

# Good example of field of system safety research paper

[Law](#), [Security](#)



## **Introduction**

With the recent advancements in various fields it can be found that many industries and corporations currently deploy some form of automation in their daily routine activities. However, there is always the need to have safety precautions to ensure safety of the equipment and of the personnel. There is evidence of accidental damage and injury to personnel within several factories that such measures could help to prevent. Whether it is due to mechanical malfunction or unavoidable accidents that can occur, a proper safety model is a necessity to any workplace.

The safety model should be developed after carefully analyzing the mechanical and technological flaws within any workplace. It should be designed in such a way that it will prevent these accidents in the future. Furthermore these models should take into consideration the present and the rising future risk factors of the given workplace. (Lewis, 2008). This report will thereby discuss how accidents take place, how a safety model can be prepared and will then conclude with recommendations on how to deploy safety practices inside the workplace.

## **Discussion**

In recent times, due to the continued technological development of the average workplace, the engineering field has progressed a great deal. As a result many organizations are implementing new practices that include more automation. But along with this practice comes the risk of unavoidable and unforeseen accidents that can and do arise. Current practices are far different and must adapt to and plan for the current state of the modern

workplace. Old practices that were once sound are swiftly being replaced by new and more efficient methods that are meant to decrease the number of accidents that occur.

Today every organization deals into I. T. in one way or another, and as a result it becomes necessary for them to protect their datasets and other valuable information. But digital accidents are also common. These generally come in the form of computer viruses or even Trojan horse programs that manage to enter a system through another, seemingly innocuous program that seems perfectly innocent.

There are always bound to be new and different hazards that are a part of the growing pains that come with the development of technologies and automations. With the recent developments in the nuclear and chemical fields, the probability of accidents taking place has increased equally (Strasak et al., 2007). The complexity of many programs has increased more than ever before, which in turn necessitates the need for a better safety model. A safety model is a must for every organization to ensure safety and security of their equipment and of their working personnel.

Before looking into how a safety model can be prepared, this report will provide an overview of the industrial scenario of the past generations. During those times accidents used to take place due solely to human error. There were no major automations installed inside the workplace. There were no safety acts established during that time and hence, those who were the victims of random accidents were not properly educated or even prepared for what might come.

Consider a water tank that has just exploded as an example. This tank is

carefully constructed with every attempt at superior engineering that goes into its construction. However, it is still not accident proof, and is subject to some type of mechanical failure. When the proposed accident is analyzed it is found that the rupture was due to too much moisture in the atmosphere.

Source: System Safety Engineering: Back To The Future (2002) by Nancy G. Leveson

It is therefore necessary to take precautions and provide safety measures in such cases. It is the responsibility of the engineering team to monitor such tanks on a periodic basis and replace them when required. Due to lack of proper technologies and appropriate management approaches such safety issues lead to accidents that are otherwise manageable.

Relating this information to other industries it is seen that the probability of accidents taking place remains the same. Consider an example of the airline industry, where there is plenty of room for pilot error, lack of proper procedure, FMS inconsistencies or even manufacturing deficiencies in the airplane itself. The result is that without proper safety models accidents are likely to abound in any field. This is also true of the construction field, where mechanical and human errors have conspired to create faults in large structures upon which society is dependent upon. For this reason it is of the utmost importance that safety models be implemented, so as to save both lives and property from accidents that could otherwise be avoided.

Every bit of evidence presented demands the deployment of the safety model within each respective workplace. However one needs to consider certain factors for designing a safety model. Consider the same example of a failing water tank and one realizes the need for preventative measures that

can discourage accidents that might occur in the future.

A safety model can be used to provide the knowledge of what to use so that a water tank does not suffer overexposure to moisture. It can also determine that certain materials are better than those used in the past to help avoid any escalating problems. In the example of the water tank desiccant can help with exposure to moisture, and using stainless steel or carbon plate will help with corrosion. Also the thickness of the metal is a factor that can aid with the overall strength of the tank. (Abid & Hassan, 2015). The engineers should immediately reduce the operating pressure once the tank ages. In order to further prevent extensive damage and fragmentation, the engineers can use a burst diaphragm. The entire equipment should be kept up to date and in good working order so as to avoid injury to the personnel.

It has been observed that safety models are generally prepared by engineering designers. They provide the necessary training and operating guidance to the actual operators that will be deploying the approved model. The engineers often design models after taking into consideration all the original design specifications of their workplace. However there are still variances that are closely observed so as to determine which accidents might take place in the future and how they can be avoided. A successful safety model takes into account every last variable that can be conceived so as to keep the personnel safe and operational.

The safety model in larger organizations starts from the manufacturing section. Once the requirement of safety levels and other safety criteria are taken, there are safety reports and inspection reports that must be prepared. Each of these reports is then checked by a special engineering team to find

out if any important information is missing. Based on the given requirements, the details of the safety reports will be provided to the safety model preparation team (Srivastava & Thakur, 2013). They then consider the inputs of hazard analysis, safety constraints, and other test reports that help them to prepare the model in a better way.

There is a special Hazard Documentation prepared that works as a guide and working module for everyone. Once the assurance certification is received, the model is sent into the testing phase where it is once more tested by the project management team. This team will be the one that will be deploying the model in their practical implication.

In this manner the same model is passed over to the company management team who will be analyzing the safety model from the perspectives of safety regulations, safety laws and standards, legal norms, and other certifications. Once they find it appropriate, they will approve the model. The project team will then start working on the deployment phase of the approved safety model in their respective workplace.

It has been observed that the safety laws come into the picture due to unidentified hazards, missing control actions, inappropriate design of the control algorithm, communication flaws, and flaws in the creation process, time lag and even inadequate actuator operation. The organization needs to take into consideration each of these factors and act accordingly when it comes to preparing the model. They also need to prepare a contingency plan that will ensure a backup option in case the model fails to deliver.

There are also quality assurance programs which could be included in the daily operational activities of the organization. The manufacturing team will

follow the norms of these programs to ensure that there are no glitches in any of the safety parameters (Lewis, 2008). Even in the field of Information and Technology, the respective organizations will take great pains to prepare the software design after protecting it against the external threats of viruses and Trojans.

All the safety practices are deployed while still keeping in mind the environmental issues, operator's capability and the system components. There are various assumptions made about the system, internal and external environment, and the operator's capability. While developing a system safety model for the engineering project, the information that is collected is regarding the responsibilities of the operators, logical principles that will be applied, issues of several flaws, validation plans, analysis plans, test plans, preliminary hazard analysis reports, design specifications, performance audits, error reports, operator manuals, and training materials. There are various levels that are designed to collect this information and each one does so in a step-by-step manner (Strasak et al., 2007). This is shown in the below figure:

Figure: Gathering of information for preparation of System Safety Model

Source: System Safety Engineering: Back To The Future (2002) by Nancy G. Leveson

This is how the system safety model for the engineering project is constructed. It can, however, be changed from time to time depending upon the changing requirements.

## Conclusion

Safety is an important issue for everyone in this world. The safety model is prepared once the purpose of the organization is defined. There are several environmental assumptions and constraints that need to be considered before the actual implementation.

The project team needs to look out for the quality issues, performance parameters, designing specifications, implementation principles, and other controls before they deploy the safety model to protect a given engineering project. The organizations can implement Quality Standards across the organization for the safety of their equipment and also to ensure safety of the working personnel of the organization.

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