Course Learning Outcomes for Unit IV

Upon completion of this unit, students should be able to:

2. Analyze public policy issues with consideration given to societal norms and preferences related to engineering systems.
   - 2.1 Demonstrate an understanding of how systems theory can be utilized in contemporary accident causation models to accomplish the intended outcomes underpinning Occupational Safety and Health Administration (OSHA) regulatory compliance management within the industrial sector.
   - 2.2 Demonstrate an understanding of how the STAMP model of accident causation compares to other contemporary systems-based accident causation models developed for the industrial sector.
   - 2.3 Demonstrate an understanding of global systems-based approaches at implementing accident causation management systems within the industrial sector.

Reading Assignment

Chapter 4: A Systems-Theoretic View of Causality, pp. 77-100

Kwon, H., Yoon, H., & Moon, I. (2006). Industrial applications of accident causation management system. *Chemical Engineering Communications*, *193*(8), 1024-1037. doi:10.1080/00986440500352089

Mitropoulos, P., Abdelhamid, T., & Howell, G. (2005). Systems model of construction accident causation. *Journal of Construction Engineering and Management, 131*(7), 816-825. doi: 10.1061/(ASCE)0733-9364(2005)131:7(816)

Unit Lesson

In Unit II and Unit III, we closely considered Leveson's (2011) STAMP model in various applications related to a wide cross-section of industry sectors. Specifically, we considered the three major components of a cost-effective system safety process (including the subsystems of management, development, and operations within the larger system). As such, we recall that this design effectively incorporates the most powerful design features known to optimize the decision-making process. Further, we recall that the STAMP model works to align and subsequently address processes and identify controls with a clear, linear perspective of systems component criteria interrelationships. As such, we deduced that as scholar-practitioners of safety engineering and decision science, we must become proficient practitioners at managing within various fields of engineering disciplines.

In this unit, with the clear intent of preparing ourselves for your ultimate creation of an operations safety management plan for a specific industry in Unit VIII of this course, we now begin to analyze samples of contemporary systems-based accident causation models against the STAMP model.

First, we want to consider the industry sectors that were at the heart of the establishment of the Occupational Safety and Health Administration (OSHA), given that this might lend us the information that we need to closely pair OSHA's intentions for a safer workplace with our own interest in mitigating accidents. We must remember that the sole purpose of OSHA is to protect workers as they go about their respective duties during the day, contributing to our societal development within a highly industrialized and global society (as cited in Goetsch, 2011).

Specifically, we want to focus our attention where we perceive the largest (most frequent) interactions between humans and machines may exist. For the purposes of this unit, we are going to closely consider the construction industry and the chemical manufacturing industry.

Next, we want to compare and contrast one of the most arguably effective, contemporary, systems-based accident causation models with the STAMP model. We will compare the STAMP model against Mitropolulos, Abdelhamid, and Howell's (2005) *systems model of construction accident causation*.

Finally, we want to look for some of the most effective features of the STAMP model that may be embedded within one of the most arguably effective, contemporary, systems-based accident causation management systems. We will investigate Kwon, Yoon, and Moon's (2006) *accident causation management system* applied to the chemical manufacturing sector of industry.

This exercise will cause us to revisit Leveson's (2011, pp. 75-100) description of the STAMP model design and suggested application techniques, even as we evaluate these two additional peer-reviewed models applied to the construction and chemical manufacturing sectors of industry.

As you read the two peer-reviewed journal articles, consider these points: (a) the theoretical basis for each model, (b) the authors' perception of the need for their model to be introduced to the respective industry sector, (c) the authors' use of existing models within their own model, (d) the authors' use of systems theory within their models, (e) the author's focus on the human aspects as a component of their system (think in terms of behavior-based safety theory), and (f) the authors' attempts to quantify the validity and reliability of their models.

With this unit exercise you will now be able to focus the main tenants of STAMP and subsequently identify effective aspects of contemporary systems-based accident causation models, even while learning to recognize how to develop the fundamental aspects of an effective accident causation management system within a given industry sector.

You will find that at the completion of this unit your ability to think in terms of Systems Theory and direct application of the STAMP model within your own industry sector's work systems will be greatly enhanced. This is because you are now becoming a systems-thinking decision scientist, even half way through this critical course!

Let's get started evaluating these systems tools together!

References

Goetsch, D. L. (2011). *Occupational safety and health for technologists, engineers, and managers* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Kwon, H., Yoon, H., & Moon, I. (2006). Industrial applications of accident causation management system. *Chemical Engineering Communications*, *193*(8), 1024-1037. doi:10.1080/00986440500352089

Suggested Reading

Skakon, J., Nielsen, K., Borg, V., & Guzman, J. (2010). Are leaders' well-being, behaviours and style associated with the affective well-being of their employees? A systematic review of three decades of research. *Work & Stress, 24*(2), 107-139. doi: 10.1080/02678373.2010.495262

Learning Activities (Non-Graded)

Behavior-Based Safety as a Systems-Based Approach

Consider the two peer-reviewed journal articles (required reading) solely from a behavior-based safety perspective. Think carefully about the human element at work as a component of the work system in both industrial scenarios (construction site and a chemical manufacturing plant). Create alternative decisions within each model's design that will improve the decision-making of the worker in both scenarios (while still accommodating for the variability inherent within human thinking under your own experienced work stress in a production environment).

Feel free to present your suggested improvements to others in the Student Break Room. If you are experiencing any issues, be sure to email your professor for guidance.

Conceptual Model Analysis

Browse the CSU Online Library databases for a topic that interests you. Look specifically for a scholarly article that presents work system conceptual model using behavior-based safety theory. Closely read the article and critically evaluate the model. Develop at least five improvements to the model, given your current understanding of the topic.

Non-graded Learning Activities are provided to aid students in their course of study. You do not have to submit them. If you have questions, contact your instructor for further guidance and information.