



# Workplace primary prevention programmes enabled by information and communication technology



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## ABSTRACT

As the workforce is ageing across the globe, employers are implementing primary prevention programmes to encourage their employees to live healthier lives. Information and communication technology (ICT) can support these programmes by collecting, storing and processing data, and by visualizing health progress. However, there is a lack of knowledge of how ICT is utilized in primary prevention programmes at workplaces and how its utilization affects social issues. This paper fills that gap by presenting an illustrative case of a primary prevention programme in Finland. We find that offering employees the opportunity to use ICT for data collection, storage and sharing, contributes to their acceptance of the programme. Moreover, our findings show that while visualizing the effects of the programme through ICT contributes to lifestyle change, such soft factors as the involvement of doctors are just as important.

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## 1. Introduction

An increasing share of the workforce is over 60 as retirement ages are increasing in many countries (Burtless, 2013). People in their 60s and 70s are increasingly capable of working because physically intensive jobs are increasingly being replaced by knowledge-intensive jobs (Christensen et al., 2009). Older workers are not necessarily less innovative than younger workers, as shown by a recent study (Ng and Feldman, 2013). Keeping older employees healthy is thus an increasing concern for employers, not only to increase productivity but also to reduce health-related costs (Baicker et al., 2010; Perez et al., 2009; Weldon, 2011). Organizations increasingly recognize the importance of wellbeing in the workplace (Ylikoski et al., 2009) and the impact of health on productivity (van Scheppingen

et al., 2012). Employee health is particularly important for knowledge-intensive organizations, as health affects mental functioning and creativity (Leka and Jain, 2014; Zwetsloot and Van Scheppingen, 2007).

People's lifestyles have a strong effect on their health conditions (Blumel and Scheller-Kreinsen, 2010). Lifestyles can be improved by adopting healthier eating and drinking patterns, increasing physical activity and exercise levels, and stopping smoking (Christensen et al., 2009). Primary prevention programmes that stimulate both physical activity and diet improvements reduce absenteeism rates and increase job satisfaction (Goldgruber and Ahrens, 2010). A suggested method to encourage people to exercise more is to prescribe physical activity as a treatment (Aittasalo et al., 2006; Leijon et al., 2010; Smith et al., 2000; Swinburn et al., 1999). In order to be effective, however, their progress needs to be monitored (Aittasalo et al., 2006).

ICT can be an important enabler for primary prevention programmes in the workplace. It can be used to (1) collect lifestyle and health-related data through sensors and online

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applications; (2) store and process lifestyle and health-related data, including early diagnoses and intervention advice based on predictive analytics; and (3) provide feedback to participants by visualizing the effects of the programme. It is unclear, however, how ICT should be applied in primary prevention programmes and how it affects social issues of acceptance and privacy, and lifestyle.

This paper discusses the impact of implementing ICT in primary prevention programmes in the workplace. We build on an illustrative case in which ICT enables employees (patients) to visualize and monitor their own health progress. The case is used to discuss the implications and potential effects of the programme.

Section 2 presents the background to ICT and primary prevention programmes. Section 3 explains the case method. The results are presented in Section 4. Section 5 discusses the findings and Section 6 concludes the paper.

## 2. ICT and primary prevention programmes

ICT is often considered a driver of innovation in healthcare (Dobrev, 2010; Ho, 2007). ICT solutions for e-healthcare are expanding rapidly (Currie and Seddon, 2014) and healthcare is shifting towards personalized services with distributed care processes (Seppälä et al., 2012). E-healthcare, which includes tele-care and tele-medicine, refers to a wide range of services, such as remote medical monitoring, assisting, supporting, and emergency alarm services (Oh et al., 2005). In preventive programmes that are part of e-health, healthcare professionals often use ICT tools, for example portable health clinics (Ahmed et al., 2014). Nevertheless, patient-driven solutions are also emerging (Swan, 2009). The value of new solutions comes from the analysis of personal data and motivating individuals by visualizing their personal improvements, for instance in the form of graphs (Ruckenstein, 2014). In addition, social community tools are increasingly being utilized.

ICT solutions can be used for primary prevention programmes in several ways. First, ICT generates new opportunities to automatically collect lifestyle and health-related data from employees. Health data can increasingly be collected automatically, especially by sensors in watches, necklaces and wearables (Riquebourg et al., 2006). Although the cost of integrating sensors in every object used to be very high, costs are dropping rapidly thanks to rapid technology advancements (ScienceDaily, 2011). For instance, smartphones are also equipped with advanced sensors and they can be used as always-on sensors of life, collecting data on people's everyday behaviour (Klasnja and Pratt, 2012). Sensors collect data on heart rate, medicine intake, blood pressure, activity level and sleep patterns directly from a person's body or environment (Oh et al., 2005). While collecting data from different types of sensors is challenging due to fragmentation (Wichert et al., 2012), platforms are emerging that may integrate different devices and services (Nikayin et al., 2013).

Secondly, ICT can be used to store and process lifestyle and health-related data. Services such as Endomondo, Polarpersonaltrainer and Microsoft HealthVault are increasingly used to store and process such data. Predictive analytics plays a major role in the processing of data (Appel et al., 2013). For instance, small changes in the activities of daily life can signal the early stages of illness, such as dementia. Other

examples in the health domain are the early identification of epidemics (Liebowitz, 2013) and the application of evidence-based medicine (i.e. systematic reviewing of clinical data to make treatment decisions based on the best available information) (Kayyali et al., 2013).

Thirdly, ICT plays a major role in providing feedback about the effects of lifestyle interventions. Previous studies show that primary prevention programmes that visualize the effect of lifestyle on work, family and social life can induce lifestyle changes (Weisburger, 2002). For instance, consumers are increasingly visualizing their own health status for self-care purposes; this is known as the 'quantified self' movement (Swan, 2009).

To summarize, emerging sensors and mobile technologies will create tremendous opportunities to automatically collect health data on people. While seizing such opportunities is currently challenging, new service platforms that integrate information from heterogeneous sensors and assistive devices are emerging. Current technological advancements are creating opportunities for healthcare providers to offer more effective and less costly services for individuals. At the same time, technology is enabling individuals to more effectively manage their health in order to prevent chronic health conditions.

## 3. Method

This paper illustrates the implementation of an innovative ICT-driven primary prevention programme in Finland, where ICT is used to collect, store and process data and to provide feedback to participants. The case is an illustration of a primary prevention programme in the e-health sector, rather than an explanatory case study with predefined conceptual propositions.

### 3.1. Case selection

The Finnish context was chosen for a number of reasons. First, employee health is prominent on the policy agenda. For instance, a recent OECD report<sup>1</sup> points out that retirement ages in Finland need to be increased and hence employee health should receive more attention. Secondly, primary prevention programmes are regarded in Finland as the main instrument to improve employee health. For example, the national Current Care Guidelines developed by the Finnish Medical Society Duodecim<sup>2</sup> point out that increasing physical activity is crucial to prevent health problems. At the same time, studies show that Finnish employees engage in less physical activity as they get older, and that one in five employees does not exercise at all (Husu et al., 2011). Thirdly, employers in Finland are legally obliged to offer preventive occupational healthcare to all their employees. Most employees receive their healthcare from healthcare service companies that are contracted by the employer. Employers pay for the healthcare of their employees as well as for primary prevention programmes.

The specific case used in this paper is a pilot project that was started in 2011. The aim is to implement the Physical Activity Prescription (PAP) programme, in which medical doctors (MDs) prescribe physical sports and exercises in order to improve employees' physical health. Through dedicated

<sup>1</sup> <http://www.oecd.org/eco/surveys/economic-survey-finland.htm>.

<sup>2</sup> <http://www.kaypahoito.fi/web/kh/suosituksset/naytaartikkeli/hoi50075>.

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