Visual Journey Analytics

Richard Brath
I4JM
June 2025

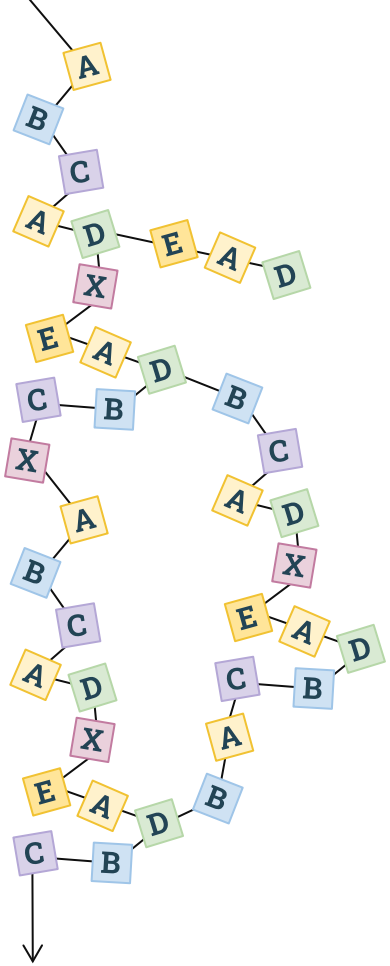
uncharted

Intro / Overview

- Who is Uncharted/Richard
- Origins of journey viz and problems thereof

1. Journey analytics: domains & tasks
2. Our characterization of 14 journey viz (and demos)
    a. Data
    b. Tasks
    c. Visualizations (layouts, nodes & edges)
    d. Interactions
3. What's next (hint: AI)

Q & A

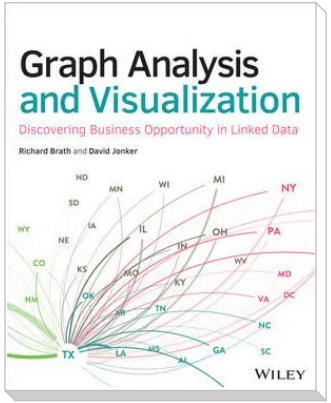


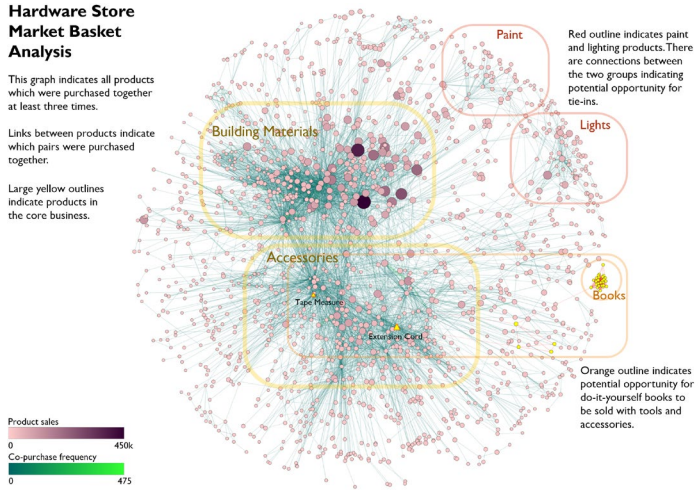
uncharted

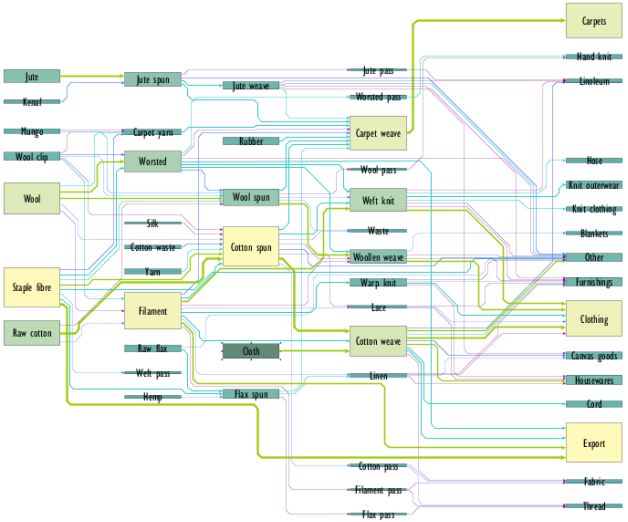
We connect *people*
with emerging technology.

- A privately-owned partnership since 2001.
- 50+ staff, deep expertise in AI, analytics and viz.
- Incubating innovation from idea to deployment for software vendors and DARPA programs.

Richard: finding journeys in graph data





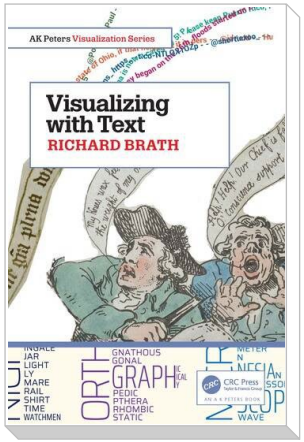


Graph Analysis book by R.Brath and D.Jonker 2014

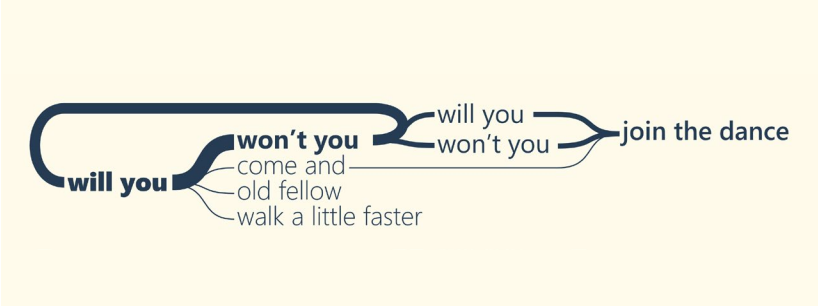
Example: **Market Basket Analysis**. Which items are purchased together

Example: **Industrial Process Analysis**. Transformation of raw materials to finished products (textile industry)

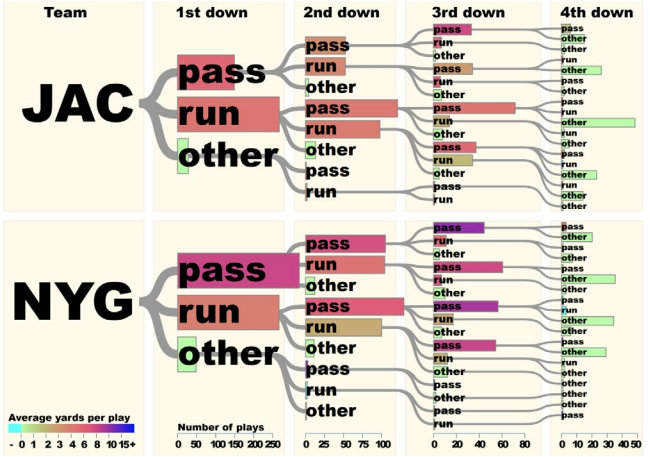
Richard: finding journeys in poems and football



Text Analysis book by R.Brath 2021



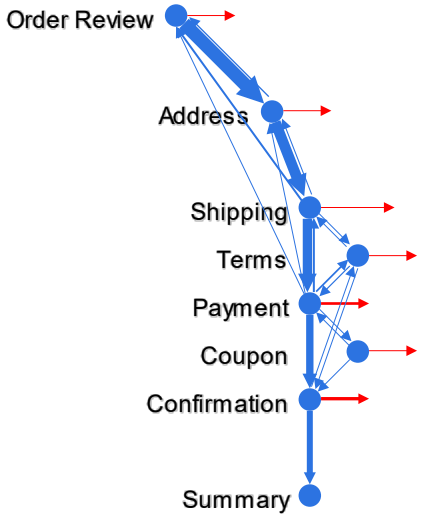
Example: **Word sequences**. Word sequences from Father Willam poem (Lewis Carroll)



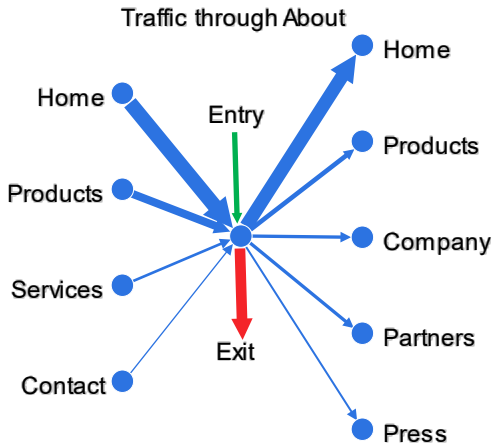
Example: **Football play sequences**. Jacksonville Jaguars vs NY Giants. NY is a passing team, JAC runs.

1. How did we get here?

Where this started



2003: Web sales funnel



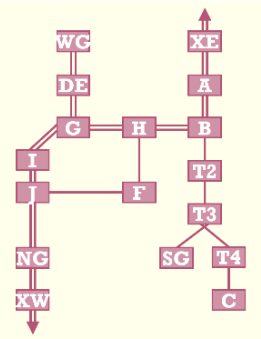
2003: Web page flow

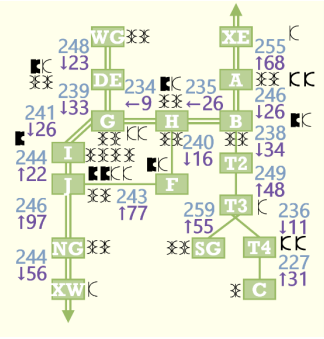
And, same idea, for goods

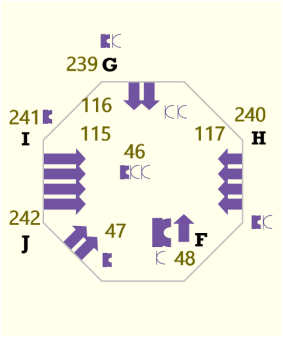
- Macro supply chain – a country's customers and suppliers
- Micro supply chain – a company's customers and suppliers
- Gas supply network – a pipeline's upstream and downstream connections
- Electrical grid – the grid's upstream and downstream connections

And variations there of, e.g.

- The customers of a customer, the suppliers of a supplier
- Local neighborhood, the customers and suppliers and their interconnections
- Sources and sinks: where a lot of goods, gas, power start and end







What’s missing?

- Clean-data, not multichannel
- Just transitions, not paths
- No journey map, no sense of objectives or goals
- Descriptive analysis, no predictive potential

- The **customer** and their **journey** is afterthought

2. Journeys and effective visualization

Journey Analytics

- Customer journey
  movement of customers across channels with potentially changing objectives, and rich detailed data such as demographics, behavior, unstructured dialogue, content served, actions offered, actions taken, responses, follow-on services, etc.
- Patient journey
  movement of patients through health procedure(s), including services provided by recurring entities such as clinics, caregivers, insurance; tests, diagnoses, procedures, prescriptions, and outcomes.
- Supply chain journey
  movement of orders, shipments and invoices between customers, suppliers, logistics companies and shipping companies around the world with high dimensionality (places, products, partners, prices, modes, milestones, direction, etc) and predictive analytics (e.g. ETA, inventory shortage, etc).

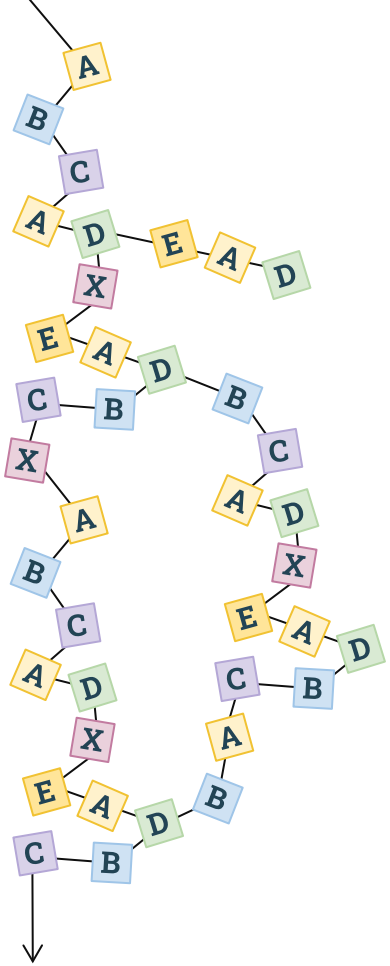
In addition to *process sequence* and *process statistics*, many supplementary data and data integration challenges:

- Data is fragmented, incomplete, and joins are not perfect
- Sequence step definition
- Temporal alignment issues
- Spurious steps
- Unstructured data

Journey Analytics Tasks

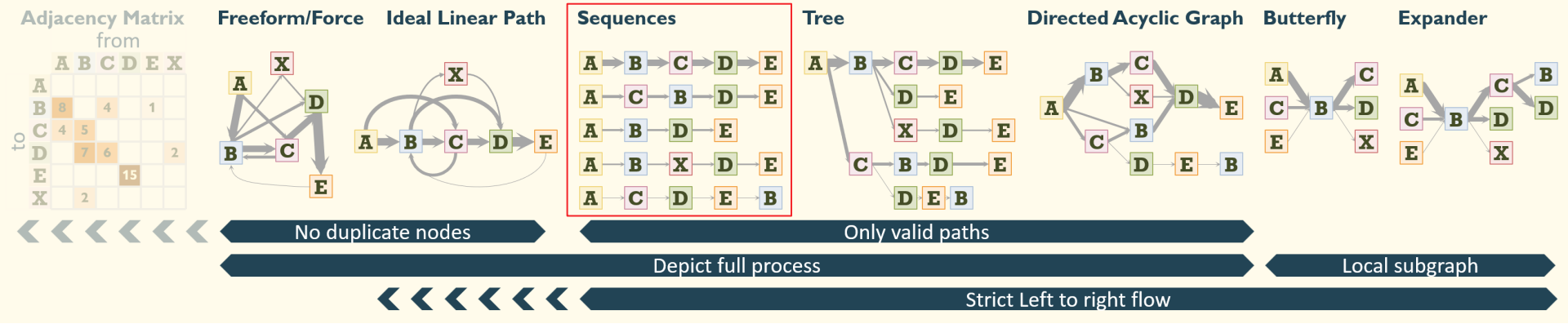
- Sequence Discovery
  visualize sequence to comprehend the system to evaluate correctness of hypotheses
- Comparison
  compare similar paths, before/after process modification, comparison of simulations, differences between sub-populations
- Decomposition / Composition
  successively decompose a high level journey to lower-level journeys or to higher-level journeys
- Problems and Intervention
  journey visualization provides a convenient point of access to intervene in a journey, revealing friction, dormancy, journey switches, etc., allowing journey modification in progress, or process modification
- Operations and Risk
  processes can be monitored in real-time, to trigger alerts and indicate areas of emergent risk
- Predictive Simulation and Optimization
  an analytic model can aid prediction; optimization may be used to adjust offerings

- All of these tasks are greatly aided with visualization!



Visualization choices

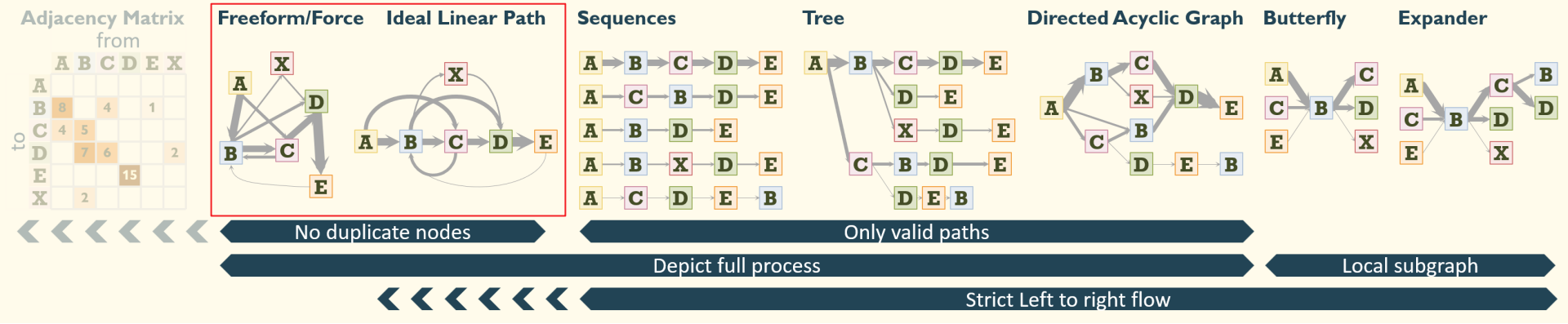
Every Unique Sequence



The Ground Truth
- Often hundreds of unique paths
- Does not scale

Visualization choices

Focus on nodes

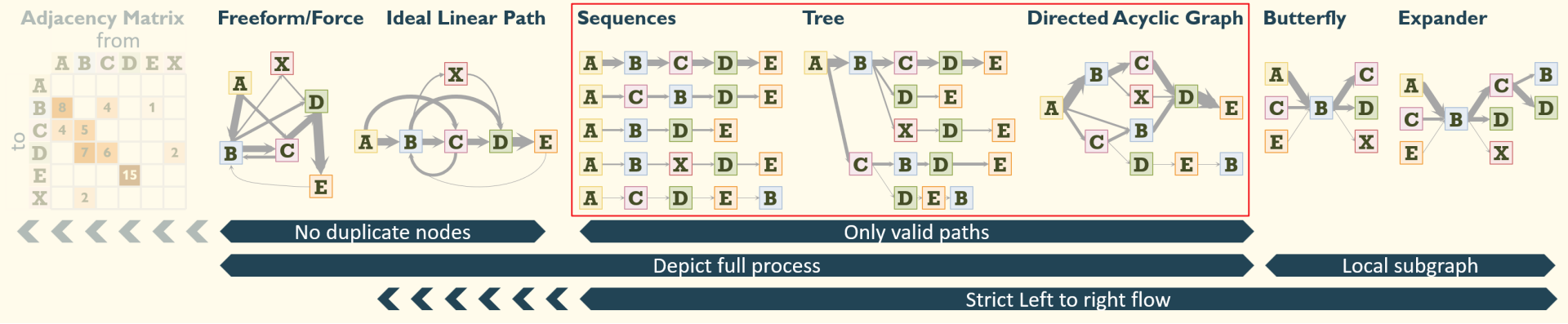


Liked by systems modelers
- Looks like spaghetti

Flow dominant!
- Shows paths that do not exist

Visualization choices

Focus on paths

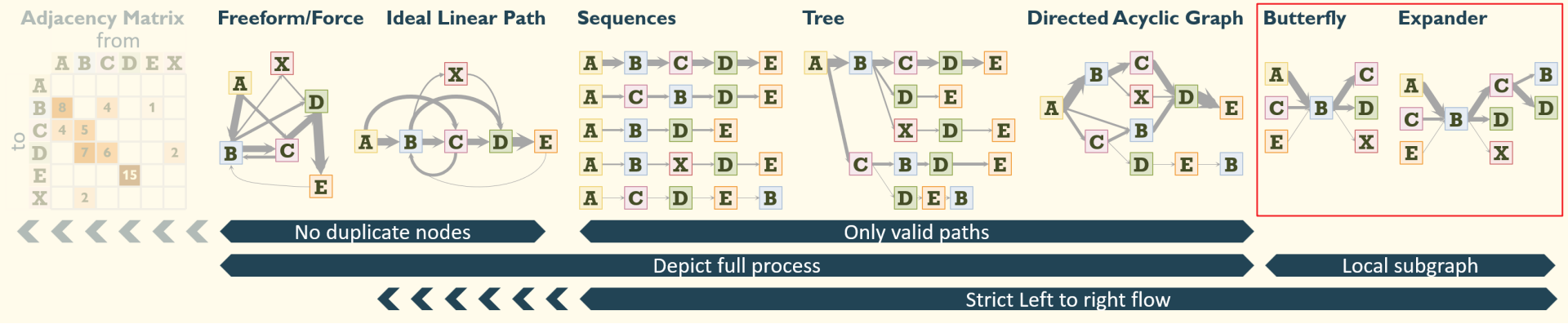


Key sequences
~ aggregate what?

Intuitive
- nodes many times
- more than one combo

Visualization choices

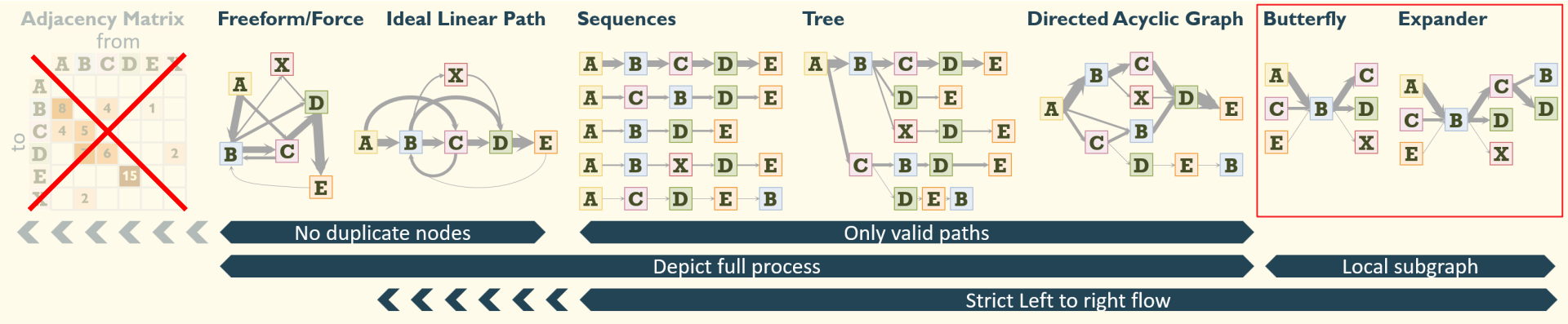
Focus on local subgraph



Very easy to understand.
- Lacks context
- Shows non-existent paths

Visualization choices

Focus on connections



Liked by engineers
- Confusing to most
- Never used in real-world apps

Visualizations in 14 real apps

Rank how we use in practice?

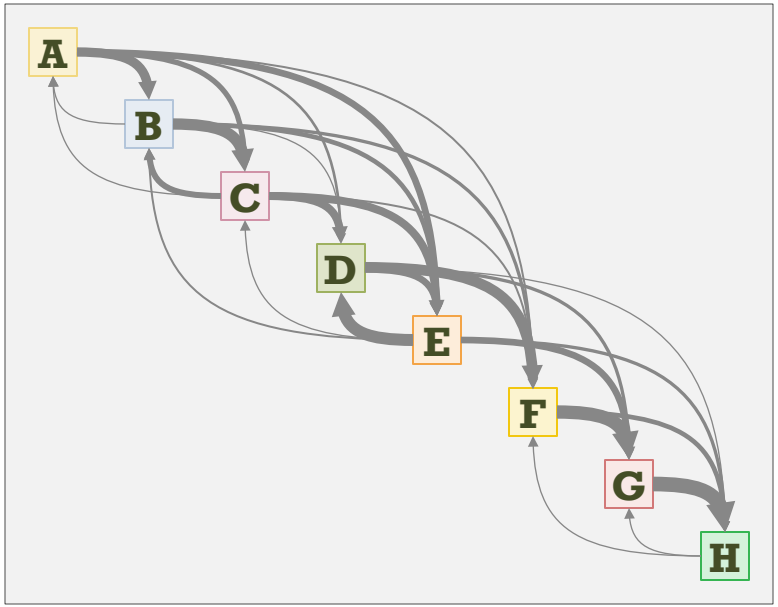
- **1st** DAG
- **2nd** Butterfly
  - Linear
  - Freeform
  - Geo
- **3rd** Expand
  - Sequence
- **4th** Tree
- **Never** Adjacency matrix

App	Freeform	Linear	Sequence	Tree	DAG	Butterfly	Expand	Geo
A	X (hierarchy)				X			
C	X							
E			X			X		
G		X						
I						X	X	
K					X			
L								X (abstract)
M								X (abstract)
O				X				
P					X			
R	X (hierarchy)				X		X	
S						X		
T		X	X		X			
Z		X						X (abstract)

Note -- No adjacency matrices!

Real-world example

- Analysis of **sequence** of real-world events where data comes from many different sources.
- Depicted as an “ideal path”, although many other paths exist.
- Not shown: interactions for filtering uncommon events, uncommon paths, etc. Connection weight shows frequency, color can be used, e.g. to show average duration at stage or edge, status, .
- Supports tasks such as journey discovery, decomposition, recomposition, overlay in-progress journeys, estimating journey times, setting alerts, etc.
  e.g. journey made of three sections ABC, DE, FGH. DE could occur in either order: ED or DE.



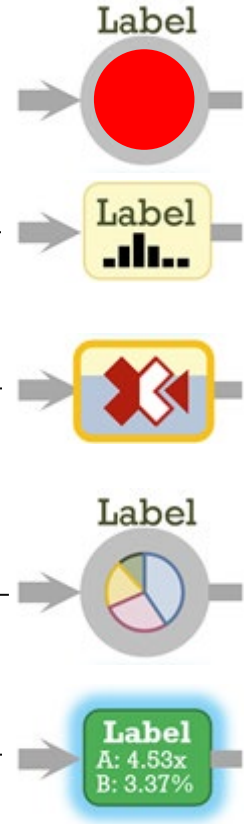
Node & Edge visualization choices

Node representations can be complex encoding a variety of categoric, quantitative and textual data.

Edges, on the other hand, tend to use simple representation of flows between nodes (thickness, color, length, and style)

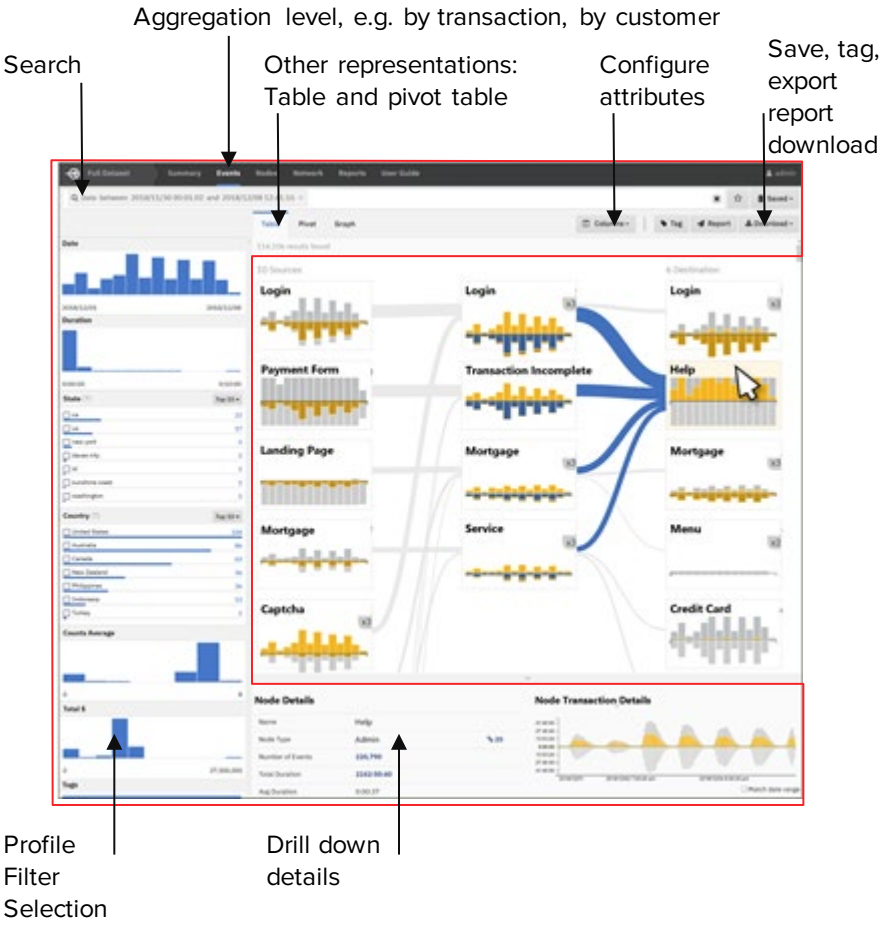
VA app	Label	Bk clr	Size	Glyph
A	X	C		
C	X	C		Sparkline glyph
E	X	C	X	
G	XX	Q	X	Compound radial glyph
I	X			Sparkline glyph
K	X	Q		
L	XXX	Q		
M	X	C	X	Pictoglyph w/ fill (+ size)
O		Q		Multivariate pictographic glyph
P	X	C	XX	Pie glyph
R	X	Q		
S	XXX	Q	X	
T	X	C		Sparkline glyph
Z	X	C		Pictographic glyph

Node representations per application including label, color, size and glyph (if any); with examples on right.



Real-world example

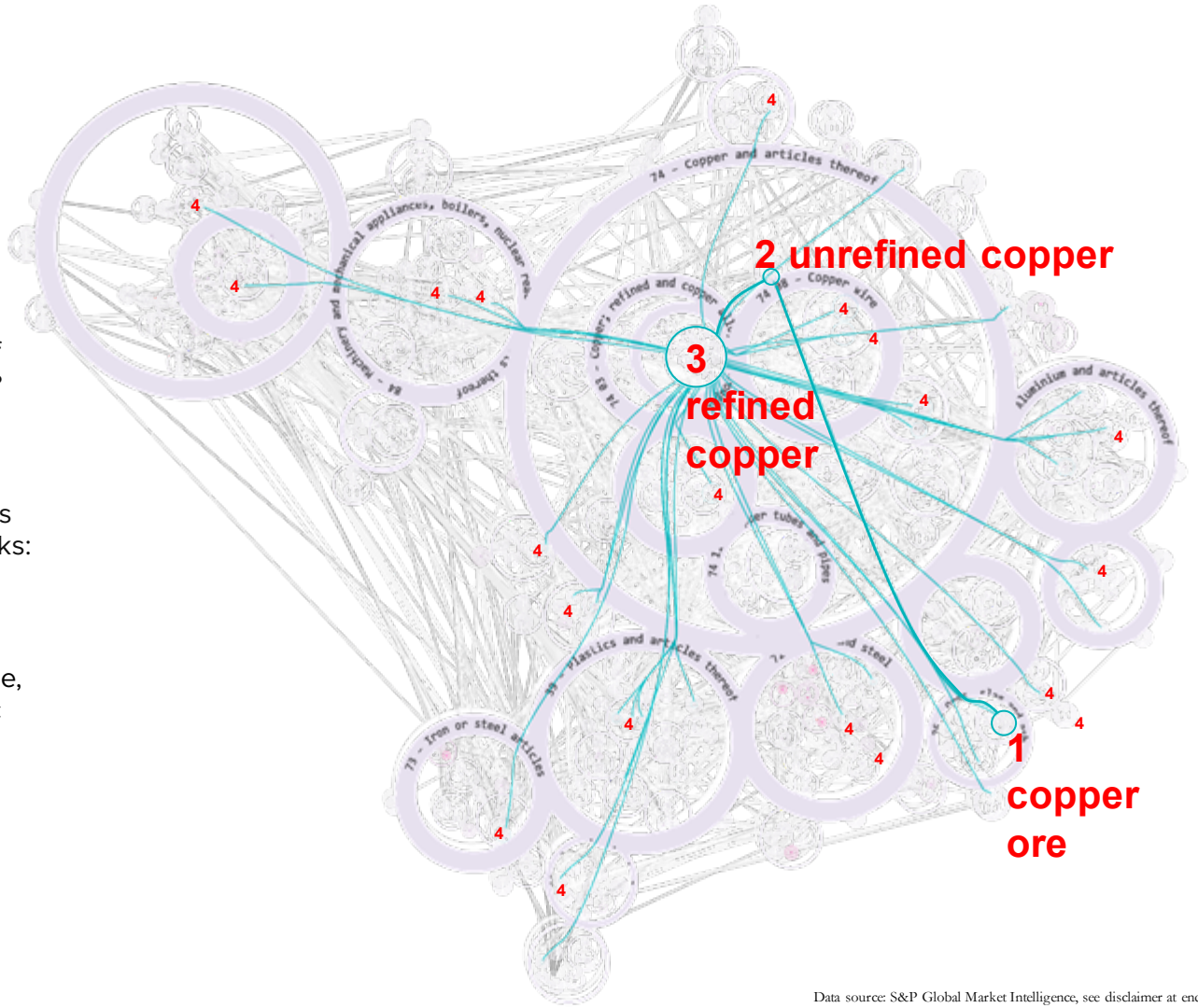
Many **interactions** required to support workflows from initial high-level overviews and exploration, search and filter, dig down through detailed connections, through to reports and exports.



Real-world: Copper journey

What happens when there are thousands of potential steps, and millions of connections?

- Teeny dots are companies (~2700)
- Rings group companies by product
  e.g. copper wire, machinery, etc.
- Lines are connections between companies
- Most common journeys on successive clicks:
  1 Copper ore
  2 Unrefined copper
  3 Refined copper
  4 Many things downstream after that: wire, fittings, transformers, alloys, inorganic chemicals, machinery, ammunition



Data source: S&P Global Market Intelligence, see disclaimer at end.

Real-world customer journey management

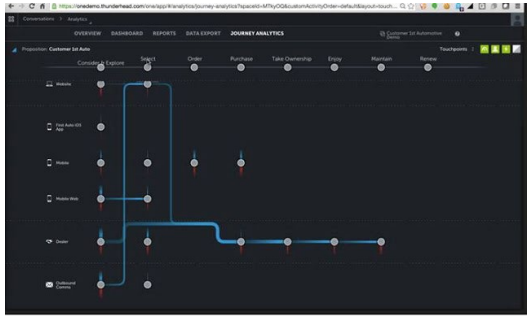
spiceworks

Customer Data Management

Thunderhead ONE Provides Powerful Journey Orchestration

April 18, 2016

As I wrote a couple of posts back, I've recently noticed a new set of vendors offering "journey optimization engines"*. The key feature of these systems is they select customer treatments based on movement through a journey map. The treatments are usually executed through external systems such as email service providers, CRM, or Web content management. The systems also assemble the unified customer database needed to track customer journeys. This, of course, is a function they share with Customer Data Platforms. But CDPs don't necessarily have journey mapping or treatment selection functions. On the other hand, journey optimization engines don't always expose their data to external systems, which is a core requirement for CDPs. Journey optimization engines also provide at least some tools to analyze customer journeys and choose the best customer treatments. These may include predictive models, machine learning, and automatic creation of journey maps, but don't have to.



Thunderhead ONE Engagement Hub is a charter member of this new little club. UK-headquartered Thunderhead itself was founded way back in 2001 and launched its original customer engagement product (highly personalized customer communications such as account statements) in 2004. ONE was developed by a U.S.-based engineering team. It was released in Europe in 2015 and in the U.S. earlier this year.

BLUEPOLARIS

JT on EDM

James Taylor on Everything Decision Management

First Look – Chordiant's Visual Business Director

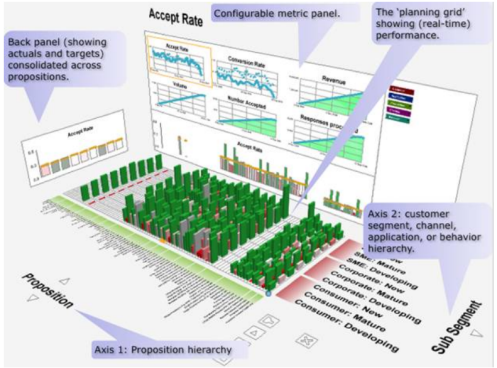
on OCTOBER 15, 2008

in BI, DECISION MANAGEMENT, PRODUCT NEWS, STRATEGY

Share / Save

Today Chordiant announced their new Visual Business Director (CxVBD). I saw an early prototype of this some months back and got a more detailed look at the finished product at their recent Customer Advisory Board. I really like CxVBD as I think it shows the critical business value of externalizing decisions. I have yet to see anything like it – despite various rules and decisioning platforms offering "simulation" capabilities – and I think business users will immediately see the potential of the product.

The premise of CxVBD is that simulation of a business, especially the decisions that drive a business, is critical to change management, to planning and to devising strategy. Users of Chordiant's decisioning platform (reviewed here) already have the information available when a decision is made (inputs), the outcome, the responses to the decision and the logic used in the decision. Extending the platform to capture this information allows CxVBD to replay logic, report on and monitor decisions, simulate alternative approaches and provide some look-ahead capability. Here's a quick screen shot:



Successes and Gaps

- 9/14 deployed > 5 years
  finance, supply chain, customer journeys
- Each 10’s-100’s of users
- Measurable gains
  churn, upsell, prediction, recommendations
- Enduring apps
  ∝ solve real needs

- Tech challenges?
- Novice users?
- Incremental or strategic?
- Too slow?

3. Where next?

Where do we go from here?

- **Real-time**: Alerts, metric targets, next-best-action channel-mix, offer-mix
- **Simulation / digital twins**: What-if scenarios
- **Visual alignment**: Journey viz actual data ≠ journey maps
- **Text**: dialogue, content → themes, issues, qualitative analytics
  e.g. using AI approaches such as GraphRAG
- **Exploratory analysis**: Weeks of data science → hours for expert → minutes for novice?
  e.g. using AI to facilitate most analytic tasks for easy review, augmentation, and distribution
- **Strategy analysis**: Not just analysis but actionable recommendations
  e.g. using AI to extract insights, then assemble insights into trade-offs and recommendations

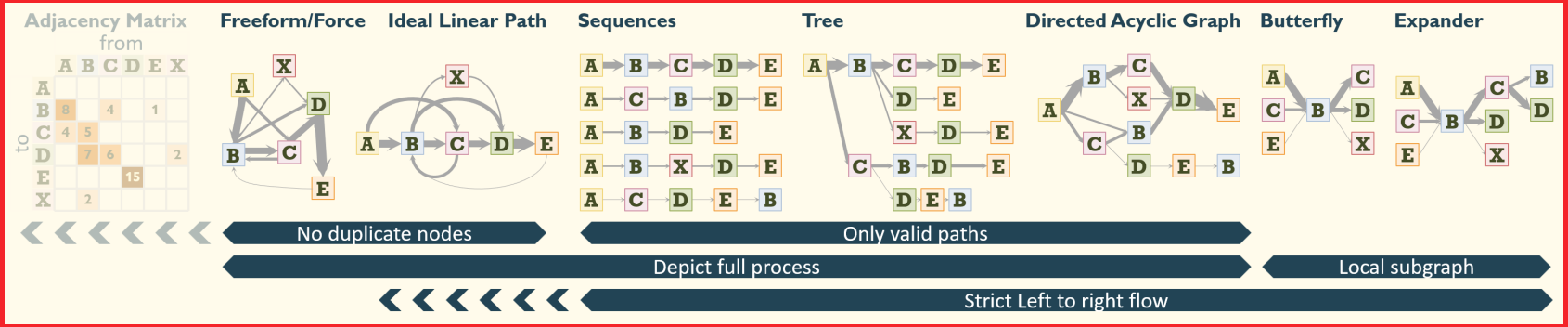
Conclusions

- Customer journeys also has cross over with, process mining, supply chain, healthcare, and other domains

- There will never be “one” journey visualization. It depends on your question. But there are many appropriate visualizations

- AI will change what kind of data we can use, how we analyze data, how we get to actionable answers

THANKS



More info

Research paper: link

Contact us: info@unchartedsoftware.com