

RESEARCH ON KNOWLEDGE WORKERS

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Abstract. Research on knowledge workers and their management started in autumn 2010 and it still continues. The objective of the research is to verify some aspects of knowledge work and the management of knowledge workers. First results of the pilot were published in proceedings from the conference Economics and Management, 2011. After the pilot and the feedback from this conference, the questionnaire we use was changed to allow us to examine factors we could not examine before. This article discusses latest findings of the research on topics as work of knowledge workers with knowledge, learning of knowledge workers, and knowledge sharing.

Keywords: knowledge, tacit knowledge, explicit knowledge, management of knowledge workers, learning.

Jel classification: M19

1. Introduction

This article brings information on the research on knowledge workers executed in the Czech Republic. The research on knowledge workers and their management started in autumn 2010 and it continues. As Jedinák and Šugár (2011) write, human capital represented by knowledge workers belongs to the most precious resources of any organisation and organisations should pay it priority attention. The objective of the research is to verify some aspects of knowledge work and management of knowledge workers.

As for the methodology, the research is a quantitative research and it is based on a questionnaire. Questions are constructed as closed questions. Respondents choose from given options or evaluate given options on the Likert 1-5 scale. Likert scale options are as follows: 1 - factor is poor, 2 - factor is under average, 3 - factor is average, 4 - factor is over average and 5 - factor is excellent. Some of the closed questions offer the option of commentary. Respondents fill the questionnaire without the supervision of researchers. Questions are constructed so that they did not indicate what may be a "correct answer".

Globally, knowledge workers represent great portion of all employees. Simply said, they are people who, when working, use their brain more than their muscles (Davenport 2005). Knowledge economy depends on the work of knowledge workers and the labour productivity they can achieve.

Knowledge is a major tool, resource and creative force of knowledge workers. Quality of work of knowledge workers depends on their ability to

work with knowledge; on their ability to create, distribute and share it. Knowledge is created of two dimensions, explicit and tacit one. Explicit knowledge can be articulated in some code; script, picture, notes. Tacit knowledge is partly or fully subconscious and highly personal. It is very difficult to formalise it the same way as explicit knowledge. A tacit dimension of knowledge is crucial for knowledge workers. It enables them to do practical activities, it enables them to work. It is ownership of tacit knowledge that makes knowledge workers special.

Being aware of importance of knowledge for knowledge workers and their organisations, we decided to focus one part of our research on knowledge workers on the problematic of knowledge, knowledge development, and knowledge sharing and knowledge exploitation.

The article covers this part of the research. Up till now results of the research show, that knowledge, especially the tacit dimension is very important for knowledge workers and their work.

2. The Research

The research on knowledge workers and their management started in autumn 2010 by the pilot research and it still continues. The objective of the research is to verify some aspects of knowledge work and the management of knowledge workers. Attention is, for example paid to the importance of knowledge for knowledge workers, the way in which they develop and share it. The research also examines the shift in managerial styles caused by

special character of knowledge work and knowledge workers (not covered by this article).

The research works with few presumptions (hypothesis). We are aware of the fact that the word hypothesis has special meaning and that management is not an exact science and the interviewed sample is not the random sample. That is why we prefer to use the word presumption.

The covering presumption is that managing knowledge workers in the traditional way is contra productive. We think that knowledge workers prefer a different style of management. Knowledge workers are difficult to manage. Due to the intangible character of knowledge, managers cannot control their work; the most important part is done in their heads even though the final result of a knowledge worker's work has a manual character. We can observe the work of manual workers and correct any inaccuracies or problems. The work of knowledge workers is hidden; the observer does not see and know the process. The work of knowledge workers cannot be observed (Kelemen 2010).

Other presumptions are focused on special problems of knowledge work and management of knowledge workers. Topic of work with knowledge includes two important presumptions. Presumption that tacit knowledge is crucial for work of knowledge workers and presumption that knowledge workers develop their tacit knowledge in practical activity and by practical experience.

As for the methodology, the research is a quantitative research and it is based on a questionnaire. Certain questions help us to separate respondents who are non-knowledge workers from respondents who are knowledge workers, give answer on the role of tacit knowledge in knowledge work and on how knowledge workers develop their knowledge. Questionnaire also helps us to identify important aspects of the management of knowledge workers. Questions are constructed as closed questions. Respondents choose from given options or evaluate given options on the Likert 1-5 scale. Some of the closed questions offer the option of commentary. Respondents fill the questionnaire without the supervision of researchers. Questions are constructed so that they did not indicate what may be a "correct answer" as we know that human opinions are very sensitive to how the problem is presented and in which framework it is placed (Švecová 2011).

Respondents of the research are students of combined and distant programmes of the University of Economics, Prague, the Police University of the Czech Republic and the Armed Forces Academy Liptovský Mikuláš Slovakia. We decided for them because many of them work in knowledge intensive jobs. The professions of re-

spondents are different. Respondents interviewed at the University of Economics, Prague work mostly in business and finance; respondents of the Police University of the Czech Republic work in security services as policemen, fireman, soldiers and in public administration; respondents from the Armed Forces Academy Liptovský Mikuláš Slovakia work as soldiers. Knowledge workers of other professions are planned to be interviewed in later phases of the research.

Even though we know that most of our respondents are knowledge workers, the questionnaire includes few questions the answers to which enable us to classify the respondent as a knowledge or non-knowledge worker. In case of doubt, the questionnaire is excluded from the research. This article includes answers of 405 respondents.

3. Theoretical background of the Research

The topic of knowledge workers and their management is the multidisciplinary one so the theoretical background of the Research comprises topics of not only knowledge work and workers, but also of knowledge and knowledge management.

When creating theoretical background for our research we started with the term knowledge. Literature offers many ways how to define knowledge. For example Tobin (1996) understands knowledge as information plus intuition and experience. Wolf (1990) sees knowledge as organised information used for problem solving. Turban (1992) writes that knowledge is information that is organised and analysed to become legible and usable for problem solution and decision making. Veber (2000) defines knowledge as a changing system with interactions among experience, skills, facts, relations, values, thinking processes and meanings. Kanter (1999) says knowledge is information with context that provides the basis for actions and decision making. Nonaka and Takeuchi (1995) define knowledge as justified true belief. For Wiig (1993) and Wiig *et al* (1997) knowledge is the body of understandings, generalisations, and abstractions that we carry with us on a permanent or semi-permanent basis and apply to interpret and manage the world around us. Van der Spek and Spijkervet (1997) understand knowledge as a set of insight, experiences and procedures that are considered correct and true and that therefore guide the thought, behavior, and communication of people (Mládková 2012).

Many authors come to the conclusion that there is difference between term data, information and knowledge. Brinkley (2008) thinks that what distinguishes knowledge from information is the way in which knowledge empowers actors with

the capacity for intellectual or physical activity. Knowledge is a matter of cognitive capability and enables actors to do and reflect. Information, by contrast, is passive and meaningless to those without suitable knowledge. Knowledge provides the means by which information is interpreted and brought to life (Brinkley 2008). Tobin (1996) and Bureš (2007) distinguish between data, information and knowledge. Data are facts, information represents formatted, filtered and summarised data and knowledge is understood as instincts, ideas, rules and procedures that lead to action and decision. Tobin (1996) added another level. It is wisdom, the ability to understand and work with a complex system of different pieces of knowledge. Veber (2000) defines data, information and knowledge as follows. Data is everything we can monitor by using our senses or a set of discrete, objective facts about events. Information is data that the user finds important during the process of their interpretation. As already mentioned, knowledge can be defined as a changing system with interactions among experience, skills, facts, relations, values, thinking processes and meanings (Mládková 2012).

Knowledge can be classified into different groups. Nonaka and Takeuchi (1995) offer classification into three types of knowledge; explicit (transferable to data), implicit (hidden subconscious that can be transformed to data) and tacit (hidden in the heads of people, not transferable to data). Nonaka and Takeuchi (1995) see knowledge as created and expanded through interaction between tacit and explicit knowledge. Spender (1995, 1996) offers a classification to an individual (owned by an individual) and a collective (owned by a group) knowledge. Spender also identifies different types of knowledge used in organisations: conscious knowledge (explicit knowledge held by the individual), objectified knowledge (explicit knowledge held by the organisation), automatic knowledge (preconscious individual knowledge), collective knowledge (context dependent knowledge visible in the practice of the organisation).

Explicit knowledge is encoded in organisational formal models, rules, documents, drawings, products, services, facilities, systems, and processes and is easily communicated externally (Vail 1999). Its conversion takes two forms (Nonaka, Takeuchi 1995). It can be converted to tacit knowledge through internalisation when an individual reads and understands well coded knowledge. It can also be converted to another type of explicit knowledge through combining more than one form of knowledge to generate new knowledge. Although conversion of explicit knowledge

is easier than that of tacit knowledge, it still requires several resources such as time, technology, and commitment (Vail 1999; Mládková 2012).

Tacit knowledge is stored in peoples' brains as mental models, experiences, and skills and is difficult to communicate externally (Vail 1999). The conversion of tacit knowledge also takes two forms (Nonaka, Takeuchi 1995). It can be converted to another tacit knowledge through socialisation in face-to-face interactions or to explicit knowledge through externalisation by codifying an individual's knowledge. Capturing tacit knowledge and codifying it is one of the biggest challenges of knowledge management (Bair, O'Connor 1998).

As Nonaka and Takeuchi note, the tacit and explicit dimensions of knowledge interact in four basic processes of so called knowledge conversion (SECI) - creation, combination, internalisation, externalisation and socialisation (Nonaka, Takeuchi 2005). When working, knowledge workers use all four processes. Managers of knowledge workers should understand this process, supervise it and help their knowledge workers when some problem in knowledge interaction appears.

Combination is a creation of new explicit knowledge from existing explicit knowledge. Combination is the process of connecting discrete elements of explicit knowledge into a set of explicit knowledge that is more complex and systematic than any of its parts. Knowledge is combined through documents, meetings, phone calls. Combination also includes the breakdown of concepts. Combination happens through three processes. First, explicit knowledge is collected and combined (from both outside and inside the organisation). Second, the new explicit knowledge is spread around. Third, the explicit knowledge is edited and again spread around the organisation.

Internalisation is the process of embodying explicit knowledge as tacit knowledge. It is related to learning-by-doing. Internalised knowledge is used to broaden, extend and change people's tacit knowledge. It is the basis for shared mental models or various types of know-how. In practical life, internalisation puts together two dimensions. First, explicit knowledge is embodied in action and practice. Second, explicit knowledge can be embodied by simulation and experiments.

Socialisation is the process of sharing tacit knowledge through shared experience. To acquire tacit knowledge, people have to share the same experience through joint activities. A typical example is a traditional apprenticeship. Apprentices learn a craft through observation and practice. Informal meetings of people by the coffee machine, in corridors, etc., work in the same way. Stories

serve as a media for tacit knowledge sharing. Socialisation is difficult to manage. The first step towards socialisation is the personal experience with some activity or situation; the second step is trust, love and care cultivated between members of the company or the community.

Externalisation is a process of articulating tacit knowledge as explicit knowledge. It creates new, explicit concepts from tacit knowledge. When tacit knowledge becomes explicit it can be shared and becomes the basis for the creation of new knowledge. The success of externalisation depends on metaphors, analogies and models.

Knowledge is created through a continuous and dynamic interaction between tacit and explicit knowledge. All four processes work on different levels - individuals, groups, organisational and inter-organisational. Properly managed processes create a learning spiral. Organisational knowledge creation is a never-ending process that upgrades itself continuously. A healthy knowledge organisation uses and manages all four processes (Kelemen 2010; Mládková 2012).

Knowing well that our managers do not have time to learn and work with complex theoretical definitions and concepts we decided to use the simplest possible concept. In our research we work only with explicit and tacit knowledge and basic processes of knowledge conversion (SECI) (Nonaka, Takeuchi 1995). A knowledge worker uses knowledge at his work – he creates, distributes or applies explicit as well as tacit knowledge.

As for knowledge workers, literature offers three basic approaches to this term (Brinkley *et al.* 2009); conceptual approaches, data (industry) driven approaches, and job content approaches.

Conceptual approaches explain the term knowledge worker from the point of view of employees' importance for an organisation, and his style of work with knowledge. Education and other factors are also taken into account. The most important representative of this approach is Peter Drucker (1954) who was the first to use the term knowledge worker. By Drucker knowledge worker is the person who:

- Has knowledge important for the organisation and is often the only person who has it.
- A person who can use the knowledge in work.
- The knowledge is partly subconscious, the worker may not know about it or may not understand its importance.
- other employees of the organisation have a limited approach to the knowledge,
- Other employees cannot or are not allowed to use it (knowledge is linked to some certificate or diploma).

In Drucker's understanding knowledge workers often work intellectually, but this is not a rule.

Another representative of this approach, Jack Vinson sees knowledge worker as the one who depends on his knowledge and ability to learn, and who works with his brain (Vinson 2009). Lowe (2002) limits knowledge workers to those with a university degree.

Thomas Davenport (2005) sees knowledge workers as people with high degrees of expertise, education, or experience. Davenport says that the primary purpose of a knowledge workers' job involves the creation, distribution, or application of knowledge. Knowledge workers think for a living (Davenport 2005).

Data driven approaches see knowledge workers as all those who work in particular organisations or in particular sectors or institutions – sometimes under the dubious impression that knowledge workers make up the overwhelming majority of workers in such industries. However, in practice, organisations in these industries need to deploy a wide range of complementary jobs with varying degrees of intellectual content (Brinkley *et al.* 2009).

Sveiby (1997) takes the data approach and relates knowledge workers with software and advertising firms. Alvesson (2002) sees knowledge workers as people who work in knowledge intensive organisations, R&D and high tech companies.

Job content approaches see knowledge workers as people who do a certain type of job. Alvin Toffler (1990) understands the typical knowledge worker as a scientist, an engineer or a person who operates sophisticated technology. He states that a knowledge worker must be able to create and improve his technological knowledge or manage the technological knowledge of co-workers.

Jonathan B. Spira in an internet discussion concludes: 'We can, in part, describe knowledge workers in terms of what they are not. They are not factory workers, they are not labourers, they are not farm or field workers (the term "out in the field" notwithstanding). But that doesn't tell us very much. Many, but not all, knowledge workers are office workers. Some, but not all, are managers or white-collar workers. Some, but not all, are professionals, such as doctors or lawyers.' (Spira 2008).

Robert Reich (1992) was a bit more explicit in outlining what he terms as the 'symbolic analysts', the workers who engage in non-standardised problem solving using a range of analytic tools often abstract in nature. The keys to these workers' success include creativity and innovation and incorporate occupations ranging from lawyers to bankers to researchers to consultants (Brinkley *et al.* 2009).

Kidd (1994) identifies knowledge workers as people who work in design, marketing, management and consultancy, advertising, broadcasting, law, finance and research. Nomikos (1989) classifies knowledge workers as a group that includes scientists, engineers, professors, attorneys, physicians and accountants. Nevertheless, he concludes that knowledge workers are highly qualified and highly educated professionals. Their work consists largely of converting information to knowledge using their competencies for the most part, sometimes with the assistance of suppliers of information or specialised knowledge. Tomlinson (1999) identifies them as managers, people in technical and professional occupations and associate professionals.

Concluding all these concepts together, Reboul *et al.* (2006) summarises - knowledge worker's main work tool is his brain. Therefore, a company losing a knowledge worker is also a loss of its knowledge (Mládková 2012).

As our research is the research on management of knowledge workers and the way how they work with knowledge we decided to base it on the conceptual approach. This approach explains the term knowledge worker from the point of view of employees' importance for an organisation, and his style of work with knowledge and perfectly fits our purposes.

4. Results of the research

The author is aware of some limitations of this paper. The most important fact that should be mentioned is that the sample of respondents is not the random sample. The questionnaire was answered by quite a big number of respondents but majority of them belong to only few knowledge professions. As the purpose of our research was to get answers to basic questions concerning knowledge workers we have not examined the relationships among various aspects of knowledge worker management and work. This will be the task of future researches. That is why the author of the article decided not to do statistical analysis. It would provide biased and irrelevant data.

The article covers only chosen results of the research on knowledge workers and their management. It is focused on basic presumptions concerning knowledge workers and knowledge work.

First, it is necessary to introduce the research sample. This article includes answers of 405 respondents. If the summation of responses is not equal to 405, respondents answered more questions (it was possible) or did not answer the question at all. Percentages are rounded off.

Table 1. Sample of the Research

		Nb.	%
Age	Under 25	58	14
	26-45	328	81
	46-65	19	5
	66-75	0	0
	76 and older	0	0
Sex	Female	113	28
	Male	289	71
Education	Only primary	1	0
	Vocational	4	1
	Secondary	179	44
	University	218	54
	Scientific title	0	0
	Pedagogical title	0	0
Job requires diploma	Yes	242	60
	No	162	40

As Table 1 shows, majority, 81 % of our respondents, were people of age group 26-45 years, 71% of them were men and majority of them, 54 % have the university degree (mostly of bachelor level). 60 % of our respondents reported that their job requires university diploma. These results fully reflect special character of our respondents. As mentioned before, we did not choose our respondents randomly but asked combine and distant students of the University of Economics Prague, the Police University of the Czech Republic and the Armed Forces Academy Liptovský Mikuláš Slovakia to answer our questionnaire. The choice of sample explains the age group, prevalence of men respondents over women respondents in our sample and the fact that 60 % of respondents need university education to be allowed to do their job (legal requirement in the Czech Republic concerning jobs in public administration and security services).

Table 2 provides answers to questions on work with knowledge, role of tacit knowledge in work of knowledge workers and learning and knowledge sharing.

First we examined of what type is the output of work of interviewed knowledge workers. Literature states that it can be both material and non-material (Drucker 1954). As for the chosen research sample we suspected that the result of work will be mainly non-material, which turned out to be the case, 55 % of respondents chose this option. The fact that 40 % of respondents reported both material and non-material results shows that it may be difficult to cut clearly between these two options. Material results of knowledge work (10 %)

were reported exclusively by respondents who work as soldiers.

Table 2. Work with Knowledge

		Nb.	%
The result of work is	Material	39	10
	Non-material	223	55
	Both	160	40
My work requires me	Working alone	27	7
	Working in group	83	20
	Combination	299	74
Knowledge required for work is	Generally available	57	14
	Special available only for my profession	317	78
	Very specific, available for small group of people	30	7
Dimension more important for my work	Explicit	54	13
	Tacit	81	20
	Both	263	65
I developed my knowledge due to	Long intensive study	56	14
	Long practice	125	31
	Special talent	7	2
	Combination of all	222	55
I share knowledge with colleagues more in (only for now 270)	Written form	21	8
	Verbally	244	90

We asked our respondents whether they work alone or in group because of knowledge sharing. When sharing knowledge, organisation tries to internalize knowledge into more persons and the value of the knowledge is increased in such a way (Savanevičienė, Girdauskienė 2011). Results of work in groups or team are directly influenced by ability and willingness of knowledge workers to share their knowledge. Working in group requires sharing of knowledge, especially sharing of the tacit dimension and indicates tacit demandingness

of the job. One of presumptions on knowledge workers is that their work is tacit knowledge demanding. We know that the answer may be related to the type of job and that some jobs require working alone but in our opinion, they are not many. Answers to the question concerning the style of work indicate that the presumption is true. Only 7 % of respondents reported that they work alone, 20 % of respondents reported work in group, 74 % of respondents reported that they use both options. E.g. for 94 % of respondents work in groups is important.

Knowledge is of intangible character and organisation can own and use it only through its owners, knowledge workers. Many knowledge workers possess knowledge that is not generally available. When they leave an organisation, their knowledge leaves it, too. If the knowledge is not generally available, the organisation may have problem to find another knowledge worker with similar or same knowledge. Knowledge drain is great problem of public administration and security services in both the Czech and Slovak Republic. We were curious if our respondents belong to group of employees whose loss may be dangerous for their organisation. Answers of our respondents proved this presumption. Only 14 % of respondents reported that knowledge they use for their work is generally available. 78 % of respondents reported that their job requires knowledge available only for their profession, e.g. their organisations depend on renewal of knowledge. 7 % of respondents' job requires knowledge that is available only for small group of people, e.g. highly specialised knowledge. In the case of loss of such knowledge worker, similar knowledge may not be available at all. Results of the research show that 85 % of respondents of our research possess knowledge difficult to substitute.

The presumption on tacit demandingness of knowledge work was definitely proved by answers to the question which dimension of knowledge is more important for work of interviewed knowledge workers. Only 13 % of respondents reported explicit knowledge more important for their work. 20 % of respondents reported tacit knowledge as most important and 65 % of respondents reported both dimensions as important.

When asked how they developed knowledge they use for their knowledge work, interviewed knowledge workers answered as follows. 2 % of respondents developed their knowledge due to the special talents. This proportion does not surprise us as our respondents do not do jobs that require special talent, as for example artists do. 14 % of respondents developed their knowledge due to long intensive study that corresponds with the per-

centage of respondents that reported explicit knowledge more important for their work than tacit one (13 %). 31 % of respondents reported that they developed their knowledge due to long practice and 55 % of respondents reported that they used all options which indicates that importance of tacit knowledge for their job.

To prove the importance of tacit knowledge for knowledge workers we asked our respondents how they share their knowledge. We offered them two options, in written form or verbally. Only explicit knowledge can be shared in written form. Verbal form is important for sharing of tacit knowledge. This question was incorporated to the questionnaire later, compared to other questions, only 270 respondents answered it. 8% of respondents out of 270 share their knowledge mostly in written form. 90 % of respondents reported that they share their knowledge verbally which again indicates importance of tacit knowledge for knowledge workers.

5. Conclusions

Knowledge workers and knowledge work are very important for the knowledge society and individual organisations. Present-day managers must manage knowledge workers and their productivity but they often do not know how to do it. They face problems of the intangible character of knowledge. Knowledge is hidden in the brains of knowledge workers and managers cannot control how knowledge workers create and work with it. Some knowledge workers possess and use highly specific knowledge of a tacit character. They may be the only one who has the knowledge in an organisation and they may not be aware that they have it. Mismanaging or losing such knowledge workers means losing his knowledge. As well as this, managers also fight with other problems, for example with non-linearity and the sometimes surprising long-term effects of knowledge work, with the egos of knowledge workers, and problems with knowledge sharing (Mládková 2012).

Present-day managers who manage knowledge workers are in a similar situation to the managers of manual workers who lived before the Gilbreths and F. W. Taylor. While we know how to manage manual workers and how to measure and improve their productivity thanks to these theorists, we are still at the beginning when the management of knowledge workers is concerned (Mládková 2012).

The research on knowledge workers and their management started in autumn and it still continues. The objective of the research is to verify some presumptions on knowledge work and the man-

agement of knowledge workers. The research is a quantitative research and is based on a questionnaire. Questions are constructed as closed questions. Respondents choose from given options or evaluate given options on the Likert 1-5 scale. Some of the closed questions offer the option of commentary. Respondents fill the questionnaire without the supervision of researchers. Questions are constructed so that they did not indicate what may be a "correct answer".

Respondents of the research are students of combined and distant programmes of the University of Economics Prague, the Police University of the Czech Republic and the Armed Forces Academy Liptovský Mikuláš Slovakia. We decided on them because many of them work in knowledge intensive jobs.

This article includes answers of 405 respondents to questions on important aspects of work of knowledge workers.

Results of the research indicate that typical presumptions on knowledge workers and their work are true. 94 % of respondents reported that they work in groups with other people, e.g. in environment where they must share their knowledge. 85 % of respondents reported that their job requires specialised knowledge that is not generally available and only 13 % of respondents reported explicit knowledge more important for their work than tacit one. This result together with results on how knowledge workers learned their knowledge (86 % through combination of long practice and study plus talents) and the fact that 90 % of respondents reported that they share their knowledge verbally indicates importance of tacit knowledge for knowledge workers.

The research on knowledge workers and their management will continue. We plan to interview knowledge workers of other occupations to get more representative sample of respondents.

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