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*Swiss excellence in vocational
education and training*

O C C U P A T I O N A L F I E L D D E V E L O P M E N T

against the background of current developments and structural change

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EXECUTIVE SUMMARY

This expert report analyses the impact of various current developments, such as digitalisation, COVID-19 and climate change, on the labour market and training and continuing education in various occupational fields. On behalf of SERI, a literature study and interviews with experts in specific occupational fields were carried out to assess the challenges of occupational (field) development against this background.

The three trends analysed differ significantly in terms of how they emerged and their impact. Digitalisation, a collective term for various technological innovations, is a driving force behind continual structural change of the economy. By contrast, COVID-19 came as a complete surprise. It had a shock impact on the markets, including the labour market, which nevertheless recovered relatively quickly. Climate change, on the other hand, has been going on for many decades. However, it took a long time before it was recognised as a man-made challenge for the economy and society and before political measures were taken to combat it.

In light of these wide-ranging challenges, the question is how can occupations and occupational fields be developed in future to meet the demands of the changes. This report therefore explores the current range of instruments available in occupational field development. Occupational field development here refers to the process of the emergence, change and ending of occupational fields and occupations. In vocational education and training (VET), the term occupational development is used in the narrower sense where VET ordinances are negotiated based on the partnership between the Confederation, cantons and professional associations. This process ensures a strong focus on the labour market so that new developments can be systematically incorporated into the VET ordinances. Nationally recognised occupations ensure that the skills acquired are not restricted to the host companies, but can be widely used on the labour market. In contrast, other management principles apply in the general education areas of the education system, for example most schools and universities are organised at cantonal level and the professional organisations/associations are only involved indirectly.

The analysis of the specialist literature on the trends indicated provided an overview of previous adjustments of the education system and labour market to changes in the framework conditions. As specific impacts of new developments and megatrends in Swiss occupational fields can only be identified in the literature to a limited extent, interviews were conducted with experts from six occupational fields as well as from the university sector to supplement and extend the findings.

Digitalisation is changing occupational activities, is causing an increase or decrease in the importance of occupations and is creating new occupations. However, the specific impacts described in the literature and interviews cannot be reduced to a common denominator, but instead differ between occupations, and even between companies in the same sector. Within the education system, changes to skills requirements are occurring most rapidly in continuing education. They are also reaching formal education with a slight delay. Firstly, new and modified skills are being incorporated into the educational principles, whether it is digital skills in the narrower sense, or interdisciplinary skills to ensure the mobility of apprentices and students on a changing labour market. Secondly, new training programmes



are being created to enable specialisation in the digital field. Thirdly, digitalisation also covers teaching and school management in all parts of the education system.

COVID-19 accelerated the pace of digitalisation in the education system because of the mandatory requirement for remote learning. The experiences of teaching staff in this respect were mixed in terms of the design of remote learning and support of apprentices/students. The pandemic-related slump in employment on the labour market was only brief, and the apprenticeship market and admissions to other types of training programmes were only affected temporarily across all occupational fields. Only in continuing education was there a sharp decline in participation in some cases. It is unclear whether the pandemic has changed the attractiveness of individual occupational fields, such as the restaurant/hotel and healthcare sectors, long-term.

Efforts to curb *climate change* and promote sustainability also cover all occupational fields. While these efforts incur costs, they also create jobs for relevant specialists whereby the occupational fields are affected in different ways. Sustainability aspects are becoming increasingly well established in occupational practice and are being incorporated into the structure of training programmes and principles. In VET, this takes place through the systematic involvement of the Federal Office for the Environment (FOEN) and the Swiss Federal Office of Energy (SFOE) in the revision of VET ordinances. In continuing education programmes in the field of the environment, it is clearly evident that demand is also dependent on political measures used to promote sustainability and the related occupational activities.

The analysis of the three trends shows that their impact is wide-ranging. The labour market and education system have so far proven capable of continually meeting the demands of technological development and those presented by the *COVID-19* pandemic short-term in crisis mode. However, in the case of climate change and environmental issues, it is not sufficient to rely on the flexible adaptability of the labour market and education system. Carefully devised political measures are needed. The state can also support the organisational capacity of the economy and social issues in general in new occupational fields. There are nevertheless good reasons for the collective management of the education system whereby the partnership between the Confederation, cantons and professional organisations (VPET partners) and federalism play a key role. Centralised state control would not be able to respond adequately or quickly enough to the new developments whose impact differs depending on the occupational field.

However, the different control mechanisms in VET and general education present a challenge for the coordinated development of the relevant training and continuing education in the occupational field. While the partnership-based negotiating processes of VET have proven effective, they are time-consuming and only allow for acceleration or flexibility to a limited extent. When defining educational principles, it is important to consider which provisions are required and to what degree of detail and how much autonomy the actors should be granted in terms of implementation (subsidiarity principle). Finally, great importance is attached to innovation capability in general to improve the crisis resilience of complex systems. This means innovation in occupational (field) development – in particular trialling new approaches in terms of content, methodology, technology and teaching methods at all learning locations – could be taken into account more systematically and the scope for such experiments actively promoted.



1. INTRODUCTION

This expert report analyses the impact of various current developments, such as digitalisation, COVID-19 and climate change, on the labour market and training and continuing education in various occupational fields. The report was commissioned by the State Secretariat for Education, Research and Innovation SERI and will be used as the basis for answering two postulates of the Council of States and National Council.

With the Graf postulate 21.3290 'Auswirkungen der Covid-19-Krise, der Klimakrise und der Digitalisierung auf den Arbeitsmarkt und Perspektiven für eine innovative, nachhaltige Berufsfeldentwicklung' (Impact of the COVID-19 crisis, the climate crisis and digitalisation on the labour markets and prospects for innovative, sustainable occupational field development), the Council of States is calling upon the Federal Council to "produce a report to show the impact of COVID-19, the climate crisis and the acceleration of digitalisation on the labour market and vocational education and training (VET), in particular in sectors undergoing significant structural change. The report should outline prospects for the innovative development of occupational fields" The postulate of the Economic Affairs and Taxation Committee (WAK-N) 21.4342 'Bedürfnisse des Arbeitsmarkts, der Arbeitskräfte und der Wirtschaft in Einklang bringen' (Harmonisation of the requirements of the labour market, labour forces and economy) calls on the Federal Council "to propose measures for the effective harmonisation of the training and continuing education requirements of the economy and labour market with those of the Swiss workforce."

The external mandate awarded by SERI covers an analysis of occupational (field) development against the background of current developments (megatrends) and structural change. This should address the following questions:

- How has training and continuing education been aligned with structural change to date?
- How have major developments been integrated into occupational (field) development up until now? What were the success factors?
- In current occupational (field) development, what steps are being taken to ensure new requirements presented by the mega-trends are taken into account from an overall perspective? How are the instruments available rated?
- How is a balanced consideration of interests ensured by and through the actors in occupational (field) development?
- Are there opposing requirements of current developments that impact on occupational (field) development?

The report is divided into three main sections. The key concepts are outlined in section 2 in order to analyse changes to the labour market and training and continuing education due to new developments and trends. The methodical procedure used in the project is described in section 3. The results of the literature research and interviews are presented in section 4. The conclusions on occupational (field) development are set out in section 5.

We would like to thank the interview partners for the valuable information provided and the advisory group¹ for their contribution.

¹ Advisory group members: Christoph Blaser (BFE), Tommy Durrer (SERI), Daniel Duttweiler (SERI), Kornelia Hässig (SFOE), Damiano Pregaldini (SECO), Amélie Speiser (SECO).



2. THE CONCEPTION OF CURRENT DEVELOPMENTS, MEGATRENDS AND THEIR IMPACT ON THE LABOUR MARKET AND EDUCATION

2.1 Developments and trends

Human societies are continually faced with new challenges that require adjustment. Without new influences, systems, such as the labour market, would level out into a long-term state of equilibrium which means the number of employees in certain occupations and companies in certain sectors would no longer change. However, the systems are subject to a high degree of dynamism produced by new demographic, social, technological and environmental developments.

These developments take very different forms. The health-related/demographic developments include the emergence of new pathogens and related epidemics and pandemics, but also the increasing ageing of society (for health-relevant trends, see Leumann & Trede, 2022). Technological developments include digitalisation in particular and result in consequences such as automation, outsourcing and offshoring, to name but a few. Environmental developments are reflected in climate change, a reduction in biodiversity and environmental pollution in general. In the following text, we classify these types of 'developments' as being equivalent to 'trends' and 'impacts'.

The developments indicated not only differ in their form, but above all in terms of their impact on human society. Depending on the definition used, digitalisation began with the sending of Morse code in the 19th century, with the development of electronic calculators in the 1950s, or, more narrowly defined, during the 21st century with the digital transformation where a growing degree of interconnection results in digital infrastructures covering more and more areas. The transformation is being driven by individual technological developments and inventions that are having a disruptive impact which means certain production processes and business models may change completely. However, as a comprehensive economic and social phenomenon, digitalisation acts more as a new driver of structural change which has been ongoing for some time which describes the shift of employment from the first sector (agriculture) firstly into the second sector (industry and commerce), and then into the third sector (services). This means digitalisation has long been identified as a general development but whose impacts are not easy to assess because the technological sub-trends can have very different effects (see the sub-section 4.1 on the labour market).

Unlike digitalisation, the COVID-19 pandemic came as a complete surprise. While warnings had been issued about the danger of a pandemic caused by new pathogens and emergency plans prepared for some time, the timing of a pandemic and the exact nature of the incidence of disease could not be foreseen. While the pandemic itself and the health measures imposed to contain it radically changed many social processes short-term, the changes were reduced significantly a few years after the start of the pandemic or reversed completely. This means the shock-like but temporary impact of the COVID-19 pandemic is considered different to a long-term development, such as digitalisation, even if both developments may have an impact on or intensify one another, as was the case, for example, with the introduction of new learning technologies during the pandemic (see sub-section 4.6).

Climate change is a development that is different again and which has been progressing for many decades, but whose existence was disputed for a long time. The greatest challenge is



that the planet's climate depends on complex interaction between natural processes in the solar system and on Earth as well as the impact of human activity. This makes it more difficult to identify natural causes compared with man-made ones and also complicates accurate forecasting and, above all, the search for effective and realistic solutions.

The diversity of the three trends analysed in this report means that the challenges vary and often require different solutions. In view of this, attention is focused on the adaptability of social systems, not least that of the labour market and education system.

Society clearly faces challenges from many other developments which are not addressed specifically in this report. They include demographic development (e.g. the increase or decrease in the number of school leavers, the ageing of society), the business cycle and the change in social values. Other current issues, such as the shortage of specialists, can be seen more as the consequence of other developments. Well-structured occupational and occupational field development processes take account of the relevance of all of these trends and subsequent developments in the occupational field.

2.2 Influences on the labour market and education

Every development requires society in general and the economy, labour market and education system in particular to make changes. Production processes in the economy are adapted, for example, due to the development of new goods and services, increase in production of existing ones due to greater demand or sales via new channels. These processes favour some companies and sectors, while resulting in poorer earnings prospects for others. On the labour market, this firstly changes the tasks of employees within existing occupations and sectors and creates continuing education requirements because the workforce has to keep its skills up to date (life-long learning).

Secondly, the demand for labour changes in different sectors and occupations. Employees move to those sectors and occupations where there is growing demand and that can provide good employment conditions. Continuing education also plays a major role in these transfers (or re-entry) because it enables the employees concerned to obtain lacking or newly required skills.

Thirdly, people's choice of educational pathways is changing, especially young people, who face a choice of occupation or other educational decisions and focus on changes in labour market opportunities.

Fourthly, the change in demand on the labour market can have an impact on educational programmes and curricula at all levels of the education system. This applies in particular to VET whose express aim is to prepare young people and adults for the challenges in working life (see sub-section 4.3 and 4.4). New skills requirements enter the educational system via reforms of syllabuses, VET ordinances and examination regulations. Finally, such reforms also change the training of teaching staff, lecturers and VET professionals.

Politicians, the state and the economy set the formal framework conditions for all adjustments indicated on the labour market and in the education system. Unemployment insurance and employment market measures promote the reorientation of employees on the labour market. In the education system, great emphasis is placed on the permeability of education and training programmes so that individuals have various ways of obtaining the



qualifications which they have identified as being suitable for them in view of current developments on the labour market. The curricula also make sure that the skills acquired in VET are not too narrow and ensure the mobility of employees on the labour market. There are also various opportunities for recognising or validating labour market experience which also promotes individual mobility.

2.3 Occupational development and occupational field development

Institutional orders determine how the labour market, education system and other social systems are governed. The principles of community, the market and the state are generally used to describe how a social/economic sub-area functions. For Switzerland and other countries with collective VET systems, another governance element plays a key role – the associations (Streeck & Schmitter, 1985). Employer and employee intermediary organisations are involved in the governance of VET and perform public duties. Employer associations in particular ensure that private companies are involved in training (Culpepper, 2003). Another benefit of this collective governance is relatively precise alignment of VET with the labour market. Nationally recognised occupations provide a wide range of skills that go beyond the specific requirements of individual companies, ensuring the mobility of the workforce between companies (Busemeyer & Trampusch, 2012).

In Switzerland, this collaboration between the Confederation, the cantons and the professional organisations, which has developed over the course of time, is enshrined in the Vocational and Professional Education and Training Act of 2002. The key role played by the employer associations in collective governance means that occupational development in Switzerland is strongly aligned with the labour market. This is in contrast with VET systems where the state plays a stronger role and which therefore have weaker links with the labour market (Busemeyer & Trampusch, 2012).

Occupations can be assigned to occupational fields, for example, by informally grouping a sector's occupations into a category, such as the building technology occupations or the engineering, electrical and metalworking occupations. On the other hand, the term occupational field designates similar occupations governed by a common VET ordinance and in which part of the training takes place jointly (as in the occupational field of agriculture which consists of six occupations e.g. farmer and vegetable gardener) (Häfeli & Gasche, 2002). In careers guidance, the term occupational field is used for 22 areas of interest to which various occupations are assigned (for example, 'nature' and 'electrical engineering') (SDBB, 2018). Hence, occupations are always grouped based on similarities and beyond the scope of individual occupations.

Occupational field development is the process of the emergence, change and dissolution of occupational fields and occupations. Such changes may be driven by different trends and influences, such as technological change, economic and demographic developments or amendments to legislation. The change of occupational fields can be self-sustaining if occupations are aligned with labour market developments by removing outdated content and incorporating new content or by newly combining activities in the occupational field. This may also result in changes to the occupational profiles which can have a more general focus or be tailored to more specific areas of activity. Occupational (field) development is necessary in order for an occupation to continue to exist. However, occupations can also be dissolved or completely realigned.



The boundaries between established occupational fields can be blurred by developments on the labour market – this is currently taking place, for example, as a result of digitalisation in the commercial and retail sectors where new hybrid occupations are emerging, such as e-business developer. Such developments also affect the distribution of roles between the organising bodies responsible which must be renegotiated. Another example of shifts between the boundaries of occupational fields is developments in the healthcare sector where new occupational profiles have to be assigned at upper-secondary level and at tertiary levels A and B – different actors have different preferences and the solutions are the result of sometimes time-consuming negotiation processes.

The term occupational development is often also understood more narrowly. It then refers to the procedure negotiated by the VPET partners for the definition of VET ordinances in basic vocational education and training. This process was developed during the implementation of the last reform of the Vocational and Professional Education and Training Act from 2004. The organising bodies of the occupations play a leading role in terms of content, but there is coordination with the Confederation, cantons and other stakeholders (employee organisations, VET schools etc.) in clearly defined process stages and committees. Basic VET programmes are reviewed every five years to ensure they are up-to-date (SBFI, 2017). In professional education and training at the tertiary level, there are also provisions on the development of professional and advanced professional examinations where fewer actors are involved in this process (primarily the Confederation and organising bodies), making its structure simpler. The standardisation of occupational development is one of the key strategic thrusts undertaken in 2002 to align VET with current developments and to assure its quality (Bürgi et al., 2022). A key aspect is that the professional associations remain responsible for the definition of the syllabuses. This results in ‘standardised diversity’ (ibid, p. 63) as the representation of interests is organised differently in relevant governance bodies on a sector-specific basis. Capable, institutionally recognised professional associations are necessary to manage the tasks assigned to them and to ensure the participation of companies in VET (Strebel et al., 2021).

Other laws govern continuing education and higher education while the constellation of actors also differs. In the Federal Act on the Funding and Coordination of the Higher Education Sector of 2011, the professional organisations are not directly involved in the governance and the universities enjoy a degree of autonomy. This means the focus on the labour market is less strong. The skills taught are not specifically geared towards occupational activities on many programmes. In the Continuing Education Act of 2014, the professional organisations are involved, but play a less significant role than in VET. Universities as well as professional organisations, international (online) educational providers and other continuing education organisations are active in the continuing education sector. Only some of the continuing education programmes aim to provide the skills required for the labour market.

Despite these different institutional framework conditions, the areas of education are closely interlinked. Decisions in one area have an impact on the others. Especially in the context of upskilling and demographic change with a falling number of school leavers, general and vocational educational pathways are in competition with one another. The regulations on admission to baccalaureate schools and universities have an impact on the profiles of people seeking apprenticeships and university graduates. A change in the education choices of potential employees also has an impact on companies’ recruitment strategies.



The development of the occupational fields is influenced by institutional framework conditions and national legislation and negotiating processes between the actors involved as well as by current trends and influences. In addition to the impact of trends and shocks, this report also explores negotiating processes in occupational field development with a focus on VET. This plays a key role for the Swiss labour market and domestic specialists as most young people enter the labour market via the non-academic educational pathway. It is also the area where the state at national level and professional organisations play the most active role in terms of impetus and developments.



3. METHODOLOGY

The study is based on a combination of literature analysis and interviews with experts. Firstly, research results on the impact of developments and megatrends on the education system and labour market as well as literature on occupational field development were selected. The analysis of this specialist literature provides an overview of the adjustment to date of the education system and the labour market to the new framework conditions. It focuses on the themes of COVID-19, the climate crisis and digitalisation. Both specialist articles from international research and studies on Switzerland were included.

As specific impacts of new developments and megatrends in Swiss occupational fields can only be identified in the literature to a limited extent, interviews were conducted with experts to supplement and extend the findings. The interviews primarily aim to gain a more specific understanding of the adjustments of the education and labour market system for certain occupational fields. They also enable the strengths and weaknesses of the system to be assessed in relation to various challenges. The interviews ultimately allow the effectiveness of the range of instruments available to the various actors to be assessed.

The interviews systematically addressed how the various shocks – in particular COVID-19, the climate crisis and digitalisation – impacted on the labour market and the various educational levels in the relevant occupational field. The interview guidelines were structured in various thematic areas where the sequence of the questions could be adapted to the course of the interview.

The potential experts for the interviews were selected after consultation with the authority that commissioned the report. People in leadership positions with a high degree of relevance to Swiss VET were selected. Everyone selected possesses extensive, in-depth knowledge about VET and the process of occupational (field) development which they have experienced and supported themselves. In total, seven online interviews were conducted between November 2022 and January 2023 (see Table 1). These interviews lasted 90 minutes on average, with slight variations, which were mainly due to the fact that one or more trends or shocks were addressed to a greater extent in a particular occupational field and therefore required greater discussion. The interviews were not transcribed but instead digitally recorded so that various aspects discussed could be reviewed later.

*Table 1: Details on experts interviewed*

No.	Occupational field²	Date	Duration	Institution
1	Building technology	07.11.2022	95 min.	suissetec
2	Hotel, restaurant and catering	18.11.2022	95 min.	Hotel & Gastro formation
3	Economy, administration, tourism	23.11.2022	85 min.	Schweizerische Konferenz der kaufmännischen Ausbildungs- und Prüfungsbranchen (Swiss conference of commercial training and examination sectors)
4	Sales, purchasing	13.12.2022	90 min.	Bildung Detailhandel Schweiz
5	Healthcare	14.12.2022	90 min.	OdASanté
6	Universities of applied sciences	16.12.2022	95 min.	Zurich University of Applied Sciences
7	Metal, machinery, watches	18.01.2023	75 min.	Swissmem

² The occupational fields according to Zihlmann (SDBB, 2018) are indicated in the table. They are not always identical to the occupations covered by the associations interviewed.

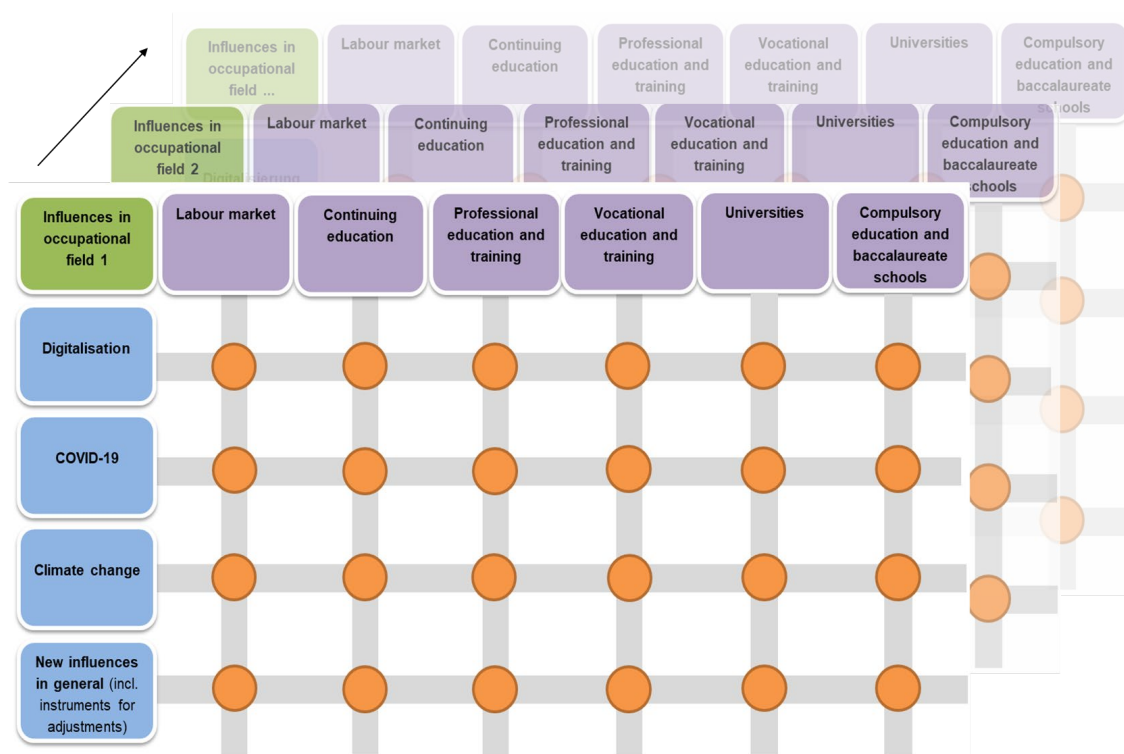
4. ANALYSIS

Literature research and expert interviews aimed to highlight the current developments and challenges and previous experiences with adjustment mechanisms for the labour market and education system. The diagram in Figure 1 shows which aspects were analysed per occupational field. The analysis focuses on the orange intersection points of the vertical and horizontal lines.

The horizontal (purple) dimension of the figure illustrates how changes often firstly become evident in the labour market. They form the starting point for the necessary adjustments in training and continuing education. Here the first informal training measures are also carried out on-the-job at the companies. Then the changes become evident in non-formal continuing education. In the formal education system, we distinguish between the changes in various areas of education, with an emphasis on professional education and training (PET), which in practice is often still understood as continuing education, vocational education and training (VET) and the universities. The other schools are only covered briefly to complete the picture of the education system.

This section contains six sub-sections which are the same as the purple boxes in the figure.³ The three example trends – digitalisation, COVID-19 and climate change – are explored in each sub-section. The findings on other influencing factors and the instruments of occupational field development are also discussed. The sub-sections are preceded by a brief summary of the key findings.

Figure 1: Dimensions of the analysis of selected occupational fields



³ In the interviews with representatives of certain occupational fields, this grid formed the basis for the interview guidelines applied to the respective occupational field.

4.1 Labour market

Summary

Digitalisation is changing occupational activities and is resulting in an increase or decrease in the importance of some occupations. However, the impacts cannot be reduced to a common denominator, but instead actually even differ between companies in the same sector. So far there is no indication of a net loss in employment or of polarisation of society into two poles of low and highly qualified employees. Instead a process of upskilling has been taking place in Switzerland for some time which is reflected by a continual rise in people with tertiary qualifications from universities and PET institutions.

The labour market was hit hard by COVID-19 short-term, particularly in some sectors and occupations. These negative effects were cushioned by unemployment insurance and short-time working. With the increasing level of partial immunity amongst the population and withdrawal of measures to combat the pandemic, the situation on the labour market quickly returned to normal. The legacy of the pandemic includes the effects on the popularity of certain occupational fields, such as the restaurant and healthcare sectors, and greater acceptance of and increase in the use of new forms of working and mobile working.

Climate change is having a negative impact on some sectors and occupations. However, tackling this global challenge is likely to create more jobs in Switzerland than it costs because there are many relevant specialists working in Switzerland. The occupational fields are nevertheless all affected in different ways by changes to achieve greater sustainability.

4.1.1 Digitalisation

The wide-ranging influences of digitalisation on the labour market have been discussed intensively in the media and research for around ten years.⁴ Some developments represent a continuation of trends which have been having an impact for decades. As the transformation towards a knowledge and services-based society progressed, demand for employees in service occupations rose. The demand for specialists with information and communication technology skills in particular continues to grow (IWSB, 2020). Due to digitalisation, IT skills requirements are also increasing outside of IT occupations where the nature and depth of the knowledge varies, as does the effect on salaries (Buchmann et al., 2020). IT skills which are already an established component of an occupational qualifications profile are not reflected in a higher salary, whereas this is the case with additional or new skills.

An often feared development is the loss of jobs due to increasing automation and use of robot technology. However, overall employment in Switzerland has continually risen since the second half of the 1990s with some economic fluctuations⁵. By contrast, a polarisation of employment has been observed in many countries which means that people with average qualifications are losing shares of employment to those with low or high qualifications (Goos et al., 2014). Such polarisation at the expense of people with average qualifications could

⁴ The extensive recent literature cannot be fully presented here. An overview of international research is provided by Acemoglu und Restrepo (2019), while Aepli et al. (2017), Rütter Soceco (2017), and Bundesrat (2017; 2022) provide an overview of the situation in Switzerland.

⁵ Federal Statistical Office (2021). FTEs per sector [je-d-06.02.00.01.01]. <https://www.bfs.admin.ch/asset/en/je-d-06.02.00.01.01> (viewed on 24.02.2023).



not be confirmed for Switzerland in empirical analyses (Aepli et al., 2017; Murphy & Oesch, 2018; Pusterla & Renold, 2022)⁶.

A clear change can be observed in the tasks on the labour market where manual routine tasks that can be automated are being performed increasingly less. Instead, the importance of non-routine tasks of an analytical and interactive nature, such as problem-solving or care activities, is increasing (Aepli et al., 2017; Gschwendt, 2022). The share of employees with tertiary education – in other words who have graduated from a university or obtained PET qualifications – is continually increasing accordingly (Aepli, Kuhn & Schweri, 2021). This rise is also related to the growing use of ICT and the number of experts required (Pusterla & Renold, 2022). Rather than polarisation, upskilling can be observed on the Swiss labour market.

The question as to what impact new and developed technologies will have on the labour market in future largely remains unclear. Analytical and interactive activities are likely to remain difficult to automate and employment growth looks set to be focused on jobs and occupations involving such activities. This means the emphasis should be placed on acquiring relevant skills in training and continuing education. For example, in a survey of HR development managers and specialists, the skills of self-reflection, openness to change and interdisciplinary thinking were named as ‘critical success factors for organisational learning in the world of work 4.0’ (IAP, 2023).⁷

On the other hand, new technologies could affect many more activities considered not possible to automate thus far. Studies on the latest artificial intelligence applications conclude that they will primarily perform tasks currently carried out by highly qualified employees (Muro et al., 2019; Webb, 2019). However, experts point out that such processes are not predetermined but instead society can control whether it wishes to invest more in technologies that replace human capabilities or in those which supplement and enhance them (“augmentation, not automation”, Brynjolfsson, 2022).

This means the distinction between ‘safe’ non-routine tasks and replaceable routine tasks changes with the technology. Conversely, automatability that exists theoretically and technically certainly does not mean that the related occupations will disappear quickly. The Oxford study indicated that the occupation of train driver was almost 100% automatable in 2013 (Frey & Osborne, 2013). However, rail companies are still complaining of an acute shortage of specialists in this occupation ten years later.

In-depth studies on the skills requirements in individual sectors and occupational fields mainly come from Germany. These studies underline the wide-ranging effects and requirements of digitalisation which differ from sector to sector and often even between companies within the same sector (e.g. Pfeiffer et al., 2016; Hackel et al., 2015). A study in Switzerland which carried out an in-depth analysis of five occupational fields came to a similar conclusion (Aepli et al., 2017).

⁶ One possible explanation is that routine tasks are at the bottom end of the pay scale in Switzerland, whereas they concern the average wage segment in the USA (Haslberger 2021).

⁷ For approaches and difficulties of developing these kinds of transversal skills, see Scharnhorst et al. (2018).



In several of the occupational fields in which we carried out interviews, it was emphasised that while digitalisation changes working processes, the key tasks are still performed by humans. New digital technologies are being used in building technology, such as for the visualisation of rooms. However, customers still appreciated analogue sketches drawn by hand. The actual installation work is still manual. In a similar way, restaurants are using more modern appliances and concepts (intelligent kitchen equipment, digital checkout and management systems, self-cooking center at home), but customers still appreciated the 'craft' and associated quality and freshness, which combined with personal, courteous service, represents added value. Processes are being modified and documented digitally in the healthcare sector, but here too most activities must be performed by humans. The situation in the commercial occupations is less clear. Digitalisation is very present in the office occupations, but large-scale job losses have not been observed so far. Digitalisation is enabling the creation of new sales channels in the retail sector, while well-informed customers are placing greater demands on specialists who must be prepared to deal with this in training and continuing education. In summary, the exact skills requirements differ between occupational field and within the occupational fields depending on the market situation or positioning of the companies.

This means the term digitalisation can be used to sum up technology-driven changes on the labour market which have been key drivers of structural change for over ten years. In particular, due to the wide range of phenomena lying behind it, it is not clearly defined enough analytically to enable clear forecasts on the individual occupational labour markets and the skills requirements of the future.

4.1.2 COVID-19

The COVID-19 pandemic had a major impact on the labour market short-term with a sharp rise in unemployment, but above all short-time working (Hijzen & Salvatori, 2022). However, the situation quickly returned to normal when the measures to combat the pandemic were ended, and many occupational fields even reported difficulty in finding suitable specialists.

The COVID-19 pandemic is an example of a surprise and intensive shock of relatively short duration. The instruments of unemployment insurance, in particular short-time working, proved successful in overcoming the critical phase on the labour market. However, the burden on sectors and people was distributed very unevenly. 31 percent of jobs were potentially restricted by the lockdown (Faber et al., 2020) with those on lower and average incomes being affected much more. However, there were no significant differences between the genders or between urban and rural areas. There are also differences in the extent to which people were affected by short-time working and unemployment (Götz et al., 2021): Short-time working concerned older and long-standing employees to a greater extent, while younger and temporary employees were overrepresented amongst the unemployed in 2020. Employees on short-time working arrangements did not spend more time on a secondary job or continuing education, but instead tended to carry out unpaid work. In view of the limited duration of the crisis, the impact of this behaviour was not very disadvantageous. This nevertheless raises the question as to whether time could be used more effectively for continuing education activities in future crises. Refugees and, to a lesser extent, other migrants were affected to a disproportionately high extent by job cuts and short-time working (Brücker et al., 2021) for which the employment characteristics already mentioned



(temporary contracts, short length of service) were responsible to some extent. Overall, employment growth amongst these groups of people was much lower in 2020 than during previous years.

Apart from the direct effects of the infection and the measures to combat it, the pandemic also produced indirect effects. For example, experts feared that the trend towards automation due to the social-distancing rules imposed would intensify, exacerbating economic disparity in society (Korinek & Stiglitz, 2021).

The review of the COVID-19 period differs depending on the occupational field surveyed. In office occupations, the trend towards working from home, mobile working and part-time working, including the relevant IT infrastructure, increased. There was also an increase in working from home and part-time work in the engineering, electrical and metalworking sector, leading to unequal treatment between employees in production and those in product development and services. In the retail sector, the trends towards online retail and the restructuring of sales channels (e.g. omni-channelling) were further promoted. In contrast, the pandemic hit the healthcare sector and the hotel and restaurant industries very directly, in the former case by creating additional pressure, and, in the latter case, due to a temporary suspension of business activities. As a result, both occupational fields are affected by an acute shortage of specialists because the high additional workload placed on some specialists has led to more people leaving the occupation and exacerbated the existing shortage of specialists. In contrast, the lack of employment opportunities and extensive short-time working in the hotel and restaurant sector resulted in many professionals leaving the occupational field and seeking employment in other sectors and are now no longer working in their original occupational field. This raises various urgent questions for the occupational field that are relevant to labour market developments overall, but which have not yet been analysed to a great extent: Where are the professionals moving to (economic inactivity, related occupational fields or conversion with continuing education programmes) and which skills enable them to undertake this conversion? How can these people be attracted back to the occupational field or why are they not returning now the crisis is over? In both cases – in the healthcare and hotel and restaurant sectors – the changed image of the occupational field or a change in the risk perception by both employees and people faced with the choice of starting training in these occupational fields are relevant questions.

4.1.3 Climate change and ecology

The effects of climate change are reducing economic activity and work productivity in some sectors (Stalhandske et al., 2022; Vöhringer et al., 2017). Some sectors, such as tourism (Bandi et al., 2022) and agriculture, (Briner et al., 2012) must anticipate negative effects on their productivity.

The measures being implemented to tackle it also mean restrictions which may reduce employment. However, these measures also require new technologies and capabilities that can have positive effects on employment (Cedefop, 2021; ILO, 2018; Rutzer & Niggli, 2020). Studies indicate that Switzerland will achieve net gains in terms of employment thanks to its high share of the workforce in occupations with high green potential (Lobsiger & Rutzer, 2021; Rutzer & Niggli, 2020). For example, the Energy Strategy 2050 is resulting in investment in the solar sector which is creating new jobs (Rohrer, 2020).



Employees in occupations with a high degree of green potential are on average younger, more frequently male, have a higher level of education and a greater probability of being immigrants than employees in other occupations (Lobsiger & Rutzer, 2021). There is already a shortage of qualified employees in this area.

In the various occupational fields, climate change and efforts to achieve sustainable development are having a significant impact on the products, sales and qualification requirements in the labour market. In building technology, the trend towards photovoltaics represents a clear development that is reflected in new skills requirements. However, new developments are also taking place in the restaurant sector (regional, seasonal products, vegetarian and vegan products), in the commercial occupations (traceability and sustainability in resource procurement and supply chains), in the retail sector (new products and labels, customer information requirements, food waste and packaging in operational processes) and in the healthcare sector (management of limited resources, recycling of materials). Employees require additional and new skills in all cases, while new functions and positions are being created in some.

4.2 Continuing education

Summary

Digitalisation as a long-term technological development and the shock-like impetus given to digitalisation due to the measures imposed to combat COVID-19 are resulting in continuing education requirements at companies. Climate change is also creating continuing education requirements. However, these requirements also depend heavily on political measures being undertaken to tackle climate change which can promote or hold back continuing education in this area. Provisions in collective employment agreements finance or support sector-specific continuing education programmes in various occupational fields. Companies and continuing education stakeholders also increasingly prefer shorter programmes based on situational requirements to extensive ones. However, the greater need for continuing education during the pandemic period did not see greater continuing education activities and higher spending by companies. The market collapsed and participation in continuing education declined sharply – but new online and hybrid forms of teaching and learning were then eventually developed which continue to exist after the pandemic period. In addition to traditional continuing education providers, such as association educational institutions and universities, international online platforms are increasingly emerging as continuing education providers. This development is also linked to the increase in the use of micro-credentials, which are (online) certificates for short to very short continuing education units. The continuing education landscape is more flexible, market-oriented and complex than other areas of education. Lots of new programmes may emerge short-term in highly present thematic areas, such as digitalisation or climate change, but they may also disappear just as quickly if they fail to appeal to the target audience. At the interfaces between the academic and non-academic educational worlds, competing programmes are emerging, but so too are regulations that aim to limit such competition to some extent.

4.2.1 Digitalisation

Technological transformation is resulting in a change of occupational activities and consequently also in a change in employee skills requirements. Schultheiss und Backes-Gellner (2023) empirically analyse the relationship between continuing education and various types of occupational activities and skills. They differentiate between hard skills and soft skills and argue that hard skills (e.g. mastering a programming language) quickly outdate, whereas soft skills (e.g. team skills) retain their value over time. This means employees in occupations with more hard skills require greater continuing education to continually adapt their skills to technological development. Continuing education is therefore important to maintain the original level of performance of these employees. In contrast, employees in occupations with more soft skills are only faced with a loss in the value of their skills to a small extent, or not at all, which means continuing education supplements their existing skills set.

Due to its wide-ranging effects on machinery as well as production and working processes, digitalisation is creating relevant continuing education requirements from companies (Gollob, 2021); for example, in the commercial occupational field in relation to digital skills and new forms of work and organisation (interview 3). In-house company continuing education programmes are becoming more important in this respect. A more recent development is that the provision of online tutorials and international online-based continuing education platforms, such as LinkedIn Learning or Coursera, can be used by employees worldwide.



This is why increasing use is being made of digital continuing education programmes because they meet the need for continuing education that is focused thematically and temporally, flexible, up-to-date and application-oriented (Gollob, 2021).

On one hand, continuing education providers can open up new markets in this environment by providing their own distance-learning programmes. i.e. they can provide content and formats in such a way that enables them to reach more participants with the same expenditure, but, on the other, this creates new dynamism and competition between locally established and international providers (interview 6). Large international providers are expected to enjoy an advantage for some scalable content (such as tutorials on widely used software or basic knowledge) (Gollob et al., 2021).

The restructuring of continuing education towards online and hybrid programmes presents new opportunities, such as for example, continuing education for restaurant workers (professional certificate for adults) during the 'break between shifts' (interview 2) because the absence of employees from the company for continuing education is a challenge in this sector. The digitalisation thrust is seen as positive, on one hand, while, on the other, it entails high investment costs (for infrastructure and the production of new forms of teaching and learning) for training providers. There is also potential for using online learning platforms from VET for continuing education purposes (interviews 2 & 7). 'Holzbau Schweiz', the Swiss timber construction association, has already developed a very comprehensive, sector-specific continuing education platform called the 'Holzbau-Lab' (Hedinger, 2023).

4.2.2 COVID-19

COVID-19 triggered economic recession in many countries. Recession can impact on the continuing education activities of companies in various ways. On one hand, companies can use the recession to provide training for temporarily inactive employees to improve their productivity after the recession. On the other, the costs of recruiting qualified employees fall during a recession which may encourage companies to hire the specialists required instead of providing training for existing staff. However, if companies report a decline in profit, they may also cut back on continuing education (Brunello & Bertoni, 2021).

During the COVID-19 pandemic, participation in continuing education fell sharply overall, affecting the economic sectors differently. The sharpest fall was in healthcare and social services (-25%) as well as in the hotel, catering and restaurant industry (-26%) (Bundesamt für Statistik, 2021c).

The decline tended to exacerbate existing inequalities in society as it was most prevalent amongst older people and people whose highest qualification was at upper-secondary level (Bundesamt für Statistik, 2021c). The ad-hoc shift to online teaching also excluded participants with a lack of basic ICT skills or inadequate access to suitable infrastructure from continuing education. This is also contributing to the widening of the digital gap in society (Gollob et al., 2021).

In contrast to this development, there is greater demand for continuing education from companies. A non-representative survey of SMEs shows that demand for continuing education at companies increased again due to the acceleration of digitalisation by the pandemic (Gollob, 2021). The focus here is on skills for agile working, social and communicative



skills, but also digital skills. However, not all companies which identified this requirement have stepped up their continuing education activities and have even cut spending on external continuing education programmes (Gollob, 2021).

The continuing education providers were severely hit by the measures imposed to contain the pandemic. They experienced a slump in demand and high losses in revenue. The level of provision fell by 38 percent (Gollob et al., 2021). The economic crisis of continuing education providers was cushioned to some extent by short-time working compensation.

As in the education sector overall, the pandemic also accelerated the pace of the digital transformation in continuing education. Infrastructure, methods and skills for digital continuing education were developed within a short space of time. A phase of consolidation is currently taking place where new online programmes, combined with classroom-based teaching, are being incorporated into the permanent programmes of continuing education providers. The process of restructuring continuing education is still under way and it is currently unclear which programmes will establish themselves, but the continuing education providers anticipate a long-term change (Gollob et al., 2021).

4.2.3 Climate change and ecology

New continuing education programmes have been developed in the occupational fields heavily affected by climate change to address the shortage of specialists. They are often provided by organising bodies, such as VET schools or universities of applied sciences, and receive state funding, in particular from the Swiss Federal Office of Energy (FOE) (M. Frey, 2021). It is very clear that state funding and political decision-making are influencing the development of demand for specialists and the related continuing education programmes in this area. However, there must be sufficient, long-term demand for the qualification from the labour market in order to establish a continuing education programme long-term (M. Frey, 2021). The shortage of specialists in a sector can also contribute towards holding back continuing education for fear of qualified employees being enticed to competitor companies or because there will be a lack of professionals in the company during continuing education.

How occupational field development typically progresses is illustrated by the trend in the field of solar systems. During an expansion phase of solar energy initially politically promoted, a continuing education programme for 'solar engineers' was set up by local schools and with state funding, but whose number of participants fell again when the financial support for solar energy was cut (M. Frey, 2021). Due to the energy crisis and the renewed boom in solar systems, demand for qualified specialists is increasing again and state-recognised qualifications at VET and PET level have now been developed. Here organisational responsibility was borne by professional associations already established in VET.

4.2.4 Range of instruments

Continuing education is generally more flexible than formal education. The processes are more dynamic and paths shorter in continuing education. Trend changes are identified more quickly as they are reflected in the number of participants. As continuing education must meet its costs, there is greater focus on the market and its requirements or programmes (particularly in the field of sustainability) receive grants (M. Frey, 2021). This means the identification of requirements and coordination between various actors is also important in the continuing education sector. There is a competition situation at the interface between



continuing education programmes of universities of applied sciences and professional education and training (PET) although attempts are being made to mitigate this to some extent through mandatory regulations (e.g. universities of applied sciences may carry out preparatory courses for VET and PET exams, but cannot award CAS diplomas for these). The universities of applied sciences also monitor each other's programmes and consideration is given within the individual universities of applied sciences as to whether new programmes might compete with their own existing ones (interview 6). Customer orientation is also extremely important in view of this competition between providers and market orientation. Participants in continuing education programmes react quickly to changes which means these programmes must adapt more rapidly. Participants may be attracted, for example, by physical presence close to a railway station, but also by a provider's prestige. Another strategy of continuing education providers is to seek collaboration with companies as continuing education partners.

The competition from international online courses is also intense in the continuing education sector (interview 6). The topic of micro-credentials is also relevant in this regard. These are a new form of qualification certificates for small learning units which are often completed on digital platforms (Hedinger, 2023). It is also important to point out that skills which employees have already acquired can be credited towards continuing education (e.g. professional certificates for adults or admission to educational courses).

Educational institutions organised by associations are active in the engineering, electrical and metalworking sector: the Swissmem Academy and the 'SfB Bildungszentrum', which is incorporated into the sector's collective employment agreement. To align the continuing education courses at the Swissmem Academy (leadership, management, organisational development) with the industry's requirements, close discussions are held with the companies. It currently appears that companies prefer shorter continuing education units or programmes with a modular structure to longer courses (interview 7). In addition to its own programmes, Swissmem, as the industry association, also performs an information role – the 'Find your future' online platform aims to provide better guidance for specialists considering the wide range of continuing education programmes available.

The inclusion of continuing education in the collective employment agreement also strengthens its position in the building technology sector. Employees can use five paid days of work for continuing education purposes. This is why Suissetec developed its own programmes (especially in the field of transversal skills) to promote the skills acquisition of employees. Some of these have stopped running because of low demand. Building technology sector, in collaboration with the cantons (e.g. Fribourg), has also set up programmes for professional certificates for adults, but the quantity structure is deemed too low to address the shortage of specialists (interview 1).

In the hotel and restaurant industry, efforts are being made to tackle the shortage of specialists through continuing education and professional certificates for adults. The collective employment agreement plays a key role here. The cost of lots of industry-specific continuing education programmes is currently being borne. Key skills and integration courses, industry certificates and professional certificates for adults are also being strongly promoted. These measures are also being supported by the higher pay for qualified employees, which is also incorporated into the collective employment agreement, which provides an incentive for training (interview 2).



4.3 Professional education and training (PET)

Summary

Overall, PET shows a high degree of responsiveness to the developments analysed. The organising bodies have created new qualifications and programmes or adapted existing ones in relation to digitalisation and climate change. The greater level of regulations, compared with the university sector, of VET in general and especially of occupational (field) development in PET was seen as a disadvantage by the sector representatives interviewed.

Digitalisation is changing PET in two ways: Firstly, the skills descriptions in existing PET college core syllabuses are being updated which means the PET programmes themselves also have to be developed. Existing federal professional and advanced federal professional examinations are also integrating new skills. Secondly, new PET certificates focusing more heavily on the digital transformation are also being created. However, the potential of digitalisation in teaching and school management of PET colleges does not yet seem to have been fully exhausted.

Distance learning is considered heterogeneous by PET students and teaching staff. Learning is less successful in distance learning than face-to-face teaching – that is the assessment of students and apprentices in VPET.

It is not currently possible to clearly assess the impact of digitalisation, the pandemic and climate change on participation in PET programmes and, where applicable, on the discipline-oriented (partial) funding.

The more developed regulations in the healthcare sector resulted in greater difficulty in adjustment – also in occupational (field) development – during the pandemic than in other sectors. Especially in the field of climate and environment, such regulatory and funding measures in the sector are also seen as a positive driver for occupational (field) development – regardless of the pandemic.

4.3.1 Digitalisation

The occupational activities of students and graduates of PET business colleges – as an example for PET overall – are changing significantly due to digitalisation. Marketing/communication and process management technologies are of greatest importance for former students in their day-to-day working lives. The changes to the skills described are reflected in the core syllabuses for the PET business colleges (Renold et al., 2019).

Digitalisation is also evident in the development of the relevant federal professional and advanced federal professional examinations. Prominent examples include the professional examinations 'Cyber Security Specialist with Federal PET Diploma' (M. Frey, 2021) and 'E-Commerce Specialist with Federal PET Diploma' (interview 4). Newly required digital skills are also integrated into the occupational profiles during the revision of existing federal examinations. There is often specialisation at this level which is not yet possible at basic VET training level (interview 3).

The individual PET colleges differ greatly in terms of the importance they attach to digitalisation in their programmes and school management. However, it generally seems evident

that digitalisation has neither been fully incorporated strategically in school management nor is it being used by specifically trained staff. In 2020, a third of the PET colleges surveyed by Scherer und Keim (2020) were not yet using blended learning. However, there is a positive assessment of the suitability of digital forms of learning and teaching from both the education providers as well as the cantons and experts in the recognition procedures (Engelage & Haberzeth, 2020).

The graduates of PET colleges believe that digitalisation improves their productivity and makes their tasks more interesting. On average, digitalisation results in greater job satisfaction (Bolli & Pusterla, 2022).

4.3.2 COVID-19

During the pandemic, the PET colleges had to overcome similar challenges to the education system as a whole: the implementation of the protective measures and restrictions on the number of people, the temporary ban on classroom teaching and the postponement or digitalisation of events etc.

No conclusive assessment can be made on whether these general challenges impacted on participation in education or on financing. The figures reveal the following picture: Participation in the federal examinations (federal professional and advanced federal professional examinations) fell during the pandemic in terms of the number of candidates. There was a 12% decline (Bundesamt für Statistik, 2021b) between 2019 and 2020 due to the postponement of exams. In the following year, the number of candidates rose by over 20%⁸. The total number of students at PET colleges also continued to rise during the pandemic, increasing by 2.5% from the 2019/20 study year to 2020/21. This rise was less sharp than the increases during the five previous years which averaged 4.2%. The figures indicate a further slowdown in growth for the 2021/22 study year: The total number of students is up by 1.6% on the 2020/2021 study year⁹.

Since 2018, candidates have been able to obtain discipline-oriented (partial) funding of examinations. The share of candidates who received a contribution climbed from 17% in 2018 to 41% in 2019 and to 48% in 2020. It is not possible to assess whether this increase would have been greater without the pandemic.

How do students or teaching staff in PET assess the consequences of the pandemic on PET? Despite the huge challenges, the teaching staff at PET colleges generally viewed the distance learning in spring 2020 as a positive experience. Teaching staff with more advanced technological knowledge rate the teaching experience in distance learning more positively than less tech-savvy lecturers. The distance learning skills of teaching staff can be professionally developed and enhanced (Hänni & Aeschlimann, 2021).

The vast majority of teaching staff at VET schools and PET colleges were less successful in helping apprentices/students through individual learning support in distance learning.

⁸ Calculations from the Federal Statistical Office (2022). Discipline-oriented funding in PET [su-d-15.06.04.01]. <https://www.bfs.admin.ch/bfs/de/home/statistiken/bildung-wissenschaft/bildungsfinanzen/hoehere-berufsbildung.assetdetail.23445919.html> (viewed on 1 May 2023).

⁹ Calculations from the Federal Statistical Office (2022). Tertiary level, professional education and training: students based on type of training, field of training and nationality [je-f-15.02.03.01]. <https://www.bfs.admin.ch/bfs/en/home/statistics/catalogues-databases.assetdetail.je-f-15.02.03.01.html> (viewed on 28 February 2023).



Performance assessment reached its limits as hardly any experience of virtual examinations existed. Around half of teaching staff indicated they had difficulty in organising teaching as they were not able to use conventional distance learning methods very proficiently. The teaching staff at PET colleges were slightly less critical in their assessment of the support for self-directed learning. Over half nevertheless suspect that the apprentices and students learned less during remote learning than during comparable periods of classroom-based teaching (Aeschlimann et al., 2020).

The regulations in the healthcare sector are relatively extensive and wide-ranging. The performance of functions and the funding of certain services are linked to specific qualifications. The cantonal responsibility also creates a heterogeneous regulatory situation. During the pandemic, greater requirements were placed on the sector, and the regulations meant suitable flexible deployment of personnel appeared more difficult than during periods without COVID-19. The answer to the question of how care quality can be ensured in future in ways other than qualifications and structures has since seemed even more urgent. The programmes of the universities of applied sciences, which compete with the PET colleges to some extent and actually almost completely replace them in French and Italian-speaking Switzerland, are governed at cantonal level which means they can be adapted or re-structured more quickly. This is why the sector would like to see – regardless of the pandemic – more flexible VPET in general and more flexible occupational development processes in particular (interview 5).

4.3.3 *Climate change and ecology*

PET has been very important to the requirements-led development and expansion of labour-market-oriented skills related to climate change and ecology for many years. Pasi (2016) sees legislation and overarching (strictly speaking political) strategies as key drivers of changes to training in the field of the environment in general – in other words, regardless of the sector. Changes to demand, information requirements and processes also have a sector-specific influence on the structure of PET programmes and qualifications, as the example of the retail sector shows (interview 4).

Various organising bodies have developed several recognised qualifications at the level of federal professional and federal advanced professional examinations which aim to have a positive impact on the climate, ecology, environment and nature (Pasi, 2016). The organising bodies of the federal examinations are also reacting to developments in relation to existing qualifications. The building technology sector, for example, is currently undertaking a complete revision of the federal examinations within its area of responsibility, such as 'Buildings energy advisor with Federal PET Diploma' or 'Solar assembly project manager with Federal PET Diploma' (Euw et al., 2021). Such adjustments or newly created qualifications were also undertaken for PET colleges: In 2022, for example, SERI approved its own core syllabus for the 'Advanced Federal Diploma of Higher Education in Energy and Environmental Technology'. However, according to Pasi (2016) there are much fewer programmes available at tertiary level and in continuing education in the field of the environment for people without preliminary academic education compared to university graduates. Universities are increasingly admitting non-academics, particularly in the field of continuing education.

The number of PET qualifications in the training fields of ‘environmental protection technologies’ and ‘electricity and energy’ increased, particularly during the 2000s. By contrast, the number has barely risen over the last decade¹⁰. The reasons for this stagnation are not explored. The complete revision in the field of building technology may indicate that there is growing demand for ecology-related skills in established qualifications and PET college programmes outside of the two training fields mentioned and that PET is responding adequately to labour-market developments.

4.3.4 *Range of instruments*

PET’s adjustment processes are generally governed by SERI. The examination regulations of the federal professional and advanced federal professional examinations may be revised by the organising bodies if required. As in VET, the examination regulations are based on an analysis of the occupational activities in the occupational field. The example of the ‘Cyber Security Specialist’ professional examination shows that this process can be implemented very quickly (M. Frey, 2021). However, heavily regulated sectors, such as healthcare, have less room for manoeuvre which means occupational development is also less dynamic in these sectors. The organising bodies of the PET qualifications must re-apply within seven years of the approval of the core syllabuses at the latest (M. Frey, 2021), making continuous development mandatory.

The range of instruments for adjustments provides the organising bodies with room for manoeuvre. This can support the targeted proximity to the labour market and inclusion of relevant trends. However, the range of instruments does not automatically guarantee that trends will be incorporated into PET and implemented as training measures. The organising bodies sometimes bring future-oriented developments into the sector and PET at their own initiative (interview 1).

For adjustments at PET level, a comprehensive occupational field analysis, including the relevant VET programmes, is advisable. New gradations were defined in the retail sector which take account of market developments and trends (interview 4). An opening-up of the organising bodies and qualifications for cross-occupational-field qualifications – such as those typically found in the digital sector – can be assessed with the existing range of instruments (interview 3).

Whether and how PET will respond to the general trend towards university qualifications and to what extent the existing range of instruments is suitable for doing so cannot be conclusively assessed at this stage. However, the professional organisations are monitoring developments closely (interviews 4, 5 & 7).

Which factors affect demand for PET qualifications and the importance of qualifications being up-to-date and conforming with the market cannot be conclusively determined today. The example of the restaurant industry (interview 2) nevertheless suggests that stronger support of those requiring training (demand-side financing) and stable long-term provisions in the collective employment agreements can have a positive impact on demand – irrespective of whether the target occupational skills are a precise fit for the labour market.

¹⁰ Federal Statistical Office (2022). Tertiary level, professional education and training: Qualifications. Development. [je-d-15.03.03.01]. <https://www.bfs.admin.ch/asset/de/22784472> (viewed on 27 June 2022).

4.4 Vocational education and training

Summary

The digital transformation is clearly evident in the change to existing and emergence of new occupations (for example, building IT specialist, digital business developer). The regular review and revision of VET programmes and their close links with the labour market ensure that new technologies and, as a result, related occupational skills are systematically incorporated into VET.

The COVID-19 pandemic enabled innovations that would usually have been met with greater resistance. Digital forms of teaching and learning and examinations have gained acceptance and vocational trainers have improved their skills in the use of these tools. Overall, the crisis was successfully overcome – probably thanks to the coordinated approach of the VPET partners and the VET 2020 Task Force – and the apprenticeship market was generally stable in 2021.

Like the digital transformation, climate change is also having an impact on all occupations to varying degrees. The systematic involvement of the Federal Office for the Environment and the Federal Office of Energy means that relevant themes are directly incorporated into the VET ordinances on an occupation-specific basis. This cooperation is generally considered positive by the organising bodies.

The standardised occupational development process achieves broad but still sector-specific inclusion of interests. However, the process is considered very time-consuming which can also slow down the inclusion of new developments on the labour market into VET.

4.4.1 Digitalisation

In VET, digitalisation is having an impact on demand for certain occupational groups, the occupational skills to be taught as well as on the learning processes and learning location cooperation.

Digitalisation is creating new occupations. For example, 'Information Technologist Federal VET Diploma' was introduced in the 1990s and early 2000s and has continually developed (Oswald-Egg & Renold, 2015). The occupation Building IT Specialist, Federal VET Diploma was introduced in the field of building technology which is supported by two organising bodies (EIT.swiss and 'ICT Berufsbildung Schweiz') – (interview 1). This is an example of how digitalisation is changing the boundaries between occupational fields. Another example of this kind of hybrid occupation is that of 'Digital Business Developer, Federal VET Diploma' which was newly created in 2022. This lies at the interface between the occupational fields of commerce and IT. Experts from commerce and IT collaborated on its development. New occupations can be initiated by various parties subject to the condition that there is an organising body active Switzerland-wide and a national labour market requirement exists (SBFI, 2017). SERI then assesses whether an occupational profile is clearly delineated and sufficiently wide. It performs a coordination function between potential organising bodies if required (interview 3).

The occupational development process in VET is based on the everyday activities of the professionals. Activity analyses are generally used as a basis for revisions of VET



ordinances. This means new activities are included in VET ordinances and training plans and training in these new activities is systematically provided (Petrini, 2022). Current examples include building information modelling – a method that is playing an increasingly important role in construction occupations – but also communication technologies in occupations involving sales and customer contact. The use of social media and websites for communication with customers and sales are increasingly important and are therefore being incorporated into VET ordinances during revisions (for example in the revision of the occupation of Florist, Federal VET Diploma). SERI made the digital transformation (SBFI, 2022) guide available as an aid. It provides the organising bodies with support in identifying the skills affected by the digital transformation and incorporating the digital skills required in the occupation into the VET ordinances.

In the current revision of VET in the field of commerce, digitalisation had a major influence on the new occupational profile. The new VET takes account of both the new forms of organisation and work as well as the networking and use of new technologies. However, basic digital skills are taught as part of VET. Specialisation takes place later at the level of continuing education or PET (interview 3). In the case of the retail sector, which is heavily affected by digitalisation, a specialisation in online retail in the third year of the apprenticeship was created in the current revision of VET based on the occupational field analysis. Specialization here takes place through the creation of the new vocational examination E-Commerce Specialist at PET level (interview 4). However, it is not just digital skills that are becoming more important, but also the ability of specialists at VET level to deal with well-informed customers and to obtain and evaluate information (interview 4).

In relation to the learning processes, digital learning resources, such as online learning platforms, are currently being developed in various occupations. They are partially replacing traditional formats such as textbooks (for example, also commerce, retail and building technology). Virtual or augmented reality can also be used in VET. One example of this is a project in the occupational field of building technology which aims to allow apprentices to practise the welding of bitumen in a virtual reality environment (interview 1).

The use of digital resources can accelerate learning processes and improve learning performance. However, how these digital resources are used plays a key role. To ensure they achieve a positive impact, digital resources should support apprentices with independent learning, practising or independently performing tasks (Educa, 2021). If digital resources are used as a replacement for teaching staff, the performance of learners tends to deteriorate, whereas if they complement traditional teaching methods and support teaching staff, they can contribute towards improving learning performance (Educa, 2021).

The development of digital resources can also help to improve learning location cooperation in VET. For example, the experience room model¹¹ from the leading house Dual-T helps to identify discontinuities between learning locations and to highlight ways of overcoming them (Boldrini & Cattaneo, 2017). This means digital resources can be used to establish better links between VET schools, branch courses and host companies in terms of theory and

¹¹ “The experience room is a pedagogical model that aims to promote cooperation between training centres using state-of-the-art technology. It allows experiences gained at the workplace to be ‘captured’ and transferred to school settings. This provides an opportunity to discuss and learn from experiences.” (Boldrini & Cattaneo, 2017, S. 13).



practice. For example, digital recordings of apprentices at host companies can be worked on in schools.

A survey carried out by the Swiss Federal University for Vocational Education and Training (SFUVET) amongst teaching staff at VET schools indicates that satisfaction with the development of the digital transformation in general and support from the schools during the changeover is high. The COVID-19 pandemic also fostered the positive attitude and belief in the benefits of digital resources in teaching (Rauseo et al., 2021).

4.4.2 COVID-19

The measures imposed to tackle the pandemic impacted on the various economic sectors and occupational fields in very different ways. The hotel and restaurant sectors were heavily affected for a longer period by business closures, and even after the pandemic, the number of apprentices had dropped by over half in some cases at regional level (interview 2). In contrast, work at building sites continued without change almost uninterrupted – apart from hygiene measures (interview 1).

The COVID-19 pandemic impacted on VET in different ways. Firstly, the restrictions imposed during the pandemic made it more difficult for young people during the career choice phase: They were afforded less insight into the occupations of interest to them and trial days at companies were difficult or impossible to arrange. A strong relationship was observed between the intensity of the restrictions imposed by the government to combat the pandemic and search requests for apprenticeship places. This meant significantly fewer apprenticeship contracts were concluded during the first months of the lockdown in 2020 than during the same period in the previous year. The search intensity of students for apprenticeships was in line with the pre-pandemic level again by March 2021 (Goller & Wolter, 2021).

Economic shocks generally lead to a pro-cyclical, moderate response on the apprenticeship market immediately and during the following years (Lüthi & Wolter, 2020). However, the COVID-19 crisis did not have any significant impact on entry to VET in Switzerland. Of the young people who completed the 11th year of mandatory education in June 2020, 46 per cent undertook a VET programme. This is in line with the historical values from the previous years (Bundesamt für Statistik, 2021a). The proportion of apprenticeships occupied for the start of training in August 2020 stood at around 90 per cent (Bolli et al., 2020).

The COVID-19 pandemic had an adverse effect on the ability of apprentices already undertaking training to acquire occupational skills. In workplace training, the shift of occupational activities towards working from home had a significant negative impact on the practical skills of apprentices (Bolli & Morlet, 2022). The quarantine requirements and protective measures in companies led to apprentices missing workplace training – to different degrees of intensity – which made the acquisition of skills more difficult (Bolli et al., 2021). In particularly hard hit sectors, cantonal bridging solutions were found in some cases, for example by providing apprentices in the restaurant industry with the opportunity to practise at suitable venues. The funding priority ‘apprenticeships COVID-19’, which supported around 85 projects, helped to stabilise the apprenticeship market (Task Force ‘Perspektive Berufslehre 2020’, 2021).



Teaching at VET schools was also severely affected. Around half of the teaching staff surveyed found the switch to distance learning challenging as they struggled to implement conventional learning methods in distance learning. Most of the teaching staff surveyed thought that learning assistance in the form of the individual support of apprentices was less successful in distance learning (Aeschlimann et al., 2020). The shift to digital learning platforms, which also took place in Germany, was nevertheless also perceived as a learning opportunity there. During the second phase of school closures, apprentices were able to use digital devices and software better than during the first phase (Seyffer et al., 2022).

Another area affected by the pandemic was the implementation of performance assessments and final qualification procedures. Like in distance learning, virtual examinations were also introduced on an ad-hoc basis as little experience of using them existed before the pandemic. From a current perspective, this experience gained from the crisis is viewed as positive for the future development of qualifications procedures (interview 5).

In the occupational fields heavily affected by digitalisation, such as retail, commerce and in the VET schools, the COVID-19 crisis was primarily perceived by the experts interviewed as an accelerator of digitalisation processes. The crisis enabled innovations that would usually have been met with greater resistance. Alternative training models, such as block catch-up weeks, supplementary school teaching, blended learning and new teaching and learning resources were experimented with (interviews 2 & 3). The acceptance of digitalised training formats improved, vocational trainers were made aware about the tools and opportunities of digitalisation in terms of methodology/didactics and improved their digital skills (interview 4). This means that, towards the end of 2022, the experts interviewed tended to see the positive learning and innovation effects produced during the COVID-19 crisis more than the short-term negative effects on the apprentices concerned. This was also thanks to the successful collaboration between all VPET partners which enabled solutions to be found quickly during the crisis.

4.4.3 Climate change and ecology

VPET will play a vital role in the transition to a greener economy. On one hand, new occupations and greater demand for certain specialists may be created, while, on the other, sustainable development skills will be taught in VPET (Cedefop, 2021; M. Frey, 2021). Government initiatives, such as the promotion of photovoltaic systems, also play a crucial role in this area for creating and maintaining the relevant areas of employment and therefore also the demand for specialists and skills requirements (M. Frey, 2021).

In the first case, the climate and energy crisis is currently having a major impact on VET in the occupational fields of construction and building technology. Under the influence of the increased demand for specialists in photovoltaic systems, new VET programmes were developed in 2022 through an accelerated procedure: Solar Installation Engineer, Federal VET Diploma and Solar Assembly Engineer, Federal VET Certificate. Here the Confederation played a coordinating role between the potential organising bodies. Skills required to install solar systems were also integrated into the existing occupations of the building technology sector (interview 1). The integration of new, additional occupational skills into a VET programme can – as in the case of the building technology occupations – lead to an extension of the apprenticeship term: the VET programmes Sanitary Facilities Installer, Federal VET Diploma, Heating Installer, Federal VET Diploma and Plumber, Federal VET Diploma have taken four years instead of three since 2020.



Secondly, in terms of teaching sustainable development skills, the fact that the Federal Office for the Environment (FOEN) and Swiss Federal Office of Energy (SFOE) are systematically involved in the revision of the VET ordinances at an early stage today is a key factor. This and the cooperation with FOEN and SFOE are viewed as positive by the majority of the experts interviewed. This means the federal offices contribute their expertise to occupational development and relevant sustainability aspects can be integrated at the level of the occupational profile, occupational skills and performance goals for all learning locations (M. Frey, 2021; SBFI, 2020). This procedure ensures sustainability aspects are systematically incorporated into VET ordinances. This coordinated approach also means that sustainability topics can be closely linked with the occupational activities and taught in a skills-based way. In this regard, SERI has published a sustainable development guide (SERI, 2020) which helps the organising bodies in occupational development to analyse the extent to which their occupation can contribute to sustainable development. The organising bodies of VET can also benefit from the funding provided in some cases when implementing sustainability-relevant aspects (M. Frey, 2021).

The greater focus on sustainability does not just affect the building technology occupations. For example, the association 'Hotel & Gastro formation' is addressing the trend towards meat-free and plant-based cuisine and is looking for solutions to also provide training for vegetarian restaurants, e.g. through training programmes or host company networks to enable apprentices to acquire additionally required skills.

Awareness about sustainability and the careful use of resources is also being raised in occupations which are not directly affected by changes to activities or greater demand (interviews 3 & 5). Themes such as product labels, which are relevant when advising customers aware of sustainability, in sales and in the use of products (e.g. retail; Beautician, Federal VET Diploma; Florist, Federal VET Diploma) are also being incorporated into various occupational fields.

To the best of our knowledge, no systematic analysis has been carried out yet on whether the sustainable development skills incorporated into the educational principles are also being implemented at the various learning locations. Research results from Germany indicate that VET trainers at all learning locations have often been able to promote learners' existing intrinsic learning motivation in a targeted way and, as a result, the teaching of these skills has been very successful (Haan et al., 2021; Hedinger, 2023; Herzog, 2021; Jahn & Otto, 2021).

4.4.4 Range of instruments

The associations generally obtain an overview of the developments in their occupational fields and identify change requirements through their committees and their close contact with member companies. They ensure a balance of interests between members within associations. For example, the conflicting priorities between innovation and tradition must be addressed to ensure less innovative companies also support innovations (interview 1). Science-based methods were used to analyse requirements before the occupational revision in some of the occupational fields analysed. These range from surveys of companies to the complex, mixed-method procedure used in the last revision of commercial VET.



The associations agree the internal decisions with their other VPET partners and stakeholders. The participants interviewed see this task as a challenge to the vocational development process. The internal and external coordination means that VET is always a middle road and the greatest common denominator is sought (interviews 1 & 5). The fact that various options exist for addressing heterogeneity is beneficial: for example, the development of general training for all companies which is based on common ground; the definition of specialisations, options or fields of study which enable a degree of specialisation within the occupation. It is also important that innovations are only incorporated through the coordination if they are relevant to a certain number of companies.

The structure of the representation of interests differs depending on the occupational field. In some cases, the associations responsible cover the entire occupation-specific labour market (e.g. building technology, engineering, electrical and metalworking sector, hotel and restaurant industry, healthcare). Training is carried out in different sectors in other occupations and the organising body brings various associations together under one umbrella (e.g. retail). In the healthcare sector, where security of provision is crucial, the public sector is also involved in the organising body. Employee representatives also participate in the organising body in several occupational fields (e.g. interviews 2, 3 & 5).

In some sectors, current influencing factors – in addition to the trends and developments analysed – play a key role, e.g. increased health awareness in the healthcare sector, geopolitics in the export industry, developments in online retail in the retail sector. The inclusion of companies in the association structures means such sector-specific forms of trends are incorporated into the occupational development processes.

The interviewees also believe that companies and the labour market should be driving forces in occupational development and not political initiatives that are detached from it (interviews 4 & 7). Finding (political) solutions for VET as a whole is also very challenging as there is a high degree of heterogeneity between the occupational fields.

If various organising bodies wish to introduce similar new VET programmes due to technological developments (e.g. e-commerce), coordination between the potential organising bodies is required. This coordination is undertaken by SERI which is deemed positive (interview 3).

Some criticism of the workload was expressed in the interviews which is related to the formulation of skills and the management of revision projects. The speed at which changes can be taken into account is sometimes regarded as inadequate as is the number of guidelines available to support the process. The VPET partners met at a round table event in 2022 to determine any process improvements required.

In view of current trends and developments, some experts also saw opportunities to extend the VET occupations to fewer basic occupations with transferable skills. However, some studies indicate this approach entails risks for the acquisition of skills by apprentices and the participation in training by companies (Aepli, Schweri & Kuhn, 2021; Trede & Lüthi, 2018). Proposals were also made on individualising the qualification procedures and the learning paths (acquisition of skills at individual pace, controlled by apprentices and companies using digital learning platforms).

4.5 Universities

Summary

In the university sector, the trends of sustainability and digitalisation have developed increasingly dynamically over recent years. Digitalisation has further accelerated due to the COVID-19 pandemic. This affects universities both in terms of learning and organisational processes. Sustainability aspects are also being incorporated into the structure of educational programmes and are increasingly being embedded in structures and processes. The adjustment process to these changes is marked by the universities' high degree of autonomy, resulting in fragmented implementation. Significant differences exist mainly between bachelor/master degree programmes and continuing education programmes. The adjustment processes to the trends include both coordination at political management level as well as clear alignment with labour market requirements. Overall, this means the universities are not responding uniformly to the developments analysed.

4.5.1 Digitalisation

Digitalisation is having an impact on various aspects of degree programmes in university education: It influences the structure of programmes, learning and teaching formats and examination formats. Digitalisation also has an impact on the universities' processes and their organisation.

In terms of the structure of learning and teaching formats, digitalisation initially impacts on the objectives that lecturers wish to achieve with the use of media in their learning events. The primary driving factors concerning the use of digital media at universities are the engagement and motivation of students (Riplinger & Schiefner-Rohs, 2017). The experts surveyed highlighted these changes to the teaching requirements of lecturers in the digital sphere (interview 6).

Students can also obtain greater control over their own learning process thanks to digital learning opportunities or be more heavily involved in the learning process thanks to collaborative tools. In this respect, it is crucial to understand the extent to which digital solutions are actually used by students as there is still a lack of scientific knowledge in this area. The literature shows major differences between the specialist areas which should be taken into account in terms of the design of teaching and learning formats and in the use of digital media (Riplinger & Schiefner-Rohs, 2017).

With regard to the implementation of digital examinations, there were various pilot projects and activities at universities in Germany, Austria and Switzerland before the COVID-19 pandemic. The experience from the *Hochschulforum Digitalisierung* (University Forum on Digitalisation) nevertheless indicates that this was often restricted to a core group of few highly committed pioneers. Innovative projects with digital examinations were not in widespread use before the COVID-19 pandemic. Inconsistent approaches were often pursued within with same university which meant various procedures were developed in parallel (Bandtel et al., 2021). This situation fundamentally changed from 2020. Evidence from all three countries shows that, from the perspective of the universities and lecturers, this primarily concerned the legally compliant organisation of examinations which had to be held remotely. In Switzerland, the main examinations introduced were examinations held in exhibition halls, electronic examinations requiring personal attendance held in large computer rooms as well



as supervised and unsupervised remote examinations with and without the use of online proctoring. Open-book formats and digital examinations with restricted aids were also carried out using special browsers that limited access to online content. Oral digital remote exams and presentations via a video conference system were also carried out (Bandtel et al., 2021). Digital examinations have now become indispensable. However, they still present a challenge in terms of data protection (interview 6).

The impact on programmes has been very significant in recent years. Leder und Tratschin (2022) show that the acceleration of digitalisation in Switzerland has led to a significant development of the degree programmes. The number of programmes more than tripled during the short period between 2017 and 2021. This includes new programmes, on one hand, and fields of study and programmes with new specialisations on the other.

The interviews with experts also confirm a growing trend to integrate or extend digital aspects in the design and structure of university programmes. This increases attractiveness by improving flexibility and protects against growing competition from digital platforms, especially in continuing education (e.g. LinkedIn Learning, Coursera, etc.) (interview 6).

The study by Leder und Tratschin (2022) shows different developments at two levels. Firstly, in basic training and, secondly, in continuing education. It is notable that the universities of applied sciences have mainly introduced digitalisation-related programmes in the form of continuing education courses, while the traditional universities are more active in the field of basic study programmes. While the expansion in terms of digitalisation has taken place more at bachelor than master's level at universities of applied sciences, the situation is the exact opposite at traditional universities. There are more master than bachelor programmes that expressly address the topic of digitalisation at the traditional universities.

Finally, digitalisation at traditional universities is also having an impact on how their processes are organised. As far as students are concerned, digitalised student records and learning management systems reduce the staff costs of universities. The number of lateral entrants in staff recruitment is rising, increasing awareness of the importance of new approaches. In general, a growing willingness to harness digitalisation's scaling potential is being reported which results in performance improvement for the organisation without additional personnel costs (interview 6).

In view of the changing perception of the education landscape, the aspects highlighted show how analogue and digital realities are becoming increasingly interwoven and even merged.

4.5.2 COVID-19

The COVID-19 pandemic presented challenges for and influenced the Swiss universities at various levels. Key factor: The shift from classroom-based to distance learning which was largely achieved. The experiences during the COVID-19 pandemic resulted in greater flexibility in terms of learning and teaching formats, but also gave rise to significant negative implications in other areas. Experiences at all universities showed that distance learning and the lack of interaction on campus had an adverse effect on students' mental health (Swissuniversities, 2021). There are also learning sequences, such as laboratory work, which

cannot be carried out through distance learning. On-site teaching cannot be completely dispensed with in medicine and social services either.

The challenges presented by distance learning are also clearly evident at university level. At universities of teacher education it was recognised, for example, that lecturers could not promote and teach all skills required digitally (Döbeli Honegger, 2021).

The COVID-19 crisis also had an impact on other areas. As the experts surveyed indicated, the pandemic had an impact on the organisation of universities. The growing use of working from home means spatial requirements are changing. Students' expectations of lecturers have also changed. However, the new formats require further development. This rapid and intensive transformation process is also producing a 'transformation fatigue' phenomenon and can make lecturers want to return to established and familiar models (interview 6).

4.5.3 Climate change and ecology

The topic of sustainability also affects universities in different ways: On one hand, in relation to the structure of programme development, and, on the other, in terms of the inclusion of sustainability aspects in their structures and processes.

The content of various programmes at Swiss universities has been updated to include energy and clean-tech topics. The increasing inclusion of sustainable development in university lecturing is reflected in the sciences where sustainability is established in teaching at least to some extent (Kägi et al., 2017; Weder & Kägi, 2021). Sustainability aspects are being taken into account to a greater extent at modular level in the aim of equipping students with the required skills (interview 6). This is taking place using various modular formats (e.g. project weeks, summer and winter schools, MOOCs) which students from all disciplines can attend (Swissuniversities, 2020). Through the 'U Change – Studentische Initiativen zur nachhaltigen Entwicklung' (U Change – student initiatives on sustainable development) funding programme, the Swiss Conference of Higher Education Institutions is promoting the implementation of project proposals from students over the period 2017–24. However, this kind of initiative based on student commitment to sustainable development is not being systematically promoted and students are not being involved in strategic processes (Econcept, 2021).

The trend towards the increasing integration of education for sustainable development (ESD) in university education will continue to be extended, as provided for in the '2030 Sustainable Development Strategy' (Bundesrat, 2021).

In terms of organisation, sustainability primarily means reducing the ecological footprint, whether by cutting the amount of travel undertaken by employees, raising environmental awareness in the restaurant services or more efficient use of energy resources – especially in view of the current energy shortage (interview 6). However, need for action has been identified in terms of specialist sustainability authorities which often do not have adequate resources to achieve progress effectively in all areas (Econcept, 2021).

4.5.4 Range of instruments

The adaptation processes at university level are marked by the high degree of autonomy enjoyed by the individual universities. Labour market orientation is clearly evident in the



(further) development of programmes in terms of how they are structured at the universities. Feedback from the economy is a key factor here. The state grants the universities great room for manoeuvre to reflect the dynamism of the labour market and to avoid conflicts with the principle of the freedom of teaching and research (M. Frey, 2021). There are differences in the adaptation processes between bachelor/master and continuing education programmes (see sub-section 4.2).

The processes are more heavily regulated for bachelor/master programmes. In summary, the procedure undergoes the following three steps at the level of university management and university of applied sciences (UAS) council: (1) Principle decision by the university management based on the general concept with notification of the UAS council and inclusion in multi-year development and financial planning; (2) Definition of a detailed plan of the new programme involving external experts; (3) Approval of the new programme by the university management and by the UAS council (Interview 6).

If an existing programme is adapted, the process depends on whether the legal basis needs to be amended too (study regulations and/or annex). The number of process steps differs depending on this and various decision-making and approval bodies within and outside of the university are involved (interview 6).

The bases for the aforementioned processes are found in the respective cantonal legislation on universities of applied sciences¹². The various interests of the departments are taken into account in the process to find the right balance between stimulating and competing programmes. As such processes can be very time-consuming, the prompt and careful integration of the various stakeholders is vitally important. Issues from current political debate are also fed into the process via committees and the UAS council. The issues of political debate include the shortage of specialists (e.g. in science, technology, engineering and mathematics) or the availability of internships or restricted admission in certain subjects. This means change processes also take account of societal issues, such as the environment (interview 6).

¹² For Zurich, for example: <http://www.zhlex.zh.ch/Erlass.html?Open&Ordnr=414.10>

4.6 Compulsory education and baccalaureate schools

Summary

The compulsory education and baccalaureate schools, like other areas of the education system, face different developments. As the cantons are responsible for these schools, the responses to these developments are sometimes fragmented. Despite a shared vision and national initiatives, which should result in greater coherence, there are major differences between the cantons in relation to digital education. On one hand, federal government measures, such as the prohibition on classroom-based teaching, were imposed in response to the COVID-19 crisis, while, on the other, the autonomy of the cantons was reflected in the various measures aimed at promoting distance learning. The COVID-19 crisis also had a shock-like impact, which was reflected by the differing level of progress made by the schools in the digitalisation process, but also by different responses. Sustainability aspects are also being followed up and explored in greater depth in different ways. The instruments available only permit slower adjustment than in the areas of the education system closer to the labour market.

In terms of governance, the mandatory education and baccalaureate schools fall under the responsibility of the cantons which means the overview is sometimes fragmented despite efforts at harmonisation. The recently published Swiss Education Report 2023 provides a good overview of the various aspects of these schools (SKBF, 2023).

We focus primarily on the function of the mandatory education schools in feeding students to the rest of the education system. The transition to post-mandatory education and training and the career-choice process are relevant in this respect.

4.6.1 Digitalisation

The skills that school pupils should acquire in the increasingly digitised world of work are part of the curricula in all three language regions. The Swiss Conference of Cantonal Ministers of Education drew up a strategy on the structure of the digital transformation in the education system in 2018 (EDK, 2018). In this strategy, the cantons set joint goals on digital education. These must be followed up with specific measures at the various levels of education/training. To further accelerate the transformation, the Swiss Conference of Cantonal Ministers of Education and SERI created the specialist agency Educa which aims to improve coherence between national and cantonal initiatives. Educa aims to establish a uniform foundation for the digital Swiss Education Area.

There are still major differences in digital education despite the shared vision. There has been a constant increase in the use of digital resources for both teaching and learning in recent years. However, there are notable differences between the language regions in terms of the use of digital devices by school pupils. They are generally used more frequently in teaching in schools in German-speaking Switzerland than those in French and Italian-speaking Switzerland (Educa, 2021).

There are also clear differences between the school levels in terms of the availability of information and data for the description, explanation and evaluation of digitalisation. At present, there is relatively little information available, particularly at primary and upper-secondary levels. The existing information on the digital skills of learners and teachers comes



almost exclusively from self-evaluations, in other words subjective assessments. For example, school leaders tend to rate the digital skills of teaching staff as good (Educa, 2021). These are not objective sources and may differ from the actual skill levels. This means they can create a distorted picture and are only suitable for analysing potential influencing factors on digital skills training to a limited extent.

One of the few analyses available is the study by Antonietti et al. (2023). They developed a measuring instrument to evaluate the integration of technologies into learning activities. The results show that in Switzerland technologies are primarily integrated into activities in which pupils participate passively (e.g. projector presentations or the distribution of learning materials on an online platform). However, learning activities where pupils actively work with digital media and practise or apply the knowledge conveyed by using digital media are less common. With the same measurement, Petko et al. (2022) also show that the use of digital media is much more common in teaching at VET schools than at general education schools at upper-secondary level.

As far as continuing training after mandatory education is concerned, digitalisation has experienced a boom in recent years, especially with regard to occupation choice. Various initiatives were launched in the public and private sectors. An online survey (Yousty, 2022) shows that the choice of occupation is mainly made via digital channels. The internet is the main source of information for over three-quarters of the young people surveyed. One benefit of this development is that the use of digital media in choice of occupation, e.g. in the form of interactive games, helps overcome gender stereotypes in choice of occupation (Diesel-Lange et al., 2019).

4.6.2 COVID-19

The COVID-19 crisis affected compulsory education and baccalaureate schools in different ways. The restrictions imposed during the first wave of the pandemic also led to school closures. These closures had an impact on young people in particular. The youngest pupils, in particular, spent less time on school work (22 hours on average; around 12 hours less than before the COVID-19 crisis). In the 14 to 15 age group, the hours of study fell much more sharply than amongst older pupils. Younger pupils also had more difficulty overall in following the curriculum and missed the structure of the school day (Refle et al., 2020).

In compulsory education schools, the school closures led to a considerable rise in the purchase of hardware and software by families (Oggenfuss & Wolter, 2021). The usage intensity of digital devices in 2021 remained very constant compared with the previous year. There are still major differences in usage intensity, particularly between subjects, with greater usage in language teaching, and between the regions, where French and Italian-speaking Switzerland lag behind German-speaking Switzerland (Oggenfuss & Wolter, 2021).

However, in distance learning, pupils' effective outcomes (learning effort and emotions) depend heavily on their independence (Huber et al., 2020). The existing differences increase during crisis situations (e.g. in terms of teaching quality, the structure of teaching/learning settings, cooperation in student bodies, year-group and level teams and in the overall teaching staff, and the quality of leaders) (Huber et al., 2020). This presents major challenges for equality in terms of education and opportunity.



Compared with Germany and Austria, school leaders in Switzerland felt better informed about changes to the framework conditions and new tasks. The technical facilities (e.g. in the form of technical capabilities for digital teaching) and opportunities for individual coaching with pupils were better in Switzerland than in its two neighbouring countries (Huber et al., 2020).

4.6.3 *Climate change and ecology*

The '2007–14 Action Plan' of the General Secretariat of the Swiss Conference of Cantonal Ministers of Education from 2007 serves as a basis for inclusion of education for sustainable development (ESD) principles in compulsory education. In particular, the Action Plan requires the integration of ESD principles into the language region syllabuses of mandatory education schools and in the training and continuing education of teaching staff. The implementation and establishment of ESD in mandatory education and upper-secondary level is being carried out by *éducation21*, the national competence and services centre for ESD.

éducation21 has been supporting schools with a wide range of services since 2013, including in the field of teaching resources development. To broaden the common understanding, *éducation21* does not understand ESD as a new discipline, but as content providing guidance for all disciplines. This incorporates various inter-disciplinary dimensions (environmental education, global learning, health promotion, education on politics, human rights and economics) which shape schools as a whole.

The potential of digital tools for the teaching and addressing of sustainability aspects in education is also worthy of mention. Trechsel und Tanner (2020) show, for example, that learning platforms can initiate transformative learning. Existing sustainable development models as well as skills and learning task models can be merged in a digital setting. A platform also allows learners to work at their own pace and to explore content in greater depth in individual learning stages based on their own interests. However, there is a risk of pupils getting lost online and the teacher plays a key support role because the learning platform is not a self-learning tool.

Sustainability also plays a role in the choice of occupation. Recent initiatives, such as *Jobs for Future* of the *MyClimate* foundation, aim to raise awareness amongst the younger generation about the ecological, social and economic perspectives of sustainability when choosing their occupation. The professional associations also promote their occupations in the field of the environment, e.g. with guidance on choice of occupation (Oda Umwelt, 2020).

4.6.4 *Range of instruments*

The cantons are mainly responsible for the adjustment processes in the compulsory education schools. New trends and developments, such as digitalisation and sustainability, are being included at a slower pace than in other areas of education. While individual initiatives show a certain pioneering spirit, the overall picture is very heterogeneous. However, a rapid response was required during the COVID-19 pandemic. This shock event exposed gaps in the process of digitalising schools. In this respect, the pandemic crisis can be seen as a medium-term driving force. However, greater and more detailed data on the progress of digitalisation in schools is needed to monitor future developments more accurately.

5. CONCLUSIONS

Both the literature used in this report and the interviews with experts from various occupational fields produce the picture of a Swiss labour market and education system that is constantly faced with new challenges and which carries out a high level of adjustment. To date the education system is succeeding in preparing young people on various educational pathways for the labour market (Aepli, Kuhn & Schweri, 2021) and ensuring employee mobility on the labour market (Aepli & Schweri, 2019). The question is nevertheless raised as to how the various occupational fields and training programmes can equip themselves for future challenges.

5.1 Heterogeneous trends lead to wide-ranging challenges

The analysis of digitalisation, COVID-19 and climate change in this report shows that these trends are as different in terms of their causes, progression and duration, as their impact and predictability.

Digitalisation will continue but the individual technical developments and their exact impact will remain difficult to forecast. This explains why the effects on employment in general and on individual occupations and occupational fields are considered to be very different. This makes steering the education system in particular forward-looking directions very difficult. Instead, effective, rapid feedback from the labour market to the education system appears more realistic. This means developments that actually materialise on the labour market are addressed instead of those anticipated by observers. Responsibility for educational/training content is delegated to the professional associations in VET. In addition to VET and PET, they often also provided suitable continuing education programmes in their occupational fields.

The COVID-19 pandemic was not foreseeable in terms of its timing nor its specific social and economic impact. Rapid and flexible responses are required to completely new situations both on the labour market and in the education system. The experience gained in some occupational fields can result in improvements in areas, such as hygiene or storage, which increases resilience to similar crises. A future crisis that affects the whole of society in such a short period will nevertheless once again require rapid and targeted adjustments and responses which cannot be predicted today. Firstly, a key factor in tackling the pandemic and its consequences was the flexibility of the actors, for example the schools in converting to distance learning or the companies in organising new forms of work. Secondly, the fact that the various actors on the labour market and education system were in intensive contact thanks to suitable governance structures and, as a result, were able to quickly find broad-based solutions for overcoming the crisis situation (e.g. short-time working for apprentices, modified qualification procedures) was of great benefit. Permanent optimisations can then also be implemented, for example by including a provision in unemployment insurance law that allows VET trainers to continue the training of apprentices, even if they receive short-time working remuneration.

Climate change fundamentally differs from the trends indicated above in two respects. Firstly, it has been taking place for many decades and will continue in future, even if the exact dynamic (for example, depending on tipping points in the climate system) can only be predicted to a limited extent. Secondly, it is an issue caused by human economic activity.

The market forces of the economy are not part of the solution because the costs of climate change, like the costs of environmental damage, are inflicted on society as a whole rather than on the actors responsible. These negative externalities are a major reason why the state is intervening with various instruments to tackle the causes of climate change.

5.2 Possibilities and limits of system governance by the state

Based on the experiences of the trends described above, it can be concluded that the labour market and education system have proven capable of continually dealing with technological development and with the COVID-19 pandemic short-term in crisis mode. However, in the case of climate change and environmental issues, it is not sufficient to rely on the flexible adaptability of the labour market and education system. Carefully devised political measures are needed here, such as the already established systematic involvement of the two competent specialist offices (FOEN and SFOE) in the occupational development processes.

Partially new occupational fields are emerging due to digitalisation and climate change. In the past, such new occupational fields were not sufficiently well organised which meant there was a lack of capable, comprehensive professional associations able to take over the role of the organising body for the new occupational fields. The situation concerned the occupations in the ICT sector (Seitzl, 2021), the solar occupations (M. Frey, 2021), but also new occupations in healthcare and social services (Graf et al., 2023). In such cases, the state performed a more active role than usual in collective VET systems. The key factor here is not creating educational structures through state intervention that are detached from the labour market or even replace the involvement of the associations and companies¹³, but instead to support the organisational capacity of the companies. In specific terms, the new organising bodies were provided with support to define the training content and to promote the participation of companies in the training (Graf et al., 2023; Seitzl, 2021).

Finally, social issues are also a reason for state reform measures. As a stakeholder group, employer associations are mainly interested in ensuring that the education system and, in particular, VET provides well-qualified employees for its companies. But as the skills requirements in the operational processes increase in the context of digitalisation (upskilling), there is the risk of reducing VET's integrative function for weaker learners (Bonoli & Emmenegger, 2022). In addition to the integration of weaker learners, there are other social issues, such as equal opportunity, the protection of employees and apprentices or general education for which well-conceived state measures may be required. The strategic governance bodies and the Confederation must assume their responsibility for long-term system development in this respect. Successful examples of this include various past reform measures, such as the creation of the federal vocational baccalaureate and universities of applied sciences, the introduction of two-year VET programmes and the recent creation of integration training for refugees which provided greater permeability and equal opportunity for everyone.

¹³ Seitzl und Unterweger (2022) describe an example of this for 'branch apprentice training' in Austria, which was promoted as part of the National Action Plan for Employment, and where apprentices enter into a training contract with a training institution instead of with a host company.



Despite the cases indicated where the state plays a strategic leadership role, there are good reasons for the collective governance of the education system where the partnership between the Confederation, cantons and professional associations and federalism play a major role. Any forecasting on technological and economic development and pandemics entails great uncertainty. Centralised state control can do more harm than good when situations develop differently to how they are expected to. More suitable for such situations is a system where real changes on the labour market can quickly be incorporated into the education system and where the actors have sufficient autonomy to adapt. This means the state should only intervene where the current governance mechanisms are not working. State influence with a view to anticipated future developments may be beneficial, above all, where the knowledge about these developments is relatively certain and targeted measures can be taken to support the self-organisation of the actors instead of restricting them through excessive regulation.

5.3 Different educational governance in vocational and general education

Switzerland is a consociational democracy where many social actors are involved in political processes. This also applies to the education system where governance is generally divided into two areas: Compulsory school education and the general education pathways mainly come under the control of the cantons. At the universities, curricular negotiation processes usually take place in-house within the organisation. The framework conditions for the structure of the content of these educational pathways is relatively open and the universities enjoy a certain degree of autonomy in terms of teaching and research. Professional organisations only play advisory roles in national coordination structures and other link mechanisms with the world of work are not regulated (e.g. lecturers with an occupational background at universities of applied sciences, application-based projects with companies).

Various principles apply in the field of VET. The federal vocational baccalaureate, general education and physical education are controlled via core curricula issued by the Confederation. The professional organisations largely determine the educational content in the vocational and practical part of VET and in the federal professional and federal advanced professional examinations. The professional organisations – together with the training providers – also define an occupational profile for the PET colleges on the basis of which a core curriculum is approved by the Confederation. This means the feedback on the labour market, but also the negotiation processes between state and private actors are most developed here. The different control mechanisms between the areas of education make coordinated occupational field development more difficult because education programmes from the various areas of education play a role in almost every occupational field.

5.4 Occupational development amidst the conflicting priorities of negotiation processes and flexibility

How these feedback and negotiation processes work is ideal-typically illustrated by the occupational development process in VET. Responsibility for the content of the educational pathways is largely delegated to the professional organisations. However, they must be carried out based on a standardised procedure that sets out both methodical/formal requirements while also governing the involvement of other actors. This process is not generally questioned by the experts interviewed. They consider the distribution of roles in occupational development to be appropriate. None of the participants interviewed wishes to



abandon the occupational concept or Switzerland-wide VET. In contrast, the occupational development process is seen as too slow, time-consuming and inflexible by those surveyed in some cases.

Ideally, the process can also be carried out more quickly in the form of a 'fast track', but faster processes also mean less time for negotiations. This also means fewer actors can be involved and the actors taking the lead must make decisions more quickly which may be opposed by the overlooked stakeholders. This restricts the number of cases eligible for an accelerated procedure. The existing range of instruments also provides the opportunity to carry out partial adjustments which are less time-consuming as, for example, responsibility for training plans primarily lies with the organising bodies.

VET programmes must be reviewed in 5-year cycles to ensure they are up-to-date and updated if necessary. Here it is evident that the organising bodies of larger occupational groups make greater use of extensive analyses and science-based methods for the development of their occupational fields. By adopting this approach, they aim to incorporate future-relevant trends and developments in their occupational field and related fields to coordinate qualifications and increase the permeability in the occupational field or sector.

While such major projects provide a key strategic overview of an occupational field's development, they can generally only be financed by large organising bodies and often with additional support from the public sector. The persons interviewed who are currently or were recently involved in such comprehensive complete revisions emphasise that they are extremely challenging, including for associations with lots of resources. The managers faced great challenges defining the detailed content, while stakeholder management was also very difficult. Even the normal revision processes put strain on most of the professional organisations which are responsible for smaller occupational groups, have less well-financed resources and are dependent on the voluntary participation of members. Some already find the five-year review cycles too high (Bürgi et al., 2022).

5.5 Occupational field development amidst the conflicting priorities of autonomy and regulation

The more precisely legally binding curricula govern an education programme, the less short-term developments can be taken into account de-centrally. This should make the implementation of the rules more homogenous, but more detailed provisions increase the risk of documents not actually being used and complied with in practice. The less detailed and binding the definition of the provisions, the more heterogeneous implementation is, but the greater the autonomy of the learning locations.¹⁴ In general, the question is raised as to whether the regulation levels today comply with the subsidiarity principle under which responsibility for tasks should lie at the lowest level possible and which is most effective for performance of tasks.

Another approach of only governing what is necessary is the training plans open to all types of technology. They allow the three learning locations to incorporate new technologies into

¹⁴ It should be noted that knowledge and expertise are always linked to specific contexts and can only be developed effectively and validly assessed based on sufficiently precise provisions (cf. e.g. Scharnhorst & Kaiser 2018).



training without them having to be explicitly referred to in the plans. However, it is important to take into account that training plans can contribute towards increasing the use of new technologies and innovations within a sector (see Backes-Gellner & Pfister, 2019) which means a balance between regulation and autonomy also has to be struck.

More digital teaching and learning media are also being produced in the field of education as part of the digital transformation. Two points must be noted. Firstly, the professional organisations are responsible for the training plans and play a key role in producing the teaching and learning resources. Their ability to produce digital learning media differs greatly in terms of financial resources. Here an imbalance between occupations with few and lots of learners emerges or grows. Secondly, the dichotomy between precise provisions and autonomy is also reflected in terms of learning and teaching platforms. If they meticulously reflect which technologies or devices are used in the occupation, they must be frequently revised in areas of rapid technological change and restrict the room for manoeuvre of vocational trainers in structuring learning sequences. Another approach is learning media with more open design options which can be filled with learning content by the vocational trainers and learners themselves on a situational basis.

The current range of instruments for occupational development in VET and in the federal professional and federal advanced professional examinations provide a degree of leeway in terms of speed and the level of content detail that can be used by the professional organisations. However, the occupational fields and professional organisations differ greatly which has an impact on the definition processes and results. Friction also emerges at the interfaces between the areas of VET, general education and continuing education which are controlled differently. For example, the nationally controlled, broad-based process of occupational development seems relatively unwieldy compared with the greater flexibility of the universities and other continuing education providers.

5.6 Outlook: Crisis-resilient systems and innovation

A system's innovation capacity plays a key role in enabling adjustments and developments and ensuring its resilience to future crises (Roth et al., 2021). In collectively governed systems, only in exceptional situations can one actor unilaterally carry out rapid, system-wide changes or radical transformation to respond to new challenges. Time-consuming negotiation procedures between the actors are required to develop system-wide solutions for which various bodies exist on an occupation-specific, cantonal or national level. This means innovations in collective systems are incremental – in other words, made in small steps – but that does not necessarily mean they are less effective (Streeck & Thelen, 2005).

The advantages of this consensus-based national governance structure are widespread acceptance of the solutions found and a degree of reliability and consistency. Especially in crisis situations, it is beneficial if actors already have experience of collaboration and a close network exists to develop joint solutions quickly.

The disadvantages of this governance structure are the resources and time required by the negotiation processes and bodies. The capacity for ongoing, system-wide adjustments is limited in view of these costs which leads to a degree of sluggishness. However, there are examples of successful, innovative system adjustments, such as the introduction of the vocational baccalaureate and the universities of applied sciences in the 1990s.



Ongoing adjustments within an occupational field can be made through (occupation-oriented) continuing education due to the low level of regulation. It provides opportunities to trial new approaches in an occupational field and to respond quickly to labour market requirements. Programmes can act as a supplementary element to the formal education system and, where appropriate, be integrated into formal qualifications or count towards them.

In the more heavily regulated areas of VET, ongoing adjustments and innovations are primarily made at the level of the individual actors, who enjoy a relatively high degree of autonomy. The decentralised implementation in various occupations, cantons, companies and VET schools produces a large pool of different types of solutions which have already been trialled. Best practices can be emulated by other actors and integrated at system level.

The crisis caused by the pandemic also contributed to innovations, such as digitalisation in the field of teacher training. This raises the question as to how such innovations can be incorporated into the standard structures and how their consequences are dealt with. Innovative approaches often raise organisational, legal and financial issues which have to be addressed by the actors responsible in the system as a whole. This can in turn restrict the system's innovation capability.

The education system itself has a high degree of innovation potential. Especially in occupational (field) development, innovation – in particular the trialling of new ideas in relation to content, methodology, technology or didactics at all learning locations – can be taken into account more systematically and the scope for experiments actively promoted. This will ensure that the various occupational fields and training programmes are even better equipped for future challenges.

6. LIST OF LITERATURE

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