Proposals for Determining the Strategic Guidelines of the Multiannual Financial Framework for the Digitalization of Croatia

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Introduction

In the forthcoming period, the Republic of Croatia will have at its disposal 22 billion euros from the Multiannual Financial Framework (2021-2027) and the Next Generation EU (2021-2024) instrument, the centerpiece of which is the Recovery and Resilience Facility, which is based on the National Recovery and Resilience Plan.

AmCham believes that it is necessary to direct the planning of the use of European Union funds towards developing the digitalization of the Croatian economy, public administration, and society.

AmCham emphasizes the specific position of the business community, which is facing unprecedented challenges in the difficult business environment caused by the coronavirus pandemic. Taking into account the contribution of the private sector to generating economic growth and value creation, it is proposed to allocate as large a share of funds as possible for the needs of the business community when allocating funds for the future programming period. AmCham urges decision-makers to involve the business community in defining the availability, distribution, and absorption of funds.

In this position paper, AmCham members provide an overview of the use of funds for the previous Multiannual Financial Framework 2014-2020 and put forward proposals for the new financial cycle with recommendations for taking a negotiating position on the issue of defining priorities for digitalization projects.

Experiences from the 2014-2020 Programming Period

As shown by the ESI funds implementation report prepared by the Ministry of Regional Development and EU funds, the percentage of agreed funds from European Structural Investment Funds (ESIF) is 102.4% of the total allocated 10.7 billion euros for the current 2014-2020 programming period, which places Croatia at the very top of the EU in terms of agreed funds. A total of 40.6% of the allocated funds was paid out, with slightly more than a third, i.e. 34.2% of the allocated funds certified.

From Croatia's accession to the EU until August 31, 2020, the difference between the funds paid from the EU budget to the Croatian budget and vice versa amounts to HRK 28.6 billion in favor of the Croatian budget.

Based on the available data on the number of EU applications for previous calls in the field of ICT investment and R&D, a large number of eligible projects was observed that exceeded the allocation of available funds for EU co-financing. ICT projects (projects based on the use of information and communication technology) have a short implementation time and provide the fastest positive effect on economic activities and GDP, and stimulating private investment in ICT raises the competitiveness of the economy multiple times over and accelerates its recovery in the context of the recent COVID-19 crisis.

Outlook 2021-2027

The recommendations of European institutions emphasize the importance of ICT projects in the context of accelerating the EU's economic recovery and raising the level of resilience to future crises, which is why, at the strategic level, it is essential to provide access to digital infrastructure and services in the upcoming 2021-2027 programming period.

Along with the Green transition, digital transformation is the foundation of economic recovery. These initiatives are intertwined, given that achieving energy savings in the context of contributing to climate goals, i.e. reducing greenhouse gas emissions, is not feasible without significant investment in ICT components.

The readiness of high-value ICT projects within the field of digitalization is the basis for economic recovery and an excellent prerequisite for funding through the Recovery and Resilience Facility under the Next Generation EU instrument. ICT projects ready for implementation represent great potential, the application of which would quickly provide much-needed investments in the economy.

To receive assistance from the Recovery and Resilience Facility, Member States must draft national recovery and resilience plans setting out their reform and investment programs until 2026.

The Recovery and Resilience Facility – RRF aims to mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient, and better prepared for the challenges and opportunities of the green and digital transitions. The green transition and digital transformation form the backbone of the RRF. For that reason, each national recovery and resilience plan will have to include a minimum of 37% of expenditure for investments and reforms within the green transition, and 20% to foster the digital transformation.

It is therefore crucial that the objectives and funds for the projects that will make this possible are well defined within the national recovery plan and that the private sector is involved in the distribution of grants to the highest extent possible, receiving at least 50% of the grant allocated to the National Recovery Program.

Furthermore, the digital transformation should include elements that are an integral part of it, but also its prerequisite – connectivity. AmCham, therefore, proposes that significant funds be planned for the implementation of next-generation broadband infrastructure and related digital services through the RRF and that electronic communications operators be included in the planning.

Consequently, it is necessary to direct significant investments in the digital transition and the implementation of high-speed broadband internet, both through ESI funds and through the Recovery and Resilience Facility.

In the context of digitalization of the economy and society, it is necessary to emphasize the need to increase investment in research and development in the coming programming period, considering the significant amount of grants awarded

through the first Call under the program Increasing the development of new products and services arising from R&D activities (IRI).

As the estimated total value of prepared projects that are not funded is substantial, it is necessary to separate the co-financing of research and development activities into two separate calls; one for small and medium-sized enterprises and one for large entities in order to facilitate the availability of funds in all branches of industry and the multiplication of investments.

In addition to the mentioned investments in connectivity and research and development activities, it is necessary to provide considerable funds through the RRF for specific projects of automation and robotization of manufacturing and logistics processes in the private sector, with the aim of increasing productivity, modernizing existing or opening completely new manufacturing and logistics facilities. Such investments would have a substantial direct effect on economic growth and job creation. In particular, it should be taken into account that in the earlier programming period the focus was on small and medium enterprises and research and development, with insufficient focus on other entities and more intensive focus on automation and robotics, whereupon business entities encountered the pandemic with a noticeable technological lag that needs to be urgently compensated.

In order to comprehensively digitalize the Croatian economy, it is proposed to ensure the eligibility of all ICT costs for EU co-financing (software, hardware, telecommunications) in infrastructure projects (e.g. renovation of hospitals, restoration of cultural heritage, etc.) as well as the eligibility of EU co-financing for the subscription model (cloud, telecommunication costs for access to cloud services, etc.), as well as for micro and small businesses. We call for a discussion on this issue at the EU level to allow the Member States to consider these costs as eligible.[1]

Furthermore, in addition to EU co-financing through the award of grants for investments in digitalization, it is proposed to provide financial instruments (HAMAG) and credit lines (HBOR).

In addition to co-financing ICT investments in tangible and intangible assets, it is necessary to use EU co-financing as a lever for the development of suitable programs in the field of digital literacy of the population and the development of human resources for advanced digital skills.

[1] Ordinance on eligibility of expenditure (Official Gazette Nos 115/2018, 6/2020, 20/2020, 70/2020)

Connectivity

Broadband Internet

As defined by the National Development Strategy 2030 (OG 13/2021; hereinafter: NDS 2030), the Government of the Republic of Croatia recognizes the development of broadband electronic communications networks as one of the priority areas of public policy in the part of strategic goal 11 "Digital transition of society and economy". At the same time, the Proposal of the National Plan for the Development of Broadband Access in the Republic of Croatia in the Period from 2021 to 2027 (hereinafter: National Plan Proposal) emphasizes the provision of preconditions for the introduction of high capacity networks in the entire territory of the Republic of Croatia as a public policy priority.

AmCham believes that to achieve the priorities of NDS 2030 and the National Plan Proposal regarding broadband internet, among other things, measures should be taken to increase the potential of available EU funds to encourage private investment of operators **to introduce high capacity networks in rural areas where there is no commercial interest to invest.**

Under the Multiannual Financial Framework for the 2014-2020 budget period (hereinafter: MFF), Investment Priority 2a of the Operational Program Competitiveness and Cohesion (hereinafter: OPCC) provided for co-financing the expansion of the availability of broadband access and the construction of high-speed networks, as well as support for the adoption of new technologies and networks for the digital economy. In this regard, and in accordance with the National Framework Program for the Development of Broadband Infrastructure in Areas Lacking Sufficient Commercial Interest for Investments (hereinafter: NFP) and pursuant to the Call conducted by the Ministry of Regional Development and European Union Funds (hereinafter: MRDEUF) in the previous programming period, 71 projects were approved as projects for which local and regional self-government units expressed a valid expression of interest. Ultimately, 21 projects were approved for co-financing for which grant agreements were signed in 2020. The remaining 50 prepared projects, although approved in the first phase of the Call, were not selected for co-financing primarily due to insufficient interest of operators as a result of the restrictive selection criteria.

Namely, the total NFP allocation amounted to EUR 123 million, with EUR 24 million remaining unused despite the fact that according to the Digital Economy and Society Index (DESI) for 2020[2] (hereinafter: DESI 2020), Croatia lags far behind developed EU Member States (ranking 25 among all 27 EU Member States) – especially in terms of broadband connectivity.

Given the above, it is necessary to **ensure the continued use of grants for the construction of very high capacity networks** in areas lacking sufficient commercial interest for investment in Croatia.

[2] https://ec.europa.eu/digital-single-market/en/node/66894

AmCham also proposes the following measures as key preconditions for the absorption of available funds for the continued use of grants for the construction of very high capacity networks from the new programming period:

1. Proactive involvement of the private sector in all programming activities for the use of grants for the construction of very high capacity broadband networks;
2. Ensuring that the minimum threshold for private investment is reduced to a maximum of 20% to increase the potential use of available funds compared to the previous funding period;
3. Ensuring the development of very high capacity broadband access infrastructure in white areas where there is insufficient commercial investment interest (continued NFP) with a focus on the private DBO investment model, as the private sector has shown greater fund absorption potential;
4. Ensuring co-financing on the principle of technological neutrality (as per the European guidelines);
5. Determining the area of co-financing with a balanced approach to determining the scope of the area and the number of households, i.e. potential users of broadband internet access services;
6. Increasing the maximum amount of the grant per project to allow the co-financing of larger projects.

Through the Recovery and Resilience Facility, it is possible to co-finance projects that are already in the mature stage of preparation. AmCham, therefore, proposes that most of the 50 already prepared broadband access development projects under the NFP, which have already been approved by the MRDEUF as projects for which a valid expression of interest has been expressed, be included in the co-financing grant from the Recovery and Resilience Facility and/or from the European Regional Development Fund under the MFF 2021-2027, taking into account the above criteria/measures as rules on the granting of state aid.

Furthermore, AmCham proposes that in order to achieve the priorities of NDS 2030 and the National Plan Proposal related to broadband internet, **the construction of new and the renovation of existing submarine fiber routes to provide gigabit connectivity for the islands** be co-financed from the MFF 2021-2027.

Namely, under the NDS 2030, the development of smart and sustainable islands will be based on an integrated approach to the development and digitalization of island resources and their sustainable management. Additionally, to further revitalize island economies and island life, emphasis will be placed on, among other things, the digital economy, tourism, and the availability of public services to all islanders. The strategic connection of the island with entrepreneurs and the university community will pave the way for the design and implementation of sustainable solutions to specific island problems, including the concept of "smart islands".

Submarine optics is an essential element in ensuring digital connectivity across the EU and ensures high-capacity and high-performance digital connectivity (in terms of resilience, security, redundancy, and latency) especially for islands or countries with long coastlines[3]. Also, the installation of submarine cables connecting Europe's islands to the mainland is necessary to provide the required redundancy for such

[3] "Draft orientations towards an implementation roadmap – Connecting Europe Facility (CEF2) – Digital" from 12/5/2019

vital infrastructure and to increase the capacity and resilience of the EU's digital networks. However, such projects are often commercially unsustainable without public support. **Coherence and synergy with other relevant instruments (including the MFF) with the CEF are also possible**.[4]

Finally, according to the DESI 2020 index Croatia lags significantly behind the other Member States in the component "Demand for fixed broadband access with a minimum speed of 100 Mbit/s" (only 6% of households in Croatia use ultra-fast internet compared to the EU average of 26% of households), so AmCham proposes that within the MFF 2021-2027, co-financing of broadband vouchers that would stimulate the demand for fixed broadband access of at least 100 Mbit/s be provided for in such a way that special categories of users (especially the elderly, families with work from home needs and/or homeschooling needs and small businesses) would have the costs of using such services covered through vouchers from EU funds.

[4] Proposal for a Regulation of the European Parliament and of the Council establishing the Connecting Europe Facility and repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014

Digital Transformation

Digital Transformation of Public Administration

The COVID-19 pandemic has significantly accelerated the processes of digitalization of Croatian society, as well as shown that fast and useful public administration digital solutions provided to citizens and companies are indeed possible. It is important to point out that citizens have welcomed such digital solutions with great approval. AmCham considers the new situation as an opportunity for further strong digitalization in Croatia.

AmCham sees public administration digitalization as a process optimizing program supported by technology to provide fast and transparent public services to citizens and businesses. Complex public services of uncertain outcome are one of the main obstacles for business in Croatia. The digitalization process would provide the required clarity, predictability of outcome, timeliness, speed, and transparency of the work of public institutions.

The multi-annual financial framework for the coming seven-year period is an opportunity for an ambitious further digital transformation of the Croatian public administration and judiciary.

AmCham believes that it is extremely important to prepare projects through the MFF that will aim to build and connect databases and platforms for cooperation between state institutions at the local, regional and national levels. It is also necessary to provide as many digital services as possible and to establish a system of digital interaction of citizens and companies with the administration.

Digital Transformation of Local Government

Accelerated implementation of advanced digital technologies is vital for the further successful development of ecosystems of local communities such as smart cities, municipalities, islands, villages, and so on.

The emphasis is on the use of IoT technology to reduce losses in utility infrastructure and monitor the state of public infrastructure in general, information processing through advanced analytics and automation of business processes, and application of digital services such as digital assistants through various communication channels to improve services and their availability to users.

Given the differences in needs, preferences, and capabilities at different levels of use, especially in smaller local communities, it is necessary to encourage the development of highly agnostic systems in the form of data collection and processing, communication protocols, and integration with different software solutions.

AmCham proposes more active support and co-financing of projects that develop the concept of smart cities, municipalities, islands, villages, and other local communities, with a focus on:

- A circular economy and sustainable waste and energy management and effective environmental protection (reduction of CO2 and other waste products in the environment and renewable energy sources);
- Improving the security of citizens and property;
- Smart management of all local community resources and services provided to residents and guests using, for example, smart metering, infrastructure and environment management, smart traffic and mobility, e-charging stations, smart tourism, and so on.

In relation to the above, the private sector should be permitted to apply for funds directly or to create some form of public-private partnership when applying for funds. Grants of above 50% of the funds should be secured, which will stimulate the development of these services with a realistic rate of return.

Digital Transformation of Economy

The implementation of digital technology to connect industrial components, machines, tools, products, and people, spurred the fourth industrial revolution (Industry 4.0), in a similar way to the drivers of previous industrial revolutions – electronics, electricity, and steam power.

This revolution is not characterized or driven by a particular technological invention but is defined by the universal connection and network of manufacturing elements. We can also call it the digital transformation of manufacturing.

The components that are key in the process of transforming manufacturing into the fourth generation are not unambiguously defined and differ depending on the source and implementation. For the purposes of this document, we will limit ourselves to the following:

Big Data Analytics

Big Data Analytics is a complex process of analyzing large amounts of data to find information such as hidden patterns, correlations, market trends, and consumer preferences using technologies such as predictive analytics, statistical algorithms, what-if analysis, and simulation. This type of analytics enables business decision-making, increased efficiency, user experience, competitiveness, and profitability. Since such systems require significant IT resources, the technical basis is usually Private and Public Cloud systems.
There are two directions to be stimulated: knowledge development and investment in technology.

- There is a great shortage of experts such as Data Scientists, not only in Croatia, but also globally, and it is necessary to invest in projects that encourage the development of these competencies.
- Projects and investments in Big Data system technology are a significant cost compared to the usual IT budgets of Croatian companies, which is why it is necessary to subsidize the construction of such systems to increase the competitiveness and efficiency of companies.

Smart Factory

A smart factory is a highly digitized manufacturing plant that continuously collects and shares data between devices and components, which can be used for better

planning of manufacturing, maintenance, and self-optimization as well as self-correction of the manufacturing process. The integration of such factories into the overall supply system provides greater agility, lower costs, less downtime, and less waste. Investments in such systems can be combined with incentives in the field of environmental protection or made contingent on concrete results such as reduction of waste, raising OEE (Overall Equipment Effectiveness) parameters and the like.

Digital Twins

A digital twin is a digital, software replica of a physical factory, machine, or plant. The digital replica receives data from the sensors and systems of a real physical factory and is able to simulate the actual process. The purpose of such a system is to predict different outcomes in the software based on changed input variables, which are then used in the planning, optimization and improvements of the manufacturing process. Investments in such systems are generally easier and cheaper when done as part of building real, physical systems, whereas subsequent upgrades can sometimes prove problematic and even unprofitable. Projects can be divided into two categories:

- Greenfield - building a digital twin system at the time of building a real system. The period of building a real system is the riskiest period in the investment cycle for the investor, so incentives for such systems should be viewed in this context.
- Retrofitting – upgrading existing systems is problematic due to various modifications such as adding sensors and requires stopping production. Incentives in this segment should be focused on the development of feasibility studies to facilitate the decision and selection of suitable retrofitting systems.

Augumented Reality

Augmented reality allows for an interactive real-world experience with computer-added components to that view. The most commonly used perception is visual although other forms are possible. An example is glasses that show the production supervisor the production parameters. Such systems facilitate communication between machines and humans, which speeds up response time, facilitates troubleshooting, or allows work from a remote location. Projects in this segment should enable the trial use of AR systems to facilitate the selection and application of such systems. Special attention must be paid to ergonomics and the impact of long-term use of such systems on workers' health.

Additive Manufacturing

Additive manufacturing, better known as 3D printing, is an approach to industrial production by merging materials into a three-dimensional creation. An important application of additive manufacturing is in designing and modeling, rapid prototyping, or reducing the delivery time of certain specific parts and tools. Projects in this field should contribute to increasing the creativity and competitiveness of the domestic manufacturing and creative sector.

Digital Workplace

The evolution of the workplace took place during and between each industrial revolution. The proliferation of digital technologies also had a logical impact. Today’s environment in which we are instantly connected, continuously networked, blurs the boundaries of private and work life. The workplace becomes truly digital, online collaboration becomes constant, and mobility and work from anywhere become a

necessity. The reasons for introducing such systems everywhere, even in industrial plants, are to retain a talented workforce, increase productivity and employee satisfaction, and improve communication. The projects to be developed in this segment are as follows:

- Corporate social networks – easier communication of employees both in the company and in the ecosystem of customers, suppliers, and partners, where due to the issue of security and storage of business data, publicly accessible systems are not good practice.
- Video – training and systems that enable the creation and viewing of video content by employees.
- BYOT, BYOA, BTOD – the concept of using your own equipment, technology, or applications in a business environment.
- Mobile connectivity – a general increase in mobile connectivity and the use of mobile devices increases productivity and removes the boundaries of communication and facilitates meetings, training, etc.
- Wearable devices – network-connected wearable devices, such as glasses, watches, etc.

Industrial IoT

Information systems in manufacturing are called OT (Operational Technology) and are common in every manufacturing plant. The Internet of Things (IoT) enables digital transformation to take place by more comprehensively connecting manufacturing components and sensors to the Smart Factory. The main benefits of the adoption of IoT in industrial plants are, as a rule, cost reduction, automatic monitoring and prediction of failures, greater efficiency of the production line, and improved worker safety. In addition to the networking role they provide, investments in such systems can be combined with incentives in the field of environmental protection or made contingent on concrete results such as reduction of waste, raising OEE (Overall Equipment Effectiveness) parameters, and so on.

Gamification

Gamification is the concept of using designs, concepts, and mechanics from the segment of computer games in manufacturing plants. Younger and even middle generations of workers have grown up with computer games as part of everyday life and are accustomed to virtual environments and gaming devices, and applying such a principle in "serious play" – manufacturing – can yield surprisingly good results. The use of such technologies and principles has the effect of raising motivation, facilitates learning, and significantly improves the work experience. Projects in this segment should be oriented towards software development and models developed with associations of manufacturers.

Improving Company Communication with Customers

Today's users/consumers have digital devices at their disposal and are constantly connected. They are becoming innovators of digital trends in communication with brands and companies, whether in the manufacturing industry or the public sector. Analyses show that industries with high digital penetration have significantly higher wage growth and higher total revenues – which is why it is extremely important to encourage companies to use digital tools in advertising and marketing products and services across the global market to attract more customers. Online advertising and marketing are affordable for all types of small and large businesses compared to traditional marketing costs. With the use of modern tools with the support of artificial

intelligence (AI) and machine learning (ML), companies can respond to customer needs in real time.
To improve the overall digital user experience, in addition to digitalizing promotional and sales activities, it is important to support the customer/citizen through digital communication channels throughout the user cycle using digital services available 24x7 (self-service web services, social networks, mobile applications, chat, chatbot, SMS, ...) and the publication of transparent, easily accessible information.

Data Centers

A data center is a facility that contains a large number of computer servers and associated equipment. Data centers offer their customers a range of telecommunications services related to the storage and processing of information. In addition to standard solutions, some data centers offer additional services in the field of security, cloud solutions, etc. The demand for the services of such centers is growing; it is expected to continue to grow both in Croatia and globally. In the National Development Strategy 2030, within strategic goal 1 "Competitive and Innovative Economy", the Government of the Republic of Croatia recognizes the development of the globally competitive, green, and digital industry as one of the priority areas of public policy. Specifically, Croatia will base its economic recovery and development on economic sectors in which it has a competitive advantage. The government will emphasize the development of sectors with growth potential, at the same time taking care to protect jobs in strategically important sectors. These include the information and communication technology sectors.
In the same manner, the European Commission considers investing in data center infrastructure (including private sector data centers) to be one of the priority areas in the context of a green and digital transition. Therefore, AmCham proposes that EU co-financing funds promote the construction of (new) and the modernization and consolidation of (existing) "next-generation" data centers with a high level of availability, operability, security, and energy efficiency of private sector data center infrastructure. This would ensure the continuity of operations of the data center infrastructure and the "greening" and decarbonization of the information and communication sector, with an emphasis on electronic communications operators.

Automation

Today, the rate of innovation and the level of automation is much higher in all segments in which it is available and affects the very core of the main business processes. The majority of companies have thousands of these processes. Approximately half of the process experts say that the main goal of digital transformation is process improvement and therefore automation, which then further enables creative applications and innovative services.
The benefits of automation are standardization, increased scalability, from time reduction and more rational parallel resource use to the predictability of outcomes, and risk reduction with gradual but continuous application of best practices and process improvements.
Various forms of automation either in the digital environment such as Business Process Management, Digital Process Automation (DPA or RPA – Robot Process Automation), etc., or in the physical environment through various autonomous mobile robots (AMR) can be incorporated into existing operations to ensure short-term improvements. However, to avoid unforeseen problems, it is necessary to improve the overall systems to achieve long-term benefits.

In addition to the digital transformation in manufacturing, it is crucial to enable non-manufacturing sectors to digitalize their business through the use of Big Data Analytics, Artificial Intelligence as well as the use of other possible tools.

Reliability and Cybersecurity

In addition to sustainable business, it is important to understand the risks associated with the innovation of business units, but also to balance the imperative of protecting the company with the needs of adopting innovative technology.

Fully protecting the entire business is undoubtedly an unattainable goal, but balancing security and ongoing operations is achievable. The purpose of any cybersecurity program must be to strike a balance between protecting the organization and the need to maintain business, starting with secured endpoints.

AmCham proposes, through the RRF and/or MFF, the co-financing of projects that support:

- Construction of (new) and modernization and consolidation of (existing) "next-generation" data centers with a high level of availability, operability, security, and energy efficiency of private sector data center infrastructure;
- Project development and investment in digital business transformation projects using cloud computing technologies, the Internet of Things (IoT), advanced analytics with large amounts of data (artificial intelligence/machine learning, big data), augmented/virtual realities in all areas of the economy, from primary, secondary to tertiary sectors;
- Product development in the field of cybersecurity;
- Investments in the implementation of off-the-shelf solutions and products in the field of cybersecurity;
- Development of projects for the introduction of digitalized and robotic automated processes;
- Research and development of autonomous robotic and autonomous mobile robotic solutions;
- Investments in specific prepared projects of robotization and automation of manufacturing plants and logistics and distribution centers;
- Encouraging the development of self-service applications and digital communication channels between companies and citizens/users. Improving the digital user experience.

Digital Skills

The key factor in realizing the potential of digitalization lies in digital skills. Without digitally aware and literate citizens, the impact of digitalization of certain spheres of society is considerably reduced. According to the Digital Economy and Society Index (DESI) conducted at the level of the European Union, Croatia ranks 13th, or slightly below the EU average. However, for a relatively small country such as Croatia, the quality of human resources is extremely important because it cannot derive its competitiveness from the size of its population. The result of only 53% of citizens with a basic level of digital skills and 56% with a basic level of software skills is certainly a major obstacle to achieving high digitalization effects. It is additionally worrying that this percentage falls sharply among the over-55s, which further emphasizes the effects of the digital divide and the high probability of social exclusion due to the lack of digital skills.

Contrary to popular belief that the younger generations of "digital natives" who grow up with digital technology and devices have an adequate level of digital competence, the latest EU-level research (ICILS, International Computer and Information Literacy Study 2018) shows that as many as one-third of young people achieve results below the threshold to be considered digitally competent.

A systematic approach to education is necessary in order to develop digital skills required in the workplace. Unfortunately, in terms of participation of adults in education, Croatia with Romania, Bulgaria, and Slovakia, with less than 5% of adults participating in lifelong learning, and far from the EU-27 average of 10.8%. All the more so as the set target for the EU is an average of 15%. For comparison, the countries with the best results are Sweden, Finland, and Denmark, where the participation rate is above 25%.

Similarly, the fact that only 35% of citizens possess digital skills at a level higher than basic can be a serious obstacle to introducing new solutions based on digital technology and digitalizing the Croatian economy and public administration. In terms of ICT experts who should be implementing digitalization projects, according to the latest DESI report in Croatia, ICT experts make up 3.5% of all employees, which is below the EU average of 3.9%. Although Croatia achieved an above-average result in the number of new graduates with a degree in ICT (5.5% compared to the EU average of 3.6%), 60% of companies still report difficulties in filling ICT expert roles. Given the migration flows and the large number of Croatian ICT experts emigrating to other EU countries, Croatia needs to look for solutions through the training opportunities of employed people who are ready to change careers.

One of the key challenges in realizing the potential of digitalization and digital transformation lies in the digital skills of participants and users in these processes, i.e. employees of private and public companies, public administration, and Croatian citizens. General digital skills at the level of the entire population, regardless of age or profession, are important for achieving a higher level of quality of life through the use of digital technology-assisted services, regardless of whether they are offered commercially or as part of a public service. Equally important are specific advanced-level digital skills in various professions experiencing transformation by having a digital component added. As a consequence, in addition to traditional ICT jobs, digital

jobs are emerging from traditional occupations: designers from various industries (graphic, metal, woodworking, textile, etc.), digital marketing experts, user experience experts, data analysts and scientists, e-commerce experts, social media vendors and so on. Although the greatest demand still exists for traditional ICT roles such as software engineers, developers, and infrastructure experts, the demand for digitalized traditional and creative occupations is expected to grow.

On the other hand, even though we have succeeded in increasing the share of new graduates in the field of ICT to 5.5%, which places us in the Top10 EU Member States, our share of ICT experts in the workforce is still below the EU average, which impedes the implementation of digitalization projects. To draw level with advanced EU Member States in terms of the share of ICT experts in the workforce at a faster rate, it is necessary to focus **on adult education and career change opportunities**, as the ICT industry is certainly attractive in terms of achieving an above-average quality of life.

Based on the views expressed above, AmCham proposes to promote multi-dimensional digital skills acquisition programs through the new Multiannual Financial Framework (2021-2027) to address different groups.

Education for the Unemployed

Improvements should be introduced into the existing measures of the Croatian Employment Service for the education for unemployed and employed persons that will further harmonize the professions for which the CES educates with the needs of the labor market and employers. This should be done at the regional level with a special focus on modern professions based on digital technologies. These professions do not necessarily have to be in the field of computer science or occupations in the field of information and communication technology, but may also be in other occupations in which the job descriptions and tasks performed by persons within a profession require a large number of skills based on information and communication technology, in other words, a large number of digital skills. Examples of such professions are digital marketing expert, sales and customer management jobs on digital platforms, digital content creation expert, digital design expert, etc.

Examples of professions in the field of information and communication technology are software development specialist specializing in various software solutions (e.g. computer games, business applications, software solutions in healthcare, e-business solutions, etc.), interface design expert, expert in IT and network infrastructure in traditional and cloud technologies, expert in database and computer systems administration, expert in the application of artificial intelligence (AI) in various business areas and sectors, expert in data analysis and prediction, expert in information security, etc.

In order to increase the level of achievement of the aforementioned objective, AmCham proposes amendments to the processes implemented at the level of the Croatian Employment Service (CES) and other public bodies as follows:

1. Greater focus on the needs of employers in a particular region in the selection of occupations and jobs for which the unemployed are trained.

- Through the use of data from the Croatian Pension Insurance Institute on the number of newly employed by occupation, aggregated at the regional (or county) level and grouped by required skills that define individual occupations.
- Through the use of data on enrollment in adult education programs that are collected and managed by the Agency for Vocational and Adult Education.
- Proactive involvement of all employers in completing the human resources needs survey through informing and promoting the expediency of the survey and the possibilities of training for the unemployed, as well as the potential benefits for employers who will be hiring candidates.
- Survey of educational institutions (private and public) implementing adult education programs on trends in specific business areas and new education programs that are being introduced in response to labor market demand.

2. Easier inclusion of young people without work experience in education programs for the unemployed, immediately after graduation, regardless of the level (high school or university degree) and professional profile and without registered employment experience, to acquire digital skills in modern technologies with final evaluation through internationally recognized certification schemes, which is particularly present and sought after for digital skills and occupations.

New Digital Careers

This education project addresses a group of employed persons who want to improve their expertise and competitiveness or change jobs or professions to improve their social and life status. Given the development of digital technology and the transformation of many business areas supported by the development of digital technology, it is expected that the increased demand for people with a variety of solid digital skills will continue to grow. Such increased demand is, on the one hand, an opportunity for the employed in various jobs to compete for new jobs through education and acquisition of digital skills, but on the other, a necessary approach in recruiting for vacancies that are created by digital technologies and new jobs. Because it is not enough to address the difficulties in recruiting for jobs that require digital skills solely through candidates leaving the formal education system at the secondary and tertiary levels.

AmCham recommends encouraging employees to steer their careers in the direction of better-paid jobs and industries with added value and better prospects by implementing a system of education vouchers issued in the name of the individual, and to be used primarily in organizations registered for education and teaching, in order to control the quality of education and the transparency in the spending of funds that will result in the greater overall competitiveness of the workforce. It is necessary to recognize the differences in the value of individual education programs, and, by issuing vouchers of different value, encourage the participation of persons in educational programs that may vary in duration (from one-day seminars to programs lasting several months), in the organization that implements them (secondary education institutions, higher education institutions, adult education institutions, business support institutions), and in the credibility and recognizability of the final certificate (education programs verified by the competent state or professional body, education programs that include taking professional/vocational exams or exams to

obtain globally recognized certificates especially present in the field of digital skills and vocations).

General Digital Competencies of the Elderly Population

To reduce the impact of the digital divide on the elderly population, measures are needed that will enable older citizens to acquire basic digital skills. Making education opportunities accessible is most effective through the availability of general digital literacy education vouchers that would be available to this segment of the population and could be used in registered teaching organizations. The easy availability of vouchers would encourage organizations to promote short education programs aimed at the elderly population. In order to make this option available in the whole of Croatia, including in smaller communities with lower average purchasing power, AmCham proposes that contractors to conduct education programs in less populated, rural, and smaller urban areas be selected through providing additional incentives and through tenders, as it cannot be expected to be able to find interested contractors based only on the value of the vouchers due to the relatively small number of interested attendees.

Digital Competencies of STEM Teachers and Public and Civil Servants

A particularly important segment is the project for the education of STEM teachers for the acquisition of advanced digital competencies, especially computer science teachers, who according to the new curriculum are expected to teach advanced areas such as programming. Since understanding the process of computer operation is important for successfully navigating the digital business environment, regardless of profession, the basics of computer programming become a key skill that is strategically important to build in children through various subject topics, especially as part of the STEM curriculum. This is a necessary prerequisite to ensure that children connect computer technology with different areas of life at an early stage and, regardless of their later career and profession, have a basic understanding of the applicability of computer technology. Given that a large number of STEM subject teachers have not had the opportunity to acquire advanced digital competencies in their formal education, which include basic programming skills, a prerequisite for building these competencies in children is teacher training. This should be organized at the national level, in order to be accessible to all teachers and to provide equal conditions of primary education throughout the country.

The other component of this project is the building of digital competencies of civil servants. The competencies of the employees themselves are crucial for the successful digitalization of state and public administration. It is AmCham's recommendation to prescribe minimum levels of digital competencies for civil servants and to provide a publicly available testing system through which civil servants will be able to check their level of knowledge. If it is not at a satisfactory level, the employee would receive a voucher that can be used in commercial education providers to acquire basic digital skills (for example, Computer Business Application Specialist). A mandatory official assessment should also be introduced to assess the minimum level of digital competencies that every civil servant should meet to ensure that all civil and public servants are trained to use digital tools in their business environment over a defined period of time.

Advanced Digital Competencies of Young People

In Croatia, Computer Science has been a compulsory subject from the 5th grade of primary school since 2018. This means that high school graduates in 2026 will have 5-8 years of Computer Science on their CV (depending on the high-school program attended). Until 2026, young people will be finishing high school without an adequate and appropriate level of digital knowledge and skills unless Computer Science was their elective course in primary school, seeing as most high school programs include only 35 hours of Computer Science. To adequately prepare young people for the labor market and the general digitalization of jobs, acquiring digital skills must be made easily available throughout the Republic of Croatia in the same manner as secondary and primary education is accessible. Such wide availability can be achieved through vouchers that young people aged 18-29 will be able to use to acquire the necessary skills in organizations that offer digital skills education programs under market conditions. With these prerequisites and the easy availability of vouchers, it can be expected that the education programs will be promoted by interested educational organizations that will encourage and invite young people to acquire knowledge and skills.

Education for the Digital Adaptation of Business

As part of grant projects for the digitalization and digital transformation of business, which are expected to be available to small, medium, and large enterprises, it is important to ensure that a significant part of the funds can be used for employee education. It is equally important to provide training for a wider range of employees to acquire the digital skills necessary to work in a digital environment and use new technological solutions, as well as to train experts in the implementation and maintenance of new systems.

Digital Training for the Digital Workplace

One of the trends that makes the overall digitalization of business processes significantly easier is the range of available solutions that allow the creation of automated processes simply, without coding. This means that users who understand the business processes have a tool with which they can automate and digitalize operations without having to possess professional IT skills; instead, it is sufficient to have digital skills at advanced user level. A prerequisite for the overall digitalization and automation of business is the ability of employees to work in the digital workplace. Therefore, AmCham recommends that, at the level of grant schemes, funding be provided for projects to improve the digital skills of employees of small, medium, and large companies. Mass activation of employee training companies would significantly increase the number of adults involved in education, and companies would have the opportunity to build business efficiency and global competitiveness.

Infrastructure

Developing and Building Cloud Solutions

Modern IT services provided to end users, be it public services to citizens provided by state or local governments, banking and other financial sector services, education, business support in companies of all industries, etc., require a high level of stability, reliability, and availability of the service. Availability includes access to services regardless of the end terminals from which the user accesses them, be it a desktop computer from home, workplace or increasingly from mobile devices of every kind, as well as enhanced interaction of "smart" devices and assets with services and each other as a basis for Industry 4.0 concepts.

Such a way of providing services requires increasing IT infrastructure resources that include high computing power, large memory capacities, and rapidly growing data storage capacities.

Centralizing the provision of infrastructure and end-user cloud services allows all economic entities to modernize their business, digitalize business processes and can bring about a comprehensive business transformation leading to increased efficiency and quality of customer services.

In order for the required capacities to be available in the shortest possible time from the need arising, and for their use to be as reliable as possible, in the last few years the development of cloud solutions has been accelerated.

In that respect, the following is available:

- public cloud services,
- private cloud services of an individual company or a group of companies,
- hybrid cloud services – combining both public and private clouds.

Public cloud computing services are reserved for service providers – specialized companies operating in the market and competing with other business entities with identical or similar services, i.e. companies for which this is one of their core activities. They may be companies that provide infrastructure rental services (IaaS), computer platforms (PaaS), or the use of software, i.e. off-the-shelf software solutions and applications (SaaS).

A private cloud offers a more cost-effective, resource-efficient, and at the same time more reliable way of providing an entire portfolio of IT services. This approach primarily benefits larger economic entities that, based on economies of scale, can take full advantage of this approach, virtualization, and multiple uses of available infrastructure and application resources. Business associations of medium and small companies in larger clusters are also possible to be able to take full advantage of forming private clouds.

Probably the most economically viable way to use cloud services is to form a hybrid cloud. It is a combination of the best features of private and public clouds. A public cloud enables the provision of predefined, publicly available, market-based IT services that are available for activation practically instantly, whereas services

implemented through a private cloud provide quickly available, cheaper resources and fast customization of software solutions developed for own needs, which are not available in the public cloud.

Application and Use of IoT Infrastructure as the Basis of Smart Solutions and Industry 4.0.

The Internet of Things (IoT) is at the heart of the process of digitalizing the economy and society and is a key component of the European Commission's strategy to digitalize European industry and the digital market. European values are applied to the Internet of Things to empower citizens, thanks to the high standards of privacy and security.[5]

The Internet of Things is based on devices connected to a network, which communicate with data and can perform some action. The most common example is the installation of sensors or actuators in a device or infrastructure, which then report their readings to a central location and speed up or facilitate operations. In addition to sensors on devices, a network infrastructure is also required.

The critical role of communication infrastructure is to connect all these devices, which resulted in the definition of specific standards for IoT technology as an upgrade for the shortcomings of existing protocols available on 2G/3G and LTE networks for traditional MachineToMachine (M2M) services.

The standardization of not only data but also communication is vital in the context of communication of devices for mass use. This involves large quantities of simple devices and applications and communication of critical purpose that requires high reliability.

Another important element of the infrastructure are IoT platforms as supports that connect everything in the IoT system and its value chain, from communication management, device management, data flow, their acquisition and initial processing, to integration into the functionality of various applications. The IoT platform ensures this by providing a basic level of service with interoperability between nodes, cloud services, as well as basic IP networking, security, application layer, and device management. The IoT platform provides all the key ingredients for building effective IoT applications and the necessary security mechanisms to ensure comprehensive IoT security.

Interconnection and processing capacities enable real-time reactions, while very dynamic topologies facilitate business operations based on hyperconnected ecosystems of networked things, people, and organizations.

AmCham recommends that **eligible costs of upcoming projects** to be funded through the Recovery and Resilience Facility under the Next Generation EU instrument, as well as the Multiannual Financial Framework, include not only **all capital investments in private cloud solutions but also the operating costs of public and hybrid cloud solutions (XaaS), Internet of Things communications and infrastructure (IoT).** Such an approach has already been

[5] https://ec.europa.eu/croatia/How_IoT_is_helping_and_changing_our_everyday_life_hr

adopted in several Member States such as Spain, Malta, and Latvia. Cloud solutions are an important part of digital transformation projects, which should not be limited to investments in infrastructure.

AmCham calls on all bodies in the management and control system (MCS) in Croatia to consider the operating costs of the cloud solutions in public and private sector digital transformation projects justified in their entirety based on the principles of ownership and longevity of investments.

Conclusion

AmCham proposes that the programming of projects for the Multiannual Financial Framework 2021-2027 (MFF) and the Recovery and Resilience Facility (RRF) be significantly related to projects that will contribute to the digital transformation of the Croatian economy, public and local government and society. This is necessary in order to alleviate the technological backwardness of the economy, the economic and social consequences of the coronavirus pandemic and make European economies and societies more sustainable, resilient and prepared for the challenges and opportunities posed by green and digital transition.

It is therefore crucial that the objectives and funds for the projects that will make this possible are well defined within the National Recovery Plan and that the private sector is involved in the distribution of grants to the highest extent possible, receiving at least 50% of the grant allocated to the National Recovery Program.

As part of the digital transformation, AmCham has identified key elements that are an integral part of it, including **connectivity, digital transformation of the public and private sector** (modernization of private and public sector business driven by specific automation and digitalization projects), **digital skills development** (digitally aware and literate citizens) **and infrastructure** (data centers, IoT).

Within the framework of infrastructure development:
It is necessary to **ensure the continued use of grants for the construction of very high capacity networks** in areas where there is insufficient commercial interest in investing in Croatia AmCham proposes the following measures for the new programming period:

- Proactive involvement of the private sector in all programming activities for the use of grants for the construction of very high capacity broadband networks;
- Ensuring that the minimum threshold for private investment is reduced to a maximum of 20% to increase the potential use of available funds compared to the previous funding period;
- Ensuring the development of very high capacity broadband access infrastructure in white areas where there is insufficient commercial investment interest (continued NFP) with a focus on the private DBO investment model, as the private sector has shown greater fund absorption potential;
- Ensuring co-financing on the principle of technological neutrality (as per the European guidelines);
- Determining the area of co-financing with a balanced approach to determining the scope of the area and the number of households, i.e. potential users of broadband internet access services;
- Increasing the maximum amount of the grant per project to allow the co-financing of larger projects.

As part of encouraging the digital transformation of public and local administration and the business community:
AmCham proposes more active support and **co-financing of projects that develop the concept of smart cities, municipalities, islands, villages,** and other local communities with a focus on the circular economy, sustainable waste and energy

management, and environmental protection (CO_2 reduction, renewable energy sources, improved security of citizens and property, smart management of all local community resources).

It is necessary to allow the private sector to apply for funds directly or to create some form of public-private partnership, with secured grants of above 50% of the funds.

AmCham calls for **co-financing of investment projects and development of digital transformation competencies of the economy**, regardless of the size of the company.

Specific investment projects in the digital transformation of the economy include the following: Robot Process Automation, Big Data Analytics, Artificial Intelligence, Machine Learning, Digital Workplace, Gamification, improving business communication with customers, data centers and automation.

In addition, for the area of production and logistics processes of the private sector, AmCham calls for co-financing of investment projects that will enable the development of Industry 4.0, which additionally includes: Smart Factory, Digital Twins, Augmented Reality, Additive Manufacturing and Industrial IoT.

Within the development of digital skills, it is necessary to:

- **Expand the education of the unemployed** by contracting comprehensive digital acquisition programs (e.g. software development, interface design, IT infrastructure, system administration, digital marketing, sales and customer management on digital platforms, etc.), but also of the **employed who are willing to change careers** and learn a new profession;
- **Develop the general digital competencies of the elderly population** with special emphasis on socially vulnerable groups (e.g. from rural and sparsely populated areas, lower socio-economic status, etc.);
- **Develop advanced digital competencies of teachers**, especially in STEM subjects, and general digital competencies of public and civil servants;
- Develop digital competencies of young people, 18-29 year-olds, to work in a digital business environment;
- **Further encourage the strengthening of the competencies of companies** for the use of artificial intelligence (AI), cybersecurity, advanced analytics (Data Science), and digital adaptation management (Digital Transformation), through targeted grants for the private sector;
- **Prepare a system of value vouchers for the needs of the economy** to provide digital training for employees in the workplace.

Also, in area of infrastructure, AmCham recommends that eligible costs of upcoming projects to be funded through the Recovery and Resilience Facility under the Next Generation EU instrument, as well as the Multiannual Financial Framework, include **not only all capital investments in private cloud solutions but also the operating costs of public and hybrid cloud solutions (XaaS), Internet of Things communications and infrastructure (IoT)**.

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