

Users in Context

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- ▶ experimental relevance issues and conclusions



Users in Context - the disturbing variable in experimental IR - 1

- Experimental IR:
- Non-interactive - system-driven - algorithmic
 - Goal: relative performance of engines
 - Means: one-run experiments; sets of queries; mono-dimensional assessor judgements of pooled objects

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Users in Context - the disturbing variable in experimental IR - 2

- Interactive IR - cognitive - user centred
 - Goal: understanding which engines, information structures & interface functionality that best suit/support information seeking behaviour in work (task) contexts
 - Means: iterative or longitudinal experiments; sets of simulated work task situations/real needs; multidimensional relevance assessments by users

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II Retrieval models - overview

- ▶ Ingwersen's cognitive model for IIR (1996)
- ▶ Belkin et al.'s "episodic" model of IIR (1993/95)
- ▶ Saracevic's stratified model for IIR (1996)
 - The *relevance connection* - and the association to *information use* - in

▶ SITUATED CONTEXTS



II Retrieval models - overview - 2

- ▶ IIR in context of Information Seeking Behaviour and Work Task Situations:
 - e.g. as part of *scientific communication*
- ▶ Information seeking models:
 - *T.D.Wilson's models* (1981...1996...1999)
 - *Dervin & Nilan*: sense-making (1986)
 - *Kuhlthau's* phenomenological stage model (1991)

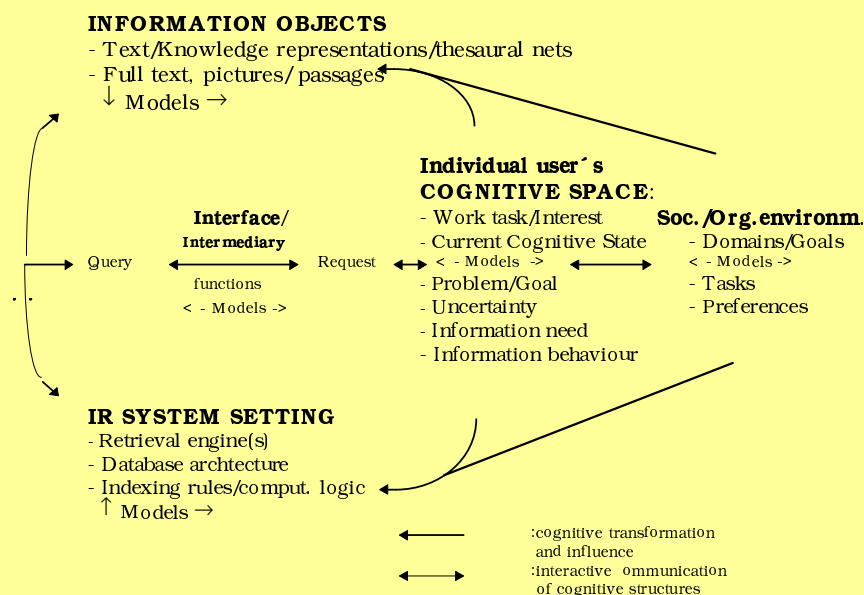
The cognitive approach to IIR

- Ingwersen's cognitive communication model (1996), based on Belkin (ASK) (1982) and earlier alike but simpler models
- 5 major components that act as context for one another during IIR
- Two kinds of tasks: **WORK & SEARCH**
- Two kinds of knowledge: **DOMAIN & IR**

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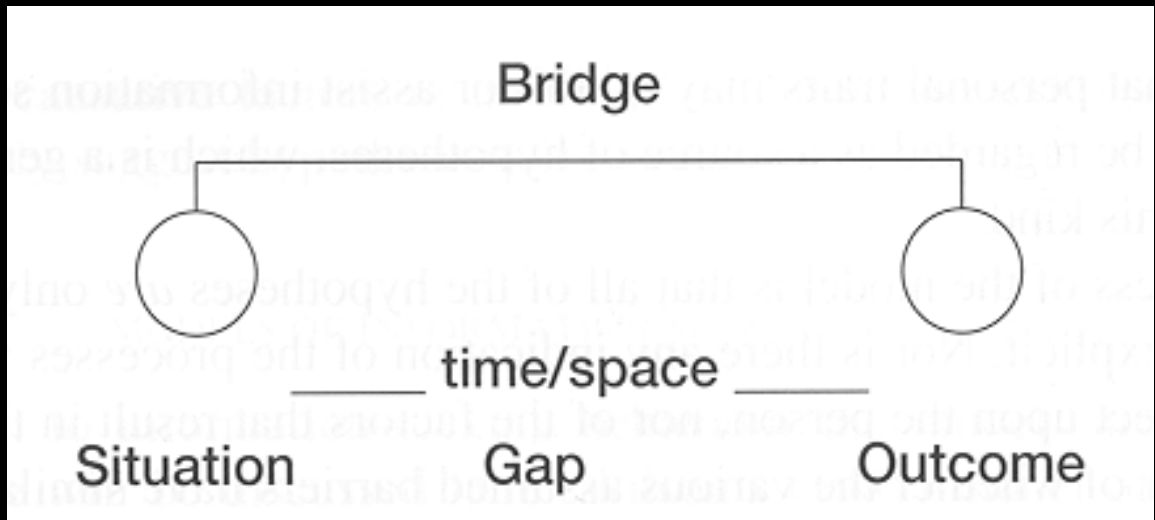
Cognitive Communication Model for IIR



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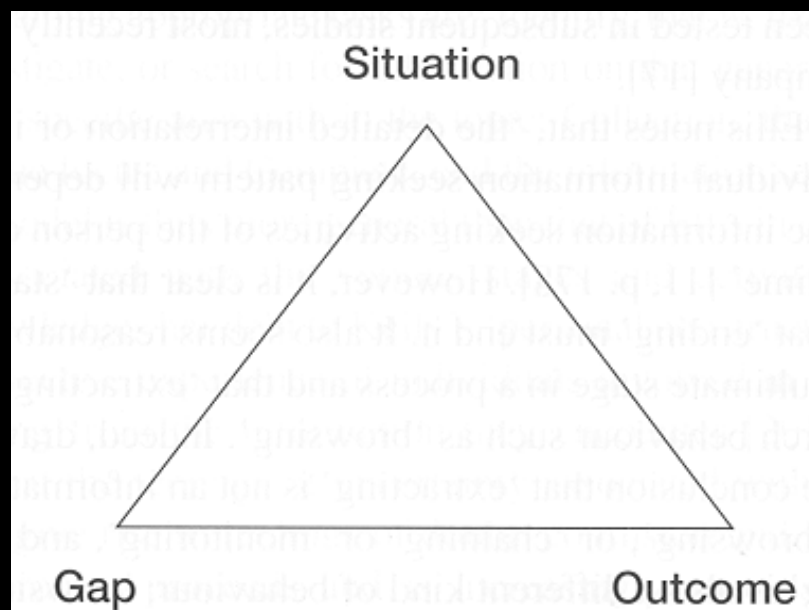
Dervin & Nilan's sense-making (1986)



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Dervin & Nilan (triangular), 1986



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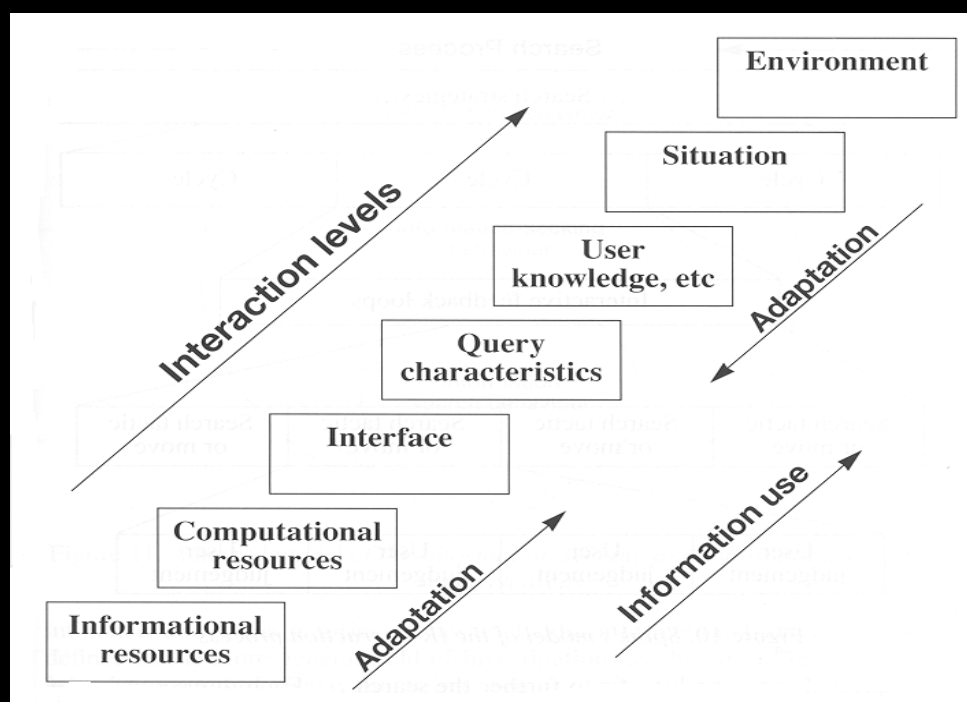
Belkin et al. Episodic strategies

- ▶ Four dimensions of retrieval “modes”:
 - **Method of searching:** scanning vs. browsing
 - **Mode of retrieval:** recognition vs. specification of relevant objects
 - **Goal of retrieval:** learning system/info. space vs. finding relevant information
 - **Resource considered:** info.objects vs. meta-data
- ▶ In total 16 cases of episodes of IIR - but..
 - Perhaps not exhaustive; some modes overlap

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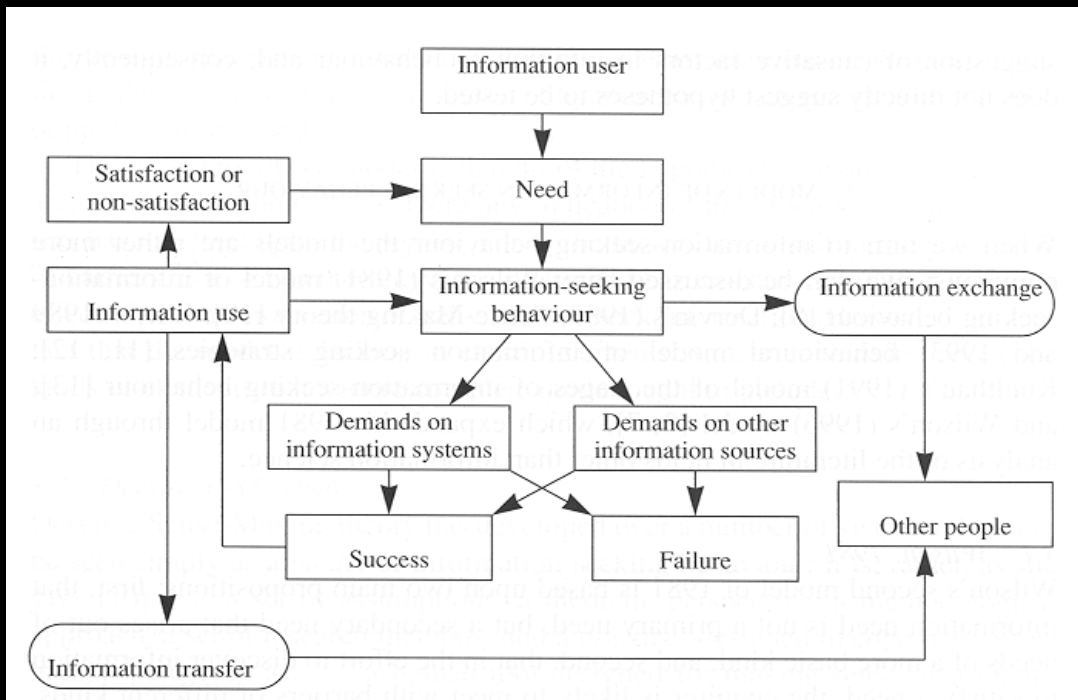
Saracevic' stratified model for IIR (1996)



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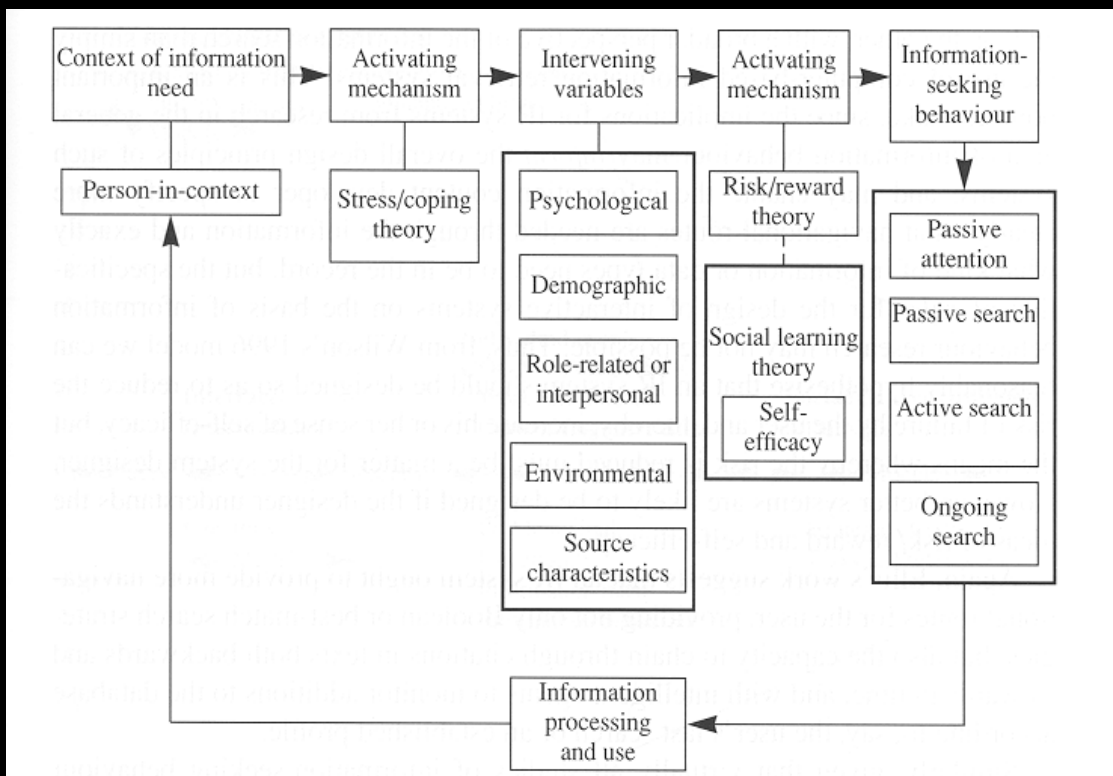
Wilson's 1981 model of Information seeking



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Wilson's stage model (1996)

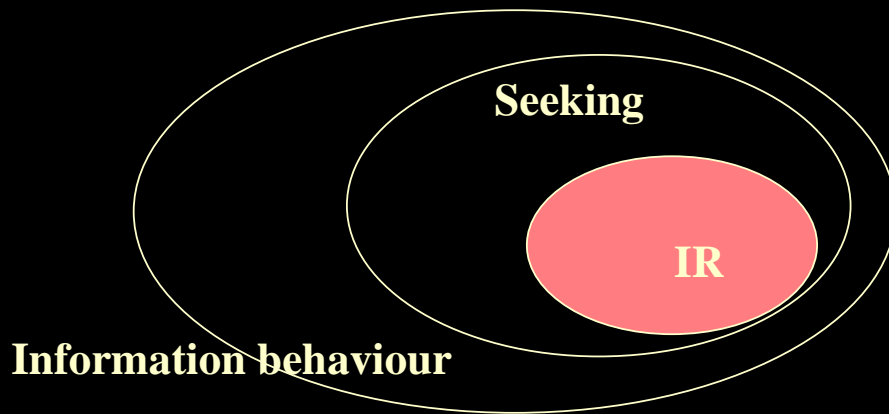


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Information behaviour and IR

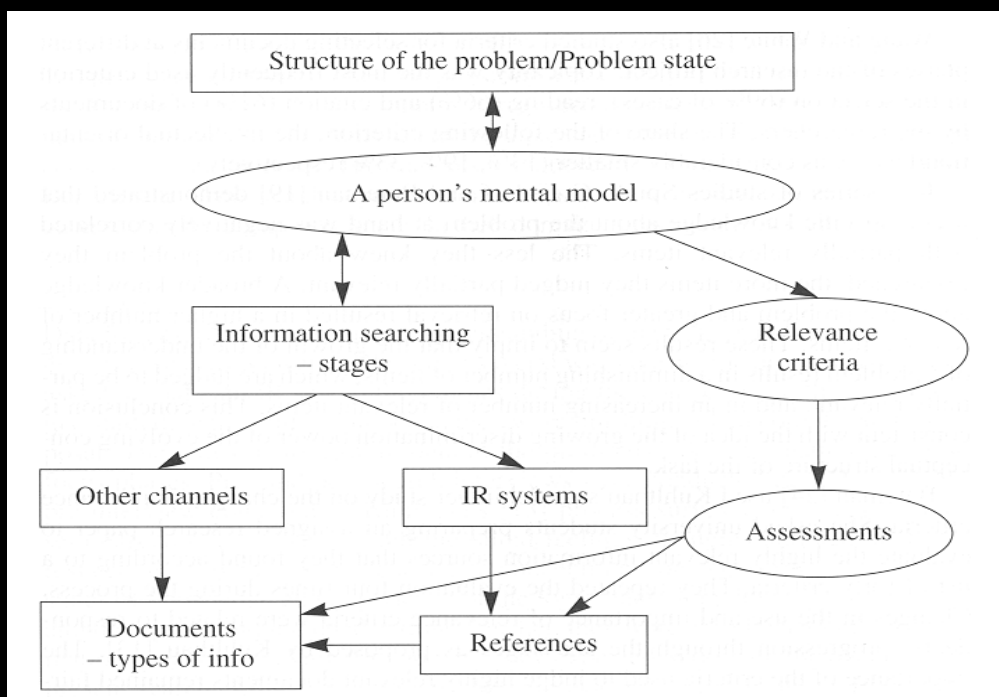
► T. Wilson's Onion Model, 1999:



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IR and relevance in Seeking context - Vakkari 2000



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Resumé of models of ISR

- ASK (1982) by Belkin et al.; Dervin & Nilan (1986); Ingwersen (1992, 1996); Saracevic (1996); Wilson (1996) refer to the **situation or context as the trigger**
- Kuhlthau (1991) concentrates on the mental process, like Wilson (1999) and Vakkari (2000), the model of whom looks like that of Wilson, 1981



Situational context » Work task » Uncertainty » Information Need

- The more complex the situation and work task - the greater the uncertainty and knowledge gap (Byström & Järvelin, 1995);
- The information need becomes increasingly ill-defined
- Impact on **search task behaviour - relevance assessments: systems design should support cognition**

Information need typology matrix

Intrinsic information need variables – given a perceived work task	Well-defined	Ill-defined
Stable	<i>Verificative Conscious topical Querying Filtering behaviour</i>	<i>Muddled task & info.need Search loops</i>
Variable	<i>Conscious topical Query-Navigation Dynamic interaction</i>	<i>Defined work task Muddled info.need Browsing Try-&-error behaviour</i>

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INFORMATION NEED TYPES - 1

- **Given a STABLE perceived TASK**
- **1. VERIFICATIVE NEEDS**
 - TO VERIFY INFORMATION OBJECTS WITH KNOWN (structured) DATA
 - Information need intrinsically STABLE

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INFORMATION NEED TYPES - 2

2. CONSCIOUS TOPICAL NEEDS

TO CLARIFY, REVIEW OR PURSUE
INFORMATION IN KNOWN SUBJECT
MATTER AND DOMAIN

WITH or WITHOUT " LABEL EFFECT"

- Information need intrinsically STABLE or VARIABLE

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INFORMATION NEED TYPES - 3

3. ILL-DEFINED or MUDDLED TOPICAL NEEDS

TO EXPLORE NEW CONCEPTS AND
RELATIONS OUTSIDE KNOWN
SUBJECT MATTER OR DOMAIN

ALWAYS " LABEL EFFECT"

- Information need intrinsically VARIABLE

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The Label Effect

- Users DO NOT ACT RATIONALLY:
- People act more randomly, becomes uncertain, even when knowing about subject matter - due to:
 - search task expectations & assumptions
 - influence of the domain context
- short compromised statements - labels
- known empirically since 1982 - Web IR



Label Effect implications

- Labels do not provide context
- Labels are unsuitable for ranked IR
 - relevance feedback is hence non-informative at initial stages of IIR
 - query modification may help machines, if user has a rich cognitive state
- Labels make distinction between well-defined and ill-defined needs difficult



Consequences

- ▶ **Stable information needs - well-defined:**
- ▶ **simultaneously to apply multiple evidence:**
- ▶ work task, problem & request statements
- ▶ plausible inference networking
- ▶ **Stable information needs - ill-defined:**
- ▶ apply (problem) & request statements
- ▶ visualise the information space (give ideas)

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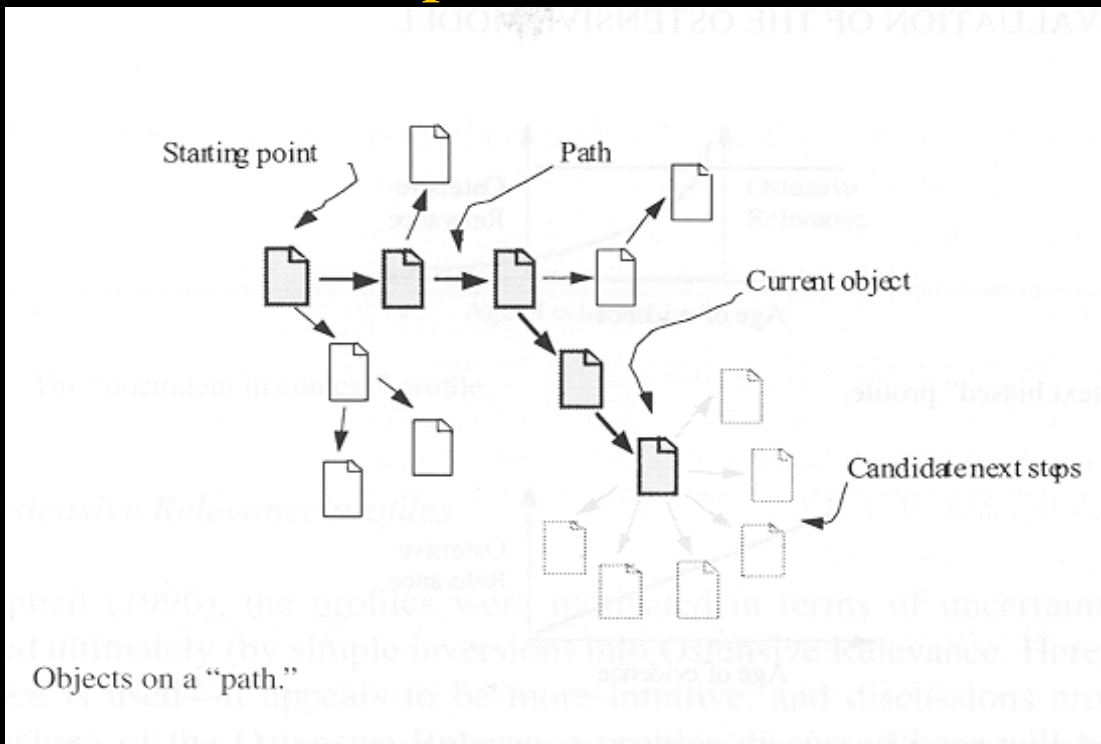
Consequences - 2

- ▶ **Variable information needs - ill-defined:**
- ▶ apply as much multiple evidence from user & objects as possible
- ▶ **visualisation, navigation & browsing tools available**
- ▶ **Variable information needs - well-defined:**
- ▶ **current relevance judgements have more weight than previous ones**

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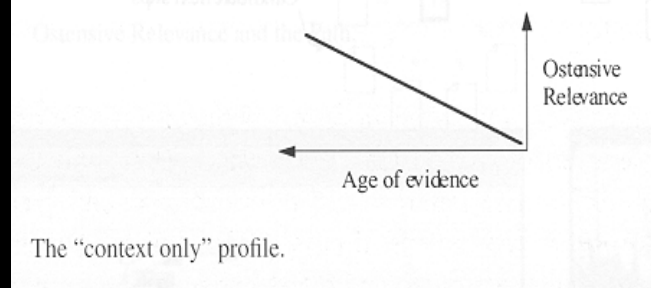
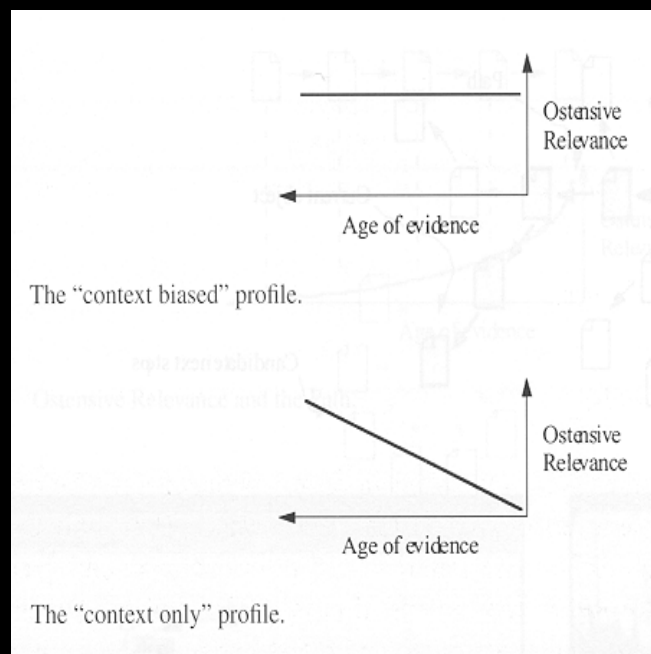
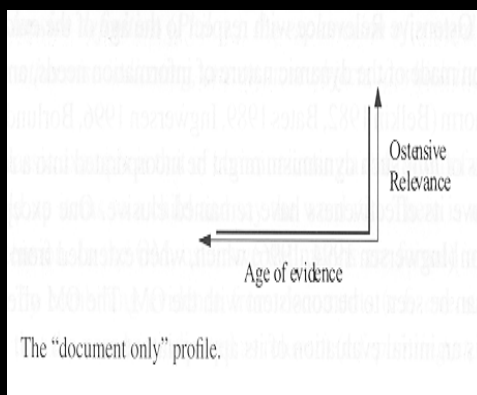
Campbell & van Rijsbergen 96: the ostensive probabilistic model:



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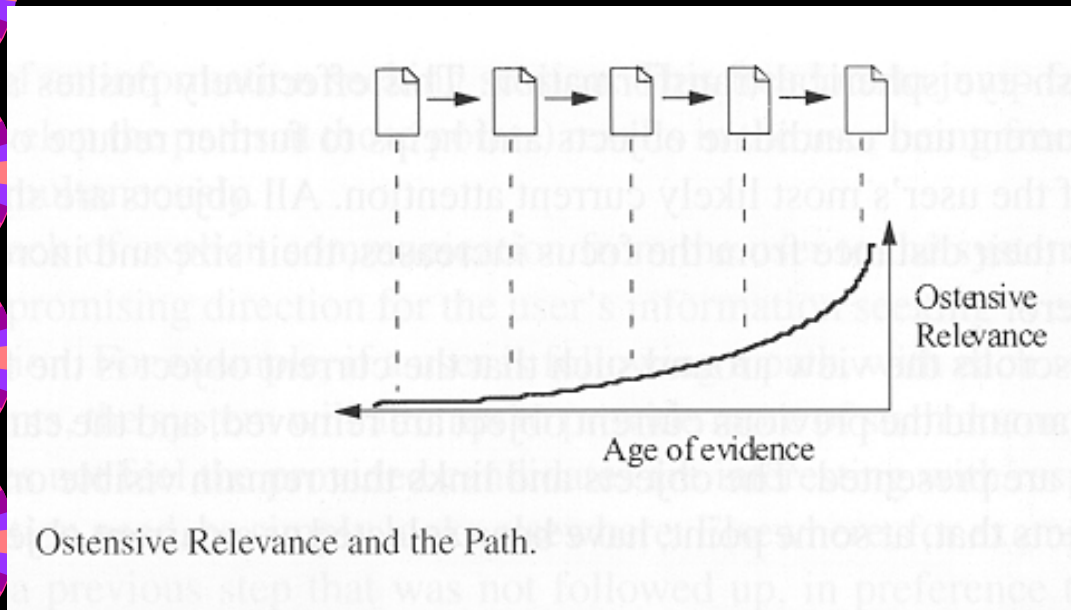
Some possible weighting schemes



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Campbell's weighting scheme



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Relevance issues in IIR

- ▶ Campbell's model relies on **relevance feedback**
- ▶ But it does not care which kind of subjective relevance that is used
- ▶ The “hidden query” is **topical** by nature, but could also include structured data types:
 - author or journal names - cited/citing networks
- ▶ dealing with **pertinence to need of object**

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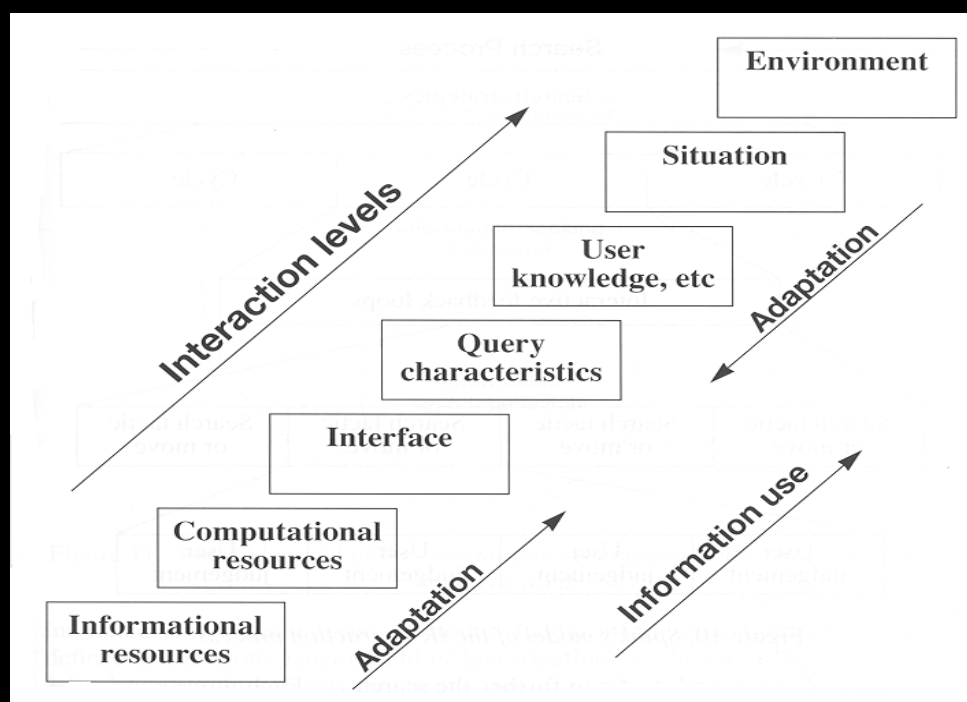
Since 1990: relevance is a multi-dimensional concept

- ▶ Schamber et al. 1990: **situational relevance**
- ▶ Harter 1992: **psychological relevance**
- ▶ Saracevic 1996: **5 manifestations of Rel.**
- ▶ Mizzaro 1997/98: **logic relevance topology**
- ▶ Borlund et al. 1997: **non-binary Rel. In IIR**
- ▶ Spink et al. 1998: **non-binary Rel. in ISR**
- ▶ Cosijn et al.: **socio-cognitive Rel. & tasks**
- ▶ Vakkari, 2000: **relevance criteria & tasks**

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Saracevic' stratified model for IIR (1996)



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Levels of Relevance Types

▶ **System or Algorithmic relevance:**

- query-object (objectivity)

▶ **Topical relevance:** **aboutness** relation of

- query-object (interpretation/subjectivity?)

▶ **Pertinence** (cognitive relevance): **perceived correspondence** of information need-objects

▶ **Situational relevance:** **relation as perceived**

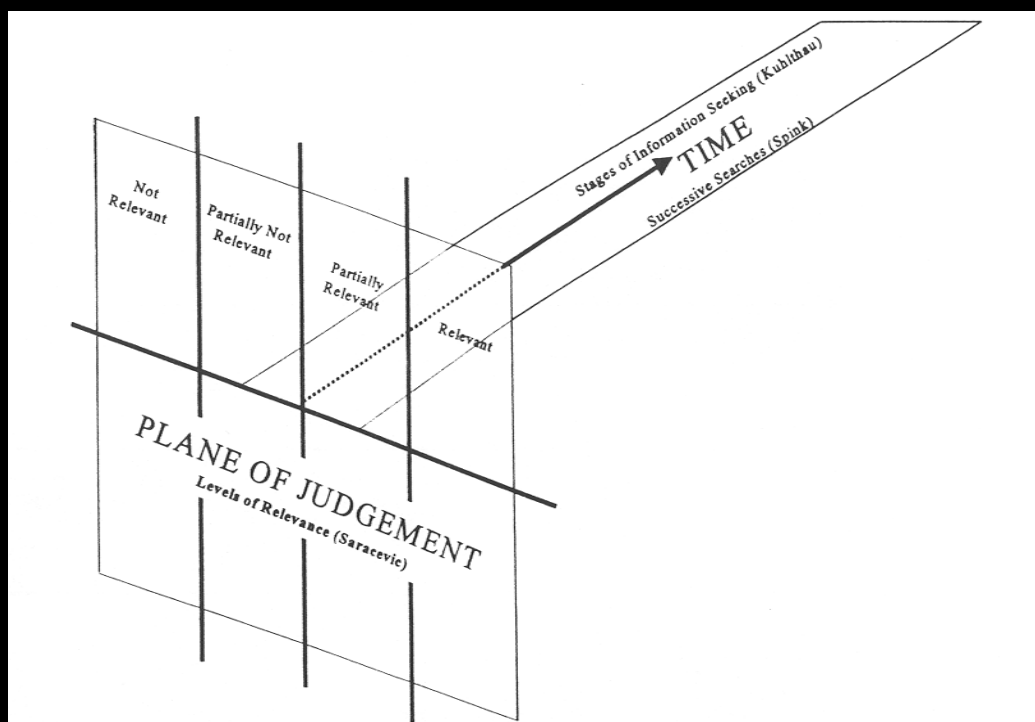
- between task, situation or problem and objects

▶ **Affective relevance:** intentionality-objects

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Spink et al. 's (1998) extensions of Saracevic' and Kuhlthau's models



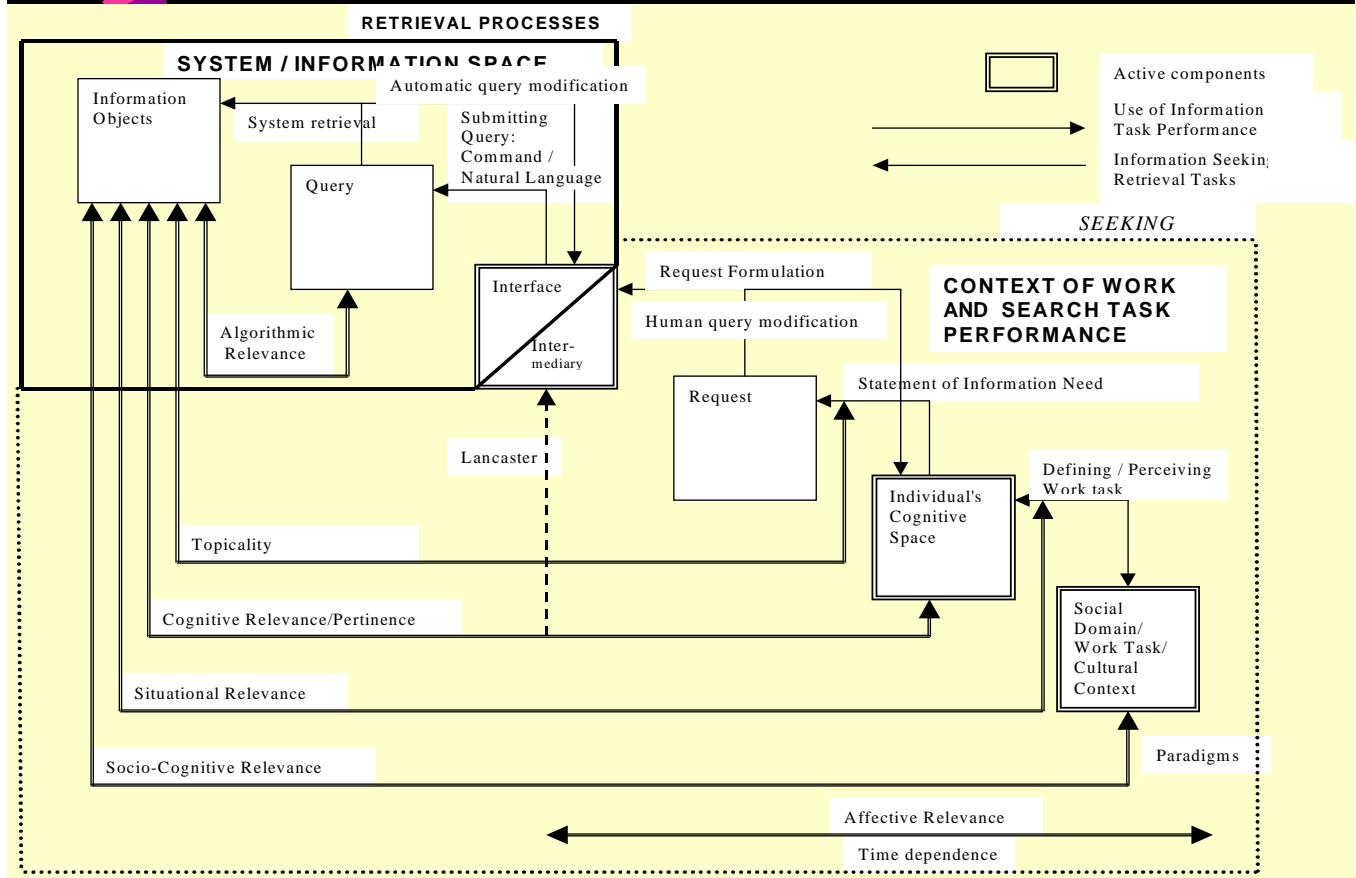
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Attributes of Relevance	Manifestations of Relevance				
	Algorithmic	Affective Relevance			
		Topical	Cognitive / Pertinence	Situational / Utility	Socio-Cognitive
Relation (See also Table 2)	Query \Rightarrow Information objects (feature-based)	Subject/topic expressed in query \Rightarrow Subject/topic covered by information objects	State of knowledge/cognitive information need \Rightarrow Information objects	Situation, work task or problem at hand as perceived \Rightarrow Information objects	Situation, task or problem at hand as perceived in socio-cultural context \Rightarrow Information objects
Intention	(a) System dependent (b) Intent/motivation behind algorithm	(a) User /assessor expectations (b) Intent/motivation behind query	Highly personal and subjective, related to information need, intentions and motivations	Highly personal and subjective or even emotional. Related to goals, intentions and motivations	Personal, subjective / org. strategy. Related to user's experience, traditions, scientific paradigms
Context	Tuning search engine performance (e.g. TREC)	All types of subjective relevance are, by definition, context-dependent			
Inference	Weighting and ranking functions	Interpretation of aboutness and subject matter	Subjective and individualized process of cognitive interpretation, selection and filtering	User's ability to utilize information objects in a way meaningful to user	Users' (or group's) ability to utilize information objects, meaningful to environment
Interaction	Automatic relevance feedback or query modification	Relevance judgements are content dependent	Relevance judgements are content, feature, form & presentation dependent	Including interaction with environment	Including interaction within environment
		Increasing	Time	Dependence	\Rightarrow

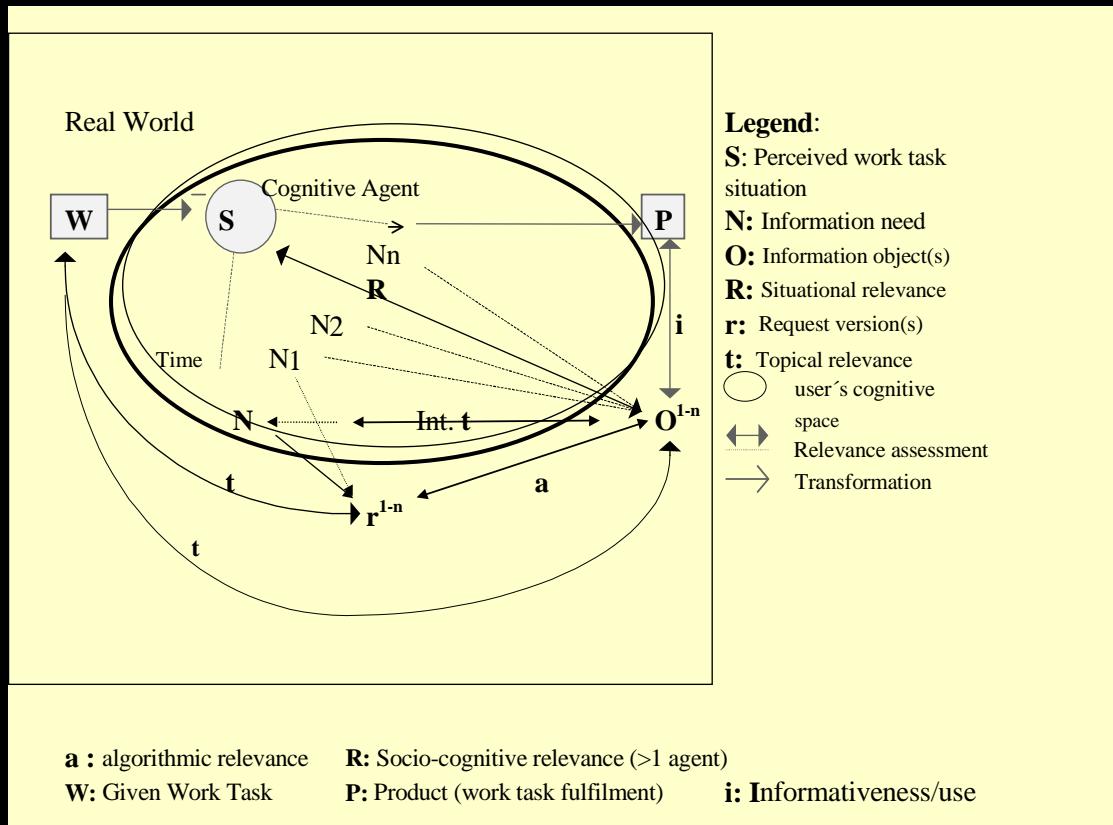
Socio-Cognitive Relevance

- Proposed by Ørom (JoD, Jan. 2000) as associated to the social context.
- Discussed by Cosijn/Ingwersen (IPM, May 2000) as possibly related to organisational or social strategies & perceptions (group decisions = peer reviews & decisions at conference PC)
- Can be measured (e.g. author co-citation analysis) over time.



ure 2: Interactive Information Retrieval: Work task performance, search task performance and relevance types

Experimental issues on relevance in IIR





Other aspects of Relevance

- ▶ **Time - final use of objects**
- ▶ **Mode of presentation of objects**
 - as title / bibliographic data (**Bibliographic Rel.**)
 - as abstract (**Summary Relevance**)
 - as full-text / entire object (**Object Relevance?**)
- ▶ **Retrieval Process Relevance:**
 - search task relevance; query term relevance



Other aspects of Relevance in IIR

- ▶ **Relevance scores**
 - **Binary commonly used in IR experiments**
 - **Non-binary scaling applied by machines**
 - **Scaling (3-5) levels could be applied to human assessments (Saracevic; Spink; Borlund)**
- ▶ **Locations of relevant objects**
 - **Expected search length (Cooper, 1971); Ranked half-life (Borlund, 98); Cumulated gain (Järvelin & Kekäläinen, 2000)**



Concluding remarks

- IIR research faces:
- inclusion of experimental controlled realism
- use of simulated & real work task situations
- social science experimental settings
- dynamic information need development
- multidimensional relevance and scaling
- contextual influence and integration - ISR
- to define proper research questions

....thank you