



Guiding Spirit to Shipping Industry

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## Human Error – not the ‘Cause’ but an ‘Effect’?

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Dr. (Capt.) Suresh Bhardwaj

In the last article – ‘Is Safety a lucky chance in Shipping?’, it was identified that today’s work environment on board the ships is very complex.

To fully understand the work environment, where there are numerous interactions between the component elements, the SHEL model is used. The SHEL Model (1) takes into consideration all the important work system elements; (2) it promotes the consideration of the interrelationships between these work system elements; and (3) it focuses on the factors which influence human performance.

There are four components to the SHEL model: Liveware- L, Hardware – H, Software – S, Environment - E. The SHEL Model is commonly depicted graphically to display not only the four components but also the relationships, or interfaces, between the liveware and all the other components.



Figure above portrays the match or mismatch of the interfaces is just as important as the characteristics of the blocks themselves. A mismatch can be a source of human error and identification of a mismatch may be the identification of a safety deficiency in the system.

Safety science today views serious accidents - not as the result of individual acts of carelessness or mistakes; rather they result from a confluence of influences that emerge over time to combine in unexpected combinations enabling dangerous alignments - sometimes catastrophically.

Meanwhile, The James Reason’s model had identified the concept of unsafe acts having shifted from being synonymous with human error to the notion of deviation from the expected performance. The model also considers the contributing factors that could lead to the performance deviation, which directs analysis upstream from the worker and process deviations. It takes into consideration barriers or defences at all stages of the accident development and the introduction of latent or dormant conditions that are present within the system (inadequate regulations, inadequate procedures, insufficient training, high workload and undue time pressure.) well before there is any recognizable accident sequence.

**Liveware – L** - The most valuable and flexible component in the system is the human element, the liveware, placed at the centre of the model.

**Hardware - H** - includes the design of work stations, displays, ols.,

**Software - S** - the non-physical part of the system including organizational policies, procedures, manuals, checklist layout, charts, maps, advisories and, increasingly, computer programs.

**Environment – E** - includes the internal and external climate, temperature, visibility, vibration, noise and other factors - political and economic constraints, Safety Culture.

The triggering or initiating error that releases the hazard is only the last in a network of errors that often are only remotely related to the accident. Accident occurrences emerge from the organization’s complexity, taking many factors to overcome systems’ network of barriers and allowing a threat to initiate the hazard release.

Investigations require delving into the basic organizational processes: designing, constructing, operating, maintaining, communicating, selecting, and training,

supervising, and managing that contain the kinds of latent conditions most likely to constitute a threat to the safety of the system.

The idea of human error as “cause” in consequential accidents is one that has been debunked by safety science. As Perrow (1984) stated the situation “Formal accident investigations usually start with an assumption that the operator must have failed, and if this attribution can be made, that is the end of serious inquiry. Finding that faulty designs were responsible would entail enormous shutdown and retrofitting costs; finding that management was responsible would threaten those in charge, but finding that operators were responsible preserves the system, with some soporific injunctions about better training”

In contemporary safety science the concept of error is simply when unintended results occurred during human performance. Error is viewed as a mismatch between the human condition and environmental factors operative at a given moment or within a series of actions. Research has demonstrated that presence of various factors in combination increase the potential for error.

