

# PRODUCT SAFETY CULTURE: A NEW VARIANT OF SAFETY CULTURE?

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## Acknowledgment:

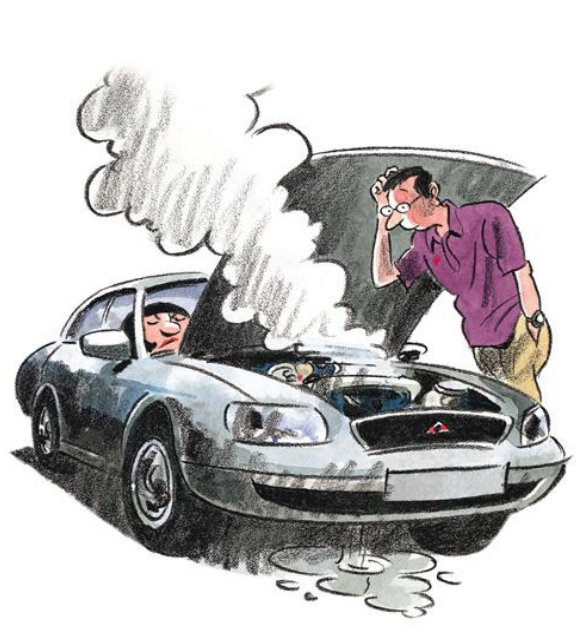
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# Outline of the Presentation

1. Reasons for examining Product Safety Culture (PSC)
2. What are the findings from safety culture research to date? (including relevant dimensions)
3. Examples of product safety failures as results of poor organizational culture
4. What is Product Safety Culture (PSC) and what are the dimensions of PSC?
5. Technology in PSC and implications for nuclear industry
6. Current research in PSC

# What is Product Safety?

- Food products – contamination
- Transportation – faulty brake cables
- Household goods – unintended overheating/ignition
- Children's toys – poisoning/choking hazards

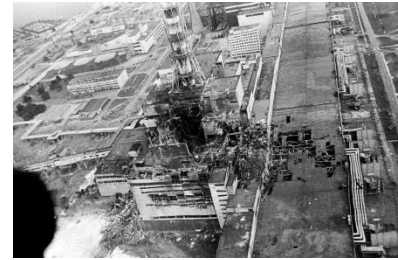


# 1. Reasons for Examining Product Safety Culture

- Product safety and integrity failures – learning from incidents
- Various manufacturing and service industries (i.e. defence, food, transportation) – that provide goods/services are concerned about product safety/ risks to users
- How can company culture influence product safety?
- Novel research area but there is extensive research on worker/ process safety culture



## 2. Research in Safety Culture



- Safety culture – set of shared attitudes, values, beliefs and practices held by an organization in terms of safety and effective control (Health and Safety Commission, 1993)
- 30 years of inspiring and engaging research post-Chernobyl accident in 1986
- Seminal studies on worker/process safety culture, including Pidgeon, Zohar, Reason and many others to evaluate theoretical models of culture to predict and mitigate safety outcomes (i.e. injuries, days lost at work, accidents)
- Focus on safety culture dimensions to create understanding of organisational influences on safety outcomes

# Safety Culture Dimensions

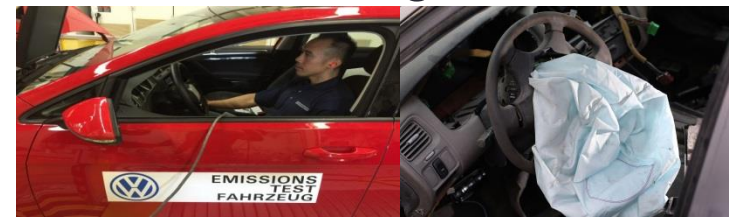
- Attempt to create a 'core' set of dimensions in research through meta-analyses (i.e. Beus et al., 2010; Christian et al., 2009, Clarke, 2006) – effects on safety outcomes related to safety culture dimensions:
  1. **Management commitment to safety** (managers encouraging good safety practices/prioritising safety)
  2. **Safety Systems** (policies and procedures encouraging workplace safety)
  3. **Communication** (sharing of ideas and knowledge relating to safety)

### 3. Product Safety Incidents

- Takata (airbag scandal 2015) – early airbag deployment and accidental shrapnel release caused deaths and many injuries; millions of vehicles recalled worldwide – cost-cutting culture, failure of management commitment
- Toyota (uncontrolled acceleration issue 2009) – deceptive and misleading statements about safety of the vehicles; millions of vehicles recalled due to safety issues – profit-driven culture, lack of commitment to safety
- Volkswagen (emissions scandal 2015) – hidden software to provide false readings during emissions testing, resulting in millions of cars recalled and resignation of senior management – damage to VW safety reputation



FROM LEFT: MEDIA STAND IN A PARKING LOT, WAITING FOR A PRIUS TO RUN AWAY; RECALLS KEPT TOYOTA SERVICE BAYS PLENTY BUSY



# 4. Product Safety Culture

- “Set of attitudes, norms, beliefs and behaviours of employees that affect the integrity of a product as a result of existing safety practices.”

(Working definition based on the definition of safety culture by the Health & Safety Commission, 1993)

- Determining how organizational culture affects external safety outcomes (e.g. product failures and accidents to user) – unlike worker/process safety that considers workers’ and workplace accidents
- More emphasis on incorporating complex technical systems into the organizational culture, not exclusively human factors based
- Very little material on product safety culture in general



# Food Safety Culture



- Research in food industry concerning organizational influences on safe food handling practices as an example of product safety culture in practice (Powell, Jacob & Chapman, 2011)
- Studies focus on examining management commitment to safety, as in worker/ process safety culture research
- A good food safety culture encourages use of appropriate protective equipment and food handling practices and food quality

# Patient Safety Culture



- Patient safety culture is a related area. Service-oriented where the user is the patient receiving medical attention
- Patient safety culture – how the culture in healthcare organizations influences adverse events (i.e. complications, iatrogenic injuries to patients) (Flin, 2007)
- Key factors in patient safety culture - management and supervisor commitment to safety; communication; perceptions of staffing levels
- Safety culture factors (e.g. management commitment to safety) may be influencing both patient adverse events and worker injuries

Flin, R. (2007). Measuring safety culture in healthcare: a case for accurate diagnosis. *Safety Science*, 45, 653-667. DOI: 10.1016/j.ssci.2007.04.003

Agnew, C., Flin, R., & Mearns, K. (2013). Patient safety climate and worker safety behaviours in acute hospitals in Scotland. *Journal of Safety Research*, 45, 95-101

# 5. Technology and Design

Rollenhagen (2010):

- In order to consider safety culture fully, one would need to be more understanding of the underlying technology as an influencing factor
- Safety culture research should attempt to be more innovative and simplify complex technical systems for better operational understanding
- Risk of safety culture becoming a catchphrase for human factors only
- However complex understanding of technical systems is not possible (Leveson, 2011) but human behaviour should not be looked at in isolation from technical systems but become an aspect of it

# Technology and Design (Nuclear)

- Principles of a Strong Nuclear Safety Culture (INPO, 2004) – more emphasis on understanding nuclear technology in the nuclear industry
- Fukushima Daiichi NPP:
  - report by the IAEA (2015) outlining necessity of considering technology and design more in-depth as part of safety culture (ability to account for any given safety scenario and make technical systems more resilient)
  - considering human interactions with complex technical systems – complex technical systems may be detrimental to safety – lax, reactive safety culture/complacency issues



## 6. Current Research

- Can existing dimensions from worker/ process safety culture be applied to Product Safety Culture?
- To examine how design, manufacturing and servicing of products is affected by the organization's safety culture (and how this can impact the user)
- Understand what constitutes an exemplar product safety culture
- Develop theoretical model for the relationship between product safety culture, managers'/workers' behaviour and product reliability

# Interview Studies



- Two interview studies in a defence sector organization carried out to date

## Study 1:

- Exploratory interview study to examine the concept of product safety culture and what it defines in the defence industry
- Interviewed 10 Product Safety Managers – subject matter specialists, key dimensions identified as communication; knowledge, awareness and understanding; moral/ethical attitudes

## Study 2:

- Further interviews with operational management (10 interviews) to examine whether initially identified dimensions from Study 1 and from thematic analysis of literature would be replicated + any other potential dimensions

# Preliminary Findings from 2<sup>nd</sup> Study

- Dimensions identified (in order of frequency of occurrence):
- **Safety systems** (including knowledge and understanding of product safety practices/policies/training) – relevant to understanding technology/relevant technical systems and resilience engineering
- **Communication**
- **Existing behaviours and attitudes in the workplace**
- **Awareness of product safety state in workplace**
- **Management commitment to safety**
- **Work ethic/moral attitudes**
- **Trust**
- **Work pressure and financial benefits**
- **Reputation**

# Next study

Case analysis study planned at two defence manufacturing sites. This will consist of: observations, 10 interviews with shop floor workers, hazard/risk reporting and accident analyses

- Safety systems - examine the role and effectiveness in two different business units (e.g. aviation and naval) and how this carried out on the shop floor
- Communication and awareness of product safety will be explored in relation to safety systems

# Conclusion

- Dimensions identified in 2<sup>nd</sup> study show that understanding of product safety is achieved through applying relevant product safety practices where necessary, as well as an awareness of possible risks throughout the product's lifecycle
- Importance of risk mitigation in product (technology) assembled through shaping safety practices and procedures to achieve necessary product safety, from its initial design through to maintenance
- Implications of nuclear industry's focus toward resilient engineering and technology practices – attitudes replicated in current research; move toward proactive consideration of technological resilience

Thank you for your attention!