

# A Method to Assess and Classify HSE standards

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## Outline:

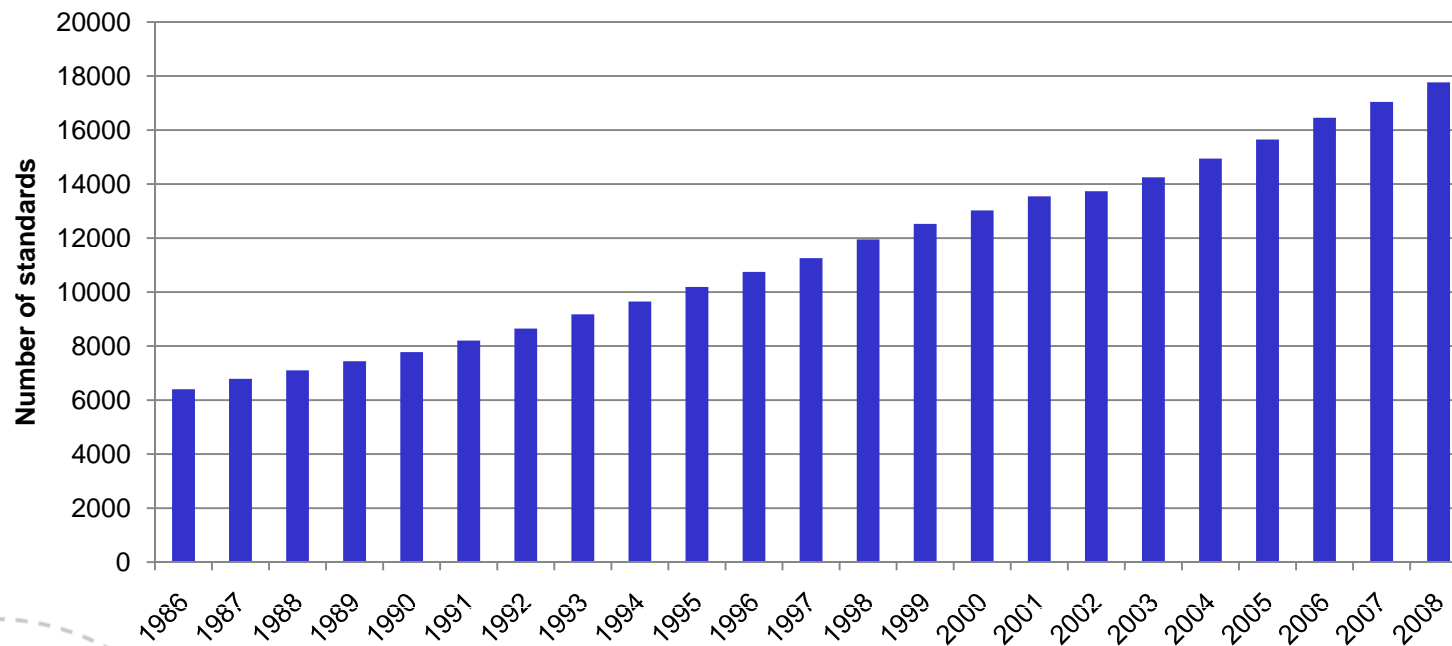
1. Introduction
2. Standards and development trends
3. Objectives and data collection
4. Results
5. Conclusion and future work

# ■ Introduction

- Safety standards tend to become more goal-based
  - E.g. DEF STAN 00-56
- Goal-based standards state goals, rather than specifying the means to achieve the goals
  - Can be hard to apply
- Goal-based standards are typically used in complex settings
  - Software
  - Human Factors
- The number of standards is increasing

# ■ ISO standards

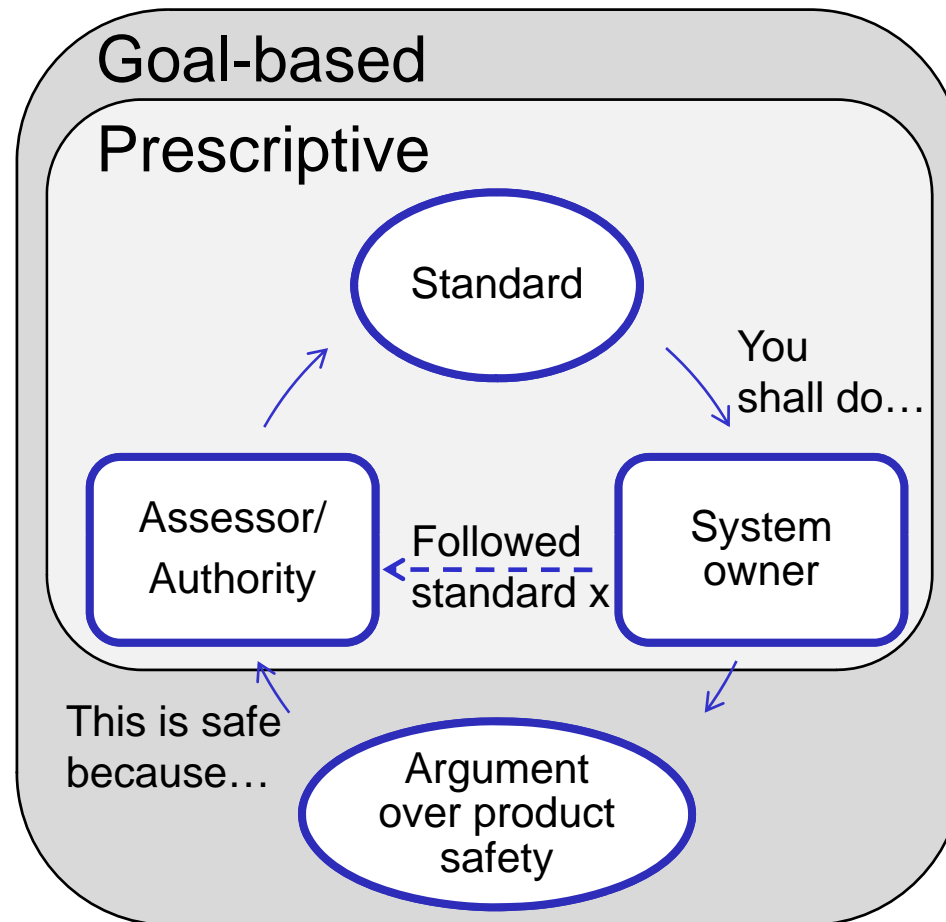
- Currently >17,000 ISO standards
- 1230 published in 2008 (724 new and 506 revised)



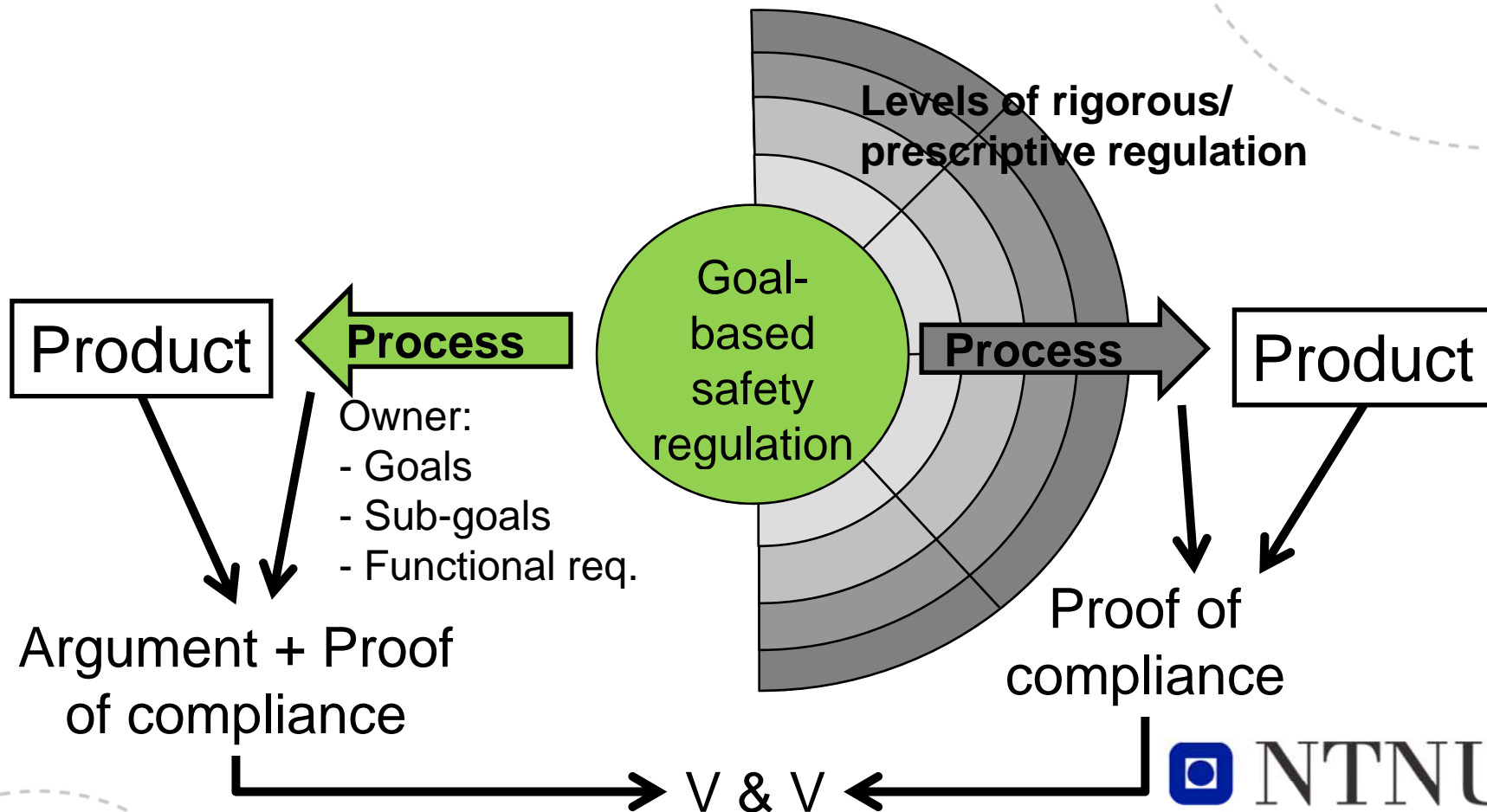
## ■ Two main approaches

<b>Prescriptive</b>	<b>Goal-based</b>
Product specific	Process/Product goals
Specific codified measures to solve a problem	Focus on what to achieve, not the means
“Install a 1 meter high fence at the edge of the cliff”	“Prevent people from falling off the cliff”
Bottom-up approach	Top-down

# ■ Prescriptive & goal-based regulation



# ■ Goal-based safety regulation



# ■ Objectives of our study

- Current trends:
  - Increasing number of standards
  - Tendency to more goal-based standards
- Assessed HSE standards to measure the effort required to apply standards
  - Goal-based
  - Generic
  - Process
- Assessed 6 standards, 13 parts in total

# ■ Data collection

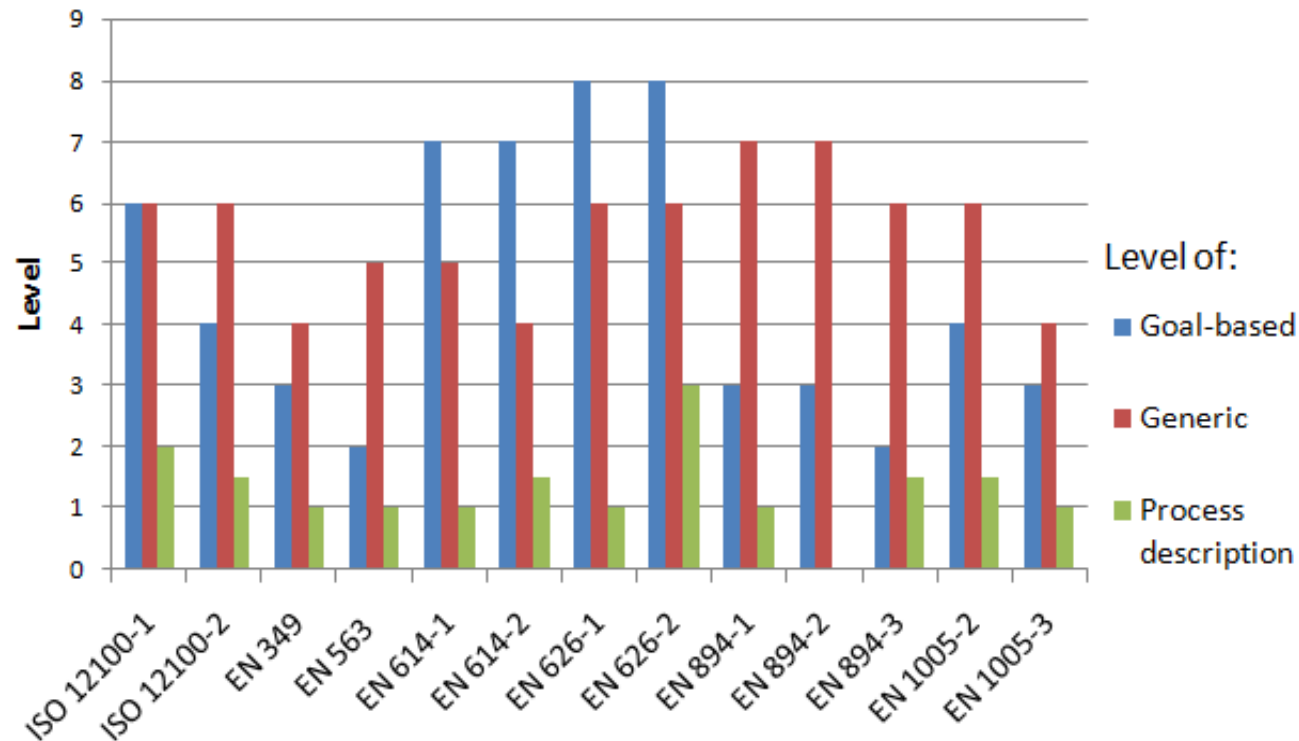
- NORSOK S-002 “Working Environment”
  - Developed by the Norwegian petroleum industry
- We selected 6 standards
  - 13 parts
  - The first normative references
- All standards were related to “Safety of machinery”
- Context was the Norwegian Oil & Gas sector
- International safety standards

# ■ Assessment metrics

- 3 primary metrics:
  - Level of goal-based or prescriptive approach
  - Level of generic approach (Industrial domain)
  - Level of process description
- Recorded properties:
  - Number of normative references
  - Publication year
  - Size

Top level	Sub level	Scale
Goal-based MRS	High	9
	Medium	8
	Low	7
Goal-based process focus	High	6
	Medium	5
	Low	4
Prescriptive	High	3
	Medium	2
	Low	1

# Assessment results



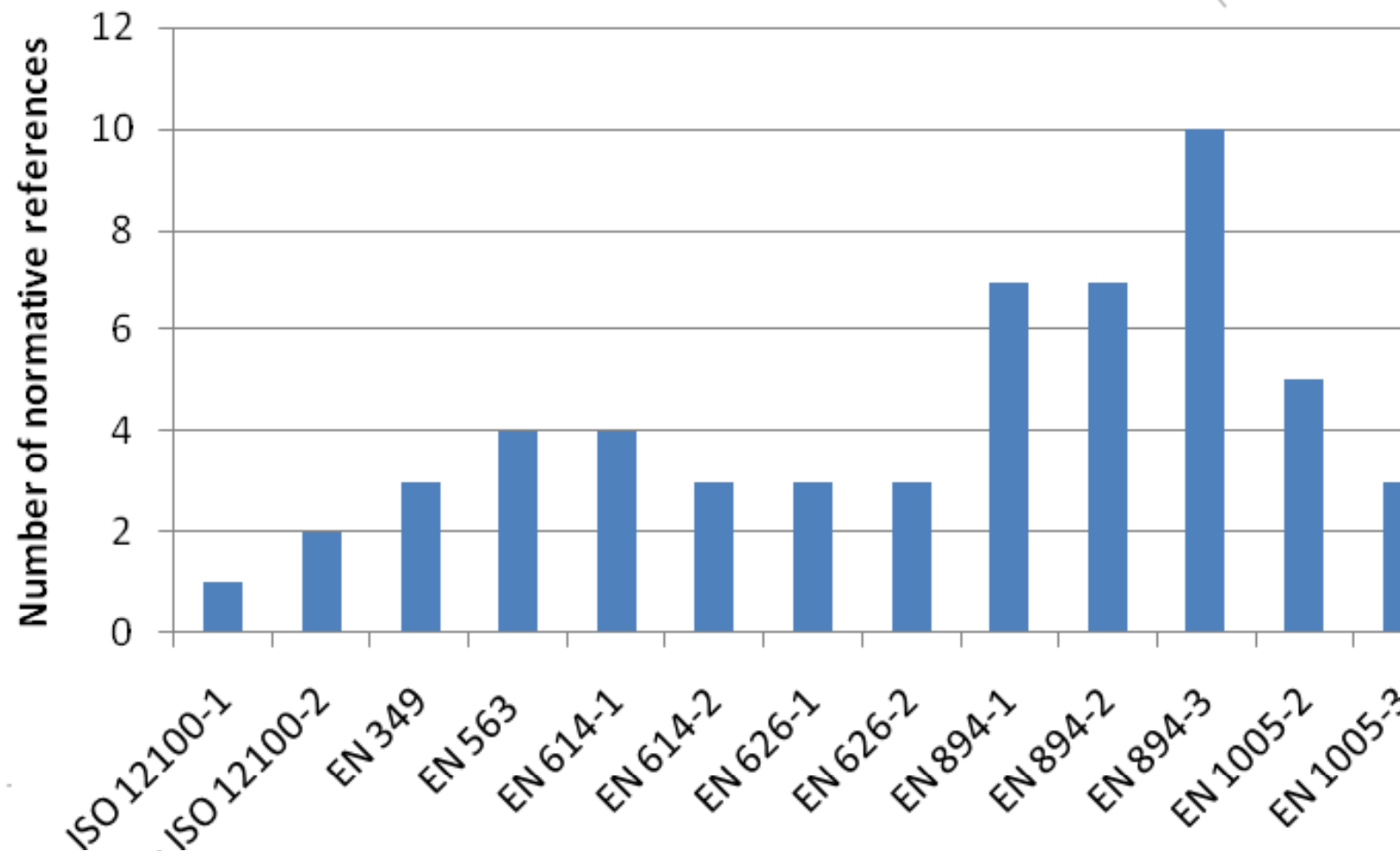
- 2 standards (4 parts) are goal-based MRS
- Generic scored high
- Process description scored low

# Results

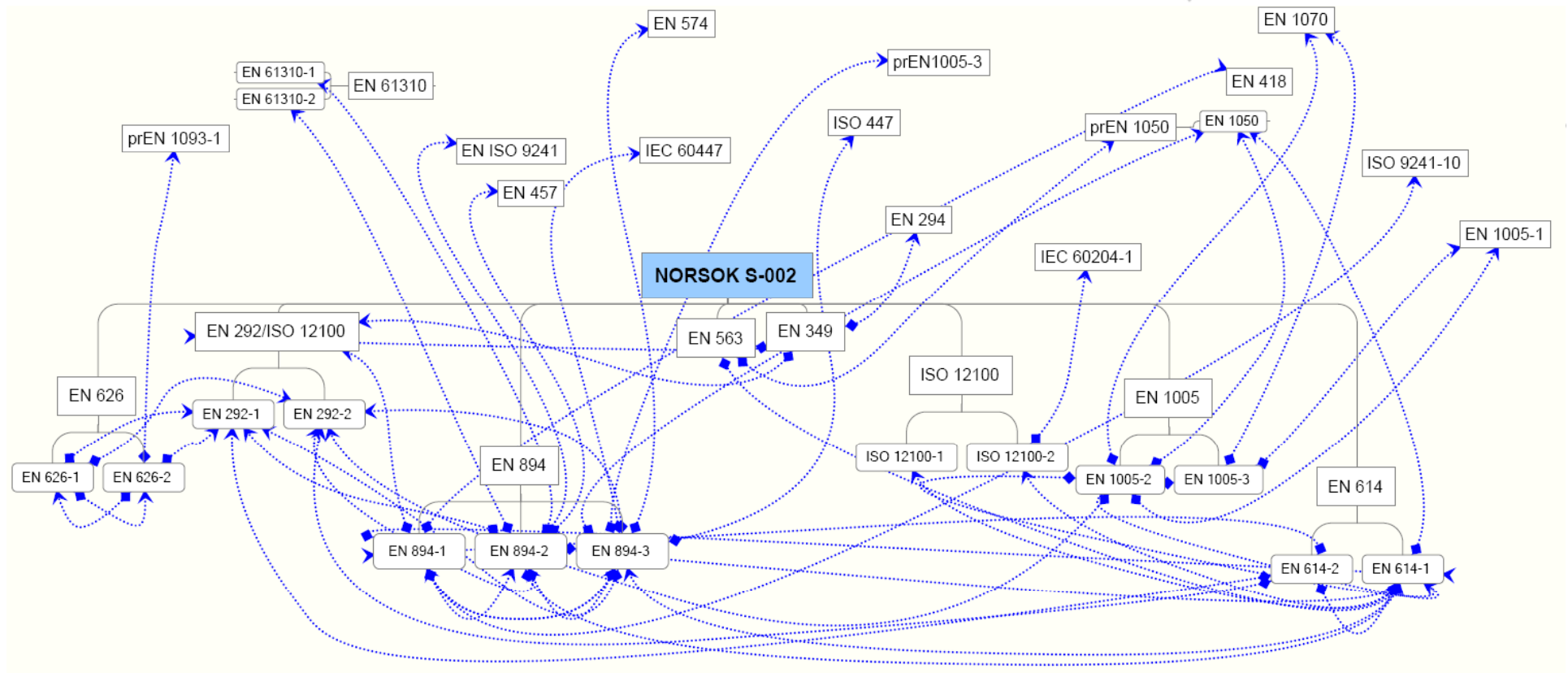
Metric a	Metric b	Spearman coefficient
Level of goal-based	Size	-0.35
Level of goal-based	Number of normative references	-0.45
Level of generic	Number of normative references	0.43
Year published	Size	0.55
Level of goal-based	Year published	0.21

- Goal-based standards appear to be smaller with fewer normative references compared to prescriptive standards
- Recent standards were larger
- Recent standards not more goal-based

# ■ Normative references



# ■ S-002 normative references



# ■ Limitations of the study

- **Construct validity**
  - Thirteen parts (6 standards) is a relatively low number
  - Oldest was from 1993
- **Internal validity**
  - Method not validated by external experts
  - Weak correlations
- **External validity**
  - NORSOK S-002 was made for Norwegian petroleum industry, but all the standards were international.

# ■ Conclusion

- Use of this method can:
  - Provide an overview of the approach (e.g. goal-based vs. prescriptive)
  - Helps predict the competence level/experience required to apply standards
- Recent standards were not significantly more goal-based than older ones
- The more goal-based → Smaller with fewer normative references

## ■ Future work

- Refine method and metrics
- Assess large number of standards
- Automate generation of a skeleton system specification
  - Code (HSE) standards as XML
  - Parse XML into UML diagrams
  - UML diagrams: Use case, sequence, collaboration diagrams etc
  - Potentially include normative references

Thank you!  
Questions?