DIGITAL EDUCATION

STRATEGY OF HUNGARY

Annex to the Government's Proposal

Budapest, 30 June 2016

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GREETING

Today digitalisation is one of the key driving forces of competitiveness, growth and welfare, therefore, the Hungarian Government is committed to digital developments. During the National Consultation (InternetKon) of 2015 on the internet and digital developments initiated by the Government, the citizens expressed their clear and unanimous will concerning the future of Hungarian internet: the web should be available and affordable to everyone, should provide assistance to education and youths, and should not pose a threat to our children's safety.

The Government has prepared the Digital Success Programme (DSP) aimed at the digital development of the Hungarian society and the Hungarian national economy based on the results of the InternetKon survey. The Programme, including the Hungarian Digital Education Strategy (DES), was brought to life based on the recognition that digital transformation is not a matter of choice: it is an inevitable phenomenon that everyone must prepare for, because 20th century knowledge will not allow anyone to be competitive in the 21st century. Digital tools and approaches should be introduced in the classrooms as they are getting deeply integrated into our everyday lives from day to day.

The immediate and radical digitalisation of the educational system is indispensable also in respect of the competitiveness and labour market chances of the upcoming generation: the functions Hungarian youths will be able to fulfil on the labour markets of Europe as well as the role the Hungarian national economy will play in international competition are being decided right now. Obviously, the best way to prepare is through conscious participation in education and lifelong learning. Therefore, since in the 21st century it is impossible to teach and learn with the methods used in the past century, one of the priority areas of the DSP is the drawing up of the Digital Education Strategy of Hungary.

To achieve this, however, it is essential to change the attitude of our social mindset, because only in this way can education become part of our national pride. Education should make teachers, parents and children proud to be part of it. At the same time, it is important that education should provide ready-to-use knowledge: a real link to today's everyday life.

I am thus convinced that the school of the future is a digital one where

- all students and teachers connect to a digital network using digital devices (either their own or those of the school);
- digitally prepared teachers use digital methodologies and digital teaching materials;
- education administration and the further training of teachers also take place on a digital basis.

It is similarly essential that digital education should not be a mere version of traditional teaching that is supported with digital tools. We should create an open educational environment which is based on new approaches, methodologies and requirements and which reacts to the challenges of the digital age.

There proved to be broad professional consensus at the consultations organised during the preparation of the DES. Almost all of the opinions expressed at the consultations held with the various organisations, specialist departments, background institutions and professionals supported

the visions and goals we had set. It has become clear that today the digitalisation of education is a need not only on the part of society and the labour market, but also those in charge of policy-making, education management and government tasks clearly recognised the potential in the digitalisation of the various sub-systems of education.

Obviously, the development of digital competences must be started in public education and should never be stopped: in fact, it is digital knowledge where lifelong learning has a real meaning, since digitalisation is not only the subject but perhaps the most efficient platform of learning.

If the goals set out in the DES are achieved, by 2018

- the digital transformation of the education system will have started and brought tangible results regarding the infrastructure, the availability of devices, digital teaching materials, the digital competences of teachers/instructors, and school administration;
- all teachers and instructors will have an opportunity to (further) develop their digital competences so as to be able to use digital teaching tools and techniques in the subjects they teach in class;
- all Hungarian citizens will have an opportunity to take part in basic digital training for free at the place where they live (or no more than 30 kilometres from there);
- the owners and/or executive officers of all Hungarian small and medium-sized enterprises will have an opportunity to take part in free digital training.

As a result of the above, by 2018 our country will have achieved and by 2020 will have exceeded the EU average in digital literacy and usage, Internet penetration, the digital competences of teachers and the level of digitalisation of education. I know these are extremely ambitious objectives, but I am convinced that it is high time we took action: digital transformation is approaching at such a speed that we must grab all opportunities to prepare Hungarian citizens, otherwise we will lag decades behind.

Given its comprehensive nature, the Digital Success Programme is a coordinated governmental programme affecting the digital ecosystem as a whole, which shows that the Government no longer regards digital developments as a mere area of its development policy: the new approach puts people's welfare in the focus of digital transformation.

All participants of the digital ecosystem must take a role in ensuring that employees and businesses all benefit from digital transformation and that digitalisation will not increase but reduce social differences. In this sense, the Digital Success Programme means that the Hungarian Government will help everyone to take a step forward and prepare for the challenges of the digital age. The DES is a key tool for achieving this goal as it can improve the competitiveness, labour market chances and living standards of the forthcoming generations.

dr. Tamás Deutsch

Commissioner of the Hungarian Prime Minister
Digital Success Programme

EXECUTIVE SUMMARY

1. The Programme, including the Hungarian Digital Education Strategy, was brought to life based on the recognition that **digital transformation is not a matter of choice**: it is an inevitable phenomenon that everyone must prepare for, because **20th century knowledge will not allow anyone to be competitive in the 21st century**.

2. It is similarly essential that digital education should not be a mere version of traditional teaching that is supported with digital tools. We should create **an open educational environment** which is based on new approaches, methodologies and requirements and **which reacts to the challenges of the digital age**.

3. The DES **will fundamentally change the operation of education and training in Hungary**. Once the strategy is implemented, the development of digital competences will not only improve the employability, living standard and social welfare of workers, but it will also **have a positive impact on all factors of the digital ecosystem:**

   - due to the higher rate of usage, it will increase the utilisation of **digital infrastructure** and thus the rate of return of these developments, which will make further developments possible;

   - it will boost demand for the products and services of the **digital economy**, thus generating further developments;

   - it will exert demand pressure on **e–administration** developments, which will improve the available range and quality of services;

   - it will improve the **digital competences** of employees working in public administration and the public sector, which will contribute to further improvements in the quality of services.

4. The preparation of the strategy was immediately preceded by Government Decision No 2012/2015 of 29 December 2015 on the Digital Success Programme (DSP), Section 3(a) of which called on the Prime Ministerial Commissioner responsible for the coordination and implementation of DSP-related governmental tasks to draw up the Digital Education Strategy of Hungary (DES) based on the necessary interdepartmental consultations. **The most important goal of the strategy was to create the possibility of the effective dissemination of digital literacy in harmony with the sectoral strategies and professional objectives at all levels of the education system, thus contributing to increasing Hungary's competitiveness.**

5. **In line with the strategic mandate, the DES covers the entire Hungarian system of education and training.** The areas of intervention/pillars include public education, vocational training, tertiary education, adult learning, and a number of priority horizontal aspects. The individual pillars were analysed in an integrated structure, taking account of the key factors that determine the processes:

   - physical infrastructure, access, intranets;
   - the availability of equipment in education institutions;
   - the digital preparedness and attitudes of teachers;

- the methodology applied (teacher training and further education as well as institution developments);
- content (review of the National Core Curriculum and framework curricula, digital content development);
- education management (administration and quality management, primary information system, student measurement-assessment, management information system).

6. The **situation analysis** carried out by pillar and **validated in the framework of broad professional consultations**

   - found that in the case of public education
     - the development of **digital literacy** is not an adequately integrated part of the knowledge to be transferred in schools: a significant number of students leave public education as digital illiterates;
     - **teachers rarely use ICT tools** and modern technology to support the teaching and learning process;
     - **the rate of usage of available tools is low**; in other cases teachers refuse to use those technologies in the classroom because of outdated equipment or the lack of tools;
     - in Hungary, less than 20% of all teachers use ICT tools in more than 25% of their classes;
     - teachers do not feel competent in the use of **subject-specific ICT tools** either;
     - although the transfer of digital competences appears in the National Core Curriculum as an output target, in order to meet the abstract requirements set out as horizontal expectations, teachers cannot rely on **consistent guidelines, teaching materials, instructions** or, in particular, on uniform and reliably working infrastructure;
     - the **huge difference in available equipment** and the use of non-uniform methodologies and contents make the transfer of digital competences practically impossible;
     - furthermore, this is **an obstacle to acquiring other skills** and makes ICT supported learning as well as other pedagogical tasks (Special Needs Education (SNE), talent development, remedial education, etc.) difficult to perform;
     - there is **no measurement-assessment framework** applied in the practice of public education institutions which could measure the current digital competences of pupils, teachers, specialised teachers and practical instructors or which could designate (and subsequently re-measure) individual development paths; not only does the **insufficient supply of ICT tools** and service environment make the transfer of up-to-date IT knowledge difficult, but it also **hinders the performance of the institutions** in several areas owing to the fact that
       - it does not prepare for the real circumstances of the labour market;
       - it does not engage the attention of students;

- ▪ it does not enable feedback opportunities embedded in the learning process (electronic measurement-assessment, management information systems);
- ▪ it is unable to follow scientific achievements on an up-to-date basis;
- ▪ it imposes a manual administrative burden on teachers and the administrative staff.

● **As regards vocational training, the situation analysis found that**

o the weaknesses and threats revealed in the case of the public education pillar are **even more present in vocational training**;

o **the ratio of digital illiterates is higher** among students learning in vocational training institutions than among secondary grammar school students;

o information technology is taught to secondary grammar school students in 180 lessons, to students studying for a secondary school leaving certificate in secondary vocational schools in 144 lessons, and to vocational training school students studying for a vocational qualification in 108 lessons as part of the compulsory curriculum, however, this classroom time is **not enough to meet the requirements of the NCC concerning competence development,** and nor is it sufficient for fulfilling the requirements of the framework curricula;

o most schools do not have the necessary conditions for presenting the latest technologies in their relevant vocational areas;

o theoretical and practical **teachers** of specialised subjects **do not have sufficient digital competences** or pedagogical-methodological knowledge to place the teaching-learning process into a digital environment;

o **the available set of tools have never been suitable for serving the purposes of digital pedagogy**, in fact, it is increasingly obsolete; vocational training is therefore unable to guarantee the transfer of necessary digital competences to students;

o with the exception of some trades (mainly related to the automotive industry), **the expectations of the labour market are not reflected** in the system of output requirements and framework curricula.

● **According to the situation analysis concerning higher education**

o in certain areas of higher education the **basic ICT infrastructure is outstanding** and meets global standards, however, in other areas it is below the EU average; the backbone network infrastructure (HBONE+ system) is excellent;

o nearly 100% of the students who enter higher education have appropriate digital work equipment (laptop, smartphone, PC), but **institutions have not developed facilities with which these tools could be integrated into the teaching process;**

o the replacement of IT infrastructure, especially the hardware, and the purchase of legal software are critical areas, particularly **due to the prohibition of centralised procurement and the loss of the vocational training contribution**;

o other deficiencies include the **procurement of tools and software** that are required in small quantities for special education and research tasks (e.g. in laboratories or practical training sessions);

o in most cases **digital support is very low** during the courses; the digital availability of course descriptions, requirements, contents, library aids and tests of the individual faculties within the institutions is varied in terms of quantity and quality;

o **the use** of digital textbook libraries and **electronic learning materials is not typical**: 13% of the students use the digital textbook library on a regular basis;

o the course descriptions of study programmes available in Hungary hardly contain work forms that differ from the traditional methods (lectures, seminars, practices); **the most frequent obstacle to modernisation** in these specialised courses **is the institution-level regulation of educational work**, which acknowledges only the most traditional activities which are based on personal presence as paid working time;

o the HAC (Hungarian Accreditation Committee) programme accreditation procedure **does not support** the national and institutional **accreditation** (and thus independent student work in foreign languages) of national and international **online programmes** (online courses available to masses);

o the **contradictory** and critical **situation of language teaching** in higher education requires special attention, **no progress can be expected without online learning**;

o a major hindrance to the spread of digital culture in higher education is that **digital education is developing slowly and sporadically**; only few instructors have the training development competences required for implementing their own courses in an electronic learning environment;

o in 2016 no Hungarian state-run higher education institution had an **internal further education scheme** (involving all teachers and instructors);

o on the other hand, higher education is the leader in the area of **electronic public services**, as these services cover the entire target group.

● For the purposes of the Digital Education Strategy of Hungary, **adult learning** is part of the lifelong learning process and includes all formal, informal and non-formal learning activities, whether general or specialised, that adults take part in to acquire knowledge in addition to what they have learnt during their original studies. In this approach, the focus of the adult learning pillar of DES extends beyond the activities defined in the adult learning act. Based on the situation analysis of this pillar:

o millions of our compatriots do not even have the basic **digital competences** necessary for everyday life;

o relatively few adults reach **higher levels of digital literacy**;

o few apply for and successfully complete **ICT vocational training courses**;

o in the area of adult learning the **utilisation** of ICT and **digital learning potential** is rather low;

o few take part in **adult learning** in general;

o those most in need of digital competence development **do not have the necessary tools** or internet access **at home**;

o **adults lack motivation** for learning;

o **small and medium-sized enterprises** do not find it important to develop their employees' competences;

o adults lack the digital competences that would enable them to join digital learning;

o it is difficult to find one's way, particularly among IT training courses; **there is no clear and uniform definition of digital competences**;

o **the supply of and access to IT training are not adequate**;

o the **misconceptions and bad experience** developed in connection with digital learning hinder its dissemination;

o the participants of adult learning **do not make use of the potential in ICT**;

o **there is no supportive or motivating environment for digital learning**; the regulatory limits and the related financing techniques withhold trainers from using digital learning forms;

o there is no uniform **set of definitions** that is accepted and used by all participants;

o there are no regularly updated and open **teaching aids** available in the required quantity;

o it is difficult to navigate through and search available **digital curricula;**

o there is a **limited availability of data** for strategic planning concerning adult learning.

● **Main findings of the situation analysis of horizontal pillars**:

o **Monitoring the learning path**:

  ● in the 2000s the establishment of **databases in education** began also in Hungary, however, they are typically independent of one another; the connection of databases and systems has only been an idea so far, therefore, the implemented **developments have been of a sporadic nature**;

  ● there is much **redundancy** and inaccuracy **among the systems** with parallel data provision;

  ● the domestic educational databases collect a large amount of data in relation to the life events of students' life paths, but the **rate of utilisation of** such massive **database is rather low**;

  ● due to the current legislative frameworks and privacy restrictions the **connection of systems at personal level is not possible**.

o **Accessibility for persons with disabilities to education and training**:

- at the various levels of public education and training some 4-5% of the students are disabled and their disabilities cause or may cause learning difficulties;

- in the case of digital education and digital learning equal opportunities can be provided by means of digital accessibility;

- Digital accessibility affects two main areas: the accessibility and operability of physical, i.e. hardware elements and the operability of digital services and software;

- in most countries of the world the web accessibility standard W3C WCAG 2.0 is regarded as the basis of legal regulation;

- in general, domestic tenders expect the lowest, i.e. A level accessibility, but they more and more often require one level higher, i.e. AA (two As) level.

  o **Security**:

  - a negligible number of school-age children are aware of security issues;

  - there is no training or recommendation available on security-conscious behaviour specifically designed for the participants of education institutions;

  - in the institutions, there are no persons in charge or a centrally accessible help desk which could be contacted and could provide assistance in case of an incident, security violation or cyberbullying;

  - the institutions do not have an information security strategy or a policy related to information security, whether on an institutional or maintainer level.

7. Based on the situation analysis, we defined the desirable **vision** for each pillar and set the **general and specific targets and the key directions of development**.

8. In the case of public education, the **vision** is a **high-quality and equitable public education system** that prepares young people who are able to adapt to the European and global social and economic environment for successful participation on the labour market, in higher education, and in lifelong learning.

   The **overall strategic goal** is to ensure that **public education can provide opportunities for acquiring the digital competences required by society and the labour market** with special regard to the requirements of vocational education and training, higher education and lifelong learning as well as to the aspects of effectiveness, equity, and efficiency. We broke down the overall strategic goal to further development objectives:

- the ICT knowledge, methodological culture, motivation and use of educational staff should meet the requirements of digital education;

- the supply of digital content, methodological support and knowledge sharing should make it possible to integrate the use of ICT tools in the process of teaching-learning and assessment in all subjects;

- the Internet and equipment supply of classrooms and places where public education tasks are performed should meet the requirements of digital education;

- the equipment provided to students should meet the horizontal requirements (IT security, equal opportunities);

- the decision support, administrative, communication, data supply and organisation options offered by digital technologies should be available to all public education institutions;

- an implementation framework should be set up for the DES;

9. The **vision for vocational education and training** is that teachers and vocational instructors use digital systems that support learning at the level of competence in teaching general and vocational theoretical subjects as well as during practical training, relying on the students' own IT tools; students have access to a sufficient amount of high-quality digital learning materials which are validated with the involvement of labour market participants; the focus of the pedagogical process is the support of students' individual learning paths, which contributes to reducing the number of early school-leavers.

The **overall strategic goal** is to ensure that students completing vocational education and training acquire general and vocational digital competences required by the labour market and necessary for continuing education. Specific objectives:

- to increase the commitment of institution heads towards digital education and digital education administration;

- to develop the digital competences of teachers and vocational instructors in line with the technical and trade-specific requirements of the 21st century;

- to improve the infrastructure necessary for digital education in vocational training institutions;

- to ensure the availability of digital vocational content in respect of all trades.

10. According to the **vision concerning higher education**, in line with the strategic document titled "Upgrading in higher education", there will be a **standardised online digital environment** in Hungarian higher education that will offer **personalised learning opportunities** tailored to age, interest, and the individual's life situation. There will be an **online learning platform, a learning community** where the members of the community are given support in their lifelong learning and development. It is this online platform where higher education institutions will present and upgrade their training offers, flexibly responding to the training needs of employers, students and society.

The **overall strategic goal** that covers the individual students as well as higher education as a whole is to enable the digital preparedness, use of tools and digital work experience of higher education graduates to reach the international standards. To this end, there are three main areas where a breakthrough is required compared to the current situation:

- a change in the present methodology of and approach to teaching-learning, a paradigm shift in higher education; promoting the implementation of student-oriented learning in institutions and encouraging them to make full use of the ICT potential in education and learning;

- development of a learning platform and university life supported with digital tools that help both students and teachers and, in addition, the building of a digital learning community;

- development, maintenance and efficiency improvement of the infrastructure necessary for the paradigm shift.

11. The **vision for adult learning** is to **make every Hungarian citizen a member of the digital community**; to significantly reduce the digital divide and the number of those who have no digital competences or who do not or rarely use such competences, while enabling people to first reach and later exceed the EU average in terms of their general digital competences.

The overall strategic goal: to enhance the competitiveness of the labour force, the active social participation of citizens and social inclusion by increasing society's digital literacy level and the participation of adults in digital learning. The specific objectives are as follows:

- to ensure the development of digital competences throughout the entire adult life path where necessary;

- to increase successful participation in vocational IT training;

- to create a supportive environment for adult-age digital learning and ensure the coordination of digital transformation;

- to ensure the continuous increase in volume and updating of as well as easy access to high-quality digital contents and open educational aids in response to the relevant needs;

- to facilitate the application of digital learning and ICT use in practice and its widespread dissemination in adult learning;

- to establish a systematically built and efficiently operating measurement-assessment and reporting system that can serve as the basis of policy decisions.

12. The set of targets of the **horizontal pillars** include the following strategic elements:

- the strategic goal in monitoring the **learning path** is to create a more competitive education through the utilisation of the sector's digital asset and to improve the effectiveness, equity and efficiency indicators at all levels of education;

- regarding **accessibility** for persons with disabilities **to education and training**, equal opportunities and the possibility of equal access must be guaranteed at all levels of public education and training;

- as for **security**, the strategic goal is that students, parents and relatives should all be aware of the safe use of the digital platform, and they should recognise and learn to manage the risks that may arise during the use of the digital world;

13. After defining the strategic vision and the set of goals, the main intervention areas (groups of tools) as well as the **specific groups of tools and actions** were identified with the involvement of various professional organisations as well as civilian, educational and administrative experts. In the case of public education these are the following:

- ***Establishing a set of output requirements that supports digital competence development***

o Identification of digital competence requirements in a progressive system, in the form of a framework of reference for teachers/trainers/vocational instructors and students.

o Identification of compulsory digital competences students are expected to acquire in the course of their progress in order to move from one level of education to the next.

o Adding the measurement of digital literacy to the National Assessment of Competences.

o Compulsory introduction of electronic examination in the written part of the secondary school leaving exam.

o Review and updating of the National Core Curriculum (NCC) and the framework curricula to support digital competence development.

o Adding an element supporting digital competence development to the interfaces of framework curricula in respect of each element of the output requirements.

o The use of students' digital key competences should be included in the framework curricula of non-IT subjects as a compulsory element.

o The learning tasks of students should include information search and processing, the use of ICT-supported solutions of collaboration, and the development of media awareness.

o The practical use of ICT should be integrated into the learning of science subjects through measurement, data processing, and evaluation on the basis of digital sensors and display in reality (e.g. via 3D printing).

o Framework curricula concerning IT disciplines must be reviewed every two years.

o The information technology subject must be re-defined in curriculum development; among output requirements IT competences must be reviewed and extended.

● *Creating learning materials and environments that support digital competence development*

o Compulsory teaching of typewriting in one of the lower primary school years, providing infrastructure which is necessary for teaching and which suits the age concerned.

o Age-specific e-learning materials should be made available to students, tailored to their needs, possibly in several alternative versions.

o Promotion of the sharing of digital lesson plans and contents developed by teachers.

o Adoption of existing international good practices concerning digital content and promotion of participation in online teacher communities.

o Use of internationally approved standards concerning teaching materials, tests and output requirements in content development as well as in connection with players.

o Introduction of digital measurement-assessment systems and the general use of electronic knowledge tests, which make it possible to support formative assessment.

o A central task bank which is able to support the measurement-assessment functions in respect of public education as a whole.

o Digital devices should be compulsory elements of classroom furniture, both for general and specialised subjects.

o Teachers should be provided methodological support in their preparation for and holding of lessons based on digital teaching.

o The employment of ICT pedagogical assistants can guarantee the implementation of the pedagogical goals set out in the DES and the support of teachers' work.

o The system administration service provided at public education institutions guarantees the high level of availability of tools and their applicability for pedagogical purposes.

o Transformation of school libraries in an effort to develop information and media literacy, learning techniques, independent learning, and information processing.

o To safeguard children's mental and physical health to the fullest possible extent, special emphasis must be laid on the establishment and maintenance of real human relationships and on counterbalancing the lack of physical activity arising from the use of digital tools.

● *Developing the ICT-based pedagogical-methodological practice of teachers*

o The compulsory level of digital competence expected of teachers for their advancement on the pedagogical life path should be determined.

o It should be compulsory to integrate special digital pedagogical methodology training into general subject teacher training, and the output requirements of teacher training must include the use of digital pedagogy as a mandatory element.

o Regular further training on digital key competences and digital pedagogical methodology should be compulsory and free.

o It should be compulsory to exploit the potential of digitalisation in the development and accreditation of the further training of non-ICT-specific teachers.

o Ensuring the exchange of experience at international and national levels concerning the dissemination of existing teaching practices.

o The basics of teaching programming should be added to the output requirements of mathematics and science teachers.

The criteria of assessment concerning digital competences should be strengthened in the teacher evaluation system.

o Development of the management competences of institution heads with a view to introducing and ensuring the sustainability of ICT-based education.

o Integration of internet awareness and security-conscious behaviour in the public education system through the further education of teachers.

o Early childhood IT education must be integrated into kindergarten education.

● *Developing digital infrastructure*

o   In public education institutions with less than 500 students, a bandwidth of at least 100 Mbps must be made available, while the minimum bandwidth should be 1 Gbps in institutions teaching more than 500 students.

o   The Gb/s local network should be implemented to provide for internet access in classrooms.

o   The required bandwidth must be provided to students by means of manageable WiFi coverage in all classrooms and the school library.

o   Internet access should be made available via a WiFi network in a community space of each kindergarten building.

o   A structured, protected network and border protection tools should be integrated into the system along with up-to-date anti-virus protection, spam filtering, content filtering and protected web interface.

o   Equipment of 50% of the classrooms with interactive display devices.

o   Providing classroom management services for the management of computers and mobile devices in the classroom (screen share, disabling internet access, user management).

o   Equipment of 40% of specialised classrooms with interactive display devices suitable for 3D display and the necessary glasses.

o   At least one 3D printer per every 500 students in primary and secondary schools.

o   In addition to the above devices, a programmable robot must be available for every 3 students in the computer classroom.

o   There should be digital data loggers[1] and sensors in science classrooms in order to support scientific experiments.

o   Each institution should have a multimedia laboratory in the library or resource centre (digital camera, VR display, workstation and peripherals suitable for multimedia editing).

o   In every school district it is necessary to equip one demonstration laboratory, which can be visited by the schools of that district, and which is suitable for demonstrating all scientific experiments required for the secondary school-leaving exams in a digitally supported form, also as remote experiments.

o   All teachers must have a laptop they can use in order to prepare for and hold digital lessons (controlling interactive displays) as well as for digital education administration.

o   As for student devices, it is a requirement that students should bring their own devices (BYOD) to class and use them in the teaching process. The school should provide the necessary devices to students who do not have their own.

o   A programme must be worked out to support the purchase of own devices in the appropriate quality and to make sure they are suitable for cooperation.

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[1] Measurement data recorder.

o In public education institutions teachers should have a possibility to hold classes other than information technology in an IT classroom.

o In the institution, a set of IT devices should be made available to teachers (tablet, laptop or hybrid device) which all or some students can use during a part of the lesson in the classroom or outside the classroom in an area designated for this specific purpose.

o Sources of funding must be made available to cover the costs arising from the depreciation and replacement of tools with a view to maintaining and upgrading the ICT infrastructure at a uniform standard.

● *Establishing digital centre support services*

o A digital methodological centre should be set up for the purposes of coordinating the innovation, methodological development, monitoring, communication, strategic and supporting tasks relating to the implementation of the Digital Education Strategy of Hungary as well as for supporting and monitoring the digital pedagogical renewal of the areas of public education and vocational education and training.

o The centre will be responsible for elaborating the framework of reference and measurement-assessment tools of digital competence requirements concerning students, teachers, institution heads and all types of education institutions and to launch pilot programmes which will use functional effectiveness assessments to serve as a basis for developments to be implemented within the framework of the Strategy.

o Further development and functional expansion of the National Public Education Portal (NPEP) through more extensive opportunities for knowledge sharing among teachers and a wider range of content; ensuring the availability of the National Public Education Portal for vocational education and training as well as for public education and higher education institutions engaged in Hungarian language teaching abroad, students, and Hungarians living abroad.

In the course of further developments, it would be necessary to establish a searchable system that is interoperable with the content libraries of public collections as well as the archives of the Media Services and Support Trust Fund (MTVA) and to keep the content and function of the National Public Education Portal up-to-date and ensure its continuous development.

o A knowledge sharing site should be made available to teachers where they can consult a collection of pedagogical good practices and which gives them an opportunity for independent learning and self-evaluation and for sharing content and cooperating with other teachers.

o A system should be defined which enables the Public Education Measurement Evaluation Department of the Education Authority to measure and assess the competence development capacities of public education institutions through the coordination of the digital methodological centre, with the involvement of experts participating in the development of the IKER (Integrated Micro-Region E-Administrative) system.

o The label system of "Digital School" should be developed in order to provide information on the digital compliance level of public education institutions, including the availability of internet access and ICT tools, the digital readiness and digital teaching practices of teachers as well as the digital extra-curricular activities they offer, etc. This should be linked to the DigCompOrg framework to ensure international comparability.

o It is an equally important task to ensure the supply of information for education administration purposes as well as to parents via the use of the electronic class registers.

o Digital education administration solutions should guarantee the ability to fulfil the data disclosure obligation of the teachers and institutions and access to information that is required for the performance of their activities.

14. As regards **vocational education and training** (VET), the strategy focuses on the following groups of tools:

● *Establishing a set of VET output requirements that supports digital competence development*

o Launching sector-specific pilot programmes to identify general and professional digital competences required by the labour market.

o Review and further development of vocational and examination requirements, vocational requirement modules and VET framework curricula with the aim of supporting digital competences.

o The regulatory documents should highlight the industry-specific IT requirements in the case of all types of vocational training (e.g. Digital design programs, drawing programs, use of planning and budgeting programs, digital management skills, etc.).

o Adding an element supporting digital competence development to the interfaces of framework curricula in respect of each element of the output requirements.

o Methodologies based on students' digital key competences should be included in the framework curricula of non-IT subjects as a compulsory element.

o Presenting digital competences as a criterion of professional advancement in the life path model of teachers and vocational instructors working in vocational education.

o Presenting digital education as an assessment criterion in the school inspection system.

● *Elaborating industry-specific curricula that support digital competence development*

o Establishing a digital knowledge base and digital code of practice which contain e-learning materials meeting labour market demands in respect of each vocational qualification to cover all vocational output requirements for the purposes of supporting different learning needs possibly in a number of alternative versions.

o Ensuring the creation of digital content developed by teachers of vocational subjects and practical instructors.

o Ensuring the share of digital content within and between the institutions.

- ***Developing the ICT-based pedagogical-methodological practice of teachers and vocational instructors***

  o Adding contents required for digital education to the requirements of vocational instructor (BSc), engineer instructor and economics teacher training courses as well as courses preparing for the master's examination.

  o Providing specialised further training supporting digital education to teachers of vocational theoretical subjects and practical instructors.

  o Supporting the introduction of Learning Management Systems in vocational training institutions.

  o Establishing communication channels necessary for the sharing of digital methodologies within and between the institutions.

- ***Development of digital infrastructure in specialised classrooms and workshops***

  o Building a Gb/s network required for local data traffic in each classroom and practical training site.

  o Providing WiFi coverage in all specialised classrooms as well as in school and company workshops.

  o Establishing online learning platforms also available to students at institutional, class, vocational qualification and subject level.

  o Building and improving specialised digital classrooms supporting vocational education (e.g. 3D designers, study offices etc.).

  o Making mobile equipment available to students anywhere in the area of the institution.

- ***Improving the commitment of institution heads towards supporting digital education in vocational training institutions.***

  o Providing further training on the methods of the institutional dissemination of digital education to heads of institutions and practical training.

  o Full introduction of a uniform, continuously maintained digital administration system to support education in all vocational training institutions.

15. The main groups of tools of the higher education pillar:

- ***Developing learning-intensive higher education***

  o Establishing a Digital Higher Education Competence Centre, which participates in the review of the regulatory and accreditation criteria of higher education and the renewal of the training offer.

  o Supporting educational innovations, methodological research, and exit to the international online education-research platform.

o Connecting fields of science that are related to digital learning, strengthening the existing higher education research centre knowledge, and involving new institutions and organisational units with relevant experience;

o Further training supporting the development of the methodological culture of teachers in the areas of education methodology (education technology) and general digital competences;

o Developing a training offer which is suitable for satisfying the learning needs of the working adult population.

o Developing the adult training organisations of higher education institutions with an entrepreneurial approach, systematising their training offer as well as standardising and digitalising their operation (establishing an online adult training network under the management of higher education institutions).

● *Developing an electronically supported higher education platform*

o The basis of the higher education digital platform is the availability of a critical mass of appropriate online and digital contents to students and teachers. o It is recommended to further develop the currently operating digital textbook library and to set out stricter requirements concerning the final form of digital learning materials.

o Online preparatory courses for the secondary school-leaving and university entrance exams organised at national level – centrally organised online preparatory courses.

o Expanding the information services of the felvi.hu website and its linking with other online customer service platforms such as information systems relating to financial aid available for housing, travelling, student loans, etc.

o Developing an online career orientation website.

o Online central site for the dissemination of information necessary for potential foreign students.

o Making university websites "bilingual" and accessible to people with disabilities.

o In addition to the development of online learning materials, special emphasis must be given to the development of courses in foreign languages as well.

o Strengthening international partnerships through the use of digital tools and digital methodologies.

o Setting up a portal of good practices which summarises both international and domestic good practices.

o Student services directly and indirectly related to learning which can also be operated via digital platforms.

● *Providing digital tools and IT infrastructure*

o Removing the procurement stop.

o Extending and renewing the clean software programme with the involvement of sector-specific software the student versions of which are available to the students of the relevant study programme.

o Elaborating a resource-generating, resource-allocating system suitable for the development of digital teaching tools, instruments and learning materials.

o Spreading the VOiP technology among institutions with a view to reducing telephony-related expenses.

o Procuring WiFi routers providing access to broadband internet at institutions.

o Establishing flexible learning (collaboration) platforms at institutions, procuring easily movable furniture and building small group rooms.

16. The adult learning pillar contains the following groups of tools:

● *Reducing the digital divide*

o Organizing a nationwide campaign to promote (digital) learning as well as promotions and additional local community campaigns and voluntary activities.

o Establishing hotspots that are suitable for digital competence development to ensure that within a maximum distance of 30 km everyone can have access to a digital learning workshop.

o The special learning needs of people with a low level of education and weak basic competences, people with disabilities, the elderly as well as those disadvantaged on account of their social and family circumstances must be taken into account.

o Introducing electronic public services as extensively as possible, giving them priority with various tools, and promoting their use.

o Regular informing, targeted sensitisation and awareness-raising of local participants (e.g. employment centres, family aid centres, experts of NGOs, employers, trainers, etc.).

● *Development of digital competences throughout the entire adult life path where necessary*

o Establishing a system that supports the recognition of competences acquired through non-formal and informal education.

o Providing financial tools (e.g. fiscal incentives, cafeteria, access to services) to the public, especially to the employees of SMEs with a view to promoting their participation in digital competence development.

o Harmonising the various sector-specific strategies, measures and regulations.

● *Promoting participation in vocational IT training courses*

o Launching programmes that go beyond traditional forms of training and reduce – already in the short run – the shortage of labour, which jeopardises the development of ICT companies and the digital economy.

o Campaigns, promotions and campaigns mobilising local communities on a national scale.

o Establishing a national coalition which deals with digital competences and jobs.

o Elaborating programme requirements aligned with market demands in addition to the current supply.

o Supporting vocational further training courses of a small number of training hours that rapidly react to technological development and the changing needs of labour market participants and ensuring quick registration.

o Identifying target groups and content areas where it is reasonable for the government to take a role.

It is necessary to find and continuously monitor modern, gap-filling foreign language digital learning materials the translation/adaptation of which is more cost-efficient than the development of new contents.

o Advanced (reformatory) professional training for IT instructors who teach in formal vocational education (adult education) and non-formal vocational training.

● *Creating an environment supporting adult-age digital learning*

o Continuous coordination with a view to harmonising sectoral strategies and strategies aimed at the utilisation of EU development resources.

o Setting up a professional body responsible for digital learning and content development.

o Supporting the elaboration of new, innovative digital learning forms and enabling their widespread use; developing forms of support tailored to the characteristics of digital learning.

o Introducing the application of creative public goods in respect of digital teaching materials available for free use.

o Setting uniform standards for the digital training environment of training organisations.

o Systemic integration of electronic identification and individual student records in relation to adult learning.

o Setting up a controlling and assessment system based on the measurement of learning outcomes acquired in the course of digital learning and laying its professional and methodological groundwork.

o Measurement embedded in the learning process of the outcomes of training and learning (including non-formal and informal learning) by extending and complementing traditional examination processes.

o Introducing, on a national level, the e-portfolio approach that verifies learning outcomes in order to ensure electronic access to information concerning acquired qualifications

and to introduce validated digital badges which verify competences acquired via non-formal and informal learning.

- ● *Providing digital contents and open educational aids*

  o It is necessary to ensure the availability and usability of teaching materials (in technical and copyright terms), their classification based on a uniform set of criteria, their quality rating, and their searchability.

  o Elaborating quality and technical requirements concerning electronic training contents.

  o Digital contents and applications necessary for the development of basic competences required for success in everyday life, learning and employability (writing, reading comprehension, numeracy, digital literacy, learning skills, etc.) in the form of open teaching content will be elaborated and made available for free use in a centralised manner.

- ● *Digital learning and ICT use*

To make sure that the supported adult training programmes are implemented in the expected quality through the exploitation of new opportunities, it is necessary

  o to identify factors that hinder the spreading of digital learning in adult education;

  o to elaborate a set of criteria relying on the typical key processes and activities of organisations engaged in digital training and education, taking the international criteria applied by digital educational organisations into account (DigCompOrg).

  o to establish an assessment system based on the self-assessment of training organisations;

  o to support the creation of the technical conditions required for the switch;

  o to develop the digital competences of instructors and teachers involved in adult learning and to elaborate training programmes.

- ● *Measurement-assessment and reporting systems*

  o Laying the foundations of decision-preparation by collecting and analysing data and measurement results and monitoring user needs.

  o Feedback concerning labour market relevance in respect of each training course, which information can be backchannelled into the development of the industry structure and training management.

  o Ensuring efficient data disclosure and easy access to relevant, up-to-date information.

  o Connecting the IT systems operating at the various governmental and background institutions and at the chambers.

  o Examining the opportunities of electronic identification in respect of adult learning and the systemic integration of the individual student identifiers.

17. Main elements of the equipment of horizontal pillars:

Monitoring the learning path:	Accessibility for persons with disabilities to education and training:	Security
- integrating the data of source databases; - checking the usability of data levels and data; - analysing the Public Education Information System and the Higher Education Information System - exploring the labour market as a data source; - managing data authenticity problems, Educational Register; - elaborating data-based pedagogy and management methodology and practice; - monitoring data integration and processes; - establishing and operating a monitoring system;	to ensure equal opportunities, electronic services and digital learning materials must be made accessible, digital devices must be made available to students with disabilities in education institutions, and educational staff teaching students with disabilities must be prepared for the use of digital tools.	- increasing the security awareness of children, parents and relatives; - widespread dissemination of information and raising awareness concerning legal opportunities; - applying sanctions and strengthening communication; - strengthening and extending assistance and victim help; - strengthening the information security related competences of system administrators; - establishing a crisis centre - central recommendation and support system; - teaching safe information management techniques; - training on information security for teachers; - regular education and training on information security - cyberbullying helpline

18. The **detailed planning of the financial conditions** of the strategy and the tools recommended in the framework of the strategy will be carried out as part of the implementation of the strategy itself. This can take place after the Government has approved the strategy.

19. In the course of financial planning the first task is to examine which **EU programmes** can contribute to the implementation of the individual development objectives. During implementation, after identifying the relevant development programmes, it is necessary to analyse **to what extent the individual programmes serve the achievement of the development objectives set out in the DES**. To perform this task, the sub-elements of the already running programmes (targets set, tools, activities, indicators) must be analysed in detail on the one hand. On the other hand, programme elements that are the **most relevant for the purposes of the DES** must be identified and adjusted, if necessary, during the planning process of the programmes under preparation.

20. It is a key criterion that a possible modification of the professional content (scope) should not hinder the scheduled implementation of the project(s). To this end, it is advisable to involve the

Digital Success Programme Secretariat and the professional team of the DES in the planning process of the annual development budgets of the OPs concerned.

21. After that, during the elaboration of the specific actions, it is necessary to make well-founded estimates of the amount and timing of additional resources required for the overall implementation of the DES objectives. The resource estimates plan must cover requirements concerning the planning, preparation and implementation of the action as well as the sustainability of its results and impacts.

22. As for financial sustainability, regarding the high demands arising from the short life cycle, the calculation of the **total cost of ownership** (TCO) must also be taken into account during implementation. Furthermore, to calculate the total cost, it is necessary to take account of other costs arising from digital solutions and the economic multiplier effects.

1 INTRODUCTION

The Government approved the Digital Success Programme, including The Digital Education Strategy of Hungary (DES) as one of its key strategic elements, aimed at the digital development of the Hungarian society and the Hungarian national economy based on the results of the national consultation of 2015 on the internet and on digital developments (InternetKon). The purpose of drawing up this strategy was to prepare the system of education and training for performing education, instruction and training tasks in line with the needs of the digital society and economy in terms of infrastructure, technology, content, work organisation and human resources.

This document contains situation analysis as well as a summary of the set of goals and tools of the DES.

1.1   Motive and Mandate

Section 3(a) of Government Decision No 2012/2015 of 29 December 2015 on the Digital Success Programme calls on the Prime Ministerial Commissioner in charge of the coordination and implementation of governmental tasks relating to the Digital Success Programme **to prepare and submit the digital education strategy to the Government** in cooperation with the Minister for Human Capacities, through consultations with the Minister for National Economy and the Minister for National Development.   After its approval, the related legislative acts and strategies must be reviewed in accordance with the content of the strategy.

In the framework of the task set out in the Government Decision, the mission statement of **The Digital Education Strategy of Hungary** was drawn up: **to prepare the system of education and training for performing education, instruction and training tasks in line with the needs of the digital society and economy** in terms of infrastructure, technology, content, work organisation and human resources.

According to the intention of the strategy, in the future **no one can leave the education and training system without basic digital competences required by the labour market**. Accordingly, the purpose of the DES is to fulfil, in all elements of the Hungarian education system, **the infrastructural, material and personnel requirements for the development of digital competences that are regarded as basic competences** from the viewpoint of employability and labour market competitiveness.

The DES will fundamentally change the operation of education and training in Hungary since it

- affects all participants and activities of education and training;
- expects all education and training organisations to provide an online learning platform;
- provides an opportunity for equal access and inclusive teaching through digital devices and services;
- aligns the professional structure and system of training with 21st century labour market needs;
- creates the conditions required for catching up with the EU average in adult education;

- relies on EU resources as supplementary means for the necessary innovation, research and trial, while laying the foundations of a sustainable and continuously renewing IT equipment and digital education system basically using domestic resources.

1.2   Significance of the Area

By now the use of digital technologies has become an integral part of our everyday lives and most work processes, therefore, it is an essential economic and social requirement that the school should prepare students for the use of digital technologies and devices at the level of competence. In spite of this trend, however, in Hungary more than one third of the population aged 15 or older are **digitally illiterate** and most of them are threatened by the digital divide. The **employability** of workers who cannot use digital devices and applications **is declining from day to day**, and so is the competitiveness of companies refusing to join the digital world.

The development of digital competences will not only improve the employability, living standard and social welfare of workers, but it will also have a positive impact on all factors of society and the economy as a whole:

- It significantly increases the number of undertakings using digital technology, thus improving their efficiency as well as international competitiveness.

- It contributes to increasing the capital attracting capacity, the main obstacle to which is the lack of appropriate workforce.

- It facilitates the social inclusion of people with disadvantages and disabilities.

- Due to the higher rate of usage, it **increases the rate of utilisation of digital infrastructure** and thus the rate of return of these developments, which will make further developments possible.

- It **boosts demand for** the products and services of **the digital economy**, thus generating further developments.

- It exerts demand pressure on **e–administration developments**, which will improve the available range and quality of services.

- It improves the digital competences of employees working in public administration and the public sector, which will contribute to further improvements in the **quality of services**.

In an international comparison, it is the area of digital competences that Hungary lags behind to the highest degree, which means

- a high rate of digital illiteracy;

- a low level of usage of the various digital (market and e-administration) services, and

- a generally low level of the population's digital competences.

Consequently, the development of digital competences both within the education system and among the adult population is a key criterion of competitiveness, while it also has considerable potential in increasing equal opportunities and living standards.

The employability and labour market chances of Hungarian employees and our children largely depend on whether or not they can meet the expectations of the digital era regardless of the profession and position they choose to work in. In fact, digital transformation does not leave any traditional sector, undertaking or business model intact. The role Hungarian employees, especially young people will play in the European labour market and the function the Hungarian national economy will have in the international competition will be basically decided in the years to come.

Digital education means much more than the mere support of traditional education with digital tools: it comprises a new approach, new pedagogical methodologies, new learning methods, the traceability of the learning path, and the development of an open educational environment which reflects to the challenges of the digital era. Obviously, the development of digital competences must be started in public education and should never be stopped: in fact, it is digital knowledge where lifelong learning has a real meaning, since digitalisation is not only the subject but perhaps the most efficient platform of learning.

Having digital competences is increasingly vital for success on the labour market, however, their development is not the task of the IT subject alone, instead, it requires an approach that embraces the educational spectrum as a whole. This involves the conscious use of digital devices and pedagogical methodologies designed for educational purposes, the systematic and continuously updated digital pedagogical preparation of teachers and instructors, the digital pedagogical support of teachers' work as well as the digitalisation of learning materials and education administration.

1.3   The Process of Strategic Planning

In addition to **professionals experienced in the digital development** of certain special areas of education, the Digital Success Programme Secretariat has also involved **methodological and development experts** in the preparation of the DES who have contributed through their digital pedagogical skills and their in-depth knowledge of strategy making methodologies to the strategy making process. Another important methodological element of strategy making was to process national and international good practices as well as to engage in continuous professional dialogue as widely as possible.

In the past months, the experts of the DES and the staff members of the DSP have taken part in numerous **professional consultations, forums, workshops, personal interviews and discussions and have held several lectures and presentations** attended by various administrative, non-governmental and professional organisations. The situation analysis of the strategy and the finalisation of its set of goals and tools were preceded by Digital Welfare Forums, each with more than a hundred participants.

The participants attending these events had a possibility to confirm that there are reasonable grounds for the strategy as well as to clarify its system of targets and tools in person or in writing (via mail or online).

1.4 Background and Related Documents

The aims of the DES are in harmony with the National Infocommunications Strategy (NIS) and the Digital Success Programme. Regarding digital education, the most important related strategic documents are:

- Hungary's Public Education Development Strategy;

- the National Core Curriculum;

- the vocational education and training concept approved by Government Decision No 1040/2015 of 10 February 2015 entitled "*Vocational education and training in the service of the economy*".

- "*Upgrading in Higher Education*".

Furthermore, during the professional consultations the Ministry of National Economy indicated that a National Core Competence Development Strategy with its overall objective being the development of the domestic population's digital competences in addition to their literacy, numeracy and foreign languages skills is being prepared.

Government Decision No 2012/2015 of 29 December 2015 on the Digital Success Programme provides for the preparation of four strategies: the Digital Child Protection Strategy (DCPS), the Digital Export Development Strategy (DEDS), the Digital Education Strategy (DES), and the Digital Startup Strategy (DSS). Tailored to the characteristics of the digital ecosystem, the individual strategies are closely related and facilitate the achievement of digital welfare by making use of and relying on each other's results. The set of tools of DES supports the elimination of the shortage of human resources both in terms of quality and quantity arising from inadequate digital competences, as specified in the DEDS, while the "Security" horizontal pillar of the strategy is based on the set of goals and tools of the DCPS).

Further related materials:

- EU and Council Recommendation of 20 December 2012 on the validation of non-formal and informal learning (2012/C 398/01).

- EU and Council Conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ("Education and Training 2020") (2009/C 119/02).

1.5 Designation of the Strategic Pillars

The pillar structure of the DES keeps track of the learning path from public education to adult learning, treating equal opportunities and accessibility, security issues and the development of monitoring systems for the learning path as horizontal pillars.
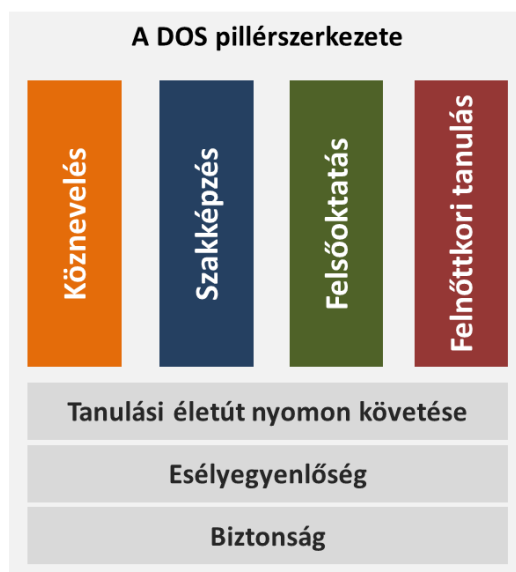
A DOS pillérszerkezete	Pillar structure of the DES
Köznevelés	Public education
Szakképzés	Vocational education
Felsőoktatás	Higher education
Felnőttkori tanulás	Adult learning
Tanulási életút nyomon követése	Monitoring the learning path
Esélyegyenlőség	Equal opportunities
Biztonság	Security

The DES covers all levels and factors of education:

● the methodology applied (teacher training and further education as well as institution developments);

● the digital preparedness and attitude of teachers;

● physical infrastructure, access, intranets;

● the availability of equipment in education institutions;

● content (review of the National Core Curriculum and framework curricula and digital content development);

● education management (administration and quality management, primary information system, student measurement-assessment, management information system).

2 PUBLIC EDUCATION

2.1 Situation Analysis

2.1.1 The importance of digital competences

Digital skills have become core competences of increasing significance in today's digitalising economy and society: social and labour market success depends more and more on the ability to handle digital devices. Therefore, education and training treats these as key competences, similar to the competence of communication in the mother tongue (writing-reading-reading comprehension). Digital competences ensure the transfer of communication messages, access to and processing of information as well as management and control during the performance of work. In everyday life and in social contact, it is a source of acquiring knowledge, learning and entertainment, an increasingly important platform for contacts, administration, and shopping.

Despite their growing significance, however, there are considerable differences in digital competences within the society, depending on geographical and social situations. This increases social inequalities because those with digital competences have access to certain services and benefits more easily and quickly, while those with no or limited digital skills are at a great disadvantage. It is essential also from the aspect of creating opportunities that education and training should treat the transfer of digital competences as a priority issue.

Although digital competences are measurable, in Hungary no standard framework system suitable for measuring digital competences has been set up in order to assess the existence or lack of digital competences. The most generally used solution, which makes international comparison possible, is the PISA survey of OECD on digital literacy.

The greatest challenge Hungarian public education is facing is to increase the quality, efficiency and opportunity creating power of education and training in a globally unstable macroeconomic environment where processes requiring a quick rearrangement of the labour market are expected to take place in several waves (spread of digital transformation, disruptive technologies, automation, robotics, and communication between sensors and machines (M2M), Industry 4.0, etc.). Although the infocommunications technologies are present at domestic schools, our relevant PISA results remain far below the expected level.

In Hungary, the average result of printed reading comprehension is stronger (by 38 points) than that of digital reading. Comparing the national results with the 2009 data we can see that by 2012 the performance of Hungarian students had further weakened, while in 2009 27% of the students performed below the average in digital sub-areas, by 2012 this rate increased to 32.5%.

Percentage of students ranked by their digital reading performance, PISA, 2012

Az országok a 2, 3, 4, 5, és 6, szinthez tartozó tanulók százalékos aránya szerinti csökkenő sorrendben szerepelnek.
Forrás: OECD, PISA 2012 database, Table I.4. Ia.

A 2. szinten vagy fölötte lévő tanulók	Students at Level 2 or above
Az Ia. szinten vagy alatta lévő tanulók	Students at or below Level 1a
Korea	Korea
Szingapúr	Singapore
Japán	Japan
Makaó-Kína	Macao - China
Hongkong-Kína	Hong Kong - China
Sangkaj-Kína	Shanghai - China
Kanada	Canada
Írország	Ireland
Tajvan	Taiwan
Észtország	Estonia
Ausztrália	Australia
Egyesült Államok	United States
Franciaország	France
Dánia	Denmark
Olaszország	Italy
Norvégia	Norway
Svédország	Sweden
Belgium	Belgium
OECD-átlag	OECD average
Németország	Germany
Portugália	Portugal
Ausztria	Austria
Lengyelország	Poland
Szlovákia	Slovakia
Spanyolország	Spain
Chile	Chile
Izrael	Israel
Magyarország	Hungary
Brazília	Brazil
Arab Emírségek	Arab Emirates
Kolumbia	Colombia
Ib. szint alatt	Below Level 1b
Ib. szint	Level 1b
Ia. szint	Level 1a
2. szint	Level 2
3. szint	Level 3
4. szint	Level 4
5. szint	Level 5
6. szint	Level 6
Az országok a 2. 3. 4. 5. és 6. szinthez tartozó tanulók százalékos aránya szerinti csökkenő sorrendben szerepelnek. Forrás: OECD, PISA 2012 database. Table I.4. Ia.	The countries are ranked in a descending order of the percentage of students at Levels 2, 3, 4, 5 and 6. Source OECD, PISA 2012 database. Table I.4 1a

Source: PISA 2012 Overview, page 48

The level of numerical reasoning skills is definitely poor: more than one quarter of all 15-year-old students are low performers. On the one hand, this weak performance is attributable to the shortages of primary school education. On the other hand, it forecasts the future of a broad section of the upcoming generation, who – due to the lack of abilities to acquire, analyse and systematise knowledge independently – will be incapable of adapting to labour market requirements, coping in the context of the adult society, developing themselves continuously, or performing high-quality work in their professions.

During the PISA survey[2], fifteen-year-old students were also asked about computer access and use at school. Access to computers and internet at school is a more complex issue, because it ranges from non-stop and easy access to the use of one single computer room only in IT classes. If we only examine the percentage of students who have access to computers and internet at school, we can see that this ratio is quite high in Hungary: 95.2% of the students have computer access and 95.6% responded that they had internet access at school. In an OECD[3] comparison, these ratios are 93.1% and 92.6%, respectively.

At the same time, the percentage of fifteen-year-old students who actually use computers and the internet at school is much lower: 69.3% use computers and 69.5% use the internet – and these indicators do not refer to ICT use in class at all. The development of digital reading is not an adequately prioritised part of the knowledge schools are required to transfer. Teachers rarely use ICT tools and modern technology to support the teaching and learning process; such activities are scarce and are not provided enough central aid. The rate of usage of the existing equipment is not always adequate. At the same time, teachers often complain about the lack of devices or their obsoleteness when they decide not to use these tools in class. At the same time, teachers do not feel competent in the use of subject-specific ICT tools either.

Although the transfer of digital competences (digital literacy interpreted in a broader sense) appears in the National Core Curriculum as an output target, in order to meet the abstract requirements set out as horizontal expectations, teachers cannot rely on consistent guidelines, teaching materials, instructions or, in particular, on uniform and reliably working infrastructure. The heterogeneous equipment, in which respect there is a huge gap between the individual institutions, as well as the scattered, inconsistent methodological and content offer practically make it impossible to transfer the necessary digital skills, which hinders the learning of other competences as well, and makes ICT-supported learning as well as the performance of other pedagogical tasks (SNE, talent development, remedial education, etc.) more difficult.

As the technological environment is improving, the lack of appropriate ICT devices and service environment attributable to a number of reasons (unfunded maintenance and upgrading of equipment, low bandwidth, lack of system administrators, lack of training) is making the transfer of state-of-the-art IT skills difficult and hinders the performance of institutions in many areas. A public education institution lacking an appropriate ICT environment:

- is unable to prepare for the real circumstances of the labour market;
- does not engage the attention of students;

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[2] *PISA 2009 Digital reading Reading on the World Wide Web* URL: http://www.oh.gov.hu/orszagos-nemzetkozi/pisa/pisa2009-digitalis

[3] www.oecd.org/pisa/

- does not enable feedback embedded in the learning process (electronic measurement-assessment, management information systems);

- is unable to follow scientific achievements on an up-to-date basis;

- imposes a manual administrative burden on teachers and the administrative staff.

Below we examine the state of digitalisation of Hungarian public education in terms of the following factors:

- infrastructure (access to devices and the internet, built environment, supporting services);

- the digital preparedness of teachers;

- digital content in the teaching and learning process.

2.1.2 Infrastructure

Already when the Lisbon targets were set, the European Union defined a clear vision concerning the use of ICT tools in education[4]:

- ICT tools should be present in the entire area of education and training should not be limited to the transfer of user skills.

- The use of ICT tools should be integrated into the teaching-learning process at the level of competence.

- The content and availability of learning materials should be more flexible, education should take place in an open learning environment.

- The school should develop and improve the basic competences necessary for lifelong learning and prepare students for the use of new learning forms and tools.

In accordance with the EU's intentions, since the turn of the millennium significant developments have been implemented with the aim of increasing the availability of infrastructure in Hungary's public education institutions. The purpose of the first notable initiative called the "Sulinet" programme was to equip schools with computers and install internet connection. In 2005, this was followed by the "Public education IT development programme", which aimed to provide interactive whiteboards to schools, and then in the EU's programming period 2007-2013 ICT infrastructure developments were implemented at schools (e.g. Social Infrastructure OP - SIOP 1.1.1, SIOP 1.1.3, Central Hungary OP - CHOP 4.6.1).

It is a noticeable trend that the initial focus of the developments started at the end of the 1990s with the aim of establishing computer classrooms was gradually shifting towards developments targeted at other classrooms as well, however, these did not result in consistent infrastructure. While the availability of equipment in computer classrooms was regulated by a decree[5] and was closely connected with IT education, infrastructure supporting general-purpose digital pedagogy as a methodology remained unregulated, hence the significant variations among institutions.

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[4] http://www.matud.iif.hu/2011/09/03.htmhttp://www.matud.iif.hu/2011/09/03.htm

[5] Decree No 20/2012 of the Ministry of Human Capacities (MHC)

2.1.2.1　The built environment of public education institutions

98% of the schools have at least one ICT room. There are two or more computer classrooms in approximately half (53%) of the primary schools and some two-thirds (65%) of the secondary schools.[6]

Computer classrooms are relatively small regarding the average class size. **In fact, 73% of the specialised ICT rooms can only accommodate half a class of students.**[7]

The types of specialised classrooms are not detailed in the KIR-STAT (public education statistics) system (e.g. ICT, sciences, art education classrooms, etc.), which causes problems when planning the necessary equipment stock.

2.1.2.2　Internet access in public education institutions

NIIFI (National Information Infrastructure Development Programme) operates the Sulinet data network with nearly 5500 school terminals. In the framework of the Sulinet development programmes (Sulinet, Sulinet+, Sulinet 5) public education infrastructure underwent substantial developments, especially as part of the SIOP-1.1.3 projects entitled "*Development of terminal connections in public education*" (Development of central services in the public education network). In the course of the project state-of-the-art terminal data network devices were installed at 3648 school terminals located in the convergence region.

At present, as a result of the Sulinet+ programme, the bandwidth available in **nearly one quarter** (23%) of the 5405 institutions served is **50-100 Mb/s (or above)** and **between 11 Mb/s and 50 Mb/s in almost half** (40%) **of the institutions**. At the same time, **16%** of them are still **not connected** to the network or are served by an **alternative** provider.

Breakdown of Sulinet institution downloads				
Alternative / unconnected	1-10 Mb/s	11 Mb/s-50 Mb/s	51 Mb/s-100 Mb/s	Total:
883	**1153**	**2155**	**1214**	**5405**

Source: NIIFI

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[6] Gyöngyvér Molnár-Anita Pásztor-Kovács: *A számítógépes vizsgáztatás infrastrukturális kérdései: az iskolák eszközparkjának helyzete és a változás tendenciái, (The infrastructural issues of computer-based examination: the situation of equipment at schools and changing trends)* Iskolakultúra 2015/4.

[7] Gyöngyvér Molnár-Anita Pásztor-Kovács: *A számítógépes vizsgáztatás infrastrukturális kérdései: az iskolák eszközparkjának helyzete és a változás tendenciái, (The infrastructural issues of computer-based examination: the situation of equipment at schools and changing trends)* Iskolakultúra 2015/4.
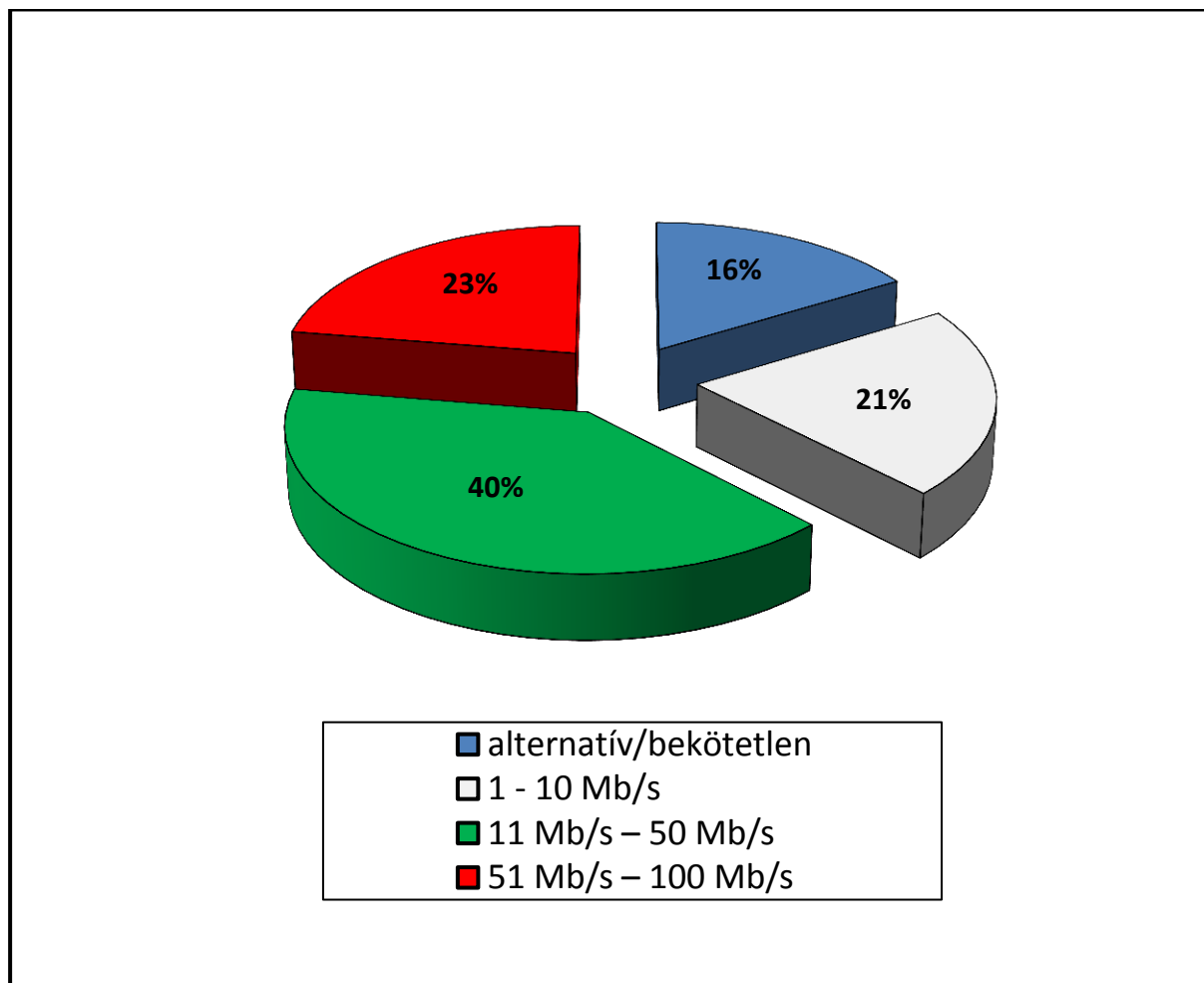
alternatív/bekötetlen	Alternative / unconnected

Source: NIIFI

During the bandwidth increasing stage of the Sulinet 5 programme, by the end of 2016 NIIFI would like to use its own budget to connect all schools with a low bandwidth or no access. Its goal is to increase the average bandwidth of the Sulinet network to 50 Mbps by the end of 2016, reduce the number of schools with a bandwidth lower than 10 Mbps, and provide internet access at all public education institutions. The new objective is to reach a minimum bandwidth of 50 Mbps, but there are likely to be terminals where 30 Mbps can be the maximum value (this is the maximum capacity of ADSL2+).

2.1.2.3   WiFi access in public education institutions

In the first stage of the Sulinet+ project WiFi service was made available in 1700 public education institutions.

- Location of schools with WiFi: 1679 locations.
- Number of WiFi devices: 3900.
- Average number of APs (access points) per location: 2.3 (3900/1700).
- Estimated average institution coverage: 31%.

Number of locations with WiFi coverage per region (numbers below 10 are marked in blue colour):
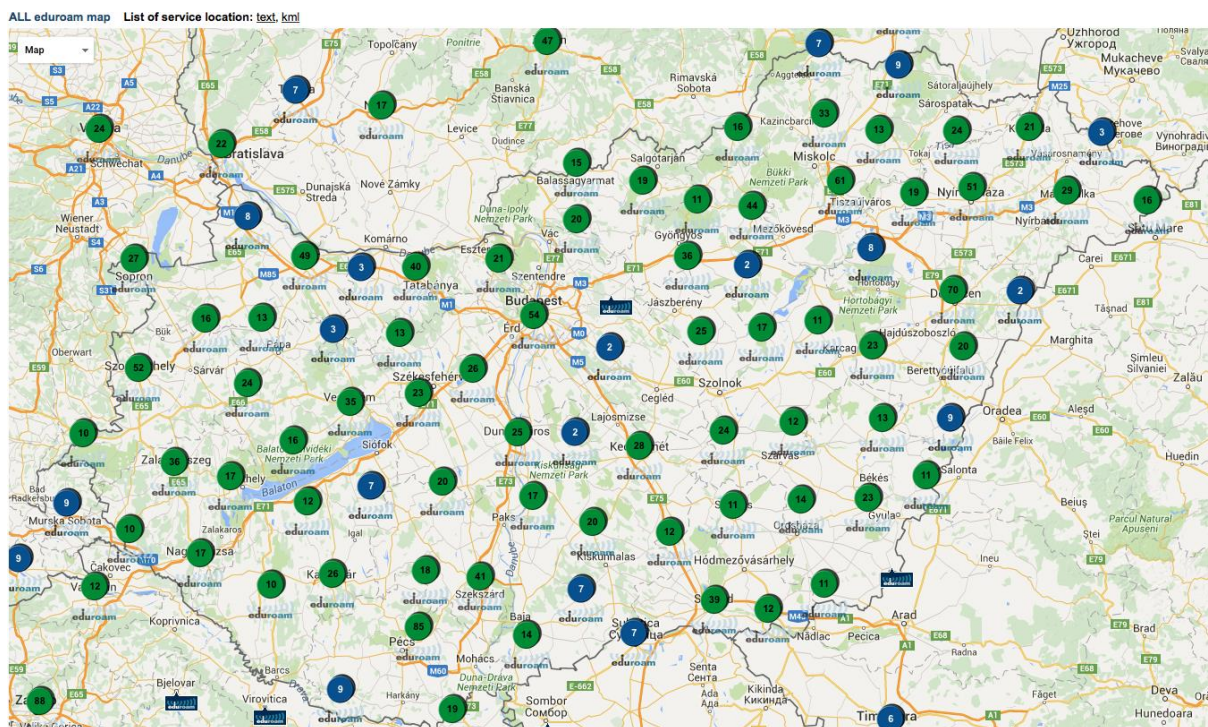
Source: NIIFI

2.1.2.4   *Availability of ICT devices in public education institutions*

In the past 8 years there have been uneven developments in terms of the availability of ICT devices in schools. As a result, the use of ICT equipment for teaching purposes has increased to a significant, but not sufficient degree, thus contributing to the development of students' ICT competences. The developments, however, did not cover the maintenance and upgrading of existing devices, so the multimedia display devices (projectors, interactive whiteboards) were installed in classrooms with generally obsolete PCs. In the last couple of years there have been bandwidth increasing upgrades in several schools, however, their rate is still insufficient, making it difficult or, in some places, even impossible to access multimedia and other online content. These factors altogether result in students' limited access to ICT devices, which are increasingly out of date.

Availability of ICT equipment in class for students and teachers[8]

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[8] https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/Hungary%20country%20profile.pdf
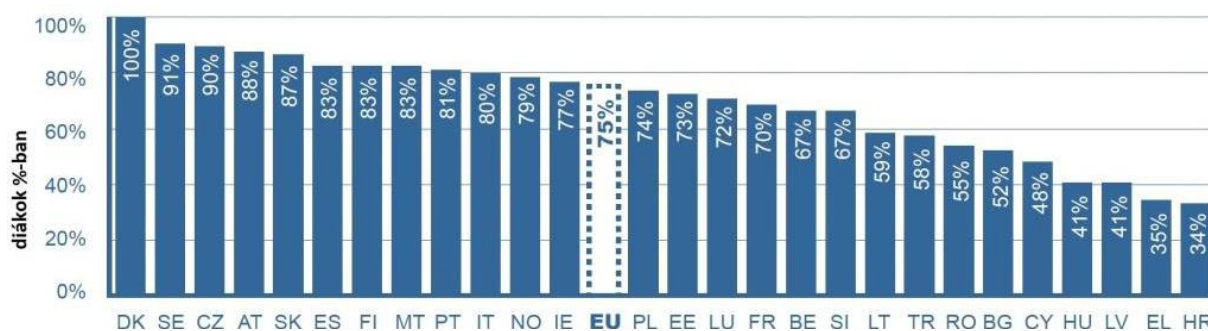
diákok %-ban	% of students

The next diagram shows the distribution of ICT devices of various ages It clearly shows that the percentage of Type 1, i.e. the youngest and most modern devices is among the lowest in Hungary. The proportion of Type 2, i.e. relatively obsolete (4-6-year-old devices) is the highest, and although the percentage of Type 3 devices is low, in the absence of appropriate supply, the Type 2 devices will be reclassified to the Type 3 category within a few years. This means that practically all the equipment will have to be replaced as it will be insufficient to upgrade the devices in order to ensure the maintenance of even the most basic level of operation.

Distribution of ICT devices in schools[9]
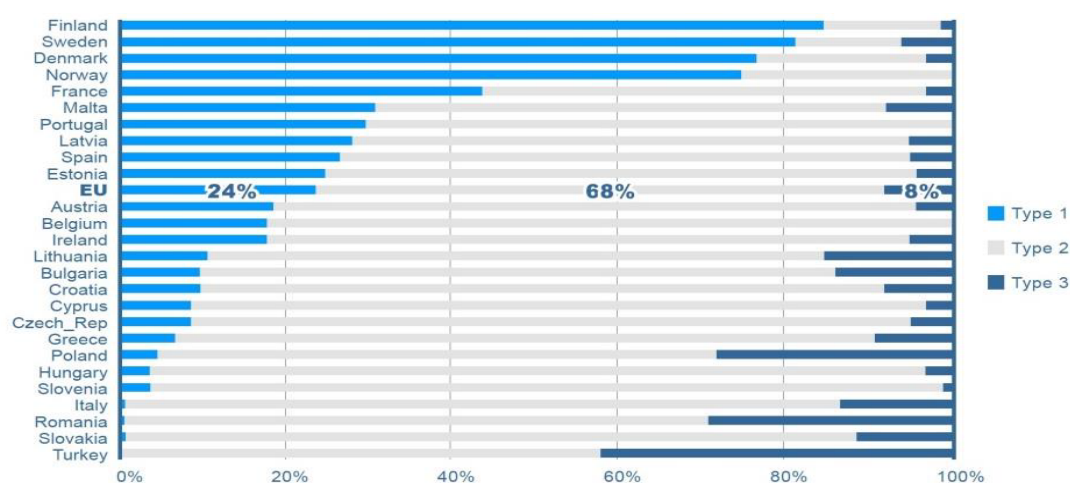
2.1.2.5   Administration and education support systems used by public education institutions

Another important section of the digitalisation of education is the utilisation of the potential of ICT tools and digital solutions in the area of education administration.

The most significant public education information system is the KIR. All public education institutions supply data to the KIR in the form of unilateral data disclosure on a regular basis, however, these data are not really utilised at local or regional level.

In addition, a considerable number of institutions also operate other administration systems purchased and maintained from external resources they have obtained in various projects. Their number has grown especially with the appearance of electronic class registers.

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[9] https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/Hungary%20country%20profile.pdf

2.1.3 The digital preparedness of teachers

2.1.3.1   The digital training of teachers

In order to enable the system of public education to strengthen basic ICT skills of key importance both from the perspective of lifelong learning and labour market requirements, it is necessary to strengthen teachers in this area.

Currently, the number of ICT-supported classes is one of the lowest in Hungary among EU Member States. The main reason for this is not the lack of appropriate technological devices, but of the competences, motivation and support of the educational staff.

Rate of teachers using ICT in at least 25% of lessons[10]
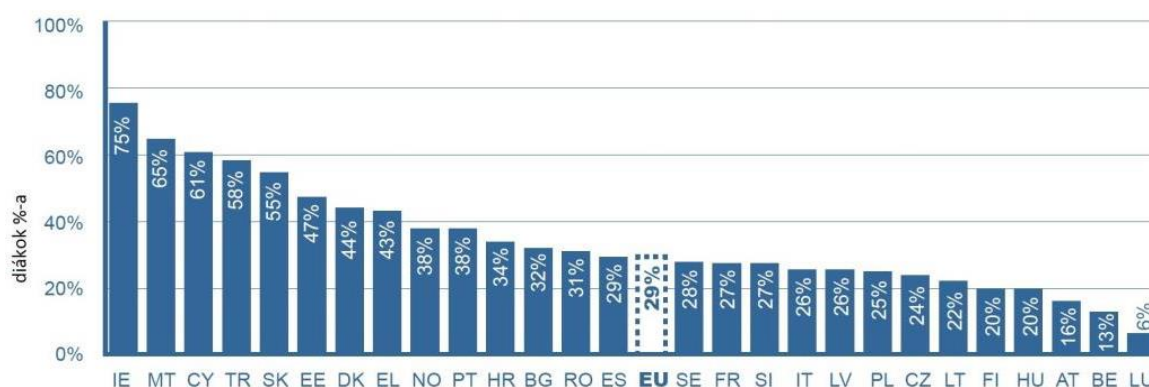
diákok %-a	% of students

In Hungary, less than 20% of all teachers use ICT tools in more than 25% of their classes.

Digital technologies are increasingly present in basic teacher training, but there is no standardised minimum requirement concerning career starting teachers' knowledge of digital pedagogical methodology and computer literacy. Due to the low number of hours of practical training and the lack of equipment, most typically teachers only have a basic knowledge of digital pedagogy, media pedagogy, and the approach, methodology and tools required for the development of digital literacy.

2.1.3.2   The digital preparedness and attitudes of teachers

Based on the eLEMÉR[11] data, the preparedness of teachers, their use of ICT for teaching purposes and the development of students' ICT use as well as the influence of the management on the teaching staff's work have shown an increasing trend recently.

Nevertheless, besides some excellent values, there are several areas of the pedagogical work that need to be improved. In general, these areas require more advanced levels of use of equipment, more sophisticated methods, and more complex infrastructure. At present, teachers use the

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[10] https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/Hungary%20country%20profile.pdf

[11] http://ofi.hu/publikacio/elemeres-2011-2015

opportunities offered by information technology mainly for enriching the process of teaching, rather than learning, and they rarely engage in joint creative work online.

The culture of evaluation concerning the use of ICT is a particular weakness. The reason for this is that a vast majority of institutions do not have an ICT strategy, and they do not plan, monitor or evaluate the use of ICT in respect of the operation of the organisation or its impact on learning and teaching.

In most schools, in the absence of a central requirement or recommendation, the management have not created conditions that would make it possible for teachers, students and parents to access learning materials, timetables, informative materials, attendance lists, absences and results recorded with the help of ICT equipment from home.

Teachers are more and more aware of the term "intellectual property" and the rules pertaining to the use of digital sources. They should also make sure that students are aware of these rules but it seems they are not efficient enough in transferring this knowledge, because this is one of the weakest indicators.

Teachers are able to select the ICT tools that suit their subject and task as they have an appropriate basic ICT qualification and take part in further training courses as well. Teachers increasingly understand that the development of digital competences is a common task, not only that of the IT teacher. While recognising their responsibility, they have also started this work in practice. Test papers are often prepared with a computer, they are aesthetic and creative, and the internet is added as a source of information.

The institution heads organise the necessary internal training courses, provided they are able to find resources, the tasks related to digital competence development are included in their local curricula, and they provide for the institutional conditions of digital communication. They monitor and assess the rate at which ICT is integrated into learning support. This, however, is only present in the public education system sporadically.

2.1.3.3 The motivation of teachers

Although the National Core Curriculum provides for the development of students' digital competences, teachers are not given actual motivation for this. The use of digital pedagogy is indirectly mentioned in the assessment concerning the teacher career life model but, in fact, this is limited to portfolio management and is not related to the complex pedagogical development activity. In addition to the direct incentives, services supporting indirect motivation are also missing. Characteristically, teachers try to create and apply the conditions of digital education alone, often without the assistance of the system administrator or methodological help.

2.1.4 Development of digital content

Digital content is an essential but not indispensable element of digital pedagogy. If digital pedagogy is to rely also on independent learning, however, it is necessary to use it.

In the early stage of development of digital contents, they were developed alongside textbooks, complementing their use, and later functions beyond the mere data carrying role were added. Now digital contents are in the spotlight on the international markets, and it is the text books that have a complementary role. In Hungary, the opposite is true: education is basically textbook-oriented, and some teachers use digital content as an additional resource based on their own motivation.

Regarding digital teaching materials and contents, the situation is similar to that of textbooks: as the market disappeared, developers left the domestic education market, so content is almost exclusively developed by the state, which makes digital content elements as an addition to textbooks, which are also published by the government.

Besides its content library function, the National Public Education Portal (portal.nkp.hu) also offers functions that support independent, group, classroom and extracurricular teaching and learning, while the similarly state-run Sulinet Digital Knowledge Base also makes digital content elements available. Although no official statistics are known, these two portals are not visited by teachers on a daily routine basis.

Based on the above experience, it is necessary to launch and promote awareness-raising programmes about digital learning-teaching opportunities.

2.2 Vision

As far as the public education pillar of the strategy is concerned, the vision is a high-quality and equitable public education system that prepares young people who are able to adapt to the European and global social and economic environment for successful participation on the labour market, in higher education, and in lifelong learning.

One of the key objectives of the strategy is to lay the foundations for the ability to adapt by facilitating the acquiring of competences required for lifelong learning with a view to preparing the citizens of the future for changes arising from continuous, 21st century technological development and the extremely rapid spreading of information and communication technologies, among others.

In order to update the content and methodology of the public education system, it is essential to organise the process of public education on an ICT basis and to create the necessary infrastructural and human conditions. To ensure the transfer of digital competences prescribed in the National Core Curriculum, it is of vital importance to utilise cross-curricular development opportunities as widely as possible and to lay the groundwork for the ICT-based teaching of subjects. Furthermore, it is necessary to build an ICT-based system of regular measurement-assessment, relying on external standards, in respect of the institutions and certain key subjects, which is capable of supporting the development of educational content, the improvement of the methodological culture of teachers, the quality improvement of institutions, and the process of external institution assessment.

2.3 Strategic Goals

In line with the Public Education Development Strategy, the general objective of The Digital Education Strategy of Hungary (DES) is to make sure that

- students leave the public education system with appropriate digital competences[12] and media awareness[13] and are capable of continuously developing these competences through lifelong learning;

- the process of teaching and learning is supported with digital tools with a view to facilitating the fulfilment of expectations concerning the public education system (effectiveness, equity, efficiency);

- the decisions made by the education management through the digital administration systems are based on real-time factual data at all levels of public education.

- Based on the foregoing, the overall strategic goal of the public education pillar is:

to ensure that public education can provide opportunities for acquiring the digital competences required by society and the labour market with special regard to the requirements of vocational education and training, higher education and lifelong learning as well as to the aspects of effectiveness, equity, and efficiency.

The strategy has a three-level hierarchy of goals:
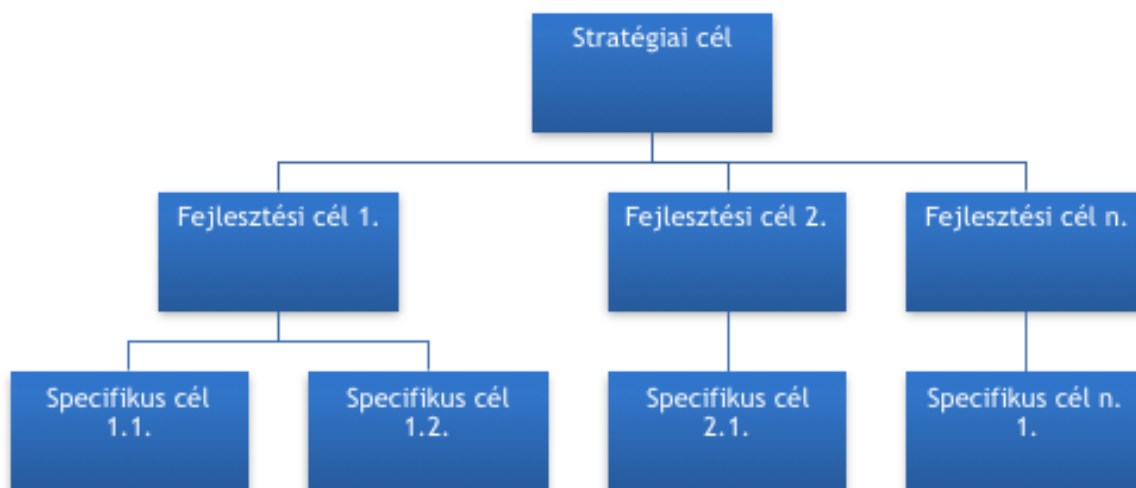
Stratégiai cél	Strategic goal
Fejlesztési cél 1.	Development goal 1
Fejlesztési cél 2.	Development goal 2
Fejlesztési cél n.	Development goal n
Specifikus cél 1.1.	Specific goal 1.1
Specifikus cél 1.2.	Specific goal 1.2
Specifikus cél 2.1.	Specific goal 2.1
Specifikus cél n.1.	Specific goal n.1

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[12] NCC, Digital competence

[13] *EU Commission Recommendation on media literacy in the digital environment for a more competitive audiovisual and content industry and an inclusive knowledge society* (2009/625/EC)http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:227:0009:0012:HU:PDFhttp://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:227:0009:0012:HU:PDF

Development and specific goals classified based on the pedagogical methodology of teaching-learning, infrastructure, and the factors of **other** support services.

2.3.1 The pedagogical methodology of learning-teaching

Digital education does not only change the tools of learning-teaching. It does not simply replace the pencil with a keyboard, but fundamentally transforms the pedagogical processes and methods of learning-teaching. In the digital environment teachers have a different task: they are released from their former main duty of repeated information transfer and simple progress checks, while they have new opportunities in their capacity as teachers: they become mentors, learning counsellors, research leaders and travel companions.

Table 1   *Set of goals of the DES public education pillar*

Factor	Development goal	Specific goal
The pedagogical methodology of learning-teaching	1.1 The ICT knowledge, methodological culture, motivation and use should meet the requirements of digital education.	The system of teacher training and further education should transfer the necessary knowledge on digital pedagogical methodology to all teachers.
		Teachers should be motivated and interested to integrate the use of ICT tool in the learning-teaching process.
		Teachers should be given methodological and technological support in their daily practice of digital education and media awareness education.
		The use of digital devices should be compulsory for students during their collaboration, the measurement and assessment of their performance, and the progress checks.
		The teaching-learning process should assist and support the remedial education of children with special education needs and the creation of equal opportunities as well as the development of their own competences using the potential of ICT.
	1.2 The supply of digital content, methodological support and knowledge sharing should make it possible to integrate the use of ICT tools in the	Given its nature as a key competence – which forms the basis of other criteria of success in the digital society and on the labour market – digital competence should be prioritised as a key output requirement to be concluded with a compulsory assessment at the end of the public education phase and followed up by means of an interim digital competence assessment.
		The development of digital competence and the use of existing digital competence, complemented with media

process of teaching-learning and assessment in all subjects.	awareness raising, should form an integral element of teaching tasks in respect of all subjects.	
	Students must be provided access to ICT equipment to support their learning process. The use of ICT tools in the institutions as well as the content and output requirements of the IT subject should reflect the rapidly changing technological trends and opportunities and should be useful, attractive and interesting to students.	
	The process of teaching-learning should be supported by an electronic platform both towards the teachers and the students which is suitable for creating, editing, sharing and playing e-learning materials, assigning measurement-assessment tasks as well as collecting and evaluating the results, provided that the nature of the task makes this possible.	
	Digital measurement-assessment should be integrated into the practice of teaching-learning and support institutional quality management processes.	
	A wide range of e-learning materials (including measurement-assessment tasks) should be available to cover the output requirements, possibly in several alternative versions to meet different learning needs.	

2.3.2 Infrastructure

The infrastructure of digital education is no longer limited to the support of the IT subject. In fact, it has become a wide-ranging, general teaching-learning platform. While being suitable for flexible use in a broad area of pedagogy and providing new opportunities to students and teachers alike, the new set of tools significantly differs from the traditional tools in terms of its life cycle and the expertise required for its management. Therefore, the integration of ICT infrastructure in public education requires new solutions for use, operation, investment and maintenance.

Factor	Development goal	Specific goal
2. Infrastructure	2.1 The availability of internet access and equipment in public education institutions and classrooms should meet – based on the relevant national standards – the requirements of digital education.	Network access appropriately serving pedagogical purposes must be guaranteed in all public education institutions.
		Teachers, students and other participants assisting the educational work (administration, equipment support) should have the necessary user devices.
		The supply of equipment should rely on the students' own devices while ensuring equal access. The school must provide appropriate equipment to students who do not have the necessary digital devices of their own.
		The continuously high quality of IT devices, as necessary for holding and preparing for classes, should be ensured through the system administration service, maintenance and the regular upgrading of IT equipment.
	2.2 The equipment provided to students should meet the horizontal requirements (IT security, equal opportunities).	The equipment used (internet access, intranet, work stations, servers) must be safe and up-to-date and should protect the students' privacy as well as the data and information managed by the institution.
		Security-awareness must be ensured during the process of teaching-learning. There should be support services at several points (public education institution, maintainer, authority, NGOs, service providers) to help students, parents and teachers acquire security awareness and provide assistance in the reporting and management of internet abuses.
		The equipment used must help and support those with disabilities to catch up and have equal opportunities.

2.3.3 Support services

Digital technology enables institutions and even teachers to exploit opportunities in education that were only available on a system level or for the purposes of education research before. The possibility of using a large amount of real-time data enables some teachers to apply the method of evidence-based education. This opens up new ways in quality management that fundamentally transform the operation of the public education system, making it more transparent and efficient.

Factor	Development goal	Specific goal
3. Support services	3.1 Digital education administration solutions should guarantee the ability to fulfil the data disclosure obligation of the teachers and institutions and access to information that is required for the performance of their activities.	All digital administration systems used at central and institutional levels should be accessible with a single user ID and password combination.
		Electronic data provision at the level of institutions must be a protected and closed process which can clearly identify the institution and the person in charge of administration on the institution's part.
		The central protection of information stored and managed by the education management body must be guaranteed and must comply with all laws and regulations concerning data security.
		It is necessary to establish an information system which supports the decisions to be made by the participants of public education, monitors the process of execution of the decisions, detects and provides feedback on the effect of decisions as well as processes and relies on factual information, and also extends to the world of work.
		A knowledge base should be set up to collect the uses of factual data in public education, the results of scientific research and international experience, classifies them and makes them available to decision-makers in a searchable form.
		Teachers and schools should have access to an electronic platform through which they can keep contact with students and parents, for example for the purposes of managing payments by parents.
		Public education institutions should have access to an education support software environment (LMS) which enables them to prepare and implement learning and teaching activities, and supports the development, storage and sharing of the required educational aids (e.g. lesson plans), enables them to measure, assess and monitor student performance, and which can be connected with the education administration system (e.g. electronic register).

		In addition to the basic digital services (email, hosting service), essential applications and software required for the implementation of the learning-teaching processes should be made available to the participants of public education free of charge.
	3.2 Establishing a framework of the implementation of the DES	Based on the example of the minimum competence of teachers, a system of minimum digital requirements should be set also for institutions supported by a framework for institutional competence.

2.4   Set of tools

2.4.1 The significance of measuring digital competence

The introduction of the DES brings about a fundamental change in the public education system which affects each and every element of the system. Digitalisation influences almost all aspects of the operation of institutions and the activity of teachers and can only be successful if implementation reaches beyond the establishment of infrastructure and achieves the transformation of processes and methods as well. To this end, it is necessary to create a comprehensive framework which directly provides information on the implementation level of each institution and helps to assess what further interventions are needed.

In order for 21st century pedagogical goals to be achieved, the preparedness of the institutions is as indispensable as that of the teaching staff and the social environment. Attempts have been made to define digital competence, so there are a number of existing conceptual definitions. One of these is the DIGCOMP framework developed in 2013; its new version 2.0 identifies 21 competences at eight levels for use in 21st century education[14]. The JRC-IPTS institute[15] of the European Commission elaborated another relevant framework, which defines the set of criteria of digitally competent education institutions based on European practices, including Hungarian experience. This framework is the DigCompOrg[16], which describes a total number of 74 criteria in seven topics related to institutional development.

Learning supported by digital technology is of key significance at all levels of education, for which the presence of innovation and digitalisation is indispensable at the pedagogical, technological and organisational levels alike. The purpose of the DigCompOrg framework is to offer a framework of reference for the organisation development and self-assessment of education institutions as well as to provide help to policy-makers in designing local, regional and national programmes and interventions.

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[14]The publication is not available yet, only the bases of the model: https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework (downloaded: 4 June 2016)

[15] https://ec.europa.eu/jrc/en/about/institutes-and-directorates/jrc-ipts (downloaded: 4 June 2016)

[16] Kampylis, P., Punie, Y. & Devine, J. (2015); Promoting Effective Digital-Age Learning - A European Framework for Digitally-Competent Educational Organisations; EUR 27599 EN; doi:10.2791/54070 (downloaded: 4 June 2016)

2.4.2 Presentation of the tools

The main areas of intervention (groups of tools) of the strategy are as follows:

- Establishing a set of output requirements that supports digital competence development.

- Creating learning materials and environments that support digital competence development.

- Developing the ICT-based pedagogical-methodological practice of teachers.

- Developing digital infrastructure.

- Establishing digital centre support services.

2.4.2.1 *Establishing a set of output requirements that supports digital competence development*

- Identification of digital competence requirements in a progressive system, in the form of a framework of reference for teachers/trainers/vocational instructors and students (IKER).[17]

- Identification of compulsory digital competences students are expected to acquire in the course of their study progress in order to move from one level of education to the next.

- Adding the measurement of digital literacy to the National Competence Assessment.

- Compulsory introduction of electronic examination in the written part of the secondary school leaving exam.

- Review and updating of the NCC and the framework curricula to support digital competence development.

- Adding an element supporting digital competence development to the interfaces of framework curricula in respect of each element of the output requirements.

- The use of students' digital key competences should be included in the framework curricula of non-IT subjects as a compulsory element.

- The learning tasks of students should include information search and processing, the use of ICT-supported solutions of collaboration, and the development of media awareness.

- The practical use of ICT should be integrated into the learning of science subjects through measurement, data processing and evaluation on the basis of digital sensors and display in reality (e.g. via 3D printing).

- Framework curricula concerning IT disciplines must be reviewed every two years.[18]

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[17] The concepts of digital competence and digital literacy are not adequately defined in Hungary, they are not tailored to or identified in terms of Hungarian circumstances and development needs. Therefore, the aim is to identify digital competences by means of state regulation through the establishment of a common national framework of reference, similar to the framework for language competences and the examination system. The framework of reference contains the levels of digital competences, the required competence areas and skills and their levels, and provides for the system of institutions taking part in implementation and their scope of responsibilities (Common Framework of Reference for Infocommunications - "IKER"). The ultimate goal is to create strong central coordination through the standardisation of digital competences and requirements and the establishment of an institution system enabling implementation and mass training and the necessary infrastructure (learning materials, training concepts, online examination system, etc.).

- The information technology subject must be re-defined in curriculum development; among output requirements IT competences must be reviewed and extended. The specification of the required number of hours is the responsibility of the National Education Roundtable, but we recommend that the following aspects should be taken into account:

  o Meeting the output requirements set out in the framework of reference for digital competence (IKER).

  o Main content elements: operation of digital devices, information security, management of basic platforms, responsible personal presence in the virtual space (handling user accounts).

  o The aspects of embedded and use-oriented IT use should be given priority in the teaching-learning process (e.g. management of office applications, creation of IT-based presentations, student collaboration, content development and sharing).

  o There should be at least 1 IT class per week in each grade and each type of school.

  o Encoding/programming should be integrated in the NCC as a separate subject in each year from grade 3. Furthermore, the teaching of encoding should be integrally linked to the other subjects as well.

  o In grades 3-4 the elements of the programming subject shall be introduced: algorithmization, process engineering, rule-making.

  o In grades 5-8 the curriculum should include block-based programming, sensor handling, complex rule-making, robot programming.

  o in grades 9-12 students should get familiar with mobile application development and website making and should become capable of finding IT-based solutions to everyday practical problems.

  2.4.2.2   Creating learning materials and environments that support digital competence development

- Compulsory teaching of typewriting in one of the lower primary school years, providing infrastructure which is necessary for teaching and which suits the age concerned.[19]

- A wide range of e-learning materials tailored to students' age-specific needs (including measurement-assessment tasks) should be available to cover the output requirements, possibly in several alternative versions to support different learning needs.

- Promoting the creation and sharing of digital lesson plans and content developed by teachers.

- Adoption of existing international good practices concerning digital content and promotion of participation in online teacher communities.

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[18] In particular, they should be kept up-to-date with the involvement of industry actors (IVSZ) and NHIT (National Council for Telecommunication and Information Technology).

[19] This would require the introduction of a new subject or it could be embedded in the curriculum of Hungarian language classes.

- Use of internationally approved standards concerning learning materials, tests and output requirements in content development as well as in connection with players.

- Progressive introduction of digital measurement-assessment systems and the general use of electronic knowledge tests[20], which make it possible to support primarily formative assessment through the development of an extensive range of assessment tools.

- Ensuring the availability of a central task bank which is able to support the measurement-assessment functions in respect of public education as a whole. Adaptive measurement should be made possible in the case of final (end of topic) tests in priority subjects.

- Digital devices should be compulsory elements of classroom furniture, both for general and specialised subjects and should be included in Annex 2 to Decree 20/2012 of 31 August 2012 of the Minister for Human Capacities (MHC).

- Teachers should be provided methodological support in their preparation for and holding of lessons based on digital teaching. The employment of ICT pedagogical assistants can guarantee the implementation of the pedagogical goals set out in the DES and the support of teachers' work.

- The system administration[21] service provided at public education institutions guarantees the high level of availability of tools and their applicability for pedagogical purposes.

- School libraries should operate as resource centres[22] in order to develop information and media literacy, learning techniques, independent learning, and information processing.

- During the course of introduction and application of digital education, it is essential to safeguard children's mental and physical health to the fullest possible extent, and special emphasis must be laid on the establishment and maintenance of real human relationships and on counterbalancing the lack of physical activity arising from the use of digital tools.

2.4.2.3   *Developing the ICT-based pedagogical-methodological practice of teachers*

- The compulsory level of digital competence expected of teachers for their advancement on the pedagogical life path should be determined.

- Teacher training[23] and further education should be digitalised[24] in consideration of the following criteria:

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[20] The introduction of electronic measurement may take place in several ways (article by Gyöngyvér Molnár). These involve the potential of technology into the process of traditional paper-based testing at different levels and to different degrees: a) partial digitalisation, the possibilities of combining traditional paper-based and technology-based testing; b) technology-based testing without internet connection, the submission and collection of tests on removable media, which enables subsequent evaluation; c) internet-based online testing in examination centres with subsequent or automatic evaluation, fixed tests or adaptive testing based on a task bank; d) internet-based online testing in primary and secondary schools with subsequent or automatic evaluation, fixed tests or adaptive testing based on a task bank and with scaling models that are based on test theories.

[21] It should be no longer expected of IT teachers to perform system administration tasks as a favour. The current regulation also allows the employment of system administrator depending on the number of students and computers. The current regulation must be revised. The provision of system administration services should not depend on the student number but on the availability of equipment and services.

[22] Celler, 1983, 19.: Dr. Zsuzsanna Celler, who introduced the model in Hungary, defines a learning resource centre as follows: "It is a complex unit which is easy to access for the purposes of facilitating the process of teaching and learning, comprises media of appropriate quality and quantity that fulfils the needs and a system of the necessary equipment and services, and which is capable of flexibly reorganise its activity to adapt to the changing requirements of the pedagogical process.

- o It should be compulsory to integrate special digital pedagogical methodology training[25] into general subject teacher training, and the output requirements of teacher training must include the use of digital pedagogy as a mandatory element, with special attention to lower primary years.

- o Regular further training on digital key competences and digital pedagogical methodology should be compulsory and free.

- o It should be compulsory to exploit the potential of digitalisation in the development and accreditation of the further training of non-ICT-specific teachers[26].

- Exchange of experience concerning the dissemination of existing teaching practices at international and national level (promoting the getting familiar with and the use of international resources available online).

- The basics of teaching programming should be added to the output requirements of mathematics and science teachers.

ICT consultancy[27] should be included in the areas listed in Section 26(4) of Decree No 48/2012 of 12 December 2012 of the Minister for Human Capacities.

- The criteria of assessment concerning digital competences should be strengthened in the teacher evaluation system.

- Teachers should join international cooperation networks and take part in study trips abroad.

- Development of the management competences of institution heads with a view to introducing and ensuring the sustainability of ICT-based education.

- The verifiable hours of online presence and activity teachers spend directly with the students preparing for classes or supporting the learning activity should be included in the teaching activity to a specified extent.

- Integration of internet awareness and security-conscious behaviour in the public education system through the further training of teachers.

- Early childhood IT education must be integrated into kindergarten education, whereby:

- o the basic document of kindergarten education, the National Core Programme of Kindergarten Education must be reviewed and aligned with the DES;

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[23] Teachers need to leave their teacher preparation programs with a solid understanding of how to use technology to support learning. Effective use of technology is not an optional add-on or a skill that we simply can expect teachers to pick up once they get into the classroom. Teachers need to know how to use technology to realize each state's learning standards from day one.

[24] They need continuous, just-in-time support that includes professional development, mentors, and informal collaborations.

[25] Government Decree No 283/2012 of 4 October 2012 on the system of teacher education, specialisation, and the register of degree courses in teaching

[26] This equally applies to the development of PTC (pedagogical training centre) services and services offered by external providers.

[27] It is recommended to include five hours of documented consultancy visits into the compulsory 120 credits to be acquired every 7 years. In practice, this could be implemented in a way that the colleague requesting consultancy, the consultant, the head of the institution and the PTC manager in charge of appointing the consultant sign a document on the basis of which the PTC issues a numbered certificate.

o the national and international good practices of IT education must be mapped and institutions engaged in early childhood education should be supported by means of professional recommendations freely available to anyone online;

o based on the already existing good practices subjects dealing with digital kindergarten pedagogy should be integrated into the training of kindergarten teachers.

2.4.2.4   Developing digital infrastructure

- In public education institutions with less than 500 students, a bandwidth of at least 100 Mbps must be made available, while the minimum bandwidth should be 1 Gbps in institutions teaching more than 500 students.

- The Gb/s local network should be implemented to provide for internet access in classrooms.

- The required bandwidth must be provided to students by means of WiFi coverage manageable within the EduRoam network in all classrooms and the school library.

- Internet access should be made available via WiFi network in a community space of the building of each institution engaged in kindergarten education.

- A structured, protected network and border protection tools should be integrated into the system along with up-to-date anti-virus protection, spam filtering, content filtering, and protected web interface.

- Regarding classroom equipment, the following developments are required:

  o Equipment of 50% of the classrooms with interactive display devices.

  o Providing classroom management services for the management of computers and mobile devices in the classroom (screen share, disabling internet access, user management).

- In the case of equipment in specialised classrooms the following developments are required:

  o Equipment of 40% of specialised classrooms with interactive display devices suitable for 3D display and the necessary glasses.

  o Procuring at least one 3D printer per every 500 students in primary and secondary schools.

  o In addition to the above devices, a programmable robot must be available for every 3 students in the computer classroom.

  o There should be digital data loggers[28] and sensors in science classrooms in order to support scientific experiments.

  o Each institution should have a multimedia laboratory in the library or resource centre (digital camera, VR display, workstation and peripherals suitable for multimedia editing).

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[28] Measurement data recorder

- o In every school district it is necessary to equip one demonstration laboratory, which can be visited by the schools of that district, and which is suitable for demonstrating all scientific experiments required for the secondary school-leaving exams in a digitally supported form, also as remote experiments.

- o As for the requirement concerning teachers' access to equipment, all teachers must have a laptop they can use in order to prepare for and hold digital lessons (controlling interactive displays) as well as for digital education administration.

The pedagogical potential of digital devices
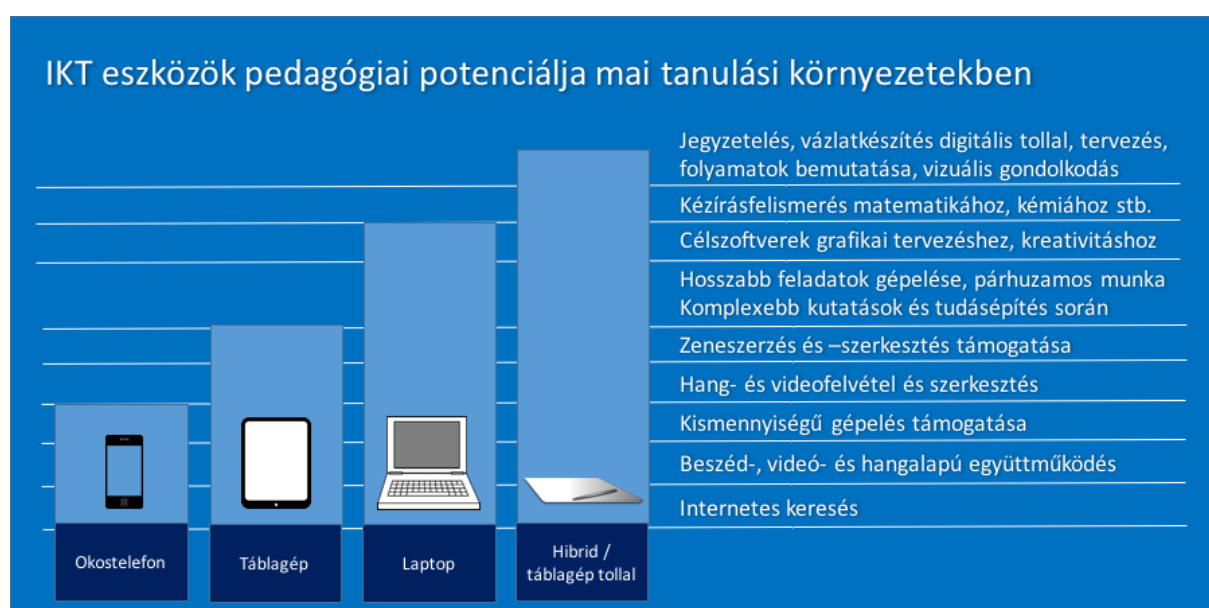
IKT eszközök pedagógiai potenciálja mai tanulási környezetekben	The pedagogical potential of ICT devices in today's learning environments
Jegyzetelés, vázlatkészítés digitális tollal, tervezés, folyamatok bemutatása, vizuális gondolkodás	Note-taking and drafting with a digital pen, planning, presentation of processes, visual thinking
Kézírásfelismerés matematikához, kémiához stb.	Handwriting recognition for mathematics, chemistry, etc.
Célszoftverek grafikai tervezéshez, kreativitáshoz	Specific software for graphic design and creativity
Hosszabb feladatok gépelése, párhuzamos munka Komplexebb kutatások és tudásépítés során	Typing longer assignments, parallel work in the course of complex research and knowledge building
Zeneszerzés és -szerkesztés támogatása	Supporting music composing and editing
Hang- és videofelvétel és szerkesztés	Sound and video recording and editing
Kismennyiségű gépelés támogatása	Support of minor typing tasks
Beszéd-, videó- és hangalapú együttműködés	Voice, video and sound-based cooperation
Internetes keresés	Internet search

- As regards the requirement of students' access to equipment, it should be made possible to involve the students' own devices into the learning process. The school must provide appropriate equipment to students who do not have the necessary digital devices of their own.

- A programme must be worked out to support the purchase of own devices in the appropriate quality and to make sure they are suitable for cooperation.

- In public education institutions teachers should have a possibility to hold classes other than information technology in an IT classroom.

- In the institution, a set of IT devices should be made available to teachers (tablet, laptop or hybrid device) which all or some students can use during a part of the lesson in the classroom or outside the classroom in an area designated for this specific purpose.

- Sources of funding must be made available to cover the costs arising from the depreciation and replacement of tools with a view to maintaining and upgrading the ICT infrastructure at a uniform standard.

- An institutional card-based check-in system (above a certain institution size) should ensure the physical traceability of students within the public education institution.

- Digital whiteboard and displays with content managed by the students should provide information within the school building.

- The client and authorisation management of the school canteen should be electronic.

- A common central electronic waste management system should be set up for the environment-friendly treatment of obsolete devices.

2.4.2.5   Establishing digital centre support services

- A digital methodological centre (DMC) should be set up – as an organisational unit established within the framework of the existing institution system – for the purposes of coordinating the innovation, methodological development, monitoring, communication, strategic and supporting tasks relating to the implementation of The Digital Education Strategy of Hungary as well as for supporting and monitoring the digital pedagogical renewal of the areas of public education and vocational education and training. The DMC will be responsible for elaborating the framework and measurement-assessment tools of digital competence requirements concerning students, teachers, institution heads and all types of education institutions and to launch pilot programmes which will use functional effectiveness assessments to serve as a basis for developments to be implemented within the framework of the Strategy.

- The process of teaching-learning should be supported by an electronic platform both towards the teachers and the students which is suitable for creating, editing, sharing and playing e-learning materials, assigning measurement-assessment tasks as well as collecting and evaluating the results, provided that the nature of the task makes this possible.

- The further development and functional expansion of the National Public Education Portal (NPEP) should be implemented through more extensive opportunities for knowledge sharing among teachers and a wider range of content. It is also necessary to ensure the availability of the National Public Education Portal for vocational education and training as well as for public education and higher education institutions engaged in Hungarian language teaching abroad, students, and Hungarians living abroad.

- In the course of further developments, it would be necessary to establish a searchable system that is interoperable with the content libraries of public collections as well as the archives of the Media Services and Support Trust Fund (MTVA) and to keep the content and

function of the National Public Education Portal up-to-date and ensure its continuous development.

● A knowledge sharing site should be made available to teachers where they can consult a collection of pedagogical good practices and which gives them an opportunity for independent learning and self-evaluation and for sharing content and cooperating with other teachers.

● A system should be set up to enable the Public Education Measurement Evaluation Department of the Education Authority to measure and assess the competence development capacities of public education institutions through the coordination of the digital methodological centre, with the involvement of experts participating in the development of the IKER (Integrated Micro-Region E-Administrative) system.

● The label system of "Digital School" should be developed in order to provide information on the digital compliance level of public education institutions, including the availability of internet access and ICT tools, the digital readiness and digital teaching practices of teachers as well as the digital extra-curricular activities they offer, etc. This should be linked to the DigCompOrg framework to ensure international comparability.

● It is an equally important task to ensure the supply of information for education administration purposes as well as to parents via the use of the electronic class registers.

● Digital education administration solutions should guarantee the ability to fulfil the data disclosure obligation of the teachers and institutions and access to information that is required for the performance of their activities.

● This requires the following, among others:

    o A standardised administration system with optional modules that are adapted to local needs.

    o All digital administration systems used at central and institutional levels should be accessible with a single user ID and password combination.

    o The identification of students and teachers should be based on a common directory service, which also provides for the authorisation management of the various services.

    o Deregulation of data collection in education statistics.

    o An information system should be developed to support the decisions of public education stakeholders as well as to manage and use the factual data of public education (user-friendly public education information services (KIR) for teachers).

    o Teachers and schools should have access to an electronic platform through which they can keep contact with students and parents for purposes such as providing information on the students' results, management of payments and statements made by parents.

    o In addition to the basic digital services (email, hosting service), essential applications and software should be made available to the participants of public education free of charge.

    o Establishment of the quality management system of education.

2.5 Logical Framework Matrix

The structure of relations between the set of goals and tools is shown in the form of a logical framework matrix. The logical framework matrix of the strategy was elaborated at the level of the development goals and the groups of tools. The matrix illustrates which group of tools contributes to the implementation of the individual development goals. Apparently, the development of digital infrastructure is of key importance in each intervention area, and the digital preparedness of teachers is indispensable for the widespread use of support services that increase the efficiency of operation and reduce the administrative burdens of institutions.

Table 2   *Intervention areas and development goals*

Intervention area	Development goals
1. The pedagogical methodology of teaching-learning	1.1 The teachers' ICT knowledge, methodological culture, motivation and use should meet the requirements of digital education.
	1.2 The supply of digital content, methodological support and knowledge sharing should make it possible to integrate the use of ICT tools in the process of teaching-learning and assessment in all subjects.
2. Infrastructure	2.1 Access to the internet and to ICT tools in public education institutions and classrooms should meet the requirements of digital education.
	2.2 The equipment provided to students should meet the horizontal requirements (IT security, equal opportunities).
3. Support services	3.1 The decision support, administrative, communication, data supply and organisation options offered by digital technologies should be available to all public education institutions.
	3.2 Establishing a framework for the implementation of the DES

	1. The pedagogical methodology of teaching-learning		2. Infrastructure		3. Support services	
	1.1	1.2	2.1	2.2	3.1	3.2
I. Establishing a set of output requirements that supports digital competence development	X	X			X	
II. Creating learning materials and environments that support digital competence development		X				
III. Developing the ICT-based pedagogical-methodological practice of teachers	X	X				
IV. Developing digital infrastructure		X	X	X	X	
V. Establishing digital centre support services					X	X

The monitoring tasks of the strategy (the implementation of the goals of the DES and the continuous updating of the situation analysis) would be defined and performed by the Digital Methodology Centre (DMC) which is proposed to be set up within the framework of the institution system.

2.6   Financing

The detailed planning of the financial conditions of the strategy and the tools recommended in the framework of the strategy will be carried out as part of the implementation of the strategy itself following its approval by the Government.

In the course of financial planning the first task is to examine which EU programmes can contribute to the implementation of the development goals. The following table summarises the development programmes which can contribute to the implementation of the goals based on currently available information.

During implementation, after identifying the relevant development programmes, it is necessary to analyse to what extent the individual programmes serve the achievement of the development objectives set out in the DES. To perform this task, on the one hand, the sub-elements of the already running programmes (targets set, tools, activities, indicators) must be analysed in detail. On the other hand, program elements that are the most relevant for the purposes of the DES must be

identified and adjusted, if necessary, during the planning process of the programmes under preparation.

After that, during the elaboration of the specific actions, it is necessary to make well-founded estimates of the amount and timing of additional resources required for the overall implementation of the DES objectives.

The resource estimates plan must cover requirements concerning the planning, preparation and implementation of the action as well as the sustainability of its results and impacts.

Table 3 *Development programmes contributing to the implementation of the public education goals of DES*

Overall goal: In Hungary, public education should guarantee the acquiring of digital competences expected by society and the labour market and exploit the potential of digital technologies with a view to making its operation more efficient, effective, and equitable.			
Intervention areas	**Development goals**	**Development programmes (to be reviewed) relevant to the implementation of the goal**	
Teaching-learning methodology	1.1 The teachers' ICT knowledge, methodological culture, motivation and use should meet the requirements of digital education.

1.2 The supply of digital content, methodological support and knowledge sharing should make it possible to integrate the use of ICT tools in the process of teaching-learning and assessment in all subjects. | EDIOP-6.2.1-CCHOP-15 (Economic Development and Innovation OP - Competitive Central Hungary OP) | Participation in the OECD's Programme for the International Assessment of Adult Competencies (PIAAC) |
		HRDOP-1.4.1 (Human Resources Development OP)	Professional support of integrated child programmes
		HRDOP-3.1.1	Support of early childhood education
		HRDOP-3.1.2	Methodological preparation of teachers to prevent early school leaving without qualification
		HRDOP-3.1.3	Support of social inclusion and integration by public education measures

		HRDOP-3.1.5	Support of institutions exposed to high drop-out rates
		HRDOP-3.1.6	Strengthening the opportunity creating role of public education
		HRDOP-3.1.7	Creation of opportunities in public education
		HRDOP-3.2.1	Hungary – a country of talents
		HRDOP-3.2.2	Development of the content regulators of public education and the tools of pedagogical methodology
		HRDOP-3.2.4	Development of digital competence
		HRDOP-3.2.5	Development of career orientation, with special attention to Maths, Science, Technology and IT skills and competences in the public education system
		HRDOP-3.2.6	Promotion of the competence deployment of students in public education institutions
Infrastructure	2.1 Access to the internet and to ICT equipment in public education institutions and classrooms should meet the requirements of digital education. 2.2 The equipment provided to students should meet the horizontal requirements (IT security, equal opportunities).	EDIOP-3.4.1-15	Development of new generation NGA and backhaul networks
		EDIOP-3.4.2-CCHOP-15	Development of the network access and connections of institutions
		HRDOP-3.1.5	Support of institutions exposed to high drop-out rates
		HRDOP-3.1.9	Institutional support of early childhood education
		HRDOP-3.2.3	Digital environment in public education
		HRDOP-4.1.2	Regional development of the school system
		HRDOP-4.1.3	Infrastructure development of public education institutions
		HRDOP-4.1.6	Infrastructure development of public education institutions (standard)
		HRDOP-4.1.4	Strengthening the supportive role of public education
		HRDOP-4.1.8	Strengthening the supportive role of public education (standard)
Support services	3.1 The decision support, administrative, communication, data supply and organisation	HRDOP-3.2.3	Digital environment in public education
		HRDOP-4.1.2	Regional development of the school system
		HRDOP-4.1.3	Infrastructure development of public

		education institutions
	HRDOP-4.1.6	Infrastructure development of public education institutions (standard)
options offered by digital technologies should be available to all public education institutions.	HRDOP-4.1.8	Strengthening the supportive role of public education
3.2 Establishing a framework for the implementation of the DES.	HRDOP-4.1.8	Strengthening the supportive role of public education (standard)

3 VOCATIONAL EDUCATION AND TRAINING

3.1 Situation Analysis

3.1.1 Key trends

In Hungary, vocational training has a low social prestige. For this very reason, application for admission to vocational education is already characterised by strong selection: a high percentage (27%) of students entering vocational schools are from disadvantaged social groups, and their academic achievements and motivation are both rather low. Obviously, this affects their digital competence as well. The number of applicants to vocational institutions is declining every year (19.2% at present), while the number of secondary vocational school students is more or less stable (40.3%).

IT trade groups

Informatika szakmacsoportokban a szakmák száma intézményenként 2013-2015	Number of trades within the IT trade group per institution 2013-2015
Intézmények száma	Number of institutions
Informatikai szakképesítések száma (IR)	Number of IT qualifications (IR)
Lineáris (intézmények száma)	Linear (number of institutions)
Lineáris (informatikai szakképesítések száma (IR))	Linear (number of IT qualifications (IR))

The low rate of participation in vocational education and training is partly due to the transformation and optimisation of the VET institution system, which – together with low willingness for mobility – reduces the number of career choices at an early stage of life and directs more students to secondary grammar schools offering general development. This phenomenon is particularly visible in the case of IT trades, where the number of institutions offering IT courses fell from 186 in 2013 to 108 in 2015.

Several governmental measures have been taken to raise the standard of vocational training and make it more attractive, and there are structural reforms going on which will renew the VET system according to the expectations of the department concerned.

In Hungary, the elaboration of the so-called Industry 4.0 programme started parallel with the writing of this situation analysis as part of the Irinyi Plan[29], which also involves the digitalisation of industrial processes, among others.

Having digital competences is increasingly becoming a basic requirement in all areas of the labour market. During the development of certain trades and the emergence of new ones, digital competences are gradually coming to the fore and become indispensable. While digital processes are being integrated into trade protocols, and their operation requires digital competences, they are also a means of rapid knowledge change and renewal within specific trades.

Vocational training must be based on the basic digital competences acquired in primary school, because within the framework of VET it is not possible to make up for the lack of digital knowledge. At the same time, as detailed in the chapter on public education, according to the PISA surveys, one third (32.5%) of Hungarian 15-year-old students are digitally illiterate, which reduces the efficiency of the learning process and the development of adaptability to labour market demands. The difference between school types is significant in this respect, too: the percentage of digitally literate students is higher in vocational institutions than in secondary grammar schools.

Another problem is that in the National Core Curriculum (NCC) information technology represents the lowest share among the areas of study. Information technology is taught in 180 hours in secondary grammar schools, a total of 144 compulsory hours in secondary vocational schools until the secondary school-leaving exams, and only in 108 hours in vocational training schools until the vocational qualification. However, this amount of lessons is insufficient for meeting the requirements of the NCC concerning competence development or those of the framework curriculum. As a result, students leave secondary education as digital illiterates.

Despite the fact that the significance of the use of digital education in vocational training was already recognised two decades ago, it is difficult to give an accurate view of the situation without adequate data. One of the reasons for this is that during the past two decades the developments were not carried out along a common digital education strategy, but by various stakeholders, using various resources. Secondly, formal vocational training forms part of the public education system, and therefore some of the development projects (e.g. the digital competence development of teachers) were implemented in a general, public education context, instead of a VET-specific one.

As a consequence, there is no available system of measurement that could supply reliable data specifically relating to the area of vocational training and education.

The Public Education Information System (KIR) provides data on the level of equipment supply of public education – including VET – institutions, and information is also available from a monitoring

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[29] Magyar Idők: *A digitális gazdaság a fejlődés motorja,* (The digital economy is the driving force of development), 10 March 2016 Source: http://magyaridok.hu/gazdasag/digitalis-gazdasag-fejlodes-motorja-448150/

system (eLEMÉR)[30]which enables public education institutions to conduct self-evaluations on a voluntary basis.

These data are not available in respect of each location but at an institutional level, however, they make it possible to identify institutions which also have a vocational training function. Based on the above, the most important indicator is that 70% of the computers used in public education institutions also engaged in vocational education and training are older than three years.

Method of computer use
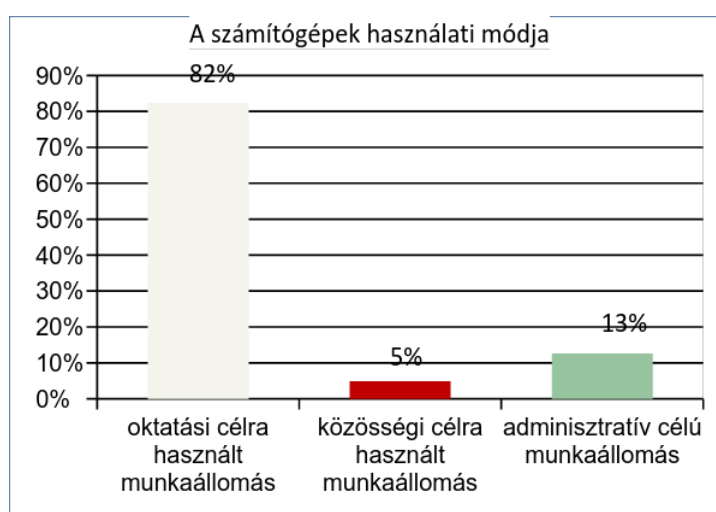
A számítógépek használati módja	Method of computer use
oktatási célra használt munkaállomás	workstation used for educational purposes
közösségi célra használt munkaállomás	workstation used for community purposes
adminisztratív célú munkaállomás	workstation used for administrative purposes

School use these computers mostly in the course of their educational work (82%) as well as for administrative tasks (13%). Their use for community purposes is relatively low (5%). More than a quarter (27%) of the institutions do not have a network server, and another alarming figure is that there is no available portable computer in 13% of the schools.

The results of the eLEMÉR survey reveal that the condition of infrastructure is deteriorating at an increasing rate. The greatest problem is the replacement of obsolete devices and the repair of defective equipment (clearly due to the lack of resources).

The devices are increasingly unsuitable for fulfilling the purposes and tasks of the school, and the equipment and furniture of classrooms in VET institutions do not support the use of digital pedagogy and modern learning methods to an adequate level either.

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[30] In order to measure the use of information technology for school development purposes, the Hungarian Institute for Educational Research and Development (IERD) established an online framework supporting the self-evaluation of schools and a measurement method which indicate to what extent the institutions have integrated the use of ICT tools in institution development.

In a majority of the schools the availability of ICT tools is adapted to the low number of information technology lessons. However, in order to meet the requirements of the framework curricula (general and vocational subjects), it is not possible to hold general and vocational subjects in a digital environment, with only few exceptions. Students have no access to computers outside the classroom, in the hall or library of the school, and there is no management access to school networks with the students' own devices (smartphone, tablet). Similarly, there is no practice concerning the use of these devices (which students take to the schools in a value of several tens of billions of Hungarian forints at national level) for learning purposes even though these tools represent a substantial ITC capacity in total.

Among public education institutions, the supply of ICT and other equipment of vocational institutions was typically better than that of primary schools and secondary grammar schools, but the transformation of the usage system of the vocational contribution practically deprived vocational training institutions of new equipment supplies and the budgetary resource available for maintenance tasks did not cover this purpose either.

It would be important to guarantee that all students have access to digital devices, while it is also of key significance that along with technological modernisation the availability of innovative teaching methods, interactive software and online learning materials is ensured.

Regarding the development of digital learning materials, the preparation of teachers and the expansion of methodological knowledge in vocational education, from the early 2000s Apertus Közalapítvány (Public Foundation), the Regional Integrated Vocational Training Centres and Tempus Közalapítvány have implemented the most significant development projects. Nevertheless, looking at the whole spectrum of vocational education, the sporadically, if at all, available contents are far from being complete, and most of them have become obsolete and need updating due to the rapid technological development of certain trades.

At present, teachers use the opportunities offered by information technology mainly for enriching the process of teaching, rather than learning, and they rarely engage in joint creative work online.

The digital competences and methodological knowledge of vocational teachers and practical instructors also need to be developed because, as experience shows, it is the lack of ICT knowledge that lies behind their reluctance to apply ICT-supported teaching-learning practices in many cases. Another key issue is to convince institution heads to spread the use of state-of-the-art technologies for pedagogical purposes at the school level as it is often the lack of commitment on the management's part that hinders such efforts of vocational teachers and practical instructors.

In most schools, the management have not created conditions that would make it possible for teachers, students and parents to access learning materials, timetables, informative materials, attendance lists, absences and results recorded with the help of ICT equipment from home.

All in all, it can be concluded that the current vocational education and training system does not ensure the development of digital competences: in many cases schools do not have the necessary conditions for presenting the latest technologies of the trades concerned, the theoretical and practical instructors of vocational subjects do not have an adequate level of digital literacy or

pedagogical-methodological knowledge to place the teaching-learning process into a digital environment, and the equipment, which has never been suitable for serving the purposes of digital pedagogy, is becoming increasingly out-of-date.

The situation map was drawn up, among others, in an effort to find out to what extent vocational training is currently capable of guaranteeing the transfer of the necessary digital competences to students. In other words, do we know exactly what digital knowledge has to be transferred, what legal regulatory instruments will set out the requirements, how will they be applicable in practice, and how will they become guaranteed, measurable and suitable for feedback?

There are severe shortages in this respect as well: with the exception of some trades (mainly related to the automotive industry), the labour market requirements are not assessed and integrated into the system of output requirements and framework curricula despite the fact that one of the key aspects of the ongoing reviews is the integration of content elements and methodologies designed to develop digital competences. There is no measurement-assessment framework used in the practice of vocational training institutions which could measure the current digital competences and designate the individual development paths of students, teachers, vocational instructors and practical trainers (and provide subsequent feedback).

Therefore, the strategic goals and tools identified in respect of the formal vocational education and training system were designed with a view to developing the general and trade-specific digital competences of students participating in vocational education in a comprehensive way, complementing the public education system, and to creating a digital environment that supports the teaching-learning process.

3.1.2 SWOT analysis

Erősségek

- Iskolahálózat – Szakképzési Centrumok
- Motivált és nyitott pedagógusok és diákok köre (szűk, de lelkes csoport)
- A tanulók többsége rendelkezik „okos" eszközökkel
- Vállalati gyakorlat
- Fejleszthető, naprakész tananyagok
- Otthoni internetelérés, ellátottság
- Szakmastruktúra – széles szakmai kínálat
- Vannak hazai tartalomfejlesztők
- Az oktatók gyakorlati felkészültsége (bár tudásuk nem mindig naprakész)
- Van internet-elérhetőség az iskolákban (habár a minősége eltérő)

Gyengeségek

- Intézmények technikai/eszközbeli hiányosságai + elavultság (fontos, hogy ne csak informatika órán álljanak rendelkezésre az eszközök)
- Az oktatók többségének motivációja nem megfelelő (befogadó készség, félelem a változástól)
- A szaktanárok informatikai felkészültségének hiánya
- Hiányzik a köznevelési megalapozottság
- Kevés a digitális tananyag
- Tévhitek az e-learningről
- Az ipar a mai igényeknek megfelelő szakembereket akar, de a szakképzési intézmény a jövőre akar felkészíteni
- Hiányosak a diákok ismeretei – hiányos IKT-kompetenciák (például nem tudnak információt keresni az interneten)

Lehetőségek

- A munkaerőpiaci belépés esélyének növelése
- Kormányzati elköteleződés
- A mobil eszközök terjedése
- Minőségirányítás (adatosítás – a diákok és pedagógusok teljesítményének folyamatos mérése)
- Módszertani fejlesztések az IKT-k alkalmazására (oktatók felkészítése)
- Pályaorientáció, pályaismeret erősítése
- Létezik innovatív iskolahálózat, amire építeni lehetne
- Tanulói eszközfejlesztés (a tanulók digitális eszközökkel való ellátása)
- Sok ingyenes tartalom van (jelenleg használatlanul)
- „Bring your own device!" (Hozd magaddal az eszközöd!)
- Digitális tanár továbbképzések
- 2020-ig biztosan vannak EU-s források a fejlesztésekre
- Egységes learning management system
- Infrastruktúra fejlesztések
- Szakmafejlesztés

Veszélyek

- Érdekviszonyok inkoherenciája
- Digitális tananyagok frissítés nélkül, nem megfelelő tartalommal
- HH-s és HHH-s gyerekek (eszközhiány, motiválatlanság)
- Változó/nem kiszámítható jogszabályi környezet
- Technológiai és szakmai gyors elévülés
- Amennyiben a tudás – tartalom – eszköz nem egyszerre kerül fejlesztésre
- Folyamatos IT-helpdesk biztosításának hiánya
- Félelem a változástól (elutasítás)
- Alapvető hiányosságok (tanulók)
- Amennyiben a munkaerőpiaci igények nem jelennek meg a tananyagfejlesztésnél
- Az egyensúly felbomlásának veszélye a hagyományos és a digitális módszerek és eszközök használata tekintetében
- Az informatikai szakképzés nem a munkaerő-piacra készít fel, hanem a felsőoktatási rendszerbe történő belépésre
- A nemzetközi tapasztalatok nem hasznosulnak
- Hatalmas a feladatok komplexitása

	Strengths	Weaknesses	
Strengths	• School network - VET Centres • Group of motivated and open teachers and students (a small but enthusiastic group) • Most students own "smart" devices • Company trainee programmes • Up-to-date, upgradeable learning materials • Access to internet and internet coverage at home • Occupational structure - wide range of trade options • Availability of domestic content developers • Practical preparedness of instructors (although not always up-to-date knowledge) • Access to internet at schools (although the quality varies)	• Technological / equipment shortages + obsoleteness in the institutions (it is important to make equipment available in classes other than information technology) • Most of the instructors have insufficient motivation (inclusiveness, fear from changes) • Lack of digital preparedness of vocational teachers • Lack of foundation skills public education should have transferred • Insufficient amount of digital learning materials • Misconceptions about e-learning • The industry wants specialists to meet today's needs while VET institutions want to prepare for the future • Students have a lack of knowledge - shortages in ICT competences (e.g. they cannot browse the internet for information)	**Weaknesses**
Opportunities	• Increasing chances to enter the labour market • Governmental commitment • Spread of mobile devices • Quality management (data recording - continuous measurement of student and teacher performance) • Development of methodologies for ICT use (preparation of instructors) • Strengthening career orientation and career awareness • There is an existing innovative school network to rely on • Students' equipment development (ensuring students' access to digital devices) • Availability of a lot of free content (currently unused) • "Bring your own device!" • Digital teacher further trainings • Access to EU funds for development guaranteed until 2020 • Common learning management system • Infrastructure developments • Trade development	• Incoherent interests • Digital learning materials not updated, with inappropriate content • Children with disadvantages and multiple disadvantages (lack of tools and motivation) • Changing/unforeseeable legislative environment • Rapid outdating in technological and professional terms • Unsynchronised development of knowledge content and tools • Lack of availability of a non-stop IT helpdesk • Fear of changes (rejection) • Basic deficiencies (students) • If curriculum development does not take account of labour market requirements • The balance between the use of traditional and digital methods and tools may be upset • Vocational training in ICT does not prepare for the labour market but for entrance to higher education • International experience is not utilised • Huge complexity of tasks	**Threats**

As appears from above, the experts involved in the strategy-making process regard the vocational education and training centres set up under the professional management of the operators of the Ministry of National Economy (MNE) among the strengths of the area of vocational education. The infrastructural background focused in the centres and the opportunity for the exchange of experience between instructors can contribute to the development of a digital educational environment as well as to the adoption and dissemination of the new methodological culture. The small number of extremely enthusiastic and motivated teaching staff was mentioned as a further strength, as they are open towards the use of new methods and tools supporting digital learning. Other strengths include students' access to smart devices, the extension of the dual training programme, and the availability of domestic content developers, who can be involved in the development of digital learning materials and interactive interfaces.

The experts view the increasing chances to enter the labour market, the high degree of governmental commitment, the spread of mobile devices, the elaboration of the quality management system, and the methodological preparation of instructors as an opportunity for exploiting the potential of digital competence development.

The main weakness of the present VET system is the lack of technological infrastructure and equipment of the institutions and the obsoleteness of existing devices. Most teachers and vocational

instructors are under-motivated and afraid of changes with the lack of technological preparedness lying in the background in many cases.

The situation is made even more difficult by the lack of foundation skills which students should have acquired in public education: they do not have sufficient IT knowledge or competences required for digital education and they are not familiar with the new learning techniques, nor with the new methods and tools for acquiring information. In the area of vocational education there are few learning materials available, and most of them are out-of-date as far as experts have experienced.

Regarding the integration of digital education into vocational training, one of the threats mentioned is that the quality of digital learning materials is not satisfactory, which is basically due to the fact that a major part of the digital learning materials developed in vocational education were published in the mid-2000s, so their content should be revised.

At the same time, the motivation of students with disadvantages and multiple disadvantages, whose proportion is rather high among VET students, is low, and they do not even have the basic ICT equipment. From their viewpoint, this results in further segregation in the field of digital education and makes the inclusion of digital education problematic.

The changing, unforeseeable legislative environment, the rapid outdating in technological and professional terms, the unsynchronised development of the triple unit of knowledge-content-tools, the high number of vocational training courses (several hundreds of trades), and the risk that labour market needs and requirements will not be channelled into the development of teaching materials all pose additional threats.

By placing vocational training on a digital educational platform, experts envision a VET system which enables its students to acquire the digital vocational competences they will need for entering the labour market, exploits the potential of digital pedagogy for the purposes of motivating students and increasing the effectiveness of learning, and uses digital technology for the quality assurance of the learning process.

3.2   Vision

The vocational education and training pillar has defined a vision for the VET system, where:

- Under the control of the minister in charge of employment policy, vocational education basically offers training courses that are tailored to labour market requirements and specific local circumstances in a dual system, which is available to all students who are willing to learn.

- The content requirements of vocational training are set out as learning outcomes including, most importantly, digital knowledge, skills and competences.

- As regards the use of ICT, young people entering secondary education are already able to search, evaluate, store, create, present and transfer information based on multimedia technology and participate in online network at the level of competence.

- Relying on these competences, digital devices are in the focus of the educational activity of VET centres and institutions not operated by the state, thus enabling young VET graduates to enter the labour market with the ability of and the need for independent learning and self-development.

- In the course of the theoretical instruction of general and vocational subjects and practical training, teachers and vocational instructors use digital systems that support learning[31] at the level of competence, relying on the students' own ICT devices. There is an appropriate number of high-quality digital learning materials available to students, and their validation takes place with the involvement of labour market participants.

- The pedagogical process focuses on supporting the individual learning path of students, which contributes to reducing the number of early school-leavers.

- The development of digital competences is not carried out in the framework of one single subject, but appears throughout the entire spectrum of education. At the same time, the teaching of the IT subject is given an important role as it provides for the continued development of students' core digital competences based on initial training. ● In this context, the common framework of reference for infocommunications (IKER) is introduced, as it is suitable for identifying the level of digital competence of students, vocational subject teachers and practical instructors as well as for monitoring their development.

- In classrooms and practical workshops there are appropriate hardware and software available for the theoretical and practical teaching of the trades concerned, and there is access to broadband internet connection in the educational and community areas alike.

- Teachers and vocational instructors regularly develop their digital competences, which the state supports by providing free further training programmes and promoting horizontal learning opportunities and school networks.

- The digital administration system of vocational training institutions ensure that teachers, vocational instructors as well as the students and their parents have access to up-to-date information concerning the students' individual academic progress and the opportunities supporting it.

- Vocational training is planned with the help of a central electronic database which relies on labour market requirements and provides up-to-date information for the indicators of the system monitoring the implementation of digital education.

3.3   Strategic Goals

Without acquiring an adequate level of digital competences, employees will be unable to join production processes, operate devices or tools, communicate with their colleagues or clients, or keep their   knowledge   up-to-date.

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[31] (LMS - learning management system)

Workforce with a lack of appropriate digital competences puts businesses at a competitive disadvantage, because it prevents them from using the most state-of-the-art and efficient technologies and engaging in modern production management processes. Moreover, it is their responsibility as employers to arrange and finance additional, supplementary training.

In order to make sure that VET graduates acquire the general and vocational digital competences required by the labour market and necessary for continuing education, in harmony with and complementing the VET concept approved by Government Decision No 1040/2015 of 10 February 2015 entitled "*Vocational education and training in the service of the economy*" as well as the goals set by the public education pillar, the vocational education and training pillar of The Digital Education Strategy of Hungary aims to achieve the following strategic goal in respect of the vocational education and training sector:

> **To ensure that students completing vocational education and training acquire general and vocational digital competences required by the labour market and necessary for continuing education.**

The promotion of digital education among institutions engaged in formal vocational education and training is not an end in itself, but a very important tool of guaranteeing that young VET graduates have appropriate labour market competences also in this area, which enables them to solve problems on their own. With regard to the fact that digital literacy is vital for lifelong learning, it is of special significance to ensure that students have an appropriate level of general digital competences required for continuing education.

Based on the experience of employers, young people graduating from vocational training do not use digital devices and programmes at the level of competence, which makes their on-the-job training for the use of certain company-specific applications rather difficult. In addition to the knowledge and use of trade- and company-specific IT systems, the ability of and the need for independent learning and self-development are indispensable for professional advancement, for which digital platforms serve as excellent tools. Acquiring information in this way makes it possible to continuously increase professional knowledge and keep it up-to-date.

We recommend that the strategic goal presented above should be implemented through the identification of development goals and the specific goals aimed at their achievement as follows:

STRATÉGIAI CÉL	**A szakképzésben végzett tanulók rendelkezzenek a munkaerőpiac által elvárt, valamint a továbbtanuláshoz szükséges általános és szakmai digitális kompetenciákkal**

FEJLESZTÉSI CÉLOK	Az intézményvezetők elköteleződésének növelése a digitális oktatás, illetve a digitális oktatási adminisztráció területén	A tanárok és szakoktatók digitális kompetenciáinak fejlesztése a XXI. századi technikai és a szakma-specifikus követelményeknek megfelelően	A szakképzési intézmények digitális oktatáshoz szükséges infrastruktúrájának fejlesztése	Digitális szakmai tartalmak biztosítása valamennyi szakma vonatkozásában

SPECIFIKUS CÉLOK	Az oktatást támogató digitális adminisztrációs eszközök használatának intézményvezetői támogatása valamennyi szakképzési intézmény esetében	A tanárok és szakoktatók rendelkezzenek a digitális oktatáshoz szükséges technikai ismeretekkel és módszertani kompetenciákkal	A szakképzési intézmények rendelkezzenek a digitális tanításhoz és tanuláshoz szükséges korszerű informatikai eszközökkel	A tanárok és szakoktatók munkaerő-piaci szempontból releváns digitális tartalmakra építve legyenek képesek a szakmákhoz szükséges tudás átadására, valamint az azokhoz tartozó kompetenciák kialakítására
	A digitális tanítási és tanulási módszerek alkalmazásának ösztönzése gyakorlattá válik intézményvezetői szinten a szakképzési intézményekben	A tanárok és szakoktatók váljanak elkötelezetté a digitális oktatás irányában	Valamennyi szakképzési intézmény rendelkezzen a digitális oktatás kiterjesztéséhez szükséges internet hozzáféréssel és WiFi hálózattal	A digitális tartalmak megosztásának támogatása

STRATÉGIAI CÉL	STRATEGIC GOAL
A szakképzésben végzett tanulók rendelkezzenek a munkaerő pác által elvárt, valamint a továbbtanuláshoz szükséges általános és szakmai digitális kompetenciákkal	To ensure that students completing vocational education and training acquire general and vocational digital competences required by the labour market and necessary for continuing education
FEJLESZTÉSI CÉLOK	**DEVELOPMENT GOALS**
AZ intézményvezetők elköteleződésének növelése a digitális oktatás, illetve a digitális oktatási adminisztráció területén	To increase the commitment of institution heads towards digital education and digital education administration
A tanárok és szakoktatók digitális kompetenciáinak fejlesztése a XXI. századi technikai és a szakmaspecifikus követelményeknek megfelelően	To develop the digital competences of teachers and vocational instructors in line with the technical and trade-specific requirements of the 21st century
A szakképzési intézmények digitális oktatáshoz szükséges infrastruktúrájának fejlesztése	To improve the infrastructure necessary for digital education in vocational training institutions
Digitális szakmai tartalmak biztosítása valamennyi szakma vonatkozásában	To ensure the availability of digital vocational content in respect of all trades
SPECIFIKUS CÉLOK	**SPECIFIC GOALS**
Az oktatást támogató digitális adminisztrációs eszközök használatának intézményvezetői támogatása valamennyi szakképzési Intézmény esetében	To ensure that institution heads support the use of digital administration tools that support education in all vocational institutions
A digitálistanítási és tanulási módszerek alkalmazásának ösztönzése gyakorlattá válik intézményvezetői szinten a szakképzési intézményekben	To promote the use of digital teaching and learning as a practice at the level of management of vocational training institutions
A tanárok és szakoktatók rendelkezzenek a digitális oktatáshoz szükséges technikai ismeretekkel és módszertani kompetenciákkal	To make sure that teachers and vocational instructors have the technological knowledge and methodological competences required for digital education
A tanárok és szakoktatók váljanak elkötelezetté a digitális oktatás irányában	To make teachers and vocational instructors committed to digital education
A szakképzési intézmények rendelkezzenek a digitális tanításhoz és tanuláshoz szükséges korszerű informatikai eszközökkel	To guarantee that vocational training institutions are equipped with all modern ICT tools that are required for digital teaching and learning
Valamennyi szakképzési intézmény rendelkezzen a digitális oktatás kiterjesztéséhez szükséges internet hozzáféréssel és WiFi hálózattal	To provide access to the internet and a WiFi network necessary for spreading digital education in all vocational training institutions
A tanárok és szakoktatók munkaerő-piaci szempontba releváns digitális tártálmakra építve legyenek képesek a szakmákhoz szükséges tudás átadására, valamint az azokhoz tartozó kompetenciák kialakítására	To enable teachers and vocational instructors to transfer the knowledge required for the trades concerned based on digital content that are relevant to the labour market and to develop the related competences
A digitális tartalmak megosztásának támogatása	To support digital content sharing

The following table shows the main indicators which measure the implementation of the specific goals.

STRATEGIC GOAL	DEVELOPMENT GOAL	SPECIFIC GOAL	EXPECTED OUTCOME	INDICATORS
Students completing vocational education and training acquire general and vocational digital competences required by the labour market and necessary for continuing education.	The commitment of institution heads towards digital education and digital education administration increases.	Institution heads support the use of digital administration tools that support education in all vocational institutions.	Vocational training institutions use a common administration system which makes their operation more cost-efficient and transparent both for their internal and external partners.	The ratio of institutions using the common administration system compared to all VET institutions (%).
		The promotion of the use of digital teaching and learning methods becomes a practice at the level of management of vocational training institutions.	The strategic documents of the institutions include all institutional principles and professional concepts concerning digital education, which teachers and vocational instructors intentionally use.	The ratio of digitally supported lessons compared to all lessons (%). The ratio of digitally supported practical workshops compared to all practical workshops (%). The number of institution-level regulatory documents on requirements related to digital education (pcs).
	Development of the digital competences of teachers and vocational instructors in line with the technical and trade-specific requirements of the 21st century.	Teachers and vocational instructors acquire the technological knowledge and methodological competences required for digital education.	Teachers and vocational instructors use digital tools for the purposes of their work to prepare for classes as well as during the lessons. They have acquired knowledge concerning digital teaching-learning methodology which they use at the level of competence.	Ratio of teachers with digital competences compared to the total number of teachers at institutional level (%). Ratio of vocational instructors with digital competences compared to the total number of vocational instructors at institutional level (%). The qualitative indicators of digitally supported lessons/workshops (based on the assessment of students,

			teachers, vocational instructors).
	Teachers and vocational instructors are committed to digital education.	The teachers and vocational instructors of vocational training institutions are aware of the advantages of digital education and use it in the teaching-learning process on a regular basis.	Ratio of usage of online platforms by teachers and vocational instructors compared to the total number of teachers and vocational instructors at institutional level (%).
Development of the infrastructure necessary for digital education in vocational training institutions.	Vocational training institutions are equipped with all modern ICT tools that are required for digital teaching and learning as well as with infrastructure supporting the use of learning techniques.	All classrooms and practical workshops have access to equipment suitable for holding lessons and practical training sessions.	The average age (years) of computers (laptops). Number of students per computer (head). Number of students per portable computer (head). Number of devices in proportion to the number of classrooms/practical training rooms (%).
	All vocational training institutions – taking the content of the institution's vocational education activity into account – have Internet access and a WiFi network required	All classrooms and practical training rooms have internet access. Students have access to a managed network and internet at school.	The bandwidth available in the institution (Gb/s). Bandwidth per student in the institution (Gb/s). Ratio of classrooms with internet access compared to the number of all classrooms (%) (including number of classrooms with WiFi access).

		for spreading digital education.		Ratio of practical training rooms with internet access compared to the number of all practical training rooms (%) (including number of rooms/spaces with WiFi access). Number of students per computer used for community purposes and having internet access (head).
	The availability of digital vocational content in respect of all trades.	Teachers and vocational instructors are able to transfer the knowledge required for the trades concerned based on digital content that are relevant to the labour market and to develop the related competences.	Trade-specific digital content and learning materials available to vocational training institutions.	Number of digital study materials per trade (pcs).
		Supporting digital content sharing.	An online knowledge sharing interface operated and maintained on a national scale.	Quality indicators of the online knowledge sharing interface operated and maintained on a national level (based on the assessment of the teachers and vocational instructors using the interface).

The monitoring tasks of the strategy (the implementation of the goals of the DES and the continuous updating of the situation analysis) would be defined and performed by the Digital Methodology Centre (DMC) which is proposed to be set up within the framework of the institution system.

3.4   Set of tools

3.4.1 Set of output requirements that supports digital competence development

- *Launching sector-specific pilot programmes to identify general and professional digital competences required by the labour market.*

The employer interviews conducted in the preparatory stage of the strategy pointed out the need for identifying the scope of general and vocational digital competences expected by the labour market with the involvement of future employers. With regard to the high number of trades, it is impossible to assess needs in each individual case. However, in the case of some sectors (industries) that are of key significance from the aspect of employment and digitalisation, it would be useful to create, as a pilot project, cooperation platforms where employers, vocational training institutions and other stakeholders involved in the elaboration of the output requirements and framework curricula of vocational education and training will review the current regulatory documents together and identify the requirements which are essential for young VET graduates of a specific trade to become successful on the labour market.

In addition, according to our expectations, the more intensive involvement of labour market participants will initiate closer partnerships which can ensure the continuous presence of professional requirements in the training contents and tools. This may have a positive impact on the employment chances of those who have acquired vocational qualifications (prepared workforce) as well as on the increased economic profitability of companies (more efficient work).

- *Review and further development of vocational and examination requirements, vocational requirement modules and VET framework curricula with the aim of supporting digital competences. The regulatory documents should highlight the industry-specific IT requirements in the case of all types of vocational qualification (e.g. digital design programs, drawing programs, use of planning and budgeting programs, digital management skills, etc.).*

In our modern world, the digital transformation of trades and professions is so intensive that it necessitates changes in the content of vocational training and, in particular, in the tools required for the pursuit of certain professions. Today, a production process is almost unimaginable without modern equipment (production lines) and management systems. For this very reason, it is crucial to lay an emphasis on IT competences specific to a certain trade or profession among the requirements for acquiring qualifications. To this end, it is necessary to review and update all vocational and examination requirements, requirement modules, and VET framework curricula in response to the current IT needs of the industries concerned.

- *Adding an element supporting digital competence development to the interfaces of framework curricula in respect of each element of the output requirements. Methods based on students' digital key competences should be included in the framework curricula of non-IT subjects as a compulsory element.*

In order to integrate digital contents and teaching-learning methods supported by cutting-edge technologies into the everyday practice of vocational training institutions, it is essential to make sure that these requirements are clearly reflected in the regulatory tools determining the vocational training contents of the individual trades. Therefore, the task is to review and update framework curricula by adding content-methodology elements that include digital competence development.

● *Presenting digital competences as a criterion of professional advancement in the life path model of teachers and vocational instructors working in vocational education.*

The vocational training development concept plans to elaborate and introduce a special life path model which is similar to the life path model of teachers. This involves setting out the requirements of the system of advancement of vocational subject teachers and instructors concerning digital competences (IKER Levels 3 and 4).

● *Presenting digital education as an assessment criterion in the school inspection system*.

3.4.2 Trade-specific learning materials that support digital competence development

● *Establishing a digital knowledge base and digital code of practice which contain e-learning materials meeting labour market demands in respect of each vocational qualification to cover all vocational output requirements for the purposes of supporting different learning needs possibly in a number of alternative versions.*

In the case of all vocational qualifications it is essential to develop e-learning materials adapted to labour market requirements, collect and, where necessary, update existing ones, and to create a methodological base for digital teaching-learning processes with a view to providing professional-methodological assistance to vocational subject and practical instructors for holding ICT-supported lessons as well as for efficiently developing the digital competences of students.

AT present, the existing digital learning materials are not complete, they are of varied quality, and there is no common platform (knowledge base) which teachers and vocational instructors could quickly and easily access.

● *Ensuring the creation of digital content developed by teachers of vocational subjects and practical instructors.*

In addition to the development of learning materials, it is also important to motivate vocational subject teachers and practical instructors for creating their own digital content and to provide an interface for such new content. Another aim is to elaborate and introduce an incentive programme in VET institutions.

● *Ensuring the share of digital content within and between the institutions.*

The recommended knowledge and methodology base is suitable for enabling the teachers and instructors of VET institutions providing identical training programmes to share their methodological solutions and the digital contents they have developed regardless of geographical distances. By

developing a "forum" function it will be possible to build virtual professional communities, thus engage in professional consultations, and learn from one another.

While functioning as a collection of pedagogical good practices, this kind of knowledge sharing portal could offer an opportunity for independent learning, self-assessment as well as content sharing and cooperation with vocational teachers and practical instructors.

3.4.3 Development of the digital methodological practice of teachers and vocational instructors

- *Adding contents required for digital education to the requirements of vocational instructor (BSc), engineer instructor and economics teacher training courses as well as courses preparing for the master's examination.*

The fulfilment of digital competence requirements necessary for transferring knowledge and developing competences should be a basic criterion for teachers to acquire a qualification in the theoretical and practical instruction of vocational subjects.

The output requirements must be reviewed in respect of all relevant training programmes and qualifications, and they must be complemented with the digital competence requirements necessary for education and training.

- *Providing specialised further training supporting digital education to teachers of vocational theoretical subjects and practical instructors.*

Similar to the further training system of teachers, it is also necessary to provide training courses which enable vocational theoretical subject teachers and practical instructors to acquire in-depth, trade-specific technological knowledge. In addition, there is a need for further training courses aimed at the development of general digital competences, which would provide an opportunity to already graduated and practising teachers and vocational instructors for further development.

The training/further training requirements set out in the public education pillar must be extended to teachers of vocational theoretical subjects and practical instructors who work in the vocational education and training system.

- *Supporting the introduction of Learning Management Systems in vocational training institutions.*

The measures of the public education pillar include the establishment of an electronic platform, which provides assistance in the process of teaching and learning for teachers and students alike. This platform is suitable for creating, editing, sharing and playing e-learning materials, assigning measurement-assessment tasks as well as collecting and evaluating the results, provided that the nature of the task makes this possible. It is also possible to allow vocational subject teachers and practical instructors to be channelled into this platform.

In addition to the creation of a common framework, it is important to make sure that the teachers of vocational subjects and practical instructors get familiar with the currently available learning support and learning material editing systems, for which it is necessary to organise further training courses.

● *Establishing communication channels necessary for the sharing of digital methodologies within and between the institutions.*

The establishment of a knowledge and methodology base (online platform) can assist teachers and practical instructors in selecting and adopting the teaching-learning methodology that best suits their specific thematic field.

Another method of horizontal learning is to support the organisation of workshops within and between the vocational training institutions, also within the framework of compulsory further training courses. These workshops can serve as an appropriate forum for the presentation and adoption of good practices and the transfer of tacit knowledge. The development and dissemination of the knowledge sharing culture represents substantial added value from the aspect of the improvement of cooperation between teachers and instructors, thus contributing to the continuous expansion and updating of digital teaching-learning methods and contents. Furthermore, the workshops can also add to an increase in personal commitment and motivation.

3.4.4 Digital infrastructure development in specialised classrooms and workshops

● *Building a Gb/s network required for local data traffic in each classroom and practical training site.*

On the basis of the parameters specified by the public education pillar and in line with the results of the technical and viability assessments of the working group set up for the purposes of implementing Section 3(b) of the Government Decision on the Digital Success Programme, it is necessary to build a local network required for holding lessons and workshops in a digital environment in all specialised classrooms and practical training sites (workshops, etc.).

● *Providing WiFi coverage in all specialised classrooms as well as in school and company workshops.*

In order to involve students' own equipment and mobile devices into the learning process, it is essential to provide WiFi coverage. For this very reason, efforts should be made to ensure that the WiFi network required for the acquisition of knowledge is available not only in the area of vocational training institutions, but also in company workshops, in due consideration of the findings of the technical and viability assessments.

● *Establishing online learning platforms also available to students at institutional, class, vocational qualification and subject levels.*

The knowledge sharing portal specified in the public education pillar must be created in a way that it should be accessible to students as well, thus providing an online learning platform which is able to manage the creation of virtual communities of various levels (institution, class, vocational

qualification, subject), the joint acquisition of knowledge and problem solving, or even the measurement and assessment of the knowledge acquired.

- *Building and improving specialised digital classrooms supporting vocational education (e.g. 3D designers, study offices etc.).*

In the case of trades where digital devices and programmes have an emphatic role within the basic set of tools, it is of key importance to ensure that vocational training institutions have well-equipped specialised classrooms which are suitable for the transfer of vocational skills and knowledge at a high standard. Future employers can give useful input criteria for the equipment of the specialised classrooms because in this way they will be suitable for teaching the use of technical devices, programmes and systems that are actually used in practice.

- *Making mobile equipment available to students anywhere in the area of the institution.*

In order to provide wide-ranging assistance for ICT-supported independent learning and problem-solving and to create equal opportunities, it is highly important to ensure that mobile devices required for learning are available to students not only in the classrooms but also in the community areas (e.g. lobby, library, etc.). Therefore, it may be necessary to furnish a room in each institution where the participants of the training have a possibility to use ICT tools for learning purposes outside the classroom as well.

3.4.5 Developing the management's commitment towards supporting digital education

- *Providing further training on the methods of the institutional dissemination of digital education to heads of institutions and practical training.*

The digital transformation of vocational training institutions is impossible without the commitment of their management. For this reason, it is of key importance to organise management training programmes which present the advantages of digital education, take account of the conditions required for digital education, and provide methodological support for its introduction at the institutional level.

- *Full introduction of a standard, continuously maintained digital administration system to support education in all vocational training institutions.*

Generalising the use of the electronic class register is an equally essential task from the aspect of education administration and parent information, so it is given priority among the measures of the public education pillar. In the case of vocational training institutions, regular contact with parents is of utmost significance as it is this level of education that the drop-out rate and the number of early school-leavers is the highest.

Furthermore, digital education administration solutions should guarantee that vocational teachers, practical instructors, and vocational training institutions can fulfil their data disclosure obligation and access information that is required for the performance of their activities.

3.5   Logical Framework Matrix

GROUP OF TOOLS	DEVELOPMENT GOALS/SPECIFIC GOALS							
	To improve the infrastructure necessary for digital education in vocational training institutions		To develop the digital competences of teachers and vocational instructors in line with the technical and trade-specific requirements of the 21st century		To ensure the availability of digital vocational content in respect of all trades		To increase the commitment of institution heads towards digital education and digital education administration	
	Modern IT tools and infrastructure required for digital teaching and learning	To improve access to the internet in vocational training institutions	ICT knowledge, methodological preparedness	Motivation and interest in digital education	To provide digital content relevant to the labour market in all trades	Digital knowledge sharing	Extensive use of digital administration tools that support education	To increase the commitment of institution heads in vocational training institutions
Digital vocational output requirements	X		X	X	X	X		
Digital vocational content	X		X	X	X	X		
Development of teachers and vocational instructors	X		X	X			X	X

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Digital infrastructure	X	X						
Institution management			X	X			X	X

3.6   Financing

In addition to the state budget, vocational training developments are also funded by the Human Resources Development Operational Programme (HRDOP) and the Economic Development and Innovation Operational Programme (EDIOP). The 2016 Annual Development Budget (ADB) of the HRDOP does not finance programmes supporting vocational education and training, and although the operational programme makes reference to the VET development objective within the investment priority entitled *"Infrastructure investments for increasing the knowledge capital"* in Chapter 9 of the OP, in setting out the ex-ante conditionalities it already clarifies that vocational education and training belongs under the EDIOP.

The 2016 Annual Development Budget[32] of the EDIOP mentions two VET-related priority projects and one financing scheme, which can be applied for in the form of grant applications.

The above three financing schemes provide development funds for vocational education in a value of more than HUF 17 billion in gross terms. It should be made clear, however, that in the framework of these three EU projects vocational education and training must share the available funds not only with adult training but also with general purpose goals that are independent of digital education and training. The digital development of vocational education must not be a one-off and closed task. As the world, technologies and digital systems are developing, digital contents, infrastructure as well as the knowledge of teachers and vocational instructors, etc. must also be continuously developed. Project financing is not an appropriate means for this, instead, there is a need for a reliable source of funding, which can only be provided from the state budget.

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[32] Government Decision No 1006/2016 of 18 January 2016 amended by Government Decision No 1201/2016 of 15 April 2016.

4 HIGHER EDUCATION

4.1 Situation Analysis

4.1.1 The general state of higher education

4.1.1.1 International and national trends

In line with the OECD's publication on the educational sector[33], a document which is regarded relevant and well-established all over the world, the Hungarian higher education strategy – *Upgrading in higher education*[34] – lays special emphasis on transforming higher education and rethinking its tasks, while it also focuses on its outstanding role in successful entry on the labour market.

The expansion of higher education is still ongoing in the world. In terms of the OECD average, more than 20% of the youths are first generation graduates, which has a definitely positive effect both on the social expenses and the innovation and development capacities of a country. Having recognised this potential, our country has decided to increase the number of higher education graduates to 30% by 2020.[35]

In our country, the switch to the Bologna system was not so smooth. International trends show that although the number of students entering bachelor's programmes is much higher than those in master's degree courses, a master's degree offers better opportunities (higher salary) on the labour market.

Since 2010 the value of budgetary resources allocated to higher education decreased in several OECD countries. In the forthcoming decades, the demographic and economic factors as well as the international cultural partnerships are expected to urge changes in the global higher education sector. Students' mobility between countries will increase or decrease parallel with the economic cooperation of these countries.

The global exchange of knowledge will be multidirectional. Let us just think of the partnerships already established – and the ones yet to be established – on account of research and educational processes not only between institutions but also between institutions and global companies (the infrastructure and knowledge base managed by the NIIF Institute serve this very purpose). This makes institutions which have exploited the opportunities offered by these partnerships visible at the global level as well.

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[33] http://www.oecd-ilibrary.org/docserver/download/9615031e.pdf?expires=1461307423&id=id&accname=guest&checksum=22C046527F563B9015437C042041FBFF;

[34] http://www.kormany.hu/download/d/90/30000/fels%C5%91oktat%C3%A1si%20koncepci%C3%B3.pdf;

[35] http://ec.europa.eu/europe2020/pdf/targets_hu.pdf;

Higher education is gradually transforming also due to the need for new learning techniques and the growing potential of digitalisation. In addition, the transformation pressure and the introduction of digital tools and methods provides an opportunity for laying the groundwork for a modern higher education system.[36]

The features of modern higher education are:

- Quality improvement due to shared, available, high-quality learning materials and creative, modern pedagogy.

- Development of a more complex higher education system by improving access and supporting lifelong learning.

- Better international visibility and easier international entry achieved through addressing new international student groups.

- Opportunities for better local and global cooperation.

- Individual learning path based on high-quality data.

Our country has made significant progress in the integration of labour market needs by promoting dual training. The introduction of the dual training system creates an opportunity for increasing the number of future higher education graduates who are capable of entering the labour market immediately, without several years of further training or further expenses. Thus, the training model contributes to the achievement of the objectives laid down in the new higher education concept entitled "*Upgrading in higher education*" aimed at reducing the drop-out rate, promoting practice-oriented training, and offering degrees that match with the actual labour market needs.

4.1.1.2   The situation of IT training programmes[37]

Information technology is taught in 20 higher education institutions in 13 cities of the country to a total number of some 19,000 students according to the data of the 2015/2016 academic year.[38] The number of students admitted to BSc and MSc courses in information technology has declined by 18% in the past five years despite the fact that information technology is the most dynamically growing industry and the number of tasks requiring a higher education degree in IT is increasing exponentially all over the world. Vacancies in IT jobs amount to over 20,000 in our country.

Market actors complain about unsatisfied labour demands at all levels of the information technology industry. There is a need not only for highly qualified professionals, but also for technicians serving lower levels. However, most major companies operating in the ICT industry require a higher education degree and knowledge as a general criterion. On the other hand, there is also a substantial

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[36] New models of learning and teaching in higher education; High Level Group of Modernisation of Higher Education; October 2014; http://ec.europa.eu/education/library/reports/modernisation-universities_en.pdf;

[37] Source: Versenyképes oktatás, versenyképes munkaerőpiac - Javaslatok az informatika helyzetének javítása érdekében a magyar oktatásban; (Competitive education, competitive labour market - Recommendations for improving the situation of information technology in Hungarian education); NHIT 2015.

[38] Source: Educational Authority

demand for junior programmers without advanced knowledge in mathematics and physics. Typically, the market is so hungry that some companies tend to entice this workforce from the lower years of higher IT specialist training programmes, which has a detrimental effect not only on individual careers but also on the labour market in the long run.

Companies are of the view that the main task of the university is to transfer basic professional knowledge which students can further develop in their area of specialisation and which can serve as a basis for the necessary industry- and company-specific knowledge.

The shortage of IT specialists in terms of quantity and quality basically arises in three forms:

- insufficient number of specialists (shortage);

- inappropriate qualification levels, difference between the available and necessary expertise (gap);

- the training programmes are not market- or practice-oriented;

- difference between the expertise transferred by the training programme and the requirements of the labour market (mismatch);

- the training contents are often obsolete.

The reason behind the quantitative shortage is the low number of applicants as well as the high drop-out rate. Owing to the "top-heavy" training structure, the practical training takes place after the initial theoretical courses, so a lot of students drop out of IT training after the first or second year with "empty hands". This blinkered, inflexible training path does not allow room for multi-output training, which would take heterogeneous labour market needs into consideration.

4.1.2 The digital situation

4.1.2.1 The situation and condition of digital infrastructure[39]

In some areas, the basic ICT infrastructure in higher education is excellent and meets world-class standards, however, in some other fields it is below the EU average.

The basic network infrastructure (HBONE+ system) is of outstanding quality. Pursuant to Government Decree No 5/2011 of 3 February 2011 on the National Information Infrastructure Development Programme, the NIIF Institute is responsible for the coordinated development of the information infrastructure and nationwide computer network services of higher and public education institutions, research and development establishments, public collections, and other education, scientific and cultural organisations on the HBONE+ backbone network and for access to national and international network connections and information services. Higher education institutions have access to broadband internet connection, the infrastructure is fully installed at all existing establishments. The new establishments will be connected to the network under the SIOP programme. At the same time,

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[39] Digital Nation Development Programme - Proposed concept of the higher education sector

there is a shortage of intra-institutional WiFi services, so many institutions have severe problems with wireless broadband internet access, so they cannot exploit the full potential of broadband internet. It is also important to note that the amount of funds available for developments in the Central Hungary region was rather low, so network equipment will become obsolete in a few years' time. The standardisation of the network could be a key aspect in future developments.

Furthermore, the system of virtual collaboration labs (VIRCA) is operated with the participation of higher education institutions but at the MTA-SZTAKI base (Institute for Computer Science and Control of the Hungarian Academy of Sciences).

The service of the NIIF Institute is called EDUROAM, which refers to a European virtual university campus. In the area of research and higher education the NIIF Institute has already established a system for federated identity and authorisation management (eduID, eduGAIN), which is aligned with international systems and provides an appropriate basis for system-level identification. The Kempelen Farkas Digital Textbook Library, which provides higher education contents, currently contains 13,000 titles and is used by 20-25 thousand people daily.

The Electronic Information Services National Programme operating since 2001 provides access to scientific databases in a central annual subscription system. As a result of the Social Renewal Operational Programmes (SROP), in addition to the original 6 major databases students, academics and researchers have access to more than 20 databases.

4.1.2.2 Availability and use of ICT equipment[40]

Almost 100% of students entering higher education have the appropriate digital equipment (laptop, smartphone, desktop computer). However, institutions have not created opportunities to enable the integration of these private workstations into the educational process.

The digital services of the institutions are being continuously developed: one of the most common directions of development is the provision of a wireless network (WiFi) coverage, which has been available in all major institutions except for one or two dormitories. Yet, the replacement of the IT infrastructure, especially the equipment, and the acquisition of legal software are critical areas. The central procurement prohibition that started four years ago coupled with the loss of the vocational training contribution has led to the rapid deterioration of the condition of equipment in higher education institutions. Other deficiencies include the purchase of tools and software that are required in small quantities for special education and research tasks (e.g. in laboratories or practical training sessions).

Based on a survey conducted by the NIIF Institute in the autumn of 2015, telephony expenses make up a relatively high proportion of the institutions' operating costs, which could be lessened by introducing the Voice over IP, i.e. VoIP service at sectoral level. The institutions participating in the survey would basically welcome the introduction of this well-established technology, but the

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[40] *Felsőoktatási informatikai és hallgatói szolgáltatási területek felmérése* (Assessment of ICT and student services areas in higher education) - Final review; MKIK GVI; 2014; page 42.

implementation of a service of this nature requires the upgrading of the organisational and ICT infrastructural background in the case of several institutions.[41]

Based on data from the 2015/2016 National Statistical Data Collection Programme (OSAP), there are great variations between the institutions in terms of the number of computers per student. On average, the number of computers is one quarter of the number of students in the institutions[42]. In general, all computers have broadband internet connection, except for only 174 of the more than 77 thousand workstations.

As regards software, it is important to note that the use of legal software is not a general practice, particularly for students who have difficulty accessing the legal versions of professional software during their studies[43]. It would therefore be reasonable to launch aid programmes which facilitate the use of professional software in higher education and which are based on the cooperation of software producers and the institutions.

The cloud technology is not widely used in higher education. Although institutions use it for some purposes, typically this is not a deliberate activity (e.g. Google Drive, etc.). Based on the NIIF survey, it is advisable for institutions to introduce cloud services (IaaS, PaaS, SaaS) so as to make the remote use of various types of services available.

4.1.2.3 Digital competences and attitudes (academics, students, employees, managers)[44]

Domestic demographic processes and the relatively narrow output of secondary schools awarding a general certificate of secondary education do not favour the achievement of the strategic goal undertaken in EU 2020. However, the decreasing number of students is also a resource, because the resulting free capacities can be utilised efficiently during the quality transformation of higher education.

The development of digital competences in higher education are aimed at the following:

- enhancing existing digital literacy (concerning ICT tools relating to professional training, relying on already acquired core competences);

- providing access to tools relating to professional training;

- increasing output in terms of quantity and quality in IT training.

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[41] *Vállalkozási szerződés keretében a felsőoktatási tagintézmények által használt informatikai szolgáltatások felmérése* (*Assessment of IT services used by higher education member institutions under a service contract*) – survey and the production of statistics for the NIIF Institute, September 2015

[42] The headcount data include the number of students in evening and correspondence courses.

[43] Although there is an example for this as well: at BCE (Corvinus University of Budapest) there are nearly 100 programmes that students can access with their Neptun code.

[44] Digital Nation Development Programme - Proposed concept of the higher education sector

As for those who enter higher education in the framework of lifelong learning but who have no digital literacy, there is a need for special higher education pedagogical interventions in respect of older students and senior academics alike.

There is a shortage of IT specialists on the Hungarian labour market both in terms of quality and quantity, which affects the ICT sector itself as well as sectors using ICT, clearly hindering the growth of these sectors. Moreover, in Hungary the ratio of specialists with a qualification in production is very low. Therefore, it is equally important to expand ICT specialist training both in quality and quantity and ensure their future supply.

Significant progress has been made in this area recently. At the University of Óbuda there is a competence centre developed with large ICT companies, and the practice-oriented renewal of Northern Hungarian ICT and related training programmes is being implemented within the framework of the SROP 4.1.2/F project. ELTE is an EIT ICT KIC member participating in ICT research.

This means that in the case of several institutions the current requirements of the ICT sector are integrated on a daily basis into the educational programmes through competence centres cooperating with companies. Where a shortage was found, they have launched development projects.

It is a significant step forward in the area of training courses supporting R&D within the ICT sector that for the purposes of the EU Digital Agenda and Future Emerging Technologies (FET) programmes, a "Confidence and Security", a "Future Internet", and a Future ICT centre was set up in Veszprém (PE), Debrecen (DE), and Szeged (SZTE).

There is an increasingly wide range of programmes promoting ICT with the participation of higher education institutions. Programmes familiarising 12-18-year-old students with STEM professions in the form of games are highly successful.

4.1.2.4 The methodological background and penetration of digital education and learning[45]

In the wake of the international comparison of higher education programmes it can be concluded that the Hungarian course descriptions contain few work forms that are different from the traditional ones (lecture, seminar, practice). The main obstacle to modernisation within study programmes is the centralised regulation of the academic work, which recognises only the most traditional "face-to-face" activities as paid working time.

The training output requirements and the MAB programme accreditation procedure undermines the national and institutional accreditation (and thus independent student work in foreign languages) of national and international online programmes (online courses available to masses). On another stage of learning some institutional experiments have already been initiated: the existing university career centres are being turned into competence centres where personal career guidance, career orientation, international mobility and language teaching are planned to partly take place on a digital

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[45] Digital Nation Development Programme - Proposed concept of the higher education sector, page 43

basis (the "Videotorium" established by NIIFI would have a key role in this project). The contradictory and critical situation of language teaching in higher education requires special attention as no progress can be expected without online learning.

Student surveys reveal that a very low level of digital support is given during the courses. The availability of course descriptions, requirements, contents, library aids and tests shows great variations in volume and quality in the faculties of the institutions. Despite the development efforts of institutions, we cannot talk about standard student support in this area. The partial digitalisation of course-specific university libraries has somewhat improved the situation – as a result of serious efforts – but it is still far from the competitive international standard.

The institution developments carried out so far have brought little improvement in the area of digital competences in spite of the fact that there are internationally recognised training systems (corporate academies) that are perfectly adapted to labour market demands as well as companies (such as Cisco, Corning, Huawei, IBM, Microsoft, HTTP Foundation, Oracle, Codecool) which operate parallel with but partly inside the higher education institutions themselves.

One of the greatest impediments to the spread of digital culture in higher education is that digital education is developing slowly and sporadically. Another important methodological deficiency is that few academics have training development competences that would enable them to hold their own courses in an electronic learning environment.

Since in 2016 no Hungarian state-run higher education institution had an internal further training scheme (involving all members of the academic staff), the development of teachers' digital competences cannot be started at an adequate level.

4.1.2.5   The situation of digital content development and content services

Digital content development has been present in public education for more than a decade, almost in a pioneer role, while it only gained ground in higher education in the late 2000s and the SROP period. As a consequence, most institutions became involved in the development of e-learning content, although to a different degree.

The results of institutional content development are collected in the Kempelen Farkas Digital Textbook Library, which contained 13,000 titles including more than 4,300 in a book format in the spring of 2016. Nevertheless, earlier surveys point out the fact that a considerable part of the uploaded content cannot be considered "real" e-learning materials as many of the lecture notes can only be downloaded in .pdf format.

According to surveys, the use of the digital textbook libraries and electronic learning materials is not typical[46], although already in 2014 more than 86% of the students owned a laptop (this percentage is close to 100% now). Students use their own devices primarily for the purposes of searching various

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[46] Final review– „*Felsőoktatási elektronikus tananyagok minőségi elemzése*" ("Analysis of the quality of higher education e-learning materials" IN THE FRAMEWORK OF SROP PROJECT NO 7.2.1-11/K-2012-0005; Educational Authority 2014

up-to-date contents – especially in the examination periods – and share information with each other using their own social networks. 13% of the students use the digital textbook library on a regular basis.

Another content providing service which operates as a central development is the knowledge base available in the framework of the Electronic Information Services National Programme, which aims to buy electronic information sources that are essential for higher education and scientific research centrally, based on a national licence. As a result, it is able to provide much more information than the higher education or research institutions would be capable of themselves.

In 2016 the Electronic Information Services (EIS) had 148 subscriber institutions with access to a total of 26 international databases. The EIS operates within the organisation of the Library and Information Centre of the Hungarian Academy of Sciences (MTA)[47].

Digitalisation in the management of higher education - national and institutional practice

The Higher Education Information System (FIR) operated by the Educational Authority is a uniform system in legal terms. It has a number of modules which facilitate management at the level of institutions as well as national education policy. In an earlier period, several developments were successfully carried out at national level and often serve as a benchmark for higher education analyses even if their operation has not become part of everyday practice.

All in all, it can be concluded that higher education is the leader in the area of electronic public services as these services cover the entire target group.

4.2   Vision

According to the vision concerning higher education, in line with the strategic document titled "*Upgrading in higher education*", there will be a standardised online digital environment in Hungarian higher education that will offer personalised learning opportunities tailored to age, interest, and the individual's life situation. The goal is to enable the higher education system to be one of the leaders in Europe in terms of digital development within three to five years.

There will be an online learning platform, a learning community where the members of the community are given support in their lifelong learning and development. It is this online platform where higher education institutions will present and upgrade their training offers, flexibly responding to the training needs of employers, students and society. In addition to the current student community of higher education, the academic staff and future students are also participants of the learning platform, just like non-traditional student groups, which are playing increasingly important role in the development dynamics of higher education. The development of the digital culture and the digitalisation of higher education are a tool, not a goal. The digital learning platform focuses on students. The purpose of improving and digitalising higher education processes is to better prepare students for entering the world of work through continuous self-development and with an attitude

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[47] Final review – „*Elektronikus tartalomfejlesztés és szolgáltatás a kutatásban és felsőoktatásban*" ("Electronic content development and services in research and higher education" - SROP 4.2.5-09/1-2010-0002

open to continuous learning. In this learning environment academics are better prepared both in professional and methodological terms. They are at such a level of digital literacy that they can transfer this knowledge to those entering higher education.

Individual differentiation and the planning of individual learning paths are based mostly on digital technologies and new, efficient methodologies, which may go beyond the traditional ways of planning the learning path: students have much more freedom to set up the credits they undertake to acquire in a semester. Learning as well as the personal and virtual communication of academics and students are continuous and intensive. In addition to group-based, frontal teaching methods, which require physical presence (lectures, seminars), individual consultation (including through virtual forums), regular progress checks, and ongoing, often group- and project-based, foreign-language student work requiring communication via digital devices are playing an increasing role. The related legal regulation encourages the establishment of digital learning platforms at institutional and national levels, in which higher education institutions take into account the relevant credits and knowledge acquired within the European Higher Education Area (e.g. industry-specific company exams, general digital literacy, online training) in the course of higher education studies.

The content of the learning platform, i.e. the higher education learning materials are developed with the help of international frameworks where the authors and institutions can equally profit from uploads and can access global learning materials and the educational contents of others on favourable conditions. Higher education students and academics have access to digital higher education contents and tools ("digital goods") in the same quality as other institutions of the EHEA. This is guaranteed by an appropriate, stable institutional system and a predictable annual budget. It supports the continuous improvement and internationalisation of higher education learning material.

Digital methodologies have gained ground in the research activity and knowledge transfer processes of the institutions, and researchers make use of the available collaboration solutions and calculation capacities.

The learning community is operated by higher education institutions, which are supported by network and central services. As a result of considerable developments, their processes are completely digitalised, information flow within and outside the institutions takes place electronically and in accordance with the challenges of cyber security. Major universities organise language teaching, career orientation, health education, self-management and presentation courses in independent competence centres and make some of them available to all students – partly – in the form of online courses.

The reformed training offer and course structure (flexibly arranged personal consultation, flexible individual work, flexible digital access) makes entry into higher education possible also for groups that were previously precluded from university education for practical reasons (women on maternity leave, people with physical-locomotory disabilities, those living in small settlements). This supports the enhancement of participation in higher education and knowledge distribution.

Higher education institutions have all the equipment required for modern education, often with the security-conscious involvement of students' own devices. In addition, they have calculation capacities at their disposal which support access to internationally recognised research results.

After 2025 the breakthrough stage of digital modernisation will have been completed, and the focus will shift to the harmonisation of existing systems. In this process, the function-oriented developments will be replaced by the fine-tuning of the "learning experience".

It also involves digitalising the internal operation of the higher education institution as an organisation. This means that the existing administrative processes of the institution are being reviewed, rationalised and digitalised and, as a result, both the academic staff and the students can manage administrative tasks online, in a safe and transparent manner, using digital authorisation and documentation.

4.3   Strategic Goals

The objectives of the digital development of higher education can be identified based on the above vision as well as the hindering and supporting elements.

As it is seen in the above chapters of the strategy, there are three approaches concerning the operational areas of higher education:

- levels of intervention: individual, institutional, sectoral;

- milestones in students' life path;

- target areas of the digitalisation of higher education: educational process, student activities, support, infrastructure.

The goals and interventions can be designed in a way that these various logics can be converged. Our findings as well as the operation levels of the digital higher education platform were previously discussed along the individual stages of the student life path, however, it is more appropriate to set the goals along the levels of intervention.

According to the vision, the main goal applicable to both individual students and higher education as a whole is that the digital preparedness, equipment usage and digital work experience of higher education graduates should reach international standards through the creation of a digital learning platform where students can acquire the skills, knowledge and competences required for employment and for lifelong learning on their personalised, flexibly designable learning path.

To achieve this goal, a breakthrough must be made in three main areas as compared to the current situation. Some of the goals reach beyond the scope of The Digital Education Strategy of Hungary, but only by spreading the use of electronic devices and methods can the objectives of the strategy be implemented in a truly effective way:

- changing the present methodology of and approach to teaching-learning, a paradigm shift in higher education; promoting the implementation of student-oriented learning in institutions

and encouraging the institutions to make full use of the ICT potential in education and learning.

● developing a learning platform and university life supported with digital tools that help both students and academics and, in addition, building a digital learning community.

● Developing, maintaining and improving the efficiency of the infrastructure necessary for the paradigm shift.

Goals related to the digitalisation of higher education
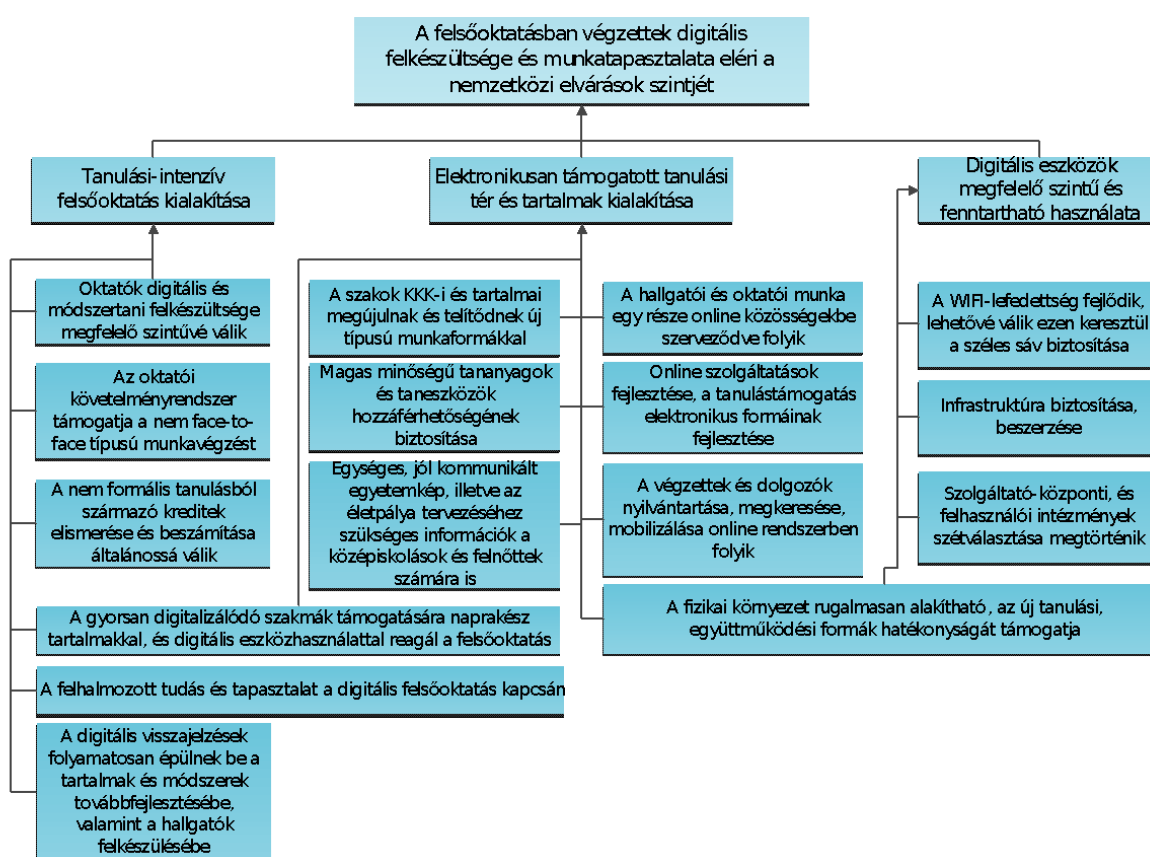
A felsőoktatásban végzettek digitális felkészültsége és munkatapasztalata eléri a nemzetközi elvárások szintjét	The digital preparedness and work experience of higher education graduates meet international standards
Tanulási-intenzív felsőoktatás kialakítása	Development of learning-intensive higher education
Oktatók digitális és módszertani felkészültsége megfelelő szintűvé válik	The digital and methodological preparedness of academics reaches an adequate level
Az oktatói követelményrendszer támogatja a nem face to face típusú munkavégzést	The teaching requirements support non-face-to-face work
A nem formális tanulásból származó kreditek elismerése és beszámítása általánossá válik	The recognition and transfer of credits acquired in non-formal learning becomes a general practice
A szakok KKK-i és tartalmai megújulnak és telítődnek új típusú munkaformákkal	The training and output requirements and contents of the courses are updated and include new types of work forms
Magas minőségű tananyagok és taneszközök hozzáférhetőségének biztosítása	Access to high-quality learning materials and learning tools is guaranteed
Egységes, jól kommunikált egyetemkép, illetve az életpálya tervezéséhez	Information required for designing a uniform and well-communicated

szükséges információk a középiskolások és felnőttek számára is.	university image and life path for secondary school students and adults
A gyorsan digitalizálódó szakmák támogatására naprakész tartalmakkal, és digitális eszközhasználattal reagál a felsőoktatás	Higher education responds to the support of rapidly digitalising industries with up-to-date content and the use of digital tools
A felhalmozott tudás és tapasztalat a digitális felsőoktatás kapcsán	Accumulated knowledge and experience in the area of digital higher education
A digitális visszajelzések folyamatosan épülnek be a tartalmak és módszerek továbbfejlesztésébe, valamint a hallgatók felkészülésébe	Digital feedbacks are continuously integrated into the improvement of contents and methods as well as the preparation of students
Elektronikusan támogatott tanulási tér és tartalmak kialakítása	Development of electronically supported learning platforms and contents
A hallgatói és oktatói munka egy része online közösségekbe szerveződve folyik	Some of the learning and teaching work is performed in online communities
Online szolgáltatások Illesztése, a tanulástámogatás elektronikus formáinak illesztése	Integration of online services and the electronic forms of learning support
A végzettek és dolgozók nyilvántartása, megkeresése, mobilizálása online rendszerben folyik	Graduates and employees are registered, contacted and mobilised in an online system
Digitális eszközök megfelelő szintű és fenntartható használata	The appropriate and sustainable use of digital devices
A WIFI-lefedettség fejlődik, lehetővé válik ezen keresztül a széles sáv biztosítása	The WiFi coverage is improving, thus making it possible to provide broadband
Infrastruktúra biztosítása, beszerzése	Supply and procurement of infrastructure
Szolgáltató- központi, és felhasználói intézmények szétválasztása megtörténik	The institutions of the services centres and users are separated
A fizikai környezet rugalmasan alakítható, az új tanulási, együttműködési formák hatékonyságát támogatja	The physical environment can be transformed flexibly and supports the effectiveness of new learning and collaboration forms

In addition to the above goals, there are horizontal objectives which affect digital higher education as a whole:

- To meet the requirements of IT security.

- To collect and process data on higher education processes at institutional and sectoral levels as extensively as possible.

- To improve equal access and involve target groups in higher education that have had no or only limited opportunity to enter.

- To support the business activity of higher education with digital solutions, particularly in the area of adult training and R&D&I.

The monitoring tasks of the strategy (the implementation of the goals of the DES and the continuous updating of the situation analysis) would be defined and performed by the Digital Methodology Centre (DMC) which is proposed to be set up within the framework of the institution system.

4.4   Set of tools

4.4.1 Comprehensive regulatory interventions

To ensure the digital renewal of higher education and expand training offers that are matched with the needs of the digital economy and are competitive also at international level, it is important to set up a Digital Higher Education Competence Centre, which takes part in revising the regulatory and accreditation requirements of higher education and the renewal of the training offer based on the following criteria.

Most importantly, the digitalisation of higher education is a change of culture, so it is basically not a regulatory issue. Given its characteristics, this culture change occurs at individual, teacher and student levels, which can obviously be supported and motivated with regulations by the higher

education institution and the sector, but a real shift and a change in everyday life cannot be expected merely from the tools of regulation. Therefore, the primary purpose of regulatory interventions is to provide "equal access", i.e. to identify and remove factors hindering the digitalisation processes and to enhance the motivation of or encourage participants.

At sectoral level, the basis of the current regulation is Act CCIV of 2011 on national higher education (hereinafter: Higher Education Act) as well as its numerous implementing decrees. In this respect, legislators should take account of the following directions of intervention.

4.4.1.1 Regulation of teaching-learning processes

The rules pertaining to the employment of academic staff (assistant lecturers, senior lecturers, associate professors, college and university professors) are set out in the Higher Education Act in the form of requirements concerning scientific degrees and recognitions, the holding of lectures, and the professional experience of academics. The detailed rules are laid down by the employment policies of the individual institutions within this legislative framework.

Since digital higher education involves the radical transformation of teaching-learning processes and applied methodologies, it is a prerequisite for implementing this goal that in addition to the scientific achievements of the academics, priority should also be given to the quality of the higher educational activity. As far as academics are regarded, in order to increase the value of the educational activity, more emphasis should be laid on requirements concerning the quality of education among the rules of employment in certain jobs during an academic's life path. Of course, the quality of education refers to educational methodologies that meet 21st century standards, are learning-oriented and -intensive, and use digital technology on a daily basis. It is therefore of key importance that the institutional assessment and quality assurance system should cover the use of learning-intensive digital methodologies in the educational work of the academic staff.

At present, Section 26 of the Higher Education Act specifies the minimum teaching time, that is the time an academic must spend holding lectures, seminars, practical sessions or consultations.   This legislation currently regulates forms of teaching that involve physical contact with the students.

We recommend that the regulation should include the requirement of continuous virtual contact between the professor and the student, whereby the student work is more independent and most of the teaching work consists of the supervision and support of the students' independent or group work rather than frontal teaching.

Consequently, the rules of the credit system regulated under Government Decree No 87/2015 of 9 April 2015 on the implementation of certain provisions of Act CCIV of 2011 on national higher education (hereinafter: Implementing Decree) should also be revised. Basically, the term "credit" refers to the amount of work performed by students. Yet, the current regulation prescribes the ratio of the number of lessons within a work schedule, thus making it impossible to spread digitally supported, individual and group or collaborative learning methodologies, whether in the form of full-time or other training programmes. For this reason, we suggest that within the work schedules the

ratio of lessons assuming physical attendance should be made flexible because the effectiveness of learning and the efficiency of teaching do not depend on school attendance. Nevertheless, we do not recommend the elimination of full-time or part-time work schedules, because it enables those entering higher education to make clear distinction between these two forms of work schedule, i.e. to see if there is a teaching-learning process going on during the working hours of the training programme. Obviously, in the full-time work schedule participation in certain projects and activities is a requirement also in digital higher education, while in the case of part-time training it is clear that those who apply for this type of training do work in this period and perform study-related activities only outside this period.

The paradigm shift in the higher education process does not require special regulatory tasks in respect of the recognition of knowledge acquired in non-formal or informal learning. In fact, this area has been regulated (see Section 49(6) of the Higher Education Act), it is now possible in higher education to recognise credits based on the knowledge acquired in or outside formal education. The fact that this does not actually happen in reality is attributable to the lack of motivation towards recognition. In order to make sure that the institutions view this opportunity as a real opportunity for increasing the number of students, it would be necessary to organise various awareness-raising and sensitising events.

Government Decree No 395/2015 of 12 December 2015 on implementing Act XXXIII of 1992 on the legal status of public service employees and certain issues of employment in higher education institutions (hereafter: "Public Service Act Implementing Decree") sets out the criteria concerning the quality assessment of the academic staff.   The currently applicable criteria of the quality assessment of education are as follows:

- Performance of the educational and research activity.

- Other education-related activities (especially thesis consultation, scientific student conference activity, participation and teaching in international mobility programmes).

- The opinion of students concerning the general quality of the academics' educational activity.

- The opinion of students concerning the academic' attitude towards assisting the professional advancement of students.

- We recommend that the criteria of assessment of academics should be complemented with aspects relating to the use of learning-intensive, digital educational methodologies.

4.4.1.2   Regulation of training contents

A key question is what higher education learning materials should actually contain and how they should be approximated in a regulatory framework. In traditional higher education based on frontal teaching training contents include knowledge that has to be acquired in the course of a predetermined learning path. In the case of higher education this is regulated by Decree No 15/2006 of the Minister for Education, which is being reviewed and updated at the moment. The training and

output requirements set out in this Decree contain the knowledge and skills to be acquired in the study programmes concerned, with the acquisition of knowledge in the foreground. The new decree, which is being drawn up now, concentrates on the competences instead of the knowledge to be acquired during the training, so at the level of regulation the training content focuses more on the output (on the knowledge, skills and attitudes to be acquired as the outcome of the training) than on the input (the content of the courses a student must complete). However, the implementation of the new degree also requires institutional regulation and appropriately controlled change management processes.

This shift of emphasis from knowledge transferred to knowledge, skills and attitudes acquired by the student is of key significance because it supports – from the regulatory side – the renewal and transformation of frontal-type educational methodology into a methodological culture that focuses on students' individual and group learning in a flexible, project-based form. Thus, the direction is appropriate, but the amendment and renewal of the relevant regulation – as we saw it in the case of the validation of informal and non-formal knowledge –does not necessarily result in the transformation of institutional practice, so there is a need for further incentives and mandatory rules to be applied during its implementation.

One of the factors that may bring about a change in higher education is accreditation. Pursuant to the provisions of the Implementing Decree (Section 18(6a)), during registering degree courses and specialisation programmes providing a professional qualification, the Educational Authority asks the Hungarian Accreditation Committee to issue an expert opinion.   The opinion given by the HAC must state whether the submitted curriculum is in line with the training and output requirements and how the curriculum developed by the higher education institutions facilitates the acquisition of output competences by students, what learning support tools and methodologies the institution uses, and if enough workforce and resources are available for launching that particular training at the institution.

Based on the above regulation the accreditation procedure may be suitable for promoting a digital learning support culture in higher education, however, the previously mentioned legislation of 2015 does not reveal HAC's new approach concerning the assessment criteria and protocol. Therefore, it has not been clear so far to what extent HAC will meet the expectations of the digital higher education strategy.

Another key and relevant component of higher educational content is the continuously updated materials, which a digitally living and operating higher education should contain. This type of continuous renewal does not really work in practice now, which has several reasons.
 One of them is that content development relies on new degree courses and specialisations, but this is limited by the course structure defined in Government Decree 139/2015 of 9 June 2015 and is subject to ministerial approval.   Due to the rapid economic and technological changes, the course structure will need to be made flexible so as to add the appropriate digital training content elements to the institutions' curricula and study programmes on a continuous basis. This requires institutional capacities and labour market cooperation supporting the regular reviews.

In specific areas such as teacher training, it is a particularly important task to transfer in-depth knowledge on digital methodologies at the levels of training and output requirements, curricula, and learning contents.

Nevertheless, it is a key problem that in a traditional higher education organisation the courses and training programmes have no appointed managers, so there is no person in charge of keeping the relevant contents up-to-date. When launching a training programme, it is necessary to designate a course manager, but later, when the course is running, this manager has no authority or responsibility in respect of the coordination of educational work. To rectify this problem, it would be important to set up a legislative framework for the employment of a course manager with functions similar to those of a product manager.

Another barrier to the management of higher education contents and training is that the current financing system encourages higher education institutions to keep students in the relevant training programme for a long time instead of leading them along the path of obtaining a degree that is meaningful and useful on the labour market. To solve this problem, we suggest that a financing scheme focusing on output rather than input should be introduced.

4.4.2 Creation of an e-learning platform

Pursuant to the higher education strategy, students enrolled in formal higher education are entitled to use the e-learning platform. Therefore, the higher education admission procedure must be suitable for making up-to-date contents widely available in a flexible form, as specified in the strategic goals. If older applicants and career changers find the criteria of the higher education admission procedure too complicated, forming a barrier to their entry, adult training and the "open university"-type institutions of the global world will attract those who intend to study away from the domestic higher education system. On account of these criteria it would be advisable to review the objectives of the strategy "*Upgrading in higher education*" which would require advanced level secondary school-leaving exams and an intermediate level language exam for entering into higher education from 2020.

The professional examination to be introduced from 2017 and held by higher education institutions will offer an alternative to the fulfilment of the advanced level school-leaving exam requirement to those who graduated from secondary school before 2005 with an intermediate level exam in the subject concerned.
This means that if someone would like to continue his or her studies at an entirely different area than the subject of his or her school-leaving exam taken at the end of secondary school education, based on the current regulation the only possible way of entering higher education from 2020 is to apply for an advanced level exam.

It would be necessary to rethink the above from the regulatory side because the general requirement of an advanced level exam strengthens the exclusive nature of higher education, while European

standards as well as the 21st century labour market and technological processes point towards the need for the admission of wider groups, i.e., towards an inclusive approach.

In our opinion, the e-learning platform to be provided to students already admitted to courses does not require any regulation since it is an established, complex service. On the other hand, the possibility of electronic administration can be an issue which does need to be regulated. At present, under the provisions of the Higher Education Act, for the purposes of the Hungarian state scholarship scheme, electronic contact with students is mandatory, and during the admission procedure most applicants choose the e-verification option via the electronic portal. This mandatory regulation along with socialisation in the admission procedure raise the possibility of generalising compulsory electronic contact with the institutions and public administration concerning higher education students. This would enable the e-learning platform supporting the learning process during higher education studies to serve as an administrative platform for university life as well. However, beside the need for regulation, this would also require the overall digitalisation of the internal administrative processes of higher education institutions.

From a regulatory viewpoint concerning higher education studies via the e-learning platform, attention should be paid to the thesis, which concludes the degree course. It should be compulsory to publish the theses online. This obligation could combat counterfeiting and plagiarism and result in an improvement in the quality of theses, so we recommend its introduction similar to the requirement to publish doctoral dissertations. Before the introduction, however, the legal aspects concerning privacy and data processing need to be examined.

4.4.3 Proposed regulation at institutional level

It is also important to review the key points which should be regulated at institutional level with a view to facilitating the achievement of the strategic goals. Regarding the directions of the sectoral regulation as presented above, we can make the following recommendations concerning the institutional level:

As part of the Organisational and Operational Rules of the higher education institution, the set of requirements applicable to academics lays down the detailed rules and procedures for the criteria of filling teaching jobs. One of these rules is the habilitation or appointment policy. Under these policies it is important to make sure that - in line with the above - educational-methodological innovativeness, the abundant availability of tools and the use of digital equipment are given key significance among the criteria concerning the academic staff as well as the assessment of their educational work.

Only after the sectoral regulation has been implemented in the above-mentioned direction can higher education institutions modify their own internal rules pertaining to the organisation of their educational work, introduce flexible learning forms for students, and promote their support by the academic staff.

As regards the formal requirements of the theses to be written by graduating students, however, we suggest that the internal rules prescribing the exclusive written format and determining the number

of characters and pages should be reviewed and should allow the use of the increasingly widely available tools of the media and online content in the thesis writing process.

4.4.4 Development tools

Above we listed the comprehensive, regulatory interventions, while below we describe the project-based development activities. In many cases the proposed developments require both regulatory and project-based interventions.

4.4.4.1   Creating learning-intensive higher education

One of the key goals of the digital higher education strategy is aimed at a culture change in teaching and learning, which is urged by the global digital world and supported through the use of digital tools in education. This aim is closely related to the second goal of the strategy, which applies to the development of a digital higher education platform. These two goals cannot be imagined and are not viable without one another.

The goal pertaining to learning-intensive higher education is basically aimed at providing a framework for the relationship between academics and students, the educational methodologies, and the improvement of the effectiveness of higher education.

The proposed interventions support the achievement of both goals.

As for the methodology of higher education, most of the existing practices are based on international experience because little input information is available on the preparedness of the Hungarian academic staff. This is why it is important to conduct surveys which assess and develop this area. The priority R&D project can be most efficiently implemented by means of the collaboration, networking and internationalisation of higher education institutions running doctoral schools specialising in the disciplines of digital learning, research centres, and companies, therefore, it is necessary to support educational innovations, methodological research, and exit to the international online research and development arena. These surveys may cover the adaptation of the training practices of multinational companies already operating at international level as well as raising awareness for and familiarising with high-volume online training management systems. It is as a result of these research projects that the R&D&I database of digital learning can be established and used for sharing good practices.

Furthermore, it is necessary to link disciplines that are related to digital learning by means of strengthening the existing relevant know-how of higher education research centres and involving institutions and organisational units with substantial relevant experience, which should be integrated into a digital methodological centre to be set up during the process.

The above recommended research projects will accumulate knowledge which is required for arranging further training and preparatory courses aimed at the development of academics' methodological culture.

The age pyramid of the academic staff is not optimal, the older generations socialised in a different education technological environment than today's students.

For this reason, the further training of academics should focus on two areas: education methodology (education technology) and the development of general digital competences.

Another benefit of the learning-intensive approach is that it also supports lifelong learning, because students taking part in a higher education programme organised in this way have a chance to acquire independent learning and cooperation competences which will make their learning easier and more efficient also in later stages of their lives. While higher education institutions transfer the necessary competences to students, it would be important to develop a training offer and training courses structured in a way that are suitable for meeting the learning needs of the working adult population. Of course, the use and integration of digital technologies in training is of key significance. In close relation to the above, it is necessary to develop the adult training organisations of higher education institutions with an entrepreneurial approach, systematise their training offer as well as to standardise and digitalise their operation (establishing an online adult training network under the management of higher education institutions).

The database established by student feedback systems can be an essential data provider for the development of the training offer and the content and methodology of the courses, and can also supply appropriate input information for the methodological development of the academic staff as well. The use of such electronic feedback systems have a considerable quality assurance potential in higher education.

4.4.4.2   Developing an electronically supported higher education platform

To create electronically supported higher education platform and content, it is necessary for institutions and the higher education sector to address – already – secondary school students by complex career orientation, services and preparatory activities with the following components:

- Online entrance/school-leaving exams organised at national level.

- Enrichment of the content of the felvi.hu website:

  o with the institutions' own materials – "Why should you choose us?";

  o optimisation and internationalisation of the search system;

  o expansion of the information services of the felvi.hu website and its linking with other online customer service platforms such as information systems relating to financial aid available for housing, travelling, student loans, etc., development of a "one-stop-shop" client-driven admission information system.

- Development of an online career orientation website with online tests, prompt evaluation (scores), professional advice, recommendations for training and career paths; the tests completed by secondary school students could form the basis of serious international surveys.

- Online central site for the dissemination of information necessary for potential foreign students – a website similar to "studyinhungary.com";

The basis of the higher education digital platform is the availability of a critical mass of appropriate online and digital contents to students and professors. Therefore, it is essential to develop the currently operating textbook library and specify the formal requirements of digital learning materials.

It is also necessary to elaborate a development programme which provides continuous resources for the purposes of developing digital learning materials and tools (including, as appropriate, open educational contents) and makes them available on a national scale. Sources of funding should be guaranteed to higher education institutions, publishers or their consortia for developing high-quality learning materials and tools in respect of the identified shortage areas. The continuity of content development would be motivated by the elaboration of a tender system, which would provide sources of funding for the development of new content and the adaptation of existing ones – with the expectation regarding the avoidance of duplications in mind – in one-year cycles.

Furthermore, it is necessary to regulate the situation of the Electronic Information Services National Programme both in terms of legislative requirements and financing: the subscription budgets should be managed by the implementing body to replace the current multi-channel financing model.

Due to the decline in the number of higher education students, which is partly attributable to demographic causes, the websites of universities should be made "bilingual" and accessible to people with disabilities as criteria of university recruitment. Attracting potential foreign students as well as domestic disadvantaged groups into higher education could mitigate the negative impacts of the demographic downturn and offer an opportunity for social mobility which could be unique even at international level. These types of developments should be carried out parallel with the development of visual communication (the external communication of universities, e.g. websites, learning materials, typography, diagrams, information structure, interface design). The required conditions could most efficiently be created in the framework of a priority project.

While developing online content, special emphasis should also be given to the development of foreign language courses, which could attract the attention of potential foreign markets to Hungarian higher education and support the improvement of the language competences of Hungarian students at the same time. The online courses should also appear on the major international online learning platforms, the MOOCs. In order to develop online courses that will raise international interest, it is necessary to ensure the networking and partnership of domestic institutions.

International partnerships can be strengthened more efficiently by using digital tools and methodologies, which need further improvement. Institutions must use their own resources to carry out pilot projects which are targeted at the involvement of certain student groups in learning projects to be implemented with foreign partner institutions. In fact, all resources necessary for this project are available to domestic institutions, so its promotion is a matter of institutional/sectoral decisions.

An appropriate and efficient tool for the promotion of digital higher education is the establishment of a portal which collects international and national good practices, whether at institutional or sectoral level. This portal would offer ideas to students, academics, departments, faculties and institutions, thus helping them make the digital transition more effective and easier to implement.

Student services directly and indirectly related to learning constitute an important part of the higher education platform and some of them can be operated through digital platforms. The digitalisation of student services can take place parallel with the transformation and digitalisation of the administrative and operational processes of universities, which need to be regulated in a legal framework.

4.4.4.3 *The appropriate and sustainable use of digital devices*

To establish and maintain infrastructure in the required quality, the most important intervention in higher education is to remove the restriction on procurements. As information technologies are becoming obsolete very quickly, their continuous supply should be guaranteed, so in addition to making procurements possible, institutional budgets should allocate funds for IT purposes on an ongoing basis.

Regarding IT infrastructure, we can make the following recommendations:

- Increasing the amount of funds allocated to the EIS; instead of the multi-channel central support the subscription budgets should be managed by the implementing body and expanded to include journals needed by institutions.

- Spreading the VOiP technology among institutions with a view to reducing telephony-related expenses.

- Procuring WiFi routers providing access to broadband internet at institutions.

- Establishing flexible learning (collaboration) platforms at institutions, procuring easily movable furniture and building small group rooms.

- Extending and renewing the Legal Software Programme by involving sectoral software with the student versions available to the students of the relevant courses (e.g. architecture students could access architectural design software, sociologist students could use database management software, etc.).

- Elaborating a resource-generating, resource-allocating system suitable for the development of digital teaching tools, devices and learning materials.

4.5   Logical Framework Matrix

The following logical framework matrix shows the tools and the related goals that contribute to the digital transformation of higher education.

Table 4   *Higher Education Logical Framework Matrix*

Development goal	Specific goal	GROUP OF TOOLS						
		Regulation of educational processes	Regulation of educational contents	Regulation of electronically supported higher education	Regulation of institutions	Development of educational processes	Development of electronically supported higher education and contents	Developing digital infrastructure
Renewal of teaching-learning	Improvement of the digital and methodological preparedness of the academic staff	X		X	X	X		X
	The set of requirements pertaining to the academic staff supports the spread of non-formal educational methods, which do not need physical attendance	X			X			
	The recognition and transfer of credits acquired in non-formal learning becomes a general practice		X	X			X	
	Higher education		X				X	

	responds to the support of rapidly digitalising industries with up-to-date content							
	Accumulated knowledge and experience in the area of digital higher education					**X**	X	
	Digital feedbacks are continuously integrated into the improvement of contents and methods as well as the preparation of students		**X**	**X**	**X**		X	
Development of an electronically supported higher education platform	Some of the learning and teaching work is performed in online communities	**X**		**X**	**X**	**X**		X
	The training and output requirements and contents of the courses		**X**					

	are updated and include new types of work forms								
	Access to high-quality digital learning materials and learning tools is guaranteed		X				X	
	Information required for designing a common and well-communicated university image and life path for secondary school students and adults			X			X	
	Development of online services and the electronic forms of learning support			X			X	
	Graduates are registered, contacted and mobilised in an online system			X			X	
Infrastructure	The WiFi coverage is improving, thus						X	X

making it possible to exploit the potential of broadband							
Providing for the financing of IT developments			**X**			X	X
The physical environment can be transformed flexibly and supports the effectiveness of new learning and collaboration forms				X		X	X
The institutions of the services centres and users are separated			X	X			

4.6 Financing

The detailed planning of the financial conditions of the strategy and the tools recommended in the framework of the strategy will be carried out as part of the implementation of the strategy itself following its approval by the Government. In the course of financial planning the first task is to examine which EU programmes can contribute to the implementation of the individual development objectives.

During implementation, after identifying the relevant development programmes, it is necessary to analyse to what extent the individual programmes serve the achievement of the development objectives set out in the DES. To perform this task, the sub-elements of the already running programmes (targets set, tools, activities, indicators) must be analysed in detail on the one hand. On the other hand, programme elements that are the most relevant for the purposes of the DES must be

identified and adjusted, if necessary, during the planning process of the programmes under preparation.

After that, during the elaboration of the specific actions, it is necessary to make well-founded estimates of the amount and timing of additional resources required for the overall implementation of the DES objectives. The resource estimates plan must cover requirements concerning the planning, preparation and implementation of the action as well as the sustainability of its results and impacts.

5 ADULT LEARNING

5.1 Situation Analysis

5.1.1 Definition of adult learning

The Digital Education Strategy of Hungary based its interpretation of the term "adult learning" on the definition provided in the renewed European agenda on adult learning issued by the European Council in 2011[48]. According to this definition, adult learning is part of the lifelong learning process and includes all formal, informal and non-formal learning activities, whether general or vocational, that adults take part in to acquire knowledge in addition to what they have learnt during their original studies.

In this approach, the focus of the adult learning pillar of the DES extends beyond the activities defined in the Adult Learning Act, while it obviously does not cover training courses regulated by the Higher Education Act. This broad spectrum of the interpretation of adult learning comprises the formally structured learning activity planned by adult training institutions (e.g. based on the training programme and the curriculum), which may as well be completed with a state-accredited qualification, as well as informally structured learning planned on an ad hoc basis and designed to meet a specific goal, which may be completed as an independently controlled learning process based on freely available digital contents. Adult learning may take the form of traditional adult education involving physical attendance, in the framework of a training course, or of digital learning on an ICT basis, either exclusively via digital channels or in a blended form.

The ability to confidently use digital tools, applications and networks has become vital from the aspect of access to information, communication and problem-solving, and high-level ICT competences are inevitable for meeting the changing needs of the labour market and for filling newly emerging jobs.[49] The everyday use of digital competence as key competence has become a determining factor in social exclusion and inclusion, therefore, there is a need for extensive collaboration on both European and Hungarian level in order for all citizens to become active members of the digital community.[50]

The demand of business undertakings for IT competences and qualifications is growing at an increasing rate, and the vocational training courses enabling the acquisition of these qualifications directly contribute to economic growth. The development of the digital competences of the adult population is important not only for reducing the digital gap, increasing competitiveness and employability, and enhancing active participation in civil life, but also for ensuring that the

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[48] Council Resolution 2011/C 372/01 on a renewed European agenda on adult learning.
(http://eur-lex.europa.eu/legal-content/HU/TXT/HTML/?uri=CELEX:32011G1220%2801%29&from=EN#ntr1-C_2011372HU.01000101-E0001),

[49] The latest report of the EU Commission on adult learning*: "Improving Policy and Provision for Adult Learning in Europe",* (p. 27) http://ec.europa.eu/education/library/reports/policy-provision-adult-learning_en.pdf .

[50] On 10 June 2016 the European Commission published its communication on the priorities of the New European Competence Development Programme, in which it proposes the establishment of national digital competence coalitions with the involvement of all stakeholders.

investments and infrastructural developments planned in the Digital Success Programme benefit the society and contribute to digital welfare to the highest possible degree. The historic mission of the strategy is to enable millions of Hungarian citizens – most of whom completed their studies in an age when information technology was not included in the core curriculum – to efficiently acquire and develop digital competences.

The intensive international development trends and policies of the past years point out that the targeted exploitation of the potential of ICT can help to increase the rate of participation in adult learning in a number of ways and open up new perspectives towards improving the effectiveness of adult education:

- ITC motivates people to learn: it makes learning more interesting and enjoyable for many adults. ICT keeps people motivated and interested by enabling them to plan their studies according to their individual needs, at the most convenient pace, and with relevant content.

- It broadens access to learning: by making broadband internet and mobile technologies available to anyone, ICT makes it possible for everyone to learn whatever they need at any time and anywhere. This provides new opportunities for learning to those who live in small settlements, who study while having a job, or who have been unable to access training due to their physical disabilities so far.

- ICT-supported learning efficiently develops digital competences as well as other basic skills. It is particularly important for disadvantaged adults that while they are developing their digital literacy as well as their communication and social skills, they are building personal relationships, and all these give them the possibility of effectively catching up and achieving social and labour market inclusion.

- The open (freely available) and other digital teaching aids[51] provide access to high-standard and regularly updated contents which are widely and often freely available and reusable and facilitate independent learning.

- ICT supported adult learning and adult training can contribute to the reduction of direct and additional costs as well as to the improved cost-efficiency of adult education to a considerable degree.

Throughout the world there is a new digital divide between those who have and who do not have access to innovative ICT-based digital learning and the related online services.[52]

The strategy aims to identify the directions of development and set the system criteria necessary for ensuring that in the years to come adult learning can develop in a systematic way, keep pace with European and global trends, continuously respond to the increasingly rapid technological changes,

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[51] Open teaching aids include teaching and learning contents which are freely available for use and which can be adapted to specific learning needs and can be shared.

[52] A conclusion of the European Commission's report of December 2015 on adult learning: *"Improving Policy and Provision for Adult Learning in Europe",* (p. 27) http://ec.europa.eu/education/library/reports/policy-provision-adult-learning_en.pdf .

integrate innovation results, and provide new learning technologies and wide access to modern and efficient learning opportunities.

5.1.2 Main findings of the situation analysis

The main conclusions of the situation analysis were drawn in respect of two priority areas:

- the digital competences of adults and the possibilities of their development;
- the exploitation of the potential of ICT and digital education in adult learning.

Millions of our compatriots do not even have the basic digital competences necessary for everyday life.

60% of the 25-64-year-old working-age adults, i.e. 3.4 million adult citizens do not have higher than a basic level of digital competences, if any.[53] According to the European Commission's forecast, in the near future 90% of the jobs will require a certain level of digital competence, which means that a significant part of these 3.4 million Hungarian citizens will have to learn if they are to keep their jobs or find new ones. At the same time, access to devices and internet services is no longer a major barrier given the fact that 76% of the domestic households had internet connection in 2015. Unfortunately, it is exactly those who have no digital competences that lack internet access.

The number and availability of training programmes aimed at developing the key digital competences are very limited and uneven in geographical terms, with a lack of non-formal and informal learning opportunities that would be suitable for the involvement of disadvantaged people. Due to the absence of a framework of reference concerning the self-assessment of competences and the classification of training courses, it is difficult to find one's way among the training offers.

Relatively few adults reach higher levels of digital literacy.

Little interest is shown towards training courses aimed at digital competence development: in 2015, only 5% of the adults (some 36 thousand) who enrolled to adult training courses chose this type of training. Since a majority of the population have no possibility to attend a high-standard ICT course which would meet their needs, they typically develop their digital literacy alone or through their informal relations. For this reason, in a European comparison, the number of people who actually reach a higher of level of key digital competences is below the EU average.

Few apply for and successfully complete ICT vocational training courses.

Applications to vocational ICT training courses are limited by the very fact that few people reach a higher level of key digital competences, which is a precondition for entering vocational training

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[53] http://ec.europa.eu/eurostat/web/informationsociety/data/database?p_p_id=NavTreeportletprod_WAR_NavTreeportletprod_INSTANCE_p grsK5zx6I84&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-2&p_p_col_count=1http://ec.europa.eu/eurostat/web/information-society/data/database?p_p_id=NavTreeportletprod_WAR_NavTreeportletprod_INSTANCE_pgrsK5zx6I84&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-2&p_p_col_count=1

courses.

Another obstacle is that the career opportunities offered by ICT professions are not widely known, and there are few programmes which transfer up-to-date knowledge and competences that are relevant to employers.

In the area of adult learning the utilisation of ICT and digital learning potential is rather low.

According to a report made for the European Commission in 2015 on the situation of ICT-based adult learning[54], Hungary belongs to the last, traditional group of the 16 countries under review, where the perspective of ICT and digital learning have not been integrated into the strategy, there is typically a lack of coordination between the stakeholders, and there are serious barriers to the emergence of digital learning and the widespread use of new learning technologies. In addition to the regulatory barriers, there is a lack of a motivating and supportive environment, comprehensive knowledge concerning new technologies and development trends, and the recognition of ICT potentials. Adequate definitions and forms of financing have not been created to date. Another hindrance is that training organisations are not prepared for the digital transition, there are no business models that are based on the new technologies, and the necessary organisational competences and development resources are missing. The instructors and teachers who undertake a role in adult education are not aware of the potentials of ICT and have insufficient digital competences.

Few take part in adult learning in general.

In Hungary, the rate of participation of adults in lifelong learning is extremely low (7%) and well below the targets set out in the Europe 2020 Strategy (15%). One of the main reasons for this is public opinion about the significance and necessity of learning. Neither the adults themselves, nor a major part of the small and medium-sized enterprises find it useful or necessary for employees to learn. One of the greatest challenges the strategy should address in order to be successful is to change this public opinion and way of thinking.

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[54] *Adult Learners in Digital Learning Environments,* written by Ecorys and Bertelsman Stiftung upon the authorisation of the Directorate-General for Education and Culture of the European Commission in 2015.

5.1.3 SWOT analysis

Table 5   *Digital competence development SWOT analysis*

Erősségek	Gyengeségek
• Az internet-hozzáférés széleskörű (háztartások, képzőhelyek) • A felnőttek többsége rendelkezik „okos" eszközökkel • Vannak már elérhető digitális tananyagok • Korábban sokan vettek részt ECDL képzésekben • Elérhetőek hazai jó gyakorlatok a digitális kompetenciafejlesztéshez kapcsolódóan • Az eMop, NYITOK hálózat és a közművelődési intézmények országos lefedettséget biztosítanak • Az MKKR támogatja a tanulási eredmény alapú programfejlesztést • A felülvizsgált IKER támogatja a digitális kompetenciák fejlesztését, a gyenge tanulási készségekkel rendelkezők bevonását • Nagyvállalatok egyre gyakrabban a digitális tanulást preferálják	• A leginkább digitális készségfejlesztésre szorulók nem rendelkeznek otthoni eszközökkel és internet-hozzáféréssel • A felnőttek motivációja hiányzik a tanuláshoz • A kis- és középvállalkozások nem tartják fontosnak az alkalmazottaik kompetenciafejlesztését • A felnőttek digitális kompetenciái hiányoznak ahhoz, hogy bekapcsolódjanak a digitális tanulásba • Nehéz az eligazodás, különösen az informatikai képzések között, nincs átlátható, egységes értelmezése a digitális kompetenciáknak • Informatikai képzési kínálat és hozzáférés nem megfelelő • A digitális tanulással kapcsolatban kialakult tévhitek és rossz tapasztalatok hátráltatják ennek elterjedését
Lehetőségek	**Veszélyek**
• Kormányzati elköteleződés a digitális megosztottság csökkentésére • A mobil eszközök további terjedése lakossági igényeket támaszthat a digitális kompetenciáik fejlesztésére („Bring your own devices!") • A lakosság számára a digitális tanulás kedvezőbb ára • Országos kampányok a tanulás népszerűsítésére, vonzóvá tételére, új formáinak terjesztésére • Rugalmasabb, az egyéni és munkaerőpiaci igényekre jobban reagáló képzési kínálat • A digitális tanulás esélyteremtő szerepe az alacsony iskolázottságúak bevonására	• A digitális megosztottság nő, ha nem sikerül a hátrányos helyzetűek, alacsony iskolai végzettségűek hatékony bevonása • Ha nem alakul ki a digitális tanulás kultúrája, a magyar felnőttek nagy része nem lesz képes kompetenciáinak megújítására a társadalmi-gazdasági elvárásokkal összhangban, mélyül leszakadásunk a világ fejlettebb államoktól • Hiányzik, hogy a kulcsszereplők egyformán fontosnak lássák a digitális kompetenciák fejlesztését és a digitális tanulás elterjesztését

Strengths

- Internet connection is widely accessible (households, training establishments)
- Most adult own "smart" devices
- There are available digital learning materials
- A lot of people attended ECDL training courses earlier
- There are good practices relating to digital competence development available in Hungary
- The eMop, NYITOK network and the institutions of community culture provide national coverage
- The HuQF (Hungarian Qualification Framework) supports programme development on the basis of learning outcome
- The revised IKER supports the development of digital competences and the involvement of people with weak learning skills
- Large companies increasingly tend to prefer digital learning

Weaknesses

- Those most in need of digital competence development do not have the necessary tools or internet access at home
- Adults lack motivation for learning
- Small and medium-sized enterprises do not find it important to develop their employees' competences
- Adults lack the digital competences that would enable them to join digital learning
- It is difficult to find one's way, particularly among IT training courses; there is no clear and uniform definition of digital competences
- The supply of and access to IT training are not adequate
- The misconceptions and bad experience developed in connection with digital learning hinder its dissemination

Opportunities

- The Government's commitment towards reducing the digital divide
- The further spread of mobile devices can raise people's demand for the development of digital competences ("Bring your own devices.")
- Digital learning is available to the public at a more favourable price
- National campaigns to promote learning, make it more attractive, and to disseminate new forms of learning
- The training offer is more flexible and responds better to labour market needs
- Digital learning creates opportunities for the involvement of people with a low level of education

Threats

- The digital divide will grow unless disadvantaged people and those with a low level of education are effectively involved
- Unless the culture of digital learning is developed, a major part of Hungarian adults will be unable to renew their competences to meet social-economic requirements, thus causing our country to lag even more behind the more developed states of the world
- Key stakeholders should regard the development of digital competences and the dissemination of digital learning equally important

Table 6   *The utilization of ICT in the practice of adult learning in Hungary*

Erősségek	Gyengeségek
• Vannak már elérhető digitális tananyagok • Elérhetőek hazai jó gyakorlatok a digitális kompetenciafejlesztéshez kapcsolódóan • Az MKKR támogatja a tanulási eredmény alapú programfejlesztést • A felülvizsgált IKER támogatja a digitális kompetenciák fejlesztését célzó képzési programok kidolgozását	• A felnőttkori tanulás szereplői nem használják ki az IKT-ban rejlő lehetőségeket • Hiányzik a digitális tanulást támogató, ösztönző környezet, a szabályozás korlátai és az ehhez kapcsolódó finanszírozási technikák visszatartják a képzőket a digitális tanulási formák alkalmazásától • Nem alakult ki egységes, mind szereplő által elfogadott és alkalmazott fogalmi készlet • Nem állnak rendelkezésre a szükséges mennyiségben rendszeresen frissített nyitott oktatási segédanyagok • A rendelkezésre álló digitális tananyagok köre nem könnyen átlátható, kereshető • A felnőttkori tanulással kapcsolatos stratégiai tervezéshez csak korlátozottan állnak rendelkezésre adatok
Lehetőségek	**Veszélyek**
• Erős kormányzati és szaktárca szintű elköteleződés a digitális tanulási formák elterjesztésére • A DJP fejlesztések nyújtotta lehetőségek, illetve további fejlesztések (akár a szakképzésben, felsőoktatásban) közötti szinergiák kihasználása • A piaci szektor is érdekelt a fejlesztésekben • Az informatikai szakemberek iránti igény és a munkaerőpiaci igényekre reagáló képzések kényszerítő hatása • A lakosság részéről nőhet az igény a digitális tanulást támogató képzési formák iránt • A digitális tanulás olcsóbb és szélesebb körű hozzáférést biztosít a tanuláshoz; • A digitális tanulás különböző formáinak népszerűsítése a képzők között • 2020-ig rendelkezésre állnak EU-s források • Szabadon felhasználható digitális tartalmak hozzáférhetőek, de rendszerezetlenek • Oktatói továbbképzések biztosítása / támogatása	• Az intézkedések hatástalanok maradnak az akadályozó tényezők részleges elhárítása miatt • A különböző szereplők érdekütközése megakadályozhatja a digitális tanulás különböző formáinak elterjedését • A tananyagfejlesztések során nem, vagy rossz minőségben jönnek létre digitális tananyagok • A létrejövő tartalmakra szerveződő képzések nem lesznek népszerűek, ha nem reagálnak a lakossági és munkaerőpiaci igényekre • A digitális megosztottság nő a hátrányos helyzetűek, alacsony iskolai végzettségűek hatékony bevonásának elmaradása miatt • A digitális tanulás terjedését megakadályozza a felkészült oktatók és tanulástámogatási technológiák hiánya • A tartalmi és infrastrukturális beruházások elmaradása miatt a meglévő erőforrások hamar elavulnak

Strengths

- There are available digital learning materials
- There are Hungarian good practices available relating to digital competence development
- The HuQF supports programme development on the basis of learning outcome
- The revised IKER supports the elaboration of training programmes aimed at the development of digital competences

Weaknesses

- The participants of adult learning do not make use of the potential in ICT
- There is no supportive or motivating environment for digital learning; the regulatory limits and the related financing techniques withhold trainers from using digital learning forms
- There is no uniform set of concepts that is accepted and used by all participants
- There are no regularly updated and open teaching aids available in the required quantity
- It is difficult to navigate through and search available digital curricula
- There is a limited availability of data for strategic planning concerning adult learning

Opportunities

- Strong governmental and departmental commitment towards spreading digital learning forms
- Exploitation of the synergies between the potentials of DSP projects and other developments (including those in vocational training and higher education)
- The market sector is also interested in the developments
- The demand for ICT specialists and training courses responding to labour market needs have a compelling effect
- The population may have an increasing need for training forms that support digital learning
- Digital learning provides a cheaper and wider access to learning
- Promotion of various forms of digital learning among trainers
- Access to EU funds is guaranteed until 2020
- There are digital contents available for free use but they are not systematised
- Providing for/supporting further training for the educational staff

Threats

- The partial elimination of hindering factors causes measures to remain ineffective
- The conflict of interest between the various participants may prevent the widespread use of the various forms of digital learning
- In the course of curriculum development digital learning materials are produced in a poor quality, if at all
- The training courses organised on the basis of the developed contents will not be popular unless they are matched with the needs of the population and the labour market
- The digital divide will grow unless disadvantaged people and those with a low level of education are effectively involved
- The spread of digital learning is hindered by the lack of prepared instructors and learning support technologies
- The absence of investments in content and infrastructure development causes the existing resources to become obsolete

5.2 Vision

DOS Vízió - Felnőttkori tanulás 2020	DES Vision - Adult learning 2020
DÖNTÉSHOZATALT HATÉKONYAN TÁMOGATÓ INFORMÁCIÓS RENDSZER	INFORMATION SYSTEM EFFICIENTLY SUPPORTING DECISION-MAKING
A felnőttkori tanulásban való részvétel 2020-ra eléri a 18%-ot.	The rate of participation in adult learning will have reached 18% by 2020.
RUGALMAS, változó igényekhez igazodó, technológiai fejlődéssel lépést tartó KÉPZÉS - ÉS SZOLGÁLTATÓ RENDSZER	FLEXIBLE TRAINING AND SERVICES SYSTEM adapted to the changing needs and keeping pace with technological development
A tanulás eredményeit minden esetben digitális módon is leírják és hitelesen igazolják.	The learning outcomes are always recorded and verified in digital format.
Helyben vagy 30 km-en belül elérhetőek a digitális kompetenciafejlesztéshez és a digitális tanuláshoz biztosított alapvető támogatások (pl. hozzáférés, tanulási tanácsadás, képzési szolgáltatás).	The basic allowances (e.g. access, learning guidance, training services) provided to support digital competence development and digital learning are available locally or within a 30-km distance.
A tanulásban történő előrehaladásról információt nyújtanak a tanulás analitikus alkalmazások a kutatók, szakemberek, illetve döntéshozók számára.	The learning analytic applications provide researchers, professionals and decision-makers with information on progress achieved in learning.
A digitális világba belépő felnőttek különféle támogatást kapnak a hivatalos elektronikus ügyintézés, eKormányzati szolgáltatások igénybevételéhez és az önálló tanuláshoz.	Adults entering the digital world are given all kinds of support in e-administration, the use of e-government services, and independent learning.
A nyitott oktatási segédanyagok és online kurzusok portálja átlátható, kereshető tárházat biztosít mind az oktatók, mind pedig a tanulni vágyó felnőttek számára.	The portal of open teaching aids and online courses provides a clear, searchable resource centre both to the educational staff and to adults who wish to learn.
digitális tananyagok online kurzusok oktatói fórum	Digital learning materials online courses instructors' forum
Egy egységes referencia keret alapján bárkiről megállapítható, hogy milyen szintű digitális kompetenciákkal rendelkezik és ez alapján	Based on a common framework of reference any person's level of digital competence can be assessed and, as a result, he/she can be

javasolható neki a megfelelő továbblépést biztosító képzés.	offered an appropriate training that best suits his/her further development.
Az online képzések a résztvevők, illetve a piaci szereplők igényekhez igazodnak.	Online courses are adapted to the needs of the participants and the market actors.
A dolgozók kompetenciafejlesztése munka-folyamatokba integráltan, jórészt a munkahelyen munkavégzés közben valósul meg.	The competence development of employees is integrated in the work processes and mostly takes place on-the-job.
A tanulási programok jelentős része on-line vagy vegyes (blended) formában valósul meg.	A significant part of the learning programmes is implemented online or in a blended form.
Új szerepek alakulnak ki a hagyományos oktatói szerep mellett, nagyobb hangsúlyt kapnak a tanulási tanácsadás és a tanulástámogatás új, innovatív formái.	New roles are emerging in addition to the traditional teaching role, and more emphasis is given to the new, innovative forms of learning guidance and learning support.

5.3   Strategic Goals

The overall objective is divided into development goals set in respect of two main areas of development (digital competence development and the exploitation of the potentials of ICT and digital learning) as follows:

Overall goal

To enhance the competitiveness of the labour force, the active social participation of citizens, and social inclusion by increasing society's digital literacy level and the participation of adults in digital learning.

Development goals and indicators

All Hungarian citizens should be members of the digital community! To reduce the digital divide and the number of those who have no digital competences or who do not or rarely use them (digital inclusion).

Indicators:

- The basic infrastructure required for the development of digital core competences and digital learning is established with national coverage and, in addition to its promotional functions, it provides access to the devices necessary for connection, short-cycle training courses aimed at the development of core competences (including in blended forms), and counselling services.

- By 2020, the percentage of 25-64-year-old, working-age adults with no or only a low level of digital competences will have decreased from 60% (3.4 million working-age adults) to 30%.

The development of digital competences should be ensured throughout the entire adult life path where necessary (progress)!

Indicators:

- By 2020, the number of people taking part in digital key competence development training courses resulting in an increased level of digital key competences will have increased from 36 thousand to 100 thousand.

- The Common Framework of Reference for Infocommunications (IKER) and other reference frameworks established on the basis of the IKER are laid down in the form of legislations and strategies.

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- There is a training programme linked to all levels and sub-areas of the IKER which are classified by the methodological and competence centre engaged in digital competence development.

- In the area of digital literacy Hungarian adults reach the average EU standard in the case of higher level activities (such as the use of basic mathematical formulae in Excel sheets, the production of electronic presentations with a presentation-making software, the installation of a new operating system, the modification of the configuration features of a software application, the writing of a computer program in a special programming language).

- The network of learning guidance services providing assistance in digital competence development is available to all citizens at their place of residence or nearby.

Successful participation in vocational IT training (ICT-related trades) should be increased!

Indicators:

- The number of people enrolling to courses of IT trade groups covered by the Adult Training Act will have increased by 30% by 2020.

- The number of people participating in in-service vocational IT courses will have increased by 30% by 2020.

- The number of IT-related training programme requirements registered as class "B" courses will reach 100.

- The central online learning portal provides access to at least four modern, freely available IT teaching aids which have been translated from a foreign language.

Creating a supportive environment for adult-age digital learning and ensuring the coordination of digital transformation (supportive environment and coordination).

Indicators:

- By 2020, the legislative environment will have become flexible in respect of the application of new technologies and learning methods and the monitoring of progress.

- Forms of support relying on the common conceptual framework of digital learning will be established.

Ensuring the continuous increase in volume and updating of as well as easy access to high-quality digital contents and open educational aids in response to the relevant needs (content development and sharing).

Indicators:

- A central open learning portal will be established with a view to assisting citizens who are interested in digital learning as well as trainers, teachers, and curriculum developers.

- The digital learning materials formerly developed under European Union co-financing schemes or from the national budget will be collected and published on a central open learning portal.

- The range of open educational aids available on the central open learning portal will continuously grow and include all digital learning materials developed under European Union co-financing schemes or from the national budget or translated from foreign languages.

Facilitating the application of digital learning and ICT use in practice and its widespread dissemination in adult learning (digital learning and ICT use).

Indicators:

- By 2020, the ratio of 16-74-year-old adults taking part in online courses will have increased from 3% to 6%.

- By 2020, the current 7% ratio of NQR training courses which can be organised in a digital or blended form will significantly increase – the exact rate of intended growth will be determined with the involvement of the Hungarian Chamber of Industry and Commerce (MKIK).

- The number of training providers offering online or blended forms of training will be tripled between 2016 and 2020.

Establish a systematically built and efficiently operating measurement-evaluation and reporting system that can serve as the basis of policy decisions (measurement-evaluation and reporting system).

Indicators:

- The administration of the training system will be fully and exclusively digitalised.

- Learning analytic tools will be introduced to ensure substantiated decision-making.

- Portability standards will be applied in order to minimise the fragmentation of IT systems operating at the various governmental and background institutions and chambers.

The monitoring tasks of the strategy (the implementation of the goals of the DES and the continuous updating of the situation analysis) would be defined and performed by the Digital Methodology Centre (DMC) which is proposed to be set up within the framework of the institution system.

5.4   Set of tools

The strategic tools are presented in relation to the development goals.

5.4.1 Reducing the digital divide

Raising awareness of the indispensability of digital key competences is a perspective-forming complex activity. To address a wide group of the adult population concerned, it is necessary to launch national-scale campaigns promoting (digital) learning as well as additional campaigns and volunteer activities mobilising the local communities. It is especially in the involvement of groups which are hard to reach that a key role is assigned to digital learning workshops established in the course of the expansion and capacity building of eMagyarország Pontok (eHungary Points) available locally or within a maximum distance of 30 km, which, while promoting digital learning, provide **free** guidance and learning support as required for the development of digital competences.

The services are designed with special attention to the special learning needs of people with a low level of education and weak basic competences, people with disabilities, the elderly as well as those disadvantaged on account of their social and family circumstances and to the elimination of barriers to their involvement.

The increasingly widespread introduction and prioritisation of electronic public services, which are being extended and made available in a user-friendly form as a result of Section 7 of Government Decree No 2012/2015 of 29 December 2015, have a motivating impact – with different tools – on the use of digital competences and facilitates the recognition of the lack of competences and willingness to develop them.   At the same time, these measures contribute to the well-planned expansion of the scope of electronic (public) services with a view to reaching the level of national coverage and to the efficient support of their introduction by giving citizens targeted assistance in learning their use.

The regular information, targeted sensitisation and awareness-raising of stakeholders potentially taking part in adult education and who are able to address and influence the situation of disadvantaged groups, in particular, and are in contact with these groups (e.g. employment centres, family aid centres, experts of NGOs, employers, trainers, etc.) facilitate the promotion of the opportunities of digital competence development and the successful involvement of the target groups.

5.4.2 Development of digital competences

The consistent interpretation of digital key competences at each level is ensured by the Common Framework of Reference for Infocommunications (IKER), which

- Supports the clear specification of social and employer requirements concerning the level of digital key competences.

- Serves as a basis for the measurement tools to be designed in the course of implementation of the DES, which will enable all adults to assess the level of their digital key competences, identify the areas that need to be improved, and plan the perspectives of their individual development, specific learning goals and the steps to take.

- Contributes to the efficient coordination of digital competence development at national level.

- Promotes the targeted elaboration of training programmes aimed at the development of digital key competences.

In order to fulfil the labour demand of the Government's programmes targeted at the development of the digital economy and the digital industry (Industry 4.0, Irinyi Plan, Digital Export Development Strategy of Hungary), it is necessary to initiate programmes which go beyond the traditional forms of training and can mitigate, already in the short run, the shortage of labour, a risk hindering the development of ICT companies and the digital economy.

It is the responsibility of the methodological and competence centres engaged in the digital competence development of adults to classify training courses into the IKER levels as well as to develop and regularly review the frameworks of reference and frameworks related to IKER.

The acquisition of competences required for digital learning is of key significance for all adults, therefore, it would be essential to create an opportunity to transfer these competences online by developing a learning programme aimed at the acquisition of digital learning competences by means of openly accessible and freely usable learning materials.

It is particularly important to ensure that the development of digital competences is implemented in a way that it is adapted to the challenges of the employed person's job (e.g. by contextualising training contents, organising on-the-job training, and by means of the targeted support of this type of training).

The establishment of a national system which supports competences acquired through non-formal and informal learning makes sure adults can flexibly enter the appropriate courses after assessing and taking account of their previously acquired knowledge. The acquired competences will be verified and presented by authentic digital certifications.

In addition to awareness-raising and sensitisation, the participation and advancement of adults including, in particular, the employees of small and medium-sized enterprises, in digital competence development could be effectively motivated by various financial tools (e.g. fiscal incentives, cafeteria, access to services), the scope of which is to be specified as one step of the implementation of the strategy.

The various sectoral strategies, measures and policies should be harmonised with a view to developing a comprehensive system of motivation and ensuring its sustainable operation. This coordination task will be performed by the Digital Preservation Coalition set up upon the recommendation of the European Commission.

5.4.3 Expansion of the scope of vocational IT training

Another aim of the national campaigns, promotions and programmes mobilising the local communities is to raise awareness of the demand for IT specialists and employment opportunities on the labour market.

The work of the national coalition set up at the initiative of the European Commission with the aim of dealing with digital competences and jobs contributes to the assessment of initiatives targeted at the promotion of IT-related professions and the identification of deficiencies in the training offer. In this respect, a key role is played by organisations which are capable of facilitating cooperation between market participants, employers and training organisations.

It is often not only the individuals themselves who need help to develop their digital competences, but also the market participants in training their employees. Regarding professional competences in information technology, the European e-Competence Framework (e-CF) provides guidelines to business undertakings for selecting the most appropriate training courses for their employees.

In order to broaden the range of training offers and ensure that the newly developed courses contain relevant contents and up-to-date approaches, it is necessary:

- to make sure that after assessing business needs the Hungarian Chamber of Commerce and Industry, with the involvement of the relevant non-governmental organisations, specifies **programme requirements** to complement the existing offer (supply) in a way that they are **matched with the actual market demands**.

- to support vocational further training courses of a small number of training hours that rapidly react to technological development and the changing needs of labour market participants and to ensure their quick registration.

- to identify target groups and content areas where it is reasonable for the government to take a role.

- in addition, to find and continuously monitor modern, gap-filling foreign language digital learning materials the translation/adaptation of which is more cost-efficient than the development of new contents.

- to use open teaching aids uploaded on the central portal which contains digital educational materials and learning opportunities, and to ensure that the learning outcomes elaborated in detail by the e-CF and IKER development tool contribute to the development of ICT training courses that are relevant to the labour market.

The development of the adult education competences of teachers employed in professional training courses on an occasional basis is supported by courses available online on the portal.

In addition to the professional recertification courses of IT teachers who teach in formal vocational training (adult education) and non-formal vocational training, it is reasonable to support initiatives

which provide a link between the world of training and labour market, development and service providing organisations, especially in the dynamically growing areas.

5.4.4 Supportive environment and coordination of digital learning

During the course of implementation of the adult learning pillar of the DES it is necessary to ensure continuous coordination in order to provide for the harmonisation of sectoral strategies and strategies concerning the utilisation of development resources provided by the European Union. This task can be performed by a board of experts responsible for digital learning and content development, which will create a common conceptual background for the developments and regulations and prepare decisions regarding the development and dissemination of the learning/training programmes and contents. The permanent members of the board of experts responsible for digital learning and content development: the delegates of the sectoral, speciality and governmental organisations responsible for implementing the goals of adult digital learning, the advocacy groups affected by the use of ICT for training purposes, as well as the invited representatives of professional organisations.

The organisational background required for the operation of the board of experts will be provided and the programming, coordination and monitoring tasks relating to the implementation of activities in line with the approved operational objectives will be performed by the DSP's organisational unit in charge of secretarial duties.

One of the prerequisites of the successful execution of the strategy is that policy- and decision-makers responsible for the management of the relevant area, professionals working in public administration as well as the heads and staff members of institutions involved in the system of adult education are provided access to information and are appropriately prepared for keeping pace with the changes resulting from the increasing development and spread of learning technologies and their impacts and for recognising the new potentials they offer.

In order for the regulatory environment to promote the wider use of digital learning with its own tools, it is necessary to examine the barriers - which influence the spread of digital learning - in the regulatory and controlling system as well as the measures and time required for their elimination.

Some of the key elements of this are to support and enable the development and widespread use of new, innovative digital learning forms, to elaborate appropriate forms of support adapted to the characteristic features of digital learning, and to introduce the application of creative public goods within the scope of freely available digital learning materials.

To ensure that the training programmes organised on the basis of the new digital learning forms can be carried out in a high quality, it is essential to review the requirements concerning quality assurance and control and adapt them to the characteristics of digital learning, to examine the possibility of switching from process-based regulation to regulation based on learning outcomes, and to prepare experts involved in control and quality management for facilitating the high-standard implementation and promotion of digital learning with their work.

By setting clearly defined requirements that are following the technological and methodological changes and are tailored to the outcome of the developments as well as the criteria of assessment based on those requirements, it is possible to specify common standards based on which the educational aids produced in the framework of the individual development projects actually become open and reusable.

The validation and recognition of competences acquired in the course of digital learning and interoperability between formal adult education and non-formal training are supported by a combination of several tools:

- Setting uniform standards for the digital training environment of training organisations.

- Systemic integration of electronic identification and individual student records in relation to adult learning.

- Setting up a controlling and assessment system based on the measurement of learning outcomes acquired in the course of digital learning and laying its professional and methodological groundwork.

- Measurement embedded in the learning process of the outcomes of training and learning (including non-formal and informal learning) by extending and complementing traditional examination   processes.

- Introducing, on a national level, the e-portfolio approach that verifies learning outcomes, which ensures electronic access to information concerning acquired qualifications and introduces validated digital badges which verify competences acquired via non-formal and informal learning.

The open central portal of digital learning will contain news, information and professional announcements regarding ICT use and the application of digital learning in adult education.

5.4.5 Content development and sharing

In the recent years a number of digital learning materials were developed in the framework of projects implemented under the co-financing scheme of the European Union. The collection of these materials and their uploading on the central open learning portal – as an openly available educational aid – would be necessary for facilitating their further use and development.

To achieve this in an effective way, it is essential to ensure their accessibility, the identification of their usability (in technical and copyright terms), their classification according to a common set of criteria, their quality rating, and their searchability on the portal.

By examining the legislative environment and the arising copyright issues and making the necessary changes and clarifications it will be possible to continue to use the developed contents in a legal and

efficient manner and to increase the efficiency of further developments. As the first step of the implementation of the strategy, the quality and technical requirements of the electronic training contents will be set in line with the adult training act and based on the international content description standards with a view to supporting wide-ranging interoperability and open use.

The central open learning portal may serve as a platform which simultaneously supports adults interested in digital learning, adult trainers, content developers and instructors by means of publishing training offers, open educational aids, guidelines and sets of criteria. Another important task is to communicate the purpose of the portal and the rules pertaining to its use.

The portal also supports the production and sharing of open teaching aids by instructors mostly by providing easily usable tools and a supportive environment to instructors with specialist knowledge who play a key role in the development of trade-specific learning materials but have no experience in digital content development (e.g. methodological materials, guidelines, templates, etc.).

In order to identify the target groups and content areas which require state aid for the purposes of content development (e.g. development of core competences and skills needed for digital learning; digital content and learning materials developed in response to skills shortages, quick satisfaction of unforeseeable competence development requirements arising on the labour market, etc.), it is necessary to conduct broad consultations and discuss preferences in the framework of the active role of a board of experts responsible for digital learning and content development.

Digital contents and applications necessary for the development of basic competences required for success in everyday life, learning and employability (writing, reading comprehension, numeracy, digital literacy, learning skills, etc.) in the form of open teaching content will be elaborated and made available for free use in a centralised manner.

5.4.6 Digital learning and ICT use

Technological development is continuously creating new potentials for adult learning. It is therefore essential to ensure that aid programmes aimed at the competence development of the above target groups make it possible to find and use innovative solutions.

The digital transition and service provision of training organisations can be encouraged mainly through the collection and adaptation of applicable business models.

To make sure that the supported adult training programmes are implemented in the expected quality through the exploitation of new opportunities, it is necessary:

- To examine and eliminate factors standing in the way of the widespread use of digital learning in adult training.

- To elaborate a set of criteria relying on the typical key processes and activities of organisations engaged in digital training and education, taking the international standards applied by digital educational organisations into account (DigCompOrg).

- To establish, based on these standards, an assessment system relying on the self-evaluation of training organisations.

- To support the creation of technical conditions required for the transition.

The development of the digital competences of instructors and teachers taking part in adult learning is supported by training programmes which will be elaborated and available for use in a cost-efficient and simple way (adapted to the tools, technologies, the target groups of the training courses, the designated training areas and systems) as well as by learning materials suitable for individual use, learning guidelines, and courses available online. To facilitate the development of training programmes, it is necessary to work out, apply and regularly review the validity of a reference framework which supports the interpretation, assessment and systematisation of the digital competences of the educational staff, takes account – in addition to ICT knowledge – of the characteristics of adult learning and the participant-centred approach as well as the IKER levels and their descriptors.

In order to support digital learning and digital competence development efficiently, it is of vital significance to support the elaboration of training programmes for getting familiar with the new teaching roles and innovative methods.

Quality awards offered by ministries, ministerial background institutions, chambers, and organisations embracing industry stakeholders could serve as an efficient means of motivation directly addressing teachers and instructors on a voluntary basis. Through these awards the work of teachers who achieve outstanding results in ICT use and content development with ICT tools and share these achievements would be recognised.

5.4.7 Measurement-assessment and reporting system

An integrated measurement-assessment and administrative system will be developed through the enhancement of the existing data collection practice and information system with the following functions:

- Laying the foundations of decision-preparation by collecting and analysing data and measurement results and monitoring user needs.

- Feedback concerning labour market relevance in respect of each training course, which information can be backchannelled into the development of the trade structure and training management.

- Ensuring efficient data disclosure and easy access to relevant, up-to-date information.

 The fragmentation of the information systems operated at the various government and background institutions and chambers can be reduced by setting out portability standards, which must be

elaborated with the involvement of stakeholders, while supporting the relevant development processes of certain institutions. One of the expected outcomes of the application of these standards is the availability of structured data which are retrievable from the different systems and related to the learning life path, which may support fact-based decision-making.

The technological development and the parallel international and national renewal of the conceptual framework of digital learning urges the review of (process) regulation, data collection and monitoring systems. This review ensures compliance with the requirements concerning the processes of planning, implementation, evaluation and feedback, bearing in mind the need for reducing the administrative burdens of the stakeholders and increasing the efficiency of data supply by using new solutions and learning analytical tools.

The electronic administration and data supply of the training system will become complete, exclusive, and more rational and will be supported by electronic applications designed to meet central requirements and standards.

An examination of the opportunities of electronic identification for the purposes of adult education and the systemic integration of individual student identification will determine the possibilities of reducing the administrative burdens of both the applicants and the training providers arising from the inquiring, processing and use of personal data, with special regard to application to courses and the execution of the adult training contracts. This will also identify new electronic services suitable for using electronic identification more widely. The established digital ecosystem will support the verification and storage of certifications suitable for the transfer of learning outcomes (e.g. certificates, validated digital badge) and the monitoring of the learning path.

The board of experts in charge of digital learning and content development facilitates the achievement of the development goals by setting the criteria relating to the measurement-assessment and reporting system, providing feedback concerning the applicability of the system, evaluating and discussing the retrieved data, and making proposals for improvement.

5.5   Logical Framework Matrix

Development areas and goals / Groups of tools	Digital competence development			Exploitation of the potentials of ICT and digital learning			
	Digital inclusion	Advancement	ICT trade	Supportive environment and coordination	Content development and sharing	Digital learning and ICT use	Measurement, assessment, and reporting
1. Awareness-raising, reaching, information	X	X	X	X		X	X
2. Promotion of digital competence development and use	X	X	X			X	
3. Improvement of access to learning opportunities	X	X	X	X	X	X	X

and training courses							
4. Provision of access to high-quality digital learning content			X		X		
5. Innovation and knowledge base building	X					X	
6. Support and motivation of teachers, developers and other experts and volunteers	X	X	X	X	X	X	
7. Capacity development and switch-over of training organisations to digital education						X	
8. System development (tools developing systemic operation)		X	X	X			
9. Sectoral and inter-sectoral communication and coordination	X	X	X	X	X	X	
10. Examination of legal and regulatory instruments				X	X		X
11. Collection and evaluation of data							X

5.6   Financing

The detailed planning of the financial conditions of the strategy and tools recommended in the framework of the strategy will be carried out as part of the implementation of the strategy itself following its approval by the Government.

In the course of financial planning the first task is to examine which EU programmes can contribute to the implementation of the individual development goals. The following table summarises the development programmes which can contribute to the implementation of the goals based on currently available information.

During implementation, after identifying the relevant development programmes, it is necessary to analyse to what extent the individual programmes serve the achievement of the development objectives set out in the DES. To perform this task, the sub-elements of the already running programmes (targets set, tools, activities, indicators) must be analysed in detail on the one hand. On the other hand, programme elements that are the most relevant for the purposes of the DES must be

identified and adjusted, if necessary, during the planning process of the programmes under preparation.

It is a key criterion that a possible modification of the professional content (scope) should not hinder the scheduled implementation of the project(s). To this end, it is advisable to involve the Digital Success Programme Secretariat and the professional team of the DES in the planning process of the annual development budgets of the OPs concerned.

After that, during the elaboration of the specific actions, it is necessary to make well-founded estimates of the amount and timing of additional resources required for the overall implementation of the DES objectives. The resource estimates plan must cover requirements concerning the planning, preparation and implementation of the action as well as the sustainability of its results and impacts.

Development projects contributing to the goals of the adult learning strategy of the DES (to be examined)		
Development goals	Development projects (to be reviewed) relevant to the implementation of the goal	
Digital inclusion	EDIOP-3.3.1.	Development of community internet access points and expansion of their portfolio of services
	EDIOP-3.3.2.	Facilitating the spread of online governmental, public administration and e-health services
	EDIOP-6.1.2.-15	Reducing the digital divide
	EDIOP-6.1.4.-16	Development of labour market key competences
	EDIOP-6.1.6.-16	Support of on-the-job training programmes for the employees of small and medium-sized enterprises
	HRDOP-3.7.1.	Actively for knowledge
Advancement	EDIOP-3.1.1.- CCHOP-15	Promotion and support of cooperation between education institutions and ICT companies
	EDIOP-3.2.1.-15	ICT motivation, perspective-forming and competence development programme for SMEs
	EDIOP-6.1.1.-15	Training people with a low education level and public service employees
	EDIOP-6.1.2.-15	Reducing the digital divide
	EDIOP-6.1.4.-16	Development of labour market key competences
	EDIOP-6.1.6.-16	Support of on-the-job training programmes for the employees of small and medium-sized enterprises
	EDIOP-6.2.4-CCHOP-16	Improvement of the quality and content of 21st century vocational and adult training
	HRDOP-3.7.1	Actively for knowledge
	PACSDOP-2.1.1-CCHOP-15	Development of the complex competence, life path programme and education technology of public services

ICT trade	EDIOP-3.1.1-CCHOP-15	Promotion and support of cooperation between education institutions and ICT companies
	EDIOP-3.3.2-16	Facilitating the spread of online governmental, public administration and e-health services
	EDIOP-6.1.4.-16	Development of labour market key competences
	EDIOP-6.1.6.-16	Support of on-the-job training programmes for the employees of small and medium-sized enterprises
	EDIOP-6.2.4-CCHOP-16	Improvement of the quality and content of 21st century vocational and adult training
	PACSDOP-2.1.1-CCHOP-15	Development of the complex competence, life path programme and education technology of public services
Supportive environment and coordination	EDIOP-3.3.2-16	Facilitating the spread of online governmental, public administration and e-health services
	EDIOP-6.2.4-CCHOP-16	Improvement of the quality and content of 21st century vocational and adult training
Content development and sharing	EDIOP-6.2.4-CCHOP-16	Improvement of the quality and content of 21st century vocational and adult training
Digital learning and ICT use	EDIOP-3.1.1-CCHOP-15	Promotion and support of cooperation between education institutions and ICT companies
	EDIOP-3.2.1.-15	ICT motivation, perspective-forming and competence development programme for SMEs
	EDIOP-6.1.1.-15	Training people with a low education level and public service employees
	EDIOP-6.1.2.-15	Reducing the digital divide
	EDIOP-6.1.4.-16	Development of labour market key competences
	EDIOP-6.1.6.-16	Support of on-the-job training programmes for the employees of small and medium-sized enterprises
	EDIOP-6.2.4-CCHOP-16	Improvement of the quality and content of 21st century vocational and adult training
	HRDOP-3.7.1.	Actively for knowledge
	PACSDOP-2.1.1-CCHOP-15	Development of the complex competence, life path programme and education technology of public services
Measurement-assessment and reporting system	HRDOP-3.7.2	Developments laying the groundwork for lifelong learning

6 HORIZONTAL PILLARS

6.1   Monitoring the learning path

6.1.1 Situation Analysis

In order to create a competitive educational system, reduce early school-leaving, implement the strategic goals defined in the pillars of this strategy, and to fulfil the educational obligations set out in the "Education and Training 2020" Strategy, it is essential to set up a joint database, which contains systematised, accurate and up-to-date information on the studies and academic achievements of the individual students.

6.1.1.1   Policy background

The "**Education and Training 2020**" Strategy set four common EU objectives to address challenges in education and training systems by 2020: Making lifelong learning and mobility a reality and at the same time improving the quality and efficiency of education and training. Promoting equity, social cohesion, and active citizenship, and enhancing creativity and innovation at all levels of education and training.

To monitor the changes, it is indispensable to operate a joint database, which contains systematised and accurate information of the studies and academic achievements of the individual students. Pursuant to the Public Education Development Strategy[55], one of the tasks of Hungarian public education is to connect educational data in a way that problems related to data protection and personality rights are solved.

The objective of the EU 2020 Strategy aimed at the enhancement of competitiveness and employability is to reduce the rate of early leavers from education and training[56] in the EU below 10% on average. Hungary has undertaken to reduce this rate to 10% by 2020. In 2011 the Council of the European Union adopted a Recommendation[57] on policies to reduce early school leaving. The Recommendation calls on the Member States to identify the main social and educational factors leading to early school leaving, continuously monitor the learning path of the most vulnerable target groups, and build an early alarm system to prevent early school leaving, which Hungary has undertaken to introduce in its medium-term strategy on the prevention of early school leaving[58].

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[55] Public Education Development Strategy p 51 ln: http://2010-2014.kormany.hu/download/d/72/21000/k%C3%B6znevel%C3%A9s%20fejl%20strat.pdf (Downloaded on: 15 June 2016)

[56] Early school-leavers The rate of 18-24-year-old people who have not completed upper secondary education and do not participate in education or training at the time of the survey.

[57] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2011:191:0001:0006:HU:PDF (Downloaded on: 15 June 2016)

[58] Medium-term strategy on the prevention of early school leaving. p 19 ln: http://www.kormany.hu/download/5/fe/20000/V%C3%A9gzetts%C3%A9g%20n%C3%A9lk%C3%BCli%20iskolaelhagy%C3%A1s%20.pdf (Downloaded on: 15 June 2016)

To fulfil the obligations undertaken in the "Education and Training 2020" Strategy, it is necessary to support the planning of learning and employment paths. In accordance with the above, the medium-term strategy on the prevention of early school leaving specifies the tasks concerning the further development of the career orientation information system, which directly contributes to reducing the rate of early school leaving[59].

6.1.1.2   Data and databases in education

Data and databases on education have been available – in an administrative sense – for a long time, so countries operating highly developed educational information systems already switched over from the paper-based filing system to electronic administration in the appropriate stage of information technology development. This phenomenon, i.e. the opportunities offered by the modern IT solutions have resulted in socio-economic expectations from the education systems – both at institutional and sectoral levels – which opened up completely new perspectives in assessing the quality and effectiveness of education. The fact that there are standardised data available on groups of students, whether small or large, in an increasing proportion of countries – and on all students in an increasing proportion of countries – has actually raised education systems and their assessment to a new level of development.

The main possible functions and aims of the collection of educational data:

- Management and organisation of the education system: education administration, records.

- Budget planning.

- Sectoral and institutional development: evidence-based decision-making, monitoring, strategic planning, management information systems, BSC, indicators.

- Education research and analysis.

- Assessment: students, teachers, institutions, the sector.

- Providing information to the public, transparency.

Making use of the possibility of data transmission, central electronic registers were established, based on which databases suitable for statistical purposes could be built, while maintaining the original intended purpose of registration. Today, about half of the European Union's Member States produce a major part of their education statistics from such registers. The main collectors of administrative data are the institutions and institution operators themselves.

Most of the education policy decisions were influenced by these data and a significant proportion of these decisions aimed to affect the characteristics of the education systems described by these data. In fact, no or only a limited amount of data was available on the actual effectiveness of education,

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[59] Medium-term strategy on the prevention of early school leaving; pp 31-32 ln:
http://www.kormany.hu/download/5/fe/20000/V%C3%A9gzetts%C3%A9g%20n%C3%A9lk%C3%BCli%20iskolaelhagy%C3%A1s%20.pdf (Downloaded on: 15 June 2016)

particularly at systemic level, and even if there were available data, they had little effect on decision-making. In this respect, the breakthrough was the spread and compulsory use of test-based student performance assessments and then the linking of public policy decisions with the results.

This phenomenon has contributed to the increasing significance of evidence-based decision-making also in education policy in the past decades, with the main reason being the substantiation and more efficient accountability of education policy decisions, which have serious financial consequences and a serious effect on the living circumstances of many people.

6.1.1.3 International practices of student performance assessment and monitoring

In order to monitor the achievement of the goals defined in the "Education and Training 2020" Strategy and to underpin evidence-based decision-making, it is essential to link and analyse the collected educational data. Several educational administrations have already been capable of performing these tasks.

Having recognised the potentials of these systems, governmental organisations and agencies have been set up in many countries for the specific purposes of collecting administrative databases and managing their secondary use. This has a well-established practice and tradition in Denmark, the Netherlands, Sweden and Finland, but special attention is paid to addressing this problem also in the United Kingdom. This process has been supported and urged by a number of international organisations (e.g. the European Commission, the UN, the OECD, the World Bank).

Today, approaches to learning are more and more focused on the individual. While formerly the focus was on the teacher or the institution, now it is on supporting the learning paths and the individual learning needs as well as service developed with the aim of addressing those needs.

6.1.1.4 Legislative framework and data protection in Hungary

The most relevant legislative acts include the currently effective law on data protection as well as Act CXII of 2011 on the right of informational self-determination and freedom of information (hereinafter: "Info Act"), which superseded the previous privacy regulation, i.e. Act LXIII of 1992 on the protection of personal data and the publicity of data of public interest (hereinafter: Privacy Act). One of the key purposes of the act is to specify the rules concerning data processing with a view to ensuring that data managers respect the privacy of natural persons. The registers kept in education often include personal data on students.

The Info Act clearly defines the term "*personal data*": "Personal data shall mean data relating to the data subject, *in particular by reference to the name and identification number of the data subject or one or more factors specific to his physical, physiological, mental, economic, cultural or social identity* as well as conclusions drawn from the data in regard to the data subject."

It is important to emphasise that the Act applies to any data management and data processing activity performed in Hungary which involves the data of natural persons or data of public interest or

public data to be disclosed in the public interest. The integration of student-related data into one system is subject to the above rules on data management and data processing.

6.1.1.5 Educational registers and databases in Hungary

In Hungary, major IT investments in the area of education started in the 2000s. It was also in the early 2000s that the use of school administration programs began to spread and the institution-based statistical data reporting system (the so-called "October statistics"), which had formerly – up to 2000 – been paper-based, was modernised. This created the demand for electronic data reporting, so the Public Education Information System (KIR) and later the Higher Education Information System (FIR) were established, and the educational ID code was also introduced. This is a unique identification number which is assigned to each child – already when entering kindergarten – and this code will accompany them along their entire learning path. By 2008 the fully web-based statistical data reporting system had been introduced and, at the same time, the development of central electronic registers began in some areas.

These include personal registers (institutional records, student and teacher registers, database for secondary school enrolments, school-leaving examination database, admission information system and the higher education information system). These systems, with some exceptions, are operated parallel with each other, with hardly any connection. As an exception, there are some initiatives where information contained in several public administration databases has been integrated. An example for this is the data reconciliation of the higher education information system and some labour records, which are based on personal data but are treated anonymously, and which provide accurate information on the labour market situation of tens of thousands of graduates.
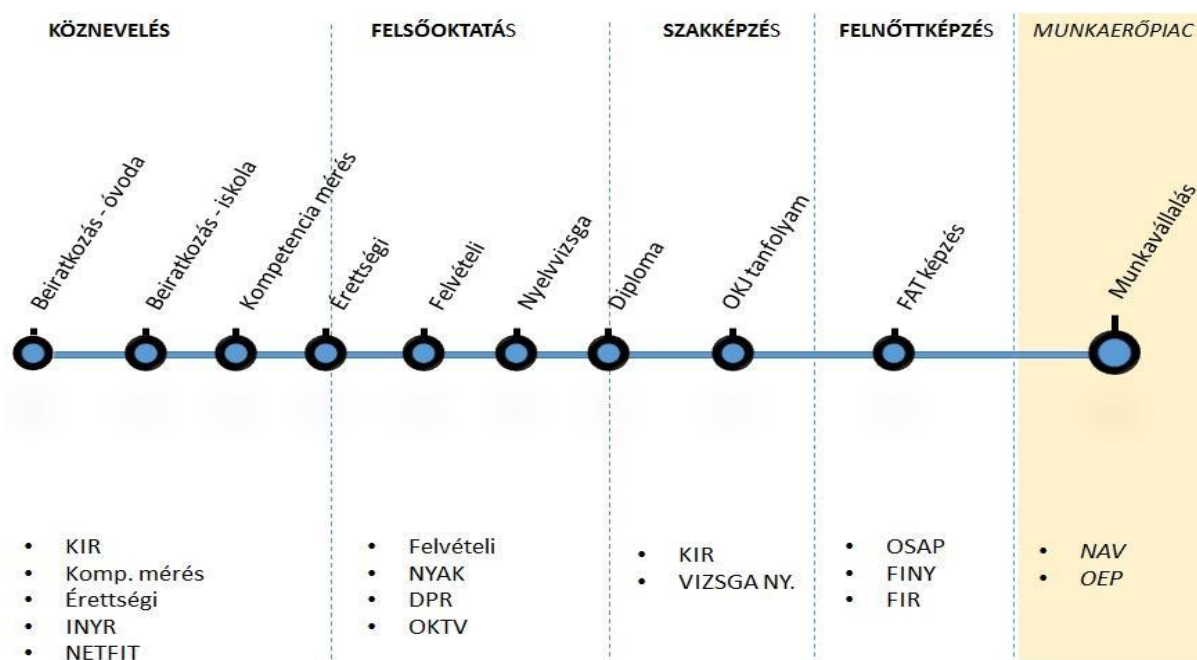
The main databases presented in the full version of the strategy:

- Public Education Information System (KIR);
- Higher Education Information System (FIR);
- Central electronic register of certificates of complex vocational exams;
- Adult Education Information System;
- Statistical database of adult education (OSAP 1665).

6.1.1.6 Utilisation of data in Hungarian education

The information contained in the above databases comes and is "uploaded" mostly in relation to various educational life events. A majority of these data are used – since they have a specific purpose – in the course of the actions and processes identified by the reason for their collection as well as in the framework of ad-hoc analyses and research projects. At the same times, they are sometimes used – although often to a limited extent and sporadically – in connection with other life events.

Learning path – educational life events and data sources

KÖZNEVELÉS	PUBLIC EDUCATION
FELSŐOKTATÁS	HIGHER EDUCATION
SZAKKÉPZÉS	VOCATIONAL EDUCATION AND TRAINING
FELNŐTTKÉPZÉS	ADULT EDUCATION
MUNKAERŐPIAC	LABOUR MARKET
Beiratkozás - óvoda	Enrolment - kindergarten
Beiratkozás - iskola	Enrolment - school
Kompetencia mérés	Competence assessment
Érettségi	School-leaving exam
Felvételi	Entrance exam
Nyelvvizsga	Language exam
Diploma	Degree
OKJ tanfolyam	NQR course
FAT képzés	FAT (Adult Training Accreditation Board) training
Munkavállalás	Employment
• KIR • Komp. mérés • Érettségi • INYR • NETFIT	• KIR • Competence assessment • School-leaving exam • INYR (Integrated Monitoring System) • NETFIT
• Felvételi • NYAK • DPR • OKTV	• Entrance exam • NYAK (Accreditation Centre for Foreign Language Examinations) • DPR (Graduate Career Tracking System - GCTS) • OKTV (National Secondary School Competition)
• KIR • VIZSGA NY.	• KIR • EXAMS
• OSAP • FINY • FIR	• OSAP • FINY (Adult Training) • FIR
• NAV • OEP	• NAV (National Tax and Customs Administration of Hungary) • OEP (National Health Insurance Fund)

Other sources of information include databases the contents of which are not directly linked to students, instead, they provide personal and infrastructural support for the sector's operation, for example the institution operators' records, the personal registers of the educational staff, records relating to textbook orders and documents, lists of specialists, consultants, and examination board chairs, etc. Even in the absence of personal data linking, these can be useful sources of information

for the purposes of monitoring the learning path, therefore, there are reasonable grounds for their integration as a secondary source.

6.1.2 Strategic Goals

The strategic goal is to create a more competitive education through the utilisation of the sector's educational asset and to improve the effectiveness, equity and efficiency indicators at all levels of education.

The direct goal is to link existing databases and records and create an educational information system at sectoral level, which is suitable for monitoring the learning path, and thus providing data that ensure more substantiated decision-making at both institutional and sectoral levels. Furthermore, they supply accurate, validated information on the actual performance of education institutions and stakeholders, and by means of their comparison or their involvement in the assessment procedure we can get a more precise view of the current situation and development of both the individuals and the institutions.

During the course of implementation of the goal, the educational data asset will be completely assessed, the sectoral and institutional needs will be identified, and by processing all this information it will be possible to carry out the legal, organisational and information technological planning and development tasks that are essential for improvement as well as to elaborate a sustainable model.

Another goal is to integrate these data into pedagogical practice and into sectoral and institutional decision-making, to elaborate methodological knowledge and practices for data-based procedures, as required for the use of such information, and to provide continuous professional support.

The direct goals of the strategy are:

- Adopting the practice of learning path monitoring in education using the available data asset of the educational and labour market sectors and linking the data and databases relating to students' life events.

- Identifying the risk factors of early school leaving based on the learning path monitoring data and elaborating a student profile and alarm system for early school leaving, thus providing an opportunity for well-founded interventions at sectoral (scholarships, other forms of support) and institutional (mentoring) levels alike.

- Providing labour market feedback similar to the sectoral data integration model applied to the already implemented graduate career tracking system, extending student path monitoring to all levels of education.

- Integrating data from external data sources into measurement-assessment and quality assurance procedures at student, teacher, institutional and sectoral levels.

- Supplying reliable and up-to-date information as required for supporting management decisions, making and adopting data-based decisions, and providing data sources that are essential for the elaboration of strategic indicators.

- Making benchmarks and ranks based on the sectoral and institutional indicators, data and databases of the education system and making them available to the public; supporting international data supply and perspective-forming.

- Establishing an information system which is suitable for analyses for education policy and education research, for examining correlations as well as for model calculations and impact analyses.

- Ensuring publicity and transparency and providing information to citizens.

The scope of the strategy covers the existing data and their linking, it is not a goal to define new sets of data. During the course of IT development, the strategy specifies three data levels for the purposes of linking the databases:

- primary: the data of which are relevant to the student's life events;

- secondary: which are linked to the created database;

- tertiary: which can be linked to the database in technological terms but do not contain data which are relevant to the strategic goals.

6.1.3 Set of tools

6.1.3.1 Integrating the data of source databases

Today, there are comprehensive sectoral electronic records available on students taking part in formal public education, vocational education and training and higher education courses. However, their data content is inconsistent – given the purpose of the data storage – as they are made of information of various levels of standardisation and quality. The first step of the development process should be to use an appropriate approach to review the types of data relevant to the monitoring of learning paths and to clearly specify the data protection and data validity frameworks of their usage.

In addition, it would be essential to establish an infrastructure with appropriate parameters, suitable for anonymous data management, which would enable the storage, processing and, if required, the migration of large amounts of data. This does not necessarily mean that new systems should be built, but it must be guaranteed that the storage and processing of data can take place separately, independent of the databases that store information directly suitable for personal identification.

6.1.3.2 Usability of data levels and data

After the necessary anonymity steps, data from the individual databases can be integrated into the learning path tracking system at various levels.

Some of the data are generated in connection with or as a result of the educational life events of students (e.g. enrolment data, measurement-assessment information, labour market information, etc.), and these make most information available about the learning path of the students concerned:

background, performance, functional effectiveness, etc. We regard these as primary data from the viewpoint of their life paths.

In addition to the primary data, there is another category of information – which we define as secondary data – which is not produced during the educational advancement of the student, but results from the operation of the sub-systems of education: data relating to the participation of the institutions and the teachers, measurement-assessment, and infrastructural data. These are also integrated in a form unsuitable for personal identification, however, they are linked to the primary data at the level of elementary data records.

The impact the phenomena described by the secondary data have had on the student's life path can be analysed as a result of the data link created during integration, and these also enable further, more complex analyses – provided that sufficiently detailed and enough information is available – such as the creation of predictive models, complex impact analyses, etc.

The third group of data to be integrated are the supplementary data, which cannot or can only partially be directly linked to the elementary (student) data. Their integration provides additional information to users, whether they are of a statistical nature or independent data suitable for comparison.

6.1.3.3 Public Education Information System and the Higher Education Information System

The data content of the Public Education Information System (KIR) could form the basis of the system which makes the monitoring of the learning path possible. At the beginning of the life path there are several educational life events to be defined: participation in early development, kindergarten/school enrolment, or entry into adult education in the case of foreigners, for example. The data generated in connection with these events are suitable for "starting" the series of elementary student information as the first group of data. The elementary data, which are made anonymous in accordance with the privacy regulations, together with further information generated during the learning path and added to the formerly integrated data as supplementary information, constitute the continuously growing elementary (primary) data group as well as the – similarly continuously growing – secondary (independent of student life events), and tertiary (supplementary statistical) data groups.

In addition to the KIR, the Higher Education Information System (FIR) can serve as the other source database of life path tracking, at least as far as the life paths of higher education students are concerned. The students' advancement, the acquisition of higher education qualifications, their parameters, the – also anonymous – results of higher educational competence assessments, if established and "integrated" into the higher education system, the language examination results as well as the results of academic competitions all serve as an important source of information for the system.

6.1.3.4 The labour market as a data source

In the recent years several programmes have been launched with the aim of integrating public administration data with varied success, but many results. One of these good practices is the Graduate Career Tracking System developed by Educatio Nkft and still operated by the Educational Authority. The system not only collects the results of online questionnaire-based surveys conducted by higher education institutions among former and current students, but also links higher education and – now also – public education data using the methodology of integration of so-called public administrative data with labour market information. Information relating to certain key educational life events, complemented with some labour market data, have already served as a very useful source of information for students applying to higher education institutions, because these data have helped to develop services that present career opportunities offered by the individual degree courses, thus creating a new basis for using linked higher education and labour market information.

These good practices can be relevant precursors for a systematically built, regularly updated and extended and adequately sophisticated learning path tracking system, which is capable of interpreting data in accordance with an appropriate professional interpretation framework, and can prove that the primary purpose of use of public administration data – even if not produced in the world of education – can be complemented with numerous secondary purposes. Data from this system can be potentially used for purposes including, but not limited to the following:

- Cyclical and comparable statistical information on changes in the situation of participants of the educational system (progress, transfer, exit, early school leaving, etc.) at the level of institutions, areas of study, courses, etc.

- Information for the preparation of data-based education policy decisions (e.g. through the identification of trends in training demands or the in-depth exploration of problems).

- Information on the demand/entry characteristics and labour market situations of certain higher education and vocational training courses and institutions for students continuing their studies and other groups of society.

- Making training institutions comparable based on student parameters.

- Possibility of the impact analysis of state support tools (e.g. supporting entry to higher education).

- Possibility of making forecasts and model calculations to support priority objectives, e.g. to prevent early school leaving, harmonise the education system with the labour market, etc.

- Possibility of providing information of appropriate quality for the purposes of unique (education) research projects.

- Analysis of the time required for transition between secondary and tertiary studies and the interrelations between selection and self-selection as well as the choice of higher education degree courses and the secondary education life path.

- Examination of the impact of regionalism on post-secondary learning intentions and their directions.

- The targeted further improvement of the educational and teaching activities of secondary schools with a view to reducing the drop-out rate in higher education.

- Establishment of a characterised life path database with statistical methods and the use of elementary data from the KIR and FIR systems.

- Monitoring of the talent development activities of secondary schools and higher education institutions.

6.1.3.5 Data validation, management of data authenticity problems – Educational Register

There have been several attempts at tackling the above-mentioned data validation problems – disruptions in institutional data reporting, content errors in data reporting, etc. – and efforts are still being made in the institutions operating the main systems of Hungarian education. The greatest problem regarding the anonymous integration of the data of separate systems is caused by the inaccuracies of basic data which make the identification of students possible (in the source systems) and the errors in data processing.

There are several solutions to manage these problems efficiently, but the most evident one would be to make sure that the personal "database" of educational records could be checked against information in the database containing the current central personal records and to make the necessary corrections on the basis of such authentic information, in accordance with the protocols specifically designed for this purpose. This could resolve many of the data reconciliation problems, which would be of key significance in the case of a system which is basically aimed at completeness, i.e. at monitoring the life paths of all students on an anonymous basis.

The data reconciliation process outlined above can be implemented by establishing a so-called Educational Register, which would record and track the educational life events of students in an identifiable manner, based on the so-called *educational ID number* and personal data, and could ensure the efficient and authentic use of information retrieved from the educational records by setting up further related services. Since the data contained in the databases are linked to individual persons, the connection of the two systems requires high-level authorisation and user right management, but this can be solved in terms of information technology.

It would be reasonable to examine the possibility of using the health data of students generated prior to and after beginning their studies in the students' individual development process. The certifications acquired during the learning path should be made available to the persons to whom the certifications were issued or their authorised representatives in an authenticated and electronic form.

It is a priority task to accept electronic identification in respect of all administrative events of the education and training system as a whole.

6.1.3.6 Development of data-based pedagogy and management methodology and practice, professional support

In addition to the necessary information technological and legislative tasks required for monitoring the learning path, it is also essential to widely disseminate the knowledge and methodology required for the use of information to those concerned both at institutional and sectoral levels.

The first step is to collect the information, data and relevant literature necessary for development as well as to organise these in a structured form and establish a knowledge base for learning paths. This may contain a repository of international and domestic good practices, related literature, databases, and relevant research information.

The processing of professional content and the assessment of sectoral and institutional management needs, and the planning of ICT developments at systemic level could constitute a comprehensive knowledge base, which is capable of transferring knowledge on learning path monitoring, educational records in a broad sense, and their use in a practice-oriented form. To this end, it is necessary to elaborate a manual summarising the relevant knowledge base, methodological aids, as well as further training materials required for sectoral and institutional experts and those responsible for measurement and assessment who will use these data and to ensure their further training.

This monitoring task and the appropriate use of data require continuous professional support, consulting, and an online knowledge base as well as the organisation of professional forums, workshops, and conferences for the exchange of experience and the establishment of platforms and networks for knowledge transfer.

6.1.3.7 Data integration and the monitoring of processes

The aim of data collection, data integration and the monitoring of processes is to manage the problem which arises from the fact that in the past 25 years no system has been developed for the purposes of monitoring life paths. As a result, conclusions about the success of students' life paths can only be drawn from the sample of labour surveys, and the alerts cannot be treated as real awareness-raising signs. In either case it is not the development of a new information system that is required, but the use of existing data collections and databases, with supplementary data, where appropriate, the creation of new functions, the linking of certain information, and the use of data, ensuring an adequate level of data protection.

During the course of implementation, the often contradicting and/or parallel or competing institutional and organisational interests must be taken into consideration. It is therefore important to designate a governmental body which will take the main responsibility for implementation.

6.1.3.8 Monitoring system

The purpose of the monitoring system is to make sure that changes in the target area of life path tracking are presented and the reasons for shortages are revealed. To accomplish this, in respect of

the data asset produced as a result of the integrated database, the monitoring system must be suitable for

- defining and planning the goals (according to their orientation, scope and time span);

- supporting, forecasting and monitoring sectoral and institutional decision-making;

- monitoring socio-political, sectoral, institutional and civilian goals;

- identifying the necessary points of intervention and feedback.

The goals of the monitoring system must be aligned with all pillars of The Digital Education Strategy of Hungary. The monitoring of the other strategies should also be supported, if the database is suitable for this. It is necessary to develop a set of indicators for the above goals taking account of the potentials and limits of the data asset.

The set of indicators could serve as a basis for monitoring goals using indicators elaborated on a professional – education and IT – basis as well as for the identification of intervention and feedback points. The monitoring system prepares regular and ad-hoc progress reports.

The progress reports must aim to present the quantified results of the defined goals and interventions via time series data to ensure a clear understanding of trends, their international comparability, and their consistence with data retrievable from the monitoring system of the operational programmes. Already in the short run, the monitoring system enables state interventions in areas where the achievement of the goals set is behind schedule.

The monitoring report covers the planned interventions, thereby providing the possibility of presenting chronological changes. The monitoring system must comply with the quality management system of The Digital Education Strategy of Hungary.

6.2 Accessibility for persons with disabilities in education and training

6.2.1 Situation Analysis

Pursuant to Articles 70/F and 70/G of the Constitution, the Republic of Hungary guarantees the right of education to its citizens. It shall implement this right through the dissemination and general access to culture, free compulsory primary schooling, through secondary and higher education available to all persons on the basis of their ability, and furthermore through financial support for students.[60]

"The internal changes of labour market requirements have generated the need for better qualified employees. This means that the education of SEN (special education needs) students has had to face greater challenges, since it has become necessary to ensure higher quality outcomes in order to guarantee employment. From the viewpoint of human rights, special pedagogy is subject to the

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[60] http://www.oktbiztos.hu/ugyek/jelentes2002/kozv_jogok.html

burden of continuous expectations. The United Nations Convention on the Rights of Persons with Disabilities also emphasises the need for active participation. Pursuant to Document COM (2010) 636 of the Council of the European Union, the European Disability Strategy 2010-2020, A Renewed Commitment to a Barrier-Free Europe for Disabled Persons, *priority must be given to providing timely support for inclusive education and personalised learning, the early identification of special needs, and adequate training and support for professionals working at all levels of education. The development tasks of the period 2014-2020 will be defined to serve the above goals.*

AT present, 63% of the SEN students are educated and taught in an integrated form. However, educational activities performed in an inclusive and adapted form require further support in the future, for example in the key areas of health development". [61]

At the various levels of public education and training some 4-5% of the students are disabled and their disabilities cause or may cause learning difficulties. Regarding the right of education as set out in the Fundamental Law, equal opportunities and the possibility of equal access must be guaranteed at all levels of public education and training. In the case of persons with disabilities, equal opportunities can be guaranteed by ensuring equal access (in addition to other actions concerning social and lifestyle compensation).

In the case of digital education and digital learning equal opportunities can be provided by means of digital accessibility.

Digital accessibility affects two main areas: the accessibility and operability of physical, i.e. hardware elements and the operability of digital services and software. Having recognised this problem, the national legal regulations as well as international conventions and laws are being amended with a view to supporting not only physical, but also infocommunications accessibility, and they often prescribe compliance with this requirement.

In most countries of the world the web accessibility standard W3C WCAG 2.0[62] is regarded as the basis of legal regulation. In general, domestic tenders expect the lowest, i.e. A level accessibility, but they more and more often require one level higher, i.e. AA (two As) level. A proposed recommendation for guidelines[63] has already been submitted to the European Commission, which the European Parliament has already adopted. This document stipulates that in all future projects to be implemented from state or European Union funds, whether full or in part, accessibility conforming to the WCAG 2.0 AA standard will be required.

Since making any software or website subsequently accessible costs much more energy than if the developers had met these requirements immediately when developing them, it is important to make

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[61] Public Education Development Strategy, 2014

[62] http://www.w3.org/TR/WCAG20/, Hungarian translation: http://w3c.hu/forditasok/WCAG20http://w3c.hu/forditasok/WCAG20/

[63] http://ec.europa.eu/digital-agenda/en/news/proposal-directive-european-parliament-and-council-accessibility-public-sector-bodies-websiteshttp://ec.europa.eu/digital-agenda/en/news/proposal-directive-european-parliament-and-council-accessibility-public-sector-bodies-websites

sure that no more infocommunications tools are made without taking account of at least these most basic criteria, as these tools and platforms will hopefully serve needs for many long years to come. It is therefore essential to observe these guidelines in the case of all newly developed platforms.

6.2.2 Strategic Goals

In The Digital Education Strategy of Hungary priority is given to the issue of equal opportunities in harmony with the Public Education Development Strategy as well as the laws regulating certain areas of education and training and the Fundamental Law. In line with the above, the DES has set the following objectives concerning equal access:

- The websites of education institutions as well as the infocommunications platforms available to students and parents should be made accessible at the WCAG 2.0 AA level.

- A central organisation should be established for the purposes of checking and guaranteeing the accessibility of infocommunications platforms and providing help in barrier-free access arrangements.

- Special hardware and software tools used by students with disabilities should be made accessible.

- Detailed instructions of use should be provided for hardware and software to students with disabilities as well as the teachers and IT specialists of the education institutions. The use of these tools must be integrated into the SEN programmes.

- It would be necessary to develop a learning material which can be indirectly or directly used by the students concerned, teachers, parents, university students, and instructors and which sensitises them to the main groups of persons with disabilities.

6.2.3 Set of tools

The interventions required for ensuring equal opportunities vary among the areas of education and training and the different life cycle stages to such an extent that the requirement of equal opportunities – in a broader sense – are discussed separately in each pillar. At the same time, barrier-free access to digital tools and services basically require common actions, therefore, these are given priority in The Digital Education Strategy of Hungary and thus presented separately from other categories of equal opportunities.

In order to ensure equal opportunities, electronic services and digital learning materials must be made accessible, digital devices must be made available to students with disabilities in education institutions, and educational staff teaching students with disabilities must be prepared for the use of digital devices.

6.3　Security

6.3.1 Situation Analysis

Pursuant to the Directive of the European Parliament and of the Council concerning measures for a high common level of security of network and information systems across the Union, to achieve and maintain a high level of security of network and information systems, each Member State should have a national strategy on the security of network and information systems defining the strategic objectives and concrete policy actions to be implemented. The strategy must contain an indication of the education, information and training programmes relating to the national strategy on the security of network and information systems.

Chapter II of Government Decision No 1139/2013 of 21 March 2013 on the National Cyber Security Strategy of Hungary titled "*Hungary's set of values, vision and objectives relating to cyber security*" stipulates that

"To address present and future challenges, Hungary lays down the requirement that the Hungarian cyberspace shall provide a secure and reliable environment:

- for individuals and communities to ensure social development and

  integration through communication based on liberty, freedom from fear, and guaranteeing the protection of personal data;

- for the business sector to develop efficient and innovative business solutions;

- for future generations to ensure value-based learning and uncorrupted collection of experience resulting in a sound mental development;

- for electronic public administration, to promote innovative and cutting-edge development of public services.

6.3.1.1　　*Kindergarten education*

The vulnerability of the group of 3-7-year-old children is increasing within the family due to their access to digital devices and the uncontrolled content available through those devices. The patterns learned at home, within the family have a severe impact on the development and awareness of children. Since the direct education of 3-7-year-old children is less efficient, it could be more effective to focus on pattern-based behaviour formation through the parents and teachers.

Besides the illustrative functions of digital tools, IT education has an increasing role in the local educational programmes of kindergartens, which clearly indicates that kindergarten teachers are looking for possibilities of integrating ICT tools into kindergarten education. Therefore, it is necessary to map all national and international good practices where the high-standard work of kindergarten educators is harmonised with the exploitation of the educational potentials of ICT tools. The basic document of kindergarten education, i.e. the National Core Programme of Kindergarten Education

(Government Decree No 137/1996, as modified from time to time) must be revised so to align it with the DES, because currently this document does not deal with the new challenges of the information society at all, it does not even mention the spread of digital devices and technologies or the ICT tool usage in early childhood, nor does it state how kindergarten teachers should respond to this trend.

It is important, however, to take account of the fact that children do not only meet ICT tools at home, but increasingly in the kindergarten environment as well (camera, PC, notebook, tablet, dictaphones), which the institutions use primarily for illustration purposes or in thematic lessons.

The storage and publishing of digital contents and photos produced during kindergarten lessons are a daily practice, so institutions must draw up privacy guidelines and policies and agree with the parents how they can ensure the protection of the personality rights and personal information of the 3-7-year-old children.

Thus, the need for the protection of personal data arises already in kindergarten, and the institutions must be aware of the current regulations and in their own data management policies should lay down the rules for the processing of the personal data of children, parents and staff members in their institutions. As communication via social networks, websites and e-mail is becoming increasingly common, it is essential to introduce security-conscious data management already in the kindergarten environment. This is a new challenge for all participants of kindergarten education since they need to adapt to the changes brought about by the digital space both in terms of applied knowledge and the related set of tools and the behavioural patterns they are expected to provide.

6.3.1.2 *Public education and vocational training institutions*

Undoubtedly, students are exposed to the greatest threat concerning risks arising from internet use. According to international surveys, parents regard harmful internet content and contact with dangerous strangers as the major potential sources of risk.

Almost everywhere in the world children begin to get familiar with the digital world and the opportunities offered by the digital space at an increasingly early age. Regarding the internet use of children aged 9-16 years, most of them use the internet on a daily basis, while weekly use is considered completely normal. Based on surveys, almost all students who use the internet daily have encountered risky activities (cyberbullying; adult content, contents including violence, aggression, cruelty; the negative effects of social media sites; phishing, unauthorised use of data, malware), and the ratio of those who also have personal experience is increasing. One fifth of the students have already browsed contents which are potential threats to them. In spite of the above, browsing adult content is negligible, only one out of ten children has this type of experience. Nearly 70% of the children asked claimed they had been subject to some kind of cyberbullying. Seeing images and videos that contain adult content affected 30% of the children, and nearly one third of them admitted to have had experience with messages and actions related to such contents.

Hardly any children are aware of the following:

- Safe information management concerning the use of data and information: generation, processing, management, "movement", storage, saving, destruction, removal, etc. of data and information.

- Application and software: installation, security settings, permanent deletion, etc.

- Tool management: security settings, restoration of default settings, re-installation of devices, etc.

- Safe use of e-services: authentication, document encryption, document verification, password creation, password handling, etc.

- Online abuses and their management: unauthorised access to and modification of data, password cracking, spams, hoaxes, viruses, worms, Trojans and rootkits (infecting the system kernel), botnets, adware, spyware, malware, rogue software, scareware, phishing, infectious websites, man-in-the-middle.

- Physical abuses: stealing passwords, social engineering, IT identity theft (stealing personal identity in information systems), theft of devices and data carriers, scrapping, disposal of devices, dumpster diving, sharing personal/official information on social networks.

- Safe use of office applications: deleting personal data from documents, protection of documents with passwords, document encryption, teamwork use, the risks of data synchronisation between devices, the risks of wireless internet (WiFi) usage.

- There is no training or recommendation available on security-conscious behaviour specifically designed for the participants of education institutions (students, teachers, administrative staff, system administrator, principal).

- Institutions have no capacity to detect and report incidents.

- In the institutions there are no persons in charge or a centrally accessible helpdesk who/which could be contacted and could provide assistance in case of an incident, security violation or cyberbullying.

- Nevertheless, there are several good examples for security-awareness in the life of schools: many of them have learned to filter out web contents that are of value to them and often hold internal awareness-raising forums on the internet security. These forums, however, are mostly based on the daily experience of teachers.

- There is an increasing number of free social networks and websites that are made available by a civil society organisation or market offer where teachers and students can get information about the risks and how to avoid them.

- There is no available assessment or inventory of the data assets of public education institutions at local or maintainer level. ● There is no mandatory policy, decree or other legislation to be observed by the institutions in respect of the assessment and classification of their data assets.

- The institutions do not have an information security strategy or a policy related to information security, whether on an institutional or maintainer level.

- The data managed by the institutions have not been classified by confidentiality and criticality and the place and method of their storage have not been identified.

- Most institutions have no risk assessment practice or an action plan for mitigating the identified risks.

- The physical and logical protective measures to be taken depend on the knowledge and diligence of the local system administrator.

- The institutions have not designated or appointed persons to be in charge of information security or incident management, and there is no internal resource for carrying out assessments concerning the data assets.

- There are no recommendations which could assist and support institutions in assessing their data assets or in evaluating and managing risks.

- No summary or assessment of risks concerning the data asset is centrally available (at least at the level of the maintainer).

The solutions available in national legislation can be basically divided into two groups: preventive solutions providing an active safety net and solutions determining and providing a framework for legal requirements and assisting reparation (in response to and aiming to remedy already occurred problems).

Active solutions include the accessibility of filtering software which internet providers are required to provide in order to protect minors, rules concerning advertisements, content classification, and the related legal obligations. These ensure the protection of children while using the internet. Reparative solutions include sanctions imposed under the civil or criminal law in cases of infringement.

The tools providing for the online protection of children form a complex system. This is partly provided by the legislative requirements set out within some areas of law, some of which are specifically aimed at protecting children (e.g. media regulation, advertising rules, E-commerce Act), while other norms do not only serve the protection of minors but are applicable to them (e.g. privacy protection under the civil law, criminal law, data protection).

Other institutions of the government sector have been set up with the primary (or exclusive) aim of protecting children, particularly of supporting online child protection. The child protection activities of the Internet Roundtable for Child Protection, the Commissioner for Educational Rights, and the Commissioner for Fundamental Rights can be mentioned in this context.

The central services provided to public education institutions are operated by the National Information Infrastructure Development Institute (NIIFI) within the framework of the "Sulinet Programme" in accordance with the provisions of Government Decree No 5/2011 of 3 February 2011 on the operation of the National Information Infrastructure Development Programme.   At present, the services are used by some 1,700 public education institutions, which is about one third of all

institutions, which are maintained by the Ministry of Agriculture, KLIK (Klebelsberg Institution Maintenance Centre), NSZFH (National Institute of Vocational and Adult Education) and the MNE. The services presented below provide an opportunity for institutions to achieve a basic level of protection relying on a centralised service, for the maintenance of which they receive state support.

If the Sulinet services are not available to an institution because its central connection is not possible due to its geographical location or it decides at its own discretion that it does not intend to use the services, then it will be compelled to procure and operate the tools required for safe operation mostly on its own.

The operation of such institutions is usually quite extreme: the ones that choose to operate their own service usually have it performed by a well-prepared system administrator or a team of system administrators, while most small institutions that are difficult to connect usually remain without access.

It is a similarly frequent situation that even if an institution operates the central services, it does not know how to use them, thus practically missing all the available advantages except for having internet access. Unfortunately, it is rather rare when an institution takes further actions besides the central services such as using firewall or proxy solutions, filtering software, or operating any other border protection or anti-virus programs and tools. The level of protection varies among the institutions, the solutions used are not homogeneous in any geographical unit (district, school district, county, etc.) and their levels of operational competence are also different.

The obvious disadvantage of this is that there are substantial variations among institutions concerning their level of protection, and they work sporadically, which means they have no possibility for central reports, monitoring, or for proactive or reactive protection. The sources, information and competences required for the organisation of protection are not available at the school district or maintainer level, so the institution is unable to take action to increase its protection level alone and often fails to notice the occurrence of a security-related incident.

The public register of personal and institutional data of public education institutions is maintained by the Educational Authority. The records are kept through the Public Education Information System which has provided data on all institutions and students in the past decade. In quantitative terms, this means 1.5 billion data records, which also comprises up-to-date information on 1.7 million students, some 210,000 teachers and about 6,000 public education institutions. The reporting of data to the Public Education Information System (KIR) is required under a separate legislation and is mandatory for all institutions. Besides keeping personal and institutional registers, the Educational Authority operates a number of special educational systems designed to provide for central statistical data reporting, the implementation of the two-tier school-leaving exams, the national competence assessment, the organisation of school competitions, and student ID applications, among other tasks. The Authority has contact with almost all participants of the education sector via an information system. The "clients" of the Authority are the parents, students, maintainers, government agencies, public education experts, research institutes, co-authorities and the state secretariats of the Ministry of Human Capacities, which is responsible for their supervision.

Tasks related to the creation, operation and IT development of electronic databases and applications serving the necessary registration purposes as well as data processing tasks required for data management and compliance with the act on the right of informational self-determination and freedom of information are all performed by the Educational Authority.

It is the Authority's obligation to appoint a person to be in charge of information security and to operate an information security framework in accordance with Act L of 2013. Pursuant to the Act, the Authority must have an up-to-date data inventory and a catalogue of applications and must appoint application hosts and data managers. The IT specialists and information security experts operating the information systems are subject to a compulsory national security check.

It is mandatory for the Authority to assess the security class of the IT information systems and continuously upgrade them in accordance with the action plan prescribed under the relevant legislation.

Based on a separate government decree, the Authority's telecommunications provider (Internet and telephony services) is NIIFI, while the investigation of reported security incidents is performed by the National Cybersecurity Institute operating at pan-government level.

The central supervision and coordination of public education and vocational training institutions is performed via the maintainers (Klebelsberg Centre, MNE, MA, NSZFH), the common feature of which is that they all belong to the scope of Decree No 41/2015 of 15 July 2015 of the Minister of Interior and they manage the huge amount of personal data reported by the institutions, whereas in terms of information technology the NIS (National Infocommunications Services) is responsible for their operation. As regards the processed and transmitted data, they must comply – just like the Educational Authority – with the provisions of Act L of 2013 on the electronic information security of central and local government agencies (hereinafter: Information Security Act).

As a result of the amendment of the Information Security Act effective as of 16 July 2015, on 1 October 2015 the National Cybersecurity Institute was established as a common framework comprising the Government Incident Response Centre (GovCERT-Hungary), the National Electronic Information Security Authority, and the E-Security Intelligence Centre (NBF-CDMA). The primary task of the organisation is to monitor and improve the security level of electronic state systems, while it has competence and controlling authority concerning the entire information security life cycle of already developed and operating electronic information systems.

Organisational units of the National Cybersecurity Institute: National Electronic Information Security Authority, the incident management department of the Government Incident Response Centre, and the area of Security Management and Vulnerability Assessment.

The place and tasks of the Cybersecurity Institute in the national security structure are illustrated by the following diagram:

Gazdasági társaságok	Business undertakings
nem kormányzati rendszerek	Non-governmental systems
Belügyminisztérium	Ministry of Interior
kormányzati és önkormányzati	Central and local governments
Létfontosságú rendszerek	Crucial systems
Működtető szerv	Operating body
speciális rendszerek	Special systems

A number of professional associations (civil society organisations and market participants) cooperate with the central governmental security agencies at national and international levels, and they contribute a significant knowledge base and staff at industry level to the implementation of professional training in Hungary.

Below is a non-exhaustive list of organisations which all play a key role in supporting research and development relating to information security as well as the raising and dissemination of security-awareness:

- ISACA Hungary Association;
- ICT Association of Hungary -Information Security and Cybersecurity Work Team;
- Infotér Association;
- Hétpecsét Information Security Association;
- Hungarian Academy of Sciences – Computer and Automation Research Institute
- John von Neumann Computer Society, etc.

6.3.1.3 Higher education

As for the security of data managed in the institutions, one of the most important conclusions is that higher education institutions are not governed by Act L of 2013 on the electronic information security of central and local government agencies, nor by Decree No 41/2015 of 15 July 2015 of the Minister of Interior, which means that in the case of higher education institutions there is no centrally regulated requirement that would prescribe detailed security measures concerning the data asset and the ICT infrastructure. Therefore, it is the institution's own responsibility to set up a security framework, the level and standard of which depend on the management and size of the higher education institution, the selected security standard, and the availability of internal or external human resources.

Almost all higher education institutions have some kind of data protection or information security rules, which are mainly available in the form of an IT Security Policy. The common feature of the publicly available policies is that they are based on a generally accepted standard (e.g. ISO27001), specify the scopes of IT security tasks and responsibilities, and lay down rules for the detection, prevention and elimination of risks to managed, processed, stored and transmitted data.

There are significant variations in the currently applicable regulations among institutions:

● Few institutions are required to assess, classify, and rate their information asset on a mandatory basis.

● Not all institutions have an appointed information security manager (hereinafter: ISM), however, most of them have some kind of a compulsory, regularly meeting security panel or committee.

● In many cases the information security tasks are performed by the manager of the IT area.

● Not all institutions have a capacity for independent IT operation, they often outsource this task in full or in part.

● In the case of institutions operated by NIIFI, the NIIFI's user account policy and set of criteria are adopted by most institutions.

● At the same time, the effective regulations have become obsolete at certain institutions, they are not updated or detailed enough to plan the necessary physical and logical measures. However, several institutions have set the objective of complying with the principles and rules laid down in Act L of 2013 on the electronic information security of central and local governmental agencies and have achieved a high degree of preparedness in terms of their regulatory environment.

● In general, institutions have a security policy in place, but few have a long-term strategic plan for information security.

● No detailed criteria have been set for information security in respect of outsourced services (special mention should be made of the study system).

● The scope of responsibility always lies with the management of the university, while the latest regulations apply also to the chancellor system and the chancellor's responsibility for information security.

Higher education institutions act with utmost care in setting rules for authorisation management and specifying the scopes of responsibility. All policies contain a detailed description of the method of VPN and network segmentation ensuring the possibility of remote work as well as the applied encryption and authentication procedures, which are primarily related to the access of financial administrators, institutional administrators managing the study systems, and administrators operating the IT systems.

General characteristics:

- The identification of administrative staff members entering the study system takes place with the help of an authentication solution (e.g. RSA Token). It is usually a two-factor authentication process with access through an encrypted, safe channel. The access authentication system and the study system both keep record of entries and all activities are stored and retrievable.

- Financial administrators have special rights. With regard to the fact that the managed data affect personality rights and that the financial system is a central service under special protection, special users are given special rights. The financial system is normally protected with a separate firewall.

- In addition to their basic rights, the staff members of the IT area have additional rights in accordance with their operational tasks. They have access to the servers providing the institution's central services with a unique ID logged by the system. The administrator passwords of the servers providing central services are safeguarded in compliance with special regulations.

The central services provided to higher education institutions are operated by the National Information Infrastructure Development Institute (NIIFI) in accordance with the provisions of Government Decree No 5/2011 of 3 February 2011 on the operation of the National Information Infrastructure Development Programme.

Even on an international scale, higher education and academic institutions have accumulated outstanding knowledge in relation to research activities and vulnerability assessments concerning information security as well as to the dissemination and teaching of security-aware behaviour. The transfer of IT and information security knowledge has become a general part of domestic IT specialist and engineer training, however, several universities have built their own training and knowledge centres for the purposes of conducting research and education activities on IT security.

6.3.2 Strategic Goals

6.3.2.1   *Kindergarten education*

Kindergarten education should include raising the security awareness of pre-school-age children and coping with security challenges that may arise in the course of digitalisation of the institutions with a view to ensuring that:

- The parents of children participating in kindergarten education and kindergarten teachers have an adequate level of digital competence and security awareness.

- Only controlled content is accessible on the digital devices used in kindergarten lessons.

- The personal data and personality rights of children, parents and teachers are protected during communication through the digital systems between institutions and between the institutions and the parents.

Regarding the fact that within the family environment this is mainly the responsibility of the parents and relatives, it would be essential to make the kindergarten's thematic awareness-raising programmes and specific case studies available to them and to prepare them as early as possible for the safe use of digital devices in order to protect both their children and themselves.

6.3.2.2 Public education and vocational training institutions

The information security aspects of the goals set within the public education pillar of The Digital Education Strategy of Hungary are as follows:

- *"To make sure that students leaving public education have an adequate level of digital competence."*

  o Students, parents and relatives should all be aware of the safe use of the digital platform, and they should recognise and learn to manage the risks that may arise during the use of the digital world.

  o They should be familiar with and use the legal and communication tools, know how to ask for advice and help or provide help, if necessary.

- *"The process of teaching and learning should be supported with digital tools with a view to facilitating the fulfilment of expectations concerning the public education system (effectiveness, equity, efficiency)."*

  o The equipment used (internet access, intranet, work stations, servers) must protect the students' privacy as well as the data and information managed by the institution.

  o The institution should be aware of the data asset it manages.

  o The educational staff, the institution heads, the administrative staff and the system administrators should manage and protect the data handled by students and the institution in an up-to-date and security-conscious manner and should have the required competences.

- *"The decisions taken by the education management through the digital administration systems are based on real-time factual data at all levels of public education."*

  o The central protection of information stored and managed by the education management and the institutional data reporting system must be guaranteed and must comply with all laws and regulations concerning data security.

6.3.2.3 Higher education

Given the massive amount and confidentiality of the information managed by higher education institutions, it is necessary to introduce an information security policy on the basis of a common set of criteria. This could be accomplished most efficiently by extending the scope of application of Act L of 2013 on the electronic information security of central and local government agencies to all higher education institutions.

The purposes of scope extension:

- In terms of confidentiality, integrity and availability, higher education institutions should comply with the standards of security level 3 at the minimum.

- The institutions should have a common regulatory environment.

- The institutions should assess their data assets, classify their IT systems into security levels, and work out action plans to ensure compliance.

- Higher education institutions should make sure that outsourced services, particularly those concerning the study systems, comply with the relevant legislation. (The providers of study systems should be required to meet the standards of security level 3 in respect of their data processing activity and the services they provide.)

- All institutions should have an appointed information security manager.

- At the same time, sufficient resources should be provided at the level of central decision-making to ensure that the institutions reach the statutory security level in a maximum of 6 years.

- By taking physical and logical security measures in line with the security classifications and common guidelines it would be possible to guarantee that all data requested, stored and transmitted at institutional level are managed at the same level of protection. Furthermore, there would be a legal constraint obliging outsourced service providers engaged in data management and data processing including, in particular, the operators of study systems to comply with these same requirements.

6.3.3 Set of tools

6.3.3.1 Kindergarten education, public education and vocational training

Information, sensitisation:

- Increasing the security awareness of children, parents and relatives.

- Providing recommendations, programmes, informative materials (online contents, advertisements, TV programmes, etc.) at society level (government, market, charity) which prepare children, parents and relatives for the safe use of the digital space outside the school.

- Providing information on and raising awareness for legal opportunities.

- Enabling parents or relatives to recognise online violations within the family community and take the necessary legal actions to immediately remedy the injurious situation.

- In order for children to be able to protect their own personality rights, they and their parents (their legal representatives) need to be aware of the protection system provided by civil law,

the ways and possibilities of enforcing their rights in court, and – above all – their property rights. This also requires widespread publicity campaigns and social solidarity:

- Recommendations available online to early childhood educators and parents with high-quality, useful, and educationally justifiable websites, platforms, resources, applications, games, and ICT tools suitable for 3-7-year-old children as well as relevant professional guidelines and contents.

Applying sanctions and strengthening communication:

- A unique form of the application of sanctions is the removal of online contents which violate the laws or are harmful in any other way. This is expressly regulated under the Criminal Code and the E-Commerce Act. Another option is the use of hotlines operated in the form of self-regulation and/or official supervision. It would be necessary to extend, support and widely communicate the availability of hotlines operated on a governmental, market or charity basis.

Strengthening and extending assistance and victim help:

- It is a priority issue to provide for the treatment and support of child victims and to prevent and remedy negative (harmful) consequences. Foreign examples show that due to the escalation of incidents, violations committed in the online space lead to tragic consequences easily and within a short time. In addition to parents, educational institutions, social and civil society organisations operating in the relevant area, and obviously the state itself has a key role in the assistance of victims.

Providing safe tools for the operation of the public education institution:

- The equipment used (internet access, intranet, work stations, servers) must protect the students' privacy as well as the data and information managed by the institution.

- There is a need for strategic measures and action plans which enable public education institutions to ensure a homogeneous and adequate level of protection, help schools that are lagging behind or lacking protection to catch up, and make it possible to detect and reduce exposure to threats on a national scale.

- Centrally provided services must be further extended and communication on these services must be intensified.

- In order to organise homogeneous protection, the service provided by NIIFI must be further extended to cover all public education institutions. First and foremost, broadband internet access should be made available so as to provide centralised protection.

- Institutions should stop using alternative market services that offer a lower security level or that are explicitly risky, and the duplicated financing of tools or services used for identical purposes must be avoided.

- Maintainers must be widely informed of centrally accessible and protected services and institutions should be encouraged to join. (However, it should not be mandatory to join, instead, communication concerning the advantages of joining should be strengthened.)

- For institutions that are difficult or impossible to connect to the central services, an alternative security service package must be elaborated and communication between the centre and the institution should be intensified. It is advisable to maintain a dedicated hotline and a system engineering capacity for this purpose.

- It is necessary to involve system administrators in training programmes (e.g. "Sulinet" days, summer camp for system admins), and the information security competence of system administrators should be strengthened in general.

- The full use of programs providing a high level of security and currently operated on an experimental or pilot basis (eduID, EduRoam, central storage, etc.) should be introduced.

- The testing of programmes that are approved and successful also at international level should be extended throughout the country and all good practices which increase the security of institutions should be adopted (e.g. eduID, eduRoam).

- New, gap-filling security services must be introduced.

It would be essential to set up a crisis centre for the centralised investigation of and response to security incidents, which would have the following functions:

- o Receipt and analysis of incidents reported by the institutions.

- o Arrangement of assistance and response to incidents (through remote or personal intervention).

- o Recognition and reporting of trends and tendencies to the National Cybersecurity Institute.

- o Continuous communication with institution maintainers, government agencies and the National Cybersecurity Institute in information security issues.

- o Elaboration and publication of central recommendations concerning information security.

- o Maintenance of a helpline for handling reported incidents of cyberbullying.

- o Participation in the preparation and organisation of information security training designed for institutional system administrators.

- o Participation in the development of learning materials and training courses designed for institutional information security managers.

- o (Regular or ad hoc information security audits or penetration tests in public education institutions.)

A central recommendation and support system should be set up to

- Help and manage public education institutions in the assessment and protection of their information assets.

- Help institutions to assess risks.

- Help institutions to draw up their internal data protection and information security policies.

- Help institutions to develop and introduce security controls.

It should be a central requirement to appoint – at institutional or maintainer level – an internal information security manager, who will prepare and maintain the data inventory, investigate and centrally report information security incidents, organise security awareness training programmes, and conduct annual risk assessments concerning the vulnerability of the public education institution.

Promotion of security-aware behaviour:

- The educational staff, the institution heads, the administrative staff and the system administrators should manage and protect the data handled by students and the institution in an up-to-date and security-conscious manner and should have the required competences.

- Institutional participants should be provided regular training on information security.

- It is essential to design the pathway of security incident reports.

- A central crisis centre should be established to receive and manage reports from institutions, maintainers, or even from private individuals (student, parent).

- A recommendation should be issued about websites with useful and safe content.

- Recommendations and thematics on the safe use of the digital space should be centrally elaborated and presented to students and teachers. The knowledge transferred this way should be assessed and revised regularly, on an annual basis.

- In the framework of IT education students should acquire the techniques of safe information management, get familiar with the relevant tools (applications, settings, safe installation, etc.) that facilitate these, and learn how to manage their own devices (whether desktop or mobile).

- Institutions should develop the ability to recognise if a student becomes victim to cyberbullying and to provide efficient assistance.

- The harassment of students via digital devices, social networking sites, or telephone is regarded a criminal offence, and can cause severe psychological trauma to children if they are not prepared for the threat or there is no forum where they can ask for advice or help. The school management and teachers must prepare students for potential atrocities and must show an open attitude towards those seeking help.

- The contact information of civil society organisations dealing with this topic should be available to everyone (bulletin board, school website, intranet).

- Authorities and background institutions responsible for the operation of the education system should be allocated resources from the annual central budget which enables them to comply with Act L of 2013 based on the action plans of the institutions.

- The information security training of teachers should already be started during their college years and strengthened in the course of their years of practice:

  o Workshops and learning materials aimed at raising information security awareness should be a fundamental element of teacher training.

  o As a new element of educational methodology, teachers should be taught how to design lessons raising awareness of the security culture in the form of "gamification", so that they will be capable of using this new methodology in public education for developing their own learning materials and lessons.

- Modules increasing security awareness should be integrated into the further training system of teachers.

- In order to accelerate knowledge sharing, professional associations should be invited to take part in the operation of the Public Education Crisis Centre (civil society organisations and market participants):

  o Within the framework of the PPP programme, the Public Education Crisis Centre and the stakeholders joining the programme should set up a cybersecurity working group.

  o The cybersecurity working group should review current problems and make proposals for addressing those problems.

Increasing awareness of consumer protection policy:

- Most consumers have not yet been prepared for online sales techniques and channels. For this reason, in the digital environment they are exposed to unknown business practices that increase their vulnerability due to the lack of sufficient knowledge (e.g. social media sites, online auction sites, comparing sites, subscription traps and free trial periods, fake consumer ratings, online intermediaries, etc.).

- The new consumer protection policy gives priority to raising awareness of consumer rights and promoting sustainable environment and health awareness in consumption among children and students of mandatory school age as a key task.

Hungary's 5th medium-term consumer protection policy, effective until 2018, approved by Government Decree No 2012/2015 of 29 December 2015 lays great emphasis on educational and awareness-raising activities.   One of the tasks set out in the consumer protection policy (Section 1.4) is to help children and students of mandatory school age to become aware consumers. In addition, pursuant to Section 1.2 of the consumer protection policy, consumers must be prepared for the challenges of the digital age.

- In accordance with this, the transfer of age-appropriate knowledge on consumer protection should play a more important role also in public education. Regarding children of mandatory

school age, special attention should be paid – during the development of digital competences, for example – to students having difficulties in writing, reading and reading comprehension as well as children with special education needs, because they are more vulnerable when exposed to the methods of sales promotion used in online marketing.

● In order to avoid problems that may arise in the future in connection with online purchases or contracting, it would be reasonable to start consumer education already in the kindergarten. Obviously, the related "curriculum" would be taught in the form of age-appropriate games. The goal is to integrate the necessary "self-defence techniques" in the thinking of young children at the level of competence.

Environmental awareness

● A common, central e-waste management system should be established at all levels of education and in all institution types for the purposes of managing obsolete devices in an environment-friendly manner.

● The responsible, environmentally aware use of ICT tools should be given sufficient emphasis in education.

6.3.3.2 Higher education

● A common information security policy should be drawn up for Hungarian higher education institutions.

● It would be necessary to maintain the high quality and uninterrupted operation of the services provided by NIIFI.

● The research network services operated by NIIFI and Hungarnet Association should be continuously extended and their high quality maintained.

● Regular information security education and training should be held for all institutional participants (students, teachers, administrative staff and executive management).

● In the case of students, the curriculum should include training on information security awareness which should be completed and annually repeated on a compulsory basis at all grade levels.

● The institutions and their participants must be prepared for reporting and efficiently responding to incidents.

● It should be mandatory for institutions to design an internal incident management pathway which gives a clear and comprehensible guide to students and the educational staff for reporting security incidents.

● A support structure should be set up within the institution (which may be the information security manager) for the purposes of receiving security incidents and taking the necessary steps to respond to them or forward them to the Higher Education Crisis Centre.

● A Higher Education Crisis Centre should be established similar to or as part of the NIIF-CSIRT to ensure uniform incident response.

It would be essential to set up a crisis centre for the centralised investigation of and response to security incidents, which would have the following functions:

- o Receipt and analysis of incidents reported by higher education institutions.
- o Arrangement of assistance and response to incidents (through remote or personal intervention).
- o Recognition and reporting of trends and tendencies to the National Cybersecurity Institute.
- o Continuous communication with institutional security managers, information security knowledge centres, government agencies and the National Cybersecurity Institute in information security issues.
- o International contacts with bodies responsible for institutional or centralised information security which ensure the security of research networks.
- o Elaboration and publication of central recommendations concerning information security.
- o Maintenance of a helpline for handling reported incidents of cyberbullying.
- o Participation in the preparation and organisation of information security training designed for the institutions' educational and decision-making staff.
- o (Regular or ad hoc information security audits or penetration tests in higher education institutions.)
- ● It is necessary to support knowledge centres as well as research and development activities and specialist training in the area of information security and to support the widespread communication of achievements.
- ● The knowledge centres must be integrated into the teaching and dissemination of security aware behaviour and thinking at society level. Widely available opportunities should be provided to the specialists of knowledge centres for holding lectures and conferences, writing information materials, and providing quality assurance in relation to kindergarten education, public education, vocational education and training as well as higher education and adult education.