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UXLabs + City University London

Designing the Search Experience

Agenda

- The landscape of search
- A framework for design
  - Dimensions of search user experience
- Patterns of search behaviour
  - Design implications
- Design resources
- Conclusions

The landscape of search

Understanding the territory

The classical view

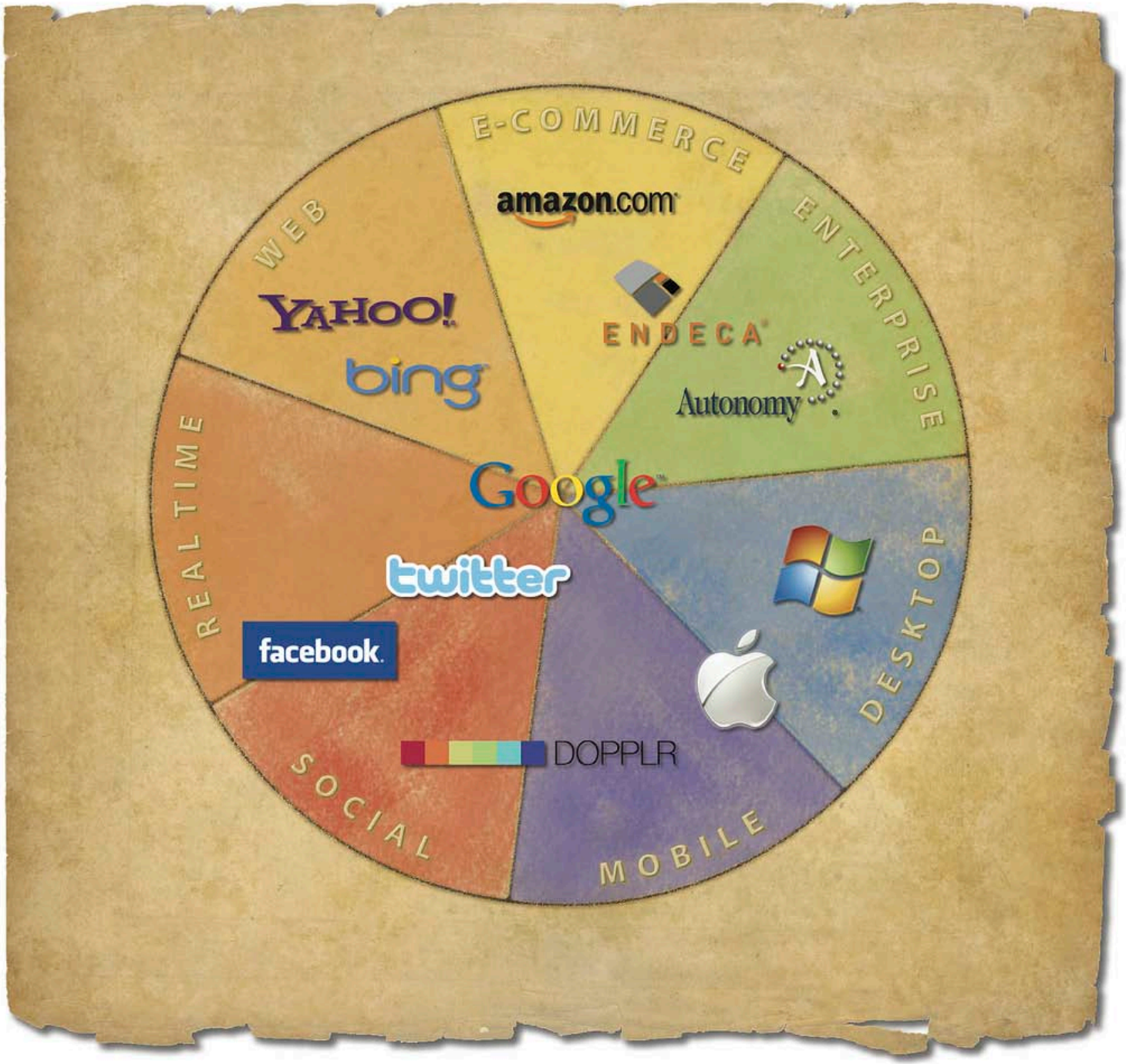
Web Search

- Multiple engines
- Single source

Enterprise search

- Single engine
- Multiple sources

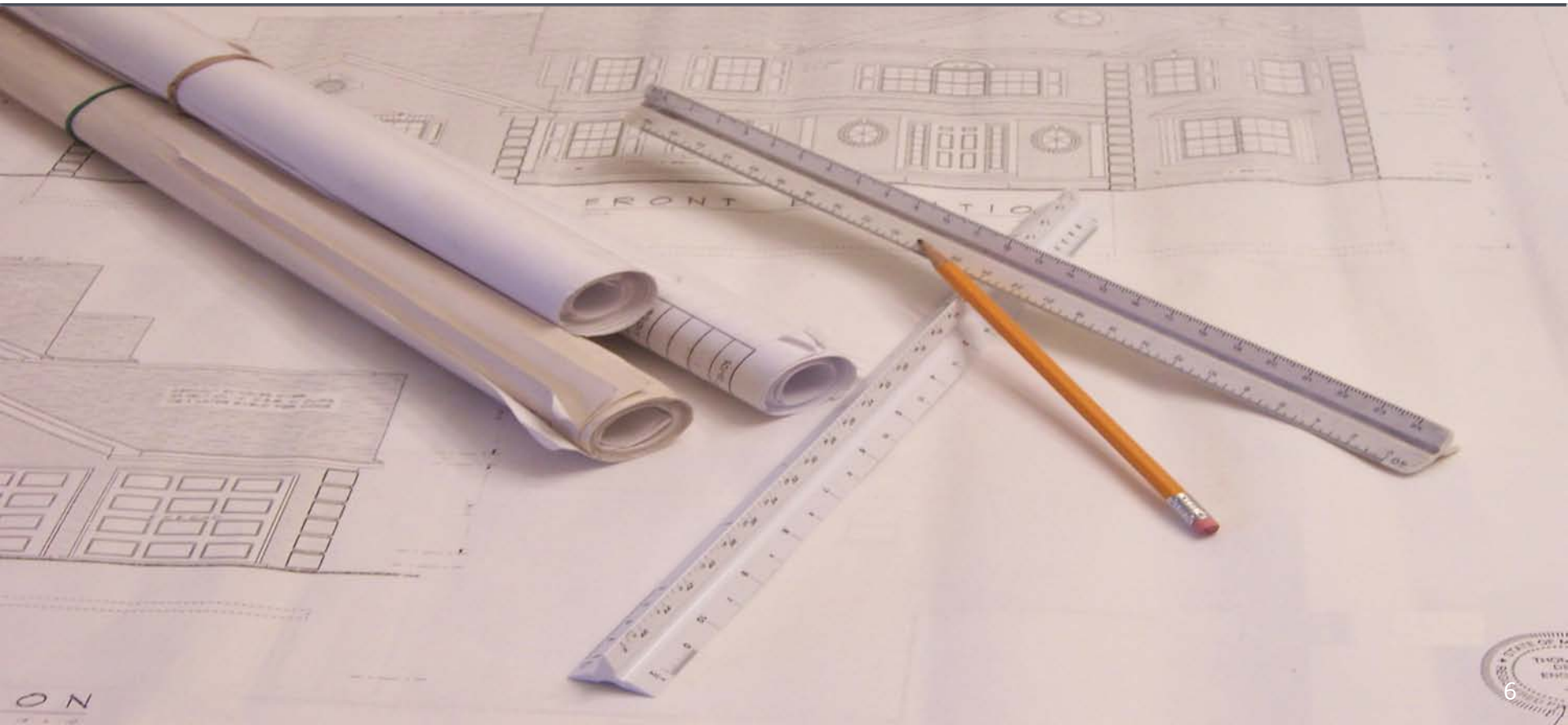
- Key differences
  - Rich link structure
  - Redundancy
  - Adversarial search & spam
  - User goals & tasks:
    - fact finding to *exploratory search*



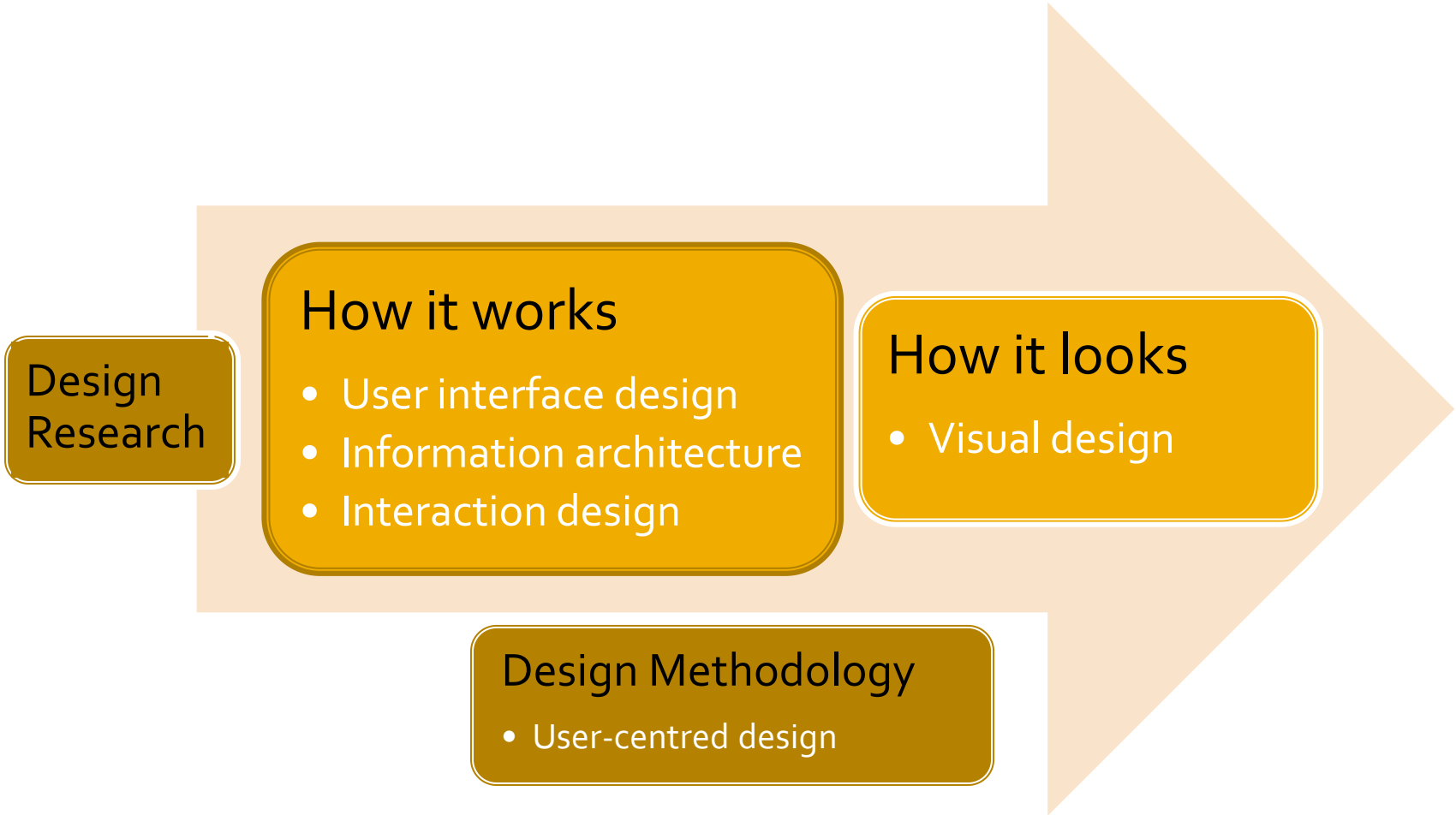
Search Patterns,
Peter Morville 2009

A framework for design

Disciplines and dimensions

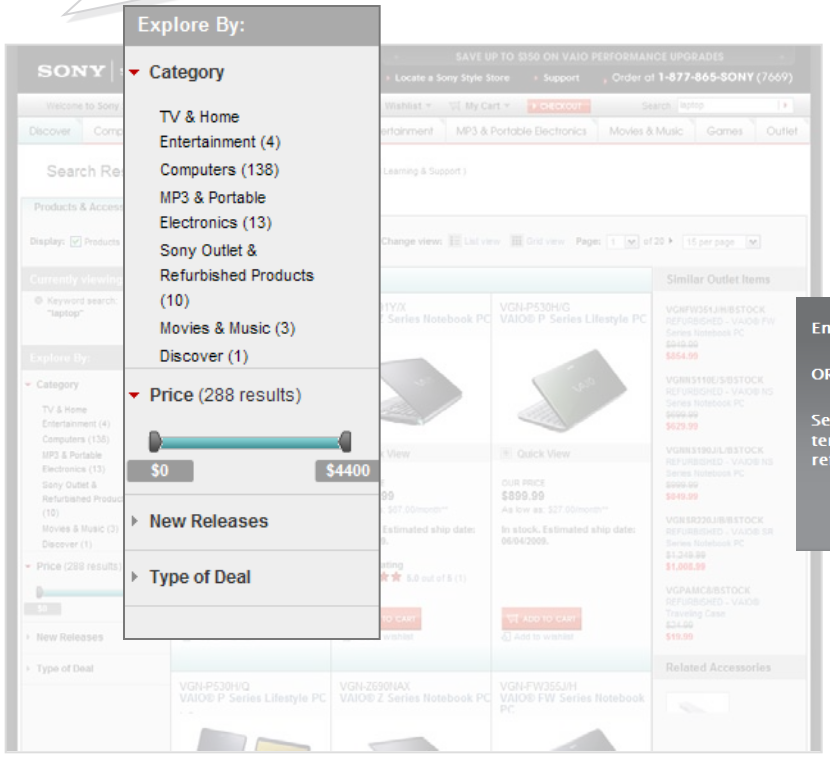


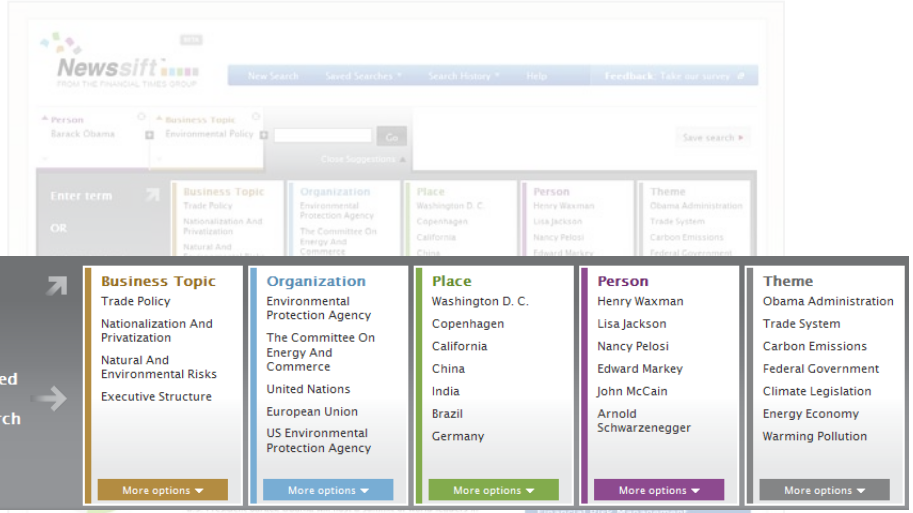
Design disciplines



Exploring the design space (1)

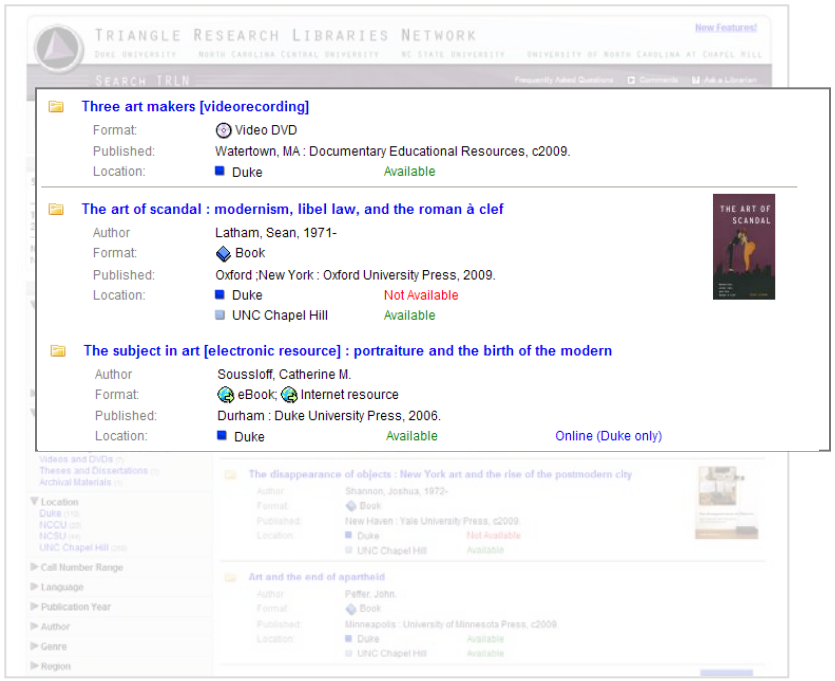
Where should the **Faceted Navigation** menu be located and how should it be organised?

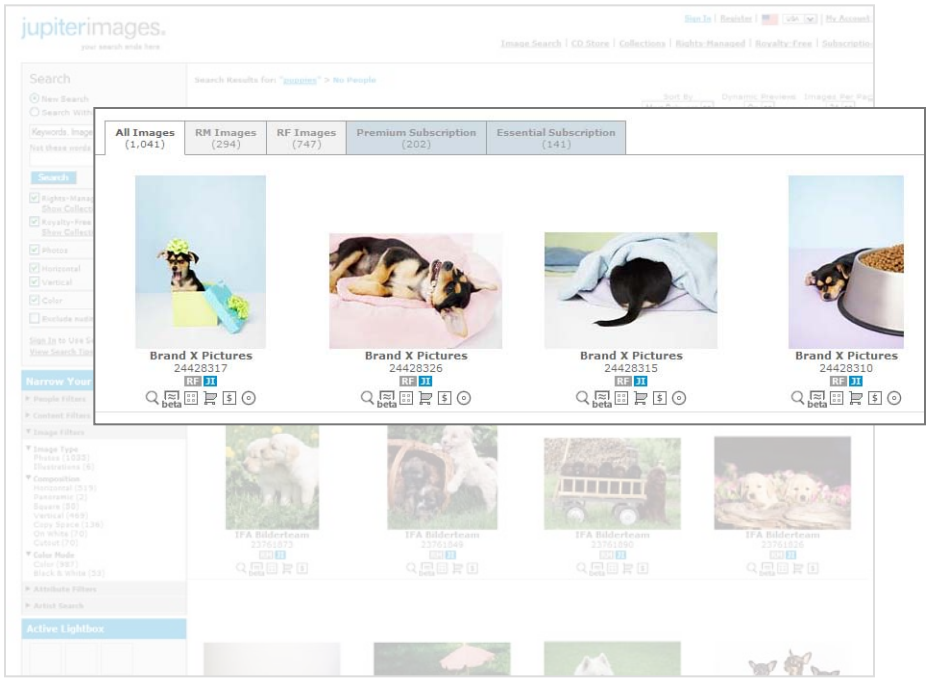




Exploring the design space (2)

How should we present **mixed content results** to help users discover the most relevant and useful items?





The Dimensions of Search User Experience

User Type

- Electronics Engineer
- Purchasing Agent
- Novice Shopper
- Technical Enthusiast
- …

Objective

- "Find part #35456…"
- "Discover compatible parts …"
- "Understand part obsolescence …"
- …

Assets

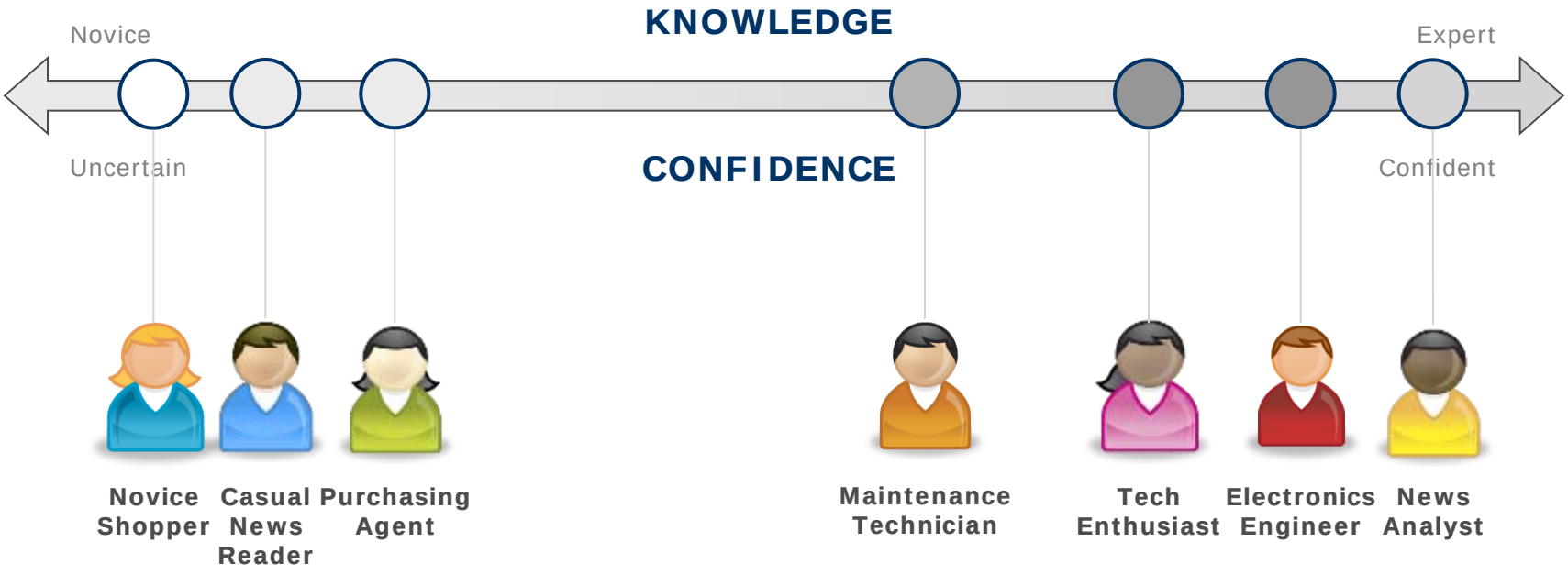
- Products
- Rich Media
- Textual Info
- Relationships
- Community
- …

Mode of Discovery

- Analyzing
- Comparing
- Evaluating
- Exploring
- Locating
- …

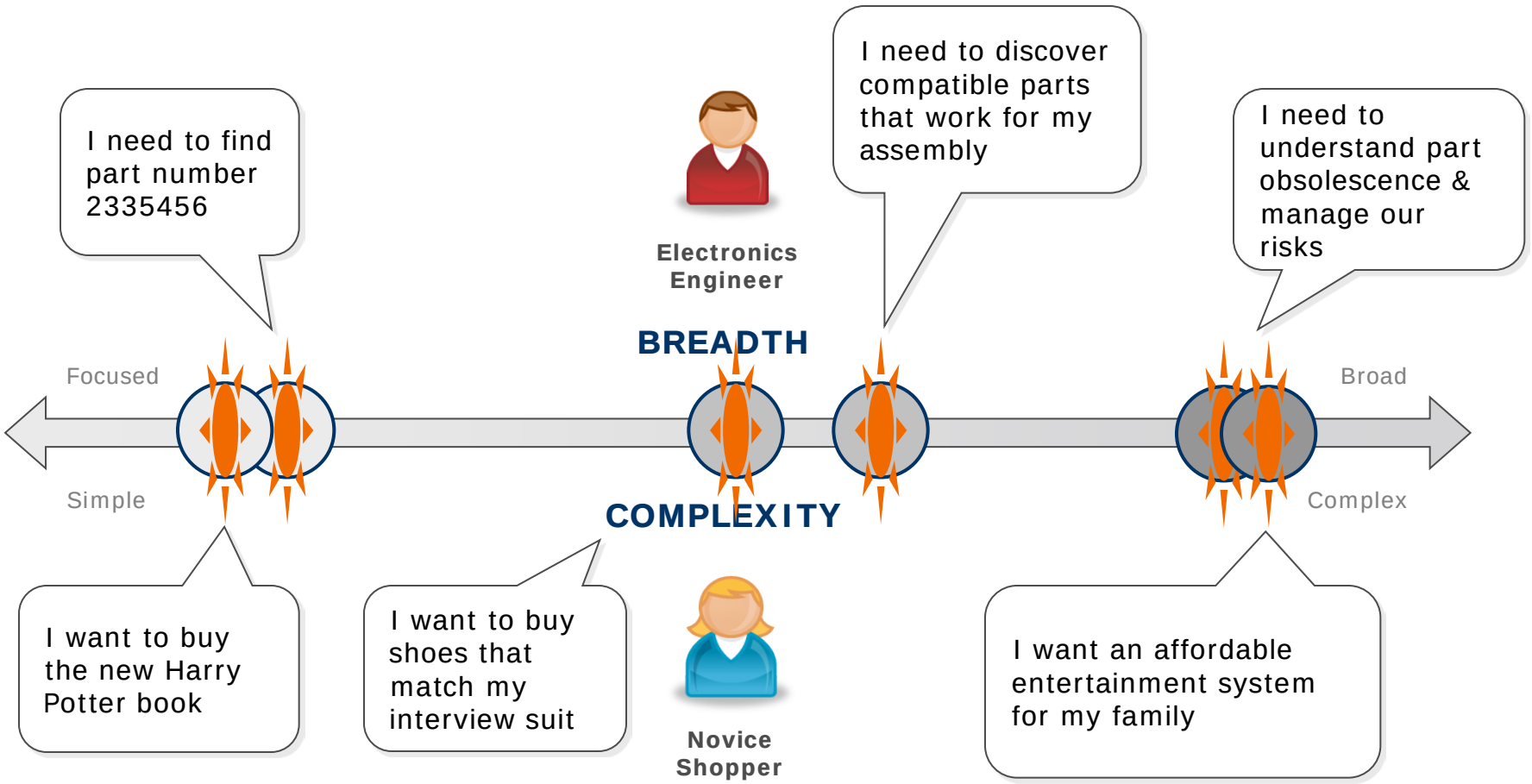
Dimension 1: user type

Users vary in their level of knowledge, confidence & attitude

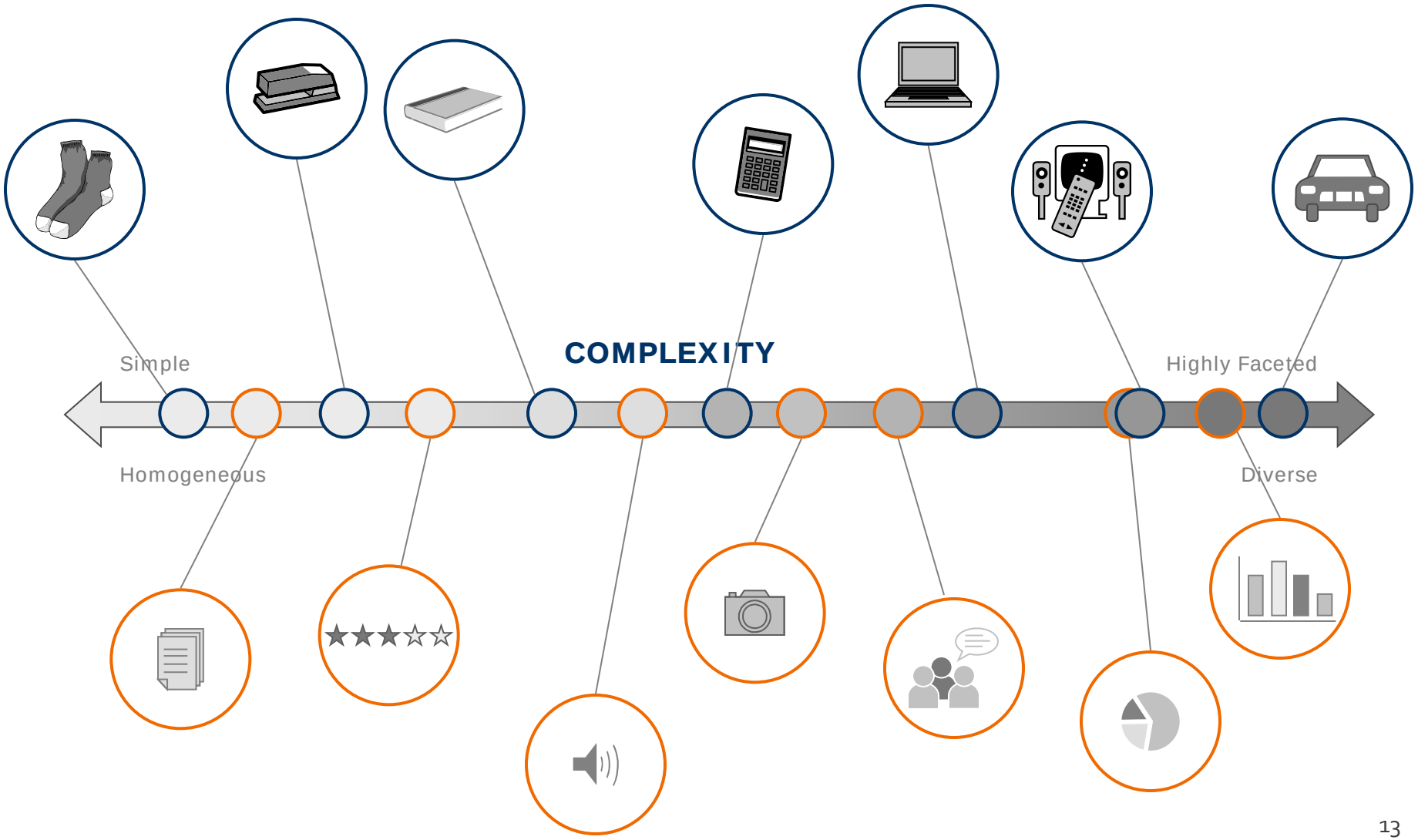


Dimension 2: objective

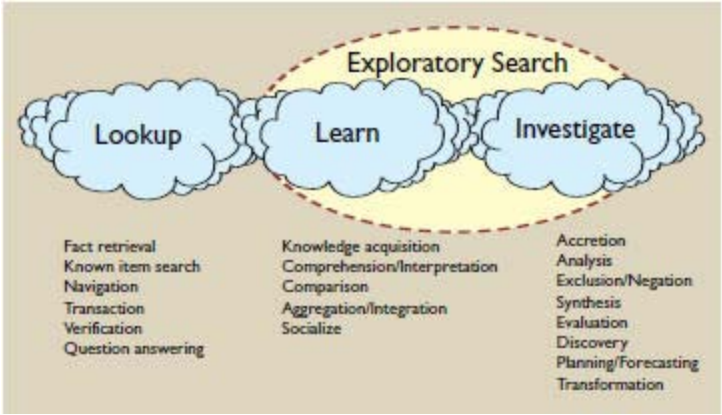
Objectives vary in breadth & complexity



Dimension 3: assets



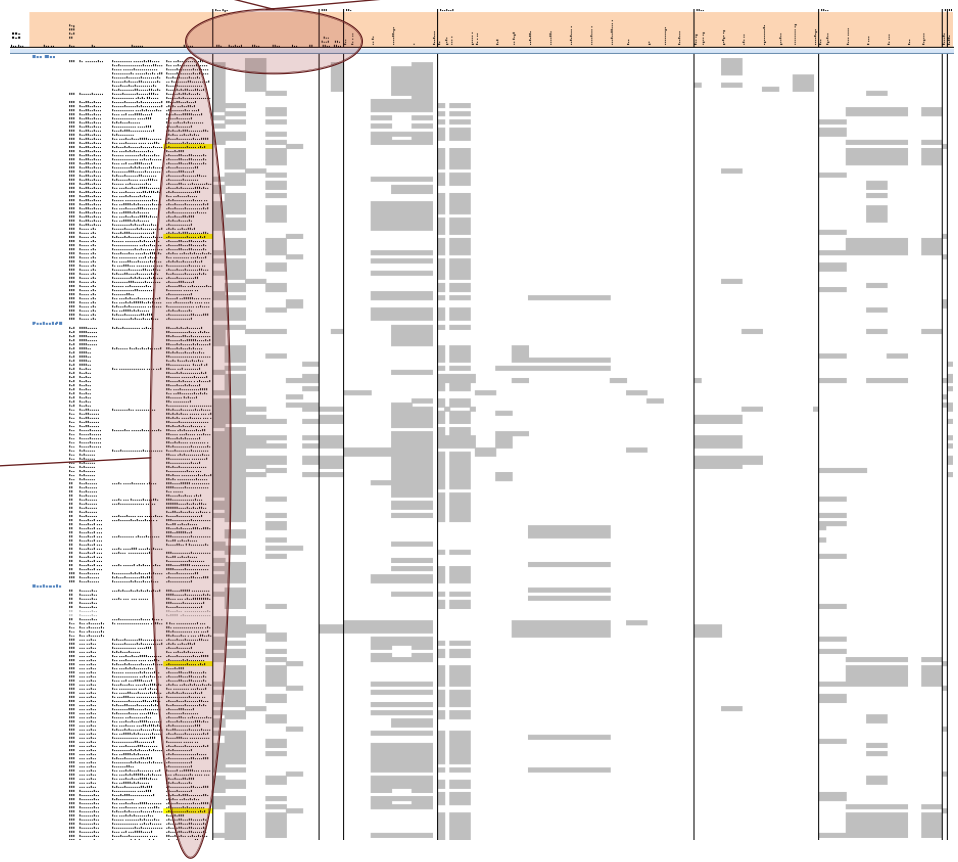
Dimension 4: mode of discovery



Analysing the Modes

Locating | Verifying | Monitoring | Comparing | Comprehending | Exploring

Scenarios



Modes of Discovery: Lookup

Locating

- To find a specific (possibly known) item
  - *e.g. I need to find a new part with particular technical attributes and then source it from the most qualified supplier –* **Engineering**

Verifying

- To confirm or substantiate that an item or set of items meets some specific criterion
  - *e.g. How can I determine if I am looking at the latest information for a part or supplier? -* **Supply Chain Specialist**

Monitoring

- To maintain awareness of the status of an item or data set for purposes of management or control
  - *e.g. I need to monitor at risk/failing customers/dealers so I can prompt my Account Reps to fix the problems -* **Sales Manager**

Modes of Discovery: Learn

Comparing

- To examine two or more items to identify similarities & differences
  - e.g. *I need to compare our module set teardowns with competitive teardown information to see if we're staying competitive for cost, quality and functionality* – **Engineering**

Comprehending

- To generate insight by understanding the nature or meaning of an item or data set
  - e.g. *I need to analyze and understand consumer-customer-market trends to inform brand strategy & communications plan* – **Director, Brand Image**

Exploring

- To proactively investigate or examine an item or data set for the purpose of serendipitous knowledge discovery
  - *e.g. I need to understand the cost drivers for this commodity so I can negotiate better terms with my suppliers and forecast business risk based on market indices* - **Procurement**

Modes of Discovery: Investigate

Analyzing

- To critically examine the detail of an item or data set to identify patterns & relationships
  - e.g. *I need to know the cost drivers for a part such as materials that impact cost. Is the relationship a correlation or step function for a part cost driver?* – **Engineering**

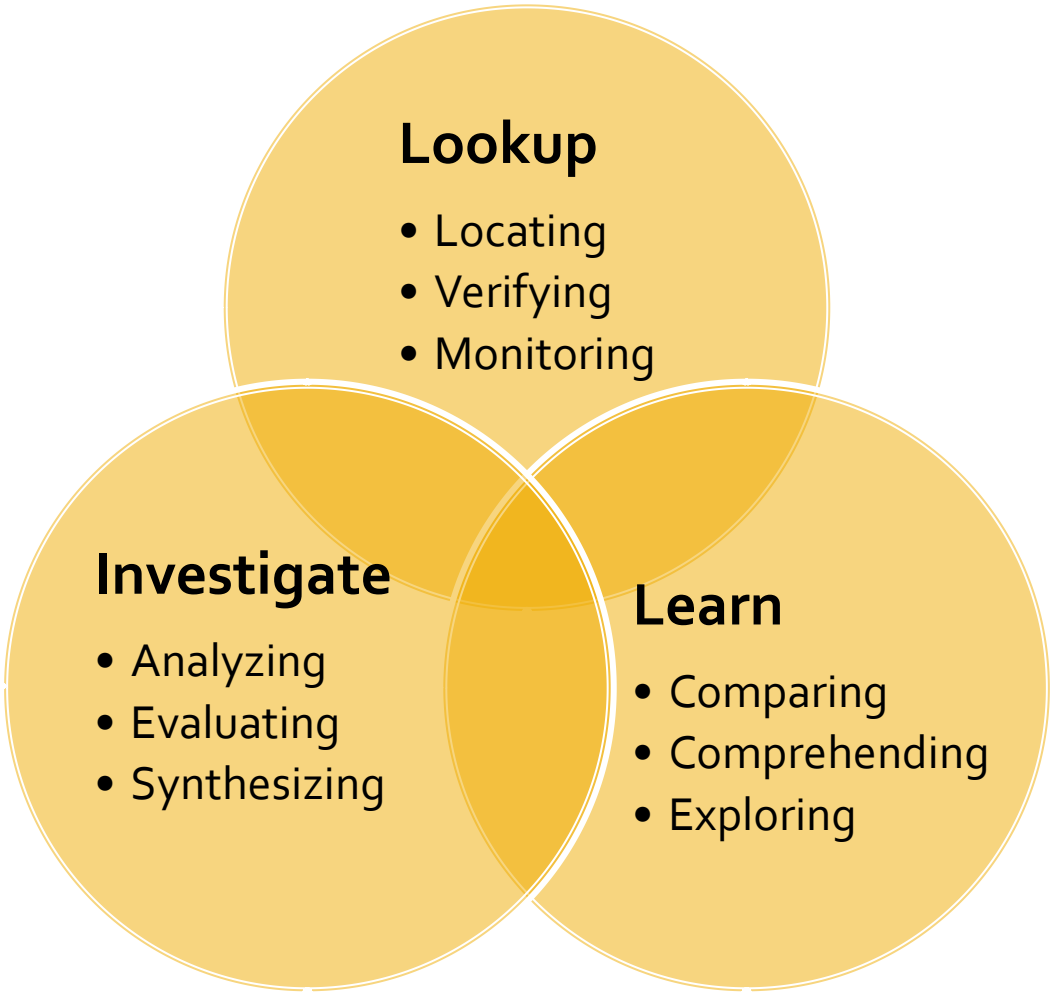
Evaluating

- To use judgement to determine the significance or value of an item or data set with respect to a specific benchmark or model
  - e.g. *I need to determine my current state in my prints so I can evaluate if I have price variation to negotiate a better price* – **Procurement**

Synthesizing

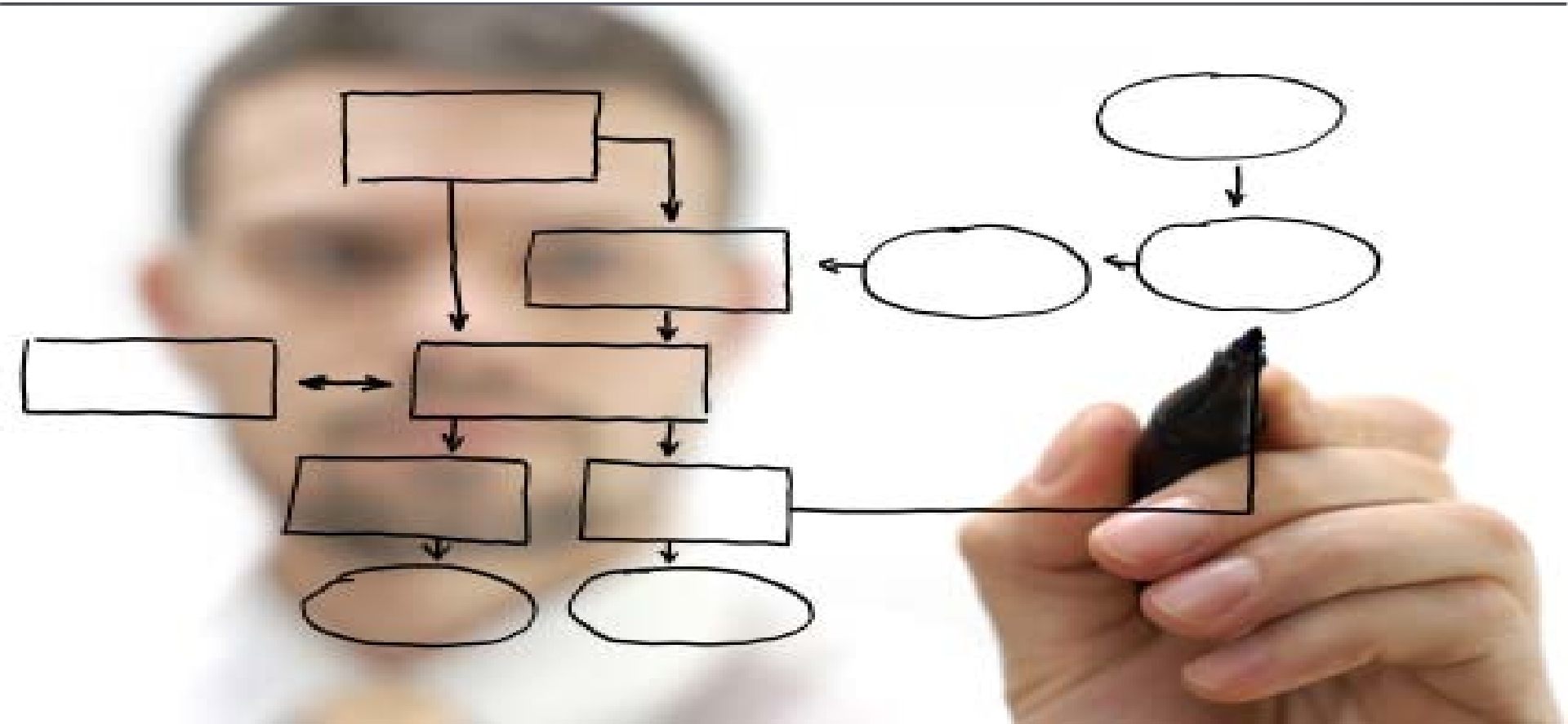
- To generate or communicate insight by integrating diverse inputs to create a novel artefact or composite view
  - e.g. *I need to prepare a weekly report for my boss (sales mgr) of how things are going* - **Account Rep**

Modes of Discovery



Patterns of search behaviour

Mode chains and sequences



Comparison–driven search

- **Engineering:** Compare our module set teardowns with competitive teardown information to see if we're staying competitive for cost, quality and functionality.
- **Portfolio Manager:** Compare a lead's performance claims with relevant benchmarks to assess the lead's claims
- **Cost Estimators:** Analyze & understand gaps between current costs of commodity versus best in class manufacturing costs
  - ➔ Patentability search?

Exploration-driven search

- **Core Engineer:** Identify opportunities to optimize use of tooling capacity for my commodity/parts
- **District Manager:** Identify sales opportunities and targets (increased key customer market share across categories/brands; upsell-cross sell; promotional targets
- **Category Manager:** Evaluate & optimize our product portfolio: Which products should we de-list and retire? What new products should we be making/selling?
  - ➔ Validity search?

Strategic Insight

- **Engineering:** Track module cost versus functionality over time to determine trends.
- **Portfolio Manager:** Understand a lead's underlying positions so that I can assess the quality of the investment opportunity
- **Procurement:** Understand the cost drivers for a commodity so I can negotiate better terms with my suppliers and forecast business risk based on market indices
  - ➔ Freedom-to-operate search?

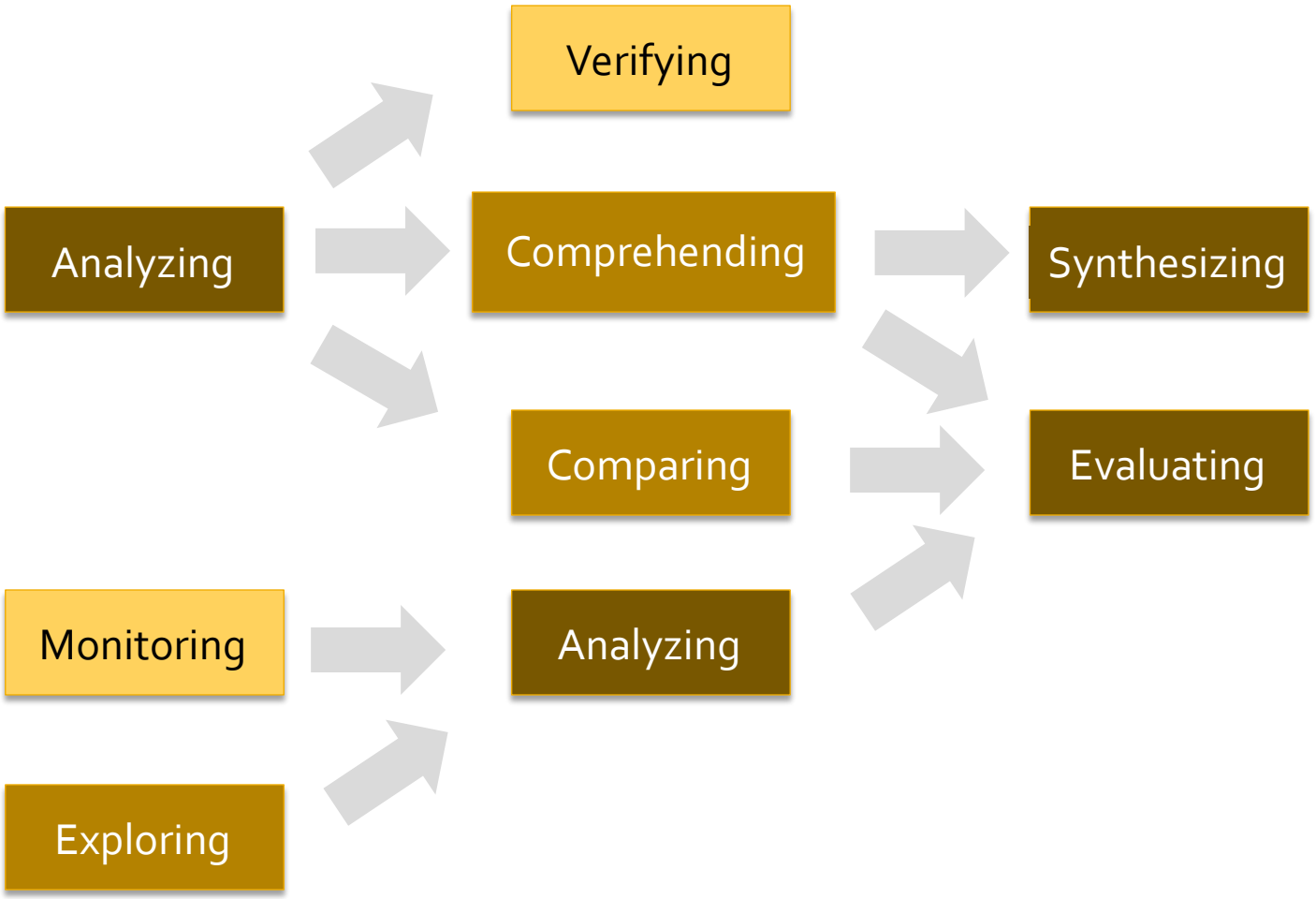
Strategic Oversight

- **SVP Sales:** Monitor how well we are tracking to revenue and margin targets by division
- **Core Engineer:** Monitor global commodity use in relation to plan/guidelines to identify gaps that require corrective action
- **Financial Analyst:** Monitor & assess commodity status against strategy/plan/target
  - ➔ Patent watch?

Comparison–driven synthesis

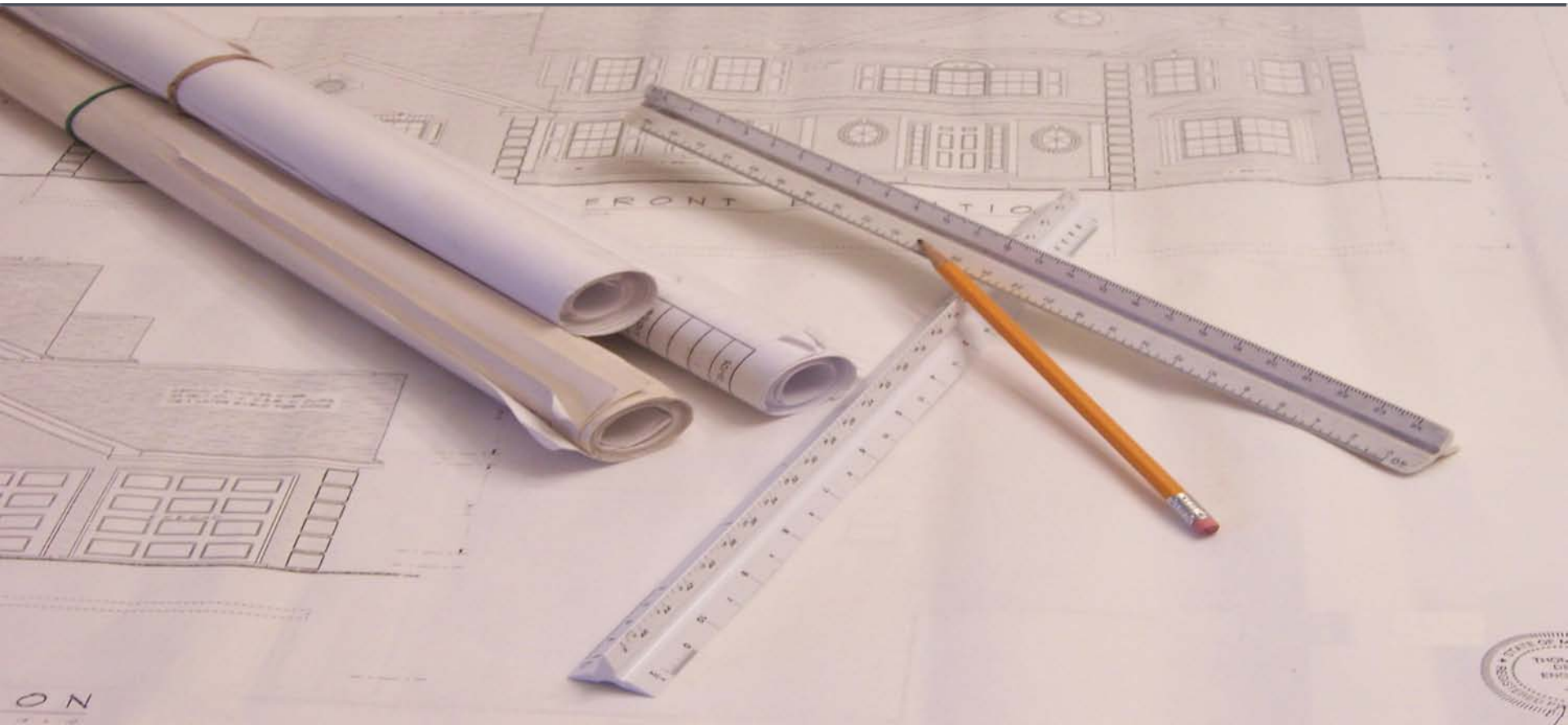
- **Director, Brand Image:** Analyze and understand consumer-customer-market trends to inform brand strategy & communications plan
- **Engineering:** Find out how many parts I have in my module set of parts and find ways to reduce cost across them
- **Core Buyer:** Formulate scope & strategy for sourcing and gap closure
  - ➔ Gap analysis (SOTA search)?

Mode Networks



Design Implications

Applying the insights



Finding the right balance

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Within current results | Search

Guided Navigation

- My Active BOMs
  - Trench (757)
  - Dakota (9328)
  - Deep Sea 3 (543)
  - More...
- Part Family
  - + Bearings (77,453)
  - – Couplings (53,245)
    - Compression (6432)
    - Slip (1434)
    - Threaded (15,423)
    - Flexible gear (5863)
    - Rigid (6748)
    - Muff (453)
    - Beam (4878)
    - Pin (2553)
    - Spider (220)
    - Bibby (659)
    - More...
- Preferred Suppliers
  - Renold (143,964)
  - Emerson (76,013)
  - Klauslaumayer (34,642)
  - Rimtec (9,543)
  - More...

Price

25 50 75 100 125 150 175

CAD Diagrams

Your Results:

Part Family: Couplings ⊗

Showing Parts 1-20 of 5,534,673

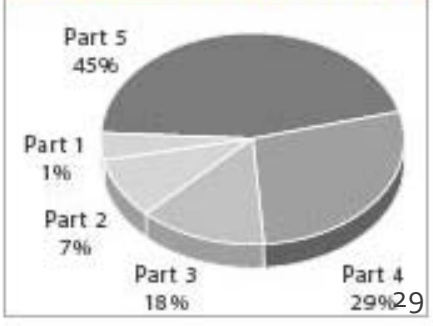
PART #	DESCRIPTION	ACTIVE
026P0864	Plain sleeve and indenting tool	YES
08G48950	Straight screw sleeve	NO
077P1122	Clevis Pin to Threaded Coupling	NO
042F2636	Split injector valve	YES
01K23570	168-mm-diameter tube	YES
021H7636	Five-piece compression fitting	NO
089G3880	Double-threaded brass ring	NO
097P1995	ACE PVC conduit	NO
057G9213	Steel grounding ferrule O3D1	YES
08G51739	IM upper intake manifold	YES
021H7575	Matrix E4OD Super Heavy Duty	NO
022R0313	IAuxiliary transmission cooler	NO
024L1586	PVC threaded coupling 1/2"	YES
08J50765	Docking Port Rings	YES

Inventory Location [x]

Research Notes [x]

rustproof exchange rate new composites MagnaDrive product launch recalled tear down ISO update strike field testing

AVG Fulfillment Time [x]



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25 50 75 100 125 150 175

CAD Diagrams

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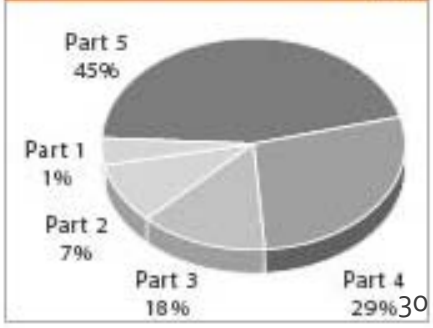
08G51739	IM upper intake manifold	YES
021H7575	Matrix E4OD Super Heavy Duty	NO
022R0313	IAuxiliary transmission cooler	NO
024L1586	PVC threaded coupling 1/2"	YES
08I59765	Docking Port Rings	YES

Inventory Location [x]

Research Notes [x]

rustproof exchange rate new composites MagnaDrive product launch recalled tear down ISO update strike field testing

AVG Fulfillment Time [x]



ENDECA

Within current results | Search

Guided Navigation

Materials
- Stainless (1456)
- Brass (143)
- Nickel Alloy (90)
- More...

Preferred Suppliers
- Arnault (2556)
- Tritex (1690)
- Sernoff (943)
- More...

Mean Time To Failure
- 10 (4112)
- 15 (3934)
- 20 (1581)
- More...

Inner Diameter (mm)

0 16 32 48 64 96 128

Max Torque (Nm)

0 125 250 375 500 625 750

Screw (ISO 4762/12.9)

More ▲▲ ▼▼

Your Results:

Part Family: Couplings > Threaded ⊗

Showing Parts 1-20 of 15,423

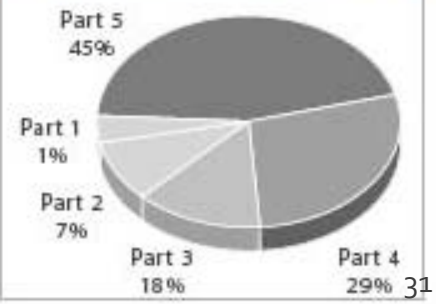
PART #	DESCRIPTION	ACTIVE
021H7575	• Aluminium camlock coupling type E	NO
022R0313	• Rollor Chain Couplings	NO
024L1586	• Trans Fluid Coupling	YES
08J59765	• TSCHAN S-Coupling	YES
02637680	• MagnaDrive industrial coupling	NO
044H7837	• Haldex Coupling	NO
097H7520	• Manifold Coupling	YES
089H9939	• CentriFlex Coupling	YES
02N85527	• Sella Transmission Coupling	NO
022R0774	• Type 40 Assy Coupling	NO
026P0864	• Standard Duty Coupling	YES
08G48950	• Helical shaft couplings	YES
077P1122	• Single joint gear couplings	NO
042E2636	• Ductilic Grooved Coupling	NO

Inventory Location [x]

Research Notes [x]

recalled tear down ISO update strike field testing rustproof exchange rate new composites MagnaDrive

AVG Fulfillment Time [x]



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More ▲▲ ▼▼

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08G48950	• Helical shaft couplings	YES
077P1122	• Single joint gear couplings	NO
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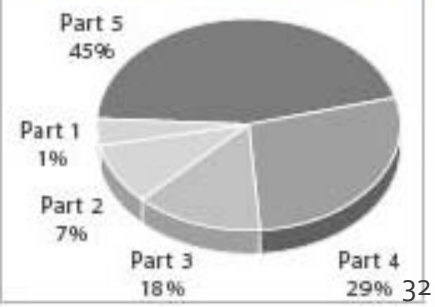
Inventory Location [x]

Research Notes [x]

recalled tear down ISO update strike field testing rustproof exchange rate new composites MagnaDrive

AVG Fulfillment Time [x]



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Within current results | Search

Guided Navigation

- Materials
  - •Stainless (945)
  - •Aluminum (540)
  - •Brass (82)
  - •More...
- Preferred Suppliers
  - •Arnault (316)
  - •Smithson (194)
  - •Trinity (79)
  - •More...
- Mean Time To Failure
  - •10 (674)
  - •15 (330)
  - •20 (213)
  - •More...

Inner Diameter (mm)

0 16 32 48 64 96 128

Max Torque (Nm)

0 125 250 375 500 625 750

Screw (ISO 4762/12.9)

More ▲▲ ▼▼

Your Results:

Part Family: Couplings > Threaded ⊗

Geo: Lat 50.03 Long 8.68 + radius 1750 Km ⊗

Showing Parts 1-20 of 2,791

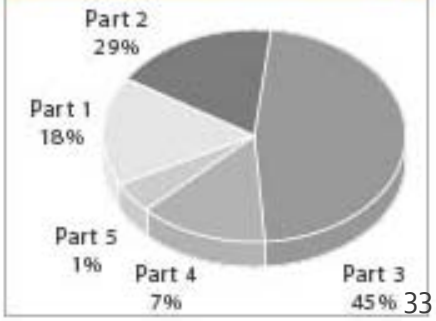
PART #	DESCRIPTION	ACTIVE
26P0864	• Haldex Coupling	YES
08G48950	• Manifold Coupling	NO
077P1122	• CentriFlex Coupling	NO
042F2636	• Sella Transmission Coupling	YES
01K23578	• Type 40 Massy Coupling	YES
021H7636	• Standard Duty Coupling	NO
089G3880	• Split threaded coupling nut	NO
097P1995	• Hexagonal Coupling	YES
057G9213	• National Pipe Thread (NPT) Hose	YES
08G51737	• Threaded tubular coupling	NO
021H7575	• Forged socket weld coupling	NO
022R0313	• PVC threaded coupling 1/2"	YES
024L1586	• Docking Port Rings	YES
08I59769	• M D-MOUNT COUPLING	NO

Inventory Location [x]

Research Notes [x]

rustproof exchange rate new composites MagnaDrive product launch recalled tear down ISO update strike field testing

AVG Fulfillment Time [x]



ENDECA

Within current results | Search

Guided Navigation

Materials
- Stainless (945)
- Aluminum (540)
- Brass (82)
- More...

Preferred Suppliers
- Arnault (316)
- Smithson (194)
- Trinity (79)
- More...

Mean Time To Failure
- 10 (674)
- 15 (330)
- 20 (213)
- More...

Inner Diameter (mm)

0 16 32 48 64 96 128

Max Torque (Nm)

0 125 250 375 500 625 750

Screw (ISO 4762/12.9)

More ▲▲ ▼▼

Your Results:

Part Family: Couplings > Threaded ⊗

Geo: Lat 50.03 Long 8.68 + radius 1750 Km ⊗

Showing Parts 1-20 of 2,791

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08G48950	• Manifold Coupling	NO
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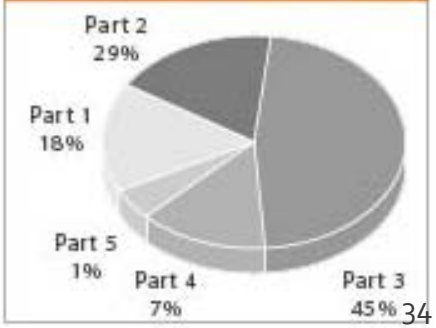
Inventory Location [x]

Research Notes [x]

rustproof exchange rate new composites MagnaDrive product launch recalled tear down ISO update strike field testing

AVG Fulfillment Time [x]



ENDECA

Within current results | Search

Guided Navigation

- Materials
  - Stainless (1343)
  - Aluminum (302)
  - Copper (117)
  - More...
- Preferred Suppliers
  - Arnault (844)
  - Klein (405)
  - Ylan (180)
  - More...
- Mean Time To Failure
  - 10 (1217)
  - 15 (623)
  - 20 (492)
  - More...
- Max Torque (Nm)

0 125 250 375 500 625 750

- Screw (ISO 4762/12.9)
- Mounting length (mm)
- Angular Misalignment
- Hub length (mm)
- More ▲▲ ▼▼

Your Results:

Part Family: Couplings > Threaded ⊗

Geo: Lat 53.83 Long 1.54 + radius 168 Km ⊗

Inner Diameter: 96 mm ⊗

Showing Parts 1-20 of 5,688

PART #	DESCRIPTION	ACTIVE
021H7575	• Aluminium camlock coupling type E	NO
022R0313	• Rollor Chain Couplings	NO
024L1586	• Trans Fluid Coupling	YES
08J59765	• TSCHAN S-Coupling	YES
02637680	• MagnaDrive industrial coupling ...	NO
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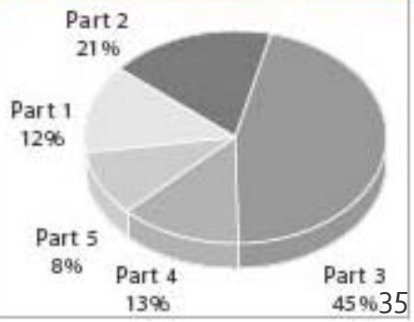
089H9939	• CentriFlex Coupling	YES
02N85527	• Sella Transmission Coupling	NO
022R0774	• Type 40 Assy Coupling	NO
026P0864	• Standard Duty Coupling	YES
08G48950	• Helical shaft couplings	YES
077P1122	• Single joint gear couplings	NO

Inventory Location [x]

Research Notes [x]

angular force extreme conditions ISO torque strike field testing rustproof drilling new composites stress testing DARPA

AVG Fulfillment Time [x]



ENDECA

Within current results | mar | Search

- Research: marker (103)
- BOM: Mariana (4)
- Supplier: Martins (38)
- Month: March (543)

Guided Navigation

Materials
- Stainless (1343)
- Aluminum (302)
- Copper (117)
- More...

Preferred Suppliers
- Arnault (844)
- Klein (405)
- Ylan (180)
- More...

Mean Time To Failure
- 10 (1217)
- 15 (623)
- 20 (492)
- More...

Max Torque (Nm)

0 125 250 375 500 625 750

Screw (ISO 4762/12.9)

Mounting length (mm)

Angular Misalignment

Hub length (mm)

More ▲▲ ▼▼

Your Results:

Part Family: Couplings > Threaded ⊗

Geo: Lat 53.83 Long 1.54 + radius 168 Km ⊗

Inner Diameter: 96 mm ⊗

Showing Parts 1-20 of 5,688

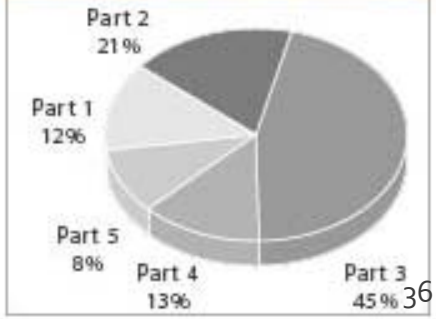
PART #	DESCRIPTION	ACTIVE
021H7575	Aluminium camlock coupling type E	NO
022R0313	Rollor Chain Couplings	NO
024L1586	Trans Fluid Coupling	YES
08J59765	TSCHAN S-Coupling	YES
02637680	MagnaDrive industrial coupling ...	NO
044H7837	Haldex Coupling	NO
097H7520	Manifold Coupling	YES
089H9939	CentriFlex Coupling	YES
02N85527	Sella Transmission Coupling	NO
022R0774	Type 40 Assy Coupling	NO
026P0864	Standard Duty Coupling	YES
08G48950	Helical shaft couplings	YES
077P1122	Single joint gear couplings	NO
042F2636	Ductilic Grooved Coupling	NO

[x]

Research Notes [x]

angular force extreme conditions ISO torque strike field testing rustproof drilling new composites stress testing DARPA

AVG Fulfillment Time [x]



ENDECA

Within current results | Search

Guided Navigation

- Materials
  - Stainless (42)
  - Carbon Fiber (8)
  - PVC (3)
  - More...
- Preferred Suppliers
  - Wilem (41)
  - Gould (12)
  - Klein (3)
  - More...
- Mean Time To Failure
  - 20 (31)
  - 25 (22)
  - 30 (18)
  - More...
- Max Torque (Nm)

0 125 250 375 500 625 750

- Screw (ISO 4762/12.9)
- Weight (g)
- Mass moment of intertia
- More ▲▲ ▼▼

Your Results:

Part Family: Couplings > Threaded ⊗

Geo: Lat 52.74 Long 5.68 + radius 425 Km ⊗

Inner Diameter: 96 mm ⊗

Search: "marine" ⊗

Showing Parts 1-10 of 93

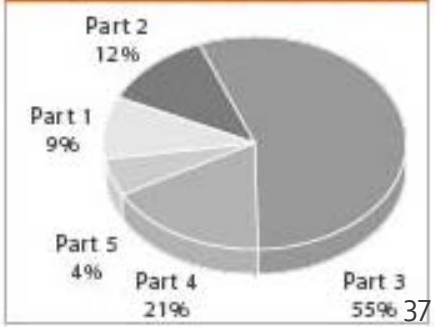
PART #	DESCRIPTION	ACTIVE
026P0864	• Helical shaft couplings ...tested for marine and desert...	YES
08G48950	• Single joint gear couplings ...marine stress tests indicate...	NO
077P1122	• Ductilic Grooved Coupling ...designed for marine environ...	NO
042F2636	• Morris coupling ...marine MTT is designated as...	YES
01K23578	• Farleigh 4t bin coupling ...marine conditions and salinity...	YES
021H7636	• Wet vacuum pump coupling ...high temperature and marine use...	NO
089G3880	• Flanged Gear Coupling ...brackish salinity for marine rigs...	NO
097P1995	• Klein Series 800 threaded coupling	YES

Inventory Location [x]

Research Notes [x]

rust proof ISO 5839 environment pumping MagnaDrive sand helical marine tear down drill salinity field testing

AVG Fulfillment Time [x]



ENDECA

Within current results | Search

Guided Navigation

- Materials
  - Stainless (42)
  - Carbon Fiber (8)
  - PVC (3)
  - More...
- Preferred Suppliers
  - Wilem (41)
  - Gould (12)
  - Klein (3)
  - More...
- Mean Time To Failure
  - 20 (31)
  - 25 (22)
  - 30 (18)
  - More...
- Max Torque (Nm)

0 125 250 375 500 625 750

- Screw (ISO 4762/12.9)
- Weight (g)
- Mass moment of inertia

More ▲▲ ▼▼

Your Results:

Part Family: Couplings > Threaded ⊗

Geo: Lat 52.74 Long 5.68 + radius 425 Km ⊗

Inner Diameter: 96 mm ⊗

Search: "marine" ⊗

Showing Parts 1-10 of 93

PART #	DESCRIPTION	ACTIVE
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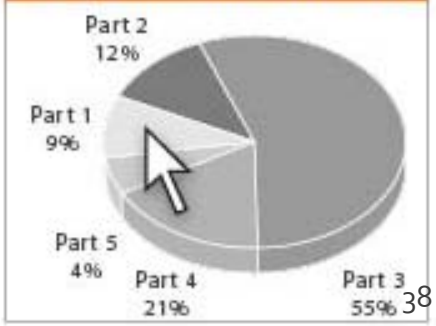
097P1995	• Klein Series 800 threaded coupling	YES

Inventory Location [x]

Research Notes [x]

rustproof ISO 5839 environment pumping MagnaDrive sand helical marine tear down drill salinity field testing

AVG Fulfillment Time [x]



ENDECA

Within current results | Search

Guided Navigation

- Mean Time To Failure
  - 20 (1)
  - 25 (1)
  - 30 (1)
- Screw
  - M4 (2)
  - M8 (1)
- Material
  - Titanium (1)
  - ISO Stainless (2)

Your Results:

Part Family: Couplings > Threaded ⊗

Geo: Lat 52.74 Long 5.68 + radius 425 Km ⊗

Inner Diameter: 96 mm ⊗

Search: "marine" ⊗

AVG Fulfillment Time: 1 ⊗

Showing Parts 1-6 of 6

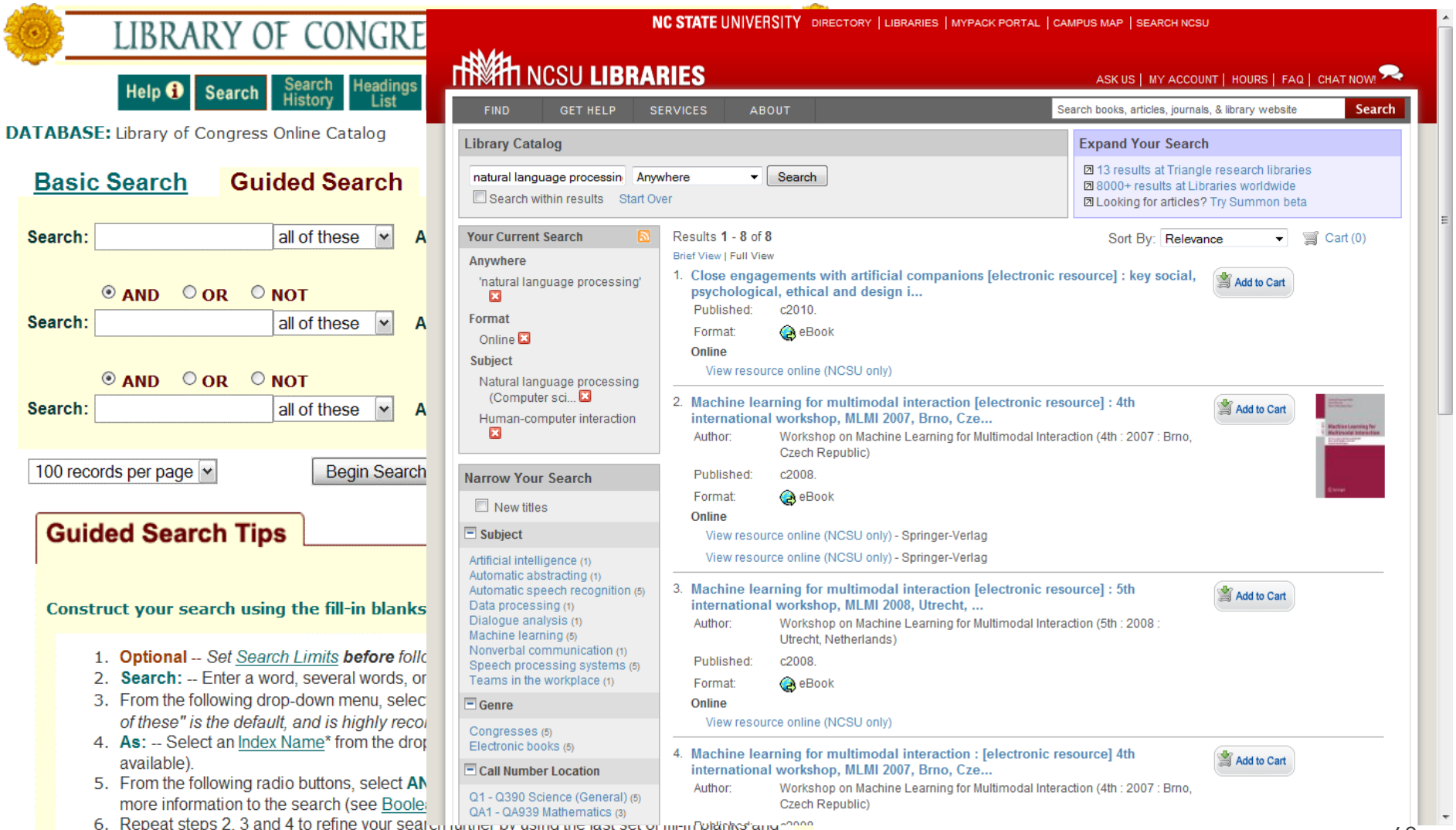
PART #	DESCRIPTION	ACTIVE
57G9200	• Klein Series 80 threaded coupling ...marine conditions and salinity...	YES
57K9213	Klein Series 800 threaded coupling ...high temperature and marine use...	YES
59G9400	Klein Series 810 threaded coupling ...coated for marine applications...	YES
39L3291	RIX marine flexi coupling ...salinity is simulated for marine...	YES
39M3940	RIX extreme torque coupling ...marine stress tests indicate...	YES
16M4950	Warner maximum M4 coupling ...marine MTT is designated as...	YES

Inventory Location [x]

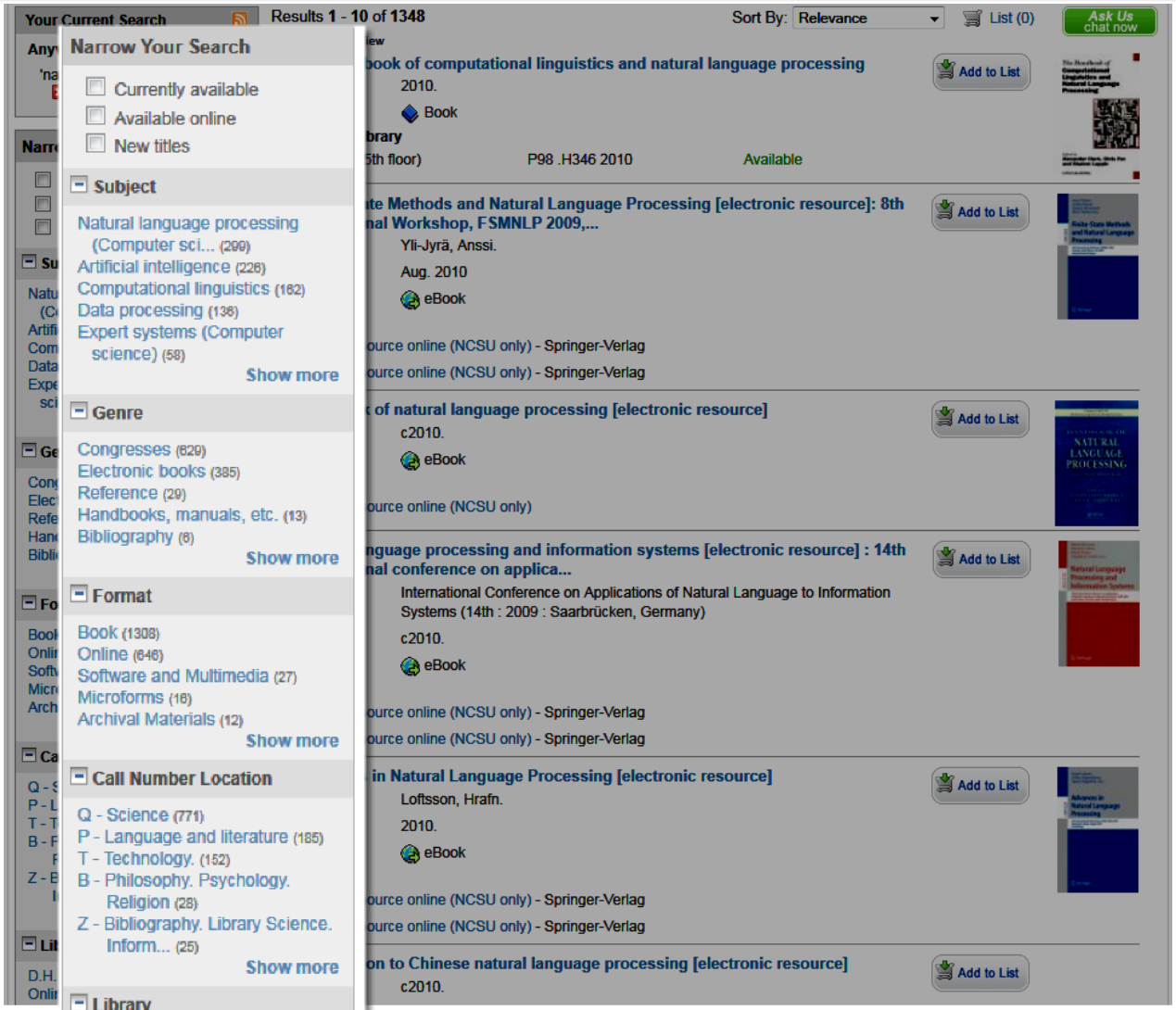
Research Notes [x]

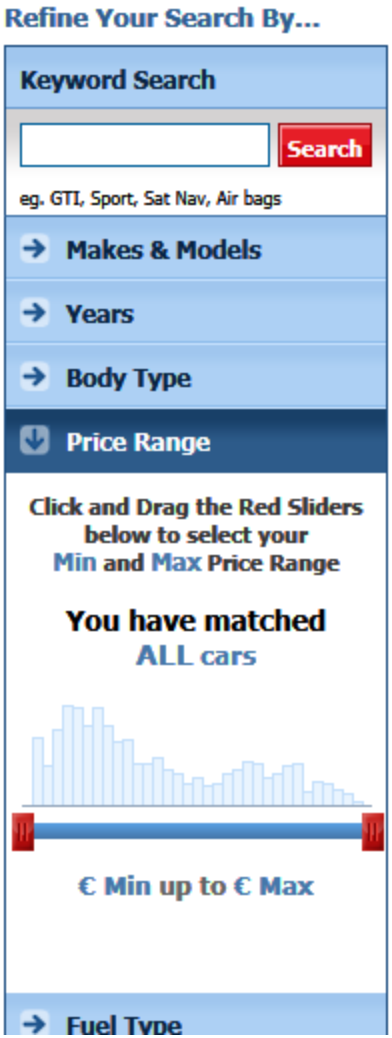
marine tear down drill salinity field testing rustproof ISO 5839 environment pumping MagnaDrive sand helical

From forms to facets

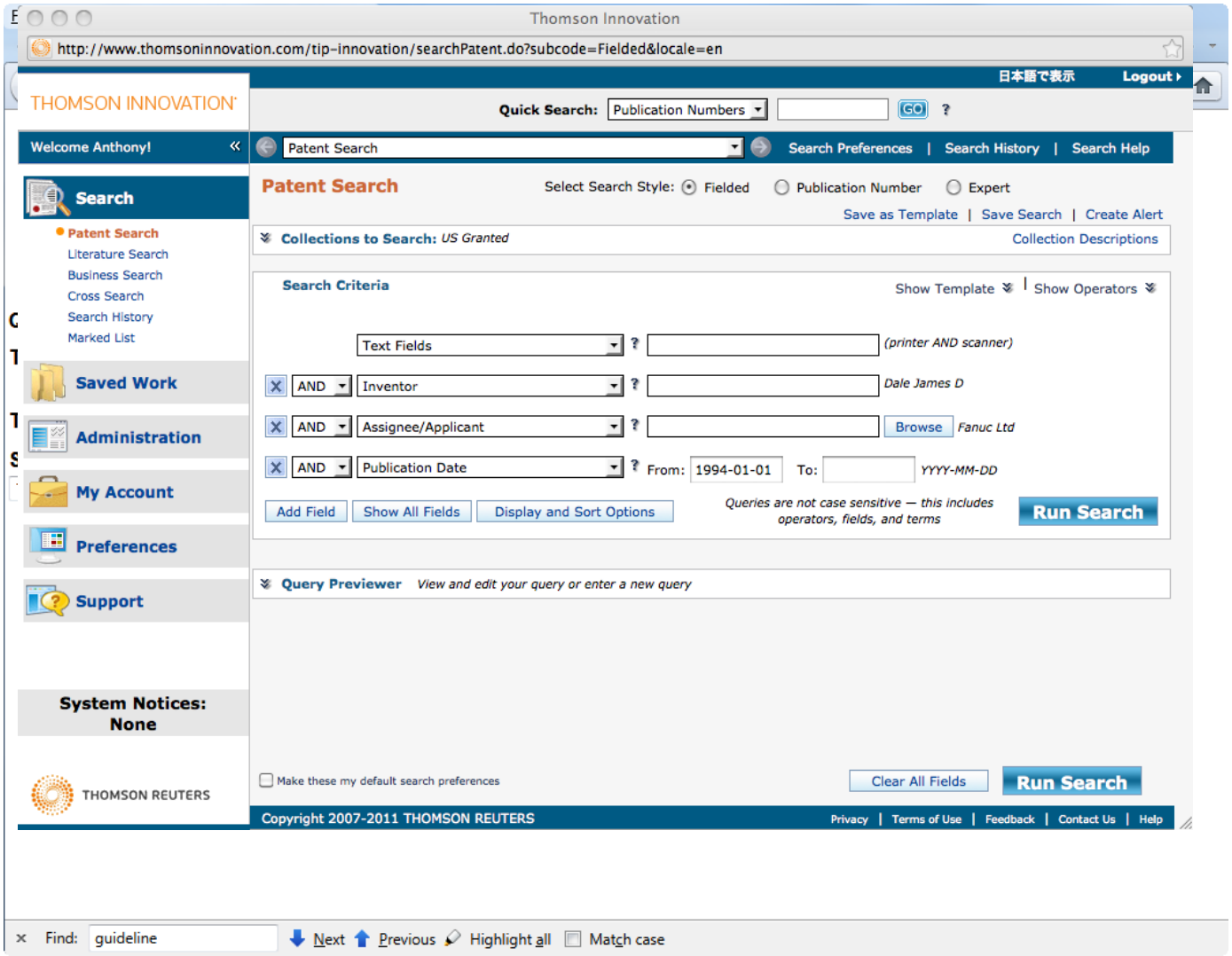


Facets & information scent





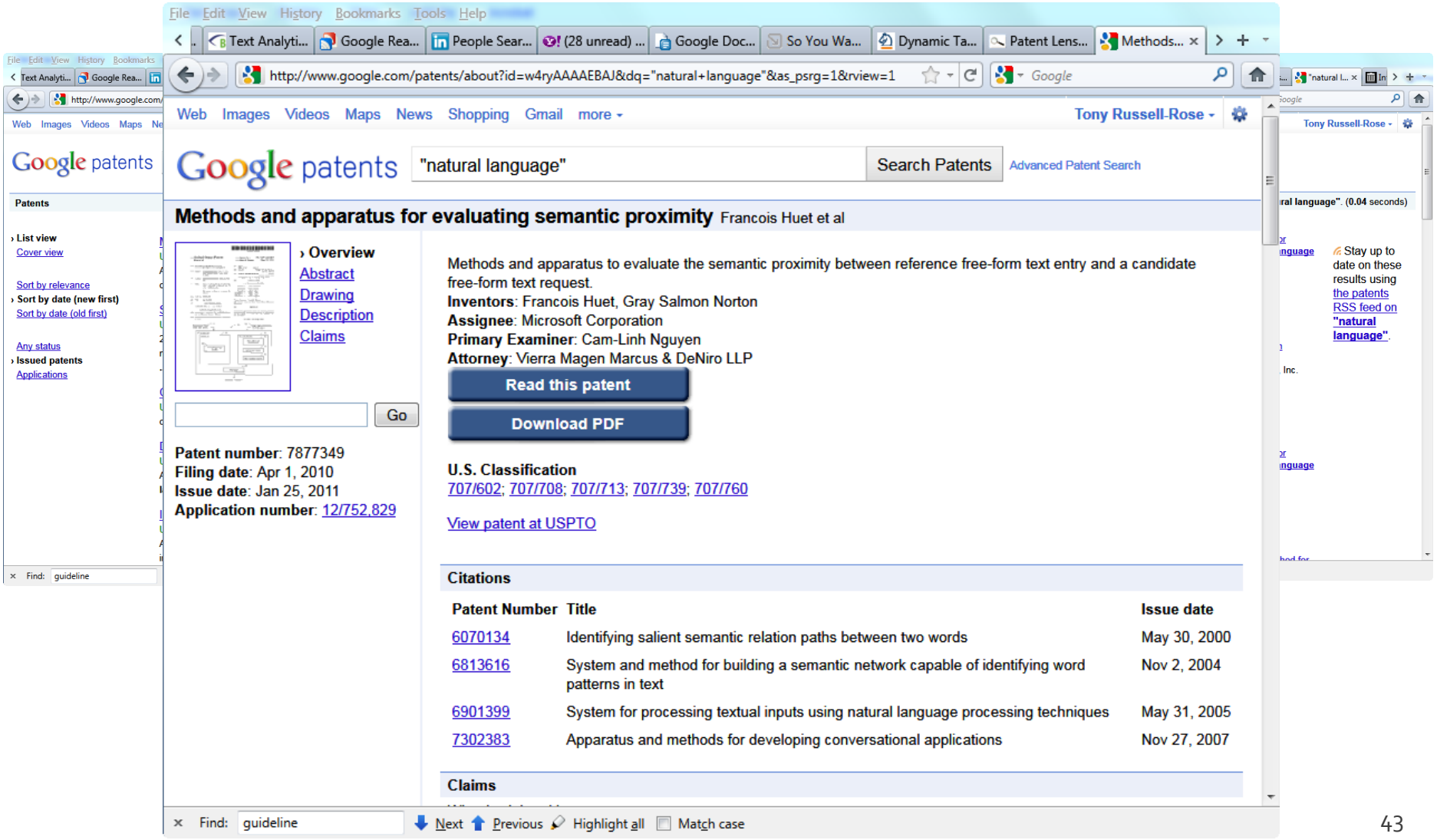
From forms to facets



- Think facets, not forms
- Stay on the page
- Keep it lightweight
- React immediately

Designing Web Interfaces, Bill Scott & Theresa Neil, 2009

Facets at Google?

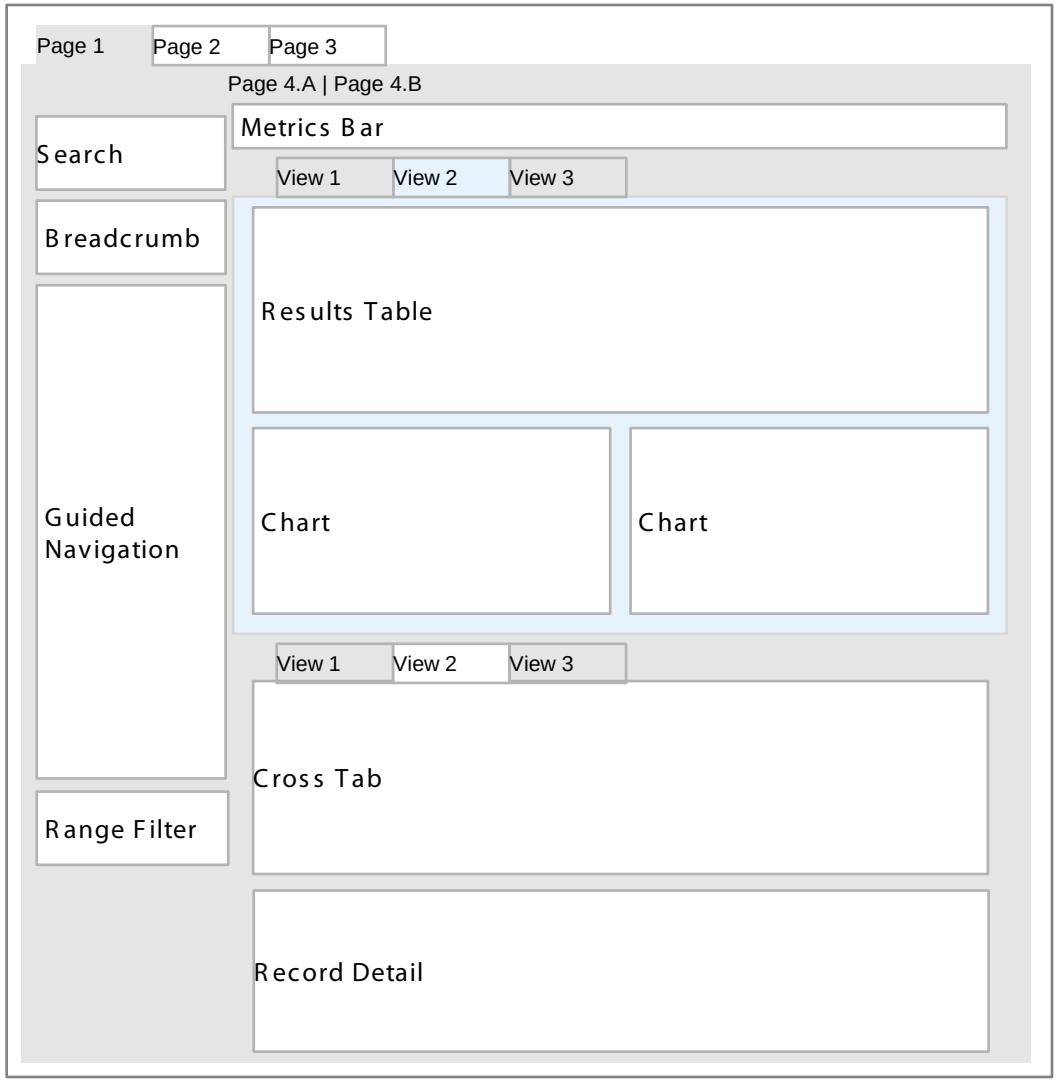


Design for discovery principles

- Map discovery modes to screen components
  - Avoid "one size fits all"
- Create views by combining components
  - Communicate conceptual relationships through Gestalt principles of organization (e.g. similarity, closure, proximity, etc.)
- Compose applications by combining views

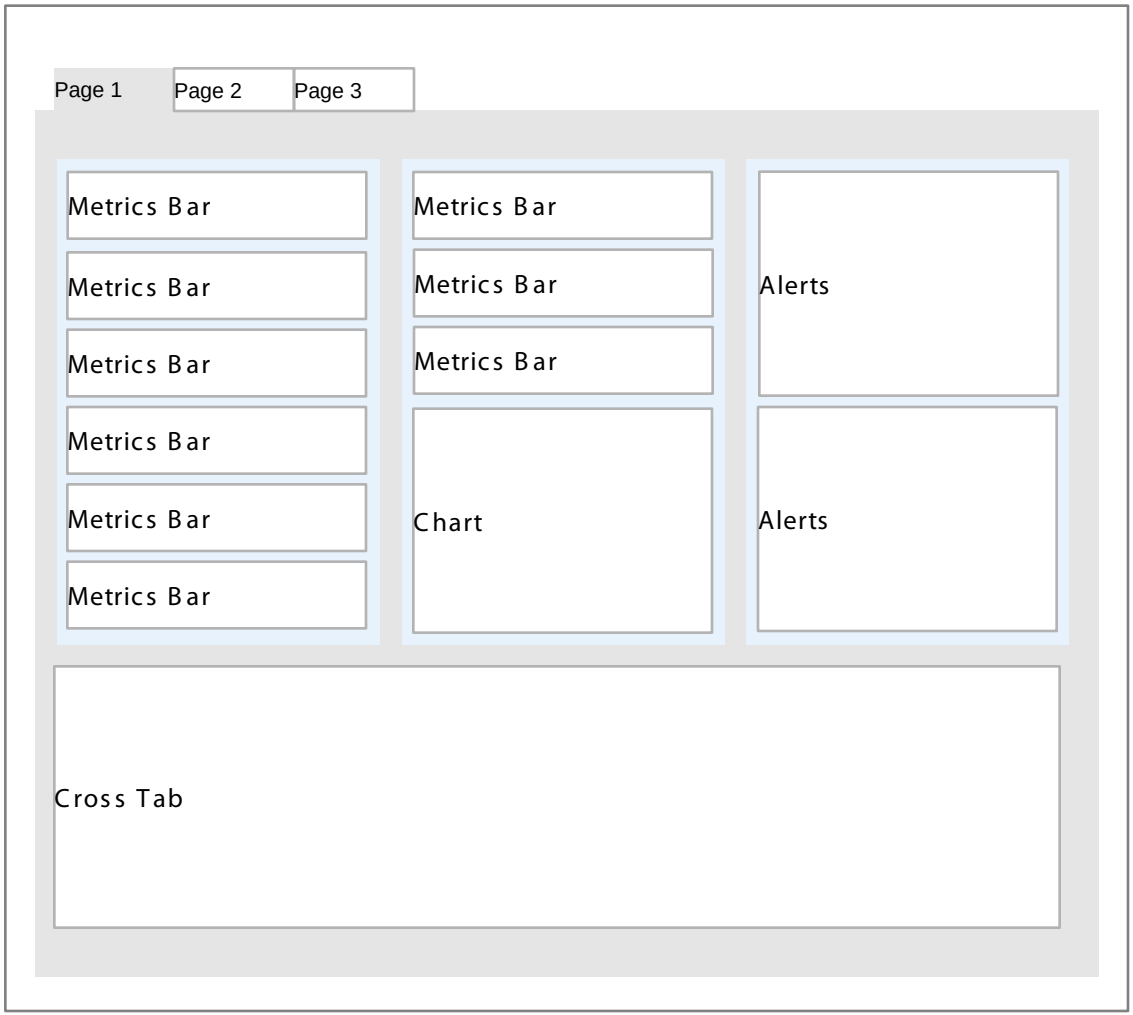
View: multi-purpose

- Purpose
  - Supports exploration, comparison and visualization
- Modes
  - Locating
  - Verifying
  - Evaluating
  - Analyzing
  - Exploring
- Components
  - Breadcrumb
  - Faceted Navigation
  - Metrics Bar
  - Results Table
  - Chart
  - Cross Tab



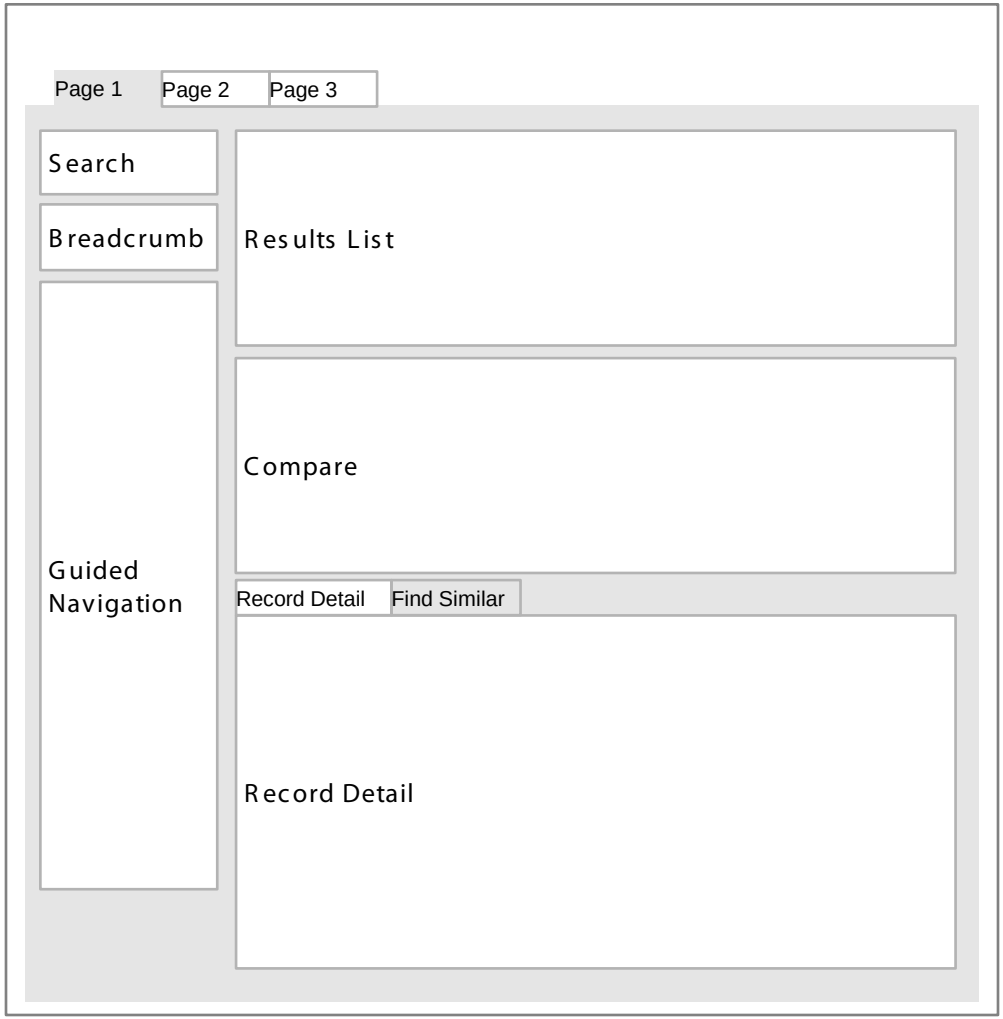
View: status & alerts dashboard

- Purpose
  - Present global overview / summary of key metrics
- Modes
  - Monitoring
  - Exploring
- Components
  - Metrics Bar
  - Alerts
  - Chart
  - Cross Tab

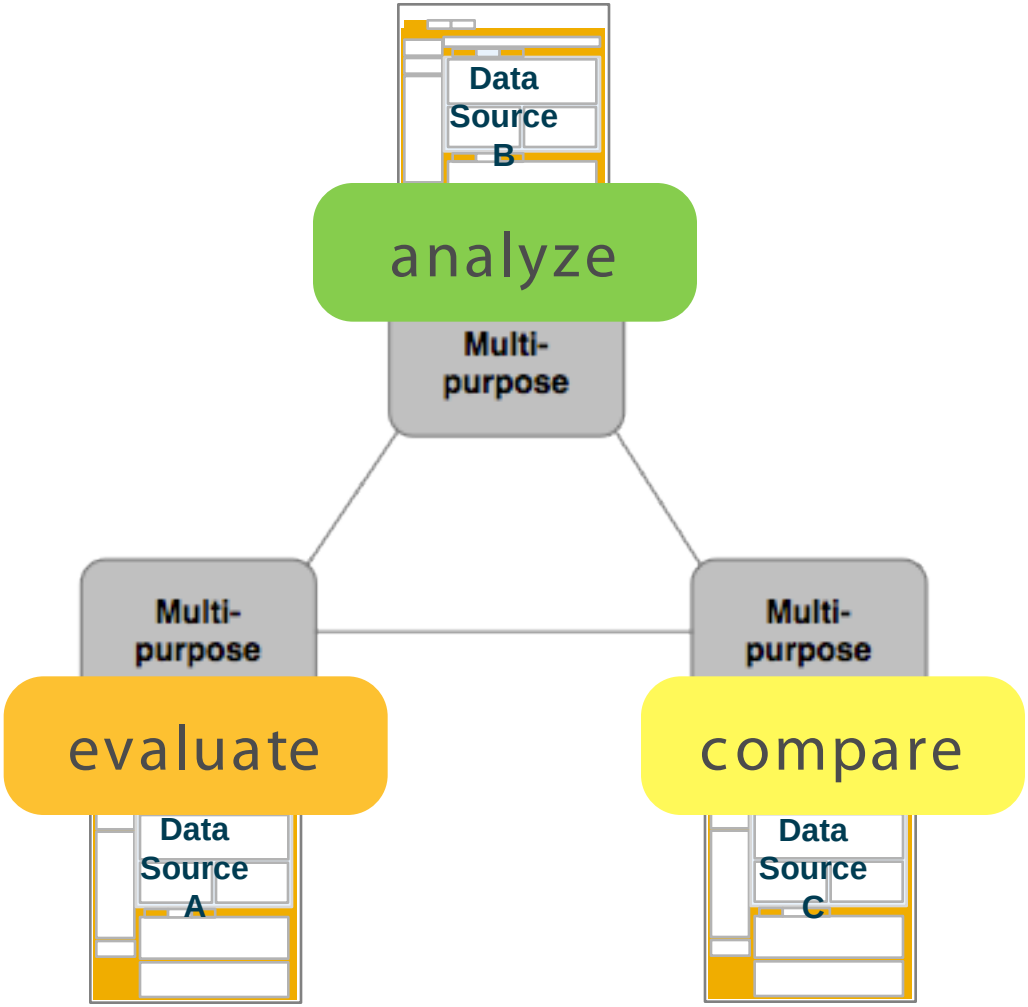


View: unstructured data discovery

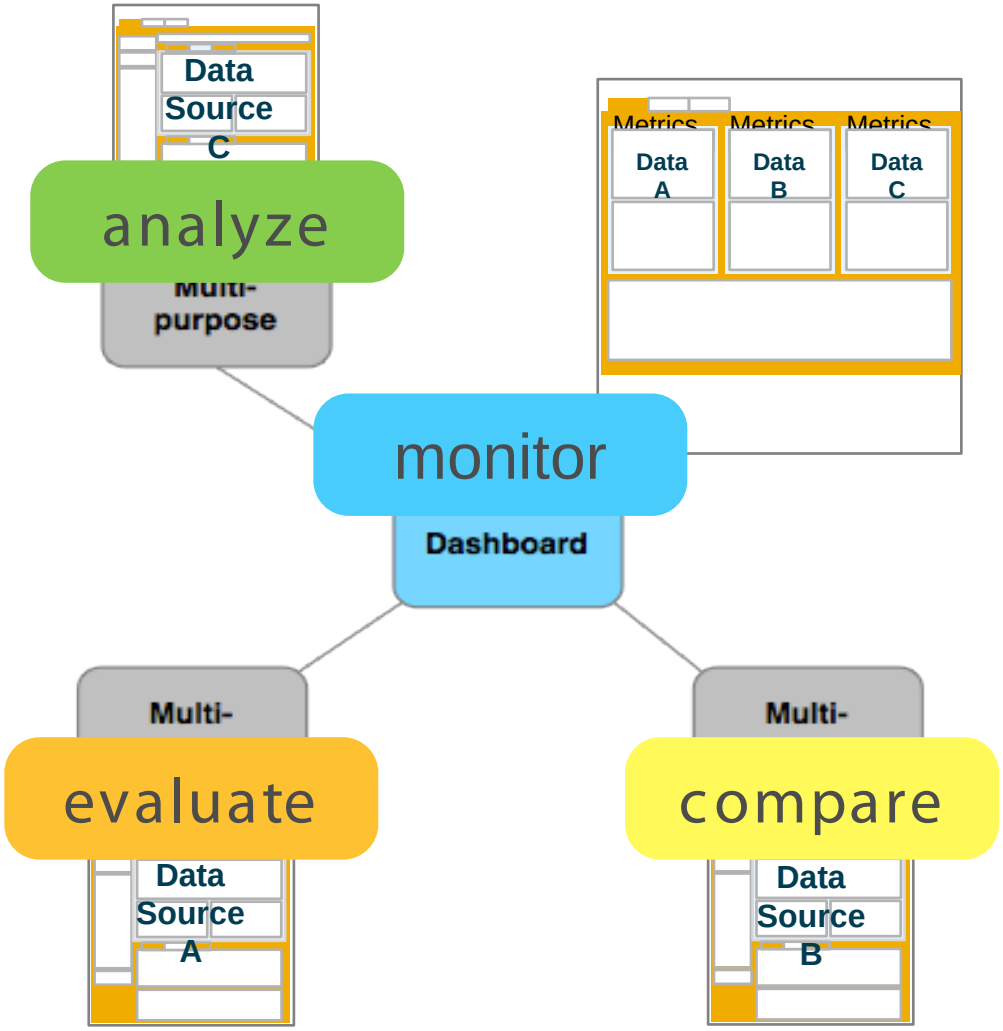
- **Purpose**
  - Explore unstructured data
- **Modes**
  - Comprehending
  - Exploring
  - Synthesizing
- **Components**
  - Search
  - Breadcrumb
  - Faceted Navigation
  - Results List
  - Compare
  - Record Detail
  - Find Similar



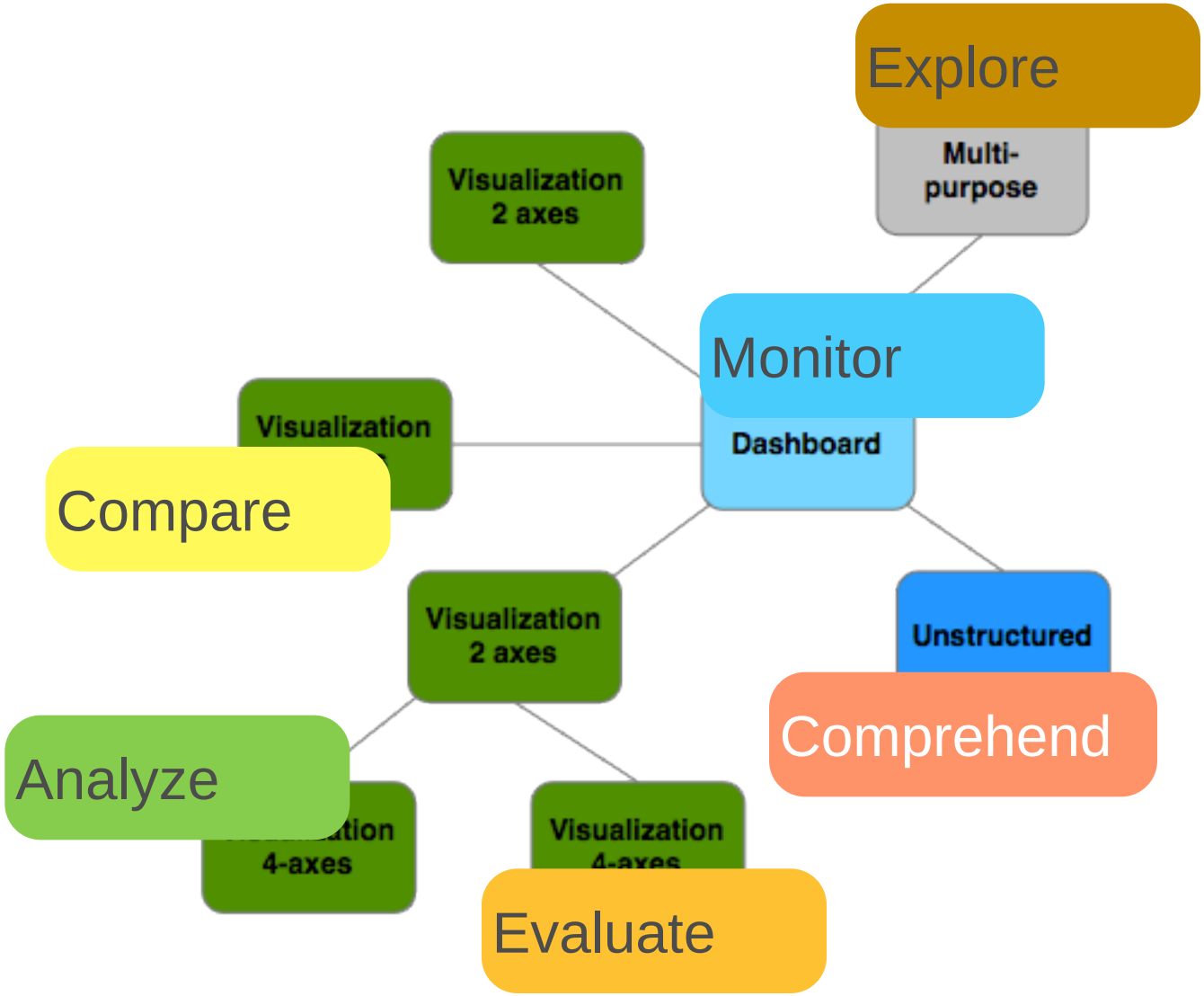
Application structure: classic



Application structure: hub & spoke



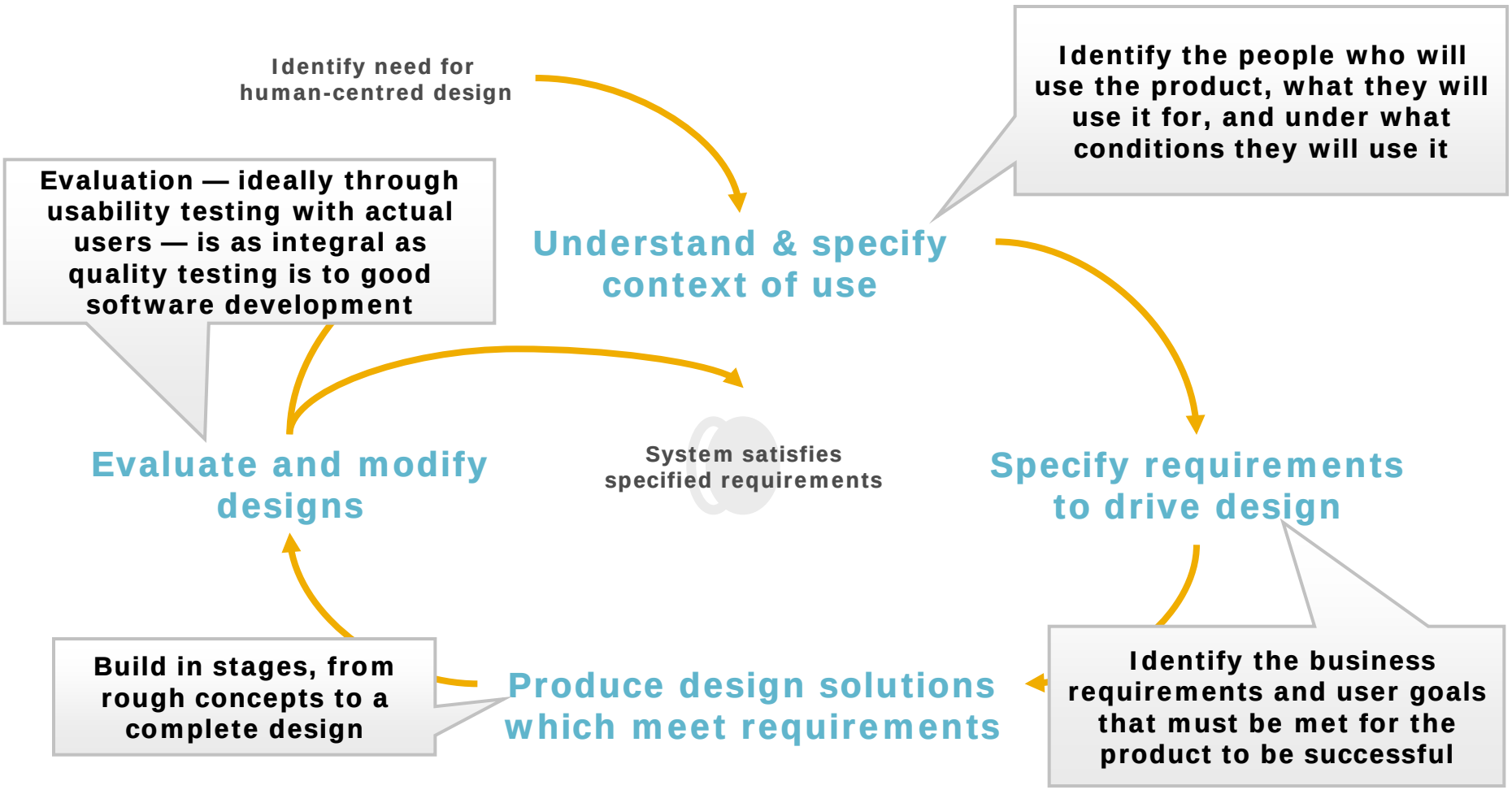
Application structure: comprehensive



Design resources

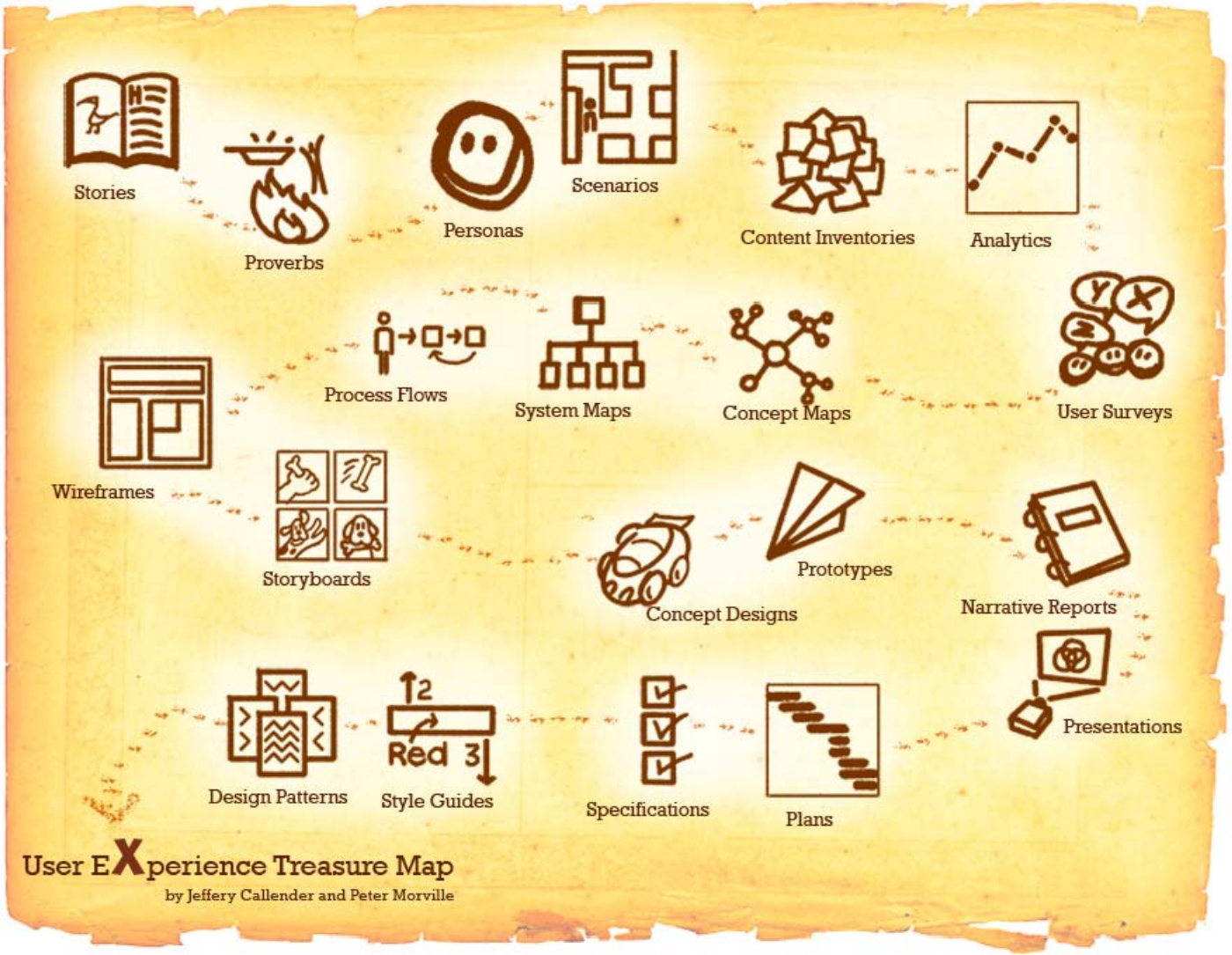
Building on the foundations

Design process

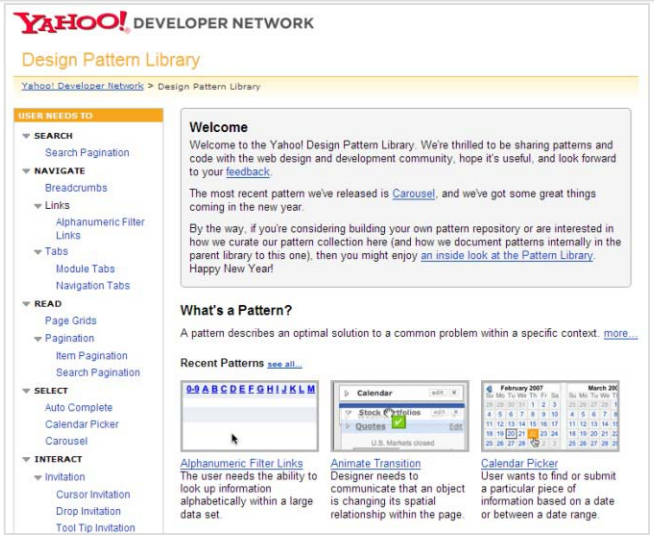


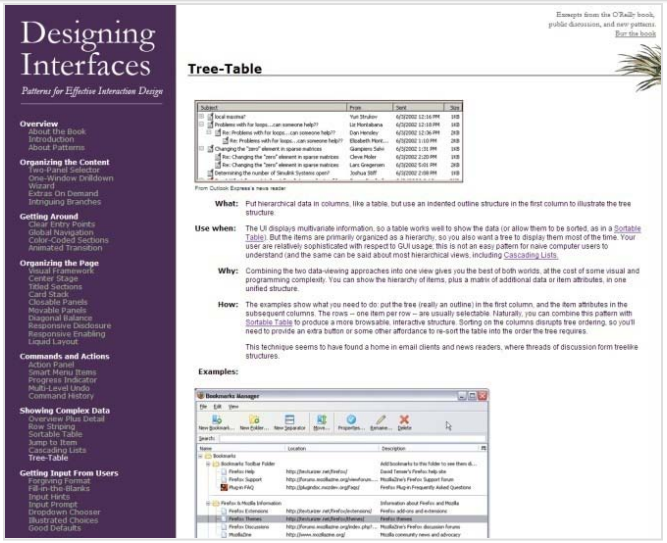
* ISO 13407: Human centred design processes for interactive systems (renamed as ISO 9241-210)

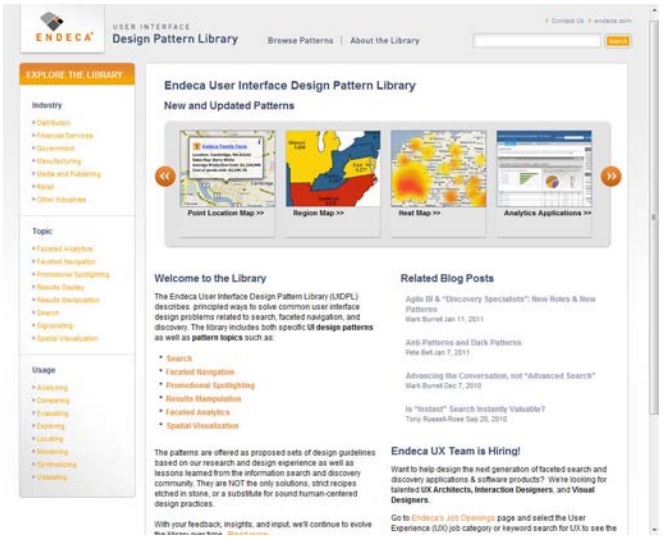
Design deliverables

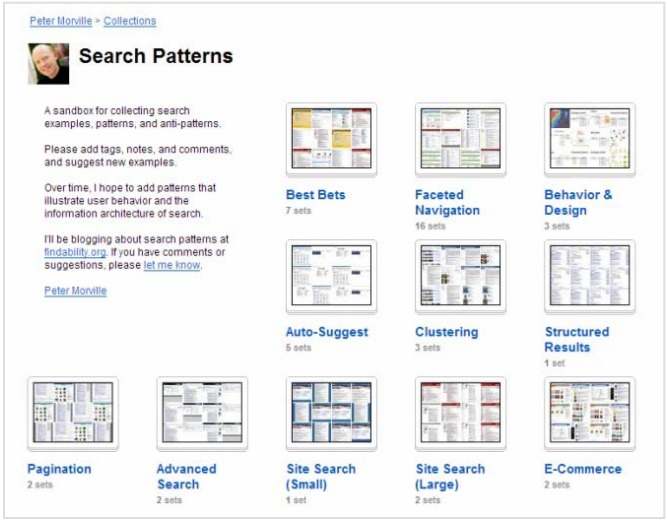


Design pattern libraries









Conclusions

Final thoughts and reflections

Summary

Don't think *user interface…*

- …think *user experience*

Look for patterns of search behaviour

- Identify discovery modes & workflows

Learn from other design contexts

- Apply ideas from the wider search landscape

Stand on the shoulders of giants

- Use proven design processes, methodologies & resources

Thank you!

Tony Russell-Rose, PhD
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Chair, IEHF HCI Group

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