INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Developing System Models to Help Railways Embrace Innovative Technologies with Confidence

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System Models to Help Railways Innovate

Key Points

- Use technical standards as a distilled source of system knowledge;
- Creation of a search mechanism to find the set of technical standards relating to the system of interest, and;
- Integration of the data to create a system model.

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Agenda

- Innovation context
- Hot axle box detection – The system of interest
- Model structure
- Identifying the standards
- Output examples
- Future work

MBSE and Railroad Innovation

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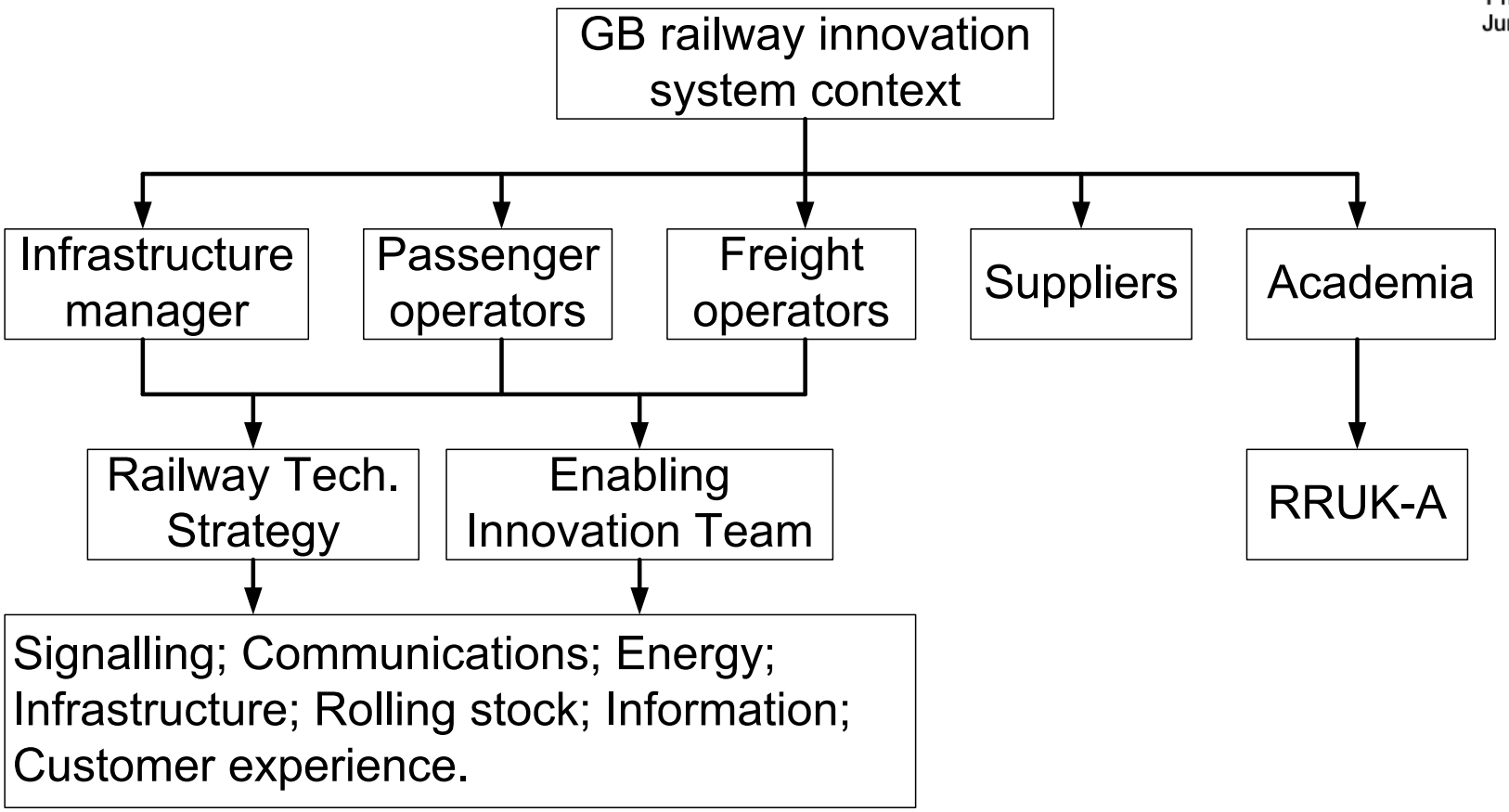
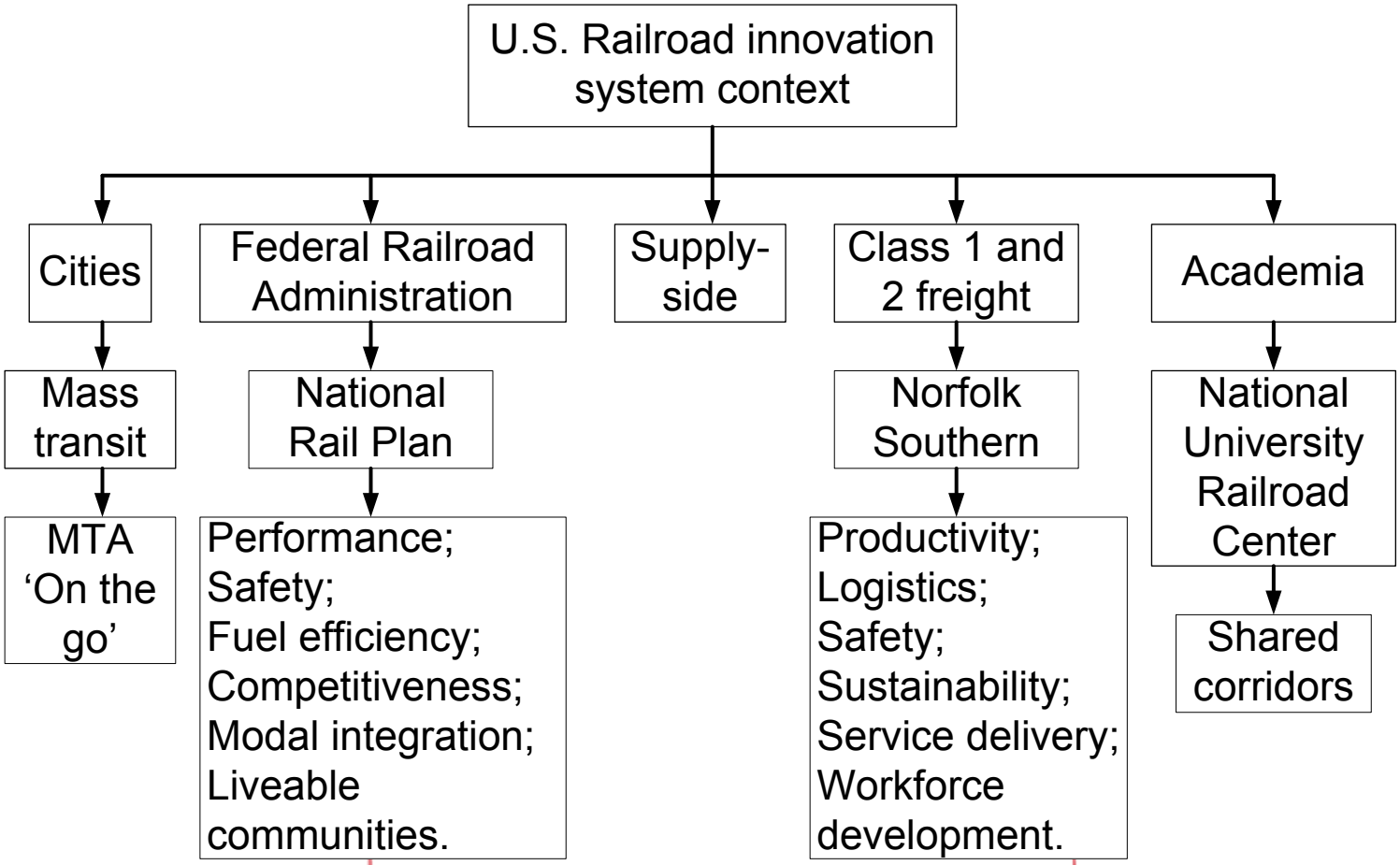


MBSE and Railroad Innovation



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Out with the old….

and in with the new?

Hot Axle Box Detector Innovation

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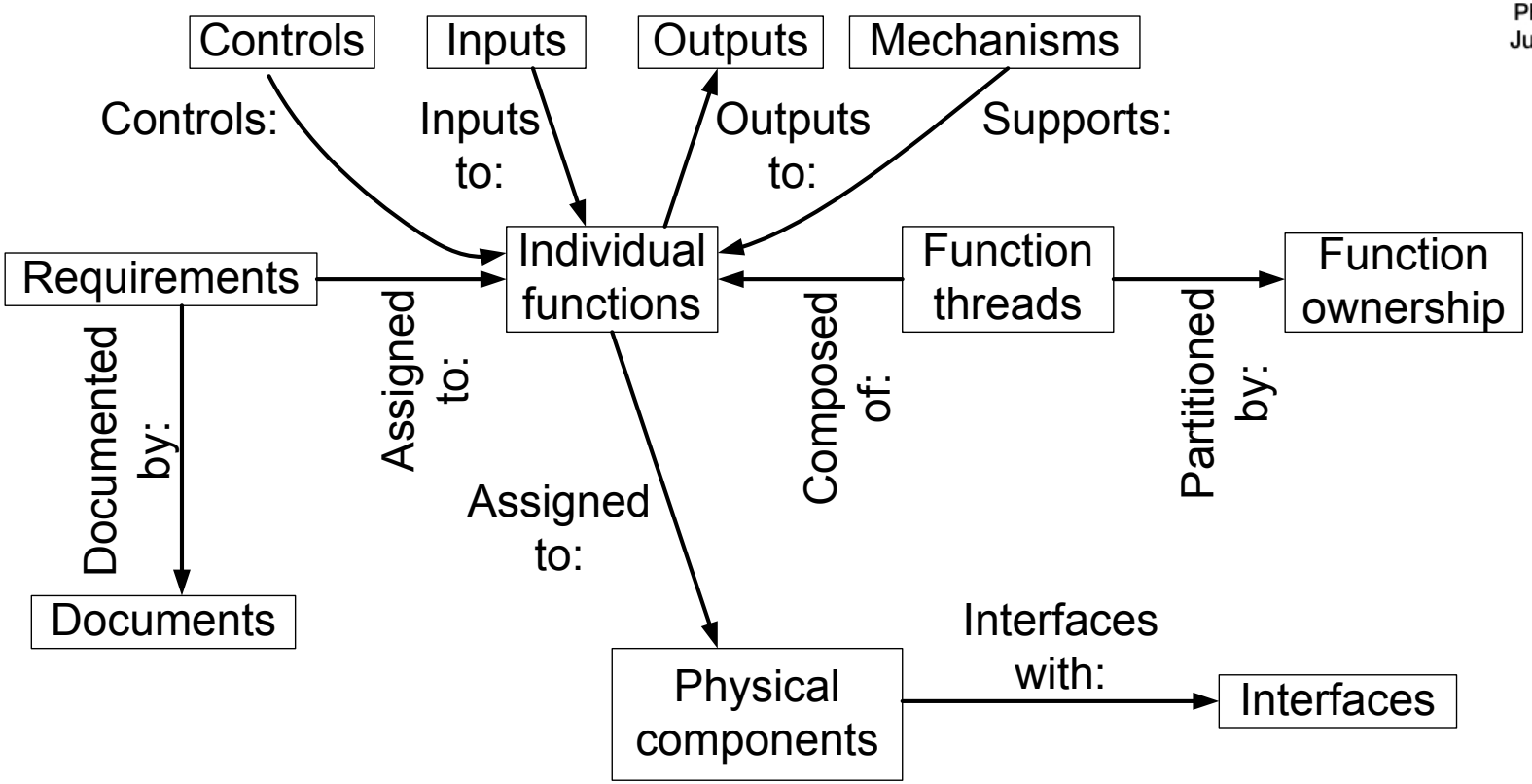

Entity /Attribute / Relationship Database

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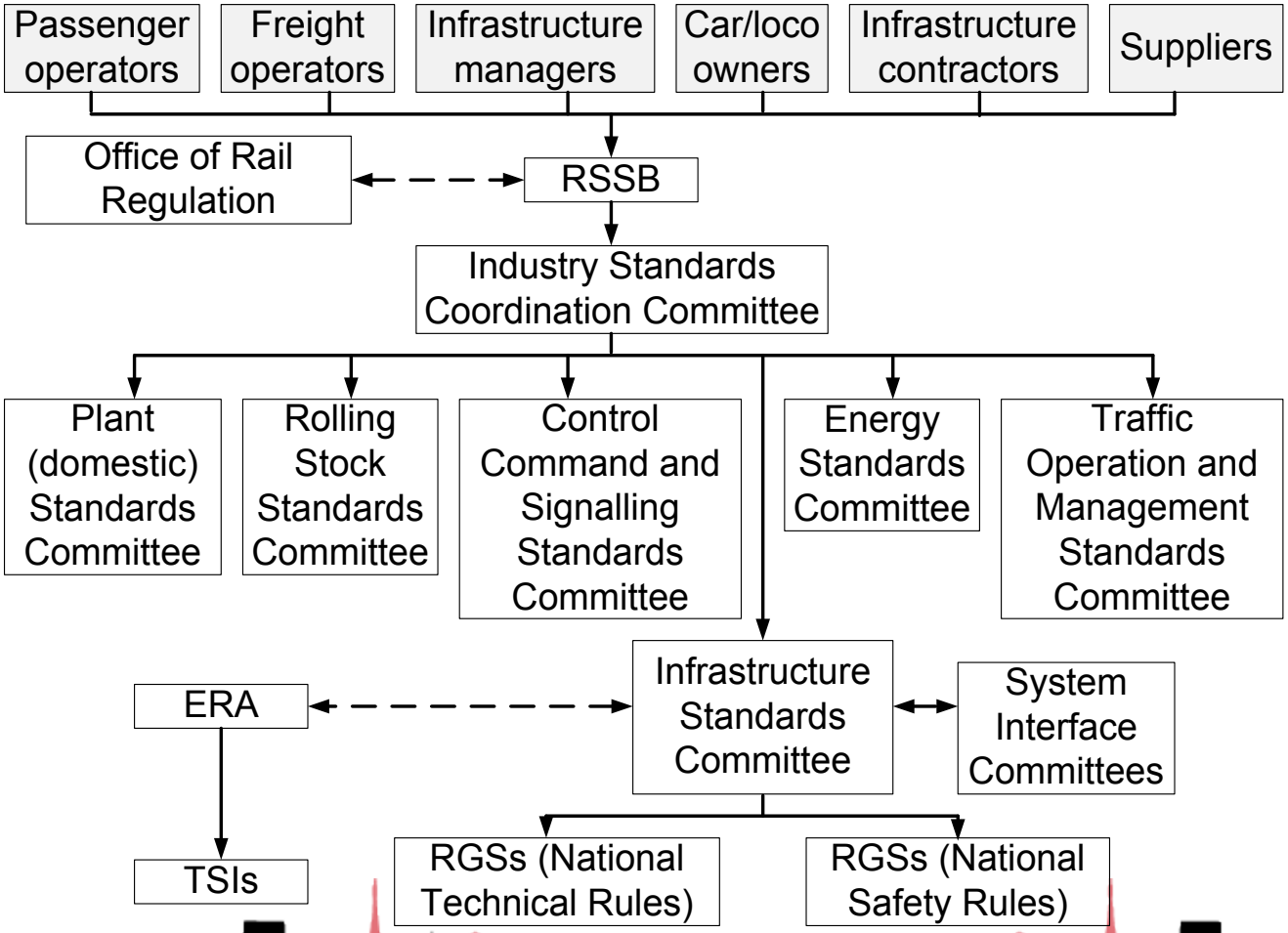

British Railway Group Standards

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Hot Axle Bearing Detection

Railway Group Standard
GE/RT8014
Issue One
Date June 2001
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References

GA/RT6001	Railway Group Standards Change Procedures
GA/RT6004	Temporary Non-Compliance with Railway Group Standards
GA/RT6006	Derogations from Railway Group Standards
GE/RT8047	Reporting of Safety-Related Information to Railtrack
GE/RT8250	Safety Performance Monitoring and Defect Reporting of Rail Vehicles and Plant and Machinery

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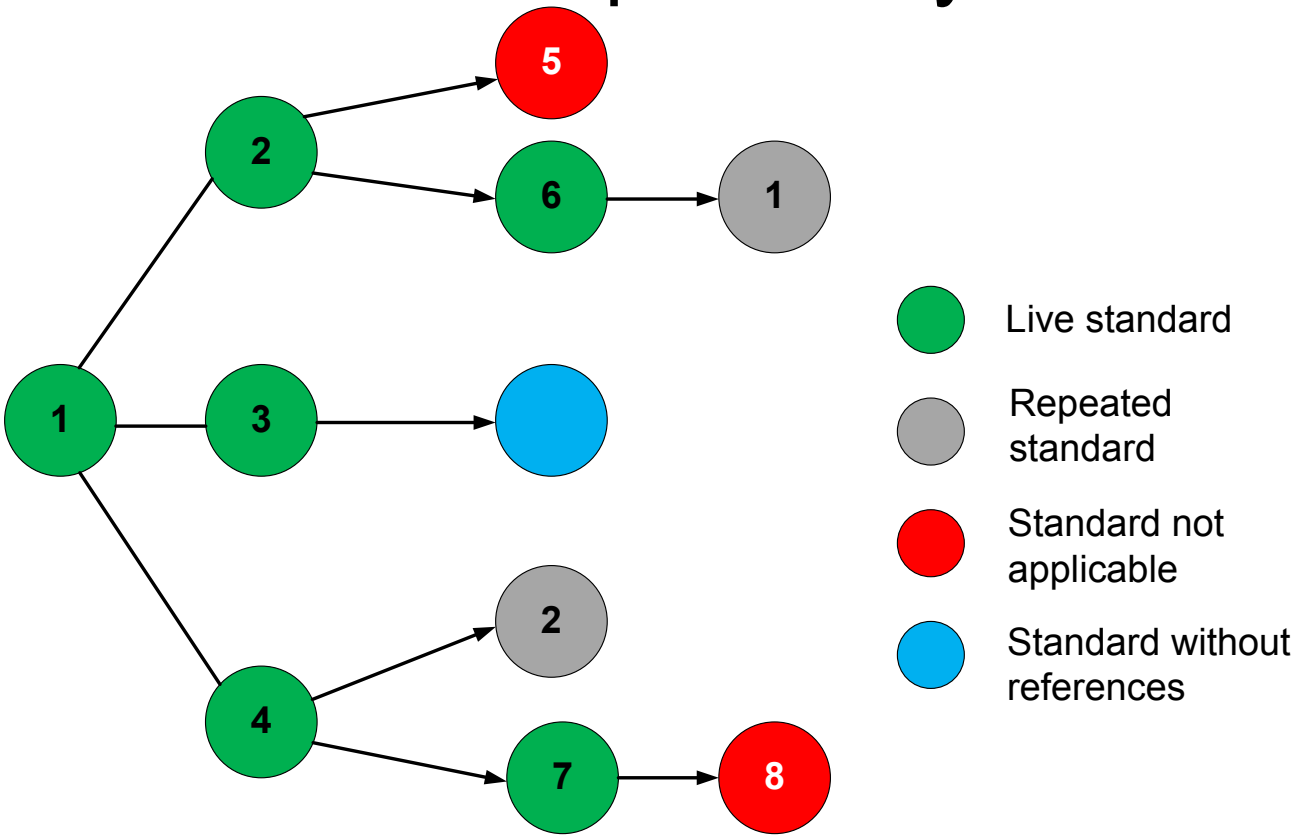

Standards Search Process

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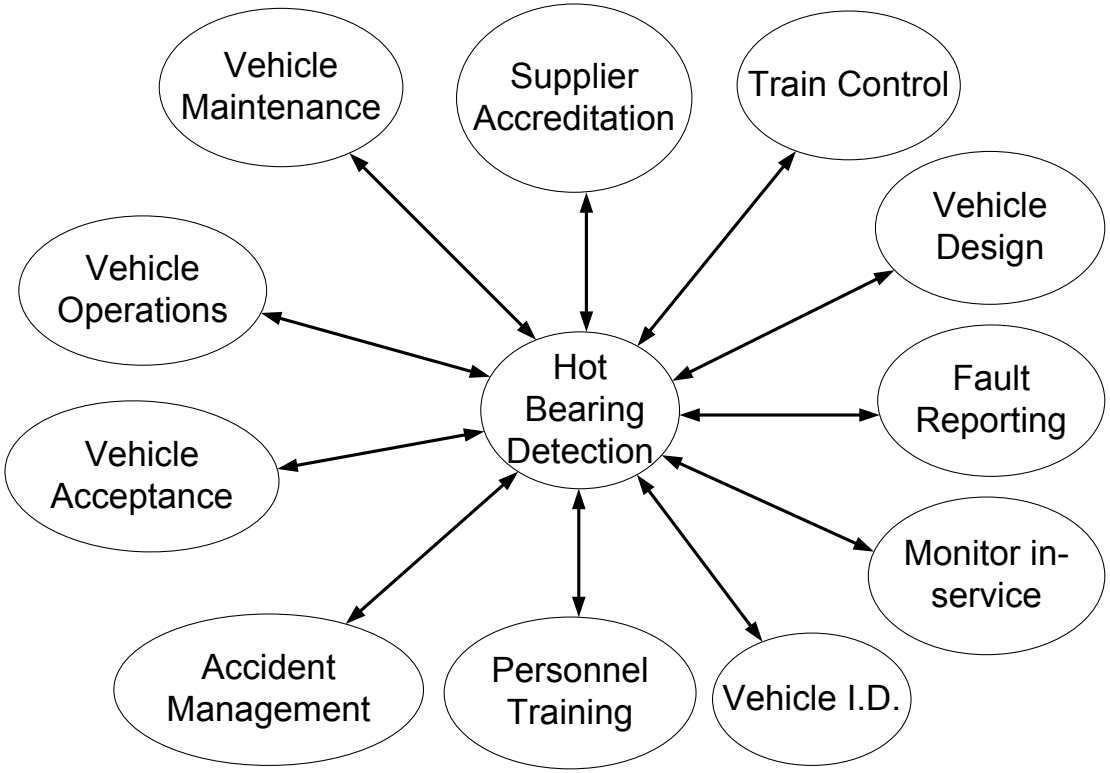

Hot Axle Bearing Detection System Interfaces

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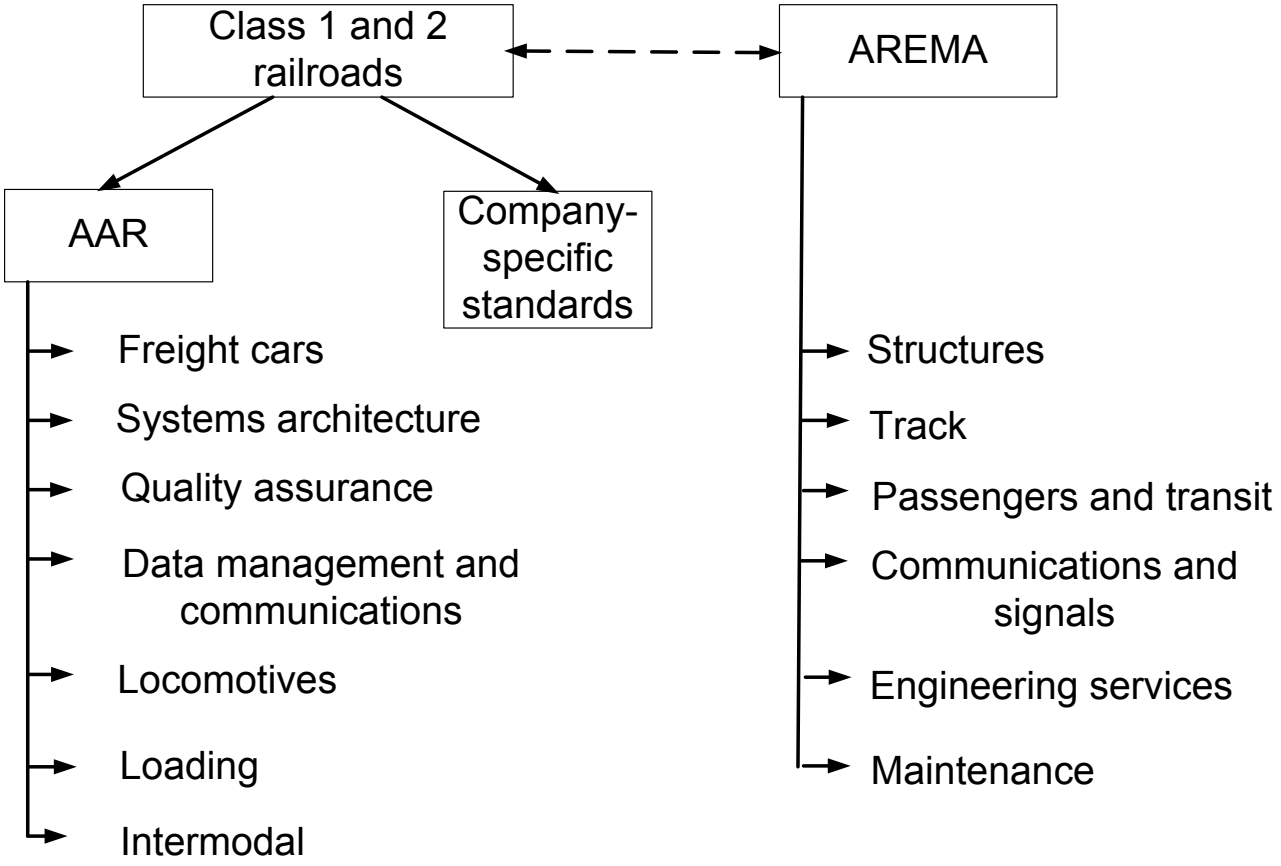

US Railroad Standards

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1.2 References

1.2.1 American National Standards Institute, *American National Standard for Freight Containers—Automatic Identification,* ANSI MH5.1.9-1990

1.2.2 International Standards Organization, ISO 6346—Freight Containers—Coding, Identification, and Marking

1.2.3 International Standards Organization, ISO IS 10374—Standard for Automatic Identification of Containers

1.2.4 International Standards Organization, ISO 9001—Quality Systems

1.2.5 AAR *Manual of Standards and Recommended Practices*, Section C, Part III—Specifications for Tank Cars (M-1002); Section L—Lettering and Marking of Cars (S-910)

1.2.6 AAR *Universal Machine Language Equipment Register (UMLER) Data Specification Manual*

AAR S-918 Automatic Equipment Identification

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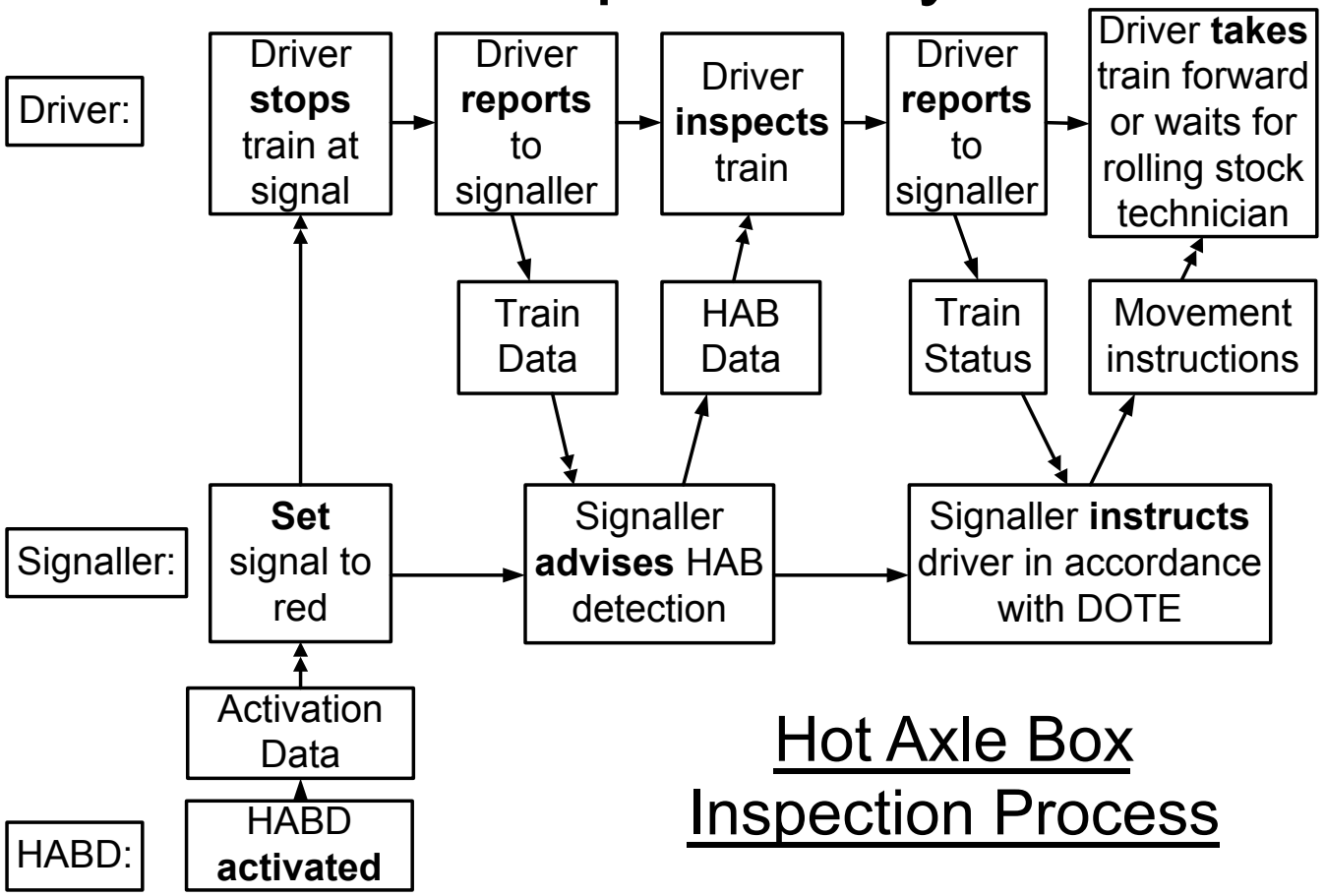

Hot Axle Box Inspection Process

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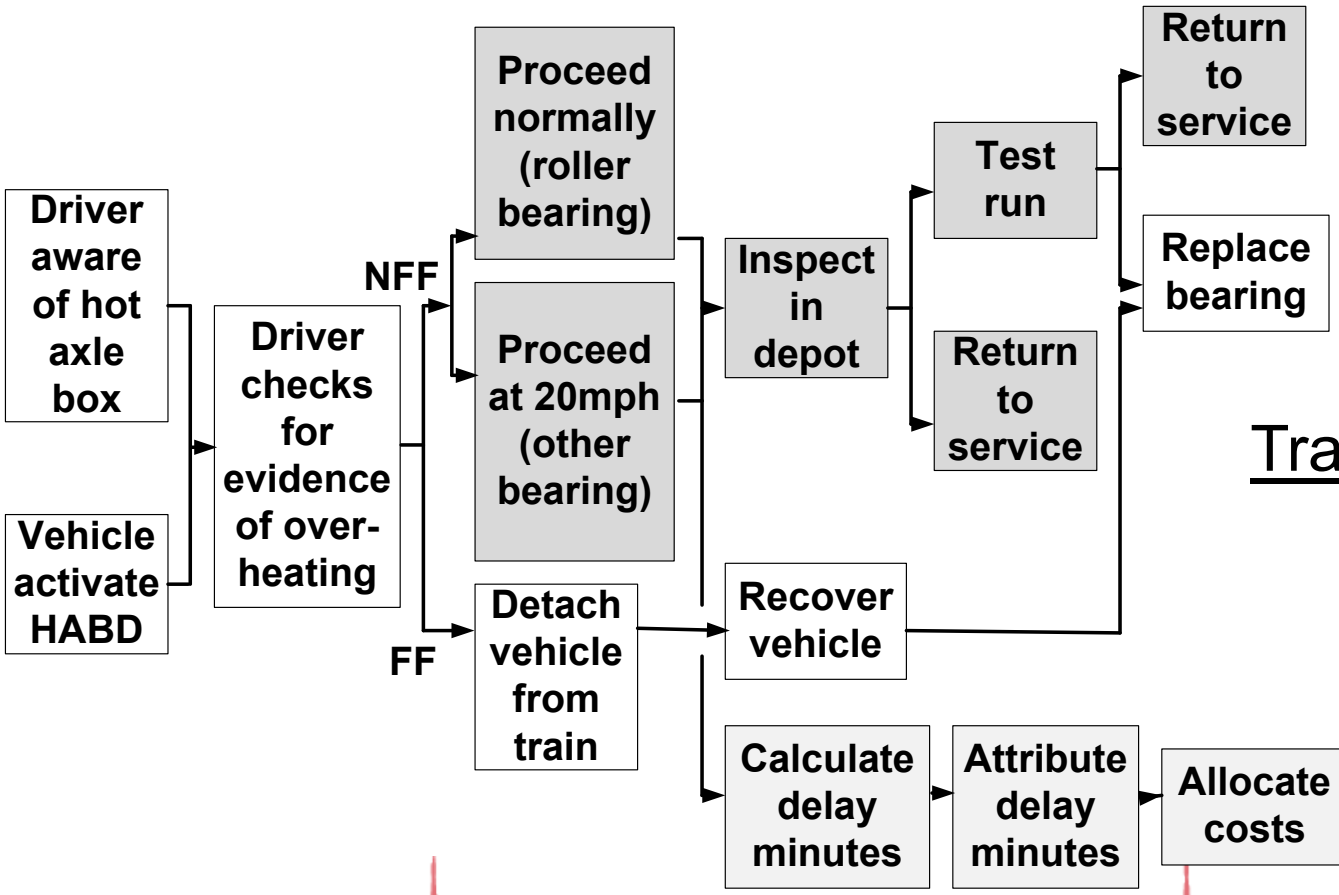

Tracing Impact

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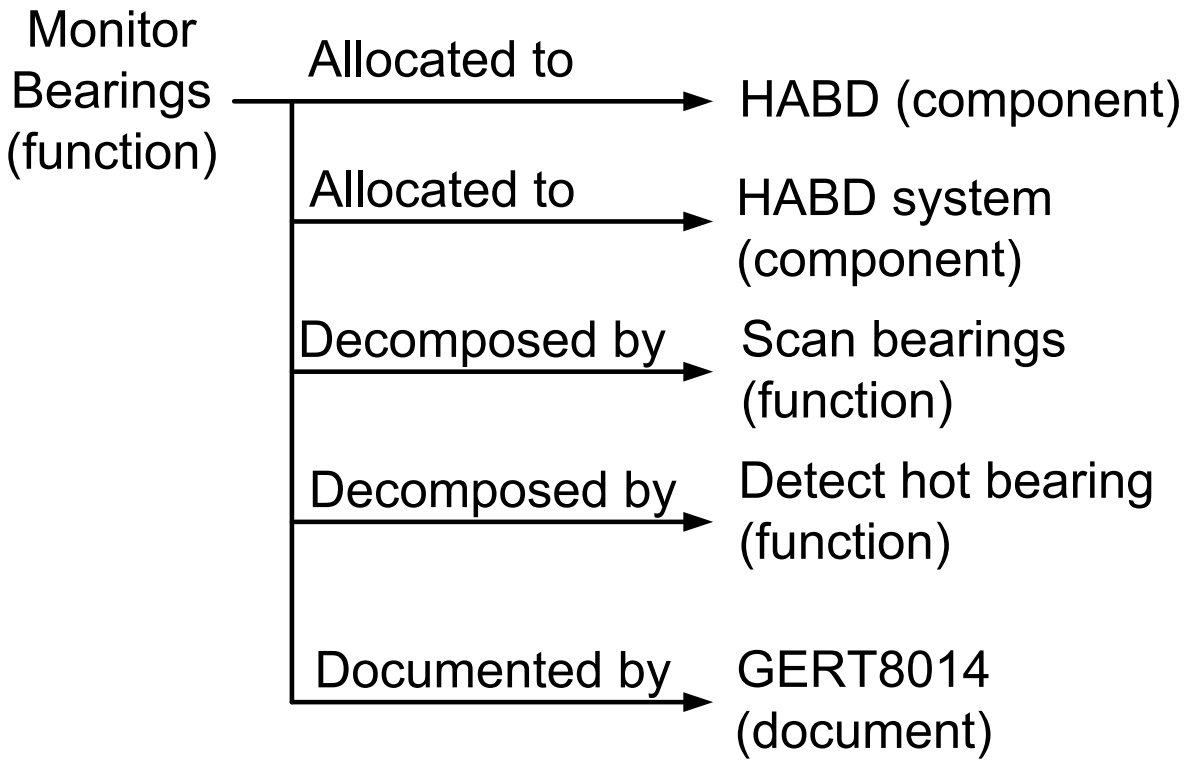

System Traceability

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Conclusion

1. British railway technical standards and entity-attribute-relationship databases can be used to create system models to support innovation, and;
2. Preliminary analysis of railway technical standards in the U.S.A. suggests the same approach may be valid there

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Further Work

1. Test the methodology on an American example, with access to standards (AAR, AREMA, railroad company);
2. Develop guidance on the level of model detail required;
3. Explore linking models to management accounting systems, to help build business cases, and;
4. Explore use of the methodology to support standards rationalization.

System Models to Help Railways Innovate

And finally:

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- Association of Train Operating Companies (www.atoc.org);
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Thank You

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