Creating an IT- and Data-Driven PES 5

by Willem Pieterson

Introduction

The world in which Public Employment Services operate is constantly evolving. Not only are PES still recovering from the financial crisis that started in the late 2000s, but they also face new challenges due to changes in societies, technologies, new phenomena such as 'big data', and ever-evolving philosophies on how to best manage a governmental service organization. For example, many experts expect robotization to lead to massive amounts of changes in societal employment. On the one hand, this creates the challenge for PES to mediate between an increasing number of jobseekers and a decreasing number of jobs. On the other hand, artificial intelligence underpinning robotization creates opportunities for PES to set up new and better systems to serve these clients and potentially reduce their operating costs. Furthermore, being confronted with this evolution brings about the realization that change no longer needs to be seen in terms of discrete events. Change is continuous. PES that can adopt structures and practices that allow them to be more agile and adapt to continuous change are best suited in the long term to satisfy their organizational goals.

But what exactly are the changes that PES face? What kinds of technological changes should PES embrace and what are the consequences of such changes for the ways in which PES are structured and operating?

In this chapter, we seek an answer to these questions. First, we look at technological changes that interact with and drive changes in (big) data, societies, and organizations. Next, we explore the opportunities that these (IT and data) developments offer. Lastly, we discuss some of the challenges that PES will have to overcome when becoming more IT- and data-driven.

Changing worlds; the rise of technology

No one shall deny that technology has impacted life and the societies we live in. From the invention of the wheel through the industrial revolution, technologies have always had a profound influence on our behavior. While most will acknowledge that technological change is ongoing, few realize two key points that are starting to impact organizations working with information technologies. The first is that the pace of technological change is increasing. The second is that many technologies are cumulative (i.e., many technologies come, but far fewer go away). This obviously makes the technology landscape more complex.

We can easily illustrate the increasing pace of technological change by looking at this matter from two angles. The first is the development of computers and the exponential increase in computing power. Moore's Law was first posited by Gordon Moore, one of Intel's co-founders, in 1969. It states that the number of transistors on a computer chip will double every 18-24 months. Up until this day, Moore's law is still in place. This doubling of transistors on a chip basically implies that the (computational) power of computers doubles roughly every two years. Furthermore, this doubling over time leads to exponential, rather than linear growth.

So computers are becoming increasingly powerful, leading to several generations of IT innovations in history:

- 1960s & 1970s | Mainframe computing
  The first wave involved large-scale automation, largely in the back-office. This computerization was aimed at improving productivity and efficiency through large "number-crunching" mainframe systems.
- 1980s & 1990s | Personal computing
  The second wave involved the adoption of mini- and microcomputers, which could more readily be located close to users. This resulted in more innovations involving the front-office functions of the public sector. Examples are systems used by case-workers for data-entry and monitoring or terminals used by telephone agents.
- 1990s – 2010s | Networking and mobility
  The third wave of IT innovations centers on networking and mobility. Not only are most computers connected to the Internet or intranets, computers have been miniaturized, and mostly through smartphones, are accessible from everywhere.
- >2010s | Ubiquity and intelligent IT
  The most recent and currently relevant wave is the rise of intelligent robots powered by artificial intelligence coupled with a ubiquity of devices connected through the Internet of Things (IoT). This creates new types of IT applications (such as intelligent assistants) and has the potential to radically transform existing applications (such as self-driving cars). Below, we will discuss the opportunities of this new phase of technological developments.

The second angle is the argument that more and more individual technologies are being invented at an increasingly higher speed (Brynjolfsson & McAfee 2011). Furthermore, thanks to globalization and the Internet, people are able to learn from and adopt these innovations quicker. For example, while it took about 50 years for 50% of the population to adopt a (landline) telephone, it only took 5 years for the smartphone to achieve similar levels of adoption.

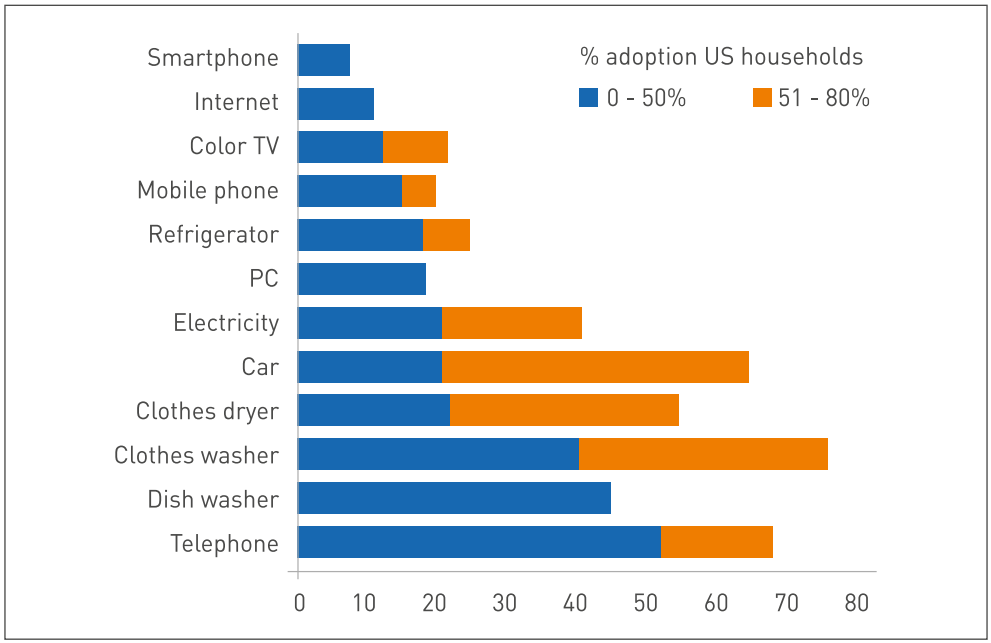

Figure 7: Adoption of technologies in the US

The second key point is the combined point of legacy and accumulation. In a nutshell, many technologies appear, fewer disappear (one example would be that fax machines have fallen out of use). And as the pace of technological innovation increases, organizations will start to use more and more technologies of different generations alongside each other. For example, one analysis[6] showed that American government agencies are still using computer systems from the 1970s, computers with 3.5" floppy disks, mainframes using near-ancient COBOL and FORTRAN programming languages, and systems running Windows 3.1. This co-exists next to every conceivable 'modern' technology and everything in between. This existence of legacy creates problems in terms of maintaining systems, but also regarding interoperability with newer technologies and the sheer complexity of managing an interconnected web of many different systems.

Accumulation also manifests itself at the front-office where organizations have an increasing number of channels to choose from when serving their clients. Pieterson,

6 http://www.pcworld.com/article/3075284/hardware/us-government-agencies-are-still-using-windows-31-floppy-disks-and-1970s-computers.html

Ebbers & Østergard (2017) describe five generations of channels tied to different generations of technological evolution:

Gen.	Period	Label	Alternative(s)	Channels
0	<1990s	Traditional	-	In-person, telephone, mail
1	1990s	Electronic	Digital	Website, email
2	2000s	Social	Social media, Web2.0, Government 2.0	Social media (e.g., social networking sites, (micro-) blogging, video sites, wikis)
3	2010s	Mobile	M-Government	Smartphones, responsive sites, mobile apps
4	2020s	Robots	(Social) Robots, Robotization	Social & conversational robots, artificial intelligence, virtual intelligence

While the table shows that the number of potential channels up until the 2010s was large to begin with, another generation of channels is already about to arrive. This new generation is defined by the use of artificial intelligence to create new types of channels and/or replace existing channels. For example, chatbots, conversational robots, and intelligent assistants have the potential to (partially) replace existing channels. Chatbots are robots that exist in software form only. They use artificial intelligence to respond to written (query) inputs. Initially, they could be used to respond to relatively simple and unambiguous questions. However, as the underlying artificial intelligence learns and becomes more intelligent, it might become possible for chatbots to (partially) replace human-powered service interactions that are based on text (such as chat or e-mail conversations). Conversational robots could perform something similar for spoken conversations. Robotization also creates new types of service channels. Virtual and augmented reality are examples of these. In a PES setting, virtual reality could be used to simulate in-person service interactions for people unable to travel. Furthermore, it offers great potential for (simulated) training and/or coaching purposes, such as interview training for jobseekers.

So, what we are seeing is a channel landscape that has grown quite drastically in size since the 1990s. While some of the newer channels have complemented or partially replaced other channels, we can conclude that far more channels have arrived than have disappeared. Even (traditional) mail is still in heavy use across the world for formal (notification related) communication as well to transfer forms back and forth between governments and citizens.

This situation creates two challenges for Public Employment Services. The first is the multi-channel management challenge of deciding which channels to deploy for what services to which clients in which situations. Because channels all have different characteristics, rendering them suitable for different services, and are all in different stages of deployment at governments and adoption among citizens, this challenge becomes rather complicated. The second is the cost and resource aspect of channel deployment. Every single channel has a set of associated fixed costs for the specific technical infrastructure and resources such as staff, staff training, and branding the channel to match the identity of the organization (Wirtz and Langer 2015).

This (short) review of the evolution of IT within Public Employment Services and the development of the service channel landscape can teach us three important lessons:

1. The landscape is becoming increasingly complex as more and more technologies of different generations are being used throughout the organization. To oversee and control these complexities, PES need data about the impact and performance of these technologies. Fortunately, these same technologies allow to create and store the data that could be used to manage these complexities.
2. The technology landscape is changing faster and as a result societies are changing too. The implication is that PES need to change as well. For this purpose, organizations need information about the changing environment in order to make decisions that anticipate future changes.
3. Organizations need to make decisions about which new technologies to adopt and how to deploy them in order to meet certain organizational goals. Here, PES again need data about the needs and behaviors of their clients, as well as the performance or current organizational processes to determine how new technologies fit into this picture.

From these lessons put together, it appears that there is a symbiotic relationship between technologies (IT) and data. Data is needed to make decisions about the adoption of technologies and to monitor the performance of (technology-driven) processes. At the same time, technologies facilitate the collection, storage, and analysis of data. This creates an IT/Data feedback loop (Pieterson 2016).

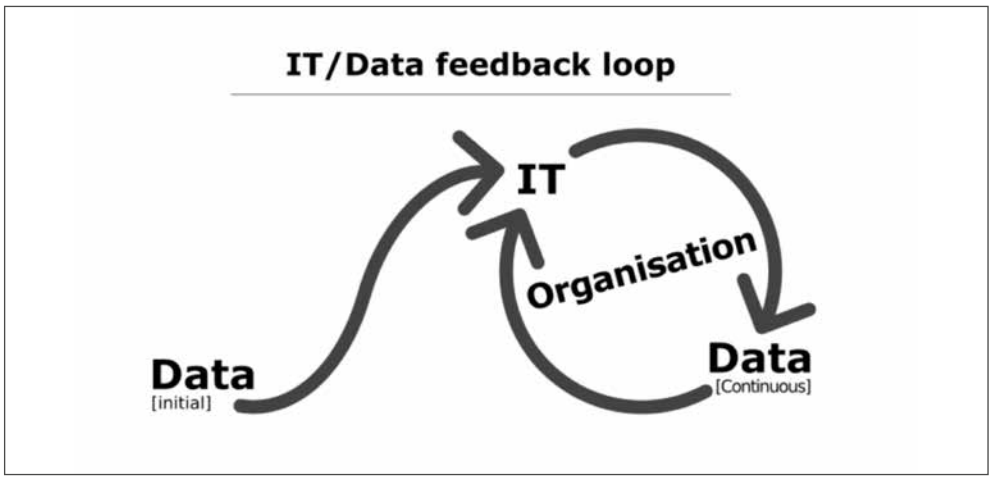

Figure 8: IT/Data feedback loop

Therefore, it comes as no surprise that the use of data within governments is gaining importance and the use of big data is commonplace. But what exactly is big data?

The data revolution

In its simplest form, big data simply refers to very large data sets, although there is no unified idea of what 'big' entails (which arguably is also a moving target). Larsen and Rand (2015) see big data as data "generated through different digital devices such as smart phones, websites, apps, sensors embedded into objects, scanning of machine-readable objects (bar codes) and Social Media postings". More commonly, big data is defined by the three V's (Burns 2015):

- Volume (referring to the quantity of information)
- Variety (referring to the multitude of information types)
- Velocity (referring to the speed with which data is stored, analyzed, and/or changed).

Kreibich (2015) argues that the goal should not be to have big data, but "smart data", which he defines as the combination of big data, clear organizational goals (utility), proper labelling and organization of data (semantics), and high quality of data that is secure and protected. According to Manyika et al. (2011), big data is the 'the next frontier for innovation, competition, and productivity'. In retailing, it was found that by using Big Data-based analytics retailers can realize a 15 to 20% increase in their return on investment (Perry et al. 2013). McKinsey predicts that governments, in Europe alone, could save $100B per annum through operational efficiency improvements[7].

It is not just the data itself that could be analyzed and used to optimize processes and increase efficiency. The data is also a key ingredient, together with lots of computational power and advanced machine learning algorithms, of the artificially intelligent systems mentioned above. Massive amounts of data need to be analyzed and used to create and 'train' these smart robots and intelligent service channels. The more data is available, the better the opportunity to create robots that are intelligent enough for more complex tasks in the organization. For example, an intelligent job matching algorithm could in time learn about the success of matching while learning from previous matches and tweaking the matching system based on certain inputs. However, while the intersection of data and IT seems to be creating opportunities for public employment organizations, there are important challenges that are often overlooked.

The challenges break down into three categories. The first concerns the broader implications of artificial intelligence and new technologies for the labor market and the playing field of Public Employment Services. While new technologies do create new jobs and job categories, there is a fear that artificial intelligence-based robots will replace existing work. Estimates by MGI (2013) suggest that intelligent systems could substitute approximately 140 million full-time knowledge workers worldwide. In 2016, research agency Forrester argued that artificial intelligence might replace 6% of all jobs within the next five years. While both numbers take a US-centric view, there is little reason to assume that similar numbers would not apply to other (advanced)

7 http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/big-data-the-next-frontier-for-innovation

markets as well. From this perspective, many public employment organizations could very well face an increase in workload in the coming years. It is quite possible that the only way they can tackle this is to embrace more technologies and data themselves to work more efficiently and effectively.

Second, there are challenges related to data itself. Most data that organizations collect is not very well integrated, let alone organized. In fact, 90% of all collected data is unstructured (Kim et al. 2014). This implies that the data lacks 'structure'; for example, descriptions, labels, and categories. As a result, organizations spend as much as 90% of their time cleaning and organizing data (Taylor et al. 2014). Also, governments must have the capability to conduct, interpret, and consume the outputs of data and analytics work intelligently (Yiu 2012). In short, getting started with data is an arduous and resource-intensive process. Organizations hoping to achieve results quickly while working with big data are often disappointed.

Third, as mentioned above, technological change is happening at an increasing speed. This could create problems for organizations that are unable to keep up with these changes. Lagging one or two generations of technologies behind may not directly cause problems for a public employment service. But what if it starts to fall behind significantly? What if jobseekers start expecting certain service channels that the organization has yet to embrace? What if jobseekers need to be trained in the use of technology that the organization does not understand itself? What if the organization lacks the data insights for making quicker decisions and being more frugal with increasingly tight budgets? Research has shown that public sector organizations are typically not very fast at adopting innovations and diffusing them internally in any case (Greenhalgh 2005). Furthermore, around 70% of all change programs fail (Beer & Nohria 2000), and there are no signs that this will drastically change in the near future.

Conclusion

Our main conclusion is that PES, while in majority still recovering from the recent financial crisis, will probably face new challenges shortly. New technologies offer opportunities to create further service channels and improve processes. However, the technology landscape is also becoming more and more complex and is changing

increasingly fast. Data that can be collected from these technologies offers the possibility of control and improved decision-making, but is often not very well organized. Even if the organization can use data to encourage change, it is no guarantee that these changes will be successful. Therefore, PES should rethink the role of IT and data within the entire organization and adopt more holistic views on their integral roles in preparing for a more technology-driven and faster-changing future to which the organization can continuously adapt.

Dr. Willem Pieterson works as an independent researcher and consultant. He is specialized in helping public sector agencies interpret technological and societal changes and translate these changes into actionable visions, strategies, and policies. He has a Ph.D. cum laude in Communication and has published over 40 (academic) articles, book chapters, reports and conference contributions. Willem has consulted the European Commission, the Inter-American Development Bank (IDB), and many public sector organizations around the world.

The new world of work is characterized by globalized employment, a mobile yet vulnerable workforce, and the challenges of demography and rising income inequality. Technological changes in both the demand for and supply of skills have a cross-cutting influence on how labor markets develop. In this book, different stakeholders from international organizations in the private and public sector discuss which role Public Employment Services and Workforce Development Agencies ought to play in the labor market today and in the future, why cooperation is crucial, and what kind of support digital services and software can provide for a more effective and efficient delivery.

Managing Workforce Potential – A 20/20 Vision on the Future of Employment Services seeks to inspire decision-makers in and around the labor market to reflect on governance, services, and partnerships to better cater to the new world of work.

Why this book?

As a world leader in Public Employment software solutions, WCC believes in sharing knowledge. It is our vision that combining what we know and sharing this with the world leads to maximum value across the board. This is why we take initiatives to both exchange and expand expertise. For example, we started the PEPTalk webinar series, which provides a platform for Public Employment Services to share their knowledge about best practices and their vision on the labor market. This book is another example; with its publication, we aim to contribute to an all-round clearer vision on the developments in public employment.

*The term **20/20 vision** is used to express normal sharpness of vision. It means you can see clearly at 20 feet what should normally be seen at that distance.*

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