Conceptualising Search as a Set of Cognitive Prostheses

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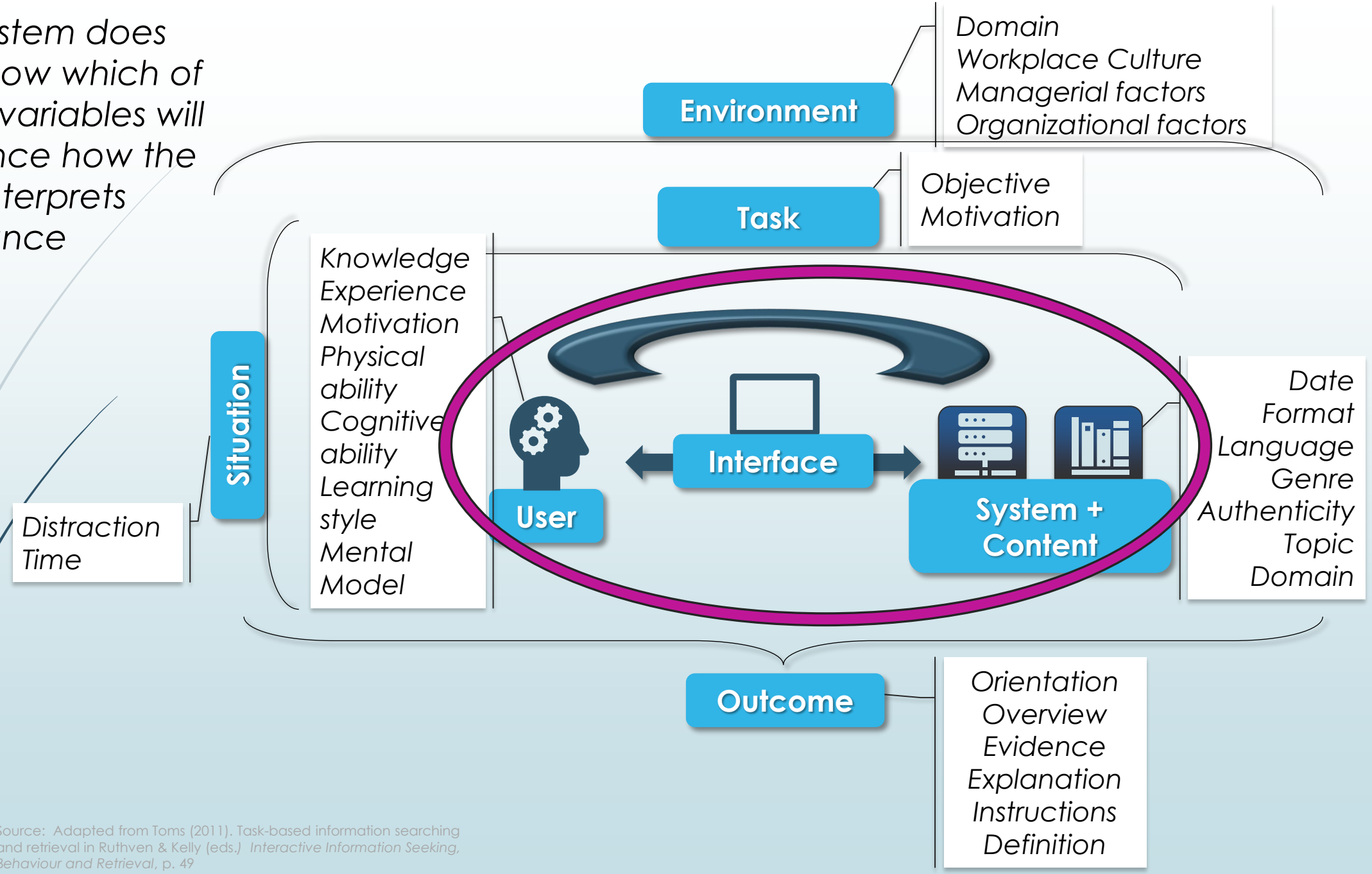
Basic assumption of information retrieval?

A *User* enters a search query, and the *System* responds with one or more relevant information objects (e.g., snippets, documents)

The Reality..

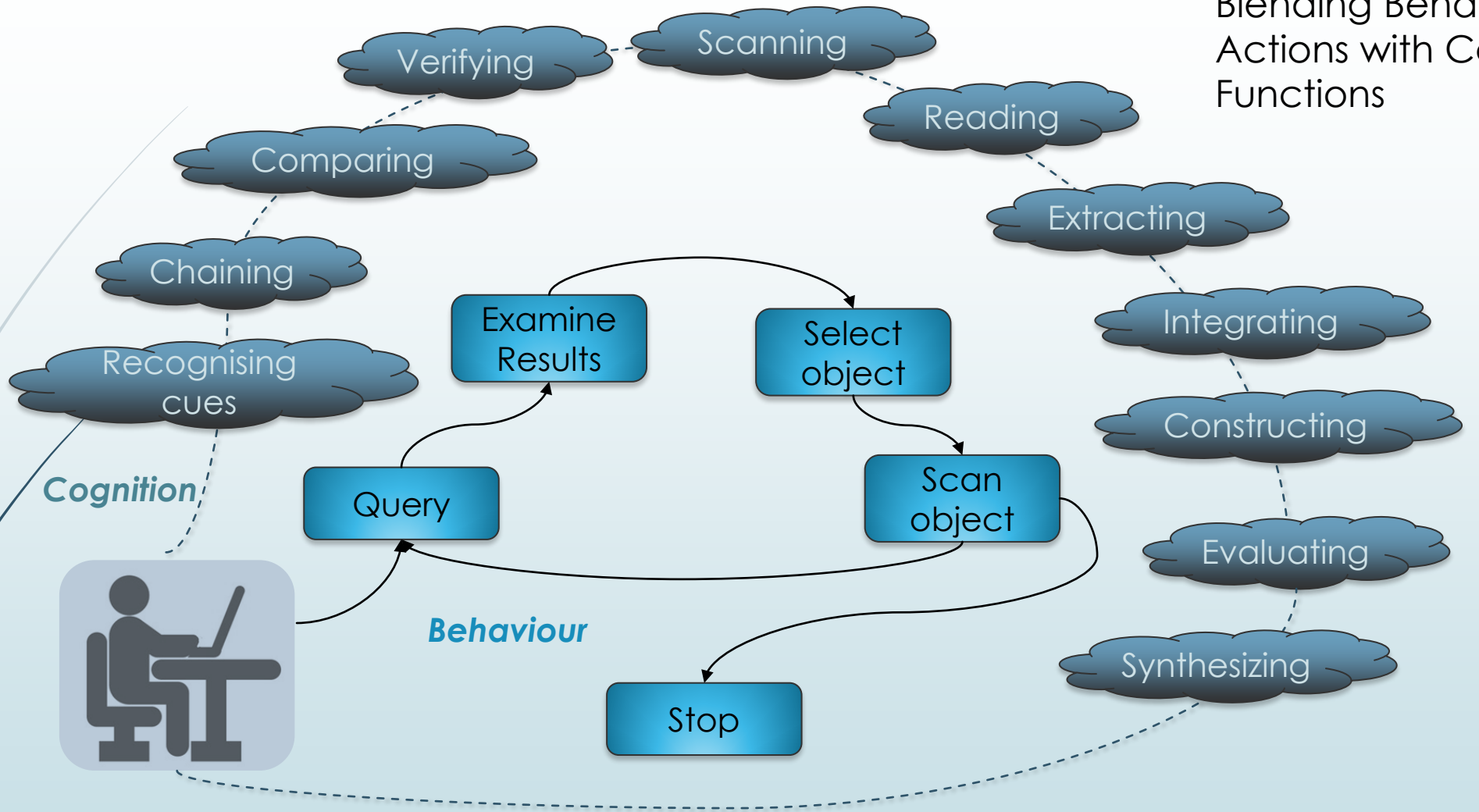
- The system only knows what the user enters into the search box
- The system selectively knows about the user's environment, albeit in a limited fashion, e.g., previous search queries, documents clicked on, scrolling, personal location,…
- The system may know more about the user from 3rd party linked data (e.g., Twitter, Facebook, work-based systems)
- But…

The system does not know which of these variables will influence how the user interprets relevance



Source: Adapted from Toms (2011). Task-based information searching and retrieval in Ruthven & Kelly (eds.) *Interactive Information Seeking, Behaviour and Retrieval*, p. 49

Blending Behavioural Actions with Cognitive Functions

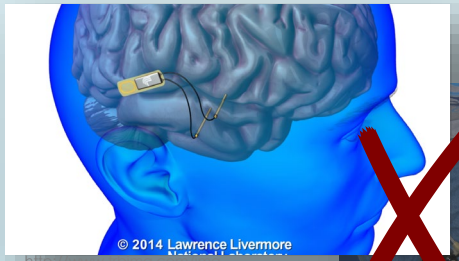


How do we support cognitive functions?

Source: unpublished manuscript © E. Toms 2020

… with Cognitive 'Prostheses'!

- Definition: An electronic computational device that extends the capability of human cognition or sense perception (https://en.oxforddictionaries.com/definition/us/cognitive_prosthesis)
- Something that amplifies human cognition and perception and leverages human **intellectual** capacities (www.lpi.usra.edu/publications/reports/CB-1089/ford.pdf
  - fundamentally different from the Turing Test ambition – it doesn't set out to imitate human abilities, but to extend them.
  - "Shift from making artificial super humans who replace us to making superhumanly intelligent artifacts that can amplify and support our own cognitive abilities." http://www.lpi.usra.edu/publications/reports/CB-1089/ford.pdf



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Not physical prostheses that aid physical actions or brain implants to support/augment cognitive activity

Cognitive Prostheses for Search?

- Augment human cognitive function, and not just support behavioural actions;
- Assist how one decides among information objects and gains insights from those objects
- Facilitate all information processes and analyses from filtering and comparing to extracting, sensing, and scanning, etc.

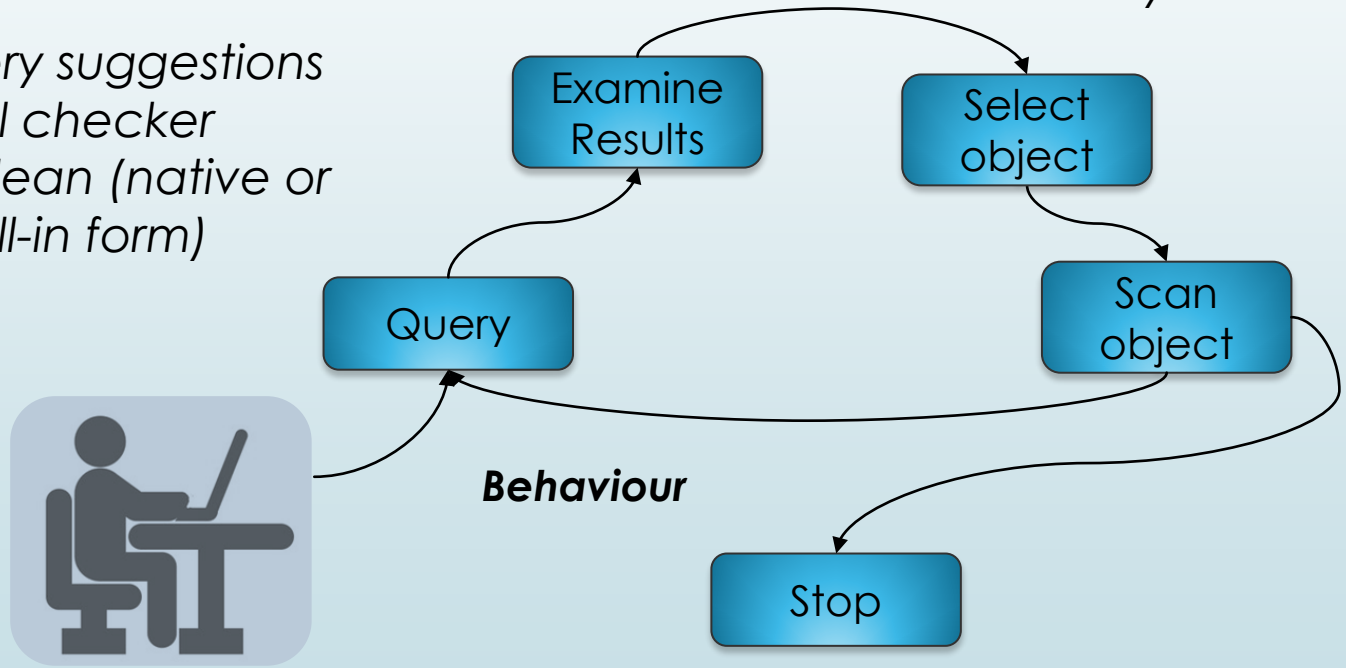
A toolbox of cognitive prostheses!

Cognitive Prostheses that support **Behavioural** action

Filter by date, format, publisher, etc.

Highlighted query words
Snippet
URL
Entity Cards or summaries

Query suggestions
Spell checker
Boolean (native or by fill-in form)



Document format, e.g., headers, paragraph, list

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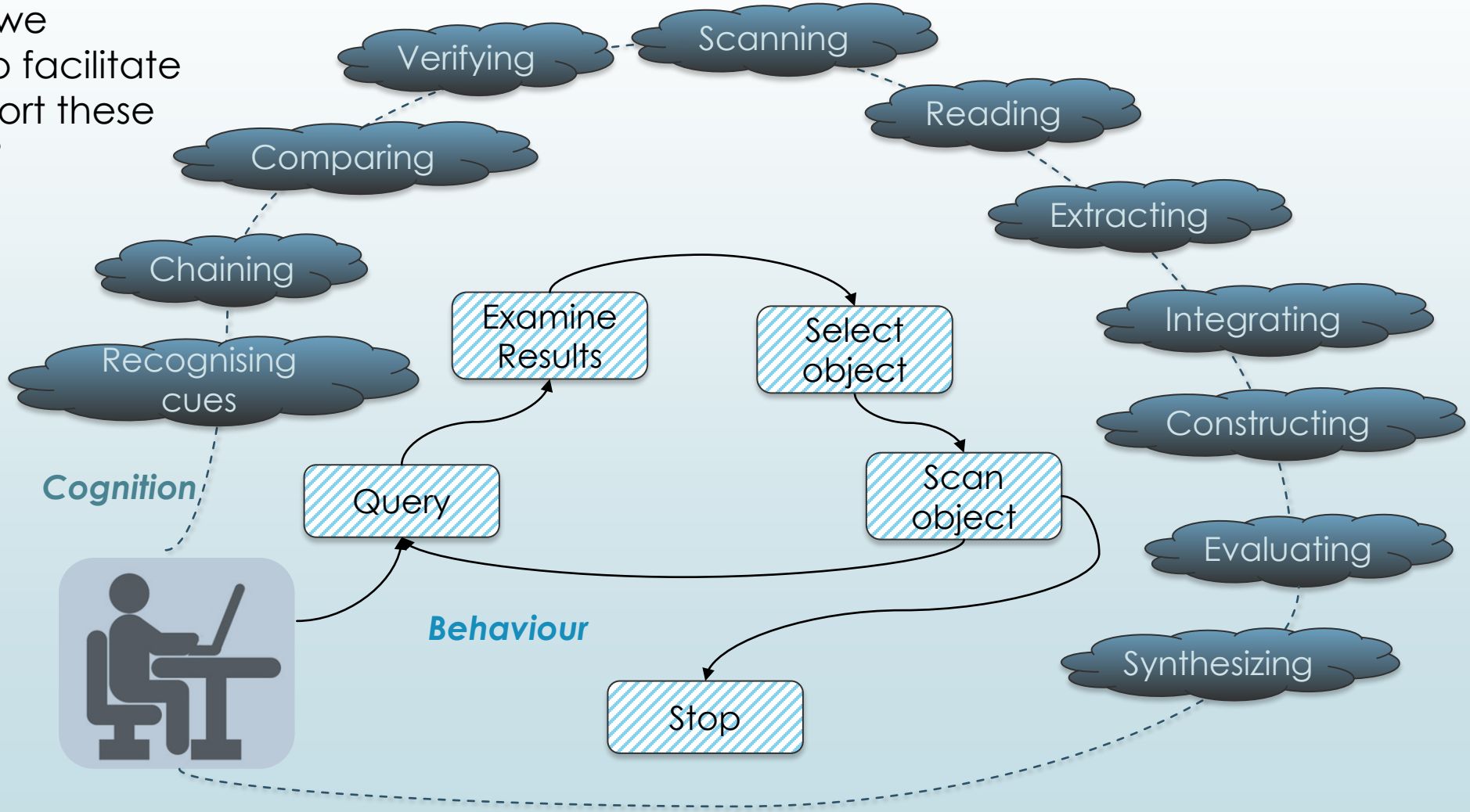
Cognitive Prostheses that support **Cognitive function?**

What do we provide to facilitate and support these activities?



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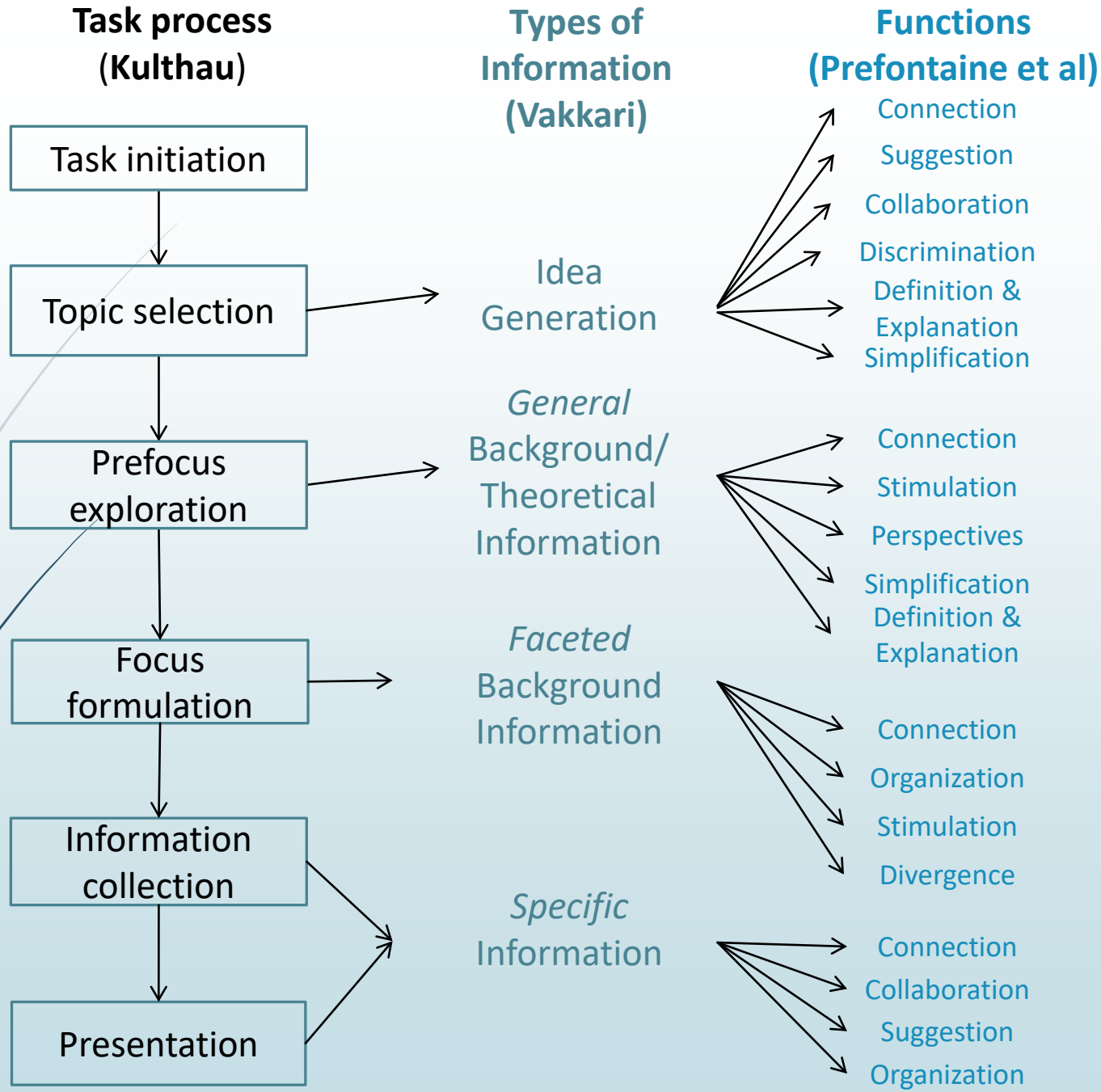


Source: Adapted from: Gilbert et al

Sufficient?

Cognitive Activities used in Information Processing

Interaction Patterns

- Annotating
- Assigning
- Comparing
- Composing/Decomposing
- Drilling
- Filtering
- Linking / Unlinking
- Selecting
- Storing / Retrieving
- Translating

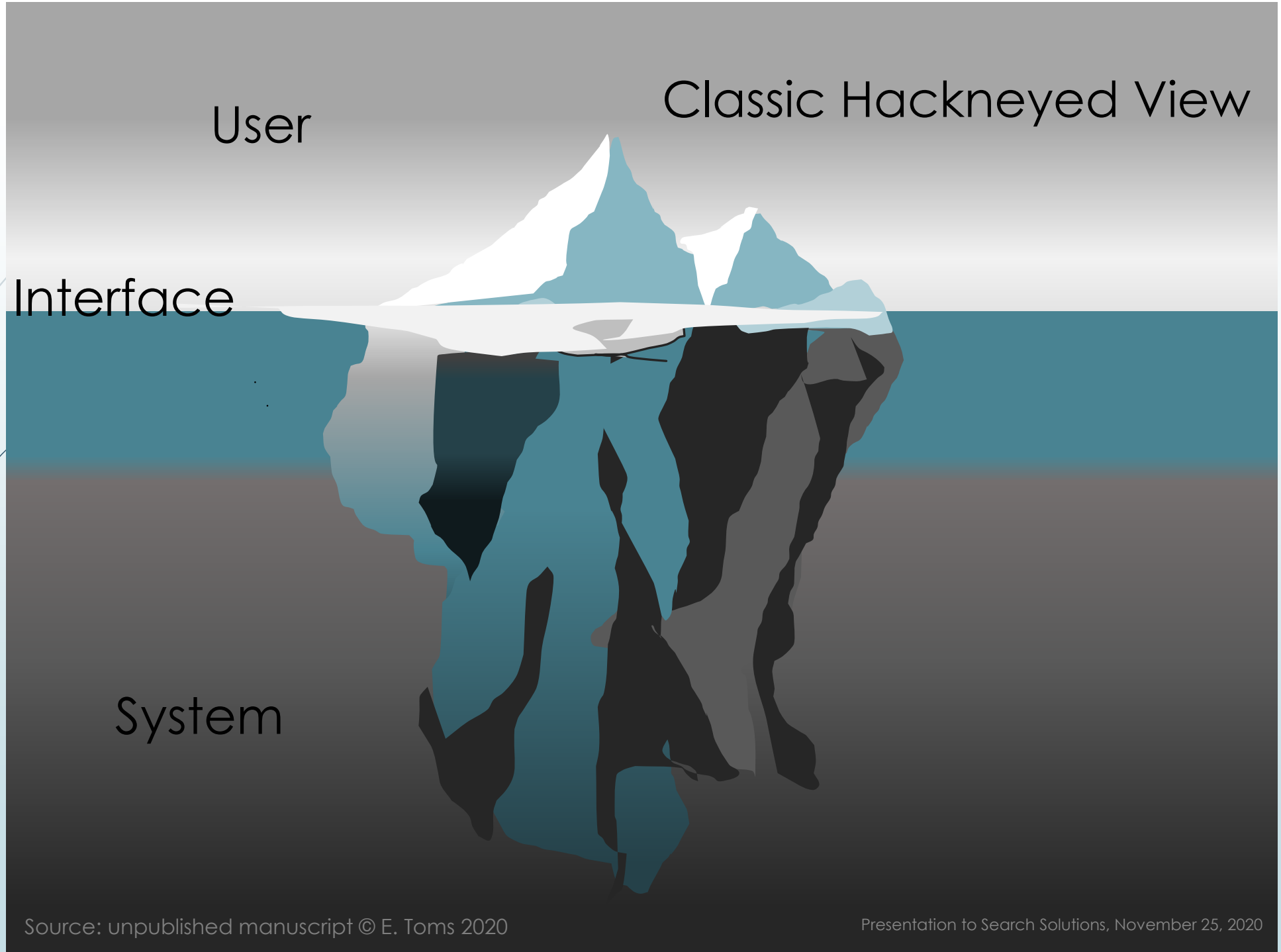
Sedig et al. 2012

Tasks/Sub-Tasks

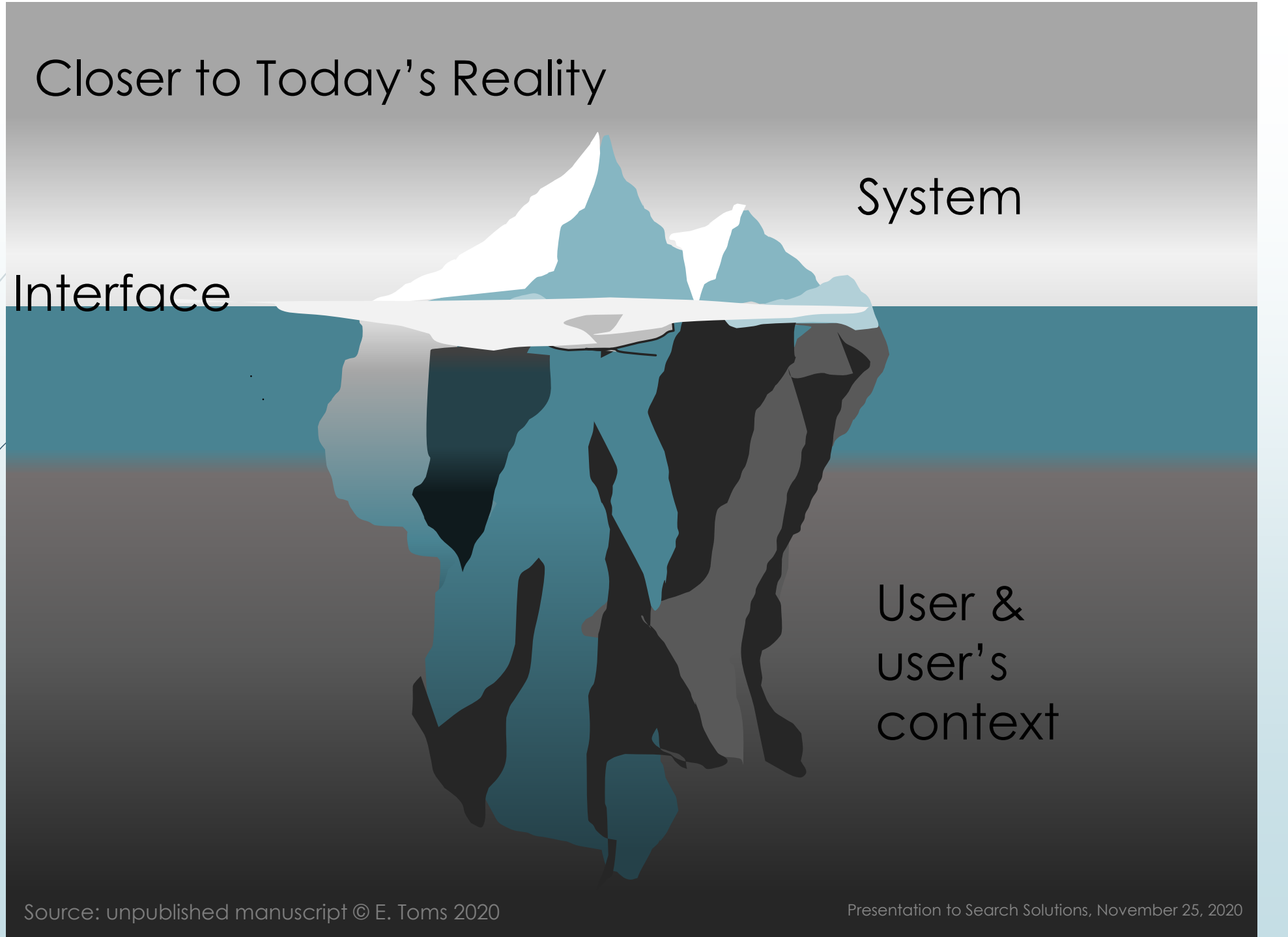
- Where, i.e., location
- How to
- Scope
- Current status
- Condition
- Trend
- Expertise
- Stats
- Compare
- Relation

Toms et al

Classic Hackneyed View



Closer to Today's Reality



Questions/Issues/Directions

- Cognitive functions/activities
  - Which ones should be facilitated?
  - Is there a common set that is cross domain? Which ones are unique to a particular domain? [Analogical to the differences across typical office applications]
- Possible approaches:
  - Common integrated interface for 'knowledge work' – think Microsoft Office ribbons on steroids
  - A 'dashboard' that includes Search + eDiscovery + Text Analytics + Data Analytics – an integrated tool – a swiss-army knife – for information access, retrieval and use
- Need new thinking about what IR R&D needs to achieve and also new models and frameworks for how we think about the role of search in real-world tasks
- Ultimately, where does/should the *Human* Stop and the *Machine* Start?

MSCA ITN/ETN No. 860721

DoSSIER

Domain Specific Systems for Information Extraction and Retrieval

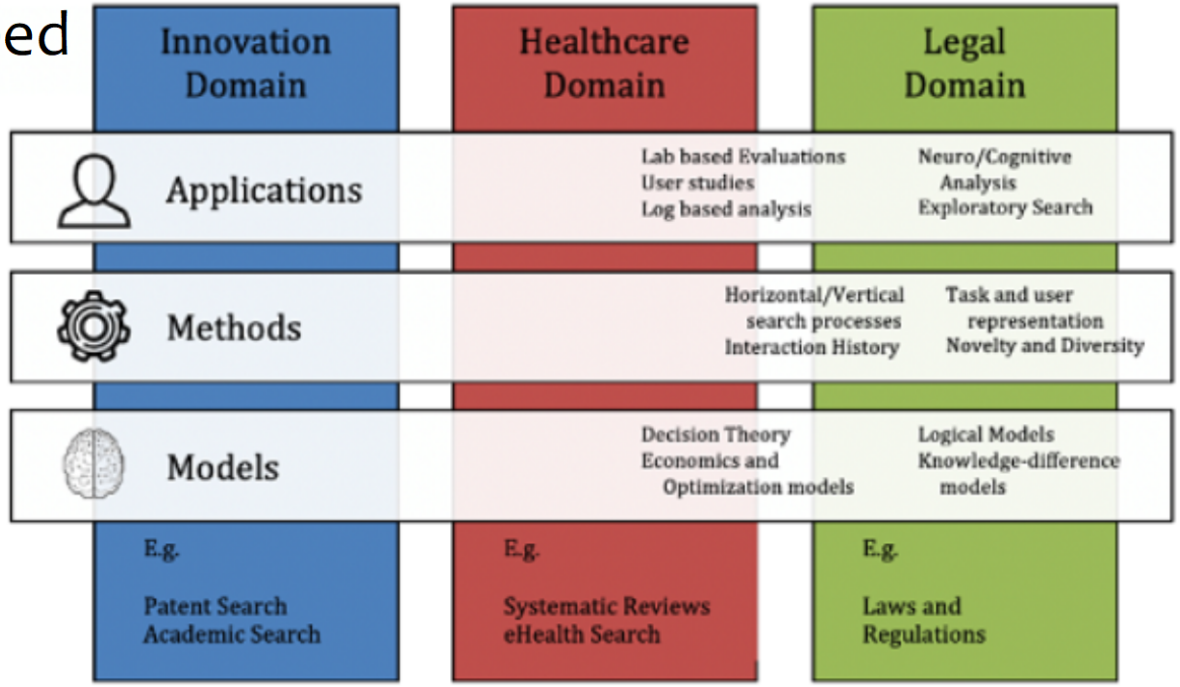
Domain Specific Systems for Information Extraction and Retrieval

EU Horizon 2020 MSCA ITN/ETN

Domain Specific Systems for Information Extraction and Retrieval

- Address professional users Information Need
- Aim for a new generation of Information Access Systems
- Three areas and three target domains
- 15 PhDs
- 8 Beneficiaries

EU Horizon 2020 ITN/ETN



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