

**Searching and Selecting. If Google Is the Answer, What Was the Question?**

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“Search is the watchword of the information age.” (Stark 2009: 1)

## Introduction

Recently, a flood of literature on Google and search machines has been published, highlighting their importance for the contemporary world (for a good start, see Becker 2010). One tenor of this literature is that Google has become one of the biggest firms with one of the most intriguing business models today (Auletta 2009; Battelle 2005; Lowe 2009; Vise 2005). But why is this of interest, apart from the economic fact that Google is a big firm with a near monopoly? Several authors claim that Google changes the way we conceive of information (Battelle 2005; Halavais 2009; Specter 2000; Stross 2008; Vaidhyathan 2011), and, in a more pessimistic formulation, poses even a danger for our knowledge and will make us collectively “stupid” (Carr 2008; Ichbiah 2007; Jeanneney 2007). The underlying assumption is that Google and the Internet completely redefine how we search. However, in none of these books we find an analysis of what searching was before Google. The authors simply assume that Google represents a revolution compared to an undefined and now superfluous earlier form of searching.

The historian of technology David Gugerli has made a remarkable first step to identify some non-Internet based search machines that led to Google (Gugerli 2009a). Seen from this viewpoint Google is foremost a search *technology*. This implies a history of search *machines*, implying that search before Google was also machine-based and an object, if only a Butler (Krajewski 2010). But this unnecessarily restricts the view to a particular type of machine, and to a particular set of searches that people do.<sup>1</sup> This discourse understands information as academic, explicit and written knowledge. But people and organisations search for many other things:

products to buy, partners to mate, politicians to elect, know-how for everyday tasks, and new knowledge or objects that do not yet exist.

In social theory, the rise of search machines has triggered little interest. Sociological theorizations of the Internet and of information society tend to focus on the changes induced by the internet to the form and mostly the stratification of societies, on the relationship of hierarchies and networks and of the various uses that people make of the Internet and computers (Golumbia 2009; Dijk 2000; Mansell 2009; Tredinnick 2008; Castells 2009; Cavanagh 2007). The existing literature on general search is written from the viewpoint of information and library sciences and focuses on best ways to search, rather than showing an interest in searching as a general social process (for an overview: Baeza-Yates 2011; Case 2008).

David Stark is probably the only social theorist, who has attempted to theorize searching in more general terms. For him, searching is a key concept for organizational theory, because it is “the watchword of the information age” that “best exemplifies the challenges of contemporary organizations” (Stark 2009: 1). Stark has also pointed out that the focus on search machines is too narrow, because their search results “are of precisely the wrong kind to answer the more fundamental problems confronting organizations today” (Stark 2009: 1). However, Stark concentrates on a theory of contemporary organizations and the problem of innovation. His focus is on the distinction between what Guha et al. call navigational searches, where people know what they are looking for, and research searches, where they are looking for the unknown (Guha, McCool and Miller 2003; Stark 2009: 166-183). This is an important distinction, and I return to it later, but it is only a first step, if we want to explore more seriously Stark’s contention that “search is a fundamental human activity” (Stark 2009: 169). To do so, we need a more fine-grained and more general theory that transcends the specific problems of contemporary organizations.

This article is thus an attempt to develop a general socio-theoretical vocabulary to describe search procedures and their historical changes. This theory must be general enough not only to describe search machines, but also other search procedures. It must also be specific enough, most notably with respect to a theory of technology, to understand the difference between different search machines, and between search machines and other search procedures.

We can then start to ask: How do people and organisations search? What do they search for? When do they search? Why do they search? What are the instruments and technologies for searching? How and why do search practices differ and change in history and in different places? How are search practices learned and adapted across fields, times and contexts?

The theory of searching and selecting is a first attempt to develop a general theoretical language that can describe such varying search and selection procedures in different contexts and to therefore allow thick descriptions of search procedures among different times and places and different technical environments.

I start by elaborating a general framework to analyze searching and selecting procedures. This framework allows then to analyze both the technization but also the de-technization of search procedures. Second, I show that historically, unlike what the discourse on search machines stipulates, we do not only witness a permanent technization of search and selection procedures, but also its opposite, which I describe as a turn to indeterminate search and selection procedures. I demonstrate this turn with cases from four cases central to sociological analyses, such as the arts (aleatoric compositions), organizational decision-making, epistemology (Feyerabend's philosophy of science), and love (speed dating).

## **Towards a Theory of Searching**

To develop a theory of searching and selecting requires first to understand what these procedures are, and what a search machine is. In "Search Machines. The World as Database" David Gugerli

has undertaken an important step towards such a theorization (Gugerli 2009a).<sup>2</sup> His important contribution consists in defining search machines in broader terms than mere Internet search machines. In his book, he discusses four case studies from the 1950ies-1970ies as examples of precursors of search machines: First, dragnet investigation by the German police in the 1970ies; second, a TV-show called “Was bin ich?” (“What am I?”), where celebrity participants have to guess occupations of strangers; third, another TV-show with the name “Aktenzeichen XY” (“file number XY”), where the audience helps to find suspected criminals; and fourth, relational databases as invented by Edgar F. Codd. Based on these examples, Gugerli defines a search machine as a machine with the following qualities (Gugerli 2009a: 15):

1. It searches for goals that can be named (i.e.: “search for a man with a hat”, rather than: “search for this guy who knocked me down, but I can’t really explain how he looked like”).
2. It looks in a defined space of addresses (i.e.: “search among all persons with a French passport”, rather than: “Search among those who could have been nearby, when I was knocked down”).
3. It follows a strict routine („program“), which renders search machines inherently „open-ended“ (i.e.: Search for the first match in a database, start with the beginning of the alphabet and then go letter by letter until you end at Z”. Rather than: “Take the first database entry that you encounter”).<sup>3</sup>

The definition is already helpful, because it steers away from the narrow focus on Internet search. Importantly, it allows making a distinction between searches with search machines and those without search machines. It allows to define search ex-negativo and to define analogue searches. Furthermore it allows writing a history of the technization of search procedures and the changes in search procedures because of different search technologies.

A search then is simply an interaction between a search body and the world, in which the search body screens the world (or parts thereof), to obtain an object the search body does not yet possess or know about. The search body can be a human, but also an animal, a robot or an organisation. The world consists of anything, both material objects as well as data or information (i.e., one can search for a lemon, but also the information where lemons grow).

What Gugerli omits is the fact that searching alone is only half the cake. A search usually immediately leads to a selecting operation, because it most often returns more than one item. This is true in all his examples, and we need to theorize this further. But we now have a framework for defining search/selection patterns (thereafter abbreviated as s/s patterns). We can attempt to outline a general theory of s/s. To do so, we have to go a little bit more into the details of the above three categories, search object, search space, search procedure and selection procedure.

## **The Search Situation**

Each search is constituted by a search situation. A search situation is a kind of interaction and not an intention of an actor. A search situation is any situation in which an actor (which can be a non-human such as an animal, a robot or an organisation) switches to a register in which the interaction is directed towards obtaining a search object. A search situation is thus defined by the relationship between a search body and a search object, mediated by an s/s procedure, that often contains a search machine (and a selection machine). The coupling of search body and object starts a search situation and it is ended by selecting an object. The selected object then gets attributed the state that it was searched and selected for – a politician is assigned mayor, a fact is declared a truth, a person is declared lover or spouse – and the s/s situation ends. A search situation can obviously comprise single individuals and a single object, but it can also be a vast actor-network of persons and objects, as for example in Gugerli's example of “Aktenzeichen

XY”, or elections, where hundreds of experts, politicians, spin doctors and very complex technologies are involved (Carson 2001).

## 1. Object

Once a search has been instantiated, a search goal or a search object is selected. We can differentiate three *kinds of search*. I build here on Gugerli’s assumption that search machines always have defined search objects, which I would like to dispute. Guha et. al. have introduced for the context of Internet search machines the distinction between “*navigational* search” and “*research* search” (Guha, McCool and Miller 2003). In navigational search, the existence and the address of the object is known ahead and the search only consists in finding this object. In contrast, in research search the object is not known.

An example for a navigational search is when one searches for Dan Browns “Da Vinci Code” on the Amazon site. This search is navigational because the search body already knows that this book should be on the Amazon site and the search basically consists in a more or less speedy way to get there. Other examples for navigational searches are searches for lost keys or all the examples in Gugerli’s book. For example in “Aktenzeichen XY” the police must be able to describe the criminals that they are searching, otherwise the TV-audience cannot help finding them.

However, if Gugerli defines search machines as relying on a defined search object, he excludes current and future internet “search machines” by definition. For, Guha et al. proposed the notion of *research* search in the context of developing semantic search machines for the Internet.

Semantic search machines are search machines that can “understand” a natural language input. Research searches are search procedures where a user “intended to denote an object about which the user is trying to gather/research in- formation. There is no particular document which the user knows about that s/he is trying to get to” (Guha, McCool and Miller 2003: 702). Here, only a vague description of an object is known, but no address. This is for example the case, when I

try to find a “beautiful sofa” or a “thrilling movie” or if a firm tries to find a new employee. In this case, the search body only has a vague idea what it is looking for, and the search is likely to produce surprises. I might find out that the kind of sofa I am imagining does not exist, that other people judge movies thrilling that I find boring or that all the possibly good employees do not want to work for the wage the firm is offering. Current Internet search machines are still not very good at doing research searches, but they do not completely fail.

Both of these kinds of search can be conducted with an Internet search machine. If a theory of searching should be sufficiently general to accommodate all search procedures in society, then we need to add a third type of search, namely what I would like to call *productive* searches. Here, the existence of the search object itself is unknown and the search object is made to exist only with the help of the search procedure. This is typically the case in scientific research or the arts, and it is the kind of search that David Stark focuses on (Stark 2009: 163 ff.). The term “productive” implies that without a given search procedure, the search object would never be found or not even exist. The search object depends on the search procedure and is a result of it. In contrast, both in navigational and in research search, the search object pre-exists independently of the search procedure and has probably been found by other search bodies with similar or different search procedures.

Typically, navigational and research search is *proscriptive* in the sense that the search procedures for both of them can be (but must not be) pre-defined. For an Internet search machine, the search procedure needs to be predefined to work. Otherwise the search machine cannot search. Productive searches on the other hand are usually *descriptive*. One cannot precisely describe how a new planet is to be found. Rather, one can only describe it after one has found a new star. The correct search procedure how to find a star emerges along with the search object. As long as a scientist has not found a new star, she does not know whether her search procedures are the right ones. Only once a star has been found, the search procedure for having found this star can



be described.<sup>4</sup> Google cannot find a new planet, because it can only find what it already knows of, it is proscriptive.

Obviously it is not always possible to neatly define a search situation as navigational or research search. For example, somebody looking for a partner might have a very precise idea – as can be witnessed by reading partner ads: size, ethnicity, hobbies, profession, income etc. – for whom she is looking, but she may also have no idea at all. Changing search procedures often have repercussions for the status of search objects. For example, the invention of said partner ads forces people who are looking for a partner to *define* their search objects and in predefined ways at that.

## 2. Search Space

Each s/s-procedure operates in a *search space*. A search space is not necessarily a physical space, but the aggregation of addresses in which a search takes place. An address is an identifier for an item that can be searched for. An address does not need to be well defined. For example a name such as “Peter” can be an address.<sup>5</sup> “Peter” is in many contexts a badly defined address, since there are many people and other objects (such as pets) called “Peter” in the world, and the address “Peter” contains no further help to select among the many Peters. A search space for a “Peter” can for example entail all first names in the world, or all males in Singapore, or all my friends and their friends. We can distinguish the following search spaces:

a) A *conceptual* search space is defined by a descriptive concept that aggregates addresses, including physical territories and language. A conceptual search space can be “France”, “all French citizens”, “all member of McDonalds” or “everybody with red hair”.

b) A *capability*-based search space is defined by the capabilities of the search body, rather than her rendering of the world. The most usual case is a language-based search space, since the capability to search is often bound to language use, including sociolects. Most obviously this matters when

searching with Internet search machines. I receive quite different results when entering the Italian word “pranzo” or the English word “lunch” even if they refer to the same thing.

Both *conceptual* and *capability* search spaces are foremost a product of the search body, and not necessarily an implementation of search aids into the world. They limit the search procedure, because the search body either voluntarily or involuntarily narrows down the items to be searched. The other two search spaces are much more results of rendering the world according to search needs and of previous search procedures.

c) A search space can be *tagged*, as is the case with the World Wide Web. In this case the addresses have stable tags, which order them according to predefined criteria. In the World Wide Web, words are tags themselves, because the Internet is searchable for words, whereas for example images are not tags and need to be tagged separately. Very often, tagging builds on *conceptual* search spaces. For example states routinely operate on their territory as *conceptual* search spaces and spend a lot of energy to tag the items on their territory, both citizens (Scott 1998: 64-71) and things such as roads, buildings (see: Tantner 2003). States enforce that people have first and last names and that each building has a street name and a house number. Tagging is an inherently political activity, since tagging has tremendous importance for search procedures. For example in state performed *conceptual* searches, some people are tagged, namely those who live legally in a given territory, whereas illegal migrants remain untagged, which omits them from official statistics, but also denies them access to social services.

d) A search space can be defined by a *trajectory*: In this case search space is defined or restricted by previous *selecting operations*, i.e. *path*-like selection procedures (see below). This is for example the case in scientific research, when one is working with data sets and methodological procedures established in previous s/s procedures. A search space based on a trajectory is also always organised. That is, the search body knows already some of the properties of the search space and

the addresses it contains, a feature that is usually absent from *capability*-based or *conceptual* search spaces.

e) Last, a search space can be *addressed*. Here the search space itself remains unknown, but it is defined by the description of the search object. An example for this is “Aktenzeichen XY”, where the wanted criminals are described and everybody who watches the show is assumed to search for them, assuming they could be anywhere. The addressing of the search space in “Aktenzeichen XY” is a direct reaction to the imperfect tagging of the search space. If every person in the world would need to carry a machine that would permanently indicate his or her whereabouts – as through the possibility to locate cell phones – then “Aktenzeichen XY” would be unnecessary. Similarly, when issuing a call for papers for a scientific conference, the search space is defined by the description of the papers sought, and not by knowing the universe of those who might respond to the call for papers. In an addressed search space, it is not necessary to have tagged search objects, since the search itself describes the space.

Obviously, several of these search space definitions can apply to a given search. For example, a search for a lover can be both *conceptual (territorial)*, *capability* (language) and *trajectory* based, if I search for example with a word of mouth campaign within my closest friends, who all happen to live in Palermo and only speak Italian.

### **3. Search Procedure**

A search procedure is any procedure that produces *options* to *select* from. We can distinguish the following search procedures.

a) *Immediate* search procedures work by reducing the procedure to something outside the powers of search bodies. For example, this can be the case when asking an oracle or a divine entity, but also when using randomisation procedures. *Immediate* search procedures produce the most unexpected results, because they are (supposedly) free from societal influences and interests,

which make them preferred in some situations, but also prone to critique in others. In the second part of the article, I will look at a various immediate search procedures.

b) An *authoritarian* search procedure is a search procedure where the search body produces a finite number of options without further recourse to due process except that the search body ascribes or is ascribed the power to propose. This is for example the case when a firm searches a new CEO and the board of directors simply gives a choice of two that were selected from their own employees.

c) A *call* is a search procedure where the search body relies on the search object to answer to the search. In a call the search body issues a statement of search to a public. A call is therefore dependent on other actors to assist in a search. Typical examples are calls for papers for scientific conferences or calls for job candidates.

These search procedures share that they are not influenced by previous events. Neither for a call, an authoritarian or an immediate procedure does it matter what results previous search procedures produced. I can issue a call for papers, and the result of the call is in no way limited by who has previously attended a conference that I organised. The fourth search procedure is different in this respect.

d) A *path* is a search procedure where the search object results from following a previous s/s procedure already accomplished. A path procedure contains elements to create *and* limit options at the same time and both, the limits and the newly created options are part of a track of previous s/s patterns. This is most often the case in *productive* searches such as in scientific research or art. “Thought styles” (Fleck 1935) or “paradigms” in Thomas Kuhns later parlance, accepted methods and theories and artistic styles all depend on previous s/s patterns. New research builds on these thought styles, methods and theories and varies them to produce new results.

## 4. Selection Procedure

A selection procedure is a procedure that selects one or many objects from the results of the search. The first three selection procedures are the same as the respective search procedures:

- a) *Immediate* selection procedures produce results independently of the selection body. As in immediate search procedures, this can be either the case with randomisation or divine intervention.
- b) In *Authoritarian* selection procedures a selection body simply decides without further legitimisation or discussion. Obviously, in many everyday s/s procedures this is the case, for example when somebody selects a Yogurt from a shelf in a supermarket.
- c) *Path*-dependent selection procedures select based on historical previous selections. However, *path selection* procedures do not occur so much in science and the arts, but much more in other contexts. For example many authoritarian decisions are in fact path decisions, since they are taken according to previous decisions. Most people select the same Yogurt from the shelf, because they have always selected this Yogurt. Similarly, many voters vote for the same party as in the last elections, simply because they or even their family have always voted for this party.

While in science and the arts path-dependent search leads to new forms and insights, the selection procedures are almost always authoritarian. Scientists simply *know* which result to work with and artists simply *know* which sketch to use for elaboration and which one to destroy. The idea to select data according to a path is inimical in science and the arts and is rather seen as an obstacle in theories of both.

There are two more selection procedures, which do not exist for searching. While individual persons can – but need not – perform the first three selection procedures, the last two are group dependent by definition. They both reflect the problem that selection procedures, since they narrow down given choice, need to deal with divergences in taste, knowledge and status between

selecting persons – much more so than search procedures that open up these selections in the first place.

d) In *vote* a defined group of selectors vote between different search results. The obvious example is political elections, but vote happens in many other contexts too.<sup>6</sup> For example, a group of friends may vote where to go for a day out, a club may vote on whether to take on new members, a family may held a vote on which car to buy etc. In its purest form, a vote discards arguments in favour of proportional power in the decision making process of the members. As *immediate* and *authoritarian* procedures and unlike *path* procedures a *vote* procedure is in principle independent of a previous s/s procedures.

e) The last selection procedure is *discussion*. Here a selection is made after a group of persons weighs the options against each other. Clearly, often *discussion* simply precedes *votes*, but sometimes *discussions* simply converge on a selection. In many everyday cases it seems it is in an ad-hoc fashion decided whether discussion suffice or a vote is needed.

The theoretical disaggregation of s/s into two different procedures allows a very fine-grained discussion and comparison of s/s procedures. It allows comparing many at first sight unrelated s/s procedures and it allows analysing them in great detail. In theory, but also in reality, s/s procedures can be combined in any way. It should also be apparent that for a given search object different search procedures could be selected with different effects. For example, to search for a partner any of these s/s procedures can be employed. In an *immediate* search one can ask an oracle (She loves me, she loves me not) for whom to marry. Arranged marriages are examples for authoritarian search, while putting up an ad in the New York Review of Books is an example for a call. To decide to marry a friend of my deceased spouse for example would be a case of *path*. Similarly, the selection procedure (If someone can't decide) for a partner can be *immediate* (tossing a coin), *authoritarian* (just taking a decision), *path*-dependent (selecting as ones parents already had selected, for example according to religion or ethnicity), a *vote* (among ones friends), or discussion

(again among ones friends). In fact, the categorization proposed herewith allows many insightful historical and cross-cultural studies of such variations in search procedures.

## Historical Shifts of Search Procedures

We can now derive a framework for comparative and historical analysis. The search machine literature amounts to the thesis that search practices have historically become ever more technologized. Accordingly, on all levels, from search object, search space to search procedure (and even selection procedure, although this is rarely addressed) a shift occurred from the less well defined to the better defined. More precisely, search procedures shift from *authoritarian* to *path* and *call* procedures and search space shifts from *conceptual* (mostly *territorial*) to *tagged* and *addressed*.

The examples in Gugerli's book are proof of such a shift towards defining search spaces, search objects and search procedures. For example "wer bin ich" attempted to identify persons with occupations – rather than with political views or kinship, thereby narrowing the search space. For Gugerli, this is proof of the modernisation of the German state after the war. Similarly, relational databases, Aktenzeichen XY and Horst Herold's dragnet investigations were complex attempts to define addresses, restrict search spaces and test varying search procedures. In this sense the apotheosis of these precursors are today's Internet search machines.

Historically, the enormous change that Google represents is not that its algorithm is better than the one of its competitors. This is the source of the relative success of the business and the wealth of its founders (Auletta 2009; Battelle 2005). Far more important is that the Internet is an incredible apparatus to attach *defined addresses* to objects and thus completely uncouple searching from a *conceptual* (*territorial*) search space and to invent a search technology that allows *path* procedures to operate almost instantaneously in this enormous space of tags. The first important inventions were not search machines, but the invention of the Internet address protocols TCP and IP, because they allowed giving computers a defined address (Post 2009). The second and

most central invention is not a single invention, but the process of the ever-increasing attachment of offline things and persons to internet addresses. This allows for understanding Internet addresses as substitutes for things in the non-Internet world and to render “everything searchable” (Brewer 2001). The central invention of Internet-shopping is basically to attribute each product its own address, so that a search body can directly find and buy a lemon rather than finding a store that might stock lemons. The next step, already used for example by mailing and logistics firms is to attach each *physical* lemon an address and make it traceable, all the way from field into the supermarket, to the dinner table and finally to the rubbish bin.

What Google has brought to the world is primarily that each object gets an address and is tagged and that the search space has widened for most searches to be either global or merely *language* restricted. This has gone so far that many searches that would have been naturally *territorial* or *trajectory* based – such as those for a partner, an employee or shopping goods – are now merely tagged. Because this is so, they need to be artificially reterritorialized (Kellerman 2002). Territory becomes itself a tag. For example when searching for a flat on the Internet, or when looking for a partner, a reterritorialization of the search is needed, because it is equally easy to find a new flat or a new partner on the other half of the globe as next door. Thus the respective websites allow restricting search by address.

### **Indeterminacy: On Widening Search Procedures**

The literature on search machines is misleading, because it only looks at Internet search machines and what appear to be their precursors. This is a teleological history, with history converging in an endpoint called Google. But the narrowing of search procedures is not simply a unidirectional process. The goal of all the search machines that Gugerli describes is to enhance the precision of search goals, narrow down search space and rationalize search procedures. What this perspective omits, is that between the 1950ies and -70ies, at the same time as these early search machines



were invented, a variety of s/s procedures were tried out with the goal to overcome the narrowing of s/s procedures through search machines.

Let me thus look at the invention and rise of some s/s procedures at that time. The discussion of the following examples serves to prove the usefulness and the descriptive power of a general theory of searching and to correct the narrow assumption of a general technisation of search procedures. These are only brief examples to show the range of the theory and cannot replace more detailed empirical studies. The examples also show that a variety of practices in seemingly unconnected fields can be shown to relate to similar developments based in a cultural history of s/s procedures. The examples I discuss represent a variety of social fields and different kinds of s/s procedures: aleatoric art as represented by John Cage's compositions, group decision making with the I-Ching, the philosophy of science of Paul Feyerabend and key parties and speed dating. The term "indeterminacy" is a key to understand these examples (Savage 1989).

The indeterminist reaction against search machines is a reaction to the perceived teleology of existing s/s procedures. From the viewpoint of indeterminist s/s regimes, the existing s/s procedures became more and more restricted, by narrowing search types down to *navigational* and thus *proscriptive* searches, by relying on *paths* and *calls* for s/s procedures, and by increasingly *tagging* search space. This resulted in a higher precision of search procedures at the expense of defining the world in ever more depth. The proponents of indeterminist search procedures however can be described as trying to find ways to un-define the world and thus to create surprises. They attempted to turn searches into *productive* and thus *descriptive* rather than *proscriptive* searches. However, contrary to expectations, in many ways this was not an anti-technological stance in the sense that they wanted to search without the aid of objects. Rather, they tried to invent objects and procedures that render searching more indeterminate.

## Aleatoric Compositions

After a first period in classical modernism (Gertrude Stein, André Breton, Kurt Schwitters), aleatorics became widespread in the arts since the 1950ies, for example in the compositional techniques of John Cage, various Fluxus artists who followed him, in the cut-up poetry of William Burroughs and others, and in the works of the Oulipo group around Raymond Queneau. Let me discuss John Cage as one representative example:

John Cage became famous in the early 1950ies when he started to use randomisation tools, mostly the Chinese I-Ching, to select the notes. Therewith he departed from the notion of a composer as an inspired person that would compose by selecting notes according to some composition theory or some stylistic rules. John Cage used the I-Ching for the first time in 1951 for the composition “Music for Changes” (Savage 1989: 113-128; Schulze 2000: 153-178; Cage 2007). The I-Ching consists of 64 sets of six lines. The lines contradict each other so that each new throw of the lines results in new predictions. As applied to composition, the I-Ching worked as a randomisation instrument. Cage threw the I-Ching and then selected notes according to the results. Further than just defining the notes with the I-Ching, Cage also left all the other usual determinants in compositions, such as duration, speed, loudness and mood at the whim of the performer. The result was unlike anything that has ever been composed, exactly because it was not a composition in the traditional sense, but the result of a randomisation instrument. Savage sums the technique up as: “The emergence of indeterminate processes *per se* is fundamental to Cage's programme; in the transition away from the use of indeterminate techniques as a means of overturning such [rational structural] schemata, his methods seem to progress beyond the original opposition (Savage 1989: 129).”

In the language of s/s previous compositional techniques mostly relied on *path* as a search procedure and *authoritarian* selection procedures. A composer would select notes based on historical rules of composition and a sequential logic of ordering the notes. John Cage shifted

“composition” into a realm where the notes were searched (and even selected) with *immediate* procedures from a narrowly defined search space. Furthermore, some of the selection procedures were even moved away from the composer to the performer, who needed to decide on them in an *authoritative* way.<sup>7</sup> Both steps not only radically redefined how “music” can sound, they also completely redefined who “composed” the music. Cage shifted it first into the hands of a randomisation instrument and second, equally unusual in classical music, into the hands of the performer. Only by shifting the power away from the composer, indeterminacy could guarantee “compositions” as unexpected as they could be.

### **Decision Making with the I-Ching**

If the arts seem to be a minor field of society, the very same techniques were used in a field much closer to the heart of sociology, namely organizational decision-making. As Boltanski and Chiapello have observed, in the 1970ies a new, artistic critique of capitalism emerged (Boltanski 2005). Other than the previous critique of capitalism that challenged capitalism on grounds of inequality, the artistic critique of capitalism posited that capitalism suppressed creativity and spontaneity. As Boltanski and Chiapello observe, this critique was absorbed by capitalism itself, by championing networks and creative ideas over hierarchy in management discourses. The artistic model not only reflects a shift away from hierarchical styles of management to networks, but also represents a shift in techniques for searching and selecting decisions. This shift can be traced again with the I-Ching. The I-Ching was employed in the 1960ies as a decision making tool by small groups of freaks, only to then become a staple of business literature two decades later.

As Fred Turner points out in “From Counterculture to Cyberculture” (Turner 2006), a direct line links the 1960s west-coast counterculture through the network of Stewart Brands “Whole Earth Catalog” to the liberal ideology of the cyberculture-scene of the 1990ies. One key figure in that group was Ken Kesey, the author of “One Flew Over the Cuckoo’s Nest”, who founded in 1964

a loose counter-cultural group called “the merry pranksters”. As Turner details, one of the innovations of the pranksters consisted in trying to find ways of dealing with the problem of authority in groups. They tried to move away from what they considered “excessive party politics practised by the American government” and make group decisions less dependent on strong individuals (Turner 2006: 65). Rather than turning to voting, the group turned to objects to produce indeterminist decisions.

“One of the devices was a simple spinner. The Pranksters regularly played a game in which a number of them would sit in a circle. Someone would spin the spinner, and whoever it pointed to would then have full power over the group for the next thirty minutes. Another tool they used was the *I-Ching*. When important decisions loomed, Kesey and others—like hippies everywhere in the coming years—would throw a set of coins, find a correlated bit of text in the book, and use it as the basis for taking action. The spinner and the *I-Ching* did serve to take power out of the hands of designated leaders. If the former turned group members into followers, it did so only temporarily, and only with the members' consent. “ (Turner 2006: 65).

The I-Ching became thus a tool to search for new forms of decision-making. Again, as in aleatoric composition, previous ways of s/s were considered to be inadequate, leading to the same predictable results. Ironically, these previous forms of s/s were the established democratic forms. As Turner observes, the use of the I-Ching served to “reassign [power] to devices” and in fact masked the “the very real and centralized leadership Kesey was exerting” (Turner 2006: 65).

But the story does not end here. Already in the “Last Whole Earth Catalogue”, the I-Ching, as coda and last entry in the book, was celebrated as *the* generalized tool “that profoundly served the generation that emitted the original whole earth catalog”: “Everyone from then has I Ching stories” (Brand 1980: 593). This was but a first step of a tool that was invented as a means to distribute power in small groups of freaks to become two decades later, along with a general surge in interest in Eastern forms of spirituality, a tool for decision-making in business. Books

such as Michael Colmers “Executive I Ching : The Business Oracle” from 1987 (Colmer 1987) or Cleary and Cheng’s “I Ching, the Tao of Organization” (Cheng 1988) or more recently William Sadlers “The I Ching of Management : An Age Old Study for New Age Managers” (Sadler 1996) all use the I-Ching for business decision advice.

For a theory of s/s, their central feature is that they render decision making indeterminate and thus allow to react to quickly changing, unpredictable environments, problems that could not be solved by the classical techniques of business knowledge, such as rational decision making. The shift from Kesey to the business literature obviously changed the object at stake: The merry pranksters tried to take away decisions from specific decision-makers, while the business advice authors tried to improve the decisions by managers, without redistributing power. The search body did not change, but what the I-Ching accomplished was to change searching for decisions by adding an element of chance, that was not available with previous decision-making techniques.

### **Philosophy of Science as Description**

A third indeterminist search strategy is the philosophy of science developed by Paul Feyerabend in his book “Against Method” (Feyerabend 1975). Originally devised as a controversy between Feyerabend and his friend Imre Lakatos (Lakatos 1999), “Against Method” appeared as a monograph after Lakatos’ unexpected death in 1974. The debate between Lakatos and Feyerabend was a crucial moment in the history of philosophy of science and one of the births of the new sociology and history of science.<sup>8</sup> The central thesis of Feyerabend was an attack on Lakatos and other Popperians’ attempt to write a *proscriptive* philosophy of science. Lakatos held that philosophy of science should posit criteria of rationality as arbiters for which research programmes should be pursued. Lakatos, as many other philosophers of science, firmly believed that philosophy of science can create standards or rules of method by which to judge science. In my terminology, Lakatos held that science is a type of *navigational* search and this implies, a *prescriptive* kind of search, where, given the correct, rational search procedures, the truth about the

world would eventually be found. Since science is *navigational* and *prescriptive*, the rationality of search procedures could be judged – by philosophers – *before* research is undertaken.

Feyerabend's contribution to this debate consisted in a sceptical deconstruction of the proscriptive claims of philosophy of science. He wondered whether in history scientists had ever followed the rational rules of methods that the philosophers of science claimed as the hallmarks of science. He came to the conclusion that scientists actually operated mostly by trial and error, that many important inventions were based on luck and accidents and that the rules of method were only applied afterwards to celebrate the scientists achievements.

Read from a s/s perspective his contribution consisted in a radical step to deny that science is *navigational* and thus to deny any *proscriptive* possibilities of the philosophy of science. He insisted that the s/s procedures of science can only be described after the fact. Science, in his view, is a form of *productive* search and can thus only be *described* after the fact. "Anything goes", the famous slogan of his book, then was not so much another, although "anarchistic" proscription, but the admission that science is based on *path* search procedures and *authoritarian* selection procedures that are developed on the spot by scientists themselves without following whatever proscriptive theories philosophy of science might hold. Other than the inventions based on the I-Ching, the goal for Feyerabend did not consist of inventing a new method based on chance for science. For Feyerabend, science empirically already operated along chance procedures. What he was after, was freeing the sciences from the rationalizing descriptions other philosophers had invented.

With the computerization of research the question whether science operates on prescriptive rules has resurfaced. The philosopher Peter Slezak started a debate about whether computers based on artificial intelligence are able to make scientific discoveries (Slezak 1989). For Slezak, discoveries by computers would refute the strong programme and the historicist post-Feyerabend consensus of contemporary Science and Technology Studies. If computer programmes can discover natural laws upon running an algorithm on a dataset, then either science would not be descriptive but

proscriptive – or computers would be able to mimic social behaviour that is only descriptive, not proscriptive. For the defenders of a sociology of science the former would destroy the claims of STS and the latter would destroy “any idea of a social science which takes social collectivities as the primary unit of analysis (Collins 1989: 617).” While Feyerabend opened up a new form of description for the search operations of science, Slezak raises the question, to which search body these descriptions apply.

## **Key Parties and Speed Dating**

While the history and anthropology of partner search would require a whole separate book to be written as a central locus of changing s/s procedures, I would like to close with pointing out that recent inventions for searching a partner again are based on indeterminacy. Partner search is different from the other search procedures described so far, because it is symmetrical. Partner search consists of two s/s bodies that have to agree in their s/s procedures to be successful. This is why partner search has historically produced such an amazing variety of complex s/s technologies.

Partner search is usually based on a *conceptual* and most often *territorial* search space. In various cultures, the institution of matchmakers has helped to expand search space, and introduced an element of tagging (“I am looking for a handsome and wealthy man from a good Indian family for my daughter”). Classifieds in newspapers, marriage bureaux and later classifieds in the Internet have expanded search space further and resulted in further tagging (for an overview see: Mullan 1984). The effect of classifieds however is a highly generic description of persons (Coupland 1996; Hardey 2004). While classifieds extend the search space in *territorial* terms, they narrow it down in *conceptual* terms. Tagging means that only those persons, who have given, describable features are ever met. This has the disadvantage that central features of a person are difficult to tag and are only accessible through face-to-face interaction. Classifieds are perfect early search machines in Gugerli’s terms. They are both logically and conceptually a mixture of

“Wer bin ich?”, namely a self-categorization according to a small set of descriptive variables (age, size, ethnicity, hobbies, profession) and dragnet search, namely a database-backed selection according to these tags.

But again, a variety of s/s inventions has since attempted to both restrict search space, while at the same time adding an indeterminist element to increase “success”. First, partner search itself was reconfigured as the indeterminist practice per se (though along historical precursors that stressed the unpredictability and transcendence of sex, such as for example Arthur Schnitzler’s “Reigen”/”La Ronde”). Charles Jencks in his important book “Ad-hocism” pointed to “ad hoc games” with “exploratory purposes” among which he prominently mentioned “the get-together dance” and the “computer dating system” (Jencks 1973: 193) and he called “sex [as] *the* mode of social adhocism” (Jencks 1973: 197).

More specifically, in the 1970ies, key parties were held as a form of exchanging sex partners (Bell 1971: 74). As shown in a famous scene of the Ang Lee movie “the Ice Storm”, in a key party, the males of arriving couples would place their car keys into a bowl on arrival. At the end of the evening, the females would randomly select a car key from the bowl and leave (and potentially have sex) with the owner of the key. Key parties operate on three levels: they first radically restrict the search space to those who agree on specific sex practices. Second, by having the males place the car keys into a bowl, the heterosexual symmetry is achieved. Only these two steps that guarantee symmetry allow to introduce indeterminacy: Taking out keys from the bowl assigns randomly who leaves with whom.

Speed dating, a recent invention, introduces indeterminacy for different effects: Rabbi Yaacov Deyo invented it in 1998 (Porter Brown 2003; SpeedDating 2010b). The idea behind speed dating was to allow (Jewish) individuals who are looking for a partner to meet many others in the same situation. Speed Dating is based on seven short meetings with seven different individuals each seven minutes long in one room. After each meeting, the participants write down on a note



if they are interested to meet the person again. The organisers of the speed-dating event then check for matches and hand out contact addresses for those where both signalled further interest.

Speed dating is the indeterminist answer to the widening of search space cum tagging. It narrows down the *territorial* search space, but opens up the *conceptual* search space and combines it with the central resource for dating, namely face-to-face meetings. Similarly to I-Ching, it introduces a very simple device, namely a room with tables and a subscription service to solve the problem generated by tagging. Speed Dating gains its attraction from the fact that the other in dating is *randomly* selected from a defined search space (a given area) and one tag (being Jewish, in the original version). It selects only two search criteria, a territorial and a religious one, which are central for the participants, but it denies any further tagging. The “rules & recommendations” of Speed dating even mentions that participants should *not* talk about each other’s profession, and instead recommends: “Have a fresh conversation. How about your favourite book or movie? Where you last went on vacation or how your life would change if you won the lottery” (SpeedDating 2010a). The rules thus explicitly encourage the participants to use speed dating to explore non-taggable parts of their life, by assuming that love or a partnership does not so much depend on them. A more recent and more radical form are the random interactions with video-chat called ‘Chatroulette’ (Chatroulette 2010). Again, the goal of Chatroulette is to widen the interaction space ad infinitum, by randomly selecting a person to chat with, except that here, the internet itself operates as indeterminist search machine.

## **Indeterminist Searches**

These four small vignettes point out a larger phenomenon: while search machinisation has clearly been an important cultural trend of the last forty years or so, with the world becoming more and more a *tagged* space in which search machines of all kinds operate, we can also observe a parallel, indeterminist trend: in science and the arts, but also in organizational decision making and partner search, proscriptive search machines based on tagging appear too restrictive. Aleatoric

Music, the I-Ching in business, Feyerabend's philosophy of science and speed dating each in its own way are important inventions to widen search practices with other means than search machines. For the moment, they represent a first step at a more general picture of a history of s/s procedures.

The search space in many of these tools is now more restricted than before: In the model of the artistic genius, the search space was principally infinite. A painter can paint any form, and a composer can compose any sound. But in reality it was restricted through traditions and embodied routines. The tools to create the new forms, the I-Ching (Cage and decision making) or a room with chairs and rules for a game (speed-dating) restricted search space to a given number of notes or duration of tones or a number of participants on a speed dating evening. But doing so allowed to widen the search goals: Instead of falling back into the always same routines, new, never before existing experiences, decisions and sounds were created.

The changes implied not only a shift from an infinite search space defined by artistic genius to a restricted search space defined by tools. It also came with a change in the role of the search subject. Whereas the artist in the previous model was considered to follow his own thoughts, his inner feelings or a tradition, the new indeterminist model deleted all these emotions and the role of the artist's body and replaced it with a tool. While the role of the scientist in the earlier philosophy of science made him into a tool for objectivity, a machine that executed the rules of science, already knowing what he was looking for, with Feyerabend, the scientist became an anarchist, freed from any rules. While the role of the organizational leader in rational decision-making was restricted by Fordist rules of rationalizing the factory, the I-Ching shifted her role towards "innovation." The subject searching for a partner was either a passive subject, who was handed a partner by relatives or a match-maker. Or she advertised herself using pre-defined tags and thus turned herself and her search objects into pre-defined sets of categories. With speed-dating she became a quickly reacting, interactionally savvy individual.

In this regard, the new indeterminist forms mirror the new computerised search of dragnet investigation. In dragnet investigation, the skills of the individual police officers were replaced by sifting through piles of data with the help of computers. Similarly the search space was now clearly defined and persons were replaced by algorithms as search agents. What differentiates the indeterminist model is that it looks like a parody of dragnet investigation. The replacement of persons, the exclusion of emotions, the invention of new procedures to get where no one has been before is not legitimated with more “rational” search results, but the opposite.

Indeterminate s/s procedures do not advertise themselves with that you get what you were looking for, but that you get what you were *not* looking for. Indeterminate search procedures do not derive their strength from a legitimating force such as reason or beauty, but unexpectedness. Previous methods produced too predictive results; the new indeterminate tools produce new ones, because they could never have been foreseen.

### **Conclusion: Towards a Comparative Analysis of Search Procedures**

In this article I have outlined first steps towards a history of search procedures. I started with the observation that Google has been an object of scholarly investigation, but scholars rarely asked what Google actually replaced. The important exception is Gugerli's generalized definition of search machines as having a search goal, a search space and a search routine. From there I developed a first generalized theory of search procedures by specifying different types of search objects, search spaces, and search and selection procedures. I then used this framework to show that technologization of search procedures, as seems to happen through Google and the examples given by Gugerli is but one historic trend that is counteracted by what I call indeterminate search procedures.

This is nothing but a first step and I would like to point at some further avenues opened up for research. First, we need detailed historical studies of how and why search procedures change in different fields or functional systems. Science and Technology Studies has, under very different

theoretical language done this for science over the past twenty years or so.<sup>9</sup> But we do not have such histories for many other fields. Second, one could study how different search procedures travel from one field and one activity to another. I described the indeterminate search procedures above as unrelated to each other. However, if the historical diagnosis is correct, then indeterminate search procedures were probably learnt and taken up between these different fields.

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<sup>1</sup> Similarly to Gugerli's history, a symposium in Vienna under the title "Before Google" discussed older search technologies for (academic) resources, texts and papers (Tantner 2009). Also see the articles of Robert Darnton, Paul Duguid and Katja Mayer in Becker (2010).

<sup>2</sup> An English excerpt of the book is Gugerli (2009b) and Deicke (2009) has written an insightful review in English.

<sup>3</sup> He adds a fourth point – closeness to game and simulation – but it is not necessary to the definition.

<sup>4</sup> See below the chapter on Feyerabend for an elaboration.



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<sup>5</sup> In the context of social systems theory, addresses and addressability have become prominent theoretical concepts that allow to theorize how things and persons are attached to each other and made communicable, see for example Fuchs (1997). Stichweh points out that in pre-modern societies person names were the only addresses and these also locate a person in a social structure – attach them to a family and put them in a social place. In modernity, a number of often incongruent addresses, such as car numbers, telephone numbers, street numbers, social security numbers, IP-adresses relate to persons, things and organisations and mostly do not indicate the social place of the person (Stichweh 2000; also see Scott 1998: 64-71).

<sup>6</sup> As far as I am aware of, there is very little empirical literature on everyday voting practices outside of the political realm. This is astonishing given the central place voting has in political theory. We largely do not know, when, how and why people take decisions by voting in small groups, in families, in schools and clubs. For a rare exception see Vree (1999).

<sup>7</sup> A few years later free improvisors abolished the function of the composer completely and s/s in music was left to performers. However, it soon turned out that this freedom in itself resulted in a style with its restrictions and repetitions. In the early 1980s John Zorn devised “game pieces” such as “Archery” or “Cobra” as a search machine that would overcome the restrictions of free improvisation without resorting to a composer (Zorn 2007). In these pieces the musicians themselves play according to “rules” that define speed, pitch, style etc. and as in sports, a referee controls that the rules are kept.

<sup>8</sup> An important precursor to Feyerabend, at least seen from the viewpoint of s/s is Robert King Merton with his concepts of “unintended consequences” (Robert K. Merton 1936) and “serendipity” (Robert King Merton 2004). But the former concept was not developed with regard to science and the second, although written in the 1950ies, was only published after Merton’s death in 2004. In *serendipity* Merton makes the general claim that most scientific discoveries are not planned, but happen accidentally (2004 chapter 9). *Serendipity* is an intellectual history and sociology of one specific anti-technological search procedure.

<sup>9</sup> Campbell has already developed a theory of science based on a theoretical vocabulary of selection (and searching) (Campbell 1988).