

ORGANIZATIONAL INFLUENCE ON EFFECTIVITY OF KNOWLEDGE APPLICATION BY KNOWLEDGE WORKERS: AN ATTENTION-BASED APPROACH

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Abstract

Although there is hardly any doubt that actual application of knowledge rather than a vast repository of knowledge is the source of company's competitive advantage, most of existing knowledge management research focuses on knowledge creation and sharing, not on knowledge application. In the paper presented we shall be concerned with factors affecting the effectivity of knowledge application by knowledge workers, where knowledge application is thought to be the process of relating available knowledge to data / information specific to a task, and 'attention' is taken as a proxy for the effectivity of this process. Particularly, we are concerned with factors at the organizational level: rather than "Why some knowledge workers seem to be more effective at knowledge application?" we ask "Why some places knowledge workers seem to be more effective at knowledge application?" Besides a review of relevant concepts we outline ways how to approach this topic empirically.

Keywords: knowledge application, knowledge worker, attention, effectivity, information processing.

JEL Classification: M12, M19.

Introduction

Increasing complexity of modern life has brought about abundance of options which an individual can pursue. Specifically advances in IT technology resulted in availability of information that could not have been imagined ever before. Consequently, we might feel overwhelmed sometimes. The issue of information overload and attention capacity is especially pertinent for knowledge workers, as it is part of their job to process information. As lots of information does not necessarily mean lots of relevant information and the capacity of humans to process information is limited, it is a key to knowledge workers' productivity to sensibly select among the available information sources – let's call the phenomena related to selectivity and the ability to maintain focus 'attention'. Especially in popular literature there are many manifests that the scarcity of attention could be a bottleneck for knowledge economy (Jackson, 2008; Gallagher, 2009; Thompson, 2005; Carr, 2010; Wallace, 2006; Davenport & Völpel, 2001; Davenport & Beck, 2001; Langer, 1989), but despite of the general interest the issue has so far not been developed in a complex manner, esp. with respect to organizational settings.

The goal of this paper is rather modest: to introduce the concept of attention as a factor of knowledge application effectivity below the organizational level, and to outline ways how to further approach it via empirical research. Thus, at the moment we shall rather try to formulate right questions than to provide answers ready-to-use.

Knowledge Application as a Process

First of all, it has to be made clear what we understand as 'knowledge application'. Alone from this it should be clear how important is the role that selectivity and focus play. Although for some authors the line between knowledge and information is blurred (e.g. Davenport & Völpel, 2001; Davenport & Beck, 2001) – after all, it is a question whether knowing where to locate a piece of information constitutes knowledge or not – and some readers might argue that each knowledge application is part of (some other) knowledge creation, we feel that it is useful to conceptually distinguish these terms.

Although there is quite lot of research concerning knowledge creation and sharing (e.g. Nonaka & Takeuchi, 1995; Davenport, 2005; Davenport & Prusak, 2000; Grant, 1996), little is known about the actual act of knowledge application – relating knowledge to information / data specific to the task at hand. In existing literature knowledge application is defined e.g. as knowledge transfer to routine application by non-knowledge, typically aided by IT systems (Alavi & Leidner, 2001), or just as the act of integrating partial knowledge of particular team members with the aim of applying it on a particular task (e.g. Lewis et al., 2005). Jovovic & Draskovic (2008) define knowledge application as 'the level of knowledge internalization & reuse', with 'reuse' meaning 'recontextualization of knowledge', i.e. as the effectivity of knowledge

transfer from the KM system to particular workers so that these can apply it sometime later on (a view analogous to the 'internalization' stage of the SECI model by Nonaka & Takeuchi, 1995). Sometimes (e.g. Soonhee & Hyangsoo, 2010) knowledge application is defined to be the extent to which existing KM systems are being utilized – no matter how: this approach is typically tributary to the aim of justifying existing or planned investments in knowledge management systems being aware of the fact that the actual application of knowledge rather than a vast repository of knowledge is the source of company's competitive advantage (e.g. Dröge et al., 2003).

None of the definitions outlined above deals with factors affecting the process of applying knowledge onto particular tasks. For us, quite simply, knowledge application is combining knowledge and transactional data / information, the latter being specific to the task at hand. No matter from where knowledge comes – it might be tacit knowledge (retrieved, possibly unconsciously, from long-term memory), or explicit knowledge (retrieved largely from external sources, either from formal KM systems, public sources, or from other colleagues). As we shall see, for our purpose explicit knowledge from external sources is essentially equal to information. The act of combining the two types of inputs generally takes place in the working memory or happens unconsciously.

Principally, there are two phases of this process: a) choice of the base input set, i.e. the set of information which we shall further work with (conf. 'bounded rationality' context within which choice is rational; below), and b) knowledge application within the base input set. It is clear that we can rarely draw a clear line in practice – during the task the base input set is usually updated continuously as needed (in fact, bulk of the actual work might consist in fine tuning this base input set). As it is, the key point is that a selection must be made among the various options to be considered – then we either make a rational choice or we gradually zero in until rationality becomes possible. The final phase of the knowledge application process, not taken into account by this conceptualization, is creating output.

To make the point clear we shall consider data / information at several levels: 1. data / information generally available in the company, including public sources and tacit knowledge of particular knowledge workers (it becomes explicit knowledge when communicated to a colleague), 2. data / information available in the company, which the knowledge worker is aware of and which is potentially accessible to him, 3. data / information considered by the knowledge worker as potentially relevant to the task at hand, i.e. those that needs to be processed (and can be processed within the specified limits), 4. data / information actually relevant to the task. The act of selecting the base input set happens between levels 2 and 3; furthermore, as it is virtually impossible to say what is the objectively optimal set at level 4, it is apparent that choice of the base input set is vital to knowledge application effectivity.

Attention and the Effectivity of Knowledge Application

We assume that knowledge itself remains a scarce resource and that the feelings of overload and the resulting impaired ability to select and focus are due to large amounts of information to be processed. With respect to knowledge we assume that knowledge workers are able to utilize on knowledge that is available to them, both tacit (stored in their heads) and explicit (stored in an external source or consulted from their colleagues). As opposed to this stance, some authors think of attention as a filter with respect to knowledge, e.g. "If there is a limit to the success of knowledge management, it lies in the area of human attention. There is only so much employee and managerial attention to go around, and even the highest-value knowledge is of little use unless someone can attend to it." (Davenport & Völpel, 2001)

Another point to be highlighted is that we are concerned with attention at the individual rather than at the organizational level – a concept of 'organizational attention' has been suggested in business administration literature (Yaniv, 2006; Yaniv, 2011) dealing with issues which knowledge to store (in the collective memory, a formal KM system being just one part of it) and to share and to which stimuli from the external environment to respond – possibly by making a task to be resolved or a piece of knowledge out of them. Hence, we are concerned with lower-level factors affecting selectivity and focus of knowledge workers within a task, i.e. once the task has been determined.

The distinction is crucial – while ordinary knowledge workers (unlike a few decision makers in a company) often have little control over which tasks to perform, they typically have considerable control within work, i.e. over the way how they perform their work. This is in accordance with theories of work motivation related to knowledge workers emphasizing their need for self-determination / autonomy (Deci & Ryan, 1985; Deci & Gagné, 2005). However, motivation alone is not sufficient for effective work, since within a task (below the choice of which goals / motives to pursue and in what way) it influences may be the

amount of effort that is invested into the task ('intensive' aspects of attention may be regarded as a subset of the broader dimension of arousal; conf. the theory of mental effort by Kahneman, 1973), but it does not influence the selectivity and focus onto specific aspects of the task.

We assume that *a certain level of attention is needed for the knowledge worker in order to be effective at knowledge application*; in analogy to findings in basic psychological research, where it has been proven that attention is crucial for performing basic cognitive tasks. We shall not try to explain the extent of attention's influence on effectivity of knowledge application; the rationale for this is that the effectivity of knowledge application is affected by many different things, many of them specific to the situation at hand (the substantive factor, i.e. influences based on the contents of the particular task – to explore the specifics of a particular situation is subject of practical application, not of research), attention being just one of them. One might also argue that not all situations call for attention as a prerequisite for effective action, though it is questionable if we still talk about knowledge work in such a case (esp. with respect to the selectivity facet of 'attention').

In psychology, the label 'attention' is used as a cover term for a whole set of phenomena: "While attention is here to stay as a topic, it has become increasingly clear that it is just that: a general topic, not a single psychological process. 'Attention' now refers to a whole set of phenomena to be explained rather than to a single process which explains those phenomena. The various issues which psychologists address under the general heading of 'attention' still do have something in common though. They are all concerned with selectivity in mental life, and these days in neural activity also." (Driver, 2001)

But what do we mean exactly by 'attention' in organizational settings? The case is clear for a manual worker: if he does not pay attention (in the sense of vigilance), he can get hurt. However, situation is a bit more complicated with knowledge work. In the following text we shall draw a parallel to three main concepts in attention research: *limited capacity of attention*, *selective attention* and *sustained attention*. We will use this parallel in subsequent considerations about 'attention' in organizational settings. Note that although the primary subject of our considerations is selectivity, we apparently have to address both selective and sustained attention as real-world knowledge work cannot be accomplished in one go, unlike the laboratory tests usually performed in the area of psychology (like the Stroop or Tower of London task).

Limited capacity of attention. To accept the assumption that selectivity is one of keys to knowledge application effectivity, we have to understand the bounded rationality concept (Simon, 1947). The principal point is that an individual is not able to consider all possible options, because his level of knowledge and amount of information he can process are both limited. Thus, a base set of inputs (comprising not only knowledge, information but also assessment regarding which aspects are a key to effective output) is selected and the choice of what shall be presented as output subsequently takes place in this constrained context. As opposed to the original Simon's idea, the limitation is not only due to inaccessibility of relevant knowledge but nowadays also due to large amounts of available information which an individual cannot possibly all process. In other words, today it is increasingly more difficult to select the base set of inputs which is fundamental to knowledge application effectivity and attention (selectivity – as the ability, or luck? we don't know, to come up with right guess – and possibly maintaining focus as well) apparently plays a key role therein.

The self-initiated choice of the bounded rationality context is especially important when knowledge workers have a large job control within tasks, which is to support they need for self-determination / autonomy. Otherwise a straight-forward means how to influence selectivity is simply to tell the workers which inputs to take into account.

Selective attention's concern is "what happens when people try to focus on just one source of information and ignore other sources?" (Pashler, 1999; conf. also Styles, 2006) The key insight is that we cannot substantially increase the quality of selective attention by managerial intervention – selectivity is to a large extent determined by absorptive capacity of an individual (Cohen & Levinthal, 1990): the idea is that prior knowledge (all knowledge stored in the long-term memory, not just that brought to awareness) and learned concepts as stored in long-term memory largely influence to which stimuli one would respond; besides the areas of learning and innovation this notion can be easily transferred to the situation when an individual has to mark certain stimuli = transactional information / data as relevant for the task at hand. We can merely try to prevent interference that decreases the workings of selective attention – possibly applied several times as is the case with complex tasks (sustained attention) and decreases the capacity which is available. In other words, we shall explore factors that enable the individual knowledge worker to release maximum of his ability as given by the level and breadth of his/her knowledge and individual differences in IQ or in the attention-span.

The quality of selective attention (relatively to the absorptive capacity base line) can thus be thought of as the amount of distractors – i.e. task-irrelevant stimuli – that pass through the gate and get processed (thus consuming the limited capacity at the expense of pursuing relevant goals).

According to the load theory of selective attention suggested by Lavie et. al. (2004; alt. Lavie, 2005) the interference of distractors is decreased by high perceptual load and increased by high cognitive load. The rationale is that during tasks with low perceptual load external stimuli pass through the ‘early’ gateway of sensual perception – assumed not to impose priorities hence taking up all stimuli in the order they’re arriving until its capacity gets exhausted – and have to be filtered out by cognitive control; when the task involves high cognitive load, there remain less cognitive resources (specifically, working memory resources) to impose priorities and goal relevancy among the incoming stimuli. In fact, the load theory offers a resolution of the classical debate in attention research regarding the question whether selection takes place ‘early’ or ‘late’: according to the filter theory by Broadbent (early-selection), people block some of information if the incoming flow is too great and whatever is not attended to is simply lost; in contrast, the late-selection theory argues that all sensory inputs receive some processing and that the bottleneck on processing capacity comes relatively late in the system, presumably just before conscious processing in the working memory. The relation between selective attention and working memory is supported also by Cowan (1998) and Gazzaley & Nobre (2011). Note that implicit to the load theory is the assumption that distractors’ filtering happens consciously (in working memory) – we could infer that experts relying more on automatic processing (unconscious competence) are less prone to distractor interference. Furthermore, load theory deals with external distractors and it is a question if internal distractors (e.g. self-initiated side thoughts) follow the same rules. We shall assert they do – e.g. the conscious prioritization of internal stimuli is quite analogous to the (internal) cognitive appraisal mechanism in the area of psychological stress (Lazarus, 2006) – except for the fact that high levels of sustained focus / concentration on the task can on the contrary prevent internal distractors at surfacing or being generated in the first place.

Besides the (cognitive) load on working memory dual-task processing (Lavie et. al., 2004; also labelled as divided attention: “what happens when a person attempts to take in sensory information from several sources at approximately the same time?” in Pashler, 1999) and task-switching (Monsell, 2003) constitute additional factors increasing distractor interference. Along with the influence on selective attention, dual-task processing also has deleterious effects on the interaction of consciousness with long-term memory, decreasing the quality of later retrieval (Steinmetz, 2008): „Using fMRI imaging, UCLA psychologists found that when you focus on a demanding task, your brain’s hippocampus, which is important to [long-term] memory, is in charge. However, if you try to work while distracted by instant messaging or the like, the striatum, which is involved in rote activities, takes over. As a result, even if you get the job done, your recollection of it will be more fragmented, less adaptable, and harder to retrieve than it would be if you had given it your undivided attention.“

Sustained attention, or vigilance, as it is more often called, refers to the state in which [selective] attention must be maintained over time. There is a fine line between sustained attention and concentration (in layman’s terms). According to Gallagher (2009) „Not focusing on what you’re allegedly doing sounds a big problem, but sometimes it actually makes you more productive“. Of course, high level of focus, i.e. sustained attention is not necessarily a prerequisite for effective knowledge application, esp. when we are concerned with ‘ordinary’ knowledge workers not involved in R&D activities, a group quite numerous in nowadays organizations. The reason why interruptions can be helpful might be the mechanism of implicit learning (Bowden, 2005): in phases when we switch off conscious processing, non apparent associations can be established inside the head due to on-going cooperation between the right and left hemisphere – sometimes it is simply better to sleep on it. However, we can distinguish between intrusions and breaks, as do Jetta & George (2003): although it might be useful to interrupt the flow of thoughts so as to get fresh insight, quick intrusions or longer periods that we fill with some other demanding task (task-switching) do not leave space for implicit learning and thus do not contribute to the effectivity of the primary task; sometimes it is better to take a break and have a chat with a friend in the cafeteria than to stubbornly sit behind the desk, but it is clearly different when we work on something else than when we let the mind run idle while travelling in the train or taking a shower. But note that even intrusions can have positive effects on knowledge application, esp. in terms of communicating information that would not be shared otherwise and, on the contrary, taking a break might not contribute anything but foster procrastination (Jetta & George, 2003). As it is, within a single ‘chunk of work’ (including processing of information that comes via a ‘positive’ intrusion) it is more

advantageous to focus on what I am doing, esp. with complex knowledge work that is proportionally more heuristic in nature than algorithmic.

In contrast to distractors, interruptions (either external or internal; an analogy to distractors in the domain of selective attention) are clearly more susceptible of external intervention – either by direct manipulation or by creating suitable conditions in the organizational context.

Inhibitors of Attention during Knowledge Application

Assuming that attention is crucial for effective knowledge work (we measure the attention as the state of mind by two factors: *proneness to task-irrelevant distractors* / selective attention, and the *inability to focus* / sustained attention) we will try to explain which conditions in the narrow organizational context (i.e. those artefacts in the organizational settings that have direct impact on everyday knowledge work) are predictors for this. To achieve this end we have to set up a list of candidate factors that could be responsible for whether the individual is attentive at knowledge work or not. The choice of this list is arbitrary, of course, but we are guided by analogy of factors that influence attention (whether selective or sustained) in the area of psychology: distractors, load on working memory, dual-task processing, task-switching, interruptions.

Factors that we propose to consider include: job control, pace of work, type of motivation, scatterness of knowledge, ambiguity in inputs, perceived amount and quality of inputs, task difficulty, perceived cognitive overload, multi-tasking (dual-task processing – an example being the need to handle the underlying technology used for automation – or task-switching), external interruptions. Note that e.g. opportunity for implicit learning (part of pace of work) introduced rather as a substitute for sustained attention can be one of factors facilitating effective selectivity; also note that cognitive overload is assumed to be an independent variable (it determines limits of an individual's capacity, relatively to which we try to maximize 'attention'). Expertise is the only personal factor that we take into account as it is related to the limited capacity base line conceptualized as the absorptive capacity.

In this list, factors at the level of symptoms (type A) and at the level of conditions in narrow organizational context (type B) are mixed; we omit high level factors at the level of the whole company (type C; like the country where the company operates or whether the company is private or public). Of course, there might be internal dependency among the selected list of factors – specifically, type B factors might create conditions for type A factors to come into effect – but the exact mechanism is not known at the present moment (recall also that we consider 'attention' just as a parallel to the psychology concept, thus generalization of available findings to outside psychology – specifically, type A factors being a determinant of the dependent variables – cannot be taken for granted). The principal hypothesis is that there are some factors of this kind, i.e. that the organizational influence is not negligible.

Understanding of factors influencing the structure of attention during knowledge application will enable us to manage them – either at the organizational (attention management of ...), or at the personal level (attention management for knowledge workers).

Proposition of Research Methodology

In the first phase of empirical research we suggest to use a structured questionnaire, respondents being particular knowledge workers from several different companies so as to ensure sufficient diversity of the sample; in fact, the specific company does not matter as we are interested in the role of a narrow organizational context. The questionnaire shall ask for specific values of factors listed in the preceding section, consisting of two parts – the first being questions about the general working conditions (narrow organizational context), the second being questions specific to a selected (by the respondent) knowledge work task. Apparently, we cannot make any conclusions about the particular knowledge worker's abilities or style of work this way, but this approach is in accordance with our not taking individual differences into account; on top of that, being aware of this fact, respondents might be less hesitant to provide information. Only in the second phase of research where we get to fine-tuning the statistical findings we shall make use of structured face-to-face interviews.

In the questionnaire we shall use the following questions to measure the dependent factors proneness to task-irrelevant distractors and the inability to focus: 1. while working, my thoughts kept wandering off the task to other issues, possibly work non-related, 2. at moments when it was needed, I was unable to fully focus on the task at hand; the result was spending more time on rote activities, simple transactions like short e-mail, quick personal interaction, mechanically writing down what was already clarified, filling document templates and similar.

Limitations of the Approach Proposed

We have dealt only with factors affecting attention ‘within task’. There is an *upper level*, of course – at the level of choice of tasks, organizational influence cannot be doubted, e.g. business / operations strategy, standard operating procedures, or attention profile of individual decision makers can be determinants of the ‘organizational attention’ pattern (Ocasio, 2007; March & Olsen, 1976; Yaniv, 2006; Yaniv, 2011).

It is clear that individual level factors may also play a role: not only stable *individual characteristics* (like the length of attention span or the general ability to focus, as measured by performance on the Stroop or London of Tower task) but also more situational influences like whether the person is not ill at the moment, or the choice of *working practices* (at this point the overlap between organizational and personal factors is may be the clearest as specific working practices can be employed on both sides, conf. Kirsch, 2000). Our aim is to show that the narrow organizational context influences the level of releasing the individual’s cognitive capacity to a considerable extent, no matter whether you go to ‘brain training’ sessions or not: may be, you can temporarily increase your cognitive capacity, but the percentage which is being utilized is still affected by the organizational settings – even below the level of task choice and besides the influence of work motivation.

Other limitations we are aware of are the following. The proposed *research is correlative* so it will not explain the direction of causality. It might just work the other way round: in companies where people with low attention span work, unfavorable conditions for effective knowledge application arise. During the conceptualization of knowledge application we left out the *output phase*, which might also constitute a bottleneck. The measurement via a questionnaire remains *at the phenomenological level*; we shall not measure brain activity via fMRI, EEG or may be by pupil dilatation. This is not necessarily bad, after all there is a basic truth in the saying that ‘each of us lives in his own world’, but it constitutes a need for caution during results’ interpretation: shall we shift particular factors’ values by altering the underlying conditions or just persuade the worker to perceive them differently? Additionally, in the proposed approach we don’t filter out possible effects of *psychological stress* (Lazarus, 2006) – for a particular factor stress can be a by-product, becoming the medium which impairs the cognitive performance. Thus, in such a case persuading the individual to change his appraisal of the situation is well justified. Last reproach is that we don’t handle the effects of automatic vs. controlled processing, except computing variations in correlation between experts and non-experts.

Conclusions

The article reviewed different conceptualizations of knowledge application pointing out that knowledge application is indeed underresearched with respect to its socio-psychological aspects. We also reviewed the plethora of circumstances that are / or can be referred to as attention and proved that there is lot of confusion about what constitutes attention of knowledge workers in organizational settings and about its relationship to the knowledge application concept; the confusion being perhaps the main reason why the issue of knowledge worker’s attention has not yet been approached in a rigorous manner.

We have succeeded – hopefully – to make the matters clear a bit: in particular, we clarified the different levels at which attention in organizational settings can be considered and we discussed in detail knowledge workers’ attention during knowledge application, arguing the importance and possibility of its management in the context of everyday knowledge work and demarcating it as a research topic. We can conclude that despite the ambiguity of the label, ‘attention management of knowledge workers’ (in the narrow organizational context) is not only a hot issue in popular literature, but it also qualifies as a concept suitable for further theoretical and empirical research.

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