

Vocational education and training for the future of work: Belgium

Authors: Nicolas Roland, Researcher in Educational Sciences, Isabelle Allinckx, ReferNet Coordinator and Anna Karno, Policy Officer

Contributors: The partners of ReferNet Belgium: Deutschsprachige Gemeinschaft Belgiens, Fédération Wallonie-Bruxelles, Vlaamse Gemeenschap, Actiris, Bruxelles Formation, EFP, IFAPME, IWEPS, LE FOREM, SFPME, SYNTRA Vlaanderen, VDAB.

Table of Content

TABLE OF CONTENT	3
INTRODUCTION.....	4
CHAPTER 1. VET POLICY STRATEGIES TO ADAPT TO DIGITALISATION.....	9
CHAPTER 2. VET 4.0 INITIATIVES AND PROGRAMMES	14
CHAPTER 3. USING 4.0 INTELLIGENCE FOR VET	22
CHAPTER 4. VET 4.0 LEARNING PRACTICES.....	25
CHAPTER 5. ADAPTING TO AI AND AUTOMATION.....	27
CHAPTER 6. CONCLUSIONS	31
ABBREVIATIONS AND ACRONYMS	33
BIBLIOGRAPHY.....	34
WEBSITES	37

Introduction

In 2017, a study conducted in the United States by the computer technology company Dell and the think tank 'Institute for the future' speculated that 85% of the occupations of 2030 did not exist yet (Institute for the future, 2017). In Belgium, Agoria (2018) – the largest employers' organisation in the country – has reached similar conclusions: by 2030, a whole range of occupations is doomed to disappear from the country, 310 000 workers and job seekers will have to retrain to find a new job and if no measures are taken, nearly 600 000 vacancies will not be filled.

The common cause of these various pessimistic findings is that technological innovation due to digitalisation – such as the internet of things, artificial intelligence, 3D printing, big data, etc. – is today giving rise to a new industrial revolution, the so-called industry 4.0 (Kohler and Weisz, 2016). The first industrial revolution mechanised production by water and steam; the second one used electricity, gas and oil to enable mass production; the third one was based on electronics as well as information and communication technology (ICT) to automate production. Today, this industry 4.0, a concept that first appeared at the 2011 *World industry forum* in Hannover, is basing itself on the fruits of the third industrial revolution to devise new personalised forms of production (Schwab, 2016).

According to Geandarme (2018), industry 4.0 seeks to respond to a demand for unique products by consumers while preserving equivalent costs. To this end, a range of digital technologies and interconnected computer systems are being used, in particular to control physical objects or machines. The idea is to make factories more intelligent – *smart factories* (Gimélec, 2013). The internet of things, artificial intelligence and other industry 4.0 technologies make it possible to automate tasks linked to physical activities or support them in order to enhance their efficiency (Schwab, 2016). Augmented reality, for instance, is proving to be the operator's ideal partner to perform high-precision tasks. By superimposing a digital model on physical reality, the operator can project luminous information over an actual object and thereby position the operation to be carried out in a constrained and complex environment – an engine for instance – without risk of error (Maurice, 2018). Moreover, in industry 4.0 repetitive or routine tasks will tend to disappear. For example, the Organisation for Economic Co-operation and Development (OECD) forecasts (OECD, 2018) that 1.8 million of the three million lorry drivers in Europe will be replaced by connected self-driving vehicles by 2030.

As highlighted by various international studies (Frey and Osborne, 2013; Arntz et al., 2016; OECD, 2018; Cedefop, 2018), this digitalisation will lead to a shake-up of competences required on the labour market. Apart from some skills upgrading, new ones will be required in the technology sector but also, to various

degrees, in all sectors of the Belgian economy. Initial and continuing vocational training is therefore central: 'In the future, the ideal candidate will be the result of 'co-creation' and not recruitment: the company will provide the resources and clear paths guiding the candidate's development' (Agoria, 2018, p. 7). Even though there is a lot at stake, very little has been written about the way in which the vocational education and training (VET) systems in Belgium are restructuring to meet the challenges of automation, digitalisation and, more generally, the future of work.

Digital transformation in Belgium

About 4.12 billion people currently use the internet worldwide, i.e. 54% of the world's population, of whom 2.73 billion use a mobile device (Journaldunet.com, 2018). It is estimated that by 2020 there will be more than five billion internet users and 50 billion connected objects. This digitalisation of society changes the way people live and work and also impacts the way in which public authorities and companies operate. While it poses many challenges, it above all presents an opportunity for the Belgian economy: in 2016, the digital share in Belgium's gross domestic product (GDP) amounted to nearly 25 billion Euros, i.e. 5% of total GDP (Leroy et al., 2018) and by 2030 this will have risen to 95 billion Euros, or 16.5% of GDP.

Belgium has enjoyed prosperity thanks to the previous industrial revolution (Leboutte et al., 1997). However, facing the current digital revolution the country is struggling to develop in an equally efficient manner (Leroy et al., 2018). This is why many initiatives have been taken in recent years to make optimum use of the opportunities offered by digitalisation in order to boost the Belgian economy and aim to attain by 2020 the third place in the Digital Economy and Society Index ⁽¹⁾.

Belgium's wish to reach a higher DESI level does not seem unrealistic: the *Digitising Europe* study by the Boston consulting group and Google (Boston consulting group, 2016) points out that Belgium is well placed to draw benefit from the European single digital market plan ⁽²⁾. However, in 2018 the country ranked only eighth in DESI ⁽³⁾ (DESI, 2018), although it ranked sixth in 2017. With the exception of connectivity (fifth position in terms of infrastructure), Belgium generally scores less well than some other countries in Europe. According to the conclusions of the DESI (2018), Belgium faces some major challenges: public services are still

(1) <https://ec.europa.eu/digital-single-market/en/desi>

(2) The European strategy rests on three pillars: improving access to digital goods and services throughout Europe for consumers and business, creating a conducive environment and conditions of fair competition for innovative services and advanced digital networks, and maximising the growth potential of the digital economy.

(3) <https://bit.ly/2s9oriM>

hardly digitised, people's trust in digital procedures should be improved and cyber defence needs to be strengthened. Moreover, the country is in twelfth place with regard to digital human capital ⁽⁴⁾, highlighting that the country still needs to improve people's digital skills, encourage the young to move towards careers in the digital field, and promote STEM disciplines much more strongly – Belgium is 23rd of 28 countries on this latter point.

Role of human capital in Belgium's digital transformation

The reason why politicians focus their attention on the fourth industrial revolution is that it entails unprecedented developments in terms of human capital needs. According to Bughin et al. (2018), the rise of industry 4.0 will require one in three workers to reskill by 2030. Demand for advanced technological skills (such as programming and coding) will increase by 55% compared to the present situation. The need for social and emotional skills will increase by 24%. Other skills, such as creativity and complex problem solving, will become increasingly important aptitudes.

These conclusions of the McKinsey Global Institute are borne out by the more precise results of the survey that the Roland Berger consultancy conducted for Agoria (2018). It is the first in-depth study of the Belgian labour market for 2030. It includes forecasts on various aspects including job losses, the development of employment, the number of vacancies and unemployment by region, the gap between supply and demand, and the digital skills necessary for the future. This study supplements the one undertaken by PricewaterhouseCoopers (PwC) & Flanders Make (Flanders Make, 2017), which presents a comparison between PwC 2016 Belgium survey on global industry 4.0 and the Flemish findings published by the Flanders Make centre. This study offers companies a strategy to find their feet in digitalisation.

Across the board, these various reports envisage three types of shifts linked to digitalisation of the Belgian labour market. Firstly, particular occupations will be in decline, such as that of unskilled manual workers, cashiers and administrative clerks (Agoria, 2018). According to McKinsey & Company, 670 000 jobs, across all sectors, will be lost by 2030 (Bughin et al., 2018). However, at the same time 3.7 jobs will be created for each job lost (Agoria, 2018) ⁽⁵⁾. Health care (18%), ICT

(4) Human capital is the whole range of aptitudes, talents, qualifications and experience accumulated by an individual, which partly determines the person's ability to work or produce for themselves or for others.

(5) Demand for labour in the Belgian economy will increase by 0.9% a year between now and 2030. In other words, there will be a total increase by 629 000 units by 2030. The strongest increase will be in the services, teaching and health care sectors. At present, these sectors are still not very digitised (Agoria, 2018).

(18%) and teaching (13%) are the sectors that will see the greatest demand and encounter the greatest difficulties in filling their vacancies (Agoria, 2018). Secondly, occupations such as sales representatives, shop assistants and factory workers will remain but will see a fast and ongoing development due to particular tasks being automated (Leroy et al., 2018). Thus, certain occupations will undergo change. Others such as engineers, digital experts, and nursing and care professionals will see an increase in employment (Agoria, 2018).

Lastly, new occupations will appear such as mobility planner, consumer coach, and employee responsible for data filtering, processing and protection (Agoria, 2018).

Investment in human capital and in education and training is therefore proving to be one of the main pathways towards ensuring the success of this digital transformation (Leroy et al., 2018).

As the table below shows, work of the future will require new competences: creativity, the ability to express emotion and empathy, listening skills, communication skills, ability to work in multidisciplinary teams, and the ability to adapt to or engage in a process of lifelong learning. Non-technical skills will also become more important with regard to the complementarity of man and machine.

Table 1. What work in the industry of the future?

Daily tasks	Supervising machines and production lines, diagnostics and maintenance, alternating between work phases and design phases
Working method	Working in project mode, overall grasp of the production process and its environment, close collaboration between production employees and the various departments
Tools	Connected tools (3D glasses, tablets, virtual reality tools, etc.), complex man/machine interfaces, collaborative robotics, exchange platform
Know-how	Specialised technical skills, command of multiple skills: hybridisation of conventional jobs, new skills to cope with the spread of digitalisation (programming, data processing and data analysis, etc.), abstraction, representation and anticipation skills
Life skills	Independence, decision making, multi-tasking, flexibility, adapting to change, relational skills (communication, team work, etc.)

Source: Bidet-Mayer and Toubal, 2016.

Industry 4.0 will also make it necessary for workers to improve their digital skills: 4.5 million Belgian workers are affected by this upgrading of digital skills (Agoria, 2018). One of the main challenges will be retraining or reskilling (Bughin et al., 2018), i.e. the ability to train and retrain the labour force in this mass industrial transformation. According to Agoria (2018), this restructuring should be implemented in two ways: one process limited to two to six months covering 150 000 people and another, more intensive six- to eighteen-month exercise covering 160 000 people.

Structural labour shortage and insufficiently specialised skills are foreseen and about one in ten job offers (11%) could remain vacant in Belgium by 2030. Moreover, 'there are clear regional and sectoral differences: the risk is higher in Flanders (12%) and Brussels (10%) and weakest in Wallonia (7%)' (Agoria, 2018, p. 15).

Throughout the VET systems in Belgium, human capital is at the heart of what is at stake in the digital transformation and it is in particular one of its main conditions for success. In this article, we will analyse to what extent the Belgian political authorities are committed to reforming VET systems to provide people with the skills necessary for industry 4.0 by 2030. We will discuss the strategies put in place, both at federal and regional level and analyse the strategies that have entailed specific reforms or initiatives – such as new VET programmes. We will also describe the initiatives that have recourse to automation, artificial intelligence or other technologies of industry 4.0 to highlight the need for reforming VET systems in line with future skill requirements. Particular pedagogical initiatives intended to foster a digital culture among individuals and their ability to meet the challenges of the technologies of industry 4.0 will also be presented. The last chapter will focus on AI strategies in Belgium and their commitments to adapt the training offer accordingly.

CHAPTER 1. VET policy strategies to adapt to digitalisation

In Belgium, education comes under the competences of the Flemish, French-speaking and German-speaking communities whereas training is a community and/or regional matter.

Nevertheless, at federal level, the government launched *Digital Belgium* ⁽⁶⁾ in 2015, a plan of action that outlines the country's long-term digital vision and divides it up into clear objectives. This plan consists of five priority areas: digital infrastructure, trust in digital procedures and digital security, digital public authorities, the digital economy and digital skills and jobs. The aim is to improve Belgium's position in the digital domain and attain by 2020 the third place in the Digital Economy and Society Index (DESI) ⁽⁷⁾. In this *Digital Belgium* ⁽⁸⁾ plan, the Federal State notes that 'nine jobs out of ten will require digital aptitudes. The public authorities should therefore ensure that as many citizens as possible, whatever their age and past experience, can seize the opportunities offered by digitalisation. Acquiring a minimum of digital skills is crucial in this regard'.

Accordingly, in order to organise the development of digital skills and jobs, the government has set up *Digital Champions* ⁽⁹⁾, an alliance bringing together stakeholders of various public authorities, education and the private sector. The aim is to put in place initiatives ensuring that all citizens have a chance to prove their digital skills: introduction to programming, upgrading knowledge, discovery of digital security, etc.

To develop Belgium's digital ecosystem further, a new coalition called AI4Belgium was formed in 2019 resulting in a new AI strategy. It aims at urging political leaders to make AI and its implications one of the priorities of the next government, alongside other ongoing initiatives (see chapter 5 for more details).

Flanders has implemented the *Vlaanderen Radicaal Digitaal* plan (Vlaamse Overheid, 2015) with a range of subjects more focused on technological innovation: information and communication technology (ICT) applications, the internet of things, big data, industry 4.0, smart mobility, training in particular in the STEM disciplines – science, technology, engineering and mathematics – developing e-commerce, etc.

⁽⁶⁾ <http://digitalbelgium.be/fr/>

⁽⁷⁾ <https://ec.europa.eu/digital-single-market/en/desi>

⁽⁸⁾ <http://digitalbelgium.be/fr/>

⁽⁹⁾ <https://www.digitalchampions.be/digitalchampions/>

In Flanders also, the Social and Economic Council of Flanders (SERV) has brought a range of experts and organisations together in meetings, individual discussions and interviews to focus on future of work challenges. This has enabled the Council to update themselves on the various political challenges (SERV, 2018), similar to the abovementioned findings, such as the desire to cope with the changes engendered by digitalisation and to make optimum use of the opportunities offered by the digital transformation in order to create prosperity and well-being.

On this basis, three education and training issues have been defined: (i) the need to be constantly informed of new requirements created by digitalisation, (ii) use of distance training, and (iii) development of a culture of lifelong learning.

As regards the first point, the Council proposes establishing permanent monitoring of new skills needed on the market, the demands of employers and new jobs. According to the Council, digital literacy - achieving and maintaining a level of digital skills within different sectors - should also be included in the political agenda. In order to support distance training, the Council asks politicians to invest more in new and flexible forms of teaching and learning. Lastly, to promote lifelong learning, it wants to introduce incentives such as the possibility for every employee to get training during working hours.

The Federation of Wallonia-Brussels has developed its *Digital Strategy for Education* ⁽¹⁰⁾. It follows the *Pact for education of excellence* and presents an integrated vision of digital transition for compulsory education. It stresses the need to invest in digital skills right from compulsory education level so as to give all citizens the ability and means to adapt to the digital era. The Federation thus joins up with the initiatives of the Federal Government and the regional governments which seek to develop a long-term digital vision for society. It also presents five additional approaches: definition of digital content and resources for the benefit of learning, guidance and training of teachers and heads of establishments, definition of the conditions for equipping schools, sharing, communication and dissemination, and lastly development of digital governance.

With regard to higher education, the Academy for Research and Higher Education (ARES) has issued a report proposing measures to develop higher education capable of meeting the challenges of 2030 (Finance and Leonhard, 2017). The digital dimension is highlighted in terms of contextual changes but the strategy is summed up in the following quotation: 'To this end, it is of essential importance that the institutions train leading citizens and professionals knowing and managing the use of digital working methods' (Finance and Leonhard, 2017, p. 37).

⁽¹⁰⁾ <http://enseignement.be/index.php?page=28101&navi=4540>

The *Brussels' 2025 strategy* (issued by the Brussels Government in 2015) has as its main objective to sustainably boost the Brussels economy and to promote the capital to the level of a digital capital. In order to do so, the strategy sets out five priorities: education, training, economy, employment, research and innovation, and mobility. It thus comprises various strategic objectives linked to the digital transformation of education and training: modernising the pedagogical resources of qualifying teaching establishments, strengthening the use of ICT in classrooms, encouraging the citizens of Brussels to move towards occupations that offer high-quality jobs, and promoting dual learning. More specifically, the strategy proposes strengthening combined work/training policies and strengthening vocational training to improve access of citizens to qualifications and job placements. These objectives require a better match between the supply of training courses and the sectors offering jobs; but also by developing occupations of the future, as identified in another component of the strategy.

To promote the digital ecosystem in the city in 2019, the Brussels' government has at its disposal three tools: Brussels Smart City Strategy – setting trajectories for digital priorities for the region; Innoviris Brussels – the Regional Plan for Innovation, the framework for research and innovation policy and a lever for socio-economic development to improve the well-being of Brussels residents and the NextTech Plan ⁽¹¹⁾. One of the axis of the NextTech Plan concentrates ⁽¹²⁾ on raising awareness and train strategic and promising audiences, such as young people, support the reconversion of job seekers into new professions and ensure coherence in the offer of ICT training available for these target audiences.

In the Walloon Region, the *Marshall Plan 4.0* – and since 2017, the new regional policy statement - earmarks a budget of EUR 2.9 billion for the period 2015-19 (Service public de Wallonie, 2015). It lays down a tight plan focussed on priority measures for economic redeployment that should underpin a proper industrial policy based on innovation. The Plan comprises five approaches for economic redeployment in Wallonia and for working out a proper industrial policy. Among the priorities, human capital accounts for EUR 304.5 million dedicated to education and training measures implemented in collaboration with the Wallonia-Brussels Federation. The focus is mainly on developing guidance for learners (occupational centres and introduction to occupations) and facilitating access to higher education and lifelong learning. Through this Plan, Wallonia strives to put its businesses in a position in which they can draw full benefit from technological change.

⁽¹¹⁾ <http://bedigital.brussels/a-propos/>

⁽¹²⁾ <http://werk-economie-emploi.brussels/fr/-/bhj> & <https://nexttech.brussels/>

To this end, within the Marshall Plan, a digital transition strategy called Digital Wallonia has been set up seeking to stimulate the Walloon digital economy. This strategy focuses on five main areas along the same lines as the federal strategy: digital sector, economy through digitalisation, connected and intelligent territory, public services, skills and jobs. The strategy also aims at developing a digital culture among citizens and specifically among young Walloons in training. The Marshall Plan is strongly linked to the *Regional policy declarations* (Gouvernement Wallon, 2014), which announced that the *employment and training pact* published in 2016 (Gouvernement Wallon, 2016) should serve as legislation strengthening the links between the two worlds of education and work. The main objective is that the achievements of vocational training and those of dual training give rise to appropriate certification. Moreover, the supply of vocational training should focus mostly on trades 'in shortage'.

The Digital Wallonia 2015-2018 strategy has made Wallonia part of the dynamics of a region seizing opportunities for digital transformation. The strategy has also helped to initiate a process of structuring and streamlining the initiatives and the actors who carry them within the Walloon digital landscape. Given the impact and the strategic importance of digital technology for the Walloon Region, the Walloon Government has decided to pursue the Digital Wallonia dynamic and validated a framework defining the guidelines for Wallonia to seize the socio-economic opportunities of the digital transformation for the 2019-2024 period⁽¹³⁾.

Considering the state of the development of abovementioned strategies in 2018, the *digital transformation* working party of the federal government (Leroy et al., 2018) believed at the time that the political landscape was too fragmented and lacked convergence.

The *National strategic investment pact* working party had found inspiration in *Digital Europe's plan* (European Commission, 2015) to move Europe towards a reliable single digital market, proposing five areas for investment: digital ecosystems, digital infrastructure, digital public authorities, digital trust and digital human capital. As regards this latter point, Belgium still needs to invest in a programme to strengthen digital skills and redistribute existing resources to train people for tomorrow's occupations. For the working party, this digital transformation was a new reality that should not be underestimated as regards education and training; it still requires indispensable digital skills. Through the *National strategic investment pact*, the working party thus proposed three main objectives:

(13) <https://www.digitalwallonia.be/fr>

(a) redeploying the working population through a systematic and coordinated digital restructuring programme across all sectors, with training establishments set up for the benefit of workers and job seekers;

(b) developing digital skills throughout the education system, bringing teachers' pedagogical material up to date, making provision for retraining teachers to become coaches and transforming the traditional teaching methods in classrooms into new learning formats that focus on the learner and his/her knowledge accumulation;

(c) adapting courses to the new digital era and creating new didactic content focussed on digital work and at the same time acquiring other aptitudes that will become increasingly important in the future (creativity, solving problems, working in teams, etc.). An important role is also assigned to promoting Science, Technology, Engineering and Mathematics (STEM) training courses by increasing academic capacity, creating STEM academies and making STEM grants available.

CHAPTER 2. VET 4.0 initiatives and programmes

Having considered the strategies developed by the various levels of public authority in Belgium, this chapter is devoted to reviewing the reforms and actions adopted in VET systems and designed to take account of new skill needs linked to automation, artificial intelligence and other industry 4.0 technologies.

A distinction first needs to be made between initiatives designed to train people for the digital world – i.e. developing skills to cope with the challenges of industry 4.0 and the digitalisation of society – and initiatives in which digital methods are used as innovative ways of training delivery – digital learning – that can, as a by-product, enhance people's digital skills.

2.1. Digital Belgium Skills Fund

At the federal level, emphasis is clearly placed on developing citizens' digital skills. In 2017, Alexander De Croo, the Minister for the Digital Agenda, set up the *Digital Belgium Skills Fund* ⁽¹⁴⁾. For a period of two years, six million Euros have been invested to fund projects linked to acquiring and strengthening digital skills among socially vulnerable children, youngsters and young adults. Through invitations to tender for projects, the fund finances training initiatives of variable duration. The *digital Belgium skills fund* thus contributes to filling the gap in digital skills and enables citizens to deploy their talents in the digital society and the new economy.

40 projects were supported in 2017 and 37 in 2018 (King Baudouin Foundation, 2018). By way of example, the King Baudouin Foundation (2018) mentions four projects in particular: the first one is BeCode ⁽¹⁵⁾ which had already received support in 2017. It enables young adults to become programmers/developers, regardless of their previous training. The second is the *Robot Code* project of Scientothèque, which offers programming and robotics initiation workshops and traineeships for young Brussels citizens between the ages of 8 and 18. Thirdly, Interface3 Namur ⁽¹⁶⁾ has developed the *my digital future project* that encourages young people aged between 18 and 30 to learn digital skills through three training courses - software development, digital literacy and

⁽¹⁴⁾ <https://www.decroo.belgium.be/fr/le-ministre-de-croo-et-la-fondation-roi-baudouin-lancement-le-digital-belgium-skills-fund>

⁽¹⁵⁾ <https://www.becode.org/>

⁽¹⁶⁾ <http://www.interface3namur.be/>

digital strategy skills - contributing to the development of small and medium-sized enterprises (SMEs). Lastly, Wannawork in Antwerp ⁽¹⁷⁾ enables socially vulnerable young people between ages 17 to 29 to develop their digital skills through workshops and courses designed to get them into employment.

2.2. Raising awareness of new technologies

In Flanders, initiatives seek a hybrid approach: training for the digital world by using digital methods. In education, the Education and Training department ⁽¹⁸⁾ of the Flemish Community (*Departement Onderwijs en Vorming*, 2016) promotes raising awareness of artificial intelligence, virtual and augmented reality, and STEM disciplines. With this in mind, the department shares pedagogical material on the abovementioned subjects through the educational portal and the images archives ⁽¹⁹⁾. Moreover, the *Gamefonds* allows actors such as publishers of educational media and Game developers to introduce projects using, for instance, virtual reality or artificial intelligence ⁽²⁰⁾. Thus, an educational language game was recently approved: pupils practice the language by holding a conversation with a 3D character. An increasing number of this type of projects is being developed.

Finally, a new collaboration programme, entitled *Smart Education @ School*, has been created with IMEC (the world's leading centre for R&D, nanoelectronics and digital innovation). Through a call to submit project proposals, six projects – out of the 48 submitted – have been funded in 2018-2019. Among these, several are linked to STEM and aim to enrich the scientific material through augmented reality or to set up artificial intelligence courses. In 2019, a new call was issued for 2020 projects in Flanders.

In the Wallonia Brussels Federation, raising awareness of new technologies is a component of the reform carried out by the Pact for a Teaching of Excellence. The aim is to integrate digital skills better in general education curricula to equip all learners accordingly before they access qualifying education.

2.3. Introducing new courses and forms of learning

In the continuity of new strategies for digital development, Syntra training centres have promoted a range of training courses to meet the requirements of industry 4.0: digital transformation coach, virtual reality video producer, e-learning expert,

⁽¹⁷⁾ <https://wannawork.com/>

⁽¹⁸⁾ <http://onderwijs.vlaanderen.be/>

⁽¹⁹⁾ <https://onderwijs.hetarchief.be/>

⁽²⁰⁾ <https://www.vaf.be/vafgamefonds/>

internet of things (IoT) expert and Blockchain business solution developer. The Flemish employment and training service (VDAB) and Syntra Vlaanderen, the Flemish agency for entrepreneurial training, follow the *radicaal digitaal* strategy of Flanders (Vlaamse Overheid, 2015) and the SERV recommendations (SERV, 2018) and have developed their own approach. Within this framework, the VDAB provides digital training to meet the labour market's needs for agility and flexibility – blended learning, on-site and distance coaches, *EWise* methods, workshops and e-method skills labs. Via the VDAB's digital tools, VDAB's follow up and application of new technological trends and 21st century skills, the search for work and the development of a career can be facilitated. Aware of the rising importance of the artificial intelligence, the VDAB is also working on new learning modules for its public (see chapter 5).

Syntra Vlaanderen promotes dual learning at all levels of education to close the gap between education and the labour market. It does this in two ways; firstly, dual learning facilitates and improves the coordination between the different actors in the field of education and employment. Secondly, dual learning ensures an agile adaptation of the training programmes with regard to their contents, forms and acquired competences, including digital and soft skills. Moreover, Syntra Vlaanderen aims to stimulate lifelong learning by making dual learning accessible to adult employees and jobseekers as well.

2.4. Integrating digital skills in curricula

The *digital strategy* of the Wallonia-Brussels Federation, referred to in the previous section, strives to provide digital training by defining the skills connected with the digital society. From 2020, digital skills will play a more important role in the common school curriculum. The aim is to integrate digital methods as a subject for learning (education *working out loud* in digital methods) but also as a support for other disciplines (education by digital methods). Education by digital methods will require active participation in all disciplines as every study area has a specific use for digital methods in which pupils ought to be initiated. Moreover, because of the importance of new technologies in all production processes, digital methods will play a crucial role in learning that comprises mathematics, science and manual, technical and technological skills, making people increasingly aware of computer sciences, in particular algorithms.

A new repository of skills and knowledge is being set up to operate at the end of the second and third stages of technological and general secondary education in computer science. It integrates cybersecurity, the Digital Strategy for Education (including the European recommendations contained in “Digcomp 2.1.”) and must

establish a link with the working group responsible for drafting the manual, technological and digital training repositories for the knowledge and skills base of the new common core ⁽²¹⁾.

The idea is to achieve digital literacy and media education through learning procedures relating to citizenship and education in human and social sciences. As from 2022, new adapted standards will also be worked out in relation to the new stream in higher secondary education.

The input from the European Commission, resulting from the work it has done in this field – e.g. DigComp (European digital competence framework for citizens), a set of standards concerning digital competences ⁽²²⁾ – and the ICT passport project (basic office automation and computer skills) will be taken into account.

2.5. Strengthening digital infrastructure

This strategy also makes provision for training by digital means by focussing on training and guidance to developing digital skills among teachers and heads of establishments. As part of the “successful digital transition” project within the Pact for a Teaching of Excellence, an analysis of the training needs linked to these digital skills of teachers is deployed. This analysis will feed the development of a new digital approach in career training.

With regard to equipment, ‘It is essential that all establishments and all teachers have the minimum standard equipment from both an administrative and pedagogical point of view in terms of hardware, software, network infrastructure and internet connections. Account being taken of the current situation, the public authorities need to ensure for each classroom at least a high internet throughput connection and at least a terminal to connect to the internet’ (Federation of Wallonia-Brussels, 2018, p. 29).

The task is therefore to progressively deploy basic administrative digital equipment, starting with nursery schools and primary schools and, taking account of existing resources, strengthen the direct provision of technical and pedagogical support for all schools.

⁽²¹⁾ The *Pacte pour un enseignement d'excellence* carried out by the Wallonia Brussels Federation aims at strengthening the quality of education for all students by postponing the choice between general and vocational education at the end of the third year of secondary education (instead of the second year).

⁽²²⁾ <https://ec.europa.eu/social/main.jsp?catId=1315&langId=fr>

2.6. Adapting training profiles

Moreover, the Service francophone des métiers et des qualifications (SFMQ) ⁽²³⁾ [Francophone service of occupations and qualifications] strives to establish training profiles that match occupational profiles. In this way, the SFMQ guarantees the coherence and relevance of training provided. Within this framework, the Federation makes provision for training in digital procedures. Training profiles in fact progressively include digital skills. For instance, the profile of stonecutter has been recently brought up to date by including all aspects of digital cutting.

2.7. Public-private partnerships and other training initiatives

Advanced Technology Centres (*Centres de Technologies Avancées*, CTA), created in 2007, are infrastructures that puts advanced educational equipment at the disposal of learners and educational actors in a number of Wallonia Brussel Federation schools. Apprentices and trainers from IFAPME, AWIPH ⁽²⁴⁾ and SFPME, job seekers and workers can also access them to develop their technical and professional skills. The implementation of these centres was part of the actions taken by the government to upgrade qualifying education to meet the requirements on terms of knowledge and skills, notably digital. Currently, the development of the following digital skills are offered in five CTA in French-speaking Belgium ⁽²⁵⁾: automation, maintenance of industrial automated systems, production chains, programmable logic controllers, electro-pneumatics, electronics, robotics, computer graphics, 3D printing, design and 2D-3D creation.

The Brussels' 2025 Strategy launched in 2015 by the Brussels' Government has given rise to a number of initiatives. One of these, the 2020 Training Plan edited in 2016 is designed to improve the chances of employment of Brussels citizens by developing their skills and introducing specific measures for the right to lifelong qualifications. To achieve this, employment training centres (*Pôle Formation Emploi*, PFE) are being set up. These centres are established on a sector-by-sector basis and are the fruit of a public/private partnership. The first centres concern digital occupations (ICT) and those of the technological industry.

⁽²³⁾ <http://www.sfmq.cfwb.be/>

⁽²⁴⁾ The Walloon Agency for the Integration of Handicapped People, *Agence Wallonne Pour l'Intégration des Personnes Handicapées*.

⁽²⁵⁾ Institut Saint-Laurent in Liège, Pierrard Institute of Arts and Crafts in Virton, Athénée Toots Thielemans in Molenbeek (Brussels), Diderot Institute in Brussels, Marie-Thérèse Institute.

The objectives of the ICT centres for 2020 are in particular to double the capacity of ICT training courses leading to qualifications (from three to six months) for job seekers (e.g. junior SAP/ERP software consultant; net developer, system administrator, etc.) and treble that of short training courses in ICT (from one to five days) for job seekers, workers and teachers (mainly with Cefora ⁽²⁶⁾, the joint commission for employees).

The Brussels initiatives for vocational training – in particular Bruxelles Formation – move along four main paths: developing digital competences of trainers to incorporate digital methods in their practices, making digital tools available for training, providing guidance in transforming traditional occupations – i.e. occupations where digital methods are gradually phased in – and enhancing the promotion of digital occupations. Moreover, Bruxelles Formation had set up a distance learning platform with a training facility ⁽²⁷⁾. This virtual space (with assistance provided when needed) gave jobseekers access to a wide range of distance training resources in ICT (e-learning). Now, this *Espaces numériques* (Digital spaces) is becoming a fully-fledged training centre, dedicated to digital learning always for the benefit of learners, with a service offer for the development of digital learning within others Bruxelles Formation centres and ultimately, with its partners,. Bruxelles Formation Management & Multimedia ICT Department is also evolving towards two distinct training departments: one dedicated to management and the other to IT and the graphic industry called BF Digital. Its aim is to gather the entire training offer related to new computer technologies and the web. In a near future, BF Digital will be a part of the recently formed PFE ICT.brussels, a hub gathering employment and training resources operating in the information and communication technology sector ⁽²⁸⁾.

Bruxelles Formation also supports initiatives to learn coding and programmes for digital occupations such as those offered by *BeCode*, *MolenGeek* and *school 19* ⁽²⁹⁾.

Since 2017, Wallonia has, through its Digital Wallonia strategy (Gouvernement Wallon, 2018) set up a number of projects for training in and with digital methods. On the one hand, *WallCode* ⁽³⁰⁾ seeks to bring together actors and initiatives with a view to developing digital skills (computer programming, coding,

⁽²⁶⁾ <http://www.cefora.be> The Joint Auxiliary Commission for Employees (CPAE or CP200) brings together some 55,000 companies.

⁽²⁷⁾ <https://www.bruxellesformation.brussels/annuaire/epnf/>

⁽²⁸⁾ <http://www.evoloris.be/fr/content/pfe-%E2%80%93-ictbrussels-%C3%A0-la-recherche-de-partenaires-priv%C3%A9s>

⁽²⁹⁾ <https://www.s19.be>

⁽³⁰⁾ <https://www.digitalwallonia.be/fr/projets/wallcode>

algorithm logic, robotics) for young talented people in Wallonia. On the other hand, *EdtechForum* ⁽³¹⁾ is a series of conferences to identify trends and prospects in education and training, regardless of learning context. Lastly, *Digital school (École numérique)* ⁽³²⁾ provides primary and secondary schools with equipment and high-quality connections.

In vocational training, the Walloon institute for dual training, self-employed people and small and medium-sized enterprises (IFAPME) ⁽³³⁾ [Institut wallon de formation en alternance et des indépendants et petites et moyennes entreprises] follows the digital strategy as laid down by the regional policy declaration of Wallonia (Gouvernement Wallon, 2014 and 2017), Marshall Plan 4.0 (Service public de Wallonie, 2015). The IFAPME adopts a mixed approach, promoting training in digital methods as well as training with digital methods.

With regard to the supply of training courses, the IFAPME provides flexible, adapted and updated courses to meet new market requirements (learners and companies) but also to include in the various training paths a minimum level of digital skills for learners (IFAPME, 2017). As regards procedures, the IFAPME applies innovative pedagogical methods and didactic tools based on making full use of digital resources.

Forem (the public employment service in Wallonia) has a plan of digital action with five components: self-positioning of the worker, proposing digital training content, testing and validating skills, establishing practicing facilities (smart corners, open learning lab, edulab, etc.) and worker activation (training/company link) ⁽³⁴⁾. Among the new professions developed by Forem, the 'digital mediator' has been described within the framework of an employment market forecast initiated by Forem in 2017. This report analyses the trends that will impact the nature of this profession (institutional context, development of technologies, new forms of work and of access to services, etc.).

There are also many reforms implemented in so-called 'Skills Centers'. Technifutur ⁽³⁵⁾ and Technocampus ⁽³⁶⁾ have put in place trainings for unemployed

⁽³¹⁾ <https://www.digitalwallonia.be/fr/projets/edtechforum>

⁽³²⁾ <http://www.ecolenumerique.be/>

⁽³³⁾ IFAPME offers training courses for occupations in a wide range of vocational sectors on the basis of the dual learning principle.

⁽³⁴⁾ Le Forem is currently deploying a new range of digital initiation training courses to meet the need for basic competences – standard key competence included in the European Key Competences Recommendation. This is clearly connected to the DigComp.

⁽³⁵⁾ <http://news.technifutur.be/un-exemple-concret-de-lindustrie-4-0-travers-le-partenariat-de-2-entreprises-gf-machning-solutions-et-ertec/>

⁽³⁶⁾ <http://www.technocampus.be/enjeux-de-lindustrie-4-0/>

and for small and medium-sized companies (SMEs). Some of them specialise in Industry 4.0 (smart industry and Internet of Things (IoT) expert by Technobel, data academy by Technofutur TIC (ICT), IoT by Technocité, etc.). They are involved in the IA – so called *Artificial Intelligence* network - to develop free access courses for this new field (see chapter 5).

Finally, within the German-speaking community, the *Garage 4.0* ⁽³⁷⁾ initiative helps companies and professionals of the car industry to tackle the transition towards alternative propulsion technologies, innovative automotive technologies and new economic and distributive models. Few initiatives have been put in place, but the employment office of the German-speaking Community of Belgium ⁽³⁸⁾ (ADG) indicates that thought is being given to working out new programmes and providing training.

The ADG is currently working on new modules concerning digital skills for job seekers on the basis of self-assessment of digital skills as presented by Europass ⁽³⁹⁾.

⁽³⁷⁾ <http://www.garage40.eu/>

⁽³⁸⁾ <http://www.adg.be/fr/desktopdefault.aspx>

⁽³⁹⁾ <https://europass.cedefop.europa.eu/resources/digital-competences>

CHAPTER 3. Using 4.0 intelligence for VET

At present, Belgium does not yet make generalised use of innovative technologies to understand labour market needs, adapt, and institute reforms in teaching and the vocational training sector. However, a number of pilot initiatives have been set up in the country.

3.1. Exploiting the value of big data for training curricula

In the Flemish Region, the two public training bodies, i.e. Syntra Vlaanderen and VDAB, have put in place several projects for using big data in dual training. Since 2015, Syntra Vlaanderen has developed the *duaal leren* ⁽⁴⁰⁾ [dual learning] platform which is due to start in September 2019. The aim is to manage digitalisation by adapting its provision of services in dual learning. Through data analysis, Syntra Vlaanderen can monitor demand, optimise its provision by gaining a grasp of the needs of the market and making dual learning facilities available that are conducive to efficient learning ⁽⁴¹⁾.

In Brussels, Innoviris wants to develop a strategy of using big data established at European level to find out more about the needs for deploying artificial intelligence. Despite numerous initiatives, supporting companies in artificial intelligence – through the Shape and Explore programmes –, these tools are not yet fully functioning and they still need to be completed to allow a better understanding of education and training need.

View.brussels, the Brussels Observatory for Employment and Training (*Observatoire bruxellois de l'Emploi et de la Formation*) has for its part expanded its field of research and analysis to training since 2017 in the framework of the Training Plan 2020 (*Plan Formation 2020*). Their activities improve the consistency, cross-tabulation and analysis of the statistics on employment and training. To this end, view.brussels benefits from enhanced collaboration between the research and statistics service of Actiris, Bruxelles Formation and VDAB Brussels. At a later stage, the results of these studies contribute in particular to the planning of training offers.

Since September 2018, the General Administration of Education of the French Community has a new service: the Observatory of Vocational Education, Trades

⁽⁴⁰⁾ <https://onderwijs.vlaanderen.be/nl/duaal-leren>

⁽⁴¹⁾ <https://svl.login.kanooh.be/het-digitale-loket-voor-ondernemingen>

and Technologies (*Observatoire du Qualifiant, des Métiers et des Technologies*, OQMT). This Observatory produces analyses of the VET offer in the Wallonia Brussels Federation. Moreover, an Institute for trades and technologies surveillance (*Veille des Métiers et des Technologies*) is being developed.

3.2. Analysing job vacancies using AI methods

VDAB strives to be an excellent service provider on the labour market and consequently continuously improves services to job seekers, employers and employees. A skill measurement tool has thus been undergoing tests since 2018, the VDAB digital TPD (technical pedagogical dossier). It is designed to compile reports of skills based on the scores of individuals in order to guide them in their search for employment through the competent ⁽⁴²⁾ database. For example, a VDAB team leader can view online TPD reports for all course participants of all VDAB courses. The evolution of their skills and if necessary adjustment can be followed. There are types of two reports available: the first gives an overview of the scores of active students in a specific program at a specific location; the second gives an overview of all trainees per location and per course. Online TPD reports are part of a micro strategy tool. To monitor results in, for example, customer processes, job seekers VDAB uses a micro strategy tool with 50 existing indicators (50 additional indicators will be implemented in the future).

To compare vacancies and job seekers profiles, VDAB use the Jobnet algorithm. It works according to a specific matching model called Deep Learning. The algorithm finds vacancies that match the profile of the job seeker and job seekers who match vacancies.

The VDAB is also offering a vocational guidance tool that is accessible online (orientering) ⁽⁴³⁾ and a digital starter package providing remote guidance to university students on the labour market. As regards data management, the VDAB has *arvastat* ⁽⁴⁴⁾, a statistical representation tool which makes it possible to quickly and easily consult statistics on unemployment and job offers in Flanders.

In the Walloon Region, Forem has created the '*mon profil*' [my profile] application which enables job seekers to describe and publicise their digital skills. The pilot trial conducted in 2018 has been positive: 16 970 people have used this application and 67% decided to make their skills public, i.e. making them visible to employers. New developments are planned on this basis: developing a diagnostic

⁽⁴²⁾ <http://production.competent.be/competent-nl/main.html>

⁽⁴³⁾ <https://www.vdab.be/orientering>

⁽⁴⁴⁾ <https://arvastat.vdab.be/>

test to confirm the level stated, the possibility to automatically propose personalised adapted training, etc.

In the German-speaking community, no measures of labour market intelligence relying on artificial intelligence are currently being contemplated.

CHAPTER 4. VET 4.0 learning practices

Alongside the implementation of innovative technologies, Belgium is engaged in pilot projects concerning the utilisation of innovative practices to raise awareness of the new challenges for VET.

In the Flemish Region, Syntra Vlaanderen set up the *ideaal dual* [ideal dual] competition in 2018. In 2019 the five regional technological centres (RTC) have searched for innovative projects that match the situation at schools with the realities of the world of work (*InnoVET*). The VDAB also emphasises the digitalisation of the training courses it provides, while working on a framework linked to STEM. It has set up T2 campus and more than 1 000 students can attend courses or workshops relating to STEM. In 2018, VDAB has also launched a *work out room*, a hub for innovative labour market projects. The work out room takes on three different roles, depending on the project: trendwatcher, instigator and incubator.

In the Region of Brussels, *Innoviris* continues to raise awareness of the sciences e.g. through *CanSA*t, Science Mundi and Women at Science. These have been strengthened by the launch of *Fablab mobile*, a project seeking to provide financial support for one or more projects to raise awareness among Brussels citizens of science and technology studies and job opportunities which they can offer. Within Bruxelles Formation, the *tremplin jeunes* centre has launched the *e-tremplin jeunes* initiative, a call for proposals of projects intended to finance initiatives in the digital field for young people in order to integrate/reintegrate them in courses leading to qualifications to get them back to work. In this way, innovative pedagogical projects are funded such as the *MolenGeek coding school*, which teaches coding and provides training for new digital occupations and, in particular, mobile and web development for job seekers aged 18 to 25 living in the Brussels-Capital Region. Through a socio-constructive approach – active learning – and project-based teaching, the school offers training in computer languages and transversal skills necessary to develop an entrepreneurial project. The school offers full-time courses over a six-month period.

In the Walloon Region, the IFAPME has set up digital projects after issuing a call for project proposals in February 2018 entitled ‘Innover pour se préparer à l’alternance 2018-19’ [innovating to prepare for dual vocational training 2018-19]. The aim of this call for project proposals was to enable agents in the field to work out innovative projects to meet the requirements of candidates for dual vocational training. Under the current circumstances, IFAPME is facing this new public who need an adapted programme in order to prepare for their entry into business and ensure the success of their training path. The pilot pedagogical projects are based

on innovative and concerted action supported by the agents in the field. The actions implemented are conducive to developing and maintaining human competencies (soft skills) required for learning and integration in a company and the success of the training path (teamwork, citizenship, initiative, self-confidence, etc.).

CHAPTER 5. Adapting to AI and automation

Artificial intelligence is considered as a trans-sectoral phenomenon in Belgium, which will have an impact on all sections of the economy. As was stated in a Belgian contribution to the European Commission ⁽⁴⁵⁾, all policy levels are aware of the importance of AI, comparing it to previous industrial revolutions. Accordingly, different policy making levels have already implemented new initiatives.

At federal level, the Minister for Digital Agenda convinced that digital progress is the key for social progress and that the digital progress is and will increasingly be driven by AI, encouraged the organisation of a reflexion group, which resulted in the AI4Belgium coalition and a new plan for the AI expansion in Belgium. This plan articulates the AI4Belgium strategy in five axes. The first axis places the human component in the centre of the strategy and proposes a new Pact for Education within which digitalisation would be included as a basic skill. The four other axes include developing a responsible sharing data strategy, supporting IA within the private sector, innovation and dissemination. The plan judges initiatives like BeCode ⁽⁴⁶⁾ or DataCamp ⁽⁴⁷⁾ popular and important however not sufficient. New bachelors' and master's degrees in AI must also be available for learners. Essentially, the plan stands as a guideline for federated entities to implement an AI strategy on their territory.

Flanders aims to invest EUR 32M per year in its AI impulse programme, which is based on three pillars. The first one focuses on basic research where four strategic challenges will be addressed ⁽⁴⁸⁾. The second one, on technology transfer and industrial application. The last one foresees a share of EUR 5M dedicated to supporting activities such as raising awareness, or providing educational and training materials, etc. A "data and society" research centre will support actors to include the ethical dimension into the implementation of AI driven applications ⁽⁴⁹⁾. This impulse programme should thus boost the AI implementation in enterprises, AI research strategies and the expansion of the training offer.

⁽⁴⁵⁾ CEI (2019). "Towards an integrated Belgian AI strategy", *Contribution to the European Commission*.

⁽⁴⁶⁾ See page 12.

⁽⁴⁷⁾ Online learning platform for data science and analytics.
<https://www.datacamp.com/about/>

⁽⁴⁸⁾ Help to Make Complex Decisions Through Data Science, Deliver Artificial Intelligence to the Edge: Realtime & Power Efficient AI, Interact Autonomously with Other Decision-Making Entities: Multi-Agent Collaborative AI and Communicate and Collaborate Seamlessly with Humans: Human Like Artificial Intelligence.

⁽⁴⁹⁾ CEI, "Towards an integrated Belgian AI strategy", *op. cit.*, p. 4.

Flanders has already taken some steps in the implementation of an AI training offer. The Flemish Minister for Innovation and Employment presented with the collaboration of the VDAB and partners such as Robovision and Google Belgium an online AI course “Iedereen mee met AI” ⁽⁵⁰⁾ to allow and encourage citizens to strengthen their competence and thus actively support Flanders economy. The Agoria technology federation cooperated with the VDAB and has launched a similar online course in the form of a practical guide for companies to start their own AI pathway.

The VDAB also ensures that citizens have the opportunity to learn to deal with AI in an accessible way, offering modules of training in data machines or applications. There currently are 250 courses online and an additional 100 will be available in December 2019. The Managing Director of the VDAB insists on the importance of learning AI methods, as even though it is unlikely that 100% of today’s jobs will disappear, it is conceivable that a 100% of them will change.

In line with the federal AI4Belgium plan, the Walloon Region has established a specific strategy called DigitalWallonia4AI ⁽⁵¹⁾ to be among the pioneering initiatives in AI. With the support of stakeholders like the Agence du Numérique (Digital Agency), the Infopôle Cluster TIC and the Réseau IA (AI Network, see below), the DigitalWallonia4AI programme, launched in July 2019, identified two main objectives: accelerate the adoption of artificial intelligence in Wallonia and its development in the Region. In practice, the programme will support enterprises wishing to incorporate artificial intelligence into their business or in the development of prototypes. It will also aim at raising AI awareness and set up training initiatives. The Region dedicated a seed-funding budget of EUR 900.000 for the launch of the initiative until July 2020 ⁽⁵²⁾.

Within this strategy, with the impulse of the Digital Agency, an enterprises network was created: the Réseau IA ⁽⁵³⁾. Companies organised themselves to gather expertise, create synergies, simplify access to information, structure the offer, etc. and all take actions to speed the economic development of Walloon companies. Moreover, as a leader of DigitalWallonia4AI, Réseau IA has been recognised as a core member of the AI4Belgium coalition.

Beside the Réseau IA, DigitalWallonia4AI will also implement the Walloon AI Hub (composed of private, public and academic stakeholders to pilot the

⁽⁵⁰⁾ <https://www.vdab.be/wat-is-AI>

⁽⁵¹⁾ <https://www.digitalwallonia.be/fr/projets/digitalwallonia4-ai#publications>

⁽⁵²⁾ Maxime Samain, « La Wallonie fait (enfin) de l'intelligence artificielle une priorité », *L’Echo*, 28 November 2019, p. 14.

⁽⁵³⁾ <https://www.reseauia.be/>

programme) and set up an experimental programme of AI-based products developments ⁽⁵⁴⁾.

Various initiatives have also been taken to adapt the training offer in the AI department. The Employment and Vocational Training Agency in Wallonia, le Forem and Competence Centres, have integrated AI in their training curricula as modules. They are constantly in relation with important AI actors such as Microsoft or BeCode. Competence Centres such as Technobel, Technocité or Technofutur TIC offer AI training units; for example, DATA and machine learning module training are available at Technofutur TIC. Moreover, in 2019 Technofutur TIC has set up a partnership with Technifutur and Alblackbet to organise a specific training programme for workers (mainly managers and developers). Initiatives have also been developed to guide workers in need of upskilling. In 2019, Technofutur TIC created a new department to work on a digital strategy for these particular workers. The Walloon Region is also currently working on a more structured plan in this area. With time, the plan foresees to determine the new training strategy as a key axis; works are set to begin in mid-2020 ⁽⁵⁵⁾. Also in 2020, all Competence Centres will take a stand regarding the DigitalWallonia4AI plan and will continue to strengthen their training offer.

The Brussels Region has been committed to the AI development for many years and had a pioneering role hosting the first academic laboratory dedicated to AI in Europe. Many initiatives have thus already been set into motion ⁽⁵⁶⁾.

Innoviris, a regional organisation, provides financial resources to feed the innovative Brussels ecosystem. As such, it is an important support to AI-related research and innovation. Among various programmes in 2017, “Team Up” which encourages collaboration between academia and the industrial world in Brussels, funded 10 projects in various fields, all in connection with AI ⁽⁵⁷⁾. Since then, Innoviris has shifted to more specialised call for example dedicated to industry 4.0.

The digital strategy for Brussels, or Digital.Brussels as it is called at national level, presents a global vision for digital strategy in the capital city. Currently, three plans are part of this strategy: the Regional Innovation Plan ⁽⁵⁸⁾, Smart City ⁽⁵⁹⁾ and NextTech plans. NextTech is coordinated by hub.brussels, the Brussels Agency for Business Support, and focuses on three priority sectors: Internet of Things, Big Data and the subject of this chapter, the AI. As such, it gathers the main entities involved in AI in the Region. The NextTech plan rests on three pillars: facilitating

⁽⁵⁴⁾ CEI (2019). “Towards an integrated Belgian AI strategy”, *op.cit.*, p. 5.

⁽⁵⁵⁾ *Ibidem*.

⁽⁵⁶⁾ *Ibidem*, p. 6.

⁽⁵⁷⁾ See Innoviris Activity Reports: <https://innoviris.brussels/fr/rapports-dactivites>

⁽⁵⁸⁾ <https://innoviris.brussels/regional-innovation-plan>

⁽⁵⁹⁾ <https://smartcity.brussels/the-project>

the adoption of technologies, training and attracting investments. Moreover, hub.brussels, together with its cluster software.brussels provides tailor made support and advice to any entrepreneur and enterprise involved in AI.

A further development of services and an undertaking of new actions are planned to reach a coordinated and comprehensive AI support offer in Brussels.

A new type of partnership ⁽⁶⁰⁾ is also being set in the AI training department. BeCode, Microsoft and its collaborators ⁽⁶¹⁾ join forces to open the first AI training centre in Belgium. They aim at bridging the skill gap and address the important number of vacancies on the job market. This training will be divided in two phases: a 7-month period of full-time on-site learning followed by a 3-month contract within one of the partnering companies. In 2020, this training offer will be available in three Belgian cities: Brussels, Charleroi and Antwerp, each accommodating 25 learners.

⁽⁶⁰⁾ <https://www.becode.org/ai-school/>

⁽⁶¹⁾ Cronos, Xylos, Delaware, KPMG and Faktion.

CHAPTER 6. Conclusions

The aim of this article is to describe and understand the political strategies, programmes and initiatives developed in Belgium to prepare vocational education and training systems for the challenges and requirements of skills in the industry 4.0 era.

It is no longer necessary in Belgium to demonstrate the challenges of digitalisation for the labour market nor the need for action, as these are now well documented and accepted. Belgium also gets its inspiration from EU recommendations and intends to become one of the leaders in Europe. However, while the boundaries for action are clearly defined, implementation comes under different levels of authority: federal, regional or community. Notwithstanding the areas of convergence that have been highlighted, the Belgian landscape of strategies and initiatives intending to adapt VET to the challenges of digitalisation remained very fragmented at the end of 2018.

This state had led to a lack of efficiency because of the multiplicity of actors involved. While many strategies were promoted at all levels of authority, specific reforms and implementations were rarer and slow to materialise. The actors in the field perceived this digital transformation as a sword of Damocles: digital methods and procedures were ubiquitous, politicians constantly emphasised their importance and the challenges facing us, but few instructions, funding or clear guidelines reached the actors in the field. As a result, the main actions that were taken often originated from the willingness of a handful of people or institutions. While these hand and still have notable institutional and pedagogical impact, they remained confined to their own contexts. Consequently, there was a gap between top-down strategy and bottom-up action. Moreover, as most strategies set their target at 2030, consequently we can see the first instances of detrimental social impact due to a failure to anticipate the way occupations are developing.

This situation is still reflected at the end of 2019. However, recent developments in AI for example show that policy makers are gradually organising a coherent approach to the digital revolution. Even though there is no strategy encompassing the entire country, each policy making level works to adapt its ecosystem to a modern world.

With regard to the years ahead, the *digital transformation* working party (Leroy et al., 2018) had identified three main conditions for a transformation of VET systems:

First, the public authorities should stimulate lifelong learning. Even though the law imposes on every employer, the obligation to offer at least two days of training a year to their employees, the time that Belgian workers devote to lifelong learning

is much shorter than in neighbouring countries. Introducing compulsory training in the transition between education and employment imposed on job seekers could also lead to efficient reskilling, which is already being implemented in other countries.

Secondly, coordination among the various actors in training and employment should be made more efficient; at present, training courses are not necessarily fit for purpose as companies communicate little about the skills that are essential for them.

Thirdly, the promotion and guidance of individuals towards STEM disciplines and the provision of training and guidance for teachers, teaching them in and with digital methods, should constitute two of the most important tasks for future VET in Belgium.

As these proposals show, a coherent systematic approach, linking strategies to specific reforms and initiatives, is necessary to move beyond the still compartmentalised – though sometimes mutually complementary – actions that are seen in Belgium today. Though efforts are made at some policy making levels, all the different levels of public authority should be able to move ahead together and speak with one voice to make optimum use of the window of opportunity that the digital world opens up and turn Belgium into one of the leading countries in this domain.

Abbreviations and acronyms

ADG	Employment office of the German-speaking Community of Belgium
AI	artificial intelligence
AMS	Arbeitsmarktservice [public employment service Austria]
ARES	Academy for research and higher education
AWIPH	Agence Wallonne Pour l'Intégration des Personnes Handicapées [The Walloon Agency for the Integration of Handicapped People]
Cedefop	European Centre for the Development of Vocational Training
CPAE	Commission Paritaire Auxiliaire pour Employés
CTA	Centres de Technologies Avancées [Advanced Technology Centres]
DESI	digital economy and society index
DigComp	European digital competence framework for citizens
Forem	Service public de l'emploi et de la formation professionnelle en Wallonie [public employment service in Wallonia]
GDP	gross domestic product
ICT	information and communication technology
IFAPME	Institut wallon de Formation en Alternance et des indépendants et Petites et Moyennes Entreprises [Walloon institute for dual training, self-employed people and small and medium-sized enterprises]
IT	information technology
OECD	Organisation for Economic Co-operation and Development
PFE	employment training centres
PwC	PricewaterhouseCoopers
SERV	Sociaal-economische raad van Vlaanderen [Social and economic council of Flanders]
SFMQ	Service francophone des métiers et des qualifications [Francophone service of occupations and qualifications]
SFPME	Service Formation des Petites et Moyennes Entreprises [Training service for small and medium-sized enterprises]
SME	Small and medium-sized enterprise
STEM	science, technology, engineering and mathematics
TPD	technical pedagogical dossier
VDAB	Flemish employment and training service
VET	vocational education and training

Bibliography

URLs accessed on 15.12.2019

- Agoria (2018). *La digitalisation et le marché du travail belge: shaping the future of work*. https://info.agoria.be/hubfs/Be%20The%20Change/brochure_FR_V04-1.pdf
- Arntz, M.; Gregory, T.; Zierahn, U. (2016). *The risk of automation for jobs in OECD countries: a comparative analysis*. OECD Social, Employment and Migration Working Papers, No 189. Paris: OECD Publishing. <http://www.ifuturo.org/sites/default/files/docs/automation.pdf>
- Bidet-Mayer, T.; Toubal, L. (2016). *Mutations industrielles et évolution des compétences*. Les synthèses de La Fabrique, No 5. <https://www.la-fabrique.fr/wp-content/uploads/2016/03/S5-Mutations-industrielles-et-%C3%A9volution-des-comp%C3%A9tences.pdf>
- Boston Consulting Group (2016). *Digitizing Europe: why northern European frontrunners must drive digitization of the EU economy*. Stockholm: BCG. http://image-src.bcg.com/BCG-Digitizing-Europe-May-2016_tcm22-36552.pdf
- Bughin, J.; Lund, J.; Hazan, E. (2018). *Automation will make lifelong learning a necessary part of work*. Harvard Business Review. <https://hbr.org/2018/05/automation-will-make-lifelong-learning-a-necessary-part-of-work>
- Cedefop (2019). *Automation risk in the EU labour market: A skill-needs approach*. https://www.cedefop.europa.eu/files/automation_risk_in_the_eu_labour_market.pdf
- CEI (2019). "Towards an integrated Belgian AI strategy", *Contribution to the European Commission*.
- Commission Européenne (2015). *Un marché unique numérique pour l'Europe: la Commission définit 16 initiatives pour en faire une réalité*. Communiqué de presse du 6 mai 2015. http://europa.eu/rapid/press-release_IP-15-4919_fr.htm
- Departement Onderwijs en Vorming (2016). *STEM Framework for Flemish schools: principles and objectives*. <https://onderwijs.vlaanderen.be/sites/default/files/atoms/files/STEM-kader%20%28Engels%29.pdf>
- Finance, J.-P.; Leonhard, D. (2017). *L'enseignement supérieur de la Fédération Wallonie-Bruxelles à l'horizon 2030: 18 mesures pour faire face aux défis de demain*. Rapport du Collège d'experts extérieurs établi à la demande du Conseil d'administration de l'ARES. <https://www.ares-ac.be/images/publications/etudes/ARES-Horizon-2030-Rapport-College-experts-2017.pdf>

- Flanders Make (2017). *Industry 4.0: hype or reality? The current state of play in Flemish manufacturing*.
[https://www.flandersmake.be/sites/default/files/Industry%204.0%20-%20hype%20or%20reality%20-%2024-03-17%20\(002\).pdf](https://www.flandersmake.be/sites/default/files/Industry%204.0%20-%20hype%20or%20reality%20-%2024-03-17%20(002).pdf)
- Frey, C. B.; Osborne, M. A. (2013). *The future of work: how susceptible are jobs to computerisation?* Oxford University, Working paper of the programme on the impacts of future technology.
https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf
- Gimélec (2013). *Industrie 4.0: les leviers de transformation*.
<https://docplayer.fr/7959084-Industrie-4-0-les-leviers-de-la-transformation.html>
- Gouvernement de la Région Bruxelles-Capitale (2014). *Déclaration de politique générale du Gouvernement de la Région de Bruxelles-Capitale*.
<https://be.brussels/files-fr/a-propos-de-la-region/competences-regionales/declaration-de-politique-generale-du-gouvernement-de-la-region-de-bruxelles-capitale-2014-2019/view>
- Gouvernement de la Région de Bruxelles-Capitale (2016). *Plan formation 2020*.
https://didiergosuin.brussels/sites/default/files/documents-articles/20161206_15_plan_formation_2020_def_0.pdf
- Gouvernement Wallon (2014). *Déclaration de Politique Régionale 2014-2019*.
<http://www.wallonie.be/fr/publications/declaration-de-politique-regionale-2014-2019>
- Gouvernement Wallon (2016). *Pacte pour l'emploi et la formation*.
http://www.bassinfe-liege.be/images/2016_RW-pacteemploiformation.pdf
- IFAPME (2017). *Contrat de gestion entre le gouvernement wallon et l'institut wallon de formation en alternance et des indépendants et petites et moyennes entreprises 2017-2022*.
http://www.wallonie.be/sites/wallonie/files/actualites/fichiers/ifapme_contrat-gestion-2017-2022.pdf
- Innoviris (2017). *Rapport d'activités*. <https://innoviris.brussels/fr/rapports-dactivites>
- Institute for the future (2017). *Emerging technologies' impact on society & work in 2030*.
http://www.iff.org/fileadmin/user_upload/downloads/th/SR1940_IFFforDellTechnologies_Human-Machine_070717_readerhigh-res.pdf
- Kohler, D.; Weisz, J.-D. (2017). *Industrie 4.0*. Paris: La Documentation française.
- Leboutte, R., Puissant, J.; Scuto, D. (1997). *Un siècle d'histoire industrielle: Belgique, Luxembourg, Pays-Bas*. SED éditions.
- Leroy, D.; Hublet, L.; Rion, P.; Lybaert, D.; Lauwereins, R.; Hinssen, P.; Geerts, T. (2018). *Pacte national d'investissements stratégiques: transformation digitale*.
<https://www.premier.be/sites/default/files/articles/Final%20Report%20Digital.PDF>

- Maurice, C. (2018). Usine du futur, vers une transformation des métiers de l'industrie. *Le blog du modérateur*.
<https://www.blogdumoderateur.com/usine-futur-transformation-industrie/>
- OECD (2018). *Transformative technologies and jobs of the future*. Background report for the Canadian G7 Innovation Ministers' meeting of 27-28 March 2018. <https://www.oecd.org/innovation/transformative-technologies-and-jobs-of-the-future.pdf>
- Samain, M. « La Wallonie fait (enfin) de l'intelligence artificielle une priorité », *L'Echo*, 28 November 2019.
- Schwab, K. (2016). *The fourth industrial revolution*. Genève: World Economic Forum. <https://luminariaz.files.wordpress.com/2017/11/the-fourth-industrial-revolution-2016-21.pdf>
- SERV (2018). *The transition towards a digital society: policy recommendations and actions*.
<https://www.serv.be/sites/default/files/documenten/20180710%20Digitalisation%20-%20policy%20recommendations%20and%20actions.pdf>
- Vlaamse Overheid (2015). *Vlaanderen radicaal digitaal 2015-2019*.
<https://overheid.vlaanderen.be/sites/default/files/Conceptnota%20Vlaanderen%20Radicaal%20digitaal.pdf>

Websites

URLs accessed on 15.03.2019

ADG. <http://www.adg.be/fr/desktopdefault.aspx>

BeCode. <https://www.becode.org/>

BeCode AI School. <https://www.becode.org/AI-school/>

Bruxelles Formation. <https://www.bruxellesformation.brussels/annuaire/epnf/>

Cefora. <http://www.cefora.be>

Competent database. <http://production.competent.be/competent-nl/main.html>

DataCamp. <https://www.datacamp.com/about/>

DESI (2018). The digital economy and society index. <https://ec.europa.eu/digital-single-market/en/desi>

DESI report Belgium. <https://bit.ly/2s9oriM>

DigitalBelgium.be. Digital Belgium: cinq priorités. <http://digitalbelgium.be/fr/5-priorites/infrastructures-numeriques/>

DigitalChampions.be. Digital champions?
<https://www.digitalchampions.be/digitalchampions/home/about-us/>

Digital Skills Fund. <https://www.decroo.belgium.be/fr/le-ministre-de-croo-et-la-fondation-roi-baudouin-lancent-le-digital-belgium-skills-fund>

Digital strategy for education.
<http://enseignement.be/index.php?page=28101&navi=4540>

Digital Wallonia. <https://www.digitalwallonia.be/fr>

DigComp. <https://ec.europa.eu/social/main.jsp?catId=1315&langId=fr>

Duaal leren. <https://onderwijs.vlaanderen.be/nl/duaal-leren>

École numérique. <http://www.ecolenumerique.be/>

EdtechForum. <https://www.digitalwallonia.be/fr/projets/edtechforum>

Education and training Flanders. <http://onderwijs.vlaanderen.be/>

Europass – digital competences.
<https://europass.cedefop.europa.eu/resources/digital-competences>

Federation of Wallonia-Brussels (2018). Stratégie numérique pour l'éducation.
<http://enseignement.be/index.php?page=28101&navi=4540>

Evoliris. <http://www.evoliris.be/fr/content/pfe-%E2%80%93-ictbrussels-%C3%A0-la-recherche-de-partenaires-priv%C3%A9s>

Garage 4.0. <http://www.garage40.eu/>

Geandarme, F. (2018). *Industrie 4.0: définition et mise en œuvre vers l'usine connectée*. <https://www.visiativ-industry.fr/industrie-4-0/>

Gouvernement de la Région de Bruxelles-Capitale. *Stratégie 2025*.
<https://strategie2025.brussels/>

Gouvernement Wallon (2018). *Digital Wallonia 2019-2024*.
<https://www.digitalwallonia.be/fr/publications/2019-2024>

Het archief onderwijs. <https://onderwijs.hetarchief.be/>

Interface3 Namur. <http://www.interface3namur.be/>

Journaldunet.com (2018). *Nombre d'internautes dans le monde*.
<https://www.journaldunet.com/ebusiness/le-net/1071539-nombre-d-internautes-dans-le-monde/>

King Baudouin Foundation (2018). Le digital Belgium skills fund sélectionne 37 nouveaux projets. Online: <https://www.kbs-frb.be/fr/Newsroom/Press-releases/2018/20180302NDDigitalSkills>

NextTech. <http://werk-economie-emploi.brussels/fr/-/bhj>

Réseau IA. <https://www.reseauia.be/>

Regional Innovation Plan. <https://innoviris.brussels/regional-innovation-plan>

School 19. <https://www.s19.be>

Service francophone des métiers et des qualifications. <http://www.sfmq.cfwb.be/>

Service public de Wallonie (2015). Plan Marshall 4.0.
<http://planmarshall.wallonie.be/>

SmartCity Brussels. <https://smartcity.brussels/the-project>

Syntra-Vlaanderen. <https://svl.login.kanooh.be/het-digitale-loket-voor-ondernemingen>

Technifutur. Example of industry 4.0. <http://news.technifutur.be/un-exemple-concret-de-lindustrie-4-0-travers-le-partenariat-de-2-entreprises-gf-machining-solutions-et-ertec/>

Technocampus. <http://www.technocampus.be/enjeux-de-lindustrie-4-0/>

VDAB guidance tool (orientering). <https://www.vdab.be/orientering>

VDAB AI. <https://www.vdab.be/wat-is-AI>

VDAB arvastat (statistical representation tool). <https://arvastat.vdab.be/>

WallCode. <https://www.digitalwallonia.be/fr/projets/wallcode>

Wannawork. <https://wannawork.com/>