

Workplace innovation and its relations with organisational performance and employee commitment

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Article Index:

[Introduction](#) [The importance of workplace innovation for economic growth](#) [Societal level](#) [Company/firm level](#) [Worker level](#)
[Workplace innovation and the organisational level](#) [High performance work systems](#) [Application of IT](#) [Quality of work](#) [Performance](#)
[Layout of the paper](#) [Method](#) [Participants: organisations](#) [Measures](#) [Analyses](#) [Results](#) [Conclusions and discussion](#) [Note](#)
[REFERENCES](#)

According to some theoretical approaches workplace innovation is the implementation of new and combined interventions in work organisation, HRM and supportive technologies, and a strategy that improves the performance of organisations and the quality of jobs. Using data from a large-scale survey among companies in the Netherlands, it is demonstrated that there indeed is a positive relationship between workplace innovation on the one hand, and quantitative and qualitative organisational performance and commitment of employees on the other. No relation was shown between workplace innovation and the risk of work stress as reported by the employer. A relatively large flexible buffer was positively related to performance, but not to employee commitment. The presence of IT to support the work processes did have a weak relation with performance but did not show to have any relation to employee commitment. The conclusion is that workplace innovation matters to performance and to people in organisations.

Introduction

There is a growing importance of non-technical factors to foster economic growth, implying technological innovation alone is not enough to make renewal of organisations work. Non-technical factors are for instance High Performance Work Systems and New Ways of Working. It builds on “old school” socio-technology and human relations thinking, stating that the success of technological innovation is contingent on innovation of the social system. Such non-technical innovations are interchangeably termed “organisational innovation” (Hage, 1999; Lam, 2004), “workplace innovation” (Totterdill, 2010; Pot, 2011; Dortmund/Berlin Position Paper, 2012), and “social innovation in the workplace” (EU DG Enterprise and Industry, 2012; Eeckelaert et al., 2012; Pot, Dhondt & Oeij, 2012). These innovations are not the end products (new products or services), nor the R&D expenditures, but deal with renewal and improvement of the deployment of people, management, HR, organisational structure, primary process, marketing methods, production methods, organisational policies, redesign, and so on. Here, we use the term workplace innovation, defined by Pot (2011) as “the implementation of new and combined interventions in the fields of work organisation, HRM and supportive technologies. Workplace innovation is considered to be complementary to technological innovation”. Pot stresses new and combined interventions, by which “new” is understood as “innovation” and “combined” as a bundle of measures referring to work organisation, Human Resource Management and supportive technologies.

In this respect, workplace concerns several elements of the organisation. This viewpoint is also shared by Totterdill (2010: 3), who calls workplace innovations “collaboratively adopted changes in a company’s work, organisational and human resource management practices that lead to improved operative/human performance and that also support other types of innovation”. One can see that Totterdill underscores the participative role of people with the word “collaboratively”. It makes sense to say that workplace innovations have to do with organisation and people. The term innovation is taken up by Pot as “renewal” and by Totterdill as a “change” leading to improvements. Innovations can be seen as renewals, either “radical” (revolutionary) or “incremental”

(gradual). We would like to regard such renewals as strategic to the organisation, in the sense that it affects how the organisation carries out its tasks to reach its goals in new ways (Oeij, Dhondt & Korver, 2011b).

Innovation can be distinguished between innovation as a process and innovation as an outcome. As a process, innovation at organisational level implies that organisations have the capability to innovate – hence an independent variable in relation to performance outcomes. Organisations may produce profits and desired outcomes and are able to adapt to changing circumstances, because they can dispose of “resources” and “capabilities” that enable them to do so. Innovation as an outcome at organisational level becomes manifest in new products and services, new product features and production methods. In this case the innovation itself is an “end product” - a dependent variable. We will, however, focus on the first description, innovation as a process, since we consider innovation to be a means instead of a goal, namely a means to improve performance.

Workplace innovations are, according to Pot, complementary to “technological” innovations and, sometimes even refer to all non-technological innovations within organisations. Non-technological innovation is a broader concept, including also dynamic management, new marketing practices and external collaboration (Pot, 2011). Because there is no strict definition available, such non-technological innovations are often termed “organisational” or “workplace” innovations (e.g. Hage, 1999; Lam, 2004; Armbruster, Bikfalvi, Kinkel & Lay, 2008) or, especially in the Netherlands, “social innovation” (Pot & Vaas, 2008a, 2008b; Pot & Koningsveld, 2009; Pot, 2011; Oeij, Dhondt & Korver, 2011b).

This article aims to assess the relation between the role of work organisation, HRM and IT (automation) on the one hand, and organisational performance and commitment of employees on the other. The empirical information comes from a large-scale survey among organisations in the Netherlands. The central question that will be addressed is: Does workplace innovation have a positive effect on organisational performance and on employee commitment and the absence of work stress risks? If it does, it would align the notion from other studies that workplace innovation might indeed be beneficial to company performance and quality of work.

The importance of workplace innovation for economic growth

Workplace innovation is important because of its social, economic and labour market impact, which is now being widely acknowledged among many European policymakers (Totterdill, 2012). In this section we look at workplace innovation related to the levels of society, organisations and employees to underpin its economic growth relevance (‘Dortmund/Brussels Position Paper’, 2012).

Societal level

While the debate on regional and national innovation systems has predominantly centred around structural, political and institutional prerequisites for innovative capacity on a national and regional level, management and work-related aspects of innovative capacity have become more and more important (Howaldt & Schwarz, 2010). Investments in organisational change are now visible in the New Growth Accounts (Corrado et al., 2005). From the analysis of these accounts, it is clear that such “intangible” investments influence up to some ten percent of economic growth in the past decade. The extent of such investments is very different between countries. It is still unclear “how much investment” is needed, but no investment in organisational change leads to lower economic growth. These analyses demonstrate that such investments lead to competences at the company level which are fixed. Investments in other intangibles such as R&D, in patents or in HR can disappear overnight. For policymakers, organisational competences once developed remain local.

Within the European Union the highest investments are made in the UK, The Netherlands, Belgium and Germany. The lowest investments are made in Greece, Romania and Spain (Jona-Lasinio et al., 2011).

Company/firm level

Different types of research show consistent results on the positive economic and social impact of workplace innovation. The analysis of the European Community Innovation Survey (CIS) shows that organisational innovation is the only innovation type that leads to higher contemporaneous Total Factor Productivity (TFP) levels. Product and process innovation only lead to higher TFP when performed in combination with organisational innovation. This is true for industry and for service sectors, but with stronger effects in service

sectors (Polder et al., 2010). Information and communication technologies (ICTs) explain productivity differences between the US and the European Union, but the impact on innovation goes via organisational innovation (Polder et al., 2010). A review of some sixty American articles shows that the magnitude of the effects on efficiency outcomes is substantial, with performance premiums ranging between 15 percent and 30 percent for those investing in workplace innovation (Appelbaum et al., 2010).

A review of European research shows that improvements in both the quality of working life and organisational performance can be combined successfully (Pot & Koningsveld, 2009). The most comprehensive research on this topic in the European context is based on 470 workplace projects between 1996 – 2005 in Finland. Findings suggest that the main performance driver is staff participation (Ramstad, 2008). The most striking difference between the best and worst groups was that, in the former, staff played a role in initiating the project more often, employee participation was stronger and internal collaboration was better than in the worst group (Ramstad, 2009).

What is unclear from these results is the prevalence of workplace innovation practices in companies. In the Innobarometer, commissioned by the European Commission, innovation trends were investigated between 2006 and 2009 in sectors of industry that are supposed to be innovative. Surveyed firms had at least 20 employees. Of these enterprises, 49% introduced new or significantly improved organisational solutions (e.g. in knowledge management, workplace organisation or external relations) (The Gallup Organization, 2009). However, this survey might be somewhat selective. In the Dutch situation, such social innovative companies would account for at best 15% of all companies (Oeij et al., 2011b). Workplace innovation would account for 75% of innovation, technological innovation only 25% (Volberda et al., 2011). Even with such evidence of the impact of workplace innovation (WPI) on performance results, it remains remarkable that so few companies are investing in workplace innovation.

Worker level

At the workplace level of employees, the best information available is found in the European Working Conditions Survey (EWCS, see Eurofound, 2012). Workplace innovation results in “active work situations”: workplaces and jobs in which workers have sufficient autonomy to control their work demands combined with more discretionary capacity for learning and problem-solving.

The new results of the EWCS (2010 survey) reveal striking findings at the EU level. Job autonomy has not risen in the past decade. Improvements in autonomy over the order of tasks have been offset by a decrease in autonomy over working methods. The stability in job autonomy is counterbalanced by an increase in job demands. Over the last twenty years in Europe, some 15% more workers experience working to tight deadlines. Challenging work has not increased over the last twenty years. Rather, the amount of repetitive tasks has remained the same and the degree of monotonous work has slightly increased. Regarding workers' participation, only 47% of the European workers are involved in improving work organisation or work processes in their department or organisation. Again, only 47% are consulted before targets for their work are set. Of all workers, only 40% can influence the decisions that are important for their work.

The results show important variations in the spread of active and learning forms of work organisation across EU Member States, with a clear distinction between Western European countries and Southern/Eastern European countries (OECD 2010, based on EWCS 2005).

Workplace innovation and the organisational level

From the previous section it becomes clear that workplace innovation seems to have a positive relationship with performance of firms and organisations. We now have a deeper look at some of the evidence available from research in the literature. Pot (2011) makes a distinction between work organisation, HRM and supportive technologies. Work organisation and HRM are related to high performance work systems and supportive technologies could stress the application of IT (automation). These can be seen as drivers behind both “quality of work” and “performance” of the organisation.

High performance work systems

Economic growth, or more specifically, achieving a return on investments, requires a matching workforce-development and workplace-innovation strategy. Labels used to describe research on this relation include high-

performance work systems, high-commitment work systems, high-involvement work systems and high-performance human resource management. The common thread within these forms of workplace innovation, as we call them, is according to Appelbaum, Gittel and Leana (2011) “that achieving and sustaining high levels of performance requires a positive workplace environment and practices that develop and leverage employees’ knowledge and ability to create value. While the specific practices need to be tailored to fit different industries and occupations, they generally include selection, training, mentoring, incentives, knowledge-sharing, partnership-based labour-management relations and other shared decision making mechanisms. These practices are most effective when they are implemented together and in concert with new capital or technological investments.” (Appelbaum et al., 2010).

Researchers have documented the impact of high-performance work practices on efficiency outcomes such as worker productivity, manufacturing quality, customer service, financial performance and profitability, and a broad array of other performance outcomes (e.g. Huselid, 1995; Appelbaum, Bailey, Berg & Kalleberg, 2000; Michie & Sheehan, 2005; Kleinknecht et al., 2006; De Menezes et al., 2010; Gittel & Bamber, 2010; Vergeer & Kleinknecht, 2011; Zhou, Dekker & Kleinknecht, 2011). Although some studies have found mixed results regarding performance differences associated with these work practices, many other studies have found that these work practices explain significant performance differences among various industries (Combs, et al., 2006; Boxall, 2012). “The evidence is clear-cut: achieving and sustaining world-class levels of performance requires an integrated approach to capital investment, investment in and introduction of new technologies, and implementation of high performance workplace practices tailored to the specific industry and technology. Policymakers can support the development and widespread adoption of such practices by linking them directly to economic or technological investments that are made to support a sustainable path for economic growth.” (Appelbaum et al., 2010).

Application of IT

We already referred to the study of Polder et al. (2010), which presented evidence that organisational innovation has a positive influence on total factor productivity, and stated that product and process innovations do not have a positive effect without organisational innovation. This study found that IT investments and IT applications are important drivers of organisational innovation, compared to R&D investments, stressing that IT is relevant for the innovation process of firms and the complementarity of IT-enabled non-technical innovation to technological innovation alone.

The relationship between IT, quality of work and performance is somewhat more complicated. Companies following a HPWS strategy are following a strategy of generalisation instead of specialisation from the perspective of the division of labour. Generalisation refers to a broad functional availability of staff. HPWS strategies seem coherent with upgrading the skills of workers. It is, therefore, relevant to look closely at the role of IT: several studies found that investments in computer technologies enhance firm productivity and have led to upgrading of skills (e.g. Black & Lynch, 2003; 2004). Research from the Netherlands, however, is indicating that the way IT is used causes either upgrading or downgrading of skills, i.e., less or more division of labour. If IT is applied to improve productivity and performance (the automation strategy), it leads to a more generic structure of tasks, because of “bundling of tasks”. But if IT is applied to improve communication, it more often results in specialisation of tasks, due to the “unbundling of tasks” (Borghans & Ter Weel, 2006; Akçomak, Borghans & Ter Weel, 2011). In line with the general notion of most HPWS studies, these findings show that less division of labour is leading to both upgrading skills and improving productivity. Therefore, the role of IT appears to be more diverse.

Quality of work

The findings discussed in most cases seem to underline the importance of organisational innovation or workplace innovation and the enabling role of certain IT applications for the improved performance of firms. There are also indications that workplace innovation is beneficial to the quality of work of employees, based on an evaluation of research brought together by Pot and colleagues (Pot & Koningsveld, 2009; Pot, 2011; Pot, Dhondt, De Korte, Oeij & Vaas, 2012; Pot, Dhondt & Oeij, 2012).

We already mentioned that projects in Finland (Finnish Workplace Development Programme – concerning work, organisational and management practices, WOM) combining performance and quality of working life increased

employment, reflected an important role of staff initiating the project, and scored better on issues such as employee participation and internal collaboration (Ramstad, 2009). In another investigation, a representative sample of 398 manufacturing firms with more than 50 employees in Finland in 2005, it was found that innovation practices such as performance-based pay, flexible job design and employee involvement, developing employee skills and labour-management cooperation are positively correlated to firm productivity (see Pot & Koningsveld, 2009).

A German study of companies in production sectors and in trade and services, who paid attention to topics such as physical workload, sickness absenteeism, ergonomics, work organisation, safety, style of leadership, and stress management, reported improved performance according to their managers (ranging from a quarter to over a third reported improvements). Higher productivity goes hand in hand with better communication and higher employability, resulting from both a decrease in absenteeism and an increase in social and vocational competences (see Pot & Koningsveld, 2009).

Performance

Pot (2011) discusses three studies on the positive relationship between workplace innovation and performance from the Netherlands. A first research among 650 Dutch SMEs indicated that companies with workplace development projects achieve higher productivity and financial results compared to companies that do not implement this kind of projects. However, the outcomes regarding quality of working life have not been measured except for employment which in most cases had increased. Another study included 932 Dutch companies of different sizes in different private business sectors. Compared to non-social innovative companies the social innovative companies – covering activities related to either dynamic management, flexible organisation, working smarter or external cooperation - perform better, regarding their increase in turnover, profit and market share, and regarding innovation, productivity, new clients and reputation. The third study concerns the “Netherlands Employers Work Survey” (in Dutch: Werkgevers Enquête Arbeid) (NEWS) 2008, which looked into four aspects of workplace innovation - strategic orientation, product-market improvement, working flexibly and smart organising – among 3468 employers with 10 or more employees (Oeij, Dhondt & Korver, 2011b). Organisational performance, measured as a combination of an increase in turnover, profit and labour productivity during the last two years, was significantly better in organisations with more activities in workplace innovation. This is also the case for the four different aspects of social innovation. Employers in workplace innovative companies were more content with the terms of employment and HR practices in their organisations, compared to those in non-innovative organisations (see Pot, 2011).

Pot (2011) states that this research indicates that workplace innovation may positively affect organisational performance, and that simultaneous improvement in quality of working life and productivity is possible, in particular in the case of strong employee participation.

Layout of the paper

To reiterate, and based on the presented discussion, this paper explores empirical findings about workplace innovation in relation to measures of performance and facets of quality of work on the other. The central research question is: Does workplace innovation have a positive effect on organisational performance and on employee commitment and the absence of work stress risks? Organisational performance is measured through self-reports of directors and managers, who are the respondents in the study, about the way they evaluate the quantitative and qualitative performance of the organisation, whereas effects on the employees are measured by asking the same respondents about risks of work stress in their organisations and how committed the employees are in their view.

From the studies discussed above, we hypothesise that the relationships between workplace innovation and performance and employee commitment will be positive, and the relation with the presence of work stress risks are negative (Hypothesis 1). With respect to HRM, we study how flexibility of work is related to workplace innovation. We expect that the extent of the flexible workforce has an opposed effect on performance and quality of work, in the sense that more (contract) flexibility has a positive effect on performance but a negative effect on employee commitment (Hypothesis 2). Concerning IT-use, we hypothesise that the presence of IT that supports the work process will improve company performance (Hypothesis 3).

Method

Participants: organisations

The three hypotheses were tested with data from the Netherlands Employers Work Survey (NEWS) (WEA, 2010, Oeij et al., 2011a) gathered late 2010. A survey was carried out among a sample of Dutch profit and non-profit organisations. Respondents, first approached by telephone, received an internet link or postal questionnaire, upon affirming their willingness to cooperate. Organisations under study are "establishments". Respondents are (managing) directors/owners or HR-managers. A cross-sectional random sample of Dutch establishments, stratified on branch and establishment size, was taken from the LISA database (a database with Dutch establishments). The response rate was 37% (5,518 cases).

The analyses were performed on a sub-sample of organisations with 20 or more employees because smaller firms normally do not have formalised organisational policies of this kind. After listwise deletion of missing values 2,250 valid cases remained for the analyses.

Of the organisations in the sub-sample (referred to as organisations) 19% had 20-49 employees, 35% 50-249 employees and 46% 250 or more employees. As a consequence of the selection criterion of a minimum of 20 employees, rather large shares of the sample come from Industry (20%), Commercial Services (15%), Healthcare and Welfare (10%), Trade (Wholesale and Retail) (12%), and Education (9%). There were smaller shares from the Construction and Transport and Communication sectors (each 8%), "Other" services (such as the culture industry) (5%), Hotel and Catering (5%), Public Sector (4%), Financial Services (4%) and Agriculture, Forestry and Fishery (1%).

Measures

The NEWS survey contains questions to enable the measurement of a "workplace innovation index" by four subscales: "autonomy", "self-directed teamwork", "internal flexibility" and "innovation". The first, autonomy, is operationalised with four items: the degree to which employees can decide on: determining the working method, determining the division of work, determining working times and breaks, and solving operational disturbances in the work process. The items were measured on 5-point Likert response scales (ranging from 1= not at all to 5= to a very large extent/completely). The reliability of this subscale (Cronbach's alpha) was .78. The subscale score was computed as the mean of the four items.

A second dimension involves whether self-directed teamwork was present, measured by (1) a question whether teamwork is an important characteristic of the work organisation, and, if confirmed by the respondent, (2) whether (a) the supervisor decides, or (b) whether the team members decide among themselves, on the division of tasks and how the tasks are performed. If the latter (b) was also the case, it was defined, here, as presence of self-directed teamwork (0= no; 1= yes).

A third dimension of the workplace innovation index was internal flexibility consisting of five items. Two of these items were derived from the room perceived by supervisors for making tailor-made arrangements with employees with reference to terms of employment, namely "In your situation, to what extent is there much or little room for individual, tailor-made arrangements concerning the following terms of employment? (tailor-made means being able to make different arrangements with different employees)": working times of employees and work performance of employees (1= very little/no room-5= very much room). Three remaining items refer to flexibilisation of work measured as: "Does your organisation apply the following forms of flexible work to a large or to a small extent?": multi-functional use of personnel, flexible working times, self-rostering (response categories ranging from 1= to a very large extent-5= not at all). Cronbach's alpha of this five-item subscale was .69.

The fourth dimension is innovation, measured by a subscale of five items. Two of these concern innovation policy of an organisation: "Our organisation continuously finds new ways to combine elements to (re)organise the working process (e.g., simultaneously combining flexible availability of personnel with new ICT applications)" and "Our organisation regularly innovates the working process" (1= not at all-5= to a very large extent). The three other items refer to "innovations implemented in the last two years" such as introduction of "a new or substantially improved process in producing goods or delivering services", of "a new or substantially improved marketing method", and/or of "a new or a substantial organisational change" (1= yes-2= no). Cronbach's alpha of this five-item subscale was .60. In other words, the items relate to "innovative organisational measures" regarding shop

floor autonomy, self-managing teams and internal flexibility (e.g., flexible working times, functional flexibilisation and self rostering); and to “innovations realised with having potential organisational consequences”, namely new combinations in organising (or the renewal of the work process) and /or improvement of the work process, improvement of the marketing method, or the introduction of organisational change.

Next, the subscales were dichotomised (0= absent; 1= present) as follows. Autonomy scores of 3.5 and higher (on a 1 to 5 scale) indicate presence of substantial autonomy. Scores higher than 3 on the internal flexibility subscale indicate presence of substantial internal flexibility. Scores of 3.5 and higher on the innovation subscale indicate presence of innovation. The sum of these three dichotomised subscales together with the absence or presence of self-directed teams represent the number of measures taken by an organisation: a workplace innovation index (range 0 to 4 measures, dichotomised into 0= 0 up to 2 measures taken; 1= substantial workplace innovation, namely 3 or 4 measures taken).

Two further variables were constructed for the analyses. First, a variable was computed indicating the flexible buffer, computed as the total number of workers with flexible contracts, divided by the total number of workers with flexible contracts plus the number of employees with a permanent job (next, four dummies were constructed since non-linear associations may be present: dummy (1) representing a 0% flexible buffer; (2) indicating a buffer larger than 0% up to 15%; (3) 15% up to 25%, and (4) indicating a flexible buffer larger than 25%).

Lastly, the automation variable, as a form of IT-application, was measured by the question whether the organisation's processes are (also) controlled by computers, for instance by workflow software, ERP, groupware, social media/social ware-applications).

Four dependent variables were used: risk of work stress (“What are the most important work related risks in your organisation?” 1= yes- 2= no, 0,1 dummy), employee commitment (“How satisfied are you with the commitment of your personnel?”, 1= to a very large extent-5= not at all), perceived development of the quantitative performance of organisation (“To which extent do you agree or disagree on the following statements on organisational performance in the last two years?": “The labour productivity in our organisation has improved”, “The growth in turnover in our organisation has improved” and “The growth in profit in our organisation has improved” (or financial results for not-for-profit organisations, 1= completely disagree - 5= completely agree; Cronbach's alpha of this 3-item scale was .78),

Perceived development of the qualitative performance of the organisation (“To which extent do you agree or disagree on the following statements on organisational performance in the last two years?": “The quality of the products / services on our organisation has improved”, “The satisfaction of the clients of our organisation has improved”, 1= completely disagree-5= completely agree, the correlation between these two items, $r=.58$).

These variables point either to performance or to consequences for employees. Indicators of performance are the perceived quantitative and qualitative performance; and indicators for employee consequences are work stress risks and commitment. The last two are (rather) weak indications for the quality of working life that Pot (2011) points out.

Analyses

Descriptive analyses were conducted to study the prevalence of workplace innovation, flexible buffer and automation and variants of organisational performance of organisations, divided by sector of activity and organisational size (number of employees). Logistic and hierarchical multiple linear regression analyses were carried out on the dependent variables, entering the independent variables in blocks. In order to enhance the robustness, the findings were controlled for sector and company size, as well as for “social demographic” characteristics of the organisations' workforce (education level of the personnel).

Model 1 (M1), therefore, solely contained the following background variables: sector (12 sectors); size of the organisation (3 categories); percentage of higher educated employees among the establishment's workforce. In Model 2 (M2), the workplace innovation index (WPI), flexible buffer dummies and automation variables were entered into the regression analysis. Next, in Model 3 (M3), four interaction terms were entered, in order to test for moderation effects (namely 'WPI*IT', 'WPI*flexible buffer (>0-15%)', 'WPI*flexible buffer (>15-25%)' and 'WPI*flexible buffer (>25%)'). The interaction terms were computed according to the guidelines of Aiken and West (1991).

Results

Table 1 shows the descriptive analysis. Presence of workplace innovation (WPI) correlates (weakly) with quantitative organisational performance ($r=.08$) and qualitative organisational performance ($r=.17$), and with work stress as reported by the employer ($r=.07$) and employee commitment ($r=.16$). Moreover, WPI is negatively and weakly related to a small size of the flexible buffer ($r=-.06$) and weakly positively to automation ($r=.06$). The financial services seem to be most active regarding WPI ($r=.08$), while industry and construction associate negatively with WPI ($r=-.08$), compared to the other sectors.

Table 1. Descriptive statistics (mean, standard deviation) of all study variables and Pearson correlations (r) ($N=2,250$).

	M	S.d.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	
1. Agriculture, Forestry & Fishery (dummy)	.008	.089	1																										
2. Industry (dummy)	.200	.400	-.04	1																									
3. Construction (dummy)	.077	.266	-.03	-.14	1																								
4. Wholesale and retail (dummy)	.117	.321	-.03	-.18	-.10	1																							
5. Hotel & Catering (dummy)	.045	.208	-.02	-.11	-.06	-.08	1																						
6. Transport & Communication (dummy)	.078	.269	-.03	-.15	-.08	-.11	-.06	1																					
7. Financial Services (dummy)	.036	.186	-.02	-.10	-.06	-.07	-.04	-.06	1																				
8. Commercial Services (dummy)	.153	.360	-.04	-.21	-.12	-.15	-.09	-.12	-.08	1																			
9. Public Sector (government) (dummy)	.043	.203	-.02	-.11	-.06	-.08	-.05	-.06	-.04	-.09	1																		
10. Education (dummy)	.087	.282	-.03	-.15	-.09	-.11	-.07	-.09	-.06	-.13	-.07	1																	
11. Healthcare (dummy)	.104	.305	-.03	-.17	-.10	-.12	-.07	-.10	-.07	-.14	-.07	-.11	1																
12. 'Other' Services (dummy)	.052	.222	-.02	-.12	-.07	-.09	-.03	-.07	-.03	-.10	-.03	-.07	-.08	1															
13. Number of employees in total organisation: dummy relatively small: 20 - 49 employees (dummy)	.185	.388	.10	.08	.02	-.06	.04	.00	.01	.05	-.07	-.04	-.08	-.01	1														
14. Number of employees in total organisation: medium 50 - 249 employees (dummy)	.351	.477	-.02	.05	.03	.02	.00	.02	.01	.01	-.06	-.02	-.10	.02	-.35	1													
15. Number of employees in total organisation: large 250 or more employees (dummy)	.464	.499	-.03	-.11	-.04	.03	-.03	-.03	.00	-.03	.11	.03	.16	-.02	-.44	-.68	1												
16. Higher educated (percentage)	30.9	30.5	-.06	-.20	-.18	-.15	-.11	-.13	.08	.28	.02	.41	.00	.02	-.08	.01	.06	1											
17. WPI (0=no up to 2 measures taken; 1=3 or 4 measures taken)	.231	.422	.00	-.08	-.08	-.03	.03	-.03	.02	.09	.05	.00	.04	.03	.01	-.01	.00	.21	1										
18. Flexible buffer 0% (dummy: 0 = larger than 0%, 1 = 0%)	.117	.321	.00	.03	-.01	.03	-.04	-.01	.00	.00	.06	.02	-.03	-.03	.08	-.03	-.03	.02	-.06	1									
19. Flexible buffer > 0% up to 15% (dummy)	.428	.495	-.01	.06	.05	-.08	-.15	-.01	.06	.00	.06	.00	.02	-.02	-.10	.02	.06	.06	-.01	-.31	1								
20. Flexible buffer > 15% up to 25% (dummy)	.201	.401	.02	.04	.00	.00	-.03	-.01	-.01	-.01	-.07	-.02	.06	.01	-.04	.03	.00	-.01	.01	-.18	-.43	1							
21. Flexible buffer > 25% (dummy)	.254	.435	-.01	-.12	-.06	.07	.25	.02	.06	.01	-.04	-.01	-.04	.06	.10	-.03	-.03	-.08	.04	-.21	-.50	-.29	1						
22. Automation (work processes (also) supported by IT) (0=no; 1=yes)	.772	.420	-.06	.14	-.03	.02	-.06	.01	.03	.02	-.02	-.12	-.03	-.02	.19	.01	.14	.04	.06	-.07	.08	.09	.08	1					
23. Work stress risk present (0=no; 1=yes)	.663	.473	-.01	-.18	-.09	-.06	.02	-.03	.02	.08	.02	.16	.12	-.01	-.15	-.02	.14	.27	.07	-.01	.04	.02	-.03	.03	1				
24. Satisfaction with employee commitment (1=very unsatisfied - 5=very satisfied)	3.92	.69	.00	-.11	-.04	-.03	.02	-.08	.02	.03	.04	.11	.09	.03	.00	-.03	-.03	.18	.16	.04	.01	-.02	.01	-.03	.10	1			
25. Development of quantitative organisational performance (1=strongly decreased - 5=strongly increased; last 2 year)	3.20	.74	-.04	-.01	-.12	.10	.00	-.02	.02	.00	-.02	-.06	.11	-.01	-.02	-.08	.09	.03	.08	-.07	-.07	.02	.11	.08	.04	.13	1		
26. Development of qualitative organisational performance	3.53	.53	.01	-.05	-.08	.06	.08	-.01	.03	.01	-.03	.01	.01	.00	.03	-.04	.01	.04	.17	-.04	-.07	.00	.11	.07	-.02	.15	.41	1	

Note: text in italics: $p < .05$, underlined text: $p < .01$; bolded text: $p < .001$.

Table 2. Results of multiple regression analyses of dependent variables Satisfaction with employee commitment, Development of quantitative organisational performance and Development of qualitative organisational performance (N=2,250).

	Satisfaction with Employee Commitment			Development of quantitative organisational performance			Development of qualitative organisational performance					
	M1	M2	M3	M1	M2	M3	M1	M2	M3			
	β	p	β	p	β	p	β	p	β	p		
Sector (industry-reference category)												
- Agriculture, Forestry & Fishery (dummy)	.02		.02		-.04	***	-.04	***	.02		.02	
- Construction (dummy)	.03		.03		-.10	***	-.09	***	-.05		-.03	
- Trade (dummy)	.03		.02		.09	***	.08	***	.09	***	.08	***
- Hotel & Catering (dummy)	.06	***	.06	***	.00		-.03		.10	***	.07	***
- Transport & Communication (dummy)	-.01		-.01		-.01		-.02		.02		.02	
- Financial Services (dummy)	.00		.00		.01		.02		.06	***	.06	***
- Commercial Services (dummy)	.06	*	.06	*	-.02		-.03		.03		.02	
- Public Sector (government) (dummy)	.07	***	.06	**	.03		-.02		-.03		-.03	
- Education (dummy)	.09	***	.10	***	-.08	***	-.08	***	.02		.04	
- Healthcare & Welfare (dummy)	.13	***	.13	***	.08	***	.08	***	.03		.03	
- 'Other' Services (dummy)	.06	***	.06	**	-.01		-.03		.02		.01	
Number of employees in total organisation: dummy relatively small: 20 - 49 employees-reference category)												
- Number of employees in total organisation: medium 50 - 249 employees (dummy)	-.05		-.04		-.04		-.04		-.06	*	-.06	*
- Number of employees in total organisation: large 250 or more employees (dummy)	-.02		-.01		.05		.04		-.03		-.04	
Higher educated (percentage)	.14	***	.11	***	.11	***	.06	*	.04		.00	
WPI (0=no up to 2 measures taken; 1-3 or 4 measures taken)			.12	***	.12	***	.06	***	.06	***	.15	***
Size of flexible buffer (0%-reference category)												
- Flexible buffer > 0% t/m 15% (dummy)			-.06		-.06		.04		.04		.01	
- Flexible buffer > 15% t/m 25% (dummy)			-.07	*	-.07	*	.08	*	.08	*	.03	
- Flexible buffer > 25% (dummy)			-.07	*	-.07	*	.16	***	.16	***	.10	***
Automation (work processes (also) supported by IT) (0=no; 1=yes)			-.02		-.02		.06	*	.05	*	.08	***
Interaction term WPI measures taken * Automation					-.03				-.03			
Interaction term WPI measures taken * Size flexible buffer >0% up to 15%					.01				.03			
Interaction term WPI measures taken * Size flexible buffer >15% up to 25%					.02				.03			
Interaction term WPI measures taken * Size flexible buffer >25%					-.01				-.01			
R ²	.056***		.071***		.073***		.047***		.069***		.071***	
R ² Change			.022***		.001		.023***		.002		.056***	
F	9.46 ^a		9.02 ^b		7.59 ^c		7.85 ^c		8.77 ^c		7.44 ^c	

* $p < .05$, ** $p < .01$, *** $p < .001$.

^aThis F-value has 14, 2 235 df; ^bThis F-value has 19, 2230 df; ^cThis F-value has 23, 2226 df.

The multiple regression analyses in Table 2 show that WPI is significantly related to satisfaction with the commitment of employees ($\beta=.12$; $p<.001$) and reported increases in qualitative performance ($\beta=.15$; $p<.001$). WPI is also significantly but weakly ($\beta=.06$; $p<.01$) related to increases in quantitative performance. In the multiple analysis, WPI shows no relationship with the risk of work stress as reported by the employer (not in the Table).

Looking at the change in variance explained by WPI, it turns out that, compared to the model with only the control variables, R-square for quantitative organisational performance increases by .004 (.4%), for qualitative organisational performance .024 (2.4%), and for satisfaction with employee commitment .013 (1.3%) (not presented in Table 2). Although we cannot express these outcomes in terms of profits or number of happy workers, we nonetheless can, generally speaking, assume that WPI is indeed beneficial to both the performance and quality of work indicators, which supports the first hypothesis (H1).

The regression analyses also reveal that the presence of flexible buffers were as expected (hypothesis 2) positively related to quantitative and qualitative organisational performance (respectively $\beta=.10$; $p<.01$, and $\beta=.16$; $p<.001$), and associated weakly negatively with commitment of staff ($\beta=-.07$; $p<.05$). Roughly speaking, it may be stated that higher percentages of workers in flexible contracts are more likely to positively affect performance rather than the commitment of employees, thus, partly supporting the second hypothesis (H2). In the situation where the IT-applications are present, i.e., "automation" is having a supportive role in the work process, there is a positive relation with quantitative and qualitative organisational performance (respectively $\beta=.05$; $p<.05$, and $\beta=.07$; $p<.001$), but no significant relation with employee commitment. Flexible buffers and automation show no relation at all with work stress risks.

The interaction analyses, meant to control for the moderation effects, show no significant relations. This supports the assumption that combined strategies of WPI with either more flexibility or supportive IT-applications might have no significant relation with the dependent variables.

Conclusions and discussion

We conclude, in answering the central question, that workplace innovation (WPI) is related in a positive and significant way to perceived, self-reported quantitative and qualitative organisational performance on the one hand, and to satisfaction with employee commitment on the other. The relations are rather modest, but in the expected directions, which implies that our theoretical assumptions are supported. It can be observed that only

relatively large flexible buffers of personnel have a positive association with both performance measures but a negative association with satisfaction with employee commitment. A weak relation was found between the presence of IT and WPI. Employee commitment and the prevalence of work stress risks were not associated with IT. Perhaps, with regard to work stress, employees are confronted with many e-mails, continuous virtual and electronic interactions with the working environment, or see the pace of work speeding up constantly. Yet, for some employees it may result in stress, where for others it may not. It might also be possible that respondents, i.e. directors and managers, underestimate the stress risks for their employees. It should be mentioned that works stress risks were reported by employers and not by employees, which may give a biased view. This needs further research.

A critical point to mention is that the NEWS-data are gathered for more purposes than only the examination of relations such as in this study; the NEWS is a monitor to measure organisational policies concerning work matters and social issues in organisations. As a consequence, there are limitations with the construction of some of the concepts such as the role of IT. Regarding the results of the (non-significant) interaction terms, an underestimation in the strength could well be present. Generally, interactions are more difficult to reveal as a result of multiplying error terms of the constituting main terms. Another point to put forward is that our analyses are cross-sectional, which means that we can not draw any definite conclusions in terms of the causal direction of our findings.

Many studies substantiate the main findings about the assumed benefit of workplace innovation in our contribution (a very recent one is Beblavý, Maselli & Martellucci, September 2012). Meanwhile, there is a rather large variation in the extent to which companies have implemented workplace innovation measures (see e.g. the standard deviation of WPI in the appendix, while in an earlier study we found that only a minority of organisations implemented workplace innovations, see Oeij, Dhondt & Korver, 2011b). That raises the question why not most if not all companies exploit these potential benefits. From the view of designing policies that help in sustaining Europe's competitiveness, it is important that future research focusses on this question. European firms miss out on a promising opportunity if they do not reap the benefits of WPI to improve both performance and quality of work.

Although it seems that workplace innovation has a positive association with productivity and performance in our NEWS data, the research on workplace innovation lacks unification concerning theory and constructs. Our data set consists of self-reports from representatives of establishments, but it would be better to be able to apply external effect measures (e.g., productivity statistics). Work in this field is under progress (Vergeer, Kraan & Dhondt, 2012). In terms of policy relevance, it is important that future research on WPI provides (more) empirical support for the question whether WPI indeed is positively related to productivity and quality of work.

Policy on workplace innovation at this time is scattered and unsystematic, and should be linked with (national and European) innovation policies in general (linking with EU-social innovation) to really become effective. The initiative of the Dortmund/Brussels Position Paper (2012) and recent conferences and meetings across Europe (see e.g. the websites of Social Innovation Europe and the European Commission's DG Enterprise and Industry) are an important step in this direction. Recently (beginning 2013) the European Commission started a European Learning Network for Workplace Innovation (Totterdill, 2012).

Scientific evidence may help the policy field to regard WPI as a condition for successful (technological and economic) innovation. It is, therefore, important that policymakers understand that workplace innovation is a characteristic of organisations instead of a characteristic of persons and a human ability to cope with unhealthy, unsafe and uninspiring working conditions.

Lifelong learning, the nucleus of this journal, deals with continuous improvement to make our lives inside and outside work organisations better in a sustainable way. The history of workplace innovations, which in our view is balancing the goals of organisations and employees, as well as the economic (welfare) goals and the environmental (well-being, diversity and sustainability) simultaneously, shows an incoherent and inconsistent picture. Short term demands often win over a long term vision. Investing in decent workplaces is a long term effort with sustainable opportunities to combine seemingly opposed goals. It would prove to be an act of lifelong learning to demonstrate the "entrepreneurial gut" to give way to workplace innovation.

Note

First findings were presented by Oeij, P., Dhondt, S., & Kraan, K. (2012). Workplace innovation and social innovation: monitoring and policy in the Netherlands, at the 2nd International Wellbeing at Work Conference, Manchester (U.K.), Lowry Centre, May 21-23, 2012 (<http://www.hsl.gov.uk/health-and-safety-conferences/wellbeing-2nd-international-conference-2012/presentations.aspx>). A paper version was presented at INSCOPE 2012 Annual Conference, New Journeys of Research into Innovation, November 23, 2012, Rotterdam School of Management, Erasmus University, Rotterdam (Netherlands) (<http://www.erim.eur.nl/events/detail/2801-inscope-2012-annual-conference/>)

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Table 1. Descriptive statistics (mean, standard deviation) of all study variables and Pearson correlations (*r*) (N=2,250).

	M	S.d.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	
1. Agriculture, Forestry & Fishery (dummy)	.008	.089	1																										
2. Industry (dummy)	.200	.400	-.04	1																									
3. Construction(dummy)	.077	.266	-.03	-.14	1																								
4. Wholesale and retail (dummy)	.117	.321	-.03	-.18	-.10	1																							
5. Hotel & Catering (dummy)	.045	.208	-.02	-.11	<u>-.06</u>	-.08	1																						
6. Transport & Communication (dummy)	.078	.269	-.03	-.15	-.08	-.11	<u>-.06</u>	1																					
7. Financial Services (dummy)	.036	.186	-.02	-.10	<u>-.06</u>	-.07	<u>-.04</u>	<u>-.06</u>	1																				
8. Commercial Services (dummy)	.153	.360	-.04	-.21	-.12	-.15	-.09	-.12	-.08	1																			
9. Public Sector (government)(dummy)	.043	.203	-.02	-.11	<u>-.06</u>	-.08	<u>-.05</u>	<u>-.06</u>	-.04	-.09	1																		
10. Education (dummy)	.087	.282	-.03	-.15	-.09	-.11	<u>-.07</u>	-.09	<u>-.06</u>	-.13	<u>-.07</u>	1																	
11. Healthcare (dummy)	.104	.305	-.03	-.17	-.10	-.12	-.07	-.10	<u>-.07</u>	-.14	-.07	-.11	1																
12. 'Other' Services (dummy)	.052	.222	-.02	-.12	<u>-.07</u>	-.09	<u>-.05</u>	<u>-.07</u>	<u>-.05</u>	-.10	<u>-.05</u>	-.07	-.08	1															
13. Number of employees in total organisation: dummy relatively small: 20 - 49 employees (dummy)	.185	.388	.10	.08	.02	<u>-.06</u>	.04	.00	.01	.05	<u>-.07</u>	-.04	-.08	-.01	1														
14. Number of employees in total organisation: medium 50 - 249 employees (dummy)	.351	.477	-.02	<u>.05</u>	.03	.02	.00	.02	-.01	.01	<u>-.06</u>	-.02	-.10	.02	-.35	1													
15. Number of employees in total organisation: large 250 or more employees (dummy)	.464	.499	-.05	-.11	-.04	.03	-.03	-.03	.00	-.05	.11	.05	.16	-.02	-.44	-.68	1												
16. Higher educated (percentage)	30.9	30.5	<u>-.06</u>	-.20	-.18	-.15	-.11	-.13	.08	.28	.02	.41	.00	.02	-.08	.01	<u>.06</u>	1											
17. WPI (0=no up to 2 measures taken; 1=3 or 4 measures taken)	.231	.422	.00	-.08	-.08	-.03	.03	-.05	.02	.09	<u>.05</u>	.00	.04	.05	.01	-.01	.00	.21	1										
18. Flexible buffer 0% (dummy: 0 = larger than 0%; 1 = 0%)	.117	.321	.00	.03	-.01	.03	-.04	-.01	.00	.00	<u>.06</u>	.02	-.05	-.05	.08	-.03	-.03	.02	<u>-.06</u>	1									
19. Flexible buffer > 0% up to 15% (dummy)	.428	.495	-.01	<u>.06</u>	<u>.05</u>	-.08	-.15	-.01	<u>.06</u>	.00	<u>.06</u>	.00	.02	-.02	-.10	.02	<u>.06</u>	<u>.06</u>	-.01	-.31	1								
20. Flexible buffer > 15% up to 25% (dummy)	.201	.401	.02	.04	.00	.00	-.05	-.01	-.01	-.01	-.07	-.02	<u>.06</u>	.01	-.04	.03	.00	-.01	.01	-.18	-.43	1							
21. Flexible buffer > 25% (dummy)	.254	.435	-.01	-.12	<u>-.06</u>	<u>.07</u>	.25	.02	<u>-.06</u>	.01	-.04	-.01	-.04	<u>.06</u>	.10	-.03	-.05	-.08	.04	-.21	-.50	-.29	1						
22. Automation (work processes (also supported by IT) (0=no; 1=yes)	.772	.420	<u>-.06</u>	.14	-.05	.02	<u>-.06</u>	.01	.05	.02	-.02	-.12	-.03	-.02	-.19	.01	.14	.04	<u>.06</u>	-.07	.08	<u>.04</u>	-.08	1					
23. Work stress risk present (0=no; 1=yes)	.663	.473	-.01	-.18	-.09	<u>-.06</u>	.02	-.03	.02	.08	.02	.16	.12	-.01	-.15	-.02	.14	.27	<u>.07</u>	-.01	.04	.02	-.05	.03	1				
24. Satisfaction with employee commitment (1=very unsatisfied – 5=very satisfied)	3.92	.69	.00	-.11	-.04	-.05	.02	-.08	-.02	.05	<u>.04</u>	.11	.09	.03	.00	-.05	.05	.18	.16	.04	.01	-.02	-.01	-.03	.10	1			
25. Development of quantitative organisational performance 1=strongly decreased -5=strongly increased; last 2 year)	3.20	.74	-.04	-.01	-.12	.10	.00	-.02	.02	.00	-.02	<u>-.06</u>	.11	-.01	-.02	-.08	.09	.03	.08	<u>-.07</u>	-.07	.02	.11	.08	.04	.13	1		
26. Development of qualitative organisational performance	3.53	.53	.01	-.05	-.08	<u>.06</u>	.08	-.01	.05	.01	-.05	.01	.01	.00	.03	-.04	.01	.04	.17	-.04	<u>-.07</u>	.00	.11	.07	-.02	.15	.41	1	

Note. text in italics: $p < .05$; underlined text: $p < .01$; bolded text: $p < .001$.

Table 2. Results of multiple regression analyses of dependent variables Satisfaction with employee commitment, Development of quantitative organisational performance and Development of qualitative organisational performance (N=2,250).

	Satisfaction with Employee Commitment						Development of quantitative organisational performance						Development of qualitative organisational performance					
	M1		M2		M3		M1		M2		M3		M1		M2		M3	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p
Sector (industry=reference category)																		
- Agriculture, Forestry & Fishery (dummy)	.02		.01		.02		-.04		-.04		-.04		.02		.02		.02	
- Construction (dummy)	.03		.03		.03		-.10 ***		-.09 ***		-.09 ***		-.05		-.03		-.03	
- Trade (dummy)	.03		.02		.02		.09 ***		.08 **		.08 **		.09 ***		.08 **		.08 **	
- Hotel & Catering (dummy)	.06 **		.06 **		.06 **		.00		-.03		-.03		.10 ***		.07 **		.07 **	
- Transport & Communication (dummy)	-.01		-.01		-.01		-.01		-.02		-.02		.02		.02		.02	
- Financial Services (dummy)	.00		.00		.00		.01		.02		.02		.06 **		.06 **		.06 **	
- Commercial Services (dummy)	.06 *		.06 *		.06 *		-.02		-.03		-.03		.03		.02		.02	
- Public Sector (government) (dummy)	.07 **		.06 *		.06 *		-.03		-.02		-.02		-.03		-.03		-.03	
- Education (dummy)	.09 ***		.10 ***		.10 ***		-.08 **		-.08 **		-.07 **		.02		.04		.04	
- Healthcare & Welfare (dummy)	.13 ***		.13 ***		.13 ***		.08 ***		.08 **		.08 **		.03		.03		.03	
- 'Other' Services (dummy)	.06 **		.06 *		.06 *		-.01		-.03		-.03		.02		.01		.01	
Number of employees in total organisation: dummy relatively small: 20 - 49 employees=reference category)																		
- Number of employees in total organisation: medium 50 - 249 employees (dummy)	-.05		-.04		-.04		-.04		-.04		-.04		-.06 *		-.06 *		-.06 *	
- Number of employees in total organisation: large 250 or more employees (dummy)	-.02		-.01		-.01		.05		.04		.04		-.03		-.04		-.04	
Higher educated (percentage)	.14 ***		.11 ***		.11 ***		.06 *		.05 *		.05 **		.04		.00		.00	
WPI (0=no up to 2 measures taken; 1=3 or 4 measures taken)			.12 ***		.12 ***				.06 **		.06 **				.15 ***		.15 ***	
Size of flexible buffer (0%=reference category)																		
- Flexible buffer > 0% t/m 15% (dummy)			-.06		-.06				.04		.04				.01		.01	
- Flexible buffer > 15% t/m 25% (dummy)			-.07 *		-.07 *				.08 *		.08 *				.03		.03	
- Flexible buffer > 25% (dummy)			-.07 *		-.07 *				.16 ***		.16 ***				.10 **		.10 **	
Automation (work processes (also) supported by IT) (0=no; 1=yes)			-.02		-.02				.06 *		.05 *				.08 ***		.07 ***	
Interaction term WPI measures taken * Automation					-.03												-.02	
Interaction term WPI measures taken * Size flexible buffer >0% up to 15%					.01												-.01	
Interaction term WPI measures taken * Size flexible buffer >15% up to 25%					.02												.01	
Interaction term WPI measures taken * Size flexible buffer >25%					-.01						-.01						-.03	
R ²	.056***		.071***		.073***		.047***		.069***		.071***		.025***		.060***		.061***	
R ² Change			.022***		.001				.023***		.002				.036***		.001	
F	9.46 ^a		9.02 ^b		7.59 ^c		7.85 ^a		8.77 ^b		7.44 ^c		4.03 ^a		7.54 ^b		6.34 ^c	

* $p < .05$, ** $p < .01$, *** $p < .001$.

^a This F-value has 14, 2 235 df; ^b This F-value has 19, 2230 df; ^c This F-value has 23, 2226 df.