# Legal and Ethical Implications of Generative AI in Engineering:

*A Case Analysis on Technical Failure and Liability*

*Introduction - 245 Words*
*Analysis - 2114 Words*

# EXECUTIVE SUMMARY

This report investigates **a catastrophic transformer explosion that occurred during a high-rise construction project, stemming from technical failures linked to the use of Generative AI (GenAI) for electrical grid design optimisation**. The incident had severe consequences, including tragic loss of life and extensive property damage. The analysis is centred on four key aspects: legal liability, ethical responsibility, risk management, and the integration of AI technologies in engineering practices.

The **failure raises significant questions about accountability under common law and contract law, as well as the professional duties of engineers and project managers involved.** A detailed examination of the incident highlights the **increasing complexities of assigning liability when advanced AI systems are integrated into engineering workflows**. My analysis further explores the implications of professional ethics, focusing on how the use of GenAI may conflict with established codes of conduct and legal obligations.

From a risk management perspective, the **incident underscores the importance of rigorous safety protocols and the need for enhanced oversight when deploying AI systems in critical infrastructure projects**. My report suggests that insufficient testing and verification of the GenAI model contributed to the failure, highlighting gaps in current risk assessment practices.

In my opinion, there is an **urgent need for clearer regulatory frameworks governing the use of AI in engineering projects**. Enhanced guidelines and oversight mechanisms are essential to ensure that the integration of such technologies aligns with legal and ethical standards. Ultimately, this case demonstrates **the importance of prioritising public safety and maintaining trust in the engineering profession when incorporating innovative AI tools into project planning and execution**.

# CONTENT

# INTRODUCTION

In recent years, I have observed that the rapid adoption of Generative AI (GenAI) has reshaped engineering practices, particularly in complex and high-stakes projects such as urban high-rise developments. Although the use of AI-driven tools has undeniably improved efficiency and precision, I believe that the increasing reliance on these technologies has brought about significant challenges, particularly concerning issues of liability, safety, and the role of human oversight.

**This case study examines a tragic incident at a high-rise construction site, where a transformer explosion led to a devastating electrical fire, resulting in the loss of an engineer's life. The incident was attributed to the failure of an AI system that was responsible for predicting an overload but did not do so accurately**.

This situation highlights the inherent risks associated with integrating emerging technologies into critical infrastructure. In analyzing this case, I will **address key questions regarding the legal defenses available to the involved parties, the possibility of criminal negligence charges, the ethical and professional responsibilities of engineers, and the broader implications of AI on safety protocols** in construction projects.

Overall, this case raises important concerns about the use of GenAI, particularly in life-critical applications, and challenges existing legal frameworks and professional standards. It underscores the **evolving responsibilities of engineers in managing advanced technologies** while **emphasizing the necessity of maintaining human oversight and accountability**. Through this analysis, I hope to shed light on the complexities of balancing innovation with safety and ethical considerations in modern engineering practice.

# ANALYSIS OF CASE

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My analysis of this case covers four main sections: **[1] legal defenses and dispute resolution preferences, [2] stakeholder liability and criminal negligence potential, [3]compliance or non-compliance with the Code of Ethics** and **[4]the role of safety in occupational environments**, with a focus on the risks associated with Generative AI (GenAI).

Each of the sections examines the relevant legal frameworks, ethical obligations, and practical considerations that influence decision-making in complex engineering environments. The insights that I have drawn from this analysis are aimed at informing about professional conduct, risk management strategies, and the safe integration of advanced technologies in engineering practice.

## 3.1. Legal Defenses and Dispute Resolution Preferences

**In both common law and statutory law**, when dealing with technical failures, particularly in the context of emerging technologies like Generative AI (GenAI), *a common defense involves demonstrating compliance with accepted industry standards and addressing unforeseen risks*. **Under common law**, the primary concern is negligence, which is identified when there is a "***failure to meet the duty of care, leading to harm"*** (McKendrick, 2023).
In this case, engineers or contractors might argue that they acted responsibly by relying on GenAI, which was a recognized tool at the time for predictive analysis. However, **the defense** would focus on whether the failure was foreseeable. Given that AI technology, such as GenAI, may misinterpret data due to anomalies, the engineers could claim that the malfunction was an unforeseeable circumstance, which could not have been reasonably predicted or prevented (Turner, 2022).

**Statutory defenses** are also available under the **Work Health and Safety Act 2011** (WHS Act), which requires employers to take all reasonably practicable steps to ensure worker safety (Safe Work Australia, 2023). If engineers and contractors followed industry guidelines and used GenAI in a responsible manner, they could argue that they met their legal obligations under the WHS Act, despite the failure of the technology.

The ***key issue here is foreseeability***. Under common law, engineers are required to predict and prevent foreseeable risks (Turner, 2022). However, given that GenAI operates based on complex algorithms and vast data analysis, the failure might fall outside traditional expectations, rendering the engineers' reliance on the technology justifiable. The defense could thus argue that the malfunction was beyond the engineers' control, presenting it as an "unforeseen circumstance" that could not have been reasonably predicted.

***GenAI introduces complexities in determining liability***. While traditional liability often involves human error, AI complicates the issue by shifting some responsibility to the system itself. In this case, if the AI system was improperly trained or contained design flaws, the engineers and contractors could face new challenges related to the adequacy of the system (Turner, 2022). The question then becomes whether the engineers are liable for failing to predict AI's shortcomings, or if the liability lies with the creators or designers of the AI system.

***Arbitration or mediation*** are in my opinion the preferred methods of resolution both being efficient forms of ***Alternative Dispute Resolution*** (ADR) that are particularly well-suited for complex, technical issues. Arbitration is beneficial if a binding decision is required, as technical experts will be involved to assess the role of GenAI in the failure. On the other hand, mediation offers a more collaborative approach, allowing the parties to settle through negotiation with a neutral third party. In technical disputes, mediation enables stakeholders to discuss the issues in detail without the formalities of a court trial (Fisher & Ury, 2020).

**In conclusion, while common law and statutory defenses emphasize foreseeability and reasonable precautions, in my assessment the complexities of GenAI introduce new dimensions to liability. The preferred approach for resolving disputes involving such technologies would be ADR methods like arbitration or mediation, which will provide a more efficient and expert-driven resolution process.**

## 3.2. Stakeholder Liability and Criminal Negligence Potential

It can be argued that the building contractor, project manager, and engineer - as is their job - each holds a duty of care under common law to ensure the safety of their workplace and the reliability of the systems involved. This duty of care, as outlined in contractual and tort law, obligates professionals to perform due diligence and prevent foreseeable harm. In this case, their reliance on Generative AI (GenAI) to optimize the electrical grid and the subsequent failure to foresee the overload indicates a breach of their professional responsibilities (Smith, 2021).

***The contractor and project manager are responsible for overseeing the entire project, including the integration of AI technology***. Their duty extends beyond merely executing tasks; they are tasked with ensuring that all systems comply with safety standards. In this context, they would be liable if it is found that they failed to independently verify or supervise usage of the predictions made by GenAI. "*As supervisors, they should have anticipated the risks associated with implementing emerging technologies and ensured that safety checks were in place"* (Turner, 2022)***. The engineer, as the technical expert, also holds responsibility for confirming that the design and systems meet required safety standards***. Failure to properly test or monitor the AI's output could be considered negligence, as engineers are expected to evaluate all tools and predictions used in the design process to ensure their accuracy (McKendrick, 2023).

The ***potential for criminal negligence*** charges arises if the actions of the involved parties show a ***"gross deviation"*** from the ***standard of care expected***. Under the **Work Health and Safety Act** (WHS Act), negligence can extend to criminal liability if the failure to act was grossly negligent, such as when parties knowingly disregard safety or fail to take reasonable precautions. ***If the contractor, project manager, or engineer failed to sufficiently test, monitor, or intervene in the AI system's decision-making process, it could amount to gross negligence.*** For instance, the engineers relied solely on AI predictions without understanding the system's limitations and did not perform manual checks, showing a reckless disregard for safety (Safe Work Australia, 2023). The fatal outcome of the technical failure, resulting from this inaction, underscores the possibility of criminal charges, as the severity of harm would be seen as disproportionate to the level of diligence exercised by the parties involved.

***GenAI complicates traditional liability frameworks because it introduces technological uncertainty***. AI systems, while powerful, are not infallible and may not fully predict or account for all risks. Reliance on an imperfect system like GenAI without sufficient oversight could be deemed negligent, especially when human expertise could have identified potential flaws (Turner, 2022). *In this case, the failure to verify AI-generated recommendations before implementation will be viewed as a breach of professional responsibility, as the engineers, contractors, and managers failed to adequately assess the risks.*

In conclusion, the contractor, project manager, and engineer I believe should/might face liability for damages due to negligence, particularly as they failed to appropriately supervise the use of GenAI and failed to conduct necessary safety verifications. Criminal negligence charges are applicable as their actions amount to gross negligence, demonstrating a reckless disregard for safety. "***The integration of GenAI highlights the need for professionals to maintain oversight and responsibility when relying on technology that may not fully predict or mitigate risks"*** (Smith, 2021).

## 3.3. Code of Ethics Compliance and Public Trust

**It can be argued that upholding a strict Code of Ethics is essential for professional engineers**, particularly when working with emerging technologies like Generative AI (GenAI), due to the potential impact on public safety and welfare as is true in this case. ***Engineers are bound by ethical principles to prioritize public safety, transparency, and competence***. This is especially crucial in high-stakes engineering projects -like in this case the electrical grid design-, where errors can have catastrophic consequences. The **Engineers Australia Code of Ethics (2017)** explicitly outlines that ***engineers must act with integrity, ensuring their work benefits the public and adheres to high standards***. Failure to do so, as seen in this case involving GenAI errors, undermines public trust in engineering practices and leads to fatal outcomes.

The ***Code of Ethics provides a framework for us engineers to make decisions that balance legal compliance with ethical responsibility***. In situations like this where technology like

GenAI is employed, engineers must not relinquish human judgment entirely. I firmly believe that ethical compliance dictates that engineers remain skeptical and cautious, ensuring that AI systems are rigorously tested and reliable before implementation. "***Engineers must also communicate clearly about any limitations or risks associated with the technologies they are using to promote transparency and trust with the public"*** (Engineers Australia, 2017).

***Public Trust is intrinsically linked to the ethical conduct of engineers***. When we engineers adhere to high ethical standards, we build public confidence by demonstrating that we prioritize safety over convenience or profitability. For example, transparency in the integration of AI systems—highlighting their limitations, risks, and the steps taken to mitigate potential failures—helps foster trust. **This is I believe critical as public reliance on technology increases, particularly in vital infrastructure systems**. The ***"use of Generative AI in high-risk sectors must be accompanied by rigorous oversight and ethical consideration to maintain public faith"*** (Safe Work Australia, 2023).

The **compulsory registration of professional engineers must become mandatory to further strengthen public's trust**. Registration ensures that engineers are held accountable for their decisions and that they have the requisite qualifications to evaluate and manage complex systems, including AI. ***The continuous professional development and training required for license renewal ensure that we engineers remain up-to-date with technological advancements and ethical challenges*** (Safe Work Australia, 2023). This regulatory framework, which requires engineers to meet ethical standards, will as evidence suggests contribute significantly to the assurance that engineering decisions are made with competence and integrity, particularly in emerging technologies like GenAI.

**In the context of Generative AI, adherence to the Code of Ethics becomes even more significant as these systems evolve rapidly and can introduce unforeseen risks. I recommend that the** Engineers must continuously assess the performance of AI systems, ensuring they do not make decisions beyond their capabilities.

With proper ethical oversight, engineers can prevent errors, such as this case where AI systems misinterpretation of data leads to significant public safety incident.

I believe it is reasonable to conclude that Ethical decision-making practices, reinforced by compulsory registration, are thus integral to maintaining public trust in engineering, especially in the face of rapidly evolving technologies like GenAI.

## 3.4. Safety in Occupational Environments and GenAI Risks

**Safety in occupational environments, particularly in engineering, is often seen as "freedom from dangers and risks."** ***However, I believe this concept is an ideal, not an attainable reality.*** The notion of absolute safety has been critiqued by experts, recognizing that risks can be minimized but never eliminated. The **Work Health and Safety (WHS) Act 2011** in Australia stresses that " *the employers must ensure, as far as reasonably practicable, the health and safety of workers"* (Safe Work Australia, 2023), including implementing

safety measures, conducting regular inspections, and preparing for emergencies. However, the **WHS Act** also acknowledges *"the inevitability of residual risks in any workplace"* (Fisher & Ury, 2020).

One of the ***key challenges that we engineers face in modern engineering is integrating emerging technologies like Generative AI (GenAI)***. While according to my experience, GenAI holds significant promise for enhancing efficiency and predictive capabilities, **its use introduces new, complex risks for us**. A **notable danger is the over-reliance on AI**. Engineers can place *too much trust* in AI predictions, potentially overlooking their limitations. In this case it caused a fatal fire due to the GenAI system failure, ("***the engineers' failure to question AI-generated recommendations led to disastrous consequences"-*** (Safe Work Australia, 2023)). This in my opinion, highlights the importance of human oversight in mitigating AI-induced risks.

Another **critical risk that we face is GenAI's reliance on input data quality**. "*AI systems function by learning from vast datasets, and if the data is flawed or incomplete, the AI's predictions can be inaccurate"*. For example, the GenAI algorithm might have failed to predict a transformer explosion because it was trained on insufficient or biased data, which led to faulty predictions in this case**.** These flaws underscore that there is a "***necessity for regular verification and validation of AI systems*** to ensure the accuracy of predictions and mitigate potential errors"(Turner, 2022).

Further, it is fact that **Bias in AI algorithms poses risk in engineering applications**. "*AI models can reflect **Biases** present in their training data, resulting in skewed predictions that may compromise safety"***.*** In engineering, where precision is paramount, such **Bias** in my opinion can lead to dangerous decisions, such as inadequate safety measures or poorly designed systems. Additionally, "***AI's inability to understand contextual nuances—such as human judgment or qualitative factors—limits its decision-making capacity, which engineers must always be aware of "*** (WorkSafe Victoria, 2023).

In redefining safety for AI-driven environments, **the ideal would be to aim for "freedom from foreseeable and controllable risks, with acknowledgment of inherent technological limitations."** This modified safety definition aligns with the reality that ***no system can be entirely free from danger***. Engineers ***must integrate hybrid safety protocols—such as manual verification of AI outputs—during critical stages*** to ensure that the safety of systems is not compromised by the technology itself (Fisher & Ury, 2020).

In conclusion, **while achieving absolute safety is impossible, engineers can minimize risks through ongoing risk assessments, safety protocols, and human oversight, particularly when using advanced technologies like GenAI. Balancing AI capabilities with human responsibility remains key to ensuring that safety is maintained in AI-enhanced engineering environments**.

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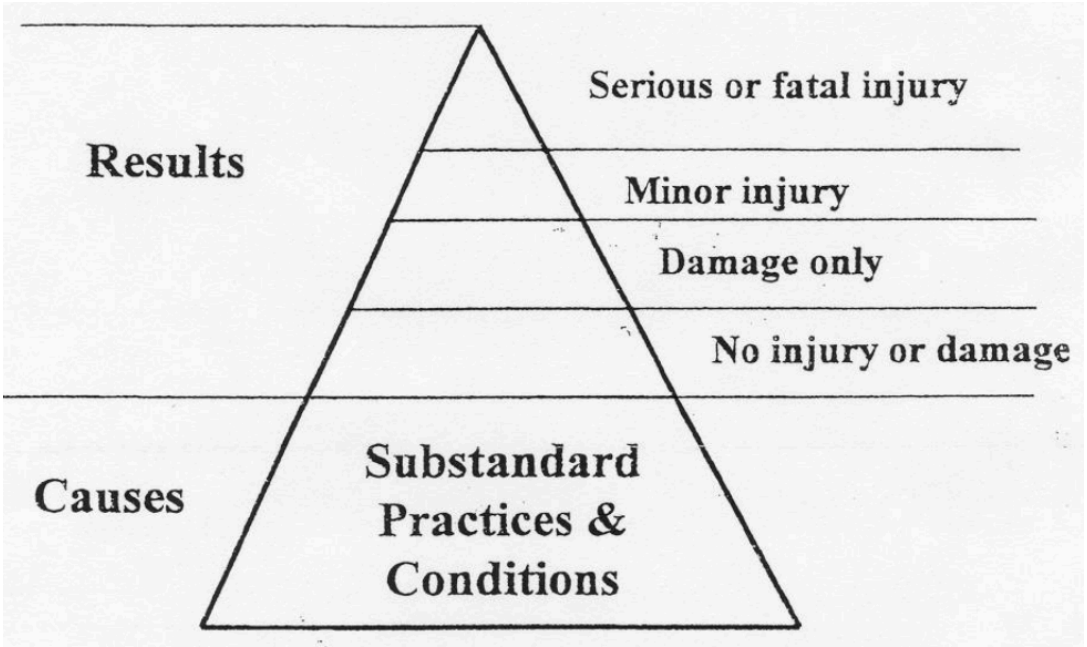
# APPENDIX

**A.1. Incident Investigation**




**A.2. Facts-**

- It has been estimated that there are at least 2,900 deaths related to work annually - one and a quarter times the annual suicide number and nearly one and a half times the number of annual motor vehicle traffic accident deaths**. (Statistics Unit, Worksafe Australia - June 1996)**
- One in 12, or over 650,000 workers suffer a work-related injury or illness each year, approximately 170,000 of whom require at least five days absence from work as a result. **(Statistics Unit, Worksafe Australia - June 1996)**
- In August 1994 Worksafe Australia's estimated the annual cost of work-related injury and disease as being between $15 billion and $37 billion, in 1992- 93 dollar terms. Assuming a 6% earnings potential, these costs become between $196 billion and $490 billion over 10 years, in 1992-93 dollar terms. **(Statistics Unit, Worksafe Australia - June 1996)**
- The Industry Commission subsequently estimated the yearly cost at $20 billion, with approximately 30% being borne by employers, 30% by employees and 40% by the government. **(Statistics Unit, Worksafe Australia - June 1996)**