Factors of Attention

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Abstract

The importance of the role of attention is widely recognized not only by psychologists but also among academics and managers involved in knowledge management. It has become the bottleneck of the performance of white-collar workers. The previous studies of attention in the field of knowledge management primarily concerned with getting the attention of the individuals and/or groups. However, for the process of knowledge increase it is also important that we are able to pay attention – and there is no white-collar work without knowledge increase. There are many factors influencing our attention. This paper examines the factors along the dimensions of cognition and motivation only; the environmental impacts (like noise) are not investigated. The role of love and the muse – the emotional involvement – is discussed in detail. The result of the paper is a descriptive model of attention, which is then simulated with Doctus knowledge-based system. The model presented here (both, the descriptive and the simulative ones) is offered to discussion aiming to gain expert validation and fine-tuning.

Keywords: *knowledge management, cognition, business informatics*

Introduction

Attention is probably the hottest topic of knowledge management today: *"… within knowledge management, attention management has become the most important success factor."* (Davenport & Völpel, 2001) The reason for it is simple: attention is identified as the bottleneck of the performance improvement of white-collar workers in knowledge management. Because of the importance of this issue we are willing to pay for it (or give something in exchange), and so some authors speak about attention economy. (e.g. Davenport & Beck, 2001) Most efforts to-day are concerned with modes of catching the attention, as matter of fact there is a whole industry around this – the advertisement industry. It is indeed of essential importance to find out how to make people willing to pay attention to something. This paper aims to address the next phase, i.e. to find the individual characteristics determining if people *can* pay attention or not once they are *willing* to do it. This investigation is done within the framework of knowledge increase but as the white-collar work usually involves constant knowledge increase this is no restriction.[1]

The examination goes along two dimensions, cognition and motivation. To understand what attention is, this inquiry begins with examination of the nature of attention, so we should go back to the early psychological experiments in the area; this is done in the next section. After a basic inquiry to the nature of attention the cognitive aspect is discussed in detail in the subsequent section starting from the model of flow experience (Csíkszentmihályi, 2002) to which Baracskai (1999) and Baracskai and Velencei (2004) applied the approach of cognitive psychology. There are then two sections devoted to examine the motivational conditions of attention, starting from Maslow's (1954) hierarchy of needs dedicating significant effort to inquire into the role of love and even that of the muse. After this analytical part of the inquiry comes a section of synthesis of the identified factors. It seems that the first and probably most obvious question about the nature of attention: does multitasking exist? – at least fifty years of experimental records suggest this.

[1] The reason for this is explained in the section "The cognitive conditions of attention".

Does multitasking exist?

Cherry's (1953) subjects were listening to two different messages from the left and right headset speaker and later they were asked questions about them. If they were told in advance which message would they be asked about, they were very good at answering those questions but had only some very general recollection of the other message (e.g. they usually did know if the speaker was female or male but not if the message was in English or other language). This and similar experiments suggest that the attention cannot be distributed. On the other hand we can drive and listen to music and also thinking of our next meeting at the same time; or we can see children doing their homework, talking on the phone and be writing an instant message to some friend simultaneously. So can attention be distributed or not? Is there some real multitasking or only fast switching between the processes?

The question of distributed attention makes us revisit the inquiry about parallel knowledge representation introduced by Rummelhart and Norman (1988). We also know that the capacity of short-term memory (STM) is Muller's (1956) magic number 7±2.[1] This paradoxical situation can be easily resolved by adopting the conception of Davenport and Beck (2001) about distinguishing between the front-of-mind and back-of-mind attention. We can say that there is always only one of our activities in our front-of-mind attention and possibly several others in our back-of-mind attention. The front-of-mind attention is exclusive, the back-of-mind attention is parallel. Nevertheless the front-of mind attention seems to be somewhat weakened by the simultaneous processes occupying our back-of-mind attention except if all the processes in our attention are concerned with the same thing. E.g. thinking about how to continue this paper, typing it and looking over some background literature. In this case we have all our attention focused which Davenport and Beck (2001) compare to Csíkszentmihályi's flow experience.

Cognitive conditions of attention

The cognitive aspects of attention in this paper are examined using the conception of cognitive schemata and the flow experience.

In cognitive psychology knowledge is described by the number of cognitive schemata, originally introduced by Bartlett (1932). Dreyfus and Dreyfus (1986) defined the levels of knowledge and Mérő (1990) used the number of schemata to distinguish between these levels. The beginner level is characterized with few tens of schemata, the advanced with few hundred, the expert (also called candidate master) with few thousand and the (grand)master with few tens of thousands.[2]

Csíkszentmihályi (2002) portrayed the flow experience as a state in which *"Concentration is so intense that there is no attention left over to think about anything irrelevant, or to worry about problems."* The flow experience can be described as a harmony of skills and challenges in narrow flow channel between boredom and anxiety. (See Figure 1, left) In his own words: *"People seem to concentrate the best when demands on them are a bit greater than usual, and they are able to give more than usual. If there is too little demand on them, people are bored. If there is too much for them to handle, they get anxious. Flow occurs in that delicate zone between boredom and anxiety."* (Goleman, 1986) There is an additional important point we can note in this comment: the demand should be a bit greater. This is the reason that this

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[1] There are some other models of STM (e.g. Baddeley, 1999) but all consider it to be limited and that is the only relevant aspect here.

[2] Dreyfus and Dreyfus used different names for the levels; here Mérő's terminology is adopted. The amateur, having no schemata in the discipline is not included.

investigation is restricted to knowledge increase. For the same reason Goleman (1996) suggests a new model for education which would aim at flow experience; and Baracskai (1999) draws an ironic conclusion that everything can become boring if we are docile.

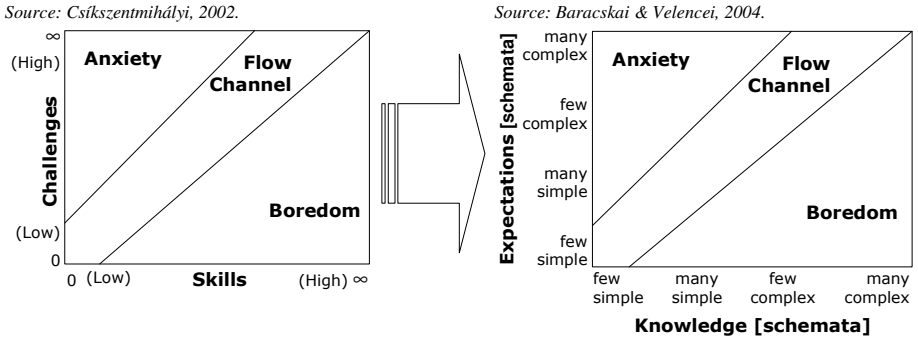


Figure 1: The flow experience.

Baracskai and Velencei (2004) applied the cognitive psychology approach on Csíkszentmihályi's model, to express the relation of knowledge and expectations in terms of knowledge levels, i.e. number of cognitive schemata. (See Figure 1, right)

One of the characteristics of the flow experience was described as paying very concentrated attention to what we are doing. Can we reverse this logic and ask what is needed to have such a focused attention? We can get parts of the answer from the previous discussion: Flow experience cannot occur without knowledge increase, i.e. the demand should be a bit greater than the knowledge. As lecturers we can also frequently experience that the best performance is often preceded by something like stage-fright in actors. This is nothing like anxiety but more like some state of excitement of doing something interesting,[1] People in business life usually talk about it as a challenging job.

The knowledge increase as described here actually makes the difference between the challenge and the anxiety in work. We can receive a new schema (new knowledge) from the same knowledge level as ours or one higher; if it is at least two levels higher we will experience anxiety, if it is lower we will be bored. Baracskai (1999) calls these to situations anti-experiences. Here they are identified as the cognitive conditions of attention.

Motivational conditions of attention

Every discussion of motivation begins with Maslow's hierarchy of needs. Sometimes it is presented in five levels (physiological, security, belongingness, esteem, and self-realisation), sometimes in eight (Maslow, 1987) to include the need "to know and understand", the "aesthetical" needs and the "transcendental" ones.

To be faithful to the process of the investigation a private experience will be described here as this has given me the essential understanding of Maslow's model. It happened years ago and remembering it made me realize that motivation has to be included into the model of attention. I was working on a new course-book with my mentor Zoltán Baracskai, a task that delighted me. After a couple of days of this work I was distracted and produced almost no result. All the sudden, my mentor asked me how much money I needed. I was surprised. I really had some financial troubles but I never told him about. How did he know? He has lent me some £200, a sum that would certainly not get me out of any serious trouble but it was

[1] This excitement shows some similarity to sexual excitement, as reported by numerous performance-artists.

enough. I continued my work enthusiastically and successfully. Later, when we were discussing this topic, he told me that it was simply according to Maslow. I did not want to believe: "but Spinoza had written so beautiful things and died of hunger, and there are numerous similar examples…" The answer surprised me: "Yes, but he did not write those beautiful things when he was hungry." I was taught on the MBA course that Maslow was wrong and it was explained using Alderfer's (1969) model. I had obviously believed.

Alderfer (1969) distinguished three groups of needs, of existence, of relatedness and of growth. These were very similar to the needs described by Maslow; the difference is in their interrelations. Alderfer said that if one factor is suppressed for some reason, the other can increase (a common example used in management courses is student with no security pursuing knowledge). Actually, Maslow had never said that a higher need would not appear before the lower was satisfied. On the contrary, he spoke of "hierarchy of prepotency" and the "degree of relative satisfaction". In the first edition of his book he said explicitly: *"In actual fact, most members of our society who are normal are partially satisfied in all their basic needs and partially unsatisfied in all basic needs at the same time."* He also admitted that the hierarchy is not rigid, the basic needs are not in strictly fixed order, e.g. in some people esteem seems to be more important than love. However, it is still not explained how a certain need is sometimes greater than other times.

This last contradiction can be resolved if we realize that needs are what we perceive as needs; and it has sometimes little to do with impartial measures like water content of blood or its hydrogen-ion level (from Maslow's original description). The same can be done more elegantly by applying Russell's (1948) egocentric particulars: *"The four fundamental words of this sort are «I», «this», «here» and «now»."* Or as a colleague of mine told me a year ago when I moved to the UK: *"In the UK you are considered poor if you do not have a dishwasher, a second car or three televisions."* What does this have to do with poverty?

Once we see clearly what our needs mean we can move forward with their examination. For the purpose of knowledge increase it makes no sense to distinguish the physiological and the security needs, as both of these are the needs of biological level (or existential as Alderfer named them). Similarly, the belongingness and the esteem are the social level (Alderfer's relatedness). Unlike the previous ones, the need to know and understand, the aesthetical needs and the self realization should remain separately as they are of particular importance for knowledge increase. The transcendental needs are not included into this discussion.

Maslow (1954) originally suggested that the degree of satisfaction of a lower need will determine the degree of emergence of a higher need. He described this phenomenon in the following way: *"For instance, if I may assign arbitrary figures for the sake of illustration… if prepotent need A is satisfied only 10 percent, then need B may not be visible at all. However, as this need A becomes satisfied 25 percent, need B may emerge 5 percent, as need A becomes satisfied 75 percent, need B may emerge 50 percent, and so on."* As measuring is impossible in case of higher needs we should find some more convenient approach. In the following section grades for the social level are suggested to describe the emergence of remaining three needs.

Inspired attention

Let this section begin again with a personal example. I read a book about a year ago, in which, on his pilgrimage to San Tiago, Coelho (1997) learned that there are three words for love in Greek: philos, eros and agape. A couple of weeks later I met a Swedish man on a conference in Oxford, who has Greek wife; he confirmed it and added that in Swedish there is only one word for love, thus, for example, you cannot say to your children that you love them.

Fromm (1957) investigated the role of love in our life. He explained that essentially love is a capability of person, not something that happens to him/her: *"Love is not primarily a relationship to a specific person; it is an attitude, an orientation of character which determines the relatedness of a person to the world as a whole, not towards one «object» of love."* Fromm identifies five objects of love and five types of love accordingly: brotherly love, motherly love, erotic love, self-love and love of God.

Brotherly love is philos. It is the most essential type of love; the other types of love do not exist without the brotherly love. It is our sense of responsibility and care, our curiosity to know other people, our respect towards others. Brotherly love is love between equals, which does not mean that we are the same but that we are one. Brotherly love also lacks exclusiveness. Thus self-love also belongs to philos. Self-love emerges from emotional maturity, we cannot love others without loving ourselves, as Fromm (1957) said: *"There is no concept of man in which I myself am not included."* Actually self-love defines the brotherly love: "love thy neighbour as thyself". Therefore philos is suggested as the first grade of needs on the social level.

Eros or erotic love is much more than sexuality; sexuality belongs to physiological needs (Maslow, 1954). All kinds of love make us become one with other people but the total union is the erotic love. This is a total fusion with another person. But we are not capable of total fusion with all the other people, thus the erotic love is exclusive; it is a union with a single other person. The phenomenon of oneness and individuality that we can see on personal plain is repeated in erotic love – one loves all the people but loves someone in a special, individual way. Eros, like philos is love of equals. If in eros there is no philos it is only passion. Therefore eros is considered as the second grade of social needs.

If love governs us towards unity with other people, than agape, the love of God, governs us to embrace the whole nature, the whole universe. Coelho (1999) calls it *"love that consumes"*. He gives two examples where he says it can be observed in its purest form: one is a hermit, who leaves the world of people to be consumed by this love and united with everything; the other is the enthusiasm of a person doing… well, doing anything. This second is the same as the flow experience (Csíkszentmihályi, 2002). Thus, agape is the third grade of the social-level needs.

The motherly love is not included in this model. It seems to be somehow a mixture of the previous ones; it is unconditional as philos, exclusive as eros and non-equal as agape. On the other hand there is no recorded experience how the motherly love influences the knowledge increase apart from turning ones attention away from it. This could probably be a topic for a future investigation.

Let's have a detour here to examine how the inspiration works. Many artists and scientists reported about their muses, who inspire them. What is a muse? It usually appears as a lover, so it should indicate the presence of eros. But the achievements associated with muses clearly point to agape. The muse is a metaphor of a lover, in whom eros and agape are united. It seems that agape can be reached in some other mode as well, although most creative people (mostly artists) are reporting about muses.

How to merge the factors?

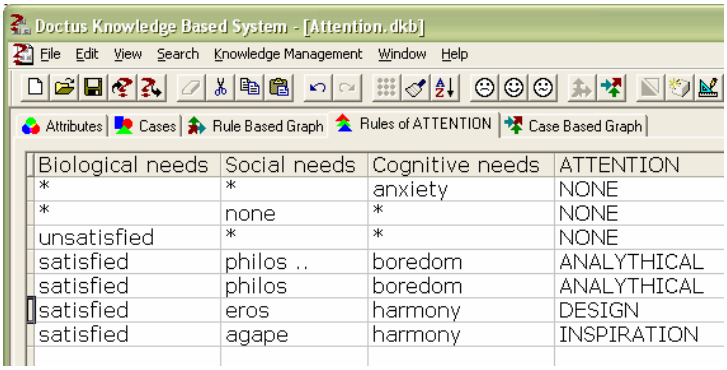
The three grades of satisfying the social needs would work the following way: in case of philos, the need to know and understand emerges; in case of eros aesthetic need also emerges; and in case of agape we pursue self-realization. Of course it is also possible that the social level is not satisfied at all, in which case the person could not pursue higher needs. At the same time we should also take into account the needs of the biological level and how it alters this train of thought.

If the biological level was simply described with satisfied-unsatisfied grades we could say that if the biological level is satisfied, the satisfaction at the social level determines the emergence of higher needs as explained above; and if the biological level is not satisfied the satisfaction at the social level will make no difference. This argument may seem crude but as the need to know and understand, the aesthetical needs and the self-actualization is on much higher level in the hierarchy than the biological needs, it actually does not contradict to Maslow's (1954) original presentation.

The fact that there are only two grades assigned to the biological level might appear to be a weak point to the cursory glance. The reason for this is that we work in the framework of knowledge increase where the biological level is in vast majority of the cases fairly satisfied, and thus, even a small deficiency of it appears as major dissatisfaction. The biological and the social level as explained here would be two separate but interrelated factors and the higher levels would be the grades of the outcome.

Now, we should add the cognitive conditions to the previous two factors. Csíkszentmihályi's (2002) original notions of anxiety, boredom and flow become obvious candidates as grades for the cognitive factor. There is only one thing that we should consider: we do not speak of flow experience but of the conditions for the flow experience. Thus it makes sense to avoid the use of term flow and use e.g. harmony instead. This harmony is between the existing knowledge and the expectations, which means that the expectations should be a bit higher than the existing knowledge. Csíkszentmihályi (2002) has already said this but working in the framework of knowledge increase we can also see the explanation. If one already has the knowledge fitting the expectations, no knowledge increase will happen and one will be bored. This explains the meaning of challenging job. It is obvious that the harmony is the highest grade but of the two, is boredom or anxiety worst? Probably the anxiety. If one is bored, one can occupy oneself with something else, switching back from time to time to the original process; on contrary, being anxious makes one unable to pay any attention at all. Therefore the suggested order of grades is none, anxiety, boredom, harmony, and the factor could be called the cognitive needs.

The need to know and understand, the aesthetical needs and the self-actualization are the grades of the outcome. To create grades that reflect the domain of the knowledge increase better we can borrow terminology from de Bono (1994) and call the attention at the level of need to know and understand it as "analytical" and the attention at the level of aesthetic needs as "design"; which terms were used by de Bono to describe different learning levels. If the two lower two grades of attention are described by de Bono's notions, the logical highest grade would be the inspired learning and the inspired attention accordingly.



Biological needs	Social needs	Cognitive needs	ATTENTION
*	*	anxiety	NONE
*	none	*	NONE
unsatisfied	*	*	NONE
satisfied	philos ..	boredom	ANALYTHICAL
satisfied	philos	boredom	ANALYTHICAL
satisfied	eros	harmony	DESIGN
satisfied	agape	harmony	INSPIRATION

Figure 2: Complex rules of attention.

We can create logical rules between the grades of the factors; we need 24 elementary rules to connect all the values. On Figure 2 above the model is describe using seven complex rules between the grades of the factors.[1]

The model as presented here is only weakly validated but so far it seems to fit the observations. The validation happened in the form of discussion with experts, who intended to find counter-examples, and when they have found any the model was fine-tuned, i.e. the rules were modified. The validation of the results requires further examinations.

Conclusions

This paper was an inquiry into the nature of attention, not asking the question how to make people willing to pay attention but what makes it possible when they are already willing. Two aspects of attention were found to be important, motivation and cognition; and these were elaborated into three factor named biological, social and cognitive needs.

The reader of this paper has probably noticed that there are other factors that are omitted in this investigation. E.g. several impacts of the environment are possible and not examined like noise, temperature, etc. They are omitted as their impact can usually be ignored, when they are weak and attention is otherwise high; on other occasions, when they are very strong they interrupt the process of knowledge increase completely and the effect is obvious. The environmental impacts are also so diverse that it is impossible to model them.

The personal attitude towards the knowledge increase could be also included. This can be done by distinguishing between talented and non-talented people, and the presented model describes the attention of talented people only and the non-talented are not examined here. In any discipline we would like to work with talented people so it is debatable if there is a reason for modelling the attention of non-talented ones.

The cognitive need itself can be further examined; actually we would need to consider three cognitive aspects, the number of schemata, the speed of changing the relations between the schemata and the number of meta-schemata; as suggested from an ongoing investigation (see next paragraph). This would probably be the next step of this research.

This paper is a part of a wider investigation that concerns the modelling of knowledge increase. Attention is one of the factors identified as significant for knowledge increase, the other two are learning capability and learning willingness. The three factors together determine the docility of a person. Constructing a higher-level model of learning ability for better understanding of knowledge increase is matter of further research to which the model of attention is a significant step forward.

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[1] Or, as they are called in the Doctus Knowledge-Based Expert System (www.doctus.info) with which the rules were created, complex rules between the values of the attributes. "*" means that there can be any of the values of the particular attribute.

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