SmartWoW – constructing a tool for knowledge work performance analysis

SmartWoW – Constructing a tool for knowledge work performance analysis

Structured abstract

Purpose – New Ways of Working (NewWoW) refers to a novel approach for improving the performance of knowledge work. The idea is to seek innovative solutions concerning facilities, information technology tools and work practices in order to be able to "work smarter, not harder". In order to develop work practices towards the NewWoW mode there is a need for an analytical management tool that would help assess the status of the organization's current work practices and demonstrate the impacts of development initiatives. This paper introduces such a tool.

Design/methodology/approach – Constructive research approach was chosen to guide the development of the SmartWoW tool. The tool was designed on the basis of previous knowledge work performance literature as well as on interviews in two knowledge-intensive organizations. The usefulness of the tool was verified by applying it in four organizations.

Findings – SmartWoW is a compact questionnaire tool for analyzing and measuring knowledge work at the individual level. The questionnaire consists of four areas: work environment, personal work practices, well-being at work and productivity. As SmartWoW is a standardized tool its results are comparable between organizations.

Research limitations/implications – SmartWoW was designed a pragmatic managerial tool. It is considered possible that it can be valuable as a research instrument as well but the current limited amount of collected data does not yet facilitate determining its usefulness from that perspective.

Originality/value – This paper makes a contribution to the existing literature on knowledge work measurement and management by introducing an analytical tool which takes into account the NewWoW perspective.

Keywords – Knowledge work, performance, productivity, measurement, new ways of working

Paper type – Research paper

1. Introduction

The performance of an individual knowledge worker drives the success of knowledge-intensive organizations (Alvesson, 1993; Blackler, 1995; Miles, 2005; Groen et al., 2012). Therefore, the improvement of knowledge work performance is a key challenge of modern

economy (Drucker, 1999). *New Ways of Working* refers to a novel approach to overcome this challenge.

The concept of New Ways of Working (NewWoW) deals with the application of non-traditional and flexible work practices and locations for carrying out knowledge work (Van der Voordt, 2004; Gorgievski et al., 2010). The utilization of ICT is typical for NewWoW practices. For example, Gorgievski et al. (2010) describe 'new ways of working' as a possibility to work when and where people prefer to work using fast and mobile IT-facilities. They also depict offices becoming networks of activity-related non-assigned "hot" desks and people using additional external work places at home, at the client, in a restaurant etc. The concept arises from the needs of modern companies to provide flexible work arrangements and more cost efficient and creative office environments in order to support competitiveness and employee productivity without decreasing job satisfaction (e.g., Van der Voordt, 2004, Beauregard and Henry, 2009; Kattenbach et al., 2010). NewWoW is used to refer to such concepts as telework, mobile work, desk sharing, paperless offices, videoconferencing and flexible or alternative workplaces and practices (Van der Voordt, 2004, Van Meel, 2011). NewWoW idea consists of applying novel practices and open-minded testing of different options rather than doing things as before without questioning the suitability of existing practices. The whole idea is to work smarter, not harder (Bontis, 2011). In this paper, we construct a framework for measuring the "smartness" of work practices that are expected to lead to improving knowledge work productivity and the welfare of knowledge workers.

Measurement information on knowledge work performance is needed both in daily managerial activities and in demonstrating the impacts of development initiatives, such as new ways of working. It is suggested in this context that the purpose of measurement should be oriented towards facilitating the employees' performance instead of formal control (Amir et al., 2010; Groen et al., 2012). While the nature of knowledge work and the means to improve its performance (Davenport, 2008; Miller, 1977) have been studied a lot, there are fewer studies on knowledge work performance measurement (Takala et al., 2006). In the literature, there are some measurement models for knowledge work (Ramirez and Nembhard, 2004; Laihonen et al., 2012; Takala et al., 2006) and some case-specific measurement processes for NewWoW interventions (Ruostela et al. 2014; Palvalin et al. 2013). However, there are no prior managerial tools for analyzing the status (or maturity) of NewWoW practices and the related level of productivity and employee welfare. Thus, this paper and the tool introduced clearly have both academic and managerial novelty value.

In order to develop an organization's ways of working towards the NewWoW mode, there is a need for an analytical tool that would help assess the status of the organization's current work

practices (i.e. the extent of novelty of work practices in use) and their effectiveness in terms of productivity and employee welfare. This tool would be useful in a) analyzing the status of work practices, b) guiding development practices towards the NewWoW mode and c) capturing the impacts of NewWoW interventions. The objective of this paper is to introduce such a tool.

This paper presents a new tool – SmartWoW – for knowledge work performance analysis and improvement. The tool is particularly tailored for measuring the NewWoW mode of operations. SmartWoW is a questionnaire-based self-reporting tool as opposed to, for example, objective measures, peer evaluations or managerial ratings (see e.g., Ramirez and Nembhard, 2004; Koopmans et al., 2013; Laihonen et al., 2012). Subjective measurement tools, while having their limitations, have been considered useful in knowledge work context (Koopmans et al., 2013). This paper reports the construction process of the new tool. From a research methodology perspective, this study follows the phases of the constructive research approach (Kasanen et al., 1993, Labro and Tuomela, 2003), which is well-suited for studies aiming to develop new managerial tools. This includes, for example, the literature-based justification of the elements of the measurement model and the empirical testing of the tool in four case organizations.

This paper is organized as following: In the next section there is a methodology which describes shortly the steps of constructive research approach and co-operating organizations. After that, there is a literature about the topic of measuring performance in knowledge work context. Sections 4 and 5 present the results and discussion of the study. These sections follow the steps of constructive research approach which is typical format to report constructive research. At the end we have concluding remarks to summary the paper.

2. Methodology

This research was conducted using the constructive research approach. According to Kasanen et al. (1993), constructive research approach can be used to create a managerial construction to solve a practical problem. There are seven phases in the constructive research approach: 1) Find a practically relevant problem, which also has research potential, 2) Examine the potential for long-term research co-operation with the target organization, 3) Obtain a general and comprehensive understanding of the topic, 4) Innovate and construct a theoretically grounded solution idea, 5) Implement the solution and test whether it works in practice, 6) Examine the scope of the solution's applicability, and 7) Show the theoretical connections and the research contribution of the solution (Kasanen et al., 1993; Labro and Tuomela, 2003).

Research methods for constructing this new SmartWoW tool include literature review, interviews as well as pilot tests in four case organizations. In addition to reviewing literature, we carried out an interview study in two of the case organizations (2 and 4). Altogether 18 knowledge workers were interviewed in order to understand how various aspects of work environment and work practices affect the productivity and wellbeing of employees. This helped to identify the main elements of knowledge work to be covered by the measurement tool. After testing the SmartWoW tool in practice, we conducted interviews in each organization to collect feedback for the solution's applicability.

Organization 1 is a small 33 person company which aims to guide other companies to develop their business. Its mission is to increase regional well-being while working in collaboration with the business world, public sector and universities.

Organization 2 has more than 400 employees of with 75 were selected as the target group for the pilot tests in this study. All the participants are working in consulting services. Energy efficiency and building services design are the core competences of the organization.

Organization 3 is a large real estate and business facility company employing thousands of people. An 80 person side office participated in this study. While the company's main operations include fairly basic facility services all the respondents were white-collar workers.

Organization 4 is a medium-sized company operating in the field of built environment. It offers expert services to assist in decision-making which is sustainable from the viewpoints of economy, environment and workplace well-being. 60 employees were involved in this research.

3. Literature review: Measuring performance of a knowledge worker in a "smart" context

The context of knowledge work was introduced 1959 by Drucker when he used it as a term to separate knowledge work from manual work. Drucker proposed that knowledge worker is a person who works primarily with information or is a person who develops and uses knowledge at workplace (Drucker, 1959). Since then, knowledge work is defined in many ways, but there is no standardized definition for it (Dahooie et al., 2011; Kelloway & Barling, 2000). The problem with defining knowledge work is that knowledge has some role in every work (Dahooie et al. 2011). In this research we use Drucker's (1959) definition, but add that "knowledge worker's work is not usually dependent on location or time". This addition is used to outline e.g. the work of doctors and teachers which is high knowledge intensive work, but has a special nature.

Instead of labeling all workplace and work practice changes as 'new', we elaborate the concept of NewWoW and rename it as 'Smart ways of working' (SmartWoW). The important

notion is to work smarter, not harder (Bontis, 2011). This wording emphasizes the importance of renewing work practices in smart ways – not just focusing on whether the initiative is new or even innovative but that it works in practice in a given context in order to improve productivity without having more stress and frustration. Smart ways of working attempts to change the organizational culture in a way that the knowledge workers can decide about the ways they work: work practices, schedules and work places can be controlled by employees.

Existing literature recommends balanced performance measurement frameworks as a solution for measuring performance of knowledge-intensive organizations. For example, the framework of Ramirez and Nembhard (2004) focuses on productivity dimensions and provides several aspects to be considered in measurement: quantity, costs, profitability, timeliness, autonomy, efficiency and many others are recognized as the drivers of knowledge work productivity. Authors note that different subsets of these dimensions are typically used in measurement. Takala et al. (2006), propose a structured framework for measuring white-collar performance. Their framework approaches the performance of strategic work from four aspects: results, process, behavior and physiology. In routine work only results are measured. The problem with the balanced performance frameworks is that they do not provide any measurement solutions (how to measure); they only support in recognizing measurement objects (what to measure).

In addition to the above-mentioned organizational approach to the issue, Jääskeläinen and Laihonen (2013) recognize two specific components that should be carefully considered in the performance measurement of knowledge-intensive organizations: performance of a knowledge worker and customer-perceived performance. Both perspectives represent essential success factors (Alvesson, 1993; Groen et al., 2012) of knowledge-intensive organizations and also provide specific measurement challenges. Knowledge worker perspective represents the most relevant aspect for tackling the objective of this research. It calls for specific evaluation instruments capturing the individual nature of knowledge work.

Subjective evaluation methods are widely supported in measuring knowledge worker performance at the individual level. It has been argued that these flexible methods capture the unique and changing nature of knowledge work, and provide the possibility to comprehensively capture the relevant intangible aspects of knowledge worker performance. (Jääskeläinen and Laihonen, 2013) There are specific subjective measurement tools for knowledge work performance (Clements-Croome and Kaluarachi, 2000; Kemppilä and Lönnqvist, 2003; Janz et al., 2007) but they are characterized with complex and theoretical constructs which are difficult to apply as practical managerial tools.

Similar measurement solutions are provided by the human resources management literature (HRM). Tools and practices like behaviorally anchored rating scales, competence frameworks and 360° feedback evaluations are often used for supporting performance appraisal (Fisher, 2005; Mann et al., 2012; Koopmans et al., 2013). The same tools are also used for evaluating employees' competencies and creating a basis for remuneration, promotion or termination and to identify training needs (Dulewicz and Fletcher, 1992). The challenge in these methods is that they often concentrate on individual performance but are only implicitly linked to organizational performance (Jääskeläinen and Laihonen, 2013). Most of the existing subjective measurement tools are also suitable for measuring the change in performance of knowledge work as an output variable but they have limited ability to provide explanations about the reasons for performance changes. One reason for this is that performance is approached from the perspective of task performance. However, contextual factors such as facilities, technological equipment, personal relationships or working atmosphere (Ferris et al., 2009; Kahya, 2008; Koopmans et al., 2013) are often the triggers of performance improvements.

Although the measurement of organizational change is a common setting in academic studies, the literature on performance measurement and management has paid little attention on the examination of change processes (Barbosa and Musetti, 2011). There are surveys tailored to specific change contexts but less tools proving managerially relevant and comparable information from different organizational environments posing changes. This particular setting brings along with specific measurement challenges (Laihonen et al., 2012) such as the identification of aspects impacted by the change. The key question is whether the identified impacts are the result of studied change or some other random factors. There is a need to measure both the change itself and its impacts (Adcroft et al., 2008; Taskinen and Smeds, 1999). This means that there is a need to obtain information not only from outputs or outcomes but also the actual work processes and practices (Laihonen et al., 2012; Okkonen, 2004), i.e performance drivers.

It appears that the current literature on knowledge worker performance evaluation has not kept up with the modern work environment reflecting new ways of working, NewWoW. NewWoW seems to be a highly potential approach for improving both productivity and employee welfare in knowledge work context. However, the theme is still quite new and there is a lack of empirical evidence on the effectiveness of NewWoW practices. There is also a lack of practical tools for analyzing and managing performance from the NewWoW perspective. In the extant literature, there are some examples of studies in which the impacts of NewWoW have been examined related to specific interventions, for example, changes in physical office environment (Gorgievski et al.,

2010; Haynes, 2007; Maarleveld et al., 2009), impacts of information and communication technologies (Jacks et al. 2011; Palvalin et al., 2013) or flexible workplace policies and shifts in organizational culture (Halpern, 2005; Kelly et al., 2011). While these studies provide valuable understanding of knowledge work performance and related measurement practices they usually focus only on a certain performance driver and its impact on either productivity or employee welfare. Instead, the key point of NewWoW thinking is the evaluation of the functioning of work practices as a whole in the given context. Thus, a need for a new kind of measurement tool clearly exists.

There are some previous attempts to develop subjective measurement tools for analyzing performance in general. For example, Koopmans et al. (2013) created a generic three-dimensional individual work performance questionnaire (IWPQ) for measuring task performance, contextual performance and counterproductive work behavior in occupational sectors. They define individual work performance as "behaviors or actions that are relevant to the goals of the organization, and under control of the individual". The IWPQ focuses on measuring employee behaviors instead of the effectiveness of these behaviors. However, we see that both perspectives − behaviors and outcomes − should be included when analyzing knowledge work. In addition to these, work environment plays a crucial role in supporting knowledge workers, including physical, virtual and social-organizational environments (Bosch-Sijtsema et al., 2009). These contextual factors are also integrated into our construct of knowledge work performance.

4. Constructing the SmartWoW tool

4.1 Starting point

The SmartWoW tool was constructed through seven phases of constructive approach as was described in Section 2. Firstly, the relevance of the problem, that is, the need for a new kind of knowledge work performance measurement tool has been explained in the first and third sections of the paper. In addition to what has been already mentioned, this study was motivated by the practical needs raised by an ongoing research project dealing with the measurement of the impacts of companies' NewWoW initiatives. During the project it became evident that there is a need for an easy to use standard tool which can be used to carry out before-after comparisons or to compare companies with each other. Secondly, ongoing research collaboration with a group of knowledge-intensive business organizations gave a starting point to this research. Four case organizations were

selected for this research. They all experienced a need to find a novel tool for measuring the performance of knowledge work.

Thirdly, the authors preunderstanding of the theme is based on several years of experience on the topic of measuring and managing the performance of knowledge-intensive organizations. In addition, for the past three years they have been involved in a research project in which the NewWoW approach as a mean to develop knowledge work performance has been examined. Thus, the background knowledge of the topic was strong already in the beginning of the project. Understanding of the theme was further strengthened by reviewing the latest literature (discussed in Section 3).

As a result of the previous steps, we suggest that the following three factors are important when analyzing the performance of knowledge work (in the NewWoW environment): contextual factors, actual work processes and practices as well as results and outcomes of work (Figure 1). When taking all these factors into account, it is possible to have a comprehensive view on performance and to identify the reasons behind good or poor performance. Moreover, by evaluating both the performance drivers and outcomes, it is possible to detect the impacts of NewWoW initiatives and to identify, for example, which of the practices or tools improve performance.
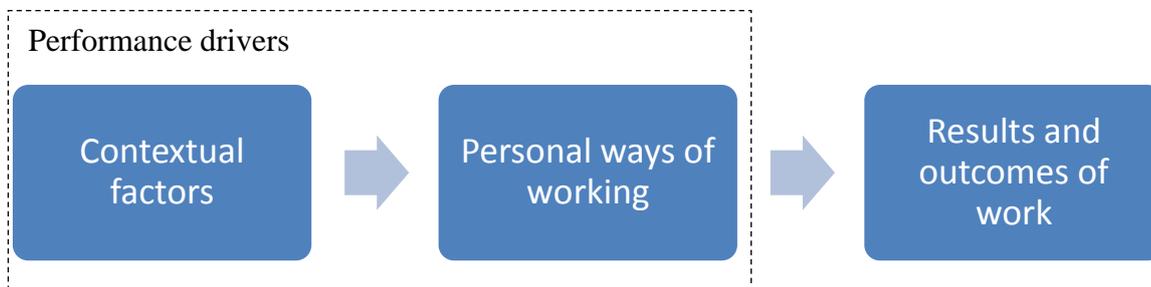
Figure 1. Three components of knowledge work performance.

4.2 "Innovate and construct a theoretically grounded solution idea"

The initial idea was to develop a general subjective measure for knowledge work productivity and include productivity drivers in it. The authors had previous experience in applying subjective productivity measures in several companies. In addition, the interviews carried out in the two companies suggested that a subjective approach would be useful in capturing the subtle, individual experiences related to knowledge work practices. The perspective of employee well-being was also integrated in order to better cover the NewWoW thinking – to aim at both productivity and well-being.

Then, relevant existing literature and questionnaires were analyzed in order to validate the construct and generate items for the tool (e.g., Maarleveld et al., 2009; Koopmans et al., 2013; Wännström et al., 2009; Schaufeli et al., 2006; Vuolle et al., 2008). This creative questionnaire design process included several researcher workshops and two commentary rounds, one with the authors' colleagues and one with collaborative companies. Several revisions to different aspects of the tool were made during these iterative rounds in order to reach a solution that met every party's expectations. Figure 2 presents the four key components of the tool. Compared to Figure 1, 'Results and outcomes' have been divided into 'Well-being' and 'Productivity'.
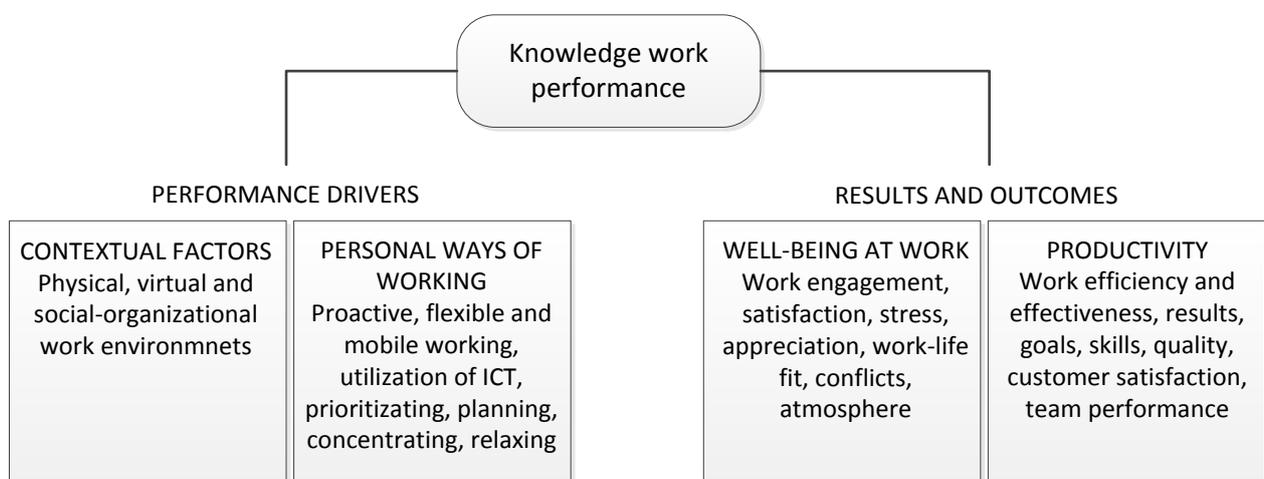
```
                          ┌──────────────────┐
                          │  Knowledge work  │
          ┌───────────────│   performance    │───────────────┐
          │               └──────────────────┘               │
          │                                                   │
   PERFORMANCE DRIVERS                            RESULTS AND OUTCOMES

┌──────────────────┬──────────────────┐    ┌──────────────────┬──────────────────┐
│ CONTEXTUAL       │ PERSONAL WAYS OF │    │ WELL-BEING AT    │ PRODUCTIVITY     │
│ FACTORS          │ WORKING          │    │ WORK             │ Work efficiency  │
│ Physical, virtual│ Proactive,       │    │ Work engagement, │ and              │
│ and social-      │ flexible and     │    │ satisfaction,    │ effectiveness,   │
│ organizational   │ mobile working,  │    │ stress,          │ results, goals,  │
│ work environmnets│ utilization of   │    │ appreciation,    │ skills, quality, │
│                  │ ICT,             │    │ work-life fit,   │ customer         │
│                  │ prioritizating,  │    │ conflicts,       │ satisfaction,    │
│                  │ planning,        │    │ atmosphere       │ team performance │
│                  │ concentrating,   │    │                  │                  │
│                  │ relaxing         │    │                  │                  │
└──────────────────┴──────────────────┘    └──────────────────┴──────────────────┘
```

Figure 2. The key components of the SmartWoW tool.

The questionnaire is presented in Appendix 1. The first two parts of the SmartWoW tool analyze the contextual factors and personal ways of working that are both seen as important drivers of knowledge work performance. The rest of the SmartWoW tool measures the results and outcomes of knowledge work in terms of well-being and productivity. All of the statements are positively phrased and they are scored using a 5-point Likert scale from 1 = "Disagree" to 5 ="Agree". In addition, at the end of each dimension there is one open-ended question.

Contextual factors include physical location, virtual and social workplaces as well as organizational context (e.g., Bosch-Sijtsema et al., 2009; Vartiainen, 2007). The *physical workplace* should be supportive to tasks needing both concentration and collaboration in order to stay productive and creative (e.g., Halpern, 2005; Heerwagen et al., 2004; Maarleveld et al., 2009; Gorgievski et al., 2010). Statements related to physical workplace measures the functionality, ability to concentrate and ergonomics of the workplace. For example, whether there are enough spaces for official and informal meetings and whether space can be used based on activity and

orientation (Maarleveld et al., 2009). A high level of noise and interruption distracts workers and, thus, workers should be able to work concentrated when needed to be productive (Jett and George, 2003; Haynes, 2007; Mehta et al., 2012)

Technology plays a significant role in providing employees control over how, where and when they conduct their work (O'Neill, 2010). Statements related to *virtual workplace* measures whether organization provides proper tools for accessing real-time information and for efficient communication and collaboration. These tools also help knowledge workers to increase their awareness and creating a sense of belonging in a community which are especially important issues for remote and mobile workers and virtual teams (Vartiainen and Hyrkkänen, 2010). Virtual workspace includes, for example, ICT tools and platforms, video conferencing, shared calendars and documents and other collaborative groupware, instant messages, mobile tools and social network services (e.g., Vartiainen and Hyrkkänen, 2010; Holtshouse, 2010). All these tools have a possibility to impact knowledge workers productivity through time savings and increased information (Palvalin et al. 2013). Some might be worried out that employees are spending too much time using all modern tools at work but it has been noted that employees use, for example, instant messaging in ways that help them to manage interruption, such as quickly obtaining task-relevant information and negotiating conversational availability (Garrett and Danziger, 2007).

Social workplace measures whether knowledge workers are supported or allowed to have autonomy and utilize new ways of working in terms of attitudes, common routines and policies as well as organizational habits. Social environment refers to cognitive constructs, thoughts, beliefs, and mental states that employees share (see, e.g., Vartiainen, 2007). Organizational context includes, for example, culture, strategy, policy and rewards (Bosch-Sijtsema et al., 2009). In order to improve engagement and performance of people and organizations, it is important to provide choice about where, when and how to work (O'Neill, 2010) and have support from colleagues and supervisors (Bakker and Demerouti, 2008). Statements related to social and organizational context include policies and attitudes for flexible, mobile and remote working, clear goal setting, transparency, as well as common routines and policies for efficient meetings and communication, which all have an impact on productivity (e.g. Drucker, 1999; Origo and Pagani 2008; Ramirez and Steudel, 2008). In addition, it is suggested that work should be evaluated more in terms of results achieved instead of only measuring working hours (Kelly et al., 2011). Moreover, innovative climate is the key for utilizing smarter culture as it encourages workers to think of ways to improve things at their workplace (Wännström et al., 2009).

Whereas contextual factors define the overall atmosphere and support for conducting knowledge work in new ways, *personal ways of working* measures if the workers are willing or motivated to utilize such practices (Ruostela and Lönnqvist, 2013; Koopmans et al., 2013). Individual work practices and behaviors include ways to have control over schedule, workload and interruptions whether it means that a worker prefers to come to the office during office hours or to work flexibly at home or at the office or in various other places utilizing ICT. Workers can control, for example, the timing of their work and the location where they work, which affects their commuting time and total time away from home (Kelly et al., 2011). Mobile services can be used for accomplishing tasks that need a rapid reaction or response, improving situation awareness and utilizing idle time for working while on the move (Vuolle, 2010). Planning behavior, including goal setting, prioritizing and, for example, preparing for meetings, help workers to focus on results and control their time and workload (Kearns and Gardiner 2007; Claessens et al., 2004). Interruptions can be managed, for example, by working remotely when needing concentration (or boosting creativity). It is also suggested that the effect of email interruption could be reduced, for example, by changing the settings and modes of using the email software (Jackson et al., 2003; Garrett and Danziger, 2007).

Well-being at work is measured through overall job satisfaction, work engagement, stress, appreciation, work-life balance, conflicts and atmosphere. The welfare of knowledge workers is a highly important driver for a high-performing organization because engaged workers are known to be more creative and open to new information and they tend to be productive (Bakker and Demerouti, 2008; Bakker, 2011). In addition, flexible work practices can reduce stress and work-family conflicts, improve health, work-non-work fit and well-being (Greenhaus and Powell, 2006; Beauregard and Henry, 2009; Halpern, 2005; Kelly et al., 2011). The importance of social climate of the workplace is also acknowledged in literature (Wännström et al., 2009). There is a lot of existing research on the measurement of well-being and employee satisfaction. Thus, for the purposes of the SmartWoW we used selected questions from established and tested personnel welfare surveys QPSNordic (Dallner et al. 2000; Wännström et al., 2009) and UWES (Schaufeli and Bakker, 2003; Schaufeli et al., 2006).

Productivity is measured by statements related to work efficiency and effectiveness, achieving results, goals, utilizing skills, quality of work, customer satisfaction and team performance (e.g., Ramirez and Nembhard, 2004; Ramirez and Steudel, 2008; Wännström et al., 2009). These are all typical issues related to productivity, reflecting internal efficiency of the worker and the effectiveness of the outcomes from the customer perspective (Palvalin et al., 2013).

Instead of just asking about productivity directly, we considered it more useful to focus on the more detailed components or related factors to indicate about the status of productivity.

5. Testing the SmartWoW tool

5.1 "Implement the solution and test whether it works in practice"

SmartWoW was tested in three stages and some adjustments to it were made in between. First, the tool was tested by authors' fellow researchers. The result of this test was that while the tool seemed to work quite well as a whole some of the questions were unclear in terms of formatting and some relevant issues seemed to be missing (e.g., related to work engagement). Thus, some modifications were made. Second, SmartWoW was tested in the first external organization (Pilot test #1). The feedback from the respondents was positive and no changes were required. However, the reporting of the results pointed out a few problems. For example, work environment and individual work practices sections had questions which were not giving any relevant information or seemed to be in the wrong place. Based on these experiences the tool was slightly modified again. Third, SmartWoW was implemented in the three other companies (Pilot tests #2-4) for testing on how it works in practice. Table 1 summarizes the pilot tests showing their sample size, the number of respondents, response rate and results.

Table 1. Summary of the pilot tests.

	Organization 1		Organization 2		Organization 3		Organization 4		
Sample size	33		75		80		60		
N	22		28		26		35		
Response rate	67%		37%		33%		58%		
Dimension (number of factors)	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Cronbach's alpha
1. Physical workplace (5)			3.60	1.26	3.24	1.42	3.81	1.21	0.77
2. Virtual workplace (6)	3.41	1.34	3.67	1.28	3.42	1.34	4.27	0.91	0.69
3. Social-organizational workplace (9)			3.49	1.10	3.23	1.31	4.04	0.99	0.86

4. Personal work practices (10)	3.42	1.18	3.26	1.27	3.59	1.26	3.52	1.34	0.73
5. Well-being at work (8)	3.38	1.07	3.90	0.84	3.58	1.16	4.31	0.83	0.88
6. Productivity (7)	3.40	0.92	3.89	0.85	3.96	0.93	4.16	0.69	0.84

Table 1 also presents Cronbach' alphas in different dimensions of SmartWoW. All alphas are fairly over 0.5 which is the minimum requirement and each area except for virtual workplace exceed the limit of 0.7, which is usually considered a good level. High internal consistency enables examining questions in selected groups.

Figure 3 shows an example of presenting an overview of the results of SmartWoW, which was send to the organization managers. The percentages are calculated by valuating the answers from 1 disagree to 5 agree and then calculating the average. The mean value was then compared to the maximum value 5 to get percentages. As SmartWoW is a standardized tool, the results are comparable. Thus, it is possible to compare the results between internal departments, between companies, over time (e.g., before and after a work place development project) or between industries or professions. In the pilot test we compared organizations 2, 3 and 4 to each other. The results indicated clear differences between the companies. This was very helpful in understanding how a certain company performs in relation to others, that is, to determine whether a certain measurement result is actually good or bad.
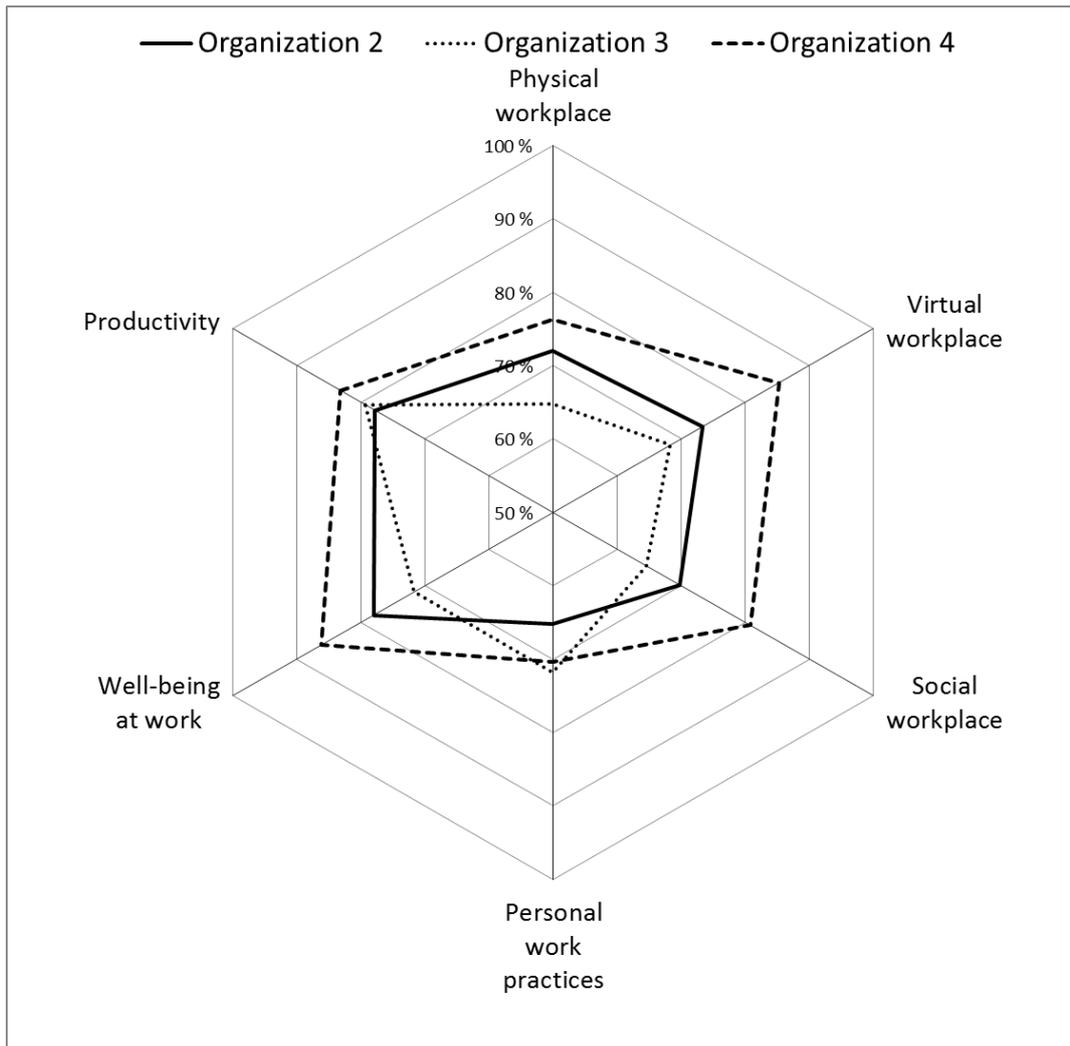
Figure 3. An illustration of the comparison of SmartWoW results.

As mentioned, open-ended questions are also a key part of SmartWoW. Some examples of real responses for the question "How could your productivity be improved?" are listed below:

- "Every worker should have clear personal goals, which are strictly related to the results. At the moment I am working with several units, but there are moments when I do not know my goals."

- "Less bureaucracy. Focus more to the actual doing, not discussing how every small detail should be done."

- "More working as a team. Increased level of communication, e.g. weekly meetings."

As the examples show, the open-ended questions provide more insight on the Likert scale questions. In addition, they are more development focused, providing means to improve the problematic areas.

5.2 "Examine the scope of the solution's applicability"

In constructive research, the model being developed is usually validated by using the so-called market test. According to Kasanen et al. (1993), there are three types of market tests: weak, semi-strong and strong. The construct passes the weak market test when a high level manager in an organization is willing to use it in decision-making. The semi-strong market test requires that the construct is used throughout the organization. The strong market test is passed when there is evidence for economic benefits from using the construct and it is used systematically in several organizations. (Lukka, 2000; Kasanen et al., 1993) According to Labro and Tuomela (2003), the semi-strong and strong market tests cannot be passed in short time and, thus, those are not applicable in this case. Below, we report the feedback from the pilot organizations concerning SmartWoW.

Organization 1 felt that they needed this kind of tool to measure their human resources, work well-being and productivity. They were interested in using SmartWoW again in order to get more information on how well-being and productivity have changed during the year. They also implement SmartWoW results as a part of their performance measurement system.

Organization 2 is going to continue their physical workplace change project and the results of SmartWoW are going to be used in decision making. They felt that SmartWoW is good for recognizing the problems but at the same time felt that it should also provide some solutions. Respondents in organization 2 felt that SmartWoW works very well and it has good usability.

Organization 3 had very positive feeling about SmartWoW. The first good signal was that the results were forwarded immediately to the company managers because the contact person felt that the information was relevant and important. Company representatives were very pleased about that there finally is a standardized tool for measuring productivity and work well-being. They felt that this is extremely important for getting comparable data. Comparison to other companies and comparison to previous results were regarded as the most valuable information produced by SmartWoW. Organization 3 is planning to do some changes in its work environment in the near future and they were interested in using the SmartWoW again after the changes in order to evaluate their impacts. They were also interested in using SmartWoW with their clients to identify the need for changes.

Organization 4 also had a positive feeling about SmartWoW and they felt that their organization is suitable for this kind of tool due to advanced ways of working. They were a little bit disappointed because the term 'tool' referred to the questionnaire. Organization 4 was interested in knowing how to improve performance and they valued open-ended questions highly. They were

also interested in knowing what they could learn from the other organizations' results. Organization 4 felt that SmartWoW has potential to be used with their clients.

When analyzing the observations from pilot organizations it appears that the measurement tool is versatile. It fulfills three key comparative task of performance management (Matta, 1989). Organization 1 regarded the tool as a useful component of a performance measurement system where it can be monitored annually with updated objectives and action plans ('goal analysis'). Organization 2 highlighted the benefits in measuring the impacts of change interventions ('trend analysis'). In practice, this means measurement before and after change interventions. Organizations 3 and 4 felt that the value of such a tool links especially to the possibility to utilize it in comparison analysis. When the 'maturity' of working practices is captured in several work environments and units it is possible to utilize the data in comparisons and learn from other organizations. Furthermore, it was mentioned that the measurement results act as a trigger for discussion around knowledge work performance and its drivers.

To summarize, the pilot organizations found SmartWoW useful and are willing to use it again. Some were also interested in using it with their own clients. Therefore, it can be stated that the tool fulfills the criteria of the weak market test. At the moment, we only applied SmartWoW in four organizations. Thus, it is not possible to claim that it would be universally applicable or useful in all knowledge work environments. However, it is a compact and generic tool and, thus, it should be useful in many different contexts.

5.3 "Show the theoretical connections and the research contribution of the solution"

The theoretical basis of SmartWoW has been discussed thoroughly in previous sections. It is connected to the ongoing discussion on knowledge work performance improvement, with a fresh twist related to the NewWoW thinking. More specifically, the tool seems promising as a research instrument in exploring the relationships between the components of the tool. It can act as a platform for the analysis of performance benefits from changing work practices and work environment. Currently available surveys have yet rarely incorporated modern, flexible or alternative workplaces and practices. Furthermore, the survey tool can be applied in studying the balance between sometimes competing objectives of productivity and work well-being. However, more data is needed in order to explore these further research possibilities.

6. Concluding remarks

Knowledge work performance management is not an easy task and there is a need for pragmatic tools to support the managerial work. The new SmartWoW measurement tool constructed in this study has demonstrated potential as a part of a managerial toolbox of knowledge-intensive organizations. The experience gained from applying SmartWoW is so far positive and promising. The tool fulfills rather well the objectives defined at the beginning of this study. It supports in analyzing the status and novelty of knowledge work practices and facilitates an open-minded search for new ways of working. Furthermore, when SmartWoW is used before and after change interventions it is useful in capturing the impacts of NewWoW initiatives.

Knowledge work performance is a phenomenon that is difficult to approach. It has an immaterial, qualitative and changing nature. Earlier research highlights the need to understand the drivers of performance in order to measure and manage knowledge work performance. The framework underlying the SmartWoW tool is a novel addition to existing literature, categorizing the knowledge work performance drivers from the perspective of modern work practices. There are several avenues for further research applying and refining the survey tool itself.

Further research could go deeper in the different forms of knowledge work in order to better understand the varying nature of different contexts. The experiences of this study indicate that SmartWoW is applicable specifically in non-standard and mobile knowledge work but less so in fixed office work. The tool was specifically addressed to the needs of practitioners. From the academic perspective, validity and reliability requires more testing with wider datasets and consideration of modifications to the survey structure. This paper did not attempt to identify rigor causalities between the identified perspectives of knowledge work which is one obvious direction of further research. Such research would benefit from objective dependent variables for productivity. In order to fulfill the criterion of practicality, the survey structure was compromised in length. There is probably a need to reconsider the different analysis levels such as the individual, the team, the unit and the whole organization. Furthermore, more detailed questions regarding social context, especially in terms of attitudes and culture, could improve the validity of the survey.

References

Adcroft, A., Willis, R., Hurst, J. (2008), "A new model for managing change: the holistic view", *The Journal of Business Strategy*, Vol. 29, No.1, pp. 40-45.

Alvesson, M. (1993), "Organizations as Rhetoric: Knowledge-Intensive Companies and the Struggle with Ambiguity", *Journal of Management Studie,* Vol. 30, No. 6, pp. 997-1015.

Amir, A., Ahmad, N., Mohamad, M. (2010), "An investigation on PMS attributes in service organisations in Malaysia", *International Journal of Productivity and Performance Management*, Vol. 59, No. 8, pp. 734–756.

Bakker, A.B. (2011), "An evidence-based model of work engagement", *Current Directions in Psychological Science,* Vol. 20, No. 4, pp. 265-269.

Bakker, A.B., Demerouti, E. (2008), "Towards a model of work engagement", *Career Development International,* Vol. 13, No. 3, pp. 209-223.

Barbosa, D.H., Musetti, M.A. (2011), "The use of performance measurement system in logistics change process", *International Journal of Productivity and Performance Management*, Vol. 60, No. 4, pp. 339-59.

Beauregard, T.A., Henry, L.C. (2009), "Making the link between work-life balance practices and organizational performance", *Human Resource Management Review,* Vol. 19, No. 1, pp. 9-22.

Blackler, F. (1995), "Knowledge, Knowledge Work and Organizations: An Overview and Interpretation", *Organization Studies*, Vol. 16, No. 6, pp. 1021-1046.

Bosch-Sijtsema, P.M., Ruohomäki, V. and Vartiainen, M. (2009), "Knowledge work productivity in distributed teams", *Journal of Knowledge Management,* Vol. 13, No. 6, pp. 533-546.

Bontis, N. (2011), "Information Bombardment", *Rising above the digital onslaught*, Institute for Intellectual Capital Research. Hamilton, Canada.

Claessens, B.J., Van Eerde, W., Rutte, C.G., Roe, R.A. (2004), "Planning behavior and perceived control of time at work", *Journal of Organizational Behavior,* Vol. 25, No. 8, pp. 937-950.

Clements-Croome, D., Kaluarachchi, Y. (2000), "Assessment and measurement of productivity", Clements-Croome, D. (ed.) *Creating the Productive Workplace*, pp. 129-151, Suffolk, E & FN Spon.

Dahooie, J., Afrazeh, A., Hosseini, S. (2011), "An activity-based framework for quantification of knowledge work", Journal of Knowledge Management, Vol. 15, No. 3, pp. 422 – 444.

Dallner, A, Elo, A-L., Gambrele, F., Hottinen, V., Knardahl, S., Linstrom, K., Skogstad, A., Orhede, E. (2000), "Validation of the General Nordic Questionnaire for Psychological and Social Factors at Work", *Nordic Council of Ministers Copenhagen*, DK. Nord 2000:12.

Davenport, T.H. (2008), "Improving Knowledge Worker Performance" in Pantaleo, D. and Pal, N. (eds.) *From Strategy to Execution: Turing Accelerated Global Change into Opportunity*, Springer Berlin Heidelberg, pp. 215–235.

Drucker, P. (1959), "The Landmarks of Tomorrow: A Report on the New" Post-Modern." World. Harper Colophon Books, New York.

Drucker, P.F. (1999), "Knowledge-Worker Productivity: The Biggest Challenge", *California Management Review*, Vol. 41, No. 2, pp. 79–94.

Dulewicz, V., Fletcher, C. (1992), "The context and dynamics of performance appraisal", In *Assessment and selection in organizations. Methods and practice for recruitment and appraisal*, pp. 1-680, Third Edition, Edited by Peter Harriot. John Wiley & Sons, New York.

Ferris, G.R., Witt, L.A., Hochwarter, W.A (2009), "Interaction of Social Skill and General Mental Ability on Job Performance and Salary", *Journal of Applied Psychology,* Vol. 86, No. 6, pp. 1075-1082.

Fisher, C. (2005), "Performance management and performing management", in Leopold, J., Harris, L., and Watson, T. (eds.) *The strategic managing of human resources*. Prentice Hall, Edinburgh, UK.

Garrett, R.K., Danziger, J.N. (2007), "IM= Interruption management? Instant messaging and disruption in the workplace", *Journal of Computer-Mediated Communication,* Vol. 13, No. 1, pp. 23-42.

Gorgievski, M.J., van der Voordt, T.J.M., van Herpen, S.G.A., van Akkeren, S. (2010), "After the fire – new ways of working in an academic setting", *Facilities*, Vol. 28, No. 3/4, pp. 206-24.

Greenhaus, J.H., Powell, G.N. (2006), "When work and family are allies: A theory of work-family enrichment", *Academy of management review,* Vol. 31, No. 1, pp. 72-92.

Groen, B., van de Belt, M., Wilderom, C. (2012), "Enabling performance measurement in a small professional service firm", *International Journal of Productivity and Performance Management*, Vol. 61, No. 8, pp.839 – 862.

Halpern, D.F. (2005), "How time-flexible work policies can reduce stress, improve health, and save money", *Stress and Health,* Vol. 21, No. 3, pp. 157-168.

Haynes, B.P. (2007), "The impact of the behavioural environment on office productivity", *Journal of Facilities Management*, Vol. 5, No. 3, pp. 158 – 171.

Heerwagen, J.H., Kampschroer, K., Powell, K.M., Loftness, V. (2004), "Collaborative knowledge work environments", *Building Research & Information,* Vol. 32, No. 6, pp. 510-528.

Holtshouse, D. (2010), "Knowledge work 2010: thinking ahead about knowledge work", *On the horizon*, Vol.18, No. 3, pp. 193-203.

Jacks, T., Palvia, P., Schilhavy, R., Wang, L. (2011), "A framework for the impact of IT on organizational performance", *Business Process Management Journal*, Vol. 17, No. 5, pp. 846-870.

Jackson, T., Dawson, R., Wilson, D. (2003), "Reducing the effect of email interruptions on employees", *International Journal of Information Management,* Vol. 23, Vo. 1, pp. 55-65.

Janz, B.D., Colquitt, J.A., Noe, R.A. (1997), "Knowledge worker team effectiveness: the role of autonomy, interdependence, team development, and contextual support variables", *Personnel Psychology*, Vol. 50, No. 4, pp. 877–902.

Jett, Q.R., George, J.M. (2003), "Work interrupted: A closer look at the role of interruptions in organizational life", *Academy of Management Review,* Vol. 28, No. 3, pp. 494-507.

Jääskeläinen, A., Laihonen, H. (2013), "Overcoming the Specific Performance Measurement Challenges of Knowledge-intensive Organizations", *International Journal of Productivity and Performance Management*, Vol. 62, No. 4, pp. 350 - 363.

Kahya E (2008), "The effects of job performance on effectiveness", *International Journal of Industrial Ergonomics,* Vol. 39, No. 1, pp. 96-104.

Kasanen, E., Lukka, K., Siitonen, A. (1993), "The constructive approach in management accounting research", *Journal of Management Accounting Research*, Vol. 5, No. 1, pp. 243-64.

Kattenbach, R., Demerouti, E., Nachreiner, F. (2010), "Flexible working times: effects on employees' exhaustion, work-nonwork conflict and job performance", *Career Development International*, Vol. 15, No. 3, pp. 279-295.

Kearns, H., Gardiner, M. (2007), "Is it time well spent? The relationship between time management behaviours, perceived effectiveness and work-related morale and distress in a university context", *High Education Research & Development,* Vol. 26, No. 2, pp. 235-247.

Kelloway, E. K., Barling, J. (2000), "Knowledge work as organizational behavior", *International Journal of Management Reviews*, Vol. 2, No. 3, pp. 287–304.

Kelly, E.L., Moen, P., Tranby, E. (2011), "Changing Workplaces to Reduce Work-Family Conflict Schedule Control in a White-Collar Organization", *American Sociological Review,* Vol. 76, No. 2, pp. 265-290.

Kemppilä, S., Lönnqvist, A. (2003), "Subjective Productivity Measurement", *The Journal of American Academy of Business*, Vol. 2, No. 2, pp. 531–537.

Koopmans, L., Bernaards, C., Hildebrandt, V., van Buuren, S., van der Beek, A., de Vet, H. (2013), "Development of an individual work performance questionnaire", *International Journal of Productivity and Performance Management*, Vol. 62, No. 1, pp. 6 – 28.

Labro, E. and Tuomela, T-S. (2003), "On bringing more action into management accounting research: process considerations based on two constructive case studies", *European Accounting Review*, Vol. 12, No. 3, pp. 409-42.

Laihonen, H., Jääskeläinen, A., Lönnqvist, A., Ruostela, J. (2012), "Measuring the productivity impacts of new ways of working", *Journal of Facilities Management*, Vol. 10, No. 2, pp. 102 – 113.

Lukka, K. (2000), "The key issues of applying the constructive approach to field research", *Management Expertise for the New Millenium: In Commemoralion of the 50th Anniversary of the Turku School of Economics and Business Administration*. Publications of Turku School of Economics and Administration, Series A-1:2000, pp. 113-141.

Maarleveld, M., Volker, L., Van Der Voordt, Theo JM (2009), "Measuring employee satisfaction in new offices–the WODI toolkit", *Journal of Facilities Management,* vol. 7, no. 3, pp. 181-197.

Mann, S., Budworth, M.H., Ismaila, A. (2012), "Ratings of counterproductive performance: the effect of source and rater behavior", *International Journal of Productivity and Performance Management*, Vol. 61, No. 2, pp. 142 – 156.

Matta, K. (1989), "A Goal-oriented Productivity Index for Manufacturing Systems", International Journal of Operations & Production Management, Vol. 9, No. 4, pp. 66–76.

Mehta, R., Zhu, R.J., Cheema, A. (2012), "Is Noise Always Bad? Exploring the Effects of Ambient Noise on Creative Cognition", *Journal of Consumer Research,* Vol. 39, No. 4, pp. 784-799.

Miles, I. (2005), "Knowledge Intensive Business Services: Prospects and Policies", *Foresight*, Vol. 7, No. 6, pp. 39-63.

Miller, D. B., (1977), "How to Improve the Performance and Productivity of the Knowledge Worker", *Organizational Dynamics*, Vol. 5, No. 3, pp. 62–80.

Okkonen, J. (2004), "The Use of Performance Measurement in Knowledge Work Context". Tampere University of Technology, Tampere, Finland.

O'Neill, M.J. (2010), "A model of environmental control and effective work", *Facilities* 28(3/4), 118-136.

Origo, F., Pagani, L. (2008). "Workplace flexibility and job satisfaction: some evidence from Europe", *International Journal of Manpower*, Vol. 29, No. 6, pp. 539-566.

Palvalin, M., Lönnqvist, A., Vuolle, M. (2013), "Analysing the impacts of ICT on knowledge work productivity", *Journal of Knowledge Management,* Vol. 17, No. 4. pp. 545-557.

Ramirez, Y.W., Nembhard, D.A. (2004), "Measuring knowledge worker productivity: a taxonomy", *Journal of Intellectual Capital*, Vol. 5, No. 4, pp. 602–628.

Ramirez, Y.W., Steudel, H.J. (2008), "Measuring knowledge work: the knowledge work quantification framework", *Journal of Intellectual Capital*, Vol. 9, No. 4, pp. 564-584.

Ruostela, J., Palvalin, M., Lönnqvist, A., Patjas, M., Ikkala, A-L. (2014), "'New Ways of Working' as a tool for improving the performance of a knowledge-intensive company", *Knowledge Management Research & Practise*. Advance online publication, March 10, 2014; doi:10.1057/kmrp.2013.57.

Ruostela, J., Lönnqvist, A. (2013), "Exploring More Productive Ways of Working", World Academy of Science, Engineering and Technology, International Science Index 73, 7(1), 611 - 615.

Schaufeli, W.B., Bakker, A.B. (2003), "UWES–utrecht work engagement scale: test manual", *Unpublished Manuscript*: Department of Psychology, Utrecht University, Utrecht, Germany.

Schaufeli, W.B., Bakker, A.B. & Salanova, M. (2006), "The measurement of work engagement with a short questionnaire", *Educational and psychological Measurement,* Vol. 66, No. 4, pp. 701-716.

Takala, J., Suwansaranyu, U., Phusavat, K. (2006), "A proposed white-collar workforce performance measurement framework", *Industrial Management & Data Systems*, Vol. 106, No. 5, pp. 644–662.

Taskinen, T., Smeds, R. (1999), "Measuring change project management in manufacturing", *International Journal of Operations & Production Management*, Vol. 19, No. 11, pp. 1168-87.

Van der Voordt, Theo, J.M. (2004), "Productivity and employee satisfaction in flexible workplaces", *Journal of Corporate Real Estate,* Vol. 6, No. 2, pp. 133-148.

van Meel, J. (2011), "The origins of new ways of working - Office concepts in the 1970s", *Facilities,* Vol. 29, No. 9/10, pp. 357-367.

Vartiainen, M. (2007), "Analysis of Multilocational and Mobile Knowledge Workers' Work Spaces", *Lecture Notes in Computer Science,* Vol. 4562, No. 1, pp. 194-203.

Vartiainen, M., Hyrkkänen, U. (2010), "Changing requirements and mental workload factors in mobile multi-locational work", *New Technology, Work and Employment,* Vol. 25, No. 2, pp. 117-135.

Vuolle, M. (2010), "Productivity impacts of mobile office service", *International Journal of Services Technology and Management,* Vol. 14, No. 4, pp. 326-342.

Vuolle, M., Tiainen, M., Kallio, T., Vainio, T., Kulju, M., Wigelius, H. (2008), "Developing a questionnaire for measuring mobile business service experience", In *Proceedings of the 10th international conference on Human computer interaction with mobile devices and services, ACM,* pp. 53-62).

Wännström, I., Peterson, U., Åsberg, M., Nygren, Å., Gustavsson, J.P. (2009), "Psychometric properties of scales in the General Nordic Questionnaire for Psychological and Social Factors at Work (QPSNordic): Confirmatory factor analysis and prediction of certified long-term sickness absence", *Scandinavian Journal of Psychology,* Vol. 50, No. 3, pp. 231-244.

Appendix 1 SmartWoW questionnaire.

Physical workplace
1. There is a space available for tasks that require concentration and peace at our workplace when needed
2. There are enough rooms for official and unofficial meetings at our workplace
3. There is a space for informal interaction at our workplace when needed
4. Issues related to ergonomics are properly taken care of at our workplace
5. The restlessness of the work environment does not significantly interfere with my working

Virtual workplace
6. The most important information systems are easy to use
7. Workers have an access to information regardless of my location

8. Workers have opportunity to see each other's calendar
9. Workers have possibility to communicate with each other using instant messaging (e.g. Lync, Skype)
10. Our workplace has equipment that enables having video conferences
11. Group work software is used in our workplace

Social workplace
12. Workers have the possibility to work in the most suitable ways and when it is the most convenient
13. Telework is a generally accepted practice at our workplace
14. Operations in our workplace are transparent
15. Knowledge flows adequately between the key persons at our workplace.
16. Meeting practices are efficient
17. Our workplace has clear policy how to use IT and communication tools
18. I have clear personal goals for my work
19. I am being evaluated according to the results I achieve, not, for example, according to the working hours
20. New ways of working are actively explored and experimented at our workplace
OPEN-ENDED: What is the best practice in your organization?

Personal work practices
1. I exploit video conferences to minimize the need for unnecessary traveling
2. I use mobile services for working in situations where I have idle time (e.g. working in trains by using smart phones or laptops)
3. I am able to prioritize my tasks in order to manage my workload
4. I often telework for carrying out tasks that require uninterrupted concentration
5. I prepare for meetings
6. I stretch my muscles during the brakes
7. I follow the organization communication channels
8. I shut down email and other communication tool to concentrate important work task
9. I plan my day beforehand
10. I actively seek for the most suitable work practices and tools
OPEN-ENDED: What are your personal best practices for smarter and more productive working?

Well-being at work
1. I enjoy my work
2. I am enthusiastic about my job
3. I find my work meaningful and having a clear purpose
4. My work does not cause stress
5. My work performance is appreciated at the workplace
6. My work and leisure time are in balance with each other
7. The atmosphere at my workplace is pleasant
8. Our work community is able to solve conflicts quickly
OPEN-ENDED: How could your well-being at work be improved?

Productivity
1. I achieve satisfactory results in relation to my goals
2. I am usually able to carry out my work tasks efficiently (smoothly, without problems)
3. I am able to use the majority of my working time for conducting relevant tasks related to my goals

4. My job mainly includes tasks in which I am able to exploit my knowledge and skills efficiently
5. I am able to meet customers' expectations
6. The quality of my work outputs is high
7. The work group I work in works efficiently as a whole
OPEN-ENDED: How could your productivity be improved?

Background
Gender (male/female)
Age (<30, 31-40, 41-50, >50)
Experience in current (< 1 year, 1-5 years, >5 years)
Profession (manager, expert, supportive)
Working place % (office, home, other company, vehicle, public place)