

Engineering disasters essays example

[Experience](#), [Failure](#)



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Engineering

The role of an engineer is to respond to a need by building something as per a set of specifications. It is important for the device, plan or creation to function without failing because a disaster could be costly in terms of life and effort. There have been catastrophic disasters in the past in various fields of engineering: infamous ones include the sinking of the Titanic, the explosion of Space Shuttle Challenger, the oil rig explosion of British Petroleum and the Chernobyl nuclear plant disaster. Second only to the medical profession, engineers are held in high esteem by society, and there are very few knowledgeable people who would have the capability, other than engineers themselves, who could find a flaw in a system before a failure occurs. Therefore, it is incumbent on the community of engineers to strive to

prevent disasters. The thesis of this paper is that prevention of engineering disasters needs concerted action from the functional as well as the holistic frameworks.

Preventing Engineering Disasters - the Functional Framework

A typical engineering department consists of a hierarchy, beginning from the President. Invariably, a Chief Engineer follows the President. A Project Manager, in charge of a specific project, reports to the Chief Engineer. The hierarchy goes three or four levels further down till the technicians. The entire hierarchy is responsible to ensure that engineering projects do not fail. However, if the system is not alive to common flaws in the engineering process, they invariably allow failure to creep in (Lewis, n. d.).

The Endless Revision Cycle

Often, a design is flawed. The engineers decide to correct the design. In doing so, they fix some of the original problems. However, the changes cause new problems. The cycle is repeated. The product never seems to get completely error-free. As this cycle is hard to break, it is best to prevent it altogether (Lewis, n. d.).

One method to prevent the endless revision cycle is to simulate the behavior of circuits being designed so as to spot problems before the design is fabricated. Second, a well-documented revision history is mandatory, so that engineers can go back into the design process to identify where in the design history did a failure get injected into the process. Third, engineers must be humble enough to admit that no design is perfect. Therefore, they should allow their designs to be subject to peer review so as to get valuable

feedback about loopholes they did not visualize. Fourth, they should do piece-wise test of the design as much as possible through simulation and emulation techniques to identify fault-prone components. Fifth, existing designs known to work could be used as part of new projects; instead of designing everything from the ground up, the engineers would be relying on a few known failure proof components (Lewis, n. d.).

Projects Doomed at the Start

Many engineering projects are doomed to failure right at the beginning because of poor planning, improper resources or poor specifications. If the engineering department does not have key personnel such as a senior engineer, the project may not be provided with correct specifications. The project may be hampered with a lack of proper design tools and test equipment. In a bid to save on costs, the management may have opted for free tools. The hidden cost of ‘free’ tools is the time taken to master them. Technical support, that comes with paid software tools, more than makes up for the costs incurred. If the company does not invest in proper simulation tools, the project is hampered in fault identification. Specifications introduced into the system at a late stage would cause the project costs to rise exponentially and the performance to suffer. While the project may depend upon consultants, it is important to retain enough knowledge in-house so that the company can provide ongoing support and create updates without external help (Lewis, n. d.).

Preventing Engineering Disasters - the Holistic Framework

Behind the functional framework lie a number of deeper reasons why engineering catastrophes occur. It is important for senior management to be aware of these attributes so as to prevent catastrophic failure.

Cognitive Bias

Researchers have noticed a pattern in catastrophic failures. Multiple near misses have often preceded a disaster. In every disaster, the previous near misses were often ignored or misread. Cognitive bias conspires to blind managers to such near misses. Managers tend to believe in ‘normalization of deviance’ (Tinsley, Dillon & Madsen, 2011), wherein anomalies are accepted as normal over a period of time. The second cognitive error is ‘outcome bias’. When people observe successful outcomes, they tend to focus on the results more than on the complex underlying processes. Once the focus on the process is lost sight of, the project fails due to lack of attention to detail (Tinsley, Dillon & Madsen, 2011).

Preventive Ethics

The root causes of catastrophes are often human error, technological failure or bad strategic decisions. One important contributory cause to catastrophe is the absence of preventive ethics. Once engineering standards are violated to meet unrealistic expectations, it is important for engineers and managers to point out the error to the management. Lack of ethical and moral courage often dooms projects in a fundamental manner and to an extent where the micro-management of prototyping and design become irrelevant (Parks, 2014).

Recommendations

At the level of workers, there are many factors an engineer cannot control. However, he could contribute to prevention of failures by knowing the schedule of a project, so that he is aware of deadlines and workflows. There should be a backup plan to cater for things that do not work out. Designs should be made within specifications. Simulation of projects is an important step in fixing errors before they are transferred to the live project.

Engineers need to guard against the momentum of continued success, and be aware of cognitive biases that prevent them from identifying emerging faults. At all levels, there is a need for moral courage and ethical behavior. Engineers must have the gumption to speak up and point out errors in a project before the project results in catastrophic failure.

References

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