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Information seeking behaviour: what should a general theory look like?

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A general theory of information seeking behaviour must include an outline of an evolutionary theory of how organisms have adapted their cognitive apparatus to the demands raised in order to cope with their environments. It should describe important qualitative stages in this development and explain the teleological or goal-oriented nature of the behaviour of living organisms. Such a theory should define the essential characteristics in human information seeking, including a description of its cultural and social determinants. It should consider the costs and benefits of information seeking, and the social mechanisms influencing its value.

Further, such a theory should explain information neglecting and avoidance, the utilisation of different kinds of information resources, the strategies used, and their efficiency. A general theory should formulate what the essential, non-trivial factors are, which can be generalised from different domains, and which are affecting the efficiency of information seeking. Such factors are related to peoples' basic world-views and to their fundamental epistemological assumptions.

1. RELATIONS TO PSYCHOLOGY, 'THE SCIENCE OF BEHAVIOUR'

Psychology sometimes defines itself as 'the science of behaviour' this is the way psychology is defined in the behaviourist tradition (see example, J.B. Watson's famous programme article (1)). To the degree that this is a reasonable definition, psychology should be able to provide the theoretical foundation for a theory of information seeking behaviour. This can be taken even further by looking at some views of cognitive psychology. Cognitive psychology has been defined as:

... the field that investigates how people acquire knowledge, remember it, and put it to use to make decisions and solve problems (2, p. 182).

Another definition says:

Cognitive psychology deals with the way people collect, process and use information about the world around themselves (3, p. 3-4) [my translation].

This seems to be almost identical with the aim of studies of information seeking and use (INSU) in the field of information science, but I will try to argue, that a cognitivistic psychological view is too limited a way to look at INSU.

Psychology is a field dominated by conflicting approaches. Among these approaches are behaviourism, psychoanalysis, cognitivism, phenomenology, activity theory etc. They are different approaches to the mind and they look differently at human cognitive processes. Cognitive psychology is a part of psychology that is often confused with an approach in psychology called 'cognitivism' or 'information processing psychology', which is an approach in psychology dating from 1956. It is a part of an interdisciplinary trend called 'the cognitive sciences' (or 'the cognitive revolution') which again is closely related to Artificial Intelligence. Cognitivism may still be the dominant approach in psychology, but has in recent years left ground in favour of approaches related to social constructivism, hermeneutics and related philosophies. This is not the place to have a fully-fledged discussion of psychological theories. At this point, I will only raise the problem of 'realism'.

Living organisms can be seen as material systems that are genetically programmed to maintain and replicate themselves by engaging their worlds in goal-directed ways. This is, according to Bogdan (4, p. 1), 'the trick of life'. Living organisms have goals that must be satisfied, and for that, organisms must locate and identify their goals. Organisms must guide themselves to their goals. In order to do so organisms need behaviourally relevant information about their environment. Such information can be processed by the organism, data can be stored, problems solved and behaviour modified. In short: organisms do take cognisance of, and in the course of evolution, they develop cognitive mechanism (perception, memory, thinking, etc.) in order to adapt themselves to their environments. This is the point of view of evolutionary biology and psychology, and it represents a foundational view on information seeking behaviour. (Even if one may argue that animals process information in order to fulfil some goals, but that they are not (as human beings are (seeking information in its own right)). Do animals seek information or is such behaviour something that is only done by human beings? Behavioural experiments with rats have shown 'delayed responses' and 'latent learning' that demonstrate that the animals collect information about their environments in order to improve possible future actions. Also, one can argue that animals do disseminate information to other animals about sources of food or about dangers (e.g., bee dancing). Clearly if we define 'information' as recorded knowledge, information seeking must be considered a specific human form of behaviour. Independent of the definition of 'information', an evolutionary

perspective is, however, fundamental in order to put information seeking in the proper perspective.

Information is not in itself the basic motivation or the goal for 'the information seeking organism'. Food, sex partners or a safe place to reside could be the goal. Information is not normally an end in itself, just something that helps guide the organism to a goal. It is a pragmatic phenomenon in the sense that what is information for one organism need not be information for another. The same object may inform one organism about some kind of possible actions and another organism about other possible actions. The informativeness of an object is thus subjective in its dependence on the perceiving organism, its goals, cognitive apparatus, pre-existing knowledge, and its current state. The same object (and the same physical signals from that object) can mean 'enemy' and 'danger' to one organism while meaning 'food' or 'pleasure' to another.

In order to understand the basic principles of information-seeking behaviour one must understand how organisms have adapted psychologically to their environments. We must understand how organisms have developed their cognitive apparatus as specific instruments in order to cope with specific tasks and constraints, how the subjective part of the subject-object relation has developed historically and instrumentally as adaptations to specific environmental demands.

The Russian psychologist A. N. Leontyev (1903-1979) described the development of psychological functions ('the psyche' or 'the psychical') as a set of functions developed by higher animals in order to improve their adaptation to changing conditions of life. His theory is mostly known as *activity theory*. He distinguishes (5) five stages or levels from primitive organisms to Homo sapiens:

1. *The stage of irritability* is characteristic for the absorption of food particles through the surface of the body of one-celled animals. Leontyev does not see such behaviour as evidence of something psychical. (It is a pre-form of psychological behaviour).
2. *The stage of sensory psyche* can be exemplified by insects, birds, and fishes. It is characterised by ability of the organism to sense influences, but the animal cannot integrate different influences into a whole. Animals at this stage of development show stiff or rigid patterns of reactions, i.e. instinctive forms of behaviour. Leontyev sees this stage as psychical in its most primitive form.

2. *The stage of perceptual psyche* is first and foremost characterised by the perception of objects. The organism is now not just limited to sense and responds to sound, light, simple forms, etc., but perceives specific objects (e.g. flies). This allows much more flexible forms of behaviour directed towards that object.
3. *The stage of intellect* is associated with actions, which presuppose the use of tools. The organism is no longer solely dependent on its own body. This stage is found in man and chimpanzees.
4. *The stage of consciousness* is specifically human. According to the theory of Leontyev it is associated with language and societal production.

What is described here can be interpreted as a theory of the development of biological stages of information utilisation behaviour from more primitive, specific, and passive forms of sensing information towards more advanced, complex, flexible and active forms of information utilisation.

The theory is a *materialist-phylogenetic theory*. The materialistic aspects in this theory of stages is motivated by the view of the psychical as being something secondary compared to its environment. The subjective, consciousness, concepts, psychological processes and states, etc. are all seen as phenomena developed from the material world in order to improve higher animals' adaptation to their environment. Psychological phenomena cannot be understood without considering the environment and the challenges that face the organism. Subject and object are two interwoven parts, which can be understood as a historically developed relationship. From Leontyev's perspective psychical and subjective phenomena are naturalistic; they developed with birds, fishes and insects, and further through evolution. They are defined in the following way:

Psychical phenomena are properties by living, highly organised bodies. Basically, psychical properties consist of the ability to reflect the surrounding and independent existing reality in subjective experiences. The psychical appearances—sensations, imaginations, and concepts—are more or less exact and deep images of reality. Against the reflected primary and determining reality are they secondary products. (5).

We now have some idea about what is meant by 'realism' in this view of psychology. Let us now have a look at how an ordinary activity may be explained by psychology: Schultz (6, pp. 65+117) presents the following example:

Imagine a teller. What is she doing? Why does she now tell the money? Why does she now speak with that customer? Why does she now turn to a colleague and gives him a piece of paper?

How would different psychological approaches answer these questions? Psychoanalysis might try to explain the teller's behaviour by her unconscious conflicts which can be traced to early childhood experiences. Behaviourism might try to explain it by referring to reactions to stimuli and to learned behaviour. Cognitivism might try to explain her behaviour by analysing what kind of information processing goes on in her brain, and so on. The 'realistic' answer might be found in a detailed knowledge about the working organisation of the bank. Leontyev points out, that persons are not motivated by their biology, but by 'the structure of production' (5). It should be said, that although Schultz considers Leontyev as one of his two basic theoretical inspirations, he considers this cited view as being too much a sociological reductionism of psychology. The teller has certain personal ways of dealing with her job, and certain feelings towards it.)

The example about explaining the teller's behaviour is closely related to our problem in explaining information-seeking behaviour. Most psychological theories try to do this by referring to brain structures, cognitive structures or to personality structures. Such explanations are not 'realistic'. They do not explain, for example, a student's information-seeking behaviour with the organisation of the educational system and the need for students to pass their exams in order at a later point in time to fit into 'the structure of production'. Ordinary psychological theories tend to 'psychologize', disregarding the conditions in the environment (including the individuals' socialisation).

The only psychological theory strongly aiming at such a realistic explanation is *activity theory*, founded by Leontyev, which makes this an important psychological theory for our purpose. At the same time, however, it points also beyond psychology because it forces us to study the information seeking behaviour in the context of 'the structure of production'. It necessitates a study of how information sources are organised and of the societal functions of that organisation. It necessitates a multidisciplinary approach encompassing sociology, anthropology, semiotics, library and information science etc.

There is another important lesson from psychology. The neobehaviourist Edward C. Tolman published in 1932 *Purposive Behavior in Animals and Men* (7) which is a major work in psychology. According to Smith (8, p. 95-96) Tolman demonstrated how rats are governed by hypotheses when they tried to find their way through a labyrinth, and that these hypotheses

were sometimes wrong. Originally Tolman was guided by an epistemological view of 'direct realism', but the rats made it clear to him that his own behaviour was also governed by hypothesis, which was why he could not directly observe or 'read' behaviour, but had to interpret it. Smith continues:

. . . his even deeper conviction that the observer and the observed must be granted equal epistemological status eventually took precedence. This demand for parity meant that the scientists too, had to hypothesise and infer in order to know the world. In large measure, Tolman was being led by his rats to rethink and, curiously enough, to complicate his own epistemology (8, p. 96).

Following this insight, information seeking studies must also apply the principle that the observer and the observed must be granted equal epistemological status. All organisms capable of cognisance, for example rats, children, tourists and researchers should in principle be understood as governed by some framing assumptions or 'theories' which may be more or less unclear, unconscious, ambiguous, dubious and conflicting. The way in which cognition develops in individuals may be called genetic epistemology after the psychologist Jean Piaget. Piaget's theory, however, stress universal, global phases of development, whereas newer theories stress cultural and domain specific cognition. One of those newer theories is the so-called 'theory theory' (9), which emphasises the similarity between children and researchers and also is inspired by the theory of scientific paradigms developed by Thomas Kuhn (10). They assume that children, tourists or anybody else can change fundamental assumption, or 'paradigm' in their explorative activities. In this respect, I am fully in agreement with the 'Sense making approach'. (11)

2. EXPLORING CONTEXTS OF INFORMATION SEEKING

The German sociolinguist Ulich Ammon has formulated theoretical views on social determinants of language and theoretical knowledge, which is in accordance with Leontyev's demand, that persons' activities should be explored in the context set by 'the structure of production'.

In every language we can make a distinction between common language and Languages for Special Purposes (LSP). The common language is that part of a natural language that is almost uniform among all members of a society and which refers to commonly known things, affairs, and thoughts. LSP on the other hand separates members of a society from each other and refer to things, affairs, and thoughts which are particular to parts of social life. LSP are especially developed in relation to working life, but also exist

in the sphere of consumption where many hobbies have LSP.

Ammon (12) finds that different LSP can vary in their distance from the common language. According to him, this distance depends on the distance between the working sphere where it is used and the sphere that is common for the whole society, which in his theoretical view is the sphere of consumption. The figure below shows how he explains the relative difficulties of different LSP as a function of their distance from the sphere of consumption:

A Sociolinguistic Model	
(Based on Ammon (12))	
(1) The sector for the manufacturing of the means of production	No direct connection to the sphere of consumption. The language for special purpose (LSP) is therefore very different from common language.
(2) The sector for the manufacturing of consumer goods in a broad sense	This sector is closer to the sphere of consumption, where the products end up (although mostly brought about by sector 3).
(3) The sector for the distribution of consumer goods	To a certain degree the language for special purposes is here part of the common language (e.g. 'Fiat 128' or the cake "goose breasts"). The consumers and producers/distributors do, however, emphasize different aspects.
(4) The state sector, which regulates the overall social life.	Even if state politics, the administration of justice, finances, etc. are relevant for all citizens, this sector nevertheless represents typical LSP, far removed from common language (which is seen by Ammon as a social disproportion).

Table 1: *A Sociolinguistic Model*

In my opinion this is also a relevant theory for information-seeking studies because it can help explain terminological problems and provide guidelines for working with thesauri and subject terminology. There is, however an even deeper cause. Because information seekers need terminology and because there is a connection between linguistic knowledge and substantial knowledge, such a theory might help explain problems in cross-disciplinary information seeking. It might explain what knowledge and what terminology is not a part of the normal persons' repertoire.

The fundamental principles of LSP are determined on the one hand by different groups' different communicative needs, and on the other hand by an economic principle which reduces the use of redundant information. In a firm the purchasing department must have more precise terms for tools than the workers, who manufacture the goods. The term 'tongs for spot weld' could be used by the people in the purchasing department, while just 'tongs' would more likely be used by the workers using it.

3. WHAT SHOULD A GENERAL THEORY OF INFORMATION SEEKING LOOK LIKE?

A core problem is how LIS can help people optimise their information-seeking behaviour. From this perspective, it seems important to investigate:

- 1) The subjects' realistic estimation of the potential of the existing information for his/her activities. Much of the relevant information will of course often be unknown for him or her. The subject should neither underestimate nor overestimate the amount of relevant information. If the amount is underestimated, too little effort will be invested in searching information and vice versa.
- 2) The subjects' realistic relevance assessments of known/identified items (including the current relevance assessment during information seeking). If the subject is too naïve, he/she risks investing time in something that turns out to be a dead end. If the user is too critical or too neglective, he/she loses the opportunity to benefit from the information.
- 3) His/her understanding of the structures in which s/he has to make his or her search decisions and movements. Including the understanding of the consequences of different moves (such as limiting a search to a given field or choosing one database before another or searching in different disciplines, languages or periods. It also includes the ability to evaluate

relevance when only limited clues —such as titles—are available).

- 4) Users' (and potential users') perception of the benefits and costs of engaging in different kinds of information seeking activities. This includes a realistic evaluating of the subjects' own capacity to identify and use this information.
- 5) Users' reactions to different kinds of information, disciplines, media, institutions and towards 'information overload'
- 6) Users' knowledge of the benefits and costs of applying different information search strategies to a given task.

When we study users, we do so on the basis of our own understanding of these problems. As a consequence, we tend to regard users as being non-rational if their opinions and behaviour differ from our own opinions (and especially if they do not utilise our services). Therefore, we cannot study *ONLY* the psychological side of these questions. We also have to study the reality, towards which the user's behaviour is directed. We have to develop, formulate and defend our own knowledge of the six problems mentioned. For example, we as professionals in LIS should be the experts in choosing different search strategies to a given task. We should provide arguments for what is rational and what is non-rational behaviour. We cannot expect to learn such matters from empirical studies of user behaviour. On the contrary, we need such knowledge to interpret user studies.

Outlined below are some theoretical views which represent my theoretical suggestions on these problems.

The subjects' estimating of the potential of the existing information for his/her activities

For an individual in a given situation there exists an environment with given informative potential to contribute to that individual's problem solving and adaptation to his world. Most of them are of course unknown to him. The most important problem of all is whether or not he expects to find anything valuable if he chooses to engage in information searching. This question can be reformulated as 'How can we explore the value of available knowledge to a given task X?'

Some subjects may think that all produced documents with a certain label must be relevant to a problem. Librarians, for example, may think that each book on a given topic, say eating disorders, may be relevant to those who

have to deal with this problem in one way or another (e.g., patients, parents, psychologists or researchers). They may assume that users are not rational, if they do not spend most of their time collecting and reading such books (and may regard bibliographies as extremely important resources). People with this attitude could be said to have an implicit theory which gives priority to a certain kind of information behaviour. They represent a certain kind of personality which we could term 'collectors'.

The opposite attitude is represented by various forms of critical attitudes towards reading and studying. Somebody may express the view that a more 'pragmatic' or practical approach is needed, and that one should mainly depend on common sense or oral advice from people with similar problems. They represent a certain kind of personality which we could term 'anti-intellectuals'.

Sometimes 'the collectors' attitudes may be the most fruitful and sometimes 'the anti-intellectuals' attitude may turn out to be the most fruitful, and sometimes other attitudes will turn out as the best way to deal with a given situation. What should we know, in order to decide what kind of attitude is the most rational one? We should know something about the objective potential of the existing information. We should know that any paper (or knowledge claim) is not an eternal truth, but something produced by human beings in a specific situation, governed by different motives, values and methodological views. We should have an open stance towards both the positive and the negative influences on the produced knowledge. We should treat this problem as an important 'meta-problem', and realise that the produced knowledge in some fields may reflect the producers' interests at the expense of the user's interests. That there may be paradoxical problems in the way that there is an overproduction of some kinds of knowledge and an underproduction of the kind of information needed by the users. That the users may be offered an ocean of information but may be starving even if investing much effort in searching and reading it. Theories of this kind are essentially theories about knowledge production, 'science studies' and epistemology. (They are epistemological because epistemologies are theories on how to obtain knowledge. The meaning of 'knowledge' is not only factual, but also procedural and unarticulated (tacit). Therefore, any acting organism possesses some kind of 'knowledge' which is decisive for its successful acting.)

The subjects' relevance assessments of known/identified items

Medical researchers, for example, determine the relevance of different treatment methods on the basis of clinical experiments. A given drug is seen as relevant if the available knowledge indicates this. It is considered relevant whether the patients know it or believe it. Of course any claim that a drug is relevant should be seen as just a claim, and medical science as well as everybody else should try to evaluate this claim by searching more information. (A document is relevant if the reading of the documents helps treating patients or advancing medical science.) Some users may find that medical science is not trustworthy or relevant. They may engage in alternative medicine or parapsychology. They may agree that the recovery of the patient is the final criteria of relevance, but they find the methods used in medicine and in medical evaluation non-relevant. They have their own subjective criteria for how to evaluate the relevance of information and documents.

In this way, the assessment of relevance is narrowly linked to epistemological theories. The divergence between medical science and alternative medicine is only chosen for making the issue as clear as possible. Inside *any* science, there are always different views, theories or 'paradigms', and thus disputes about what to regard as relevant. Some fields may have a relative degree of consensus, whereas others may lack such consensus, that one can doubt that the area should be recognised as a scientific field. Modern epistemology emphasizes strongly that the relevance of observations (or, of course, of documents presenting observations) depends on the theoretical assumptions, which guides the behaviour of researchers. In other words: relevance is a function of theoretical assumptions (see also 13).

The subjects' understanding of the structures in which s/he has to do his or her search decisions and movements.

There are many structures and many levels of structures. Traditionally structures such as semantic relations in thesauri and classification systems have been seen as important in LIS (further developed into semantic networks). With the appearance of fulltext databases document architecture/composition becomes a relevant structure for LIS. Other structures are bibliometric networks derived from co-citation analysis. Such networks are empirical maps very close to the researcher's decisions in the single document. They reflect the authors' relevance-assessments of

other documents and thus epistemological trends. The kinds of documents in a given domain (e.g., primarily, secondary, tertiary documents, source documents and popularised documents), the relation of a given domain to other domains (interdisciplinary structures) and much more. Overall such structures are social, cognitive and linguistic. Since Thomas Kuhn's (10) famous theory of paradigms, the cognitive/linguistic organisation of knowledge has more and more been related to the social organisation of knowledge. It is rather obvious that the users' information seeking behaviour depends on their knowledge of and 'theories' about these social/cognitive structures of organisation.

The subjects' perception of the benefits and cost of engaging in different kinds of information seeking activities.

To illuminate this problem, I will quote Bruno Latour's (14) famous book. To search for facts in the scientific literature does not look like a leisure activity to him. The scientific literature is made for attack and defence and is no more a place for a leisure activity than a bastion or a bunker. A sentence is not in itself a fact (or a fiction). It is made a fact by other sentences, more or less so depending on how it is inserted into other sentences. When a person with an 'information need' approaches the places where facts and machines are made, he gets into the midst of controversies.

'[I]t should be clear now why most people do not write and do not read scientific texts. No wonder! It is a peculiar trade in a merciless world. Better read novels! What I call *fact-writing* in opposition to fiction-writing limits the number of possible readings to three: giving up, going along, working through. *Giving up* is the most usual one. People give up and do *not* read the text, whether they believe the author or not, either because they are pushed out of the controversy altogether or because they are not interested in reading the article (let us estimate this to be 90% of the time). *Going along* is the rare reaction, but it is the normal outcome of scientific rhetoric: the reader believes the author's claim and helps him to turn into a fact by using it further with no dispute (maybe 9% of the time?). There is still one more possible outcome, but such a rare and costly one that it is almost negligible as far as numbers are concerned: *re-enacting* everything that the authors went through. This last issue remains open because there is always at least one flaw even in the best written scientific text. . . . This is possible on one condition; that the dissenter is equipped with a laboratory or with ways to get straight at Nature more or less similar to that of the author. No wonder this way of reading a scientific paper is rare! You have to have a whole machinery of your own. Resuming the controversy, reopening the black box is achieved at this price, and only at this price. . . . Any average man starting off a dispute ends up being confronted with masses of resources, not just 2000, but tens of thousands.

We saw a literature becoming more and more technical by bringing in more and more resources. In particular, we saw a dissent driven into isolation because the number of elements the authors of scientific articles mustered on their side. Although it sounds counter-intuitive at first, the more technical and specialised a literature is, the more 'social' it becomes, since the *number of associations* necessary to drive readers out and force them into accepting a claim as a fact increase . . . [I]t is already clear that if being isolated, besieged, and left without allies and supporters is not a social act, then nothing is. The distinction between the technical literature and the rest is not a natural boundary; it is a border created by the disproportionate amount of linkages, resources and

allies locally available. The literature is so hard to read and analyze not because it escapes from all normal social links, but because it is *more* social than so-called normal social ties.' (14, 60-62); [emphasis in original]

What does this quotation teach us about 'determining the benefits and cost of engaging in different kinds of information seeking activities'? In my opinion it speaks for itself. To seek information need not be a simple task involving strong and fast rewards. It often implies engagement in a controversial issue and may also involve potential social isolation and conflicts. Should we advise users to avoid such controversial information? That would, in my opinion, be an unethical decision which counteracts the idea of public libraries.

The subject's reactions to different kinds of information, media, institutions and towards 'information overload'

This is a broad field, which cannot be treated in the space available here. A lot of literature exists on this. It is my overall view, that the dominating tendencies have been to psychologise these problems. That, for example, the concept of 'information input overload' has been regarded as a physiological limit in the brain of the users, rather than, for example, a consequence of overproduction of irrelevant information, or too limited resources to cope with a given situation (see also 15).

The subject's knowledge about the benefits and costs of applying different information search strategies to a given task.

Different search strategies can be applied to a given task. People may prefer to make their own experiments or to find results in the literature; they may prefer informal information sources to formal ones, they may prefer some libraries, journals, databases, search engines etc. to others. They may prefer term searching to citation searching or some specific search fields to other fields. They may prefer some search terms to other search terms, etc.

It is (or should be) a core competence for information specialists to choose the optimal search strategy and to be able to argue why one strategy should be preferred to another. (To the degree that LIS is a nomothetic science, this can be formulated as principles; to the degree that LIS is an idiographic discipline, this can only be formulated by knowledge of specific information sources.) Some proposals on how to advance the study of this problem is given in (16 & 17).

CONCLUSION

My conclusion is that both a psychological theory of cognition and an IS theory of information seeking behaviour must be based on a realistic philosophy, which is closely related to studies of epistemology as well as to cultural development in general and to the social division of labour in particular. My basic theoretical inspiration has been 'activity theory' (cf.18). I find this approach in agreement with a description given by Bogdan (4, p. 187) who praised and found support and inspiration in two recent methodological innovations in cognitive science. 'One is the classical top-down (ICM) analysis that recommends an explanatory progression from information task to the executing cognitive programs and then to the mechanisms running the programs. The other and more recent is the evolutionary analysis that treats cognition the way biologists treat any organ, namely, as an adaptation.'

There exists in cognitive science a tradition for investigating individuals mental or cognitive models. I prefer to speak of 'epistemologies' or 'theories' rather than models because the concept of models easily becomes individualised and psychologized. Activity theory looks at individual psychological phenomena as something formed primarily in a cultural-historical process. Instead of psychologizing epistemology it epistemologizes psychology. The consequence is an emphasis on the investigation of the historical and social contexts, in which information-seeking behaviour takes place. Activity theory thus stresses what is implied in the name of this conference: Information seeking in Context.

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