Demand for Digital Skills in Sub-Saharan Africa

Key Findings from a Five-Country Study:
Côte d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda

2021

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The study was conducted jointly by IFC and the World Bank as part of the Digital Economy for Africa (DE4A) initiative under the broader umbrella of the Human Capital Project (HCP) framework. The DE4A initiative seeks to harness the digital technologies and innovation to transform Africa's societies and economies to promote Africa's integration, generate inclusive economic growth and stimulate job creation. The HCP aims to accelerate more, and better investments aimed at better equity and economic growth.

The work on the Digital Skills Country Action Plan was made possible by the generous support of the members of the Digital Development Partnership – the World Bank's program helping developing countries leverage innovation and technology to solve their most pressing challenges. For more information, please visit: **https://www.worldbank.org/en/programs/digital-development-partnership.**

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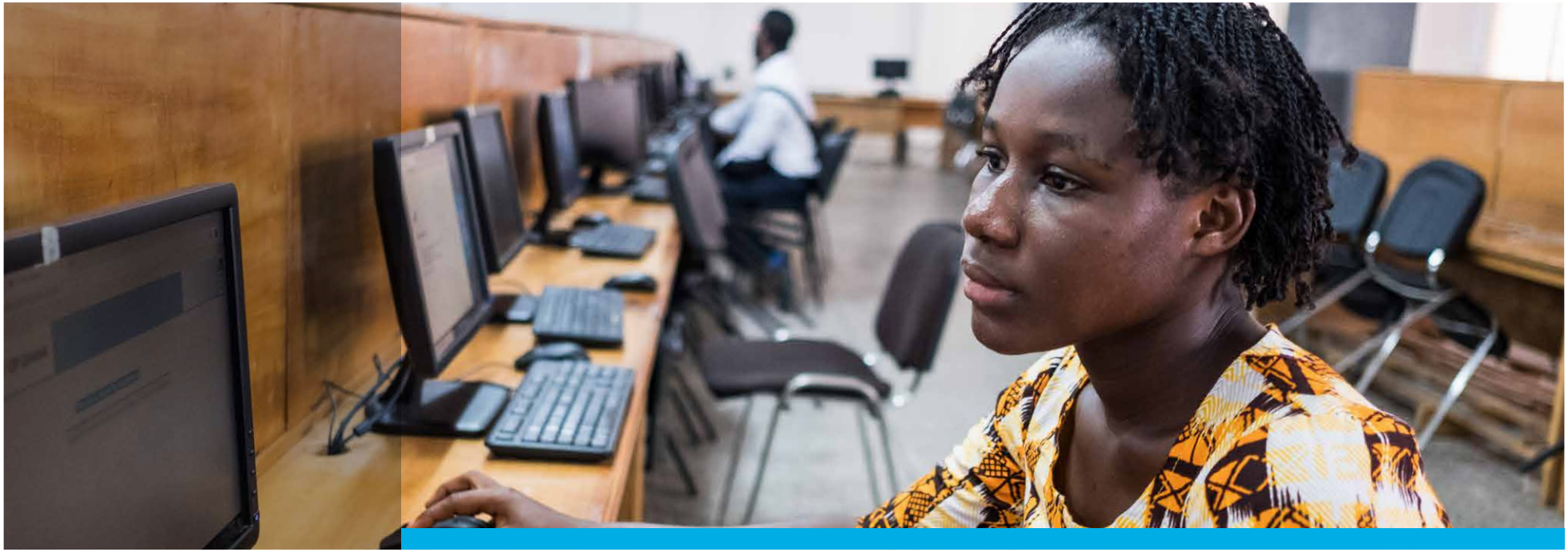

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EXECUTIVE SUMMARY

With technology rapidly changing the landscape of the workforce, employers worldwide are seeking a labor force that is increasingly digitally skilled. However, while the importance of digital skills has been recognized, there has been less of a focus—particularly in emerging markets—on the scale of demand for these skills, and the models that can be used to teach them.

This report presents an analysis of supply and demand for digital skills in five countries in Sub-Saharan Africa: Côte d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda. The study quantified the demand for digital skills in each country, assessed the market opportunity presented by that demand, and identified successful emerging training models for the provision of digital skills.

Following a high-level analysis of the demand for digital skills in Africa with a spotlight on Ghana in 2019, IFC, jointly with the World Bank, carried out a more detailed study for Côte d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda.

The five countries exhibit a large unmet demand for digital skills:

- Demand for digital skills training will surge in the coming decade, as jobs that previously did not require digital skills will begin to do so. The COVID pandemic has accelerated the speed of change.
- By 2030, some level of digital skills will be required by 50-55 percent of all jobs in Kenya, 35-45 percent of all jobs in Côte d'Ivoire, Nigeria, and Rwanda, and 20-25 percent of jobs in Mozambique.
- The majority of demand for digital skills will be from occupations outside ICT specialties and will be generated by enterprises adopting digital technologies. Seventy percent of demand is expected to be for foundational skills, followed by 23 percent for non-ICT intermediate skills.
- The study finds a total training market opportunity of $11.1 billion across the five countries through 2030. Just under half of this total, about $5 billion, would be for training the new workforce, and $6.1 billion would be for reskilling existing workers to keep them relevant with digital skills that will be required for their jobs.
- The majority of training opportunities are through business-to-business, business-to-government, and public private collaboration; these are worth an estimated $8.6 billion. The remaining $2.5 billion of the market exists in business-to-consumer training focused mainly on intermediate and advanced skills.
- Existing education providers need to align their offerings to meet this surge in demand. For traditional providers to keep pace with the speed of technological changes and provide relevant skills, they can partner with dedicated digital skills providers. The unmet training demand provides a significant business opportunity for private local, regional, and global training providers and will require partnerships across the education ecosystem to deliver.
- Models with affordability at their core will be required. By 2030, 25-35 percent of households are expected to be able to afford trainings for foundational skills by spending 1-3 percent of their income, but that affordability decreases with higher skill levels.

CONTEXT OF THE STUDY

In 2019, IFC jointly with L.E.K. Consulting developed a methodology for assessing the market demand for digital skills in Africa. The report **Digital Skills in Sub-Saharan Africa: Spotlight on Ghana** quantified the demand and identified successful emerging business models for the provision of digital skills, including the role that different stakeholders can play – particularly the private sector.

The current report summarizes the findings of extending the analysis to five additional countries in Sub-Saharan Africa: Côte d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda. Using a similar methodology to the Ghana study, we identified the market size for training opportunities of digital skills. The report also incorporates the impact of COVID-19 on economic growth and the demand for digital skills. The methodology and research approach of the study are outlined in Annex II.

RELEVANCE OF THE STUDY

Technology has been changing the landscape of the workforce globally at a rapid pace. The World Bank Group's (WBG) World Development Report from 2019, **The Changing Nature of Work**, explored how work is evolving as a result of technological advancements, including how these advancements are changing the skills that employers seek. The report shows that investing in human capital to develop new skills that are increasingly in demand in the labor market will be key. This is in line with the WBG's Human Capital Project, which emphasizes the need for economies to invest in human capital—particularly digital skills—to keep up with the rapidly changing landscape for jobs and skills.

The African Union (AU) has recognized the importance of human capital investment, particularly in digital skills. In February 2020, the AU adopted the Digital Transformation Strategy for Africa, which seeks to harness digital technologies and innovation to transform Africa's economies, generate inclusive economic growth, and stimulate job creation. As part of the strategy's implementation, the WBG established the "Digital Economy for Africa Initiative (DE4A)" with a goal of ensuring that every African individual, business, and government is digitally enabled by 2030.

While the importance of digital skills has been recognized, there has been less of a focus—particularly in emerging markets—on the scale of demand for these skills, and the models that can be used to teach them. The two studies examining the demand for digital skills in Sub-Saharan Africa are an important step in beginning to address that gap.

The impact of the COVID-19 pandemic will result in accelerating requirements for digital skills in all countries.

MAIN FINDINGS

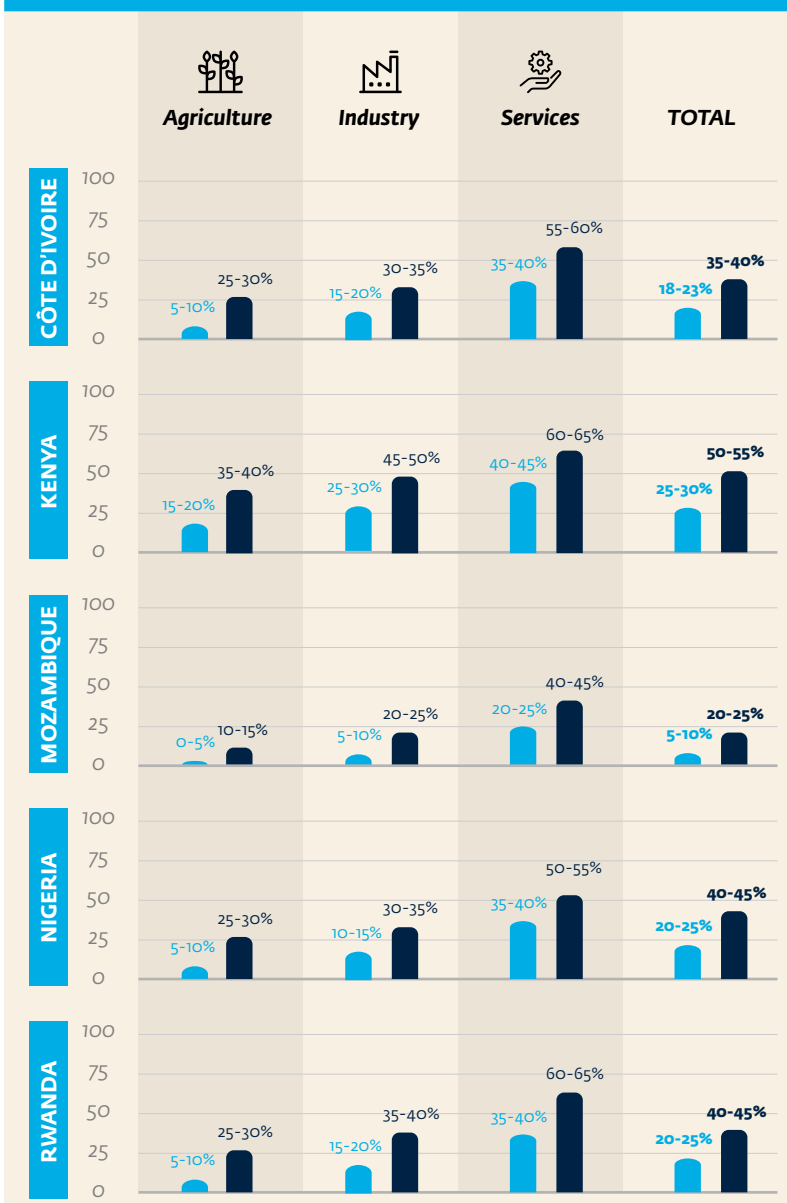
I. WHAT HAS BEEN THE IMPACT OF THE COVID-19 PANDEMIC?

The impact of the COVID-19 pandemic will result in accelerating requirements for digital skills in all countries. The pandemic has required firms of all types and sizes to digitize their operations to remain in business. This has further accelerated the demand for digital skills. This is particularly true of the ICT and e-commerce sectors across all countries. In Nigeria for example, the pandemic is expected to be a driving force in accelerating ICT infrastructure in the rural parts of the country to promote inclusiveness and support during recovery from COVID-19. The agriculture sector in some of these countries (such as Côte d'Ivoire and Nigeria) may also see an increase in the adoption of digital skills.

II. WHAT IS THE CURRENT AND FUTURE MARKET DEMAND FOR DIGITAL SKILLS?

Adoption of digital skills is expected to grow across all countries. In all countries the services sector will lead the demand for digital skills. The services sector has the highest rate of digital adoption and is expected to reach 40-65 percent of all services jobs by 2030. The key drivers for growth in adoption of digital skills vary for each country (figure 1).

Figure 1: Estimated adoption rate of digital skills across the five countries by sector



Key drivers for growth in adoption

Côte d'Ivoire: The ICT sector is one of the key pillars of the economy, contributing to 8 percent of its GDP. It is one of the few countries that has ICT incorporated into its education policy across all levels of education. Programs like "One Ivorian, One Computer" are expected to increase digital literacy in the country (but challenges for adoption include the high cost of internet access).

Kenya: Known as the "Silicon Savannah," Kenya's thriving ICT sector is home to the continent's most cutting-edge startups, which is expected to drive digital adoption. Programs such as government internships for ICT graduates and the establishment of tech hubs and incubators will increase digital literacy in Kenya.

Mozambique: Growth in the oil and gas and services sector is expected to increase digital skill adoption in the country. Government initiatives like MoRENet, which enhance ICT access in higher education institutions, will also drive digital literacy and adoption.

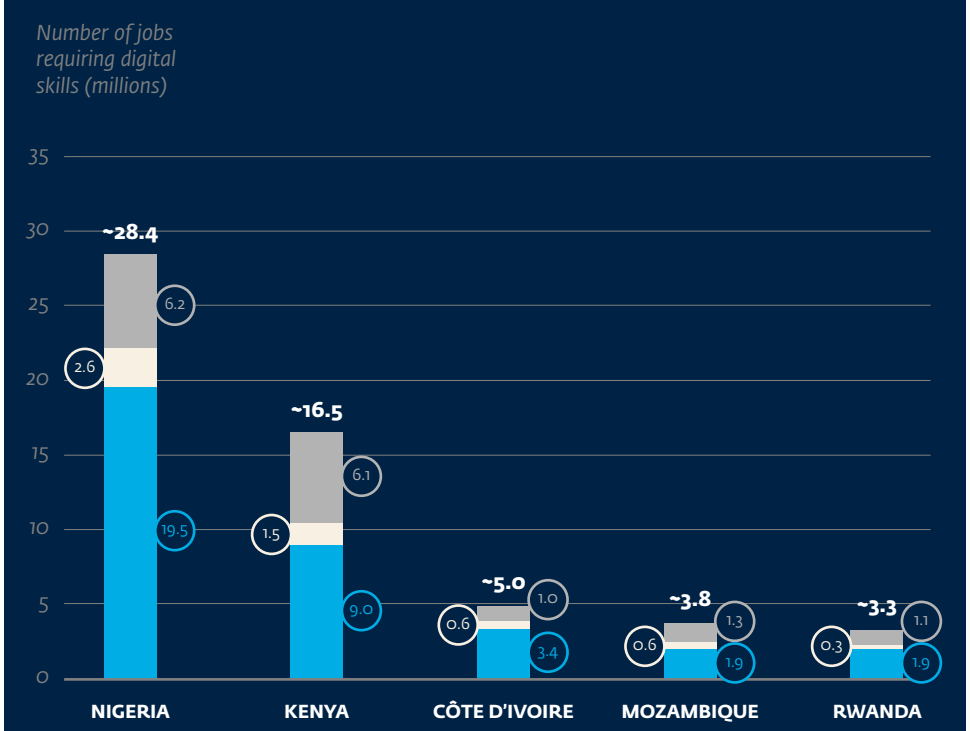
Nigeria: A higher tertiary GER (gross enrolment ratio) of about 11 percent will result in an increased number of digitally-literate graduates. Tech companies such as Google, IBM, and Facebook are also aiding digital adoption among the population. However, challenges remain related to electricity provision, lack of teacher training, and the poor quality of curriculums.

Rwanda: Rwanda's long-term vision to be a tech hub and have strong ICT infrastructure is expected to contribute to the country's growth of digital adoption. The government has invested in the country's ICT infrastructure, reflected in the 4G coverage across the country, which is at 96 percent. Rwanda has also set up coding schools to encourage adoption of advanced and highly specialized skills among its youth.

Sources: *UNESCO Institute of Statistics; Oxford Economics; industry participant interviews; and L.E.K. research and analysis.*
Note: *The degree of digital adoption across sector and by level of skilling was determined through interviews with relevant industry participants having current or past single/multi-sector specific expertise and/or prior digital transformation-related experience. See Annex II for more details.*

Across the five countries, 57 million jobs will require digital skills by 2030. However, only about two million of these jobs will be in the ICT and e-commerce sector, traditionally considered to be the main drivers of demand for digital skills. This has major implications for the type of training that populations need and how it could be delivered. **Much of the demand for digital skills will emanate from generic occupations and not from narrowly defined ICT professions, as more enterprises adopt digital technologies in a broad range of sectors (figure 2).**

Figure 2: Demand for jobs requiring digital skills by country and sector by 2030 (forecasted)



Sources: *ILO statistics; industry participant interviews; and L.E.K. research and analysis.*

By 2030, **50-55 percent of all jobs in Kenya** will require digital skills, driven by a thriving ICT sector and start-up ecosystem and resulting in strong growth in the demand for digital skills across the country. **Thirty-five to 45 percent of all jobs in Côte d'Ivoire, Nigeria, and Rwanda** are expected to require digital skills, supported by a strong ICT infrastructure and supportive policies towards digital literacy. **Mozambique's** digital readiness is the weakest among the five countries, with an expected demand of **20-25 percent** of all jobs requiring digital skills by 2030.

III. WHAT TYPES OF DIGITAL SKILLS ARE IN DEMAND?

The demand for foundational digital skills is expected to increase across all sectors and will account for 70 percent of the total demand for digital skills by 2030. Non-ICT intermediate skills will account for most of the remaining demand, while there will be less demand for advanced and highly specialized skills (refer to figure 4 in section IV). Foundational skills are generally entry level skills required to make rudimentary use of digital devices and applications. These skills are equivalent to having a general secondary education. Foundational digital skills enable individuals to access and engage with digital technology, while higher order skills enable them to use technology for task-oriented purposes and for specific ICT occupations and professions, depending on the sector (figure 3).

Figure 3: Four levels of digital skills by sector

	Foundational digital skills		Intermediate non-ICT skills		Intermediate ICT skills		Advanced and highly specialized skills	
Sector	**Task types**	**Examples**	**Task types**	**Examples**	**Task types**	**Examples**	**Task types**	**Examples**
Agriculture	• Web research • Mobile communication	• Farmers using government websites to check crop prices • Farmers using WhatsApp to exchange photos and other informative videos • Farmers using video calls to consult with a veterinarian	• Use of simple spreadsheets for accounting	• Managers in agricultural businesses using financial software to track income and expenses	n/a	n/a	• Use of big data analytics • Development of specialized automated equipment	• Data analysts in agricultural companies leveraging big data to analyze yield, chemicals and biomass index for future predictions • Engineers developing robots to pick fruit
Industry	• Online communication • E-learning	• Workers sharing photos of their work with managers to update them on progress • Workers watching tutorials/videos on how to operate new machinery	• Use of professional software for business purposes	• White collar workers using software for project management, making presentations, and spreadsheets	• Interaction with robotics equipment	• Engineers using modelling software like AutoCAD	• Computer programming • Network management • Automation • Digital manufacturing	• Specialists using advanced robotic equipment in manufacturing plants • Engineers running computer simulations for understanding physical processes
Services	• Web research • Online communication • Online government services • E-banking	• Executives exchanging emails • Small businesses accessing online banking or government tax portals • Drivers using mobile apps to connect with passengers and reading online maps	• Use of professional software for business purposes • Digital marketing	• Tourism operators using digital marketing to reach a larger base of clients • Professionals using software to develop analysis and make presentation	• Use of professional software *(coding)* • Use of design software	• Small business owners designing websites *(front end/ backend)* to attract business	• Computer programming • Cloud computing • Machine learning and AI	• Animators using specialized software to make films • Programmers developing social media sites • Developers using AI to power language learning apps

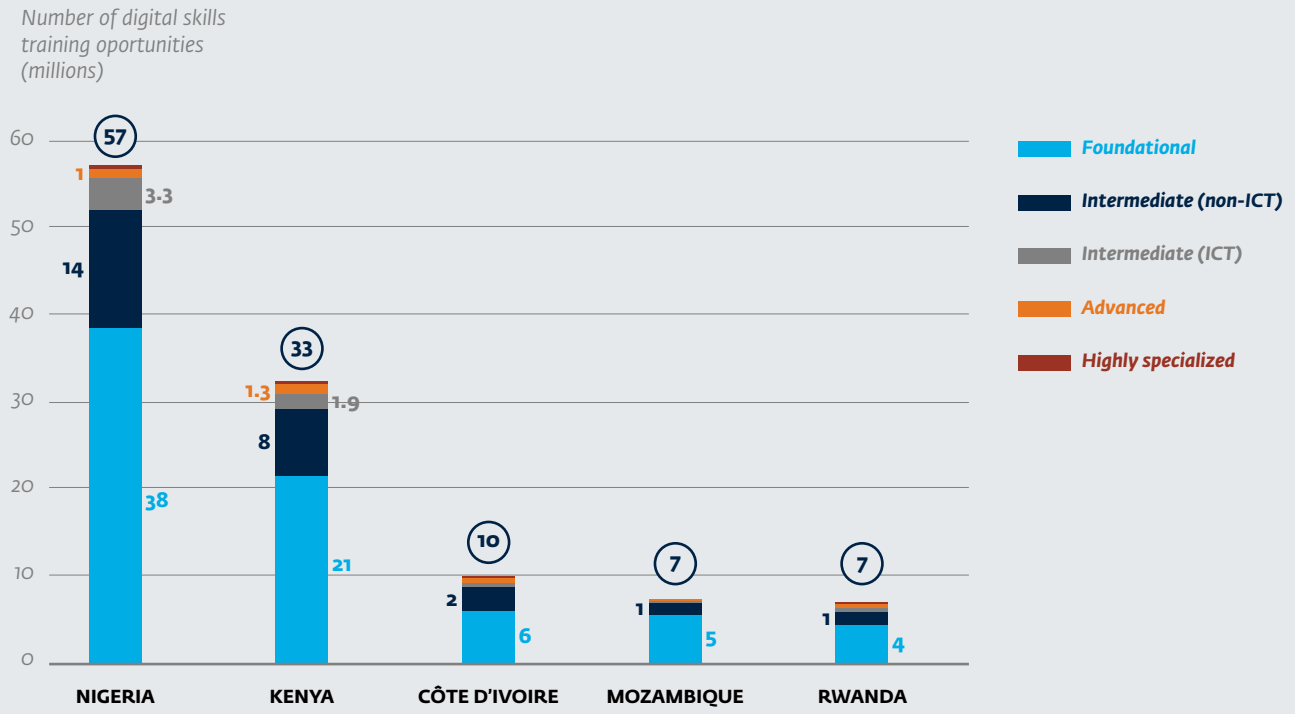
Source: *L.E.K. research and analysis.*
Note: *The task types are representative and do not encompass all task types required in each sector.*

IV. WHAT IS THE OPPORTUNITY SIZE FOR DIGITAL SKILLS TRAININGS?

The increased demand for 57 million jobs requiring digital skills over the next decade will result in a need for about 114 million training opportunities across the five countries. In the ICT and e-commerce sectors, 2 million jobs will require digital skills training through 2030, resulting in about 3 million training opportunities in ICT-focused digital skills.

Kenya and Nigeria have the highest demand for digital training opportunities, driven by the size of the labor force and expected adoption of digital skills in these two economies (figure 4). Kenya is a large, fast-growing economy that has among the highest literacy rates in Sub-Saharan Africa, as well as high mobile phone penetration and mobile money inclusion. Nigeria, on the other hand, has experienced a slower growth rate in the past few years due to the oil crisis, but it remains a large market with a demand of about 57 million cumulative training opportunities over the next decade. Côte d'Ivoire and Rwanda have relatively smaller, but fast-growing markets. Among the five countries, Kenya and Rwanda lead the way in terms of ICT initiatives and policies that the government has implemented to increase access to technology.

Figure 4: Demand for digital skill training opportunities by country and level of digital skills [2019-2030 (forecasted)]

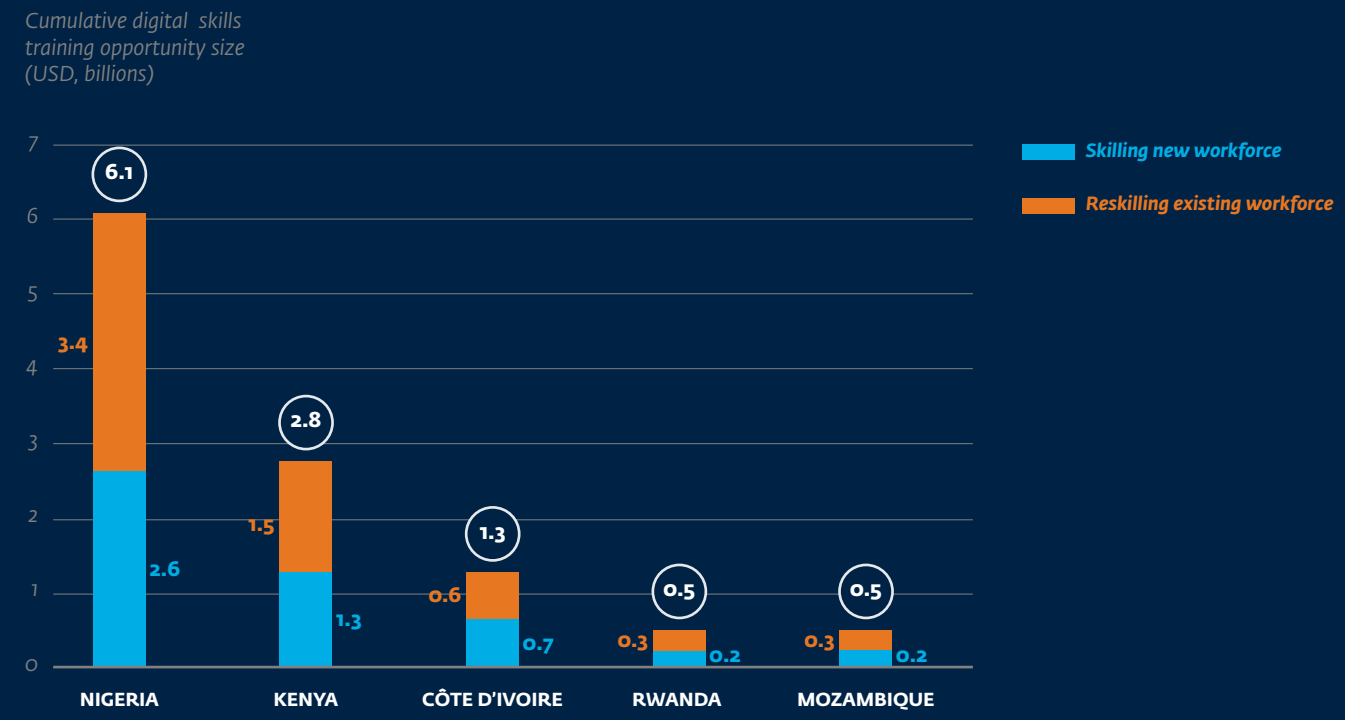


Sources: *ILO Statistics; UNESCO DLGF report; EU Digicomp report; industry participant interviews; and L.E.K research and analysis.*
Note: *Overall demand is cumulative from 2019 through 2030 (forecasted). The study uses UNESCO's Digital Literacy Global Framework (DLGF) to categorize digital skills across four categories.* ***Foundational level skills*** *are defined as entry-level functional skills required for rudimentary use of digital devices and applications, with a general secondary educational level equivalent.* ***Intermediate level skills*** *are defined as skills that enable an individual to make substantive and beneficial use of online applications and services, with a secondary/post-secondary TVET educational level equivalent.* ***Advanced level skills*** *are defined as a group of skills that form the basis of technical problem solving and data safety, with a university degree educational level equivalent.* ***Highly specialized skills*** *are the group of skills that form the basis of specialized ICT occupations and professions, with a post-graduate degree educational level equivalent.*

More than 70 percent of the training opportunities needed will be to upskill or reskill the existing workforce over the next decade. Of the 114 million training opportunities over the next decade, 70 percent or 81 million trainings would be required for the existing workforce. The remaining 30 percent, or about 33 million, will be required to skill new workers entering the labor market between 2020-30.

This demand translates into an estimated $11.1 billion opportunity to provide digital skills training over the next decade. Of this total, $5 billion would be accessible by training the new workforce and $6.1 billion would be accessible by training and reskilling the existing workforce to keep workers relevant for the digital needs required by their jobs (figure 5).

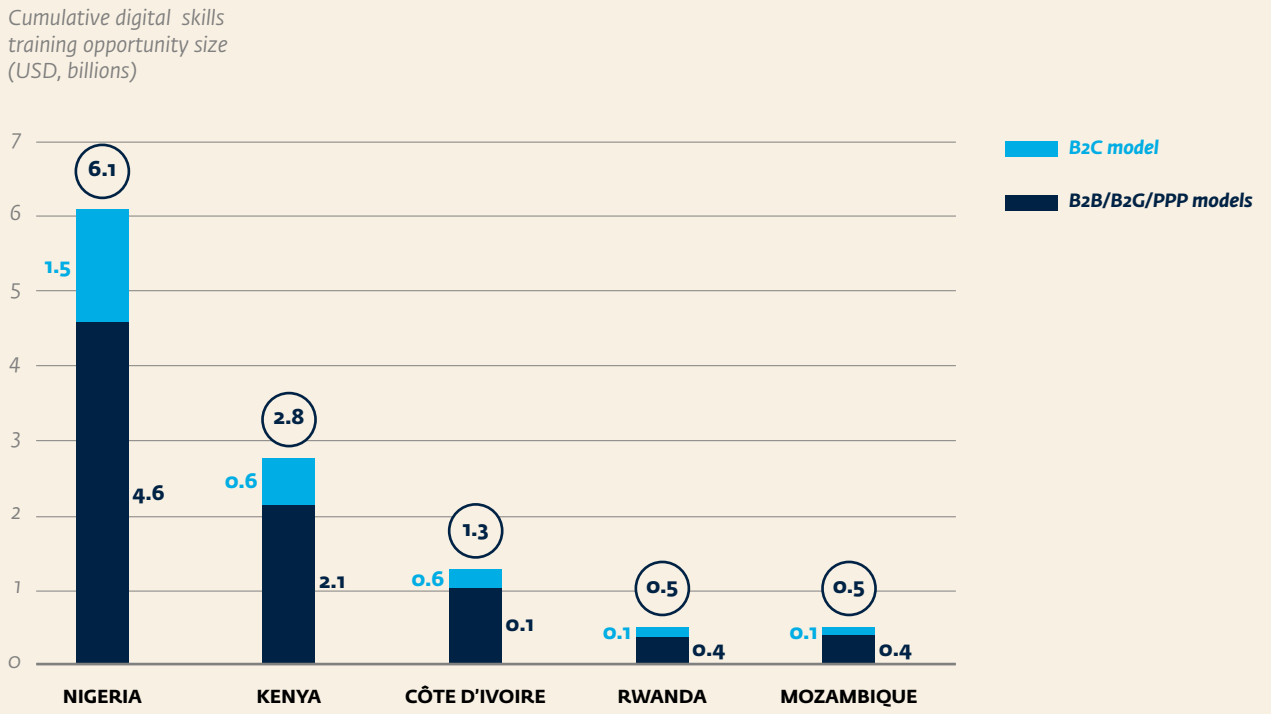
Figure 5: Estimated digital skills training opportunity size by country and by type of workforce being trained [2019 – 2030 (forecasted)]



Sources: *Euromonitor; ILO statistics; provider websites for fees; industry interview participants; and L.E.K. research and analysis.*
Note: *Cumulative demand is total demand available for the period 2019-30. Reskilling opportunities are related to the training of the existing and incremental workforce. Price points vary by level and are a fraction of the price paid at the same level by a person undertaking the skilling course.*

The largest opportunities to meet digital skills training demand will not be accessed by providers who work directly with consumers. While training demand can be met through three models: business-to-business (B2B), business-to-government (B2G), or business-to-consumer (B2C), the research shows that the majority of opportunities (about $8.6 billion) are accessible through B2B, B2G, and through public-private partnerships (PPP). Direct training for consumers through a B2C model should be focused on intermediate and advanced skills and is worth an estimated $2.5 billion over this period (figure 6).

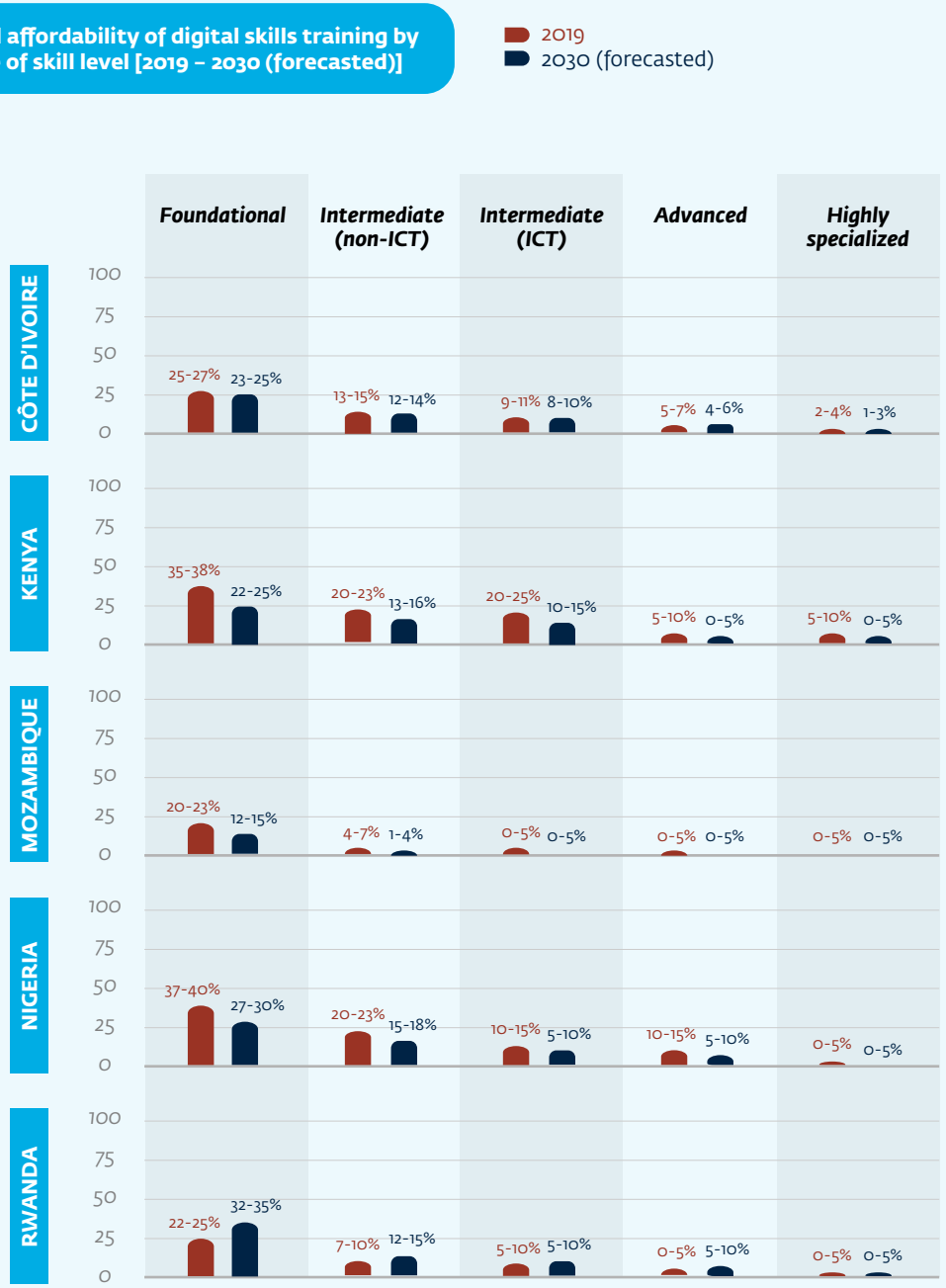
Figure 6: Estimated digital skills training opportunity size by country and by type of model [2019 – 2030 (forecasted)]



Sources: *Euromonitor; ILO statistics; provider websites for fees; industry interview participants; and L.E.K. research and analysis.*
Note: *Cumulative demand is total demand available for the period 2019-30.*
B2B: business-to-business; B2G: business-to-government; B2C: business-to-consumer; PPP: public-private partnerships

Business-to-consumer digital skills training will be constrained by affordability considerations for households. The level of affordability is based on a number of factors, including the average fee for the skilling program by skill level, the proportion of household disposable income spent on education, and the average disposable household income. By 2030, 25-35 percent of households are expected to be able to afford trainings for foundational skills by spending 1-3 percent of their income (figure 7). However, that affordability decreases with higher skill levels, with just over 3 percent of households on average expected to be able to afford trainings for advanced and highly specialized skills by 2030. Rwanda is the only country where an increased number of households are expected to be able to afford trainings across all levels by 2030, while the other four countries have lower expected affordability due to lower household disposable incomes and weaker economic outlooks.

Figure 7: Household affordability of digital skills training by country and by type of skill level [2019 – 2030 (forecasted)]



Sources: *Euromonitor; provider websites for fees; industry interview participants; and L.E.K. research and analysis.*

V. WHAT ROLE CAN STAKEHOLDERS PLAY IN NARROWING THE DIGITAL SKILLS GAP?

While there are dedicated skilling providers in all five countries, the demand for digital skills exceeds current supply and the expected growth in demand will further widen the gap. Universities and other tertiary education providers will play an important role in digital skills training, especially for the higher order skills for more specialized professions. Given the pace of technological change, universities that partner with providers holding content expertise are well placed to deliver relevant training to their students. Figure 8 provides a snapshot of some of the private sector providers that offer digital skills trainings at the regional level, as well as private sector providers and tertiary education providers at the country level.

Figure 8: A snapshot of existing skilling providers across the five countries

REGIONAL SKILLING PROVIDERS

REGIONAL PROVIDERS	DESCRIPTION AND TYPE OF SKILLS OFFERED	
2KO	• Founded in 1998, 2KO now operates across 20 countries in Africa providing web and IT services along with development, training and consulting. • Its IT services include web development, IT certification trainings and e-commerce, among others. It has partnered with IT giants such as Microsoft and Cisco.	✓ **Foundational** ✓ **Intermediate** ✗ Advanced ✗ Highly specialized
the knowledge academy	• Founded in 2009, The Knowledge Academy is a UK-based global training company. It provides IT, business management and project management training for individuals and organizations. • Its trainings are delivered through several models, including online, in-person and blended modes of delivery.	✓ **Foundational** ✓ **Intermediate** ✓ **Advanced** ✗ Highly specialized
CISCO Networking Academy	• Cisco Networking Academy is a global network of students, educators and employers impacting 10.9 million students across 180 countries, with an aim of empowering 1 billion people to the digital world. • It offers trainings in networking, IOT, programming, cyber security, OS and IT and packet tracer.	✓ **Foundational** ✓ **Intermediate** ✓ **Advanced** ✓ **Highly specialized**
moringa SCHOOL	• Moringa School is a multi-disciplinary coding school committed to closing the skills gap in Africa's job market by offering high-potential students the necessary technical and professional training in order to compete in a digital, global economy. • Over 2,000 students have been trained from Ghana; Hong Kong SAR, China; Kenya; Pakistan; Rwanda; and Uganda.	✗ Foundational ✗ Intermediate ✓ **Advanced** ✓ **Highly specialized**
Andela	• Andela is an American company that identifies and develops software developers. The company launched its operations in Nigeria in 2014 in order to help global companies overcome the severe shortage of skilled software developers. • It has offices in Kenya, Nigeria, Rwanda, Uganda and the United States.	✗ Foundational ✗ Intermediate ✗ Advanced ✓ **Highly specialized**
NIIT	• NIIT is a leading global talent development corporation, building skilled manpower pool for global industry requirements. The company was set up in 1981 to help the nascent IT industry overcome its human resource challenges. • It currently has enterprises and institutions across 40 countries and 750 centers.	✗ Foundational ✓ **Intermediate** ✓ **Advanced** ✓ **Highly specialized**
IBM	• IBM Digital Nation Africa is a free online learning and innovation platform that aims to provide youth with digital skills. • The program addresses critical aspects such as skills, innovation and jobs in emerging technologies such as Cloud, AI, IoT, blockchain,data science and cybersecurity.	✗ Foundational ✓ **Intermediate** ✓ **Advanced** ✓ **Highly specialized**

Sources: *Company websites; L.E.K. research and analysis.*

This study highlights a large unmet demand for digital skills and opportunities for the private sector in the provision of digital skills. New ways of operating will be required to access this opportunity, and the private sector will play an important role due to the magnitude of need and pace of change required. In addition, private sector models are nimble and will be responsive to market demands in the rapidly evolving landscape of digital skills.

Private providers in Africa could step up B2B programs with local industry to meet the local industry needs. Similarly, existing private providers who are already operating in the region could consider addressing this unmet demand by offering additional curriculum in local languages. Such extension of existing curriculum to other countries could be done in cost-effective ways through online programs and distance learning. Regional private providers could look to expand to smaller markets through local partnerships. Some private providers could consider using integrated models to expand their offering such as combining digital skills with job placement services through bootcamps, thus positioning themselves as B2C-B2B intermediaries.

Figure 8: continued

	PRIVATE PROVIDERS	DESCRIPTION AND TYPE OF SKILLS OFFERED	
KENYA	digikids	• Digikids is Kenya's leading STEM (Science, Technology, Engineering & Mathematics) education institute, providing tailored coding programs for kids aged 6 to 17 years. Its classes comprise weekend coding classes, holiday coding boot camps and STEM workshops.	✓ **Foundational** ✓ **Intermediate** ✗ Advanced ✗ Highly specialized
KENYA	Pwani Teknowgalz Inspire.Motivate.Liberate	• Pwani Teknowgalz is inspiring and educating girls and young women in Mombasa, Kenya to innovate with STEM through practical training programs, workshops and conferences, and to bridge the gender gap of women in technology. Using the skills acquired, the young women are able to be employed or self-employed and obtain a decent wage.	✗ Foundational ✓ **Intermediate** ✗ Advanced ✗ Highly specialized
KENYA	computerpride	• Established in 1990, Computer Pride Ltd is one of the leading computer firms that has a center specialized in providing training services on information technology. The company has also singled out itself as a provider of up-to-date and thorough total IT solutions. It provides basic, intermediate and advanced levels of trainings.	✓ **Foundational** ✓ **Intermediate** ✓ **Advanced** ✗ Highly specialized
NIGERIA	HiiT Plc 1996	• HiiT Plc is Nigeria's indigenous IT training establishment. It provides IT training/ education, publishing, IT consultancy and IT solutions development and services. • Founded 20 years ago, they have graduated over 50,000 students from their CPN-accredited IT training centers located in Abuja, Ibadan and Lagos, in addition to other cities.	✓ **Foundational** ✓ **Intermediate** ✓ **Advanced** ✓ **Highly specialized**
NIGERIA	ANCHORSOFT ACADEMY	• Anchorsoft Academy is a local training provider which offers courses for both individuals and working professionals in the field of software development, software testing and data science.	✓ **Foundational** ✓ **Intermediate** ✓ **Advanced** ✗ Highly specialized
MOZAMBIQUE	TECNICOL 15 ANOS	• Tecnicol offers professional initiation courses (4-7 months) which aims to provide students with the skills and abilities needed for the job market through trainings. The trainings are available for public and private enterprises employees as well. Each year over 2,000 students are trained.	✓ **Foundational** ✓ **Intermediate** ✗ Advanced ✗ Highly specialized

Sources: *Company websites; L.E.K. research and analysis.*

Education providers also have a key role to play. One of the main constraints to addressing the supply-demand gap for digital skills is a lack of well-trained teachers and trainers. Private providers could tap into this opportunity and partner with education providers to offer teacher training programs across all education levels. Similar to regional private providers, regional higher education providers could expand their courses to smaller countries through distance learning and local partnerships in order to meet unmet demand. Lastly, higher education institutes could build incubators and organize innovation events with industry to help support digital entrepreneurship.

Finally, a positive enabling environment for innovation in the delivery of digital skills training is required. Governments need to act as "enablers" by formulating and implementing policies for ICT infrastructure expansion and cost reduction, as well as by creating a regulatory environment that allows private sector providers to more easily scale their delivery models, including through partnerships with business, government and educational institutions. The role of governments will be important to allow quality skills provision to scale quickly and to meet the high level of demand for digital skills in Africa over the next decade.

Figure 8: continued

	UNIVERSITY AND TERTIARY EDUCATION PROVIDERS	DESCRIPTION
KENYA	KISE	• The Kenya Institute of Software Engineering offers specialized programs for software engineering, computer engineering and areas related to web development and mobile application developments.
		• Rift Valley Technical Training Institute is a post-secondary technical, industrial, vocational and entrepreneurial training institution and is a direct outgrowth of the increasing demand for technical manpower attendants. Student enrollment as of 2015 was about 5,000.
NIGERIA	COVENANT UNIVERSITY	• Founded in 2002, Covenant University is providing cutting edge education in Africa with an aim of holistic development of its students to aid in the upliftment of Africa. It offers computer graphics, advanced programming and artificial intelligence courses specific to the field of IT and computers.
CÔTE D'IVOIRE	UVCI	• Ivory Coast Virtual University has various programs in which it offers trainings and certifications to its students. • It provides various levels of IT training from basic fundamentals to highly specialized software development trainings.
	ISTC Polytechnique	• Established in 1992, the Institute of Sciences and Communication Techniques is a non-profit public higher education institution located in Abidjan. Officially accredited and recognized by the Ministry of Communication, it provides trainings in various fields including communication technology and telecommunications.
RWANDA	RCA (Rwanda Coding Academy)	• Rwanda Coding Academy (RCA) is a special model school incepted by the Government of Rwanda. It is a hybrid of both general education and TVET. Founded in January 2019, it teaches software development, embedded systems programming and cyber-security.
	Carnegie Mellon University Africa	• CMU-Africa was established in 2011 and is the only U.S. research university offering a master's degrees with a full-time faculty, staff and operations in Africa. Born out of a partnership between CMU and the Government of Rwanda, CMU-Africa is addressing the critical shortage of high-quality engineering talent required to accelerate development in Africa.
MOZAMBIQUE	UNIVERSIDADE EDUARDO MONDLANE	• The Eduardo Mondlane University (UEM) is a public institution and the oldest institution of higher education in Mozambique. • Founded on August 21, 1962, it currently enrolls about 40,000 students under different programs. It providers basic, intermediate and advanced level ICT courses.
	ustm	• St. Thomas University of Mozambique is a private higher education institute founded 13 years ago to provide good quality education in Mozambique. It offers different disciplines such economics and business, agriculture, humanities and information sciences and technologies.

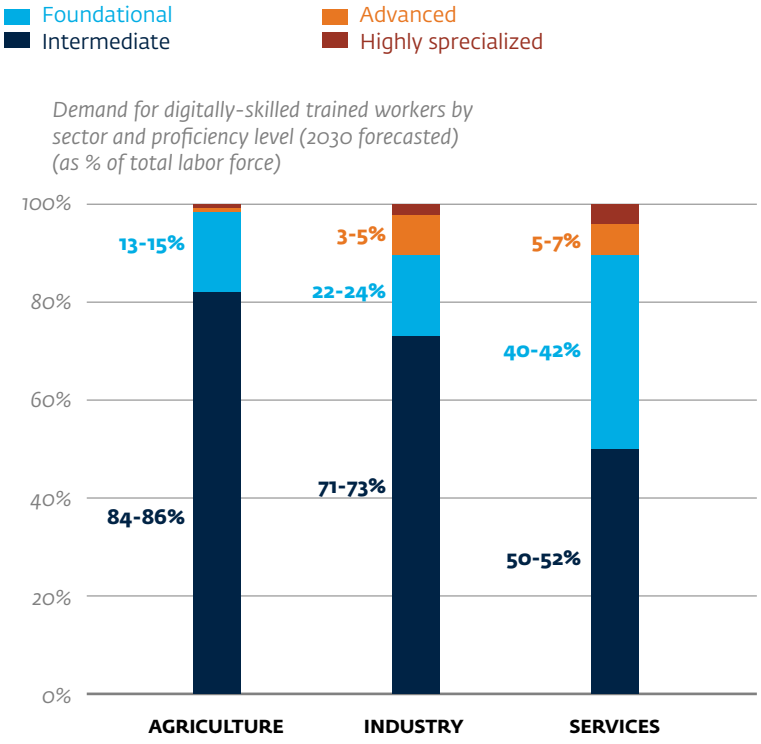
Sources: *Company websites; L.E.K. research and analysis.*

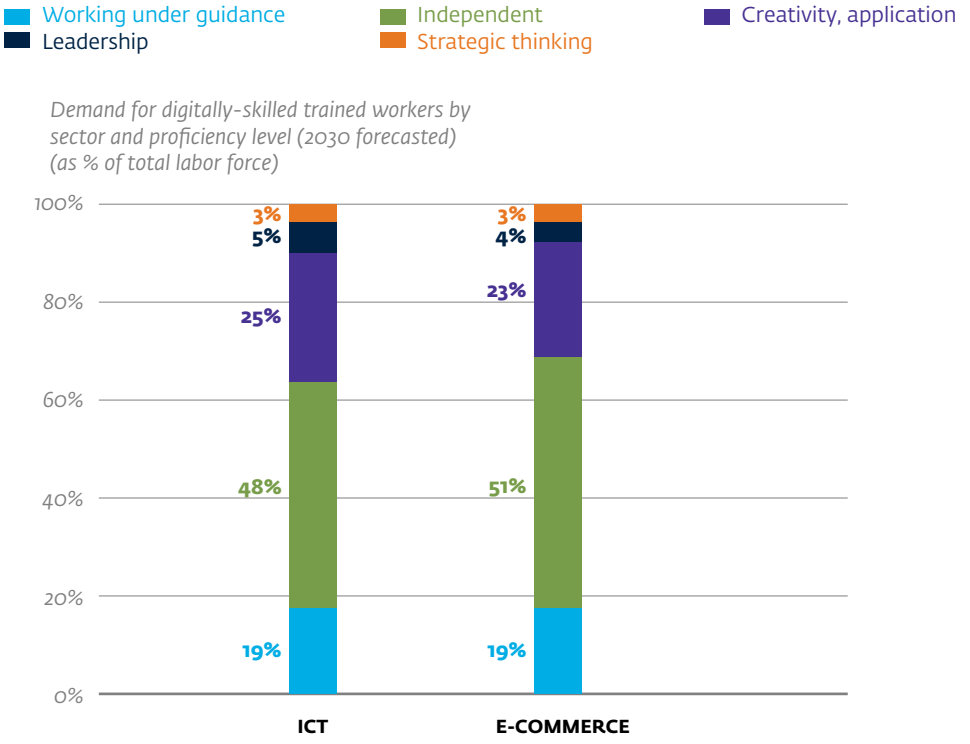
ANNEX I: COUNTRY INFORMATION RELATED TO DIGITAL SKILLS

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

CÔTE D'IVOIRE

Figure 1: By 2030, the labor force in Côte d'Ivoire will require about 5 million workers trained in digital skills across various sectors of the economy

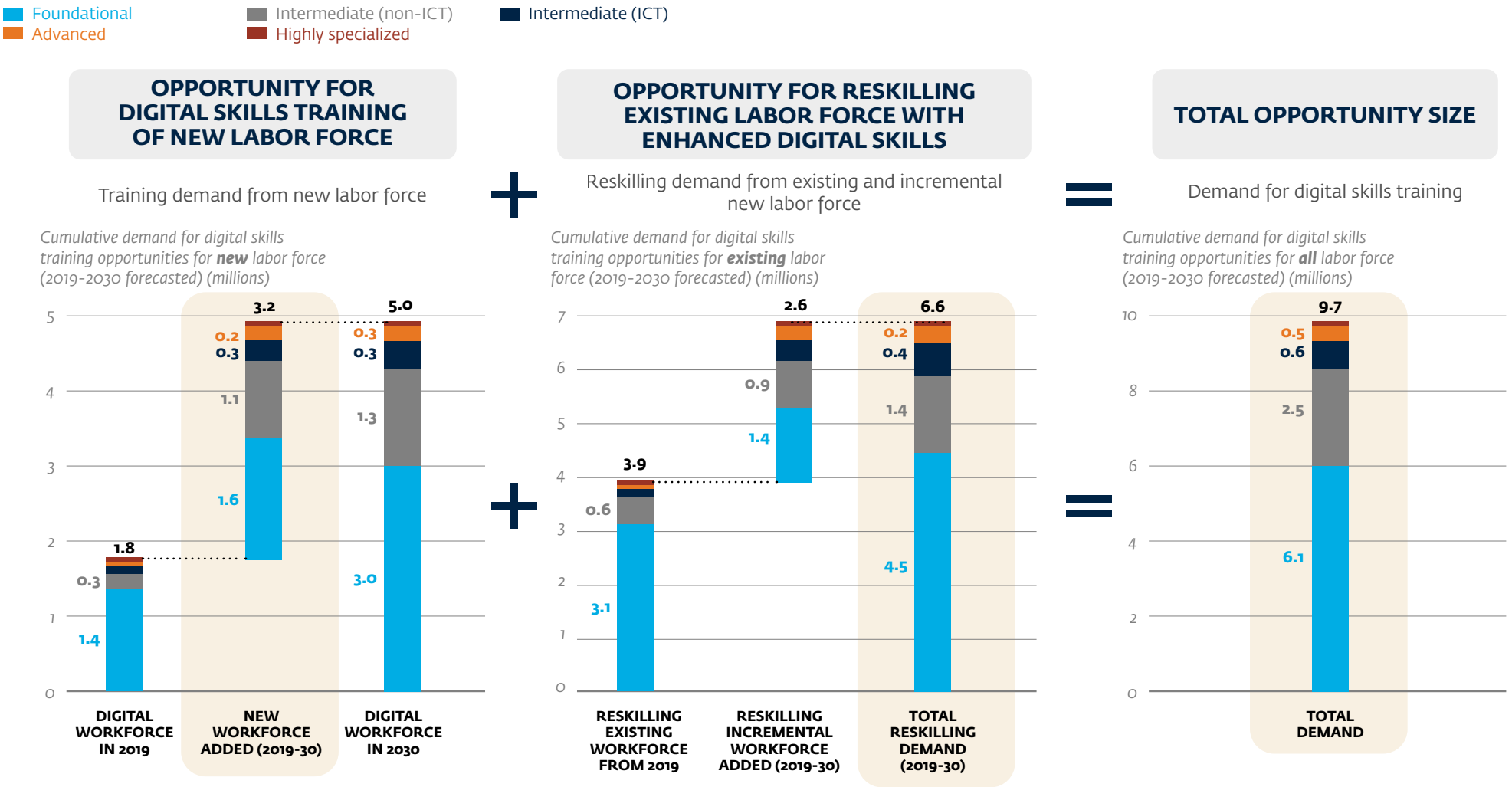




Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *As of 2019, the number of workers that are digitally trained are approximately: 0.3 million in the agricultural sector, 0.2 million in the industry sector, 1.3 million in the services sector, 120,000 in the ICT sector, and 4,000 in the e-commerce sector. In 2030, it is forecasted that the demand for the number of workers that are digitally trained will be approximately: 1 million in the agricultural sector, 0.6 million in the industry sector, 3.4 million in the services sector, 194,000 in the ICT sector, and 7,000 in the e-commerce sector.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

Figure 2: There are nearly 9.7 million training opportunities in digital skills during the 2019-30 (forecasted) period in Côte d'Ivoire

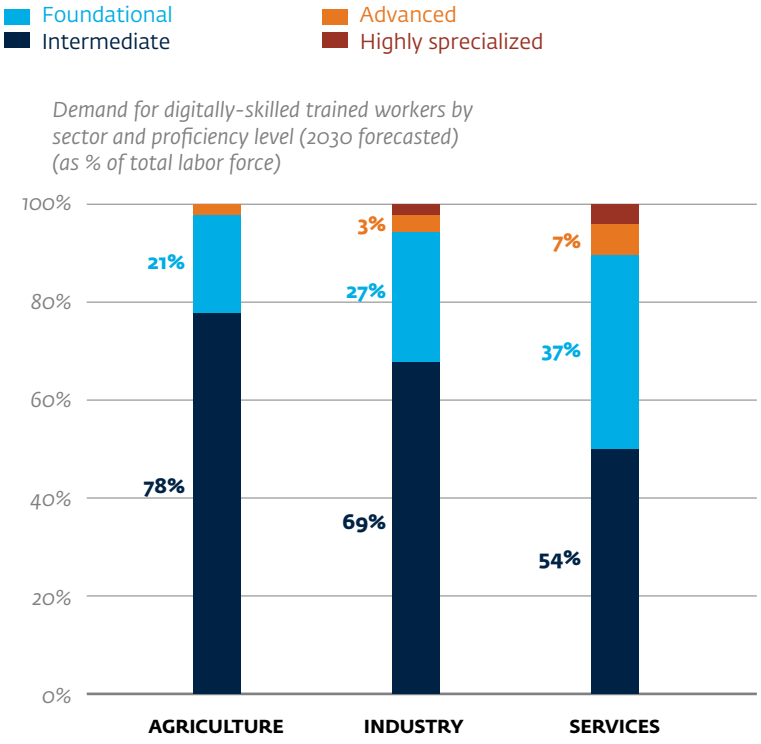


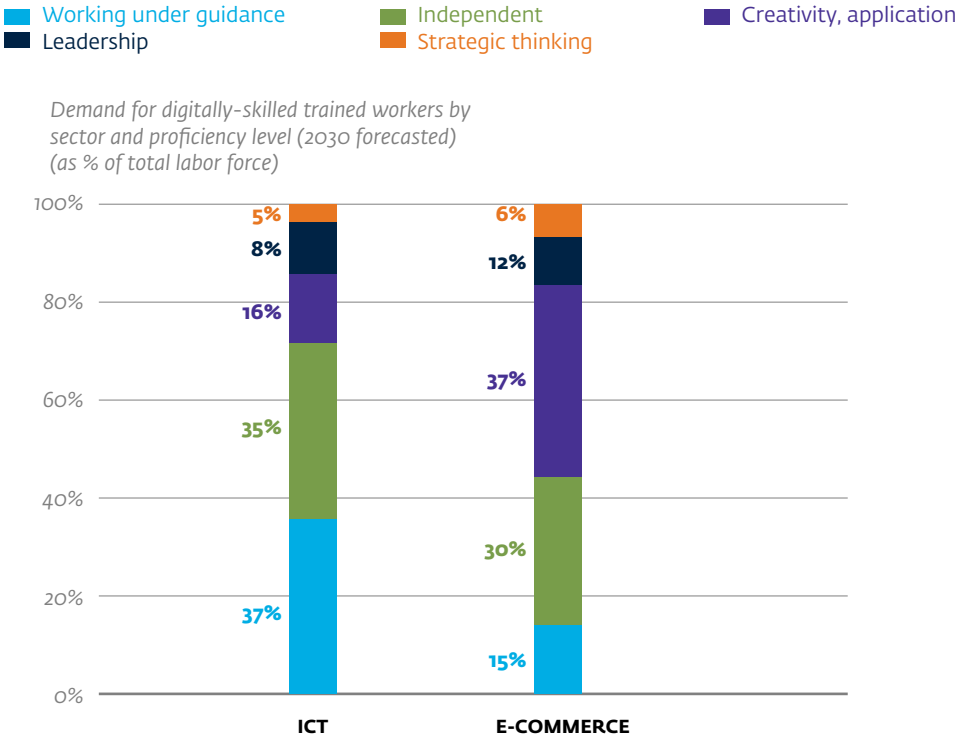
Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *It is assumed that 20 percent of the existing digital labor force will need to be reskilled every year in order to remain relevant.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

KENYA

Figure 3: By 2030, the labor force in Kenya will require about 17 million workers trained in digital skills across various sectors of the economy

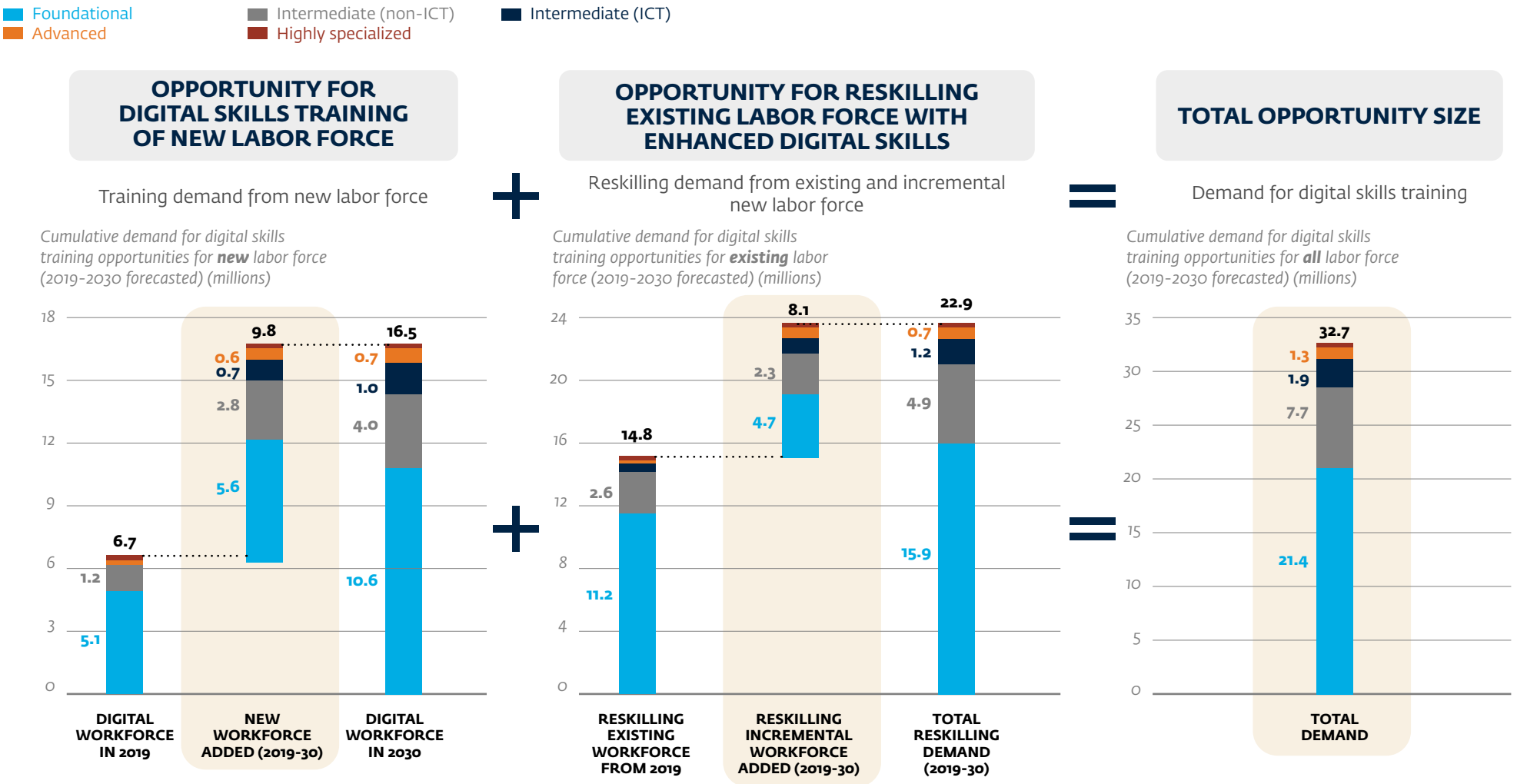




Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *As of 2019, the number of workers that are digitally trained are approximately: 2.3 million in the agricultural sector, 0.5 million in the industry sector, 4 million in the services sector, 330,000 in the ICT sector, and 8,000 in the e-commerce sector. In 2030, it is forecasted that the demand for the number of workers that are digitally trained will be approximately: 6.1 million in the agricultural sector, 1.5 million in the industry sector, 9 million in the services sector, 540,000 in the ICT sector, and 19,000 in the e-commerce sector.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

Figure 4: There are nearly 33 million training opportunities in digital skills during the 2019-30 (forecasted) period in Kenya

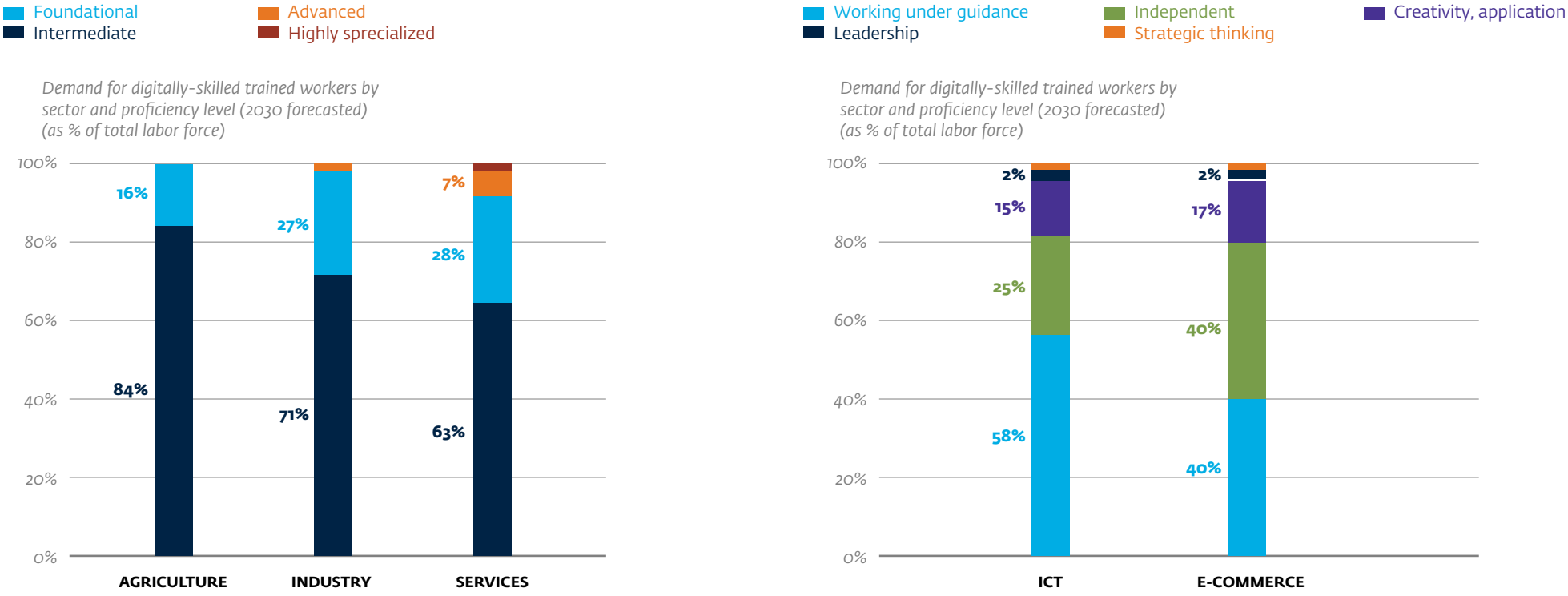


Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *It is assumed that 20 percent of the existing digital labor force will need to be reskilled every year in order to remain relevant.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

MOZAMBIQUE

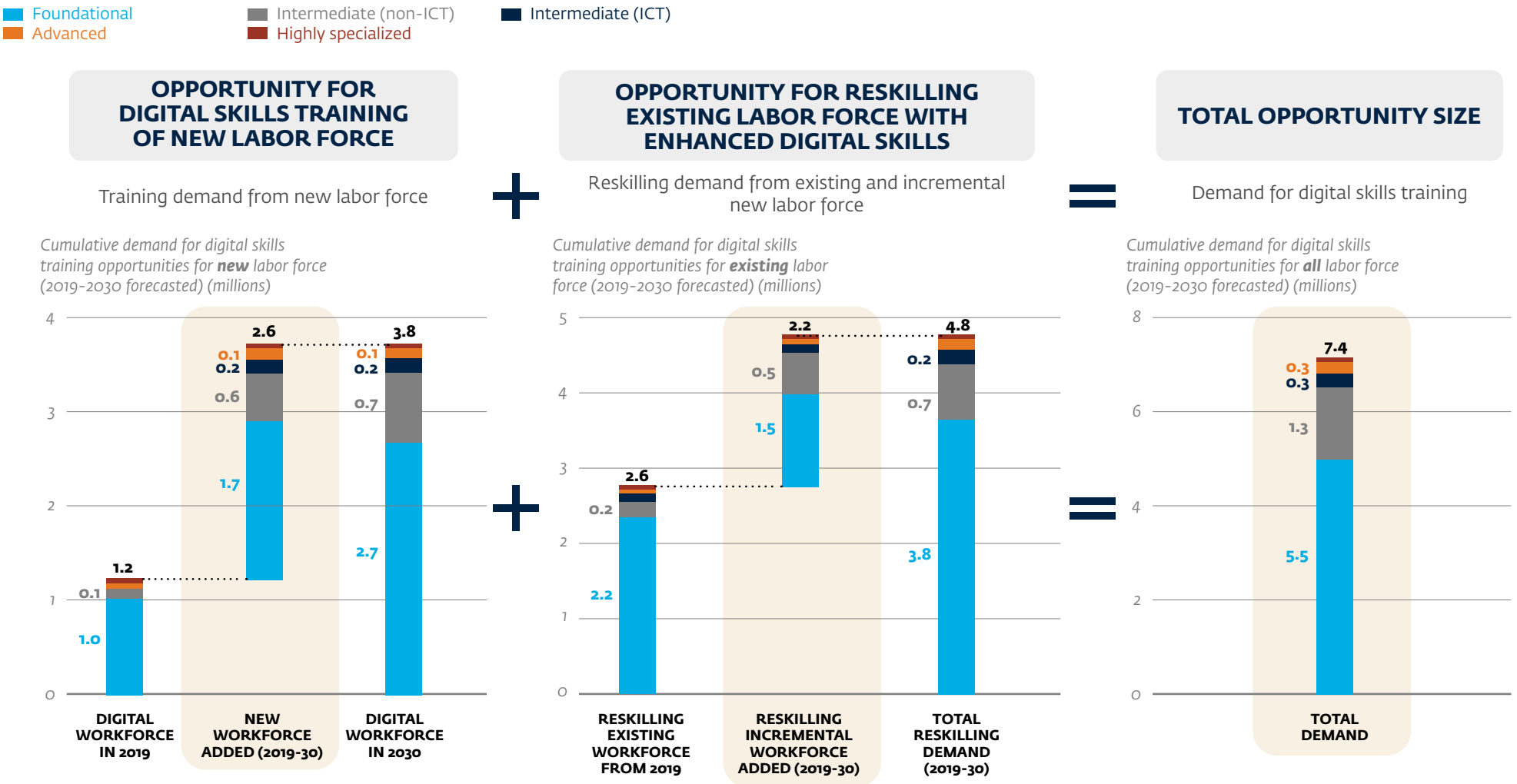
Figure 5: By 2030, the labor force in Mozambique will require about 3.7 million workers trained in digital skills across various sectors of the economy



Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *As of 2019, the number of workers that are digitally trained are approximately: 0.4 million in the agricultural sector, 0.1 million in the industry sector, 0.7 million in the services sector, 7,000 in the ICT sector, and 80 in the e-commerce sector. In 2030, it is forecasted that the demand for the number of workers that are digitally trained will be approximately: 1.3 million in the agricultural sector, 0.6 million in the industry sector, 1.9 million in the services sector, 16,000 in the ICT sector, and 1,200 in the e-commerce sector.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

Figure 6: There are nearly 7 million training opportunities in digital skills during the 2019-30 (forecasted) period in Mozambique

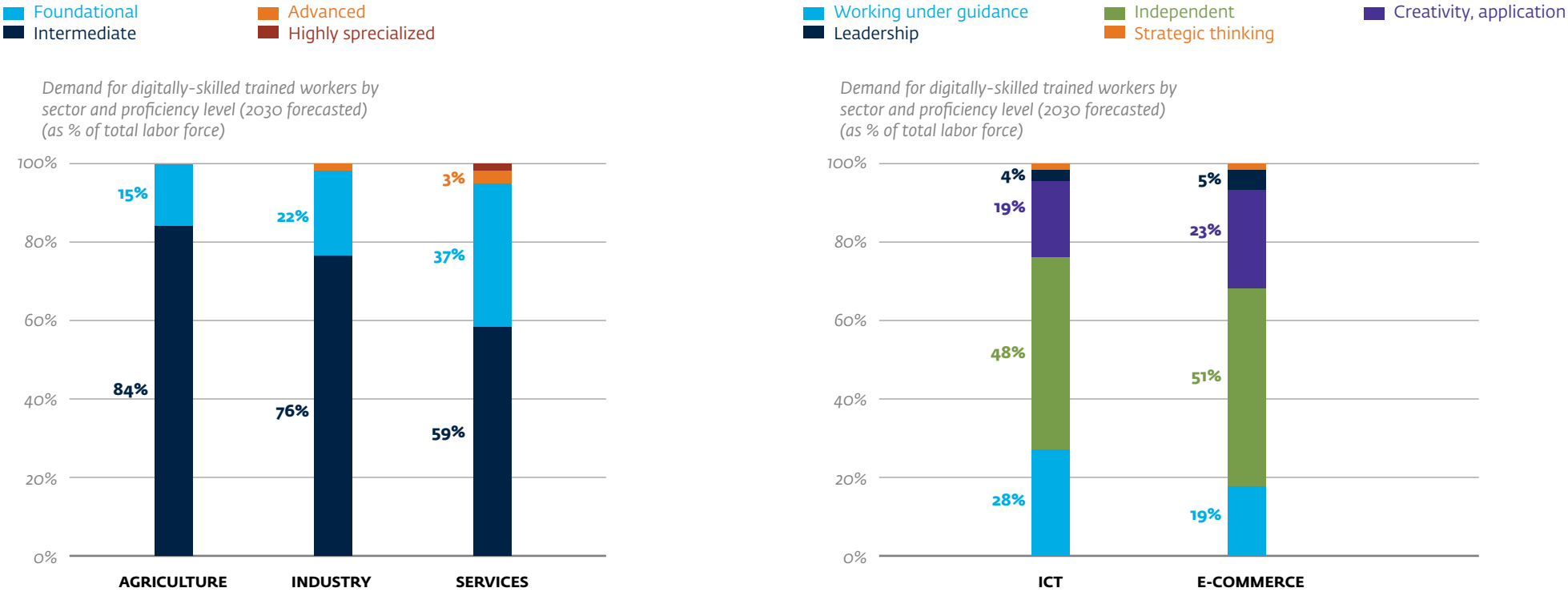


Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *It is assumed that 20 percent of the existing digital labor force will need to be reskilled every year in order to remain relevant.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

NIGERIA

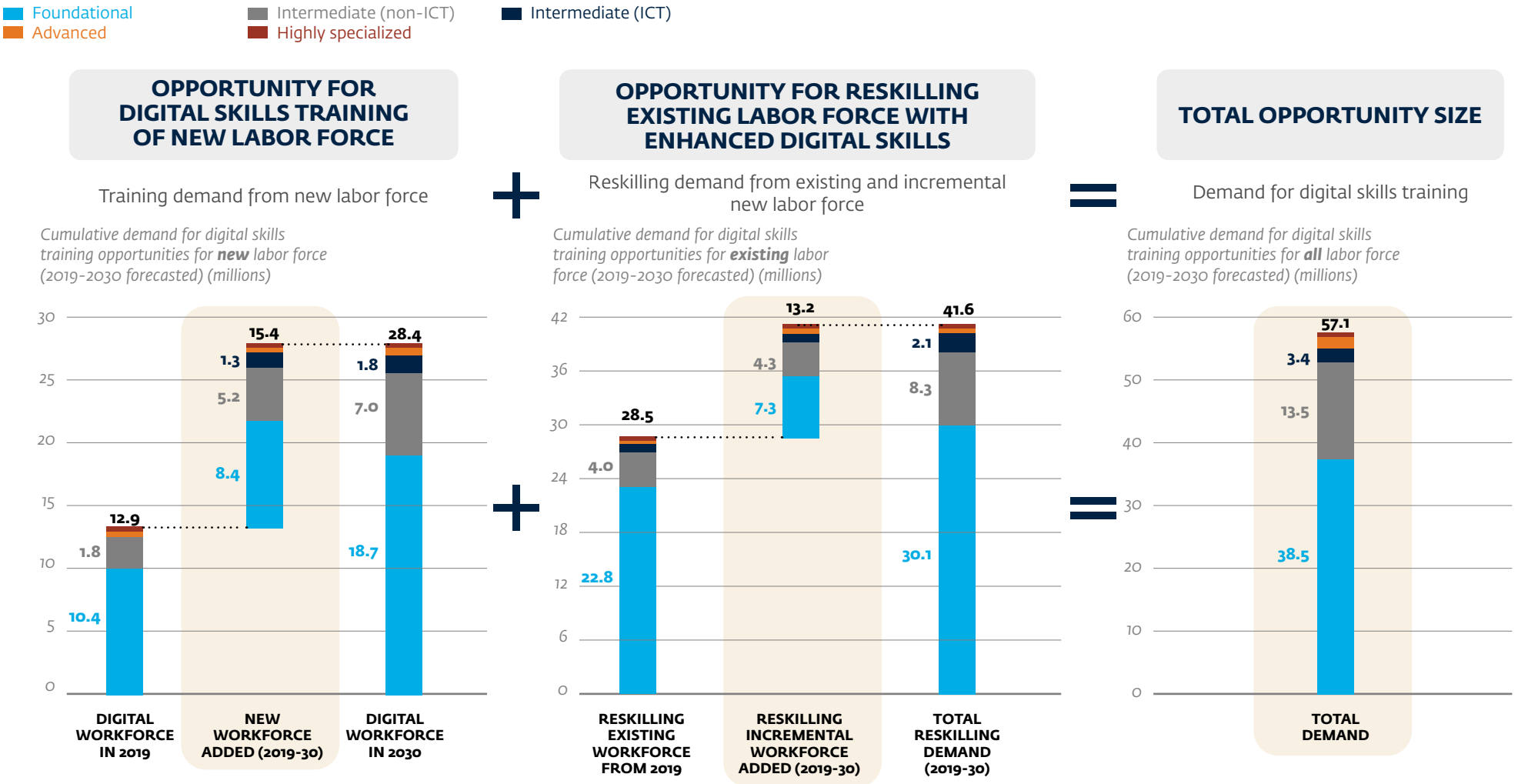
Figure 7: By 2030, the labor force in Nigeria will require about 28 million workers trained in digital skills across various sectors of the economy



Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *As of 2019, the number of workers that are digitally trained are approximately: 1.7 million in the agricultural sector, 1 million in the industry sector, 10.3 million in the services sector, 454,000 in the ICT sector, and 9,000 in the e-commerce sector. In 2030, it is forecasted that the demand for the number of workers that are digitally trained will be approximately: 6.6 million in the agricultural sector, 2.6 million in the industry sector, 19.5 million in the services sector, 732,000 in the ICT sector, and 20,000 in the e-commerce sector.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

Figure 8: There are nearly 57 million training opportunities in digital skills during the 2019-30 (forecasted) period in Nigeria

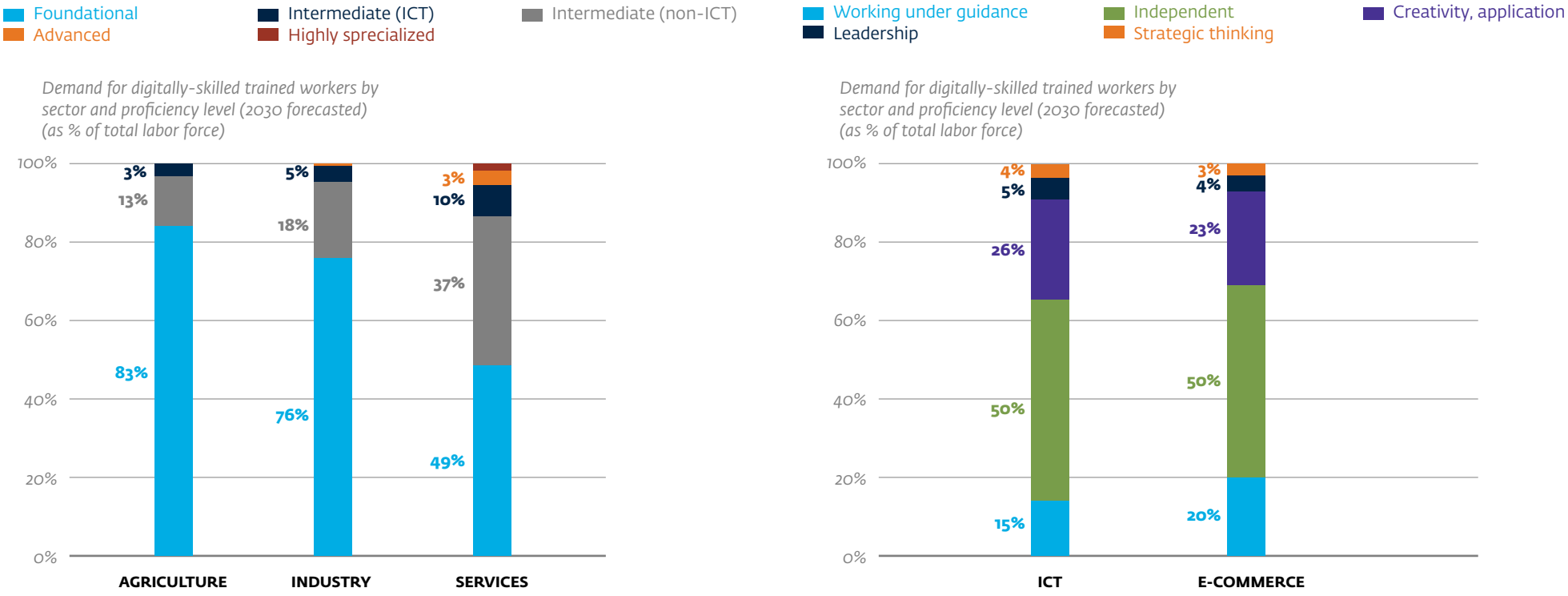


Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *It is assumed that 20 percent of the existing digital labor force will need to be reskilled every year in order to remain relevant.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

RWANDA

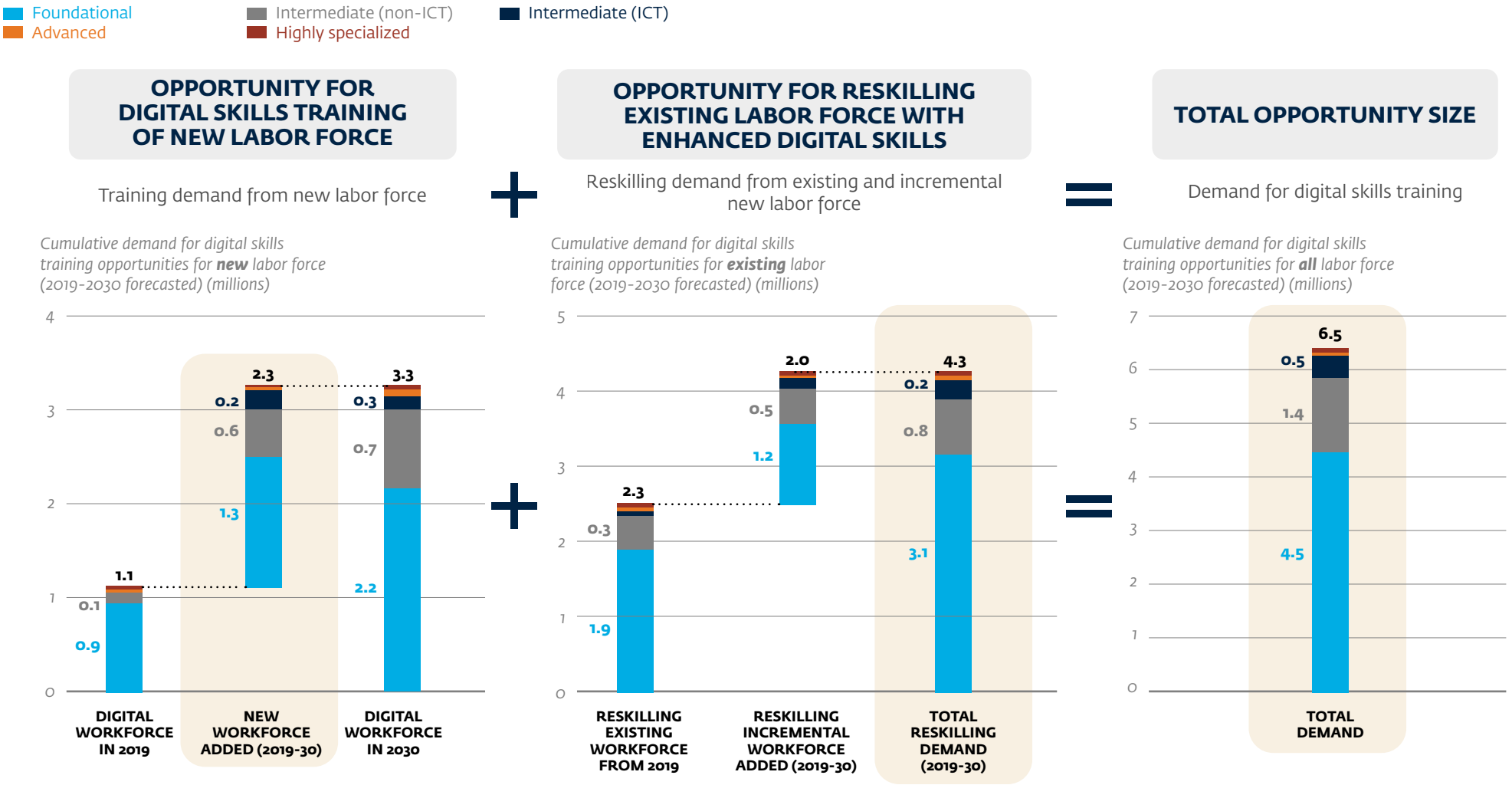
Figure 9: By 2030, the labor force in Rwanda will require about 3.3-3.4 million workers trained in digital skills across various sectors of the economy



Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *As of 2019, the number of workers that are digitally trained are approximately: 0.3 million in the agricultural sector, 0.1 million in the industry sector, 0.6 million in the services sector, 12,000 in the ICT sector, and 100 in the e-commerce sector. In 2030, it is forecasted that the demand for the number of workers that are digitally trained will be approximately: 1-1.1 million in the agricultural sector, 0.3-0.4 million in the industry sector, 1.9-2 million in the services sector, 40,000-45,000 in the ICT sector, and 3,000-3,500 in the e-commerce sector.*

1. DEMAND FOR DIGITAL SKILLS BY COUNTRY

Figure 10: There are about 6.5 million training opportunities in digital skills during the 2019-30 (forecasted) period in Rwanda

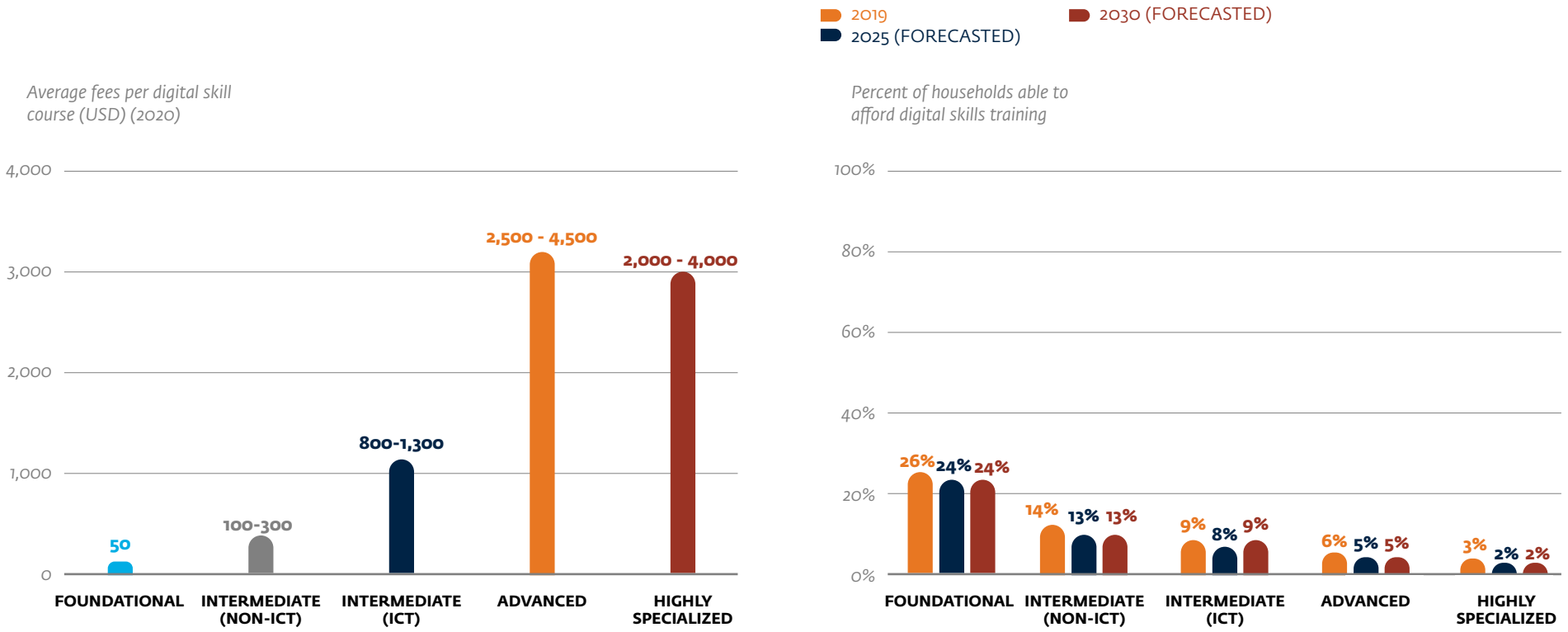


Sources: *Oxford Economics; L.E.K. research and analysis.*
Note: *It is assumed that 20 percent of the existing digital labor force will need to be reskilled every year in order to remain relevant.*

2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

CÔTE D'IVOIRE

Figure 1: About 10-15 percent of households in Côte d'Ivoire are expected to be able to afford digital skills training for intermediate skills by 2030



Sources: *L.E.K. research and analysis.*
Note: *Total fees represent the fees in USD charged to consumers by businesses. The forecasted model for 2025 and 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

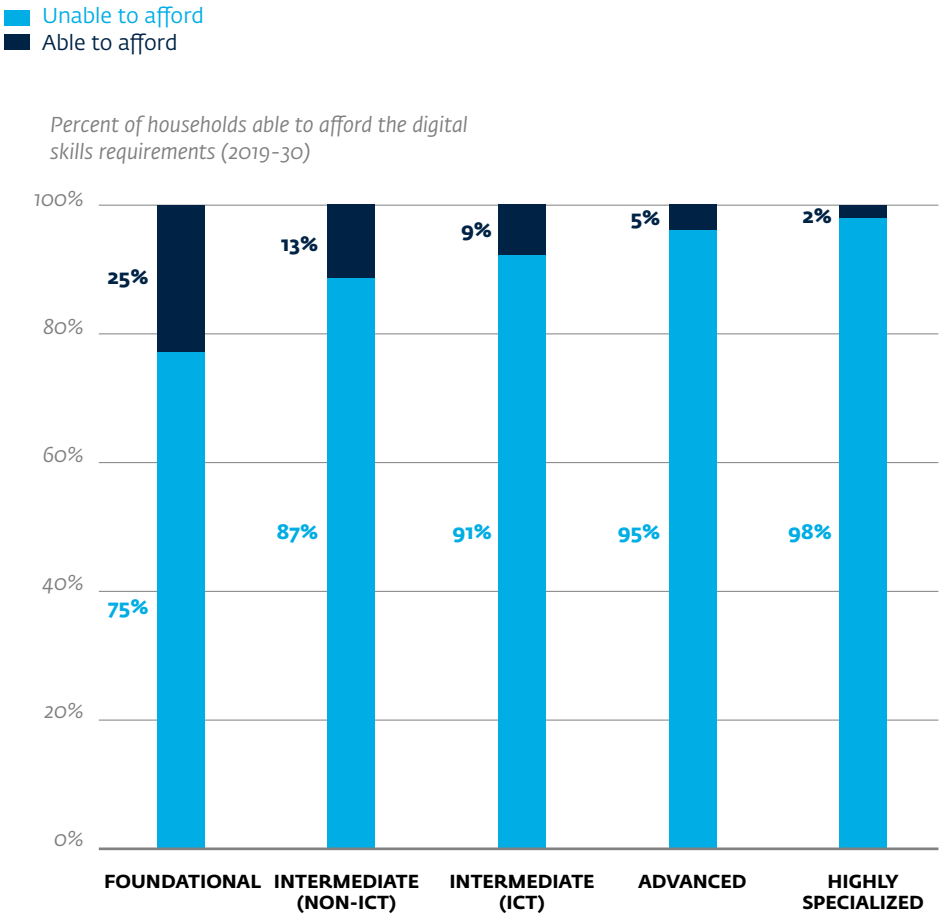
2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

Table 1: Households in Côte d'Ivoire spend about 4 percent of their income on average for digital skills training for intermediate skills

	Foundational	Intermediate (non-ICT)	Intermediate (ICT)	Advanced	Highly Specialized
Type of courses offered	• ICT in farming • Basic courses in MS Office	• Social media courses • Digital marketing courses	Programming and database courses	Degree in computer science, computer systems and related fields	Master's degree in IT, information systems, etc.
Education level mapping	Primary and lower secondary	Higher secondary, post-secondary vocational		Tertiary: University and non-university	Master's, PhD
Percent of household income spent on digital skills	1-3%	1-3%	5-7%	5-7%	5-7%
Household income cutoff (2019) (USD)	~5,000	~8,000	~11,000	~15,000	~25,000

Note: *The percent of household income spent on digital skills is based on benchmarks from emerging markets.*

Figure 2: Less than 15 percent of households in Côte d'Ivoire can afford to pay for the intermediate and higher digital skills trainings that will be required by 2030

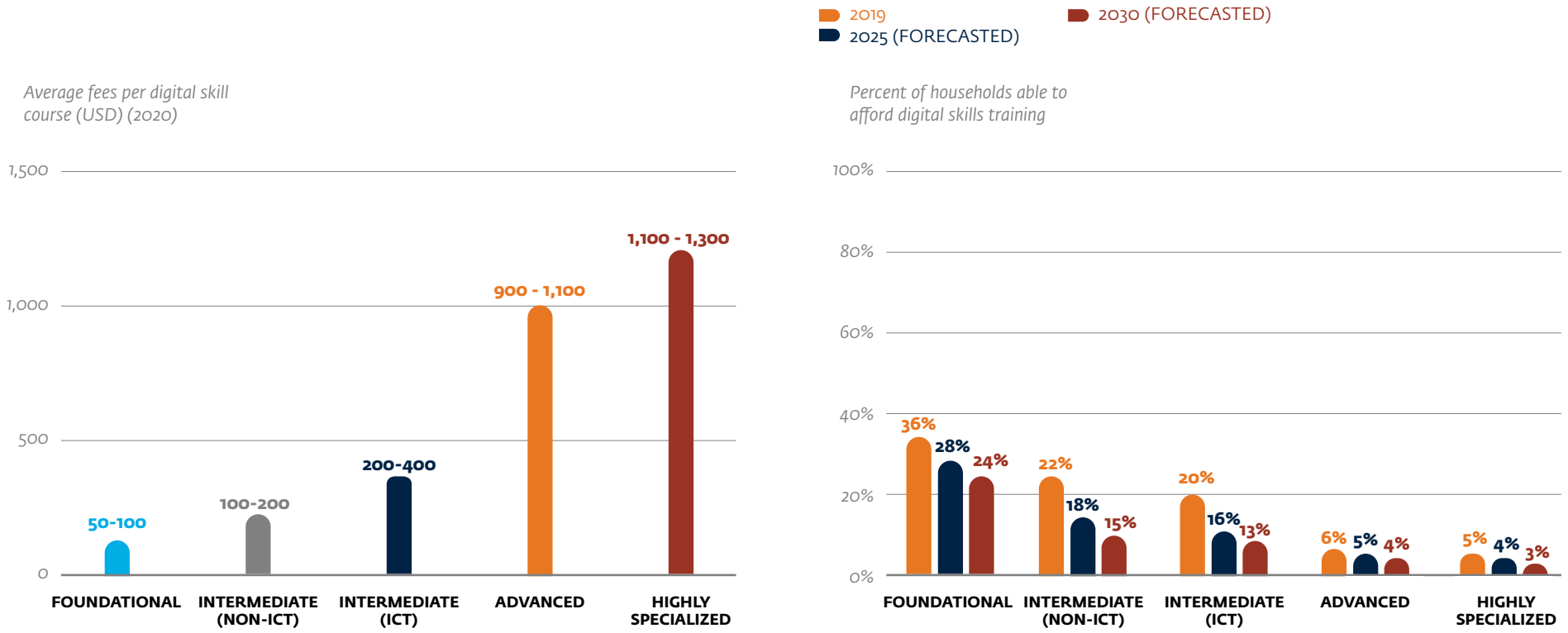


Sources: *L.E.K. research and analysis.*
Note: *The forecasted model for 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

KENYA

Figure 3: About 5-10 percent of households in Kenya are expected to be able to afford digital skills training for intermediate and more advanced skills by 2030



Sources: *L.E.K. research and analysis.*
Note: *Total fees represent the fees in USD charged to consumers by businesses. The forecasted model for 2025 and 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

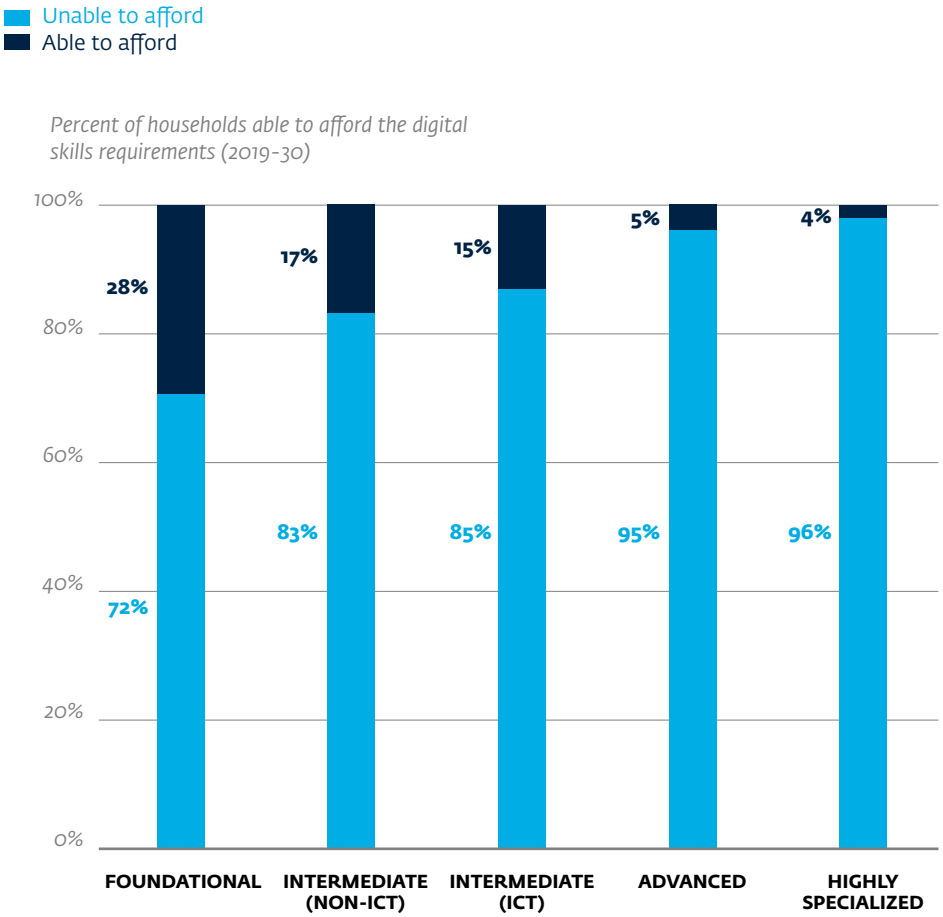
2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

Table 2: Households in Kenya spend about 5 percent of their income on average for digital skills training for intermediate skills

	Foundational	Intermediate (non-ICT)	Intermediate (ICT)	Advanced	Highly Specialized
Type of courses offered	• ICT in farming • Basic courses in MS Excel • Basic computer courses	• Project management courses • Digital marketing courses	• Programming and database courses • IT security courses	Degree in computer science, computer systems, information systems, etc.	Master's degree in IT, information systems, etc.
Education level mapping	Primary and lower secondary	Higher secondary, post-secondary vocational		Tertiary: University and non-university	Master's, PhD
Percent of household income spent on digital skills	1-3%	1-3%	5-10%	5-10%	5-10%
Household income cutoff (2019) (USD)	~4,000	~6,000	~6,000	~13,000	~16,000

Note: *The percent of household income spent on digital skills is based on benchmarks from emerging markets.*

Figure 4: Less than 20 percent of households in Kenya can afford to pay for the intermediate and higher digital skills trainings that will be required by 2030

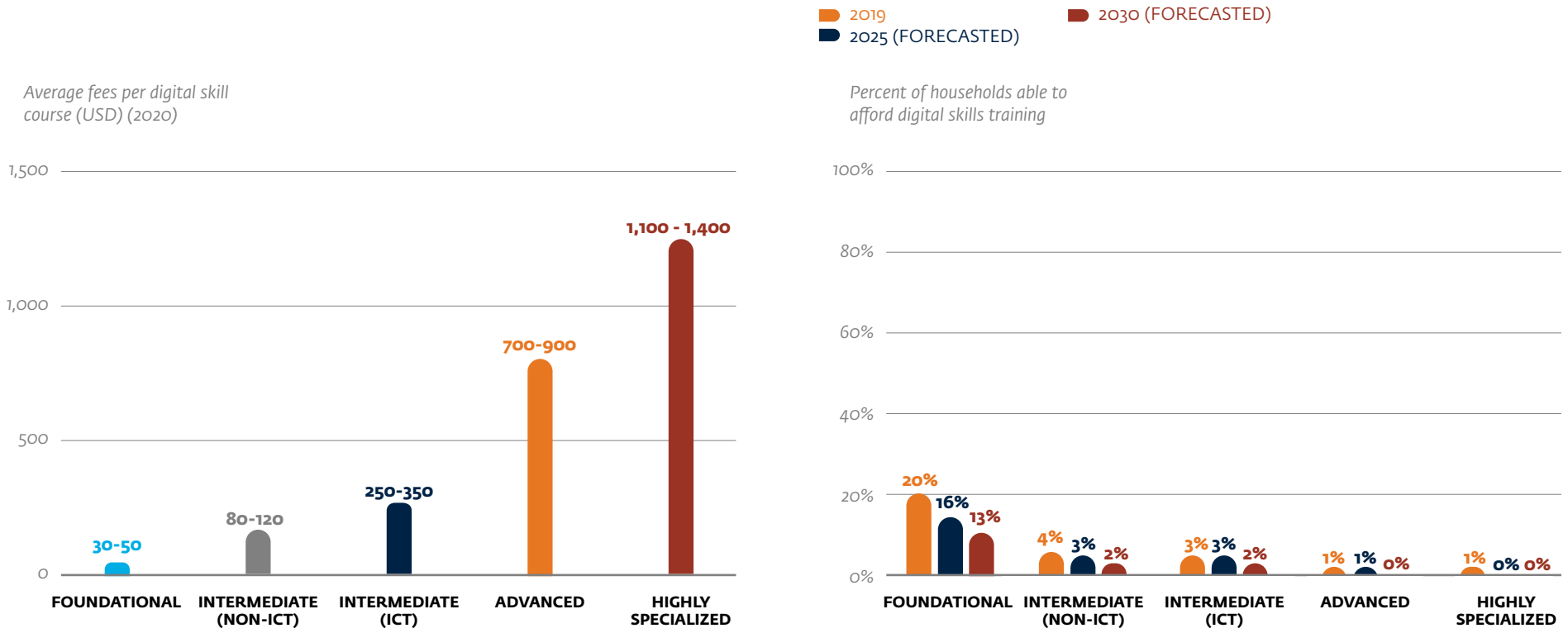


Sources: *L.E.K. research and analysis.*
Note: *The forecasted model for 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

MOZAMBIQUE

Figure 5: About 3-4 percent of households in Mozambique are expected to be able to afford digital skills training for intermediate and more advanced skills by 2030



Sources: *L.E.K. research and analysis.*
Note: *Total fees represent the fees in USD charged to consumers by businesses. The forecasted model for 2025 and 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

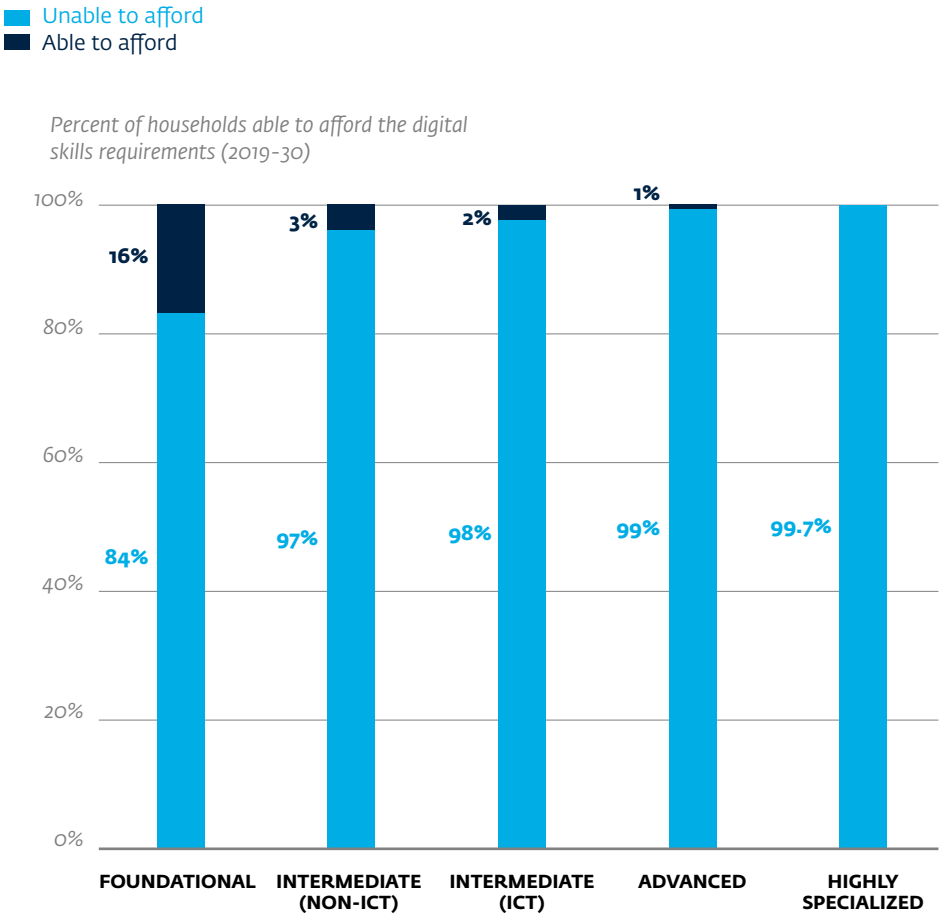
2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

Table 3: Households in Mozambique spend about 6 percent of their income on average for digital skills training for intermediate skills

	Foundational	Intermediate (non-ICT)	Intermediate (ICT)	Advanced	Highly Specialized
Type of courses offered	• ICT in farming • Basic courses in MS Excel • Basic computer courses	• Project management courses • Digital marketing courses	• Programming and database courses • IT security courses	Degree in computer science, computer systems, information systems, etc.	Master's degree in IT, information systems, etc.
Education level mapping	Primary and lower secondary	Higher secondary, post-secondary vocational		Tertiary: University and non-university	Master's, PhD
Percent of household income spent on digital skills	2-4%	2-4%	6-12%	6-12%	6-12%
Household income cutoff (2019) (USD)	~1,000	~3,000	~4,000	~8,000	~12,000

Note: *The percent of household income spent on digital skills is based on benchmarks from emerging markets.*

Figure 6: Less than 3 percent of households in Mozambique can afford to pay for the intermediate and higher digital skills trainings that will be required by 2030

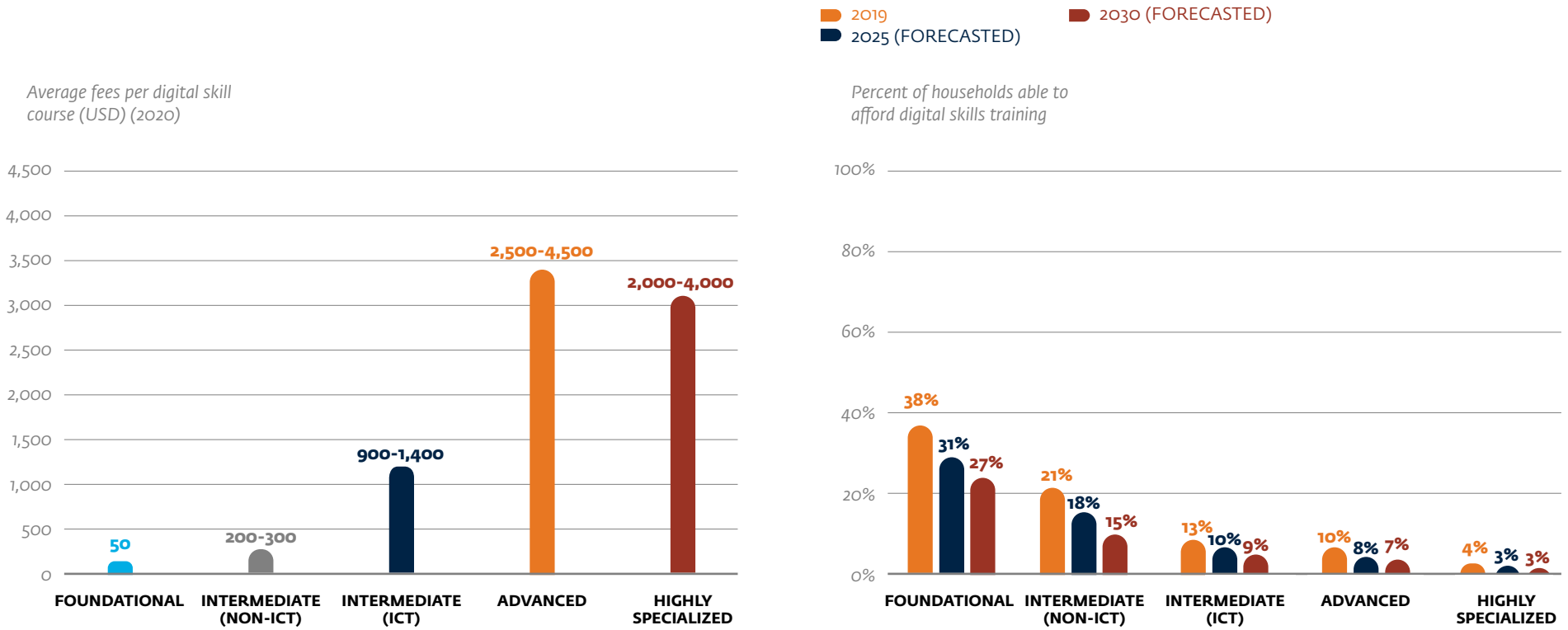


Sources: *L.E.K. research and analysis.*
Note: *The forecasted model for 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

NIGERIA

Figure 7: About 27 percent of households in Nigeria are expected to be able to afford digital skills training for foundational skills by 2030



Sources: *L.E.K. research and analysis.*
Note: *Total fees represent the fees in USD charged to consumers by businesses. The forecasted model for 2025 and 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

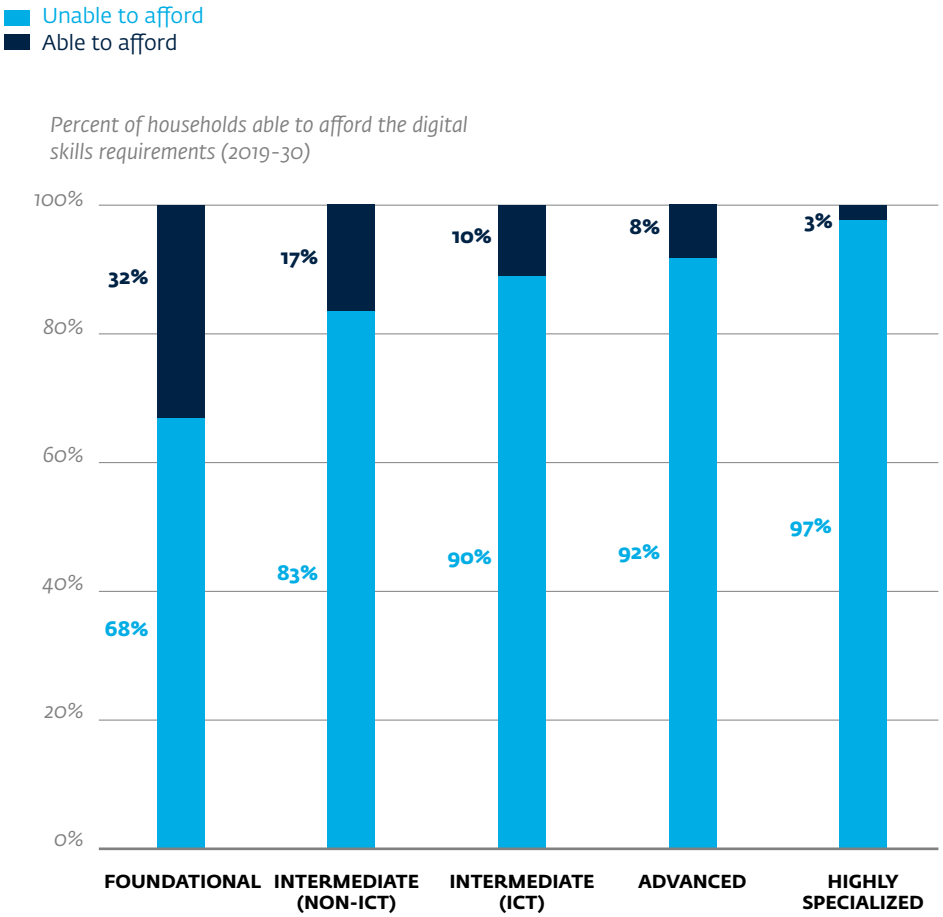
2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

Table 4: Households in Nigeria spend about 4 percent of their income on average for digital skills training for intermediate skills

	Foundational	Intermediate (non-ICT)	Intermediate (ICT)	Advanced	Highly Specialized
Type of courses offered	• ICT in farming • Basic courses in MS Office	• Social media courses • Digital marketing courses	• Programming and database courses	Degree in computer science, computer systems, and related fields	Master's degree in IT, information systems, etc.
Education level mapping	Primary and lower secondary	Higher secondary, post-secondary vocational		Tertiary: University and non-university	Master's, PhD
Percent of household income spent on digital skills	1-3%	1-3%	5-7%	5-7%	5-7%
Household income cutoff (2019) (USD)	~6,000	~8,000	~12,000	~15,000	~27,000

Note: *The percent of household income spent on digital skills is based on benchmarks from emerging markets.*

Figure 8: Less than 20 percent of households in Nigeria can afford to pay for the intermediate and higher digital skills trainings that will be required by 2030

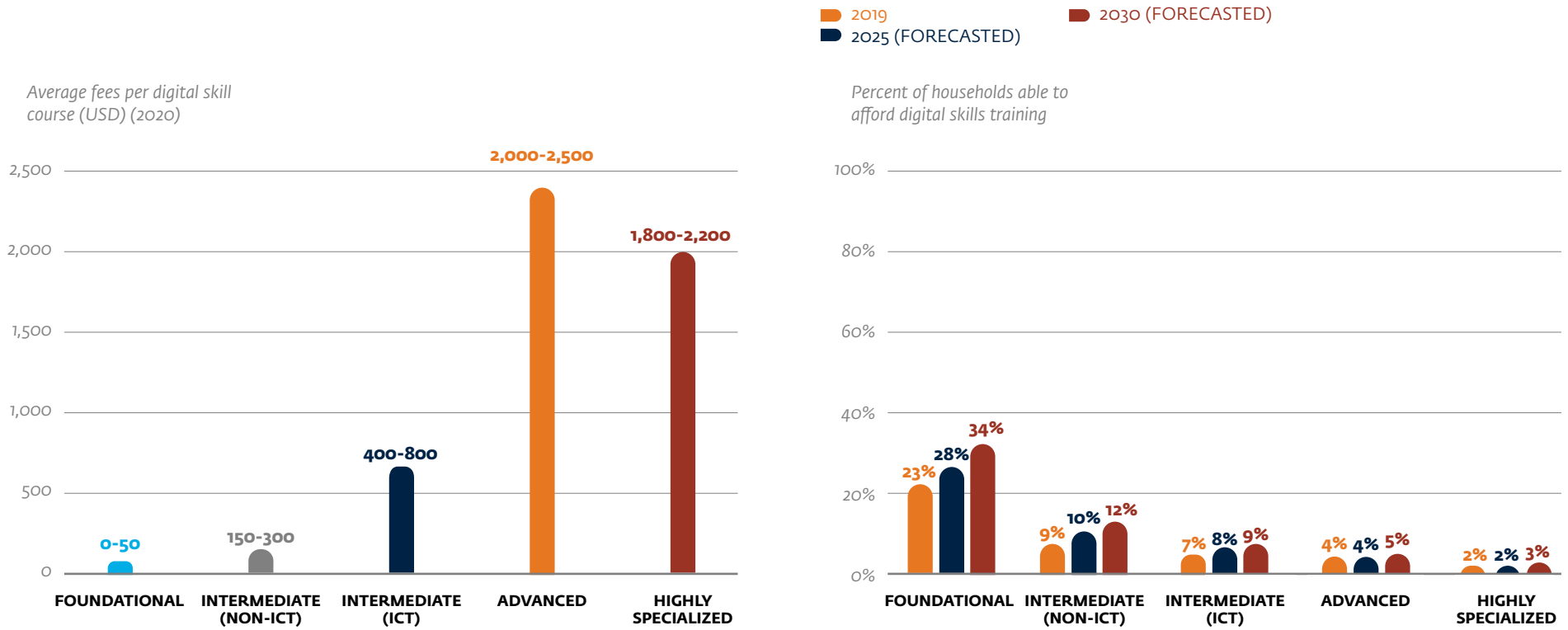


Sources: *L.E.K. research and analysis.*
Note: *The forecasted model for 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

RWANDA

Figure 9: More than 30 percent of households in Rwanda are expected to be able to afford digital skills training for foundational skills by 2030



Sources: *L.E.K. research and analysis.*
Note: *Total fees represent the fees in USD charged to consumers by businesses. The forecasted model for 2025 and 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

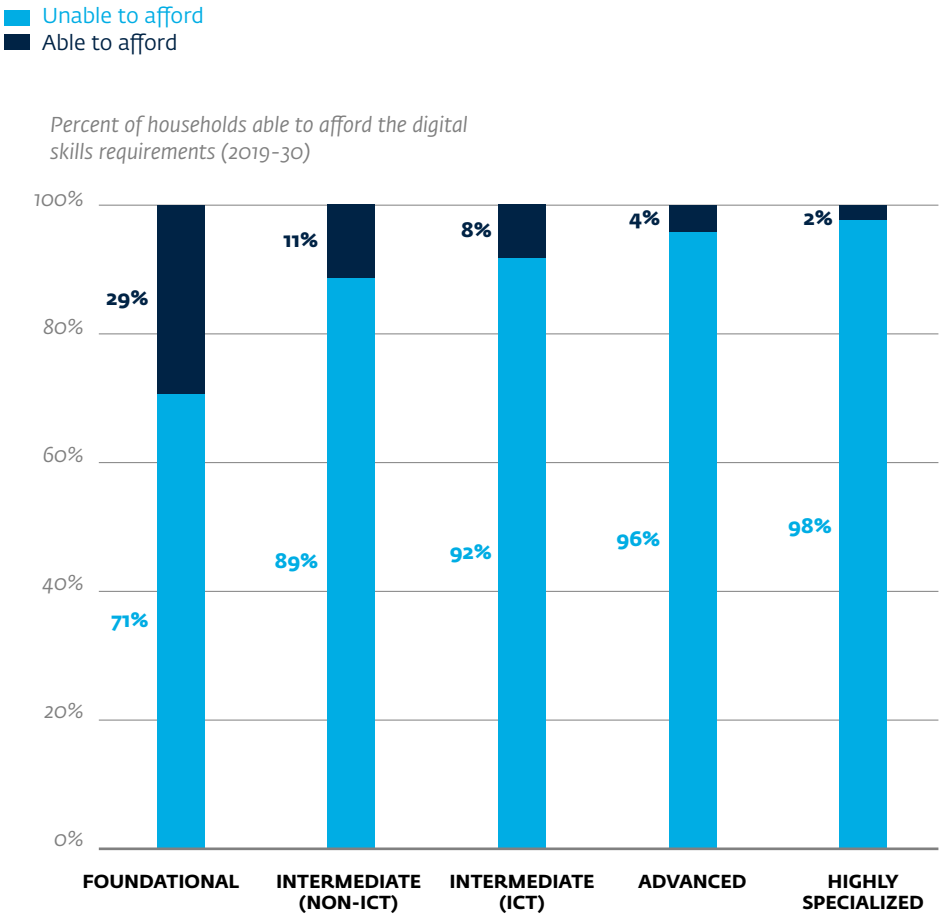
2. AFFORDABILITY OF DIGITAL SKILLS TRAININGS BY COUNTRY

Table 5: Households in Rwanda spend about 5 percent of their income on average for digital skills training for intermediate skills

	Foundational	Intermediate (non-ICT)	Intermediate (ICT)	Advanced	Highly Specialized
Type of courses offered	• ICT in farming • Basic technology usage	• Project management courses • Digital marketing courses	• Programming and database courses • Diploma in IT	Degree in computer science, computer systems and related fields	Master's degree in IT, information systems, etc.
Education level mapping	Lower secondary	Upper secondary; T-VET		Undergraduate; Non-university tertiary	Post-graduate
Program duration (years)	n/a	<1	2	4	2
Percent of household income spent on digital skills	1-3%	1-3%	5-10%	5-10%	5-10%
Household income cutoff (2019) (USD)	~3,000	~6,000	~7,000	~10,000	~14,000

Note: *The percent of household income spent on digital skills is based on benchmarks from emerging markets.*

Figure 10: Less than 15 percent of households in Rwanda can afford to pay for the intermediate and higher digital skills trainings that will be required by 2030



Sources: *L.E.K. research and analysis.*
Note: *The forecasted model for 2030 assumes that the fees will grow in line with a premium to inflation (statistics reported by Oxford Economics).*

3. PROVIDERS OF DIGITAL SKILLS TRAININGS BY COUNTRY

CÔTE D'IVOIRE

Table 1: Examples of providers for digital skills training in Côte d'Ivoire by skill level

Providers	Type of provider	Foundational	Intermediate	Advanced	Highly Specialized
UVCI	Local	✓ (MS Office)	✓ (Multimedia, digital arts)	✓ (Big data analytics)	✓ (Block-chain, cybersecurity)
BOTI Business Optimization Training Institute	Regional	✓ (Basic Adobe courses)	✓ (Graphic design)	✓ (SQL and advanced Adobe)	
theknowledgeacademy	Global	✓ (MS Office)	✓ (Digital arts)	✓ (App and web development)	
	Global	✓ (MS Office)	✓ (Digital marketing)	✓ (Big data analytics)	✓ (Machine learning, deep learning)
Invensis Global Outsourcing Services	Global			✓ (DevOps)	
CISCO Networking Academy	Global		✓ (Networking fundamentals)	✓ (Programing)	✓ (IoT-Internet of Things, routing and switching)

Non-core ICT related
Core ICT related

Source: L.E.K. research and analysis.

3. PROVIDERS OF DIGITAL SKILLS TRAININGS BY COUNTRY

KENYA

Table 2: Examples of providers for digital skills training in Kenya by skill level

Providers	Foundational	Intermediate	Advanced	Highly Specialized
computerpride	✓ (Proficiency courses)	✓ (Technical certifications)	✓ (Diploma and degree)	
moringa			✓ (Data science)	✓ (Software development)
digikids	✓ (Foundation courses)	✓ (Programming langages)		
Pwani Teknowgalz		✓ (Employable STEM skills)		
CISCO Networking Academy		✓ (Networking fundamentals)	✓ (CCNA networking associate)	✓ (Programming in C++, Python)
CfSK	✓ (Basics)	✓ (Advanced skills)	✓ (Diploma in IT)	
IBM		✓ (Design thinking)	✓ (Emerging technologies such as Cloud, AI, Data Science Cybersecurity, IOT)	✓

Non-core ICT related
Core ICT related

Sources: Government websites; blogs and company websites; L.E.K. research and analysis.

3. PROVIDERS OF DIGITAL SKILLS TRAININGS BY COUNTRY

MOZAMBIQUE

Table 3: Examples of providers for digital skills training in Mozambique by skill level

Providers	Type of provider	Foundational	Intermediate	Advanced	Highly Specialized
UNIVERSIDADE EDUARDO MONDLANE	Local	✓ (IT essentials)	✓ (Linux essentials)	✓ (Computer science and engineering)	
usfm	Local			✓ (IT systems and networks)	✓ (Software development)
ITC	Local	✓ (CCNA routing and switching)	✓ (Computer technician)	✓ (Management technician)	
TECNICOL 15 ANOS	Local	✓ (HR technician)	✓ (Basic informatics)		
theknowledgeacademy	Global	✓ (MS Office)	✓ (Social media masterclass)	✓ (Programming)	
CISCO Networking Academy	Global		✓ (Networking fundamentals)	✓ (CCNA network associate)	✓ (Programming in C++, Python)

Non-core ICT related
Core ICT related

Source: L.E.K. research and analysis.

3. PROVIDERS OF DIGITAL SKILLS TRAININGS BY COUNTRY

NIGERIA

Table 4: Examples of providers for digital skills training in Nigeria by skill level

Providers	Type of provider	Foundational	Intermediate	Advanced	Highly Specialized
Covenant University	Higher education institute		✓ (Computer graphics)	✓ (Advanced programming)	✓ (Artificial intelligence)
Anchorsoft Academy	Local	✓ (Microsoft Excel)	✓ (Software testing)	✓ (React, APIs development)	
HiiT Plc 1996	Local	✓ (Digital literacy)	✓ (IT security)	✓ (Application development)	✓ (Cloud computing)
Andela	Global		✓ (Web development)	✓ (Frameworks, libraries)	✓ (Technical team leadership)
WDC Wild Fusion Digital Centre	Regional	✓ (Email marketing)	✓ (Pay-per-click advertising)		
NIIT	Global	✓ (MS Office)	✓ (Web design)	✓ (Application development)	✓ (Enterprise project, management)
IBM, Google Digital Skills for Africa	Global	✓ (Digital literacy)	✓ (SEO and social media marketting)	✓ (Big data)	✓ (Cloud and virtualization, AI)

Non-core ICT related
Core ICT related

Source: L.E.K. research and analysis.

3. PROVIDERS OF DIGITAL SKILLS TRAININGS BY COUNTRY

RWANDA

Table 5: Examples of providers for digital skills training in Rwanda by skill level

Providers	Type of provider	Intermediate	Advanced	Highly Specialized
(Rwanda Coding Academy)	Local		✓ (Software programming)	
ALU	Local		✓ (BSc. in computer science)	
Carnegie Mellon University Africa	Local			✓ (MSc. in IT)
WeCode	Regional		✓ (Programming)	
Andela	Regional	✓ (Javascript engineer)		
2KO	Regional	✓ (Project management, IT security)		
knowledgeacademy	Global	✓ (Social media, digital arts, etc.)		
ULS	Global	✓ (Project management)		

Non-core ICT related
Core ICT related

Source: L.E.K. research and analysis.

ANNEX II:
RESEARCH APPROACH AND METHODOLOGY OF THE STUDY

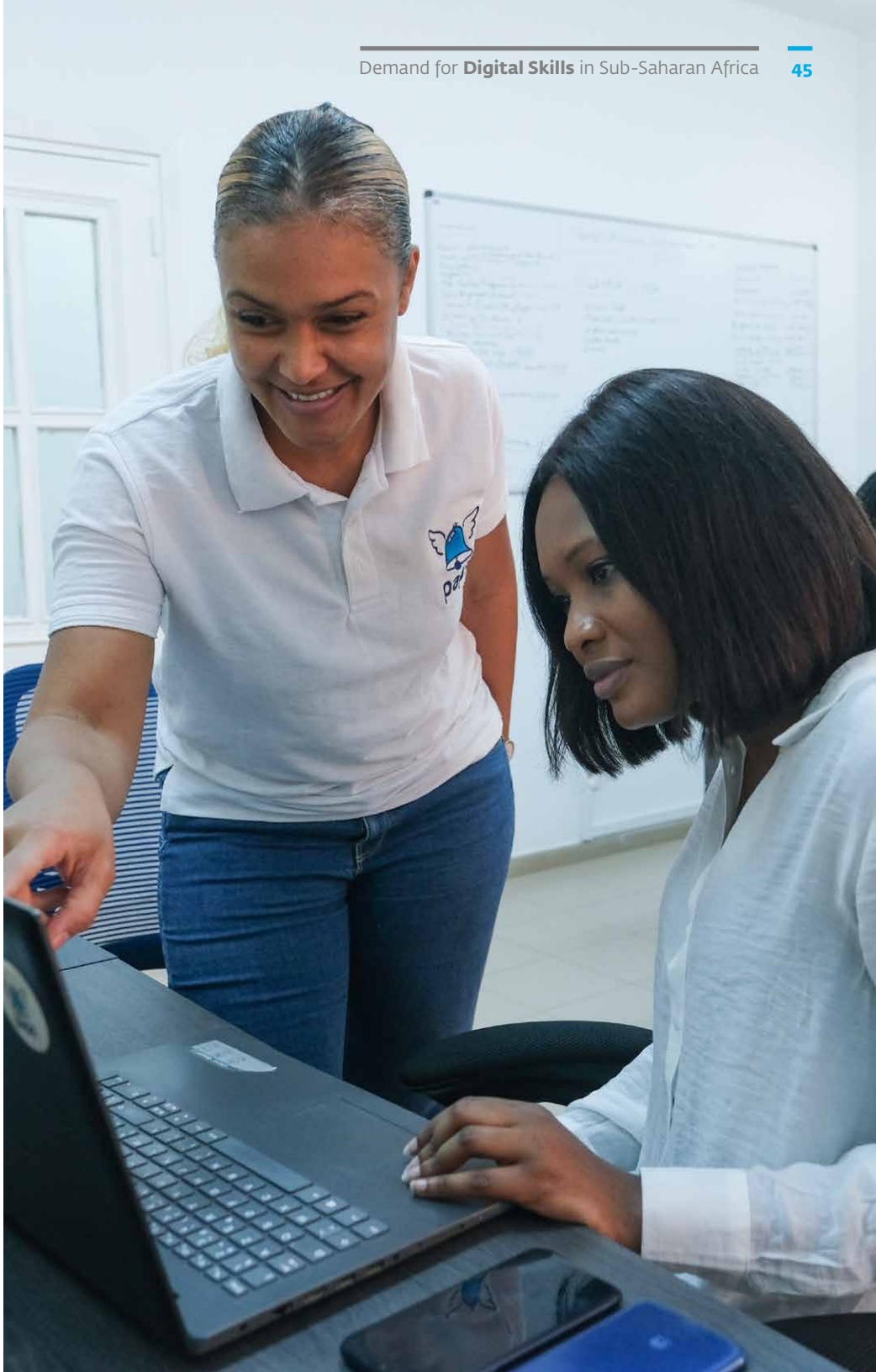
1. RESEARCH APPROACH

a. Basis of the findings: The findings in the study are based on secondary research, industry participant interviews, and L.E.K.'s past experience in the markets covered in the study.

b. Secondary data sources: Data and reports from economic databases such as Euromonitor, Oxford Economics, the International Monetary Fund, International Labor Organization, the World Bank Digital Diagnostic, government statistics databases, labor surveys, and industry research reports (from sources such as OECD, UNESCO, and Fitch Solutions) were studied.

c. Participants interviews: To understand the demand for digital skills, in-depth interviews were conducted with 20-25 industry participants across the five countries with participants having deep single or multi-sector-specific expertise and/or prior digital transformation-related experience, as well as other participants from development agencies working on digital skills.

d. Data on course tuition fees: In order to estimate the price point of each digital course by skill level, L.E.K. surveyed about 100 regional and local tertiary education providers across the five countries and built a bottom-up database through extensive secondary research (e.g. data from government ministries, secondary sources) on the scale and the tuition fees charged by the providers.



2. IDENTIFICATION OF DEMAND FOR DIGITAL SKILLS

Demand for digital skills across the five countries was determined based on the evolution of the following underlying drivers:

a. Size and growth of economy: For each country, the gross domestic product (GDP) forecast for 2030 for each of the key sectors was estimated based on projections from various economic databases such as the IMF, Oxford Economics, and Euromonitor, and was supplemented with industry participant discussions. The three key sectors identified were agriculture, industry, and services and projections were further adjusted for the impact of COVID-19.

b. Labor force requirement by sector for 2030: The labor force requirement for each sector was estimated based on the anticipated GDP by sector and historical trends in labor force productivity growth. Labor force data was drawn from government statistics and databases such as the ILO (International Labor Organisation). In addition, the number of jobs required in the technology sector in 2030 was estimated based on the expected evolution of the share of tech-related jobs in the services sector workforce by 2030 and on other mature countries, supplemented with discussions with industry participants.

c. Requirement of digital skills in the workforce anticipated for 2030 across key sectors: The study estimated current requirements and the anticipated change in digital skills requirements across three key sectors of the economy (agriculture, industry, and services). The estimates of the current and expected digital skills requirements were drawn from discussions with employers and industry participants across multiple sectors. The digital skills requirement for ICT professions was assessed based on the European e-competency framework.

d. Number of jobs requiring digital skills in 2030 by sector: The model determined the anticipated number of jobs requiring digital skills in the agriculture, industry, and services sectors by 2030. It was based on the anticipated size of the labor force, as well as the expected digital skills workforce needed across the three sectors of each economy. The expected number of jobs requiring digital skills was estimated by skill level (foundation, intermediate, advanced, and highly specialized). In addition, the anticipated number of jobs requiring higher-order digital skills in the technology sector by 2030 was also determined.

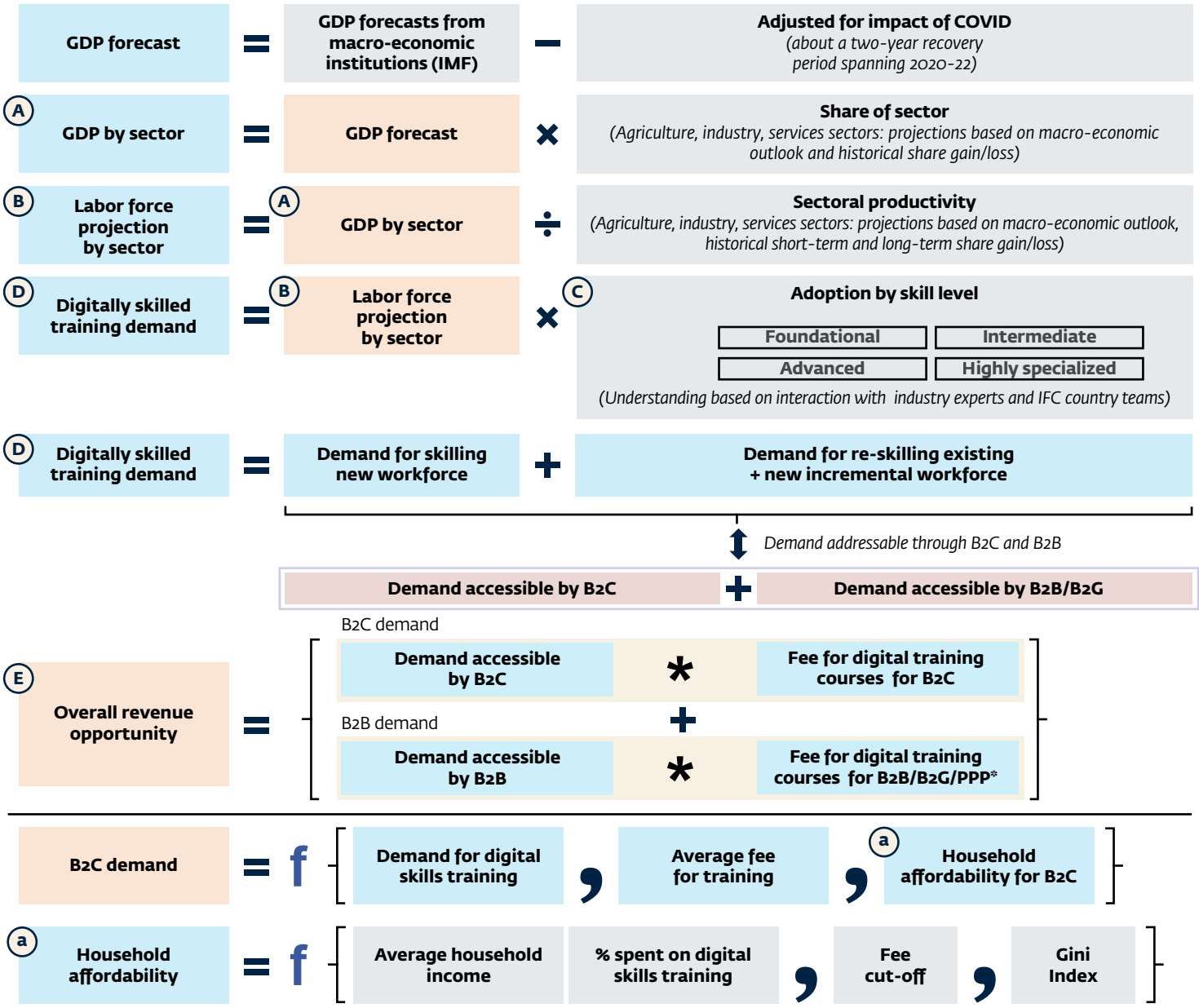
e. Training opportunity size: The study used the forecasted number of jobs requiring digital skills in 2030 by sector to estimate the digital skills training opportunity over the next decade. The cumulative opportunity includes the training needs to skill a new workforce for digital skills, to upskill the existing workforce every four to five years, and to skill the existing workforce with the latest digital skills.

f. Business-to-consumer opportunity versus business-to-business and business-to-government opportunity: Based on the household affordability for each of the skill levels, self-pay opportunity (business-to-consumer demand) was quantified. It was assumed that 1-3 percent of household spending is on skilling for foundational and intermediate (non-ICT) skills, in line with the observed benchmarks for adult skilling in markets such as China and India. For intermediate (ICT), advanced, and highly specialized skills, it was assumed that 5-10 percent of household spending could be spent on digital skills for business-to-consumer services.

g. Price of training: The price of training across skill levels was estimated by primary research on the pricing of digital skills courses currently being offered across all five countries and determining the average price corresponding to various skill levels. About 100 tertiary education providers were surveyed across the five countries.

3. METHODOLOGY FOR ESTIMATING THE POTENTIAL DEMAND FOR DIGITAL SKILLS

The demand potential for digital skills for the five countries was estimated as follows:



Source: L.E.K. research and analysis.
Note: The fee for digital training courses for B2C is based on average fees of courses by levels. The demand accessible by B2B is residual demand that remains after accounting for the demand accessible by B2C. The sources for average household income are Oxford Economics and Euromonitor. The percent spent on digital skills training is based on observed benchmarks for spending amounts on adult learning/skilling in other emerging markets such as China or India. The fee cut-off is based on the fee observed by levels. The sources for the Gini index are Oxford Economics, Euromonitor, and government databases.
*Realized pricing for B2B would be lower than B2C pricing and in line with the cost of program offering (70 percent of B2C).
B2B: business-to-business; B2G: business-to-government; B2C: business-to-consumer; PPP: public-private partnerships

4. SOURCES OF INPUTS

Metric	Data sources
GDP (including COVID-19)	• Government databases for GDP • IMF (pre-COVID and post-COVID versions) • Oxford Economics (pre-COVID and post-COVID versions) • Euromonitor • UNECA Report (for COVID) • Industry participant interviews
Labor force	• Government databases for labor • ILO statistics • Oxford Economics • World Bank statistics • Industry participant interviews
Formal vs. informal economy	• Government databases • ILO statistics • External reports on informal economies • Industry participant interviews
Adoption of digital skills	• Industry participant interviews • World Bank digital diagnostics • Government ICT policies and related documents • Regional reports on digital economy
Household expenditure on digital training	• Industry participant interviews • Savings model approach • Emerging market data from China and India for similar trainings
B2B pricing	• Industry participant interviews
% annual reskilling demand	• Industry participant interviews
Reskilling pricing	• Industry participant interviews

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