WORKING PAPER

Working conditions and sustainable work

Digitalisation, skills development and digital innovation in SMEs

Country Report: Hungary

SME digitalisation in the EU:
Trends, policies and impacts

Digitalisation, skills development and digital innovation in SMEs – Country report: Hungary

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Background to the report

This country report is based on insights collected from a series of interviews conducted in the first half of 2024. It is supplemented by a review of information from government sources, as well as academic and grey literature.

The interviews were conducted in accordance with a semi-structured interview guide prepared jointly by Eurofound and the European Centre for the Development of Vocational Training (CEDEFOP).

This country report feeds into a joint Eurofound-CEDEFOP research study on digitalisation, digital skills, innovation and training strategies in European SMEs. In addition to the empirical analysis using data from the 2024 European Working Conditions Survey (EWCS), the qualitative strand of this research examines national policy initiatives that support SMEs in their digital transition, with a focus on investment in innovation and training. It also identifies key challenges that hinder digital innovation, technology adoption, skills development, and job quality in SMEs.

Context and trends

Hungary has the very ambitious and challenging objective to be among the ten leading EU economies in terms of digitalisation by 2030. This is reflected in the National Digitalisation Strategy 2022-2030, which is aligned with the Digital Decade Policy Programme of the European Union. For now, however, the majority of the Digital Economy and Society (DESI) indicators paint a rather depressing picture.

Table 1: Digital Economy and Society (DESI) indicators, 2023

DESI indicators	Hungary	EU-27
SMEs with at least basic level of digital intensity	52 %	69 %
SMEs selling online	20 %	19 %
SME e-commerce turnover	11 %	11 %
All enterprises providing ICT training	18 %	22 %
Big data use (all enterprises)	7 %	14 %
AI use (all enterprises)	3 %	8 %
ICT specialists (% of employment)	4.1%	4.6%

Note: SMEs (10-249 persons employed), financial sector excluded
Source: DESI 2023 (data from 2022)

Our interview partner from the Ministry of Economic Development highlighted that the DESI indicators for Hungary were based on the results of public opinion surveys. These surveys followed different methodologies in the Member States, and the assessment of results varies considerably, consequently, their comparability should not be considered as reliable. The results of such surveys are interpreted differently in all the Member States. Thanks to the efforts of the Hungarian Central

Statistical Office (KSH) and relevant EU officials, there has been significant progress in 5G coverage and the use of Enterprise Resource Planning (ERP) by Hungarian SMEs. As a result, while Hungary has been at the bottom of the rankings on the use of ERP by SMEs, it has now improved its position to the top of the lower third of EU Member States (European Commission, 2024).

According to the Special Eurobarometer survey on the Digital Decade 2024, 83 % of respondents in Hungary said that the digitalisation of daily public and private services makes their lives easier. This is the second highest score in the EU and significantly above the EU average of 73 %.

In. Especially the share of microenterprises is Hungary, the ratio of SMEs to the total of enterprises is higher than the EU average high both by number and according to their role in employment. However, the Hungarian SMEs contribution to the GDP is lower than the EU average.

In 2019, a small group of experts decided to work out a methodology and conduct comprehensive field research to assess the actual level of digitalisation of Hungarian SMEs. The novelty of their methodology is that it provides feedback to entrepreneurs, namely that they can compare company's digitalisation status with that of other companies. The opportunity for feedback is open not only for SMEs involved in the sample, but is available for any company which is curious about their position within the varied group of Hungarian SMEs. This feedback serves as a self-diagnostic tool, while it is not mandatory to use it, it can provide extremely useful.

The elaboration of the methodology, the organisation of the research took place in late 2019, and the field research was scheduled for the first quarter of 2020. Unfortunately, by that time COVID-19 had likely changed the attitudes of SMEs towards digitalisation, but there was no comparable data from pre-pandemic times to show this change. Digimeter is a representative survey conducted via telephone interviews. In 2024, 600 SMEs were interviewed. Differently from Eurostat data which refer to businesses with more than 10 employees, Digimeter covers companies with more than 5 employees. Since the sample is mainly made up of smaller companies and these tend to be less digitalised, the data from Digimeter shows lower scores compared to those of the DESI.

The organisers have chosen a phone-based survey instead of an online self-administered one, because according to their experiences respondents tend to give up filling lengthy questionnaire before completing them. On the other hand, an online interview survey is the privilege of SMEs which already have some digital history. Digimeter does not examine opinions, insights, or feelings, but tries to reveal objective reality. In other words, it does not ask the respondent to classify how important something is, but, for example, what percentage of employees work with a computer, or for what percentage of employees is remote work available, or does the company use a multi-level identification system, or is there automatic backup, what cloud services do they use, etc.

The surveys usually include 50 questions in six areas: i) digital presence, ii) digital everyday life, iii) business management, iv) sales and marketing, v) digital finance, and vi) IT security. The spring 2024 report reveals an index score of 40 out of 100, showing little dynamism from the score in 2020 (40 out of 100) and 2021 (41 out of 100). There is no sign of significant changes in the overall level of digitalisation of Hungarian SMEs. While the Hungarian SMEs performance in digital finance is the most advanced and shows signs of improvement, the other indices have not caught up, despite some smaller improvements in several sub-areas (Digimeter, 2024).

The nuances are not revealed from these questionnaire-based surveys, necessitating a more thorough investigation. In 2023, a smaller survey based on in-depth interviews investigating what facilitates and

what hinders the digitalisation of SMEs was conducted. The main result of this research was that the preparedness of the company manager determines whether the SME would or could be digitised. Another important aspect is the digitalisation of processes, whether they are key value-creating processes or essential background operations like invoicing. In many cases, digitalisation is a question of manpower. In some cases, companies start to digitalise because of shortages in manpower; parallelly, it is also possible that digitalisation is stalled and slowed down precisely because of a lack of adequately skilled personnel (Digimeter, 2023).

Table 2: Score of Digimeter index in different areas on a scale of 100, 2024

	2021	2022	2024
IT security	57	54	57
Digital finance	60	61	65
Sales and marketing	16	17	14
Business management	38	38	36
Digital everyday life	40	41	42
Digital presence	39	41	39
Digimeter index	**40**	**41**	**40**

Source: Digimeter, 2024

Table 3: Score of Digimeter index by number of employees, 2024

5-9 employees	**36**
10-19 employees	43
20-49 employees	45
50-249 employees	52
All SMEs	**40**

Source: Digimeter, *2024*

Table 4: Score of Digimeter index by selected sectors, 2024

Agriculture	**34**
Industry	36
Trade	43
Services	42
All SMEs	**40**

Source: Digimeter, 2024.

The interviewee from the trade union side has underlined that **the level of digitalisation of Hungarian SMEs is highly fragmented**. SMEs that are connected to large market players, either as suppliers or as service providers, have been forced to use as many digital tools as possible. Suppliers to multinational companies have to meet stringent quality standards that require the use of state-of-the-art digital tools and solutions.

However, the majority of SMEs do not belong to this group and are lagging behind in terms of digitalisation. The main reason is the lack of capital, so they are unable to finance the digital tools they

need to develop. Furthermore, the market environment in which they operate does not really require or expect them to adopt the more advanced forms of digitalisation.

The central statistical office KSH publishes data on the digitalisation skills of the workforce. In 2022, the use of a digital device at work was reported by 32 % in more than half of their working time, by 28 % in less than half or a part of their working time and 39 % said they never use digital devices at work. Women tend to use more digital skills at work: among them 39 % responded with more than half of their working time as against 26 % of men ([1]).

In terms of digitalisation, coping with the COVID-19 pandemic was mainly successful for Hungarian SMEs that had already taken digital development seriously. For example, those who already had infrastructure for remote working or were involved in e-commerce and had in place digital solutions, have not only successfully weathered the crisis, but also have made further digital improvements. On the other side, many SMEs have gone bankrupt as a result of the pandemic. In the process of starting up again, many realised the necessity of setting up online platforms for both sales and procurement and the importance for customer relationship management (CRM) systems. Indeed, there have been significant recent developments, which cannot be definitively attributed to COVID-19, as entrepreneurs' awareness may have evolved independently of the pandemic as well.

Unfortunately, there are a lot of entrepreneurs in Hungary who have become comfortable in the position they have achieved over the past decades. Heads of several Hungarian SMEs have become complacent about IT developments. They believe that Excel spreadsheets and the simpler monitoring systems that they are used to operating will be fine forever. This is why the government launched the Modern Enterprises Programme in 2015. The most important goal of this programme was awareness raising, that is to convince the SMEs on the importance of digitalisation in their businesses. The latest amelioration of the Hungarian DESI results reflects the success of this programme. The programme will be substituted in autumn 2024 by the Modern Enterprise Programme 2.0. The promoters of the programme want to concentrate efforts on those area where SMEs still experience issues, like developing websites.

SMEs can mainly benefit from the EU funds available to Hungary through the GINOP Plusz programme. However, the government has recently decided to redirect most of the available funds of GINOP Plusz to enhance administrative processes related to workforce and business operations, rather than directly supporting SME competitiveness ([2]).

Policy outlook

Impact of EU and national strategies

The most relevant strategies, the National Infocommunication Strategy 2014 – 2020 (NIS) and the National Digitalisation Strategy 2022-2030 (NDS) have impacts on SMEs mainly in terms of setting the legislative environment and the main trajectories. These strategies have improved the efficiency of government work by systematising government tasks. Both the NIS and the NDS define the tasks,

([1]) See KSH, https://www.ksh.hu/docs/hun/xftp/mef-kieg/mef_23_h.xlsx
([2]) See Versenyképesség: a kkv-k céljai helyett az állami feladatok ellátására mehetnek az EU-s források.

responsibilities and deadlines of each government actor in practical action plans. The strategy assumed that Cohesion Fund resources could be mobilised, but funds have been suspended by the EU ([3]), so there may be obstacles to the programme's implementation.

The Department of Enterprise Technologies and ICT Industry Development at the Ministry of Economic Development (hereinafter referred to as the Ministry) has elaborated several suggestions. Unfortunately, it is possible that some of the objectives set out in the NDS, and more specifically in the related action programmes directly affecting the SMEs, will not be achieved, as the Government gives priority to the development of digital citizenship. The aim of this programme is to enable citizens to identify themselves, sign documents electronically and manage some of their personal affairs using their mobile phones. With the lack of EU funding there are not enough resources in the national budget to support the targets that were set both for citizens and for SMEs. While there will be programmes and funding available, it is likely that not all the objectives outlined in the Strategy will be achieved in the short term.

From the perspective of SMEs, it is important to note that the Electronic Public Procurement Act (EKR) of the mid-2000s sets out very detailed requirements that SMEs must meet if they wish to sell to public enterprises, central or local authorities, consequently the relevant Ministry had no additional legislative task for SMEs in the framework of NIS. Their staff was able to concentrate on elaborating development policy and project development.

Policies formulated both by the NIS and the NDS are to be realised with the help of different operative programmes. Among them two, the Economic Development and Innovation Operational Programme (GINOP) and the Public Administration and Civil Service Development OP (KÖFOP) are relevant to our topic. The aim of GINOP is to stimulate the economies of the less developed regions in Hungary. One of the priorities of this programme is raising the competitiveness of SMEs with the help of digitalisation. The aim of the KÖFOP programme is to help Hungary improve the efficiency of its public administration. The development of different and efficient digital public services is relevant for the SMEs and to create a business-friendly economic environment.

Regulatory environment and policies

In principle, digitalisation has been considered in Hungary as an extremely important process for a long time. Several strategies were elaborated in line with EU guidelines, but there is no dedicated entity within the government responsible for this area. Although there have been several changes, including transformation of ministries and their background institutions in the field of ICT, to the Hungarian institutional system responsible for the implementation of the Digital Decade policy programme, the coordination of initiatives led by different ministries is not managed at ministerial level, but is in the hands of the Digital Hungary Agency.

The regulatory environment has not adapted to accommodate and support digitalisation and digital innovation within Hungarian SMEs. Hungarian SMEs and microenterprises find it difficult to dedicate time and resources to digitalisation, but when e-solutions become necessary in their contact with state bodies, they must act and fulfil these requirements. The digitalisation of Hungarian SMEs has traditionally been driven by the expectations of the state. These have included making electronic tax returns mandatory, and the more recent implementation of electronic invoicing. In particular, e-

([3]) See Hungary's frozen cohesion funds testing EU's rule of law conditionality.

invoicing requirements for microenterprises have been a major improvement both in terms of their digital equipment and infrastructure and in the digital skills of their employees. However, the DESI measurements do not cover enterprises with less than 10 employees, so the impact of this measure will not lead to a significant improvement in the Hungarian indicators. As the majority of Hungarian SMEs have been slow to move towards digitalisation, the Ministry is s contemplating implementing mandatory measures for them. This could include introducing Enterprise Resource Planning (ERP) systems or requiring the creation of a website.

In the field of consultation on government programmes and actions related to digitalisation the interests of SMEs are represented by the Hungarian Chamber of Commerce and Industry. Within the Chamber there is a Digitalisation College, on which the Government is leaning to involve as many SMEs as possible in the preparation and monitoring of digitalisation-related programmes and plans.

For suppliers, the Association of IT Enterprises (IVSZ) is the most important representative body. As a rule, strategies and programmes, draft legislation should be discussed publicly and specifically with representative bodies beforehand. Support schemes must also be made public, and anyone must be given the opportunity to be consulted before they are announced.

Digital technology and innovation

In the case of Hungarian SMEs that do not belong to the value chain of large, primarily foreign companies, certain milestones of digitalisation were introduced later than in many other EU Member States. This was the case for the introduction of ERP, the use of cloud services and of big data. Moreover, due to the methodological problems mentioned earlier, the Hungarian DESI indicators for this topic have shown disastrously poor results. Some representatives of Hungarian SMEs possess a vague understanding of AI, which can lead to difficulties when completing questionnaires that assess AI usage within companies.

If the foundational elements of digitalisation are not present, then it becomes harder to deal with more advanced technologies. AI necessitates access to cloud-based data, which can be leveraged for various applications. However, this concept is often not fully grasped by many company managers. Nonetheless, it is noteworthy that, in certain instances, it is possible to bypass the initial stages of digitalisation. Many SMEs experience this by acquiring applications that are pre-integrated into programmes, thus obtaining AI capabilities without fully understanding the potential functionalities of the systems they have purchased. Some AI applications have been used by Hungarian SMEs for about many years, but before the buzz around generative AI started, SMEs were not even aware of how much this technology had already been integrated into their lives.

On the other hand, what Hungarian SMEs really want to introduce is the currently hyped-up generative AI toolkit. They would like to introduce GPTs, but they do not have the expertise for this, and they overestimate its importance.

A rapid spread of AI among Hungarian SMEs is not foreseeable. Companies exhibit caution due to past negative experiences with digitalisation. Moreover, this caution is justified, as there are numerous opportunistic entrepreneurs who offer services without fulfilling their promises.

In October 2018, professional and public administration organisations, international and domestic companies, universities, scientific workshops founded the Hungarian AI Coalition. One of the most important activities of the Coalition was the preparation of the country's Artificial Intelligence Strategy for the period 2020-2030.

When this strategy was completed, only a few countries had a similar programme, but unfortunately, the big vision was met with weak implementation. There has been a lack of designated entities assuming responsibility for the programme's implementation, resulting in an inability to allocate adequate resources across all areas. So far, it has not been possible to achieve concrete developments along the lines of the ambitious strategy. However, there are some exceptions: the self-driving test track in the Zala county, the development of a Hungarian-language model for a supercomputer and some customer service solutions. While some progress is evident, the question remains as to how an average Hungarian SME can profit from these developments.

The forced digitalisation brought about the COVID-19 pandemic caught many Hungarian SMEs at a very bad time. The managers of the companies established in the years after the regime change in the early 1990s are now approaching retirement age, and most of them are unwilling to change their company's usual processes. They trust their own knowledge and experience rather than new ICT systems. Even though younger employees try to persuade them to modernise, it remains difficult to convince them to embrace the 'call of the new era'.

The interviewee from the academic circle cited a research study carried out two years ago, during investigating people's internet usage habits as individuals and as employees. The research found that even though people use Google Maps as private individuals, regularly surf the Internet, are Facebook users, buy things and order goods and services online, they tend to stick to well-established analogue solutions at work. Almost 80 % of online users who are active as private individuals are reluctant to bring this knowledge to their workplace (NMHH, 2023).

When asked whether there are state-subsidised programmes aimed at increasing the IT knowledge of SMEs in the current difficult period, the ministry official we interviewed responded affirmatively, though noted that such programmes are limited in number. He mentioned that there are some new EU-funded projects in agriculture, as well as ongoing projects within the Modern Enterprise Programme.

Digital skills development

Skills needs and skills assessment

It is difficult to assess whether Hungarian SMEs understand how deep the digital skills are that they need. According to our interviewee from the academic circles, it is important to distinguish between at least five groups of entrepreneurs based on their level of digitalisation: below average, average, above average, national champions and ICT startups. The level of digital skills of the owner or the leader of the company is very important.

The public system responsible for skills and vocational development has undergone fundamental changes since the early 2010s, when a general merger of labour market institutions, vocational education and training institutions, as well as labour and OHS institutions took place (Eurofound, 2024).

In 2020 the system of vocational training was completely transformed in Hungary. Previously, all state-recognised vocational qualifications awarded within or outside the school system were defined in the National Qualifications Register (Országos Képzési Jegyzék), but this was dissolved in January 2021 and replaced by the Vocation Register (Szakmajegyzék). Now there is a clear separation between training and vocational education, and vocational qualifications can be obtained only through the latter. Thus, to respond to the shortcomings of the new state-managed training system, companies using modern technology are now forced to finance on their own the retraining of their employees and the training of their future colleagues.

Regarding SMEs, this system works with difficulty. Although there are various state subsidies, SMEs do not have sufficient resources for organising professional training. A substantial portion of state supports usually comes in the form of post-implementation financing, meaning that financial resources are disbursed only after the completion of the project, which in this case is training. According to the interviewee from the Ministry, many SMEs are unable to finance upfront the training of potential candidates. If an SME has to decide between financing its current core activity or investing training new professionals, it is almost certain that it will choose the former.

In the opinion of the interviewee from the trade union side, the government does not treat digitisation as a priority. According to him, this is very harmful, because Hungary has no mineral resources, no economic sector that could operate profitably in the long term. We should focus our resources on knowledge-based development. The basis for this could be a modern education system, in which the acquisition of IT knowledge would be of outstanding importance. The government has an education strategy, but it does not give special importance to the transfer of knowledge in preparation for further digitalisation developments. The longer we stall, the more difficult the situation is for young people. Those who recognise these circumstances are likely to seek and acquire up-to-date knowledge abroad. Consequently, there is a strong possibility that these well-qualified individuals will choose not to pursue careers in Hungary.

In relation to education, the biggest problem for SMEs is that the government expects them to provide practical training to students, meanwhile they do not have enough resources to further train their own employees. Consequently, the ICT knowledge of professionals educating young people is far from being current. According to our interviewee, a comprehensive strategy is needed for teachers and company professionals who educate the students to have an appropriate level of ICT knowledge.

Upskilling and reskilling

The need for reskilling or upskilling depends on the status of the SME. We can talk about reskilling when due to automation, certain work phases are no longer needed, and the workers who used to do them until now need to adapt and learn new ways of doing their jobs. Even if AI takes over some tasks, human intervention is still required, the employees who want to remain within the company will need upskilling.

Reskilling will definitely be necessary for those companies with a low level of digitisation, because - sooner or later - they will have to digitise their processes. In this new environment, employees will require different types of knowledge.

Our trade unionist interviewee projected that Hungarian SMEs engaged in e-sales would soon be thoroughly squeezed out of the market by foreign companies. Unfortunately, Hungarian companies are three to four years behind their foreign competitors in terms of digitalisation, and they do not

have enough capital to overcome this disadvantage on their own. Even today, it can be observed that many SMEs are unable to compete with foreigner enterprises who provide fast, accurate and cheap services, and are forced to close their businesses. Consequently, more and more people will need reskilling.

Challenges

Not only in the field of professional training, but also in terms of the development of digitalisation, SMEs that typically have little capital and are therefore in a disadvantageous situation. Most of the state subsidies go to foreign companies establishing subsidiaries in Hungary. Among the SMEs, only those that are suppliers or service providers have the chance to get some help from the state funds. Hungarian-owned SMEs suffer from a terrible lack of capital, further exacerbated by high bank interest rates, which makes it exceedingly difficult for them to improve their situation. Digitalisation support is typical only for start-up companies, but in their case the risk is high, as their ideas may or may not succeed.

The main problem with financing digital development of SMEs is that it is difficult to secure the loans needed. Interest rates are high and intangible assets, such as software, are not accepted as the purpose of the loan and collateral by mortgage banks, unlike lending conditions for investment in machinery or property development. At a meeting of state actors, financial institutions and SME representatives organised by the Ministry for Economic Development in October 2024, a ministry official asked banks to review the situation about immaterial goods qualifying as purposes for investment loans ([4]).

The uncertain outcome of the inflow of EU funds makes it very difficult to achieve the objectives set by the operative programmes supporting – among others - the digitalisation of SMEs.

Networks, tools and approaches

Hungary is involved in three European Digital Infrastructure Consortia (EDICs) already set up or in development, including the already established Alliance for Language Technologies (ALT EDIC), the Local Digital Twins towards the CitiVERSE, and the Connected Public Administration (IMPACTS-EDIC in development).

The European Digital Innovation Hubs Network (EDIH) also has a Hungarian member, the DigitalTech EDIH. It is the reference hub in Hungary in supporting start-ups, SMEs, mid-caps and public sector entities in their digital transformation focusing on key pillars of European priorities. DigitalTech EDIH relies on its ecosystem to address major issues of cybersecurity and digital competencies, including blockchain technology, education technology and digital finance. It has partnered up with 11 innovation hubs, including several universities and associations. The implementation of the project was supported by the Government of Hungary and the Parliamentary State Secretariat for Territorial Development of the Prime Minister's Office.

([4]) See Először ülésezett a KKV Hitelezési Kerekasztal – cél a vállalatok könnyebb hitelhez jutása.

Government policies and cooperation

Initiatives and collaboration

There have been several programmes in the framework of which the state has sought to promote the digitalisation of relations between large companies and their partners and suppliers. Some large companies have received support from the state for this. For example, the Modern Sample Factory programme, also called Industry 4.0 Sample Factories flagship project, has supported SMEs with a range of knowledge-based development services. These include organisational diagnostics and the development of improvement plans based on these diagnostics, customised consulting and advisory services; visits to model factories, plants and workshops; organisation of the Night of Modern Factories event and other thematic events and conferences; professional courses and trainings for knowledge transfer; and lastly, development and dissemination of online content to support SMEs (Endrődi-Kovács and Stukovszky, 2022).

It is also important to mention the training courses organised by Delta Group, the aim of which was to introduce microenterprises to Industry 4.0. The courses launched in 2022, were financed in the framework of the Modern Enterprises Programme. It was successful, but we have no information on whether it would be continued.

The Ministry has recently signed strategic agreements with three major telecom companies, Magyar Telekom, 4IG and Yettel, to show their services to SMEs, and to get them acquainted with the technology they have. Under the strategic agreements, the telecoms undertake activities to raise awareness among SMEs of the importance of 5G and the Industry 4.0 services. Furthermore, the telecoms have also agreed to run pilot projects with three actors. The Ministry plans to implement projects jointly financed by the state, the telecom company and SMEs interested in Industry 4.0 services in a tripartite partnership. Cooperation will be beneficial for all the three sides, as the telecoms providing the 5G network are creating a platform for service developers with an interest in attracting new customers in the SME sector. With this action, the Ministry targets those SMEs that want to develop but do not have enough resources to do so. If one third of the costs were sustained by the state and the other third by the telecom company, these SMEs would be more enthusiastic about development. This will be a domestically financed development, for which the Ministry has only a small amount of money available at the moment, a maximum of HUF 100-150 million (about EUR 250 000 – 380 000).

The Ministry is also exploring the idea of creating collaborations between the state, the service provider and potential user SMEs. In the framework of this public-private partnership it is envisaged that the state, the service provider and the user SME would share equally in the financing of the development.

Intercompany cooperation is important for the digitalisation of SMEs that are involved in some value chains. In Hungary, the automotive industry offers the most prominent value chains. In international value chains, there are expectations that only SMEs with the most modern IT systems can meet. For example, it is already expected not to communicate with each other by phone, e-mail or fax, but to use the internal communication channels established within the network and record the financial processes in an SAP system.

An interesting private initiative is the setting usp of the so-called 'mastermind groups'. SMEs that would not be required to set up a board of directors agree to jointly establish an advisory board. These companies are not competitors, so they are happy to learn from each other. The majority of this kind of groups are organised by business development consulting experts. The initiative is supported by some regional chambers of commerce and industry by presenting the mastermind formation at their various events, and by publishing the list of consulting companies they have qualified. Several such groups operate in Hungary, e.g. in the field of e-commerce. In addition, there are also business management clubs, where managers of companies of similar size and revenue which face many similar problems come together. It can be useful to discuss these problems with each other, or to jointly ask experts to help you navigate. According to our interviewee from the Ministry, several such clubs operate successfully in Hungary.

Monitoring and evaluation

The National Digitalisation Strategy mandates the preparation of a monitoring report every two years, a responsibility assigned to the Digital Hungary Agency (DMÜ). The inaugural report is scheduled for publication next year.

In fact, the EU Digital Decade programme requires also a monitoring exercise. Each Member State must produce this report annually based on the current values of pre-defined indicators. The main findings of the latest report indicated that in 2023, Hungary made notable progress in broadband connectivity, enhancing basic 5G coverage. Despite good advancements in the adoption of cloud and data analytics, challenges persist in the area of digital skills, especially for the older generations, and in the adoption of advanced technologies by Hungarian enterprises such as AI. Among the recommendations it is highlighted that Hungary should continue its efforts through initiating new supporting programmes and incentives to support the digital transformation of SMEs and increase resources for existing schemes, including a focus on cloud adoption by SMEs. Hungary also should develop a coherent approach focusing on the digital and green transitions.

In 2015, the government and the Association of IT Enterprises (IVSZ) launched an initiative to assess the share of the digital economy in Hungary's gross value added. The analysis using the data from the Balance of Sectoral Relationships is published under the title 'Digital Footprint'. According to the latest version, in 2019 the share of the digital economy was 25 % in Hungary.

Support measures for SMEs

Several training programmes for promoting the digitalisation of SMEs have been developed. Awareness raising platforms with a 'fun' approach are very popular. Under the Go Digital programme, a portal has been created to provide free, personalised expert assistance to SMEs for IT development, as well as exclusive consultancy or pre-qualification services for obtaining certain EU funds.

There are several initiatives to support the digital development of SMEs ([5]), but unfortunately, due to the uncertainty of funding, they have still not been announced. It is well known that such actions

([5]) See Digital Renewal Operational Programme Plus.

would be financed by the European Regional Development Fund (ERDF), and the availability of this support for Hungary is still in doubt.

In December 2020 the AI Coalition launched the AI Challenge with the aim of raising awareness around AI, by introducing at least 1 million Hungarian citizens to AI through exhibitions and events, by providing at least 100 000 of them with basic knowledge through free online tutorials. Created by experts from Eötvös Loránd University (ELTE), the Introduction to Artificial Intelligence tutorial gives readers a basic insight into the exciting world of AI, and provides case studies and success stories to help them understand the applications of the technology. Coalition members have also contributed to a video tutorial, available on the Coalition's YouTube channel, entitled Artificial Intelligence in Everyday Life.

Additionally, an AI Academy was established by the AI Coalition aiming at guiding people on the road of knowledge on AI from foundational concepts to the most advanced applications.

Twin transition: current developments

The concept of twin transition in Hungary is not addressed explicitly in digital strategies, but in competitiveness strategies. Hungary's National Recovery and Resilience Plan has a chapter on green transition and another on digital transition. Immense economic pressure has emerged in terms of seizing the opportunities offered by digitalisation to remain competitive. Sustainability in turn has instigated public pressure for businesses to take stronger actions in this regard, hence the intersection of sustainability and digitalisation. However, digital transformation presents a conundrum consisting of opportunities and deleterious effects. On the one hand, it increases the energy consumption through the high digital hunger it creates. On the other hand, it can also be a solution, if it is properly managed in a green way, transforming not just physical to virtual, but business models and processes as well as societies' ways of living, which contributes to the ultimate goal, to progress sustainable development. It has a wide range of tools that can foster green innovations, optimise resources, maximise energy efficiency, and track sustainability progress. Digitalisation is as such a key to leading to energy transition in different industries, while in a broader sense, the tech industry has the advantage to drive society's transition to a green and digital future. GreenTech is a crucial component of the future because by implementing such innovations businesses and individuals can contribute to alleviating adverse consequences of climate change and providing humanity with the chance to build a sustainable planet for future generations (Herczeg, Pintér and Bagó, 2023).

For the moment, only some big companies have some certain kind of green agenda in Hungary, and some of the SMEs have joined them, if they belong to the value chain of the given multinational company.

The opinion of our interviewee from the academic circles is that the world is currently not moving in the direction of digitalisation strengthening sustainability. The main reason for this is the rapid spread of AI. During the past five years, Microsoft and Google were not able to fulfil their commitment regarding zero emissions, although they did not communicate it loudly. The energy requirement of a simple Google search is not even one hundredth of a Chat GPT query. In addition to the development and training of AI systems, their use also requires a huge amount of energy.

In the Digital Decade Progress Report, it is highlighted that Hungary should develop a coherent approach to twinning the digital and green transitions. Firstly, it should facilitate enhancements in the energy and material efficiency of digital infrastructures, particularly data centres. Secondly, it should

promote the development and implementation of digital solutions that lower the carbon footprint in various sectors, such as energy, transport, buildings, and agriculture, while also encouraging SMEs to adopt these solutions.

Key takeaways and policy pointers

There was a consensus among our interviewees on the following:

- As far as the future is concerned, one of the most important trends is that **digitalisation, and even Industry 4.0, is becoming indispensable also for microenterprises**. New technologies are spreading across a wider spectrum, both on a sectoral and geographical dimension.
- **Technologies currently regarded as advanced will become increasingly prominent**. An AI-enhanced big data programme promises unparalleled efficiency gains. While many companies are receptive to this innovation, they are hindered primarily by a **lack of funding**.
- **Evident progress is expected mostly in manufacturing companies**, regardless of their size. It is very important to promote the process of becoming a supplier.

The interviewee from academia mentioned several factors that are needed to boost Hungarian SMEs digitalisation:

- First and foremost, **changing the mindset of company managers and owners** is crucial. Additionally, fostering a supportive organisational culture is essential, if managers are ready to modernise, employees should be open to adapting to new ways of working.
- The digitalisation of processes is the next most important factor, rather than digitalising the entire company, while managing realistic expectations of AI.
- The available workforce plays a crucial role; as labour costs rise, digital solutions will become more attractive.
- Knowledge is also a very important factor. Within this, language skills, especially knowledge of English, because without it, it is very difficult to move forward.
- Capital is also a very important factor. Unfortunately, the majority of Hungarian SMEs lack resources, which limits their access to latest technologies. Funding is typically obtained through tenders, but most **SMEs spend a large part of the funds on their own survival**.
- The **ability to select and implement effective technologies that are suitable for the business is more critical than the technology itself**. However, many Hungarian SMEs often purchase technology without first evaluating the specific problems they need to address.
- The regulatory environment, the integration into value chains, competitive pressures, and customer demands can act as digitalisation incentives.
- Lastly, the interviewee emphasised that digitalisation is an organisational issue, that needs a **strategic approach**.

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- Tamás SZÉKELY, Board member of the Hungarian Chemical Workers' Union VDSZ

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WPEF25067

The European Foundation for the Improvement of Living and Working Conditions (Eurofound) is a tripartite European Union Agency established in 1975. Its role is to provide knowledge in the area of social, employment and work-related policies according to Regulation (EU) 2019/127.