**New Era for Construction Industry**

Data to Knowledge Made Possible by Visualization
(Construction Change Order Visualization Analysis)

CPSC 533C Projects Updates By Chao-Ying Chiu

What have been found so far (1)…

- **In Terms of Domain**
  - Lots of “what to do”, but few about why
  - Complex interactions in the domain remain unknown
  - Practitioners might need to explore questions before they can ask questions

- **In Terms of Data**
  - Seems to have mysterious “Time” property of data:
    - “Timing” roles played in cause effect
    - Correlations between “Time” attributes and other attributes
  - Lots of “Texts” data need pre-process
  - But basically is safe to organize them into relations

**Background**

- Construction industry is plagued by:
  - Conditions difficult to predict
  - Too many conditions influence each other
  - So a construction project is difficult to control

- Solutions?
  - Gain more knowledge about all aspects of it through analyzing data pertinent to projects
  - However two bottlenecks…
    - Data collection costly and incomplete
    - Data collected hard to interpret
    - The less you gain from data, the less you endeavor to pursue them—Vicious cycle!

What have been found so far (2)…

- **In Terms of Tasks**
  - Better to focus on finding unknown facts and their corresponding visualization scenario
  - And then summarize good practices and principles

- **In Terms of Visualization Requirement**
  - Let users quickly “try” data—Retrieval and show data simultaneously
  - Increase possibility of seeing something—Different ways of showing the same data
  - Innovative ways of showing “Time” property of data

What have been found so far (3)…

- **In Terms of Tools Selection**
  - Tableau
  - Visually query databases
  - But surprisingly appear out of expectation, but difficult to stuff many dimensions of data in a single table

**Project domain, data, and tasks**

- **Domain—Change orders**
  - Frequent change orders disturb everyone’s plans
  - Little is known about them—ineffective control
  - Everyone does not like to spend more…

- **Data**
  - Data collected pertinent to change orders process

- **Tasks**
  - Prove that data is interpretable and useful if visualized
  - Analyze principles of using information visualization in the construction industry domain

What have been changed (1)…

- **Exploratory data analysis phase**
  - Focus on understanding the exploration scenario of tools and images of data shown and facts revealed
  - However, is it really exhaustive and effective?

- **Innovative ways of showing “Time” property of data**

What have been changed (2)…

- **Critique phase**
  - Focus on identifying which features and images more suitable for domain information needs
  - Rather than identifying pros and cons (it depends on applications)
  - The facts that the tools identified are affordable and apparently outwit Excel. No need to do cost/benefit analysis and to compare with excel.

What have been changed (3)…

- **Selection of information visualization**
  - Analyze characteristics of domain, data, task
  - Literature review of domain
  - Clean up and organize data at hands
  - Select tools
  - Analyze visualization requirement
  - Literature review of related visualization techniques
  - Identify available visualization tools
  - Explore data analysis
  - Iterate steps in phase 1 if necessary
  - Critiques selected solutions VS current practice

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**Advizor’s 15 charts**

**Exploratory data analysis phase**

- Step1: A domain expert identify what data at hands
- Step2: Use his knowledge to visually select data
- Step3: Inspired by images of data shown and facts revealed
- Step4: Iterate step2 to step3
- Rather than answering pre-defined questions