Manufacturing Domain

Summary from Breakout

What an OKN should do

- Provide uniform infrastructure
  - schema.org-like, with extensions
  - public and proprietary layers
- uniformity / reproducibility / interoperability
- discoverability, but with verifiability / provenance
- goals:
  - (weak) reduce friction between different data sources;
  - (strong) allow fusion of different data sources
- issue: how show pay-off? how get people to add their data?

Big manufacturing problem: catalog discoverability

How To Build A Classic Picnic Table

DIAGRAM 1 **TABLE SET-UP**
(all measurements in mm)

75MM GALVANISED
DECK SCREWS

CENTRE
LINE

730

495

D

10MM DIAMETER
BOLT HOLES

A

A

A
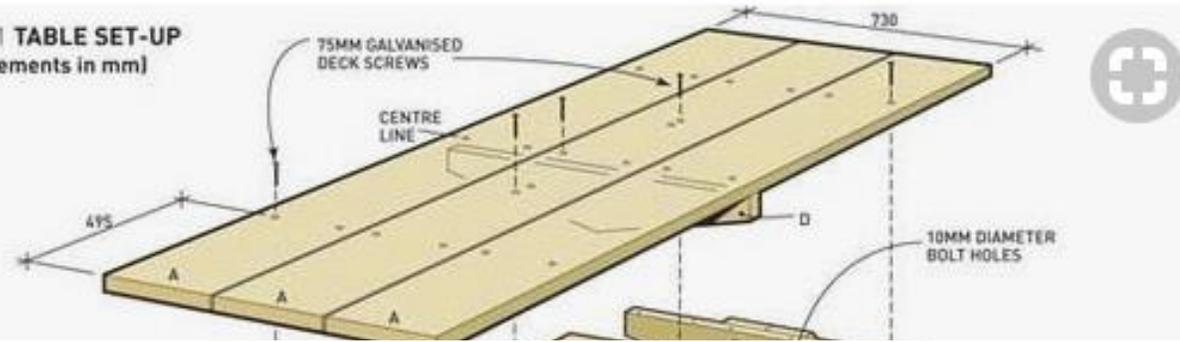
generate a shopping list tailored to your local Home Depot

A

D

E

C

D

A

B

495

725

B

400

https://www.pinterest.com/pin/254805291396931279/
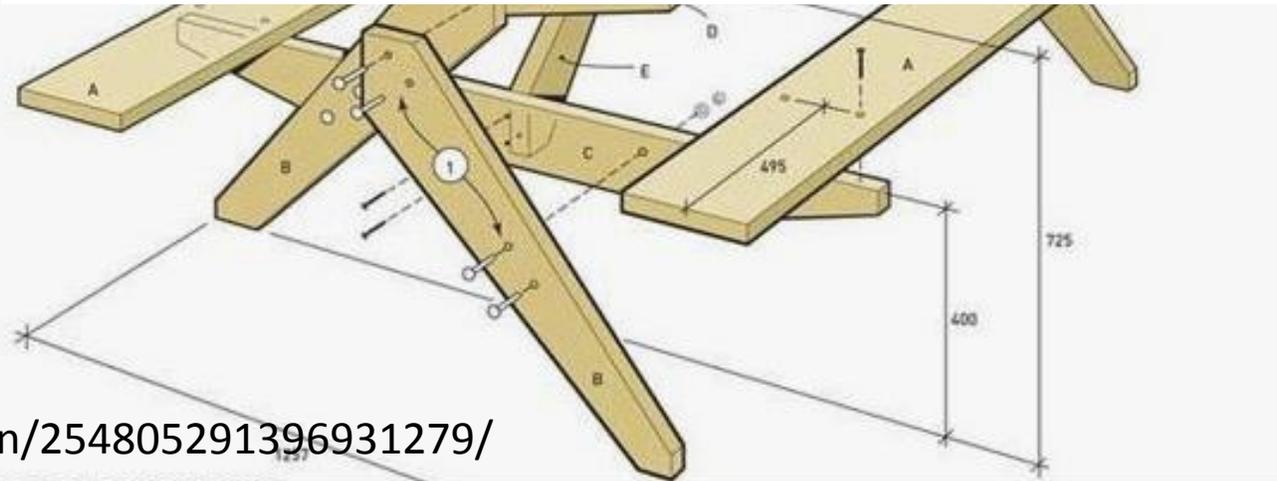
Focus: sensors

What OKN can give us

- a framework for aggregating data relating to how entities sense and act
- data about the sensors
- a data commons which you can populate with
  1. catalog data (types of sensors, …)
  2. data emitted by sensors, data about sensors (location …), data about targets, …

Focus

- manufacturing, testing of sensors; use of sensors in manufactured products

Other communities that can be engaged

- healthcare (wearable sensors), geo (weather sensors, traffic sensors), IoT (sensors inside home / car / submarine)

What can sensor data (help us) do

- **Describe** what is happening, has happened, identify departures from what should be

- **Diagnose** what has gone wrong

- **Predict** what will happen (allowing predictive maintenance of cars, aircraft, …)

- **Prescribe** (coax, nudge, …) what someone will do next (not reverse your car into a tree)

Catalog – getting *all* the information we can

- *materials, patents, process taxonomies, manufacturing components* (build your own prosthesis) *…*

- *Curation:* software problem: identify when entries in 2 catalogs point to the same entity

- Here: catalog of sensors, sensor data + software needed to integrate different bodies of sensor data

- Build experimentally for different types of sensor and extract the common factors

- Compare FDA problem: medical device interoperability

Building a Case for Medical Device Interoperability: FDA's Call to Action

Posted on **February 9, 2016** by **FDA Voice**

By: Bakul Patel, M.S., M.B.A.

As Yoda might say: build a case for interoperability, we must. While we may not have yet realized the technological accomplishments of Yoda's advanced world, today connectivity shows great promise for the future.

From blood pressure to brain scans, today's health care allows for the rapid transfer and use of information between and among different medical devices. This concept—called

exploiting sensor data through fusion

- across platforms: grandmother not answering the phone
- car adjusts automatically to traffic conditions and to driver stress levels
  - data standards needed to allow this
- failure detection in cars, aircraft, predictive maintenance

Competition

- Bosch (https://www.kaggle.com/c/bosch-production-line-performance) IEEE Big Data 2016

  - *"Because Bosch records data at every step along its assembly lines, they have the ability to apply advanced analytics to improve these manufacturing processes. However, the intricacies of the data and complexities of the production line pose problems for current methods. In this competition, Bosch is challenging Kagglers to predict internal failures using thousands of measurements and tests made for each component along the assembly line. This would enable Bosch to bring quality products at lower costs to the end user."*

- DARPA Translator Example: composition of models without *a priori* knowledge

Possible *framework* for years 1,2,3

CESMII may have interest in OKN-inspired Coordinating Center for Manufacturing Data

- catalogs
- real world data at multiple granularities

+ support for pilot projects which would use these data for fusion, diagnostics, validation

Examples of stakeholders: users, funders, manufacturers, makers, …

Bosch, GM, Boeing, …

Air Force Materiel Command, …

US Patent Office, …

metals exchanges, …

makers (Pinterest communities …)

NMIs, DOE, …

NIST (propose a competition)

…

Projects for years 1, 2 and 3

Year 1: Build OKN infrastructure for manufacturing

Aggressively ingest and incrementally curate

– real catalogs and quasi-catalogs (materials science, … Pinterest …),

– sample big datasets provided by companies (Bosch)

Design and implement software for fusion applications (statistics, reasoning)

Year 2: Test software against the OKN data to demonstrate pay-off for users including manufacturing companies

Year 3: Build out to new datasets, disseminate widely, address new challenges for fusion