

# DIGITAL SKILLS

# IN COLOMBIA

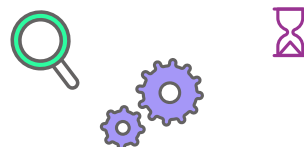
Does the digital future  
belong to everyone?

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**GAN Global** is a global alliance that aims to link and promote private sector initiatives related to skills and job opportunities for young people. It has established various networks around the world to support public-private collaboration toward the promotion of work-based learning opportunities, including the **GAN Colombia** Network.

As a member of the GAN community, GAN Colombia is led by the National Association of Entrepreneurs (ANDI, for its Spanish acronym) as an alliance of companies, public entities, international organisations, non-profit organisations, and educational institutions. The network seeks to connect the initiatives of different stakeholders in the country to raise awareness, influence public policies and reach out to the academic sector, addressing the mismatch between the talent gap and youth unemployment.

This study was conducted by ProTalentos on behalf of GAN Colombia. It analyses the internal and external factors that influence and shape the current digital skills systems in the country, as well as the existing challenges and innovations. Its findings can be used to inform the interventions of the stakeholders involved, including the creation of private initiatives or involvement in public policy issues.

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# INTRODUCTION



Digitalisation has presented challenges of varying difficulty for both the Colombian government and the private sector, as it has led to changes in labour dynamics and in the skillsets required to be successful in the labour market. For employers and governments that claim to champion the digital economy, digital skills are no longer optional, but have become a prerequisite for people entering the world of work. Increased automation of jobs and the accelerated development and deployment of digital technologies means that countries must enact measures to ensure the benefits of the new digital economy are harnessed. The success of a digital transformation process requires an enabling environment, namely into a clear regulatory framework, public policies, and regulations that facilitate a country's commitment and preparation for emerging technologies such as Artificial Intelligence, the Internet of Things, Blockchain, e-commerce platforms and other technological advances.

Over the last decade, Colombia has implemented a series of public policies aimed at increasing access to and, in some cases, improving the appropriate use of digital technologies. This has been reflected in the country's significant progress in the coverage of information and communication technologies (ICTs), although there are still significant gaps in access according to – amongst others - geographic location, socioeconomic status and educational level. Yet apart from advances in connectivity, perhaps the most important step in a successful transition at national level is the training and preparation of the workforce in ICT skills, which is the cornerstone of an effective process of labour reconversion and qualification towards a digital economy.

It is here that the biggest challenges for Colombia lie. The dynamics of labour demand in expanding sectors in Colombia contrasts with high unemployment rates – a phenomenon which can be explained in part by the incompatibility between the skills required by companies and the professional profiles of individuals looking for work. Basic skills

deficiencies in Colombia are also rooted in the poor quality of the education provided in the early years of learning, resulting, for example, in low rates of competency in English, with only 9 percent of secondary school graduates attaining intermediate level English language skills (Salazar, 2013). The challenges in digital skills development should not only be addressed within the specific framework of technical skills but should also be expanded to the non-academic (so-called soft) and cross-cutting skills that are most in demand in the productive sector.

On the one hand, the lack of connection and dialogue between industry and education has meant that the educational system fails to equip students with the skills required by employers. This status requires a coordinated effort towards a national, country-wide digital skills transformation strategy that gives a relevant response to the demands of the labour market.

On the other hand, outdated regulations governing lifelong learning and non-formal education have opened the door to a myriad of digital skills trainers and new forms of non-formal education, ranging from tech giants and innovative platforms to private providers looking to tap into the niche market, which come in the form of platforms, courses, bootcamps and non-formal certifications.

While this expansion increases the number of training options and has been well received by workers wishing to acquire skills, it adds up to a complex system and the variety of stakeholders represents a great heterogeneity in terms of training quality. The legal framework for formal education in Colombia does not adequately recognise these non-formal training processes or discern which of these programs guarantee a minimum or basic level of skills acceptable for the labour market. The performance of non-formal institutions is often reported by the institutions themselves, and this lack of standardised metrics can be detrimental to the training ecosystem, affecting the acceptance of these certificates by companies and making their coexistence with traditional education difficult. This has created a problem of information asymmetry, in which companies are unsure of the true level of digital skills that applicants claim to possess. Establishing a robust skills certification system would reassure companies that the certificates issued by non-formal education represent a basic level of endorsed skills.

A large number of reports and initiatives tackle the topic of the digital skills gap in Colombia. Some were developed by the public sector, others by the private sector, and others by civil society organisations, exemplifying a general disarticulation between the stakeholders involved in the system. Colombia needs a country-wide study to analyse the resources of the private sector, the public sector and the civil society to gain a clear and thorough understanding of the existing gaps, using publicly available information but also bringing to the table market and real-time data. The analysis and recommendations presented in

this paper aim to provide a clear picture of the internal and external factors that influence and shape the digital skills systems which are currently in place in the country, as well as the challenges and innovations that Colombia faces in order to maximise the use of digital technologies to substantially increase labour productivity.

This document consists of five chapters. The first chapter maps out the stakeholders of the digital ecosystem in Colombia, their roles, and the initiatives they have developed in this field in recent years. This is followed by a description of the existing regulatory framework in Colombia, understood as the regulations and public policy programmes developed by the national government and other authorities to boost the digital economy and address the problems of access, connectivity and use of digital technologies. The third section describes the different aspects of the access gap in the country, assessing the existing heterogeneities in the use of ICT tools at the level of gender, population groups, geographical distribution and company size. The fourth chapter analyses the interaction between the labour market and the educational offerings aimed at occupations and digital skills, with a focus on gauging the existing human capital gaps in Colombia, and determining whether they are related to quantity, relevance or quality. The final section of the paper contains recommendations stemming from the analysis presented in the first four sections.



## CHAPTER 1. //

# STAKEHOLDERS INVOLVED IN DIGITAL SKILL BUILDING IN COLOMBIA



Every month in Colombia, several digital skills education initiatives are launched by the public sector, private sector companies, educational institutions or by institutions that are part of the non-formal education system in the country. This means that not all are registered in the same database or on the same document, and this makes it difficult for them to be tracked.

This chapter attempts to compile and describe the various public and private entities involved in digital skills training in Colombia. Tracing the stakeholders involved in the world of digital skills in Colombia required not just reading official reports and written sources, but also researching the country's current affairs and interviewing participants in the sector. For this section, a total of fifteen experts were interviewed from the public (four), private (seven) and education (four) sectors.

## 1.1 ENTITIES IN CHARGE OF PUBLIC POLICY DEVELOPMENT IN THE AREA OF DIGITAL SKILLS

While many entities have an impact on the implementation and development of public policies related to digital skills, the most relevant ones are listed below:

> **Ministry of Information and Communication Technologies** (MinTIC)<sup>1</sup>: It is the entity in charge of designing, adopting and promoting the policies, plans, programmes and projects of the Information and Communication Technologies sector. One of its functions is to increase and facilitate access to information and communication technologies and ensuring that their benefits accrue to all members of society. The Ministry of Information and Communication Technologies is in charge of designing and implementing the plan “El futuro digital es de todos” [The digital future belongs to all] which is explained in detail in the chapter on public policies applied to digital skills; as well as offering a series of short, free digital training courses in ICT skills through its website.

> **Ministry of Education**<sup>2</sup>: It is the entity that leads the formulation, implementation and evaluation of public education policies to close the gaps that exist in guaranteeing the right to an education and in the provision of a quality education service. This is done within the framework of a comprehensive service that aims to ensure educational outcomes that promote the development of both individuals and societies across a diverse range of territories, ethnicities, and socioeconomic contexts.

> **Ministry of Labour**<sup>3</sup>: Its objective is to generate quality jobs, encourage harmonious labour relations, train and educate human talent and make work the axis of human

1 Ministry of Information and Communication Technologies <https://www.MinTIC.gov.co/portal/inicio/>

2 Ministry of Education <https://www.mineducacion.gov.co/portal/>

3 Ministry of Labour <https://www.mintrabajo.gov.co/web/guest/inicio>

development. It formulates the policy guidelines to be followed by the National Learning Service, SENA, and is in charge of the Public Employment Service, a platform that centralises digital information on vacancies and workers.

> **INNpulsa**<sup>4</sup>: INNpulsa is the National Government agency for entrepreneurship and innovation, which, together with the Ministry of Commerce, Industry and Tourism, supports the acceleration of high-potential ventures, innovation and financing that allow the country's companies to scale their operations to generate greater economic development, equality, and opportunities.

> **Mayors' and Governors' offices**: Apart from policies and programmes at the national level, departmental governments plan and implement their own programmes for digital skills training. In 2020, several training programmes and scholarships were launched in partnership with platforms such as Coursera, which were aimed at entrepreneurs and the unemployed, with an emphasis on digital skills training.

> **Alianza TIC**<sup>5</sup>: It is the result of the inter-institutional coordination of the Ministry of Labour, Ministry of Information and Communication Technologies, Ministry of National Education, and the National Learning Service. Together with the initiative of the Sectoral Roundtable on Technology and Digital Talent Management, these organisations set out in 2018 to gauge the national gap of the ICT and non-ICT sectors in terms of relevance, quality and quantity of human talent required.

> Finally, it is also important to take into account **Función Pública**<sup>6</sup> and **Copnia**<sup>7</sup> (National Professional Association of Engineers), as their policies limit the possibilities for a professional to access a certain public job, state contract, level or step in the professional ladder without a degree or a professional card.

## 1.2

### RUTA N, CENTRE FOR THE FOURTH INDUSTRIAL REVOLUTION AND SUMANTI

In 2019, it was announced at the World Economic Forum that Colombia would be the first country in Latin America to have a centre for the Fourth Industrial Revolution, placing Medellín at the centre of innovation and at the forefront of the challenges that ensue from using technology to solve problems.

Ruta N<sup>8</sup> is a non-profit public corporation governed by private law. Its shareholders are the Municipality of Medellín, EPM Group and Tigo-UNE. Ruta N created the Centre for the

4 Innpulsa <https://www.innpulsacolombia.com/>

5 Alianza TIC <https://www.sena.edu.co/es-co/Noticias/Paginas/noticia.aspx?IdNoticia=4507>

6 Función Pública <https://www.funcionpublica.gov.co/>

7 Copnia <https://www.copnia.gov.co/>

8 Ruta N <https://www.rutanmedellin.org/es/>

Fourth Industrial Revolution, a space to co-create, test and refine protocols, regulatory frameworks and policies to maximise the benefits and reduce the risks of Industry 4.0 technologies, such as Artificial Intelligence, Blockchain and distributed registration, Internet of Things, robotics and smart cities.

Ruta N was also the birthplace of the Sumanti Fund<sup>9</sup>, a financing fund for the education of specialised talent aimed at the comprehensive development of the inhabitants of the Aburrá Valley, in the face of the challenges posed by the Fourth Industrial Revolution. This fund was born as a result of a joint effort between Ruta N, SURA Asset Management, Protección and Comfama to provide access to specialised education in technology and innovation.

## 1.3 ENTITIES BELONGING TO THE EDUCATION SECTOR IN THE FIELD OF DIGITAL SKILLS

### 1.3.1. Higher education institutions (can be private or public)

- > **Technical Professional Institutions:** They offer short-term, post-secondary technical training in a wide variety of vocational fields.
- > **Technological Schools:** They offer higher education at the technological and professional level allowing direct access to the labour market or to higher levels of higher education.
- > **University Institutions:** They offer programmes aimed at obtaining university degrees and postgraduate degrees in certain areas.
- > **Universities:** They offer a wide range of academic programmes in various fields of knowledge, including masters and doctoral degrees.

### 1.3.2 SENA

SENA is a state institution<sup>10</sup>, under the sphere of the Ministry of Labour, which offers labour training programmes throughout the national territory. It offers both higher education programmes (technological), labour training and human development programmes (technical titles, certificates, and supplementary training). It offers a wide range of courses in information technology, directly related to the use of software and digital technologies. This includes the following subcategories:

- > **Information technology management:** with training offered in computer auditing, network and media management, television and ICT construction and management.
- > **Quality of software development:** with courses on processes and software quality.

9 Fondo Sumanti <https://fondosumanti.com/>

10 SENA <https://www.sena.edu.co/es-co/Paginas/default.aspx>

- > **E-commerce:** the only courses offered in this subcategory are aimed at the commercialisation of electronic products.
- > **Web design:** Training in the most widely used design software, such as Dreamweaver, Adobe Photoshop, Adobe Illustrator, Autocad and Corel.
- > **Data modelling:** sampling lessons and data modelling options.
- > **Office automation:** to learn how to use the office package, Excel, Word, Power Point, among others.
- > **Programming:** the offer of virtual programming courses is one of the widest in the SENA, and there are several training courses in programming using Java and UNITY.

Regarding digital skills, SENA is implementing two main initiatives. The first one is concerned with closing digital skills gaps, with SENA developing training capacities through complementary training routes and SENA bootcamps. Additionally, it is developing partnerships with technology leaders such as AWS educate and LinkedIn Learning. In 2020, 20,000 apprentices were trained, and the goal is to train 120,000 by 2021.

SENA is also working with the Office of the President of the Republic on the digital citizenship initiative aimed at developing digital skills for the general public. Thus, the plan for 2021 and 2022 is to train 2.5 million Colombians per year in basic digital skills. The areas that make up this initiative are the development of digital skills for information management, for the creation of digital content, for online communication and collaboration, and for safe online experiences. SENA works hand in hand with the technology giants in the country, supplementing its programmes with content from companies such as Microsoft, Oracle, AWS, LinkedIn, Siemens, SAP, among others.

### **1.3.3 Other private institutions that offer digital skills training programmes but are not certified**

There are hundreds of non-formal education institutions that are now playing a leading role in digital skills training in Colombia. A good example are bootcamps, defined by the Interamerican Development Bank (IDB) as intensive programmes lasting between three and six months, although this may vary depending on the level of complexity of the course. Teaching takes place in a hands-on learning environment in which real work situations are introduced. Bootcamps work closely with companies to identify the needs of their industry, adjusting the teaching to the latest trends and practices. They combine digital skills training with socio-emotional skills, such as teamwork, learning to learn, and problem solving. As part of the bootcamp, most schools offer job fairs and contact with networks of companies with the aim of helping graduates find jobs.

The COVID-19 pandemic brought a major change to this business model, as bootcamps used to have a strong face-to-face component, which had to be replaced by digital services. This not only increased the number of students in these institutions, but it also expanded the borders: today a person can be in Colombia and be enrolled in a bootcamp in Argentina. This also led bootcamps to generate online content divided in modules, offering services similar to those of online education platforms.

Below are some of the most recognised bootcamps in Colombia, which include elements of technological education platforms: Acámica<sup>11</sup>, Holberton<sup>12</sup>, Dev.F<sup>13</sup>, Laboratoria<sup>14</sup>, Make It Real<sup>15</sup>, 4Geeks Academy<sup>16</sup>, Microverse<sup>17</sup>, Monterrey Institute of Technology<sup>18</sup>, Educación IT<sup>19</sup>, Henry<sup>20</sup>, Digital House<sup>21</sup>, Coder House<sup>22</sup>, Plataforma 5<sup>23</sup>, Ironhack<sup>24</sup>, Bogotá Dev<sup>25</sup>, Nivel Pro<sup>26</sup>. Because of the gaps that exist in the country due to the limited knowledge of the English language, there are other platforms used by Colombians which are also in Spanish, such as Platzi<sup>27</sup>, Códigofacilito<sup>28</sup> and some Spanish courses that are offered on platforms such as Udemy<sup>29</sup>, Coursera<sup>30</sup> and EdX<sup>31</sup>. It worth mentioning that some formal education institutions such as SENA have also created their own bootcamps. As of today, there are more than 100 technology bootcamps in the region.

Furthermore, there are dozens of alliances between platforms, bootcamps, companies and public and private entities on the market. The Colombian firm Platzi, one of the biggest online technology education platforms in Latin America, entered into an agreement with Facebook Developer Circles<sup>32</sup> to grant one thousand scholarships to people who want to start their learning path in order to improve their opportunities in the world of technology.

These non-formal education organisations have become great allies of the public sector for the implementation of various initiatives. For example, in September 2020, the

- 11 Acámica. <https://www.acamica.com/>
- 12 Holberton. <https://www.holbertonschool.com/co/es>
- 13 Dev F. <https://devf.la>
- 14 Laboratoria. <https://www.laboratoria.la/>
- 15 Make It Real. <https://makeitreal.camp/>
- 16 4Geeks Academy. <https://4geeksacademy.co/es/inicio>
- 17 Microverse. <https://www.microverse.org/>
- 18 Mexico's Monterrey Institute of Technology <https://bootcamp.tec.mx/>
- 19 Educación IT. <https://www.educacionit.com/>
- 20 Soy Henry. <https://www.soyhenry.com/>
- 21 Digital House. <https://www.digitalhouse.com/latam/>
- 22 Coder House. <https://www.coderhouse.com/>
- 23 Plataforma 5. <https://plataforma5.la/rdm/online>
- 24 Ironhack. <https://www.ironhack.com/en/courses>
- 25 BogotaDev. <https://www.bogotadev.com/>
- 26 NivelPro. <https://nivelpro.co/>
- 27 Platzi. <https://platzi.com/>
- 28 Codigofacilito. <https://codigofacilito.com/>
- 29 Udemy. <https://www.udemy.com/>
- 30 Coursera. <https://es.coursera.org/>
- 31 EdX. <https://www.edx.org/es>
- 32 Platzi- Facebook Developer Circles. <https://platzi.com/becas-fb/>

National Government, in cooperation with the virtual education platform Coursera and with the support of the Ministry of Information and Communication Technologies, the Ministry of Labour, the Ministry of Commerce, Industry and Tourism and its affiliated entity, INNpulsa Colombia, launched a call for applications to benefit 50,000 Colombians who were unemployed as a consequence of the COVID-19 pandemic<sup>33</sup>. Several of these courses were on digital skills. Additionally, in December 2020, INNpulsa and Huawei signed an agreement to strengthen the innovation and entrepreneurial ecosystem in the country through the Education4All initiative, benefiting 3,000 young Colombians who will be granted certified scholarships in technologies such as Artificial Intelligence, 5G, Internet of Things and Cloud Computing<sup>34</sup>.

In addition, in recent years, MinTIC has been building the official offer of digital training for the public. Thus, either independently or by means of different cooperation agreements (e.g., with Platzi, Google Activate, etc). Individuals, micro, medium and small entrepreneurs can access a series of free courses through MinTIC's website. Certified digital training courses are offered in the following general areas<sup>35</sup>:

- > Digital Literacy
- > General Label
- > Digital Commerce
- > Digital Government
- > Digital Rights and Responsibilities
- > Digital Access
- > Digital Communication
- > General Health and Welfare
- > Digital Security
- > Digital Laws
- > Telework
- > Digital Culture

These are the thematic axis of the different courses and certificates offered through the MinTIC platform. The Ministry is currently offering courses in alliance with Platzi, under memoranda of understanding pursuant to which the training is carried out jointly by both parties. Courses in Online Business, Development of Ideas and Apps, Artificial Intelligence, Data Science and E-Commerce and Digital Sales are offered in this format.

33 Innpulsa. <https://innpulsacolombia.com/innformate/gobierno-nacional-abre-convocatoria-para-formar-en-habilidades-digitales-y-de-negocio>

34 La República. <https://www.larepublica.co/empresas/innpulsa-firmo-un-acuerdo-con-huawei-para-educar-jovenes-en-temas-tecnologicos-3099021>

35 MinTIC. <https://www.MinTIC.gov.co/portal/inicio/>

The second mechanism for the dissemination of offers is provided by MinTIC through agreements with private firms, such as Google Activate, under which the courses and contents of the private firm are offered through the official platform. The Ministry offers the following courses and certificates in this way: Application Programming, Digital Marketing, Fintech, Personal Branding in the Digital Age and Software Engineering Fundamentals.

It should be noted that the different topics and contents of MinTIC's official digital training offer are of a general nature. Unlike the more specific and specialised topics of the private digital training offer in Colombia, the public offer does not have complex or very elaborate technical content but focuses on topics of general interest and with less technically complex content, so as not to limit public access to them. As will be explained below, MinTIC has other initiatives to train people in more complex subjects, but these initiatives are part of a bigger picture that is not directly related to the free and easily accessible courses that MinTIC offers on its website. It should be noted that almost 100 percent of this official offer is available in Spanish, which highlights the need to adapt the preparation and training processes for people accessing labour training scenarios on virtual platforms. This is considering that, unlike the MinTIC courses, the private offer in digital training, both in Colombia and in the rest of the region, is mostly available in English<sup>36</sup>.

In parallel to this, other educational service offers have emerged for the routing of digital skills education in the country, paired with soft skills and English courses. Some examples of this are the aforementioned Sumanti fund<sup>37</sup>, ProTalento<sup>38</sup> and Coschool<sup>39</sup>.

These non-formal education institutions are revolutionising the market as companies are now accepting employees who do not necessarily have a university degree or formal education qualifications, but who have certificates in certain specific abilities and skills that are in high demand in the market. This has led to misalignments between institutions such as Copnia (National Professional Association of Engineers), which continues to require registration and certification for engineers in technological equipment, and companies that fill vacancies with people who are not professionals in these areas, but who have training in software development given by a non-formal education institution. This becomes more complicated when people in the public sector are also at a disadvantage and unable to reach a certain level in the civil service, or when getting a contract because they do not have a degree or a professional card.

As non-formal education institutions, these important players in the digital skills education market have to make costly and time-consuming manoeuvres in order to participate in programmes developed by the public sector. The interviewed stakeholders pointed out

36 In this area, Coursera has made a great effort to offer courses in Spanish, and it has also subtitled some courses that are usually offered in English.

37 Fondo Sumanti. <https://fondosumanti.com/>

38 ProTalento. <https://protalento.org/>

39 Coschool. <https://www.coschool.co/>

that one advance in the public sector is that government bodies have begun to realise that the companies themselves can certify the quality of these programmes; in this sense they have begun to request letters of recommendation from the companies as part of the process. This leads us to a scenario in which it is the market itself that endorses the educational quality of non-formal education institutions.

Finally, it should be noted that the main issue in the discussions about quality requirements for bootcamps is not so much the quality itself, as it is the market itself that ends up regulating this issue. Companies have already started developing solid selection processes that allow them to identify the candidates' skills and abilities. In this sense, a candidate could have been educated in a non-formal institution and acquired the necessary skills for the job, so the institution can be considered successful. The problem has more to do with the marketing mechanisms used by these institutions to attract more candidates, self-reporting their employability figures without standardised metrics and bringing asymmetrical information to the market, thus harming the whole ecosystem. It was this same problem that led the United States to start a certification process for these institutions, and to the creation of standardised and reliable rankings in which users themselves rank the different bootcamps according to their own experiences<sup>40</sup>.

## 1.4 THE PRIVATE SECTOR AND ITS COMMITMENT TO DIGITAL EDUCATION

As non-formal education courses do not receive any certification or qualification from the government, employers are faced on a daily basis with people who have taken various types of bootcamps, courses and certifications of all kinds. In order to level up the professionals who intend to work in their companies, they have themselves created courses, bootcamps and certifications, thus offering several alternatives for education in digital skills for Colombians. However, they are not coordinated so impact is rather limited over the target population.

Large technology firms also contribute to digital skills training in the country, even focusing on more specific areas of technology such as Artificial Intelligence, Cloud Computing, Cloud Service, Big Data and the Internet of Things, among others. Some of the big players in the course development market are Amazon Web Services, CISCO, Google, IBM, Microsoft, ORACLE, SAP, Siemens, and Huawei.

In December 2020, Microsoft Learn, in partnership with SENA, Fedesoft, Ruta N and the Bogotá Chamber of Commerce, offered free training for Colombians on topics such as

40 BestColleges. <https://www.bestcolleges.com/bootcamps/guides/accreditation/>; Schmidt, C. <https://www.linkedin.com/pulse/coding-bootcamps-dont-need-accreditation-so-why-chasing-clint-schmidt/>

Artificial Intelligence, Machine Learning and data analytics, among others<sup>41</sup>. The technology giant and LinkedIn also launched an initiative which included ten courses in Spanish to train people for the ten most in-demand jobs in the labour market<sup>42</sup>. Additionally, Microsoft has an agreement with SENA to provide education to young people so that they can obtain certifications awarded jointly by SENA and Microsoft<sup>43</sup>. Due to the political context mentioned above, this has been criticised by some of SENA's trade unions that argue that such initiatives are aimed at privatising SENA.

Another example are the programmes developed by Accenture. Its social responsibility area has programmes aimed at training young people in digital skills and soft skills, in order to link them with job opportunities, in coordination with the company. In addition, the company's own teachers have developed programmes to train women in technological skills and give them job opportunities within the company. Accenture has also created online courses that are now available on its platform<sup>44</sup> and through the INNpulsas website and the Ministry of Education's Colombia Aprende website.

It is also important to mention the Global Opportunity Youth Network of Bogotá<sup>45</sup>, which seeks to improve the well-being of young people in the city through economic opportunities, comprehensive training, participation and leadership. This strategy is developed in the country by the ASPEN Institute, Fundación Corona, Accenture, and other partner organisations. One of the main actions in Bogotá is the IT Market Place, which consists of building a shared services office to close the city's digital talent gap. An optimal model is also being sought to create a fund to scale up the IT model in the capital.

One of the main findings from the interviews with trainers and investors is that funding is not the biggest issue. Rather, the main barrier facing the country in terms of digital skills training is the educational level with which young people arrive at this stage of training, with a very poor foundation in soft skills, logic, mathematics, and literacy. This has led all the stakeholders in the market to turn their attention to the development of public policies aimed at attacking the problem in the early years, to have a better education in schools. The problem with these efforts is that they are too long term for the urgent needs of the business.

This is also the view of business federations such as Fedesoft, ANDI, among others: if good foundations for digital skills are not part of the school curriculum from an early stage, together with an adequate training in logic, problem solving and English, the measures

41 CCB. <https://www.ccb.org.co/Sala-de-prensa/Noticias-CCB/2020/Diciembre-2020/Microsoft-capacitara-gratis-en-tecnologia.-Una-alianza-con-el-SENA-Fedesoft-Ruta-N-y-la-Camara-de-Comercio-de-Bogota>

42 LinkedIn. <https://opportunity.linkedin.com/es-es/skills-for-in-demand-jobs>

43 SENA. <https://www.sena.edu.co/es-co/Noticias/Paginas/noticia.aspx?IdNoticia=4062>

44 Accenture. <https://www.accenture.com/ar-es/careers/accenture-accademy>

45 Fundación Corona. <https://www.fundacioncorona.org/es/lo-que-hacemos/educacion-orientada-al-empleo/global-opportunityyouth-initiative-goyi-bogota>; GOYN Bogotá. <https://www.facebook.com/GOYNBogota/>

that are now being implemented by all trainers, both public and private, will be insufficient to reduce the gaps. This is also related to the fact that technology is not understood as an end in itself, but as a vehicle for innovation and practice in any field of knowledge. The use of technology in a wide range of activities should be encouraged and interest in it should be awakened from an early age. For this reason, private initiatives such as CoderDojo, Geek Girls, or Arukay have also emerged, together with MinTIC's initiatives for young children, with the aim of promoting the use of technology in the new generations and passing on knowledge that will allow them to continue to be relevant in the digital economy.

Now, in terms of acquiring digital skills at an early age and to understand the reasons for gender gaps, several psychologists have started working on a way to create safe environments, as most victims of digital violence are women, and it has been proven that this is one of the reasons why girls quickly lose interest in the digital world at a young age. This is made worse by families who try to protect them, and who encourage men more than women to engage in digital scenarios.

Globant<sup>46</sup>, the region's leading software development company, has also implemented Global Academy<sup>47</sup>, a digital skills training programme. This initiative has been developed in partnership with Acámica and is also offered through the Sumanti fund. At the end of 2020, Globant launched an initiative with Mercado Libre to train young Latin Americans in digital skills<sup>48</sup>.

However, it must be noted that most of the offers available in more specific digital subjects are not free to the public. Prices vary according to the content of the course, its level of sophistication and its duration. Therefore, the MinTIC initiatives in Data Science and Artificial Intelligence mentioned in the chapter on Public Policy for Digital Skills are of great relevance in the country, to educate Colombians on topics that have been identified as strategic for the development of digital skills in Colombia.

It is worth noting that most of the certificates and courses offered by the private sector are offered and delivered in English. Only an estimated 20 percent of the courses offered are in Spanish. In a country where a very low percentage of the population speaks English, this is a significant barrier for people to access many of the digital skills education solutions offered by the private sector.

It is clear that the technological giants have become the main allies of formal education institutions in Colombia. Technical and technological institutions, universities and colleges have been incorporating the education solutions offered by these large companies and

46 Globant. <https://www.globant.com/>

47 Globant Academy. <https://globant.acamica.com/cursos>

48 Semana. <https://www.semana.com/empresas/articulo/becas-de-mercado-libre-y-globant-en-tecnologia-para-jovenes/308959/>

organisations such as Coursera into their programmes. In this way, non-formal education tools are gaining ground as an alternative to traditional education programmes for young people, in a country where the regulatory framework has not yet taken important steps towards the official recognition of this type of education.

Additionally, companies outside the industry of technology, such as Nestlé, have also developed digital skills initiatives for young people. Through the Youth Initiative<sup>49</sup>, the company offers free online courses on entrepreneurship and employability that, once completed, give young people the option to access courses offered by partners such as Google, LinkedIn, among others. Furthermore, together with more than 30 partner companies, Nestlé is promoting a dual education pilot in which young people will have the opportunity to study a technology-related course while they enter the labour market through internships offered by partner companies. One of the courses that will be promoted is Industry 4.0 skills<sup>50</sup>.

Colombia is also the cradle of startups in Latin America<sup>51</sup> and this has led these emerging, high-growth companies to become major players in the technology market, requiring digital talent, supporting education initiatives and creating some of their own, such as the one being developed by Imaginamos to educate and attract technology talent.

## 1.5 BUSINESS FEDERATIONS

Another important stakeholder in the field of digital skills is the business federations. These corporations formed by companies belonging to the same sector or industry have an impact on public policy on related issues.

A good example is Fedesoft<sup>52</sup> (the Colombian Federation of Software Industry and Related ITs), which works to strengthen the national software industry so that it can be competitive and successful at the global level. To achieve this, it brings together Colombian software companies, and it defends and promotes their interests before the government, international competitors, and other bodies. The federation works to develop public policies, promote the training and competitiveness of firms in the sector, to generate specialised sector information and to explore global opportunities that position Colombia as a world-class technology supplier.

In terms of education in digital skills, in response to the training needs of the work teams of its 605 affiliated companies, Fedesoft has partnered with Make IT Real, Exacom IT,

49 Nestlé. Iniciativa por los jóvenes. <https://jovenes.nestle.com/co/>

50 MinTrabajo. <https://www.mintrabajo.gov.co/prensa/comunicados/2020/noviembre/con-modelo-de-educacion-dual-nestle-y-mas-de-20-empresas-apoyaran-el-acceso-al-mercado-laboral-de-200-jovenes>

51 Latam List. <https://latamlist.com/10-colombian-startups-to-watch-in-2020/>

52 Fedesoft. <https://fedesoft.org/>

Intcomex and Platzi for courses in Full Stack Development and Data Science. Additionally, together with SENA and Colombia Productiva, it launched the Talento 4.0 training programme<sup>53</sup>, which focuses on advanced technologies for the software industry, to enable the specialisation of human capital in companies in the software, IT, BPO, KPO and ITO sectors in order to boost the international operations of companies through knowledge management.

The federations that do not necessarily belong to the technology industry, such as ANDI, Fenalco and Confecámaras, among others, have also tried to influence public policies on technology skills due to the lack of such skills among professionals and the existing human capital gaps. ANDI<sup>54</sup>, for its part, has been developing several related initiatives, including some promoted by the Vice-Presidency for Digital Transformation, the Human Talent survey, the Gender Equality survey, the Digital Transformation survey, among others. It also insists on the importance and promotion of skills before organisations such as the Organisation for Economic Co-operation and Development (OECD) and the International Labour Organisation (ILO).

These gaps, whether of quantity, relevance, or quality (see Chapter 4), do not allow companies to access the talent they need. Again, it is important to see technology as a fundamental area that is part of all other areas of knowledge and not as an isolated tool or an end in itself.

The expansion of technology-based companies in the country has also created other types of business alliances that seek to advocate for the interests of a particular group of companies and services. This is the example of Alianza In<sup>55</sup>, the association of apps in Colombia.

The most common complaint from these federations at the public policy level is that regulation is moving slower than technology. In addition, although there are several bills in the pipeline that have some impact at the technology level, these bills are published for comment, but the conversation is not always open for the different market stakeholders can intervene. Technology is not a separate industry and sector that can be understood as individual and isolated; technology and therefore technological skills are nowadays part of and cut through all the industries, sectors, and companies in the country.

It is not unusual to see, for example, the growth of industries such as PropTech<sup>56</sup>, LegalTech<sup>57</sup> and others belonging to areas that were normally understood to be alien

53 Colombia Productiva. <https://www.colombiaproductiva.com/talento4>

54 ANDI. <http://www.andi.com.co/>

55 La República. <https://www.larepublica.co/empresas/alianza-in-la-asociacion-creada-por-aplicaciones-de-tecnologia-a-cargo-de-david-luna-3008278>

56 Colombia PropTech. <http://colombiaproptech.com/>

57 LegalTechies. <https://legaltechies.es/2020/01/10/el-concepto-de-legaltech-y-sus-variantes/>

to technology but that are now revolutionising markets. The way in which FinTech<sup>58</sup> companies have come to revolutionise the country's financial sector comes at a price. For the same reason, conversations about technology and digital skills no longer belong only to the sphere software and technology industries per se but should be in the public arena and be the subject of participation by all market players. They should not only be priority conversations for MinTIC but they should be a priority for all public entities at the national and local level.

## 1.6 COMPENSATION FUNDS AND RECRUITMENT ORGANISATIONS

Compensation funds and recruiters have also made efforts to train people in technology skills. Due to the gaps that exist in the market, which will be discussed below, these organisations have been a valued platform to disseminate courses and initiatives aimed at improving the digital skills of the Colombian population. Compensation funds, which also act as employment exchanges for their members, have tried to implement digital skills policies to reduce the digital skills gap. A clear example of this is Comfama<sup>59</sup>, an Antioquian pioneer of initiatives such as the Sumanti Fund mentioned above.

The issues, caused by the gaps between what companies demand and the skills of people in the labour market, have deeper roots when the technical teams and human resources teams are not communicating effectively.

The members of some of the technology talent recruitment firms interviewed for this study stated that many vacancies are posted by copying and pasting the company's technology and programming language set, without a clear understanding of the true technical requirements and skill levels that should be required of the person. This often leads to job postings that include many languages and frameworks that are not necessarily needed for the role, resulting in people not applying or not having a full understanding of what the job actually requires.

Human resources teams rarely have a thorough understanding of the technical requirements of the job and this leads to candidates being rejected for not fulfilling on paper a skill that can easily be acquired within a company. The fact that the people who participate in the selection process are not familiar with technology languages means that it is often unclear what is and what is not negotiable in candidates.

58 Colombia Fintech. <https://www.colombiafintech.co/>

59 Comfama. <https://www.comfama.com/>

## CHAPTER 2. //

# PUBLIC POLICY ON DIGITAL SKILLS IN COLOMBIA: “THE DIGITAL FUTURE BELONGS TO EVERYONE”



The Colombian government promotes Information and Communication Technologies (ICTs) as enablers of social and economic development for the Colombian population. To secure the longer economic development benefits of ICT and to improve the resilience of the economy in the face of economic shocks, workers need not only to learn skills specific to certain occupational profiles, but also to acquire a greater capacity to adapt to a changing world of work.

With the plan “The Digital Future Belongs to Everyone” (2018-2022), the Colombian government aims to prepare the economy and its workforce for the Fourth Industrial Revolution, and to accelerate the closing of the digital divide such that the entire population can share the benefits of technology development. While this policy has a broader framework for action, its development and implementation have a direct impact on the field of digital skills in Colombia.

This chapter analyses the government’s roadmap for public policies aimed at surveying public policies on digital skills. The initiatives that have been developed as part of the four axes of the “The Digital Future Belongs to Everyone” plan are detailed below, with emphasis on those that are directly related to the development of digital skills in the country.

While many initiatives are in place to reduce the gaps, it is worth mentioning that the pandemic and social isolation measures have interfered with the implementation of several of them and have also meant that results reported are not up to date because the timelines have been modified.

## 2.1

### ICT ENVIRONMENT FOR DIGITAL DEVELOPMENT

“The Digital Future Belongs to Everyone” plan seeks the regulatory and institutional modernisation of the ICT sector and to this end the national government set processing a draft law as a first-year goal. Law 1978<sup>60</sup> was enacted on 25 July 2019. In addition, the Single ICT Fund<sup>61</sup> was created, which seeks to centralise planning and decision-making on the use of resources, allowing for the formulation of a single long-term ICT public policy.

## 2.2

### DIGITAL SOCIAL INCLUSION

According to the Economic Commission for Latin America and the Caribbean - ECLAC (Ramírez & Gutierrez, 2008) the digital divide can be defined as “the line or distance

60 Congreso de Colombia. [https://normograma.MinTIC.gov.co/MinTIC/docs/ley\\_1978\\_2019.htm](https://normograma.MinTIC.gov.co/MinTIC/docs/ley_1978_2019.htm)

61 MinTIC. <https://www.MinTIC.gov.co/portal/inicio/Sala-de-Prensa/Noticias/125708:Conozca-la-agenda-de-inversiones-para-2020-del-Fondo-Unico-de-Tecnologias-de-la-Informacion-y-las-Comunicaciones>

that separates the population group that can access ICTs from the group that cannot". According to this definition, the digital divide refers to the unequal opportunities of access to information, knowledge and education through new technologies. The digital divide can be classified into three stages or aspects: i) the early or access divide, which considers the difference between those who have and those who do not have access; ii) the primary or usage divide, which focuses on those who have access but are not users; and iii) the secondary or quality of use divide, which captures the differences between the participation of those who have access and the users (Peña et al., 2019). The programmes aimed at closing the digital access gap in Colombia are outlined below.

### > Programme for the Massification of the Last Mile<sup>62</sup>

The first initiative in this axis is the programme aimed at the massification of the last mile (sustainable connectivity for all Colombians), which aims to reduce the last mile deficit in the country and increase internet penetration, mainly in social strata 1 and 2<sup>63</sup>. As of June 2020, more than 146,000 families in strata 1 and 2, and in priority interest housing, located in 19 departments (including San Andrés), had benefited from this initiative. In addition, at least one WiFi Zone was installed in each municipality, reaching a total of 763 zones.

### > Programmes for the massification of universal access

The goal is to provide Internet access mainly to rural populated areas in the country that do not currently have easy access to this service, due to their geographic location and socio-economic characteristics.

This programme has four major projects:

- I. rural digital zones, which will benefit 1,000 populated areas<sup>64</sup> through public-private cooperation models;
- II. rural digital centres, which will benefit 10,000 populated areas through free internet access models guaranteed for 10 years;
- III. connectivity framework agreement, which will benefit public entities and allow them to have open spaces with free internet access; and
- IV. the obligation plan, which will prioritise populated areas that have not benefited from any other programme.

These projects will benefit 11,000 populated areas in 1,102 municipalities in the country's 32 departments.

62 MinTIC. <https://www.MinTIC.gov.co/portal/inicio/Ministerio/Viceministerio-de-Conectividad/Direccion-de-Infraestructura/125819:Programa-de-Ultima-Milla-Hogares-Conectados>

63 DANE. <https://www.dane.gov.co/index.php/servicios-al-ciudadano/servicios-informacion/estratificacion-socioeconomica#:~:text=En%20cambio%2C%20el%20estrato%20es,de%20una%20metodolog%C3%ADa%20de%20estratificaci%C3%B3n>

64 "Populated area" is a concept created by DANE for statistical purposes to identify population nuclei. It is defined as a concentration of at least 20 contiguous dwellings, neighbouring or attached to each other, located in the rural area of a municipality or a departmental township. This concentration has urban characteristics such as the delimitation of vehicular and pedestrian roads.

These programmes are particularly relevant to the efforts expected in the area of digital skills.. These projects seek

- I. a sustainable universal access component,
- II. free community access through public institutions,
- III. actions to improve the quality and coverage of mobile internet service provision, and
- IV. universal service in homes.

In addition, since 2020, a public intervention plan has been underway to improve the conditions of access and affordability of the internet service in the archipelago of San Andrés, Providencia and Santa Catalina. This intervention plan has suffered setbacks and serious delays due to Hurricane Iota that hit the archipelago at the end of 2020.

## PROMOTING CONNECTIVITY AND DIGITALISATION

### > Provision and appropriation of ICT tools for persons with disabilities

The aim of this initiative is to provide ICT tools to persons with disabilities to enable them to participate in all digital, social, cultural and educational environments, in an effort to create inclusive spaces. It is thus expected that more than 30,000 persons with disabilities will be trained during the four-year period. In 2019, 2,100 persons with disabilities were trained in the use of ICTs<sup>65</sup>.

### > ICTs as a tool to bridge the gender gap

As stated below, there is a gap in women's access to and use of ICTs. Consequently, initiatives are available at the public policy level for women to broaden their interest in the use of these tools and to use them as a source of knowledge, development and employability.

In addition, the aim is to prevent the replication of gender stereotypes that are harmful to women's empowerment, as well as potential acts of violence, which are one of the reasons why women are more reluctant to get involved in ICTs.

The most recognised initiatives in this field are Por TIC Mujer<sup>66</sup> and Hacker Girls<sup>67</sup>.

65 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

66 MinTIC. Por TIC Mujer. <https://www.MinTIC.gov.co/micrositios/porticmujer/748/w3-channel.html>

67 MinTIC. Hacker Girls. <https://gobiernodigital.MinTIC.gov.co/seguridadyprivacidad/portal/Iniciativas/Hacker-Girls/>

### > Dialogue and supplementary actions of the sector with an ethnic differential approach for digital social inclusion

In line with the Pact for Equal Opportunities for Indigenous, Black, Afro, Raizal, Palenquero and Roma groups of the National Development Plan 2018-2022<sup>68</sup>, MinTIC is strengthening the channels for dialogue with ethnic communities and implementing a strategy with actions that complement the sectoral commitments with a differential approach. This approach seeks to generate social digital inclusion, conditions of equality and social mobility through the articulation with the ICT ecosystem for the benefit of indigenous peoples, black Afro-Colombian communities, Raizal and Palenquero communities, the Roma people, and rural communities in remote areas. It is expected that 60 citizen participation exercises will be carried out during the four-year period.

At the end of 2019, at least 3,033 people belonging to ethnic groups in the country benefited directly<sup>69</sup> from the plan. A \$3 billion investment was made for 2020, in order to double the number of beneficiaries in 2019<sup>70</sup>. In the first half of the year 2020, 99 meetings were held or spaces for dialogue were convened by different entities of the sector, the national government, or by organisations or social movements and ethnic groups. Due to the pandemic, additional actions were agreed with the different ethnic communities to deal with the emergency caused by COVID-19.

## 2.3

### CITIZENS AND HOUSEHOLDS EMPOWERED BY THE DIGITAL ENVIRONMENT

#### > Use and appropriation of ICTs

With the aim of closing the gaps not from the point of view of access but from the use and appropriation of ICTs, initiatives have been strengthened, such as “digital citizenship” through which work has been done on basic skills training and the generation of intermediate and advanced skills.

This strategy also seeks to inspire people to use the Internet. Both volunteers and students in 9th, 10th, and 11th year of schooling who must perform their mandatory social service<sup>71</sup> can do so by training people who do not yet use ICTs. In 2019, 70,595 people in the 32 departments of the national territory were reached by the programme. For the year 2020, the goal was to reach 60,000 people<sup>72</sup>. However, the pandemic made it difficult to implement the programme<sup>72</sup>.

68 DNP. <https://www.dnp.gov.co/DNPN/Plan-Nacional-de-Desarrollo/Paginas/Pactos-Transversales/Pacto-por-la-equidad-de-oportunidades-para-grupos-indigenas-negros-afros-raizales-palenqueros-y-Rrom/Equidad-de-oportunidades-para-grupos-Etnicos.aspx>

69 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

70 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

71 In order to graduate, students in the last years of school in Colombia are required to perform a compulsory social service. Ministry of Education [https://www.mineducacion.gov.co/1759/w3-article-323441.html?\\_noredirect=1](https://www.mineducacion.gov.co/1759/w3-article-323441.html?_noredirect=1)

72 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

Teleworking was also encouraged, raising awareness among 22,500 people annually and promoting the efficient use of ICTs in the productive sector, with a view to improving the quality of life of the community. As of 31 July 2020, a total of 10,301 workers had been directly advised on the implementation of telework and a total of 12,020 people had been impacted, out of a total of 22,321 people. To date, the target of 10,000 people receiving information by 2020 has been exceeded, due to the COVID-19 emergency<sup>73</sup>.

### > Comprehensive Technology for Learning Policy

A public policy has been drawn up regarding the use of ICTs aimed at developing the skills demanded of students in state preschool, primary and secondary education institutions<sup>74</sup> by the digital society. The actions of this policy would be framed in four specific objectives:

- I. improving access to digital technologies,
- II. improving Internet connectivity,
- III. promoting the appropriation of digital technologies in the educational community, and
- IV. strengthening the monitoring and evaluation of the use, access and impact of digital technologies in education.

While this process was accelerated by the pandemic in that it was positioned as a public policy priority, there was also evidence of a lack of connectivity and equipment in places where children have not been able to get an education because they do not have virtual access to it.

## 2.4 SECTORAL AND TERRITORIAL DIGITAL TRANSFORMATION

Colombia must move towards a digital society and towards the Industry 4.0. The digital transformation of the society is the fundamental mechanism for implementing economic development models in the framework of the fourth industrial revolution, that increase public and private productivity, improve competitiveness, and facilitate the closing of social gaps in the population.

### > Digital Transformation of the State

The Digital Transformation of the State initiative<sup>75</sup> seeks to encourage public entities to propose initiatives and solutions that address the needs and problems of citizens through simple, agile services that create public value.

73 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

74 MinTIC. <https://www.MinTIC.gov.co/porta/inicio/Sala-de-Prensa/Noticias/126403:Con-la-politica-publica-de-Tecnologias-Para-Aprender-el-Gobierno-nacional-fortalecera-las-competencias-digitales-en-los-colegios-publicos>

75 MinTIC. <https://MinTIC.gov.co/porta/inicio/Sala-de-Prensa/Noticias/149186:MinTIC-publica-el-Marco-de-Transformacion-Digital-para-mejorar-la-relacion-Estado-ciudadano>

### > Digital transformation of businesses and productive sectors

The Digital Business Transformation of the Productive Sectors initiative aims to increase the degree of adoption of technology and e-commerce in the Colombian business sector and promote its use for productivity and competitiveness. However, no progress has been made in the commitments created to drive the digital transformation by changing the regulations in force, for the public sector to allow people with non-formal education to access jobs and contracts where standards and salaries are not undermined by the fact that the applicants do not hold a degree or a professional card.

### > Strengthening the digital industry and fostering the development of new digital businesses

The initiative to strengthen the digital industry and encourage the development of new digital businesses is made up of several projects:

- I. Apps.co: its purpose is to promote the creation and sustainable development of enterprises based on digital solutions,
- II. Crea Digital<sup>76</sup>: an initiative of MinTIC and the Ministry of Culture that supports the production of cultural, educational and entertainment content in Colombia,
- III. Colombia 4.0<sup>77</sup>: the most important digital meeting of orange economy in the country,
- IV. Promotion of the development of the digital industry by increasing the participation of digital industries in the Gross Domestic Product,
- V. Promotion of the internationalisation of the IT industry to strengthen the marketing capabilities of companies in the IT industry (software and related services,
- VI. Intelligent specialisation, which aims to strengthen the Colombian IT industry through the development of innovative technological solutions to cross-cutting problems in the productive sectors of the country's economy.

## DIGITAL TALENT STRATEGY TO PROMOTE AND DEVELOP SKILLS FOR THE DIGITAL INDUSTRY

### > Apps.co digital entrepreneurship workshops

This project aims to create and build skills for digital entrepreneurship, through theoretical and practical face-to-face workshops and virtual courses based on methods, tactics, good practices or standards applied to digital entrepreneurship. Digital entrepreneurship workshops are trainings for ideation and awareness, useful to build the skills necessary to establish and develop digital businesses.

In order to have greater coverage and generate spaces, the workshops combine face-to-face and virtual trainings. From August 2018 to date, 76,871 citizens with

76 MinTIC. Crea Digital. <https://www.MinTIC.gov.co/portal/inicio/Sala-de-Prensa/Noticias/145450:Postulate-a-Crea-Digital-2020-para-las-industrias-creativas>

77 Colombia 4.0. <https://newtenberg.co/Blog/1067:Colombia-4-0-el-encuentro-Digital-de-Economia-Naranja>

digital entrepreneurship ideas have been trained through these courses and digital entrepreneurship incubators<sup>78</sup>.

### > Abilities and Productivity Models - Digital Talent for Enterprises

The goal of the Digital Talent for Business programme is to strengthen the skills and abilities of companies in topics related to information technologies, digital areas, artificial intelligence, Fourth Industrial Revolution, among others.

MinTIC intends to cover up to 50 percent and up to 5 million pesos (approximately 250,000 USD) of the training process required by companies, with the commitment that the employer will cover the remaining value and give the trained employee a bonus for 25 percent of the total value of the training<sup>79</sup>. In this context, MinTIC will co-finance the process of generating digital skills in areas of digital talent, with a fixed ceiling per beneficiary and per company or enterprise.

It is expected that 4,000 workers from companies belonging to the different economic sectors of the Colombian economy will be trained between 2019 and 2022. For this purpose, a survey was conducted in which businesspeople and entrepreneurs stated their staffing needs and the skills required by their projects or companies<sup>80</sup>. In 2019, 632 Colombians employed by 59 companies were trained in topics related to the fourth industrial revolution. As of July 2020, 755 Colombians working for 41 companies were being trained in these skills<sup>81</sup>.

### > Programming for kids - Code for Kids

The “Code for Kids”<sup>82</sup> project aims to join efforts, actions, capacities and knowledge to develop a project with a programming methodology for children and young people, promoting and building the ICT skills of teachers as multipliers in state education.

The aim is to train at least 1,810 teachers from state schools in different departments and cities of the country over the four-year period. Trained teachers will transfer the knowledge acquired to at least 80,000 students in the schools selected for this strategy over the four-year period<sup>83</sup>.

In 2019, 21,887 students and 800 teachers were trained in the micro:bit methodology. As of July 2020, 8,115 teachers were qualified to receive programming training<sup>84</sup>.

78 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

79 MinTIC. [https://www.MinTIC.gov.co/portal/604/articles-101922\\_Plan\\_TIC.pdf](https://www.MinTIC.gov.co/portal/604/articles-101922_Plan_TIC.pdf)

80 MinTIC. [https://www.MinTIC.gov.co/portal/604/articles-101922\\_Plan\\_TIC.pdf](https://www.MinTIC.gov.co/portal/604/articles-101922_Plan_TIC.pdf)

81 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

82 MinTIC. Code for Kids. <https://MinTIC.gov.co/portal/inicio/Sala-de-Prensa/Noticias/80650:Ministerio-TIC-y-el-British-Council-forman-profesores-y-estudiantes-en-programacion>

83 MinTIC. [https://www.MinTIC.gov.co/portal/604/articles-101922\\_Plan\\_TIC.pdf](https://www.MinTIC.gov.co/portal/604/articles-101922_Plan_TIC.pdf)

84 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

### > Pedagogical Strategy for Digital Talent

The initiative Pedagogical Strategy for Digital Talent is aimed at public schools in the country with a direct impact on students aged 15 to 18. It will enable the development of competencies related to digital talent in young people.

Over the four years, 600 schools and 56,000 students are expected to benefit<sup>85</sup>. In 2019, 220 educational establishments, 700 teachers were trained, and 23,553 students benefited through the implementation of pedagogical strategies for secondary education in IT areas. It was expected that by 2020, 20,000 students from state schools would be certified in IT-related courses (Programming, Cultural and Creative Industries and Software Development)<sup>86</sup>.

Again, the pandemic hampered the implementation of this initiative as, due to social isolation measures, children did not attend school.

### > Artificial Intelligence and Data Science

On 22 May 2019, Colombia formally adopted the OECD Council Recommendation on Artificial Intelligence<sup>87</sup>, which includes a set of principles and recommendations for the design of future public policies on artificial intelligence in the country. As a result, MinTIC developed a training programme aimed at all Colombians who wish to learn, know and improve their skills and knowledge about topics related to artificial intelligence, 4IR, digital and IT areas, among others<sup>88</sup>.

The aim is to train 60,000 people<sup>89</sup> by the end of the four-year period. In 2019, 4,413 Colombians were trained in topics related to Artificial Intelligence. In 2020, 3,434 Colombians were being trained in topics related to Artificial Intelligence and 35,387 unemployed Colombians were trained with Coursera as part of the workforce reactivation strategy<sup>90</sup>.

Additionally, in 2019 the Ministry launched a Data Science training programme which has trained more than 900 people<sup>91</sup>.

In the preparation of this study, we had the chance to talk to a student of the Data Science For All programme offered by MinTIC in partnership with Correlation One<sup>92</sup>. The quality

85 MinTIC. [https://www.MinTIC.gov.co/portal/604/articles-101922\\_Plan\\_TIC.pdf](https://www.MinTIC.gov.co/portal/604/articles-101922_Plan_TIC.pdf)

86 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

87 OECD. <https://www.oecd.org/centrodemexico/medios/cuarentaydospaísesadoptanlosprincipiosdelaocdesobreinteligenciaartificial.htm#:~:text=La%20OCDE%20recomienda%20a%20los%20gobiernos%3A&text=Fomentar%20ecosistemas%20de%20IA%20accesibles,unos%20sistemas%20de%20IA%20fiabiles>

88 MinTIC. <https://MinTIC.gov.co/portal/inicio/Sala-de-Prensa/Noticias/106989:Mas-de-25-000-colombianos-podran-formarse-gratis-en-Inteligencia-Artificial-y-habilidades-para-la-transformacion-digital-gracias-a-MinTIC>

89 MinTIC. [https://www.MinTIC.gov.co/portal/604/articles-101922\\_Plan\\_TIC.pdf](https://www.MinTIC.gov.co/portal/604/articles-101922_Plan_TIC.pdf)

90 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

91 Rendición de cuentas MinTIC. [https://micrositios.MinTIC.gov.co/rendicion\\_cuentas\\_2020/](https://micrositios.MinTIC.gov.co/rendicion_cuentas_2020/)

92 Correlation One. <https://www.correlation-one.com/>

of this course is internationally recognised, and it provides young people with a very good preparation for the labour market. However, it is important that the efforts made to promote these courses also include companies and employability training. With this, the beneficiaries of these courses will have a complementary training that prepares them to enhance their professional profile in the labour market.

#### > **STEM ROUTE (Mobile Labs)**

Itinerant laboratories<sup>93</sup> with educational offerings in line with the Fourth Industrial Revolution are taken to the most remote municipalities in the country, with the aim of bringing the population closer to the development of computational thinking and the new technological trends of the Fourth Industrial Revolution.

#### > **ICT Mission**

ICT Mission 2022<sup>94</sup> is a government-led programme aimed at training 100,000 Colombian youth and adults in programming to meet the challenges of the Fourth Industrial Revolution. The 100,000 programmer goal is expected to be met by 2022.

This mission was driven by the government, entrepreneurs, companies, associations and academia and was organised in several working groups. A learning pathway was created with basic learning cycles and the option of taking two specialisation cycles in web and mobile application development.



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93 Economía Naranja. <https://economianaranja.gov.co/oferta-nacional/conocimiento/mineducacion/estrategia-de-laboratorios-moviles-ruta-stem-a-y-cuarta-revolucion-industrial/>

94 MinTIC. Misión TIC. <https://www.misontic2022.gov.co/portal/>

## CHAPTER 3. //

# UNEQUAL ACCESS TO INFORMATION TECHNOLOGIES



Colombia has witnessed a significant increase in access to information and communication technologies over the last decade. The proportion of households with landline internet grew by 16 percentage points over the 2012-2019 period, reaching a coverage level of 42 percent. This contrasts with the decrease in the proportion of households which have a computer at home, which had reached an all-time high in 2014 (37.1 percent) before starting a negative trend (Quality of Life Survey, 2019).

Households have adopted alternative tools to access digital information, and specifically there has been a significant increase in the use of smartphones. In 2019, 58.6 percent of individuals over 5 years of age used smartphones, while 73 percent of individuals in the country reported never using a computer during the year (Quality of Life Survey). The main challenge of this substitution by households lies in providing adequate mechanisms for the acquisition of digital skills through these mobile devices.

The massification of internet coverage improves access to information and facilitates communication between individuals. However, as mentioned above, this can be a challenge for the acquisition of digital skills that may later be required in the labour market. A disaggregated socio-economic analysis indicates that there is inequality in the access to and use of ICT tools for different population segments, including households with lower levels of education or income on the socio-economic stratum, rural households and those located in particular geographical regions, and those belonging to ethnic minorities. Differences by age and the gender of the head of the household were less significant. Finally, it was found that there is low ICT penetration in the productive sector in Colombia, the depth of which depends on the size of the company.

The aim of this chapter is to characterise inequalities in access to information and communication technologies in Colombia. Three main sources of primary information were used to achieve this goal: The Extensive Integrated Household Survey (DANE)<sup>95</sup>, the Quality of Life Survey (DANE)<sup>96</sup> and the Extensive ICT Survey (MinTIC)<sup>97</sup>. Based on the microdata available from these surveys, the necessary calculations were made to carry out the ICT characterisation in the country.

This chapter is divided into four sections. The first section presents an international comparison to contextualise Colombia's ICT situation. The second section analyses the evolution and inequalities of Colombian households with respect to landline internet access and computer equipment. The analysis is disaggregated by socio-economic variables: gender of the head of household, income, rurality, labour informality, educational level, age and region, in order to identify inequalities in ICT access. The third section analyses the use of Information and Communication Technologies, and it assesses the knowledge

95 <http://microdatos.dane.gov.co/index.php/catalog/599/study-description>

96 [http://microdatos.dane.gov.co/index.php/catalog/607/get\\_microdata](http://microdatos.dane.gov.co/index.php/catalog/607/get_microdata)

97 <https://colombiatic.MinTIC.gov.co/679/w3-article-74002.html>

of some ICT skills. The third section also presents a differentiated analysis based on socio-economic variables of individuals; gender, ethnicity, rurality, household income and age. Finally, the fourth section assesses inequalities in the adoption of ICTs at the firm level depending on the size of the company.

### 3.1 DIAGNOSIS OF THE DIGITAL ECONOMY IN COLOMBIA

Despite it being a stable economy and outperforming the other countries in the region over the last decade, Colombia faces a number of challenges in order to make a qualitative leap in its development path and take advantage of an increasingly digital society. The main challenge facing Colombia is its low level of productivity, which has become an insurmountable barrier to speeding up growth and reducing inequality. According to the World Economic Forum's Global Competitiveness Index, Colombia ranks 63<sup>rd</sup> among the 142 countries evaluated (2019)<sup>98</sup>. One sign of low productivity is the reduced participation of the Colombian productive sector in global value chains, with a high contribution of raw materials and fossil fuels to the detriment of sectors typically associated with dynamic value chains, such as transport vehicles, electronics and service offshoring.

The challenge in terms of productivity lies not only in the low level observed for the economy as a whole, but above all in the large gaps that exist within the economy. At the firm level, according to OECD (2019b), labour productivity in medium, small and micro firms is 46 percent, 23 percent and 6 percent, respectively, of that of large firms. Similarly, by economic activity, the information and communications sector (along with other activities such as transport and storage) has the third highest annual growth rate of labour productivity in 2019 (0.11 percent), behind financial activities, and agriculture and livestock (7.55 percent and 0.67 percent respectively). According to DANE<sup>99</sup>, the labour productivity growth of the Colombian economy for that same year was 0.84 p.p. Labour productivity in Colombia is lower than that of all its peers in the region with the exception of Peru, and in 2019 that of Ecuador.

This low productivity can be associated mainly to two factors: i) the high levels of labour and business informality, which reach a level of 47.7 percent<sup>100</sup>, weaken incentives to innovate and reduce the tax base to finance public policies, and ii) the low level of skills of Colombian workers, which is reflected in low wages and poorer living conditions. Twenty-nine point seven per cent of the households in Colombia earn less than the legal minimum wage (\$220 USD)<sup>101</sup>. As Figure 3.1 shows, Colombia's existing innovation system

98 <https://compite.com.co/informe/informe-nacional-de-competitividad-2019-2020/>

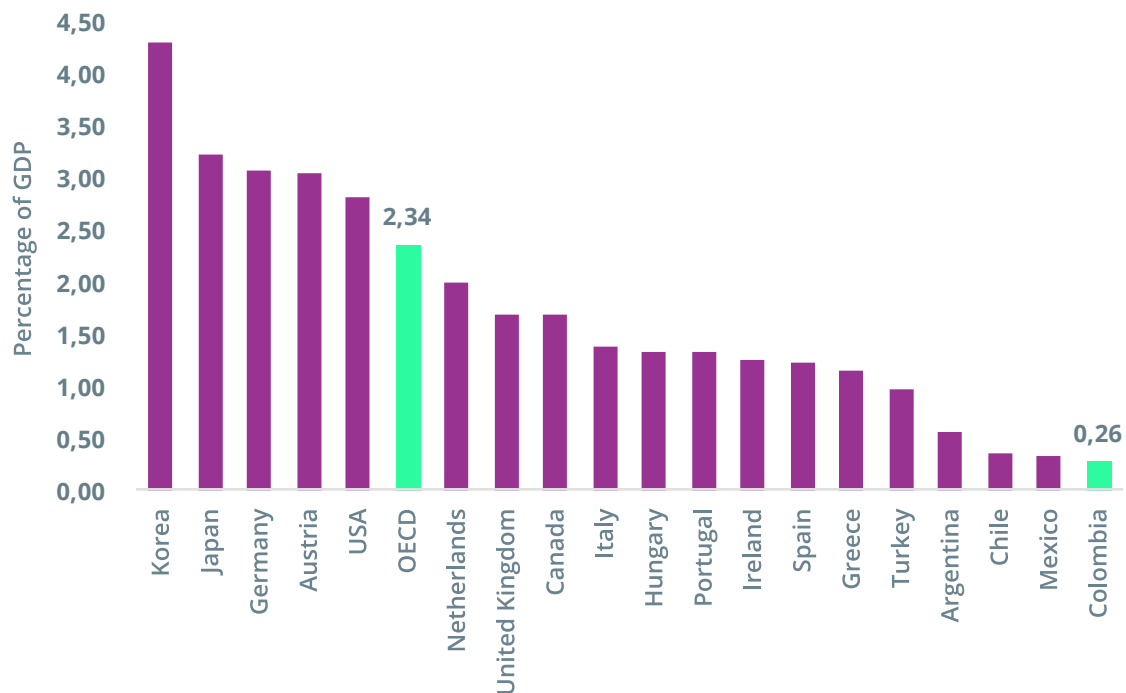
99 <https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/productividad>

100 National Statistics Department

101 Extensive Integrated Household Survey, own calculations

remains incipient, accounting for only 0.2 percent of the annual GDP, and lacks a strong entrepreneurial core, with the private sector contributing only 30 percent of R&D activities, a figure that reaches 70 percent in the OECD (OECD, 2015b).

**Figure 3.1**  
Gross expenditure on research and development, 2017



**Source:** Own calculations Taken from OECD Stats. <https://stats.oecd.org/>.

The low level of qualification of Colombian workers becomes a structural problem in times of economic crisis, since they have a low level of adaptability to changes in the work environment, which makes them vulnerable to sectoral recomposition processes such as the one generated by the COVID-19 pandemic. The reconfiguration of labour demand has increased the search for workers with strengths in soft skills, as well as advanced cognitive and technological skills (Fedesarrollo, 2021). In this scenario, a large proportion of workers, especially the most vulnerable, risk being left behind due to the fact that they lack the skills, particularly digital skills, necessary to make their way in a changing environment.

While the following sections provide a detailed analysis of the digital skills of Colombian workers, we should start by understanding the state of connectivity in Colombia, an essential input to make the most of the digital economy. Since 2010, successive administrations have aimed to expand access to and use of the internet by the population, mainly through two types of programmes: those aimed at strengthening sectors through ICTs, and those that have focused on the development of connectivity infrastructure per se (Peña Gil, Cuartas Castro, & Tarazona Bermúdez, 2019). Thanks to these efforts, the digital divide

has been closed and in recent years Colombia has led the expansion of ICT spending and has shown a significant increase in the number of users, although internet penetration is still lower than the regional average (Map 3.1).

**Map 3.1**  
Percentage of population with internet access by country, 2017



**Source:** Own calculations; Taken from International Telecommunication Union (ITU) 2017.

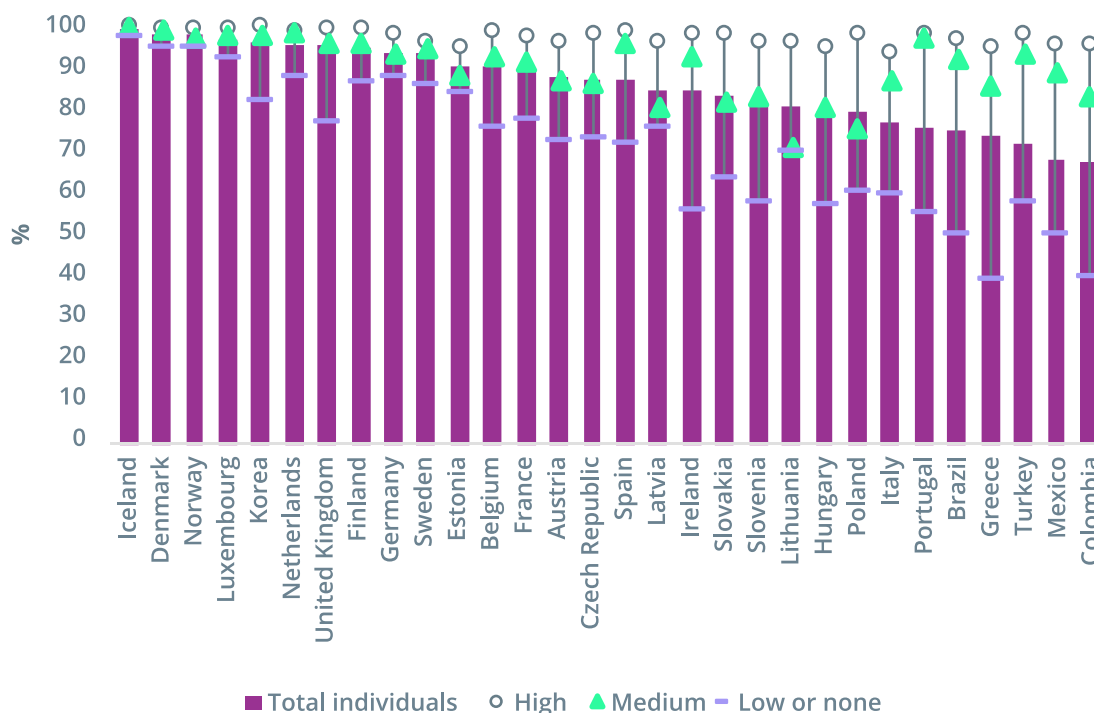
Despite all its efforts, Colombia continues to lag behind developed countries in terms of internet use by the population: by 2017, 64 percent of Colombians used the internet, an indicator that is still higher than the global average of 52 percent (OECD, 2019). But beyond the aggregate figures, the problem in Colombia is the large access gaps that exist between the different population groups.

As Figure 3.2 shows, educational level is one of the major determinants of internet use; while more than 95 percent of the population with higher education use the internet, less than 40 percent of Colombians with no educational qualifications do so. This explains why nearly half of the population that does not have access to the internet reports high costs as the main barrier to access.

It is observed that, in countries such as Colombia and Mexico, there are large disparities in internet use between those with high and low or no education, while in the Nordic countries this gap is significantly smaller. Added to this is the urban-rural gap, where the 37 percent internet penetration in the rural population compares unfavourably with 69 percent in urban areas (DANE, 2018a). Peña et al. (Peña Gil, Cuartas Castro, & Tarazona Bermúdez, 2019) show that since 2011, the number of internet users has increased in the 25-54 age group, but it has stagnated in groups such as children (5-11 years) and older adults (55 years and older).

Likewise, at the regional level they find great heterogeneity in terms of connectivity and internet access, concluding that, while the Andean region shows good connectivity, the same cannot be said of the Caribbean, Pacific and Eastern regions, where programmes aimed at providing infrastructure for connectivity should be concentrated.

**Figure 3.2**  
**Percentage of individuals who used the internet in the last 12 months, by level of education, 2018**



**Source:** Own calculations Taken from OECD Stats. <https://stats.oecd.org/>.

**Note:** Education levels are high, medium, and low or no education. Countries in the graph are those for which data are available.

Although connectivity and internet use in formal Colombian companies are acceptable and could even be considered healthy in international terms, this indicator hides two factors that call it into question. Firstly, it should be remembered that the vast majority of companies in the private sector are micro-enterprises (94.6 percent in 2019 according to the Private Competitiveness Council)<sup>102</sup>, which contribute 15.2 percent of formal jobs. Micro-enterprises, which employ no more than 10 workers<sup>103</sup>, are characterised by greater informality, more cash transactions, and less use of the internet for work related to their productive activity.

102 Taken from the National Competitiveness Report 2020-2021. Productivity and Entrepreneurship.

103 According to decree 957 of 5 June 2019, micro-enterprises have an income value for ordinary activities, lower than or equal to 23,563 UVT, 32,988 UVT or 44,769 TVU, depending on whether they belong to the manufacturing, services or commerce sector, respectively. <http://www.mipymes.gov.co/temas-de-interes/definicion-tamano-empresarial-micro-pequena-mediana>

Secondly, although internet coverage has been expanding, connection speeds remain relatively low. This is largely explained by the low penetration of fixed broadband connections, which are faster than mobile connections. Colombia has the lowest fixed broadband connection penetration among OECD countries and fibre optic coverage, despite having increased substantially in the last decade, remains very low (13 percent of total broadband connections, compared to 25 percent on average in the OECD). In this regard, OECD (2019) found that only a minority of businesses, including medium and large companies, have a connection with a speed above 30 megabits per second.

## 3.2 DEVELOPMENTS IN LANDLINE INTERNET ACCESS AND TECHNOLOGY EQUIPMENT

The need to access digital information, accompanied by government efforts to increase internet penetration in the national territory, is reflected in the sharp growth in the proportion of households that have this service. In the whole country, 42 percent of households had a landline internet service in 2019, compared to the 26 percent observed in 2012<sup>104</sup>. Despite the growth, this is insufficient to guarantee access to the majority of households in the country.

The recent health crisis generated by COVID-19 could boost household internet penetration, given the new work dynamics. However, according to our calculations<sup>105</sup>, the lowest levels of internet penetration are found in the most vulnerable households, which are engaged in less digitally adaptive work activities.

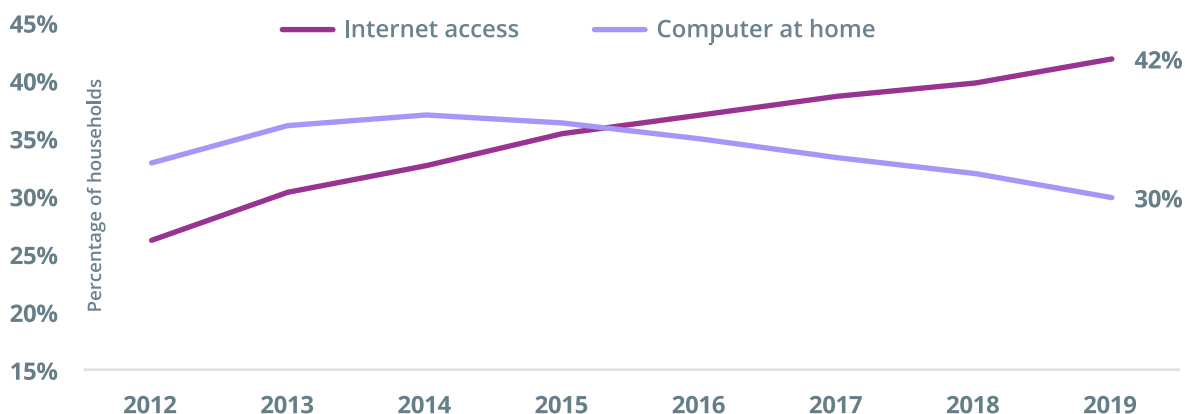
Therefore, in order to reduce inequalities in internet access, it is necessary to develop alternative mechanisms that prioritise the most vulnerable households. On the other hand, the acquisition of computer equipment seems to have taken a negative trend over the last five years. Only 30 percent of households in Colombia reported having a computer in their home, 7 percentage points less than in 2014<sup>106</sup>. Households in the country benefit from accessing information and improving their communication through digital tools, however, these households find greater efficiency in the use of mobile devices, specifically smartphones.

104 Extensive Integrated Household Survey, own calculations

105 Extensive Integrated Household Survey, own calculations

106 Extensive Integrated Household Survey, own calculations

**Figure 3.3**  
Evolution of differences in access by rurality



**Source:** Extensive Integrated Household Survey

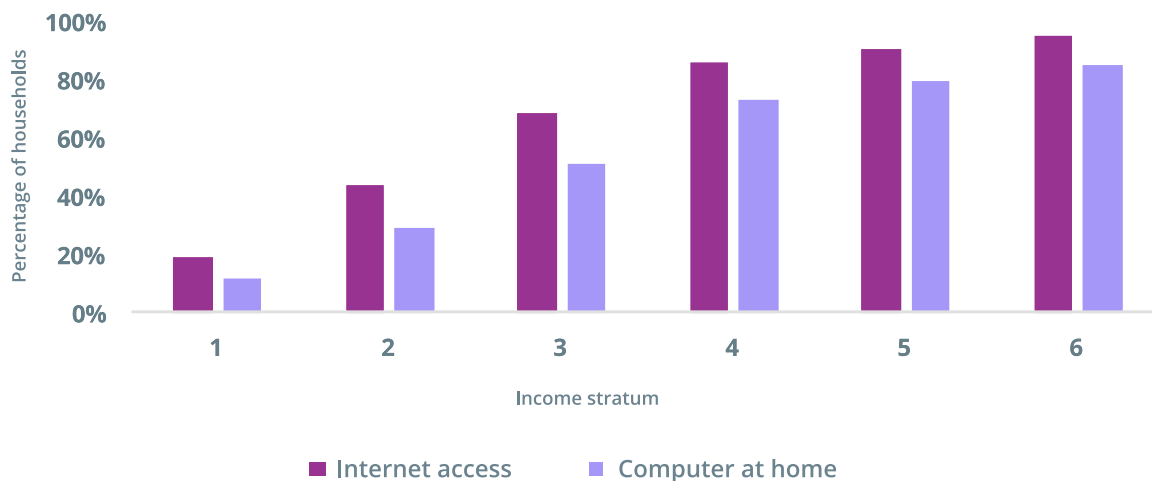
There are significant socio-economic inequalities between households in terms of their access to landline internet and whether they have a computer at home. The greatest inequality in household internet access is found when assessing household income. As shown in Figure 3.4, while 95 percent of households in the highest income stratum have an internet connection at home, only 19 percent of households in the first income stratum have access to the internet at home<sup>107</sup>. The problem lies in the fact that 33 percent of Colombian households belong to the first income stratum while only 1.2 percent of households are in the highest income stratum<sup>108</sup>. The government should increase its efforts to guarantee internet access to lower income households, especially those in strata 1 and 2. There are two socio-economic variables related to household income where inequalities in internet access and ICT equipment are also observed.

First, we find that households whose head of household has a work income have a significant difference in access to internet and ICT equipment compared to households whose main source of income is informal (see Figure 3.5). Second, the level of education attained by the head of the household appears to be another key determinant of ICT access. Households whose head of household has a higher education are on average 27 percentage points more likely to have an internet connection at home than those with only a secondary education. The acceleration of the digital transformation will mainly affect individuals whose work activity requires ICT skills; therefore COVID-19 could exacerbate inequalities.

107 Extensive Integrated Household Survey, own calculations

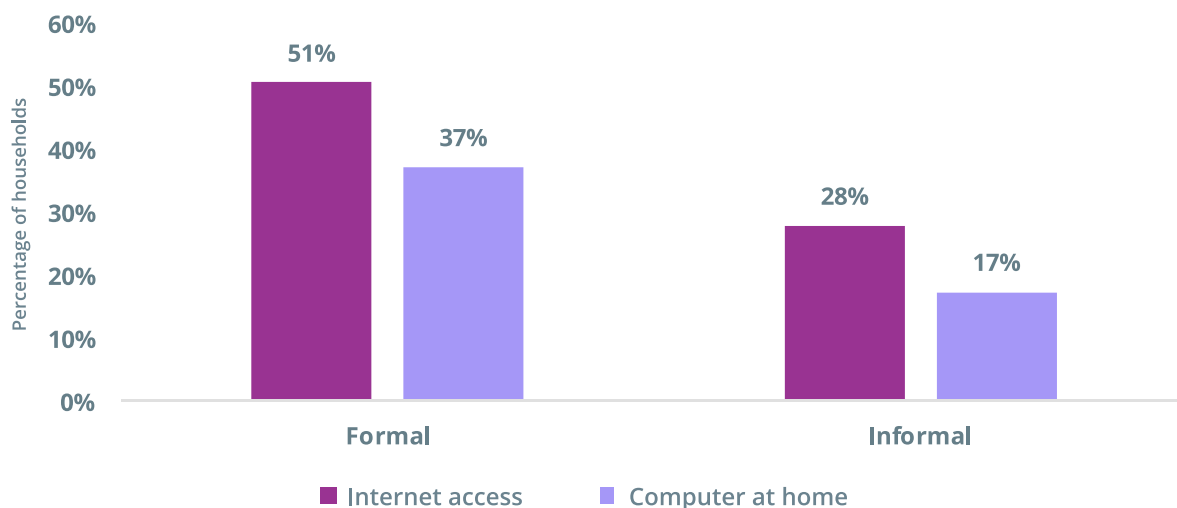
108 Extensive Integrated Household Survey, own calculations

**Figure 3.4**  
Differences in landline internet access and technological equipment by socio-economic stratum



Source: Extensive Integrated Household Survey, own calculations

**Figure 3.5**  
Differences in landline internet access and technological equipment by socio-formal stratum



Source: Extensive Integrated Household Survey

Two socio-economic variables where less significant inequalities were found in relation to household internet access and ICT equipment are the age and gender of the household head. By dividing households into four groups according to the age of the head of household (see Table 3.1), it was found that the highest prevalence of internet access and computer equipment is found in the 40-60 age group, and the lowest prevalence is found in households whose head is under 25 years old. On the other hand, female-headed households have greater access to the internet at home (43.4 percent) compared to male-headed households (41 percent); however, this difference is not statistically significant<sup>109</sup>. Finally, there are no differences regarding the ownership of a computer at home according to the gender of the head of household.

109 Extensive Integrated Household Survey, own calculations

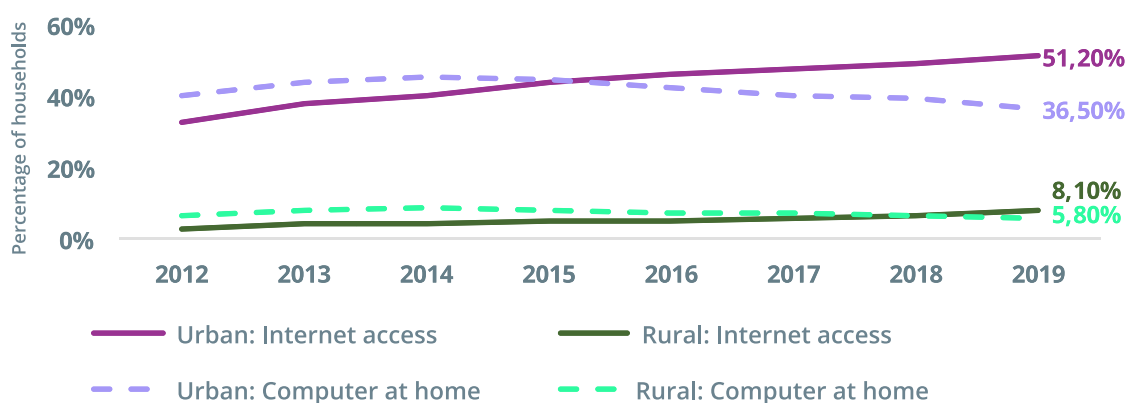
**Table 3.1**  
Differences in access and landline internet and technological equipment by gender

	Male	Female
Internet access in the home	41.0%	43.4%
Computing equipment in the home	29.9%	29.8%

Source: Extensive Integrated Household Survey

However, at the regional level, two inequalities in internet access and ICT tool ownership are evident. The first gap is the inequality in the access to ICTs between urban and rural households. Only 8.1 percent of rural households have internet access in their homes, while only 5.8 percent have a computer. This situation contrasts with the 51.2 percent internet penetration in urban households<sup>110</sup>. Despite the positive evolution in both segments over the last decade, the growth rate of internet penetration in urban areas far exceeds that observed in rural areas. While internet penetration in urban areas grew by 20 percentage points during the 2012-2016 period, the growth observed for rural territories was 2.2 percentage points<sup>111</sup>. As mentioned in the previous chapter, the national government acknowledges these gaps and is developing and implementing the rural digital zones project, which aims to benefit 1,000 population centres in 378 municipalities. On the other hand, access inequalities are also present in the main metropolitan areas of the country. Manizales along with Colombia’s three main cities lead in internet access among their residents, with 65.3 percent of households in these four cities having an internet connection. This contrasts with only 33 percent penetration in the city of Quibdó<sup>112</sup>. A relevant element to highlight is the overall low penetration in the Caribbean region.

**Figure 3.6**  
Evolution of differences in access by rurality



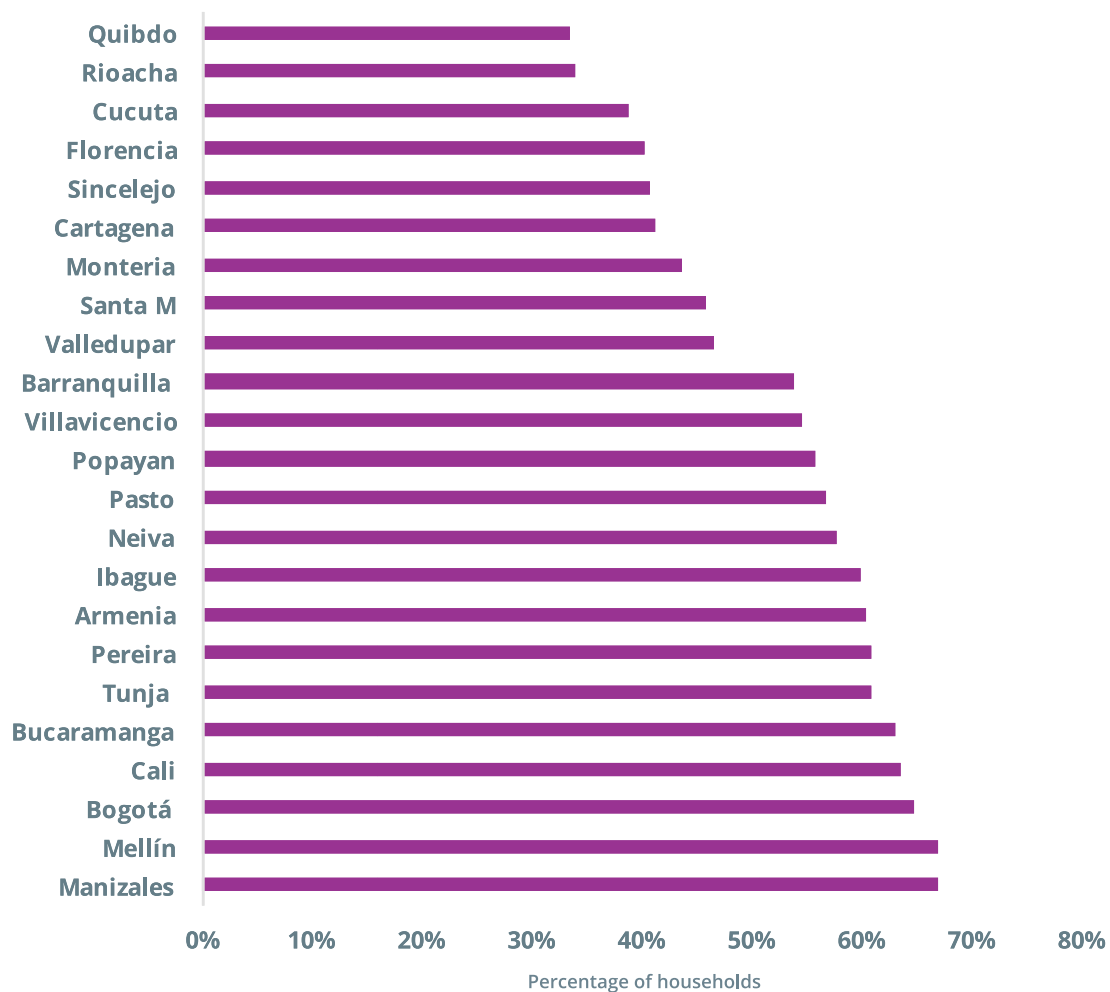
Source: Extensive Integrated Household Survey, own calculations

110 Extensive Integrated Household Survey, own calculations

111 Extensive Integrated Household Survey, own calculations

112 Extensive Integrated Household Survey, own calculations

**Figure 3.7**  
Landline internet access in 23 main metropolitan areas

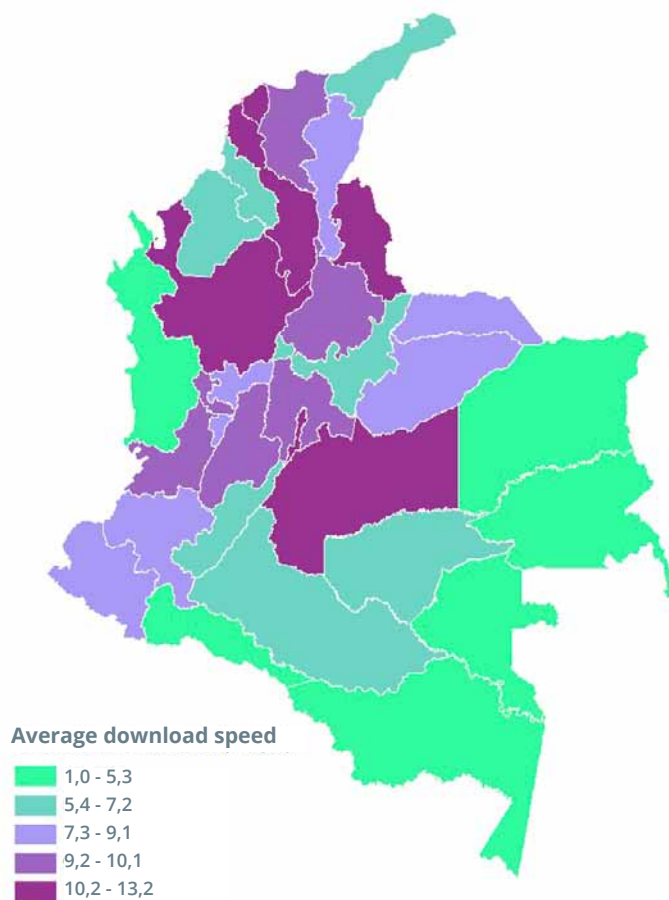


**Source:** Extensive Integrated Household Survey, own calculations

Information published by the Ministry of Information Technologies (MinTIC) in its report for the third quarter of 2020 shows that the average download speed in the country is 10.7<sup>113</sup> Mbps, contrasting with download speeds in Latin American countries such as Uruguay (29.76 Mbps), Mexico (26.57 Mbps) and Brazil (23.36 Mbps). In addition to the above, browsing speeds are not symmetrical for the entire national territory, as there is a clear gap in the quality of service for the most remote regions of the country. Territories such as Guainía, Amazonas and Vichada have download speeds ten times lower than the national average, while more economically developed territories such as the city of Bogotá and the departments of Antioquia, Atlántico and Bolívar have much higher download speeds (over 25 Mbps). This situation is proof of the digital inequality that exists in the country, as low speeds hinder the consumption of all types of multimedia content, affecting, among other things, the equality of opportunities by preventing a significant portion of the population from using the new digital tools to their advantage.

**Map 3.2**

**Average download speed at departmental level, 2019**



Source: Ministry of Technology, 2019, own calculations

**3.3**

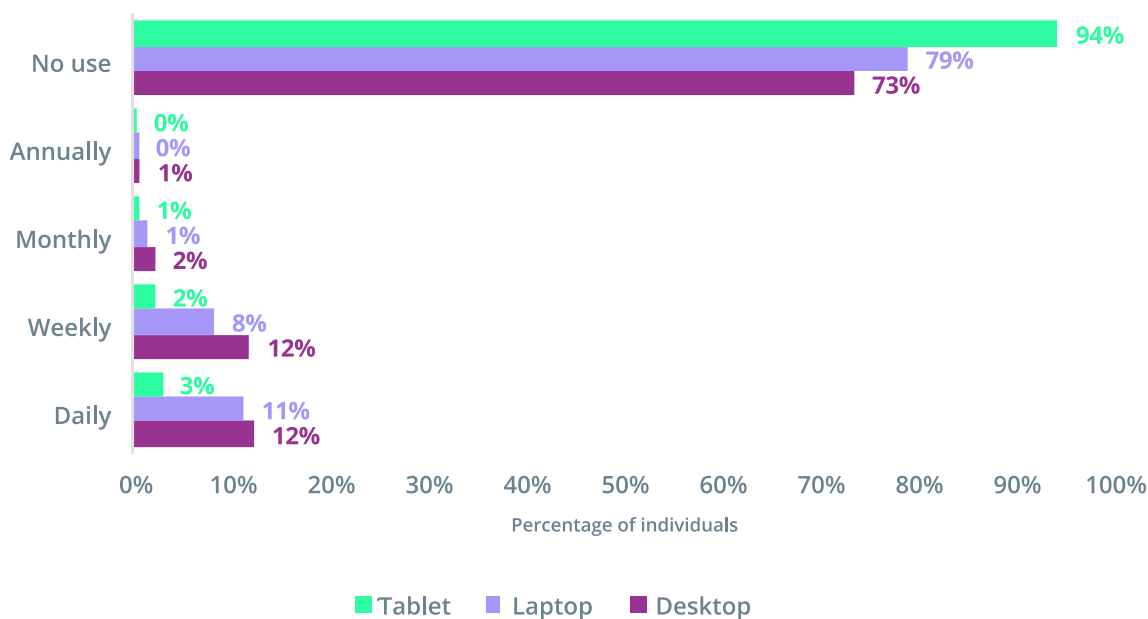
**INEQUALITIES IN THE USE OF INFORMATION TECHNOLOGIES AND DIGITAL SKILLS**

Colombia can be characterised as a country with a moderate frequency of internet use, but very limited use of computers. Only 12 percent of individuals aged seven and older reported using a desktop or laptop computer every day of the week in 2019. This proportion rises to 47 percent when asked about daily internet use<sup>114</sup>. This figure is close to the number of households that have an internet connection at home. Unsurprisingly, the availability of internet at home increases the frequency of use by increasing the availability of information and the flow of household communication. The place of greatest access to the internet for individuals accessing this service is the home, with 86.3 percent of individuals who accessed the internet at least once during the week doing so at home. Of these people, 9.2 percent accessed the internet in a paid public establishment (internet café) and 8.4 percent accessed it through the free access points set up by the national government. Finally, 60.6 percent of children and young people attending an educational

114 Quality of Life Survey 2019, own calculations

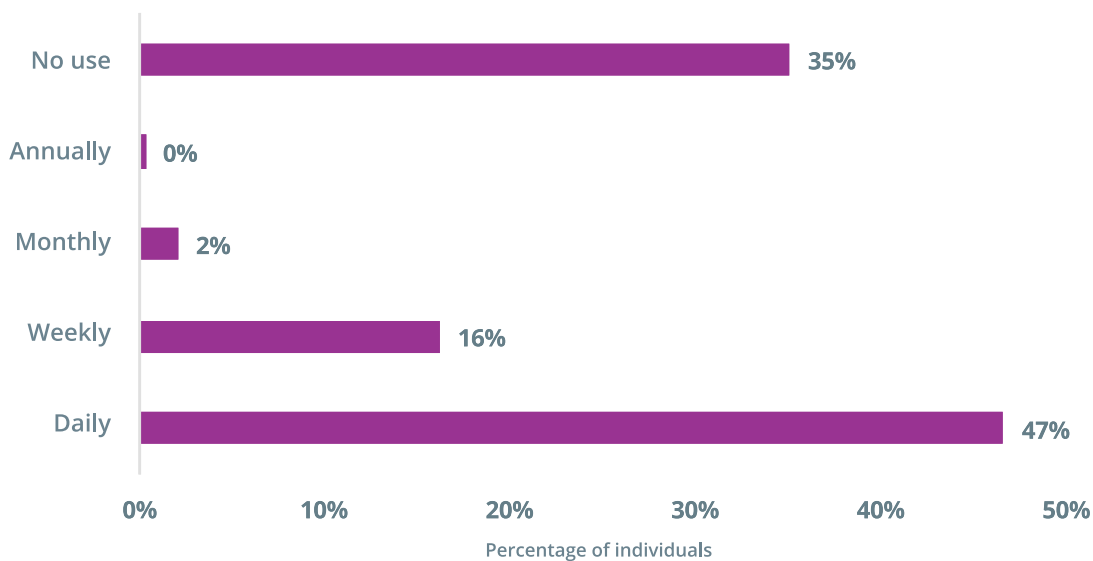
institution accessed the internet there, and 42.1 percent of working individuals accessed the internet at their place of work. As mentioned above, households and individuals have replaced traditional computer equipment with smartphones as a tool for accessing the digital system. While 89.5 percent of individuals who accessed the internet did so via a mobile device, only 34.7 percent did so via a computer<sup>115</sup>.

**Figure 3.8**  
Frequency of use of digital devices



Source: Quality of Life Survey 2019, Note: Individuals over 5 years of age

**Figure 3.9**  
Frequency of internet use



Source: Extensive Integrated Household Survey Note: Individuals over 5 years of age

The technology and information module of the Quality of Life Survey provides information to assess knowledge of basic digital skills. Specifically, the proportion of individuals who report having the skills to send an e-mail, use mathematical formulas in Excel, create a PowerPoint presentation document or use a specialised program. This information is only available for those individuals who reported having used a computer at least once in the last year. However, we could assume that individuals who did not report using a computer in the last year do not possess these digital skills, in order to determine what percentage of the total population possess basic ICT skills. Table 3.2 details the proportion of the population with the aforementioned skills. It is worth noting that the majority of the population using computers possess basic digital skills. However, when the analysis focuses on the entire population (over the age of seven), only a quarter of individuals in the country have basic ICT skills<sup>116</sup>. On the other hand, the prevalence of skills in a specialised programme is relatively low for both the general population and computer users. Only 4.69 percent of the country's population reports having skills in a specialised programme. The first step to generate a digital transformation process in which complex tools are implemented is to train the Colombian population in basic digital skills, including the use of the internet. According to individuals who do not use the internet, the main reason (43 percent) is not knowing how to use it, followed by not finding it useful (25 percent)<sup>117</sup>.

**Table 3.2**  
Proportion of individuals with access to computer equipment who have ICT skills

Skill	Percentage (users)	Percentage (general)
Email	81%	31.95%
Excel	59%	23.33%
Power Point	61%	24.08%
Specialised program	12%	4.69%

**Source:** Quality of Life Survey, 2019

The inequalities in the use of ICT tools and basic digital skills by gender and ethnicity are presented below. First, there appear to be no inequalities in the use of ICT tools and basic ICT skills according to the sex of individuals. There is no difference in the frequency and places of access to the internet between men and women in Colombia. On the other hand, there are no differences in skills between sexes, and these results are consistent with those obtained by USAID in its report on the evaluation of the digital system in Colombia (2020)<sup>118</sup>.

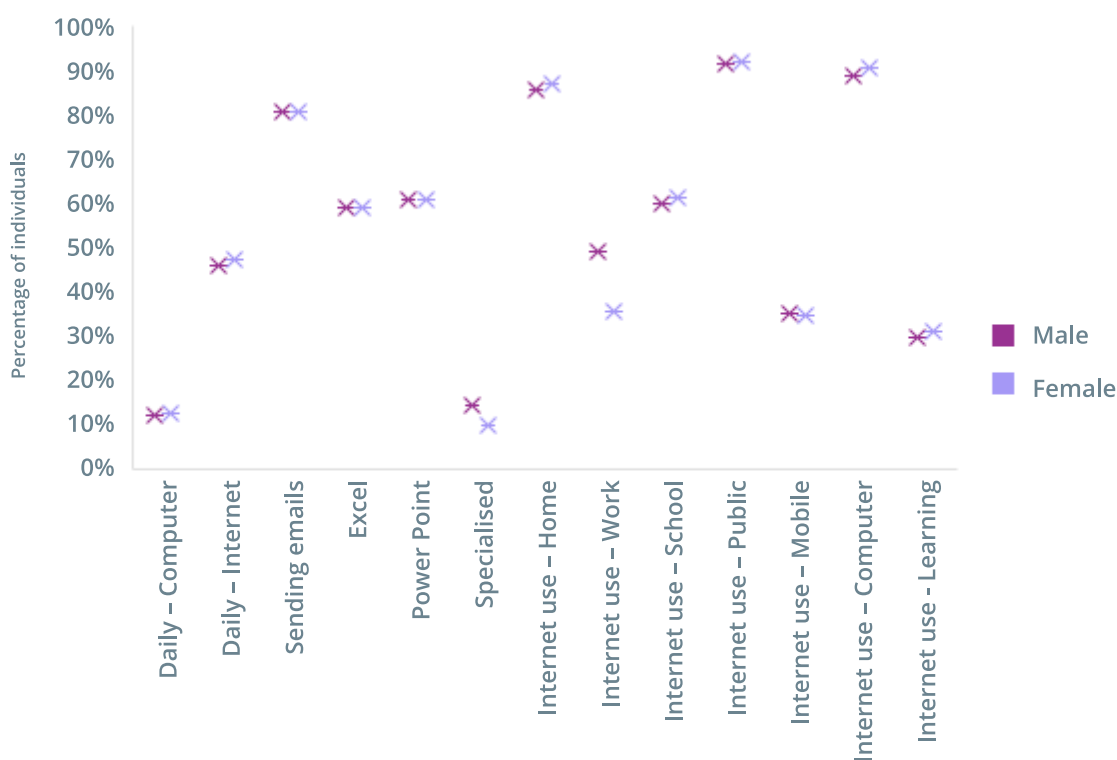
116 Extensive Integrated Household Survey, own calculations

117 Extensive Integrated Household Survey, own calculations

118 USAID. [https://www.usaid.gov/sites/default/files/documents/Colombia\\_DECA\\_Report\\_Spanish.pdf](https://www.usaid.gov/sites/default/files/documents/Colombia_DECA_Report_Spanish.pdf)

The only variable that shows a significant difference when segregated by sex is the knowledge of a specialised programme. While 15 percent of men with access to equipment say they have knowledge of a specialised programme, only 9 percent of women do<sup>119</sup>. Programmes developed by the national government such as “Hacker Girls” aim to mitigate these differences. However, when analysing the habits of using ICT tools and basic digital skills according to ethnic minority background, large inequalities are found that place those belonging to ethnic minorities at a disadvantage. The biggest differences are observed in the frequency of computer and internet use. In the first case, individuals belonging to ethnic minorities use 130 percent less computer equipment compared to their counterparts, while they use 74 percent less internet service on average. On the other hand, knowledge of basic ICT skills is 30 percent lower for individuals from ethnic groups<sup>120</sup>.

**Figure 3.10**  
Inequality in ICT use by gender

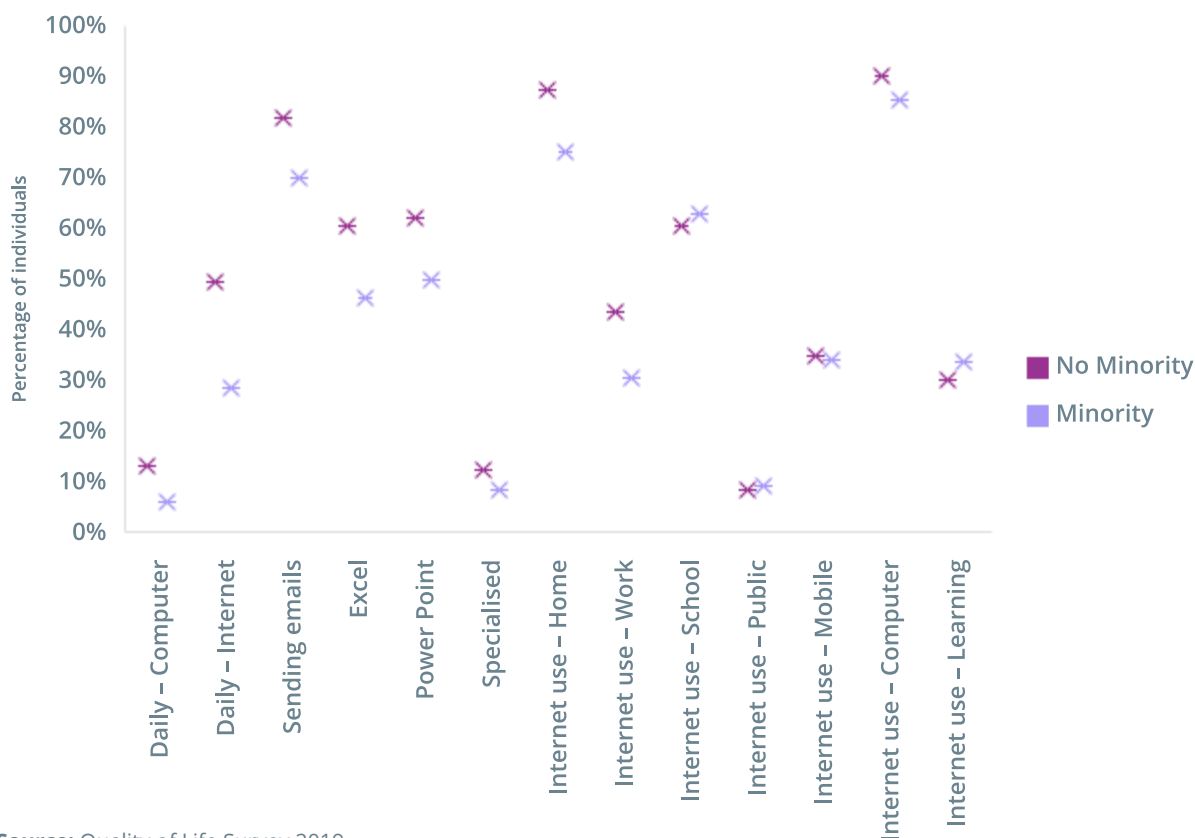


Source: Quality of Life Survey, 2019

119 Extensive Integrated Household Survey, own calculations

120 Extensive Integrated Household Survey, own calculations

**Figure 3.11**  
Inequality in ICT use by ethnicity



Source: Quality of Life Survey 2019

Income is a determining factor in the use of ICT tools and knowledge of basic digital skills in Colombia. The analysis of ICT use according to income was conducted by segmenting Colombian households according to the decile of family income to which they belonged, which yielded 10 different groups. The most important differences found when analysing ICT use according to income are the frequency of use of computer equipment and the internet, the proportion of heads of household who access the internet at their workplace and knowledge of specialised software. Firstly, 30 percent of households in the highest income decile use a computer on a daily basis, while only 1.9 percent of households in the lowest income decile do so. Making the same comparison for daily internet use, we find that the difference between these two groups is 427 percent. On the other hand, while 60 percent of workers with the highest income level access the internet at their workplace, only 15 percent of workers do so<sup>121</sup>. Digital skills are an increasing function of income.

It is important to highlight the behaviour of two variables when they are analysed according to household income level. First, the use of mobile phones to access the internet is more important for lower-income households. The proportion of individuals accessing the internet via a smartphone is decreasing for the first seven income deciles. Only deciles 9, 10 and 1 use a smartphone as their primary means of accessing the internet<sup>122</sup>. As

121 Extensive Integrated Household Survey, own calculations

122 Extensive Integrated Household Survey, own calculations

mentioned throughout this chapter, the massification of access to smartphones opens a window of opportunity for innovation in teaching digital skills through this tool. This statement takes on greater weight when considering the use that households make of the internet according to their income level. The limited access of lower-income households to the internet means that they use it more efficiently. According to the Quality of Life Survey, 30 percent of individuals in Colombia use the internet for learning, which in principle may seem low. However, it is found that the income groups with the highest proportion of learning use relative to the average are the first three income deciles plus the highest income decile.

**Figure 3.12**  
Mobile phone use to access the Internet by income decile

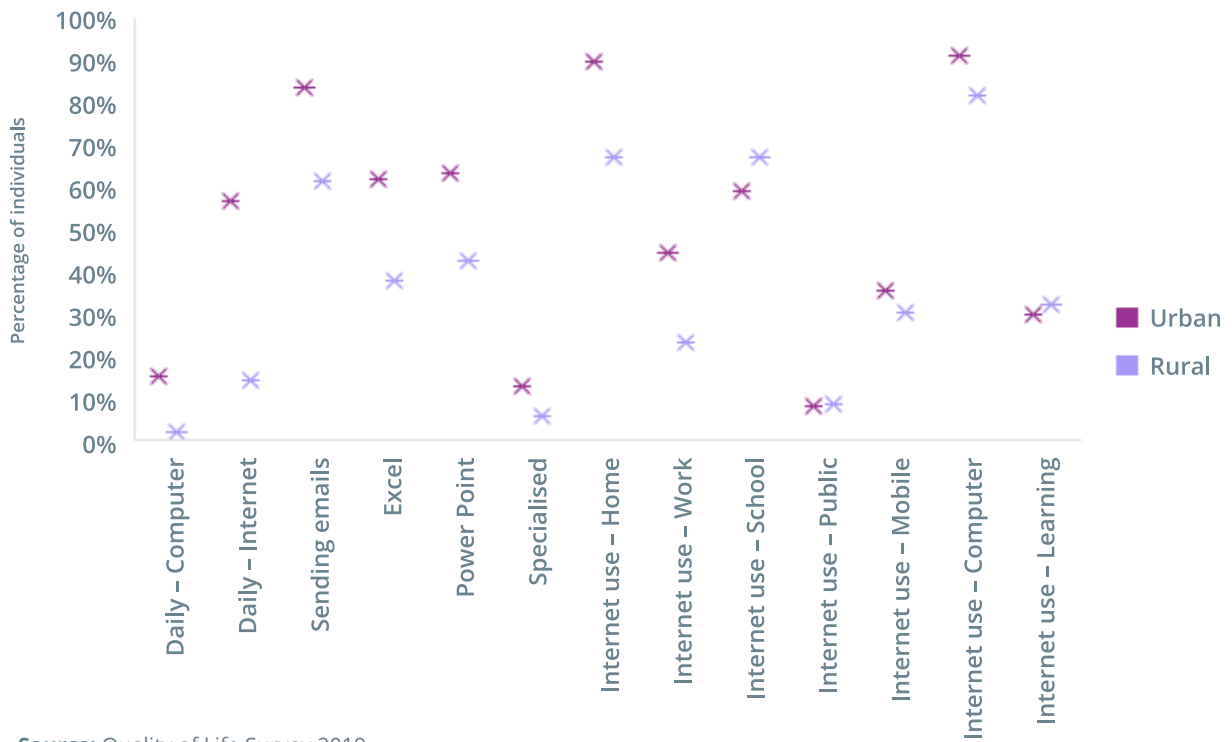


Source: Quality of Life Survey 2019

Finally, inequalities in the use of ICT tools and basic skills are persistent at the rural and regional levels. As shown in Figure 3.13, urban households have a significant advantage in the frequency of computer and internet use, as well as digital literacy. Rural areas have a clear disadvantage with respect to the implementation of the digital transformation. Two relevant elements are worth highlighting. First, rural households use the digital access points implemented by the national government in the territory in the same proportion. This result shows the importance of expanding this type of access to as many municipalities and rural areas as possible. Secondly, it should be noted that rural households use a higher proportion of digital media for learning, which again means that households with a lower probability of access optimise their digital media appropriately. Finally, Map 3.3 shows the inequalities in the knowledge of basic digital skills comparing the different departments<sup>123</sup>.

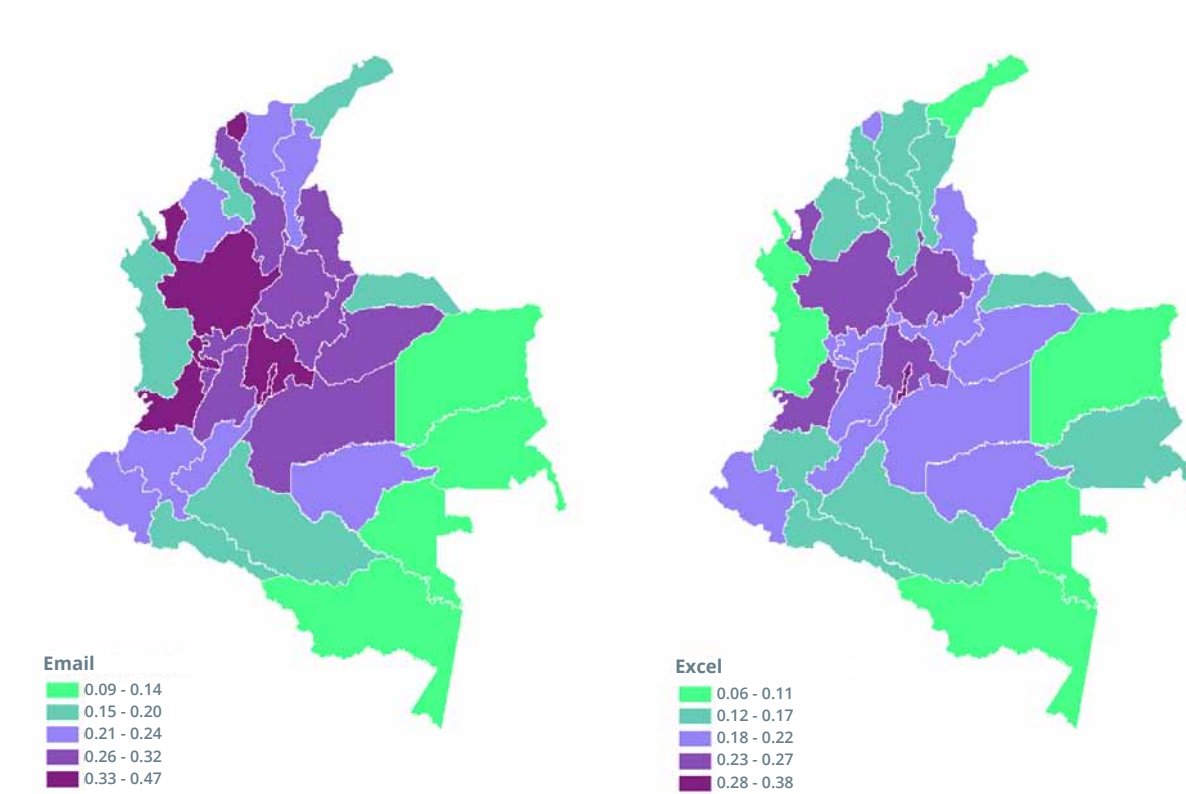
123 Extensive Integrated Household Survey, own calculations

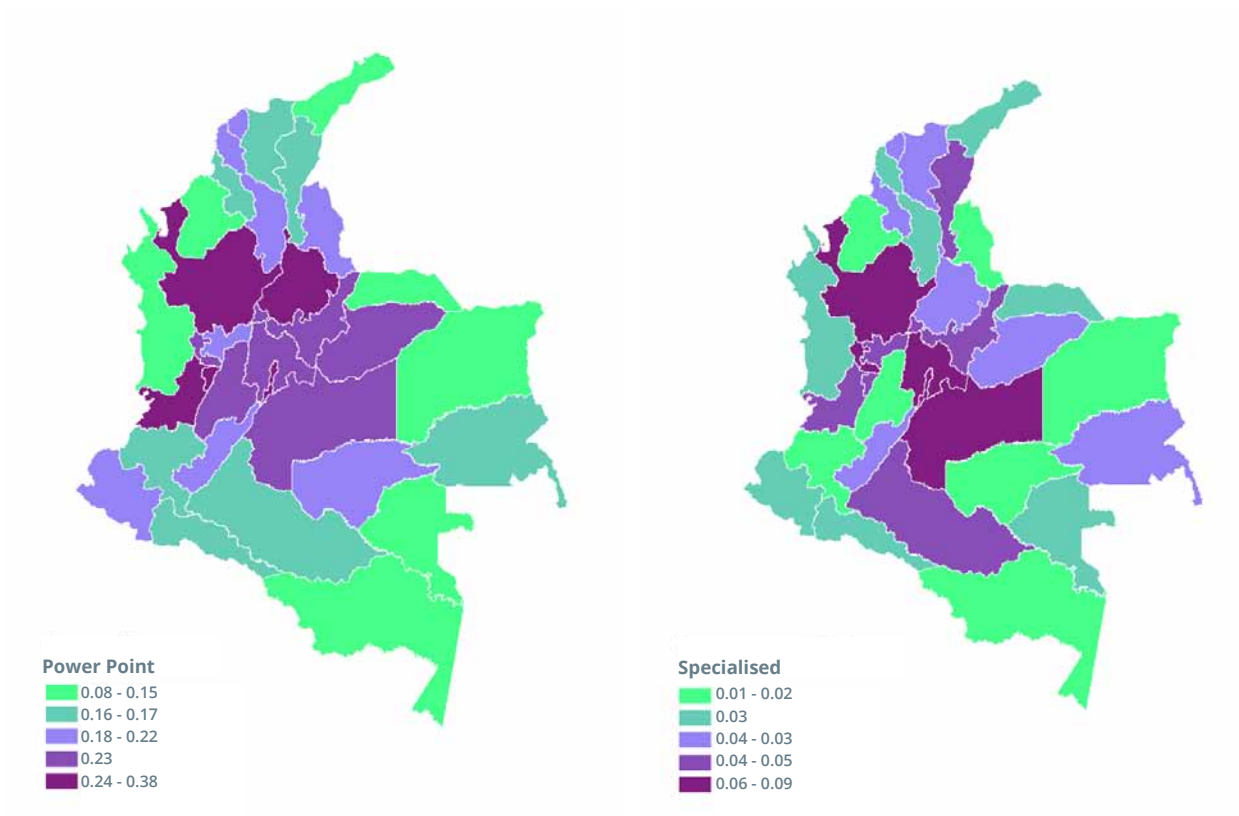
**Figure 3.13**  
Inequality in ICT use by rurality



Source: Quality of Life Survey 2019

**Map 3.3**  
ICT skills by department





Source: Quality of Life Survey, 2019

### 3.4 INEQUALITIES IN THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE PRODUCTIVE SECTOR

This section evaluates the implementation and use of information technology tools in the national productive sector. Additionally, this analysis is carried out by segmenting companies according to the number of employees as a proxy variable for their productive capacity; table 3.4 shows this segmentation. Access to and use of ICT tools in the productive sector is limited and is positively correlated with company size.

**Table 3.3**  
Segmentation of companies by number of employees

Category	Number of employees
Large enterprise	More than 200 workers
Medium-sized enterprise	Between 51 and 200 workers
Small enterprise	Between 12 and 50 workers
Micro-enterprise	Fewer than 11 workers

Source: Extensive ICT Survey

It is important to note that only 66.75 percent of companies in Colombia have access to an internet line. Inequalities in internet access are evident according to the size of the company. While 100 percent of large companies have access to this service, only 57 percent of micro-enterprises do. Of those companies that have internet service, 84 percent use a special line, while 13 percent share their home line. It is worth noting that, although small, there is a proportion of companies (0.4 percent) whose main source of access is public internet points installed by the national government<sup>124</sup>. All these companies are in the micro-enterprise segment. According to the results obtained, 44.4 percent of companies rated their internet service provided as good, while only 28.4 percent rated it as very good<sup>125</sup>. The biggest shortcoming of the service is continuity, followed by speed. In addition, 44.7 percent of the companies mentioned that their internet service is very expensive. The satisfaction, availability, continuity and speed of the internet service decrease with the size of the company, which means that smaller companies are not receiving the quality of service they require. On the other hand, companies use the internet service mainly for the commercial area (42.04 percent) followed by the administrative area (27 percent)<sup>126</sup>.

According to the Extensive ICT Survey, 34.3 percent of companies have a specialised ICT department but only 26.3 percent of companies have a specific budget allocated for this purpose. However, this again depends on the size of the company: 93 percent of large companies have an ICT area while only 52 percent of small companies have a specialised area<sup>127</sup>. Surprisingly, the main reason for not having a specialised ICT area is that companies argue that it is not necessary. However, it is also worth noting that this argument is less prevalent in smaller firms. The second most relevant reason for having an ICT area in companies, except for large companies, is implementation costs. Finally, companies also report that they do not have the necessary knowledge to create an ICT area (5.3 percent) or that they do not have the trained personnel to do so (6.2 percent)<sup>128</sup>. Accompanying and financing Colombian companies in the process of implementing ICT areas and digital transformation is thus important. The focus should not only be on training workers in digital skills, as this would have no impact if companies were unaware of the benefits of technology and information.

Only 26.3 percent of the companies surveyed claimed to have a budget for information and communication technologies. When asked about the proportion that this item represents in their total budget, an alarming 38.3 percent of companies were unaware of the figures. Of those companies that do know the value of ICTs, 24.09 percent claim to allocate less than 5 percent, and only 4 percent of companies spend more than 20 percent of their budget on ICTs<sup>129</sup>. The largest expenditure by companies that allocated financial resources was

124 Extensive ICT Survey, own calculations  
 125 Extensive ICT Survey, own calculations  
 126 Extensive ICT Survey, own calculations  
 127 Extensive ICT Survey, own calculations  
 128 Extensive ICT Survey, own calculations  
 129 Extensive ICT Survey, own calculations

on equipment maintenance, followed by the acquisition of new computer equipment. The item with the lowest budget allocation of ICT financial resources was the development of new information systems. The allocation of an ICT budget is strongly linked to company size. Seventy-seven percent of companies with more than 200 employees (large companies) allocate a value of their ICT budget while only 17.9 percent of micro-enterprises do so<sup>130</sup>. One element to highlight is the difference in ICT budget allocation between small and micro-enterprises, where the proportion of companies in the first category is 22.5 percentage points higher than that of companies in the second category. Another relevant result in this analysis was to find that the weight of the ICT budget for small and micro-enterprises is higher than that of large companies. Small companies see the importance of investing in ICT and therefore do it, despite the fact that this represents a greater weight on their financial statements.

On the other hand, 28 percent of companies in the country claim to train their employees in ICT skills. The segmentation by number of employees shows significant differences between companies. Eighty-one percent of large companies implement this type of training, a figure that drops to 65 percent for medium-sized companies, 51 percent for small companies and only 16 percent for micro-enterprises<sup>131</sup>. Training is mainly focused on the use of basic digital tools such as Excel or Word, followed by the use of social networks and the correct use of collaborative tools. It is worth noting the low proportion of companies that invest their ICT resources in tools such as data analytics or the development of mobile applications. Investment in digital skills training is determined by the size of companies. For example, medium-sized companies are less likely to train in all the ICT skills analysed compared to larger companies. The low investment in ICT skills training by companies contrasts with their claims regarding the importance of these skills in company productivity. Forty percent of companies say that it is “very important” to have staff with ICT skills. However, this perceived importance decreases with company size<sup>132</sup>.

**Figure 3.14**  
**Mobile phone use to access the Internet by income decile**



Source: Extensive ICT Survey, own calculations

130 Extensive ICT Survey, own calculations  
 131 Extensive ICT Survey, own calculations  
 132 Extensive ICT Survey, own calculations

**Figure 3.15**  
Institution which provides ICT training for companies



**Source:** Extensive ICT Survey, own calculations

An interesting element in this analysis is the evaluation of the institutions that offer ICT training for the productive sector. As shown in Figure 3.17, ICT skills training is mainly offered by the companies themselves<sup>133</sup>. Of the companies that invest in ICT training, 54.7 percent say that it is done within the company. This shows that workers lack ICT skills when they join the company; this idea will be developed in detail in the next chapter. On the other hand, an essential ally in the development of ICT skills for the productive sector is SENA, an institution that is highly credible and easily accessible for the development of workers' ICT skills. Finally, the Chambers of Commerce are another group of institutions that companies trust when it comes to training.

Two elements stand out in relation to the size of companies and ICT training. Firstly, the importance of the SENA for medium-sized companies, considering that 35 percent receive their training from this institution. Secondly, chamber of commerce training is more prevalent in micro-companies, specifically 90 percent more than in large companies<sup>134</sup>.

As closure to this chapter, an analysis is made of the innovations carried out within the companies using Information and Communication Technologies. Twenty-seven-point four percent of the companies studied claimed to have some type of innovation that required the use of ICT, this percentage only differs by 0.4 points in relation to the companies that implemented ICT training<sup>135</sup>. This can be interpreted as a very high rate of return on ICT investments to improve the productivity of the business sector. The main innovations are in the processes to improve staff training, as well as the security of the companies. The least prevalent innovations are those related to the implementation of Big Data and artificial intelligence, taking into account the complexity of these two tools. In terms of

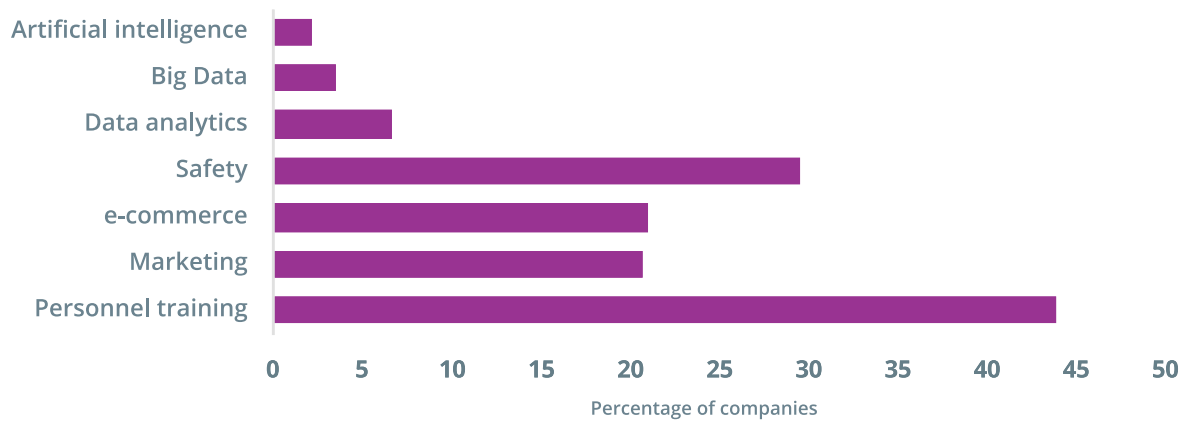
133 Extensive ICT Survey, own calculations

134 Extensive ICT Survey, own calculations

135 Extensive ICT Survey, own calculations

company size, it is important to highlight the high prevalence of e-commerce innovation in micro-companies. The main challenge of public policy in relation to information and communication technologies is to facilitate resources for smaller companies, in order to guarantee the creation of specialised areas in their companies and to train personnel. It is also important to mention that the pandemic has undoubtedly accelerated the digital transformation of companies in Colombia, since in order to survive it is they need to have a digital presence and ICT skills. These figures will become evident in the coming years.

**Graph 3.16**  
**Area of innovation using ICTs**



Source: Extensive ICT Survey



## CHAPTER 4. //

# JOB MARKET AND HUMAN CAPITAL GAP ANALYSIS FOR THE ICT SECTOR



Given the increase in digitisation and, consequently, in the demand from the industry for human capital with extensive digital skills, it is becoming increasingly necessary to adapt skills to the changing needs of the national and international market.

This chapter first presents a general diagnosis of the digital skills job market in Colombia, both in terms of the characteristics of the demand and the companies, and the workers and the existing labour supply. The second section provides a detailed description of the human capital gaps identified in the Colombian ICT sector, classified in three categories: quantity gaps, relevance gaps and quality gaps.

## 4.1

### THE COLOMBIAN DIGITAL SKILLS JOB MARKET

#### 4.1.1

##### Labour demand for digital skills

The digital transformation opens the opportunity for Colombia to diversify its productive matrix and transition from a commodity-based economy to one that produces sophisticated, high value-added goods. In contrast to more developed countries, the ICT sector in Colombia is focused on telecommunications rather than other goods and services. According to the OECD (2019), although the production and export of goods and services associated with ICTs and the generation of associated audiovisual content remains small in international terms, it has been a highly dynamic industry since 2015. In spite of this, most of the products and services are not exported, but absorbed domestically.

The Colombian ICT industry has grown to 6,096 companies in 2019, with a turnover of around 13.5 trillion Colombian pesos (3.6 billion United States dollars). As for the characteristics of the firms, about 90 percent are micro and small enterprises, 40 percent are five or less years old, and it is estimated that they employ a total of about 109,000 people. The high dynamism of these activities is reflected in the annual growth of the sector, which between 2014 and 2019 recorded a rate of expansion close to 16.7 percent per year. According to Fedesoft, approximately 46 percent of the total number of ICT companies were created in this period, 95 percent of which are MSMEs, whose main focus is the development of technologies aimed at marketing different products and services (Basto & Rojas, 2020). This type of tools are most in demand by the financial, health and government sectors.

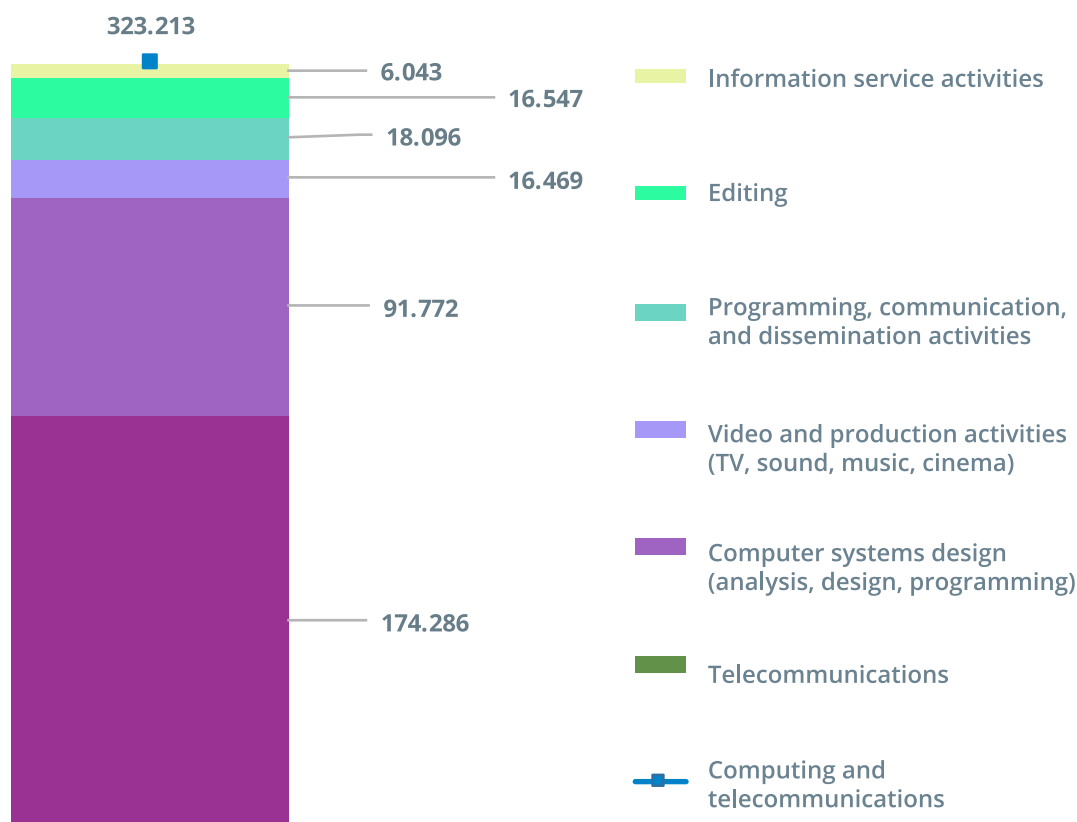
In order for the companies to adapt to a more digital environment, they are looking for certain profiles that are instrumental to guarantee a sustainable growth path. There are three main categories of profiles in demand in the sector: front end, back end and full stack developer<sup>136</sup>.

These profiles are directly related to the different types of companies in the sector which are mostly young start-ups or small and medium-sized enterprises. More specifically, there are startups that grow faster due to the adoption of technologies, and which concentrate the demand for full stack developer profiles (these being the scarcest due to the complexity of the job). On the other hand, software factories, which are usually SMEs, demand mostly back end profiles and to a lesser extent front end profiles (Basto & Rojas, 2020).

According to DANE's employment data by economic activity, in 2019 the entire information and telecommunications sector employed around 323,213 people (Figure 4.1), mostly in telecommunications activities (174,286), followed by computer systems development activities (91,772), that are linked to ICT companies, which sought to fill around 45,000 vacancies. Although companies show a preference for personnel who know how to use the relevant tools such as the programming languages and databases mentioned above and fluency in a second language, current trends have integrated other supplementary needs into the labour demand. Thus, the profiles now include a spectrum of soft skills, such as conflict resolution, self-learning, teamwork, among others, which have become more relevant as workers' capacity to adapt to new work environments has increased. This has brought other kinds of challenges to the sector, which will be analysed below, such as the standardisation of positions and profiles, the standardisation of skills and the revision of the levels of training recognised by companies.

136 The front end is in charge of optimising the user experience by improving platform loading time, and of writing the user interaction code using HTML and CSS (HyperText Markup Language, and Cascading Style Sheets); these tools combined make it possible to put together a web page, along with its appearance and presentation. The back end is expected to be able to manage databases, especially with the information gathered by the platforms, and to have knowledge of computer languages such as SQL (and the management of its Server platform), Python, Java, among others. The third profile, full stack developer, is the most complex of the three, as it integrates the skills required in the first two profiles, and it is supplemented with soft skills to interact with the client, together with the hard skills required for the profile, which involve sever and platform management and the whole architecture of the system.

**Figure 4.1**  
**People employed in the information and telecommunications sector, 2019**



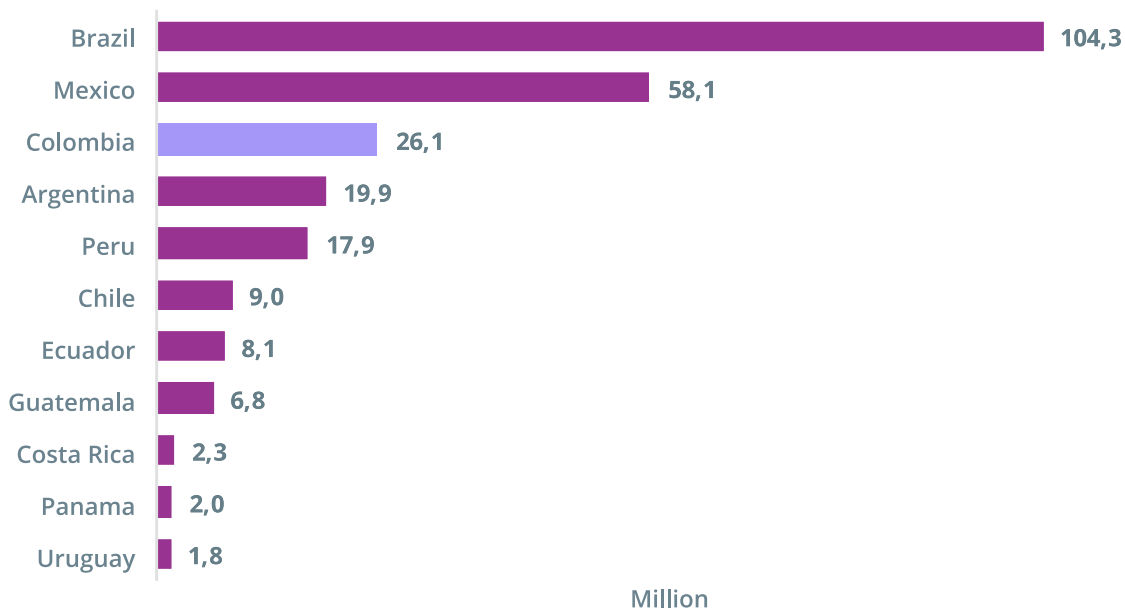
Source: Own calculations Source: Own calculations. Taken from GEIH, DANE 2019.

#### 4.1.2 Digital skills in the job market

As noted in Basto & Rojas (2020), Colombia ranked third among the countries in the region (following Brazil and Mexico) regarding human talent trained in sector-related topics in 2017, as shown in Figure 4.2.

IT specialists are not evenly distributed across the country, they are concentrated in large cities. Thus, the city with the largest workforce trained in these areas is Bogotá (25 percent), followed by Antioquia (14 percent) and Valle del Cauca (10 percent); Atlántico and Santander have a smaller representation, with 5 percent of the workforce each.

**Figure 4.2**  
Trained human talent in Latin America, 2017



**Source:** Own calculations Taken from Basto & Rojas (2020).

Although the proportion of ICT-related degree graduates is in line with the OECD average (5 percent of the total), Colombia is at risk of losing them and facing a brain drain, judging by the over-representation of these graduates in the emigrant population. A driving factor for not being able to retain this human capital is the salary level. Colombia ranks seventh in Latin America in terms of salaries, reaching only a quarter of the salaries offered in the United States (OECD, 2019).

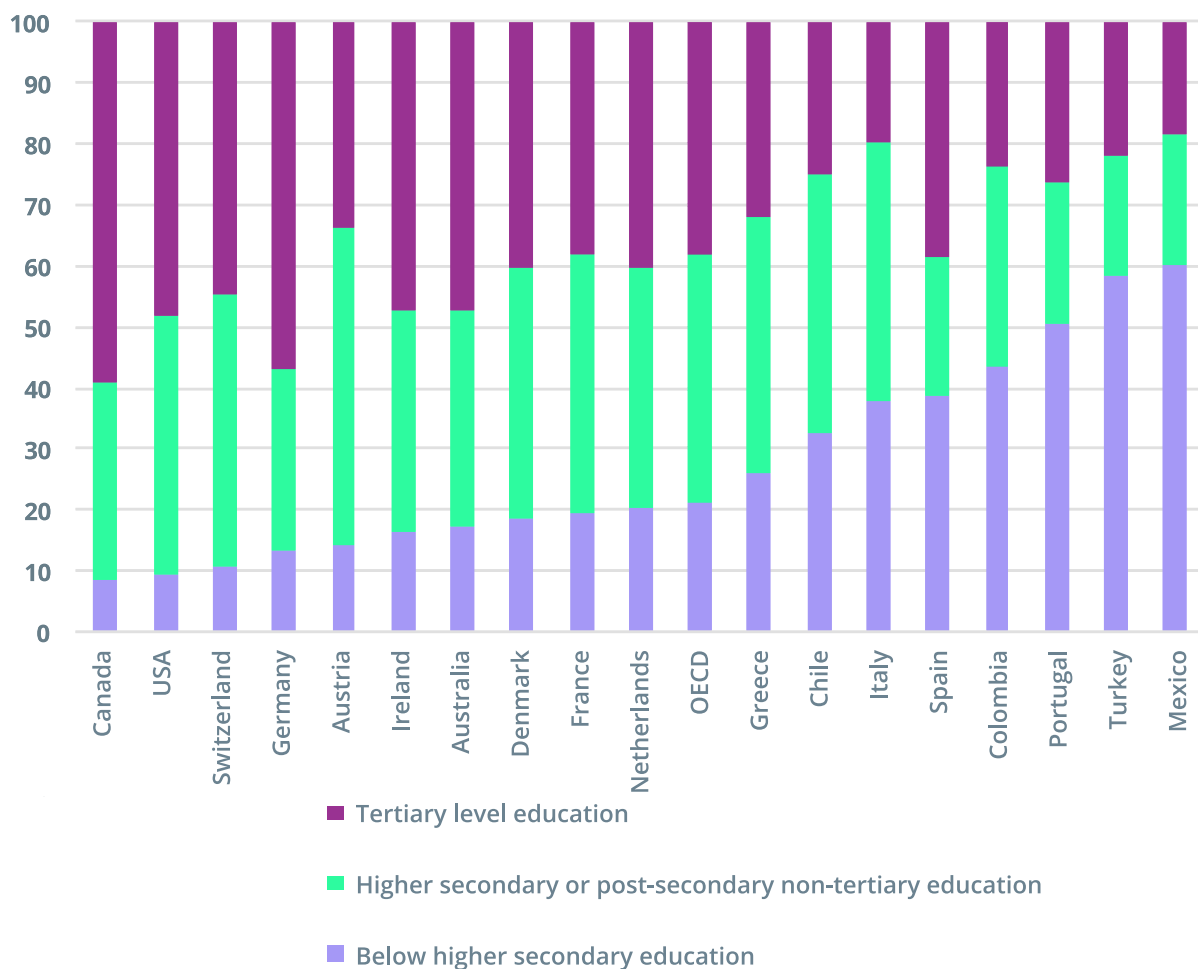
Another relevant element in the formation of human capital to generate a digital transformation is the high dropout rates recorded in related university courses. According to Velázquez (2018), 70 percent of students who are admitted to systems engineering in public universities drop out. This is the case of the University of Antioquia, where only 4 percent are admitted to this degree (100 out of 2,329 students) of which only 30 percent manage to complete their degree and graduate. The studies conducted by the Welfare Department of the University of Antioquia, found that the main reasons for students to drop out are academic difficulties in basic sciences, economic difficulties accompanied by family pressure, and professional vocation.

An important feature of the Colombian labour market is that the general population continues to have low levels of education. Thus, for example, as evidenced in the OECD database, 30 percent of workers aged 25-34 do not even have a high school diploma, and only 28 percent of this population is able to attain a higher education degree (Figure 4.3.A). The education offer in sophisticated sectors, particularly in ICT, can become scarce as the area demands substantial fixed costs. This makes it financially impossible for

small and medium-sized private institutions to offer these courses, thus limiting them to large universities and public institutions (although this may change with the increase in e-learning). The shortage of skilled workers is reflected in a high internal rate of return on investment in education—the wage differential between workers with and without higher education diplomas—which is only exceeded by Chile and Brazil<sup>137</sup> (Figure 4.3.B).

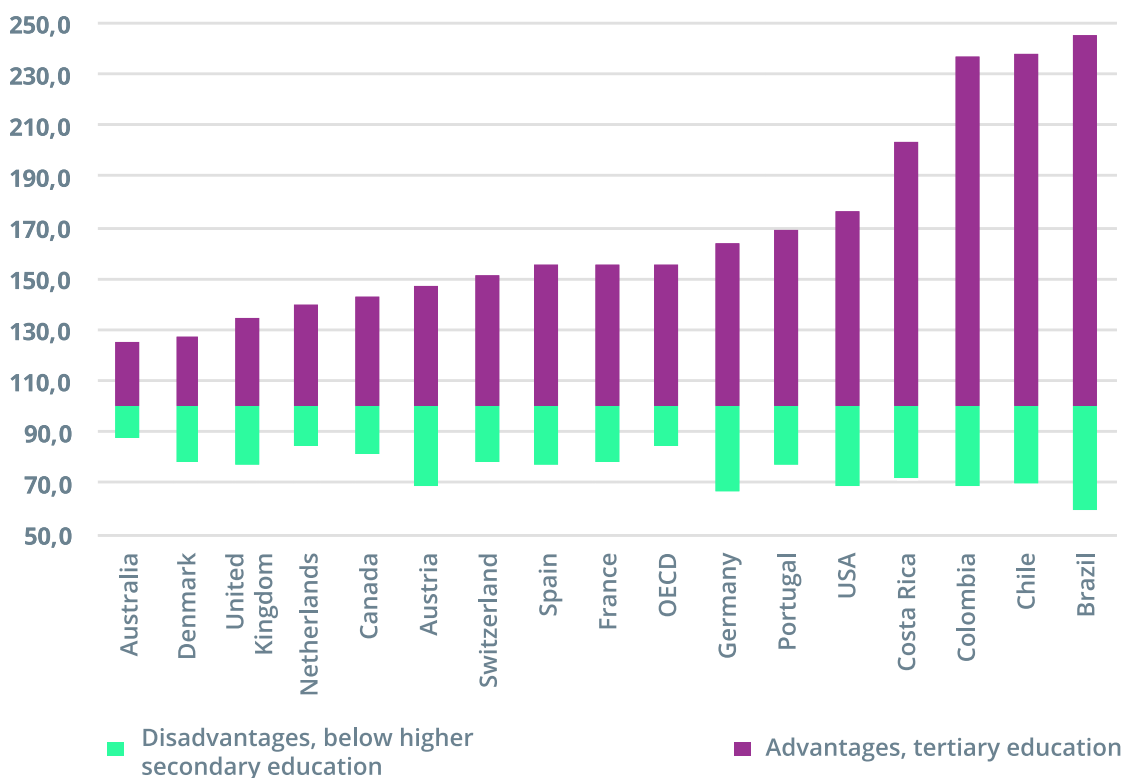
**Figure 4.3**  
Levels of education compared

**Panel A. Educational level, 2019**



137 This does not mean that rates of return are homogeneous. In fact, there is great heterogeneity in the effect of the different types of programmes on wages. Thus, approximately 30 percent of Colombian graduates have a negative rate of return on their investment in education, and this is more frequent in technical and technological programmes. In addition to this, it has one of the highest repetition and drop-out rates, mainly in the first three semesters of the degree.

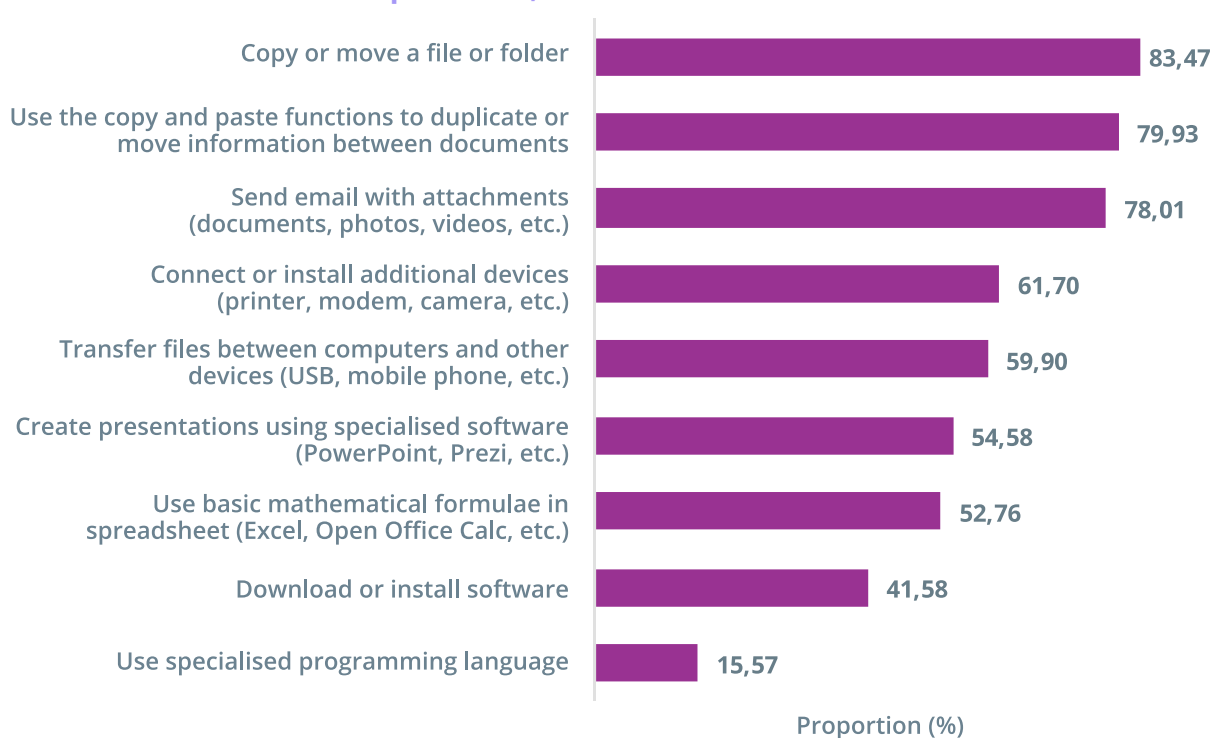
**Panel B. Wage earnings by level of education, 2018**



Source: Own calculations Taken from OECD Stats. <https://stats.oecd.org/>.

Note on Panel B: Data correspond to population aged 25-54 receiving employment income. The 100 reference corresponds to those with upper secondary education. Data for Canada, Chile and Spain correspond to 2017, France 2016, and Brazil 2015. Low educational attainment is reflected in low levels of digital literacy.

**Figure 4.4**  
**Indicators of ICT ownership and use, 2017**



Source: Own calculations Taken from DANE

Note: Data for individuals aged 5 and over.

The characterisation of the labour supply was based on the results of the Survey of Developers living in Colombia 2020<sup>138</sup>, for which 1,702 developers and programmers in Colombia were interviewed. It is worth noting that most of them are based in Antioquia and Cundinamarca, which group 74 percent of the respondents (Map 2). According to the analysis of results conducted by (Bernal, 2020) and (García, 2020), developers and programmers are 29-30 years old on average, they have few children (1 every 3.7 workers), 50.6 percent have more than five years of experience, 10.6 percent are women and 4.1 percent are founders of the company where they work. In addition to demographic data, this survey identified the professional profiles of developers. Thus, it found that nearly 70 percent of developers have an intermediate or advanced level of English (much higher than that recorded by the 2005 Census, which identified that only 8.6 percent of the employed population spoke two languages, or 6.3 percent as identified in the 2005 Census); 76 percent have a bachelor's degree. (Rocha & Martínez, 2015) 76 percent have a university degree; only 1.8 percent are self-employed/founder/freelance, while of the 98.2 percent who work as employees, 77 percent have an open-ended contract; and 38.9 percent of respondents work for foreign companies, although only 14 percent earn in dollars.

**Map 4.1**  
**Distribution of surveyed developers, 2020**



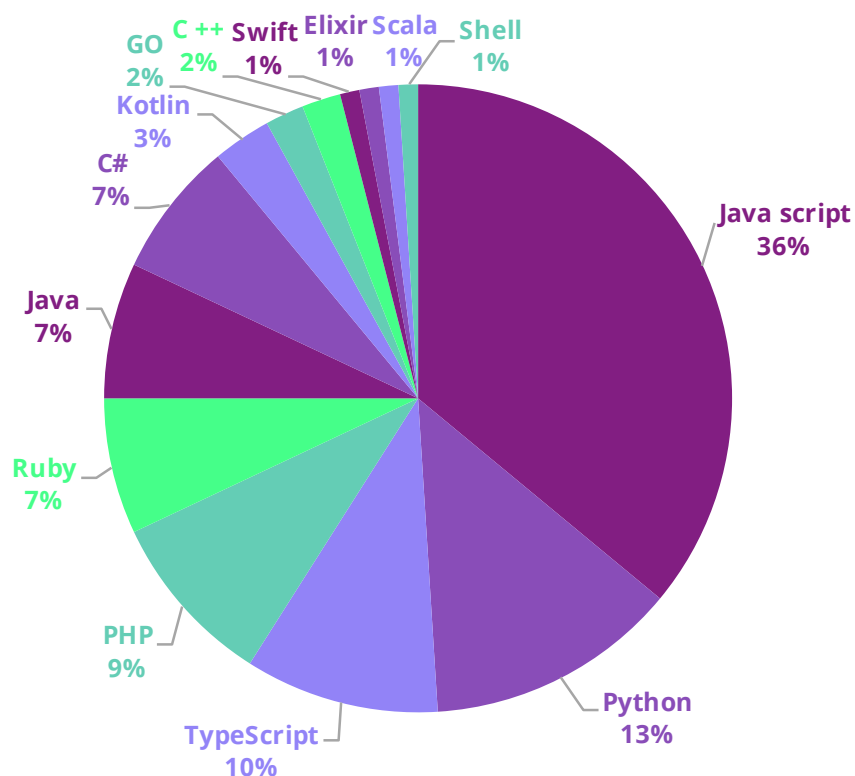
**Source:** Own calculations Taken from Ortíz, D. (2020). Survey of Developers living in Colombia 2020.

138 Based on the results of (Bernal, 2020) and (García, 2020). <https://medium.com/@santiaguf/an%C3%A1lisis-encuesta-de-salarios-desarrolladores-en-colombia-2020-3cf9208fe6fe>

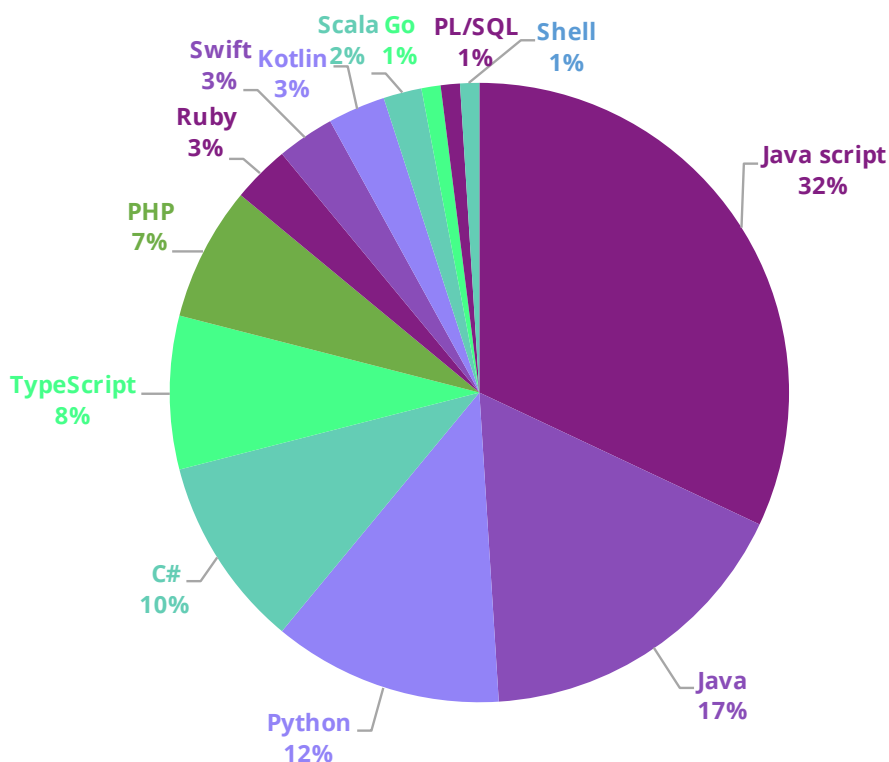
In line with the above, the language matrix has undergone major changes in terms of the percentage of respondents who use the relevant programming languages over time. The data from the survey were used to compare the programming languages used by developers who are paid in dollars (Figure 4.5.A) and those who are paid in pesos (Figure 4.5.B). JavaScript remains the top programming language, used by 71 percent of all respondents, and languages such as Java, Python and PHP remain among the most important for both groups. However, there are small differences in the use of Java, in that it is used less by international companies (7 percent) and domestic companies (17 percent). Ruby and PHP follow the same lines, with differences of 4pps and 2pps between the two groups. Finally, Elixir is among the languages used by developers who earn in US dollars, but not among those who earn in in pesos, while the opposite is true for SQL and C++. It should be added that these programming languages were acquired by developers mostly from makeltReal’s Bootcamp, and at learning centres which use platforms such as Udemy and Coursera.

**Figure 4.5**  
**Programming language use matrix, 2016 and 2020**

**Panel A. Income in US dollars**  
 Main language



**Panel B. Income in pesos**  
Main language



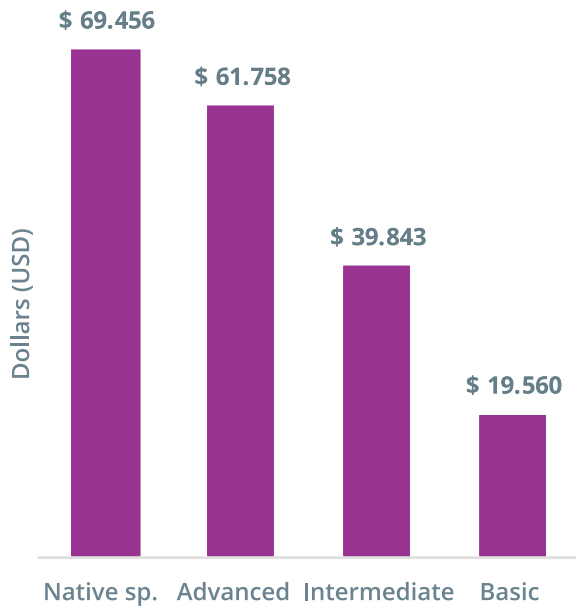
**Source:** Taken from Ortíz, D. (2020). Survey of developers living in Colombia 2020.

In terms of salary differences by type of profile, the Survey of Developers shows that the level of English is one of the main determinants of the salary earned. For those with basic English, the average annual salary is close to USD 20,000, which doubles for those with an intermediate level (USD 40,000) and triples for those with an advanced level (USD 62,000); the highest salary is earned by native speakers of English (USD 70,000)<sup>139</sup>. Regarding the level of education, those with a bachelor’s degree reach an average salary of USD 44,625, which increases by about USD 10,000 for those who hold an undergraduate degree (USD 54,119), and by about USD 20,000 for those with a master’s degree (USD 68,833). With regard to the difference in salaries relative to the years of experience of the different profiles, they increase gradually with the experience acquired (Figure 4.6.C), where the highest salary is earned by those with 10-15 years (USD 62,211) to more than 15 years of experience (USD 90,538).

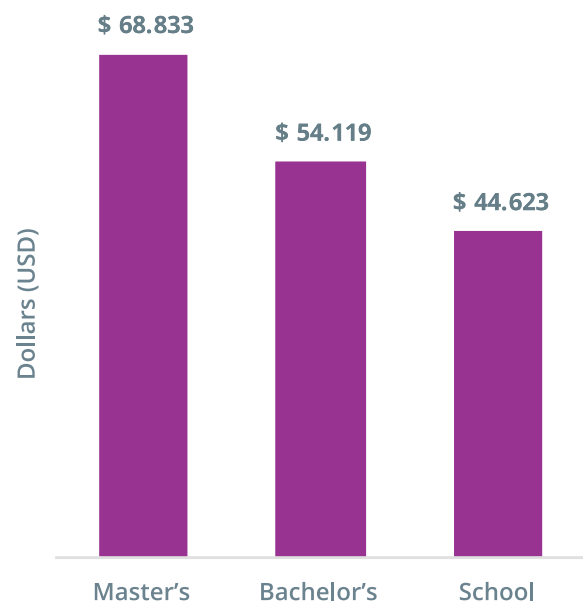
<sup>139</sup> This survey also requested information about the job search platforms used by this section of the workforce. It found that by 2020, most developers feel better connected through Stackoverflow, LinkedIn, The Job, and Twitter. In contrast, dollar earners initially look for job openings on Glassdoor.

**Figure 4.6**  
Comparison of average developer salaries by characteristics

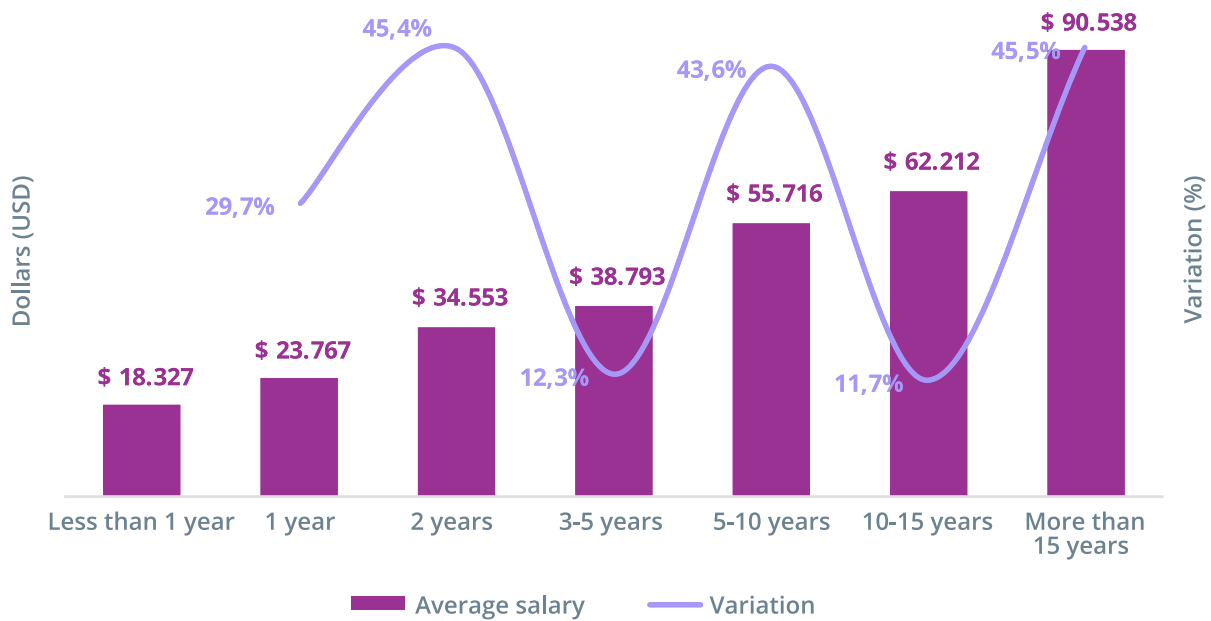
**Panel A. Comparison by level of English**



**Panel B. Comparison by highest degree obtained**



**Panel C. Comparison by years of experience**



Source: Own calculations Taken from Ortíz, D. (2020). Survey of Developers living in Colombia 2020.

## 4.2

### MEASURING HUMAN CAPITAL GAPS IN THE ICT SECTOR

According to the Economic Commission for Latin America and the Caribbean - ECLAC (Ramírez & Gutierrez, 2008) the digital divide can be defined as “the line or distance that separates the population group that can access ICTs from the group that cannot”. According to this definition, the digital divide refers to the unequal opportunities of access to information, knowledge and education through new technologies. The digital divide can be classified into three stages or aspects: i) the early or access divide, which considers the difference between those who have and do not have access; ii) the primary or usage divide, which focuses on those who have access but are not users; and iii) the secondary or quality of use divide, which captures the differences between the participation of those who have access and users (Peña Gil, Cuartas Castro, & Tarazona Bermúdez, 2019).

Unlike access gaps, human capital gaps capture the degree of connection between the disciplines and skills for which the education sector trains, and the human capital needs of companies. Generally speaking, the ICT sector is in a state of flux, and activities such as web development have shifted from being disciplines consisting of computer code programming to activities where the human factor is more important. In the ICT sector, companies are increasingly looking for people who know how to solve problems they have not yet faced, and who therefore have the ability to adapt to changing work environments and learn on their own. This ability is learned through skills such as teamwork, conflict resolution, timely decision-making and self-learning; in other words, it is achieved through training in soft skills.

However, beyond socio-emotional skills, it is important that workers acquire at least a basic level of digital skills, which become the most important and cross-cutting asset necessary to make the most of new technologies. A digitally skilled workforce can become a catalyst for firms, including micro-enterprises, to manage production activities virtually or offshore, which ultimately facilitates their entry into global value chains. Digitalisation can also help to foster financial inclusion and reduce business informality.

This section will analyse the digital education gaps in Colombia, based on the document identifying human capital gaps for the ICT sector published in 2020 by the Ministry of Labour, the Ministry of Education, MinTIC and other stakeholders at country and sector level, such as SENA and its sectoral roundtables<sup>140</sup>. This exercise combines the analysis of administrative records of the education system, the study of skills trained in educational programmes, and semi-structured interviews with companies and educational institutions

140 Alianza TIC (2020). <https://herramientas.datos.gov.co/sites/default/files/ESTUDIO%20DE%20BRECHA%20SEC-TOR%20TIC.pdf>

in the regions of Bogotá, Antioquia, Valle del Cauca, Atlántico, Santander and Coffee Axis<sup>141</sup> (Alianza TIC, 2020).

The estimate is made based on three perspectives. The first are the quantity gaps, which seek to establish in aggregate terms whether the number people who graduate from the education system in the relevant occupations is larger or smaller than the labour market demand. Secondly, there are relevance gaps, which bring the analysis down to the level of skills, and analyse the distance between the skills taught by education programmes and those demanded by companies in the job market. Third and last, the quality gaps that reflect the more subjective perception of employers regarding the skills in which workers have been trained, but where there are clear weaknesses in relation to the performance expected by the companies.

The results of these three aspects of the human capital gaps for the ICT sector in the Colombian economy are presented below.

#### **4.2.1** **Quantity Gaps**

The study to identify human capital gaps for the ICT sector analyses the quantity gaps from two points of view: from the supply side, where there is an absence of training programmes in regions where employers demand that occupational profile; and from the demand side, measured as the reduction in social demand for certain strategic programmes. Social demand is defined as the number of enrolments per place available in each programme and conveys the level of attraction that the course or discipline generates in young high school graduates who are potential students.

Regarding the deficit on the supply side, it was estimated as the percentage of institutions in the region that do not offer programmes relevant to the positions offered. Thus, a 50 percent shortfall means that only half of the institutions that could offer a programme at a given level in a region actually offer that programme, while a shortfall of 100 percent means that such programme is not offered in the region at all. Broadly speaking, the study found that the deficit in programmes offered is much higher in training programmes that require a university, technical and technological level. In this sense, all the programmes identified by the study conducted by Alianza TIC (Alianza TIC, 2020) show a 100 percent deficit with respect to the total number of institutions offering the required programme. As it arises from the research, the university programme with the greatest deficit that is present in all the regions analysed is mechatronics engineering, followed by software engineering (Table 4.1.A), while for technical and technological training (Table 4.1.B) and

141 Most of the interviews came from Bogotá (44 percent), followed by the Coffee Axis (15 percent) and Santander (13 percent); the respondents were mainly General Managers (34 percent), HR Leaders (22 percent) and IT Leaders (16 percent) at the company level.

postgraduate training (Table 4.1.C) this permanence between regions is less evident, as the programmes with the greatest deficit are repeated in a maximum of two regions.

**Table 4.1**  
Programmes with the largest deficits by region, by level of education

### Panel A. University

Position	Programme	# Regions	Deficit
Developer	Mechatronics engineer	6	100%
Software analyst/ Systems coordinator	Software engineer	3	100%
Programmer	Computer engineer	2	100%
Data scientist	Statistics	1	100%
Data scientist	Data analytics	1	100%

### Panel B. Technician/Technological

Position	Programme	# Regions	Deficit
Developer/Infrastructure leader	Analytics	2	100%
Creative	Web development technology	2	100%
Implementation engineering	Systems technology specialising in web framework application and deepening	2	100%
Database administrator	Technology in the development of applications for cloud computing	1	100%
Database administrator	Software development technology	1	100%

### Panel C. Postgraduate

Position	Programme	# Regions	Deficit
Development engineer	Front-end specialisation	2	100%
Chief of systems	Specialisation in computer security	2	50%
Developer	Masters in innovation and development	2	97%
Developer	Software security	1	100%
Software architect	Data analytics	1	100%

**Source:** Own calculations Taken from Alianza TIC. (2020). Result of the study to identify Human Capital Gaps for the ICT sector with a focus on the use of data and foresight.

On the other hand, from the demand side, the human capital quantity gap was identified based on the increase in the number of enrolments for the relevant programmes between 2017 and 2018. This second quantity gap showed 46 critical programmes, associated with high-turnover and high-demand positions, where there is a decrease in social demand. The Technical and Development Manager programme in Bogotá was the most affected one, followed by Software Analyst in Atlántico and Programmer in Bogotá. Those with lower demand were the Specialisation in Telecommunications (-42 percent in the variation of enrolments between 2017 and 2018), Analysis and Development of Information Systems Technology (-30 percent) and Specialisation in Database Development (-23 percent) programmes. The study conducted by Alianza TIC identified small gaps in the systems engineering and electronic engineering programmes, and in those which are present in most regions. This analysis showed that the regions with the most significant demand deficit were Bogotá and Antioquia.

**Table 4.2**  
Programmes with the largest quantity gap by demand

Critical position, high demand or turnover	Programme	# Regions	Percentage change 2017-2018
Database Administrator / Quality Analyst / Systems Technician	Information systems analysis and development technology	3	-16.6%
Platform Administrator / Systems and Support Technician / Technology Salesperson	Systems engineering	2	-1.7%
Platform Administrator / Helpdesk Administrator	Electronic engineering	2	-7.0%
Systems Technician	Computer engineer	1	-2.1%

**Source:** Own calculations Taken from Alianza TIC. (2020). Result of the study to identify Human Capital Gaps for the ICT sector with a focus on the use of data and foresight.

**Note:** The value of the percentage variation for each programme was calculated as the average of the positions identified in each region.

In addition to this analysis of programmes that are not offered or not in demand by young people, there are a number of results at a more general level of programmes that were identified as strategic for one reason or another. Among the general results revealed by this study, there was a certain tendency for companies to request personnel with a university degree (52 percent), more than with a technical or technological degree (33 percent) or with a postgraduate degree (15 percent). However, the educational offer of the ICT sector by level differs from the demand, with technical and technological

programmes accounting for 37 percent of the offer, postgraduate programmes for 33 percent, and university programmes for 30 percent. The qualitative exercise of the interviews revealed the five most in-demand programmes for apprentices requested by the companies: Administrative Management, Systems Assistant, Software Development, Graphic Design and Computer Systems Administration. The position of developer and consultant is also identified as critical in the industry, taking into account high turnover and demand. Other occupations such as management and specialised positions are difficult to fill, while occupational profiles such as IT architects and data scientists are among the top occupations that will be in higher demand in the future. In contrast, among these same categories, traditional platform administrators and hardware administrators are considered less relevant due to the changes in technology trends.

Two possible types of strategies can be used to close the quantity gap: the first would be to promote the opening of relevant educational programmes in institutions that have the infrastructure in the area of ICT knowledge, but do not offer certain strategic programmes; the second would seek both to inform young people about educational options, and to facilitate access to the internet and connectivity to provide them with the basic tools to choose careers related to new technologies and that offer better job opportunities in each region.

As explained in Chapter 2, the measures implemented by the national government have sought to close some of these gaps, in particular with programmes aimed at closing access gaps and fostering digital social inclusion (Table 4.3), rather than those that focus on the first strategy to encourage the inclusion of certain programmes in the education system, an alternative that is not in fact part of the public policies pursued by the Colombian government. These government strategies focus on removing barriers to access digital tools, especially for populations with physical or economic challenges. In this sense, these programmes would work to make internet coverage more widespread for a larger part of the population and provide the basic conditions necessary to bring young people to study careers related to the digital economy. Other strategies, such as digital entrepreneurship workshops, fall within the national objective of sectoral and territorial transformation, and promote workshops and virtual and face-to-face courses to strengthen the skills of the population.

**Table 4.3**  
National Government Quantity and Programme Gaps

Gap	National Government Programmes	Goals
Lack of higher education, education for work and human development programmes	Provision and appropriation of ICT tools for persons with disabilities	Training of more than 30,000 people with disabilities in the four-year period.
	Apps.co digital entrepreneurship workshops	Training of more than 91,000 people in the four-year period through entrepreneurship incubators and online courses.
Demand deficit for training programmes.	Programme to massify the last mile	Benefit of internet access for more than 500,000 households in strata 1 and 2, VIS and low Sisbén IV scores.
	Programmes for the massification of universal access	Benefiting 11,000 population centres in the 32 departments of the country, through digital zones and centres.
	San Andrés conectado Plan	Expansion of access and connectivity, and greater appropriation of ICTs by the population of San Andrés.
	ICTs as a tool to bridge the gender gap	Empowerment of 6,000 women during the four-year period, and 10,700 women trained in the use of ICTs by 2020 (by TIC Mujer). Formation of a qualified group of top female digital security experts (Hacker Girls).
	Dialogue and actions of the sector with an ethnic differential approach for digital social inclusion.	Sixty citizen participation exercises involving indigenous peoples, black and Afro-Colombian communities, among others, during the four-year period.
	Use and appropriation of ICTs	Benefit 500,000 people for the use and appropriation of ICTs during the four-year period. By 2020, it is expected to have 120,000 certifications in digital skills, raise awareness for 60,000 people through the Redvolution programme, and hold 1 million training sessions in the safe and responsible use of ICTs.

## 4.2.2 Relevance Gaps

Relevance gaps are those related to disparities in programme content and skills training. To identify them, it was necessary to combine information on the needs of the productive sector in terms of knowledge, skills, technical and cross-cutting skills, comparing them with those that higher education institutions and training for work institutions claim to offer.

This analysis identified the ten skills with the largest relevance gap at the national level, focusing on hard skills such as Typescript language and information systems analysis, and other soft skills such as conscientiousness, resilience and communication skills, among others. The trend of the skills which show the biggest gaps is common to all the abovementioned regions of Colombia: out of the ten most relevant skills in each region, Information Systems Analysis, Customer Orientation, Cooperation, Quality and Leadership were found to be the most common. Thus, a total of 19 skills were found which show disparities between the training offer and the demand of the productive sector, as well as the demand for the future (Table 4.4). These 19 skills were identified by considering all the abilities identified as having an ownership gap (ICT Alliance, 2020) (Alianza TIC, 2020) and eliminating those that were duplicated between regions.

**Table 4.4**  
Top skills with relevance gap, total regions

Soft skills	Hard skills
Autonomy	<i>Information Systems Analysis</i>
Quality	Databases
Commitment	<i>Knowledge of SQL and PHP</i>
<i>Cooperation</i>	Software development
Efficiency	Computing
Flexibility	Mathematics
Communication skills	
Leadership	
<i>Customer orientation</i>	
Planning	
Proactivity	
<i>Resilience</i>	
Problem solving	
Teamwork	

**Source:** Own calculations Taken from Alianza TIC. (2020). Result of the study to identify Human Capital Gaps for the ICT sector with a focus on the use of data and foresight.

\* The skills in italics were identified among the top 10 skills at country level.

On the other hand, the second methodology used to capture the relevance gap corresponds to the level of involvement of companies and the productive sector in the process of planning and designing the training programmes of the training institutions in each region. In relation to the percentage of companies that have not participated in the planning of the training offer, Atlántico, Santander and the Coffee Axis were found to have the highest percentages and therefore the largest gaps among the regions under study: Eighty-three-point three percent of the companies in Atlántico did not participate, while this figure reached 73.7 percent in Santander, and 63.3 percent in the Coffee Axis. (Alianza TIC, 2020). In contrast, more than 50 percent of the companies that contributed to educational planning in the region are located in the Valle del Cauca department. These results are consistent with the findings of the measurements by city made as part of the analysis leading up to the 2020 Human Capital Gaps for the ICT Sector document, according to which 83.3 percent, 75.0 percent and 73.7 percent of the companies in Barranquilla, Armenia and Bucaramanga do not participate in educational planning (Table 4.5).

**Table 4.5**  
Participation of the productive sector in the training offer planning per city

Region	Percentage of companies that have not taken part in the planning of the city's training offer	Percentage of companies that have not been called to take part in the planning of the education offer of the city	Percentage of higher education and training for work institutions reporting that the companies in the city do not take part in the planning of the education offer	Type of gap
Armenia	75.0%	75.0%	No records	High gap
Barranquilla	83.3%	83.3%	20.0%	High gap
Bogotá	62.1%	71.2%	10.0%	Medium-high gap
Bucaramanga	73.7%	63.2%	50.0%	Medium-high gap
Cali	46.2%	61.5%	16.7%	Medium-low gap
Manizales	64.3%	57.1%	0.0%	Medium-high gap
Medellín	52.9%	58.8%	0.0%	Medium-high gap
Pereira	50.0%	25.0%	No records	Medium-high gap

**Source:** Taken from Alianza TIC. (2020). Result of the study to identify Human Capital Gaps for the ICT sector with a focus on the use of data and foresight.

However, to close the relevance gap, both the government and the stakeholders in the education community must focus on programmes and efforts that foster a more fluent dialogue at the regional level between the offering institutions in the education system and the companies in the productive sector. Therefore, the programmes that the national government has focused on in the work with the productive sector and its sectoral and territorial digital transformation fall within this objective. In particular, the most relevant programme in this field is the Digital Talent for Companies programme<sup>142</sup>, which focuses on creating a dual environment in which companies, academia and the productive sector make coordinated efforts to strengthen the training of the workforce in the digital skills and abilities requested by companies. It is expected that this will be achieved through various types of training, such as those proposed in the pedagogical strategy for digital talent<sup>143</sup> and the Digital Curricula<sup>144</sup>, aimed at secondary school students.

**Table 4.6**  
**National Government Relevance and Programme Gaps**

Gap	National Government Programmes	Goals
Disparities between the skills included in the educational curricula to meet the current and future demand of the productive sector.	Comprehensive Technology for Learning Policy	Increasing access to digital technologies, improving internet connectivity, promoting the appropriation of digital technologies in the educational community, and strengthening the monitoring of ICT use.
	Education strategy on digital support	Impacting 600 schools and 56,000 students through the implementation of pedagogical strategies to include IT in secondary education. By 2020, 20,000 students are expected to be certified.
	Digital Curricula (CODE.ORG, IA, STEM Pathway)	Training 60,000 people in subjects related to AI, 4RI, digital areas and others. It is expected that 220 teachers and 8,000 students will be trained in 2020.
Participation of the productive sector in the planning of the training offer	Abilities and Productivity Models - Digital Talent for Enterprises	Coverage of up to 50 percent and up to 5 million pesos (approx. 250,000 USD) of the training process required by the companies. During the four-year period, 4,000 people are expected to be trained who are employed in Colombian companies.

142 Talento Digital para Empresas, MinTIC: <https://www.MinTIC.gov.co/micrositios/talentodigitalempresas/740/w3-channel.html>

143 Estrategia pedagógica en talento digital: <https://MinTIC.gov.co/portal/inicio/Sala-de-Prensa/Noticias/126457:Herramientas-TIC-para-aprender-en-tiempos-de-quedarse-en-casa>

144 Currículos Digitales, MinTIC: <https://www.MinTIC.gov.co/portal/inicio/Sala-de-Prensa/Noticias/159853:MinTIC-presenta-estrategia-nacional-en-busca-de-100-000-programadores-que-lideren-la-Cuarta-Revolucion-Industrial>

### 4.2.3 Quality Gaps

The last category of human capital gaps in the ICT sector corresponds to the perception of quality in the skills offered by educational programmes. The study identified quality gaps when “the contents of the educational programmes were in line with the competences required for the positions demanded by the productive sector, despite which the productive sector states that it perceives a lack of competences” (Alianza TIC, 2020). This indicator is therefore built as the number of competences in which a quality gap is perceived by the employers interviewed, with respect to the total number of skills offered by the training programmes. At the national level, soft skills such as communication, planning and leadership were identified, while only three of the top ten abilities were related to ICT skills: software development, databases and computing. Considering that 34 abilities are repeated from one region to the other, a total of 26 skills were found to have quality gaps (Table 4.7). Some skills that were consistently repeated in the vast majority of the regions were Communication Skills, Databases, Software Development and Planning. (Alianza TIC, 2020).

**Table 4.7**  
Top skills with relevance gap, total regions

Soft skills	Hard skills
<i>Autonomy</i>	Analytics
Quality	<i>Databases</i>
<i>Commitment</i>	Cloud computing
<i>Creativity</i>	<i>Software development</i>
Efficiency	<i>Computing</i>
Ethics	Infrastructure
Flexibility	Software engineering
<i>Communication skills</i>	English
<i>Leadership</i>	Artificial intelligence
<i>Planning</i>	Research
<i>Proactivity</i>	Mathematics
Problem solving	New technologies
Teamwork	Networks

**Source:** Own calculations Taken from Alianza TIC. (2020). Result of the study to identify Human Capital Gaps for the ICT sector with a focus on the use of data and foresight.

\* The skills in italics were identified among the top 10 skills at country level.

Bearing in mind that quality gaps are a matter of perception, in order to close them it would be necessary to intervene both in the quality assurance systems for the provision of ICT-related education and in the mechanisms for the assessment and certification of skills. In this sense, the government policies that could contribute to closing these quality gaps could be the Comprehensive Policy on Technologies for Learning and the Pedagogical Strategy on Digital Talent. It is expected that, both programmes will train students in pre-school, primary and secondary education in the skills required to thrive in the digital society. This would connect the needs of the productive sector to better adapt to the digital economy and provide training at the intermediate education level, thus preventing the productive sector from suffering a deficit in the workforce that will enter the job market in the future. It should be noted that, like those mentioned in the section on relevance gaps, these two programmes work together with companies, and seek to improve the quality of training in digital skills.

**Table 4.8**  
**National Government Quality and Programme Gaps**

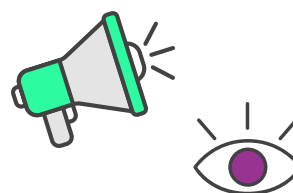
Gap	National Government Programmes	Goals
Perception of deficiency on the part of companies regarding the skills in which the educational offer does provide training	Comprehensive Technology for Learning Policy	Increasing access to digital technologies, improving internet connectivity, promoting the appropriation of digital technologies in the educational community, and strengthening the monitoring of ICT use.
	Pedagogical Strategy for Digital Talent	Impacting 600 schools and 56,000 students through the implementation of pedagogical strategies to include IT in secondary education. By 2020, 20,000 students are expected to be certified.



## CHAPTER 5. //



# CONCLUSIONS AND RECOMMENDATIONS



As the document has shown, the programmes and projects promoted by the national government with the aim of promoting access and the use of digital technologies have been numerous and addressed a variety of objectives. However, far from creating a structured ecosystem around a single vision and country strategy, the support available to ICT companies has formed a large, complex and dispersed web of programmes and institutional stakeholders. While it is normal to pilot programmes to assess their implementation and the requirements for scaling up, as the industry matures, the best strategy becomes one of integrating the dispersed policies into a single, overarching innovation system (OECD, 2019). For this purpose, it is necessary to develop a national digital strategy that involves all stakeholders and government bodies associated with the promotion of the digital economy under long-term priorities and engages available resources and funds (such as FONTIC) around a structured roadmap that allows for scaling up programmes and facilitates their integration with other policies to maximise their effectiveness.

This national digital strategy would involve integrating complementary strategies, not only to invest in infrastructure and expand connectivity in the national territory, but also in supplementary assets such as the digital skills of the workforce, the innovation capacity of firms, and the government's competence to solve the market's information problems and implement successful labour reconversion policies. The major challenges facing the ICT labour market in Colombia include: the standardisation of positions and profiles, the standardisation of the skills required, and the revision of the skills certification system in order to open the door to new ways of acquiring skills in the non-formal education sector.

## 5.1 STAKEHOLDERS AND REGULATORY FRAMEWORK

- > Achieving a real articulation between the public and private sectors to clearly diagnose the gaps, also taking into account the figures and indicators managed by organisations operating in the non-formal education sector and leveraging on tools that provide real-time information such as LinkedIn, PeakU, the Public Employment Service, among others.
- > Beyond making a diagnosis, it is also important to implement initiatives in an articulated manner in which the public sector leverages the strengths of the different stakeholders operating as non-formal education institutions. There may be companies, platforms or bootcamps that are exceptionally good at teaching tools that are not being used in the public sector due to cumbersome public procurement processes.
- > It is time to think about a bootcamp certification body that, far from becoming bureaucratic and limiting, provides the market with information transparency tools to avoid the asymmetry of information of self-reported indicators. If an autonomous body is not to be established for this purpose, a generalised ranking of these institutions should be promoted so that the users themselves can provide information about their experience and employability results.
- > While progress has already been made in this regard, private companies that want to have farther-reaching educational initiatives should seek lasting partnerships with formal education institutions to integrate their content into the curriculum. It is through formal education institutions that they will be able to provide individuals with certifications that are also accepted and valued in the public sector.
- > There must be a synergy between the human resources teams and the technical areas of the companies so that they communicate to the market what is really required, not by packing roles in lists of technological requirements that are copied and pasted but by gaining a thorough understanding of the technologies, languages and frameworks required for each role in the companies.
- > It is time to understand that the market, particularly in technology, is increasingly requiring fewer higher education degrees and more skills and abilities. Thus, the public sector will have to come to terms with institutions that provide training aimed at skills and abilities, whether or not these are certified by a degree that is validated by the Ministry of Education or a similar body. What is happening in the world of

technology, where the market itself is beginning to demand certifications in specific technologies, accompanied by technical tests, is what should happen in the future in the regulatory framework for education in the country. Nowadays, at least in the field of technology, many companies consider a Microsoft certification to be worth much more than a degree from the best university in the country. This needs to be reflected by the public policy framework. Formal education institutions must be involved in this change and be part of it.

- > The public sector must adapt to the new reality of the labour market and allow people of diverse backgrounds to access public sector jobs and contracts without their level and remuneration being undermined because they do not have a particular qualification or professional card. This requires changes to the civil service and Copnia policies.
- > The pandemic should be taken as an opportunity for technological acceleration to teach us to adapt as a country by understanding connectivity and access to ICTs as essential services for the population.

## 5.2 INEQUALITIES IN THE ACCESS AND USE OF ICT IN COLOMBIA

- > Increasing subsidies for landline internet service for lower income households, specifically in stratum 1. Providing access to this segment of households will have the greatest impact on the overall connectivity rate. Furthermore, the results have shown that these households are the most likely to use the service given their limited access time.
- > Increasing efforts to mitigate the differences in internet access and connectivity between urban and rural households, prioritising areas with a high presence of ethnic groups such as the Raizal and indigenous peoples. Guaranteeing cellular network coverage may not be sufficient, given that certain populations do not have the devices and hardware necessary to access it, and it would be necessary to supplement this with the installation of free fixed digital access points in areas with low connectivity.
- > The level of English proficiency in the population must be improved so that Colombians can access all the digital skills education tools available, most of which are in English.

- > Digital skills training must take into account that families in Colombia have decided to replace their computer equipment with mobile phones, given the lower costs of access. Institutions that develop knowledge in digital skills should implement the use of mobile devices as part of their learning process, in order to reach as many households as possible, especially those with lower incomes.
- > Making efforts to increase download speeds in Colombia's peripheral departments, as they have a clear connectivity disadvantage compared to the central regions.
- > Strengthening gender-sensitive skills programmes. This requires addressing the lack of incentives and motivations for women to enter the digital industry in larger numbers, and to train them in specialised ICT skills. There needs to be a focused effort where women-focused strategies are redirected, starting with the language.
- > Developing and implementing basic ICT literacy and internet use programmes in low-income communities that combine the use of mobile devices and face-to-face classes. The face-to-face component is essential due to the low availability of computer equipment in Colombian households. Basic ICT skills programmes should prioritise rural areas and areas with a high presence of ethnic groups. This should be done under full safety conditions during and after the pandemic.
- > Training small and micro-enterprises on the importance of ICT tools in their organisations, as they seem to be unaware of their usefulness. These trainings can be developed by SENA or the local chambers of commerce because there is a high level of trust between this business segment and these two organisations. Training can be accompanied by subsidies for the implementation of ICT areas in smaller companies because they lack the necessary resources.

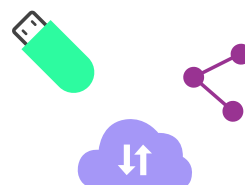
## 5.3

### DIGITAL DIVIDES IN COLOMBIA

- > One of the most important recommendations is that the government should take a proactive role in the design and implementation of tools and policies for labour reconversion. One of the most important tools to achieve this aim is the creation of a publicly accessible platform, where the occupations and skills demanded by the labour market are organised systematically, and where workers find support for the decisions they make concerning their professional future on the basis of the skills they have already acquired, either in the education system or in previous jobs. The essential input for this kind of platform is the National Qualifications Framework, on which there has been some progress, in spite of which the reference framework for the ICT sector is already in place.

- > In a changing work environment such as the current one, it is clear that workers' training cannot be limited to their passage through the education system, given that they need to be continually up to date in the new skills required by the productive sector. This raises the need to design a continuous learning ecosystem, even involving the stakeholders of the formal education system, thus providing opportunities for the working population to learn new skills after they enter the labour market.
  
- > A digital skills training ecosystem must be able to provide solid and reliable information on the skills level of workers. This is achieved on the basis of a quality and reliable assurance system for all the stakeholders involved in the system, which is visibly lacking in the case of the provision of non-formal education Colombia. Establishing standardised evaluation mechanisms and performance indicators would be a significant step in this direction.
  
- > As described in the section on human capital gaps, there is a serious disconnection between companies in the productive sector and educational planning processes, which leads to companies not finding the human talent they seek, and workers not being able to successfully enter the labour market. Thus, it is necessary to take steps to strengthen the links between the stakeholders of the innovation system and the productive sector, which can take advantage of the progress achieved through the centres of excellence in Big Data and the Internet of Things (CAOBA).
  
- > A necessary condition for long-term programmes and policies is a steady source of resources. The financial component can be approached from two perspectives: by guaranteeing medium-term public funding for programmes implemented by MinTIC and the Ministry of Education (supplemented by the Ministry of Science and other public entities in the digital ecosystem), or by leveraging resources from the private sector, which can be achieved by opening preferential credit lines for micro, small and medium-sized enterprises that invest in the integration of ICT systems into their production processes.
  
- > According to OECD (2019), national government and MinTIC programmes have been effective in informing micro-enterprises about the advantages of using new technologies for relatively simple tasks, such as making the most of social networks. However, it is not certain that promoting more complex activities, such as inventory management or delocalised supply chain management, is a viable investment for informal micro-enterprises or those facing uncompetitive environments. For this reason, OECD considers that public resources and efforts should be geared towards companies that have already had prior contact with digital technologies or whose activity can effectively incorporate these technologies to increase their productivity. Generating an effective impact on certain firms with a high return on investment can increase competition in the system and lead rival firms to seek to implement similar tools in their production process.

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In order to have a holistic view of the state of the art of digital skills in Colombia, in addition to the bibliographic sources consulted, press reports and websites of market players and different initiatives were read, and 15 experts from the public (4 interviews), private (7 interviews) and educational (4 interviews) sectors were interviewed.

*This research was conducted by the team at **ProTalento**,  
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