

Chapter 3

Report on ICT in Education in Bosnia and Herzegovina



Dragoslav Vasiljević

3.1 Overview of the Country

3.1.1 History and Geography

Bosnia and Herzegovina is a country in the southeastern part of Europe, located in the west of the Balkan Peninsula. The main and also the largest city of the state is Sarajevo. According to the final results of the 2013 Population Census, the population is 3,531,159.¹

After elections in 1990, Bosnia and Herzegovina declared its sovereignty in October 1991, followed by a referendum for the disassociation of Yugoslavia. The war broke out in Bosnia and Herzegovina and it ended in 1995. On November 21, 1995, a peace agreement was signed in the city of Dayton, USA, which ended a three-year war (final agreement was signed in Paris on December 14, 1995).

3.1.2 Political System

There are three constituent peoples in Bosnia and Herzegovina, Bosniaks, Serbs and Croats. By its state organization, Bosnia and Herzegovina is unique in the world. Its design is of a republican character, although BiH does not function or is defined as a republic due to the complexity of the units to which it is divided (entities and

D. Vasiljević (✉)

Faculty of Electrical Engineering, University in East Sarajevo, East Sarajevo, Bosnia and Herzegovina, Bosnia and Herzegovina
e-mail: dragoslav.vasiljevic987@gmail.com

¹Agency for Statistics of Bosnia and Herzegovina. Available via http://www.bhas.ba/?option=com_content&view=article&id=52&itemid=80&lang=en. Accessed March 2019 (Online document).

cantons). It consists of two entities: the Republic of Srpska, the Federation of Bosnia and Herzegovina, the District of Brčko.

The Presidency of Bosnia and Herzegovina consists of three members, one representative of each constituent people. The Parliamentary Assembly is the highest legislative body of Bosnia and Herzegovina. It consists of two houses: the House of Peoples and the House of Representatives.

3.1.3 Current Situation of Economic Development

In 2017, the estimated economic growth rate of around 3% in relation to the previous year is a continuation of the economic recovery trend in BiH, which is largely the result of favorable economic trends in EU countries and to a lesser extent in the countries of the region. The nominal gross domestic product (GDP) of Bosnia and Herzegovina (in millions of KM, 1 km is about 0.5 EURO) for 2017 was 31,862.²

The average number of employed persons in BiH in the period I-XII 2017 is 746.3 thousand, which is 2.8% more than that in the same period of the previous year. Although the number of employees in BiH increased in almost all areas of activity, the most significant growth was in the area of industrial production, trade, hotels and restaurants.

While official data on investments for 2017 are currently not available, the assumption is that BiH's investments that account for around 20% of GDP have stagnated so that their contribution grows neutrally. Overall, investments in BiH did not recover from the pre-crisis period when they amounted to 26.5% of GDP.

When it comes to economic developments in Bosnia and Herzegovina for 2017, based on available data with certainty, it can be concluded that they were in the sign of an external sector, where the foreign trade of goods is particularly high. Namely, during the year 2017, according to the BIHAS data, Bosnia and Herzegovina recorded double-digit growth rates of total trade, exports and imports of goods. The increase in export demand and the prices of certain export products (metals and energy) resulted in an increase in BiH. of goods exports of 17.4% compared to the previous year.

3.1.4 The Status Quo of Science and Technologies

Education in BiH does not change even 20 years after the end of the war. The teaching methods in the primary and secondary schools are that teaching staff still teach, and children write and then reproduce through written or oral examination. Grades are

²*Environmental and social management framework for Bosnia and Herzegovina.* Available via https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mps/Documents/Sava%20Drina%20ESMF%20for%20BiH%20draft%20for%20consultation%20Dec%2025%202019_078189335.pdf. Accessed March 2019 (Online document).

the only indicators of their work, and they are given only by a person who is teaching a particular subject.

In 2008, the Council of Ministers of BiH adopted the Strategies directions of education development in Bosnia and Herzegovina with an implementation plan, 2008–2015. Today is 2019, the current state of education is similar to 2007, although a mentioned document was created as a desire to change the existing situation.³

Academy of Sciences and Arts of Bosnia and Herzegovina is the highest scientific and artistic institution in Bosnia and Herzegovina. In 1966, NDBiH has been reformulated in ANUBiH. The task of the Academy was to take care of the overall development of science and arts, to organize scientific research, and to publish the work of its members and associates.

Problem of Bosnia and Herzegovina, which has a huge effect on science, is the departure of young and educated people, which significantly reduces it quality of human resources in BiH. According to the Global Competitiveness Report 2017,⁴ BiH is in the category of Higher education ranked in position 91 of 137 countries; quality of math and science education: 97/134; availability of latest technologies: 82/137; quality of scientific research institutions: 106/137. Overall, the Global Competitiveness Index is 103/137.

The scientific and technological system in BiH has several dedicated research institutes (for example, in metallurgy and agriculture), and a limited number industrial laboratories and universities. 3088 persons are employed in research and development activities. The largest number of employees belongs to researchers (58.2%). 1481 research works were published, of which the largest number of papers belongs to development research (59.1%), applied research (3.1%) and fundamental research (9.7%).

3.1.5 The Status Quo of Social and Cultural Development

Instrumentalization of culture in the production, distribution and consumption of products and services is very important for building comparative and competitive advantages of particular sectors and economies. Culture as a generator of jobs implies a change in public policy toward artists and cultural workers. It is necessary to support the development of crafts, cultural tourism and the provision of continuous cultural activities that can be built around the already established festivals in BiH. Cultural industries are a special economic sector that can help strengthen regional potentials. Cultivating a wide range of activities from books, films, audiovisual domains, to craft products and designs, cultural industries are closely related to the issue of

³*Osnovno obrazovanje u Bosni i Hercegovini—kvalitet, kreativnost i inovativnost Sarajevo*, Juli 2010. Available via <http://www.cpu.org.ba/media/8348/CPU-Osnovno-obrazovanje-u-Bosni-i-Hercegovini-kvalitet-kreativnost-inovativnost.pdf>. Accessed March 2019 (Online document).

⁴Schwab, K. (2018). *The global competitiveness report 2017–2018 world economic forum*. Available via <https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018>. Accessed April 2019 (Online document).

preserving and enhancing cultural diversity. Cultural production has become one of the main economic factors in the world. The relationship between cultural and economic development and its impact on the labor market is increasingly becoming the field of discussion at the European level. In 2015, cultural activities contributed 5.72% to 48 gross domestic product (GDP) in Bosnia and Herzegovina, which indicates that culture is responsible for an important part of state production, and helps to generate income and maintain the living standards of its citizens. 32% of this contribution can be attributed to direct cultural activities, and 68% can be attributed to support for these activities. The contribution of culture to GDP is underestimated; for this indicator, only private and formal cultural activities are taken into account, and the indirect and induced influences of the cultural sector are excluded. Most of the share in GDP (64%) refers to support for cultural activities. Central cultural activities, such as broadcasting, architectural activities, advertising and newspaper publishing, account for 1.83% of GDP. Given the weakened state of the economy, the impact of this sector on GDP is satisfactory.

Bosnia and Herzegovina is a trilingual state where most of the population speaks one of the three official languages. Minorities living in Bosnia and Herzegovina use their languages in mutual communication. In the territory of Bosnia and Herzegovina, the official languages are Serbian, Bosnian and Croatian. All three languages are mutually understandable and very similar, since they are based on the same (Štokavian) dialect. Official letters of BiH are Latin and Cyrillic. Mostly used foreign languages are English, German, Russian and French, but English is most widely used. In the curriculum in schools in BiH, the learning of two foreign languages, most often German and English, is obligatory. The latest data show that the number of BIH citizens who speak one or more foreign languages is increasing. 35% of BIH citizens speak English language.

3.1.6 The Relationship with China Under the “16+1” Cooperation Framework

In Table 3.1 are shown Chinese investments in the 16 CEECs (except Greece) in the period from 2009 to 2014. Share of total Chinese investments for BiH is very small (0.36%). Investment growth from 2009 until 2014 is 3.55%.⁵

The trade between China and the 16 CEE countries is more complementary than competitive, implying a bigger room for trade expansion. In 2016, using China as the benchmark, the average trade complementarity index between China and the CEE was 0.3733, with the most complementary country being Czech, with which the trade complementarity index was 0.4712, and the least complementary country being Albania, with which the trade complementarity index was 0.2926; the average

⁵Xin, C., & Zhigao, H. E. (2018). *16+1 cooperation and China-EU relationship*. Budapest: China-CEE Institute Nonprofit Ltd. Available via <https://china-cee.eu/wp-content/uploads/2018/11/161-cooperation.pdf>. Accessed April 2019 (Online document).

Table 3.1 Chinese investments in the 16 Central and Southeast European countries in 2009 and 2014

	2009	2010	2011	2012	2013	2014	2009–2014 growth (%)	Share of total Chinese investment in CEE (2014) (%)
Hungary	97.41	465.70	475.35	507.41	532.35	556.35	471.14	32.79
Poland	120.30	140.31	201.26	208.11	257.04	329.35	173.77	19.41
Czech Republic	49.34	52.33	66.83	202.45	204.68	242.69	391.87	14.31
Romania	93.34	124.95	125.83	161.09	145.13	191.37	105.02	11.28
Bulgaria	2.31	18.60	72.56	126.74	149.85	170.27	7271.00	10.04
Slovakia	9.36	9.82	25.78	86.01	82.77	127.79	1265.28	7.53
Serbia	2.68	4.84	5.05	6.57	18.54	29.71	1008.58	1.75
Lithuania	3.93	3.93	3.93	6.97	12.48	12.48	217.56	0.74
Croatia	8.10	8.13	8.18	8.63	8.31	11.87	46.54	0.70
Albania	4.35	4.43	4.43	4.43	7.03	7.03	61.61	0.41
Bosnia–Herzegovina	5.92	5.98	6.01	6.07	6.13	6.13	3.55	0.36
Slovenia	5.00	5.00	5.00	5.00	5.00	5.00	0.00	0.29
Estonia	7.50	7.50	7.50	3.50	3.50	3.50	–53.33	0.21
Macedonia	0.20	0.20	0.20	0.26	2.09	2.11	955.00	0.12

Stock/USD million

Source Xin, C., & Zhigao, H. E. (2018). 16+1 cooperation and China-EU relationship. Budapest: China-CEE Institute Nonprofit Ltd. Available via <https://china-cee.eu/wp-content/uploads/2018/11/161-cooperation.pdf>. Accessed April 2019 (Online document).

trade specialization coefficient was 0.2409, with the most competing country being Czech with which the trade specialization coefficient was 0.3983, and the least competing country being Montenegro, with which the trade specialization coefficient was 0.0729. Coefficient of Specialization and Trade Complementarity Index for Bosnia and Herzegovina are 0.1929 and 0.3389, respectively.

According to Chinese Ambassador in Bosnia and Herzegovina Chen Bo,⁶ Bosnia achieved yet another success on the bilateral cooperation plan following the end of the “16+1” Summit in Sofia. The “‘16+1’ prime ministers’ Summit was marked by the Visa Abolition Agreement between governments of Bosnia and China, an agreement in the field of agriculture between competent institutions of our two countries as well as the Loan Agreement for the construction of Block 7, of the Tuzla Thermal Power Plant,” the Ambassador said. “The two countries initiated a procedure on the signing of an agreement on cooperation in the field of civil aviation which will create the condition for the introduction of a direct airline between Bosnia and China. The two

⁶Bosnia is the winner of the ‘16+1’ Summit, N1. <http://ba.n1info.com/English/NEWS/a271474/Bosnia-is-the-winner-of-the-16-1-Summit.html>. Accessed 22 Apr 2019.

Table 3.2 Coefficient of specialization (CS) and trade complementarity index (TCI) of trade between China and CEE countries (2016)

Country code	Country	CS	TCI
8	Albania	0.1404	0.2926
70	Bosnia–Herzegovina	0.1929	0.3389
100	Bulgaria	0.2667	0.3654
191	Croatia	0.2708	0.4098
203	Czech Republic	0.3983	0.4066
233	Estonia	0.3101	0.4712
348	Hungary	0.3359	0.4122
428	Latvia	0.2843	0.3679
440	Lithuania	0.3068	0.3547
499	Montenegro	0.0729	0.4333
616	Poland	0.379	0.3296
642	Romania	0.3111	0.4181
688	Serbia	0.0761	0.3008
703	Slovakia	0.3251	0.459
705	Slovenia	0.0328	0.3104
807	TFYR of Macedonia	0.1505	0.3021

Source Xin, C., & Zhigao, H. E. (2018). 16+1 cooperation and China-EU relationship. Budapest: China- CEE Institute Nonprofit Ltd. Available via <https://china-cee.eu/wp-content/uploads/2018/11/161-cooperation.pdf>. Accessed April 2019 (Online document).

sides have initiated a procedure related to the issuance of a license to export dairy products from Bosnia to the Chinese market.”

Companies from the two countries that took part in the Summit signed two cooperation agreements concerning road infrastructure, worth over BAM 2 billion (around EUR 1 billion) The first is the construction of the Banjaluka–Prijedor–Novi Grad highway in the Republika Srpska entity and the second is the construction of the Vukosavlje–Doboj highway and its Vukosavlja–Brcko branch. In both of these projects, the Chinese investors will act as direct investors.

3.2 Overview of the Educational Development

3.2.1 Education System and Policy

Bosnia and Herzegovina education system is organized into four main levels: preschool, primary, secondary and higher education. Educational institutions are mainly public and private.⁷

Preschool education is an integral part of the educational system in BiH and in the year prior to enrollment in primary school, it is compulsory for all children of preschool age.

Primary education lasts 9 years and is compulsory for all children. It starts in the calendar year in which, until 1 April, the child has reached 6 years of age.

Secondary education is accessible to all, in line with their performance in primary school, personal interests and abilities.

Access to higher education is granted to all those who have completed 4 years of secondary school in Bosnia and Herzegovina. According to official statistics, there are 10 public and 39 private higher education institutions in BiH.

The institutional picture of the education sector in Bosnia and Herzegovina is a reflection of the state organization defined by the Constitution of BiH, entities and cantonal constitutions, and the Statute of the Brčko District and on which the competences in the field of education are legally defined.

Pursuant to the Law on Ministries and other bodies of the BiH Administration, the Ministry of Civil Affairs of BiH is in charge of carrying out tasks and performing tasks in the jurisdiction of BiH and related to the establishment of basic principles of coordination of activities, harmonization of the plans of the entity authorities and defining the strategy on the international plane, among others, for the field of education.

There are a few ministries of education: Ministry of Education and Culture of Republika Srpska, Ministry of Education of Federation of BiH, Ministry of Education of Brčko District and ministries of education in cantons.

At the level of BiH, four framework laws have been adopted:

1. Framework Law on Higher Education in Bosnia and Herzegovina;
2. Framework Law on Preschool Education in Bosnia and Herzegovina;
3. Framework Law on Secondary Vocational Education and Training in Bosnia and Herzegovina and
4. Framework Law on Primary and Secondary Education in Bosnia and Herzegovina.

Educators in preschool education, teachers in primary and secondary education are educated in accordance with targeted educational level, i.e. age of the children

⁷*Osnovno obrazovanje u Bosni i Hercegovini—kvalitet, kreativnost i inovativnost Sarajevo*, Juli 2010. Available via <http://www.cpu.org.ba/media/8348/CPU-Osnovno-obrazovanje-u-Bosni-i-Hercegovini-kvalitet-kreativnost-inovativnost.pdf>. Accessed March 2019 (Online document).

with whom they work. In BiH, they are highly qualified (completed an appropriate study programme at the higher education).

Teachers in BiH are employed in public and private institutions, and their qualifications and professional development are regulated by legislation and regulations.

3.2.2 Enrollment Rate and Retention Rate

3.2.2.1 Preschool Education

In 2016/2017 school year, in the territory of BiH, there were 332 preschool institutions with 24,918 children. Compared to the previous school year, the number of preschool institutions is 4.7% higher, the number of children in preschool institutions increased by 8.8%, and the number of employees is 7.2% higher.

3.2.2.2 Primary Education

In the school year 2016/2017, in the territory of BiH, there were 287,729 pupils enrolled in 1842 schools, which was 3613 pupils less or 1.2% lower in comparison with the previous year. At the beginning of the school year 2016/2017, there were 23,824 teachers included in the education process out of which 17,045 or 71.5% were women.

3.2.2.3 Secondary Education

In the school year 2016/2017, in the territory of BiH, there were 126,824 pupils enrolled in 311 schools, which was 6404 pupils less or 4.8% lower in comparison with the previous year. In the school year 2016/2017, there were 12,652 teachers included in the education process, out of which 7653 or 60.5% were women.

3.2.2.4 Higher Education

In the academic year 2016/2017, there were 100,333 students enrolled in winter semester of the first cycle of higher education, including integrated studies, out of which 89,715 students were enrolled in all study years, while 10,618 were candidates for graduation. In 2016, there were 15,266 students who graduated/completed academic or professional studies, which was 4.4% lower in comparison with the previous year. Out of the total number of graduated students, 58.8% were female.

In Bosnia and Herzegovina, early school leaving rate is less than 10%.

3.2.3 Government Expenditure on Education

Education system in BiH is financed from entity, cantonal and municipal budgets. The share of education in financing from the state budget is very small. Republika Srpska allocates about 4% of its GDP for education, Federation of BiH issues about 6% of GDP while Brčko District for education allocates 11.2% of the total budget of the District. Fragmentation of the education system is reflected in this segment as there are significant differences in funding (average allocations per student) as well as differences in salary levels and compensation of employees in the education sector throughout the country. About 88% of the total budget funds for education is spent on salaries and benefits of employees, 8% for material costs and only 4% is allocated for capital investments.

In Bosnia and Herzegovina in 2017, the budget allocation of institutions that fund R&D activities is 13,952,461 km. The budget funds of the institutions were allocated mostly for higher education by 77.8%. The planned budget for research and development in 2018 was 15,642,795 km. According to socioeconomic goals, most of the funds are planned for research in education (50.6%). Of the total amount in research in the education sector, funds of 7.9 million KM were planned, projects research in the sector of General Knowledge Improvement 3.026 million KM. The above data refers to allocations for research and development from the budget of the institutions of Bosnia and Herzegovina, Entity institutions and the District of Brčko.⁸

3.2.4 Teachers' Professional Development

Continuing professional development is carried out through training programmes, retraining and evaluation. Evaluation elements of professional development of teachers include participating in professional development as established by the Ministry of Education, participation in training conducted by professional institutions and associations, and professional training through monitoring of contemporary literature and magazines. Professional training is evaluated as regular and occasional. Only teachers who regularly attend professional development programmes may be promoted into mentors and advisers.

Agency for preschool, primary and secondary education in BiH has developed a Model for improving the system of continuing professional development of educators, teachers and professional associates in Bosnia and Herzegovina. The Model includes directions for professional development in order to achieve their goals and ambitions, as well as raising awareness of educators and how to accomplish the assigned tasks and to enhance the professionalism and competence.

Teacher and educator standards have also been developed as a tool for monitoring their professional development.

⁸Agency for Statistics of Bosnia and Herzegovina. http://www.bhas.ba/saopstenja/2018/RDE_03_2017_Y2_0_BS.pdf. Accessed March 2019.

3.2.5 *Quality Assurance in Education*

In the area of higher education at this moment, there are no institutional structures that are particularly concerned with the quality of education at this level, although there are standard bodies (councils, commissions) that deal with questions of quality and analysis of the state in higher education universities and competent ministries.

In the area of preschool, primary and secondary education, the situation is different. Monitoring the quality of education and support for its development is achieved through the work of pedagogical institutes and Agency for Standards and Assessment in Education for the Federation of Bosnia and Herzegovina and the Republic of Srpska.

3.2.5.1 *Pedagogical Institutes*

In Bosnia and Herzegovina, there are currently eight pedagogical institutes, namely Republic Pedagogical Institute of the Republika Srpska, the Institute for Education and six pedagogical institutes in the Federation of Bosnia and Herzegovina.

Except for three institutes (Pedagogical Institute in Bihać, Pedagogical Institute in Mostar and Institute for Education in Mostar), all other institutions operate within the ministries of education.

It is planned to establish an institute in the Brčko District.

Existing pedagogical institutes perform various tasks: the development of curricula, introduction of new approaches and methods in the educational process, implementation of teacher training, control and evaluation of the work of teachers and schools, etc. Most of the institutes are dominated by professional ones' supervision, while support for the development of quality in education is suppressed in the second plan. How institutions function is not precisely defined and often overlaps with the functions of ministries education.

Agency for Standards and Assessment in Education for the Federation of Bosnia and Herzegovina and the Republic of Srpska was founded in 2000 by decisions of the Government of the Federation of Bosnia and Herzegovina and Government of Republika Srpska.

3.3 *New Progress of ICT in Education*

3.3.1 *Educational Background in Bosnia and Herzegovina*

Before the war, the country had been a part of a big country Yugoslavia which was well known for its great educational system which produced many world-known experts and people with high level of general knowledge. Now, after suffering many losses in infrastructure, the country is still considered to be in a transitional process toward

market economy and with its economy still on the loose ground, the educational process is also suffering. One important fact that is characterizing this country's education system is an existence of three different curricula on all levels of education. This is the result of a political structure of the country which is a big obstacle for the education system. The curriculum is not harmonized, and all three parts of the country are introducing changes by themselves, without any thinking of the effect and the status of the other parts. There are no joint intentions to improve the education on a national level which is automatically eliminating the synergy effect and practically preventing the healthy growth of the nation.

Looking at the elementary and secondary levels of education in Bosnia and Herzegovina, it is evident that the teachers are still resorting to the traditional methods and techniques of teaching. Chalk and talk is the common way of transferring knowledge. The war has made the continuous professional development of the teachers impossible and caused the lack of the qualified teaching workforce. The positive aspect is the presence of the necessary equipment. Almost all of the secondary schools are fully equipped and the elementary level schools also possess the basic equipment. Although the hardware requirements had been fulfilled, the lack of trained teachers is still present and the equipment is not well utilized in the standardized teaching process.

All three parts of the country introduced some improvements into the curriculum, but they mostly concerned the modernization of the curriculum itself and none of them made any relation to the ICT supported learning on a national level. The teachers need to learn how to properly utilize ICT, create interactive environment, use the existing resources that are already available and create interactive learning materials by themselves. All the initiatives for a change in this direction were reduced to individual efforts.

The education system, based on the concept of targeted secondary schools, is significantly different from modern processes, such as computer and web based-learning, distance learning and knowledge-based learning. However, there is no determination to develop a teaching staff capable of supporting an educational process based on the use of ICT, which is able to support student and student incentives on the use of ICT. The current reform of education places the focus on the administrative element, and on the unification of certain content. Regardless of the importance of these reforms, ICT have been completely ignored and not given an appropriate priority.

Qualitative analyses of the education sector, and the use of ICT in the school system, almost never existed. The first more serious analysis is given in the "e-readiness report" from UNDP.⁹ A survey conducted for this report, which covered a total of 269 educational institutions of different types, from primary and secondary schools to faculties, revealed the following situation.

⁹E-readiness Report, UNDP. http://www.dep.gov.ba/dokumenti_politika/srednjorocna_razvojna_strategija/?id=20. Accessed 22 Apr 2019.

Table 3.3 Number of computers in educational institutions (In the analysis of the ICT sector in BiH, most of the materials used by the UNDP IKT Forum—expert studies prepared for public discussion, were used, on July 25, 2002)

	Number of schools	Number of computers	% Of institution type	% Of total computers	Average
Total	269	4795	100	100	17.83
Primary schools	133	1289	49.44	26.28	9.69
Secondary schools	77	1258	28.62	26.24	16.34
Universities	59	2248	21.93	46.88	38.10

3.3.1.1 Computer Literacy

45% of employees are able to use the computer, and only 5% of professional IT staff are employed in the IT sector or equivalent services. Compared to the total number of teaching staff, there is a very low percentage of teachers using ICT in teaching. There are few examples of using the Internet as a delivery infrastructure for teaching content, or the use of local networks, intranets and web portals in the classroom. There are no specially designed training courses for teachers or their preparation for the use of ICT in the educational process. Due to the great dynamics of changes in ICT, our educational system, due to continuous experiments and curriculum revisions, is not able to follow world trends.

3.3.1.2 Number of Computers and Equipment of Institutions

There is a big difference in the average number of computers in educational institutions, where faculties have two times more computers from primary and secondary schools (Table 3.3).

3.3.1.3 Quality and Usability of Equipment and Software

Pentium II processors are used in about 33% of all computers in educational institutions. Half of the computers in primary schools belong to the category of computers with Pentium I and Pentium II processors. Secondary schools have the highest value in the Pentium I category—which is less than the overall average, while the faculties for their part have the best technical equipment and the highest (66%) of computers in the Pentium II, Pentium III and Pentium IV categories. Only about a quarter of educational establishments have a server configuration. Computer networks exist in all types of educational institutions. At colleges, 61% are networked, in secondary schools 20% and in primary schools 10% of computers. Applications on the MS Windows platform represent the dominant part (66%) of applications that are used

on computers in educational institutions. Of the 513 registered applications, nearly a third goes to MS Office.

3.3.1.4 Internet Connection

Of the 61% of institutions that have an Internet connection, only 4% of them are connected to the Internet by a cable connection of 2–11 MB. School institutions that have access to the Internet (a total of 164 schools) use as many as 15 different ISP companies. Two large Internet operators, BiHNET and HPT, serve as much as 66.40% of all school facilities. The structure of telecom, ISP and equipment costs, service providers and qualified staff is very important.

At the World Economic Forum in Davos, out of 131 countries in 2007, BiH according to the Global Competitiveness Index (GCI) is ranked 106th, out of 125 countries in 2006, it occupied 89th place, and in 2005 out of 117 countries, it occupied 88th place. There is noticeable fall in this report (Diagram 3.1).

Today’s situation is much better comparing the period 10 years ago. Very important role in noticeable improvement of ICT application have ministries of education in both parts of Bosnia and Herzegovina. The use of information communication technologies in the Republic of Srpska has been significantly improved. Experts believe that much more investment is needed in this area to bring the Republic of Srpska closer to the developed digital world. Significant progress is noticeable in the application of ICT in public administration, local self-government, health care

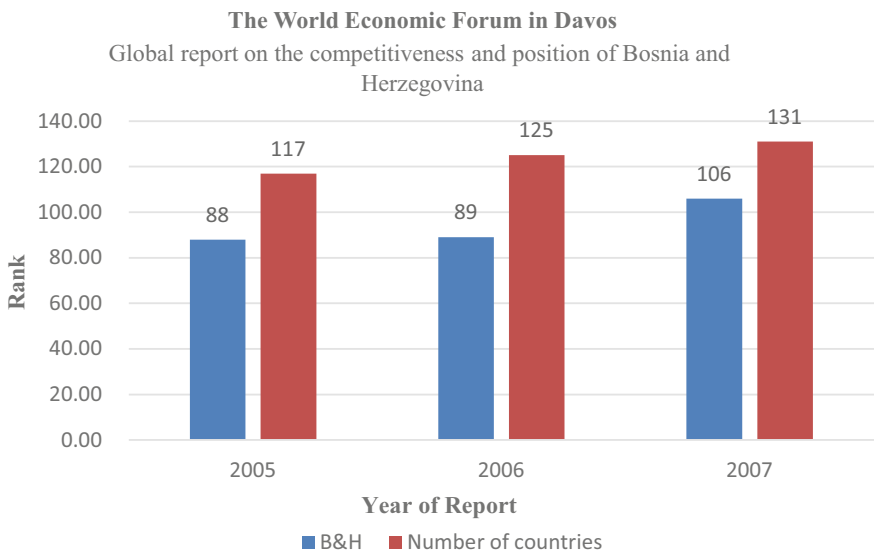


Diagram 3.1 Global competitiveness index of Bosnia and Herzegovina (Blue color: Bosnia and Herzegovina ranking; Red color Total number of countries. According to data from 2007)

and education. Huge progress in the field of ICT is in scientific research and at universities. According to certain indicators, most of ICT is applied in small and medium-sized enterprises. Table 3.2 shows the statistics on the use of the Internet in 2017 for some countries, including Bosnia and Herzegovina. From Table 3.4, we can see significant progress in the use of the Internet, i.e. approximately 70% of the population uses Internet.

The analysis mentioned above is the only one that has been done so far, where the results from the whole of Bosnia and Herzegovina are used as a sample. After this analysis, the only relevant data available and which can contribute to this report are the data of the Statistical Office of the Federation of Bosnia and Herzegovina. Table 3.5 shows the state of equipment of primary schools with computer equipment.

Table 3.4 Internet stats and Facebook usage in March 2017 in Europe (Internet World Stats 2019)

Internet Stats and Facebook Usage in Europe March 2017 Statistics					
Europe	Population (2017 Est.)	Internet users, Mar 31, 2017	Penetration (% Population)	Users % in Europe	Facebook June 30, 2016
Albania	2,911,428	1,823,233	62.6	0.3	1,400,000
Andorra	68,728	66,728	97.1	0.0	42,000
Austria	8,592,400	7,135,168	83.0	1.1	3,600,000
Belarus	9,458,535	5,786,572	61.2	0.9	840,000
Belgium	11,443,830	10,060,745	87.9	1.6	6,500,000
Bosnia–Herzegovina	3,792,759	2,628,846	69.3	0.4	1,500,000
Bulgaria	7,045,259	4,155,050	59.0	0.7	3,300,000
Croatia	4,209,815	3,133,485	74.4	0.5	1,800,000
Cyprus	1,187,575	844,680	71.1	0.1	800,000
Czech Republic	10,555,130	9,323,428	88.3	1.5	4,600,000
Denmark	5,711,837	5,479,054	95.9	0.9	3,700,000
Estonia	1,305,755	1,196,521	91.6	0.2	620,000
Faroe Islands	48,335	47,515	98.3	0.0	33,000
Finland	5,541,274	5,107,402	92.2	0.8r	2,700,000

Table 3.5 Statistical data for computers in education of Federation Bosnia and Herzegovina (According to Institute of Statistics of FBiH 2018)

Equipment for computers	11,734
With Internet access	8378
For schools' administration	3454
For schools' administration with Internet access	2806
For students	8280
For students with Internet access	5572
Number of students on one PC	1582

3.3.2 *Informational Technology Assist Teaching*

Depending on the intensity and method of using ICT in education, the following forms of e-learning are distinguished:

- classical classes—classes in a classroom where only a teacher uses a computer, where lessons are followed with computer presentation of educational content (f2f—face to face);
- ICT-supported teaching and learning—most often in computer classrooms, where the teacher uses the electronic board and computer screens in front the students, teaches for exams, assigns tasks, supervises and helps pupils via a computer network;
- hybrid or mixed instruction (hybrid, mixed mode or blended learning)—in part;
- takes place in a real classroom, and in part students take part in classes “from home” by learning from educational materials distributed to the computer network—it is also called virtual classroom;
- online classes or so-called pure e-learning (fully online)—ICT is taught entirely organized at a distance; takes place exclusively through electronic technology, computer and other telecommunication networks, computers, mobile phones, etc.

A typical e-learning system that students and pupils use in BiH is a web application that users access through a web browser on their computers. Users can access the e-learning system from any computer as long as they have access to the Internet. It's common that such systems are installed on the web servers located in a school, faculty or, in turn, at another organization. Systems provide the opportunities to create e-learning courses that provide them to place sharing materials, online discussions, quiz solutions, homework assignment tasks and the like. Of the current e-learning systems, Learning Management System (LMS) and Learning Content Management System (LCMS) are most commonly used. While LMS systems handle processes in the learning environment, LCMS systems handle the processes of creating and delivering content learning, i.e. combine the administrative and business dimension of traditional LMSs. Some of the most used e-learning systems in BiH are Moodle and Claroline.

All types of previously mentioned classes of teaching are actively applied in BiH as well in all educational institutions.

Some of the educational institutions in BiH that use the Moodle platform are listed below:

Banja Luka College (<https://e-nastava.blc.edu.ba/login/index.php>)

- Faculty of Philosophy in Sarajevo (<http://biser.ff.unsa.ba/>);
- Faculty of Economics in Sarajevo (<https://enastava.efsa.unsa.ba/login/index.php>);
- Primary school “Suljo Čilić” in Jablanica (<http://suljocilicdl.com/>);
- Faculty of Electrical Engineering in Banja Luka (<https://el.etfbl.net/login/index.php>);
- An interactive portal for the education of children in the diaspora (<https://www.dopunskanastava.mcp.gov.ba/?redirect=0>);

- Faculty of Mechanical Engineering in Zenica (<http://mf.unze.ba/moodle/login/index.php>), Secondary Electrotechnical school in Tuzla (<http://www.etsedu.org/moodle/login/index.php>);
- Full list of all registered instances that use Moodle is on the link.¹⁰

Some of the projects implemented in BiH that contribute to ICT development are listed below.

The Ministry of Education and Culture of RS, in cooperation with the company “Lanaco”, launched the program of computerization of primary and secondary schools. The goal is that each student has access to the Internet. Depending on the number of students, each school will receive a certain number of IT cabinets. On 300 students, an IT cabinet with 16 computers, a printer, and Internet connection is planned. Teaching would be conducted with multimedia contents. Electronic diaries will be introduced in the school.

The Ministry of Education and Culture of Republic of Srpska started the third phase of the “Dositej” project in August 2018, within which the remaining 62 elementary schools will be equipped with e-learning classrooms, thus creating the conditions for teaching in all primary schools in the Republic of Srpska in the most modern way. Project implies¹¹

- Procurement of 7100 PCs (for pupils) and 560 laptops (for teachers), which will be deployed in 45 schools in Republic of Srpska;
- Equipping 284 classrooms (electrical installations, space for storing and charging computers, network equipment and infrastructure, and setting up PCs);
- This means that each of these classrooms, intended for e-learning, will have 25 PCs;
- Teacher training (learning about twenty-first century learning, PCs and working with “eLearning Class” software).

The Ministry of Education and Culture of the Republic of Srpska in cooperation with the British Council in August 2018 launched the “School for the twenty-first Century in the Western Balkans” program. This program will be implemented in 15 primary schools in the Republic of Srpska in order to improve the critical-thinking skills in solving problems and increasing digital literacy among teachers and students through teaching and extracurricular activities. The program implies the division of certain computers into these primary schools in Republika Srpska.

The Government of the District of Brčko, in January 2008, adopted the Internal Policy for the Development of the Information Society of the Brčko District of BiH. It is a basic and framework document for the development of the information society of the District of Brčko. Based on this document in the further development and construction of the information society, it will be possible to adopt laws, regulations,

¹⁰Registered Moodle sites, Moodle.net. <https://moodle.net/sites/index.php?country=BA>. Accessed 24 Apr 2019.

¹¹*Obuka nastavnika i IT administratora*. LANACO Informacione tehnologije d.o.o 2012. Available via <http://stanojeviczeljko.rs.ba/literatura/DositejObukaFaza1.pdf>. Accessed March 2019 (Online document).

as well as to plan the strategy and activities of further development. The Brčko District of BiH will, by accelerated use of modern information and communication technologies, build a modern economy and society in which information, knowledge and human resources are vital.

EuroClio HIP BiH has designed the project “Improving the Key Competencies of Teachers in the Tuzla Canton area” through training on the use of ICT tools in the teaching of history that was realized in March and April 2017 in cooperation with the Ministry of Science, Education, Culture and Sports of the Tuzla Canton and the Pedagogical Institute of the Tuzla Canton. The project is supported by the Federal Ministry of Education and Science. The goal of the project is to train history teachers for the use of ICT technologies in the teaching of history, and to enhance competencies in using historical sources in active learning methods. For this purpose, EuroClio HIP BiH organized two one-day training seminars for groups of 25 teachers from the Tuzla Canton area. Each of the training parts of the lecture is designed, and the active part in which the participants will work on the creation of one lesson using electronic resources, tools and web applications, photographs, films, historical maps and other materials can be used in the teaching of history.

The application of ICT in education and training is usually determined by the content of student and computer communication, so it can globally be learning about computer, learning from computer, and learning with computer. The education system in BiH is predominantly retained on the modality of learning about the computer. The other two forms: learning from computer and learning with computer are still little explored and applied in the BiH education system.

3.4 Policy and Strategy of ICT

The education as well as ICT in Bosnia and Herzegovina is largely financed by public funds of the entities, cantons, District of Brčko and the municipal budgets, depending on the jurisdiction. This means that, in terms of location, Bosnia and Herzegovina has thirteen separate budgets for education: two at entity level, one in District of Brčko and ten cantonal budgets. There is still no strategy for the development of information communication technologies in society as well as in education. Investment in the ICT sector in education is also not clearly defined. Most projects contributing to the development of the ICT are individual, financed by the work of local ministries or private institutions. Considering that Bosnia and Herzegovina is not a member of the European Union, there are also no ways to obtain funding for the development of education from EU funds.

The Agency for Information Society of the Republic of Srpska (AIDRS) is the institution responsible for monitoring the development of the information society and promotion of the use of information and communication technologies. AIDRS has a wide range of responsibilities. Among them, these two are connected with ICT in education:

- Promoting the information society within the educational system reform and coordination of the implementation of state projects related to the participation of ICT in the educational process;
- Accreditation of educational and testing centers, in cooperation with the Ministry of Education and Culture of the Republic of Srpska, which enable the certification of citizens in the ICT field through the form of post-education and lifelong learning.

Below are some of the projects financed by ministries in the field of ICT in education.

Information Management System in Education (EMIS) was developed for the needs of the Ministry of Education and Culture of RS and primary and secondary schools (at the same time, it was implemented for the territory of the Federation of BiH). This software system enables the creation of an aggregated database, at the ministry level, from detailed school databases and the formation of numerous reports (statistical and/or financial) by various criteria: database on students, departments, employees, space and inventory, and finances. The goal of EMIS is to improve the system of information, planning and financing of education, which encourages more efficient and effective management of educational resources.

E-diary (application made on Microsoft Platforms, using Microsoft tools) is modularly organized for parents, professors, school administrator and ministry administrator. The application allows parents to see the grades and absences of students, and only the Ministry through this application has the ability to view the summary reports that are necessary for the implementation of the educational process.

Strategic Partnership Agreement between the Government of Republic of Srpska and Microsoft BiH, within which 1300 keys for academic licenses were granted free of charge to higher education institutions, primary and secondary schools by Microsoft, legalizes Microsoft software in educational institutions.

The project "Video Conference", in which eight primary schools, in the Ministry of Education and Culture of Republic of Srpska and Pedagogical Institute installed equipment that enables audio-video communication of all ten locations at the same time. When selecting schools, it was taken care that the entire territory of the RS was covered geographically.

IT training, aimed at raising the level of IT knowledge for 11,000 workers (teaching and extracurricular staff) in elementary and secondary schools in Republic of Srpska (training and testing), were completed by the end of May of the school year 2010/2011. The training program is based on the use of the MS Office package, and the use of the Internet and e-mail as part of the educational process.