



# Multilinear Events Sequencing Technology

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

## 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 an understanding of and better control 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.

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

## What is the Multilinear Events Sequencing-based investigation technology?

The Multilinear Events Sequencing-based investigation technology is an integrated body of concepts and procedures for investigating and analyzing a wide range of desired and undesired processes before or after they happen. It can best be viewed as a process investigation and analysis technology.

The basic ideas and components resulted initially from efforts to overcome observed deficiencies during the investigation of accidents, explosions, fires and injuries. Continuing refinement during investigation has led to a new investigation paradigm and investigative technology that could help users understand, and improve other processes during which undesired interactions occur. Functionally, this process investigation technology has been found applicable for the investigation of risks and development of standard operating procedures, design of facilities safety reviews, hazard analyses, emergency response assessment, and research.

The multilinear events sequencing-based investigative technology has led to several investigative breakthroughs. One of its most significant breakthroughs is its departure from the judicial heritage which dominates traditional investigation perceptions and practices, such as an adversarial environment, and working at negative goals like causes, fault, blame, failures and error/ MES has made possible a collaborative, open non-judgmental and logic-driven investigation environment, seeking understanding and improvement.

Another breakthrough is the ability to function as a “**research defining**” investigation tool. It clearly identifies and displays what one knows and doesn’t know about a process as one applies these systematic investigation procedures during data acquisition and analysis tasks.

Another breakthrough is the orderly structure of **problem discovery and definition** practices. The new technology helps investigators review process interactions systematically and uniformly and quickly, to discover problem relationships among the interactions. Understanding these relationships invariably increases the number of choices for changing the process, and estimating relative effectiveness of proposed changes.

## Why was the MES technology developed?

This investigative technology was developed to overcome observed deficiencies in traditional investigative practices. A new comprehensive, coherent, replicable collaborative and congruent investigative methodology was needed to:

- \* Provide a structured and self-guiding investigation process that was not dependent on the experiences of the investigator.
- \* Identify and capture data relevant to the investigation as data is acquired ,
- \* Provide an objective process to resolve differences among investigators.
- \* Permit objective quality control of investigation practices and outputs.
- \* Produce trustworthy, unambiguous and verifiable descriptions and explanations of accidents.
- \* Provide a robust, consistent way to identify problems or needed behavioral changes and identify and evaluate process improvement options.
- \* Predict what future behaviors should be observed to verify that future system operations are controlled and functioning as planned.
- \* Facilitate utilization of outputs by individuals who can and will implement directly any needed changes in their behaviors to improve the processes.

## MES scope

The MES-based investigation process consists of several elements These elements include a data observation, transformation and formulation process; matrix-based data documentation and organization functions; special data display and testing functions; problem search and discovery functions; data relevance testing procedures; hypothesis development procedure; problem assessment capabilities; recommendation development and assessment elements; deliverable preparation and quality control processes; emergency response performance assessment procedures; and task management functions;

Additionally the MES-based investigation system is designed for easy integration of investigation findings into other activities within an organization and across organizations, such as design, procedures development, operations, retraining, maintenance, public affairs and legal functions, among others.

## What does MES do?

MES investigation technology provides

- \* A framework for thinking about investigations, in a collaborative setting,
- \* A structure for capturing and organizing data which defines the system,
- \* Documentation of system interactions,
- \* Search methods to discover problems with the interactions and identify candidate control actions, and
- \* Guidance for monitoring predicted system performance over time.

Other elements include numerous tools, rules, generic investigation models and investigation or analysis procedures; strategies for future control; a “mental movie” data acquisition guide and testing protocol; events pairing analytic capability; and data sets procedures for identifying common events subsets.

## How does MES work?

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

1. development of a Matrix describing and explaining the process being investigated, followed by
2. a problem discovery, definition and performance improvement phase, followed by
3. the monitoring phase to verify the predicted performance after changes are made.

### 1. Description and explanation phase

Phase 1 of the system focuses on 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 a description and explanation of the occurrence being investigated. Properly prepared and quality checked, this description can serve all users of accident data. Its contents are tested for validity, completeness and cause-effect 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 resolution of needs to achieve improved performance. This is done by examining relationships among interactions 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. Each option's effects on the process can be considered and the reduction in risk estimated by tracking the new changes on the Matrixes to the anticipated new performance.

### 3. MES performance improvement plan.

The **MES** Matrixes, with the controls shown, are then used as a baseline to guide 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 guide investigation of anomalies or deviations from predicted performance, and guide the assessment of any changes to the 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** MES facilitates the integration of investigation findings with other functions in organizations, since it focuses on people and object behaviors driven and guided by a demonstrable need.

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#### The bottom line.

It sounds complicated, but in practice **MES** provides simple objective procedures that are easily understood and used. By substituting a collaborative environment for the typical fault- and blame-oriented, adversarial investigation environment, 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:

Software to support implementation of MES technology for incident investigations, hazard analyses, recommendation development, quality assurance and witness interview preparation. Contact Starline Software Ltd. for details at [mes@starlinesw.com](mailto:mes@starlinesw.com).