

MONITORING PROGRESS IN NATIONAL INITIATIVES ON DIGITISING INDUSTRY

Country report

Croatia

July 2019



Table of contents

Summary	4
1 General context	9
1.1 Economic context and status on digitisation	9
1.2 National strategy on digitising industry	12
1.3 EU cooperation in the field of digitising industry initiatives	13
2 Other policy support to digitising industry	13
2.1 Boosting innovation capacity.....	13
2.2 Regulatory framework for digital age	17
2.3 Skills development.....	20
2.4 Support mechanisms	22
3 Conclusions.....	23
ANNEX 1List of stakeholders interviewed.....	28
ENDNOTES.....	28

Tables

Table 1: Overview of initiatives	5
Table 2: SWOT of the country on digitalisation	8
Table 3: General economic and digital indicators for Croatia.....	11
Table 4: National strategy on digitising industry	12
Table 5: National initiatives to boost innovation capacity.....	14
Table 6: Main initiatives under Pillar 4	18
Table 7: Croatian main initiatives to develop digital skills	21
Table 8: Breakdown for the financing of initiatives	24
Table 9: Total input output overview	26

Figures

Figure 1: Digital Economy and Society Index.....	10
Figure 2: Croatia's readiness for future production.....	11

Boxes

Box 1: Good practice.....	25
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Summary

Croatia is part of the group of low-performing countries among EU Member States when it comes to digitalisation. On the Digital Economy and Society Index (DESI), Croatia ranks 22nd, which is an improvement by one place compared to the year before when the country ranked 23rd. Croatia has the above EU average number of internet users and progress has been made especially in the human capital aspect. For example, the number of graduates in science, technology and mathematics increased. Nevertheless, the country is facing a number of challenges. Croatia managed to improve its ranking in some DESI dimensions (Human Capital, Use of Internet Services), however in the DESI sub index Integration of Digital Technology the ranking fell by 4 places in one year (21st in 2018 compared to 17th in 2017).

The country lacks a comprehensive national strategy on the digitisation of its industry, which is seen as a challenge. The National Platform for Digitalization of the Industry of the Republic of Croatia is currently under preparation and at the beginning of 2019, the team working on the development of the Platform will be composed. Based on the data available Croatia invested overall at least EUR 15.68 million across initiatives of the different pillars of the Digitising European Industry (DEI) and support mechanisms.

The majority of initiatives undertaken by the Croatian government were initiated in 2016 or 2017, therefore the impact of these measures cannot yet fully be assessed. Most of the initiatives have been undertaken under Pillar 2, Pillar 3 of the DEI Initiative and Pillar 4. Under Pillars 2 and 3 most of the initiatives are innovation clusters or competence centres (Algebra LAB - Open Innovation Lab, CroTechHub, CROBOHUB, HUB 385-Centre for Knowledge, Creativity and Innovation). Regarding the regulatory framework, Croatia has made some improvements. In 2015, the National strategy and Action plan for Cybersecurity was adopted and some new acts were amended (Electronic Signature Act, Electronic Communications Act). Additionally, the National Council for Information Infrastructure was established in 2016. Nevertheless, the country still lacks more focused regulation on digitisation. There is lack of governmental initiatives under Pillar 5 that would address the digital skills development. All identified measures are namely initiatives of privately-owned organizations.

Table 1 presents an overview of the main initiatives identified that will be further detailed in this report. Table 2 presents a short SWOT analysis of Croatia on digitalisation.

Table 1: Overview of initiatives

Initiatives	Starting year	Overall strategy/DEI Pillar/support mechanism	Type of initiative	Sectors targeted	Digital technologies targeted	Size of companies targeted	Budget
National Platform for Digitalization of the Industry of the Republic of Croatia		Overall strategy	Strategy (in preparation)	All	All	N/A	Public, EU and national funds
HUB 385- Centre for Knowledge, Creativity and Innovation	2016	Pillar 2 & Pillar 3	Innovation cluster, coworking space for IT companies, Academy for IT skills	Information and Communication	Robotics, mechanics, programming, 3D printing, IoT and user experience design	All	Private sources
Algebra LAB - Open Innovation Lab	2017	Pillar 2	Competence centre, innovation cluster	All	Social Media, Mobile Services, Cloud, IoT, Cyber Security, Robotics and Automation Machinery, Big Data and Data Analytics	All	European Commission and national authorities
CroTechHub	2017	Pillar 2 & Pillar 3	DIH	Metal & Process industry; Aerospace; Transport & Logistics; Hospitality & Tourism; eGovernment; Fast-Moving Consumer Goods (FMCG);	Social Media, Mobile Services, Cloud, IoT, Cyber Security, Robotics and Automation Machinery, Big Data and Data Analytics, 3D-Printing, AI	All	Partner resources, Memberships
CROBOHUB Croatian Robotics Digital Innovation Hub	2016	Pillar 2	DIH, Innovation cluster	Health and quality of life; Energy and	AI, 3-D Printing, Big Data and Data Analytics, IoT, Cloud,	Start-ups, SMEs (<250 employees),	EU funding (H2020, ERDF) and national

Initiatives	Starting year	Overall strategy/DEI Pillar/support mechanism	Type of initiative	Sectors targeted	Digital technologies targeted	Size of companies targeted	Budget
				sustainable environment; Transport and mobility; Security and Food and bio-economy.	Robotics and Automation Machinery, Mobile Services, Cyber Security	MidCaps (between €2-10 billion turnover) Research organizations	specific innovation funding, private funding, partner resources
National strategy and Action plan for Cybersecurity	2015	Pillar 4	Strategy	All (economic sector, academic sector, public sector)	Electronic communication, electronic financial services, e-government	All	N/A
Electronic Communications Act	2017	Pillar 4	Legislative act	All	Information and communication, electronic services	All	N/A
National Information Infrastructure Council	2016	Pillar 4	Governmental office	Public sector	Information and communication, electronic services	All	N/A
Electronic Signature Act	2017	Pillar 4	Legislative act	Public sector	Information and communication, electronic services	All	N/A
Croatian Makers	2015	Pillar 5	Training centres	Education, schools	Information and communication, robotics, Internet of Things	All	Local philanthropes, external sources, including citizens, private companies, national and EU development funds
IT education for the safer tomorrow	2018-2021	Pillar 5	Free online and onsite IT training	All	Information and communication	All	The value of the project is EUR 179,363.58 (ESF funding).
Commercialisation of Innovation in	2017	Support mechanism	Call for projects	All	All	SMEs	Total funding available under the call: 15,339,074.27

Initiatives	Starting year	Overall strategy/DEI Pillar/support mechanism	Type of initiative	Sectors targeted	Digital technologies targeted	Size of companies targeted	Budget
Entrepreneurship grant programme							EUR. National public funding
Law on State Aid for Research and Development Projects	2018	Support mechanism	Tax relief	All	All	All	161,583.52 EUR (2018)

Table 2: SWOT of the country on digitalisation

<p>Strengths:</p> <ul style="list-style-type: none"> • Above EU average number of internet users • Improvement in human capital (Increase in the share of STEM graduates and share of ICT specialists in the workforce) • Industry share of GVA above the EU average (21%) • Developed e-services and high take-up of these services by the Croatian population 	<p>Weaknesses:</p> <ul style="list-style-type: none"> • No national strategy on the digitisation of the industry • Legislation is not fully updated • Low connectivity (limited fast broadband coverage) • Small share of innovative enterprises • Poor integration of digital technology • Digital skills gap among the population
<p>Opportunities:</p> <ul style="list-style-type: none"> • Increased political awareness and support for the digitalisation process • National Platform for the digitisation of the industry in the Republic of Croatia is under preparation • Increasing level of innovation • Improved national investments • Increase of GDP by 3.6% • Strong entrepreneurial culture¹ • Access to additional EU funding sources • Successful projects (E-schools) 	<p>Threats:</p> <ul style="list-style-type: none"> • Many pillar-specific initiatives have been launched only recently. Their real impact still needs to be seen • The brain drain of researchers and experts, especially in certain areas • A lot of initiatives still have to be taken to create sustainable foundations for the economic development (strategy development, legislation, infrastructure development)

1 General context

The objective of this report is to analyse the current status of national initiatives on digitising industry in Croatia. The analysis has been conducted against the background of the Digitising European Industry (DEI), which was the first industry-focused initiative of the Digital Single Market launched by the European Commission in 2016.

Similar country reports will be produced for each of the 28 EU Member States. These national reports allow to:

- Monitor the development of national initiatives on digitising industry;
- Compare different national approaches; and
- Identify best practices of national initiatives.

Monitoring and reporting back on the development of the existing national initiatives is an important element of the DEI initiative, and this report should be seen as one part of it.

For more details about the DEI and our methodological approach for the country report, please consult the document attached.

1.1 Economic context and status on digitisation

General economic context

The highest real GDP rate in Croatia was reached in 2016 (3.5%), but it decreased in 2017 to 2.9%. Between 2016 and 2017 the GDP per capital, expressed in PPP, has grown by 3.6%. In 2017, the industry had a share of the GVA of about 21%, which is above the EU-average of 19.6% and which was also the sector with second highest share (sector with the first highest share was distributive trades, transport, accommodation and food services with 22.6%).

Status of digitisation

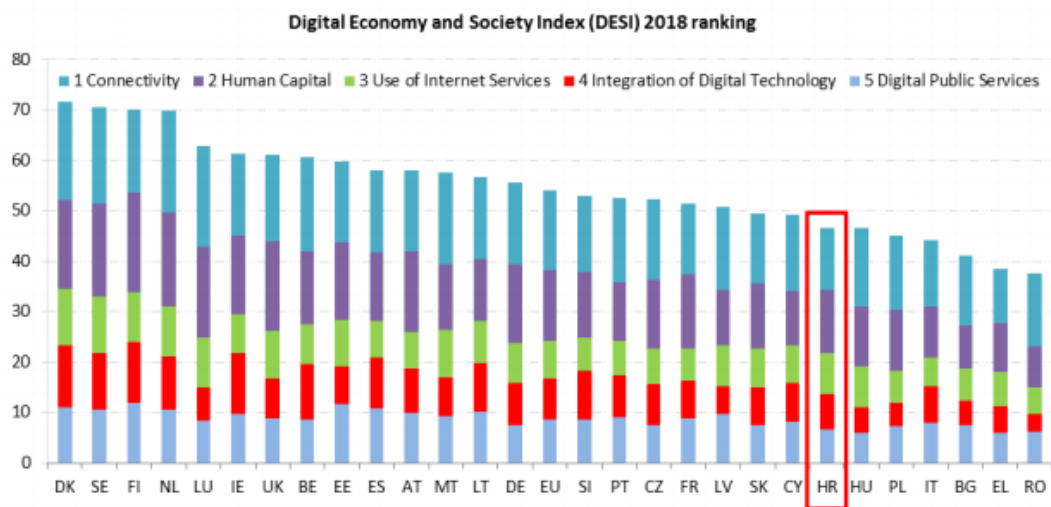
According to the 2018 Digital Economy and Society Index (DESI), Croatia ranks 22nd out of the 28 EU Member States which is a slight progress compared to 2017, when it was ranked 23rd. When compared to all 28 Member States, Croatia belongs to the low-performing cluster of countries². The weakest Croatian aspect remains connectivity due to the limited rural broadband and fast broadband connectivity, and one of the highest prices of fixed broadband in Europe. On the contrary, the country is performing better in human capital and use of Internet Services. Croatia made slow progress in the dimension Integration of Digital Technology by businesses. As other countries were progressing faster, the Croatian ranking has decreased by 4 places (from 17th in 2017 to 21st in 2018).

With 99% fixed broadband coverage, Croatia performs above the EU average (97%). On the contrary, fast and ultrafast broadband coverage remain very weak. Broadband services are available throughout the country, but the take-up of fast broadband remains low (14%). Low take up could be a result of relatively low internet use and high prices for broadband services.

In the Human Capital Dimension, Croatia improved by one rank compared to the year before. The number of ICT specialists has increased from 2.7% to 3.3%. The share of STEM graduates (graduates in Science, Technology, Engineering and Mathematics) increased by 1.7% and currently corresponds to 17.1/1000.

Regarding the integration of digital technology, Croatia is below the EU average and was ranked 17th in 2018 according to Digital Technology Integration Index (DTII), which corresponds to a decrease by one rank compared to the year before (16th in 2017). In terms of enabling conditions leading to digital transformation in the country, measured by the Digital Transformation Enablers' Index (DTEI), Croatia is scoring far below the EU average. Ranked as 26th in 2018 Croatia belongs to the group of Member States with modest enabling environment and is as such at risk of missing the trajectory of digital transformation. Worrying might be the fact that compared to one year before Croatia fell by one rank (25th in 2017)³. The figure below presents the EU ranking of Croatia in the DESI.

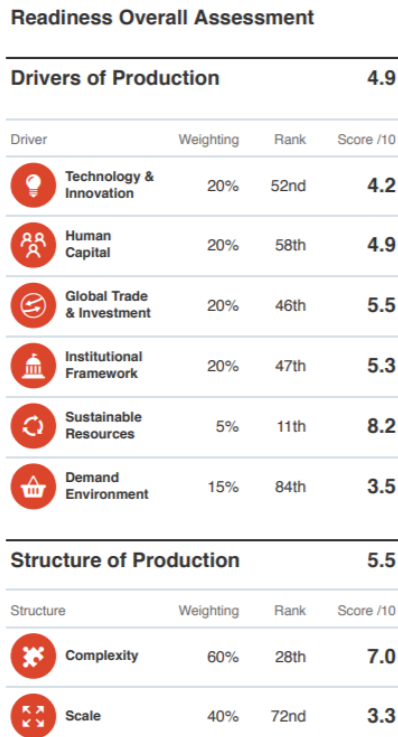
Figure 1: Digital Economy and Society Index



Source: DESI 2018 Country report - Croatia

According to the World Economic Forum's Readiness for the Future of Production Report 2018, Croatia's main drivers of production are its sustainable resources, as presented in the figure below.

Figure 2: Croatia's readiness for future production



Source: World Economic Forum, Readiness for the Future of Production Report 2018

The table below summarises some of the economic and digital indicators for Croatia.

Table 3: General economic and digital indicators for Croatia

	% GDP from manufacturing	% increase GDP growth	DESI position – and change	DESI sub-indicators Human Capital, Use of Internet, Integration of Digital Technology in 2018
Croatia	21% in 2017	2.4% in 2015, 3.5% in 2016, 2.9% in 2017	22nd in 2018 (23 rd in 2017)	<ul style="list-style-type: none"> • Human Capital: 18th in 2018 (19th in 2017) • Use of Internet Services: 11th in 2018 (14th in 2017) • Integration of Digital Technology: 21st in 2018 (17th in 2017)

1.2 National strategy on digitising industry

The table below presents an overview of the national strategy on digitising industry.

Table 4: National strategy on digitising industry

Name	National Platform for Digitalisation of the Industry of the Republic of Croatia
Type	Overall Strategy
Starting date	N/A
Objective	Objective of the future strategy is to provide platform and supporting conditions for the creation of networking opportunities, increase in overall digital connectivity, increase in the educational attainment of workforce for Industry 4.0, develop strategies for the efficient use of resources, digitisation of public administration, enactment of legal regulations and develop technical standards and security of systems and data.
Ministry/ministries in charge (website, contact person)	Ministry of Economy, Entrepreneurship and Crafts
Scope of the strategy/action plan	National
Measures included in the strategy/action plan	N/A
Overall funding and distribution by volume and source of funding (public/private, EU/national)	Public, EU and national

Implementation status and challenges

Croatia is still in the phase of preparing an active and comprehensive strategy regarding the digitisation of its industry. The National Platform for Digitalisation of the Industry of the Republic of Croatia was developed under the name of Digitising Impulse 2020- Industry for future (DIGIMP 2020-Industry4Future) and will be a basis for the National Strategy and action plan. At this stage, the measures included in the strategy are not defined, but it is known that the Government is planning to develop a general strategy, targeting all sectors. Currently, the Government is preparing reforms which should facilitate the digitalisation of industry and society. It is expected that the team, which will be working on the National strategy, will be gathered probably at the beginning of 2019.

Croatia did however in 2016 adopt Smart Specialisation Strategy (S3) for the period 2016-2020, in which the country identified the 5 thematic priority areas: 1. Health and quality of life, 2. Energy and sustainable environment, 3. Transport and mobility, 4. Security and Food and 5. Bio-economy⁴.

To address the issue of limited broadband connectivity in the country, Croatia adopted in July 2016 a Strategy for Broadband Development 2016-2020, developed by the Ministry of the Sea, Transport and Infrastructure. The Strategy defines concrete objectives, such as: 1) coverage with Next Generation Access Networks (NGA), which enable Internet access at a speed exceeding 30 Mbit/s for 100% of the Croatian population; and 2) 50% of Croatian homes using Internet access at a speed exceeding 100 Mbit/s or more⁵. Strategy involving the ICT sector is partially enshrined also in the Industrial Strategy of the Republic of Croatia⁶.

In 2016, the Central Office for the Development of a Digital Society has been established. The main task of the Office is to provide professional support to the Government of the Republic of Croatia in the development of secure digital infrastructure and public digital services and the popularisation of digital society development in all areas of life and activities of Croatian citizens,

the economy and the public sector⁷. One of the most successful examples is the e-citizen platform which enables easier communication between citizens and the public sector and increases the transparency of public sector services. Also, founders of new businesses can register their companies online, with less paperwork⁸.

1.3 EU cooperation in the field of digitising industry initiatives

Croatia and its regions are partnering in several cross-border cooperation projects⁹. Some are selected and briefly presented below:

- SKILLS +: Interreg project, aiming to advance public policies promoting ICT technologies skills among SMEs in rural areas helping them seize fully the opportunities offered by a digital single market and benefits of a digital economy (Interreg Europe)
- Smart Factory Hub: project funded by the Danube 2014-2020 Transnational Cooperation Program, which aims to improve research and development and the terms of international business cooperation policies in the manufacturing industry (Interreg Danube Transnational Programme)
- PPI2Innovate: Interreg project that seeks to encourage the use of Public Procurement of Innovative Solutions (PPIs) by public purchasers throughout Central Europe (Interreg Central Europe)
- KISS ME: Interreg project aimed at strengthening the innovation capacities of small and medium-sized enterprises (SMEs) by helping developing policy framework (Interreg Europe)
- ODEON: Interreg project aiming to establish and test the model and instrument associated with this model for building an innovative data cluster consisting of SMEs, start-ups and research institutes. The cluster goal is the development of entrepreneurial, market and social value of Open Data (Interreg Mediterranean)

2 Other policy support to digitising industry

2.1 Boosting innovation capacity

The table below presents an overview of the main initiatives to boost innovation capacity (pillars 2 and 3 of the DEI).

Table 5: National initiatives to boost innovation capacity

Name	HUB 385- Centre for Knowledge, Creativity and Innovation	Algebra LAB - Open Innovation Lab	CroTechHub	CROBOHUB Croatian Robotics Digital Innovation Hub
Type	Innovation cluster, coworking space for IT companies, Academy for IT skills	Competence centre, innovation cluster, DIH	DIH, Competence centre, innovation cluster	DIH, Innovation cluster
Starting date	2016	2017	2017	2016
Objective	To discover, support and empower talented young people, help them build start-ups and quality products designed and engineered to be competitive in the world's market.	To promote digital transformation solutions for businesses and organisations for their digital projects and digital transformation in several areas. To provide access to best practices, education, use cases, guidelines and support in applying digital technologies and the development of digital skills in order to help clients address their challenges in a business-focused way and with a common service model, offering services that are not readily accessible elsewhere.	To promote digitalisation of products as a key competitive factor of SMEs	To make a significant contribution to the development of high-tech industry in Croatia in a short term, and South-East Europe (SEE) in a long term, through strong existing research foundation and development of innovation in robotics by: using the knowledge and expertise of robotics research groups across the Western Balkans, dominantly using knowledge and expertise in ICENT and UNIZG-FER with more than 50 researchers; increasing the competitiveness of the Croatian/SEE economy; closing the gap between Croatian/SEE R&D&I performances and the leading EU MS ones.
Relevant for Pillar 2 ¹⁰ or Pillar 3 ¹¹ or both	Pillars 2 and 3	Pillar 2	Pillars 2 and 3	Pillars 2
Short description	Non-profit organisation focused on the promotion of innovation, collaboration and knowledge-sharing. Together with a community of world experts they host tech events, workshops, meetups and hackathons focused on new technologies that solve real problems and promote better living. One pillar called	Algebra LAB is an innovation/research and education hub, working as part of the largest private educational institution in Croatia, Algebra University Group. Algebra LAB represents a one-stop relevant experience point for the application of digital technologies in business.	DIH is a central point of excellence in the field of digitalisation and brings awareness to the industry of importance of the digital transformation of their businesses and products. DIH should be able to provide guidelines, know-how and support to SMEs and other companies.	Croatian Robotics Digital Innovation Hub (CROBOHUB), hosted within ICENT, is the key Croatian non-profit facility to support companies to become more competitive by improving their business/production processes as well as products and services by up-taking digital technologies and robotic solutions. CROBOHUB acts as one-stop-shop, helping Croatian and South-East

Name	HUB 385- Centre for Knowledge, Creativity and Innovation	Algebra LAB - Open Innovation Lab	CroTechHub	CROBOHUB Croatian Robotics Digital Innovation Hub
	Academy organises innovative workshops offering a combination of learning, research and discovering, tailored to the needs of the learners regardless of the level of knowledge. They also provide workshops for those younger people who, under the watchful eye of experienced mentors, learn about the basics of robotics, mechanics and programming, and through the game develop passion for learning and research.			European companies to digitalise their business through efficient orchestrating of various stakeholders in robotic innovation ecosystem such as research institutions, business support institutions and businesses operating in the field of robotics that may contribute to the development and application of advanced robotic systems in manufacturing. CROBOHUB also provides connections with investors, facilitates access to financing for digital transformations, help connect users and suppliers of robotic innovations across the value chain and foster synergies between digital and other key enabling technologies (such as biotech, advanced materials, etc.).
Granting organisation	Private sources	European Commission and national authorities	National authorities	European Commission and national authorities
Participating organisations	Private companies, especially SMEs	Croatian Employers Association, industry associations (CISEX, HURA), SMEs, large companies (Microsoft), incubators, universities	Zagreb Regional Development Agency, University of Zagreb, Incubator/accelerator, Institute Rudjer Boskovic	University of Zagreb- Faculty of Electrical Engineering and Computing, Centre for Industrial Development, Croatian Chamber of Economy, Development Agency Zagreb, University of Zagreb-Faculty of Mechanical Engineering and Naval Architecture, SMEs
Sectors targeted	Information and Communication	All	Metal & Process industry; Aerospace; Transport & Logistics; Hospitality & Tourism; eGovernment; Fast-Moving Consumer Goods (FMCG);	Health and quality of life; Energy and sustainable environment; Transport and mobility; Security and Food and bio-economy.

Name	HUB 385- Centre for Knowledge, Creativity and Innovation	Algebra LAB - Open Innovation Lab	CroTechHub	CROBOHUB Croatian Robotics Digital Innovation Hub
Technologies targeted	Robotics, mechanics, programming, 3D printing, IoT and user experience design	Social Media, Mobile Services, Cloud, IoT, Cyber Security, Robotics and Automation Machinery, Big Data and Data Analytics	Social Media, Mobile Services, Cloud, IoT, Cyber Security, Robotics and Automation Machinery, Big Data and Data Analytics, 3D-Printing, AI	AI, 3-D Printing, Big Data and Data Analytics, IoT, Cloud, Robotics and Automation Machinery, Mobile Services, Cyber Security, Energetics, Biomedical engineering, Transport
Funding (split by private/public and national/EU), state period/annual funding	Private sources	European Commission and national authorities	Partner resources, Memberships	EU funding (Horizon 2020; European Regional Development Fund) and National specific innovation funding; Private funding; Partner resources
Current status of initiatives	ongoing	ongoing	ongoing	ongoing

Impacts, challenges and perceptions

Croatia has a good foundation to build upon its innovation capacity. The country has knowledge and expertise to enhance the digitalisation process¹². Croatia has three DIHs (including Algebra LAB and CROBOHUN), created in 2016 and 2017. Identified initiatives under Pillars 2 and 3 received high scores by the industry associations (4.5/5). All initiatives are perceived as useful and their take-up is relatively high, receiving a score of 3-4 on a scale from 1 to 5, 1 being low and 5 being high¹³.

However, the country's innovation capacity is also facing several big challenges. The Digital Technology Integration index ranking of Croatia is 17 (below EU average), and according to the Digital Transformation Enabler's Index, Croatia is ranked 26th (below EU average). In only one out of seven dimensions of the Digital Transformation Monitor, Croatia scores above EU average, namely in entrepreneurial culture where Croatia is scoring 20 percentage points above the EU average. On the contrary, digital infrastructure and investments and access to finance remain a big challenge, since on these two dimensions Croatia scored almost 30 percentage points below the EU average¹⁴.

According to industry associations' feedback, the level of innovation in Croatian industry is low. There are examples of some excellent initiatives, but there is no real transformation boom. Similarly, stakeholders assess the take-up of digital technology as low, especially in traditional sectors. In the past, they considered that the government was not active regarding digitalisation. The main contributors regarding the field have been academy and research institutes, which have been carrying out many projects, usually funded by the European Structural Funds. However, it has been mentioned that the attitude seems to have changed, and the government is showing increasing awareness, hence the number of initiatives undertaken. Similarly, relevant investments have increased. Between 2015 and 2017, total capex spending in Croatia increased by 12.4%.

2.2 Regulatory framework for digital age

The table below presents the main initiatives related to a digital regulatory framework (Pillar 4).

Table 6: Main initiatives under Pillar 4

Name	National strategy and Action plan for Cybersecurity	Electronic Communications Act (NN 73/08, 90/11, 133/12, 80/13, 71/14, 72/17)	National Information Infrastructure Council ¹⁵	Electronic Signature Act (NN 62/17)
Type	IT Security regulation	Regulation on electronic communications networks and services	Governmental office	Regulation on electronic transactions
Starting date	2015	2017	2016	2017
Objective	To ensure systematic approach to the implementation and development of national legislative framework to fit the needs of modern society, including carrying out activities and measures to increase security, resilience and reliability of the cybernetic space; to establish an effective exchange, transfer and access mechanism; to strengthen awareness of the security of all users of cybernetic space; to encourage the development of harmonized education programmes; to encourage research and development, particularly in the field of e-services; a systematic approach to international co-operation in cyber security.	To provide a comprehensive legal framework regulating the area of electronic communications.	The main objectives of the National Information Infrastructure Council are to help improve the legal framework for the development of electronic administration, to monitor and give recommendations for the implementation of investments in information technology, to monitor the policy of public procurement of information technology investments, to monitor the implementation of state information and communication infrastructure projects, and to offer overall support to the Government in the application of the information infrastructure.	To regulate the electronic signature procedures in administrative and legal procedures.
Short description	A document with which Croatia tries to initiate a systematic and comprehensive planning of the most important activities for the protection of all users of modern electronic services, both in the public sector and industry, as well as citizens. For the purposes of meeting the	The Act regulates the use, provision and construction/setup of electronic communication services. The act also regulates the protection of service users' rights.	The National Information Infrastructure Council was established on 28 April 2016 for the purpose of monitoring and coordinating the development of the state information infrastructure and the preparation of the report to the Government of the Republic of	The Act regulates electronic commerce that encompasses electronic commerce using information and communication technology and the use of electronic signature in legal transactions, which also

Name	National strategy and Action plan for Cybersecurity	Electronic Communications Act (NN 73/08, 90/11, 133/12, 80/13, 71/14, 72/17)	National Information Infrastructure Council ¹⁵	Electronic Signature Act (NN 62/17)
	objectives enshrined in the strategy and action plan the establishment of the National Cyber Security Council is foreseen.		Croatia. The National Information Infrastructure Council is chaired by the Prime Minister of the Republic of Croatia, and the members are heads of central state administration bodies and expert ICT communities.	includes electronic commerce in judicial, administrative and other similar procedures, unless otherwise provided by law.
Sectors targeted	All	All	Public sector	Public sector

Impacts, challenges and perceptions

Regarding regulation governing digitisation, Croatia has made some progress, since a large number of initiatives have been identified under Pillar 4. Important acts have been introduced or amended in 2017 (Electronic Communications Act, Electronic Signature Act), and one governmental office has been established (National Information Infrastructure Council). Croatia has in place other relevant legislative acts governing digitisation processes, such as: Information Security Act (2007), Electronic Trade Act (2003/2014) and Personal Data Protection Act (2003). However, these acts are older and will probably have to be amended in the future.

Despite proactivity shown in amending the regulatory framework, there are regulatory barriers impeding faster digital transformation in Croatia. However, taking into consideration the relatively recent accession of Croatia to the EU, these barriers are understandable.

The National strategy and the Action plan for Cybersecurity provide a clear view of what Croatia really wants to achieve in the area of cybersecurity – how to treat it and what to develop. However, there is a lack of capacities (financial resources and infrastructure) to execute such strategy¹⁶.

Industry associations assess that no significant improvements in the regulatory framework have been made and a lot must still be done to really enable digital age. The main role of the regulatory framework should be to enable implementation of the innovative digital solutions and the current outdated regulatory framework in Croatia is not suitable for that. There is also a perceived lack of ambition of state/public bodies and lack of enforcement of existing regulatory framework¹⁷.

2.3 Skills development

The table below presents an overview of the main measures for digital skills development (Pillar 5).

Table 7: Croatian main initiatives to develop digital skills

Name	Croatian Makers	IT education for the safer tomorrow
Type	Training centres	Free online and onsite IT training
Starting date	2015	2018-2021
Objective	IRIM's core mission is to empower all children in Croatia and the region to develop STEM skills which are necessary for the 21st century, by providing not only equipment, but also education and other activities.	The acquisition of additional skills and qualifications in the field of computing and digital skills of the target groups, increasing their competitiveness on the labour market and their employability.
Short description	IRIM (Institute for Youth development and Innovativeness) is a Croatian-based non-profit organisation (private foundation), which has developed and implements the largest extracurricular STEM program in the EU – the Croatian Makers movement, which now includes over 100,000 children. Although IRIM originates from, and primarily operates in Croatia, it has recently undertaken activities in Serbia, Bosnia Herzegovina and Kosovo, where local partners deliver IRIM-designed major projects (with initial funding from IRIM), also with the aim of engaging in joint regional activities.	The project aims at increasing the number of adults in life-long learning education, increasing the key competences of new literacy and reducing unemployment by offering free IT training in three Croatian cities and online programmes open to all Croatian citizens. The target groups are unemployed persons over the age of 34, adults between 15-34-year-old without qualifications and those with lower levels of qualifications who will gain knowledge and develop their skills.
Granting organisation	IRIM (Institute for Youth development and Innovativeness)	Algebra
Participating organisations	Primary and secondary schools, public libraries, youth centres	University College Algebra as a project leader in partnership with the Croatian Public Employment Service
Sectors targeted	Education, schools	All
Funding (split by private/public and national/EU), state period/annual funding	Local philanthropes, external sources, including citizens (through public crowdfunding campaigns and general donations), private companies, national and EU development funds	The value of the project is EUR 179,363.58. The funds are provide by the European Social Fund.
Current status of initiatives	Ongoing	Ongoing

Impacts, challenges and perceptions¹⁸

According to Eurostat, 41% of Croatians have basic or above basic digital skills (in 2017). The percentage decreased for 6 percentage points from the year before (55% in 2016)¹⁹. The decrease in the figure corresponds to the assessment from the industry associations consulted, who assess that despite the initiatives, the level of digital skills of the workforce did not significantly improve since 2015. Initiatives such as Croatian Makers and IT education for the safer tomorrow are assessed as good initiatives, but they lack promotion and interest, resulting in low take-up. Additionally, these are private initiatives.

There is a lack of governmental programmes addressing digital gaps in manufacturing. This lack of programmes requires some actions, notably as manufacturing accounts for 16% of the Croatian GDP. Croatian universities are ready to tackle these problems, but they also need to find sufficient funding. How to develop skills and qualifications for the modern industry remains one of the main challenges for Croatia. The second challenge is also to improve public servants' digital skills. It is also challenging to educate teachers on how to teach digital skills to people outside the ICT sector²⁰.

Despite challenges and perceived lack of initiatives, Croatia can praise itself with some good examples as well. For example, the pilot project 'E-schools; Establishing a System for Developing Digitally mature schools' can be considered as an example of good practice. E-schools is an informatization project aiming to reform the Croatian primary and secondary school system by introducing digital content and technology to schools. In the first phase of the project (2015-2018) 10% of Croatian schools (151 schools) are targeted, in the second phase (2018-2022) the project will target 50% of schools (700 schools). The project is listed by UNESCO as one of the 12 most successful projects in the field of digitisation²¹.

2.4 Support mechanisms

The Commercialisation of Innovation in Entrepreneurship grant programme²²

The Ministry of Economy, Entrepreneurship and Crafts published in January 2017 a call to increase commercialization and innovation of Croatian companies, targeting especially Croatian SMEs. The purpose of this call is to support projects targeting new and high value-added products and services that have a positive impact on business performance and growth, and offer market potential at the international level. Grants awarded through a permanently open call for submission of project applications amount to the total value of 15,339,074.27 EUR (HRK 114,000,000.00).

The call is intended to offer support to SMEs in order to increase the following activities: 1) Innovation support for MSPs, 2) Support for process innovation and business organization and 3) Aid of low value (provided that the grants awarded in points 1 and 2). The minimum amount of grants that can be awarded to a particular contractor for this call amounts to 102,260.50 EUR (HRK 760,000.00), while the highest amount of grants that can be awarded to an individual entrepreneur is 1,022,604.95 EUR (7,600,000.00 HRK). It is expected that around 100 SMEs will benefit from funds awarded from this call²³.

Law on State Aid for Research and Development Projects^{24,25,26}

The Croatian Law on State Aid for Research and Development Projects of July 2018 aims to provide support in the form of tax reliefs to companies engaged in research and innovation development. The largest amount of reduced profit tax that will not be payable for this support should amount to 300,000 EUR, and it will amount between 50,000 EUR for feasibility studies up to 300,000 EUR for basic research. The new incentive regime proposed by the Law includes:

200% deduction for fundamental research costs; 150% deduction for industrial research costs; 125% deduction for experimental development costs; and 150% deduction for feasibility study costs. Deductions with respect to industrial research and experimental development may be further increased for small and medium enterprises. For the implementation of the Law in the first year, the Ministry of Economy, Entrepreneurship and Crafts secured in the State Budget for the first year of 2018 the amount of HRK 1,200,000.00 (161,583.52 EUR) for the needs of external evaluation of the eligibility of research and development projects.

3 Conclusions

Croatia belongs to the low-performing group of countries according to DESI, ranking 22nd in 2018. The country exhibits some strengths; however, it also faces significant challenges and the progress made in several DESI dimensions has been slow.

One of the biggest strengths of Croatia is human capital. The number of STEM graduates and employed ICT specialists has increased. Croatians also exhibit strong entrepreneurial culture and feel ready to start new projects and consequently take-up the digital technology. However, the country still faces challenges and a lot of work still needs to be done to enable sustainable economic and societal foundations for the country's digital transformation. The country lacks focused national strategy on the industry's digitisation and needs to update and modernize its regulatory framework. The governmental efforts could also increase in the field of skills development, since a lot of the initiatives responsible for the training of workers are private initiatives.

Nevertheless, it can be assessed that the government is showing a proactive approach and is increasingly aware of the work that still needs to be done. The majority of initiatives started in 2016 or in 2017, the highest number of initiatives being developed under Pillar 2, Pillar 3 and Pillar 4 of the DEI Initiative. The increased efforts are also reflected in the establishment of a Central Office for the Development of the Digital Society. Similarly, a national Strategy for Digitisation of the Industry is currently under preparation.

The following table provides an overview how the different digitalisation initiatives implemented in Croatia have been funded, based on the data available.

Table 8: Breakdown for the financing of initiatives

	Pillar 2	Pillar 3	Pillar 4	Pillar 5
	Digital Innovation for all	Partnerships and industrial platforms	Regulatory framework for digital age	Preparing for digital future (skills)
HUB 385- Centre for Knowledge, Creativity and Innovation	Private sources			
Algebra LAB - Open Innovation Lab	ESI Funds, ERDF			
CroTechHub	Private sources, membership fees			
CROBOHUB Croatian Robotics Digital Innovation Hub	Horizon 2020, ERDF, national funding programmes, private funding, private resources			
National strategy and Action plan for Cybersecurity			N/A	
Electronic Communications Act			N/A	
National Information Infrastructure Council			N/A	
Electronic Signature Act			N/A	
Croatian Makers				Local philanthropes, external sources, including citizens (through public crowdfunding campaigns and general donations), private companies, national and EU development funds
IT Education for Safer Tomorrow				179,363.58 EUR
Support mechanism: The Commercialisation of Innovation in Entrepreneurship	15,339,074.27 EUR			
Support mechanism: Law on State Aid for Research and Development Projects	161,583.52 EUR (2018)			
Total spending	At least 15,680,021.37 EUR			

The box below presents a good practice initiative from Croatia.

Box 1: Good practice

IT Education for Safer Tomorrow²⁷

IT Education for Safer Tomorrow is an ESF project implemented by Algebra (adult education company). 'IT Education for Safer Tomorrow' aims to develop five educational programmes for adult learners in information literacy and computing. The main objective of the project is to increase the number of adult learners in education beyond initial education, to develop new competencies in computing and information literacy for unemployed adults 34+, adults 15-34 without any qualification, and adults with lower levels of qualifications. The project offers qualification for Web Designer, Computer Operator, ECDL specialist, System and Network administrator, and Computer programmer for Internet applications. The project is implemented in a partnership with regional offices of the Croatian Employment Service (District Office Vukovar, District Office Sisak, Regional Office Rijeka). The call for the project was designed by the Croatian Ministry of Labour and Pension System and the PES. Education in ICT was chosen because the digital economy is the fastest-growing sector. 'IT Education for Safer Tomorrow' is an example of a successful private initiative that addresses the issue of the digital skills lack in Croatia. The project is also a good example of a collaboration between public and private institution.

To conclude, the table below provides a general overview of the main digitalisation initiatives implemented in Croatia, the level of take-up and perception of their impacts as well as the overall progress Croatia has made so far with regard to digitalisation.

Table 9: Total input output overview

		Pillar 2	Pillar 3	Pillar 4	Pillar 5
		Digital Innovation for all	Partnerships and industrial platforms	Regulatory framework for digital age	Preparing for digital future (skills)
Application	Name of key initiatives (start dates in brackets)	CROBOHUB Croatian Robotics Digital Innovation Hub, CroTechHub, Algebra LAB - Open Innovation Lab	HUB 385- Centre for Knowledge, Creativity and Innovation	National strategy and Action plan for Cybersecurity, Electronic Communications Act, National Information infrastructure Council, Electronic Signature Act	Croatian makers, IT Education for Safer tomorrow
	Funding (total amount and period)	N/A	N/A		179,363.58 EUR
	Industries addressed	Metal & Process industry; Aerospace; Transport & Logistics; Hospitality & Tourism; eGovernment; Fast-Moving Consumer Goods (FMCG); Health and quality of life; Energy and sustainable environment; Transport and mobility; Security and Food and bio-economy.	Information and Communication	All, public sector	Education/schools
	EU programme involved	Horizon 2020, ERDF	ESI Funds, ERDF	N/A	ESF
Usage	Perception of initiative	Policymakers have very low awareness and knowledge about digital transformation and digital economy (1/5)		No significant improvement in the regulatory framework, accompanied with slow enforcement (1/5)	Initiatives are not considered as very useful (2/5).
	Take-up	3 DIHs	N/A		N/A
Outcomes	Perception of outcomes	Take-up of digital technologies is considered as low (2/5)	Level of digital innovation is low, especially in traditional sectors (2/5)	The regulatory framework is not considered as fit for the digital age.	The required skills and labour resources are considered to be somewhat available to enable digitization (3/5).
	Outcome metrics	DESI ranking: 22nd in 2018 (23rd in 2017) DTII ranking: 17th in 2018 (16th in 2017) DTEI ranking: 26th in 2018 (25 th in 2017)		Between 2015 and 2017, total capex spending in Croatia increased by 12.4%.	The number of people employed with ICT specialist skills increased by 25% between 2015 and 2017. In the same period, the share of

			enterprises providing training to develop ICT skills fell from 25% (2015) to 23% (2017).
	Change in outcomes	From 2017 to 2018, Croatia improved from 23rd to 22nd rank in the DESI ranking on integration of Digital Technology.	
End-goal	Productivity growth	Between 2015 and 2017 real productivity per person employed slightly decreased, from 1.1% in 2015 to 0.7% in 2017.	
Summary		Croatia recently launched a number of initiatives with focus on pillar 2,3 and 4, but it is still too early to determine the outputs and outcomes of these.	

ANNEX 1 List of stakeholders interviewed

Type of stakeholder	Name of organisation
National Authority	Working group for digitizing of European industry, Agriculture, Health and Care
Industry representative	Regional Development Agency
Industry representative	Ericsson Nikola Tesla d.d.

ENDNOTES

¹Digital Transformation Monitor 2018.

² Low-performing countries are: Romania, Greece, Bulgaria, Italy, Poland, Hungary, Croatia, Cyprus and Slovakia (DESI Country Report 2018). Available at:

³ Digital Transformation Monitor 2018. (2018). Available at: https://ec.europa.eu/growth/toolsdatabases/dem/monitor/sites/default/files/Digital%20Transformation%20Scoreboard%202018_0.pdf

⁴ Research and Innovation Observatory – Horizon 2020 Policy Support Facility. (2018). Smart specialisation strategy of the Republic of Croatia for the period from 2016 to 2020 and the Action plan for the implementation of the Smart specialisation strategy of the Republic of Croatia in the period from 2016 to 2017. Available at: <https://rio.jrc.ec.europa.eu/en/library/smart-specialisation-strategy-republic-croatia-period-2016-2020-and-action-plan>

⁵ Ministry of Public Administration. (2017). E-Croatia 2020 Strategy. Available at: <https://uprava.gov.hr/UserDocImages/Istaknute%20teme/e-Hrvatska/e-Croatia%202020%20Strategy%20-final.pdf>

⁶ Ministry of Economy, Entrepreneurship and Crafts. (2018). Industrial Strategy of the Republic of Croatia. Available at; <https://www.mingo.hr/page/kategorija/industrijska-strategija-republike-hrvatske-2014-2020>

⁷ Republic of Croatia. Central State Office for the Development of a Digital Society. (2018). About the Central Office. Available at: <https://rdd.gov.hr/o-sredisnjem-drzavnom-uredu/9>

⁸ Based on the interview with the representative of the national authority.

⁹ <https://hamagbicro.hr/medunarodna-suradnja/smart-factory-hub/>

¹⁰ Measures facilitating the adoption of new technologies by industry

¹¹ Measures to develop technology building blocks

¹² Based on the interviews conducted with the representative of the national authority and representatives of the industry associations.

¹³ Ibid.

¹⁴ Digital Transformation Scoreboard 2018. (2018). Available at: https://ec.europa.eu/growth/toolsdatabases/dem/monitor/sites/default/files/Digital%20Transformation%20Scoreboard%202018_0.pdf

¹⁵ Ministry of Public Administration (2018). National Information Infrastructure Council. Available at: <https://uprava.gov.hr/o-ministarstvu/ustrojstvo/uprava-za-modernizaciju-javne-uprave-e-hrvatska/vijece-za-drzavnu-informacijsku-infrastrukturu/14391>

¹⁶ Based on the interviews with the representatives of the Industry Associations.

¹⁷ Ibid.

¹⁸ Based on the interviews conducted with the representative of the national authority and representatives of the industry associations.

¹⁹ Figures provided from Eurostat

²⁰ Based on the interview with the representative of the National Authority.

²¹ ESF Transnational Platform. (2018). 7th meeting of the ESF Thematic Network on Learning and Skills. Available at: https://ec.europa.eu/esf/transnationality/filedepot_download/1541/1694

²² Ministry of Economy, Entrepreneurship and Crafts. (2018). Commercialization and Innovation in Entrepreneurship. Available at: <https://www.mingo.hr/page/komercijalizacija-inovacija-u-poduzetnistvu>

²³ Digital Transformation Scoreboard 2018. (2018). Available at: https://ec.europa.eu/growth/toolsdatabases/dem/monitor/sites/default/files/Digital%20Transformation%20Scoreboard%202018_0.pdf

²⁴ Government of the Republic of Croatia. Final Proposal for the Law on State Aid for Research and Development Projects. Available at: <https://vlada.gov.hr/UserDocImages//2016/Sjednice/2018/05%20svibnja/99%20sjednica%20V/RH//99%20-%207.pdf>

²⁵ Official Gazette of the Republic of Croatia. Law on State Aid for Research and Development Projects. Available at: https://narodne-novine.nn.hr/clanci/sluzbeni/2018_07_64_1306.html

²⁶ Orbitax. The Tax Hub. Croatia. Available at: <https://www.orbitax.com/news/archive.php/Croatia-Introduces-New-Incenti-32492>

²⁷ ESF Transnational Platform. (2018). 7th meeting of the ESF Thematic Network on Learning and Skills. Available at: https://ec.europa.eu/esf/transnationality/filedepot_download/1541/1694