It enables the ***progressive analysis*** of data as acquired during an investigation, further improving investigation efficiency. It provides a systematic ***problem discovery and definition*** process for identifying behavior patterns that might be changed to improve future performance, expanding the number of opportunities for change. It leads investigators to develop broadly applicable improvements ***from episodic experiences***, enhancing investigation value, It produces outputs that are congruent with other organizational activities, increasing its utilization potential. It exposes any uncertainties in the investigation results, makes it possible to determine the value of additional investigation effort.

MES –based investigation process

The MES-based investigation process consists of several functions. These functions include data observation, transformation and formulation; matrix-based data organization; special data display and validation; problem pattern search and discovery; data relevance testing; structured hypothesis development; problem discovery, definition and presentation; behavioral change options development and assessment; deliverable preparation; quality assurance; emergency response performance assessment; and investigation task management.

Additionally the MES-based investigation system is designed for use in domains such as design, procedures development, operations, retraining, maintenance, public affairs and legal functions, among others.

How does MES investigation process work?

The **MES**-based investigative process is relatively simple in concept and practice. It consists of four phases:

* development of a Matrix describing and explaining the process being investigated, followed by
* a problem discovery, definition and performance improvement phase, followed by
* the monitoring phase to verify the predicted performance.

1. Description and explanation phase

Phase 1 of the system focuses on transforming source data into inputs for describing what happened and why it happened during the accidents or other process, or what can happen and why it can happen in proactive analyses. The output is an explanatory description of the occurrence being investigated. Properly prepared and quality checked, this description can serve all users of occurrence data. Its contents are tested for validity, completeness and input-output relationships with objective procedures. The MES display is the key output generated during the investigation.

2. Problem discovery, definition and control.

After the description is completed, the **MES** –based process addresses the discovery, definition, documentation and dissemination of risk-raising behavior patterns. The patterns are defined by examining relationships among each interaction occurring during the process. Then changes that could be introduced to produce different process performance are identified. Conceptually, the problem definition and control phase is based on examining interactions between specific event pairs in the description for undesired relationships, and possible new changes. Candidate control actions at each coupled event pair can be developed, using associated safety principles, strategies and techniques..

3. MES performance improvement plan.

The **MES** Matrixes, with the problem patterns shown, are then used as a baseline to guide users' observations of the ongoing process to see how it compares with the *predicted* operation. This forms the feedback loop.

This is a big MES payoff !!

MES outputs can guide users' inquiry into anomalies or potential deviations from predicted performance in their processes, and guide the assessment of any changes to their process that are proposed or observed. **MES** work products provide a useful method to implement a change control system by providing the basis for documenting, analyzing, predicting and monitoring effects of changes before they are introduced into a system or process. **AND** it facilitates the integration of investigation findings with other functions in organizations, since it focuses on people, object and energy behaviors.

The bottom line:

It sounds complicated, but in practice MES provides simple objective procedures that are easily understood and used. It also provides users alternative ways to achieve performance improvements and avoid the doubts or controversy that flow from opinions, oversights, ambiguities, abstractions, or value judgments like inadequate or improper performance, factors, causes, fault, or blame.

And now:

Prototype open source software to support implementation of MES technology for incident investigations, hazard analyses, behavior change development, quality assurance and witness interview preparation can be accessed at http:///code.google.com/meslib .

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