SMA SUPPORT OFFICE

Hazard Database for NASA Hazard Analysis

2012 IV&V WORKSHOP
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Agenda

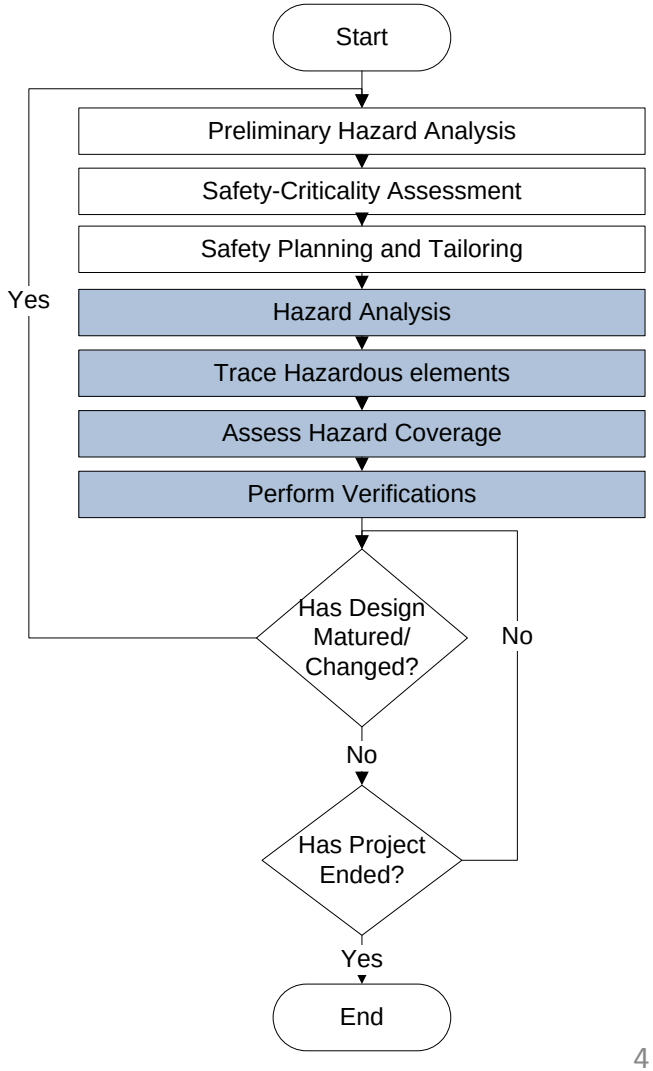
- Purpose
- NASA Hazard Analysis Overview
- Hazard Database Overview
- Example
- Conclusion

Purpose

- **Describe the use of a database to support hazard analysis**
- **Recommend functions to incorporate into a hazard database**

NASA Hazard Analysis Overview

- **Safety Process Flow chart**
  - Notional representation of the Safety Process (Extrapolated from the NASA Software Safety Guidebook)
- **Obvious to use a database to trace Project elements (requirements, etc.) to hazards**
- **Easy to extend tracing database to support all four of the highlighted activities on the flow chart**



Hazard Database Overview

Benefits of using a database

- Spreadsheets become large and too complex to efficiently manage
- Dramatically improves data management and reporting
- Can force data/process consistency
- Allows many users to simultaneously update data
- Can guide users through processes (assisting inexperienced analysts)

Cautions of using a database

- May intimidate users and make adoption difficult
- Project databases are not always available or flexible (may need separate database)

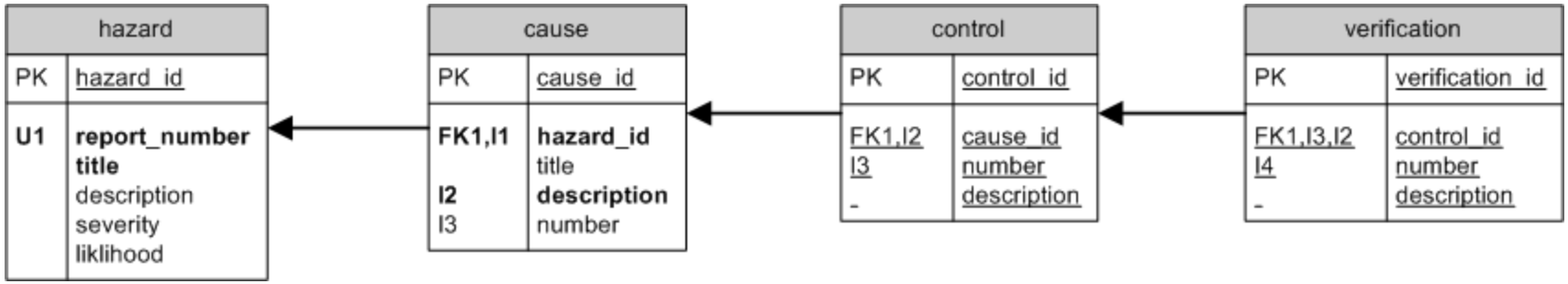
Hazard Database Overview

Three recommended hazard database functions:

1. **Manage hazard analysis results (hazards, causes, controls, verifications, etc.)**
2. **Manage traces to hazards (requirements, commands, telemetry, procedures, etc.)**
3. **Manage hazard verifications (verification steps, verification status)**

Hazard Database Overview

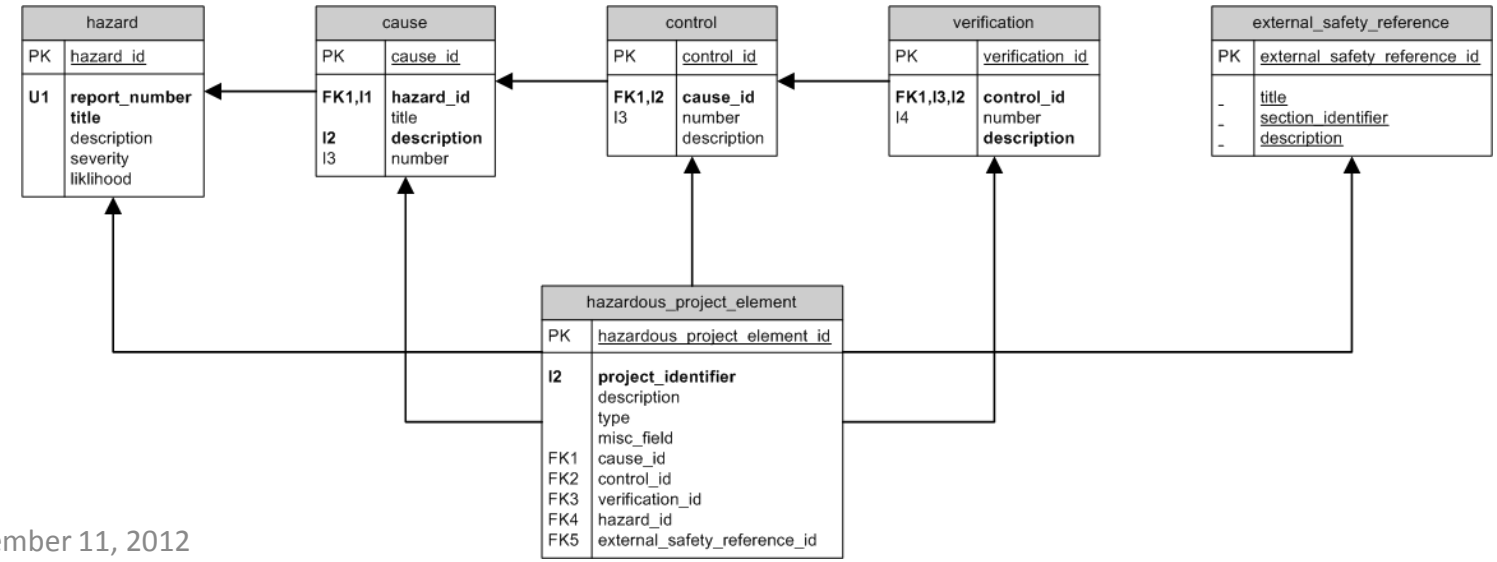
1. **Manage hazard analysis results (hazards, causes, controls, verifications, etc.)**
   - Benefits
     a) Auto-generate Hazard Reports
     b) Can use data input interface to guide users through process



Hazard Database Overview

2. Manage traces to hazards (requirements, commands, telemetry, procedures, etc.)

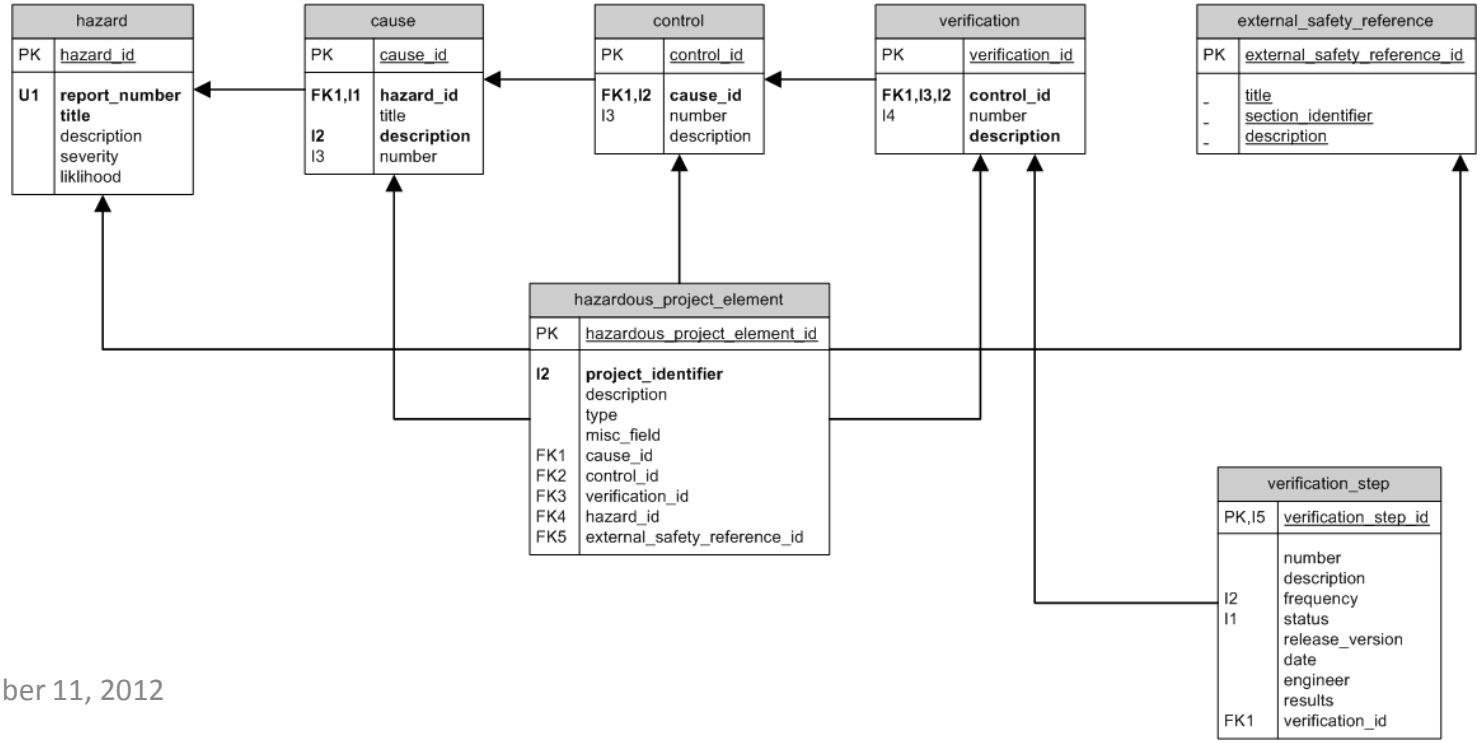
- Benefits
  a) Auto-generate safety-critical tags
  b) Reports to help assess hazard coverage (i.e., number of requirements for a given control



Hazard Database Overview

3. Manage hazard verifications (verification steps, verification status)

- Benefits
  - a) Allows verification steps to be managed (defined, assigned, tracked, etc.)
  - b) Auto-generate status reports and verification tracking log

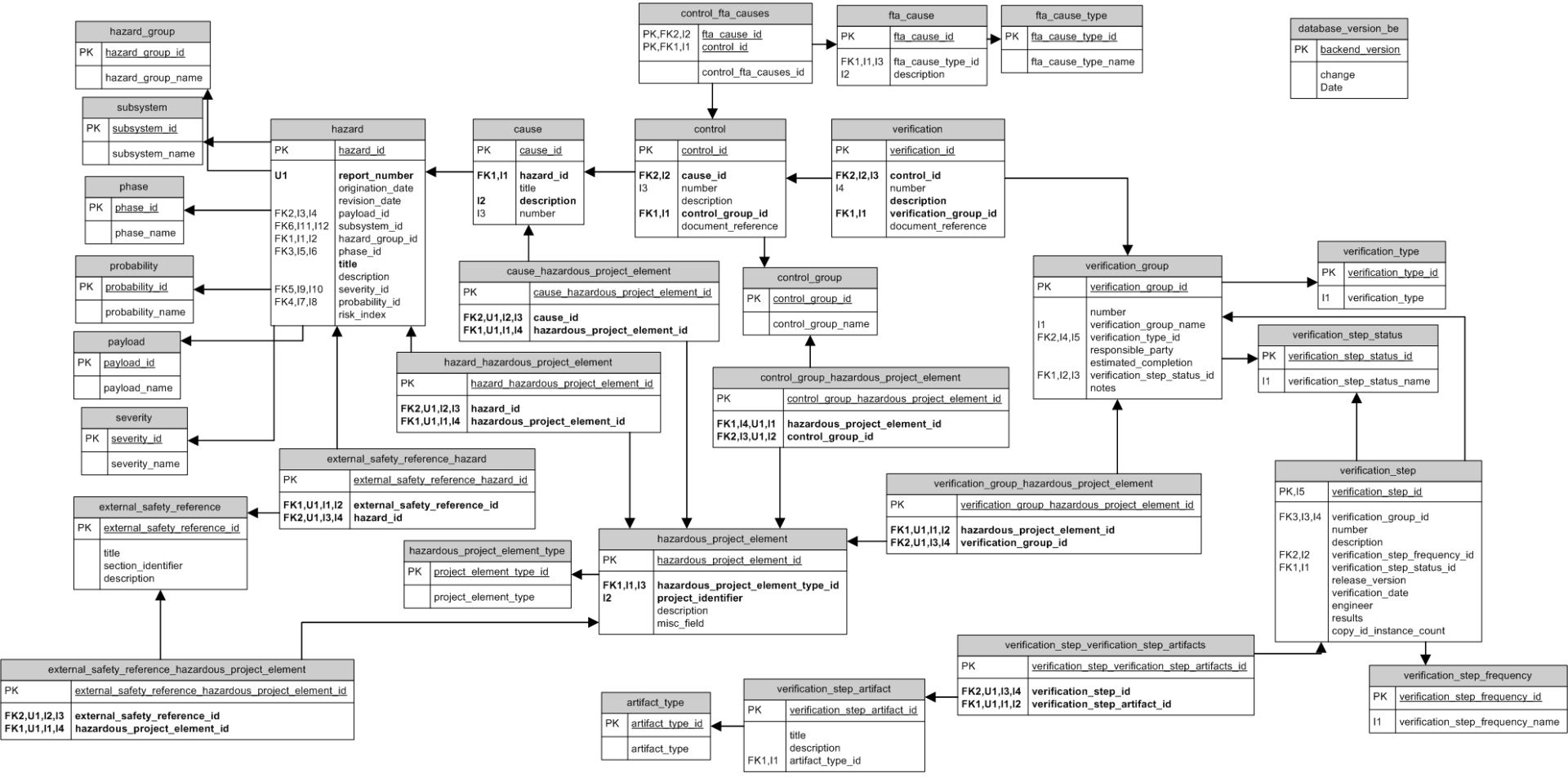


Example

- **NASA IV&V SMA Support Office has created a hazard database using MS Access**
  - Currently in use by three projects
  - Receiving positive feedback
  - Continuing to refine the database schema and front end
  - Tailoring each instance to customers' processes and needs
- **Lessons Learned**
  - It is wise to split the database (front end separate from back end)
  - 80% of time creating the database is spent on the front end
  - MS Access is great for prototyping, not for enterprise solution
  - Use a naming convention at the start
  - Some hazard report content may need to be managed separately from the database and merged post processing

Example

Current Schema:



Conclusion

- **A database can improve the efficiency and effectiveness of a hazard analysis**
- **The following functions have been found to be valuable to include in a hazard database:**
  1. **Manage hazard analysis results**
  2. **Manage traces to hazards**
  3. **Manage hazard verifications**