

Information: Behavior from Early Hominins to the Web

Professor Amanda Spink
Queensland University of Technology

Brisbane – Australia



Key Propositions

- Early humans developed information behavior capabilities
- Humans have always engaged in information behavior
- All humans engage in information behavior
- Information behavior – an important cognitive mechanism and socio-cognitive ability
- Today – the Web is a major part of peoples' information behavior
- Information behavior is key to library and Web use

Our Understanding of Information Behavior Today

- Information Behavior is the totality of human behavior in relation to sources and channels of information
- Major focus on:
 - Modeling contemporary information behaviors
 - Information seeking problem solving approach
 - Sense-making and foraging
 - Multitasking, cognitive shifting and cognitive coordination
 - Social, personality, cognitive and cultural aspects of contemporary information behavior.
 - Information behaviors can longitudinal, iterative and complex
 - May include interaction with information technologies, e.g., OPACs, Web

What Don't We Understand About Information Behavior?

- Origins and development of information behavior
- Information behavior over the ages
- Information behavior today – Web search behavior

My Talk

- New understandings of peoples' information behavior.
- Evolutionary framework for information behavior
- Lifetime developmental framework for information behavior
- Integrated framework and model of information behavior

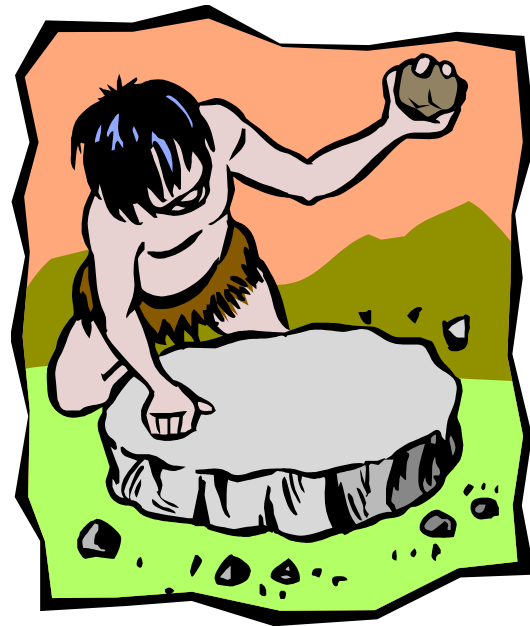
Information Behavior Origin

- Early humans evolved information behavior capabilities
- Information behavior is an important human socio-cognitive ability and competency.

Spink, A., & Cole, C. Information behavior: A sociocognitive ability. Evolutionary Psychology, 5(2), 257-274.

Information Behavior Origin

- Evolutionary psychology can help us understand how information behavior has evolved from early humans – key issues:
- How has human information behavior evolved?
- How has information behavior affected human evolution?
- How has evolution affected information behavior?

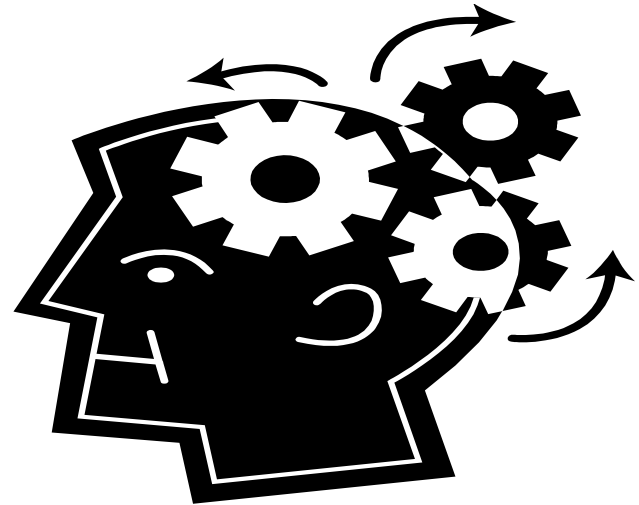


Neuro-Evolution in Early Hominins

- First symbolic representations occurred because of a dramatic transformation in human cognitive architecture.
- Allowing homo-sapien hunter-gatherers to survive while other human species (Neanderthals) did not.
- Hunter-gatherers became more efficient at exploiting their environment, more able to cope with environmental extremes, and more flexible in social behavior.
- Led to *Homo sapiens* enhancement of specific human cognitive capabilities, including - integrated action across space and time, response inhibition and preparation.

Information Behavior Origin

- Information behavior evolved from *Neanderthals* when Homo sapiens experienced enhanced working memory (EWM) capacity
- Led to *Homo sapiens* enhancement of specific human cognitive capabilities, including - integrated action across space and time, response inhibition and preparation.



Information Behavior Origin

- Enhanced cognitive information processing ability to hold a variety of information in active attention
- Gave *Homo sapiens* an advantage in the struggle for adaptation and survival - develop managed foraging systems and agriculture



Information Behavior Origin

- Neuro-evolution in early humans
- Information behavior did emerged as a behavior in early humans
- Evidence of paleoart (cave art) representations of information organizing behavior

Evolutionary Framework for Information Behavior

- Evolutionary psychology studies show that information behavior emerged in early humans - information gathering, information and using behavior
- Information behavior is a cognitive mechanism and socio-cognitive ability as an attribute or trait that is unique and unusual to humans, e.g., language

Information Behavior Over the Ages

- Artifacts to support information behavior – Information History
- Examples of personal information behavior

Artifacts Supporting Information Behaviors

	Artifacts Supporting Information Behavior
30,000 BC	Paleoart - Cave Art
6600 BC	Ideographs
4240 - 3000 BC	Calendars, Paper (Papyrus), Cuneiform
2700 - 1300 BC	Ink, Hieroglyphs, Alphabet, Phaistos Disc, Logographs, Maps
1250 - 500 BC	Scrolls, Manuscripts, Glossaries, Dictionaries, Paper (Parchment)
320 - 8 BC	Library, Bibliographies, Concept of Categories, Library Classification System
79 - 1200 AD	Codex, Woodblock Printing, Tree Diagram, Quill Penn, Library Catalogue, Movable Type, Almanacs, Paper (Rag)
1309 - 1626 AD	Registers, Printing Press, Bookbinding, Public Lending Library, Library Catalogue (Printed), Dictionaries, Newspapers, information Graphics
1735 - 1900 AD	Taxonomy (Binominal), Magazines
1900 AD – Today	Marc (Metadata), Hyperlink, Internet, Web

30,000 BC: Paleoart – Cave Art

- Images of large animals – often in context
- Supports various aspects of information behavior
- Cave art allowed early humans to engage in representing information in the form of images
- Example of organizing and using information



320-8 BC: Library, Bibliographies & Library Classification System

- What aspects of information behavior do libraries support?



Information Behavior Over the Ages

- Information behaviors reported personal writings by -
- Napoleon Bonaparte
- Charles Darwin
- Giacomo Casanova

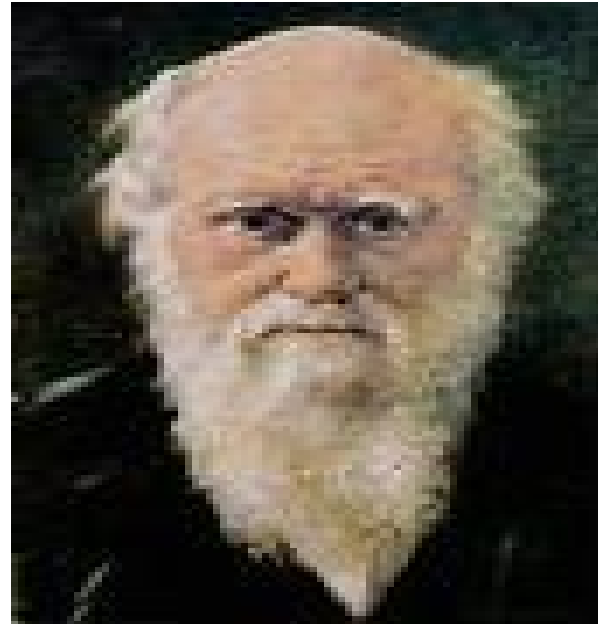
Napoleon Bonaparte

- Information seeking, organizing and using behaviors
- Maps – geographic information
- Methodical information collecting behaviors



Charles Darwin

- Information seeking, organizing and using behaviors
- Created indexes to his papers



Giacomo Casanova

- Spy – information gathering, organizing and using behaviors
- Librarian and information organizer

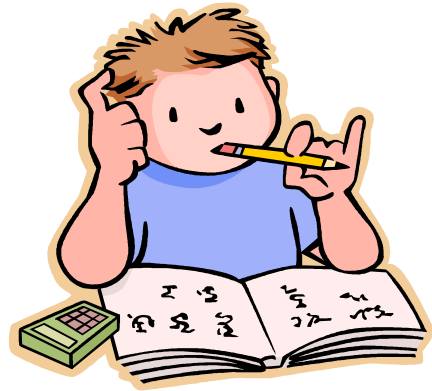


How Does Information Behavior Develop Over a Human Lifetime?

- Human development – the ways in which children grow to become healthy, educated and productive members of societies and nations.
- Human development – continues throughout childhood, adolescence, adulthood and old age.
- Development psychology – studies human development including changes across generations and during the life course.

Developmental Framework for Information Behavior – Lifetime Model

- Developmental psychology - human lifetimes consist of transitions in an individual's development
- Information behavior develops as a socio-cognitive ability from childhood, adolescence to adulthood.
- What are the transitions in the cognitive and cultural development information behavior development?



Human Development

- Cognitive development occurs in natural contexts of human interaction distributed across time and space
- Cultural aspects of human development, such as transitions across the life span, gender roles, interpersonal relations, cognitive development and socialisation
- Child and adult performances in certain skills reveal changes in age, in learning, memory, conceptualising, language, reasoning and problem solving - scaffolding of learning

Information Behavior Today

- Major focus on:
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Information Behavior Model

- Information behavior – integrating various approaches, including both active and passive information behaviors
- Information foraging
- Information seeking
- Information sense-making/everyday life information seeking
- Information organising
- Information use

Spink & Cole (2006): Integrated Information Behavior Model

Problem Solving

Problem Identification

Problem Definition

Problem Resolution

Problem Presentation

ASK Gap

ELIS

Coherence

**Sense-making
Mastery of Life**

Information Foraging

**Diet/ Scent/Attention
Maximizes Gains**

Patches

Information Behavior Challenges

- Lack of integrated information behavior framework or model
- Lack of integration with social and behavioral sciences, e.g., evolutionary and social psychology
- Library and electronic information challenge – how to support contemporary information behavior?

Library and Electronic Information Challenge

- Many people use the Web as their major information source and face the Web search challenge
- Supporting information behaviors and electronic information management and access is challenging for libraries



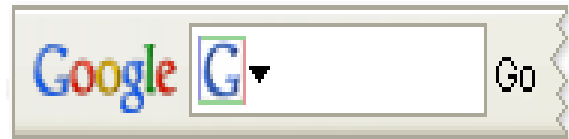
Web Search Challenge

- How to support information behavior using web technologies?
- Web search engine usage outstrip email
- Web search is now a major social issue – people are expected to search effectively



Web Search Engine Challenge

- No Web search engine covers the complete Web
- Web search engines have **different crawling policies**
- Single versus meta-search engines
- People satisfied with their searching, but know little about Web search engines
- 3% - very low overlap for the same query across different Web search engines

The logo for DÖGPILE, featuring the word "DÖGPILE" in a blue, serif font with a registered trademark symbol, set against a dark blue rectangular background.The classic Yahoo! logo, with the word "YAHOO!" in red, bold, serif font, followed by a red exclamation mark and a red arrow pointing to the right.

How Do People Search the Web?

- Track Web search trends
- Identify characteristics of Web searching - search length, query length, and use of advanced features.
- Examine the distribution of query topics, terms, queries, sources, and languages used on Web search engines.
- Web query transaction logs collected in 1997, 1999, 2001, 2003, 2004, 2005, 2006 and 2007.
- Combined dataset of 20 million+ Web searches

Web Search Engine Data Sets

- Excite.com
- Ask.com
- AlltheWeb.com
- AltaVista.com
- Vivisimo.com
- Dogpile.com

- No Google, Yahoo or MSN data



Queries Per Web Search

Queries	1999	2001	2006
Mean	1.9	2.3	2.8
1 query	60%	56%	53.9%
2 queries	20%	19%	16.6%
3+ queries	20%	25%	29.4%
	100%	100%	100%

Web search sessions are generally SHORT in queries, but getting longer.

Terms Per Web Query

Terms	1999	2001	2006
Mean	2.4	2.6	2.7
1 term	30%	27%	18.5%
2 terms	34%	31%	32.2%
3 terms	36%	42%	49.2%
	100%	100%	100%

SHORT QUERIES: But increasing towards 3 terms per query

Web Search Duration (Minutes)

- < 1 minute 56.6%
- 1 minute to < 5 minutes 15.5%
- 5 to < 10 minutes 6.8%
- 10 minutes + 20%

Use of Boolean/Advanced Features

1999	2001	2006
5%	7%	2.1%

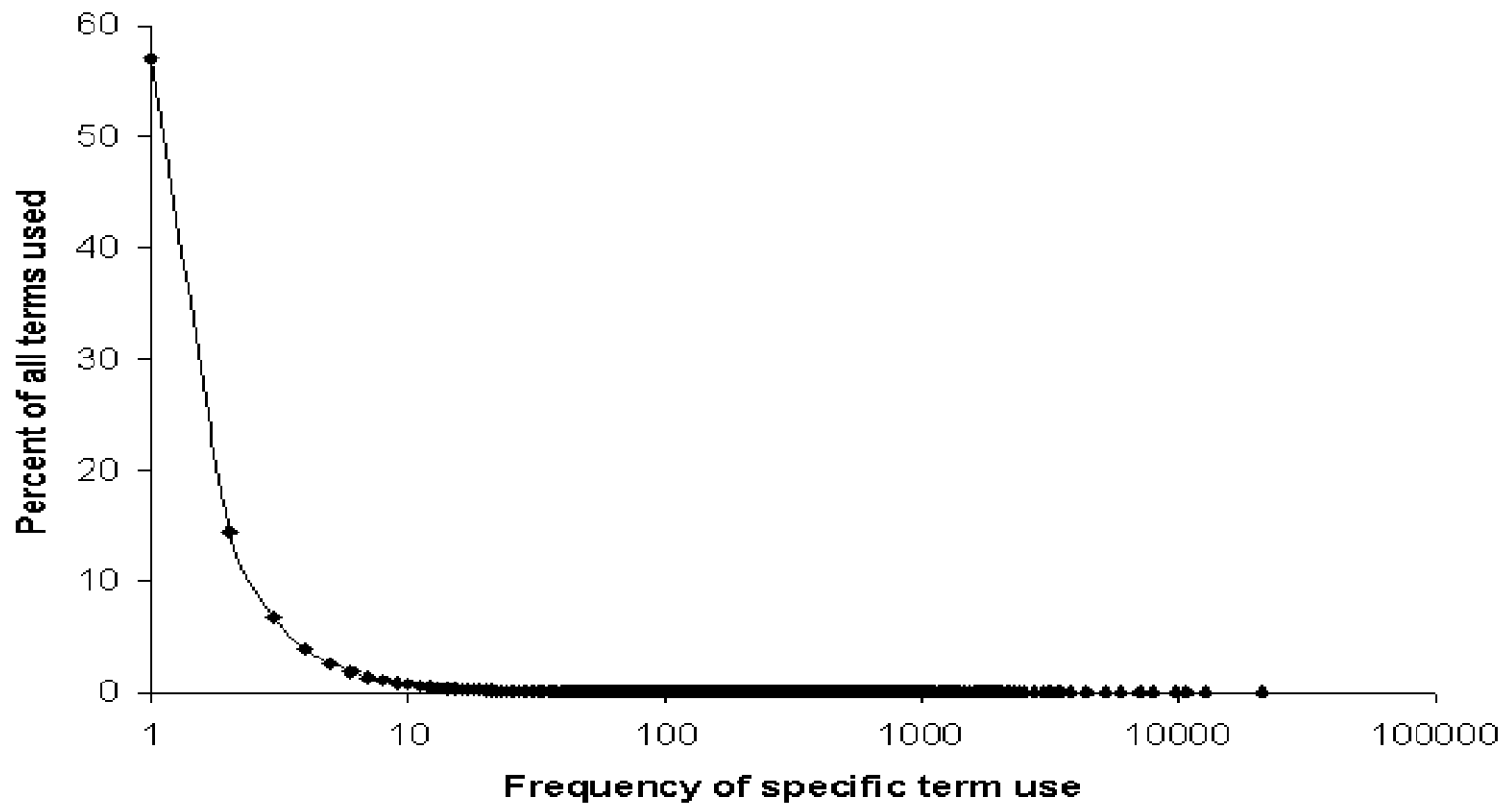
- Many search features used incorrectly
- Poor spelling

Results Pages Viewed Per Web Search

Pages	1999	2001	2006
Mean	1.8	1.7	1.6
1 page	70%	85%	69.07%
2 pages	12%	8%	16.6%
3 pages	18%	7%	14.2%
	100%	100%	100%

- Most users view VERY FEW pages beyond the first or first two pages.
- 14% of users view Web pages for less than 30 seconds
- Dogpile only shows 3-4 result pages

Search Term Distribution



Top 10 Web Search Terms

1999

sex
free
nude
pictures
university
pics
chat
adult
women
new

2001

sex
Christmas
nude
pictures
new
pics
music
university
games
porn

2006

lohan pics
music lyrics
american idol
games
poetry
funny jokes
paris hilton
google
yahoo
sex

Top Ten Co-Occurring Search Terms

1999

new - york
free - sex
free - pics
university - of
pictures - of
greeting - cards
britney - spears
free - nude
free - pictures
real - estate

2006

of - the
the - in
how - to
of - a
what - is
to - a
Lohan - pics
pictures - of
for - sale
the - the

Web Query Topics - 2006

1.	Commerce, Travel, Employment or Economy	30.4%
2.	Indiscernible or Non-English	13.2%
3.	People, Places or Things	16%
4.	Computers or Internet	13%
5.	Social, Culture, Ethnic or Religion	9%
6.	Health or Sciences	6%
7.	Education or Humanities	5%
8.	Sex or Pornography	4%
9.	Performing or Fine Arts	3%
10.	Government	3%
11.	Entertainment or Recreation	2%

Web Search Trends

- Short Web searches – some more complex successive and multitasking searching
- Shift from entertainment to e-commerce/people queries and now to computer gaming
- Increasing number of non-English queries
- More query reformulation - how to assist searchers?

Web Search Trends

- Less results and Web page viewing
- Web search technology and searching behavior is changing incrementally
- New Web search technologies, e.g. search history, search visualization
- More niche or vertical Web search engines
- Growth of Chinese, Spanish and Indian Web

Information Behavior – New Understandings

- An evolutionary adaptive basis linked to survival and human socio-cognitive ability
- Lifetime development with social, personality, cognitive and cultural aspects
- Longitudinal, iterative and complex
- Includes various integrated activities, including foraging, seeking, sense-making, information organising and information use.
- May include interaction with information technologies, e.g., Web

Key Challenges

- Help develop and promote positive change across the human lifespan and develop positive interventions
- Help people learn and think more about their information behaviors

Conclusions

- Help people learn and think more about their information behavior
- Provide better theories, models and vocabularies

References

- Spink, A. (Forthcoming). Information Behavior. Springer.
- Spink, A., & Cole, C. B. (2007). Information behavior: A sociocognitive ability. Evolutionary Psychology, 5(2), 257-274
- Spink, A., & Cole, C. B. (2006). Human information behavior: Integrating diverse approaches and information use. Journal of the American Society for Information Science and Technology, 57(1) 25-35.
- Spink, A., & Cole, C. B. (Eds.). (2006). New Directions in Human Information Behavior. Dordrecht: Springer.
- Spink, A., & Currier, J. (2006). Toward an evolutionary perspective on human Information behavior: An exploratory study. Journal of Documentation, 62(2), 171-193.
- Spink, A., & Jansen, B. J. (2004). Web Search: Public Searching of the Web. Dordrecht: Springer.
- Spink, A., & Zimmer, M. (2008). Web Search: Multidisciplinary Perspectives. Dordrecht: Springer

Questions?

Thank You

