

Perspective of smart enterprises development in the Republic of Croatia

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Abstract: - This paper show the importance of digital transformation in Europe and the Republic of Croatia. Technological-driven changes affect all industries and digital transformation is becoming a necessity for achieving global competitiveness. In the EU and Croatia, it is not sufficiently accepted that today's market requires digital transformation in economy as whole and adaptation to the digital age. The aim of this paper is to systematically present and explain the concept of a smart enterprise, analyze the characteristics, significance and benefits of smart business, describe, analyze and show the results of the implementation of measures, strategies and programs adopted by the European Union and the Republic of Croatia to stimulate digital transformation and smart business development and digital economy.

Key-Words: - digital transformation, industry 4.0, knowledge society, smart company, strategy

1 Introduction

In the new smart digital economy, many ways of doing business quickly become obsolete, and changes driven by the development of technology and society take place in all sectors. A smart enterprise has become the foundation for stimulating growth and transforming the business environment. „Digital economy already contributes up to 8% of GDP in the G-20 countries, encouraging growth and job creation“ [30]. Studies have shown that small and medium-sized companies in Europe are growing 2 or 3 times faster when they adopt new digital technologies, or when they are transformed into smart enterprises. Digital leaders who successfully carry out transformation into smart enterprises

surpass their competitors. New technology solutions, such as mobile and social solutions, data analysis and digitalization of production offer new opportunities for improvement in smart enterprises and in the economy of knowledge. However, this huge potential is insufficiently exploited, and many companies have not been digitally transformed into a smart company, and very few of them are exploiting the full potential of digital technologies, such as: mobile, social networking, cloud computing and data analytics. The government and business leaders across Europe should make it a priority to encourage and support small and medium-sized businesses in using the latest digital technology and gain additional economic benefits. The Republic of

Croatia has recognized the importance of smart companies and the smart economy to an extent and has adopted a smart specialization strategy in which it has shaped a clear long-term strategy to boost competitiveness in the global market by increasing investment in R & D, innovation and human capital. These are the results of the implementation of the Europe 2020 strategy and of Croatia's smart specialization strategy.

This paper is divided into several chapters. After the introduction follows the chapter on smart enterprises, where all the major features and trends of smart enterprises are given. Chapter 3, Incentive to the development of smart enterprises, speaks of strategies that encourage and whose realization creates prerequisites for smart business development. Chapter 4, shows how the Republic of Croatia is involved in the realization of these strategies. Finally, Chapter 5 gives the main emphasis of incentives and perspectives for the development of smart enterprises.

2 Defining a smart enterprise

A smart enterprise by some authors encompasses the entire smart, ie digital economy and industry 4.0 that is needed for the existence of a smart enterprise, while some authors limit the definition solely on the technology and new business concepts which smart enterprises adopt through its transformation.

The concepts that are always connected with a smart enterprise are: industry 4.0, digital transformation, digital economy and knowledge society

„Industry 4.0 is a strategic approach to linking systems based on Internet technology to establish communication between machines, people, products and business systems“[34]. The main goal is to create smart enterprises through digitizing business and production processes. This can increase the quality, reduce production, services and administration costs, and increase the efficiency of production, service, administration and increase business success.

Digital transformation is, in the simplest terms, the process of organizational change by using digital technologies to improve the performance, reduce overall business costs, and increase production efficiency and productivity.

Digital economy is an economy based on smart digital technologies and the intensive use of information communication technologies in all areas of the economy. This includes internal activity of organizations (companies, states, associations, non-profit organizations etc.), and external activities (various transactions) between organizations

themselves, between organizations and individuals, as well as individuals (individuals and consumers as well as citizens) [39].

The Society of Knowledge can be defined as a society in which human knowledge, skills and abilities are the most important developmental resources and drivers of economic and social changes [2].

According to Joe Lonsdale [36], smart enterprise is a new kind of computing enterprise that uses huge amounts of data to empower knowledge workers who create new value by applying knowledge and analysis of data relevant to their tasks in solving the most complex issues. In this way, smart enterprises can reduce inefficiency, completely remove "scratch" from production, enhance collaboration at a higher level through ICT integration, but also handle a large amount of collected and unused data in a new sense.

Smart entrepreneurship is a concept that involves changing the way organizations are using technology and thinking about technology - from support role to strategic role in business [25].

A smart enterprise uses technology to differentiate and achieve a competitive edge. Technology is considered to be the base tool that can enable and improve all business activities, and not just as a support function.

Smart business intelligence platforms, vertically focused on their environment, integrate heterogeneous large data sets, structure data in a useful way, and help make better decisions. They often have a network effect which is generated by sharing data between different industry stakeholders, where the value of the platform is growing exponentially with the number of users [19]. Data sharing (network performance) motivates companies, which are part of the verticals, to adopt technologies that enable them to create and use a data platform, whose value grows with the number of industry participants.

One of the key features of a smart business is connecting each other at different levels to optimize business processes. A smart company uses a heterogeneous information system, stores and manages huge amounts of structured and unstructured digital information that interconnects and thus acts in an agile environment.

As mentioned above, a smart enterprise is a broad term and, to make it even more understandable, it is necessary to define the environment in which it operates and the technology that binds it. Some of the notions (except for the aforementioned) are: big data, cloud computing, Internet of things, artificial intelligence and real-time decision.

Big Data implies a large amount of structured, semi-structured and unstructured data collected from different sources and for various purposes. Analyzing and structuring such data is a challenge for today's industry as well as the global economy, since analysis of such data creates a competitive edge and generates new products and services [15]. It is crucial to collect and select relevant information in time to keep the enterprise competitive on the market [33]. The greatest value that managers and employees can bring to the strategic decision-making process is not their current knowledge of the issue, but the ability to look for data and solutions and to make effective use of feedback [31].

Cloud Computing is a software model that allows access to shared resources, enables businesses to store and process data at a minimal cost of control, often over the Internet. It is based on sharing resources to achieve coherence and economy of scale.

Internet of Things (IoT) is connecting people, things, and devices over the Internet. From the industrial production position it includes linking IT systems to manufacturing processes, internal and external facilities, networking between suppliers and customers, Machine to Machine, M2M and employee communication [41].

Artificial Intelligence is a part of computer science that develops the ability of a computer to perform tasks that require some form of intelligence, that is, to make them be able to deal with new opportunities, to make new concepts, to make conclusions, to understand the natural language, recognize products, etc. [43].

The growth in business dynamics has influenced the need for faster business decision-making, which has induced the emergence of a new concept within business intelligence. It is predicated in the mindset of business intelligence decision-making in real-time. As a new concept that has just emerged from the theoretical framework, the concept of real-time decision-making clears the differences between rational strategic and operational decision-making, enabling the operating decision-making level to use platforms and tools that have only recently been available for strategic decision-making [1].

In order for a successful transformation to a smart enterprise, the technology itself is not enough, the enterprise needs to re-examine every aspect of their business. Enterprises need to develop new business models, review existing operating models, refresh indicators that measure their business success, and improve the methods of finding and developing digital talents.

Smart enterprise is moving away from the traditional way of thinking. It understands that the only constant in the environment is change, and uses technology to respond to changes in the business environment. To a smart enterprise, technology has a strategic role, not just the role of support. Using new technologies smart enterprises increase efficiency and productivity, stores, processes and interconnects large sets of data that enable real-time decision making. A smart enterprise invests in the knowledge of workers, finds the best digital talents because the combination of technology and knowledge society means sustainable growth and development and competitive advantage.

2.1 Trends in smart business development

The beginning of all industrial revolutions took place in the industry, causing huge social changes. Industry development is shown in Figure 1[21].

The first three industrial revolutions are the result of the introduction of mechanization, electricity and information technology.

| | 1 st Industrial Revolution 1800 | 2 nd Industrial Revolution 1900 | 3 rd Industrial Revolution 1970 | Industry 4.0 2015 |
|-------------|---|---|---|-----------------------|
| Information | Mechanization | Decentral mechanization | Automation | Autonomy control |
| Principles | Machine productivity | Taylorism/ scientific management | TQM / Green and Lean Production | Smart Factory |
| Power | Analog communication | Centralized control | Decentralized networks | Cyber-Physical System |

Figure 1 Industrial Rvolutions through the history

The introduction of the Internet into production started the fourth industrial revolution, based on self-management, the smart factory model, and the cybernetic-physical system.

In the current industrial revolution, the industry did not directly begin the transformation. The main driving force is considered to be the invention of social networks and intelligent devices used by workers of manufacturing companies. The development of this relationship promotes the development of the manufacturing sector [26].

An important element in introducing networked, smart factories is energy savings. It has been shown that applying the concept of Industry 4.0 can achieve great savings in energy consumption, which is of crucial importance for competitiveness [18].

Also, one of the key issues in today's Internet world is security. Hackers inside and outside companies have new opportunities to attack, undermine, and break the growing smart enterprises. With the increasing risks of corporate spying and digital theft,

security is becoming more and more important in organizations which are transforming into a smart enterprise [20].

Smart digital companies can now access, store, aggregate, and analyze a large amount of diverse data to inform critical projects. Examples of this digital data are: data from sensor networks, social networking data, government transactions data, healthcare data, logistics and network distribution data, personalized education data, etc.

“Over time, five major trends have dominated Silicon Valley: Electronic Tools, Semiconductor, Enterprise, Telecom, and Consumer. A sixth trend has emerged - Smart Enterprise” Figure 2 [36]. The smart enterprise wave will disrupt every sector of the global economy and improve productivity within those sectors, because it change decision-making processes [36]. The more complex decision-making processes are the result of the enormous increase in digital data, whose doubling time is shrinking. This increase has brought a corresponding increase in data complexity, formats, and silos that require sophisticated technology platforms to help knowledge workers process and leverage the information effectively.

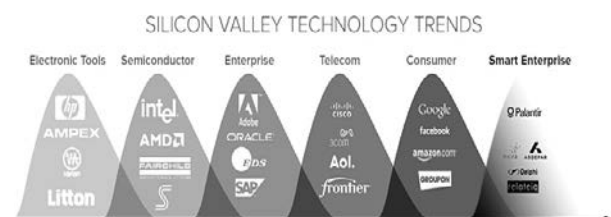


Figure 2 Technological trends Silicon valleys [36]

Firms like SAP and Oracle led the first enterprise wave by streamlining back-office processes to make companies more efficient and successful. Enterprise software helped push paper faster and speed up routine business tasks and brought basic automation to linear processes, such as payroll, accounting, supply chain and inventory management [36].

Telecom companies have created the prerequisites for generally accepted and intensive communication and networking of all the participants of the society, and the simple exchange of multimedia content. Further development of technology and network connectivity enabled users to interactively communicate via social networks. All this leads to the generation of huge amounts of digital data / information and represents a step towards digital transformation to a smart enterprise.

A smart enterprise, as a technological trend that is an upgraded version of the previous ones, is aiming at increasing flexibility, improving quality and

improving production, and thus increasing productivity.

Transformation into a smart enterprise is not easy. The existing technological infrastructure is not appropriate for the new information challenges, which makes the process very difficult, so there are numerous mistakes and problems in adding new functionalities. Implementations are long-lasting and complex. In the process of transforming into a smart enterprise, companies review and change the old technology infrastructure. Engineers address the technological issues involved in the integration of incompatible data (database, tables, spreadsheets, machine generated data, semistructured and unstructured data, etc.) into conceptual structures that knowledge workers can intuitively access and manipulate.

3 Incentives for the development of smart enterprises

Digitalization of the industry and the emergence of smart enterprises deeply penetrates into all parts of industry and society. It increases competitiveness through innovative and sustainable production of goods and services, promotes economic growth, creates jobs and achieves prosperity. However, digitization of the industry is also a challenge that requires active participation of social partners and public bodies in the implementation of digital transition and is a constant task that will forever impinge on businesses, trade unions and policy makers. EU members are committed to achieving a strategy for investing more in R & D, innovation, knowledge and achievement of regional development by concentrating resources and strengthening comparative advantages within the country.

This requires significant additional investment in digital skills and infrastructure at EU, member states and private sector level. The completion of the EU's single digital market requires a clear and stable legal environment to encourage innovation, address the problem of market fragmentation and enable all stakeholders to exploit new market dynamics on fair and balanced terms. This will provide a fundamental climate of trust that is key to the trust of the company and the consumer [16].

Surely, the most important strategy for support of smart business development is the Europe 2020 strategy, but there are also the Smart specialization strategy as well as DESI index which is used as a tool of measurement of achievement of goals.

3.1 Europe 2020 Strategy

Like most regions around the world, Europe is going through a period of transformation. The world economic crisis erased the year of economic and social progress and exposed the structural weaknesses of its economy. In 2010 the European Union and the member states launched a sustainable growth strategy for the next decade: Europe 2020 strategy. It is devoted to the short-term challenges associated with the crisis, but also the need for structural reforms by stimulating growth measures needed for the European economy to prepare for the future. The EU has set five ambitious targets for employment, innovation, education, social inclusion and climate / energy, to be achieved by 2020 [40, 8]:

1. Increase the employment rate in the age group between 20 and 65 years to 75%.
2. Increase R & D investment to 3% of GDP.
3. Reduce greenhouse gases by 20% compared to 1990 levels; increase the share of energy from renewable sources to 20%; increase energy efficiency by 20%.
4. Reduce the rate of early school leaving to less than 10% and increase the share of highly educated people in the age groups of 30 to 34 years to over 40%.
5. 20 million less people should be at risk of poverty.

Each Member State has set its national targets for each of these areas, and the EU has agreed on a number of concrete measures at EU and individual levels. They also identified the most important areas of action that are considered to be the new growth drivers and job creators. These areas are represented through seven "leading initiatives"; Innovation Union, Youth on the move, A digital agenda for Europe, Resource efficient Europe, An industrial policy for the globalisation era, An agenda for new skills and jobs, European Platform against Poverty[40].

The seven initiatives mentioned above can be divided into three basic priorities - smart, sustainable and inclusive growth, achieved through their composition in individual national and regional programs and goals.

Smart growth is based on knowledge and innovation, and requires improved "quality of education, research, promoting innovation and knowledge transfer across the EU, full use of ICT and transfer of innovative ideas for growth and employment-generating goods and services. It is particularly important to stimulate absolute growth in investment in research and development, both by the state and private investors. Smart growth is achieved through three initiatives: the Innovation

union, the Digital Agenda for Europe Initiative and the "Youth on the move" initiative [37].

Productivity is the key driver of competitiveness, investment and growth. The link between innovation and productivity has been established through the impact of investment in research and development on productivity [35]. Europe faces a gap in productivity compared to major competitors. The annual rate of productivity per employee in Europe is lower than the US, and even lower than in China and South Korea. Such a gap creates a loss of investment interest and market share in global trade [32]. The shortage of investment over the past few years, with a drop of about 430 billion euros since its peak in 2007, will likely continue to hamper the creation of new jobs and negatively affect the ability of the EU to remain competitive in the long run [14]. The Innovation Union Initiative - Investing in R & D and innovation policy must act to counter social challenges, ie they must act in accordance with climate change, energy efficiency, lack of resources, human health and negative demographic changes. Among other measures of European and national programs designed in the 'Innovation Union', the reformation of national and regional R&D and innovation systems is also encouraged to stimulate excellence and the implementation of a smart specialization strategy [13].

Youth on the move, as set of initiatives for education and employment of young people, is part of the Europe 2020 strategy for smart, sustainable and inclusive growth. Young people on the move seeks to improve the education and employability of young people, reduce youth unemployment in line with the EU's broader goal of achieving 75% of the employment rate for a working-age population (20-64 years). This increases the importance of education and training of young people, encouraging them to take full advantage of the EU's benefits for studying or training abroad; encouraging EU countries to take measures that simplify transition from education to work. The EU's objective is to enhance the quality and competitiveness of higher education systems by standardizing quality, promoting informal learning, by increasing investment in the education system and by similar measures that would result in youth unemployment being reduced. The initiative encourages EU mobility with Erasmus and Marie Curie [37].

The Digital Single Market Strategy aims to open digital opportunities for people and businesses and to improve Europe's position as a world leader in the digital economy. A digitally unique market is one that ensures the free movement of people, services

and capital, and where individuals and businesses can easily access and implement online activities in fair competition and high levels of consumer and personal information regardless of their nationality or place of residence [40].

The Strategy of the Single Digital Market was adopted on May 6, 2015 and includes 16 concrete initiatives [5]. A unique digital market can create opportunities for new startups and enable existing companies to access more than 500 million people. Completing the digital single market could annually contribute EUR 415 billion to the European economy, create jobs and transform public services. Incorporating a unique digital market provides opportunities for people with digital skills. Enhanced use of digital technologies can improve access to information and improve employment opportunities. It can promote a modern open government. The strategy of a single digital market is based on three pillars: access, environment, and economy and society [5]. Access means better access to digital goods and services to consumers and businesses across Europe. The environment implies creating real and equitable market conditions for digital networks and innovative services. Economy and society maximize the potential of e-growth of digital economy, its goal is to speed up the introduction of super-fast Internet, to generate economic and social benefits from the single digital market for the population and the overall economy, to encourage and promote the development of online services. The initiative implies the development of e-infrastructure and global networking of researchers [37].

The modernization of existing European Electronic Communications Code offers a more attractive regulatory environment that will boost investment in top quality infrastructure across the EU. By the end of 2017, the European Commission will also update the European guidelines that will assist national telecommunications bodies in deciding when to intervene in markets. The WiFi4EU Initiative will help local authorities establish free Wi-Fi connections for everyone in EU cities and villages by 2020. On March 23, 2017, the EU ministers signed the declaration on financial support for the next generation of Computer and Data Infrastructures - the industrial project of the European Airbus dimension of the 1990s and Galileo in 2000. Thanks to € 6.7bn of public and private investments, the European Open Science Cloud will offer a virtual storage to 1.7 million Europe's researchers and 70 million scientific experts by 2020, to share and reuse data [40].

Consumers will be more convinced of the benefits of on-line trade and businesses expansion will be cheaper and easier thanks to the modernized EU contract rules. The proposed regulation on geo-blocking will ensure that consumers no longer face unjustified obstacles such as redirecting to a particular country's website or requiring payment by debit or credit card from a particular country [4].

Sustainable growth implies the development of an efficient economy that is both competitive and sustainable. The goal is to achieve sustainability by using 'green' technologies, thereby reducing pollution, increasing resource efficiency and maintaining a high standard of living. The development of new "green" technologies would increase competitiveness, but at the same time increase the use of renewable energy sources, they also contribute to greater ecological safety of European society. The European Commission, in order to help enterprises in their efforts to reduce their impact on the environment, developed Eco-Management and Audit Schemes [37].

There are two initiatives for sustainable growth achievement: The Initiative "New Skills and Employment Program" aims to create a modern market by promoting self-employment, flexible work, labor mobility and lifelong learning. The "European Platform Against Poverty" initiative seeks to create social and economic cohesion by promoting common and individual responsibility in combating social exclusion by providing basic rights to the poor through the promotion of the social and pension system [37]. Inclusive growth implies raising the level of employment in Europe, more jobs, especially for women, young people and older workers, helping people of all ages to anticipate and manage change through investment in their skills and training, modernization of the labor market and social welfare system, and ensuring the benefits of growth in all parts of the EU.

The EU's Inclusive Growth Goals include [40]:

„1. A 75% employment rate for women and men aged 20 to 64 by 2020, achieved by increasing the labor force participation rate, especially for women, youth, elderly and low skilled people and legal immigrants

2. Better education, in particular:

- reduction of the early school leaving rate below 10%

- at least 40% of highly educated in the age group 30-34 years

3. At least 20 million less people in or at risk of poverty and social exclusion.“

3.2. Smart specialization strategy

It has been confirmed that smart, sustainable, inclusive, and long-term growth can be boosted by investing in research and development, innovation and people. The European Union has launched the initiative of developing a smart specialization strategy as a new approach to economic development based on targeted support for research and development activities and innovations. The smart specialization strategy is an overall assessment of public sector governance capacities, and key fundamentals for innovation - research capacities and human capital [27].

The smart specialization strategy links all three of the Europe 2020 priorities, smart, sustainable and inclusive growth. It achieves smart growth through the transformation of the region into knowledge intensive economies, it promotes creativity and innovation. It steers the development of innovation and investment towards addressing social challenges through efficient use of resources and low-carbon production, thus stimulating sustainable growth. Smart specialization also contributes to the growth of the region by strengthening territorial cohesion, managing structural changes, creating new economic opportunities, investing in skills development, new jobs and social innovations [17]. The current strategies for fostering innovation have had several weaknesses:

- lack of international and inter-regional perspectives,
- were not in line with the industrial and regional structure,
- lack of regional resources exploration,
- excessive role of the state in determining priorities,
- copying ideas from other regions without taking local potentials into account [17].

The smart specialization strategy preparation requires an integrated and territorial approach with the aim of creating conditions for development as a whole, respecting regional differences. The smart specialization strategy will stimulate efficient use of public funds for research, it will stimulate technological and innovation development aiming at modernizing existing industries by stimulating structural changes and directing growth based on the increased innovation capability and research excellence [27].

3.3. The Digital Economy and Society Index (DESI)

Digital economy has become a key challenge for development of industry, science, society and public policy. In the effort to foster the development of the

digital economy, one of the priorities of the European Commission is to establish a connected Digital Single Market, as well as the adoption of common European regulations on data protection, telecommunications and copyright regulations, the development of advanced broadband infrastructure and the simplification of consumer internet purchase regulations. This will enable better functioning of cross-border provision of services, cross-border online trade, and definition of technical standards for the development of innovative technologies and solutions. All of this suggests creating conditions for a digital economy transformation based on ITC, knowledge, creativity and innovation. National economies need a strategic framework for the development of the digital economy, strategic documents aligned with the goals of the Europe 2020 strategy and the Digital Plan for Europe. The ICT sector is an important driver of economic development, a horizontal force that is the key infrastructure for linking and strengthening all sectors of the economy by strengthening its market position in the long term.

The success of implementing this strategy at national level and the progress of Member States in the numerous areas of digitization of the economy and society as a whole is measured by the European Commission through The Digital Economy and Society Index (DESI) [22].

DESI, an indicator of economic and social digitalisation, is composed of a package of relevant indicators structured in five dimensions [30]:

- „1. connectivity (how widespread, fast and available is broadband connection),
2. human capital,
3. use of Internet (the most common user online activities, from news search to online shopping),
4. Integration of digital technology (on which level of development are the key digital technologies e-invoices, cloud services and online trade),
5. digital public services (e-government and e-health).“

DESI overall index is usually calculated as the weighted average of the 5 DESI dimensions with the weights selected by the user.

4 Smart enterprise development strategies in the Republic of Croatia

By joining the European Union in 2013, Croatia has committed itself to addressing the existing challenges by implementing strategies for investment growth in R & D, innovation, knowledge and achieving regional development by

concentrating resources and strengthening comparative advantages within the country. According to the Europe 2020 strategy, the Republic of Croatia has set the following goals [12]:

- „1. Increase the employment rate in the age group between 20 and 65 years to 62.9%
2. Increase R & D investment to 1.4% of GDP.
3. Reduce greenhouse gas emissions by 11% compared with 2005 levels, increase renewable energy to 20%, increase energy efficiency by 20%.
4. Reduce the early school leaving rate to 4% and increase the share of highly educated people in the age group from 30 to 34 to 35%.
5. 1.22 million people less in or at risk of poverty and social exclusion.“

These objectives are in line with the three mentioned EU priorities: smart, sustainable and inclusive growth, and they are achieved through their composition in individual country and regional programs and goals.

Based on the support of R & D and innovation, the Smart Specialization Strategy [3] links all three Europe 2020 priorities. The Croatian economy through smart specialization should achieve the following goals by 2020 [29]:

- „1.Improving excellence in the Croatian scientific community and ensuring a stable flow of top researchers in order to improve Croatia's current and future competitiveness, especially in the realization of current and future social challenges.
2. Overcoming fragmentation in research and development and the differences between research and production systems through the development of innovation, research and innovation infrastructure, the application of a cluster of initiatives and the establishment of technical platforms.
3. Improving the competitiveness and economic growth of the Republic of Croatia through increased cooperation and transfer of knowledge between public scientific institutions and the business sector, encouraging business investment in innovation, research and development of high value-added goods and services.
4. Usage of cross-sectoral themes in creation of new economic activities, productivity boost of the Croatian economy and creation of new sustainable jobs.
5. Development of human resources.“

Finally, the achievement of the objectives and the success of the digital economy and transformation at national level is demonstrated by the Digital Economy and Society Index, which gives an insight into the level of digitization of the state. [3]

4.1. Results of strategy implementation in Croatia

In 2015 Croatia finally came out of a six-year recession. Growth before the crisis was based on household spending driven by loans and government borrowing, therefore the average deficit was around 7% while the debt level exceeded 80% of GDP. The crisis has also shown all weaknesses of the Croatian economy in many areas, leading to high unemployment and poor productivity. Although the Republic of Croatia has taken some legal and administrative measures in order to create a better business environment and strengthen the economy, it still lags behind the EU global competitiveness average. According to the Global Competitiveness Report 2016-2017 [24]. Croatia is currently ranked 74th out of 138 countries, which is a slight increase compared to 2012 when it was 81st.

Within the Europe 2020 Strategy, Croatia has good results in increasing the employment rate in the age group of 20 to 65 years. As reported by the European commission [9], employment of the mentioned age group in Croatia has been growing steadily since 2013, but it is still one of the lowest in the European Union. It rose from 57.2% in 2013 to 59.2% in 2014, and this trend continued in 2015 to 62.1%. In 2016 it reached a level of 61.4%. Croatia could achieve its national target of 62.9%, but it is still far below the average level of other EU member states.

As part of a reduction of greenhouse gas emissions, Croatia has reduced its greenhouse gas emissions in line with the Europe 2020 strategy. According to data from 2014, Croatia has reduced greenhouse gas emissions by 13.9% and increased its outflow by 4.9%, which is above the EU average.

Education is one of five pillars of Europe 2020's growth strategy, which seeks to achieve a broad range of objectives. EU member states committed themselves to reduce the average number of early school leavers to less than 10% by 2020 and to blend education and social policy. According to European Commission's statistics on education and training at the regional level [10], Croatia is significantly below the EU average and has one of the lowest rates in all member states. The rate of early school leaving from 18 to 24 years in Croatia is 2.7%, which is one of the key contributions to the Europe 2020 program. However, Croatia has a relatively small number of highly educated people. The share of highly educated population in the working-age population in 2016 was 20.2%, while the European average was 26.5%. This strategy seeks to increase the rate and quality of education, and is striving for the competences of Croatian

experts to be fully aligned with European. Progress is visible every year. The rate of higher education for the age group of 30 to 34 in Croatia is continuously increasing from 2012 to 2014, with a significant increase from 25.6% in 2013 to 32.2% in 2014, as stated in Europe 2020 Headline indicators by European Commission. Croatia is on its way to achieving its national target of 35%, although its results are still far below the EU average of 37.9%. Smart specialization promotes knowledge-intensive activities, and the basic precondition for their development is the existence of highly educated population, especially in the areas of science, technology, engineering and mathematics. Although the number of researchers in Croatia is increasing each year in the observed period from 2010 to 2016, it is still far below the EU average. In 2016 it was almost half the size compared to the European Union average. The comparative growth of human resources in science and technology in Croatia and Europe is noteworthy. However, its volume is considerably smaller in Croatia.

Due to weaknesses in the education system, it is not easy to enter the labor market to those who gain a diploma, and it is not easy for adults to re-engage in the education system. The anticipated reform of the education system has been postponed, and the efforts to ensure the labor force's ability to acquire the skills needed in the labor market is insufficient. Improving skills of adults and unemployed people is not among the priorities, despite the direct link to productivity and employment.

Nevertheless, Croatia lags behind in the area of investment in R & D. Although investment in research and development has been growing steadily since 2010, Croatia's investment of 0.85% of GDP is still well below the EU average of 2% and its 2020 target of 1.4%. The level of investment intensity in R & D is the lowest in the EU, and Croatia as a moderate innovator achieves below-average results in all dimensions. Croatia has a low share of business investment of 0.36% of GDP, which is far below the EU average, which in 2015 amounted to 1.09% [11]. Wherefore, unlike the Republic of Croatia, the relationship between the public and private business sector is reversed in the EU, ie, most of the investment comes from the private sector. From the above stated it can be concluded that the private sector in Croatia is characterized by weak technological capacities and weak innovation capacities. The need to improve the research and development capability in the private sector is covered by the Croatian Smart Specialization Strategy (2015) and the National Innovation Strategy (2014) [28]. The problem of investing in

research, development and innovation is very complex in Croatia, starting from insufficient knowledge-intensive sectors, lack of skilled workers due to inadequate education system, insufficient incentive structure and focus on low and medium-tech sectors. The analysis of level of business sector investment in research and development presents the state of innovation, science and technology potential in the country.

Europe's Digital Progress Report [6] follows the progress of Member States with regard to their digitization, based on quantitative data from the The Digital Economy and Society Index and qualitative country-specific policy data. The Digital Europe Progress Report is organized into five chapters: connectivity (fixed broadband, mobile broadband, speed and broadband access prices), human capital (Internet access, basic and advanced digital skills), Internet usage (how much citizens use Internet content and participate in communication or online transactions), digital technology integration (digitalisation of enterprises and e-commerce) and digital public services (e-governance).

According to European Digital Progress Report [6], Croatia is ranked as 24 of 28 EU member states and its level of digitization is devastating in comparison to the EU average, especially in the area of connectivity, which takes into account the following sub-categories [7]: household coverage of fixed broadband Internet access, the density of fixed broadband Internet access connections in relation to the number of households, the density of mobile broadband connections in relation to the number of inhabitants, the coverage of households by 4G networks, the use of radio frequency spectrum for broadband Internet access, household coverage of fixed broadband high speed Internet access (new generation grids), fixed- broadband Internet access (above 30Mbit / s) in relation to the total number of broadband connections and the share of fixed broadband access prices to the parity of purchasing power in total income.

Although the availability indicator of fixed broadband networks of high speed improved in absolute terms, just as the utilization of such networks which increased from 3% to 10%, both indicators are still far below the EU average. Poor results in the area of utilization are the result of various factors, from limited demand for broadband networks of high speed to financial accessibility. Croatia is the country with the most expensive subscription for stand-alone fixed broadband access across the EU, which is 2.9% of average gross income (compared to the EU average of 1.2% of average gross income).

According to the Ministry of Economy data, there was an increase of Internet users by 5% in 2017. There has also been some improvement in digital skills. It's estimated that 55% of Croatia's population has basic digital skills, which is slightly less than the European average of 56%. However, as stated in European Commission's Education and training overview for Croatia, there has been no increase in the number of employees in the field of information and communication technology, as well as no increase in the number of people with a degree in science, technology and mathematics (STEM). Employers state that it is difficult for them to find information and communication technology specialists. Interest in science, technology and mathematics is low and is characterized by a high rate of withdrawal, so it is necessary to introduce certain measures to change this trend. There is currently no strategy for digital skill challenges in Croatia, but a number of projects, activities and initiatives have been launched. A large number of adult education institutions organize training courses for different jobs in the information technology sector. Within these courses, specialist courses for ICT professionals are offered as well. In addition, there are plans for training measures and acquisition of basic digital skills for the low-skilled population.

According to digital skills indicators for 2016, Croatia is in step with the European average in most segments, especially in the segment of average or above-average digital skills. In Croatia, 98% of Internet users have average or above average digital capabilities in the area of information (the ability to find information over the Internet), 80% in the area of editing content (using word processing software, presentations), and 75% of users have average or over average skills in all domains. However, we are far below the European Union average in the field of digital skills in the domain of communication (receiving or sending e-mails, participation in social networks, using calls or video calls over the Internet) and computer use at work, which is a visible bad state of smart transformation of Croatian companies.

Croatia has made some progress in the area of digital technology integration in the past year and is above the EU average in some areas. Although there was no increase in the percentage of companies using RFID technology, with 4.7%, Croatia is above the European average of 3.9%. Also, as stated in Digitalization Economic and Social Indeks 2016, the percentage of Croatian companies using cloud services (16%) is higher than the EU average (13%). Furthermore, 18% of small and medium-sized

businesses use online sales, which is higher than the European average of 17%. Also, in cross-border online sales, 8.9% of Croatian small and medium sized enterprises outperforms the European average by 7.5%, but e-commerce turnover is 8.3%, lower than the European average of 9.4%. The e-invoice service is not overly popular and the result is worse than the previous year and is notably worse than the European average.

In Croatia, 18% of small and medium-sized enterprises (which is larger than the EU average) have on-line sales, but only 35% of large companies have on-line sales. Croatia is also below the EU average when it comes to e-commerce traffic, as well as in buying goods and services from individuals or companies. Despite the relative absence of national politics in the field of digitization, Croatian enterprises are medium-successful. Since digital technologies enable new ways of connectivity, collaboration and business, the Croatian economy needs to have a targeted digitization strategy to increase productivity, economic growth and innovation.

When it comes to e-government, Croatia has made some progress last year as stated in e-Croatia 2020 strategy [23], but it has fallen in the overall ranking since other countries have been moving faster. When it comes to open data, Croatia has made significant progress in the past year and the results are somewhat higher than the EU average. Due to the political situation in the past year, there was not much activity in terms of e-government services. Croatia now has a revised strategy "e-Croatia 2020"; The government plans to publish a revised Action Plan for e-government. An important role is the establishment of a Shared Cloud Services Center that will coordinate all ICT applications that various state institutions provide and manage (2300 targeted public bodies that should be involved in the project). Croatia plans to develop additional e-applications for citizens. Further development and implementation of e-government strategy, including e-business, can contribute to a successful e-government environment, which could bring significant savings in Croatia. Also, Croatia is currently working on establishing the Central State Office for the development of the digital society. The task of this office will be to support the Croatian government in the development of information and communication technology infrastructures and digital public services and in popularizing the development of digital society among citizens, the economy and the public sector.

5 Conclusion

In the new digital age, a smart company has become the foundation for stimulating economic growth and development and creating new jobs. Smart companies grow two to three times faster and surpass competitors who are not capable of responding to changes and market demands. New technological and technical achievements, Industry 4.0, digital transformation, cloud computing, IoT, big data, artificial intelligence, real-time decision-making offer a whole range of opportunities for upgrading companies into a smart enterprise as it's the only way to survive in the knowledge society. Everyone must take part in the development of smart enterprises, from entrepreneurs, consumers, academic community, and even to the state itself. All listed should create a digital transformation environment together, which is the basic prerequisite for smart business development.

State measures, programs and strategies which support the creation of a digital environment are the fundamental incentives for digital transformation and the development of smart enterprises and societies. Digital transformation affects all branches of the economy, and thus the success of every business, which all the factors in society should be aware of. Digital technologies affect business models, goods, services and open new markets, change the way business operates, and without adopting technological innovations, companies can not survive.

Croatia recognized the importance of smart enterprises and a smart economy, and adopted a smart specialization strategy in which it developed a clear, long-term strategy to boost competitiveness in the global market by increasing investment in R & D, innovation and human capital. At present, the Croatian economy faces great challenges and a new approach to development through the implementation of proposed measures within the Smart Specialization Strategy and the Europe 2020 Strategy is of crucial importance for further growth and development of the smart economy of the Croatia. With the innovation strategy Croatia ensures access to sustainable socio-economic development. Competitiveness of the economy depends to a large extent on its ability to introduce innovations. Given that Croatia is just beginning to realize the importance of investing in research and development, and the power of innovation and knowledge-based societies, the strategy of smart specialization is a very important strategic document. It is being implemented in Croatia for the first time, so it is understandable that the execution is extremely complex. Croatia has several major

obstacles which are preventing its greater economic growth. Innovative results of the Croatia over the last decades have been quite weak and have failed to meet expectations. The innovation system has been below its potential and without a particularly visible contribution to economic development. There are three key factors preventing innovation: the tax system, the lack of primary and secondary investment financing and the business environment. One of the structural problems faced by Croatia is the low volume of business investment in R & D despite the abundance of existing tax reliefs. High value-added products and knowledge-based services remain a negligible part of the export, while skills and technological capabilities are stagnating. There are numerous disadvantages in education that make progress impossible. The difference in ICT skills between the Croatia and the EU has a negative impact on participation in e-commerce, e-government, e-practice as a whole. It is necessary to introduce new policies and programs in the areas of education, smart skills development, technological advancement and innovation, because without these smart enterprises can not exist. Croatia also has a problem in providing adequate infrastructure for smart enterprises (low broadband access)

The business environment in Croatia continues to suffer from major disadvantages affecting the investment climate, ranging from too much bureaucracy resulting from the lack of transformation of public services into e-services, insufficiently developed e-infrastructure and the parafiscal charges which burden businesses, therefore, having a targeted strategy for smart transformation would be useful for the Croatian economy.

The strategy of smart specialization is certainly an opportunity for Croatia to build centers of excellence, competence centers and laboratories concentrating knowledge and highly educated human capital with the help of European funds. Creating such drivers of development creates opportunities for the development of scientific and innovative excellence in the future. By investing in knowledge, creativity and innovation, the ultimate result of innovation stimulation should increase the level of competitiveness of the Croatian economy and social welfare. Croatia, therefore, has the potential to carry out the transformation of the economy into a smart economy in which knowledge will be the ultimate driver.

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