Introducing Social Anticipation in Computing Systems - Exemplified by a Cybernetic Model of Social Search Systems

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Abstract
The question we want to pose is: How is social searching possible in different complex environments? We will answer this question by introducing a sociological cybernetic model of searching and apply this model to the social search operations on the Internet. No one has to our knowledge developed and applied such a model. The main argument is that searching can be viewed as a complex social medium, which are used in all social search systems. It is showed that to use the medium of searching, the paradox of searching stated by Plato *must be* transformed into something operational. Further it is argued that theory of meaning is the theoretical basic of any search theory concerned with social searching. Finally, the paper suggests a new anticipatory way of programming search software.
Keywords: Searching, Social, Meaning, Society, Internet.

1 Introduction

This paper will develop a way of thinking about searching as a communicative (thus social) phenomenon. On the one hand, we will complicate the communicative aspects of searching; on the other hand, we will ignore biological, mental, technical, cognitive and other aspects of searching. We restrain ourselves from anything not *appearing* in the following communication (when we for instanced speak of 'participants' or 'memory', we only mean *as* these phenomena appears *in* the communication):
Tourist: Excuse me; do you know what is to see in this town?
Inhabitant: Yes! What do you want to see?
Tourist: Don't you have some great attractions?
Inhabitant: We have one of the oldest churches in the country.
Tourist: Well, we have seen too many churches on this trip. Is there some kind of living museum in this area?
Inhabitant: Living museum? What do you mean?
Tourist: Something out door, in open country. For kids, where you can make bread, see the use of original tools, and enjoy the weather!
Inhabitant: Ah, I do not know, try the tourist information...
This case contains many problems inherent social search processes. To observe these problems, we develop an operational phenomenology able to see what is otherwise taken for granted. The aim is to get behind the unproblematic way we are operating and orientating us self in the world [1]. *Our* operative phenomenology relies on four theoretical developments: (a) The functional way of asking questions [2]. (b) A second order cybernetic model [3]. (c) An operative logic of forms. [4]. (d) A theory of perception [5].

2 How to think about Searching

2.1 The Function

To observe a phenomenon as a function means observing *how* the phenomenon is possible. In functional methodology, we do not ask *why* searching, but *how* the search dialog is possible. Asking 'what questions' leads to ontological statements [6] and 'why questions' to theological statements [7]. The aim of functional analysis is to obtain information by comparing functional equivalent solutions to a problem. Defining the problem is the first step: *How is the language game between the tourist and the inhabitant possible?* The functional approach does *not* force us to state *one* solution, but rather guides us to look for different *possible* solutions to searching through established language games with different search strategies.

2.2 The System

The search communication above is viewed as a *system* with its own *environment*. It is assumed that the phenomenon of searching is reproduced with respect to environmental influences, but *not* as a result of these. Our case shows that something *nontrivial* arises *in between* the tourist and the inhabitant, that cannot be deduce to one of them (before the conversation non of them had the answer). That *something*, we call a search system, which is observed as a *nontrivial, self-referential operationally closed, and complex black box that only partially can be transparent* [8]. This is consistent with the functional approach, because the interest is not causality, but possibility. 'Cybernetic explanations' operates with *constraint* rather with efficient causes [9].

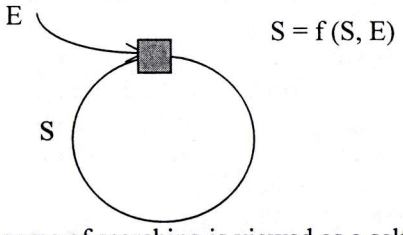

Fig. 1: The language game of searching is viewed as a self-referential system

Constraining a phenomenon as a system means identifying its form of operation [10]. The *arguments* of the system are possible solutions, and the way the system maintain these solutions is contingent. Fig. 1 shows that the system (S) reproduces it selves with reference to it self through its incorporation of *perturbations* from the environment (E).

2.3 The Operations

To conceptualise the *search operations*, we use the calculus of Spencer-Brown. The calculus start by an order: Make a distinction. Only by drawing a distinction, one becomes able to indicate something. The distinction and all what it contains, we will call a *two-sided form*. Every sentence in the case above are operations of two-sided forms. The asymmetric form has three qualities. 1) The marked side of the form (m). 2) The unmarked side of the form (um). 3) The form itself (F). Hence, we have: F = m⌉um [11]. The question then arises: What is the form (structure) of searching?

Observing the case of the tourist it becomes clear that one two-sided form *rules* the search language game. The *function* of the search language game is to process the form 'relevant⌉ irrelevant'. The form it self (similar to the concept of *rule* in the philosophy of Wittgenstein) do not determine *what* is relevant and irrelevant, but offer itself as guideline – with the asymmetric preference of relevant over irrelevant (which *motivates*). Figure two illustrate the form of all searching. What is indicated as relevant is in focus on an unmarked background of what is irrelevant. In addition, it is possible to oscillate to the *other side*, marking what is irrelevant.

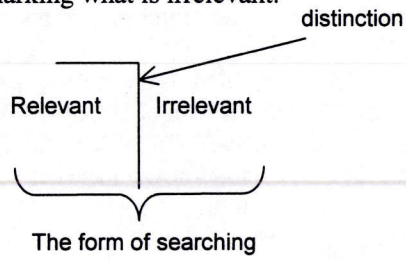

Fig. 2: The form of searching

2.4 The form

Whereas forms consist of rigid couplings, media consists of loose couplings of possible operations. This double relationship makes it possible for the rigid forms to install themselves in the looser medium [12].

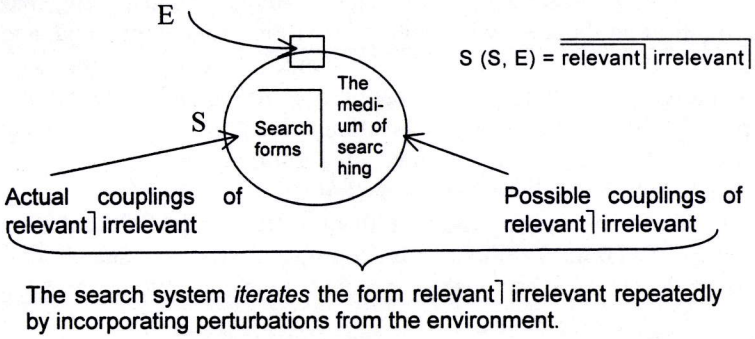

Fig. 3: Operating with the medium of searching

The reason why search systems use identical form is that they all install rigid couplings in the medium of loose couplings between relevant and irrelevant. Figure 3 shows this. On the inside of every operation, the rigid forms are installed (and observable), while loose combinations of 'relevant⌉ irrelevant' are co-produced on the unmarked side. The form on the inside can take the form 'Living Museum⌉ Churches', while a horizon of other possible *structural* couplings are produced on the background of the actual form. Simultaneous, the form 'Living Museum⌉ Churches' is *operationally* coupled to the earlier forms operated in the search system, for instance the form 'Great attraction⌉'.

3 The Improbable Searching

3.1 The Paradox

The paradox of searching was formulated in the antic world by Plato [13]: The man who searches for wisdom is only able to identify the wisdom *if* he already knows it, but if he knows the wisdom he has no motive to search for it. Plato solved the paradox by postulating that all searches are retrieval of inborn ideas one has forgotten. The *reduction* of *searching* to *retrieval* is common today to. Most search technologies take for granted that the searcher *knows* the search object and most theories of searching are theories of Information Retrieval [14].

Plato's idea installs an unsolved problem – the assumption of an already known object. Instead, we will state that the paradox cannot be solved in categorical manner. The two states – full knowledge (but no motive) and no knowledge (but full motive) - indicates two borderlines. The tourist knows and knows not what he is looking for. The inhabitant also knows and knows not what is to see. Only in the dialogue *between* the tourist and the inhabitant, it becomes clear what the tourist is looking for and what the inhabitant can refer to. The inhabitant alone cannot do the selection; neither can the tourist.

The function of the search system is to transform the paradox of searching into a state, where the inhabitant knows what the searcher knows he is searching for and vice versa. This is done through *trying out* couplings of 'relevant⌉irrelevant'.

3.2 The three Improbabilities

Following Luhmann [15] we speak of at least three improbabilities of searching:

A) It is improbable that the search process leads to mutual understanding since different and closed minds and bodies, with separate abilities to comprehend and compute information, separate the tourist and the inhabitant. No understanding is probable as their separate memories and fields of perception form individual contexts.

B) It is improbable that the search conversation makes any *effect* on the counter part. Why should the inhabitant let the communicated information take the role as premises regarding his actions? Why not just ignore the tourist?

C) Assume the tourist prefers information about a set of cities without entering them. This raises the third improbability: It is improbable that the search dialogue will continue beyond the attention established in mere face-to-face interaction [16].

3.3 The Match

There are also problems of *identification* inherent search operations. First, the search system must ensure that *both* the tourist and the inhabitant interpret what the tourist is searching for – in *similar* ways. Second, the communication must ensure that the searcher and the inhabitant interpret the objects in the town in similar ways. Third, the interpretation that the two objects are matching each other can be misunderstood.

3.4 The Double Contingency

When the tourist makes expectations of what the inhabitant expect, and vice versa, it leads to a problem of 'double contingency' [3]. If the tourist's expectation depends on the expectations of the inhabitant, and the inhabitant's expectation depends on the tourist expectations, it seems to produce an infinite regress of expectations of

expectations etc. Normally this double contingency is put to an end by a simple act or gesture *in* the language game. Neither the problem nor the solutions of double contingency can be limited to the tourist *or* the inhabitant.

3.5 The Reduction of Complexity

In the reduction of complexity, the social interaction meets the problems of *understanding*, *effect*, and *identification*. *Before* the conversation, every search object could be possible, but through the social search system, the *full* complexity becomes transformed into one choice. In this way, searching can be seen as a *mechanism to reduce complexity* and search systems as *complex* systems. Installing social systems to reduce the complexity solves the tourist's problem of orientation in an unknown town. How is this done? One answer is, *by categorising*. The flow of communication can be seen as a creation of a taxonomy constructed in a way adapted to the specific searching. In the case of communication between the tourist and the inhabitant the taxonomy 'Living museum ⌉ Great attractions ⌉ "To see" in this town' is constructed.

The three categories are used to reduce the complexity of possible search object, which make *virtual orientation* possible. The suggested elements A (the church) and B (the tourist information) are selected among other possibilities. Categorisation is probably the most successful *strategy of orientation* for sign-using systems. When we indicate something, we always make distinctions; we cannot indicate things without the use of types, forms, or frames. By the use of categories we reduce the complexity of the world, implying that the world it selves become impossible to indicate.

There are no best taxonomy. No right way of categorisation, but only a relative 'useful ⌉ useless' way depending on the social search system using the categorisation to reduce complexity and make orientation in an over complex environment possible. If the stemming of observations shall be possible, the categories must be recognisable.

4 Constraining *Social* Searching

4.1 The Constraining

The social, in our model developed *so far*, is not constrained strictly enough from other kinds (e.g. mechanical) of search operations. The constraining of *social* searching reveals that *social search operations* are much more *complex* than the we has described. *Social* search operations are co-produced with other kinds of social operations. If we set out from our case, at least four other media than the medium of searching are co-produced every time a form is installed in the medium of searching. These media helps the search operation to transform the improbable into the probable.

4.2 The Communication

First, there is the medium of communication (C). Every sentence contains a difference between what is informed and how the information is expressed. Following Luhmann [17] we will constrain social systems as operating with the medium of communication, whereby forms are installed into loose couplings of 'information ⌉ utterance' (similar to the difference between 'constative ⌉ performative' speech acts[18]). This is not so fare from the description of language games given by Wittgenstein, which characterise language game as a system of communication. *Information* can be conceptualised as a

difference that makes a difference [19] and search communications as processing information of what is relevant and not irrelevant.

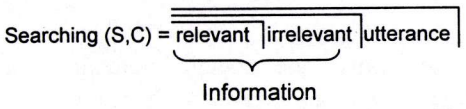

Fig. 4: The communicative form of searching

4.3 The Meaning

Second, the medium of meaning is inherent all the search operations. Every operation in the communication between the tourist and the inhabitant actualise something on a background of something that is not actualised, but implicit given. When the tourist say, he is tired of churches, not everything has *even* probability of being actualised in the next operation. Only by the use of the medium of meaning, which can be constrained as loose couplings of 'actuality⌉ potentiality', connectivity becomes possible. In every search operation, something is actualised with a *horizon* of other possibilities – which might be actualised in forthcoming operations [20].

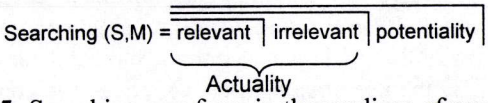

Fig. 5: Searching as a form in the medium of meaning

The form of meaning can be redefined into three media of orientation: Temporality, sociality, and objectivity. The search process uses all three media to make orientation possible. The medium of objects consist of loose couplings between 'this⌉ something else'. If we actualise what something is – we are *orientated* towards an inner infinity horizon. If we turn to the specification of what something *is not*, we are *orientated* towards an outer horizon. In our case the *search object* is actualised to begin with as the difference between 'something to see⌉ '. Next "to see" is specified by "great attractions". Further specification is made by "living museums". The temporal medium consist of loose couplings between 'before⌉ after' imbedded in all search operations. All operations are performed in the present, *orientated* towards the future or the past. The medium of sociability consist of loose couplings between 'ego⌉ alter'. Ego and alter shall be understood as *differences of perspectives*. The horizons of alter and ego are inherent in the search communication as the *attribution of the two roles* - searcher and intermediary. The communication *orientate* it selves towards these two horizons by using questions like "what do *you* mean" or "don't *you* agree?" In this way, communication handles the incongruence of the two perspectives.

What is not chosen is not eliminated but virtualised. In the horizon of meaning the full complexity of the world is inexhaustible. This combination of reducing complexity and preservation of complexity makes orientation possible. The reduction is performed through the installation of rigid forms, the preservation by the simultaneous produced medium of meaning. The meaning is not the actualisation (living museum for instance) or what is *possible* to actualise in the next moment (e.g. "outdoor"). The meaning is the *coupling* between what actually appears and what *can* be actualised in the next moment.

4.4 The Perception

Thirdly, a medium of perception is used in the search communication; that is the acoustic medium of sound. The communication only becomes partially transparent by use of a medium of perception (P), i.e. by operating with the difference of particular sounds and the sound as such [21].

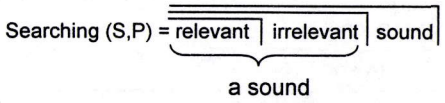

Fig. 6: Searching as a form in the medium of acoustic

The form of 'a sound⌉ sound' makes the form of communication 'information⌉ utterance' possible. Without the medium of perception, the difference between information and utterances could not be observable to more than one observer. Communication demands that the participators in the environment of the search systems are *attributed* as double creatures, operating with the form 'consciousness⌉ body'.

4.5 The Language

Fourth, the medium of language (L) is used in our case. Language permits a complex relationship increasing the possible couplings of perception and meaning. This is done by the use of the interplay of three linguistic media appearing simultaneously: First, the medium of loose couplings between sentences and words, second the medium og loose couplings between words and phonetics, and thirdly the medium of loose couplings between phonetics and acoustics. On the first level – the form sentences⌉ words; meaning occur, while perception occur on the third level in the form phonetics⌉ acoustics. This three-fold linguistic mechanism makes it possible to speak out indefinite numbers of sentences in the same acoustic medium of perception, using only a few phonetics and a few thousands words. The media of language integrate isolation (arbitrariness) and redundancy (tradition), solving the problem of understanding, *without* determining understanding [22].

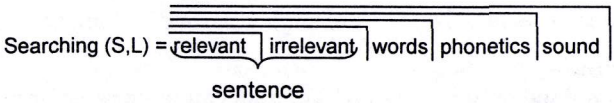

Fig. 7: Searching as a form in the medium of language

According to Wittgenstein the meaning of a word is not, what it is referring to in the external world, but what it *does in* a language game. We learn the meaning of words by coupling them into sentences and see what happens. The words in a search process are not just names of search objects. They are tools used to perform different things [23].

4.6 The Interference

The identity of the search operations are complex and interfere with the co-use of other media as well. Figure 8 shows the complex relationship of differences. The expression indicates that the identification of the search object, possible search object, and the match between, is constituted through differences in a complex operation. One could also say that the identity builds an interface, in which the different media are brought

together [24]. If the communicated search operation becomes *visible*; we will speak of *positive* media interference, otherwise we will speak of *negative* media interference.

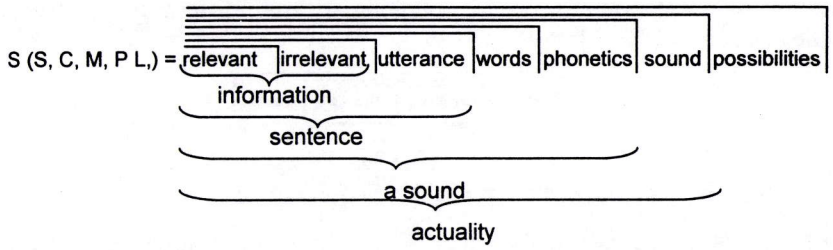

Fig. 8: Linguistic social search operations as interface of different forms

5 Searching Society

5.1 Beyond the Interaction

If the function of searching only were to ensure success of the interaction ('presence absence'), it would be successful if the interaction went on forever. However, the function of searching is not only related to the mere interaction, but goes beyond, social searching evolves towards automation and non-interaction by the use of e.g. tourist folders, search engines, and contact ads. We see four reasons for this: *First*, the medium of searching becomes stronger when interactions are shortened by successful findings. As the particular interaction 'dies', the searcher and the intermediary have experienced how to use the medium, and will probably use it again, if it was successful. *Second*, the society does not cater for the particular interaction, but for the repeatedly use of the search medium in a successful way. *Third*, in society, a certain kind of organisation, namely *libraries* have evolved to ensure the continuousness of searching beyond the mere interaction. *Forth*, our bodily founded *individual* ability of orientation in the society, is not stable (we are able to orientate ourselves in such different societies as a primal tribe society and an electronic mediated sign fixated modern world society), but rather a *symbiotic mechanism* [25], changing beyond the singular interaction.

5.2 The Medium

Searching is not the only medium of communication. In table one we have develop a list of other media [26]. The medium of trust is an example of a general medium that co-appears with more specific media. Opposite, money is an example of a specific medium. Media are functional complex but easy to use in different situations, which means that they are easy to decode. They combine *simplicity* and *motivation*. The *motive* to use a medium relies on the 'build-in preference' of the asymmetric difference constituting the medium. The asymmetry gives the medium its ability to connect communication, *affecting* the recipient. This ability is not universal, but functional specific. If one uses the medium of truth in a communication of love, it will probably not work. Social searching is a functional complex medium because one is able to search for everything and anybody at any time, but still it is very simple, you just ask: Where can I find a bookstore? Searching motivates by its performance, which is to affect both the searcher

and the intermediary. The medium of searching matches complexity of someone attributed a surplus of references with someone attributed a deficit of references.

Table 1: Communication media of the Society

System	Media	Code	Program	Roles	World	Symbiotic
The search system	**Search**	Relevant/ irrelevant	Search criteria. usability. relevan-ce program	Searcher. Intermediary. indexer	Relevant and irrelevant references	Orientation
The e-conomic system	**Money**	Payment/ non-payment	Prices. investment- and consumer progr.	Consumers. entrepreneurs. investors	Payable and non payable objects	Physical needs
The Science	**Truth**	True/ false	Theories. methods	Scientists. students	True and false theories	Perception
The political system	**Power**	Power/ powerless ness	Political programs. References to elections	Politicians. electors. representative	Powerful and powerless decisions	Physical violence
The system of Art	**Beauty**	Beautiful/ ugly	Taste. reviews	Creators. artists. audience.	Beautiful and ugly displaying	Perception and intuition
Family systems	**Love**	Love/not love	Seduction. codes of friendship	Lovers. friends. family	Kind or not kind actions	Sexuality
The religious system	**Faith**	Salvation/ condemna tion	Religious direc-tions. prohibitions. secrets. gods	Clericals. worshipers	Possibilities of salvation and condemnation	Transcen-dence
Systems of Moral	**Re-spect**	Respect/ contempt	Ethics	Respectable and disrespectable persons	Respectable and disrespect-able actions	Normative functioning
The Mass media	**Infor-mation**	informa-tion/non informat.	New. entertain-ment and adver-tisement criteria	Journalists. editors. receivers	Reality	Curiosity
Systems of edu-cation	**Man-ner**	Success/ failure	Pedagogically criteria. exams	Teachers. pupils. parents	Possibilities for success and failure	Discipline. self-control
Game systems	**Compe -tition**	Win/lose	Rules. fairness. prices	Winners. losers. participants. referee	Winning and loosing matches	Bodily per-formance willpower
The Legal-system	**Law**	Justice legal/ille-gal	The law. contracts. rules. precedence	Judges. victims. police. convicts. attorneys	Legal and illegal actions	Containmen t. impri-sonment
The medical system	**Health**	Ill/ health	Diseases. repair programs. diagnosis	Doctors. patients alternative practitioner	More or less Illness bodies	Psychosoma tic illness
-	**Trust**	Trust/ distrust	What should be trusted	Position of trust. stranger. su-spicious person	Trustful and distrustful objects	Reflexivity
-	**Mea-ning**	Actuality/ potentia-lity	Semantics	Alter/ego	Meaning and non meaning	Experience memory

5.3 The code

Every medium consists of a steering binary *code* or form (se table 1). The code is very stable over time. It is stable that science *observes* everything as true or false.

Nevertheless, *what* is programmed as respectively true or false is relatively dynamic. The search code is the same in search processes of the antic library of Alexandria and in the modern search systems on the Internet. However, *what* count as relevant and irrelevant are different, due to shifts in the programs of searching. The interaction process between the tourist and the inhabitant use and produce a more or less implicit search program. Search programs are different criteria's for what is relevant and irrelevant. They are the *value settings* installed into the 'relevant ⌉ irrelevant' code.

5.4 The Function

The function of any search system is to *maintain* and *mediate* the *memory* of the society. That means *facilitate* Self-Reference of the society. By using, the medium of searching the complexity of self-referring is reduced. The whole world is seen as a place of relevant and irrelevant references. This limitation is produced by the search system itself. The search system creates its own operations coded as 'relevant ⌉ irrelevant' references, its own boundaries (what comes into considerations) and its own structures of expectations (not every reference has identical probability).

Every functional system needs the search systems ability to increase the capacity of memory and self-referring. In the economic system, we find libraries in the enterprises, people looking for jobs and searching for payable investment objects. In the intimacy systems, we find searching for partners, private libraries, and people searching friendships, similar in the other systems. To search for a partner, is not to love the partner. Searching objects of investment is not itself investment. Searching for a theory is not to declare what is true or false. In all cases we find that *searching is an ex ante operation*. The function of the search system is demanded for the ex post operations of the other functional systems. No modern complex social system can function without the *capacity* for memory and self-referring, which the search system *make possible*. The search system makes it possible to choose the relevant, without destroying the momentary irrelevant. The code of the search medium guaranties the operational closure of the search system and makes success and failure visible in the searching for relevant and not irrelevant references. The search *programs* guaranties that the operational closure can be used to process information *about* the environment. The program is about *how* the environment shall be valued – relevant or irrelevant.

The medium of searching transfer *past* selections; but society changes and individuals change as well. Therefore, the medium of *trust* is demanded. It must be trusted that the search medium will also be successful tomorrow. The use of the search medium builds up a functional system with organisations to solve this problem. The functional system guaranty the trust to the connectiviness of the search medium by moving the question of trust from the code to the programs. This is done by the production of a reservoir of search programs ready to replace programs coming into mistrust.

5.5 The Library

Libraries are the primary organisations of the search system of society, producing complex search programs. Libraries reduce *full* complexity by building up *structural* complexity of their own [27]. Every library decides what are 'relevant ⌉ irrelevant' references on this specific library. The general functions of the search system –

memory and self-referring – by installing an *ordering system* and episodes of interactive *mediations systems*. In the modern functional differentiated society, every complex organisation (the state, the enterprise, the family etc.) has a library as a subsystem. Only so are modern complex organisations possible. The library use *inclusion / exclusion* to differentiate between what connect to communication in the library system and what does not. This is done both in the episodically *mediation* systems and in the *ordering* system.. Both the ordering system and the mediation systems makes operations possible, which set up boundaries for what is relevant or irrelevant. The ordering system builds up categorisation and indexing to differentiate between separate fields of the possible references. It is operationally closed in these operations, but structural open on the level of the index and category programs. The difference of the mediation systems and the ordering system in a library is a re-specification of the form of meaning. The ordering system maintains *possible* references; the mediation systems maintain the *actualisation* of references out of other possibilities. Therefore, the theoretical foundation of any search system is a *theory of meaning*. A library is nothing else than a re-instalment of this structure in the society. Libraries are the condition of a complex society reflecting it selves (functional equivalencies are folklore, individual memory and arbitrary graffiti). The actualisation in the mediation systems ensure the connectivity of the search system of society, the ordering system ensure the reproduction of a surplus of references categories into more or less relevant and irrelevant references. The ordering system limits it self through its own categories and index rules. The mediation systems limit themselves to communication with the addressees' searcher/intermediary inside defined librarian organisations. Hence libraries are functional complex but easy to use.

The search system of the society creates its own boundaries, its own structures (including its own roles and organisations), and its own operations.

6 Searching on the Internet

6.1 The Evolution

To understand search processes on the Internet we start by placing the medium in an evolutionary perspective, assuming the Internet to be a medium of dissemination [28].

All media of dissemination transform time and space [29], and overcome the limits of the mere interaction. With the invention of written language it becomes lesser important to remember, and it is possible to communicate without being present. It is our thesis that society's *capacity* to refer to it selves correlate with its form of differentiation and with the invention of communication technologies. The evolution of society can be simplified to four overlapping stages (table 2).

On the forth stage we find the electronic mediated search systems making billions of communicative operations possible. New possibilities arise for increase in the capacity of self-referring, which makes a more complex society possible. The stages are overlapping and all four forms of differentiation are represented on the fourth stage. Looking at the Internet one can observe segmentary, stratified, functional, and ecological differentiation. This also means, that the corresponding search systems are all

represented on the Internet. Individual memory, traditional librarian organisations, and functional specific librarian organisations are still important.

Table 2: The evolution of search systems

Differentiation of Society	Capacity of self-referring	Dissemination media	Search systems
1. Segmentary differentiation	Limited by the interactions in the segment and the spoken language	Oral	Simple queries answered by the old generations
2. Stratified differentiation	Limited by the stratification, the religious conditioning and the written language	Written language	The invention of Libraries
3. Functional differentiation	Limited by functional re-specifications and the print	Print	The out-differentiation of libraries to functional requests
4. Ecological differentiation?	Limited by functional re-specification, ecological interdependencies, and electronic media	Electronic media	Search engines, user-generated categorisation, virtual libraries

6.2 The Internet

If the objects, the addressing of social perspectives and the demarcation of before and after *change* on the Internet, it change the *conditions of orientation* [30]. On the Internet, new combinations of media appear in forms, which are hard to handle because we still lack experience about them. The media interference on the Internet must be learned, *without knowing* whether the world *is* different on the Internet. Therefore, the Internet is often *perceived* as a new world of new people, new places, and new organisations. How shall the search systems identify *possible* objects, when the searchers expecting the objects to be new, unknown and non-categorised?

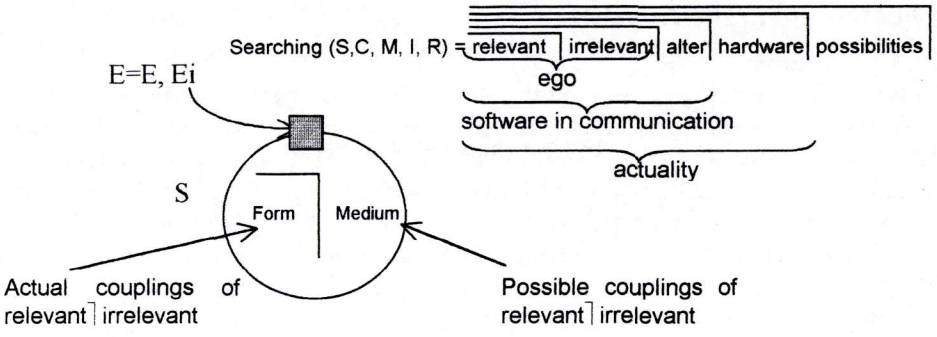

Fig. 9: The search systems (S) on the Internet

The process of ascribing roles and solve the problem of double contingency becomes complicated too. Expectations cannot be easily directed at physical bodies. The very difference between information and utterance becomes problematic. Who is actually the person who uttered information? The communication becomes very loosely coupled to actors. The dynamics of addressing responsibility and validity of the communication

challenge the search systems ability to reflect changes in social perspectives in all the other functional systems of society. Needs of real-time applications, advance processing of a very open future and a huge increasing past of data, also challenges the search systems. In the 'old' librarian organisation, stable information was ordered and mediated, but on the Internet, the users become librarians to each other and new organisational forms of search systems emerge. The search systems (S) of the Internet (I) and the roles (R) searcher/intermediary as alter/egoes can be drawn as in figure 9.
The technical features like cables, computers, modems etc. are not part of the search system, but are in the environment of the search system. It is also noticeable, that the software is in the environment, implying that the search technology is not in itself a social search system, but is used by the social search system. Moreover the roles searcher and intermediary are attributed by the search system, placing the consciousnesses in the environment of the search system.

6.3 The Software

We will end this article by treating the problem of designing software meant to form environment of search systems.
The use of search *technology* is an installation of a form in the search medium. The installation of forms is not random; rather the programming is performed in expectation of being used, and in the use, the user adapt to the program. The social search system emerging, when a user uses a search technology is a result of mutual expectations between user and programmer. Because the medium is new, the mutual expectations might be difficult to adjust to each other. This uncertainty in mutual expectations may be what makes the new media seem new to us.

6.4 Problems of Orientation

Any search system, face three problems of orientation: (1) *Temporal* problems in the mediation system between searcher and intermediary. (2) Problems of *objectivity* when references are included or excluded from the ordering system. (3) *Social* problems in the relation between different mediation systems and the ordering system. Most existing search technology solves these problems by *transactional programming*. By transactional we mean solutions based on the idea that stable data can be retrieved in a single transaction. The problem of temporality is solved by, assuming every search operation to be independent of prior operations. This implies first order observations, always with the unmarked side as unspecified. The structural coupling between searcher and intermediary is one way targeted – what count as relevant is decided before the searcher search. Every search operation is handled as an independent transaction. The problem of objectivity is solved by assuming the objects to be independent of each other, and by describing the objects *in themselves*, e.g. represented by the consisting keywords. The observation is done in one transaction, and its representation does not change. This implies first order observations, which are blind to the unmarked side of the object - its relations to other objects. The problem of sociability is solved by assuming that all agree about the social perspective, in which the selection is done. Every use of the ordering system is performed as independent transactions independent of different social perspectives. This also implies first order observation.

7 Conclusion

The anticipation-based program is an idea of how some of the problems of searching and orientation on the Internet can be solved; other functional equivalencies can be imagined. The proposed idea raises new problems to be handled by the anticipation-based search technology. The past can be overestimated and make it impossible to move into unknown future possibilities. Related references can be worked out, but what 'related' *mean* is different in different social systems, and it is a challenge to support the choice of relatedness *in* the anticipatory process of searching. Identifying the context of a sequence of search operations is very hard under ecological conditions. Risk of 'hyper-inclusion' (every thing is related to every thing) according to the past, the possible future, social perspectives and possible objects are high in the electronic media, where everything can be stored and monitored. Introducing feedback mechanisms implies risk of non-intended convergence overruling all divergences. Personalisation faces the risk of both over-individualisation and over-socialisation. Interpretations of who you are, what you are looking for and when you want to find something must be supplemented by tools, identifying who you are *not*, what you are *not* looking for, and when you do *not* want something to be found.

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