# European Network of Public Employment Services

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'How to prevent unemployment in a changing world of work?'

Workshop 3 "ICT in prevention activities"

Discussion paper

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[1] DECISION No 573/2014/EU

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# Introduction

This short paper intends to set the stage for the discussion of how new technologies can be utilised and harnessed by Public Employment Services (PES) in order to deliver better, more tailor-made services with a view to preventing unemployment. We will argue that the advent of new technologies (artificial intelligence in particular) does not only present a challenge to PES – as they might have to serve a new set of clients who will have lost their jobs due to automation and robotisation – it also presents new opportunities. We will highlight some recent developments as well as raising some issues and questions.

While PES already traditionally collect large amounts of data, new technologies make it possible to use big data and artificial intelligence to provide more in-depth and timely analyses. Furthermore, as the linking of different administrative (longitudinal) data sources is becoming widespread, analysts can have a more nuanced picture of citizens' labour market trajectories.

At the same time, PES can be more finely targeted and person-specific, due to the large amount of information which accrues on individuals. Furthermore, many services can now be delivered online, which is particularly important for clients (still) in employment.

Thus, the above-mentioned developments mean that PES workloads can be managed better than before and that clients' needs can be met in a more calibrated way. However, these developments do need large upfront investments on the side of PES in technology, data and staff skills (both for the developers and the users of new services and products). Furthermore, analyses for prevention necessitate the linking of a large number of datasets, which raises data protection issues. Finally, the use of new technologies can also lead to ethical problems.

# 1. Current measures implemented

Before providing an overview of how new developments in the use of IT can facilitate the work of PES, it is worth noting that these developments were initiated for many diverging purposes. However, all of them can be used to prevent unemployment. Linking data that can track individuals throughout their working lives provides information about possible trajectories of those at risk of losing their jobs. Scrutinising employers' (online) job vacancy descriptions can give a better understanding of which jobs are in high demand and which skills are needed for these jobs. Furthermore, by extracting detailed information about the skills of those working in jobs that are likely to disappear due to technological progress, one can better tailor upskilling activities. Likewise, accessing real-time information on the online job search behaviour of these individuals can be used to provide 'nudges' towards jobs where they might be more successful. Finally, providing services to those who are still employed and who might want to receive these services in a discreet way, outside business hours, is likely most effective via online channels.

## 1.1 Data integration

First, it is worth talking about data collection, as much of the current progress in the use of IT builds on having access to large amounts of information. Some PES are in a very favourable position in this regard, as they have easy and unlimited access to all (public) administrative records of citizens. In Norway, this is due to the NAV administering basically all benefits (from birth to death)[2], in Estonia, this is thanks to digitalised administration

[2] There are a number of other PES in a similar position, such the Centre of Labour, Social Affairs and Family in Slovakia.

and the use of the X-Road (which is able to connect all public data)[3]. Some other PES have developed data warehouses which collect all (relevant) labour market data: in Germany, this includes PES and social security data, while in Denmark (due to the multi-layered delivery of activation) data from the state, municipalities and unemployment insurance funds are collected and pooled.

Data integration is a very important development, as it has several advantages when coupled with a powerful computing system and user-friendly interfaces. First, for clients, accessing and using PES services can be made more hassle-free, as the paper trail can be significantly reduced. In other words, data integration is one of the key building blocks to the development of digitalised service delivery, which in turn is likely very important for those currently employed. Second, for PES, it also saves on precious counsellor time, which can be redistributed from data recording and matching to serving clients[4]. Third, data integration is also an essential part of having a more precise prediction of who is most likely to be at the risk of losing their job.

While data linking (integration) has a large potential, there are two questions which are integral to the prevention of unemployment: (a) How regularly are datasets linked – can they be used to track developments in a timely manner? (b) Can information from non-governmental stakeholders (datasets) be integrated? There are however a few PES that have started to work on these issues. First, at PES that have a blended service delivery (and where citizens can fulfil their job-seeking obligations online), PES can have access to information on online job search behaviour (see VDAB or UWV, for example). In particular, whenever clients search vacancy databases while logged into their PES accounts, the details of their job search activities can be accessed. A direct consequence is that the information is (quasi) real-time, as opposed to the above-mentioned solutions, where the information is static (a collection of snapshots, that is). Second, very few PES have data-sharing agreements with private companies; however, this does sometimes occur in terms of vacancy database pooling (for example in NL or BE-VDAB)[5]. This will naturally widen the information base that PES can work with, hence making all further work more accurate. This is all the more important since, in many countries next to the more 'traditional clientele' of PES, employees at risk of losing their jobs might be those performing routine cognitive tasks. Furthermore, these clients need to be steered towards jobs that might have higher skills requirements and which do not necessarily figure in the PES vacancy lists.

## 1.2 Labour market information

In terms of data analysis, the initial step is the prediction of job loss, which at this stage amounts to occupations at risk of downsizing. There are many different types of approaches currently being implemented, but most PES use more traditional channels of employer surveys, qualitative interviews with stakeholders at the regional level coupled with predictive exercises based on administrative data. Clearly, these predictions can be rendered more precise with the use of linked data (as noted above). As a positive development, PES already use online surveys to gather information from companies in their surveys.

The second step is to collect information on where these potentially affected workers could start working if they need to change workplaces/occupations. One approach taken is to

[3] See the following for more details: https://ec.europa.eu/social/BlobServlet?docId=17005&langId=en.

[4] This latter might mean that counsellors can have time for job search advice group of clients traditionally not serviced by PES: employees at risk of losing their jobs.

[5] A more recent example is the 'Labour market transparency' launched in 2015 in France, where about 100 private job boards share data on job vacancies with Pôle emploi.

analyse statistics flows between different occupations; this is done for instance by the Institute for Employment Research (Germany), based on linked administrative datasets. The 'merger profession' contains information not only on which occupation the unemployed has learned (vocational training), in which occupation the unemployed person was made unemployed (origin profession), in which occupation the unemployed person seeks employment (target occupation), but also in which occupation the person actually takes up employment (employment).

A second approach builds on online vacancy and jobseeker databases. This allows similar analyses but is clearly most effective when PES have access to private job search portals. Furthermore, this approach seems to be the most effective when coupled with a competence-based job matching system[6]. First, the use of competences can lead to an updating of occupational taxonomies and skills requirements. Thus, by using information on the skills actually required (used) in a given occupation, PES can analyse which occupations are close to each other (instead of only relying on expert/theoretical judgement), providing further insight into the transferability of skills.

Second, the analysis of online portals can provide real-time information on the supply and demand by professions and regions. Recent advances in AI can vastly improve the effectiveness of (automatised) matching, as more textual information, more languages, more nuances, etc. can be processed. This, in turn, can improve job matching algorithms and can help make online job matching more user-friendly. This approach has been further developed at VDAB (BE-Flanders), where job matching with the support of deep learning has been shown to optimise search capacities by including predictions based on four alternative algorithms to fine-tune distance search, etc.

## 1.3 Using real-time information

Given that a large fraction of clients uses online services at PES (such as VDAB – Flanders; UWV – NL) and based on recent technological advances, jobseekers' behaviour can be used in several ways, all of which can contribute to the personalisation of services.

First, traditional job matching can be complemented to include recommendation systems which analyse similar jobseekers' click behaviour and offer additional vacancies to jobseekers (developed at VDAB). In a similar way, recommendation systems can be used to refer jobseekers to online materials that could help their re-integration (developed by Pôle emploi - FR).

Second, jobseekers' online behaviour can be used to provide additional information for predictive modelling (currently pioneered by VDAB). This can be used to complement the information contained in traditional profiling systems and can hence contribute to a more accurate prediction of the chances of re-employment. The use of such data can also directly help employment counsellors (hence making the organisation more efficient), by flagging up cases which are likely to require additional attention.

## 1.4 Using IT in service delivery

Using online channels for service delivery is likely to be especially important for (still) employed jobseekers, not only because they can be available outside working hours, but also since employed jobseekers might be reluctant to physically visit the PES in fear of

[6] The essential first step of a competency-based job matching is that jobseekers and companies not only indicate the formal qualifications they possess (seek), but also indicate the range of professional skills they have acquired (either through formal or informal learning) as well as their transversal/soft skills. Job matching algorithms then consider these skill requirements when searching for good 'matches'.

negative stigma. Furthermore, new technologies can also facilitate the work of employment counsellors.

Currently, a number of PES offer online job coaching and counselling (such as SE, VDAB, NL). This typically takes the form of online interaction with an employment counsellor (including for instance, through co-browsing)[7]. Furthermore, the development of apps for job coaching is also an important step forward (such as in France, where a large number of apps is available through Emploi Store). These digital job coaches can support jobseekers in an immediate, simple way, by giving tips on how to improve job applications, by preparing a draft CV and by identifying a candidate's competences.

Furthermore, online tools can be used to provide training courses and webinars (which are widely used by UWV and VDAB[8]), possibly vastly extending the reach of PES services.

New analytics facilitate the work of counsellors in several ways. First, (based on predictive models) they can provide counsellors with suggestions on the best re-integration path for the jobseeker at hand. In particular, new estimation methods (based on machine learning) can provide chances of re-employment for alternative services and measures at fine levels of granularity[9]. This is currently being experimented at VDAB.

Second, they can analyse the CVs of jobseekers as well as job search strategies – an important input for face-to-face counselling. The analysis of CVs and fine-tuning thereof was developed by the UWV (Netherlands) in the form of 'quality cards' which extract information on the search strategies and potential job matches of jobseekers with similar skills profiles[10]. This is presented to jobseekers such that they see in a transparent way (a) how skills are mapped to applications to specific types of jobs and (b) the supply of and demand for different jobs.

## 2. Challenges

Before reviewing some of the specific challenges for the use of digital technologies, it is worth pointing out that the prevention of unemployment (and the upskilling of those who are likely to lose their jobs due to automation and robotisation) is rarely a priority in the PES of the Member States[11]. Thus, the above-mentioned developments will likely be more effective if they are reviewed with the objective of providing a backbone for preventive services.

While most advanced PES are actively using new technologies, others have issues with some of the more basic requirements of going digital. First, and foremost, many PES are stuck with IT systems that are outdated, using software that is cumbersome for all to use. Thus, analysts and data specialists often refrain from trying to push for innovations since a complete overhaul might be needed. These systems are also often inconvenient for (front-line) staff to use. This is sometimes compounded by a general deficiency in digital administration and hence continued use of paper-trails in all public administration. Thus,

[7] While there is an interest in using bots at PES, none has adopted these techniques.

[8] Pole Emploi in France rather uses a large number of online courses as well as job interview simulator.

[9] See for instance Lechner (2018).

[10] A similar approach, albeit not based on personalised, rather than automatised feedback was tested in Belot et al. (2019) in a randomised experiment. Those who got feedback, particularly the most disadvantaged, received more job interviews than those who did not.

[11] A notable exception is the Bundesagentur für Arbeit (Germany), which adopted the specific (quantitative) target of improving the job-to-job transition rate as early as 2011. This stems from the overarching objective of improving labour market matching which was translated by the BA into several numeric targets, including the 'unemployment prevention' target.

employment counsellors (especially those lacking digital skills) are often sceptical about the use of IT due to the increased workload that it might bring about[12].

A second issue is that, while in most countries linkage of (existing) administrative anonymised datasets would be possible, due to legal inconsistency (or fear thereof), PES are not using this asset for analytical purposes. Even if this information can be linked, and if all involved stakeholders reach agreement on legal barriers, there is the issue of timeliness of data collection and analysis. In other words, for preventive purposes, it is not sufficient to link data regularly, as prediction needs to be based on up-to-date data, and needs to be close to real-time in order for PES counsellors to be able to act on it.

A very specific challenge for all PES is that they have very little access to information on those at risk of losing their jobs. An exception from this is Germany, where those employees whose contract is known to end (due to early notice or end of a fixed-term contract) are required to register as jobseekers. This raises the issue that, in other countries, data about those at risk of job loss can only be collected if the employee voluntarily seeks the services of PES[13]. This raises the thorny issue of data protection and the mandate of the PES. In principle, if the PES had access to the job search behaviour of (potential) clients on job portals, it could offer them services on a voluntary basis. However, this would raise serious issues of data protection.

As mentioned, using digital services does require (in some cases) significant (upfront) investment in IT. Furthermore, accessing information and data from other providers can require a large budget. Furthermore, not only do development teams need to be hired and/or trained, but frontline staff also require a significant amount of training in order to be able to use the products[14]. It should be noted that while counsellors' digital skills need to be developed, they also need more sophisticated skills in terms of written communication[15].

Furthermore, using IT and online service delivery also requires PES to re-think and re-structure their services. This is the most apparent when thinking about training courses. First of all, training materials need to be made available online. Second, and more substantially, course content and structure need to be revisited. In relation to this, providing modularised courses is an important development in online learning and one which needs to be adapted when serving employed clients who do not need or do not have the time to 'sit' through a whole course.

Finally, one should note that, while online service provision is likely to be especially relevant in the case of employees at risk of losing their jobs, there is no direct evidence of the effectiveness of online service delivery. A further complication is that part of those workers who might be affected by automation and robotisation quite simply do not have a sufficient level of digital skills to be able to use digital services.

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[12] For instance, Pôle emploi (France) launched its Digit'@ll initiative to upskill all frontline staff in terms of IT skills. This initiative first provides a diagnostic of digital skills, then a series of short e-learning modules (lasting typically 1 hour) targeting the skills which need to be developed.

[13] A similar issue in some cases is that though PES might acquire a large amount of information on citizens while they are searching for jobs (through the PES), they might have very little information on them after they have been re-employed.

[14] For instance, e-coaching was initially tested but abandoned by AMS (Austria) in 2012, mainly due to the large training needs of counsellors.

[15] There are currently two approaches to training: (a) regular e-learning courses about online services for staff; and (b) cascaded training, in which local support personnel at each PES office receive intensive face-to-face training about new online services from the development team, and in a further step these designated persons train and coach all staff at their local office in the use of these services.

# 3. Good Practices

## 3.1 Proactive profiling

To more effectively monitor jobseekers' job search activity, the VDAB has set up a 'proactive profiling' system. The basic building blocks are jobseekers' (online) job search records, as well as their background information from their online personal folder. Based on (other jobseekers') past job search behaviour, a predictive model assigns 'risk scores' to jobseekers, measuring the likelihood of insufficient search activity. Second, as information about the jobseeker's own job search behaviour accrues, the predictions are updated. It is also compared with other jobseekers' behaviour. Based on these two pieces of information, if 'anomalous behaviour' is detected, it is flagged up to employment counsellors. As a result, counsellors can contact the jobseekers to give them advice and remind them of their duties in order to motivate them and increase their chances of re-employment.

Currently, building on the profiling tool, a 'Next Steps' module is being developed at VDAB. The purpose is to propose an integration strategy for each individual, which should lead to the highest chances of re-employment. The first step of this module is to determine in which type of occupation the individual has the best work opportunities. The second step is to use causal machine learning estimation procedures to predict the most relevant upskilling activities in order to be successful in the selected occupations.

## 3.2 Merger occupation

The Institute for Employment Research (the research institute of the BA) has developed the statistic of 'merger profession' ("Einmündungsberuf") about the profession in which a person actually takes up employment, based on the BA's linked administrative databases. Thus, based on this statistic, statements are possible on the following: which occupation the unemployed has learned (vocational training), in which occupation the unemployed person was made unemployed (origin profession), in which occupation the unemployed person seeks employment (target occupation), but also in which occupation the person actually takes up employment (employment). This measure can be used in a variety of ways: (i) the accuracy of fit of the placement can be examined by comparing the information on the placement and target profession, (ii) it can enrich the knowledge about market opportunities and risks for certain occupations, (iii) the similarity of occupations' skill content can also be verified based on these statistics by examining the trajectories of workers across different occupations. The calculation of this statistic is made possible by building the Integrated Employment Biographies dataset that the IAB has assembled for a long time. This contains social security records (occupations, earnings, etc.), unemployment register data (occupations searched for, services and measures received) as well as basic demographic and educational variables. Further datasets can be collected and linked to this one for research purposes.

## 3.3 Co-browsing

This service is part (since 2014) of the 'personalised online support' package of Arbetsförmedlingen (Sweden), which offers web visitors tailored support and guidance by specialised and dedicated employment officers. The co-browsing tool provides clients (employers and jobseekers) who visit the Arbetsförmedlingen website with the opportunity to receive real-time, personalised, hands-on support through a combination of assisted browsing, chat/text, audio and video facilities. Co-browsing is presented as a clickable banner on selected PES webpages, and the request is handled by a PES counsellor who offers assistance via live chat messages to the client. The PES counsellor (1) sees which webpages the client was visiting before clicking on the assistance banner and (2) gains

immediate remote access to their web-screen on the PES website (not the client's computer).

A number of advantages have been reported. First, client surveys show over 90% customer satisfaction with the service provided. Second, the counsellor can handle multiple dialogues simultaneously, thus increasing efficiency. Third, the tool can be targeted at web-visitors who are identified as being most in need of real-time assistance. Fourth, it facilitates access to PES online services for non-native Swedish speakers (who interact with PES counsellors in the client's preferred language). Finally, access to the co-browsing tool is easy, and co-browsing tool makes flexible service delivery easier.

## Further reading

Thematic Review Paper: Digital Technologies and Advanced Analytics in PES: https://ec.europa.eu/social/BlobServlet?docId=20787&langId=en

Analytical Paper: Multi-Channel Management in PES: from blending to omni-channelling: https://ec.europa.eu/social/BlobServlet?docId=18865&langId=en

Starting Guide: Getting Started with Digital Strategies: https://ec.europa.eu/social/BlobServlet?docId=20684&langId=en

Summary Report: The VDAB's Innovation Lab: https://ec.europa.eu/social/BlobServlet?docId=17369&langId=en

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