

Why Semantic Models of Standards?

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My Journey to Semantic Technology

- 1981 – 2009 Worked at NIST
- 1985 – 2009 Worked on manufacturing interoperability standards
 - Ad hoc syntaxes
 - EXPRESS language for STEP (digital product model)
- 1997 – Project begun to define a standard for manufacturing process specification (PSL)
- 1999 – 2nd PSL Workshop, analyzing existing languages
 - Philosophers and linguists attended
 - “If you really want to nail down definitions of terms, use a language we have been developing since Aristotle → formal logic”
 - Activity began on the Process Specification Language, using formal logic as the normative specification



Main Premise

- As a general rule, there is not enough rigor in the specification of many standards
- Many standards are not specified in a form that computers can interpret
 - Results in potential for misinterpretation
 - Raises the cost of using a standard

Rigorous Definitions

Old-style (most common) standards specifications:
(e.g. ISO 14258, Requirements for enterprise-reference architectures and methodologies)

“3.6.1.1 Time representation

If an individual element of the enterprise system has to be traced then properties of time need to be modeled to describe short-term changes. If the property time is introduced in terms of duration, it provides the base to do further analyses (e.g., process time). There are two kinds of behavior description relative to time: static and dynamic.”

Data-model standards (e.g. ISO 10303-41, Product Description and Support)

```
ENTITY product_context
  SUBTYPE OF (application_context_element);
  discipline_type : label;
END_ENTITY;
```

Semantic-model standards (e.g. ISO 18629-11, PSL Core)

```
(forall (?t1 ?t2 ?t3)
  (=> (and (before ?t1 ?t2)
           (before ?t2 ?t3))
      (before ?t1 ?t3)))
```

QUDT (Quantities, Units, Dimensions and Data Types)

- Originally funded by NASA for their handbook
- An attempt to represent the definitions specified by the metrology community in a computer-sensible form